Business and Commuter Aviation Systems
Honeywell Inc.
P.O. Box 29000
Phoenix, Arizona 85038-9000
U.S.A.

TO HOLDERS OF SYSTEM MAINTENANCE MANUAL, PUB. NO. A15-1146-063,
PRIMUS® 1000 INTEGRATED AVIONICS SYSTEM
FOR THE CESSNA CITATION ULTRA

REVISION NO. 2 DATED 1 DEC 1999

HIGHLIGHTS

Revision No. 2 is a full replacement of the PRIMUS 1000 Integrated Avionics System for the Cessna Citation Ultra System Maintenance Manual, dated 30 Sep 1994, revised 1 Dec 1999. Replace your copy of the manual with the attached revision, tabs, and spine.

This revision is a complete reissue and revision bars are not used. This manual has been converted from WordPerfect to Interleaf publishing software and renamed to System Description and Operation Manual. Table 3-1 was updated to reflect Honeywell Engineering Bulletin EB7020278, Revision E. The Record of Revisions page shows Honeywell has put in the manual all revisions through Revision No. 2, dated 1 Dec 1999.

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PRIMUS® 1000
Integrated Avionics System

Cessna Citation Ultra

System Description and Operation Manual

REVISED 1 DECEMBER 1999
30 SEPTEMBER 1994

PRINTED IN U.S.A.

PUB. NO. A15-1146-063

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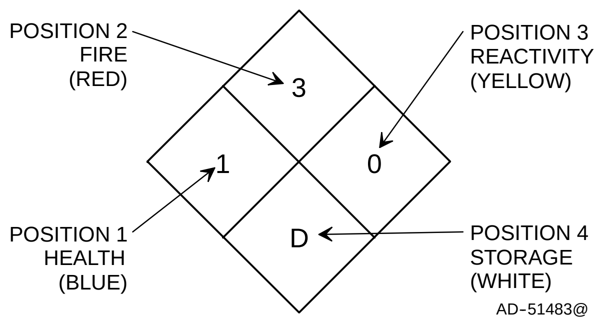
MATERIALS HAZARD RATING CODE

Honeywell uses the National Fire Protection Association system to identify the different levels of hazards that are caused by the use of a given material. A Hazard Code identifies three effects of a material on a person: health (eat, drink, touch, and breathe), fire (when and how it burns), and reactivity (chemical explosions). Also, each material is given a storage group for safety.

Each code has three numbers and one letter (for example, 130D) as shown in the Hazard Code symbol below. The three numbers show the hazard levels for health, fire, and reactivity, in that sequence. The range of each number is 0 to 4. The higher the number, the more dangerous the hazard. You must be careful with any material that has a Hazard Code with a 2, 3, or 4. The one letter (A thru E) in the code identifies a specific storage group that is applicable for the material.

If applicable, materials used for the procedures in this manual are given a Hazard Code. More data on the health and fire levels is shown on page H-2. Get specific data on a material from the data sheet supplied by the manufacturer of the material.



Hazard Code Symbol
(The code shown is 130D.)

POSITION 1: HEALTH HAZARD

- 0 No important hazard
- 1 Irritant – Use with caution
- 2 Hazardous – Prevent continued exposure, inhalation, and contact
- 3 Dangerous hazard – Use protective clothing together with protection to breathe
- 4 Very bad hazard – Do not breathe vapor or come in contact with liquid without approved special protection

POSITION 2: FIRE HAZARD

- 0 Will not burn
- 1 Must increase temperature above 93.4 °C to burn
- 2 Must increase temperature above 37.8 °C to burn
- 3 Fire and explosion hazard at ambient temperature
- 4 Highly dangerous fire and explosion hazard

POSITION 3: REACTIVITY HAZARD

- 0 Usually stable
- 1 Unstable if heated
- 2 Violent chemical change is possible
- 3 Dangerous explosion is possible
- 4 Very bad explosion hazard – quickly go out of the area if materials are exposed to fire

POSITION 4: STORAGE GROUP

- A Acids
- B Alkalis, cyanides
- C Oxidizing agents
- D Chlorinated hydrocarbons, flammable liquids, materials that are not flammable
- E Neutral salts and others

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HEALTH HAZARD RATING IN POSITION 1

Rating	Description	Effect of Exposure
4	Very bad health hazard	Very short exposures could cause DEATH or CRITICAL REMAINING INJURY even after fast medical treatment. Do not breathe the vapor or come in contact with the liquid without approved protection.
3	Dangerous health hazard	Short exposures could cause DANGEROUS TEMPORARY OR REMAINING INJURY even with fast medical aid. Use approved clothing.
2	Hazardous	Intense or continued exposure could cause TEMPORARY DISABILITY OR POSSIBLE REMAINING INJURY unless medical aid is given immediately.
1	Irritant	May cause IRRITATION on exposure. Only SMALL REMAINING INJURY would be the result without medical treatment. Safety glasses must be worn.
0	No important health hazard	Not hazardous for usual conditions. Special personal protection is not necessary.

FIRE HAZARD RATING IN POSITION 2

Rating	Description	Effect of Exposure
4	Very flammable	Any liquid or gaseous material that is a liquid under pressure with a flash point below 22.8 °C. Also materials that can form explosive mixtures with air, such as dusts or combustible solids, and pressurized small drops of flammable or combustible liquid. PREVENT ALL SOURCES OF IGNITION. NO SMOKING PERMITTED!
3	Highly flammable	Liquids and solids that can start to burn in almost all conditions of ambient temperature. Liquids with a flash point at or above 22.8 °C but below 37.8 °C. Control all sources of ignition. NO SMOKING!
2	Moderately combustible	Materials that must be warm or in an area open to high temperatures before ignition can occur. This rating is applicable to liquids having a flash point above 37 °C but below 93.4 °C. Be very careful when near a source of heat.
1	Lightly combustible	Materials that must be hot before ignition can occur. This rating includes materials that will burn in air in an area open to a temperature of 815 °C for 5 minutes or less. Liquids and solids have a flash point at or above 93.4 °C.
0	Will not burn	Any material that will not burn in air in an area open to a temperature of 815 °C for 5 minutes.

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1	1 Jul 1995	1 Jul 1995	HI
2	1 Dec 1999	1 Dec 1999	HI

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INTRODUCTION

1. General

The purpose of this manual is to help you operate, maintain, and troubleshoot the PRIMUS 1000 Integrated Avionics System to the Line Replaceable Unit (LRU) level.

Common system maintenance procedures are not presented in this manual. The best established shop and flight line practices should be used.

2. Reference Documents

Additional information on subsystems installed as part of the PRIMUS 1000 Integrated Avionics System is available in the following publications:

Document Title	Honeywell Publication Number
PRIMUS® 1000 Integrated Avionics Pilot's Manual	A28–1146–099
PRIMUS® 650 Weather Radar Pilot's Manual	A28–1146–48
PRIMUS® 650 Weather Radar System Description and Installation Manual	A09–3941–01
PRIMUS® 870 Weather Radar Pilot's Manual	A28–1146–56
PRIMUS® 870 Weather Radar System Description and Installation Manual	A09–3946–01I
PRIMUS® 660 Weather Radar Pilot's Manual	A28-1146-111
PRIMUS® 880 Weather Radar Pilot's Manual	A28-1146-102
PRIMUS® 660/880 Weather Radar System Description and Installation Manual	A09-3944–001
PRIMUS® II Integrated Radio System Pilot's Manual	A28–1146–50
PRIMUS® II Integrated Radio System Operation and Installation Manual	A15–3800–01
PRIMUS® II Integrated Radio System Event Codes Pocket Guide	A04–3800–01
RCZ–850 Module Installation Instructions	62–0097–000–02
RNZ–850 Module Installation Instructions	62–0096–000–02
Handling, Storage, and Shipping Instruction Manual	A09–1100–01
System Test and Fault Isolation Manual	A15–1146–075
Electronic Programmable Checklist	A35–3642–002–01

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3. How This Manual Is Organized

The material in this manual has been arranged so that experienced maintenance and service personnel can refer directly to those sections that relate to their work, while the less experienced reader will find the manual a valuable introduction to the PRIMUS 1000 Integrated Avionics System. This manual is organized into seven (7) sections as follows.

A. Section 1 - System Overview

The purpose of this section is to give the reader a brief overview of how the entire PRIMUS 1000 Integrated Avionics System is organized, define terms used in the sections that follow, and to serve as a guide for further study of these sections. The numerous digital data buses used within the PRIMUS 1000 system are also discussed here.

B. Section 2 - System Description

This section is divided into seven subsections that provide information about Honeywell manufactured subsystems for the PRIMUS 1000 Integrated Avionics System. Each subsection describes the function and interface of the LRUs of each subsystem, as well as subsystem operation and cockpit displays. Block diagrams of subsystem interface, figures, and tables are included as an aid to understanding system operation. The seven subsections are as follows:

- **Section 2.1 – Electronic Display System**
- **Section 2.2 – Attitude and Heading Reference System**
- **Section 2.3 – ADZ–850 Micro Air Data System**
- **Section 2.4 – PRIMUS® Weather Radar System**
- **Section 2.5 – PRIMUS® II Integrated Radio System**
- **Section 2.6 – Flight Director System**
- **Section 2.7 – Autopilot/Yaw Damper System.**

C. Section 3 - System Interconnects

This section provides wiring data for the PRIMUS 1000 Integrated Avionics System This information is provided as an aid for troubleshooting, should a failure occur during flight or ground test.

D. Section 4 - Maintenance Practices

This section describes the procedures to remove and reinstall the Honeywell LRUs. Procedures are also provided to replace lamps, set screws, and knobs. Where applicable, adjustment data is also provided. This section is divided into paragraphs that are in alphabetical order according to the unit type designator.

E. Section 5 - Shipping/Handling and Storage

This section refers to manual, Honeywell Pub. No. 09–1100–01, which contains Information on shipping/handling and storage of all system components.

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F. Section 6 - Honeywell Support

This section briefly describes Honeywell's worldwide exchange/rental program (commonly referred to as SPEX) for spares. Phone numbers and addresses of Honeywell's support centers are also included for your convenience.

G. Section 7 - System Test and Fault Isolation

This section references Honeywell Pub. No. A15–1146–075 that contains the ground maintenance test procedures. Use these procedures to check the components of the PRIMUS 1000 Integrated Avionics System for correct installation and proper operation. Procedures for retrieving event codes are also included.

4. Critical Items Compliance

NOTICE

**CRITICAL ITEMS
COMPLIANCE REQUIRED**

Honeywell has an Airworthiness Analysis procedure performed for all its airborne equipment to make sure that equipment will not cause a dangerous in–flight condition. As a result of the analysis, specific critical parts, some steps of assembly, and some tests are identified as installation critical. Complete agreement with these procedures and tests is necessary to get the approved results, certain installations have been designated INSTALLATION CRITICAL, and 100 percent compliance with those installations is required.

The clearance between the keeper pins and the drum brackets, and the diameter of the aircraft control cables are designated INSTALLATION CRITICAL.

Measuring the distance between the keeper pins and the servo drum bracket for proper clearance, and verifying the diameter of the aircraft control cables are critical to avoid failures that could cause a dangerous flight condition. Specific methods of installation are required to ensure that jamming of the cable by the keeper and drum is extremely improbable.

Refer to the MAINTENANCE PRACTICES instructions in this manual for procedures on how to verify the keeper and drum clearance, and cable diameter.

5. Weights and Measurements

Weights and measurements in this manual use both U.S. and S.I. (metric) values.

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6. Acronyms and Abbreviations

The letter symbols for abbreviations are the same as shown in ANSI/IEEE Std 260 and ASME Y1.1, except as identified in the acronyms and abbreviations table.

Acronyms and Abbreviations Table

Term	Definition
ac	Alternating Current
ACT	Attitude Compensated Tilt
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
AFCS	Automatic Flight Control System
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
ALT	Altitude
AMM	Aircraft Maintenance Manual
ANSI	American National Standards Institute
AOA	Angle Of Attack
ARINC	Aeronautical Radio, Incorporated
ASCII	American Standard for Information Exchange
ASEL	Altitude Preselect
ATCRBS	Air Traffic Control Radar Beacon System
ATT	Attitude
AUX	Auxiliary
AZ	Azimuth
Baro	Barometric
BC	Back Course
BCD	Binary Coded Decimal
CAIMS	Central Aircraft Information/Maintenance System
CCA	Circuit Card Assembly
CCW	Counterclockwise
CDH	Clearance Delivery Control Head
CH	Channel
COM	Communication
CP	Cross Pointer
CPU	Central Processor Unit
CRC	Cyclic Redundancy Check
CRS	Course Select

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Acronyms and Abbreviations Table (cont)

Term	Definition
CRT	Cathode Ray Tube
CSDB	Commercial Standard Digital Bus
CW	Clockwise
dc	Direct Current
DFGS	Digital Flight Guidance System
DH	Decision Height
DIST	Distance
DME	Distance Measuring Equipment
DTRK	Desired Track
DU	Display Unit
EDS	Electronic Display System
EEPROM	Electrically Erasable Programmable Read-Only Memory
EFIS	Electronic Flight Instrument System
EIA	Electronic Industries Association
EMI	Electromagnetic Interference
ESCI	Enhanced Serial Control Interface
ET	Elapsed Time
FAA	Federal Aviation Administration
FD	Flight Director
FDS	Flight Director System
FGS	Flight Guidance System
FL	Flight Level
FP	Flight Plan
FSBY	Forced Standby
GA	Go-Around
GAMA	General Aviation Manufacturers Association
GCR	Ground Clutter Reduction
GHz	Gigahertz
GMAP	Ground Mapping
GS	Glideslope
GSPD	Ground Speed

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Acronyms and Abbreviations Table (cont)

Term	Definition
HDG	Heading
HDLC	High Level Data Link Control
HDPH	Headphone
HF	High Frequency
HMN	Honeywell Material Number
hPa	Pressure in Hectopascals
HSI	Horizontal Situation Indicator
Hz	Hertz
I/O	Input/Output
IAC	Integrated Avionics Computer
IAS	Indicated Airspeed
ICB	Integrated Computer Bus
IDENT	Identifier
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
ILS	Instrument Landing System
inHg	Pressure in Inches of Mercury
INPH	Interphone
ISO	International Standards Organization
JAA	Joint Airworthiness Authorities (European)
kHz	Kilohertz
LOC	Localizer
LRN	Long Range Navigation
LRU	Line Replaceable Unit
LSB	Least Significant Bit
MADC	Micro Air Data Computer
MDA	Minimum Descent Altitude
MDS	Minimum Discernible Signal
MFD	Multifunction Display
MHz	Megahertz

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Acronyms and Abbreviations Table (cont)

Term	Definition
MKR	Marker
MLS	Microwave Landing System
MPEL	Maximum Permissible Exposure Level
MSB	Most Significant Bit
MSG	Message
NAV	Navigation
NM	Nautical Mile
NRZ	Non–Return–to–Zero
OSS	Over Station Sensor
PAST	Pilot–Activated Self–Test
PFD	Primary Flight Display
PN	Part Number
POST	Power–On Self–Test
PRF	Pulse Repetition Frequency
PTT	Push–To–Talk
RA	Resolution Advisory
REACT	Rain Echo Attenuation Compensation Technique
RF	Radio Frequency
RMU	Radio Management Unit
RSB	Radio System Bus
RTA	Receiver Transmitter Antenna
RX	Receive
SAT	Static Air Temperature
SBY	Standby
SC	Single Cue
SCI	Serial Control Interface
SDI	Source/Destination Identifier
SEL	Select
SG	Symbol Generator
SLV	Slave

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Acronyms and Abbreviations Table (cont)

Term	Definition
SPD	Speed
SRN	Short Range Navigation
SSEC	Static Source Error Correction
STAB	Stabilization
STC	Sensitivity Time Control
STD	Standard
TA	Traffic Advisory
TAS	True Airspeed
TAT	Total Air Temperature
TCAS	Traffic Alert and Collision Avoidance System
TCS	Touch Control Steering
TEMP	Temporary
TGT	Target
TOC	Top Of Climb
TOD	Top Of Descent
TRB	Turbulence
TST	Test
TTG	Time-To-Go
TTL	Tuned-To-Localizer
TX	Transmit
V	Volts
VANG	Vertical Angle
VAR	Variable
VHF	Very High Frequency
VLSI	Very Large Scale Integration
VOR	Very High Frequency Omnidirectional Range

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Acronyms and Abbreviations Table (cont)

Term	Definition
WC	Weather Radar Control
WX	Weather
WXPD	Weather Radar Picture Data
XSTC	Extended Sensitivity Time Control
YD	Yaw Damper

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TABLE OF CONTENTS – SECTION 1

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SECTION 1
SYSTEM OVERVIEW

1. General

The PRIMUS 1000 is a completely integrated autopilot, yaw damper, flight director, and Electronic Display System (EDS) (Figure 1–1). The PRIMUS 1000 has a full complement of horizontal and vertical flight director modes. These include all radio guidance modes, Long Range Navigation (LRN) system tracking, and air data oriented vertical modes. Key features of this integrated avionics system are given below:

- Flight director, autopilot, autopilot monitoring, yaw damper, and trim functions integrated into a single airborne computer
- Electronic Display System
- Micro Air Data Computers
- Attitude and Heading Reference System
- Automatic Fault Reporting
- Weather Radar
- Traffic Alert and Collision Avoidance System (TCAS) compatible interface
- Nonintrusive monitoring of sensor data during on–ground maintenance
- Radio System (optional).

Three–axis aircraft attitude stabilization and path control are provided for optimum performance throughout the aircraft's normal flight regime. The automatic path mode commands (flight director) are generated by the IC–600 Integrated Avionics Computer (IAC), which integrates the attitude and heading reference and air data functions into a complete aircraft control system. The system uses two IC–600 IACs, one with autopilot capability and one without. The IC–600 IACs are interconnected with a serial digital data bus (IC Bus). This and other interconnections allow either pilot to couple the other's flight display to the autopilot system for control of the aircraft.

NOTE: The left side subsystems and right side subsystems of the aircraft are designated No. 1 and No. 2, respectively. This applies to all avionics systems installed, including flight guidance, electronic displays, radios, gyros, etc.

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The PRIMUS 1000 also has provisions for Input/Output (I/O) and data management with external radio communication and navigation systems through digital/serial data bus interfaces. The system interface for the radio sensor packages on this aircraft is compatible with Honeywell PRIMUS II radios and GAMA standard ARINC specification 429. Additional data management activities that cross the boundaries of the functions listed above, include system monitoring, self–test, failure annunciation, and a system interface (IC bus) between the two IACs.

The PRIMUS 1000 is derived from a combination of existing Honeywell systems. Table 1–1 gives the components and part numbers that make up a standard system and Table 1–2 gives the optional equipment. Table 1–3 lists equipment required but not supplied by Honeywell. Figure 1–2 and Figure 1–2 show the approximate component locations for a typical installation. Figure 1–4 is a front view of the circuit breaker panel and is provided for reference purposes only.

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Table 1-1. System Components

System Component	Qty	Part Number	Honeywell A/C Conn Reference Designator	Cessna A/C Conn Reference Designator
VG-14 Vertical Gyro	2	7000622-901	1/C1	PN375/PN376
FX-220 Flux Valve	2	2594484	4/C4	UH305/UH306
CS-412 Dual Remote Compensator	1	2593379-1	5	PF317/PF318
C-14D Directional Gyro	2	4020577-3	6/C6	PN373/PN374
MS-560 Mode Selector	2	7018341-903	8/C8	PI325/PI326
MS-560 Mode Selector (With Enlarged Annunciators)	2	7018341-907	8/C8	PI325/PI326
MS-560 Mode Selector (With BC Button, Phase III)	2	7018341-801	8/C8	PI325/PI326
AZ-850 Micro Air Data Computer	2	7014700-905	9/C9	PN371/PN372
PC-400 Autopilot Controller	1	7003897-907	11	PI340
PC-400 Autopilot Controller (With Pitch Wheel Guards)	1	7003897-923	11	PI340
SM-200 Servo (Aileron)	1	4006719-906	12	PC301
SB-201 Servo Bracket	1	4005842	12A	N/A
SM-200 Servo (Elevator)	1	4006719-904	13	PT303
SB-201 Servo Bracket	1	4005842	13A	N/A
SM-200 Servo (Rudder)	1	4006719-906	14	PT301
SB-201 Servo Bracket	1	4005842	14A	N/A
RG-204 Rate Gyro	1	7007453-903	15	PN379
AG-222 Accelerometer	2	7000992	17/C17	PN377/PN378
RI-553 Remote Instrument Controller	1	7016954-903	23	PI420
RI-553 Remote Instrument Controller (With Push to Sync, Phase III)	1	7016954-907	23	PI420
WU-650 Weather Radar Receiver Transmitter Antenna	1	7008470-922	59	PN866

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Table 1-1. System Components (cont)

System Component	Qty	Part Number	Honeywell A/C Conn Reference Designator	Cessna A/C Conn Reference Designator
WU-650 Weather Radar Receiver Transmitter Antenna (With EMI Mods)	1	7008470-822	59	PN866
WU-660 Weather Radar Receiver Transmitter Antenna	1	7021450-601	59	PN866
WC-650 Weather Radar Controller	1	7008471-607	61	PI881
WC-660 Weather Radar Controller	1	7008471-667	61	PI881
DC-550 Display Controller (With SC/CP and ADC Button)	2	7016986-707	115/C115	PI417/PI418
DC-550 Display Controller (With ADC Button and no SC/CP Button)	2	7016986-607	115/C115	PI417/PI418
DC-550 Display Controller (With no SC/CP and ADC Button and a IN/HPA Button, Phase III)	2	7016986-611	115/C115	PI417/PI418
MC-800 MFD Controller	1	7007062-939	126	PI421
DU-870 Display Unit (PFD)	2	7014300-901	130/C130	PI423/PI424
DU-870 Display Unit (MFD)	1	7014300-901	131	PI422
BL-870 PFD Bezel Controller (With Inclinometer and IN/PHA Button)	2	7014331-921	N/A	N/A
BL-870 PFD Bezel Controller (With Inclinometer and no IN/PHA Button, Phase III)	2	7014331-931	N/A	N/A
BL-871 MFD Bezel Controller (With Buttons)	1	7014332-941	N/A	N/A
BL-871 MFD Bezel Controller (With Buttons and Lighted Knob Rings)	1	7014332-841	N/A	N/A

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Table 1-1. System Components (cont)

System Component	Qty	Part Number	Honeywell A/C Conn Reference Designator	Cessna A/C Conn Reference Designator
RCZ-851F Integrated Comm Unit (Diversity Mode S)	2	7510700-807	143/C143	PT521 (TAILCONE) PN528 (NOSE) / PN518
RM-850 Radio Management Unit	2	7012100-801	144/C144	PI627/PI628
AT-860 ADF Antenna	1	7510300-901	158	PC603
AV-850A Audio Panel	2	7511001-913	160/C160	J1-PI565 J2-PI567/ J1-PI564 J2-PI566
DI-851 DME Indicator	1	7513006-911	163/C163	PI809/PI810
RNZ-850 Integrated Navagation Unit (VOR/DME/ADF)	1	7510100-921,-931	164	J1A/J1B-PT611/ PT612 (TAILCONE) J1A/J1B-PN631/ PN632 (NOSE)
RNZ-850B Integrated Navigation Unit (VOR/DME)	1	7510100-923, -933	C164	J1A-PN622 J1B-PN623
CD-850 Clearance Delivery Control Head (CDH)	1	7513000-805	165	PI563
IC-600 Integrated Avionics Computer (SG/FD/AP and no TCAS)	1	7017000-80151	190	J1A-PN363 J1B-PN365 J2A-PN367 J2B-PN369
IC-600 Integrated Avionics Computer (SG/FD/AP and TCAS Function)	1	7017000-80152	190	J1A-PN363 J1B-PN365 J2A-PN367 J2B-PN369
IC-600 Integrated Avionics Computer (Without AP/TCAS Function)	1	7017000-81151	C190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370

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Table 1-1. System Components (cont)

System Component	Qty	Part Number	Honeywell A/C Conn Reference Designator	Cessna A/C Conn Reference Designator
IC-600 Integrated Avionics Computer (Without AP and with TCAS Function)	1	7017000-81152	C190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370
IC-600 Integrated Avionics Computer (SG/FD/AP and no TCAS, Phase II Improvements)	1	7017000-80153	190	J1A-PN363 J1B-PN365 J2A-PN367 J2B-PN369
IC-600 Integrated Avionics Computer (SG/FD/AP and TCAS Function, Phase II Improvements)	1	7017000-80154	190	J1A-PN363 J1B-PN365 J2A-PN367 J2B-PN369
IC-600 Integrated Avionics Computer (Without AP/TCAS Function, Phase II Improvements)	1	7017000-81153	C190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370
IC-600 Integrated Avionics Computer (Without AP and with TCAS Function, Phase II Improvements)	1	7017000-81154	C190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370
IC-600 Integrated Avionics Computer (SG/FD/AP and no TCAS, Phase III Improvements)	1	7017000-80155	190	J1A-PN363 J1B-PN365 J2A-PN367 J2B-PN369
IC-600 Integrated Avionics Computer (SG/FD/AP and TCAS Function, Phase III Improvements)	1	7017000-80156	190	J1A-PN363 J1B-PN365 J2A-PN367 J2B-PN369
IC-600 Integrated Avionics Computer (Without AP/TCAS Function, Phase III Improvements)	1	7017000-81155	C190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370

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Table 1-1. System Components (cont)

System Component	Qty	Part Number	Honeywell A/C Conn Reference Designator	Cessna A/C Conn Reference Designator
IC-600 Integrated Avionics Computer (Without AP and with TCAS Function, Phase III Improvements)	1	7017000-81156	C190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370
VC-35A U.S. Army Ultra IC-600 Integrated Avionics Computer (With SG/FD/AP with TCAS)	1	7017000-80158	190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370
VC-35A U.S. Army Ultra IC-600 Integrated Avionics Computer (With SG/FD with TCAS)	1	7017000-81158	C190	J1A-PN364 J1B-PN366 J2A-PN368 J2B-PN370

Table 1-2. Optional System Components

System Component	Qty	Part Number	Honeywell A/C Conn Reference Designator	Cessna A/C Conn Reference Designator
WU-870 Weather Radar Receiver Transmitter Antenna	1	7012640-921	59	PN866
WU-880 Weather Radar Receiver Transmitter Antenna	1	7021450-801	59	PN866
WC-870 Weather Radar Controller	1	7008471-803	61	PI881
WC-880 Weather Radar Controller	1	7008471-407	61	PI881
DC-550 Display Controller (With a IN/HPA Button, no ADC Button, and Dual FMS)	2	7016986-723	115/C115	PI417/PI418
MC-800 MFD Controller (With TCAS Button)	1	7007062-941	126	PI421

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Table 1-3. Equipment Required but not Supplied by Honeywell

Designation and Function	Qty Required	Description	Recommended Source
Directional Gyro Free/Slave Switch S2	1/DG	SPST toggle, rated at 1/2 ampere, inductive	
Fast Erect Switch S1	1/VG	SPST momentary pushbutton, rated at 1/2 ampere, inductive	MS35058-26
Directional Gyro Manual Sync Switch S3	1/DG	SPDT momentary, toggle with center OFF, 1/2 ampere rating	
Pilot's AP Disconnect Switch S4	1	Normally Closed/Open, rated at 28 V, 3 amperes, inductive	
Copilot's AP Disconnect Switch S5	1	Normally Closed/Open, rated at 28 V dc, 3 amperes, inductive	
Pilot's Touch Control Steering (TCS) Switch S6	1	Momentary SPST, normally open, 1/2 ampere rating at 28 V	Controls Co. of America Series B9000
Copilot's Touch Control Steering (TCS) Switch S7	1	Momentary SPST, normally open, 1/2 ampere rating at 28 V	Controls Co. of America Series B9000
Go-Around (GA) Switch S8	1	Momentary SPST, normally open, 1/2 ampere rating at 28 V	Controls Co. of America Series B9000
Flap Switch S10	1	SPST	
Speed Brake Switch S11	1	SPST	
Weight-On-Wheels (WOW) Switch S12	1	SPST	
Trim Transfer Relays K1 and K2	2	DPDT, rated at 28 V dc, 3 amperes, inductive	
NAV 2 Select Relay K3	1	SPDT, 28 V dc, activation current ≤ 130 ma	

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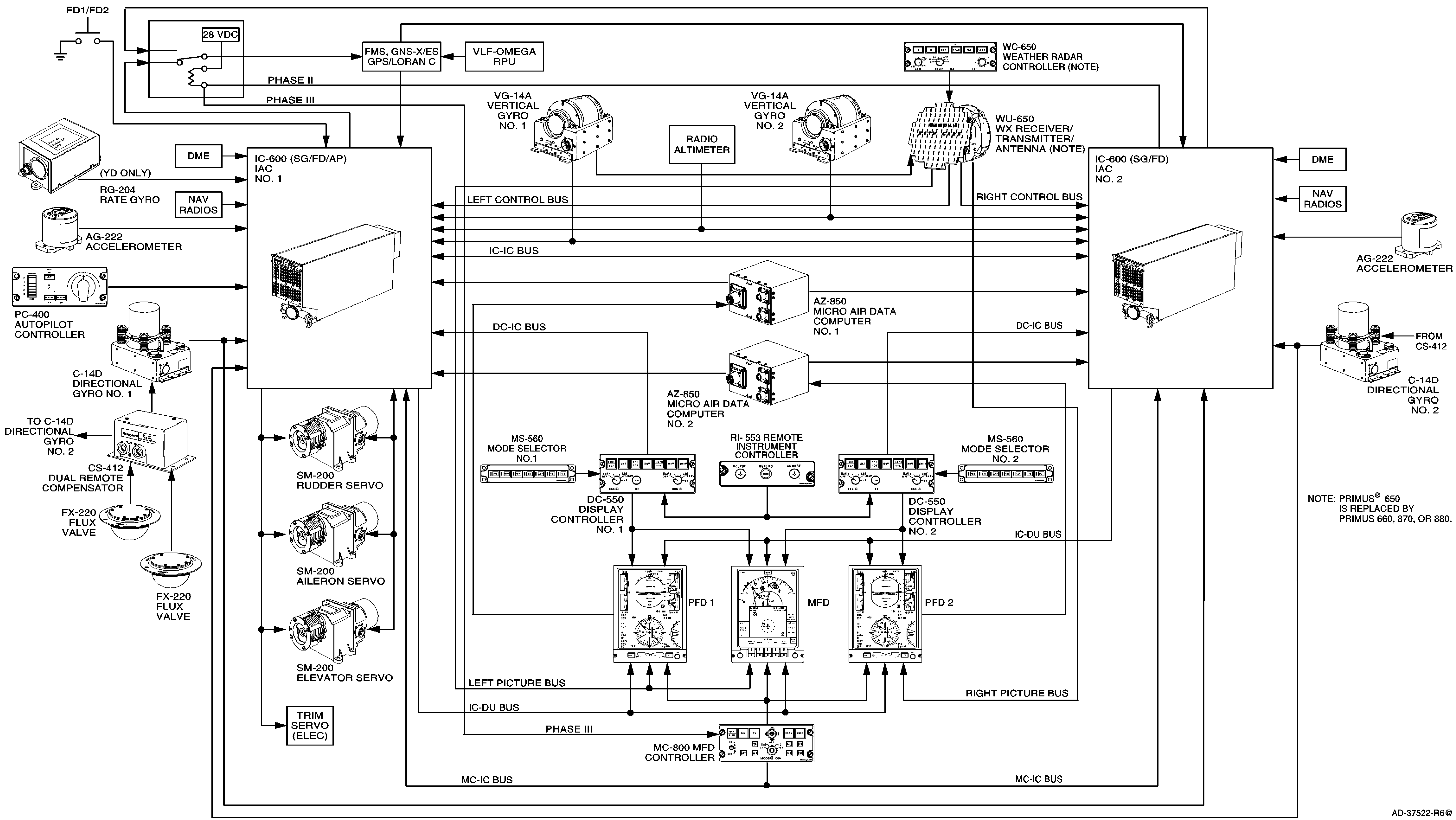

Figure 1-1. PRIMUS 1000 Integrated Avionics System Flow Diagram

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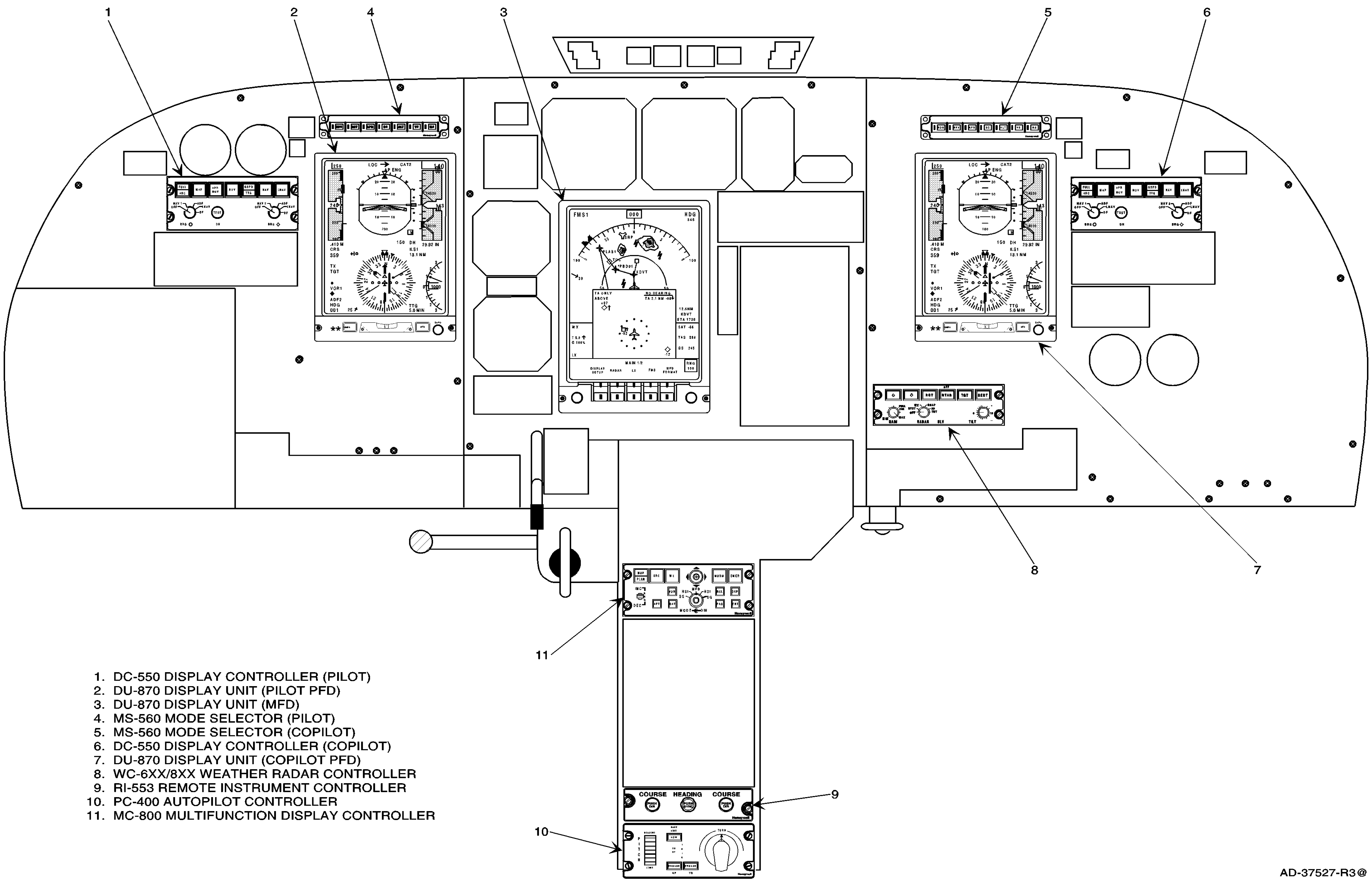

1. DC-550 DISPLAY CONTROLLER (PILOT)
2. DU-870 DISPLAY UNIT (PILOT PFD)
3. DU-870 DISPLAY UNIT (MFD)
4. MS-560 MODE SELECTOR (PILOT)
5. MS-560 MODE SELECTOR (COPILOT)
6. DC-550 DISPLAY CONTROLLER (COPILOT)
7. DU-870 DISPLAY UNIT (COPILOT PFD)
8. WC-6XX/8XX WEATHER RADAR CONTROLLER
9. RI-553 REMOTE INSTRUMENT CONTROLLER
10. PC-400 AUTOPILOT CONTROLLER
11. MC-800 MULTIFUNCTION DISPLAY CONTROLLER

Figure 1-2. Instrument Panel Component Locations

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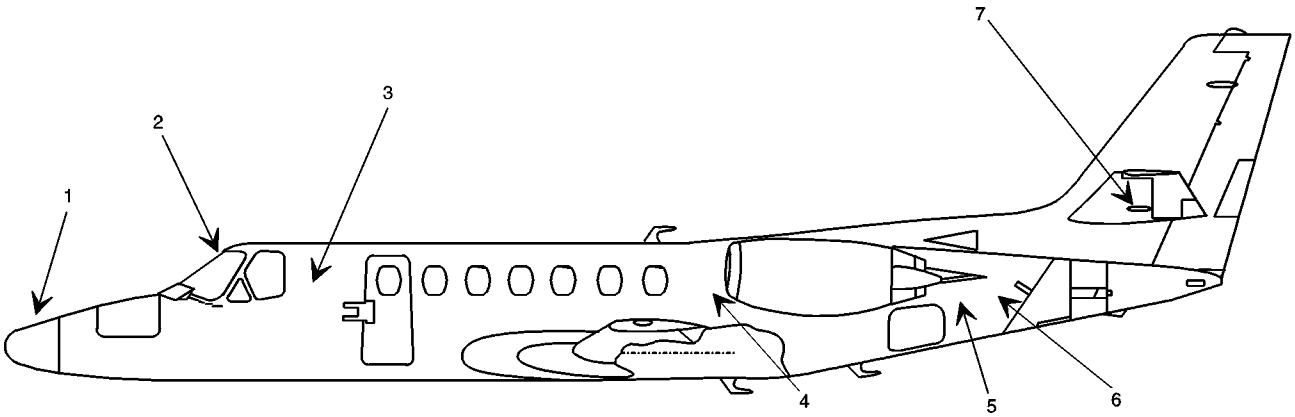

1. NOSE COMPARTMENT COMPONENTS:
   - IC-600 IAC
   - VG-14A VERTICAL GYRO
   - AG-222 ACCELEROMETER
   - C-14D DIRECTIONAL GYRO
   - AZ-850 MICRO AIR DATA COMPUTER
   - WU-6XX/8XX WEATHER RADAR RECEIVER/TRANSMITTER AND ANTENNA UNIT
2. INSTRUMENT PANEL AND PEDESTAL MOUNTED COMPONENTS:
   - DU-870 DISPLAY UNIT (PFD AND MFD)
   - MS-560 MODE SELECTOR
   - RI-553 REMOTE INSTRUMENT CONTROLLER
   - DC-550 DISPLAY CONTROLLER
   - PC-400 AUTOPILOT CONTROLLER
   - WC-6XX/8XX WEATHER RADAR CONTROLLER
3. CS-412 DUAL REMOTE COMPENSATOR
4. SM-200 SERVO DRIVE (AILER ON)
5. SM-200 SERVO DRIVE (ELEVATOR)
6. SM-200 SERVO DRIVE (RUDDER)
7. FX-220 FLUX VALVE

AD-37526 R3@

Figure 1-3. Citation Ultra Component Locations

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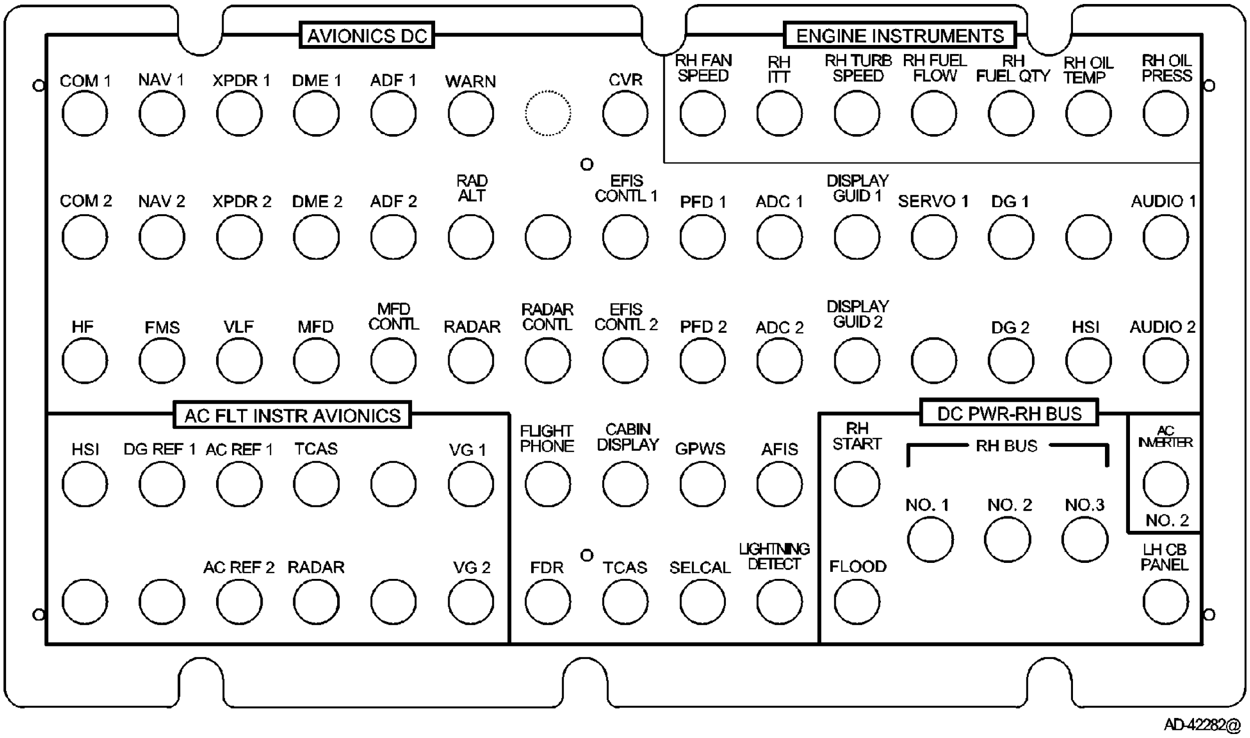

Figure 1-4. Circuit Breaker Panel

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2. System Description

The PRIMUS 1000 Integrated Avionics System LRUs, given in Table 1–1 or Table 1–2, have been organized into the following subsystems:

- Electronic Display System (EDS)
- Attitude and Heading Reference System (AHRS)
- ADZ–850 Micro Air Data System
- PRIMUS® 650/660 Weather Radar System
- PRIMUS® 870/880 Weather Radar System – Optional
- PRIMUS® II Integrated Radio System
- Flight Director System
- Autopilot/Yaw Damper System.

The PRIMUS 1000 system organization is centered around the concept of an Integrated Avionics Computer (IAC) that performs the display and flight guidance functions normally associated with a symbol generator, flight director, and autopilot/yaw damper. These functions are all co–located in the IC–600 IAC on separate Circuit Card Assemblies (CCA). The IC–600 IAC reduces the number of aircraft LRUs by housing a number of independent functions in one LRU. Some of these functions are managed by dedicated I/O hardware and some are managed by a microprocessor in conjunction with individual commands, switching logic, and drive circuitry. As installed in this aircraft, only the pilot's IC–600 IAC has an autopilot/yaw damper function. Also, depending on the IC–600 IAC installed, the Traffic Alert and Collision Avoidance System (TCAS) function is available.

During normal operation, the system displays heading, course, radio bearing, pitch and roll attitude, radio altitude, course deviation, glideslope deviation, to–from and Distance Measuring Equipment (DME) indications. Lit annunciators denote selected flight director modes. Pitch and roll flight director steering commands, developed by the IC–600 IAC, are displayed on the Primary Flight Display (PFD) in the cockpit. This computed steering information enables the pilot to reach and/or maintain the desired flight path or attitude.

When the autopilot is engaged and coupled to either the pilot's or copilot's flight director, the aircraft is controlled with the same commands displayed on the PFD. When the autopilot is engaged and no flight director modes are active, the aircraft is controlled by the pilot in pitch and roll and by inserting commands through Touch Control Steering (TCS).

Operation of a specific system component by the IC–600 IAC is dependent upon the system and other aircraft sensor data inputs. The IC–600 IAC uses software tests, in combination with Built–In Test (BIT) hardware, to detect failures and determine I/O signal validity. Based on the results of these tests, the IC–600 IAC determines if the system is capable of supplying proper display, Flight Director (FD), Autopilot (AP), and Yaw Damper (YD) mode control and/or mode annunciation. System monitoring is active in all modes of operation.

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A. Electronic Display System (EDS)

The EDS has the following LRUs:

- DU–870 Electronic Display Units
  - Primary Flight Display (PFD) for each pilot
  - Multifunction Display (MFD) for both pilots
- BL–870 Bezel Controller for each PFD
- BL–871 Bezel Controller for the MFD
- IC–600 Integrated Avionics Computer (IAC) No. 1 and No. 2
- DC–550 Display Controller for each pilot
- RI–553 Remote Instrument Controller for both pilots
- MC–800 MFD Controller for both pilots.

The EDS displays pitch and roll attitude, heading, course/desired track orientation, flightpath commands, weather radar presentations, checklists, and selected mode and source annunciators. The displays are organized into dual PFDs and a single MFD.

The PFD combines the Attitude Director Indicator (ADI), Horizontal Situation Indicator (HSI), and air data displays of airspeed, vertical speed, and barometric altitude, as well as mode annunciators into a single display unit. Essential information from sensor systems, navigation, and caution–warning systems are integrated into the pilot's prime viewing area.

Selection of the PFD formats and display intensity is accomplished with the DC–550 Display Controller. Bearing pointer select functions are also controlled from this controller. The PFD bezel controller supplies a display-select function for barometric altimeter correction.

The MFD presents data to the flight crew that enhances the operation of the aircraft. This data includes normal and emergency checklists, long range navigation display, and weather radar display. In addition, the MFD has a backup symbol generator (SG) capability in case of PFD failure. Selection of MFD formats and checklist operation is accomplished with the MC–800 Multifunction Display Controller. Selection of various navigation and aircraft performance menus and submenus is accomplished through the bezel pushbuttons.

When the display system is in its normal (no failure) configuration, IC–600 IAC No. 1 supplies the pilot's display with data and IC–600 IAC No. 2 supplies the copilot's display with data. The IC–600 IAC receives digital and discrete inputs, organizes this information into the correct formats as defined by the display controller, and transmits these formats to the display units. The IC–600 IAC communicates with the display unit over a 1 MHz serial digital databus.

The switching of navigation sensor data for display and for flight guidance is done electronically. All comparison monitoring of critical display data is done within the IC–600 IAC. Each IC–600 IAC, even with a partial failure, is capable of supplying its respective PFD and the MFD with data. In the case of a DU–870 Display Unit failure, the PFD takes priority over the MFD.

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B. Attitude and Heading Reference System

The Attitude and Heading Reference System (AHRS) is a dual system installation that is made up of the following components:

- VG–14A Vertical Gyros No. 1 and No. 2
- C–14D Directional Gyros No. 1 and No. 2
- FX–220 Flux Valves No. 1 and No. 2
- CS–412 Dual Remote Compensator.

The VG–14A Vertical Gyros supply three-wire pitch and roll analog attitude signals to the IC–600 IACs for primary flight display, autopilot and for control of the lateral and vertical flight director modes. The VG –14A Vertical Gyro also outputs a two-wire analog signal for weather radar antenna stabilization.

The C–14D Directional Gyros supply three-wire analog magnetic heading data to the IC–600 IACs for primary flight display, autopilot, and flight director modes.

The FX–220 Flux Valve detects the magnitude and direction of the horizontal component of the earth's magnetic field, for use in aligning the C–14D Directional Gyro to magnetic north.

The CS–412 Dual Remote Compensator supplies the means to compensate the flux valve for N–S and E–W errors that result from the aircraft's self generated magnetic fields. The CS–412 Dual Remote Compensator has the compensation adjustments for both C–14D Directional Gyro systems.

C. ADZ–850 Micro Air Data System

The ADZ–850 Micro Air Data System has the following LRUs/controls:

- AZ–850 Micro Air Data Computer (MADC) No. 1 and No. 2
- Baro set knob and Standard (STD) button on the PFD bezel.

The AZ–850 MADC supplies the IC–600 IAC with an ARINC 429 input of baro corrected altitude, Indicated Airspeed (IAS), Mach, Vmo, True Airspeed (TAS), Total Air Temperature (TAT), Static Air Temperature (SAT), and Altitude (ALT) rate. The baro set knob on the PFD bezel lets for pilot input of barometric pressure. The STD button on the PFD bezel allows for automatic barometric correction settings of either 29.92 inHg or 1013 hPa. The AZ–850 MADC is connected to the pitot/static and outside air temperature probes.

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Air data parameters displayed on the PFD are as follows:

- IAS/Mach
- Barometric Altitude
- Vertical Speed.

Air data parameters displayed on the MFD are as follows:

- TAS
- SAT
- TAT.

D. PRIMUS 650/660/870/880 Weather Radar System

The PRIMUS 650/660 Weather Radar System has the following LRUs:

- WU–650/660 Receiver Transmitter Antenna
- WC–650/660 Weather Radar Controller.

The optional PRIMUS 870/880 Weather Radar System has the following LRUs:

- WU-870/880 Receiver Transmitter Antenna
- WC–870/880 Weather Radar Controller.

The weather radar system is an X–band radar designed for weather detection, ground mapping, and analysis. Data is displayed on the PFD and the MFD. Storm intensity levels are displayed in bright colors against a deep black background. Areas of heaviest rainfall appear in magenta, next heaviest appear in red, rainfall of medium intensity appear in yellow, and areas of weakest rainfall appear in green.

In the ground mapping mode, prominent landmarks are displayed that enable the pilot to identify coastline, hilly and mountainous regions, as well as cities or even large structures. In Ground Mapping (GMAP) mode, video levels of increasing reflectivity are displayed as black, cyan, yellow, and magenta.

A Rain Echo Attenuation Compensation Technique (REACT) mode automatically increases receiver gain as a function of attenuation, due to intervening rainfall. At the point where the receiver can no longer detect levels less than red, a blue field is displayed indicating an out–of–calibration region. Target (TGT) alert mode is selected to indicate when level 3 (red) or greater weather is present in a sector beyond the currently displayed range.

For the PRIMUS 870/880 Weather Radar System, a Turbulence (TRB) mode is used to detect turbulent air in the 10 to 50 Nautical Mile (NM) range. Areas of potentially hazardous turbulence are shown in gray–white. After proper evaluation, the pilot can chart his course around these storm areas.

Weather (WX) radar mode selection, range, and tilt control are supplied by the WC–6XX/8XX Weather Radar Controller.

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E. PRIMUS II Integrated Radio System

The PRIMUS II Integrated Radio System has the following LRUs:

- RM–855 Radio Management Unit No. 1 and No. 2
- AV–850A Audio Control Unit No. 1 and No. 2
- CD–850 Clearance Delivery Control Head (CDH)
- AT–860 ADF Antenna
- DI–851 DME Indicator
- RCZ–851F Integrated Communications Unit No. 1 and No. 2
- RNZ–850/B Integrated Navigation Unit No. 1 and No. 2.

The PRIMUS II Integrated Radio System is a dual, remote–mounted digital radio system that encompasses all standard navigation and communication functions, including Very High Frequency Omnidirectional Range (VOR), Distance Measuring Equipment (DME), Instrument Landing System (ILS), and Very High Frequency (VHF) communications. Marker beacon and transponder (mode A/C/S) depending on installation is also included. All control functions are operated from two RM–855 Radio Management Units (RMU). A CD–850 CDU is also part of the system and is used as an alternate or emergency backup capability for tuning the remote mounted VHF Communications transceiver and/or VHF Navigation Receiver in the event Radio System Bus (RSB) tuning is not available. A DI–851 DME is used to display DME related information to the pilot. The AV–850A Audio Control Units receive digitized audio from remote units over two high–speed digital audio buses. Each audio unit selects the appropriate channels from this audio bus and reconstitutes headphone and speaker signals giving the capability to individually select the radio function the crew member desires to hear.

F. Flight Director System

The flight director system has the following components:

- IC–600 Integrated Avionics Computer (IAC) No. 1 and No. 2
- MS–560 Mode Selector.

The PRIMUS 1000 Flight Director System features an integrated avionics computer concept that combines the normal EDS display function with the flight director function. This level of integration supplies a number of benefits over existing systems and greatly simplifies the interface requirements of the flight director function. This level of integration implies that if the EDS is operational, the flight director is operational. Conversely, if the EDS has failed, the flight director also fails.

Input data requirements for the flight director are fully encompassed by the EDS function. By combining the flight director and EDS processors, the flight director I/O hardware and software can be virtually eliminated.

The flight director supplies computed steering commands to the autopilot and for display on the PFD. If the autopilot is not engaged, the pilot can manually fly the steering command presented on the PFD. The flight director supplies both lateral (roll) and vertical (pitch) steering commands. One lateral and one vertical flight director mode can be active simultaneously. Other flight director modes can be armed to automatically become active at the proper time.

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For the flight director to do its job, it looks at the following:

- What is the pilot's desired attitude/position/heading/etc?
- What is the aircraft's actual attitude/position/heading/etc?
- If there is a difference between desired and actual data, correct for the difference and control the speed at which the correction takes place.

The flight director computes pitch and roll steering commands based on data from a variety of sources, including the following:

- Air data
- Pitch and roll attitude
- Magnetic heading
- VOR/DME/ILS
- Pilot inputs
- Radio altimeter.

Flight director steering commands supply a key data point in the display and flight director system. These steering commands are output to the following subsystems:

- EDS for pilot display
- Autopilot for automatic flight path control
- Autopilot monitors.

The IC-600 IAC processes course, selected heading, attitude, air data, DME, and radio navigation data to supply computed pitch and roll steering commands for display on the PFD and for autopilot automatic flight path steering through control of the flight control surfaces using the SM-200 Servo Drives.

Flight director mode selection and annunciation is accomplished through mode select buttons on the MS-560 Mode Selector. The flight director command cue on the PFD also reflects the selected mode.

Flight director couple switching between the pilot's and copilot's flight director is accomplished through a couple switch.

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G. Autopilot/Yaw Damper System

The Autopilot/Yaw Damper System has the following LRUs:

- IC-600 Integrated Avionics Computer (IAC) - Pilot's only
- PC-400 Autopilot Controller
- SM-200 Servos (Aileron, Elevator, and Rudder).

The PRIMUS 1000 system autopilot is a fail-passive design, featuring digital attitude and servo loops. The autopilot supplies aircraft stabilization and tracking of pitch and roll steering commands from the flight director. The autopilot is not aware of which flight director mode(s), if any, are active. The autopilot simply tracks the pitch and roll steering commands from the selected flight director as attitude changes.

The yaw damper supplies yaw rate damping only, and makes no effort to control the flight path of the aircraft. Servo position reference is synchronized to zero at engagement and is constantly washed out ensuring steady state rudder forces are zero. If the rudder trim position changes, due to pilot input or aircraft configuration changes, the rudder washes out the steady state force and lets rudder servo resynchronization.

The autopilot/yaw damper monitors are capable of disengaging the autopilot and yaw damper as an independent function. Data used in the autopilot/yaw damper computations are processed in a manner consistent with autopilot flight-safety requirements, while also maximizing autopilot availability. The autopilot/yaw damper engage and disengage process is also monitored , ensuring the actual engage situation at the servos correctly reflects the engage function status in software.

The pitch axis autopilot trim function works to maintain the aircraft attitude against long-term attitude disturbances, such as fuel burn and passenger movement.

For the autopilot to do its job, it looks at the following:

- What is the pilot's desired attitude?
- What is the aircraft's actual attitude?
- If there is a difference between desired and actual data, correct for the difference and control the speed at which the correction takes place.

The autopilot and yaw damper engagement is accomplished through the PC-400 Autopilot Controller. Basic roll and pitch movements can be manually made using the PC-400 TURN knob and PITCH wheel.

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3. Digital Data Buses

An essential function of the PRIMUS 1000 Integrated Avionics System is information interchange between subsystems and/or between LRUs within a subsystem.

Some of this information is in the form of discrete data. Discrete data is carried on a single wire and typically switches between +28 V dc and open, or between ground and open. This switched data is used for annunciators, warnings, and anywhere that simple condition information is sufficient. This is a small portion of the total information interchange.

Most of the information transfer between subsystems is accomplished through the use of digital data buses. The data buses found in the PRIMUS 1000 Integrated Avionics System include the following:

- Radio System Bus (RSB)
- Digital Audio Bus
- Commercial Standard Digital Bus (CSDB)
- ARINC 429
- RS–422
- RS–232
- Serial Control Interface (SCI)
- Weather Radar Picture Data (WXPD)
- Integrated Computer Bus (ICB)
- Symbol Generator/Display Unit (SG/DU) Bus.

The following paragraphs describe the operation and uses of each of the above buses.

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A. Radio System Bus (RSB)

The Honeywell RSB, as shown in Figure 1-5, is the principal communications network, interconnecting the LRUs in the PRIMUS II Integrated Radio System. All the LRUs in the radio system, except the audio control units, are connected to the RSB. Specific details regarding the operation of the radio system are covered elsewhere in this manual.

Reliable transfer of data using the RSB is ensured by designed-in redundancy and predefined protection and isolation mechanisms. Control and data protocols are also predefined to ensure consistent application of the data bus. It is a fail-operational data bus system and actually is made up of three shielded twisted pairs. These are the PRIMARY bus, LEFT-SIDE SECONDARY bus, and RIGHT-SIDE SECONDARY bus. Fail-operational means that if any device connected to the bus fails, the bus remains operational.

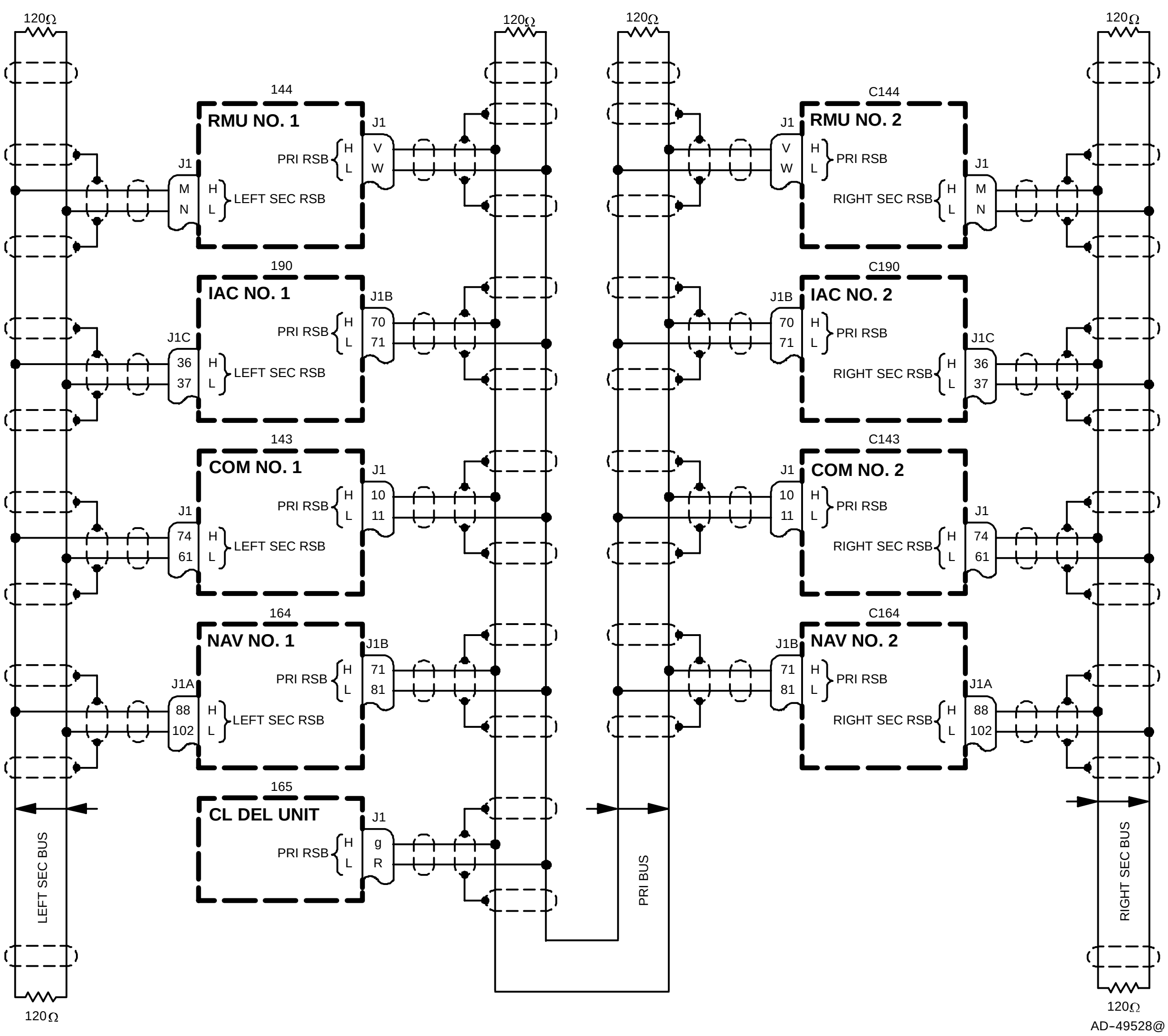

Figure 1-5. Radio System Bus

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All units connected to the RSB (RMU, IAC, remote NAV unit, etc.) are defined as users. The RSB users are all transformer coupled and impedance-matched to the data bus transmission lines. The bus is a shielded twisted pair, that is differentially driven. Data transmitted onto the bus drives one line more positive, and the other line more negative. This interface method supplies protection from faults, transients, and Radio Frequency (RF) interference. By design, the RSB interfaces are virtually immune to lightning-induced transients, hot shorts, ground shorts, and RF threats. The design precludes any fault propagation (via RSB) between the various interconnected users. At the same time, the RSB interconnect structure supplies superior RF emissions characteristics, ensuring that RSB does not interfere with sensitive receivers on-board the aircraft. The users are connected to the data buses via a splicing arrangement (using solder rings), which experience has shown to be extremely reliable and damage resistant. The type of cable that is specified for use meets regulatory guidelines for flammability and smoke, and is resistant to hydraulic fluids and fuel.

Data flow on RSB is bidirectional with a bit transmission rate of 2/3 MHz (1.5 μs/bit). Data traffic flow on RSB does not require a bus controller. All users receive and identify all bus data. Since each user knows its own user number, it sets up an internal timer, based upon the last message received, and transmits at the appropriate time. Each RSB user (other than those described as listen only) outputs its message on the PRIMARY and its ON-SIDE SECONDARY buses simultaneously. This arrangement gives each user dual-path access to its own-side data and single-path access to all cross-side data. It also makes it impossible for any single-point fault (such as a fire-ax or a projectile) to disable all three data buses. For example, a failure of the PRIMARY bus merely disables cross-side tuning of the radios, and causes no other problems.

The clearance delivery CDU and the IC-600 IAC are listen only devices. They do not transmit on the RSB.

Each bus user's transmitters are safety interlocked ensuring no user broadcasts outside its allotted time slot or in response to another user's request. The user interlock mechanisms effectively keeps the bus users from competing for simultaneous bus time windows, and thereby ensure reliable data flow.

A field is defined as a 192 millisecond time period that contains a sequence of 24 messages spaced 8 milliseconds apart, starting with message 0 (transmits address 0) and progressing in sequence to message number 23. Thus, there are 24 possible message time slots for this bus.

As shown in Figure 1-6, in the message 0 time slot, the left side NAV unit transmits on both the PRIMARY and LEFT-SIDE SECONDARY buses. Then, in the message 1 time slot, the right side NAV unit transmits on both the PRIMARY and RIGHT-SIDE SECONDARY buses. Then, there is a spare time slot (message 2) for future expansion. Since some messages combine data from more than one radio function, RMU, COM, Transponder, VOR/LOC, Glideslope, Marker, DME, ADF, and Microwave Landing System (MLS) require eight messages per system side. Left side system = 8, right side system = 8, and spare time slots = 8 more, totaling 24.

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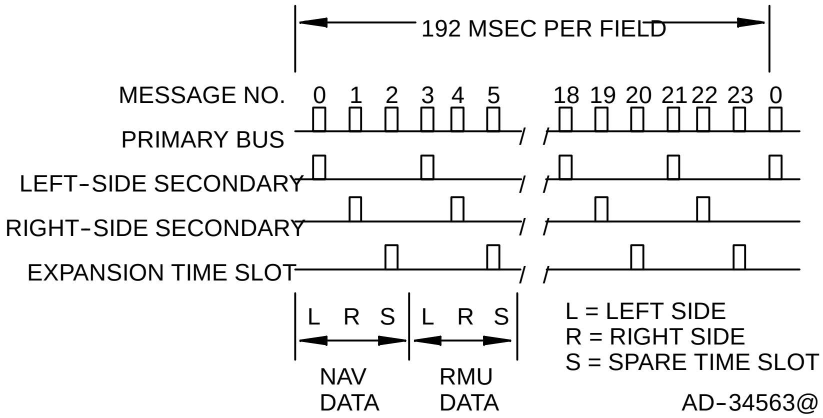

Figure 1–6. RSB Data Field Structure

When message number 23 is complete, the cycle begins again with message number 0, and the cycle repeats for as long as the system has power applied. During initial power up, the RMUs are programmed to start the bus activity by transmitting messages 3 or 4, depending on which RMU comes on line first. The sequence of transmissions is fixed, and any LRU user that is not installed in the aircraft still has a time slot assigned at the appropriate time in the field. Therefore, removal of a unit does not disable the bus functions.

Table 1–4 shows the message content for each message in the sequence in the normal operational mode.

The data format of the messages on the RSB is similar to High level Data Link Control (HDLC). This format is described by International Standard ISO 3309–1979 (E).

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Table 1–4 (Sheet 1). RSB Message Numbers (Normal Mode)

WORD POS.	0, 1, 2 Nav Rem	3, 4, 5 RMU Com	6, 7, 8 Nav Rem	9, 10, 11 Com Rem	12, 13, 14 Nav Rem	15, 16, 17 RMU Nav	18, 19, 20 Nav Rem	21, 22, 23 IAC/FMS
1 Low	MSG NO.	MSG NO.	MSG NO.	MSG NO.	MSG NO.	MSG NO.	MSG NO.	MSG NO.
1 High	CONTROL	CONTROL	CONTROL	CONTROL	CONTROL	CONTROL	CONTROL	CONTROL
2 Low	MLS	COM	ADF	COM	MLS	ADF	ADF	ATC
2 High	OUTPUT AZ	OPMODE	REL BRG	STATUS	OUTPUT AZ	OPMODE	REL BRG	OPMODE
3 Low	MLS	COM	ADF	COM	MLS	ADF	ADF	ATC
3 High	OUTPUT GP	CHAN	MAG BRG	CHAN	OUTPUT GP	CHAN	MAG BRG	REPLY CODE
4 Low	MLS	COM	VOR/ILS	COM	MLS	ADF	VOR/ILS	MISC
4 High	AZ DEV	PRESET	BRG/LOC DEV	PRESET	AZ DEV	PRESET	BRG/LOC DEV	STATUS
5 Low	MLS	ATC LEFT	VOR/ILS	COM	MLS	VOR/ILS	VOR/ILS	ATC
5 High	GP DEV	OPMODE	GS DEV		GP DEV	OPMODE	GS DEV	ALTITUDE
6 Low	DME	ATC LEFT	VOR/ILS	COM	DME	VOR/ILS	VOR/ILS	VHF COM
6 High	DIST	REPLY CODE	MARKER		DIST	CHAN	MARKER	OPMODE
7 Low	RT–SIDE	ATC RIGHT	DME DIST	ATC	RT–SIDE	VOR/ILS	DME STA	VHF COM
7 High	DME	OPMODE	RT–SIDE	STATUS	DME	PRESET	FMS A	CHANNEL
8 Low	DIST	ATC RIGHT	PRESET	ATC	DIST	VOR–DME	DME CHAN	VOR/ILS
8 High	FMS A	REPLY CODE	DME DIST	REPLY CODE	FMS A	OPMODE	FMS A	OPMODE
9 Low	DME	ATC/TCAS	LFT–SIDE	ATC	DME	VOR–DME	DME GS	VOR/ILS
9 High	DIST	OPMODE	PRESET	DATA	DIST	CHAN	FMS A	CHANNEL
10 Low	FMS B	ATC/TCAS	DME STATUS	ATC	FMS B	MLS	DME TTS	VOR–DME
10 High	DME	ALT/RANGE	R–S PRESET	ALTITUDE	DME	OPMODE	FMS A	OPMODE
11 Low	DIST	COM STRAPS	DME CHAN	ATC	DIST	MLS	DME STATUS	VOR–DME
11 High	LFT–SIDE	WORD 1	R–S PRESET		LFT–SIDE	CHAN	FMS A	CHANNEL
12 Low	DME STATUS	COM STRAPS	DME GS	ATC/TCAS	DME STATUS	MLS FWD	DME CHAN	MLS–DME
12 High	LFT–SIDE	WORD 2	R–S PRESET	STATUS	RT–SIDE	SEL AZ	FMS B	OPMODE
13 Low	DME CHAN	COM STRAPS	DME TTS	ATC/TCAS	DME CHAN	MLS SEL GP	DME GS	MLS–DME
13 High	LFT–SIDE	WORD 3	R–S PRESET	ALT/RANGE	RT–SIDE	MLS BKWD	FMS B	CHANNEL
14 Low	DME GS	COM STRAPS	DME IDENT	AUX1	DME GS	SEL AZ	DME TTS	FMS A
14 High	LFT–SIDE	WORD 4	R–S PRESET	STATUS	RT–SIDE	RES FOR DME	FMS B	DME OPMODE
15 Low	DME TTS		DME IDENT	AUX1	DME TTS	MLS–DME	MLS	FMS A
15 High	LFT–SIDE		R–S PRESET		RT–SIDE	OPMODE	STATUS	DME CHAN
16 Low	DME IDENT		DME STATUS	AUX1	DME IDENT	MLS–DME	MLS	FMS B

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Table 1–4 (Sheet 2). RSB Message Numbers (Normal Mode)

WORD POS.	0, 1, 2 Nav Rem	3, 4, 5 RMU Com	6, 7, 8 Nav Rem	9, 10, 11 Com Rem	12, 13, 14 Nav Rem	15, 16, 17 RMU Nav	18, 19, 20 Nav Rem	21, 22, 23 IAC/FMS
16 High	LFT–SIDE		L–S PRESET		RT–SIDE	CHAN	CHAN	DME OPMODE
17 Low 17 High	DME IDENT LFT–SIDE		DME CHAN L–S PRESET	AUX1	DME IDENT RT–SIDE	NAV STRAPS WORD 1	MLS FWD SEL. AZ	FMS B DME CHAN
18 Low 18 High	VOR/ILS STATUS		DME GS L–S PRESET	AUX2 STATUS	MLS AUX DATA WORD 1	NAV STRAPS WORD 2	MLS SEL. GP MLS GSTATUS	MLS OPMODE
19 Low 19 High	VOR/ILS CHAN		DME TTS L–S PRESET	AUX2	MLS AUX DATA WORD 1	NAV STRAPS WORD 3	MLS BKWD. SEL. AZ.	MLS CHANNEL
20 Low 20 High	VOR/ILS PRESET		DME IDENT L–S PRESET	AUX2	MLS AUX DATA WORD 2	NAV STRAPS WORD 4	MLS BASIC 1,3,4,5,6	MLS FORW/BACK
21 Low 21 High	VOR/ILS IDENT		DME IDENT L–S PRESET	COM CLUSTER STRAPS	MLS AUX DATA WORD 2	AHRS–A429 NAV HEADING	MLS BASIC 1,3,4,5,6	MLS GP
22 Low 22 High	VOR/ILS IDENT	AUX1 OPMODE	ADF STATUS	ATC CONFIG	MLS AUX DATA WORD 3		MLS BASIC WORD 2	ADF OPMODE
23 Low 23 High		AUX1	ADF CHAN	ATC CONFIG	MLS AUX DATA WORD 3		MLS BASIC WORD 2	ADF CHANNEL
24 Low 24 High	NAV CLUSTER STRAPS	AUX1	ADF PRESET	ATC CONFIG	MLS AUX DATA WORD 4		MLS GEN DATA	COM CLUSTER OPMODE
25 Low 25 High	NAV CLUSTER STATUS	AUX1	ADF IDENT	COM CLUSTER STATUS	MLS AUX DATA WORD 4		MLS GEN DATA	NAV CLUSTER OPMODE
26 Low 26 High	NAV CLUSTER STRAPS	AUX2 OPMODE	ADF IDENT	COM CLUSTER STRAPS				
27 Low 27 High	NAV CLUSTER STRAPS	AUX2		COM CLUSTER STRAPS		SYSTEM ON/OFF		
28 Low 28 High	NAV CLUSTER STRAPS	AUX2		COM CLUSTER STRAPS		POST SYS POST RADIOS		
29 Low 29 High	NAV CLUSTER STRAPS	AUX2	ADF CONFIG	COM CLUSTER STRAPS	MLS CONFIG	MISC CONTRL FMCS CONTR		
30 Low 30 High	VOR CONFIG	COM CLUSTER OPMODE	ADF CONFIG	COM CONFIG	DME CONFIG	NAV CLUSTER OPMODE		
31 Low 31 High	CHECKSUM CHECKSUM	CHECKSUM CHECKSUM	CHECKSUM CHECKSUM	CHECKSUM CHECKSUM	CHECKSUM CHECKSUM	CHECKSUM CHECKSUM	CHECKSUM CHECKSUM	CHECKSUM CHECKSUM

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B. Digital Audio Bus

The PRIMUS 1000 system uses a digital data bus to carry digital audio information from the remote radio system LRU to the flightcrew's audio panels. Digitizing the audio offers the advantage of complete independence from grounding problems within the aircraft and the absolute elimination of ground noise pick–up, whine, and cross–talk.

Each side has a one–way digital audio bus, made up of a shielded twisted pair differentially driven, feeding up to four audio panels. Data transmitted onto the bus drives one line more positive and the other line more negative. This interface method supplies protection from faults, transients, and RF interference. By design, the interfaces are virtually immune to lightning–induced transients, hot shorts, ground shorts, and RF threats. The design precludes any fault propagation (via digital audio bus) between the various interconnected users. At the same time, the digital audio bus interconnect structure supplies superior RF emissions characteristics, ensuring the digital audio bus does not interfere with sensitive receivers onboard the aircraft. The users are connected to the data buses by a splicing arrangement (using solder rings), experience has shown to be extremely reliable and damage resistant. The type of cable specified for use meets regulatory guidelines for flammability and smoke, and is resistant to hydraulic fluids and fuel.

Each remote LRU contains a cluster module that, in turn, contains five digitizer chips. These are standard off–the–shelf chips (called CODECs – for COder/DECoder) used by many telephone companies. The five digitizers are sampled in sequence, their digital outputs are assembled into a digital data message, and the message is transmitted on the digital audio bus.

The remote COM units supply digitized COM receive audio, and the remote NAV units supply digitized VOR/LOC, ADF, and MARKER BEACON audio. The NAV units also feed discrete digital bits (in a status byte) to enable an audio oscillator in the audio panel when MLS or DME Morse Code Identifier audio is present. Both remote units contain additional unassigned digitizers for future growth, one of which is frequently used for High Frequency (HF) received audio.

The two separate digital audio buses are put to all audio panels for flight crew selection. This allows the flight crew to conveniently select and control each individual audio source. Data flow on the digital audio bus is unidirectional with a bit transmission rate of 1.0 MHz (1.0 μs/bit). Data traffic flow on the digital audio bus does not require a bus controller. The COM unit transmits a data string of approximately 60 μs every 128 μs (see Figure 1–7). The NAV unit receives the COM message, synchronizes its transmitter, and then, transmits the approximately 60 μs NAV message immediately after the COM message. Should the COM unit fail, the NAV unit goes into a free run mode so as not to lose the NAV digital audio.

In each transmitted message, the preamble consists of 8 $\pm$ 1 Manchester one bits; and the sync consists of 1–1/2 bits of HIGH followed by 1–1/2 bits of LOW, that the receiver uses for synchronization. The remaining six bytes contain eight bits each, at 1.0 μs/Bit. The status byte identifies the message as COM or NAV. The digital audio panel then decodes and processes the individual bytes as appropriate to the flight crew selections.

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The digital audio bus is very similar to RSB described earlier in this section. The clock frequency is 1 MHz instead of 2/3 MHz, and the data bit assignments are different. Refer to the explanation associated with Figure 1–8 thru Figure 1–10.

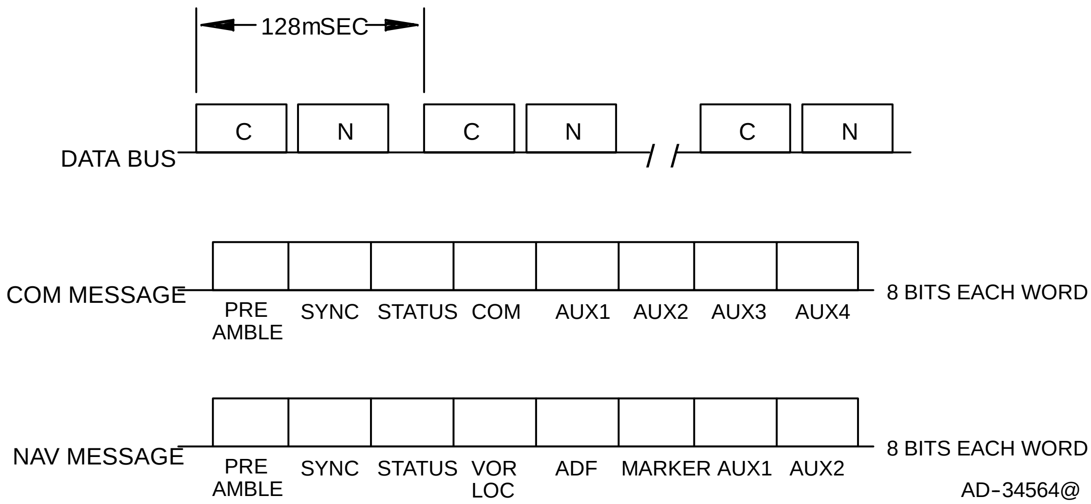

Figure 1–7. Digital Audio Data Sequence

C. Commercial Standard Digital Bus (CSDB)

The PRIMUS 1000 system uses CSDBs for some data handling. For example, backup VOR/LOC/GS/MKR navigation display data is sent to the Radio Management Units (RMU) from the No. 2 Navigation Unit on CSDB.

The CSDB system is made up of transmitters and receivers connected by shielded twisted pairs. Data is transmitted by a single transmitter to either a single receiver or to a group of up to 20 receivers connected in parallel. Each CSDB carries data in one direction only. Bidirectional transmission between two LRUs must be accomplished by using two sets of transmitters, receivers, and twisted-wire-pair buses.

The data format is in accordance with Collins Standard 523–0772774–00611R, CSDB. This data bus is frequently referred to as the Collins Pro–Line II Serial Data bus, or simply PL–II.

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D. ARINC 429

The PRIMUS 1000 system uses ARINC 429 data buses for most of the data handling. For example, MADC data is transmitted from/to various units on ARINC 429 buses.

The 429 bus system is made up of transmitters and receivers connected by shielded–twisted-wire-pairs. Data is transmitted by a single transmitter to either a single receiver or to a group of up to 20 receivers connected in parallel. Each 429 bus carries data in one direction only. Bidirectional transmission between two LRUs must be accomplished by using two sets of transmitters, receivers, and twisted-wire–pair buses.

(1) Field Definitions

ARINC 429 transmissions consists of words made up of 32 bits. These words are transmitted at either 12.5 kHz (low speed) or 100 kHz (high speed) depending on the system. Bit number 1 is always the first bit transmitted, and bit number 32 is always the last bit transmitted. Bits 1 thru 8 are called the octal label, that identifies the type of information contained within the word. For example, true airspeed has an octal label of 210. In most cases, bits 9 and 10 are the Source/Destination Identifier (SDI), that indicates the source LRU in multibox installations, by system number (1 thru 4). Bits 9 and 10 can also be used as data bits in high resolution data words. Bits 11 thru 29 compose the data field. Bit 11 is the Least Significant Bit (LSB) and bit 29 is the Most Significant Bit (MSB). In most cases, bits 30 and 31 form the SSM, which identifies the sign and validity of the data. Like bits 9 and 10 above, bits 30 and 31 can also be used as data bits in high resolution data words. Bit 32 is used for parity.

(2) Label – Bits 1 thru 8

In the octal label, bits 1 thru 8 represent numbers 0 thru 377. The eight bits are broken into two groups of three and one group of two. Each group represents a digit encoded in binary with the LSB having a value of one. The octal label is transmitted with the MSB of the most significant digit first. This reversed label characteristic is a legacy from past systems in which octal coding of the label field was, apparently, of no particular significance. Figure 1–8 shows the data bit format for octal label 274.

BIT NUMBER	8	7	6	5	4	3	2	1	
BINARY VALUE	1	2	4	1	2	4	1	2	
LSB	0	0	1	1	1	1	0	1	MSB
CHARACTER VALUE	4			7			2		

AD–34565@

Figure 1–8. Octal Label 274

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(3) Data Field – Bits 11 thru 29

Units, ranges, resolution, refresh rate, and number of significant bits for information transferred are encoded in either Binary Coded Decimal (BCD), or binary notation. Discrete information is also sent over the ARINC 429 bus. In the data field, bits 11 thru 29 are the data bits (see Figure 1–9). For some high resolution data words, bits 9 and 10 are also data bits. Bits 30 and 31 can also be data bits.

29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11
MSB									DATA									LSB

AD–34566@

Figure 1–9. Data Field (Bits 11 thru 29)

If bits 11 thru 29 contain data bits in a binary format, the most significant bit of the data field represents one half of the maximum possible of the value transmitted. Each successive (less significant) bit represents one half of the previous (more significant) bit. Negative numbers are encoded as the two's complement of positive values, with the negative sign reflected in the SSM.

For example, if we wish to encode a quantity whose maximum value is 2500, bit number 29 represents a value of 1250, bit number 28 represent a value of 625, bit number 27 represent a value of 312.5, and so on to bit number 11 that represents a value of 0.004768371541. Adding up the individual bit values yields the total value of the quantity being transmitted.

If bits 11 thru 29 contain data bits in a BCD format (see Figure 1–10), the data is grouped into four bit–bytes, each byte denoting a decimal column. The 19 data bits are broken up into four groups of four bits and one group of three bits. Each group of four can represent a number from 0 to 9; the fifth group can represent a number from 0 to 7. Refer to the following examples of BCD data fields. Data bit number 11 (the eleventh bit transmitted in a word) has the binary value of 1. Data bits numbered 12, 13, and 14 have the arithmetic value of 2, 4, and 8 respectively. Each group of bits 15 thru 29 have similarly assigned values as shown below. Using this format, decimal numbers (or characters) between 0 and 9 can be assembled using combinations of these four binary values.

29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11
4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
MSB	DATA			DATA				DATA				DATA				DATA		LSB

AD–34567–R1@

Figure 1–10. BCD Bit Assignments

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In the data field, only those bits required to transmit parameter range and resolution are used, and the remaining bits are set to 0 (zero). For example, Figure 1–11 shows the data word for selected course, with an octal label of 024, and a value of 254 degrees, that only requires three characters. The remaining two characters are filled with zeros.

Parameter: Selected Course **Octal Label:** 024 **Value:** 254 degrees

<table>
<tr><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="3">2</td><td colspan="4">5</td><td colspan="4">4</td><td colspan="4">X</td><td colspan="4">X</td></tr>
</table>

AD–34568@

Figure 1–11. Selected Course Data Word

Figure 1–12 shows a DME data word that requires five characters.

Parameter: DME Distance **Octal Label:** 201 **Value:** 257.86 NM

<table>
<tr><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td colspan="3">2</td><td colspan="4">5</td><td colspan="4">7</td><td colspan="4">8</td><td colspan="4">6</td></tr>
</table>

AD–34569@

Figure 1–12. DME Distance Data Word

Figure 1–13 shows a position data word requiring six characters. As can be seen, bits 9 and 10 are used, and the format is changed slightly.

Parameter: Present Pos. Long. **Octal Label:** 011 **Value:** E 175° 59.9’

<table>
<tr><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td colspan="4">7</td><td colspan="4">5</td><td colspan="4">5</td><td colspan="4">9</td><td colspan="4">9</td></tr>
</table>

AD–34570@

Figure 1–13. Present Position Longitude Data Word

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(4) Sign Status Matrix (Bits 30 and 31)

When bits 30 and 31 are being used for the Sign Status Matrix (SSM) function, the bits assignments are as shown in Table 1-5.

Table 1-5. Sign Status Matrix Bit Assignments

BIT		MEANING
31	**30**	
0	1	No Computed Data
1	0	Functional Test
0	0	Plus, North, East, Right, To, Above
1	1	Minus, South, West, Left, From, Below

In data words BCD encoded for longitude and latitude, bits 30 and 31 are both encoded to zeros for East or North, or both to ones for West or South. In addition, bits 9 and 10 are not used for SDI, but are included in the data field to give the resolution required for position.

For angular range, 0 thru 359.xxx degrees is encoded as 0 thru ±179.xxx degrees. The sign bits (30 and 31) determine the semicircle being referenced. The positive portion of the semicircle includes 0 thru 179.xxx degrees. The negative portion includes 180 thru 359.xxx degrees. An all-zeros configuration represents 0 and 180 degrees. All ones represents 179.xxx and 359.xxx degrees. Two's complement notation is used for the negative half.

(5) Parity (Bit 32)

Parity is one of the simplest of all the error checking methods used in data handling. There are two basic parity configurations, ODD and EVEN. ARINC 429 transmissions are always odd parity, and bit 32 is the parity bit. ARINC 429 receivers are programmed to always expect an odd number of binary 1s in each 32-bit word. Bit 32 is set to 1 (one) when there are an even number of binary 1s in the word, and set to a 0 (zero) when there are an odd number of binary 1s in the word. This creates a word that always contains an overall odd number of 1s.

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(6) Waveform Parameters

To be compatible with the transformer-coupled data bus, all ARINC 429 messages are Manchester II encoded before being applied to the bus. Unlike Non-Return-to-Zero (NRZ) data, which requires a bandwidth of dc to f_c (clock frequency). Manchester encoded data is limited to the frequency range of $f_c/2$ to f_c. Also, since Manchester data must transition in the middle of each bit period, the data clock is contained within the data and is easily extracted at each receiver for data decoding. This feature avoids having to send a synchronous clock on separate lines along with the data.

ARINC 429 transmissions return to the zero voltage condition at the end of each bit period. As shown in Figure 1-14, a high on Line A, and a low on Line B is a binary one. In addition, a low on Line A, and a high on Line B is a binary zero. When both Line A and Line B are at zero volts, there is no data bit being transmitted. ARINC 429 transmitters must supply a minimum dead time of four bits between messages because the receivers synchronize to the transmitted data by recognizing the four-bit dead time as the synchronizing command.

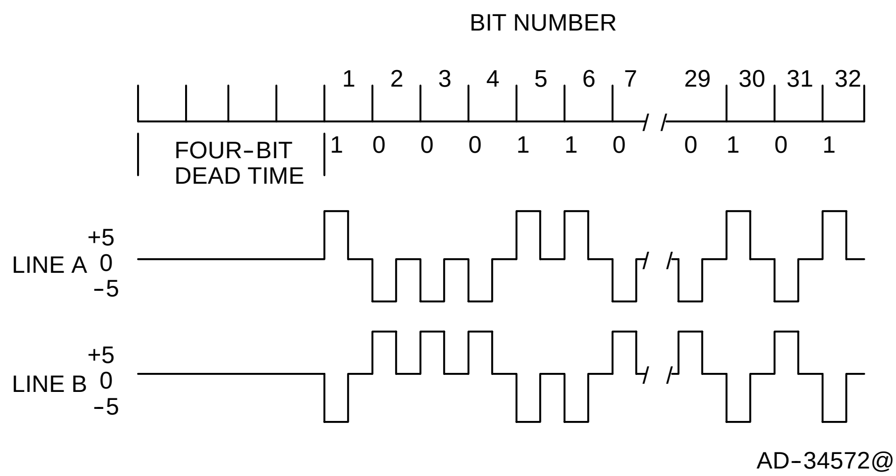

Figure 1-14. ARINC 429 Transmission Waveforms

Tri-level bipolar modulation consisting of HI (binary one), LO (binary zero) and NULL (no data) states are used in the transmission of data. The differential output signal voltage across the specified output terminals (balanced to ground at the transmitter) should be as given in Table 1-6 when the transmitter is open circuit.

Table 1-6. Transmission Waveform Voltages

	HI (1)	NULL (V)	LO (0)
Line A to Line B	+10 ± 1.0	0 ± 0.5	–10 ± 1.0
Line A to Ground	+5 ± 0.5	0 ± 0.25	–5 ± 0.5
Line B to Ground	–5 ± 0.5	0 ± 0.25	0 ± 0.25

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The differential voltage presented at the receiver is dependent upon line length and the number of receivers connected to a transmitter. The nominal voltage range at the terminals is likely to be between 6.5 and 13 volts peak–to–peak. Receiver input common mode voltages (Line A to Ground and Line B to Ground) are not specified because of the difficulties of defining ground with any satisfactory degree of precision.

The transmitter output impedance is 75 ohms balanced to ground. The receiver input impedance is typically 8000 ohms. No more than 20 receivers (400 ohms minimum for 20–receiver loads) should be connected to one digital data bus, and each receiver contains isolation provisions, ensuring the occurrence of any reasonably probable failure does not cause loss of data to the others. Bus fault tolerances for shorts and steady–state voltages are designed into the transmitters and receivers.

E. RS–422

RS–422 refers to an electrical specification defined by the Electronic Industries Association (EIA). The term RS–422 is used throughout this manual to describe any data bus that consists of shielded-twisted-pairs that have not been previously described in this manual.

Examples are as follows:

- The bus that carries data from the integrated avionics computers to the display units
- The bus that carries data from the radar receiver transmitter to the display units.

F. RS–232

Like the RS–422, RS–232 also refers to an electrical specification as defined by EIA. It is used throughout this manual to describe any of the buses that connect to a personal or laptop computer. This data bus typically carries ASCII data between the computer and one or more of the LRUs in the PRIMUS 1000 system.

An example is:

- The link between the personal or laptop computer and the IAC test function.

G. Serial Control Interface (SCI)

The mode, range, tilt, gain, and controller switch data is sent from the WC–6XX/8XX Weather Radar Controller to the WU–6XX/8XX RTA. This data is sent over the SCI bus to the IC–600 IACs.

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H. Weather Radar Picture Data (WXPD)

The weather radar picture data (WXPD) bus is a 1 MHz dedicated digital bus that interfaces with the Receiver Transmitter Antenna (RTA), MFDs, and PFDs. Picture data video information is supplied from the RTA to the MFDs and PFDs.

I. Integrated Computer Bus (ICB)

The Integrated Computer Bus (ICB) is a 1 MHz bus used for communication between the IC–600s. This bus operates on the HDLC hardware interface. The IC–600 uses this bus for the following:

- Reception of data from the cross–side IC–600
- Transmission of data to the cross–side IC–600.

These are run–time messages. There is also a boot message controlled by the boot software and is used for downloading new software.

This data bus supplies means to communicate between the left and right IC and to load software in the IC–600.

J. Symbol Generator/Display Unit (SG/DU) Bus

The IC–600 contains a 1 MHz picture bus used to transmit display formats to the PFD and MFD DU–870s. This bus operates on the HDLC interface.

- Each format transmission is encoded with an identifier specifying which display (PFD or MFD) is required to display the format
- Each IC–600 transmits data to the DU–870s at a transmission rate of every 33.3 ms (a 30 Hz update rate), although not all the data for a complete format is sent each time. Some data is updated at slower rates, multiplexed in the 30 Hz transmissions.

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SECTION 2
SYSTEM DESCRIPTION

This section gives a detailed description of the general operation and cockpit displays for the PRIMUS 1000 Integrated Avionics System. The operation and display descriptions of the PRIMUS 1000 Integrated Avionics System subsystems are presented in subsections. Each subsection includes interface diagrams, outline illustrations, and tables of leading particulars for each Line Replaceable Unit (LRU) are also supplied. The subsections are given in Table 2-1.

Table 2-1. System Description Subsections

Sub Section	Subsystem	Page Number
2.1	Electronic Display System	2-1-1
2.2	Attitude and Heading Reference System	2-2-1
2.3	ADZ-850 Micro Air Data System	2-3-1
2.4	PRIMUS® Weather Radar System	2-4-1
2.5	PRIMUS® II Integrated Radio System	2-5-1
2.6	Flight Director System	2-6-1
2.7	Autopilot/Yaw Damper System	2-7-1

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TABLE OF CONTENTS – SECTION 2.1

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List of Illustrations

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List of Illustrations (cont)

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List of Tables

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List of Tables (cont)

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SECTION 2.1
ELECTRONIC DISPLAY SYSTEM

1. General

The PRIMUS 1000 Integrated Avionics System includes an Electronic Display System (EDS) with the following LRUs:

- Two IC–600 Integrated Avionics Computers (IAC)
- Three DU–870 Display Units (DU)
- Two BL–870 Bezel Controllers for the PFD function
- One BL–871 Bezel Controller for the MFD function
- Two DC–550 Display Controllers
- One RI–553 Remote Instrument Controller
- One MC–800 MFD Controller.

Two DUs are used to display primary flight data and are called Primary Flight Displays (PFD). One DU is used to display multifunction data and is called a Multifunction Display (MFD).

The EDS is a completely integrated system that combines the processing of PFD data with flight guidance data. This level of integration supplies a number of cost and weight benefits over traditional avionic systems, and greatly simplifies the interface requirements for the flight director. The manner of integration also implies that if the EDS is operational, the flight director is also operational, and conversely if the EDS has failed, the flight director is also failed. This approach features all the performance advantages of display integration, flexibility, redundancy, and reliability.

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The EDS displays the following information in the prime viewing area on both the pilot's and copilot's PFD:

- Pitch and roll attitude
- Indicated airspeed
- Barometric altitude
- Selected alert altitude
- Heading
- Course/Desired track orientation
- Vertical speed
- Flight director commands
- Mode and source annunciations.

The MFD supplies the pilot or copilot with a variety of displays that are menu driven and controlled by five bezel–mounted buttons and two rotary knobs. The menu selections for the buttons are shown at the bottom of the MFD. The menu selections change as a function of which mode is selected for display. Checklist operation, symbol generator reversionary switching, and TCAS mode selection is accomplished with the MC–800 MFD Controller.
The MFD display formats include:

- Map display for FMS navigation
- Plan display for FMS navigation
- Weather radar display
- TCAS data, if available
- Electronic checklist
- Weather radar data window
- TAS/GSPD data window
- Wind display.

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2. Component Descriptions and Locations

A. IC-600 Integrated Avionics Computer (IAC)

Two IC-600 Integrated Avionics Computers (IAC) are located in the nose compartment. Figure 2-1-1 shows a graphical view of the IC-600 IAC. Table 2-1-1 gives items and specifications particular to the computer.

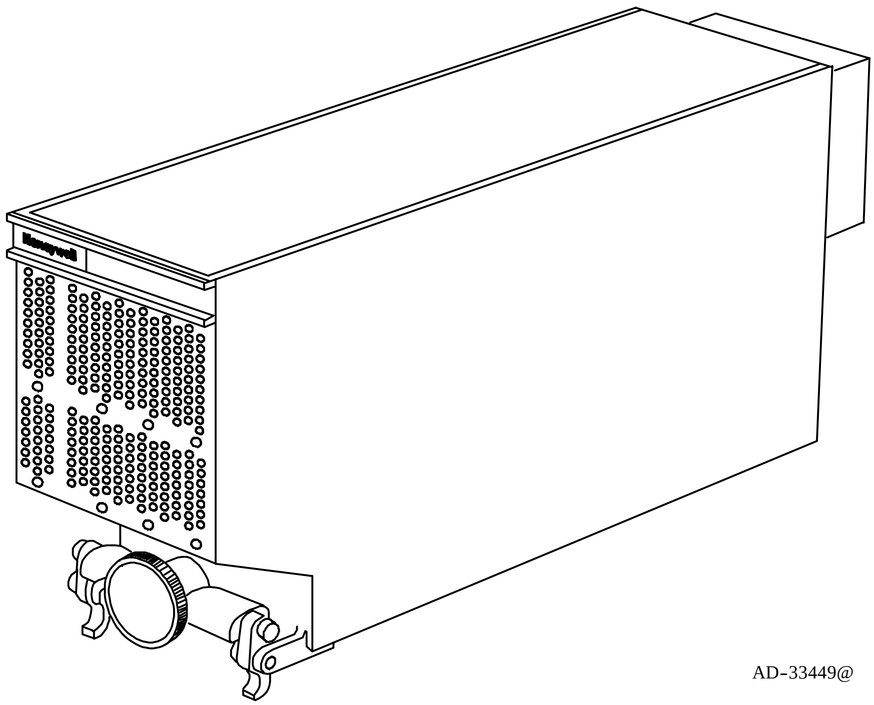

Figure 2-1-1. IC-600 Integrated Avionics Computer (EDS Function)

Table 2-1-1. IC-600 Integrated Avionics Computer Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	7.62 in. (193.55 mm)
• Width	4.13 in. (104.90 mm)
• Length	16.45 in. (418.83 mm)
Weight (maximum):	
• With Autopilot	15.5 lb (7.05 kg)
• Without Autopilot	15.0 lb (6.82 kg)
Power Requirements (with autopilot):	
• Continuous	28 V dc, 50 W (max)
• In-Rush	28 V dc (0.5 sec), 200 W (max)
• Servo Power	28 V dc, 210 W (max)/112 W (nom)

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Table 2-1-1. IC-600 Integrated Avionics Computer Leading Particulars (cont)

Item	Specification
Power Requirements (without autopilot):	
• Continuous	28 V dc, 50 W (max)
• In-Rush	28 V dc (0.5 sec), 200 W (max)
User Replaceable Parts	None
Mating Connectors (J1, J2)	ITT Cannon Part No. DPX2MA-A106P-A106P-33B-0001 NOTE: Sunbank backshell (4) required: Part No. J1560-12-2
Mounting	HPN 7017095-902

The IC-600 Integrated Avionics Computer (IAC) is the primary LRU of the EDS. The pilot's IAC is a symbol generator, flight director, and autopilot/yaw damper computer integrated into a single unit. The copilot's IAC is a flight director and symbol generator only. Integrating the autopilot control and flight director functions with the symbol generator eliminates the external interfaces between these computers. All aircraft sensors and navigation sources are connected directly to the IAC since all flight control functions reside inside the IAC.

The IAC is the focal point of information flow in the EDS. Its primary task is to convert a variety of sensor data into digital data (word) formats for storage in memory until the data can be transmitted over a 1 MHz serial (EDS) bus to the PFD and MFD. Control signals from the display and bezel controllers are used by the symbol generators contained within each display unit to select display format and information source. The system architecture also allows comparison monitoring to be performed continuously in the IAC, eliminating the need for a separate comparison monitor.

Information processed in the symbol generator includes attitude (pitch and roll), heading, glideslope, localizer, course deviation, bearing (ADF, FMS, and NAV), and selected air data quantities.

The IAC features a distributed processor architecture, which utilizes independent hardware elements to perform the aircraft control and monitor functions. The architecture is designed around functional Circuit Card Assemblies (CCA). These separate assemblies are the power supply, analog interface, digital interface, primary central processing unit, and autopilot. The autopilot CCA is not installed in the copilot's IAC. The two IC-600 IACs communicate with each other via the IC bus, which is a bi-directional, high-speed data bus.

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B. DU-870 Display Units

Three DU-870 Display Units are mounted in the aircraft instrument panel. Figure 2-1-2 shows a graphical view of the DU-870 Display Unit. Table 2-1-2 gives items and specifications particular to the display unit.

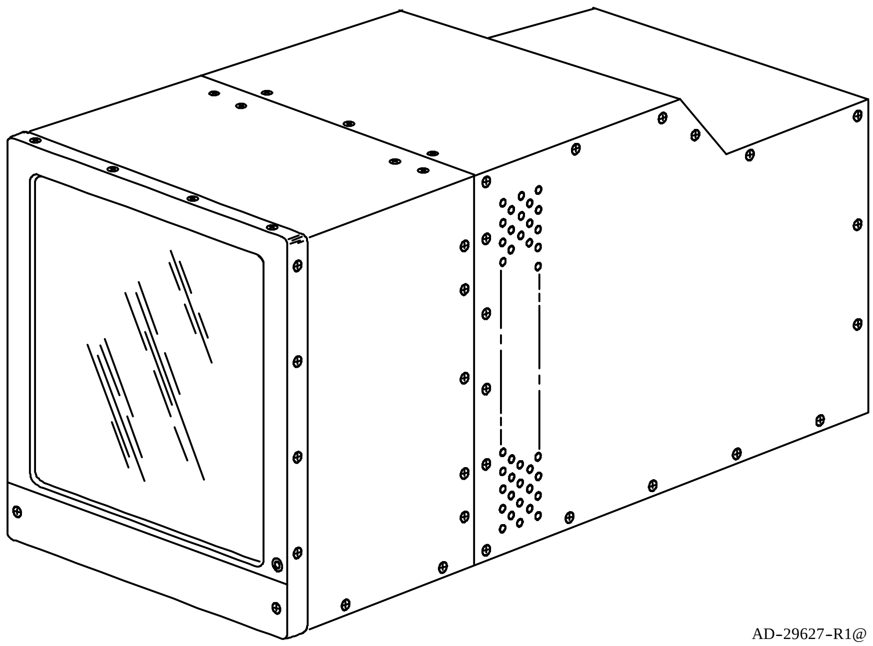

Figure 2-1-2. DU-870 Display Unit

Table 2-1-2. DU-870 Display Unit Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	9.0 in. (228.60 mm)
• Width	6.7 in. (170.18 mm)
• Length	13.53 in. (343.66 mm)
Weight (maximum)	25.6 lb (11.61 kg)
Power Requirements:	
• Nominal	28 V dc, 138 W
• Maximum	28 V dc, 177 W
User Replaceable Parts	None
Mating Connector	ITT Cannon, Part No. DPXBMA-A106-33P-0415
Mounting	HPN 7018724-902

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The DU–870 Display Unit (DU) is a large format (8–inch by 7–inch), 16–color, high resolution Cathode Ray Tube (CRT) and symbol generator integrated into a single LRU. The DU presents dynamic displays to the pilot as part of the EDS. The DU symbol generator uses two modes to generate the displays: stroke and raster. The stroke mode supplies the symbols and characters, and the raster mode supplies background shades (i.e., the blue/brown sphere) and weather radar information. Stroke writing activities are directed by a vector generator capable of both translating and rotating characters and symbols for maximum display flexibility.

NOTE: The DU has a blank plate mounted to the lower bezel assembly. The PFD BL–870 Bezel Controller or MFD BL–871 Bezel Controller is used in place of the blank plate.

The DUs are identical and interchangeable, except when a bezel controller is mounted to the front of the unit. The BL–870 Bezel Controller, with inclinometer, is mounted to the front of the DU when used as a PFD. The BL–871 Bezel Controller is mounted to the DU when used as an MFD. Provisions have been made to light the inclinometer from a standard aircraft 5–volt lighting bus. The DU wiring sends bezel controller signals to the DU rear connector.

A hold–down tray assembly holds the DU in the aircraft instrument panel. The blank plate or bezel controller must be removed to lock or unlock the DU hold–down assembly. Do not block the center cutout in the bottom of the tray. The physical design of the DU requires forced–air circulation for cooling its internal subassemblies. Two fans mounted on the rear of the DU supply the forced–air cooling. The fans pull air into the DU through the tray cutout and ventilation holes in the bottom of the DU, where the air is then directed over the subassemblies.

The DU also has non–volatile maintenance memory that records in–flight faults. The maintenance memory can be read when the DU is in a factory test environment.

(1) Video and Dimming System

The DU can operate in either the raster scan or stroke writing mode. The auto–dimming system sends a signal to the video system to control the overall display intensity. In the auto–dimming system, two strategically placed ambient light sensors generate a control signal to modulate the pilot–selected display intensity (from the dimming control on the DC–550 Display Controller).

(2) System Monitor

The DU incorporates a system monitor to supply CRT phosphor protection and a system invalid signal to the IAC, whenever the following conditions are detected:

- Loss of deflection in both axes
- Abnormal power supply outputs
- Improper CRT filament current.

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C. BL-870 Bezel Controller

The BL–870 Bezel Controller mounts on the front of each DU–870 Display Unit that is used as a PFD. Figure 2–1–3 and Figure 2–1–4 show a graphical view of the BL–870 Bezel Controller. Table 2–1–3 gives items and specifications particular to the controller.

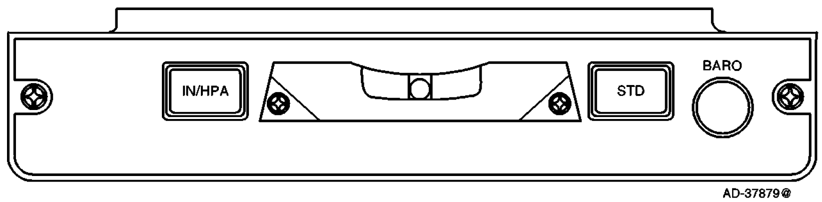

Figure 2-1-3. BL-870 (-921) Bezel Controller (Before Phase III)

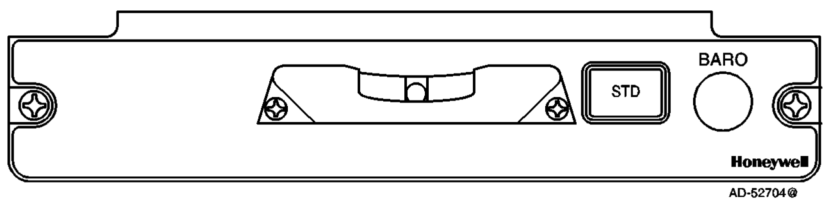

Figure 2-1-4. BL-870 (-931) Bezel Controller (Phase III)

Table 2-1-3. BL-870 Bezel Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.42 in. (36.27 mm)
• Width	6.71 in. (170.51 mm)
• Length	1.10 in. (27.94 mm)
Weight (maximum)	0.3 lb (0.135 kg)
User Replaceable Parts:	
• Inclinometer	HPN 7003115–905
• Knob (BARO)	HPN 7000895–3
• Setscrew (Hex Socket, 6–32 x 3/16–inch, cup point)	HPN 0455–224

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The BL–870 Bezel Controller controls the following PFD display functions:

(1) Standard (STD) Button

Pushing the STD button selects the standard barometric correction value for the baro set digital readout on the PFD. Barometric correction is displayed in 29.92 inHg if inches of mercury is selected, or 1013 hPa if hectopascals is selected.

(2) IN/HPA Button (–921 only)

Pushing the IN/HPA button allows barometric correction to be displayed in either inches of mercury (inHg) or hectopascals (hPa).

(3) BARO Knob

The BARO knob controls the barometric correction digital readout on the on–side PFD. The signal from the knob bypasses the DC–550 Display Controller and is sent directly to the on–side MADC, which supplies a signal to the IC–600 IAC for display processing. Rotating the knob selects a barometric correction readout in 0.01 inHg or 1 hPa increments.

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D. BL-871 Bezel Controller

The BL–871 Bezel Controller mounts on the front of the DU–870 Display Unit that is used as an MFD. Figure 2–1–5 shows a graphical view of the BL–871 Bezel Controller. Table 2–1–4 gives items and specifications particular to the controller.

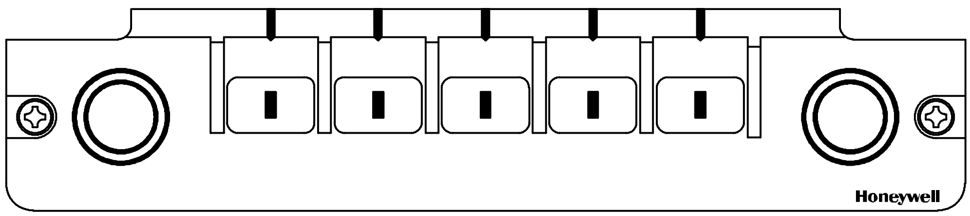

Figure 2-1-5. BL-871 Bezel Controller

Table 2-1-4. BL-871 Bezel Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.42 in. (36.27 mm)
• Width	6.71 in. (170.51 mm)
• Length	1.10 in. (27.94 mm)
Weight (maximum)	0.3 lb (0.135 kg)
User Replaceable Parts:	
• Knob, set	HPN 7000895–3
• Setscrew (Hex Socket, 6–32 x 3/16–inch, cup point)	HPN 0455–224

The BL–871 Bezel Controller has five bezel buttons and two rotary set knobs that let the pilot or copilot select display menu options. The menu selections are shown above the corresponding buttons on the bottom of the MFD display format. These menu selections change as a function of which mode is selected on the MFD. This flexibility allows the bezel buttons to control a variety of functions, while maintaining a minimum of operational complexity.

Pushing the submenu selection button causes the MFD to display that submenu. Pushing the RTN button causes the MFD to return to the top level menu, referred to as the main menu. The pilot or copilot uses the left rotary knob to set various data depending on the menu selection and uses the right rotary knob to set the altitude on the PFD for altitude preselect. Complete descriptions of the MFD menu selections are found in the operations section of this section.

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E. DC-550 Display Controller

The DC–550 Display Controller is mounted in the instrument panel next to the pilot's and copilot's PFD. Figure 2–1–6 and Figure 2–1–7 shows a graphical view of the DC–550 Display Controller. Table 2–1–5 gives items and specifications particular to the controller.

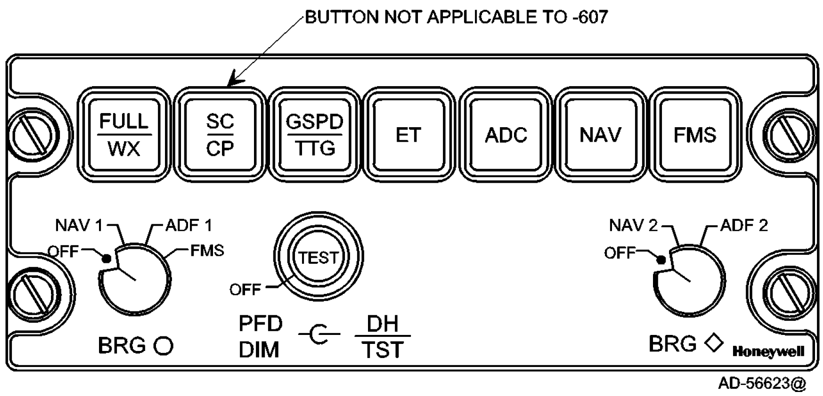

Figure 2-1-6. DC-550 Display Controller (-607 and -707, Before Phase III)

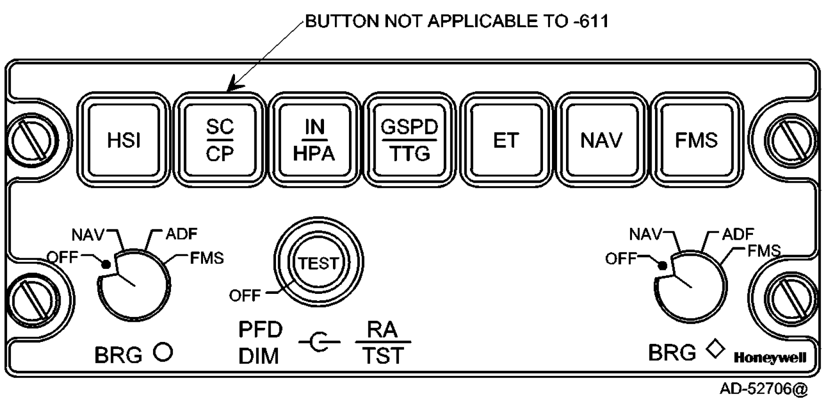

Figure 2-1-7. DC-550 Display Controller (-611 and -723, Phase III)

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Table 2–1–5. DC–550 Display Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.25 in. (57.15 mm)
• Width	5.75 in. (146.05 mm)
• Length	6.87 in. (174.50 mm)
Weight (maximum)	2.0 lb (0.91 kg)
Power Requirements:	
• Primary	28 V dc, 5.0 W (max)
• Lighting	5 V ac, 5.0 W (max)
User Replaceable Parts:	
• Knobs:	
– BRG ○ (Setscrew A)	HPN 7009437
– BRG ◇ (Setscrew A)	HPN 7009437
– DH or RA (Setscrew B)	HPN 7018748–1
– Test Button HUB (Setscrew B)	HPN 7009644–3
• Setscrews:	
– A (Multi–Spline, 2–56 x 1/8–inch, cup point)	HPN 2500148–64
– B (Multi–Spline, 4–40 x 3/16–inch, cup point)	HPN 2500148–130
Mating Connector J1	MS27473E20–B35SB
Mounting	Standard Dzus Rail

The DC–550 Display Controller gives the pilot or copilot a convenient method of selecting the following EDS display functions:

- Selecting a bearing pointer
- Selecting groundspeed or time–to–go display
- Selecting a compass format for weather radar display
- Resetting the elapsed timer display
- Selecting the navigation source
- Selecting air data computers (–607 and –707 DC–550 only)
- Selecting inches of mercury (inHg) or HectoPascals (hPa) (–611 and –723 DC–550 only)
- Selecting between cross pointers or single cue (–707 and –723 DC–550 only).

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The display controller also supplies a data acquisition function for the following remote–mounted controllers:

- PFD Bezel Controllers
- MFD Bezel Controllers
- MS–560 Mode Selectors
- RI–553 Remote Instrument Controllers
- Remote mounted Switches.

Upon receiving signals from a remote controller, the display controller transmits the acquired information to the IC–600 IAC on a two–wire digital interface bus (DC/IC). One bit is assigned on the digital bus for each button and switch input. The IC–600 IAC is configured through software to assign the appropriate function to each bit.

If a display controller is invalid when power is applied to the system after a cold–start, the following selections in Table 2–1–6 are automatically displayed on the PFD:

Table 2–1–6. PFD Selections with DC-550 Invalid

Function	Left Display	Right Display
Compass Display Format	Full	Full
FD Commands	Displayed	Displayed
FD Modes	Inhibited	Inhibited
Selected Source	NAV 1/ILS 1 (See note)	NAV 2/ILS 2 (See note)
GSPD/TTG	GSPD	GSPD
NOTE: Dependent on which frequency is selected on the SRN control head.		

A listing of the display controller functions follows. Each function can have more than one toggling sequence.

(1) FULL/WX Button (–607, –707 only)

The pilot or copilot uses the FULL/WX button to change the PFD from full compass format to the arc/weather format. In the full compass mode 360 degrees of heading are displayed. In the arc/weather (WX) mode, a partial compass of 90 degrees of heading and weather information are displayed.

Successive toggling of the FULL/WX button changes the display back and forth between the two formats. The power–up default for this selection is full heading compass format.

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(2) HSI Button (–611, –723 only)

The pilot or copilot uses the HSI button to change the PFD from a full heading compass format to a partial heading compass format. In the full heading compass mode, 360 degrees of heading are displayed. In the partial heading compass mode, 90 degrees of heading along with weather radar data, if WX is selected using the MC–800 MFD Controller. The power–up default for this selection is full heading compass format.

(3) SC/CP Button (–707, –723 Only)

The pilot or copilot uses the SC/CP button to toggle between single cue or cross pointer flight director command bars. The power–up default is single cue, if the cross pointer discrete is open or if this discrete is grounded, the default is cross pointers.

(4) GSPD/TTG Button

The pilot or copilot uses the GSPD/TTG button to display Ground Speed (GSPD) or Time–To–Go (TTG) in the lower right corner of the PFD. The PFD alternates between displaying GSPD or TTG each time the button is pushed. If Elapsed Time (ET) is currently being displayed, pushing the GSPD/TTG button selects whichever parameter was previously displayed. The power–up default for this selection is GSPD.

(5) IN/HPA Button (–611, –723 only)

The pilot or copilot uses the IN/HPA button to toggle the baro set digital readout on the PFD between inches of mercury (inHg) and HectoPascals (hPa). The power–up default for this selection is dependent on the HPA configuration discrete (open = IN and ground = HPA).

(6) ET Button

The ET button lets the pilot or copilot control an ET display on the PFD and MFD. Initial switch actuation starts the timer sequence at the previous position. Subsequent switch actuation follows this toggle sequence:

- Reset
- Elapsed time
- Stop
- Repeat.

(7) Air Data Computer (ADC) Button (–607, –707 only)

The ADC button selects the cross–side MADC as the source of airspeed, vertical speed and altitude information for the PFD.

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(8) NAV Button

The pilot or copilot uses the NAV button to select short range navigation (NAV) sources for display on the PFD. The power-up default for this selection is on-side NAV source. The toggling sequence is as follows:

- First push: On-side NAV
- Second push: Cross-side NAV
- Repeat.

(9) FMS Button

The pilot or copilot uses the FMS button to select long range navigation (FMS) sources for display on the PFD. The power-up default for this selection is on-side FMS source.

The toggling sequence is as follows for -607 and -707 controllers:

- First push: On-side FMS
- Second push: No effect.

The toggling sequence is as follows for -611 and -723 controllers:

- First push: On-side FMS
- Second push: Cross-side FMS
- Repeat.

(10) Bearing (BRG) Source Select Knobs

The HSI portion of the PFD can display two independent bearing pointers: BRG ○ or BRG ◇. Bearing source BRG ○ is dedicated to the sources on the left side of the cockpit, and BRG ◇ is dedicated to sources on the right side. The bearing sources given in Table 2-1-7 can be selected for each pointer:

Table 2-1-7. Bearing Sources

BRG O	BRG ◇
OFF	OFF
NAV1	NAV2
ADF1	ADF2
FMS1	FMS2

If the display controller is invalid, the on-side NAV bearing is displayed by default.

(11) Decision Height (DH) Set Knob (-607, -707 only)

The decision height control consists of a knob with a button in the center. The pilot or copilot turns the knob to adjust the DH setting shown as a radio altitude digital readout on the PFD.

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(12) Radio Altitude (RA) Set Knob (–611, –723 only)

The RA control is made up of a knob with a button in the center. The pilot or copilot turns the knob to adjust the RA minimums setting shown as an RA digital readout on the PFD.

(13) PFD DIM Knob

The dimming function is controlled by the outer knob of the RA knob and TEST button. The PFD is dimmed as the knob is turned counterclockwise. If the knob is set to the OFF position, the PFD goes blank and the display information is transferred to the MFD.

(14) System TEST Button

The DH or RA set knob has a momentary action TEST button. The pilot or copilot pushes and holds the TEST button for 5 to 6 seconds while the aircraft is on the ground Weight–On–Wheels (WOW) to initiate the test mode, and to do a check of the radio altimeter.

The pilot or copilot pushes the TEST button while the aircraft is in the air (weight–off–wheels) to do a check of the radio altimeter only.

NOTES:

1. The radio altimeter test is functional only if the radio altimeter is connected to the IC–600 IAC test output. If connected, the radio altimeter test can be initiated at any time except during glideslope capture or glideslope track.
2. If the aircraft is on the ground and the TEST button is held for more than 5 to 6 seconds, the system enters the initiated test mode.

The following test displays are shown on the PFD and MFD as long as the TEST button is pushed with weight–on–wheels:

- The course select, heading select, distance and GSPD/TTG digital displays are replaced by amber dashes
- The Attitude (ATT) and Heading (HDG) displays are flagged
- All pointers/scales are flagged
- All heading related bugs/pointers are removed
- The flight director command bars go out of view
- The radio altimeter digital readout displays the radio altimeter self–test value
- The comparator monitor annunciates ATT, HDG, and ILS (if ILS sources are selected on both sides)
- The word TEST (in magenta) is annunciated in the lateral capture location on the top left of the PFD
- The flight director mode annunciations are removed
- RA (comparison monitor).

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F. RI-553 Remote Instrument Controller

The RI-553 Remote Instrument Controller is mounted in the bottom of the pedestal. Figure 2-1-8 and Figure 2-1-9 shows a graphical view of the RI-553 Remote Instrument Controller. Table 2-1-8 gives items and specifications particular to the controller.

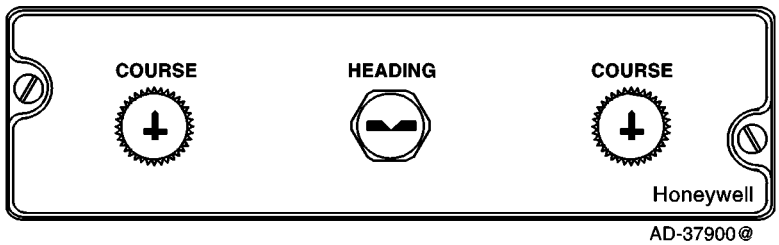

Figure 2-1-8. RI-553 Remote Instrument Controller (-903, Before Phase III)

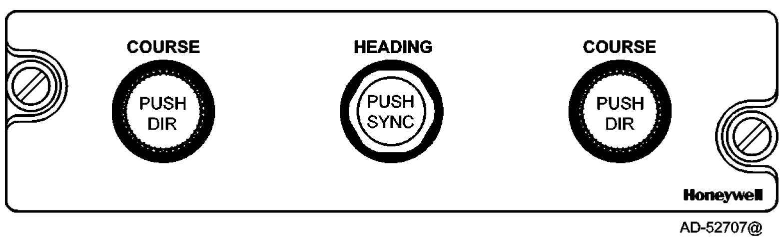

Figure 2-1-9. RI-553 Remote Instrument Controller (-907, Phase III)

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Table 2-1-8. RI-553 Remote Instrument Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.50 in. (38.10 mm)
• Width	5.75 in. (146.05 mm)
• Length	1.01 in. (25.65 mm)
Weight (maximum)	0.80 lb (0.36 kg)
Power Requirements:	
• Panel Lighting	5 V dc, 21.2 W (max)
User Replaceable Parts:	
• Knobs –903 units:	
- COURSE (Setscrew B)	HPN 7005275–908
- HEADING (Setscrew B)	HPN 7017121–902
• Knobs –907 units:	
- COURSE (Setscrew A)	HPN 7009644–1
- HEADING (Setscrew A)	HPN 7009681–1
- COURSE PUSH DIR (Setscrew B)	HPN 7015342–16
- HEADING PUSH SYNC (Setscrew B)	HPN 7015342–7
• Setscrews:	
- A (Multi–Spline, 4–40 x 1/8–inch, cup point)	HPN 2500148–128
- B (Multi–Spline, 2–56 x 1/8–inch, cup point)	HPN 2500148–64
Mating Connector:	
• J1	MS27473E14A–35SC
Mounting	Standard Dzus Rail

The RI–553 Remote Instrument Controller lets the pilot select HEADING and COURSE references. The front panel has a single HEADING knob and two COURSE knobs. The knobs are connected to rotary switches that have 16 positions and give a quadrature greycode output.

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The following paragraphs describe the functions of each knob and button:

(1) Left COURSE Knob

The left COURSE knob is a rotary knob that controls the course select readout on the pilot's PFD. The knob output of selected course is also sent to the flight director and autopilot for the VOR mode. Clockwise (CW) knob rotation changes the selected course in one–degree increments. Counterclockwise (CCW) knob rotation changes the selected course in one–degree decrements. The knob signal is sent to the DC–550 Display Controller, which supplies a grey code signal on the DC/IC interface bus to the IC–600 IAC for processing.

On –907 units, the COURSE knob contains an integral button that is used to synchronize course. Pushing the PUSH DIR button synchronizes the course readout on the pilot's PFD to the aircraft's direct–to–course, when VOR is the selected navigation source.

(2) Heading (HDG) Knob

The HEADING knob is a rotary knob that controls the heading select digital readout and the heading select bug on both PFDs. The knob output of selected heading is also sent to the flight director/autopilot for turn direction. CW knob rotation changes the selected heading in one–degree increments. CCW knob rotation changes the selected heading in one–degree decrements. The knob signal is sent to the DC–550 Display Controller, which supplies a grey code signal on the DC/IC interface bus to the IC–600 IAC for processing.

On –907 units, the HEADING knob contains an integral button that is used to synchronize heading. Pushing the PUSH SYNC button synchronizes the heading select digital readout and heading select bug to the current aircraft heading.

(3) Right COURSE Knob

The right COURSE knob is a rotary knob that controls the course select readout on the copilot's PFD. The knob output of selected course is also sent to the flight director and autopilot for the VOR mode. CW knob rotation changes the selected course in one–degree increments. CCW knob rotation changes the selected course in one–degree decrements. The knob signal is sent to the DC–550 Display Controller, which supplies a grey code signal on the DC/IC interface bus to the IC–600 IAC for processing.

On –907 units, the COURSE knob contains an integral button that is used to synchronize course. Pushing the PUSH DIR button synchronizes the course select digital readout on the copilot's PFD to the aircraft's direct–to–course, when VOR is the selected NAV source.

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G. MC-800 MFD Controller

The MC-800 MFD Controller is mounted in the top of the pedestal. Figure 2-1-10 and Figure 2-1-11 show a graphical view of the MC-800 MFD Controller. Table 2-1-9 gives items and specifications particular to the controller.

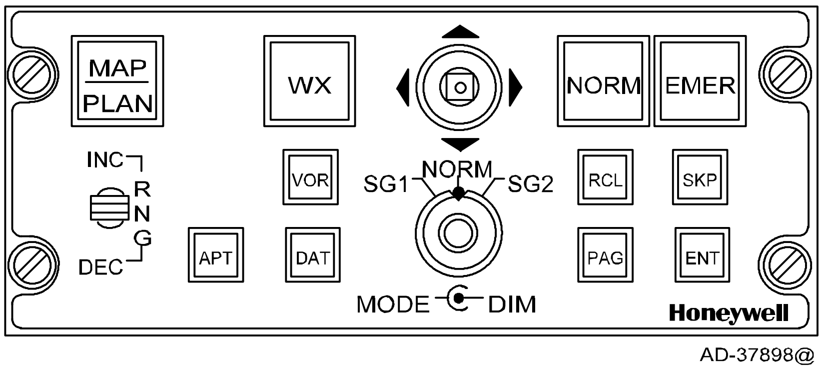

Figure 2-1-10. MC-800 MFD Controller (-939 without TCAS)

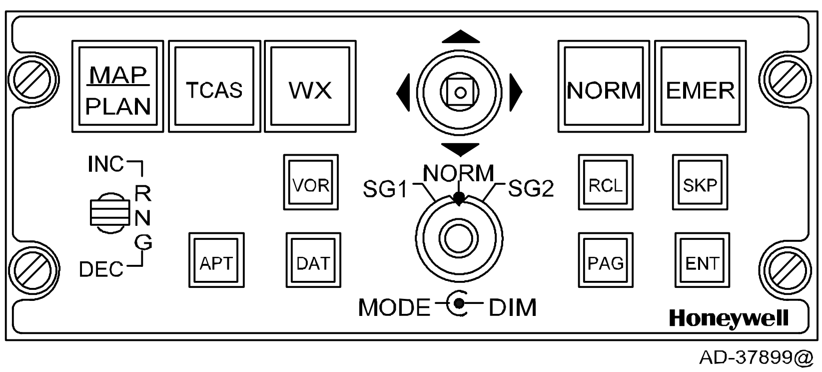

Figure 2-1-11. MC-800 MFD Controller (-941 with TCAS)

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Table 2-1-9. MC-800 MFD Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.25 in. (57.15 mm)
• Width	5.75 in. (146.05 mm)
• Length	6.59 in. (167.38 mm)
Weight (maximum)	1.8 lb (0.82 kg)
Power Requirements:	
• Primary	28 V dc, 5.0 W (max)
• Lighting	5 V dc, 5.0 W (max)
User Replaceable Parts:	
• Knobs:	
- MODE	HPN 7008180
- DIM	HPN 7008181
• Setscrew (Multi-Spline, 2-56 x 1/8-inch Cup Point)	HPN 2500148-64
Mating Connector:	
• J1	MS27473E14-35S
Mounting	Standard Dzus Rail

The MC-800 MFD Controller gives the pilot or copilot a convenient method of selecting display formats and modes that change the information on the MFD. This includes display dimming, map or plan and weather displays, normal and emergency checklists, and optional TCAS resolution and traffic advisories. The controller also lets the pilot select the display backup mode. The following paragraphs describe the available functions.

(1) Display Select Buttons

(a) MAP/PLAN Button

The MAP/PLAN button alternately selects the heading up MAP mode or the North up PLAN mode for display.

(b) TCAS Button (-941 only)

The TCAS button is an optional button that selects the fixed range traffic advisory display function.

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(c) Weather (WX) Button

The WX button is used to call up weather radar returns on the MFD map display. When weather is displayed, the map range is controlled by the WC-650 Radar Controller.

(d) Normal (NORM) Button

The NORM button gives entry into the normal checklist display function. The normal checklist is arranged in the order of standard flight operations. Pushing the button causes presentation of the normal checklist index page that contains the lowest order incomplete and unskipped checklist with the active selection at that checklist. The SKP, RCL, PAG, and ENT buttons and the joystick control this function.

(e) Emergency (EMER) Button

The EMER button gives entry into the emergency checklist display function. Pushing the EMER button results in the presentation of the first page of the highest priority callup with the active selection at the first item on the page. The SKP, RCL, PAG, and ENT buttons and the joystick control this function.

(2) Checklist Control

(a) Skip (SKP) Button

Pushing the SKP button skips the active selection to the next item. If the item skipped is the last item, the active selection is the lowest order skipped item.

(b) Recall (RCL) Button

Pushing the RCL button results in presentation of the page containing the lowest order skipped item with the active selection at that item.

(c) Page (PAG) Button

Pushing the PAG button advances the page count. The active selection is the lowest order incomplete item on that page. If there are no incomplete items on the page, the active selection is the first item on the page.

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(d) Enter (ENT) Button

Operation of the ENT button depends upon whether the display is an index page or a checklist page. If the ENT button is pushed when on an index page, a checklist corresponding to the active index line selection is displayed. The checklist is presented at the page containing the lowest order incomplete item with the active selection at that item. If the checklist had previously been completed, the system forces all items in the checklist to incomplete and presents the first page of the checklist with the active selection at the first item.

If the ENT button is pushed when on a checklist page, actuation forces the active selection to complete and advance the active selection to the next incomplete item. If ENT is actuated with the active selection at the last item in a checklist, the operation depends upon the completion status of the checklist.

If the checklist is not complete (one or more items skipped) the system presents the page containing the lowest order incomplete item with the active selection at that item.

If the checklist is complete (all items complete) the system presents the index page containing the next higher order checklist with the active selection at that checklist.

(e) Joystick

The joystick gives additional paging and cursor control. Each actuation results in the following action:

- UP moves the active selection to the lower order item
- DOWN moves the active selection to the next higher order item (this is identical to SKP)
- LEFT results in presentation of the previous page
- RIGHT results in presentation of the next page (this is identical to PAG).

(3) Designator Control (FMS Only)

(a) Skip (SKP) Button

Pushing the SKP button skips the designator's home position to the next displayed waypoint. When actuated with the designator at the last displayed waypoint, the designator returns to present position.

(b) Recall (RCL) Button

When the designator is not at its home position, actuation of RCL recalls the designator to the home position. Actuation with the designator at its home position recalls the designator to present position, if not already there.

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(c) Enter (ENT) Button

When the designator is offset, actuation of ENT causes the LAT/LON of the designator to be transmitted to the selected LRN as a requested waypoint.

(d) Joystick

The joystick gives four-direction control of the designator: up, down, left, and right. The course and distance to the designator from its home position is displayed in the lower right corner of the display.

(4) VHF Omnidirectional Range (VOR) Button

The VOR button is used to add or remove VOR/DME symbols to the map and plan displays.

(5) Data (DAT) Button

The DAT button is used to add or remove long-range navigation information to the map and plan displays.

(6) Airport (APT) Button

The APT button adds or removes airport designators to the map and plan displays.

(7) Increase (INC)/Decrease (DEC) Range (RNG) Switch

This switch increases or decreases the map or plan range (5, 10, 25, 50, 100, 200, 300, 600, and 1200 NM), if the weather radar (WX) mode is not selected. When WX is selected, the range is controlled by the WC-6XX/8XX Weather Radar Controller.

(8) Mode/Dim Control

The MODE/DIM set control consists of two concentric knobs. The outer knob selects MFD modes of operation. The inner knob adjusts the intensity of the MFD.

(a) MODE Selector

This knob is a three-position rotary switch that selects the following MFD modes of operation:

- NORM
  - The NORM position selects normal MFD operation
- SG1
  - The SG1 position lets the IC-600 IAC No.1 drive all displays
- SG2
  - The SG2 position lets the IC-600 IAC No.2 drive all displays.

(b) DIM Control

This knob controls overall MFD dimming.

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3. Operation

A. Electronic Display System Bus Interfaces

Display data is carried by several multi–user, serial asynchronous, half–duplex, digital communication buses. These display/data buses include the following:

- A digital display bus output from each IC–600 IAC to each DU
- Display controller to IC–600 IAC (DC–IC) buses
- DU wraparound buses to each IC–600 IAC
- One MFD control bus to the IC–600 IAC (MC–IC)
- Left and right Weather Radar Control (WC) and picture buses
- One IC–600 IAC to IC–600 IAC (IC–IC) data bus.

These display data buses are the primary communication paths between the IACs, DU–870 Display units, and the controllers. All of the buses listed above are made up of RS–422 transmitters and receivers connected by shielded–twisted–wire–pairs. Data is encoded in either two's complement fractional binary notation or binary coded decimal notation and transmitted by a single transmitter to either a single receiver or to a group of receivers connected in parallel.

All of the buses, except the IC–IC bus, carry data in one direction only. They use separate receivers, transmitters, and twisted-wire-pairs. The IC–IC bus is bidirectional. This bus uses Very Large Scale Integration (VLSI) Manchester encoder/decoder chips with buffered inputs and outputs to transmit and receive data on the same twisted–wire-pair. Data transmitted onto any bus drives one line more positive and the other line more negative.

Control and data protocols are pre–defined, each bus works on a message basis without bus controllers commanding users to transmit data and thus no frame controls or transmit requests. Data broadcasts follow the High Level Data Link Control (HDLC) message format as described in International Standard ISO 3309–1979 (E). Since each user knows its own user number, the bus user sets up an internal timer, based upon the last message received, and transmits at the appropriate time.

(1) Digital Display Bus

Each IC–600 IAC has a dedicated 1 MHZ display bus output. This bus, as shown in Figure 2–1–12, lets the DUs receive display format information. The DU can receive display formats from four sources and weather radar data from three sources.

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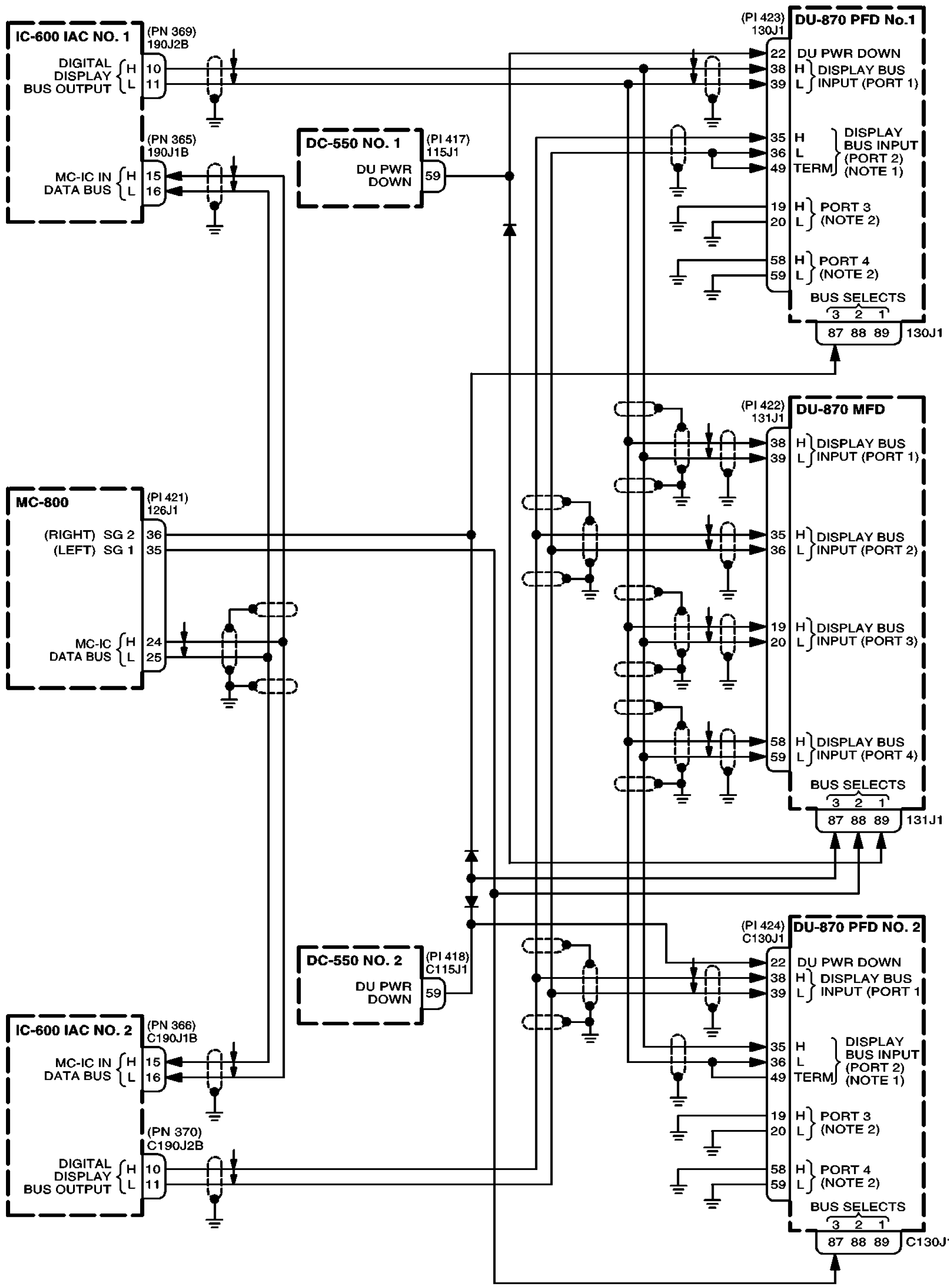

NOTES: 1. THE SIGNAL IS ALWAYS APPLIED BETWEEN THE H AND L TERMINALS. TO USE THE INTERNAL TERMINATION RESISTOR, THE LAST DU ON THE BUS ALSO HAS THE TERM PIN TIED TO THE L TERMINAL. THE MAX WIRE LENGTH BETWEEN THE L AND TERM PIN IS 6 INCHES.

2. IT IS RECOMMENDED THAT ALL UNUSED BUS INPUTS (H AND L) BE TIED TO AIRFRAME GROUND AS CLOSE TO THE DU AS POSSIBLE. IF THIS IS NOT POSSIBLE, THE H AND L INPUTS SHOULD BE TIED TOGETHER.

AD-40973-R3

Figure 2-1-12. Display Bus Interface

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(2) DC–IC Data Bus

The DC–550 Display Controller utilizes a DC–IC bus running at 9600 baud rate to transmit data to the IC–600 IAC. This bus, as shown in Figure 2–1–13, transmits momentary switch inputs and ground/open discretes (2–wire quadrature knob rotation data) to the IC–600 IAC from the controllers and remote switches listed below.

- DC–550 Display Controller
- MS–560 Mode Selector
- RI–553 Remote Instrument Controller
- PFD and MFD bezel controllers
- Attitude and heading reversion switches.

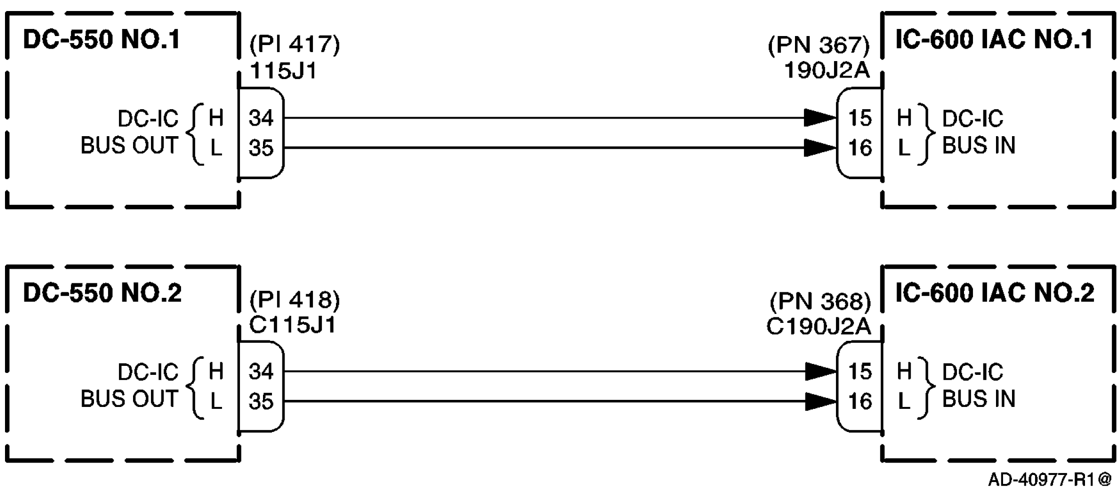

Figure 2–1–13. DC–IC Data Bus

(3) DU–870 Wraparound Bus

Each IC–600 IAC receives data from the DU–870 over a 1 MHZ bus. This bus, as shown in Figure 2–1–14, contains status information broadcast from the DU–870 and any requested wrap–around data (pitch, roll, altitude, and indicated airspeed). Under DU reversion conditions (assuming no IC reversion), the IC–600 IAC looks at another DU bus for the wrap-around information.

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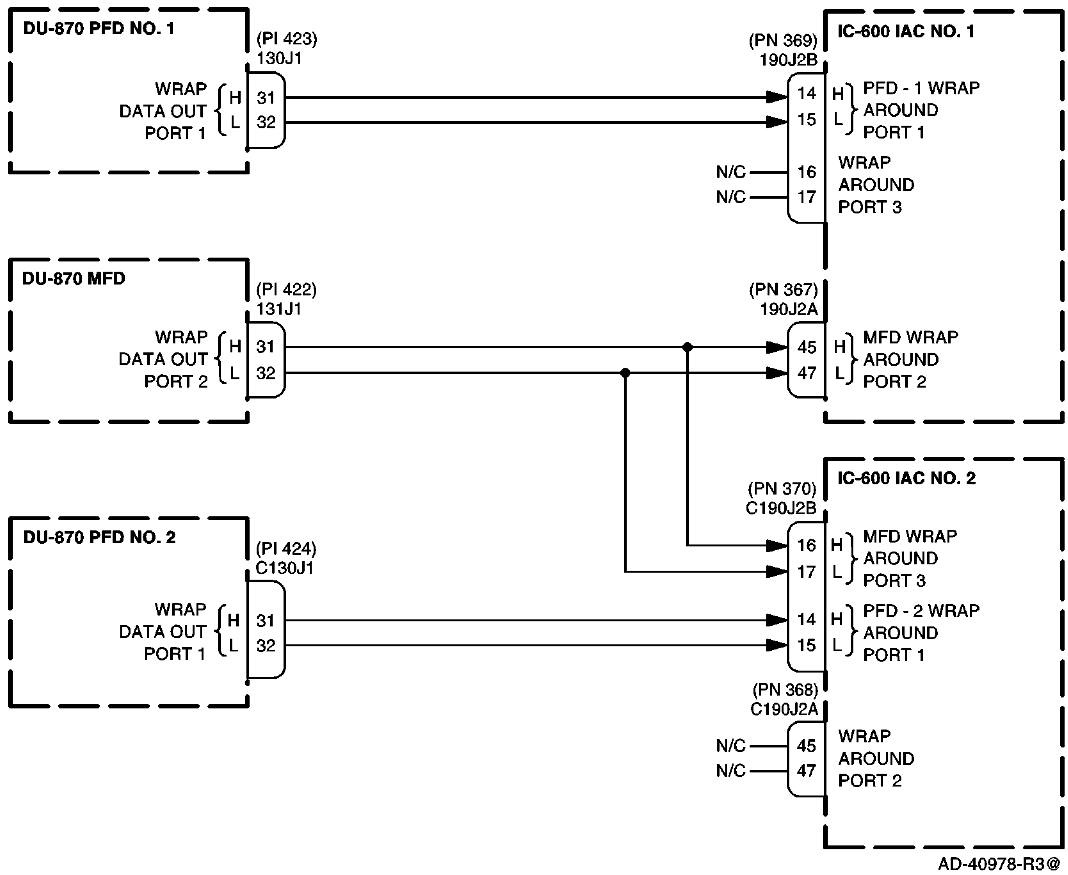

Figure 2-1-14. DU Status and Wraparound

The DU wrap-around logic is based on the following installation:

No. 1 IC-600 IAC:

- DU wrap-around port 1 connected to Left DU
- DU wrap-around port 2 connected to Center DU
- DU wrap-around port 3 not connected.

No. 2 IC-600 IAC:

- DU wrap-around port 1 connected to Right DU
- DU wrap-around port 2 not connected
- DU wrap-around port 3 connected to Center DU.

NOTE: Center DU cannot be turned OFF.

(4) IC-600 IAC Reversionary Control

The DC and MFD controllers together generate the reversionary modes of the PRIMUS 1000 system. Based on the MC-800 and the DC-550 switch positions given in Table 2-1-10, the IC-600 IAC drives the format on the indicated DUs. See Figure 2-1-15 for the hardware interconnect that supports reversionary control.

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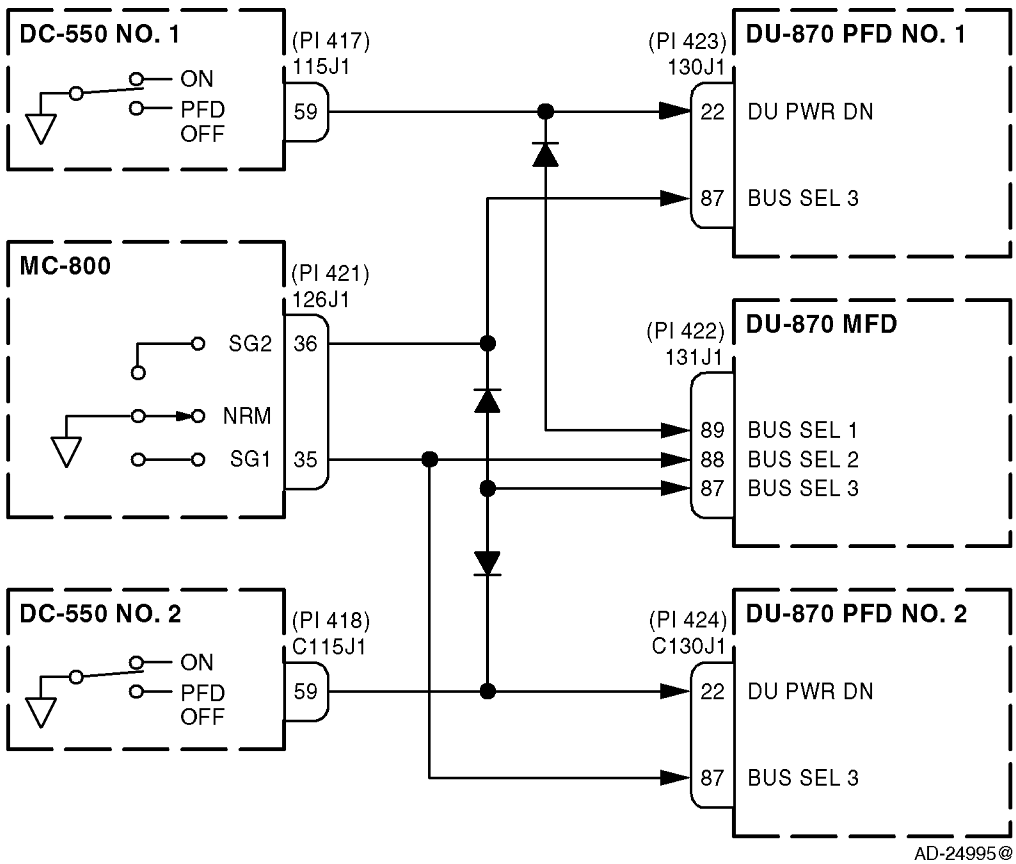

Figure 2-1-15. Reversionary Interconnect

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Table 2-1-10. Reversionary Control

MC-800 Rotary Knob Position	DC-550 No.1 PFD Dim Knob Position	DC-550 No.2 PFD Dim Knob Position	DU-870 No. 1					DU-870 (MFD)					DU-870 No. 2				
			Bus Select			Port No.	Display Format	Bus Select			Port No.	Display Format	Bus Select			Port No.	Display Format
		DC-550 No.2	3	2	1			3	2	1			3	2	1		
NORM	ON	ON	o	o	o	1	PFD1	o	o	o	1	MFD1	o	o	o	1	PFD2
SG1	ON	ON	o	o	o	1	PFD1	o	g	o	3	MFD1	g	o	o	2	PFD1
SG2	ON	ON	g	o	o	2	PFD2	g	o	o	2	MFD2	o	o	o	1	PFD2
NORM	OFF	ON	N/A			N/A	NONE	o	o	g	1	PFD1	o	o	o	1	PFD2
NORM	ON	OFF	o	o	o	1	PFD1	g	o	o	2	PFD2	N/A			N/A	NONE
NORM	OFF	OFF	N/A			N/A	NONE	g	o	g	2	PFD2	N/A			N/A	NONE
SG1	OFF	ON	N/A			N/A	NONE	o	g	g	1	PFD1	g	o	o	2	PFD1
SG1	ON	OFF	o	o	o	1	PFD1	g	g	o	4	PFD1	N/A			N/A	NONE
SG1	OFF	OFF	N/A			N/A	NONE	g	g	g	4	PFD1	N/A			N/A	NONE
SG2	OFF	ON	N/A			N/A	NONE	g	o	g	2	PFD2	o	o	o	1	PFD2
SG2	ON	OFF	g	o	o	2	PFD2	g	o	o	2	PFD2	N/A			N/A	NONE
SG2	OFF	OFF	N/A			N/A	NONE	g	o	g	2	PFD2	N/A			N/A	NONE

NOTES:

1. SG1 indicates IC-600 IAC No.1 driving all active DUs
2. SG2 indicates IC-600 IAC No.2 driving all active DUs
3. MFD1 or PFD1 indicates display format driven by IC-600 IAC No.1
4. MFD2 or PFD2 indicates display format driven by IC-600 IAC No.2
5. g Indicates DU bus select is GROUND
6. o Indicates DU bus select is OPEN

(5) MC-IC Data Bus

The MC-800 MFD Controller uses a single RS-422 Data Bus (MC-IC) to continuously transmit data to both IC-600 IACs. The data format is made up of one start bit, eight data bits, an odd parity, and one stop bit. Mode codes (NORM, SG1, SG2) are always included with the data. Joystick codes are also sent as long as the joystick is in an operating position. Button closures are only sent twice and then a none code is sent until the next button is pushed.

(6) Weather Radar Control and Picture Buses

The weather radar interface constitutes a picture and control bus, as shown in Figure 2-1-16 or Figure 2-1-17. The picture bus interfaces directly with the PFD and MFD, and the control bus interfaces with the IC-600 IAC. The picture bus is used to transmit partially scan converted weather radar video directly to the DU-870 Display Unit. The control bus is used to transmit radar status information to the IC-600 IAC. Mode annunciations are received over the serial interface from the WU-6XX/8XX RTA.

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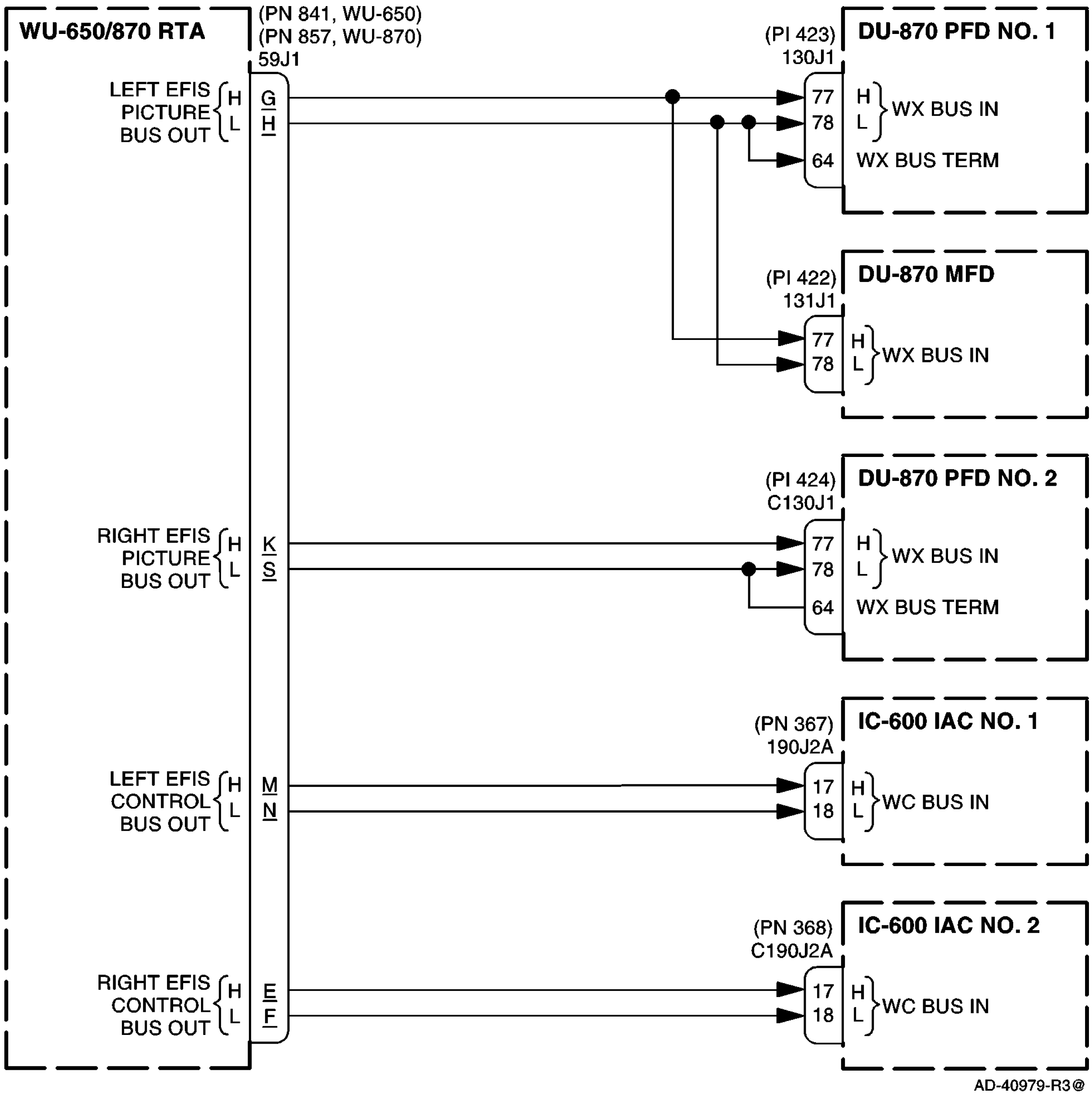

Figure 2-1-16. **PRIMUS 650/870 Weather Radar Control and Picture Buses**

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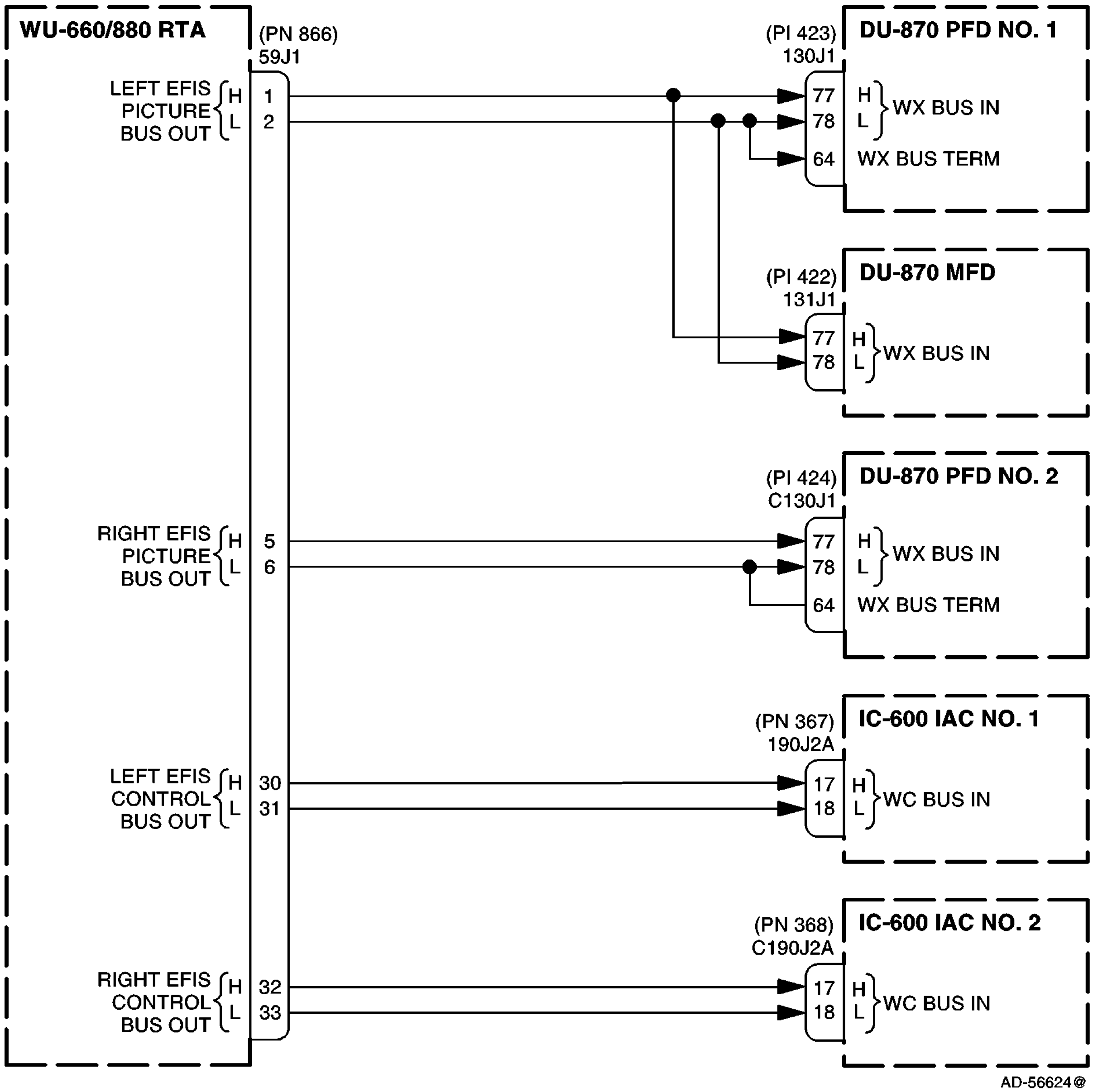

Figure 2-1-17. PRIMUS 660/880 Weather Radar Control and Picture Buses

Weather radar returns can be displayed on the PFD when the WX format is selected by the DC-550 Display Controller and on the MFD when WX is selected from the MC-800 MFD Controller. The weather radar controller interfaces with the WU-6XX/8XX RTA through a low-speed serial bus and outputs the different WX modes selected. The WU-6XX/8XX, in turn, echoes this information to the IAC.

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Data representing knob and switch selections are encoded in either two's complement fractional binary notation or binary coded decimal notation and transmitted to the WU-6XX/8XX RTA. The bus is connected by a shielded-twisted-wire pair that carries data in one direction only.

Serial bus transmissions consist of words made up of three bytes of serial information. The first byte is called the (octal) label, which identifies the type of data contained within the word, and the second and third bytes are the data.

(7) IC to IC Bus

The IC-600 IAC utilizes a high-speed data bus for communication with the cross-side IC, as shown in Figure 2-1-18. This data bus supplies the means to perform the following tasks:

- Communicate between the left and right IC-600 IAC
- Load software in the IC-600 IAC
- Record internal parameters
- Modify gains in the IC-600 IAC during flight test.

The IC-600 IAC to IC-600 IAC or cross-side message consists of a block of 260 16-bit words. Data flow on the IC bus is bidirectional (two-way transmit and receive). The first IC-600 IAC to go on-line at power-up initializes the IC-IC bus for communication by transmitting a power-up data message. When an IC-600 IAC has established system communication, the other bus users listen and then synchronize their data messages with the last message received on the bus.

Bus contention between users is avoided through the use of a delayed power-up scheme. Power-up priority is based on the users identification pins. Table 2-1-11 lists assigned user priority and delay sequence. When power is first applied, a timer in IC-600 IAC No. 1 is initialized for the delay specified in Table 2-1-11. At the same time a receiver in the same IC-600 IAC is also enabled and begins polling the bus for valid transmissions.

Table 2-1-11. Power-up Priority Assignment

Identification Pins	Priority	Power-up Delay
IC-600 IAC No. 1	1	45ms
IC-600 IAC No. 2	2	55ms

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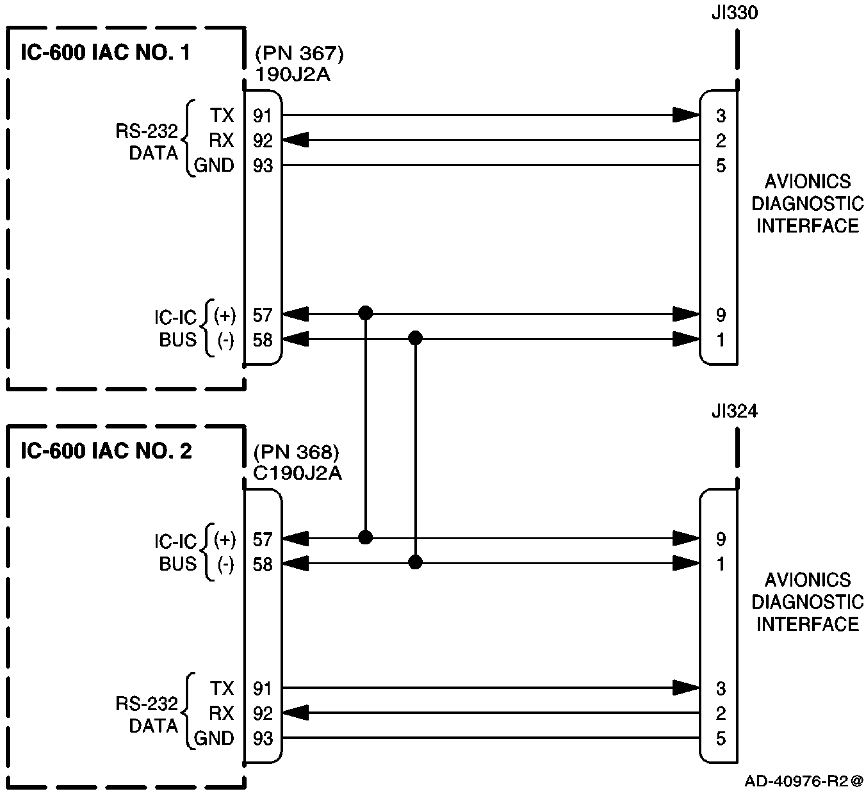

Figure 2-1-18. **IC to IC Bus/RS-232 Cabin Interface**

If the IC-600 IAC No. 1 recognizes that another user is on the bus, it goes into synchronized processing. If no data is found on the bus before the timer expires, the IC-600 IAC enables a transmitter, resets the power-up timer, and listens for bus activity. If no data is found before the timer again expires, the IC-600 IAC No. 1 transmits power-up data onto the bus.

After the transmission has been completed, the IC-600 IAC restarts the search for additional data. This power-up sequence is repeated by the IC-600 IAC No. 2 with the delay specified in Table 2-1-11.

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B. Sensor Interface

(1) Attitude Interface

Dual VG–14A Vertical Gyros are standard equipment on the Citation Ultra. Either IC–600 IAC displays the cross–side attitude source.

(a) VG–14A Vertical Gyro No. 1

The No.1 attitude interface, shown in Figure 2–1–19, consists of on–side (primary) and cross–side (secondary) three–wire, 400 Hz synchro pitch and roll attitude inputs. On–side and cross–side pitch and roll attitude data are routed internally and separately to both the display processor and to the autopilot processor in the IC–600 IAC No. 1. A 28 V dc attitude valid is also supplied.

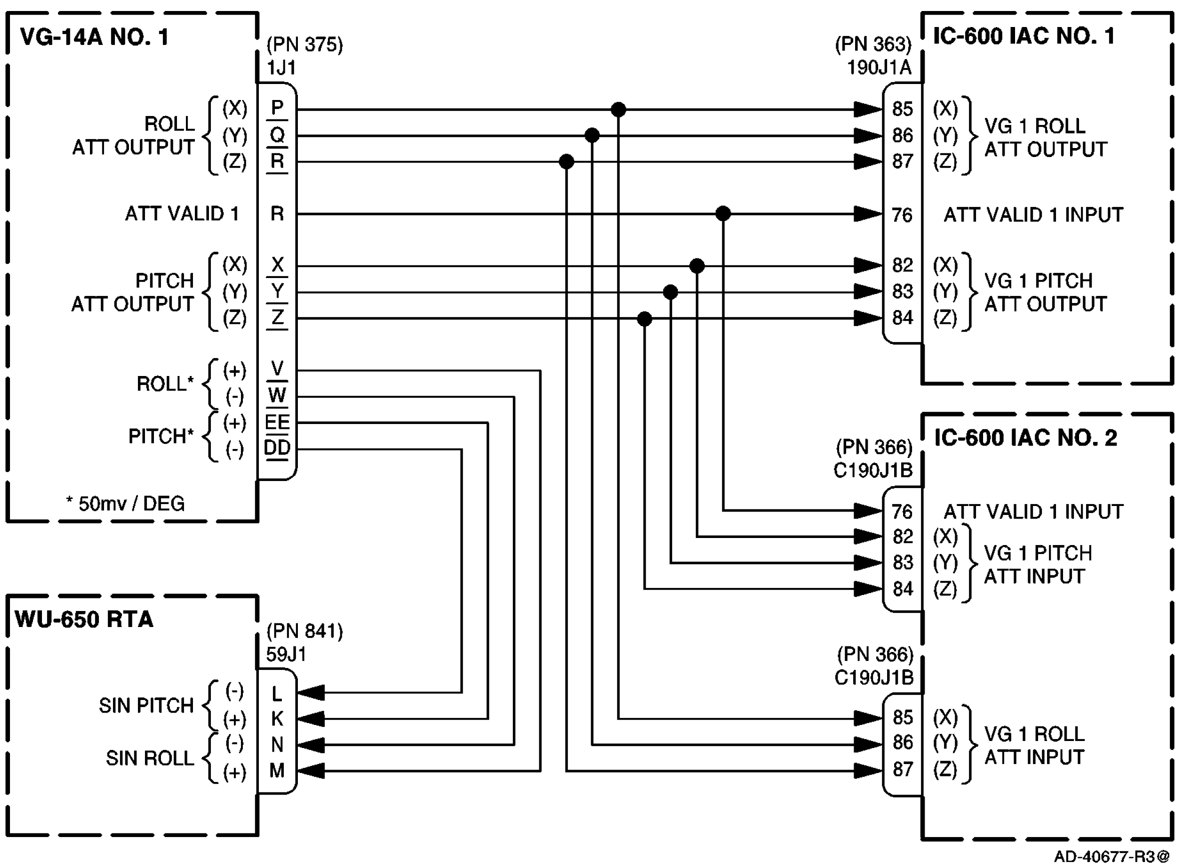

Figure 2–1–19. VG No.1 (Pilot) Interface

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(b) VG–14A Vertical Gyro No. 2

The No.2 attitude interface, shown in Figure 2–1–20, consists of on–side (primary) and cross–side (secondary) three–wire, 400 Hz synchro pitch and roll attitude inputs. On–side and cross–side pitch and roll attitude data are routed internally and separately to the display processor in the IC–600 IAC No. 2. A 28 V dc attitude valid is also supplied.

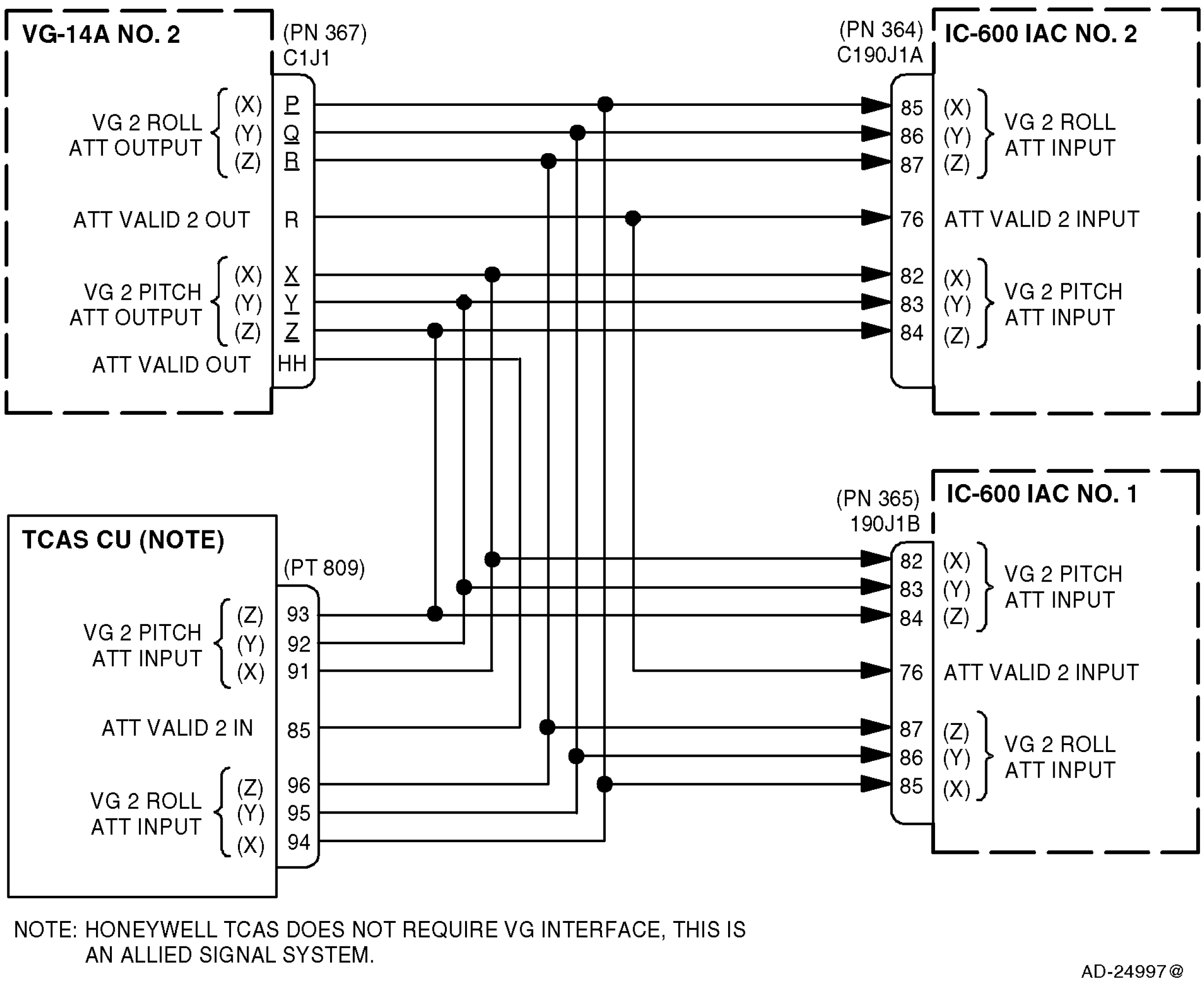

Figure 2–1–20. VG No.2 (Copilot) Interface

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(2) Heading Interface

Dual C–14D Directional Gyros are standard equipment on the Citation Ultra. Either IC–600 IAC displays the cross–side heading source.

(a) C–14D Directional Gyro No. 1

The No.1 heading interface, shown in Figure 2–1–21, consists of on–side (primary) and cross–side (secondary) three–wire, 400 Hz synchro heading inputs. On–side and cross–side heading data are routed internally and separately to the display processor and to the autopilot processor in the IC–600 IAC No. 1. A 28 V dc heading valid is also supplied as shown in Figure 2–1–22.

(b) C–14D Directional Gyro No. 2

The No.2 heading input interface, shown in Figure 2–1–21, is made up of on–side (primary) and cross–side (secondary) three–wire, 400 Hz synchro heading inputs. Both on–side and cross–side heading data are routed internally and separately to the display processor in the IC–600 IAC No. 2. A 28 V dc heading valid is also supplied as shown in Figure 2–1–22.

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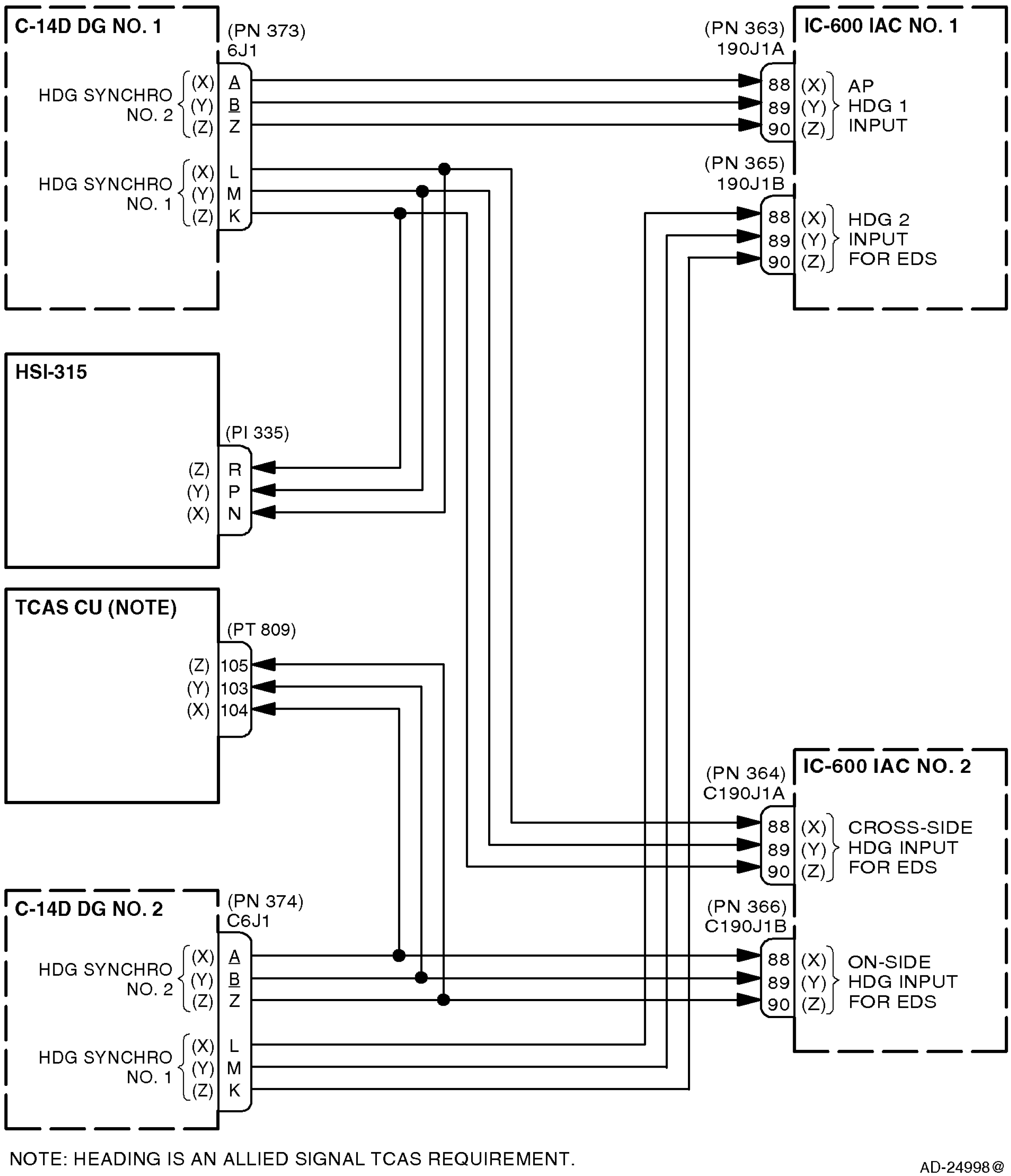

Figure 2-1-21. DG No.1 and No.2 Interface

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(3) Compass Sync/Heading Valid Interface

The compass system,shown in Figure 2–1–22, supplies a compass slaving error signal that is displayed on the HSI portion of the PFD to indicate proper slaving of the compass system. Input gradient is 200mv/dot. If the C–14D Directional Gyro heading output is valid, 28 V dc is applied from J1–J thru an interlock relay to J1–H as a heading valid output to the IC–600 IACs.

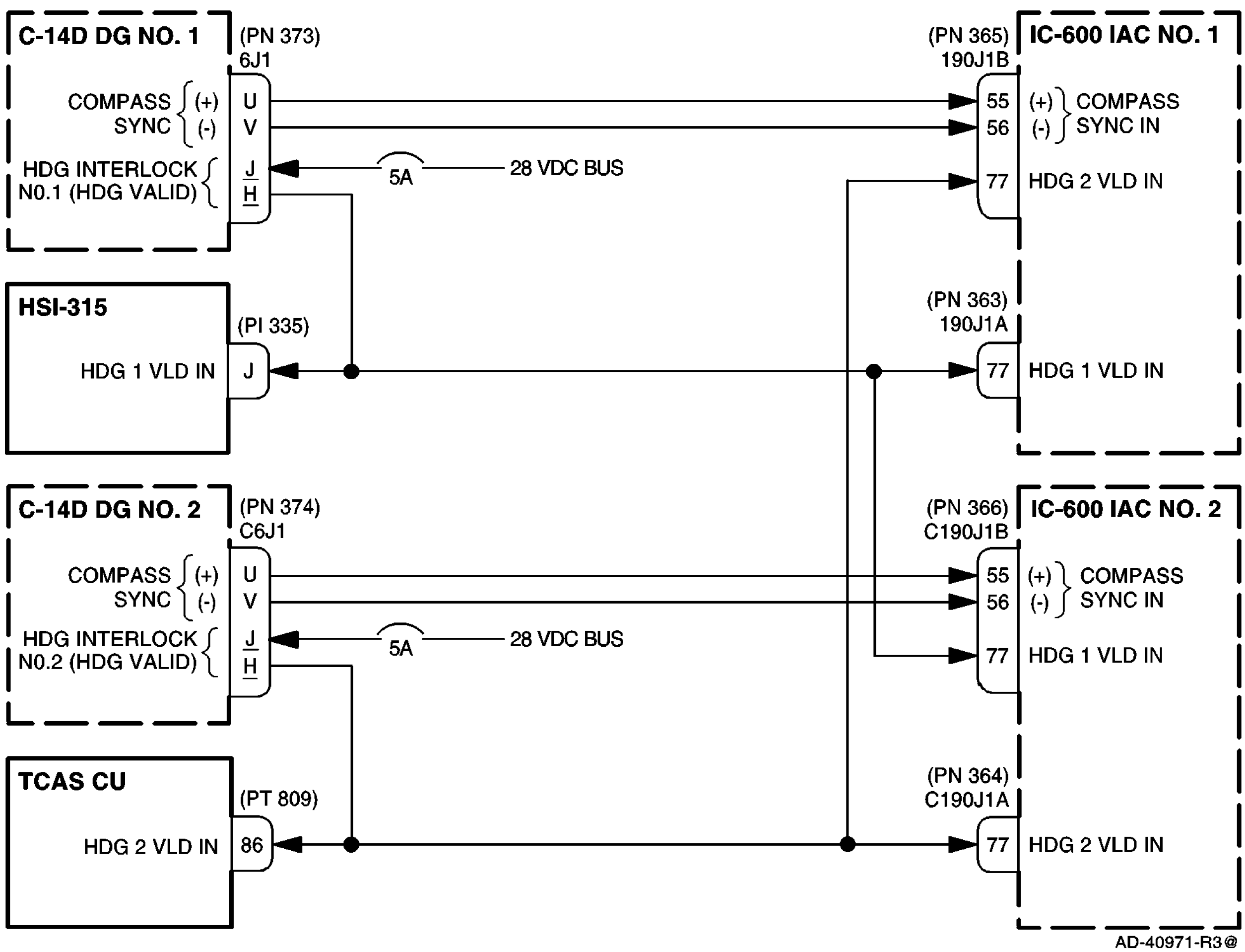

Figure 2–1–22. Compass Sync/Heading Valid Interface

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(4) ARINC 429 Radio Interface

NOTE: For the Honeywell Radio System Bus (RSB) interface, refer to Section 1, Figure 1–5.

The IC–600 IAC radio interface is compatible with GAMA standard ARINC 429. The radio interface accepts radio data transmitted over low–speed ARINC 429 data buses with the word labels given in Table 2–1–12.

Table 2–1–12. Radio System Interface

Word Label	Label Description
NAV: 034	VOR/ILS Frequency (contains Tuned–To–Localizer {TTL} bit)
173	Localizer Deviation
174	Glideslope Deviation
222	VOR Bearing
DME: 002	DME Time to Go
012	DME Ground Speed
035	DME Frequency
202	DME Distance
ADF: 162	ADF Bearing

(a) Short Range NAV (VOR/LOC/ILS)

Short range NAV data is supplied through two GAMA Standard ARINC 429 data buses (Figure 2–1–23). The VOR receiver supplies radio deviation, to/from, bearing, and flag outputs to the IC–600 IAC for two purposes; primary flight display, and automatic tracking and capture of the selected VOR radial.

Localizer data is used for lining up the aircraft on the center line of the runway. Localizer deviation is displayed on the PFD. The flight guidance function of the IC–600 IAC also uses localizer deviation for automatic capture and tracking of the localizer beam.

Glideslope data is used for guiding the aircraft down to the runway in a linear descent. Glideslope deviation is displayed on the PFD. The flight guidance function of the IC–600 IAC also uses glideslope deviation for automatic capture and tracking of the glideslope beam.

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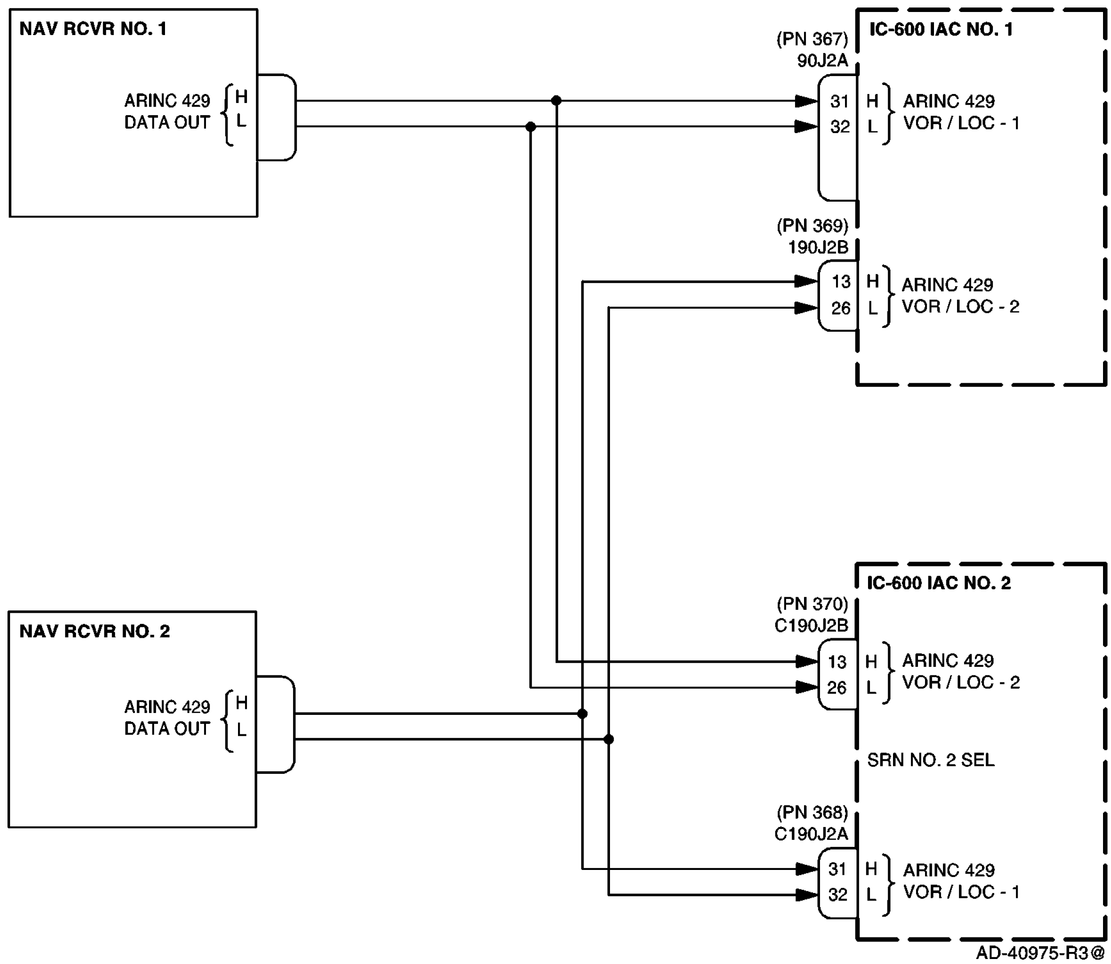

Figure 2-1-23. VOR/LOC to IC-600 IAC Interface

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(b) DME Receiver

The DME interface (Figure 2–1–24) into the IC–600 IAC is through two ARINC 429 input ports (primary and secondary) which can be configured for single or dual DME installations. Time–to–Go, ground speed and distance are displayed on the PFD.

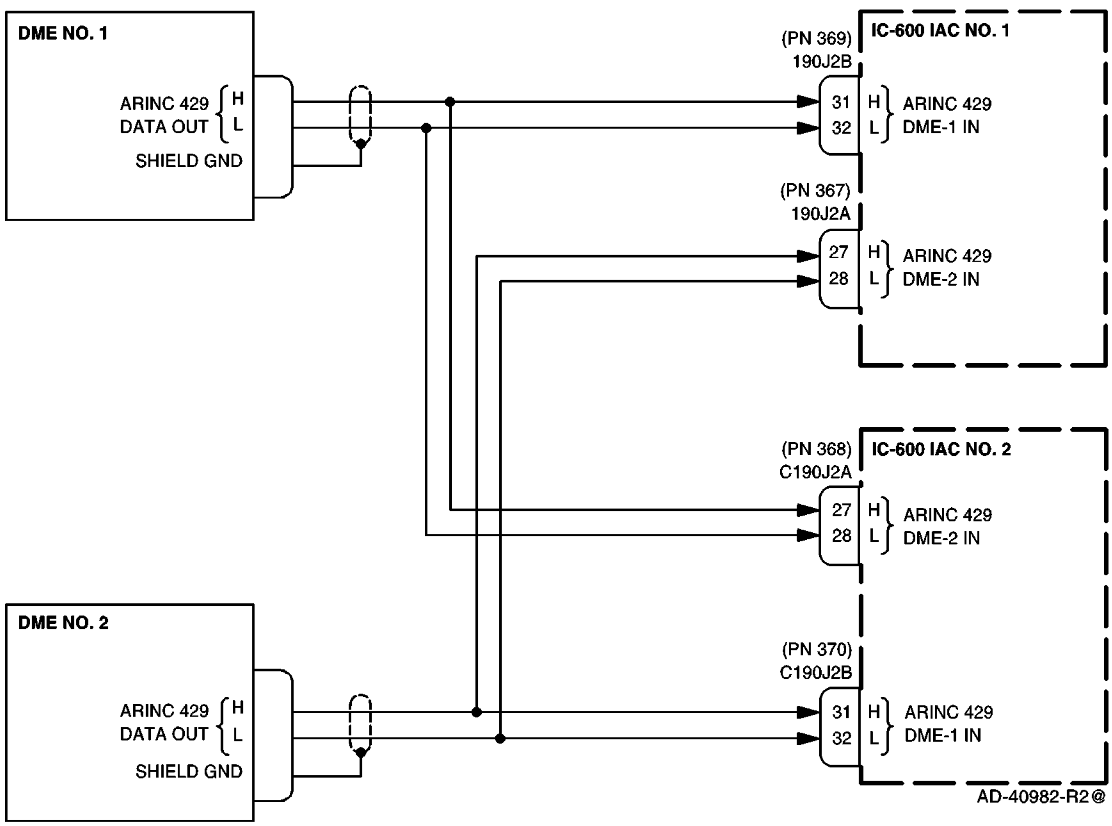

Figure 2–1–24. DME to IC–600 IAC Interface

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(c) ADF Receiver

The ADF radio interface (Figure 2–1–25) into the IC–600 IAC can be configured for single or dual installations. ADF bearing is received in ARINC 429 format.

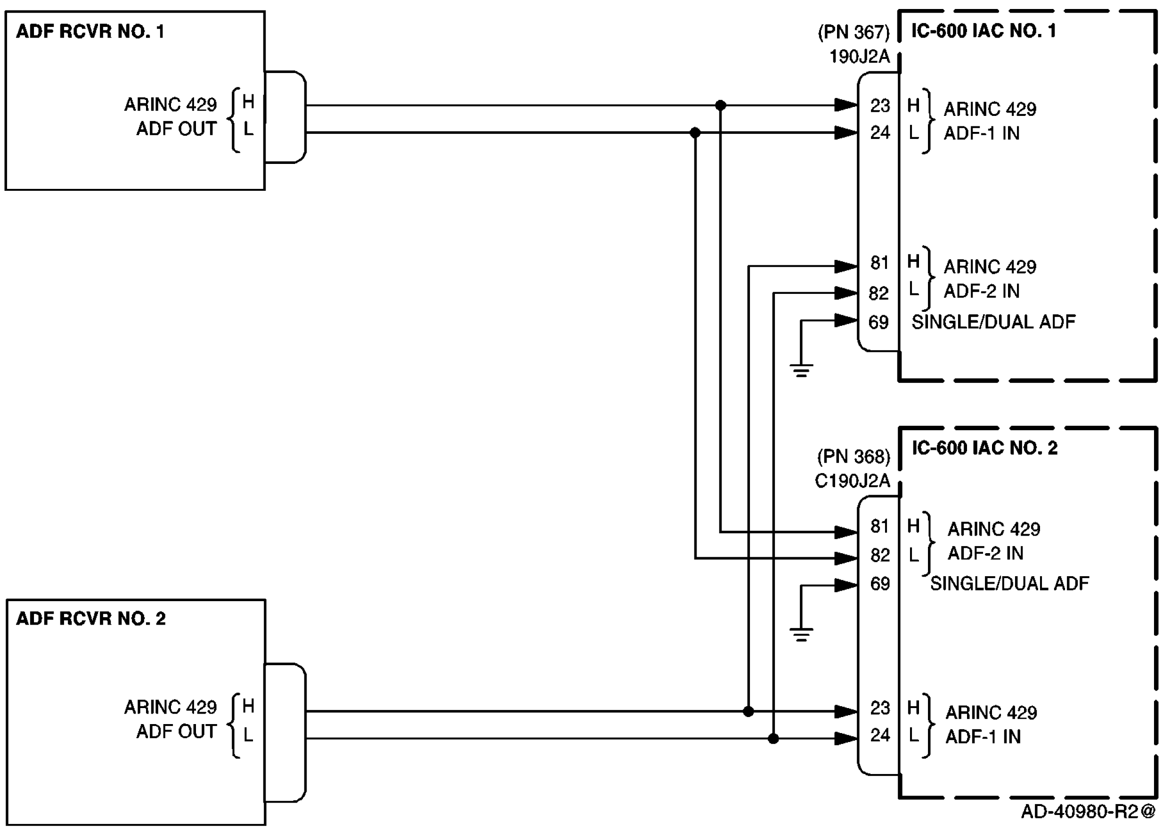

Figure 2-1-25. ADF to IC-600 IAC Interface

(d) Radio Altimeter Interface

The IC–600 IAC uses the analog signal and does not require the radio altimeter trip points from the discrete switch outputs.

The radio altimeter, shown in Figure 2–1–26, supplies a two–wire output of absolute height above the terrain. The IC–600 IACs use this information for the following purposes:

- To display radio altitude
- Comparison monitoring for decision height annunciation
- Gain program the localizer and glideslope signals as the aircraft descends below 1200 feet radio altitude.

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Each IC-600 IAC supplies a test output to start a self-test of the radio altimeter. The output is grounded and the self-test is started when the TEST button on the DC-550 Display Controller is pushed. Self-test is inhibited by a remote relay when the flight director is in the glideslope capture mode.

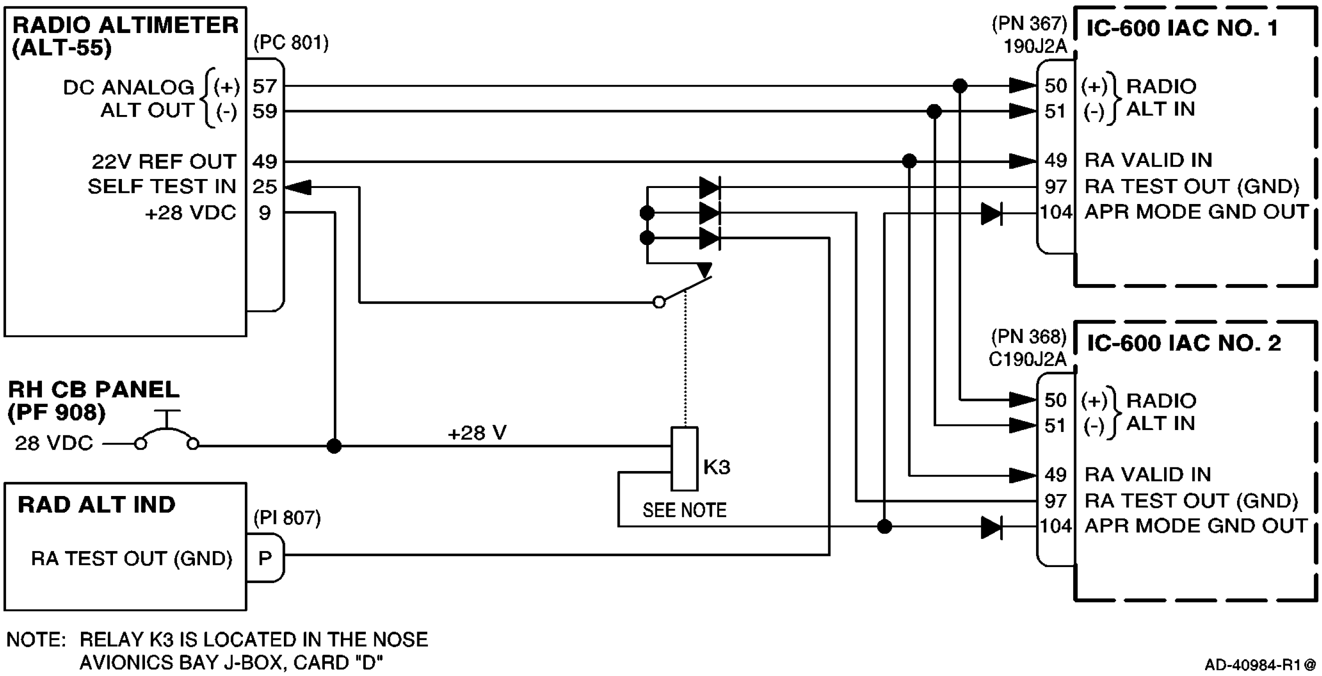

Figure 2-1-26. Radio Altimeter Interface

The Citation Ultra has the option of installing three different radio altimeters. System configuration pins on the IC-600 IAC (190J2A-70 & 71) are to distinguish between the different altimeter options. These options are defined in Table 2-1-13.

Table 2-1-13. Configuration Options for Radio Altimeters

Radio Altimeters	190J2A-70	190J2A-71
KRA-045 (King)	Ground	Open
AA-300 (Honeywell)	Open	Ground
ALT-55	Ground	Ground
Not Installed	Open	Open

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1 King KRA–405 Radio Altimeter

The KRA–405 radio altimeter supplies an analog radio altitude signal (–10mv/ft Aux output) and a 28 V dc valid. Altimeter output range is –20 ft to 2500 ft.

2 Honeywell AA–300 Radio Altimeter

The AA–300 radio altimeter supplies an analog radio altitude signal (–4mv dc/ft) and a 28 V dc valid. Altimeter output range is –20 ft to 2500 ft.

3 Collins ALT–55 Radio Altimeter

The ALT–55 radio altimeter supplies an analog radio altitude signal and a 28 V dc valid. The analog altitude signal gradient is described below:

- –20 ft to 500 ft = +20 mv/ft
- 500 ft to 2500 ft = +3 mv/ft
- Zero ft = +0.400 V.

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(e) Long Range Navigation (LRN) Interface

The IC-600 IAC receives LRN data over a GAMA standard ARINC 429 data bus, as shown in Figure 2–1–27. This data is processed by the IC–600 IAC to display flightplan waypoints, waypoint bearing, desired track, cross track deviation, waypoint distance, and time–to–waypoint. When using LRN, the flight director couples to the roll steering command. The IC–600 IAC also receives a vertical deviation signal for primary flight display purposes only. Table 2–1–14 gives the labels expected from the LRN.

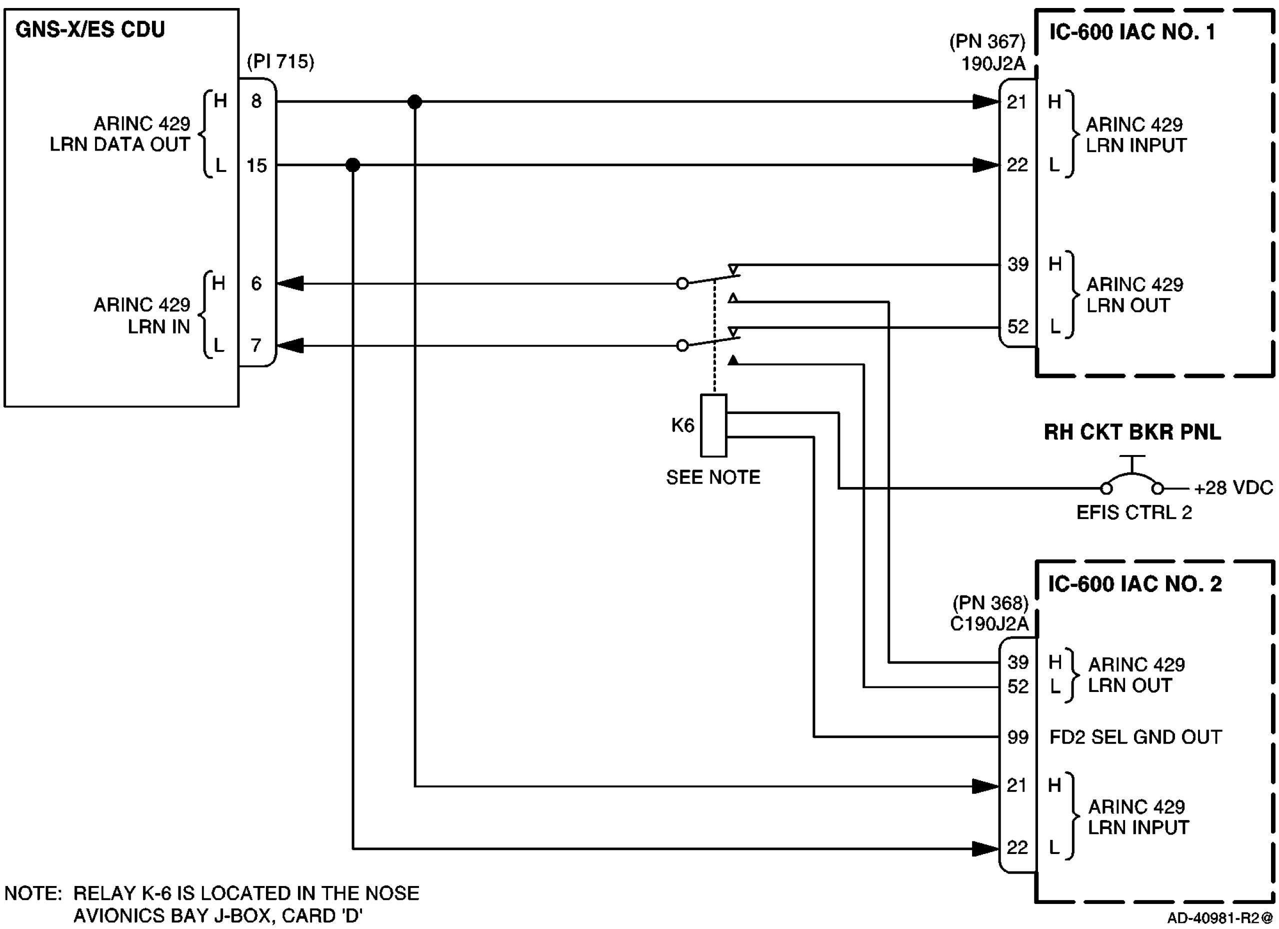

Figure 2–1–27. Long Range Navigation (LRN) Interface

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Table 2-1-14. LRN ARINC 429 Output Word Labels

Label	Description	Label	Description
075	WPT/OBS	251	Distance
114	Desired Track	252	Time To Go
115	Waypoint Bearing	275	To/From, APP, XTRK, DGR, DR
116	Crosstrack Distance	276	BISECTOR Distance
117	Vertical Deviation	312	Ground Speed
121	Roll Steering	315	Wind Speed
147	Mag-Var	316	Wind Direction
		321	Drift Angle

NOTE: The following labels support map data: 074, 113, 300, 301, 302, 303, 304, 305, 306, 307, 310, and 311.

The IC-600 IAC outputs ARINC 429 XMTR data to be used by the LRN. Table 2-1-15 gives the ARINC labels for the IC-600 IAC outputs.

Table 2-1-15. IAC ARINC 429 Transmitter Outputs

Label	Description	Label	Description
100	Selected Course	213	Static Air Temperature
101	Selected Heading	270	IAC Status Discretes
102	Selected Altitude	306	Designator Latitude
203	Pressure Altitude	307	Designator Longitude
204	Baro Corrected Altitude	320	Magnetic Heading
205	Mach Number	324	Pitch Attitude
206	CAL Airspeed (IAS for CV)	325	Roll Attitude
210	True Airspeed	333	Body Normal Acceleration
211	Total Air Temperature	371	Equipment ID
212	Altitude Rate		

(5) Air Data Interface

The AZ-850 Micro Air Data Computer (MADC) supplies the primary flight display with baro corrected altitude, true airspeed (requires temperature probe), Mach, and vertical speed information over an ARINC 429 interface, as shown in Figure 2-1-28. In a dual installation, each IAC receives data from both the No. 1 and No. 2 MADC. The dual aircraft installation allows either pilot to revert to the secondary air data source for the PFD. The MADC supplies the output word labels given in Table 2-1-16.

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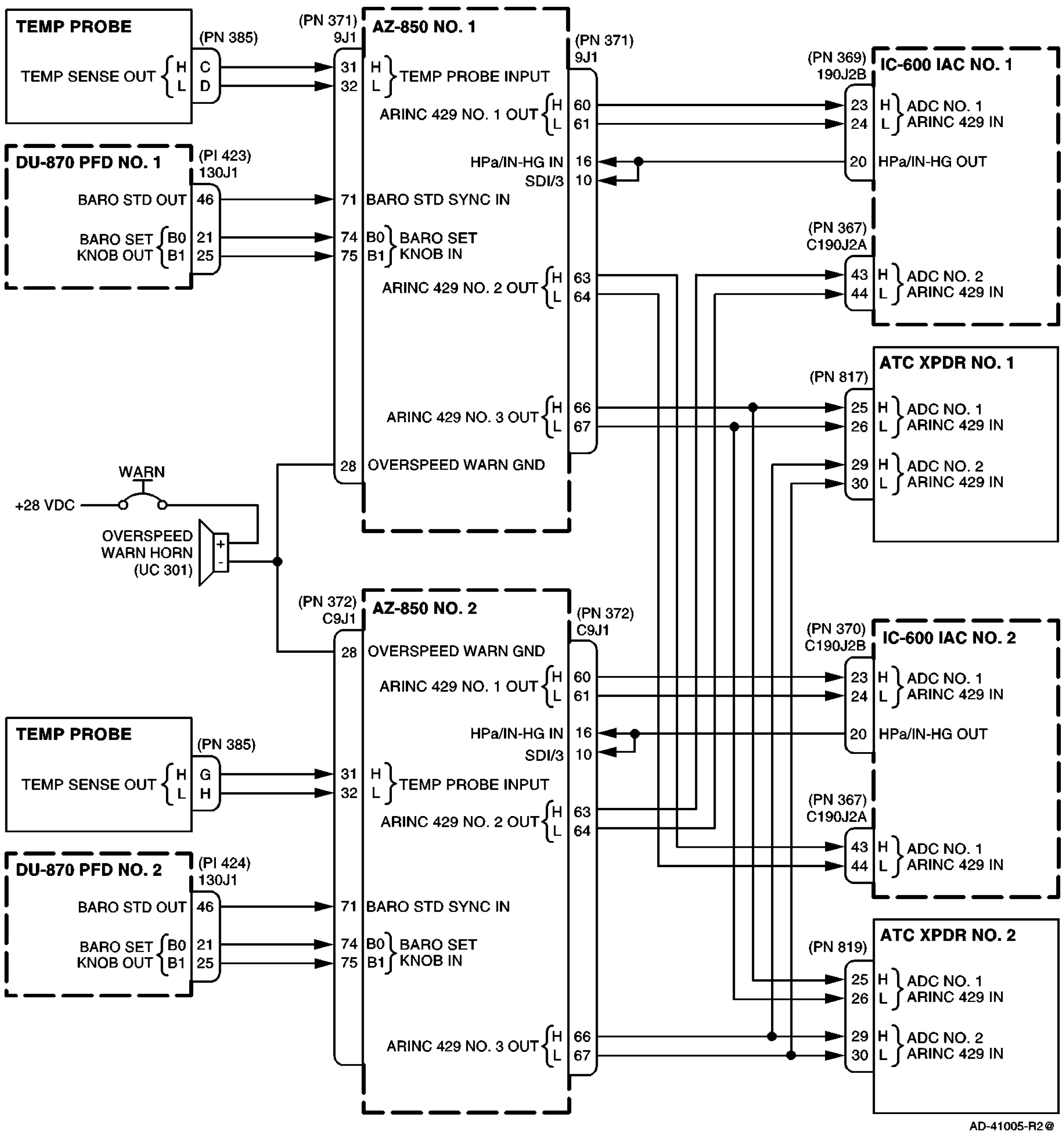

Figure 2-1-28. Micro Air Data Computer (MADC) Interface

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Table 2-1-16. Air Data ARINC 429 Output Word Labels

Label	Description	Label	Description
203	Pressure Altitude	211	Total Air Temperature
204	Baro Altitude	212	Altitude Rate
205	Mach Number	213	Static Air Temperature
206	Calibrated Airspeed	234	Baro correction - HectoPascals (hPa)
207	Max Operating Speed (Vmo)	235	Baro correction - Inches of Mercury (inHg)
210	True Airspeed		

(6) Display Control Interfaces

Control of the displays is straight forward and accomplished with a blend of fixed function buttons, knobs, and multifunction menu selections. The PFDs are controlled by the buttons and knobs on the DC-550 Display Controller, RI-553 Remote Instrument Controller, MS-560 Mode Selector, and BL-870 Bezel Controller. The MFD is controlled by menu select buttons and rotary knobs mounted on the BL-871 Bezel Controller and on the MC-800 MFD Controller.

(a) DC-550 Display Controller Function

The DC-550 gives the pilot control/change for the display formatting, such as full or partial compass display, or single cue/cross pointer flight director cues. The DC-550 also supplies a data acquisition function for the following display controls:

- DC-550 front panel buttons and switches
- RI-553 Remote Instrument Controller
- MS-560 Mode Selector
- BL-870 (PFD) and BL-871 (MFD) Bezel Controllers
- Attitude and heading reversion switches.

Button and switch closure inputs from these display controls are encoded into serial data and transmitted to the IC-600 IAC on a two-wire DC-IC digital bus. There is one bit assigned in the message for each button and switch input. The IC-600 IAC is in turn configured, through software, to assign a function to each bit. Block diagrams of the No.1 and No.2 display controller interfaces are shown in Figure 2-1-29 and Figure 2-1-30.

The controller uses ground/open discrete inputs to interface with other LRUs that supply open logic signals for the on/off condition. The contact of the momentary buttons are connected to ground through the DC-550 connector. Circuit design for input of these discretes includes a 5 ms filter followed by a buffer with a 1-volt hysteresis to eliminate switch chatter. The ON state is defined as ground or less than 2 V dc. The OFF state is defined as open.

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The serial data is a block of 13 8-bit words. Bits 0-6 of all bytes contain actual data. Bit 7 of each byte is used for data synchronization. Bit 7 of the first byte is hardwired to +5 V dc to identify the start of message and bit 7 of the remaining bytes are hardwired to ground to identify data. The last byte in the transmission is a counter that increments every transmission to indicate when new data is on the bus.

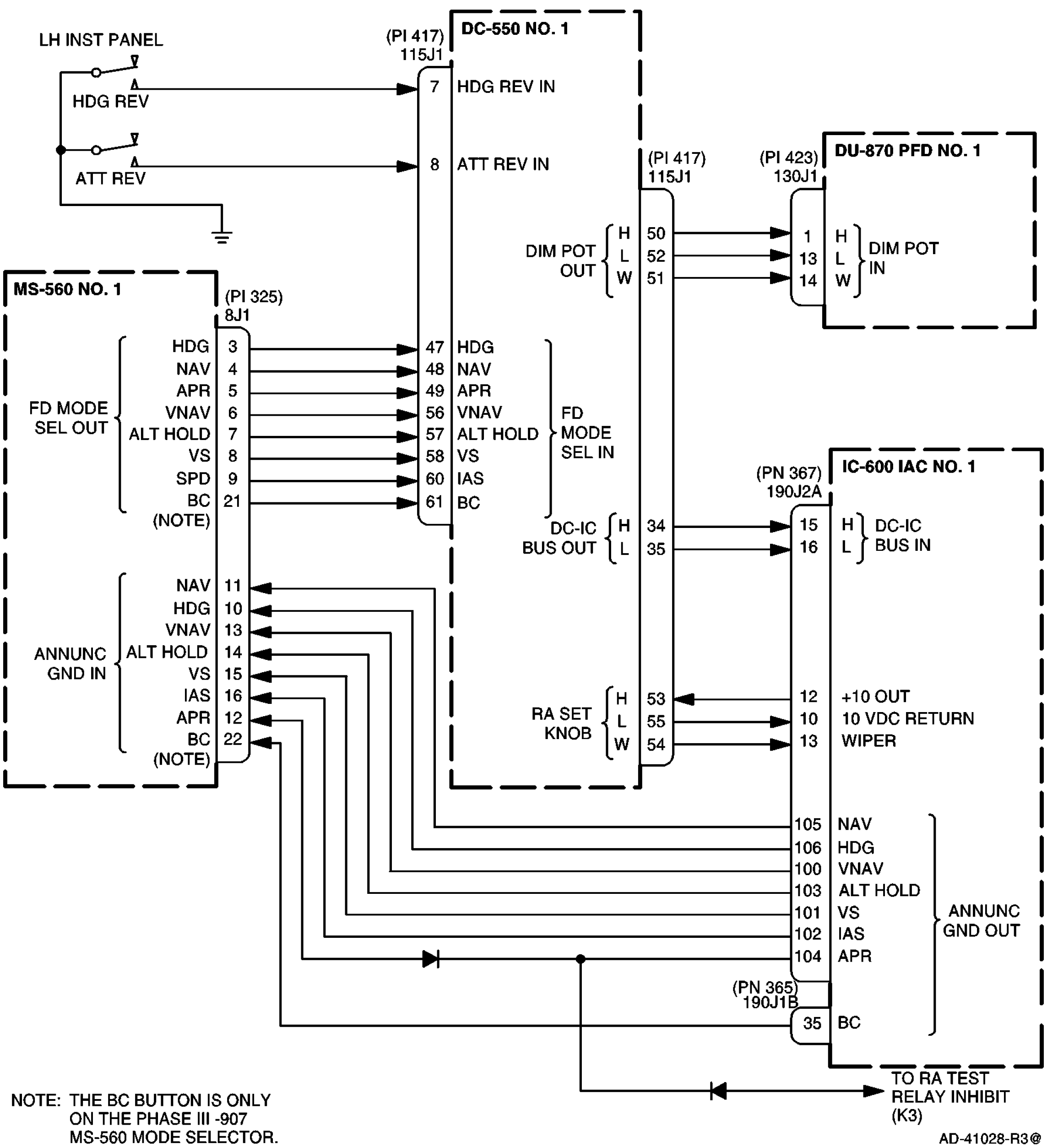

Figure 2-1-29. DC-550 Display Controller Interface (Pilot)

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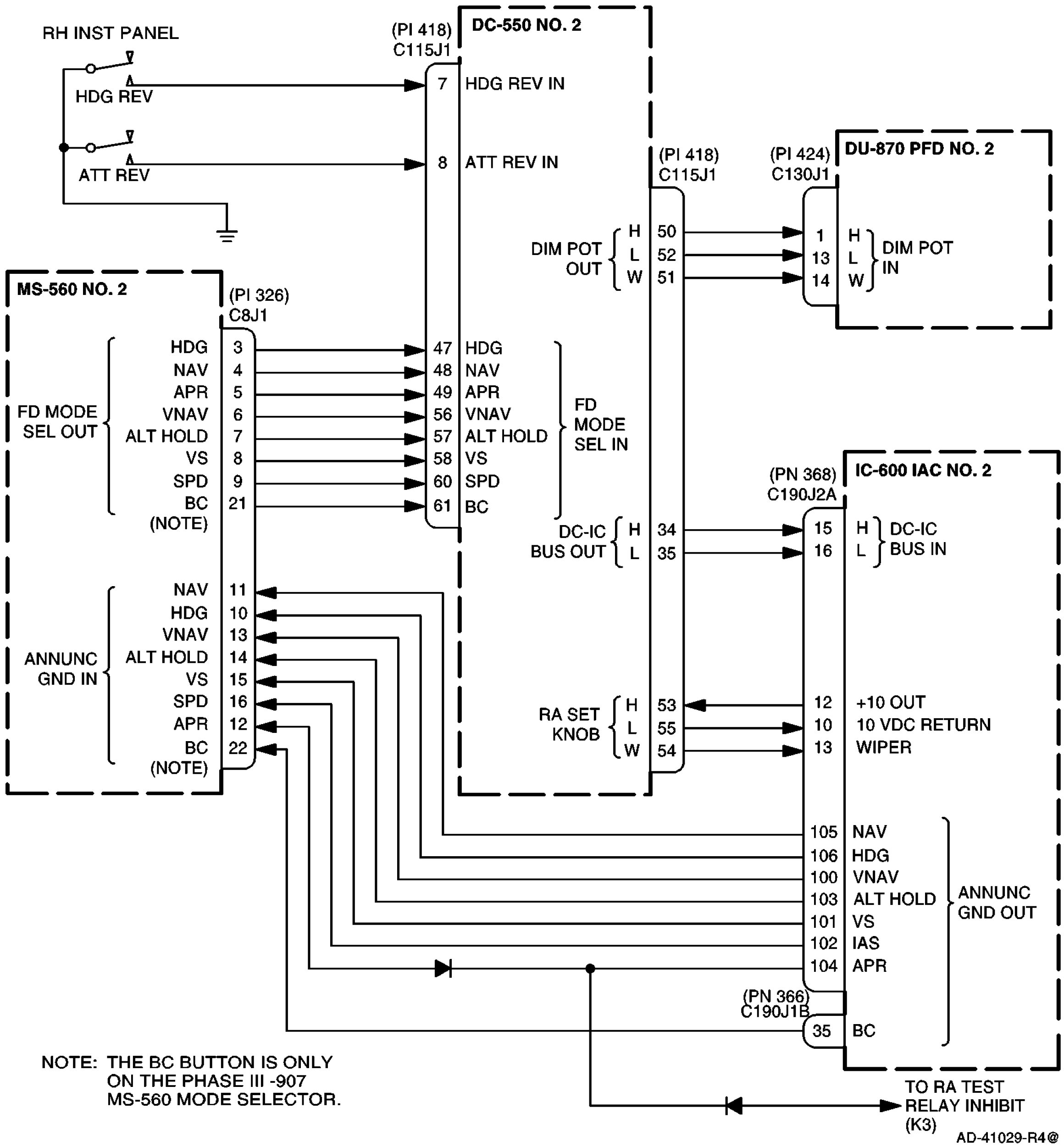

Figure 2-1-30. DC-550 Display Controller Interface (Copilot)

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(b) RI–553 Remote Instrument Controller Function

The RI–553 Remote Instrument Controller is a three- knob controller that controls selected heading and selected course. Refer to Figure 2–1–31 for a block diagram of the interface.

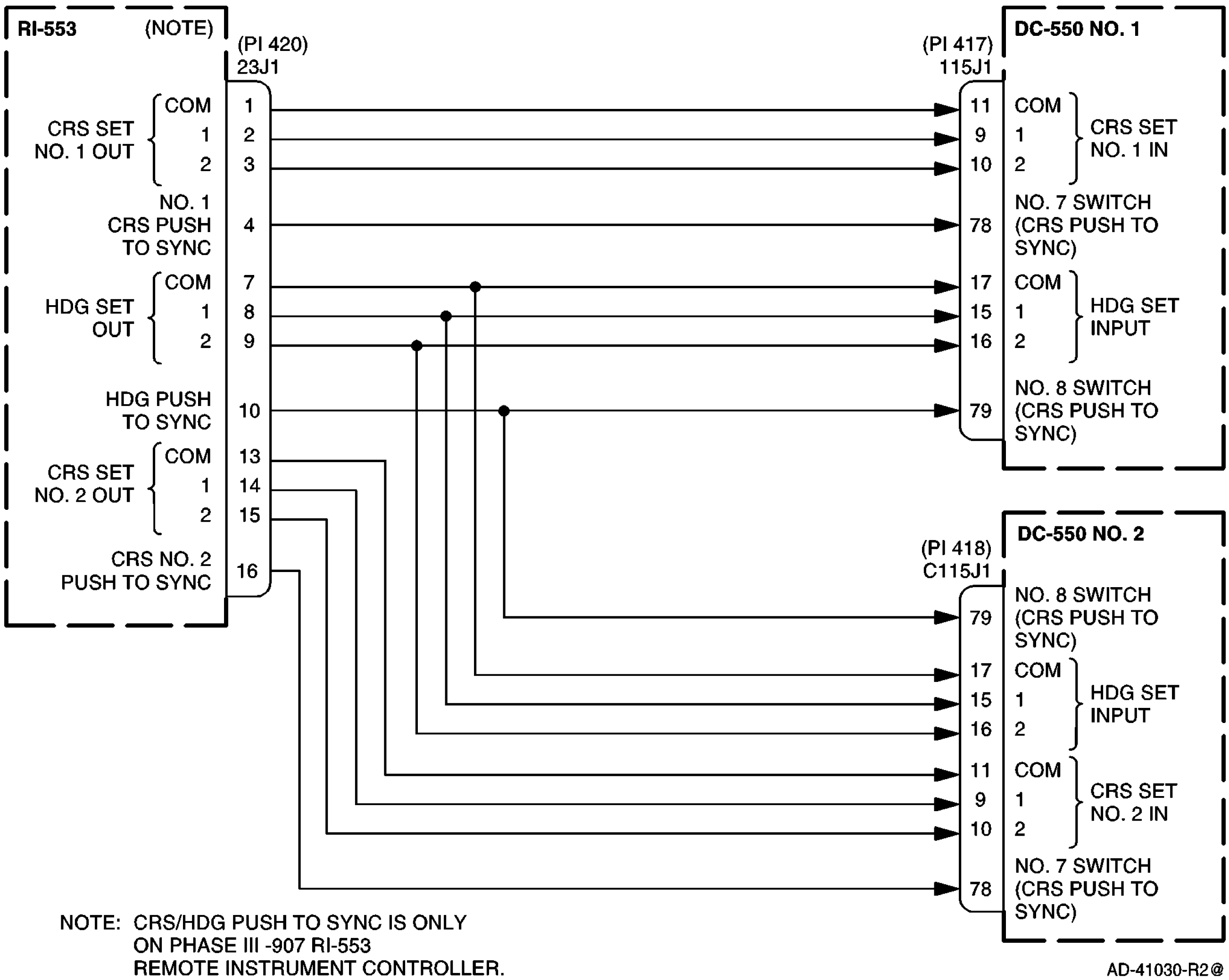

Figure 2–1–31. RI–553 to DC–550 Interface

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(c) MC–800 Multifunction Controller Functions

The MC–800 MFD Controller lets the pilot select display formats and modes that change the information shown on the MFD. This includes display dimming, map or plan and weather displays, TCAS traffic advisories, resolution advisories and normal and emergency checklists. The controller also lets the pilot select the display backup mode. See Figure 2–1–32 for a block diagram of the MC–800 interface.

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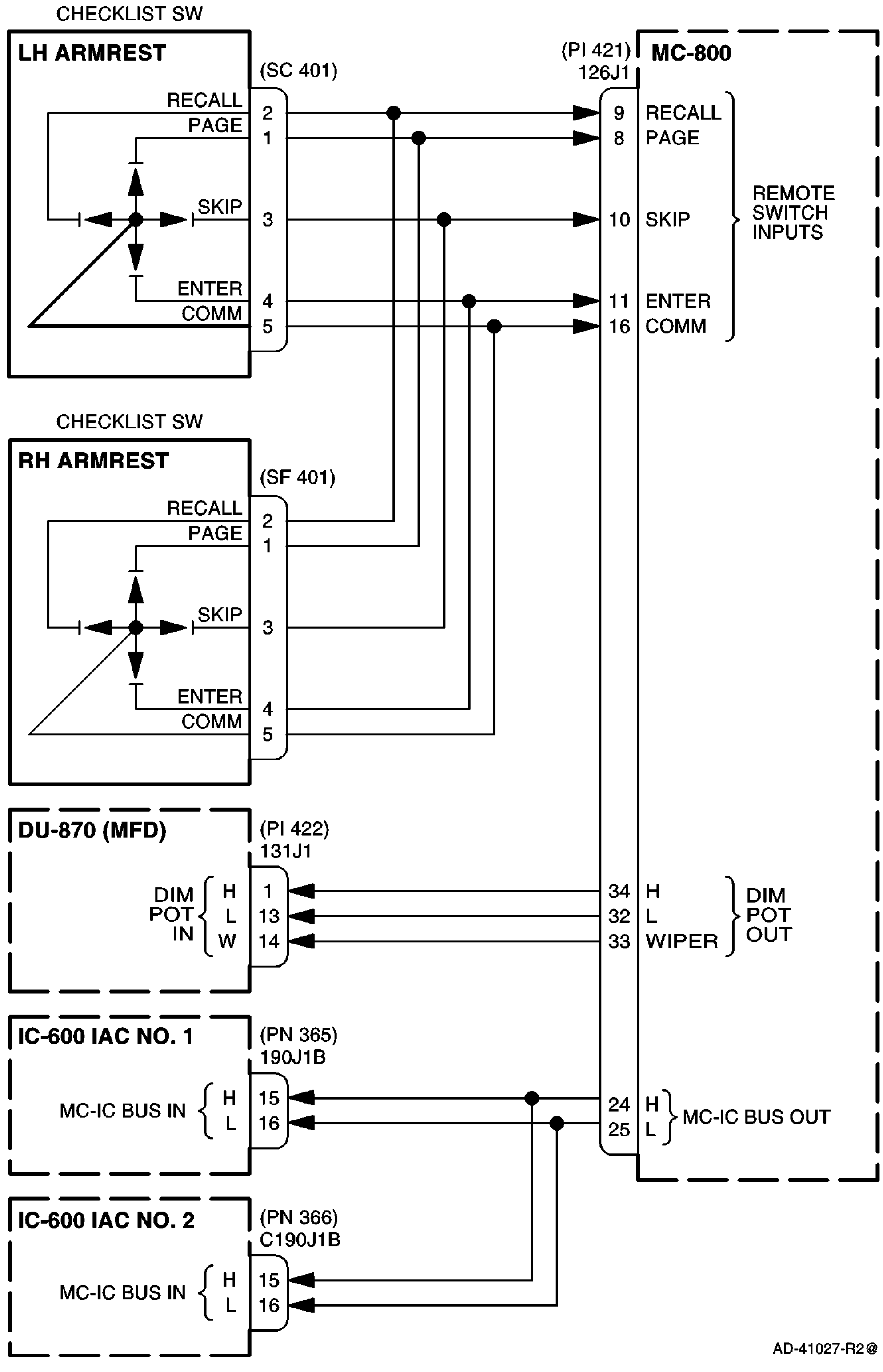

Figure 2-1-32. MC-800 MFD Controller Interface

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(d) BL–870 Bezel Controller Functions

The BL–870 Bezel Controller is mounted on the front of each DU in the PFD panel locations, and supplies the functions listed below:

- IN/HPA (bezel–button on –921 controllers only)
- STD (bezel–button)
- BARO altimeter correction (rotary knob).

See Figure 2–1–28 for a block diagram of the BL–870 Interface.

NOTES:

1. When the pilots are displaying cross–side MADC data on their PFD, they do not have control over the displayed BARO setting from their respective display controller.

2. The BARO/SET function is independent from the display controller and does not require the display controller to work to set the data.

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(e) BL–871 Bezel Controller Functions

The BL–871 Bezel Controller is mounted on the front of the DU in the MFD position. This controller lets the pilot select and manipulate display menu options. Four different menu pages can be displayed on the MFD; one top level page and three submenus consisting of a vertical navigation parameter set page, a takeoff speed set page, and a landing speed set page. Legends for the knobs and bezel buttons are shown in the display menu above the buttons/knobs at the bottom of the MFD. The BL–871 has two rotary set knobs. The left rotary knob is used to dial in Vspeed reference values. The right rotary knob is used solely for altitude preselect inputs. This function is always displayed and can be used from any of the four menu pages. See Figure 2–1–33 for a block diagram of the BL–871 Interface.

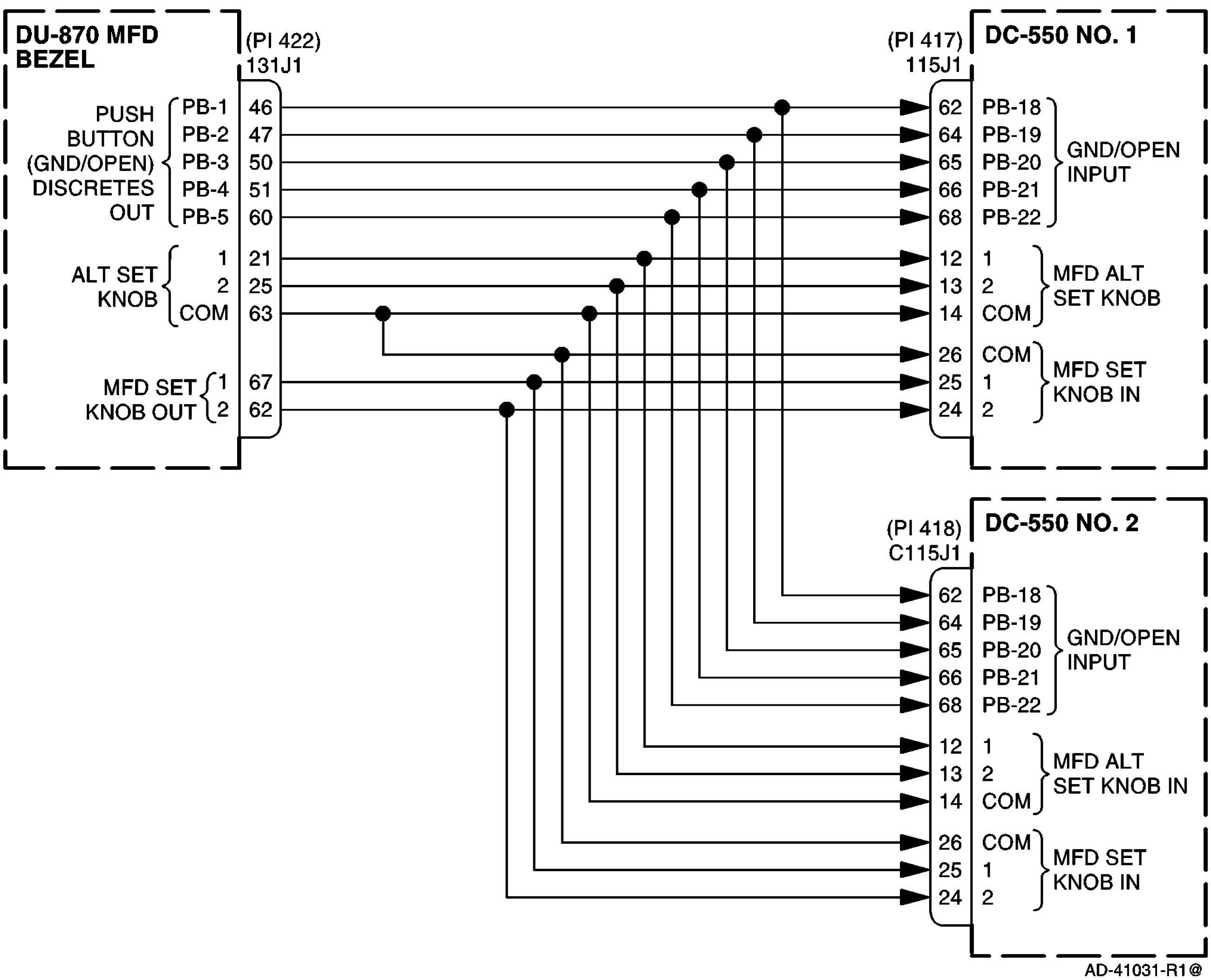

Figure 2–1–33. BL–871 to DC–550 Interface

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C. Primary Flight Display

The Primary Flight Display (PFD) is the single cockpit display where all of the required flight and navigation data is displayed. This data includes the following:

- Primary aircraft attitude and heading
- Primary airspeed, altitude, and vertical speed
- Radio altitude
- Marker beacon annunciations
- Reference and alerting data
- Speed bugs
- Comparison monitor alerts
- Navigation Data
  - Selected course
  - Selected heading
  - Lateral and vertical deviations
  - Bearing pointers
- Flight guidance system data
  - Flight director commands
  - Mode annunciations
  - Excessive deviation alerts.

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(1) PFD Functional Divisions

The PFD is divided, as shown in Figure 2-1-34, into four functional display areas: ADI display, HSI display, mode annunciations, and air data (airspeed, altitude, and vertical speed displays).

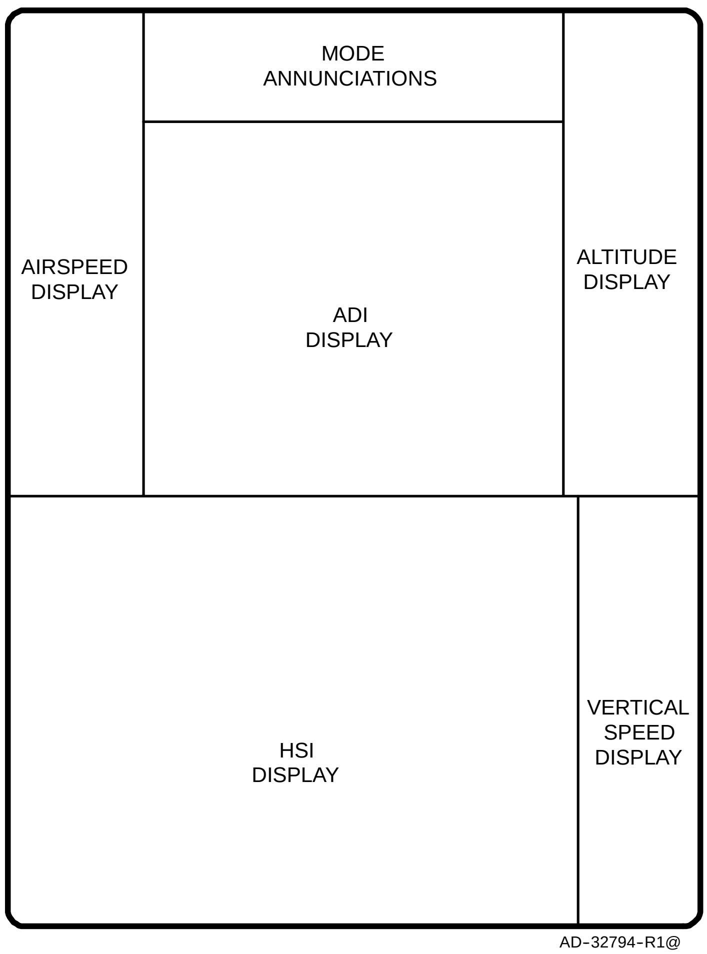

Figure 2-1-34. PFD Functional Divisions

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(a) ADI Display

The ADI symbols use a truncated sphere format to display standard attitude information as sensed by the VG–14A Vertical Gyro. When either the pitch or roll data becomes invalid, all scale markings are removed, the attitude sphere turns cyan, and a red annunciation of ATT FAIL appears at the top center portion of the sphere.

(b) HSI Display

The HSI displays actual aircraft magnetic heading as a function of information received from the AHRS. Selected course and heading inputs are controlled from the RI–553 Remote Instrument Controller. Navigation source annunciation, distance, TO, FROM, lateral deviation, etc., is supplied from the navigation source selected.

(c) Mode Annunciations

The PFD displays mode annunciations from the flight director, PFD source selections, and comparison monitor function.

(d) Airspeed Display

The airspeed display presents calibrated airspeed and Mach, as sensed by the Micro Air Data Computer (MADC). Angle–Of–Attack (AOA) is displayed as sensed by the AOA computer and sent to the IC–600 IAC. Speed bug set information is supplied by the appropriate control on the MFD bezel controller.

(e) Altitude Display

The PFD displays barometric altitude information as sensed by the MADC. The baro set is controlled from the PFD bezel controller and altitude preselect displays are controlled from the MFD bezel controller.

(f) Vertical Speed Display

Vertical speed information is displayed, as sensed by the MADC. Vertical speed target bug information is displayed as set via the MFD bezel controller when the vertical speed mode is operational.

NOTE: Various other display data, such as radio altitude, marker beacon, and states of operation annunciations are also displayed on the PFD.

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(2) PFD ADI Display and Annunciations

The ADI supplies the following display information, as shown in Figure 2-1-35:

- Sphere-type attitude display
- Glideslope or vertical deviation
- Radio altitude
- Decision height display (Radio altitude minimums display on phase III aircraft)
- Decision Height (DH) annunciator (Radio altitude minimums annunciator on phase III aircraft)
- Flight director mode annunciators
- Source annunciators for attitude and air data
- SG reversion mode annunciator
- Comparison monitor annunciators
- Category 2 (CAT II) ILS mode annunciator
- Marker beacon annunciation
- Autopilot status messages.

(a) Flight Director Mode Annunciators

The flight director mode annunciators are displayed full-time on both PFDs, above the attitude sphere. Lateral modes are shown on the top left side of the PFD. Vertical modes are shown on the top right side of the PFD. Captured modes are shown in green characters. Armed lateral modes are shown in white characters to the left of the captured modes. Armed vertical modes are shown in white characters to the right of the captured modes. Refer to Table 2-1-17 and Table 2-1-18 for a listing of the flight director mode annunciators.

Table 2-1-17. Lateral Mode Annunciations

Annunciator	Description	Mode States
BC	Back Course	Arm or Capture
HDG	Heading Select	Capture only
LNAV	Lateral Navigation	Capture only
LOC	Localizer	Arm or Capture
VAPP	VOR Approach	Arm or Capture
VOR	VOR	Arm or Capture

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Table 2-1-18. Vertical Mode Annunciations

Annunciator	Description	Mode Status
GA	Go-Around	Capture only
GS	Glideslope	Arm or Capture
ALT	Altitude Hold	Capture only
ASEL	Altitude Preselect	Arm or Capture
IAS	Indicated Airspeed	Capture only
MACH	Mach	Capture only
VNAV	Vertical Navigation	Arm or Capture
VS	Vertical Speed	Capture only

For modes that transition from arm to capture as specified below, a white box is drawn around the capture or hold mode annunciator for 5 seconds after the capture logic is satisfied.

Lateral Transitions	Vertical Transitions
VOR arm to VOR capture	ASEL arm to ASEL capture
LOC arm to LOC capture	ASEL capture to ALT capture
BC arm to BC capture	VNAV capture to ALT capture
VAPP arm to VAPP capture	VNAV capture to IAS capture

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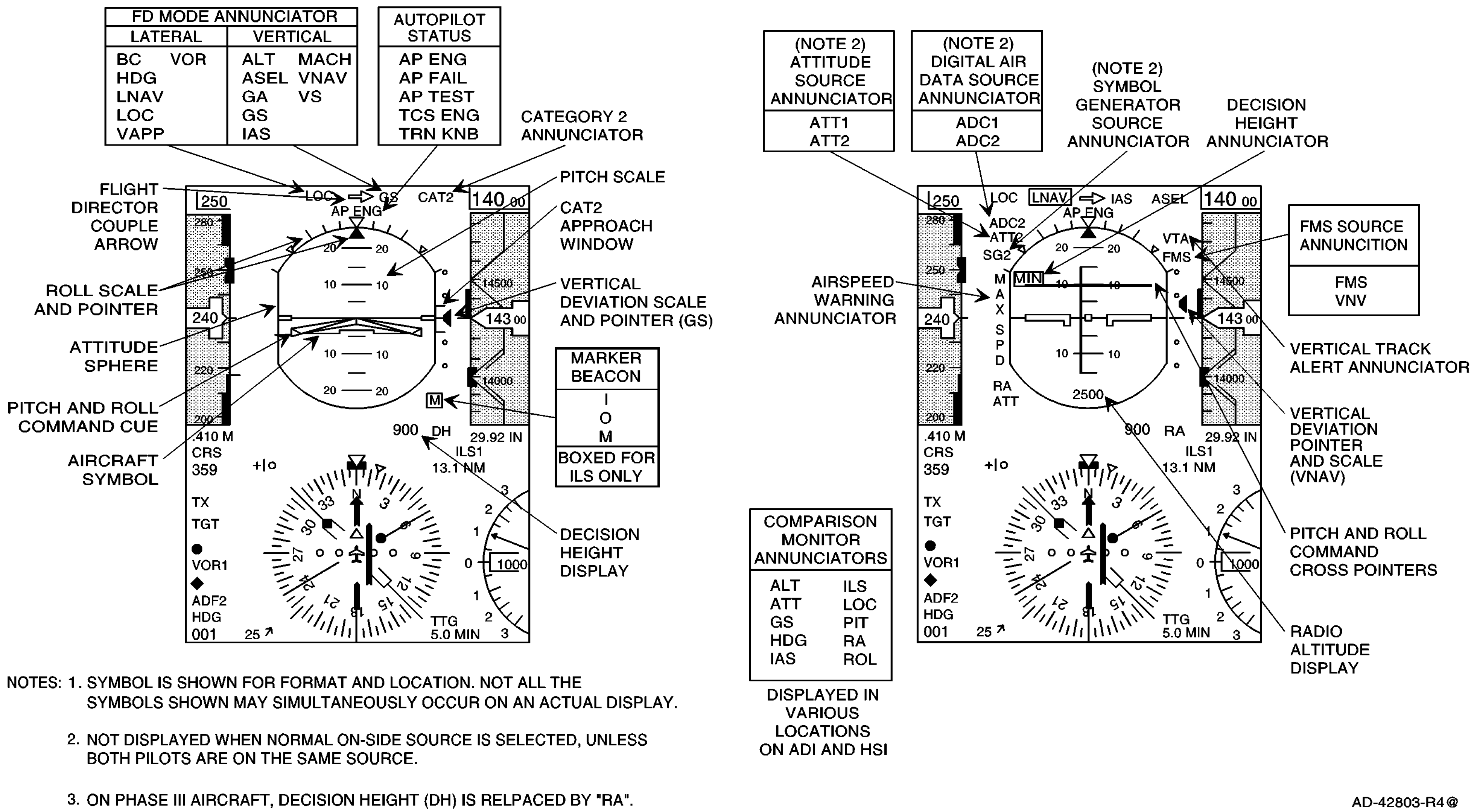

Figure 2-1-35. PFD ADI Displays and Annunciators (Before Phase III)

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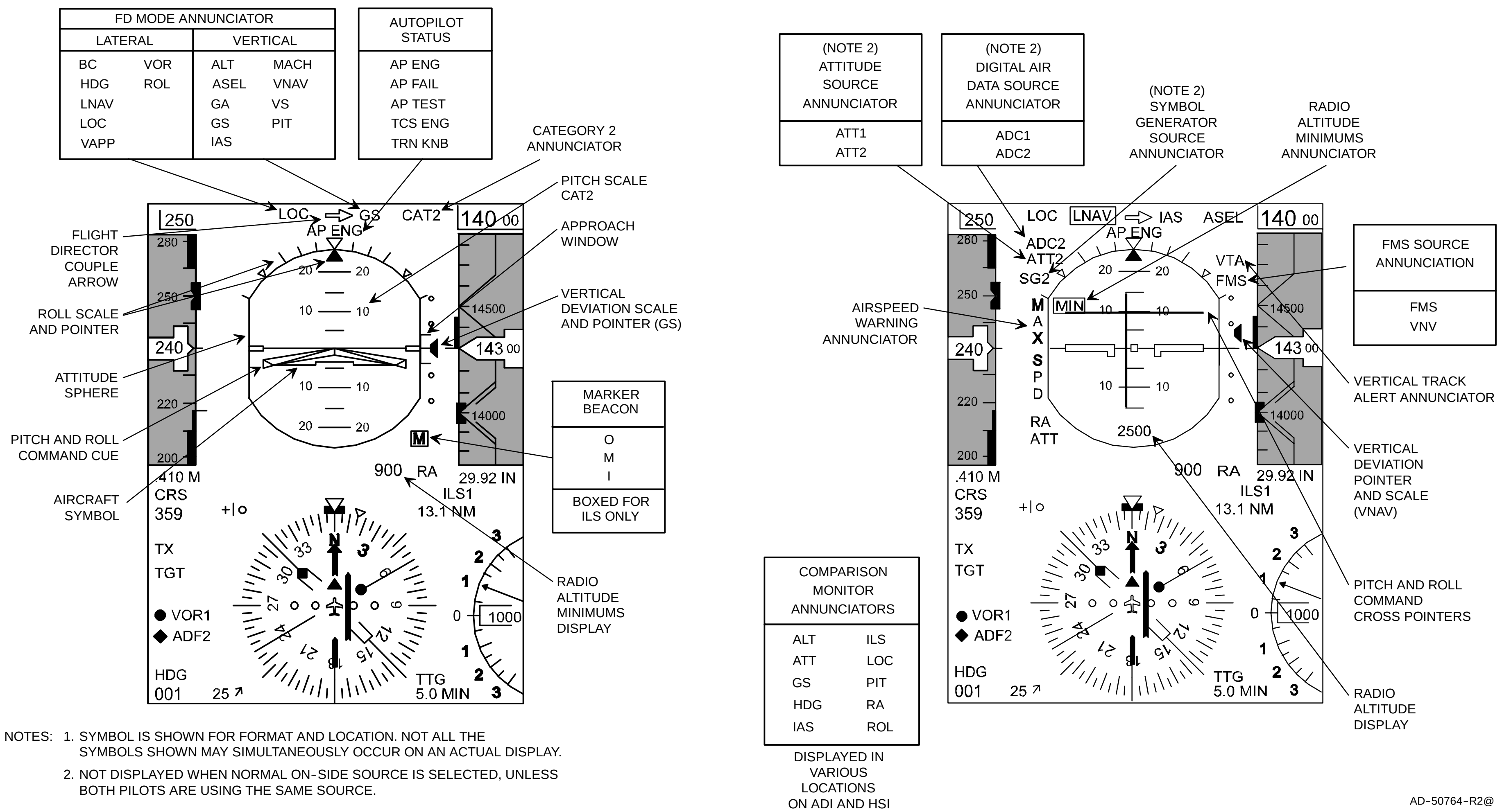

NOTES: 1. SYMBOL IS SHOWN FOR FORMAT AND LOCATION. NOT ALL THE SYMBOLS SHOWN MAY SIMULTANEOUSLY OCCUR ON AN ACTUAL DISPLAY.
2. NOT DISPLAYED WHEN NORMAL ON-SIDE SOURCE IS SELECTED, UNLESS BOTH PILOTS ARE USING THE SAME SOURCE.

Figure 2-1-36. PFD ADI Displays and Annunciators (Phase III)

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(b) Autopilot Status Messages

Autopilot system status is determined by the IC-600 IAC and displayed above (top center) the attitude sphere. During normal autopilot operation a green AP ENG message is displayed. Amber warnings replace this message under appropriate conditions. Refer to Table 2-1-19 for a list of autopilot system messages.

Only one message can be displayed at any given time. Autopilot failure is indicated by an amber AP FAIL in place of the AP ENG annunciation. Similarly, activation of the Touch Control Steering (TCS) submode is indicated by an amber TCS ENG, if the autopilot is engaged when the TCS switch is pushed.

Table 2-1-19. Autopilot Status Annunciations

Annunciation	Color	Message
AP ENG	Green	Autopilot engaged
AP FAIL	Amber	Autopilot has failed
AP TEST	Amber	Power-up test
TCS ENG	White	Touch control steering engaged
TRN KNB	Amber	Autopilot turn knob is out of detent

(c) Category 2 ILS Annunciator

The symbol generator supplies a green or flashing amber CATII category annunciator on the PFD. These mode annunciations are located above the vertical deviation scale. It also supplies a green CATII approach window on the vertical deviation display.

- The green CATII mode annunciation is an indication that excessive ILS deviation monitors are active on the PFD. These monitors are described in paragraph 2. C. (2) (d) below.
- The symbol generator activates the CATII mode annunciator on the PFD whenever APR (approach) mode is selected and the following criteria are satisfied:
  - Both display controllers RA setting must be less than 200 feet and radio altitude must be valid
  - On-side radios must be selected for display, both tuned to the ILS, and the localizer and glideslope deviations must be valid
  - Two symbol generators must be operational and they can not be selected in SG reversion
  - One radio altimeter (minimum) must be valid.

If the above criteria is not met when APR mode is selected, it is assumed the pilot does not care to shoot the ILS approach with the CATII monitors active. There is no category II approach annunciation given on the PFD in this case.

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(d) Category 2 Excessive Deviation Monitors (Optional)

When the CATII mode annunciation is displayed, the ILS excessive deviation monitors are active. If the localizer deviation exceeds the CAT2 window requirements, with radio altitude less than 500 feet, the deviation and scale is changed from green to flashing amber. The display reverts back to green if the deviation is brought back within the appropriate threshold. The same logic and symbols apply to the glideslope deviation scale. In addition, the CATII annunciation turns amber and flashes. The monitors are independent with the thresholds set in accordance with regulator guidance for category 2 ILS operations.

(e) Pitch Scale and Pointer

The pitch scale tape, shown in Figure 2–1–37, is made up of the following white scale markings:

Up	Down
10	10
20	20
30	30
40	45
60	60
90	90

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There are reference marks every 5 degrees between 10 and 30 degrees. Red fly-down pitch warning chevrons appear at 45 and 65 degrees pitch up and fly-up warning chevrons appear at 35, 50, and 60 degrees pitch down. The size of the pitch warning chevrons increase as pitch attitude exceeds these values. Pitch movement is hard limited to ±90 degrees (accuracy ±30 minutes).

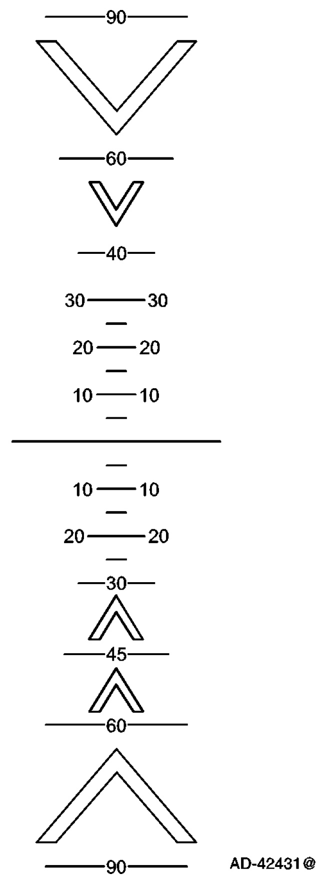

Figure 2-1-37. ADI Pitch Scale

(f) Vertical Deviation Scale and Pointer

The vertical deviation scale (white dots) and pointer are located on the right side of the attitude sphere. The deviation pointer is a fly-to indication, and can be driven from one of the following sources:

- Glideslope from a Short Range Navigation (SRN) receiver (pointer is displayed as a green triangle)
- VNAV Computer (pointer is displayed as a magenta triangle)
- FMS for VNAV (pointer is displayed as a magenta triangle).

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The navigation source is selected through buttons on the DC-550 Display Controller. When the vertical deviation is supplied by an FMS, a white FMS annunciation is displayed above the scale. When vertical deviation is supplied by the VNAV computer, a white VNAV is displayed above the scale. If invalid glideslope (SRN) information is received, the pointer is removed and a red X is drawn through the scale. The scale is removed for invalid FMS or VNAV computer data.

1 Glideslope (GS) Display

The PFD can display glideslope data from the tuned (No. 1 or No. 2) short range navigation radio receiver via the IC-600 IAC. Pointer movement for glideslope deviation is given in Table 2–1–20.

2 VNAV Display

The PFD can display data from the FMS or VNAV computer via ARINC 429 inputs whenever the data is valid. The IC-600 IAC receives data from the FMS and VNAV computer in feet. Pointer movement for VNAV deviation is given in Table 2–1–20. The values for pointer movement collapse inward as a function of FMS Approach mode.

Table 2–1–20. Vertical Deviation Scale

Pointer Position	GS	VNAV	FMS APP
2nd dot up	+150 ± 5 µA	+500 ft	+150 ft
1st dot up	+75 ± 5 µA	+250 ft	+75 ft
Zero index	0 ± 5 µA	0 ft	0 ft
1st dot down	-75 ± 5 µA	-250 ft	-75 ft
2nd dot down	-150 ± 5 µA	-500 ft	-150 ft
Partially in view	< +350 ± 5 µA > -350 ± 5 µA	< +1166 ft > -1166 ft	N/A

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(g) Marker Beacon

The marker beacons are displayed below the attitude sphere in the lower right corner. Specific symbols and colors are assigned to the markers as given below:

Marker	Color
O (outer)	Blue
M (middle)	Amber
I (inner)	White

Detection of a marker causes the symbol to flash. A white box identifies the location of the active marker beacon annunciator after tuning an ILS frequency on the selected navigation receiver (if the flight director back course mode is not armed or captured). When multiple marker inputs are active at the same time, the marker beacon symbols are displayed horizontally with the appropriate colors. Inactive or invalid marker beacon symbols are removed from the display.

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(h) Decision Height (DH) Display

The radio altitude DH set data is located below the attitude sphere, in the lower right corner, as shown on Figure 2–1–35. The range for DH set is 0 to 2500 feet. The DH value can be set within 10 feet above 200 feet Above Ground Level (AGL), and within 5 feet below that value. Above 2500 feet AGL, the set data is removed. When the radio altitude data is invalid, the display indicates a dash in each of the digits. Each time a radio altitude value is set with the DC–550 Display Controller DH knob, the set value reappears for 5 seconds.

(i) Radio Altitude (RA) Minimums Display

The radio altitude RA set data is located below the attitude sphere, in the lower right corner as shown on Figure 2–1–36. The range for RA set is 5 to 999 feet. The RA value can be set within 5 feet (5-200 feet above ground level (AGL), and within 10 feet (200-990 feet AGL). below that value. Values above 990 feet are forced to 999 feet. Setting the RA minimums value to 0 feet causes the digital readout and RA label to be removed. When the radio altitude data is invalid, the display indicates a dash in each of the digits. Each time a radio altitude value is set with the DC-550 Display Controller RA knob, the set value reappears for 5 seconds.

(j) Aircraft Symbol

This symbol serves as a stationary representation of the aircraft and is always displayed in the center of the attitude sphere. Aircraft pitch and roll attitudes are displayed by the relationship between the fixed miniature aircraft (yellow) and the movable sphere. The miniature aircraft is flown to align the command cue to the aircraft symbol in order to satisfy the commands of the selected flight director mode.

The shape of the aircraft symbol and the flight director pitch and roll command bars are selectable as either a Cross Pointer (CP) or Single Cue (SC) display. Power-up condition is with the single cue displayed. The cross-pointer is selected by the button (SC/CP) on the DC-550 Display Controller. Successive toggling of the SC/CP button changes the display back and forth from single cue to cross pointer.

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(k) Pitch and Roll Command Cue or Cross Pointers

A Command cue or cross-pointers are displayed on each PFD. Always fly the symbolic miniature aircraft to the flight director cue or cross-pointers in order to capture and maintain a desired flightpath. The on-side HSI supplies the information for the respective IC-600 IAC to compute steering for the command cue or pointers. The command display can be either single cue or cross-pointer as a function of the SC/CP button on the –707 DC-550 Display Controller or an external mounted switch. Single cue command appears as two elongated magenta triangles. Cross-pointer appears as intersecting vertical and horizontal magenta lines.

- The single cue is removed from view if an invalid condition occurs in the flight director pitch or roll channel. A lateral flight director mode must be engaged to get the single cue into view.
- The cross-pointers are flown just like the single cue. For both single cue or cross-pointer display, the following limits apply:
  - Pitch command is limited to ±20 degrees
  - Roll command is limited to ±30 degrees.

(l) Attitude Sphere

The colors for the attitude sphere are cyan for the sky, brown for the earth, and white for the horizon line. The sphere moves with respect to the symbolic aircraft reference to display actual pitch and roll attitude.

(m) Roll Scale and Pointer

The roll scale is linear with white markings at 10, 20, 30, 45, and 60 degrees of roll. The 30-degree mark is highlighted with a double-stroke tick mark. A triangle marks 45 degrees of roll. Roll movement is 360 degrees, with ±50 minutes accuracy.

(n) Flight Director Couple Arrow

A green arrow is displayed above the attitude sphere (top center) to indicate which flight director (FD1 or FD2) is coupled to that PFD for lateral and vertical sensor inputs.

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(o) Attitude and Air Data Source Annunciators

The PFD annunciates the following sources of display:

- Attitude Gyro (ATT)
- Micro Air Data Computer (MADC).

When the normal (on-side) source is selected, the mode annunciations are suppressed. The on-side mode is defined in Table 2–1–21. The mode annunciations are normally white, but when the pilot and copilot are on the same source, the annunciation turns amber on both displays.

Table 2–1–21. On-Side Source Mode Annunciations

Sensor	No. 1 PFD	No. 2 PFD	Location
Attitude	ATT1	ATT2	Upper left of ADI
MADC	ADC1	ADC2	Upper left of ADI

(p) Symbol Generator Source Annunciators

When a symbol generator reversion mode (SG1 or SG2) is selected on the MC-800 Multifunction Controller, the source is annunciated in the upper left corner, above the attitude sphere on both PFDs. An amber SG1 indicates the IC-600 IAC No. 1 is driving all three displays (No. 2 PFD is a duplicate of the No. 1 PFD). An amber SG2 indicates the IC-600 IAC No. 2 is driving all three displays (No. 1 PFD is a duplicate of the No. 2 PFD). Symbol generator source is shown on all PFD formats.

(q) Decision Height (DH) Annunciator

When actual radio altitude decreases to within 100 feet of decision height, a white box is placed in the upper left corner of the attitude sphere, as shown in Figure 2–1–35. When the actual radio altitude is equal to or less than the set value, an amber DH is placed in the box and flashed for 10 seconds.

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(r) Radio Altitude Minimums Annunciator

The RA minimums annunciator, shown in Figure 2–1–36, is displayed under two conditions, armed and captured. The annunciator is armed when the aircraft WOW indicates airborne and RA minimums is valid (RA $\geq$ RA minimums setting + 100 feet for 5 seconds). When these conditions exist and actual radio altitude decreases to within 100 feet of the RA minimums, the annunciator turns black with an amber box is drawn around it. The armed condition continues until the aircraft WOW indicates the aircraft is on the ground or RA is 100 feet greater than RA minimums.

RA minimums does not transition to the captured phases unless it was first armed. The captured condition exists when the RA $\leq$ RA minimums setting. When the captured condition occurs, a boxed MIN with a black background is displayed. At capture, the MIN annunciator flashes for 10 seconds. If the aircraft moves out of the capture condition, the MIN annunciator is removed from the PFD .

(s) FMS Source Annunciator

The FMS source is annunciated as either the FMS itself or VNV for vertical navigation.

(t) Vertical Track Alert (VTA) Annunciator

An amber VTA is displayed above the vertical deviation scale, as appropriate, when VNAV is selected. The input is supplied by the selected FMS.

(u) Radio Altitude Display

The four digit display located at the bottom of the attitude sphere indicates the aircraft's radio altitude from -20 to 2500 feet. The resolution above 200 feet of altitude is 10 feet; below 200 feet, the resolution is 5 feet. The display is blanked for altitudes greater than 2550 feet. When the radio altitude data is invalid, the display indicates a dash in each of the digits.

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(v) Comparison Monitor Annunciators

A variety of comparison monitor annunciators are provided. Selected pilot and copilot data inputs are monitored within the IC-600 IAC for reasonableness between on-side and cross-side display data (via the IC Bus). If the difference between the data exceeds a predetermined trip criteria, the miscompare is annunciated in amber on the PFD. Table 2–1–22 lists the miscompare annunciations, locations, and trip criteria. Active messages are cleared when the miscompare situation has been corrected.

When the pitch and roll attitude or glideslope and localizer signals are miscompared, a combined message (ATT or ILS) is displayed. If the radio altimeter is invalid, then localizer (LOC) and glideslope (GS) comparison monitoring is activated as a function of GS capture. LOC, GS, and ILS comparisons are only active during flight director LOC and GS capture with both NAV receivers tuned to a LOC frequency.

Table 2–1–22. Comparison Monitor Annunciations

Annunciation	Location	Trip Criteria
ROL	Below and to the left of the attitude sphere	±6° roll attitude
PIT	Below and to the left of the attitude sphere	±5° pitch attitude
ATT	Below and to the left of the attitude sphere	Pitch and Roll as stated above
HDG	Below and to the left of the attitude sphere	±6° if roll attitude < 6° ±12° if roll attitude > 6°
ALT	Altitude tape, upper right corner (top inside)	altitude ±200 ft
IAS	Airspeed tape, upper left corner (top inside)	airspeed ±5 kt
RA	Below and to the left of the attitude sphere	>10 ft $+(\Sigma_{RA}) \cdot (0.0625)$
GS	Below and to the left of the attitude sphere	GS CAP and below 1200 ft by a difference of ±50 μA GS deviation
LOC	Below and to the left of the attitude sphere	APP mode below 1200 ft by a difference of ±40 μA LOC deviation
ILS	Below and to the left of the attitude sphere	LOC and GS as shown above

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(w) Airspeed Warning Annunciator

When the flight director detects an overspeed or underspeed condition, a MAX SPD or MIN SPD warning is displayed in amber to the left of the sphere. The warning remains as long as the flight director determines the overspeed or underspeed condition exists.

(3) PFD HSI Display

The HSI presents a map-like display of the aircraft position. The HSI displays aircraft displacement relative to VOR radials, localizer, and glideslope beam as well as LRN cross-track deviation.

The HSI display can be presented in two basic formats, full or partial (arc) compass modes. In the full compass mode 360 degrees of heading is displayed, and partial compass presents 90 degrees of heading. Weather information can also be displayed in the partial mode. Power-up condition is with full compass displayed. Partial compass is selected with the FULL/WX button on the –607 and –707 DC-550 Display Controller or with the HSI button on the –611 and –723 DC–550. Successive toggling of the FULL/WX or HSI button, changes the display back and forth from full compass to partial compass display. If the weather radar is not in standby, weather information is also displayed on the partial compass.

Full Compass Displays	
• Heading	• Desired track
• Course select	• Bearing 1 and 2
• Course deviation	• Heading select
• Distance	• Time-To-Go
• Ground Speed	• Elapsed time
• To/From	• Heading and NAV source annunciators
• Wind vector	• Compass sync
Partial Compass Displays Only	
• Navigation map (range annunciator and waypoints)	
• Multiple waypoints	
• Heading bug off-scale arrows	
• Weather Information.	

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(a) Full Compass Format

The Horizontal Situation Indicator (HSI) annunciations on the PFD are shown in Figure 2–1–38 or Figure 2–1–39.

1 Compass Sync Annunciator

The green compass sync annunciator indicates the state of the compass system in the slaved (AUTO) mode. The bar represents commands to the directional gyro to slew the indicated direction. Input range for bar movement is 400 mv; +200 mv for (+) to indicate increased heading, zero for center to indicate no deviation, and -200 mv for ○to indicate decreased heading. The compass sync is removed during compass MAN (DG) mode or while the cross side compass is selected.

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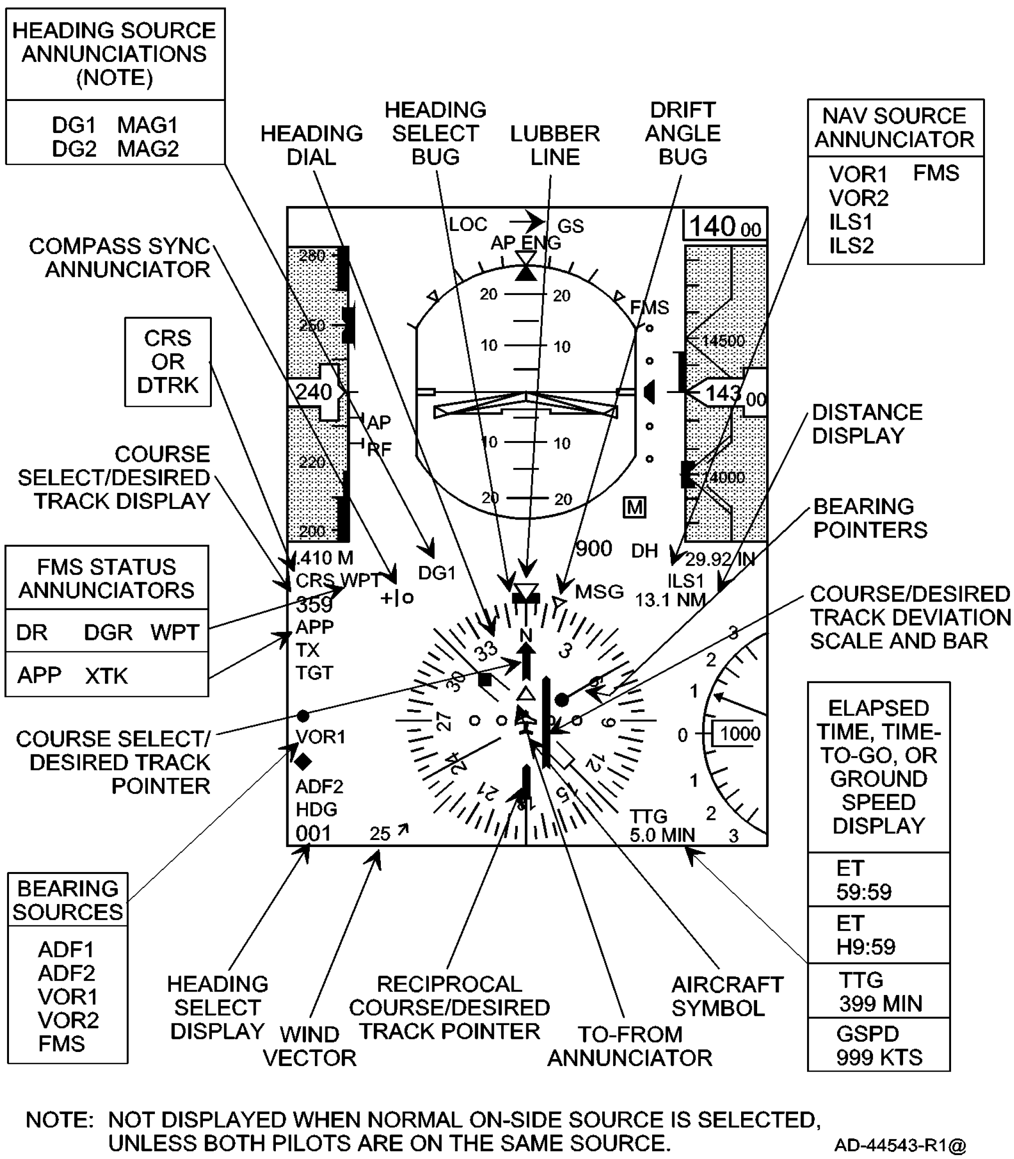

Figure 2-1-38. HSI Compass Display on PFD (Before Phase III)

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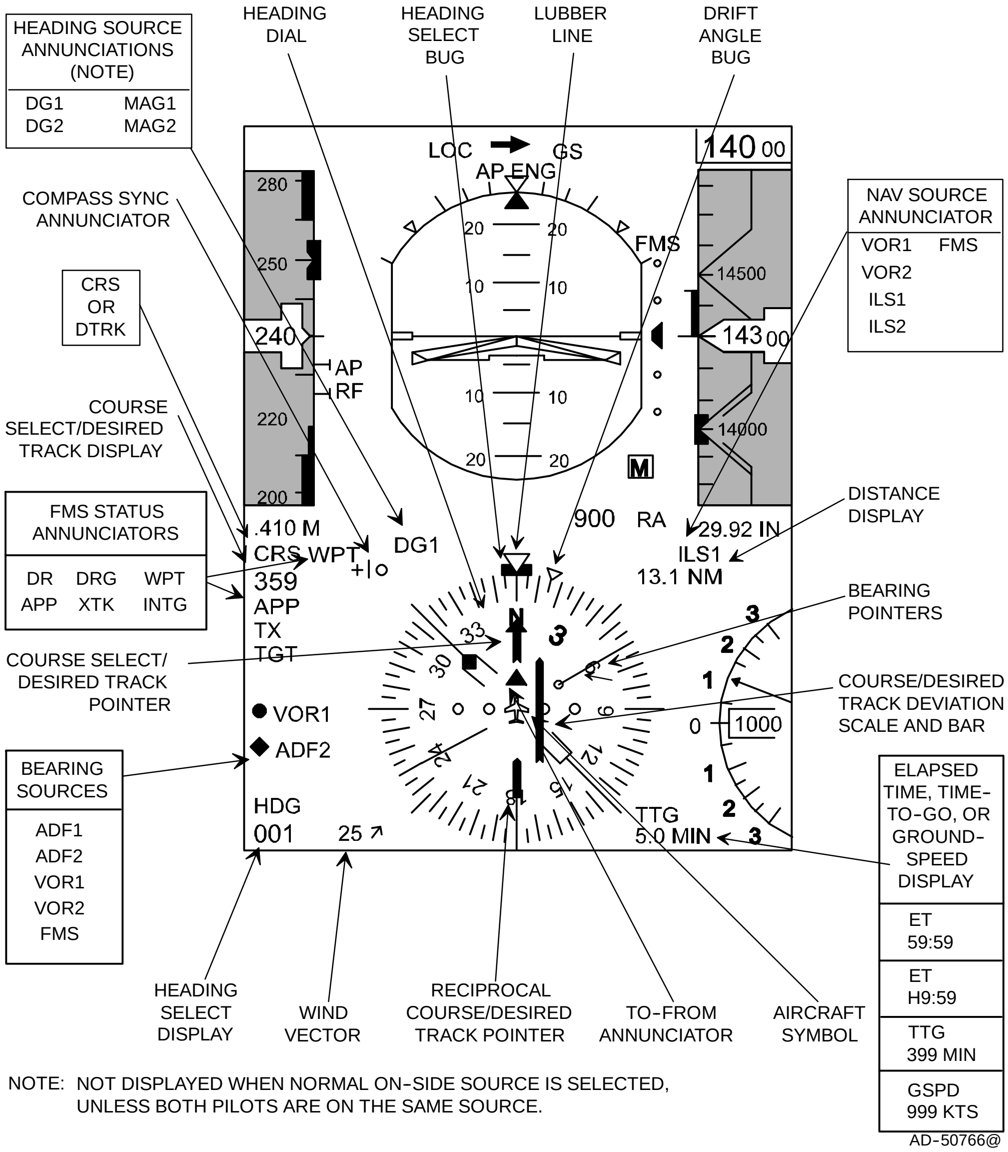

Figure 2-1-39. HSI Compass Display on PFD (Phase III)

2 Heading Source Annunciators

The PFD annunciates (upper left of HSI) the following sources of heading display:

- Directional Gyro (DG)
- Magnetic Compass (MAG).

The on-side and cross-side mode annunciators are defined in Table 2-1-23. Mode annunciations are normally white, but when the pilot and copilot are on the same source, the annunciations turn amber on both displays.

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Table 2-1-23. Heading Source Annunciators

No. 1 PFD		No. 2 PFD	
On-Side Source	**Cross-Side Source**	**On-Side Source**	**Cross-Side Source**
Displayed	DG2	Displayed	DG1
Not Displayed	MAG2	Not Displayed	MAG1

3 Heading Dial (Full)

Gyro stabilized magnetic compass information is displayed on the heading dial, that rotates with the aircraft throughout 360 degrees. The compass (azimuth) ring is composed of long and short tick marks (white), that alternate every 5-degrees.

Digits and cardinal abbreviations are spaced in 30 degree increments around the inside of the compass. Numeric identifiers are present at 30 degrees, 60 degrees, 120 degrees, 150 degrees, 210 degrees, 240 degrees, 300 degrees, and 330 degrees. These digits represent tens and hundreds of degrees at their respective locations.

4 Heading Select Bug

The notched solid cyan heading bug rotates about the compass and is displayed full time, unless off scale in partial compass (arc) format. The heading bug is positioned by rotating the heading select knob on the RI-553 Remote Instrument Controller.

The bug rotates with the heading dial; therefore, the difference between the bug and the fore lubber line index is the amount of heading select error applied to the flight director.

5 Lubber Line

The lubber line is drawn as a white triangle. The triangle is positioned at the apex of the compass, outside the azimuth ring. The triangle fits inside the heading bug, when the heading bug is positioned at 0 degrees. Angular error between the heading input and the displayed heading, as read against the lubber line, is less than ± 50 minutes. Other symbols related to the lubber line are seven tick marks, positioned at 45 degree intervals around the outside of the compass proper.

6 Drift Angle Bug

Selection of long range NAV causes the drift angle bug to be displayed. If available from the FMS, the drift angle bug with respect to the lubber line represents drift angle left or right of the desired track. The drift angle bug with respect to the heading dial represents the aircraft's actual track. The bug is displayed as a green triangle that moves around the outside of the heading dial (in either full or partial modes).

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7 NAV Source Annunciator

The annunciation of NAV source appears in the upper right corner of the HSI area. Available navigation sources are VOR 1/2, ILS 1/2, and FMS. The color of the annunciator label changes as a function of the NAV source selected for display. If the pilot and copilot are on the same source, the label is turned to amber.

The selected NAV source for display on the course deviation indicator is transmitted from the on-side display controller. If the on-side controller is invalid, the SG function reverts to on-side primary NAV (i.e. , No. 1 side - VOR1, No. 2 side - VOR2). When tuned to a localizer, the VOR portion of the label changes to ILS. For long range NAV, the source is always identified with FMS.

8 Distance Display

The digital distance readout is always shown below the NAV source annunciators (upper right corner of the HSI area). The color of the distance digits also change as a function of the NAV mode selected for display. NAV modes and colors of the distance digits (green, yellow, or magenta) change as a function of the NAV source selected for display.

The digits represent the value for distance in nautical miles to the station for a short range NAV and the distance to the next waypoint for long range NAV. Depending on equipment, the distance is displayed in a 0-399.9 or a 0-3999 nautical mile format. If DME hold is selected when the VOR is displayed, an amber H appears next to the DME distance readout.

9 Bearing Pointers and Source Annunciators

Two bearing pointers are available, ○ and ◇. The bearing pointers indicate bearing to the selected NAV aid. The pointers are selected ON or OFF from the DC-550 Display Controller. Angular error between the bearing input and the displayed bearing is less than ± 1 degree.

NOTE: ADF bearing is case referenced and SRN and LRN are card referenced.

Annunciators for the bearing pointers appear in the lower left-hand corner of the HSI area. The bearing source annunciators are symbol and color coded to match the bearing pointers. The annunciator and bearing pointer color is cyan for the circle pointer (left-side source) and white for the diamond pointer (right-side source). Selectable sources for each pointer are given in Table 2-1-24.

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Table 2-1-24. Bearing Sources

BRG ◯	BRG ◇	Reference
VOR1	VOR2	Card
ADF1	ADF2	Case
FMS	FMS (Phase III)	Card

When the bearing pointer navigation source is invalid or a localizer frequency is chosen, the respective bearing pointer is removed. If the bearing pointers are selected OFF, the annunciator symbols, ◯ and ◇ are removed from the display, in addition to the pointers being removed.

The pointers rotate about the heading dial in the same manner as the course pointer. Bearing pointer source selections come from the on-side DC-550 Display Controller. If the on-side display controller fails, the default sources are VOR1 on circle and VOR2 on diamond.

10 Course Select/Desired Track Deviation Scale and Bar

A course select/desired track (lateral) deviation scale appears in the form of two white dots on either side of the aircraft symbol. This represents NAV deviation from the selected source. The lateral deviation dots rotate around the center of the fixed aircraft symbol. The deviation bar represents the centerline of the selected VOR or localizer course. The aircraft symbol pictorially shows actual aircraft position in relation to the selected course. Bar movement for lateral deviation is given in Table 2-1-25.

Table 2-1-25. Lateral Deviation Scale

Pointer Position	VOR Computed	ILS	Cross-Track
2nd dot, right	+10 ± 0.25°	+150 μA	+5.0 NM
1st dot, right	+5 ± 0.25°	+75 μA	+2.5 NM
Zero index	0 ± 0.25°	0 μA	0 NM
1st dot, left	-5 ± 0.25°	-75 μA	-2.5 NM
2nd dot, left	-10 ± 0.25°	-150 μA	-5.0 NM
NOTE: When FMS Approach mode is active, cross-track distance 0.625 NM per dot (i.e., four times as sensitive).			

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In VOR operation, each dot on either side of the aircraft symbol represents 5-degree deviation from centerline (75 μA). In ILS operation, each dot represents 1-degree deviation from centerline (75 μA). When FMS is the selected navigation source, each dot represents 2.5 nautical miles (NM) of crosstrack error. When the FMS APP annunciator is displayed, each dot represents 0.625 NM of cross-track error. Beyond the second dots, the deviation bar continues to move at reduced sensitivity for inputs up to $\pm$ 12 degrees for computed VOR, $\pm$ 185 μA for ILS, and $\pm$ 6.2 NM for cross-track ($\pm$ 1.55 for approach mode).

When the Back Course (BC) mode is selected on the flight director, or when tuned to a localizer frequency and the selected course is more than 90 degrees from the aircraft heading, course deviation is automatically reversed to give proper deviation sensing with respect to the course centerline. The color (green, amber, or magenta) of the deviation bar changes as a function of the NAV source and on-side mode (pilot/copilot).

<u>11</u> Elapsed Time (ET), Time-To-Go (TTG), or Ground Speed (GSPD) Display

The shared display and annunciators for ET, TTG, and GSPD are located at the bottom of the HSI region, between the vertical speed scale and heading compass. The ET button on the DC-550 Display Controller replaces GSPD/TTG with a digital clock display. When in the ET mode, the ET display can present minutes and seconds up to 59:59. Leading zeros are displayed for values $\leq$ 9 minutes. It also displays hours/minutes up to 9:59. The hour/minute mode is distinguishable from the minute/seconds mode by an H on the left of the digital display. Leading zeros are not displayed for the hour/minute mode.

Successive toggling of the GSPD/TTG button on the DC-550 Display Controller, allows ground speed or time-to-go to be alternately displayed. The display format for groundspeed is knots and the range is 0-999, $\pm$1 knot. If VOR/LOC is displayed, the HSI displays ground speed from the associated DME. If FMS is displayed, groundspeed is calculated by the FMS.

The display format for TTG is minutes and the range is 0-399, $\pm$1 minute.

<u>12</u> Aircraft Symbol

The center of the heading compass has a fixed miniature aircraft symbol (white) and lateral deviation scale. The symbol shows aircraft position and heading with respect to the rotating heading dial. It also shows the aircraft position in relation to a radio course.

<u>13</u> To/From Annunciator

The To/From indicator appears as a white triangle in front of the aircraft (To) or behind the aircraft (From). A To indication appears as long as the selected course pointer is within $\pm$90 degrees of the selected NAV source bearing. The To/From annunciator is not in view during localizer operation.

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14 Reciprocal Course/Desired Track Pointer

The pointer indicates 180 degrees from the course select/desired track pointer.

15 Wind Vector

Wind vector information, that comes from the FMS, is displayed in the left of bottom center. The wind is shown in magenta with velocity and direction. In this presentation, wind information is supplied by a vector arrow showing the direction of the wind relative to the airplane symbol. The associated digital quantity indicates wind velocity.

16 Heading Select Display

A digital readout (cyan) of the heading bug's current selected value is displayed in the lower left corner of the HSI region. The selected heading is annunciated with a cyan HDG label above it. Deviation between the heading display and HDG SEL bug, as read against the heading scale, is limited to ± 1 degree.

17 Course Select/Desired Track Pointer

The course/desired track pointer rotates with and about the center of the heading dial to supply a continuous indication of course error.

When short range NAV is selected as the display source, the course pointer (green) is positioned on the rotating heading compass dial, by a remote course select knob on the RI-553 Remote Instrument Controller to select a magnetic bearing that coincides with the desired VOR radial or localizer course.

When long range navigation is selected, the course pointer (magenta) becomes a desired track pointer. The position of the desired track pointer is controlled by the long range NAV system. A digital display of desired track (DTRK) is displayed in the upper-left hand corner. When FMS is selected, the course select data is supplied by the IC-600 IAC. If the FMS allows the pilot to manually set a track, the upper left-hand corner displays that digital set value.

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18 FMS Status Annunciators

The following FMS status messages are annunciated to the left of the compass:

- Dead Reckoning (DR) - An amber DR indicates DR mode.
- FMS Approach (APP) - A cyan APP indicates the FMS is in the approach mode.
- Degrade (DGR) - An amber DGR indicates a degrade mode of operation.
- Crosstrack (XTK) - A cyan XTK message appears when the FMS has sent a crosstrack warning.
- Waypoint (WPT) Alert - A lateral waypoint crossover is annunciated by an amber WPT. Sixty seconds prior to crossing a FMS waypoint the amber WPT annunciator is displayed to the left of the heading compass. The annunciator flashes during this time.
- GPS Integrity (INTG) - An amber INTG indicates a failing GPS. The annunciation is removed when the selected NAV source is other than FMS.
- Message (MSG) is displayed to the right of the compass in amber to notify the pilot that a FMS message is present on the CDU. See Figure 2–1–41.

19 Course Select/Desired Track Display

The display for the current course select/desired track value appears in the upper left hand corner of the HSI region (below the Mach display), as green, amber, or magenta digits. If short range NAV is selected as the navigational source, CRS is annunciated in white above the display. If long range NAV is selected as the navigational source, DTRK is annunciated (also in white) in place of CRS.

(b) Partial Compass Format

The partial compass format, shown in Figure 2–1–40 or Figure 2–1–41, displays the same information as the full compass format, except for the following:

- Only a 90-degree arc ($\pm$45 degrees) of the heading dial is visible in the partial compass mode. Pushing the FULL/WX or HSI button once on the DC-550 Display Controller causes the heading dial to change to the partial compass format.
- Off Scale Arrow-In the partial compass mode, the heading bug can be rotated off the compass scale. When the HDG bug is off scale, a cyan arrow is displayed on the outer compass ring to indicate the shortest direction to its location.
- Digital heading display-For convenience, a display of the aircraft's current heading is supplied above a V-shaped notch at the top (apex) of the partial compass. The V-shaped notch replaces the lubber line, and fits inside the heading bug, when the heading bug is positioned at the center of the arc.

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- If the weather radar system is active, weather information is automatically displayed on the partial compass format.

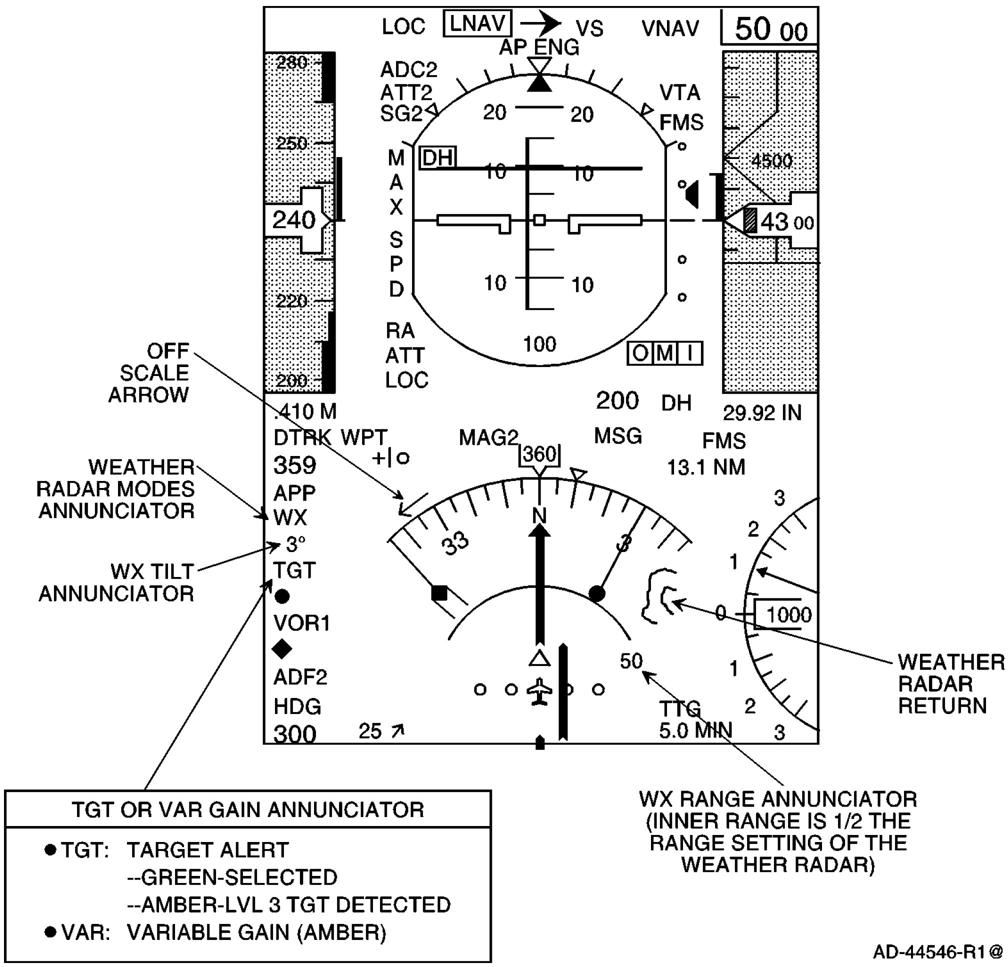

Figure 2-1-40. HSI Partial Compass Format (Before Phase III)

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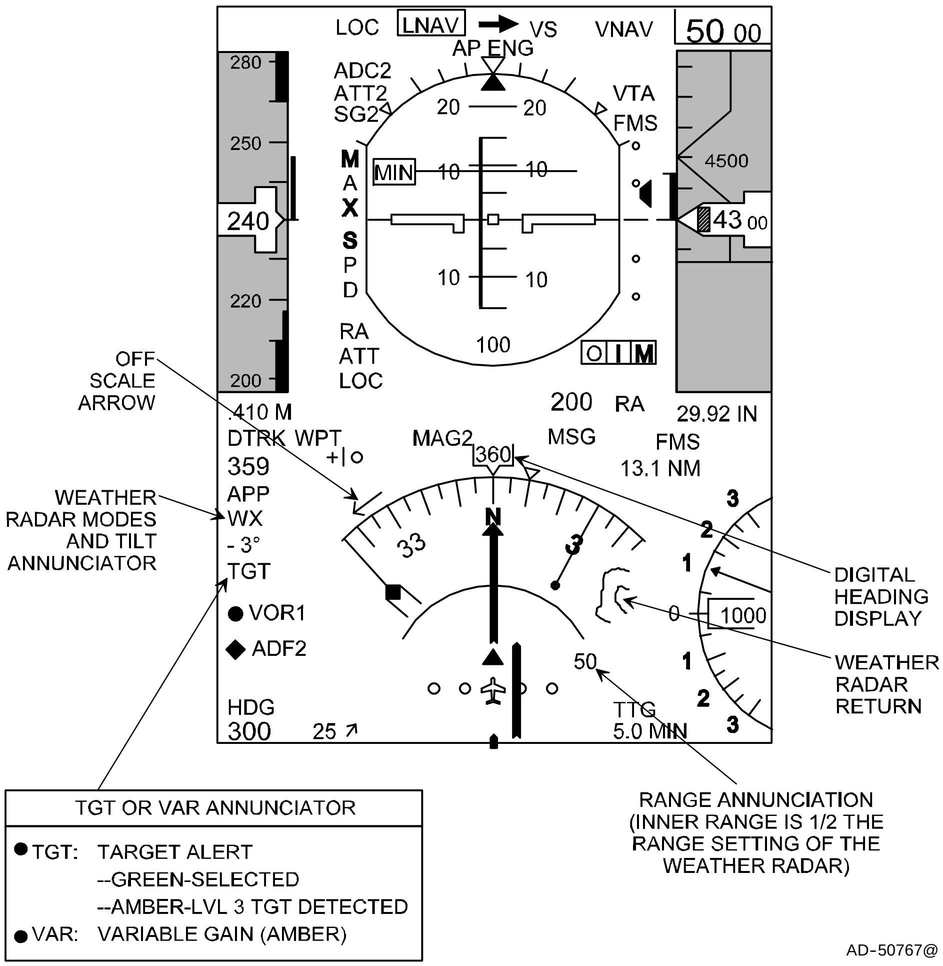

Figure 2-1-41. HSI Partial Compass Format (Phase III)

(c) Weather Radar Display

When selected by the DC-550 Display Controller, weather information is displayed on the partial compass format, as shown in Figure 2-1-41. Each PFD can display independently selected weather information.

1 Weather Radar Mode Annunciators

The weather radar (WX) mode annunciations, listed in Table 2-1-26, are displayed to the left of the compass arc below the FMS Approach mode annunciation field. Full WX modes are annunciated on the MFD. Mode annunciations are received over the serial interface from the RTA. When full compass format and WX are turned on, a magenta TX is displayed in the mode annunciation field.

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The RTA uses hardware and software monitors to detect and identify faults within the radar system. If WX fails, an amber FAIL message appears in the mode annunciation field. Faults are logged into nonvolatile memory by a unique fault code number. Readout of the fault memory contents can be accomplished by setting the mode selection knob on the weather radar controller to TST (test). Fault codes are displayed in the antenna tilt angle field. If more than one code is associated with the failure, the numbers toggle between the different fault codes.

Refer to the applicable PRIMUS 6XX/ 8XX Weather Radar System Description and Installation manual, for specific information on fault code interpretation.

Table 2-1-26. Weather Annunciations

Mode	Annunciator	Color
Warm-up	WAIT	Green
Rain Echo Attenuation Compensation Technique	RCT	Green
Ground Clutter Rejection (P-8XX only)	GCR	Amber
RCT and GCR Modes Active (P-8XX only)	GR/R	Green
Forced Standby	FSBY	Green
Standby	STBY	Green
System Self-Test	TEST	Green
Weather Detection	WX	Green
Weather and Turbulence (P-8XX only)	WX/T	Green
RCT and Turbulence (P-8XX only)	R/T	Green
Flight Plan Mode	FPLN	Green
Ground Mapping	GMAP	Green
Faults Detected	FAIL	Amber
R/T OFF	OFF	Green

2 Weather Radar Tilt Annunciator

Above the target mode line is the antenna tilt angle display. The display range for tilt angle is -15 degrees to +15 degrees. Antenna tilt is displayed in 0.5 degrees increments between -5 degrees and +5 degrees. For tilt angles greater than ± 5 degrees, the resolution is in 1.0 degrees increments. Tilt values are preceded by no sign (blank) for positive values and a minus sign (-) for negative values. A degree sign (°) appears after the tilt angle.

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3 Target Alert (TGT) and Variable Gain (VAR) Annunciators

Directly below the WX mode annunciation line is a shared target alert and variable gain status line. The target alert annunciator warns of level 3 targets. A green TGT annunciation indicates an armed condition, while an amber TGT indicates a weather alert condition. If the RTA detects an alert condition, the TGT remains amber as long as the alert condition persists. An amber VAR annunciation in place of TGT shows the radar is operating in the variable gain mode. Target mode/alert has highest priority.

4 Range Annunciator

Range rings are shown to aid in the use of radar returns and position of navaids. The outer range ring is the compass card boundary and represents the selected range on the radar. The inner range ring is 1/2 of the range setting (in nautical miles) on the weather radar controller. This range ring appears between the outer edge of the compass arc and the center of the aircraft symbol. Weather radar range is annunciated by white digits at the end of the half-range ring as shown in Figure 2-1-41. The radar range listed in Table 2-1-27, is selected through the weather radar controller. If the radar range is turned OFF, then by default the outer range ring represents 100 NM.

Table 2-1-27. Selectable Radar Ranges

Selected Range	Half Range Displayed
5	2.5
10	5.0
25	12.5
50	25.0
100	50.0
200	100.0
300	150.0

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5 Weather Radar Return

Weather radar returns (picture data) appear within the confines of a baseball diamond shaped area, bounded on the outer edge by the compass arc. The returns are color coded as shown in Table 2-1-28. WX picture data is displayed in a 90 degree pattern if sector scan has not been selected on the weather radar controller. If sector scan is selected, a 60-degree pattern is displayed. A 60-degree sector scan is further identified by two white azimuth marks (not always shown) on the half range ring, at ±30 degrees of an imaginary line running through the center of the fixed aircraft symbol.

The WX display is dimmed with the entire PFD. There is no dedicated WX dim control.

Table 2-1-28. Weather Radar Return Color Code

Return	WX Mode	GMAP Mode
Level 0	Black	Black
Level 1	Green	Cyan
Level 2	Amber	Amber
Level 3	Red	Magenta
Level 4	Magenta	NA

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(4) Airspeed Display

The airspeed display presents indicated, Mach, and maximum airspeed information. See Figure 2-1-42 for the location of annunciations described in the following paragraphs.

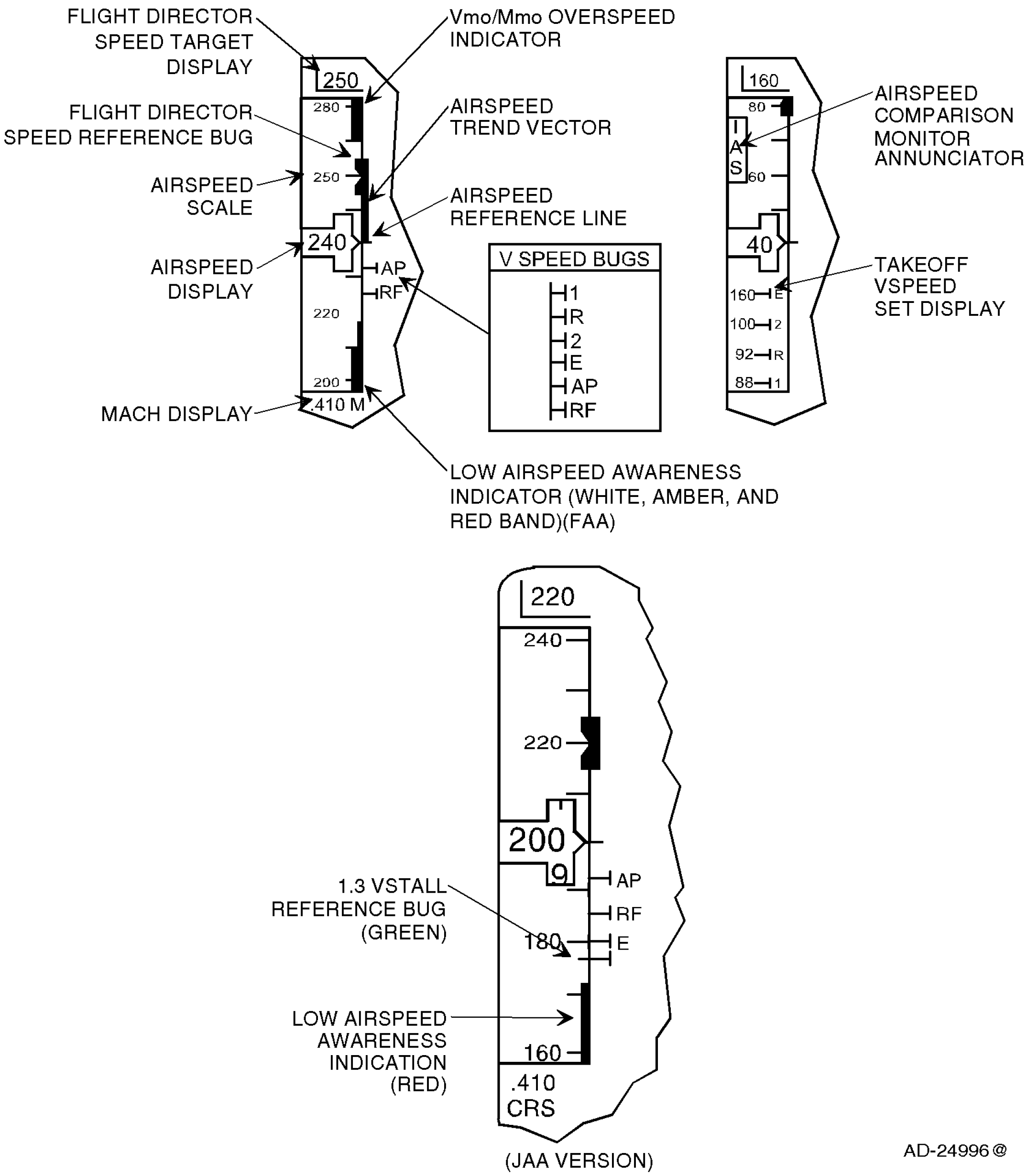

Figure 2-1-42. Airspeed Display

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(a) Flight Director Speed Target Display and Reference Bug

The pilot-adjustable indicated airspeed IAS/Mach target is displayed inside a partial box above the airspeed tape. When the flight director Speed (SPD) mode is engaged, the airspeed target is changed using the PC-400 Autopilot Controller PITCH wheel. The corresponding airspeed reference bug is shown on the right side of the airspeed tape. The airspeed digits and airspeed set bug are both cyan.

When the flight director is not in the SPD mode, the flight director airspeed bug, airspeed target, and target box on that side are removed. If neither flight director is in the SPD mode, the airspeed target, partial box, and bug are removed from both pilots displays. If the IAS/Mach target is set to a value outside the display range of the tape, the bug parks at the respective end of the tape, half visible and unfilled.

(b) Vmo/Mmo Overspeed Indicator

The Vmo/Mmo overspeed indicator is a fixed red bar located along the right-inside of the airspeed scale. The red bar originates at Vmo/Mmo and extends to larger airspeeds on the tape, until the end of the scale is reached.

(c) Airspeed Trend Vector

The airspeed trend vector appears as a magenta bar located along the outer right side of the airspeed tape. The trend vector is a prediction of what the value of indicated airspeed (direction of acceleration) is in approximately 10 seconds, if the present trend is maintained. The trend vector extends vertically from the apex of the current airspeed value display window. The vector extends upward for positive acceleration, and downward for negative acceleration.

(d) Vspeed Bugs

In addition to the airspeed set bug previously described, Vspeed set bugs, corresponding to speeds for various phases of flight are also displayed. This data comes from pilot inputs using the MFD T/O SPEEDS or LNDG menu. Six Vspeed set bugs (V1, VR, V2, Venr, Vapp, and Vref) are supplied. Each of the Vspeed set bugs has two elements, a label and horizontal T-shaped symbol. The airspeeds are labeled 1, R, 2, E, AP, and RF, and positioned on the right of the symbol. Assigned Vspeed labels and colors are given in Table 2–1–29.

The Vspeed set bugs travel up and down, along the outside right edge of the airspeed tape. Vspeed set bugs are removed after that speed has been attained and the airspeed deviates by ± 50 knots. Vref and Vapp bugs are removed when power is turned off.

When the aircraft speed is below 40 knots, V1, VR, V2, and VE are displayed in the bottom portion of the airspeed tape in the form of a digital readout. The digital readout of the set value is displayed along with the set bug symbol and label in ascending order, starting with V1. VE is automatically set to 160 knots (minimum value) and displayed when V1, VR, or V2 are set.

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Upon power up, the digital readouts for the set bugs are displayed as amber dashes. As the Vspeeds are set, the digital readouts follow the airspeed reference values entered through the MFD menu option. The digital readouts are removed from the PFD when the first Vspeed value appears on the airspeed tape.

Table 2-1-29. Vspeed Bug Parameters

Vspeed	Label	Speed Definition	Color
V1	1	Takeoff Decision	Magenta
VR	R	Takeoff Rotation	Cyan
V2	2	Takeoff Safety	White
Venr	E	Enroute	Cyan
Vapp	AP	Approach	Magenta
Vref	RF	Landing Configuration	Green

NOTE: If either PFD is in the reversionary mode (i.e., displayed on the MFD) it is not possible to set Vspeeds.

(e) Low Airspeed Awareness Indicator

Indication of low airspeed is shown by a white, amber, and red tape located along the bottom right-inside of the airspeed scale. The low airspeed awareness tape grows from the bottom up. The tape is white, amber, and red to denote the aircraft condition relative to a stall.

A white band extends from 1.3 Vstall to 1.2 Vstall, the amber band extends from 1.2 Vstall to stick shaker speed (1.1 Vstall), and the red band extends from stick shaker speed to smaller airspeeds on the tape. When the amber portion reaches the airspeed reference line, the aircraft is at approximately 0.7 Angle Of Attack (AOA). When the red portion of the bar reaches the airspeed reference line (as calculated by an AOA input) the stickshaker activates.

(f) Mach Display

A digital read out of indicated Mach number is displayed below the airspeed tape. The range of the Mach number is 0.2 to 1. Resolution of the Mach display is 0.001 Mach. The color of the digits always agrees with the color of the digits on the airspeed display.

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(g) Airspeed Display

A rolling digit display of the actual current Indicated Airspeed (IAS) value is contained within a notched T-shaped box, centered on the airspeed scale. This data is a magnification of the digits on the scale and they are readable to within a 1 knot resolution. The rolling digits within the T-shaped box are green. When the current airspeed value is equal to or exceeds the maximum allowable airspeed (Vmo/Mmo) the digits turn red. When the airspeed trend vector exceeds Vmo by 1 knot, the rolling digits turn amber unless red is required.

When an underspeed condition exists, the rolling digits also turn red. A MIN SPD message is displayed to the left of the ADI sphere when VNAV mode is engaged and the IAS drops below 160 knots. MAX SPD is displayed in place of MIN SPD anytime IAS exceeds Vmo/Mmo.

(h) Airspeed Scale

The airspeed scale is a moving vertical tape display with calibrated airspeed marks and a fixed pointer. The vertical tape is gray and the pointer is a notched T-shaped box with a rolling digital display inside. The vertical tape moves behind the pointer to indicate actual airspeed. Tick marks located along the right edge of the vertical tape are in 10 knot increments. Airspeed markings on the tape are labeled in 20 knot increments with larger numbers displayed at the top of the scale. Range of the airspeed scale is 40 to 400 knots. The T-shaped box pointer and the scale and its markings are white.

(i) Airspeed Comparison Monitor Annunciator

Activation of the airspeed comparison monitor is annunciated by an amber IAS in the upper end of the airspeed tape. The annunciation flashes for 10 seconds and then goes steady. The comparison monitor is activated by a difference of 5 knots of airspeed.

(j) Take-off Vspeed Set Display

When less than 40 knots, V1, VR, V2, and VE are displayed in digital tabular form inside the lower portion of the airspeed tape. As the airspeed increases and the values come into view on the airspeed tape, the digital display is removed and subsequently replaced by the appropriate Vspeed bug.

(k) 1.3 Vstall Reference Bug (JAA version, Phase III only)

The 1.3 Vstall bug is placed at 1.3 x stall speed value.

(l) Low Airspeed Awareness Indication (JAA version, Phase III only)

A red underspeed bar is used to indicate the aircraft condition relative to a stall. It starts from the bottom of the right hand side of the airspeed tape and stretches upward toward a < bug that represents 1.3 Vstall. The top of the bar represents 1.1 Vstall. The gap between the top of the red bar and the < bug remains constant. When AOA increases and the top of the red bar approaches the IAS window, the stick shaker is activated.

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(5) Altitude Display

The altitude display presents current altitude, altitude preselect, barometric corrected altitude, altitude alert, and altitude trend vector information. See Figure 2-1-43 for the location of annunciations described in the following paragraphs.

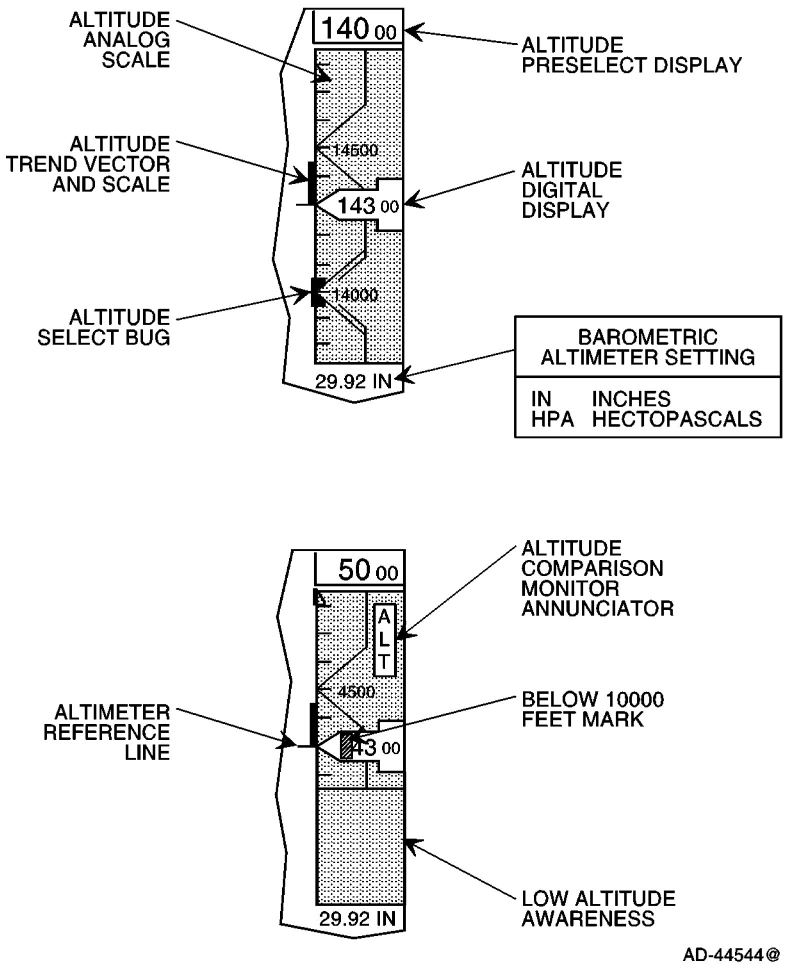

Figure 2-1-43. Altitude Display

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(a) Altitude Analog Scale

The altitude tape is a moving scale with a fixed pointer. Tick marks are located along the left edge of the scale at 100 foot intervals. The scale markings on the tape are labeled in 200 foot increments below 10,000 feet and in 500 foot increments above 10,000 feet. The altitude tape moves behind the fixed pointer window and displays a tape ±550 feet from the present altitude with the larger numbers at the top of the scale. The scale and its markings are white on a gray background.

Altitude chevrons appear at each 500 and 1000 foot mark below 10,000 feet to enhance the display. Single line chevrons are located at each 500 foot increment. Double line chevrons are located at each 1000 foot increment. The chevrons extend back to the approximate midpoint of the altitude tape and are connected to each other with a vertical line.

The chevron, altimeter reference line, and altitude select bug, are designed to align when the selected and current altitudes are on 1000 or 500 foot increments. When the selected altitude is a multiple of either 500 or 1000 feet, the altitude select bug is shaped to fit the peak of the chevron shape and the digital altitude display window.

(b) Altitude Preselect Display

The preselected altitude is displayed above the altitude tape display with larger digits for hundreds, thousands, and ten thousands digits. This data is set by the pilot using the MFD bezel controller set knob. The data originates from the selected MADC. Altitude Preselect (ASEL) digits are cyan under normal circumstances. When a departure from the selected altitude occurs, the white box around the preselected altitude display and the digits turn amber, to give an altitude alert.

The altitude alert operating region is when the aircraft enters the region where it is within 1000 feet of the preselected altitude during a capture maneuver. At this point, the box around the set data turns amber. Once the aircraft is within 250 feet of the preselected altitude, the box turns back to white. After capture, the aircraft re-enters the altitude alert operating region, if it departs more than 250 feet from the selected altitude. A momentary audio alert is also supplied when the aircraft is 1000 feet from the preselected altitude or has departed 250 feet from the select altitude after capture.

Display range of the altitude preselect window is -900 to 45,000 feet with a resolution of 100 feet. Power up condition is with cyan dashes displayed. If the MADC is invalid, the preselect window displays amber dashes.

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(c) Altitude Digital Display

Barometric altitude is displayed in a rolling digit window in the center of the altitude tape (fixed pointer). The left side of the rolling digit window is angled at the same slope as the chevrons. Display range of the altitude window is -1,000 to 60,000 feet. This data is a magnification of the digits on the scale and is readable to within a 20 foot resolution. The digits within the pointer are green and the hundreds, thousands, and ten thousands digits are larger digit numerals.

For climb/descent rates greater than 1,000 feet per minute, the rolling drum digits are replaced by two dashes to enhance altitude scale readability. Below 10,000 feet, a boxed cross-hatch replaces the 10,000's digit to enhance low altitude awareness.

(d) Barometric Altimeter Setting

The Barometric (Baro) set window is located directly below the altitude tape. The pilot has the ability to set the altimeter in either inches of mercury (in Hg) or hectopascals (hPa) as selected with the PFD bezel controller. If the on-side display controller is invalid, the SG defaults to the last selection (IN or hPa). The baro set data is always cyan.

Set range for inches of mercury is 16 to 32, ± 0.01 in Hg and for hectopascals 541 to 1083, ± 1 hPa.

(e) Altitude Select Bug

A moving altitude bug is displayed along the left side of the altitude tape across from the value set in the altitude select display. The altitude select bug is notched to fit the 1000 or 500 foot altitude tape chevron format. If the selected altitude value is not within the displayed range, the bug is parked at the top or bottom, left edge of the vertical tape, and represents1/2 the select bug (unfilled). The bug color tracks the digit color in the altitude select window. If the bug is moved off the current scale range, half of the bug remains on the scale to indicate the direction to the set bug.

(f) Altitude Trend Vector and Scale

The trend vector is a thin magenta thermometer shaped bar that corresponds to altitude rate. The altitude trend vector originates at the altitude reference line and moves along the left side of the altitude tape. The altitude trend vector predicts actual aircraft altitude in 6 seconds, if the same vertical speed is maintained. The trend vector scale is calibrated in 1000 foot tick marks from the altitude reference line. Altitude rate is output from the MADC.

(g) Altitude Comparison Monitor Annunciator

Activation of the altitude comparison monitor is annunciated by an amber ALT in the upper end of the altitude tape. The annunciation flashes for ten seconds and then goes steady. The comparison monitor is activated by a difference of 200 feet of altitude.

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(h) Low Altitude Awareness

At radio altitudes of 550 feet or less, the lower part of the altitude tape linearly changes from a gray raster to brown and the altimeter scale markings are removed. At zero radio altitude, the brown raster touches the altimeter reference line.

(6) Vertical Speed Display

The vertical speed (VS) display presents the absolute value for rate of climb or rate of descent on a scale centered around zero vertical speed. If the aircraft is equipped with TCAS, the VS display also presents traffic information and warning advisories. See Figure 2–1–44 for the location of displays described in the following paragraphs.

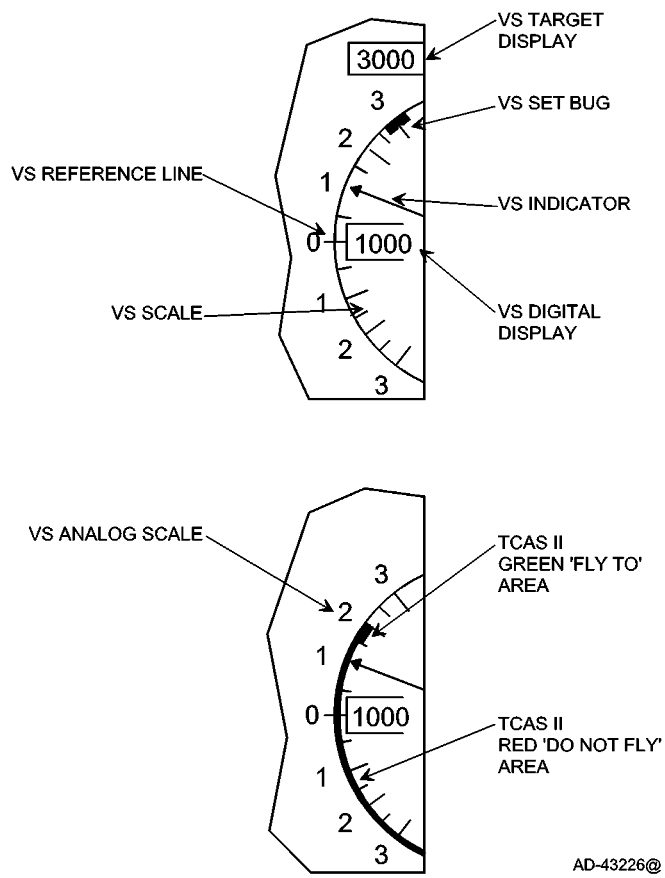

Figure 2–1–44. Vertical Speed Display

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(a) VS Target Display

The pilot-adjustable VS target is displayed inside a white box above the VS analog scale. VS target display range is from -9999 to +9999 fpm and display resolution is 100 fpm. When the VS mode is engaged from either flight director, the vertical speed target is changed using the PC-400 Autopilot Controller pitch wheel. The corresponding vertical speed set bug is shown on the inside arc of the vertical speed scale. Digits for the VS target display and the bug are both cyan. If neither flight director is in the VS mode, the vertical speed target, box, and bug are removed from both pilots displays.

(b) VS Set Bug

Engaging the vertical speed mode brings the VS set bug into view. The VS set bug travels along the inside of the VS scale. The bug lines up with the value on the VS scale set with the PC-400 Autopilot Controller. The bug is always cyan.

(c) VS Indicator

The VS arrow points to the numerical readout on the vertical speed analog scale that corresponds to the digital readout in the VS digital display.

(d) VS Digital Display

A digital display of actual vertical speed is located in a white partial box centered within the scale, at the zero reference line. This data is a magnification of the digits on the scale and is readable to within a 50 fpm resolution. Maximum value is 9900 fpm. For values between ± 550 fpm, the digital display and its box are removed. At values beyond ± 550 fpm, the digital value of vertical speed is displayed. The digits within the box are normally green and only turn red to indicate an alert.

(e) VS Reference Line

This line represents straight and level flight or vertical speed zero. When the aircraft is in straight and level flight, the vertical speed digital display is removed and the vertical speed indicator points to the reference line (0 ft/min).

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(f) VS Analog Scale

The VS scale is a fixed meter-type display, with a moving pointer that rotates about a point outside of the actual display. The scale is a 134 degree arc with tick marks incremented at 500 fpm intervals. Large tick marks are displayed at ±1000, ±2000, and ±3000 fpm, and small tick marks are displayed at ±500, ±1500, and ±2500 fpm. Scale markings are labeled outside the arc at 0, ±1, ±2 and ±3 to indicate thousands of feet per minute. The scale and its markings are white.

Pointer deflection range is from -3500 to +3500 fpm. For vertical speeds greater than ±3500 fpm, the pointer continues to move up to ±6600 fpm but at a reduced sensitivity. The digital display shows the actual vertical speed value. Also, the pivot point of the pointer adjusts such that most of it remains in view as the pointer moves up the scale.

The pointer parks at the end of the scale for values greater than ±6600 fpm. The digital display is removed for vertical speeds between -550 and +550 fpm. Pointer movement is non-linear between -1000 and +1000 fpm to give greater resolution of the vertical speed. Pointer color is normally green and only turns red to indicate an alert.

(g) TCAS Resolution Advisory Display (Option)

The VS display also presents a green fly to target and a red do-not-fly band on the VS scale that commands the pilot to comply with a TCAS resolution advisory (RA) to avoid a potential aircraft conflict.

An RA is a display indication given to the pilot recommending a maneuver to increase vertical separation relative to an intruding aircraft. There are two types of RAs, Corrective and Preventive. A corrective RA instructs the pilot to deviate from current vertical speed to avoid the intruder. A preventive RA instructs the pilot to avoid certain deviations from the current vertical speed.

For each type of RA, there is a red band on the inside edge of the vertical speed scale for forbidden vertical speeds. The digital VS display and the pointer on the scale are red when vertical speed falls within the forbidden zone. For a corrective RA, a specific green fly-to band attached to the red band is displayed. The nominal length of the green band is the length between the 1500 and 2000 fpm tick marks. The green band is twice the width of the red band.

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(h) TCAS Status Message

The TCAS status messages are presented to the left of the vertical speed display. When a TCAS RA is displayed, the vertical speed digital display notches the color of the red or green band where the pointer is located. Table 2-1-30 lists the TCAS messages annunciated on the PFD.

Table 2-1-30. TCAS Messages (PFD)

Message	Color	Description
TCAS TEST	White	Power up test in progress
TCAS OFF	White	TCAS is OFF
TCAS FAIL	Amber	TCAS failure
TA ONLY	White	Traffic alert ON
RA FAIL	Amber	Radio Altimeter failure

(7) Excessive Attitude Declutter

The display is decluttered when an unusual attitude condition is displayed. The condition is defined as follows:

- Bank greater than ± 65 degrees
- Pitch greater than 30 degrees up
- Pitch greater than 20 degrees down.

The following items are removed from the display when the above logic has been satisfied:

- FD mode annunciations and command bars
- Marker beacons
- Vertical deviation scale, pointer, and annunciator
- ADI localizer scale
- Speed bugs and readout
- Radio altitude and RA minimums set
- Altitude select data
- All flags and comparators except ATT and ADC (IAS/ALT).

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(8) PFD Test

The PFD test can be initiated by pushing and holding the TEST button on the DC-550 Display Controller when airspeed is valid and less than 60 knots, and the Weight–On–Wheels (WOW) switch is in the on-ground mode. Failure mode indications occur for the first 5 to 6 seconds after the TEST button is pushed. The following formats are displayed, as shown in Figure 2–1–45 or Figure 2–1–46 and Figure 2–1–47 or Figure 2–1–48, for this 5 to 6 second period:

- Course select, heading select, DME, vertical speed set command,airspeed command, altitude preselect, Mach, Baro correction, and GSPD/TTG digital displays are replaced by amber dashes.
- ATT and HDG displays are flagged ATT FAIL, HDG FAIL
- Vertical deviation, course deviation, airspeed and altitude scales are flagged with a red **X**
- Flight director command bars go from view and mode annunciators are removed from PFD
- Radio altimeter digital readout displays radio altimeter self test value, if radio altimeter supports self test feature; slews to 100 feet for Honeywell radio altimeter
- Comparison monitor annunciates ATT, HDG, ILS, and RA
- Magenta TEST is annunciated on the PFD
- Compass sync is removed from display
- All bugs and pointers are removed from display.

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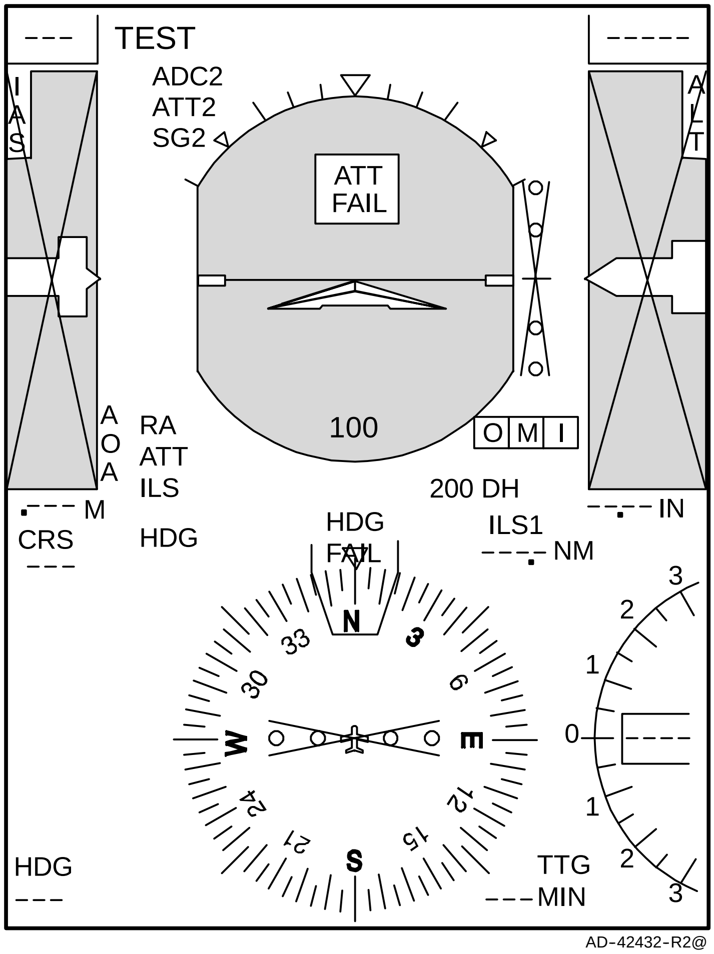

Figure 2-1-45. Full Test Mode With Failure Flags (Before Phase III)

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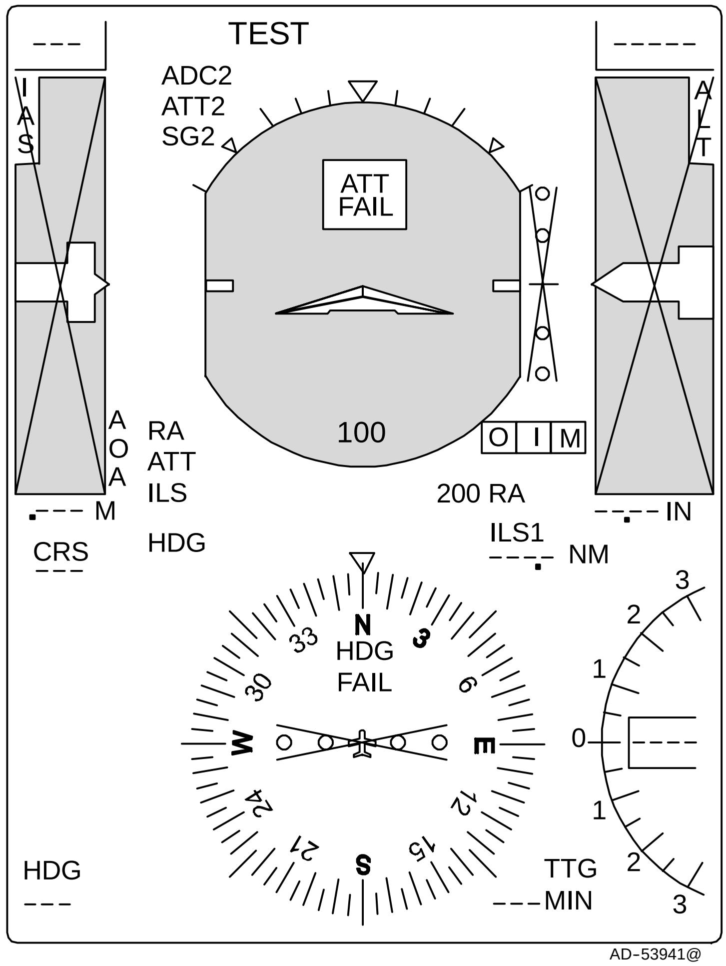

Figure 2-1-46. Full Test Mode With Failure Flags (Phase III)

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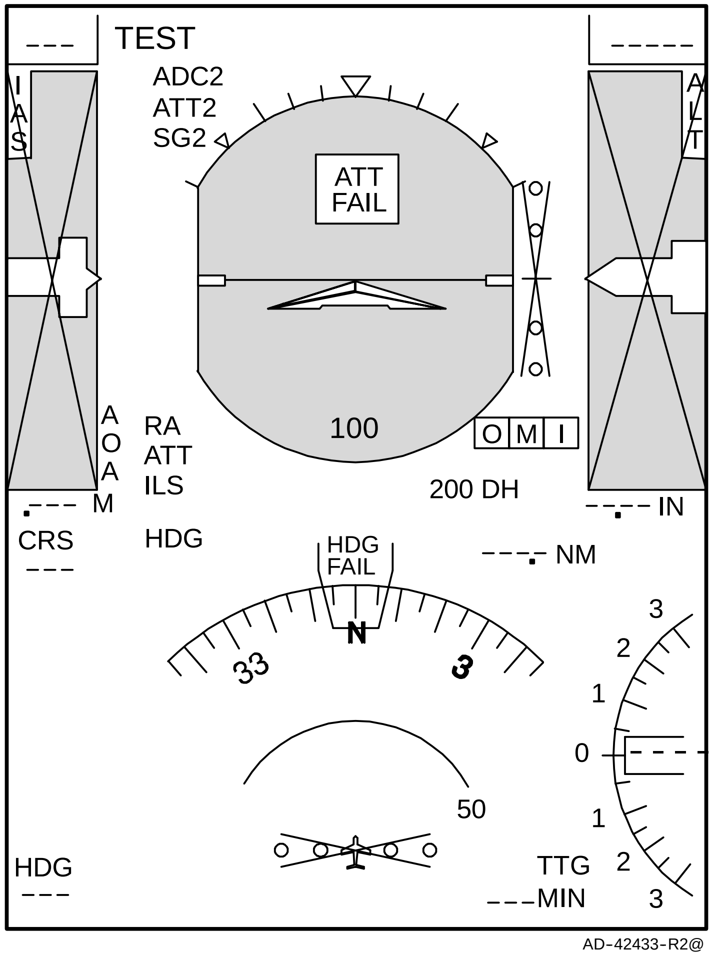

Figure 2-1-47. ARC Test Mode With Failure Flags (Before Phase III)

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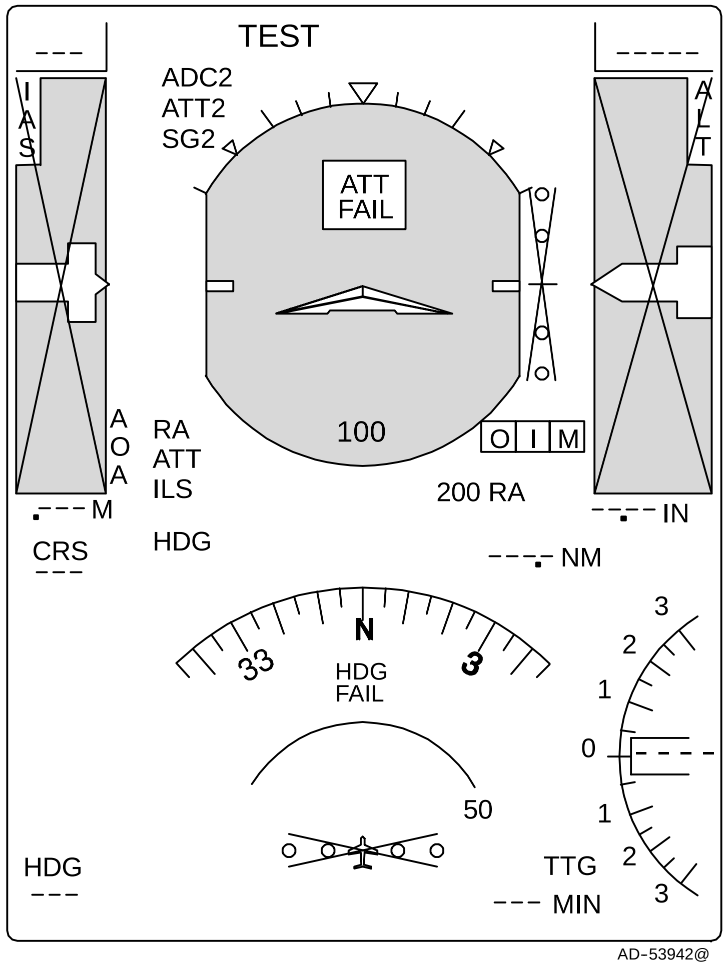

Figure 2-1-48. ARC Test Mode With Failure Flags (Phase III)

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(9) PFD Failure Flags and Annunciations

The PFD failure flags and annunciations are shown in Figure 2–1–49 or Figure 2–1–50. Refer to the figure for the location of caution and failure annunciations described below:

(a) Symbol Generator Reversion Annunciation

When selected on the MC-800 MFD Controller, and if the MC-800 control bus is valid, SG reversion is annunciated on the upper left-hand side of the attitude sphere of all PFD formats.

An amber SG1 is annunciated on all PFD formats when SG reversion of the left IC-600 IAC is selected. When in SG1 reversion, the IC-600 IAC No. 1 drives both PFDs and the MFD. The No. 2 PFD is a duplicate of the No.1 PFD.

Similarly, SG Reversion of the right IC-600 IAC is annunciated as an amber SG2 on all PFD formats. When in SG2 reversion, the IC-600 IAC No. 2 drives both PFDs and the MFD. The No.1 PFD is a duplicate of the No. 2 PFD.

(b) Attitude Reference Failure

Loss of valid attitude data in either pitch or roll, from the active attitude source, is indicated by the following:

- Removal of the pitch scale and roll pointer
- The entire attitude sphere is painted a solid cyan
- A red ATT FAIL is displayed in the top center of the attitude sphere
- The aircraft symbol remains on the display.

(c) Flight Director Failure

Loss of valid FD data from the master IAC causes the following indications:

- An amber FD FAIL warning displayed at the top-left of the ADI
- Flight director cue and all FD mode annunciators are removed.

(d) Pointer/Scale Failures

Vertical deviation, altitude scale, airspeed scale, and vertical speed scale are displayed using pointer/scale displays. Loss of a valid or detection of a related I/O failure causes the pointer/scale displays to show a failure by the following:

- Removing the pointer (GS and VS only)
- Replacing the digital readouts with amber dashes
- Drawing a red **X** through the scale (IAS, ALT, GS only).

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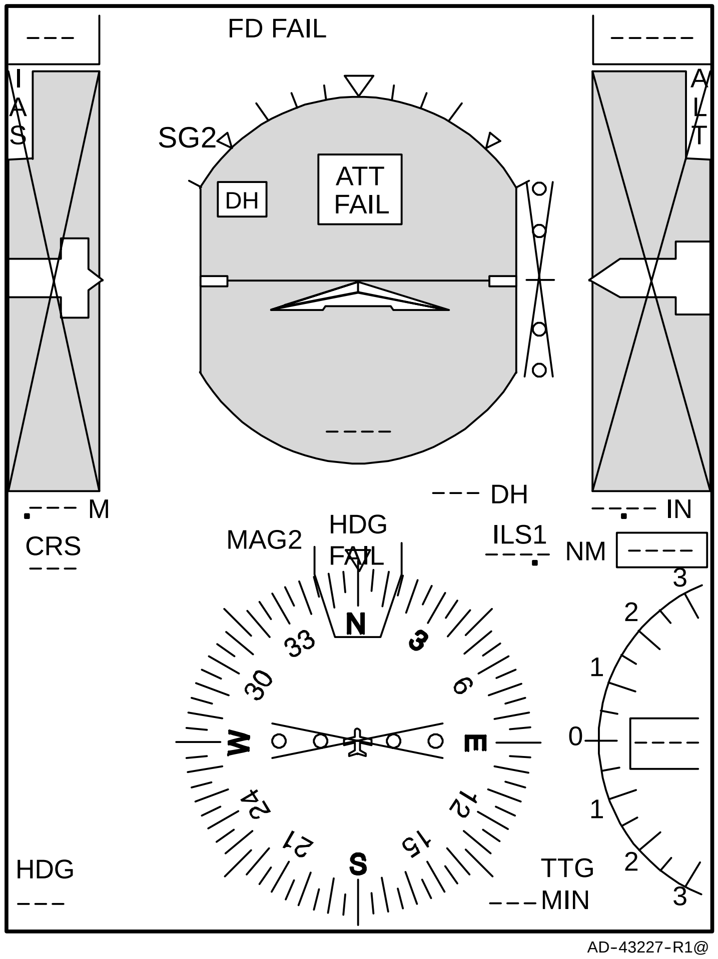

Figure 2-1-49. PFD Failure Flags and Annunciations (Before Phase III)

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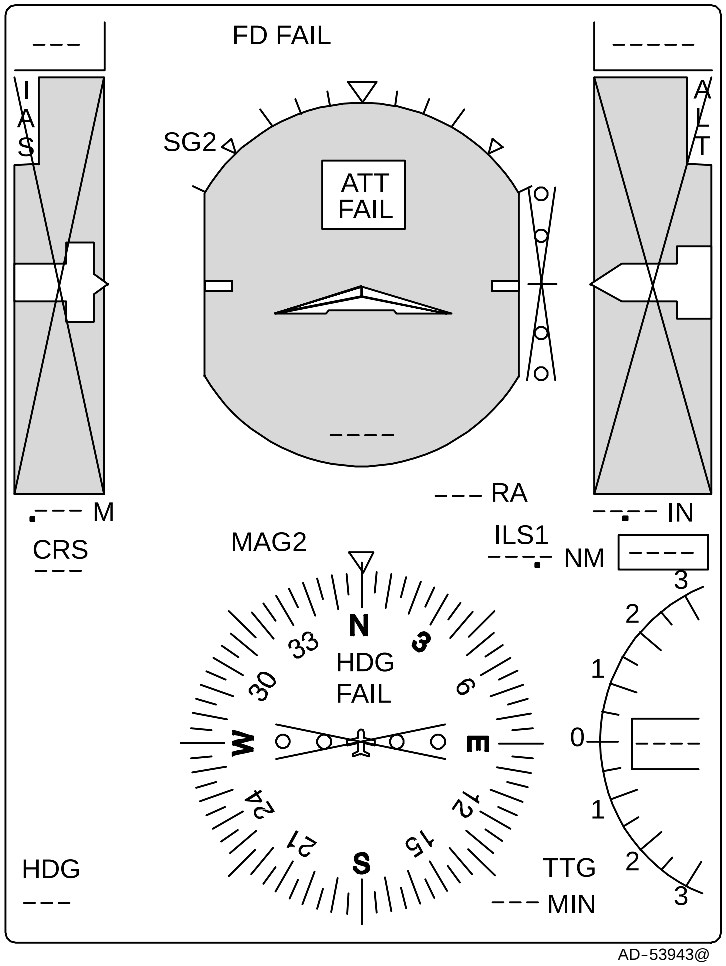

Figure 2-1-50. PFD Failure Flags and Annunciations (Phase III)

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(e) Radio Altitude Failure

In the event of a radio altimeter failure (loss of the RA valid or loss of a related I/O), amber dashes replace the radio altitude and decision height digits.

(f) Distance

Loss of the SRN DME valid or the FMS distance valid causes the distance digits to be replaced by amber dashes.

(g) Mach Number Failure

Amber dashes are displayed in place of the Mach number digits when the selected air data fails (loss of the air data valid or loss of a related I/O).

(h) Baro Correction Failure

Baro correction digits are replaced by amber dashes when the source of air data fails (loss of the air data valid or loss of a related I/O).

(i) Ground Speed/Time-To-Go

Loss of SRN DME valid or FMS distance valid causes the ground speed/time-to-go digits to be replaced by amber dashes.

(j) Heading Failure Display

Loss of the Heading valid or the detection of a related I/O failure causes the following to occur:

- Digital heading bug is removed and a red HDG FAIL is displayed
- The bearing pointers, wind vector, map display, To/From, selected HDG bug, drift angle, selected CRS/DTRK, and CRS DEV are removed
- Heading source annunciator is DG 1-2 or MAG 1-2
- HDG select and CRS select/DTRK digital display is replaced by amber dashes.

(k) Course Deviation Failure

An invalid or failure of the course deviation data (loss of the NAV valid or loss of a related I/O) is shown by removing the deviation bar and displaying a red **X** through the scale deviation dots.

(l) Course Select Failure

Failure of the course select signals causes the display to be replaced by amber dashes and the course pointer to be removed from the display. This indication also is given in the event of an invalid heading display or FMS source.

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D. Multifunction Display

The **Multifunction Display (**MFD) is primarily used for lateral representation of the aircraft's flight path. The MFD is also used to display various system checklist pages, as required by the flightcrew. In general, control of the MFD is accomplished using the BL-871 Bezel Controller and the MC-800 MFD Controller.

(1) MFD Functional Divisions

The MFD is divided into four functional display areas, as shown in Figure 2-1-51: Plan or Map Display, lower left and lower right window displays, and TCAS or checklist window. Certain symbols are available with any display format. Some symbols are only available with specific display formats. The lower portion of the MFD is always reserved for the display menu window.

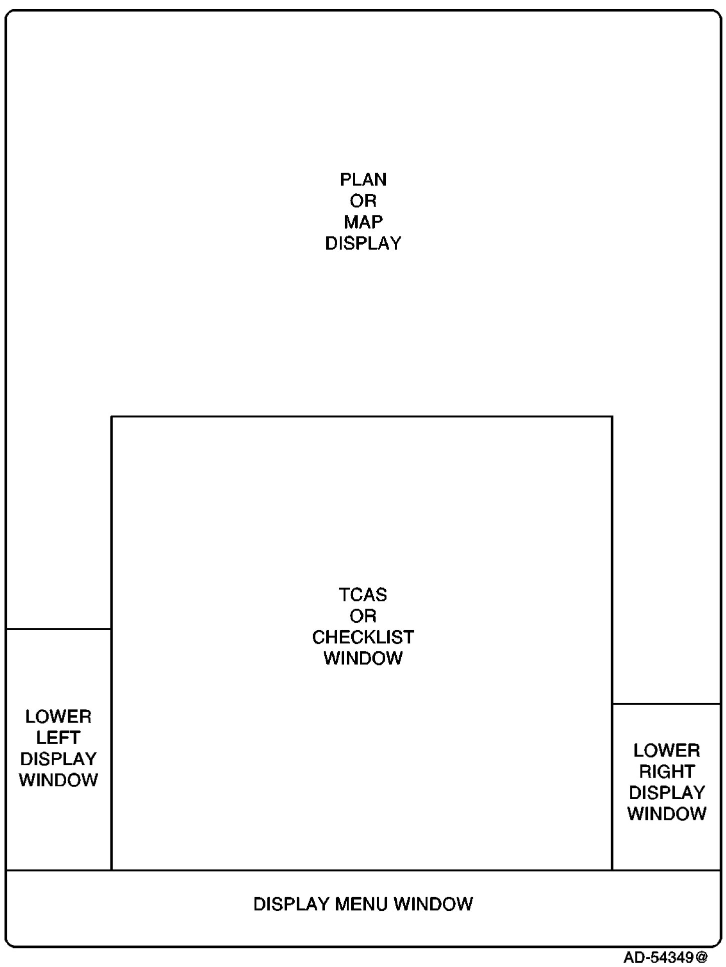

Figure 2-1-51. MFD Functional Divisions

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(a) Plan or Map Display

The MFD flight path display can be presented in two basic formats: a partial arc (MAP), and a PLAN mode. The primary difference is the base reference or HOME position (the aircraft symbol) and display of current heading. In the MAP display the aircraft current position is fixed at the apex of a 120 degrees sector with current heading up. In the PLAN format the HOME position is at the center of the display with true north up. The PLAN format encompasses 360 degrees. Checklists and TCAS resolution advisories are also displayed in either the MAP or PLAN formats. Weather information is displayed in the MAP format only.

When checklists or TCAS display functions are selected, a display window is presented in the bottom portion of the MFD between the lower left and right windows. The MFD's map or plan navigation displays are slightly repositioned toward the top of the MFD.

Display formats are selected through the MC-800 MFD Controller. Actual aircraft heading information is supplied by the selected heading source, while waypoints, airport and NAVAID information are from the FMS.

NOTE: When checklist or TCAS is displayed, a portion of the MFD's map or plan mode can be removed to give more space.

(b) Lower Left Display Window

Weather radar status and mode information is displayed in the lower left window when the selected lateral navigation display format is MAP. Basic weather mode annunciations are displayed on line one (top). Rain Echo Attenuation Compensation Technique (REACT) submodes are displayed on line two. Antenna tilt information is displayed on line three, while various status indicators are displayed on lines four and five.

NOTE: Target alerts and Variable (VAR) gain annunciations are displayed regardless of the selected navigation display format.

(c) Lower Right Display Window

True Airspeed (TAS) and Ground Speed (GSPD) information is always displayed in the lower right window, regardless of the selected lateral display format.

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(d) Display Menu Window

The majority of the display control functions are handled by the menus presented in this window. There is a top-level main menu and three submenus. These menus allow selection and setting of altitude select, vertical speeds, and control of the vertical navigation function. The submenu pages consist of a VNAV parameter set page, a takeoff speed set page, and a landing speed set page. The menus are organized to supply immediate access to and control of the required display control functions with a minimum of menu depth.

Menu manipulation is accomplished through five bezel buttons and two set knobs located along the bottom of the MFD. The legends for the bezel buttons and set knobs are shown above the buttons and knobs. Description and operation of the display menus and the bezel buttons are presented in paragraph 2. D. (6).

(2) MFD Map Mode Display

The MAP (partial arc) format, as shown in Figure 2–1–52, supplies a large horizontal situation presentation utilizing almost the entire DU-870 display area. This presentation places the aircraft position near the center of the display. Power–up condition is with the MAP format displayed. In addition to the symbols described under MFD common symbols, this paragraph details the unique map display data.

(a) Navigation and Waypoint Data

The upper right corner of the display shows the navigation waypoint data. This data includes a NAV source annunciator, a TO waypoint distance, station identifier, and time-to-go.

1 Navigation Source Annunciator

The LRN source is the FMS. The navigation source is annunciated in the upper right corner of the display area. FMS is displayed full time in magenta for lateral deviation even if the FMS data is invalid.

2 TO Waypoint Display

A TO waypoint designates the next waypoint on the flight plan. The distance, Identifier (IDENT), and time-to-go associated with the TO waypoint are displayed below the navigation source annunciation.

The EDS receives distance information from the on-side and cross-side navigation receivers and the FMS. The distance digits for the TO waypoint are magenta with a white NM label annunciation. Invalid distance is annunciated with amber dashes in place of the digits.

The waypoint IDENT associated with the TO waypoint is displayed in magenta below the waypoint distance readout. An IDENT is mnemonic text placed adjacent to a NAV aid, airport (APT), or waypoint (WPT) symbol. The color of the text corresponds to the NAV aid, APT, or WPT symbol with which it is associated. The FMS waypoint IDENT flashes when a WPT ALERT condition is transmitted by the FMS. The IDENT is removed from the display, if invalid.

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The flight time remaining TO the waypoint is displayed below the IDENT in minutes. The flight time-to-go digits and label are white. Invalid time-to-go is annunciated with amber dashes in place of the digits.

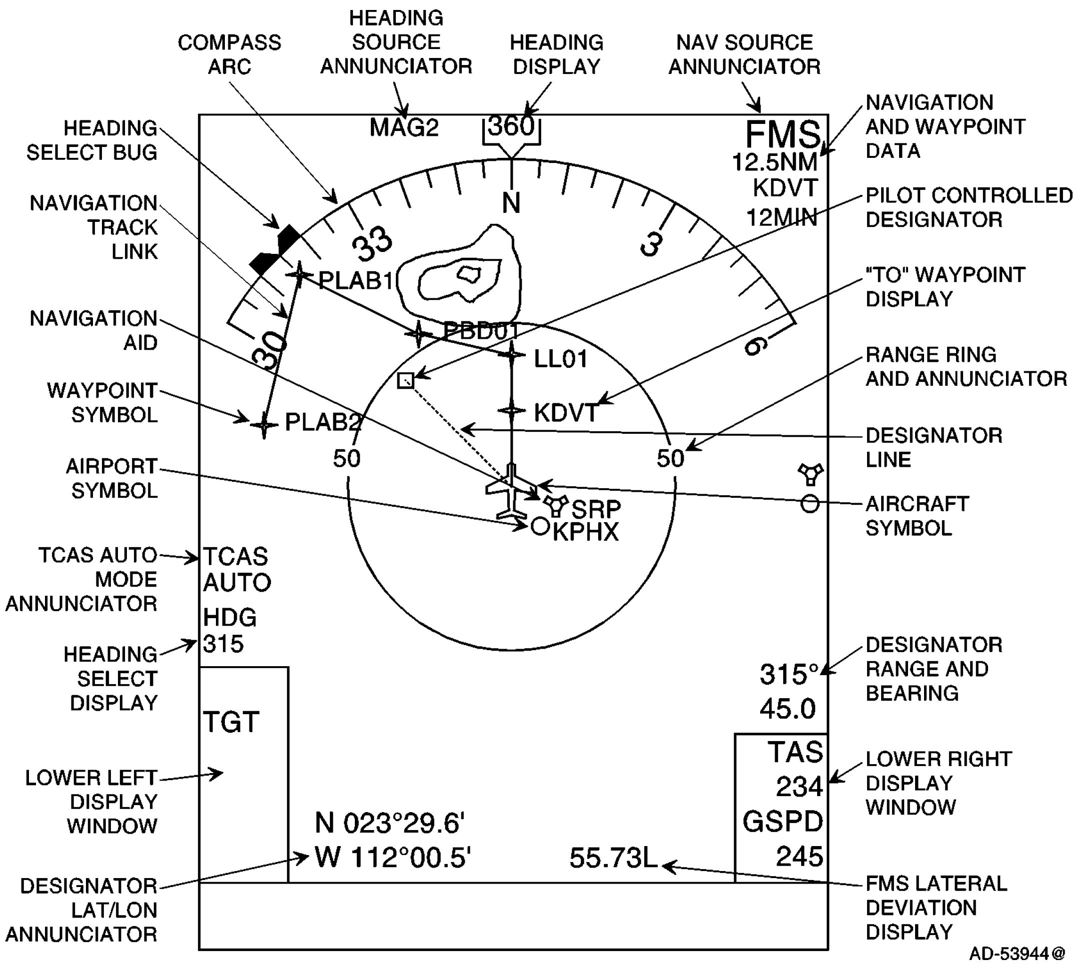

Figure 2-1-52. MFD Map Display

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(b) Flight Plan Data

Various map symbols are on the MFD map display. FMS supplied map waypoints, airports and various VOR, VOR/DME, or DME-only navigation aids data are each represented using unique symbols. If available, pilot-defined holding patterns and Top Of Climb/Top Of Descent (TOC/TOD) symbols are a function of the installed FMS.

1 Pilot Controlled Designator

The designator is displayed as a cyan square–shaped symbol connected to the reference point by a cyan dashed line, when offset. The designator is used to designate a position on the map that can be sent to the FMS in the form of distance and bearing from the reference waypoint.

The designator is applied in two distinct methods. In method one, the designator is collocated with a waypoint. In method two, the designator is positioned with a joystick. When collocated with a connected waypoint, the designator is displayed in the color of the waypoint. If the designator is moved off a connected waypoint it is displayed in cyan. When the designator is parked at its home position (the aircraft symbol), it is not displayed. Power–up condition is with the designator co-located on the present position.

2 Range Ring and Annunciator

Range rings are positioned at a constant radius from the HOME position. The range rings are drawn in white. Range annunciations are also displayed in white and positioned adjacent to the range ring, giving the range in nautical miles from the home position to the range ring.

3 Designator Line

The designator line is drawn in dashed cyan from the designator position to the selected waypoint.

4 Designator Range and Bearing

Using the joystick and SKP/RCL function on the MC-800 Multifunction Controller, the pilot can position the square map designator (cursor). Distance and bearing location of the designator, relative to its reference point, is shown above the GSPD/TAS window. The color of the designator distance/bearing readout is always cyan.

The range is displayed with a resolution of 0.1 NM below 400 NM, and for distances equal to or greater than 400 NM, range resolution is 1 NM. The bearing is drawn with a resolution of 1 degrees.

5 Designator LAT/LON Annunciator

The latitude (LAT) and longitude (LON) of the designator is displayed on the bottom, middle-left portion of the MFD in cyan with a resolution of 0.1 minutes. Leading zeros are not suppressed.

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6 Airport Symbol

The airport symbol is a circle that represents the location of an airport referenced to the present position. The airport symbol is drawn in cyan and the maximum number displayed at any given time is limited to four. If airports are selected for display, a cyan circle is displayed at the right center of the MFD.

7 Waypoint Symbol

A waypoint symbol is a four pointed star, positioned at the LAT and LON of geographical locations, referenced to the current present position, where selected transitions of the flight plan occur. All waypoints except the TO waypoint are drawn in white. The TO waypoint is drawn in magenta. A maximum of 10 connected waypoints are displayed. A NAV aid or airport can also be located on the flight plan at a transition point and is included as a waypoint in the maximum number of allowed waypoints. Waypoint lines are white lines connecting waypoints in the sequence established by the LRN source.

8 Navigation (NAV) Aid

The NAV aid symbol (VOR, DME, collocated DME/VOR) is a triangular arrangement of unfilled rectangles that represents the position relative to the present position. NAV aids are drawn in green. A maximum of four disconnected NAV aids are displayed. If NAV aids are selected for display, a green triangular arrangement is displayed at the right center of the MFD.

9 Navigation Track Line

The navigation track line begins at the aircraft symbol and connects all the waypoints on the display in the flight plan. The track line shows the pilot the flight plan in a map format.

(c) Aircraft Symbol

The white aircraft symbol supplies a visual cue to aircraft position relative to actual and selected headings.

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(d) Lower Right Display Window

The lower right window displays True Airspeed (TAS) and Ground Speed (GSPD) data.

1 True Airspeed (TAS)

TAS is displayed with a resolution of 1 knot in the lower right window. This data originates from the MADC, as selected on the on-side PFD. The digits are green, and the TAS label is white. If TAS is invalid, amber dashes are displayed in place of the digits.

2 Ground Speed (GSPD)

GSPD information is displayed (in knots with leading zeros suppressed) directly below the TAS readout. This information is received from the FMS via ARINC 429 bus. The MFD NAV source is always FMS for the MAP and PLAN formats. For valid GSPD data, the label is white and the digits are green. Invalid GSPD is annunciated with amber dashes in place of the digits when the ARINC bus fails, or when a message identifying groundspeed as invalid is received.

(e) FMS Lateral Deviation Display

Crosstrack distance information is displayed on the MFD with L or R digits when the path is left or right of desired track. Distance is displayed with values from 0 to 128 NM with a .01 NM resolution for distances less than 100 NM and 1 NM for distances over 100 NM.

(f) Lower Left Display Window

The weather radar TGT and VAR gain annunciators are displayed in the lower left window. The remaining portions of the lower left window are unique to the MAP format with weather radar selected. Refer to paragraph 2. D. (3) (h) for details.

1 WX Target Alert (TGT) Annunciator

The TGT annunciator warns of level 3 targets. A green TGT annunciation indicates an armed condition, while an amber TGT indicates a weather alert condition. If the RTA detects an alert condition, the TGT remains amber as long as the alert condition persists.

2 Variable Gain (VAR) Annunciator

An amber VAR annunciation in place of TGT shows the radar is operating in the variable gain mode. Target mode/alert has highest priority.

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(g) Heading Select Display

A digital readout (cyan) of the heading bug's current selected value is displayed above the lower left display window. The selected heading is annunciated with a white HDG label above it. Deviation between the heading display and bug, as read against the heading scale, is limited to ±1 degree.

(h) TCAS AUTO Mode Annunciator

TCAS AUTO is annunciated in white above the heading select display, when the automatic pop-up mode is enabled through a TCAS control head.

(i) Heading Select Bug

A cyan heading select bug is displayed on the compass arc. Its position follows the pilot's PFD heading select bug. The heading select bug can be rotated off the compass scale when in the map mode. When the heading select bug is off scale, a cyan arrow is displayed on the outside of the partial compass arc to indicate the shortest direction to the heading select bug.

(j) Compass Arc

Gyro stabilized magnetic compass information is displayed by a 120-degree compass arc. The arc rotates about the stationary aircraft symbol (throughout 360 degrees of motion) to continuously supply 120 degrees of heading information. Actual (current) heading is displayed in a digital readout located above the partial compass arc.

The arc (scale) is composed of long and short tick marks that alternate every 5 degrees. Digits and cardinal abbreviations are spaced in 30 degree increments around the inside of the arc. Numeric identifiers are present at 30 degrees, 60 degrees, 120 degrees, 150 degrees, 210 degrees, 240 degrees, 300 degrees, and 330 degrees. These digits represent tens and hundreds of degrees at their respective locations.

(k) Heading Source Annunciator

The heading source for this display is the same heading source that drives the on-side PFD. Heading source is annunciated directly to the left of the digital heading display. Cross-side data is displayed in amber as DG or MAG with the side designator 1 or 2 as appropriate. When the pilot and copilot sources are the same, they are annunciated on all displays in amber. For on-side DG or MAG data, no source annunciation is given.

(l) Heading Display

A digital readout of the current heading is displayed within an open pointer box positioned above the partial compass arc. The box and current heading values are shown in white.

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(3) Map Mode With Weather Display

Weather information from the radar is displayed on the map format, as shown in Figure 2–1–53, only when the radar controller has been turned on and weather has been selected for display with the MC-800 Multifunction Controller. Weather radar (WX) modes are annunciated in the lower left display window. The weather radar annunciations on the MFD are the same as the PFD, except there are four lines (fields) of mode annunciations as opposed to three on the PFD. (Line 1 is at the top of the window and line 4 is at the bottom.)

(a) Weather Radar Returns

Weather radar returns (picture data) appear within the confines of a baseball diamond shaped area, bounded on the outer edge by the compass arc. The returns are color coded as shown in Table 2–1–31. WX picture data is displayed in a 120 degree pattern.

Table 2–1–31. MFD Weather Radar Color Code

Return	WX Mode	GMAP Mode
Level 1	Green	Cyan
Level 0	Black	Black
Level 2	Amber	Amber
Level 3	Red	Magenta
Level 4	Magenta	Not Applicable
REACT	Cyan	Red

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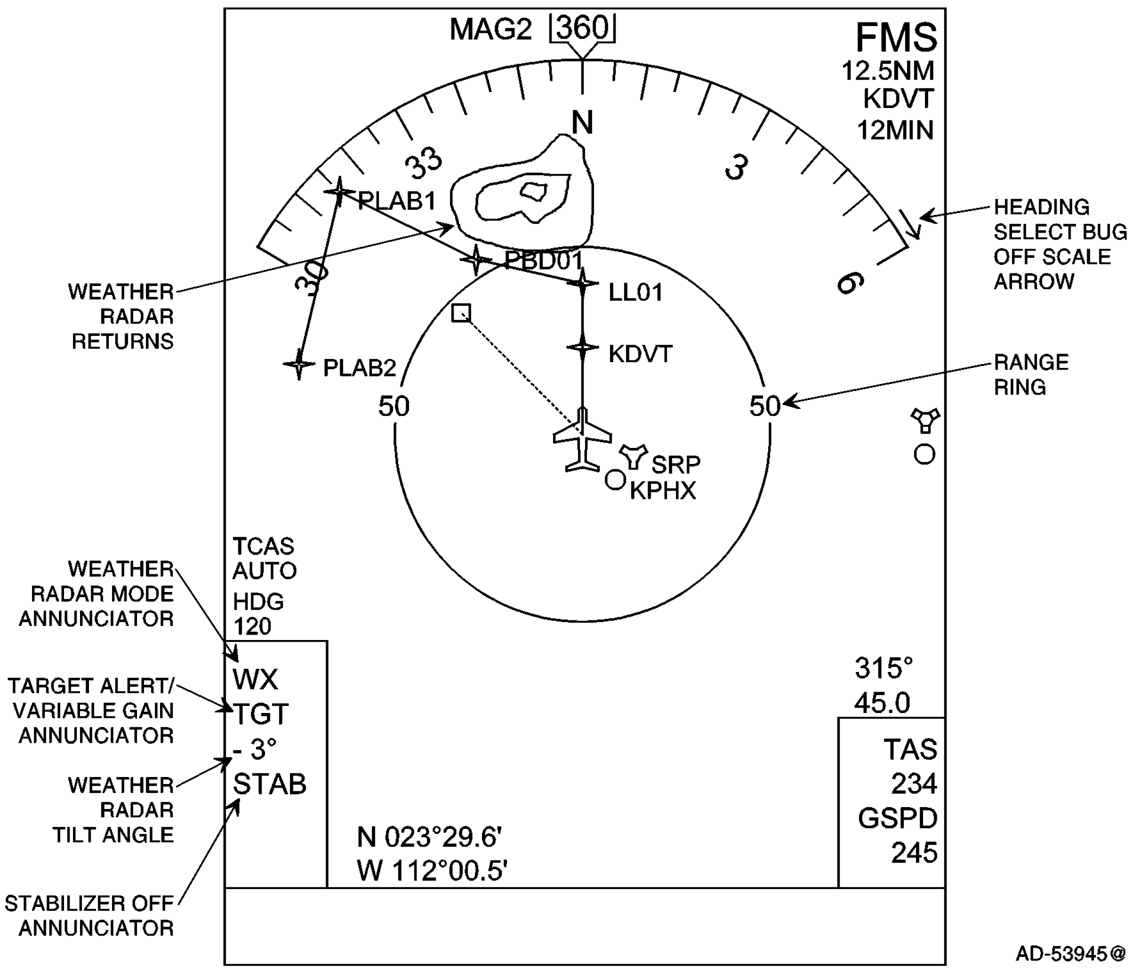

Figure 2-1-53. MFD MAP Mode With Weather Display

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(b) Weather Radar Mode Annunciator

All basic WX modes except weather radar range and Stabilization (STAB) off, are annunciated on line 1. Refer to Table 2–1–32 for details.

The RTA uses hardware and software monitors to detect and identify faults within the radar system. If WX fails, an amber FAIL message appears in the mode annunciation field. Faults are logged into nonvolatile memory by a unique fault code number. Readout of the fault memory contents can be accomplished by setting the mode selection knob on the WC-6XX/8XX WX Controller to Test (TST). Fault codes are displayed in the antenna tilt angle field. If more than one code is associated with the failure, the numbers toggle between the different fault codes.

Refer to Section 2.4 for specific information on fault code interpretation.

Table 2–1–32. Weather Radar Mode Annunciations on MFD

Weather Radar Mode	Annunciator	Color
R/T in Warm–up	WAIT	Green
REACT Mode	RCT	Green
Forced Standby	FSBY	Green
Standby	STBY	Green
Test Mode	TEST	Green
Weather Mode	WX	Green
Groundmap Mode	GMAP	Green
Flight Plan Mode	FPLN	Green
R/T Fail	FAIL	Amber
R/T Off	OFF	Green
WX Interface Failure	WX	Amber
Ground Clutter Reduction (P-8XX only)	GCR	Amber
RCT and GCR Modes Active (P-8XX only)	GR/R	Amber
Weather and Turbulence (P-8XX only)	WX/T	Green
RCT and Turbulence (P-8XX only)	R/T	Green

A magenta TX annunciator is displayed when the TEST, WX, or GMAP modes are activated from the WC-6XX/8XX WX Controller while the aircraft is on the ground, and the full compass mode is displayed on the PFD.

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(c) Target Alert/Variable Gain

The annunciations for Target (TGT) alert and variable gain (VAR) are identical to those previously described in paragraph D. (2) (f) 1 and 2. However, when radar gain is selected as a variable, a value proportion to the radar controller gain setting is also displayed.

(d) Radar Tilt Angle

Tilt data is transmitted by the R/T control bus. The display range for antenna tilt angle is -15 degrees to +15 degrees. Antenna tilt is displayed in 0.5 degrees increments between -5 degrees and +5 degrees. For tilt angles greater than ±5 degrees, the resolution is in 1.0 degree increments. Tilt values are preceded by no sign (blank) for positive values and a minus sign (-) for negative values. A degree sign (°) appears after the tilt angle.

(e) Stabilizer (STAB) Off Annunciator

Deselecting stabilization, with the WC-6XX/8XX controller STAB button, disables stabilization inputs for the antenna. When disabled, the OFF condition is annunciated by an amber STAB.

(f) Range Ring

Range rings are displayed to aid in determining the position of radar returns and active flight plan parameters. The range ring boundary is the compass card arc. The inner range ring is 1/2 of the range setting (in nautical miles) on the MC-800 MFD Controller. This range ring appears between the outer edge of the compass arc and the center of the aircraft symbol. MFD control range is annunciated by white digits at the end of the mid-range ring. Table 2-1-33 lists the range selections available to the map mode format. When weather radar data is displayed, range is selected through the weather radar controller.

Table 2-1-33. Selectable MFD Control Ranges

Selected Range	Half Range Displayed
5	2.5
10	5.0
25	12.5
50	25.0
100	50.0
200	100.0
300	150.0

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(g) Heading Select Bug Off Scale Arrow

The heading select bug can be rotated off the compass scale when in the Map mode. When the heading select bug is off scale, a cyan arrow is displayed on the outside of the partial compass arc to indicate the shortest direction to the heading select bug.

(4) MFD Map Mode Failure and Warning Displays

MFD MAP format failure and warning messages shown in Figure 2-1-54 or Figure 2-1-55 give an indication of system malfunctions. The following paragraphs describe each failure and warning message.

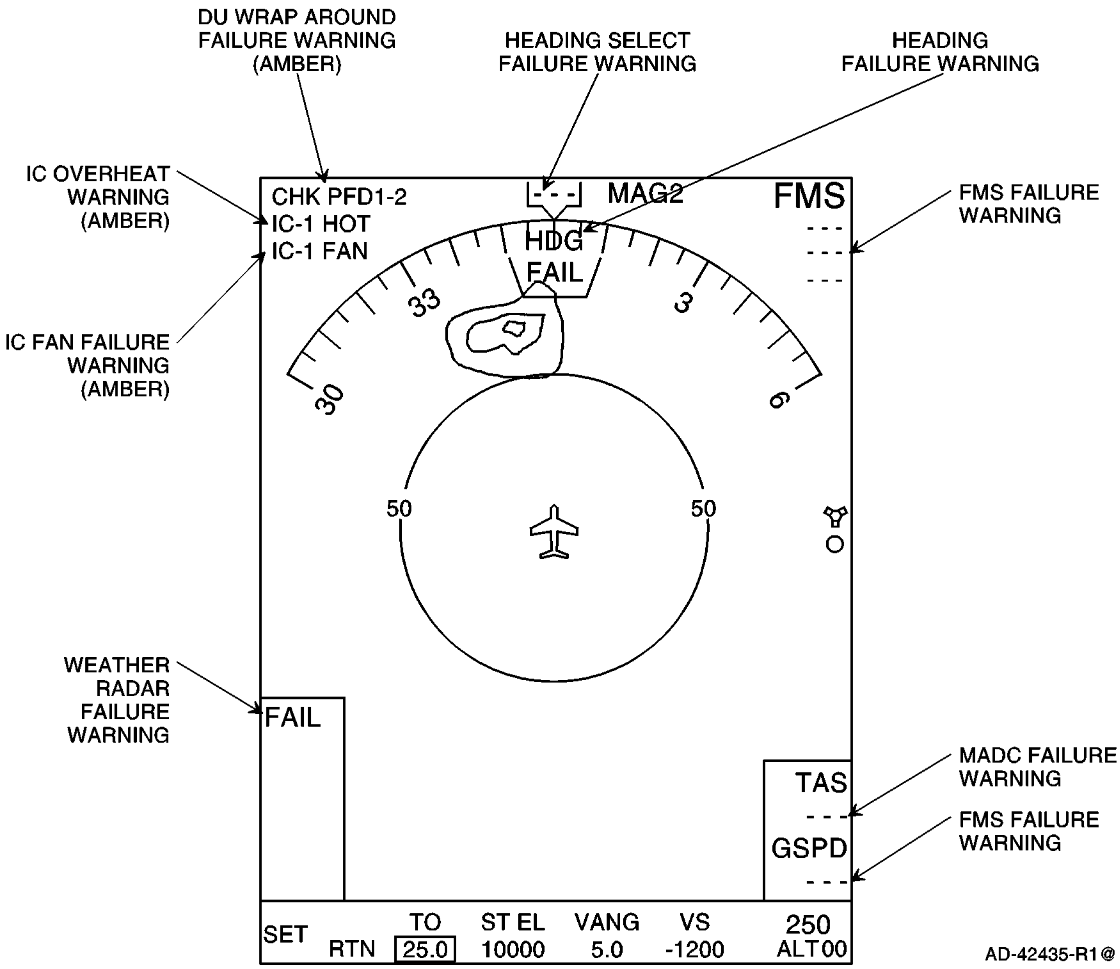

Figure 2-1-54. MFD Failure and Warning Displays (Before Phase III)

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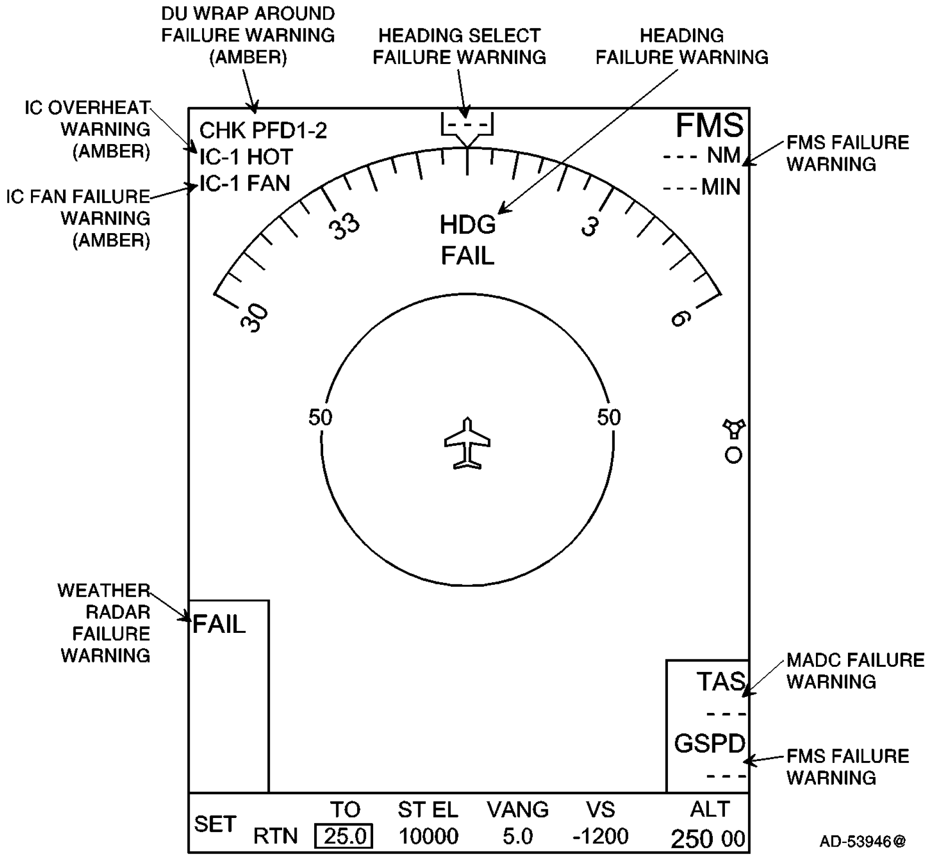

Figure 2-1-55. MFD Failure and Warning Displays (Phase III)

(a) IC Fan Failure Warning

The status of the cooling fans on both IC-600 IAC's are also monitored continuously by internal sensors. If the cooling fan(s) fails, a message indicating the most probable cause of the warning is displayed. Messages available for annunciation in this field are listed in Table 2-1-34.

Table 2-1-34. Fan Failure Warning Messages

Message	Color	Description
IC-1 FAN	Amber	IC-600 IAC No. 1
IC-2 FAN	Amber	IC-600 IAC No. 2
IC-1-2 FAN	Amber	IC-600 IAC No. 1 and No. 2

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(b) IC Overheat Warning

The temperature of both IC-600 IACs are continuously monitored by internal sensors. If the sensor detects extreme temperature increases above a predetermined level, a message indicating the most probable cause of the warning is displayed. Messages available for annunciation in this field are given in Table 2-1-35.

Table 2-1-35. IC Overheat Warning Messages

Message	Color	Description
IC-1 HOT	Amber	IC-600 IAC No. 1
IC-2 HOT	Amber	IC-600 IAC No. 2
IC-1-2 HOT	Amber	IC-600 IAC No. 1 and No. 2

(c) DU Wrap-Around Failure Warning

If either IC-600 IAC detects a wrap-around failure (miscompare) on either PFD, a message indicating the most probable cause of the warning is displayed. Messages available for annunciation in this field are given in Table 2-1-36.

Table 2-1-36. DU Wrap-Around Failure Warning Messages

Message	Color	Description
CHK PFD1	Amber	IC-600 IAC No. 1
CHK PFD2	Amber	IC-600 IAC No. 2
CHK PFD1-2	Amber	IC-600 IAC No. 1 and No. 2

(d) Heading Select Failure Warning

Failure of the heading select signals cause the numerical heading information to be replaced by amber dashes and the heading bug to be removed from the display. This indication is also given in the event of an invalid heading display.

(e) Heading Failure Warning

Failure of the displayed heading from the compass system is shown by removing the flight plan from the display. The digital heading readout is replaced by amber dashes. Additionally, a red HDG FAIL message is displayed at the top center of the display.

(f) FMS Failure Warning

A failure of the FMS removes the active flight plan, NAV aids, and airports from the display. This indication is also given in the event of an invalid heading display. The digital GSPD window is replaced by amber dashes.

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(g) MADC Failure Warning

MADC failures are indicated by replacing the TAS numerical values with amber dashes.

(h) Weather Radar Failure

Weather radar failure is annunciated by placing an amber FAIL in the weather radar mode annunciation box.

(5) MFD PLAN Mode Format

The PLAN mode shown in Figure 2–1–56 has the following features:

- True north-up map presentation
- Heading source annunciation (when cross-side heading source is selected)
- FMS source annunciation
- FMS waypoint annunciations
- FMS waypoint, airport, and NAV aid display provisions.

NOTE: Weather symbols are not available in the PLAN format.

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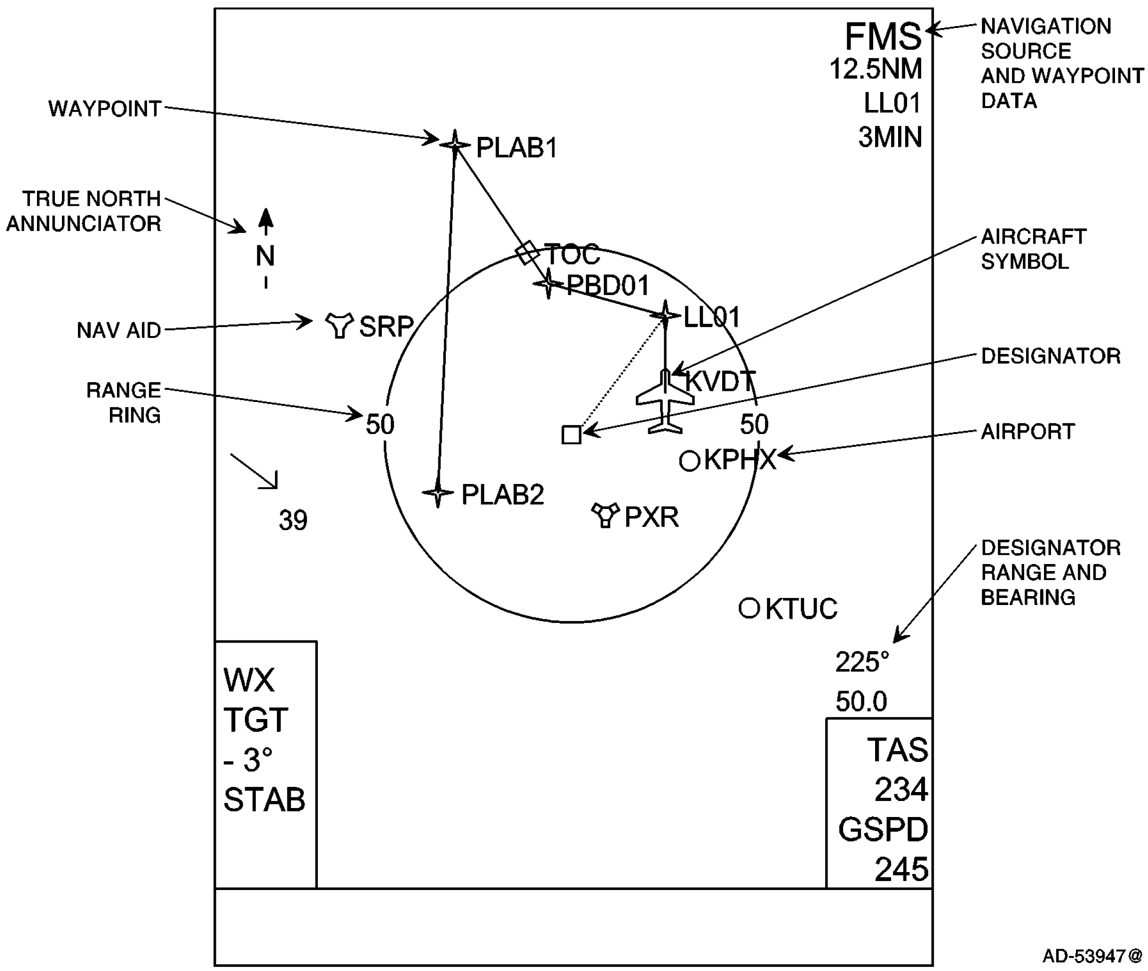

Figure 2-1-56. MFD PLAN Mode Format

The PLAN mode format, shown in Figure 2-1-56, is a north-up presentation of the active flight plan. The active waypoint is displayed in magenta at the center of the display. Track line orientation is true north. A three-inch range ring, showing the selected display range, is centered about the active waypoint. HOME position of the designator (cursor) is at the center of the range ring. The color of the aircraft symbol is changed from white to yellow, and is displayed at the present position. In the PLAN mode, gyro stabilized magnetic compass information is used to orient the aircraft symbol as it moves around the flight plan. Flight plan data does not need valid heading to be displayed in this mode.

When checklist or TCAS is selected for display, the PLAN presentation shifts towards the top of the display in order to maximize the PLAN presentation.

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(a) Navigation Source and Waypoint Data

The navigation source and waypoint data are identical to those previously described for the MFD Map format.

(b) Aircraft Symbol

The yellow aircraft symbol moves in the display as a function of aircraft present position. The aircraft symbol gives a visual cue to the actual aircraft position in relative to true north and the active flight plan.

(c) Designator

The operation of the designator in the PLAN mode is the same as for the MAP mode, except the default reference point is the TO waypoint. The designator symbol is always located in the center of the display and the flight plan is moved whenever the designator is scrolled to a new reference waypoint, or is offset from the current waypoint.

The primary purpose of the joystick and designator in the plan mode is to position the circular viewing ring so that either the route being flown or the maneuvering aircraft can be better observed. This feature becomes especially useful in maintaining position orientation in the terminal area as the aircraft is being vectored in for final approach. A bearing and distance display of the designator's position relative to its anchor waypoint is also shown in the lower right corner.

(d) Flight Plan Symbols

Flight plan waypoints, navaids and airports are transmitted by the FMS over an ARINC 429 bus. These displays are identical to those previously described for the MFD Map mode.

(e) Designator Range and Bearing

The designator range and bearing Is the same as previously described in the Map Mode.

(f) Range Ring

A range ring circle is displayed to aid in determining the position of the active flight plan parameters. The circle radius corresponds to the MC-800 MFD Controller selected range in nautical miles. Available range selections are 5, 10, 25, 50,100, 200, 300, 600, and 1200 NM.

(g) True North Annunciator

The symbol for the north-up arrow has two elements, a large N and a cupid arrow pointing up. The north-up symbol is displayed in white, on the left portion of the PLAN format.

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(h) PLAN Format Failures

The PLAN mode failures, as shown in Figure 2–1–57, indicate a system malfunction. The following paragraphs describe each failure:

1 Heading Failure Warning

Loss of valid heading information removes the aircraft symbol and moves the TO waypoint to the center of the display, if not already there. Additionally, a red HDG FAIL message is displayed at the top center of the plan range ring. Map data remains displayed.

2 FMS Failure Warning

FMS failure indications are identical to those described for the MFD map mode.

3 MADC Failure Warning

MADC failure indications are identical to those described for the MFD map mode.

4 IC Fan, IC Overheat, and DU Wrap Around Warning Messages

IC fan failure, IC overheat, and DU wrap–around warning messages are identical to those described for the MFD map mode.

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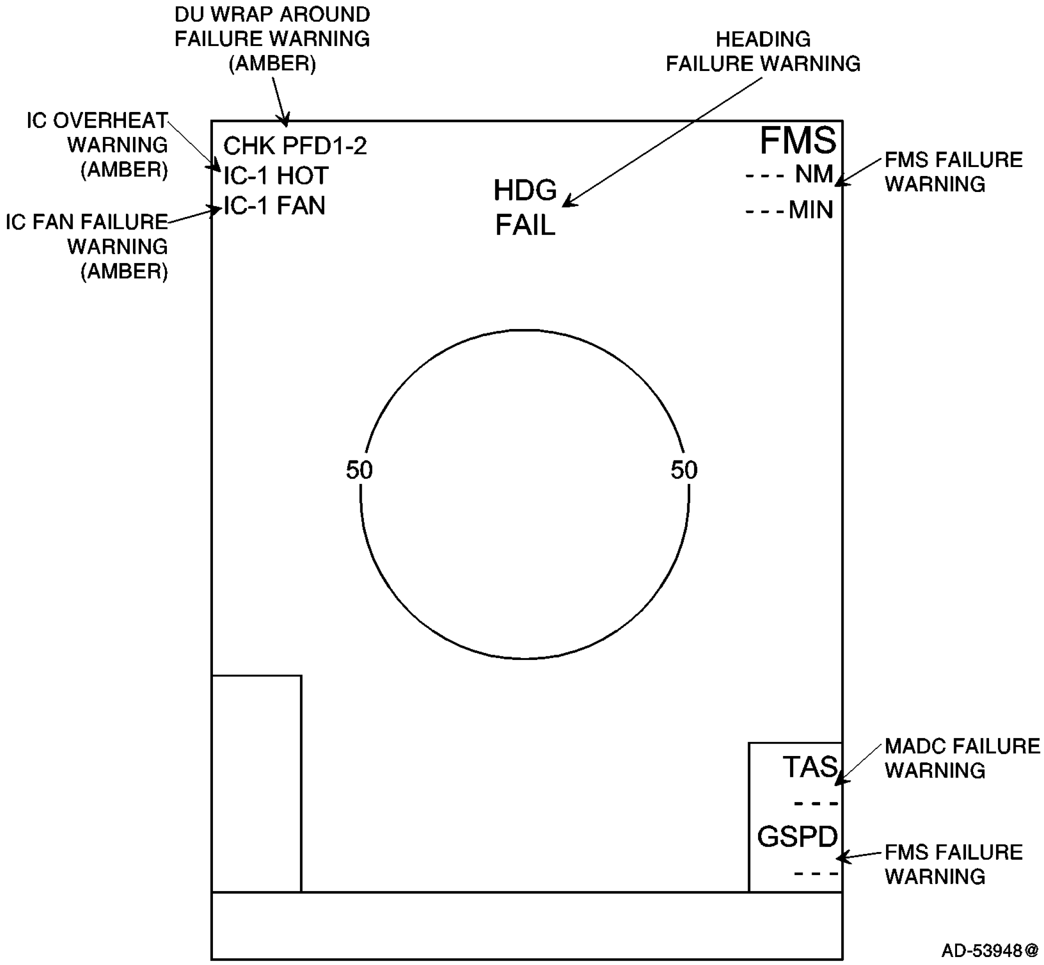

Figure 2-1-57. MFD PLAN Format Failure Displays

(6) Multifunction Display (MFD) Window

The checklist and TCAS displays are supplied using a multifunction display window. When either function is selected, the MAP or PLAN navigation displays are slightly repositioned toward the top of the display area. The multifunction display window is then presented in the bottom portion of the display between the lower left and lower right windows.

NOTE: When checklist or TCAS is displayed, a portion of the MFD's map or plan mode can be removed to give more space.

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(a) MFD Checklist Display

The checklist window is displayed with either the MFD map or plan mode, as shown in Figure 2–1–58. Normal, abnormal, and emergency checklist information stored in each IC-600 IAC is displayed. The IC-600 IAC stores up to 400 pages of pilot-defined text in non-volatile memory. Page composition is 12 lines with a maximum of 26 characters per line. All text is stroke written for readability in direct sunlight. These 400 pages can be subdivided in any ratio between normal, abnormal, and emergency checklists and must contain at least one index page for each subdivision.

NOTES:

1. The aircraft operator is responsible for downloading the actual checklist text into the IC-600 IAC.

2. When an IC-600 IAC is removed, the stored checklist is also removed. Ensure the proper checklist crossloading and operational checklist generation and storage procedures are followed. Failure to do so could result in a total loss of the defined checklist.

3. The checklist is loaded into the IC-600 IAC over an RS-232 interface plug and a personal computer. Refer to Maintenance Practices for checklist uploading and downloading procedures.

An index page is simply a listing of the procedures (collection of items) that an operator can review. A checklist page is a detailed listing of emergency and abnormal items within a particular procedure. The master index page shown in Figure 2–1–58, lists the Normal, Emergency, and Abnormal Indexes as options to be selected. The NORM button on the MC-800 MFD Controller gives access to the checklist master index.

Refer to paragraphs 2. G. for specific button information on how to access and manipulate the checklists and indexes with the MC-800 MFD Controller.

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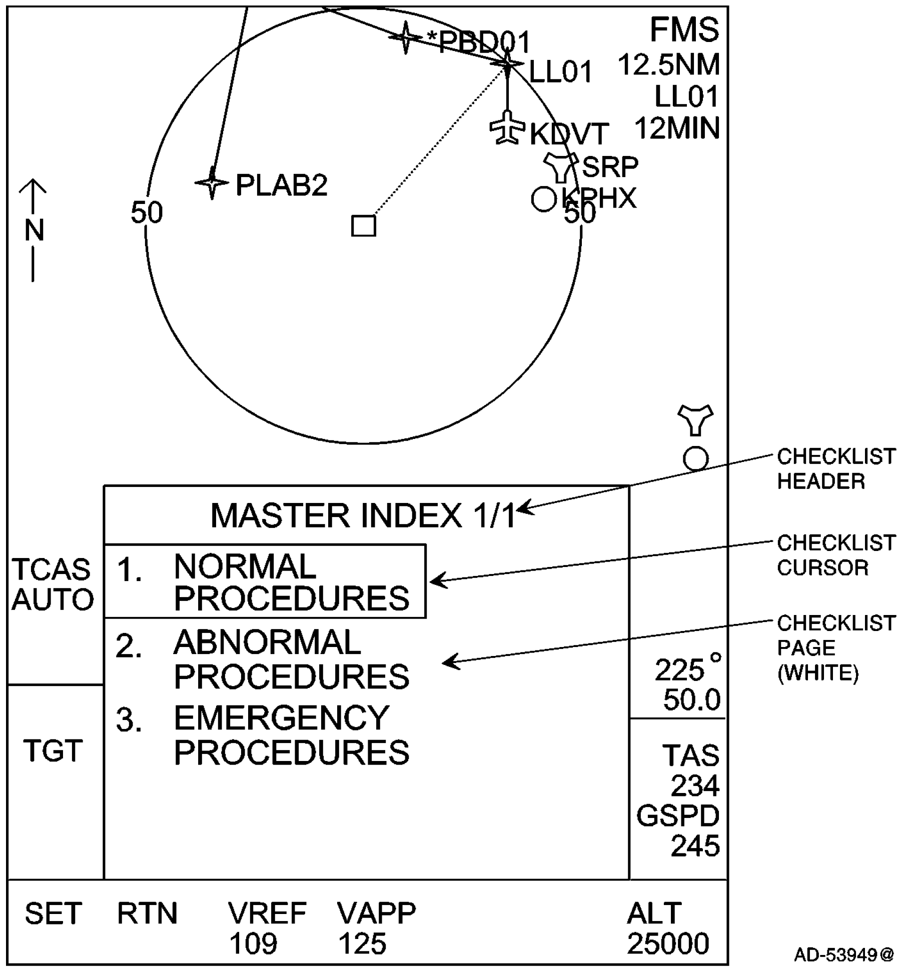

Figure 2-1-58. Typical Checklist Display

(b) TCAS Display Symbols (Optional)

The TCAS window is activated in one of two ways:

- When TCAS is selected through the MC-800 Multifunction Controller
- When the automatic pop up mode is enabled through a TCAS control head, if the checklist is not active.

The TCAS window is the same size and location as the checklist window. However, MFD TCAS auto display is not permitted to override the checklist window. Checklist has highest priority.

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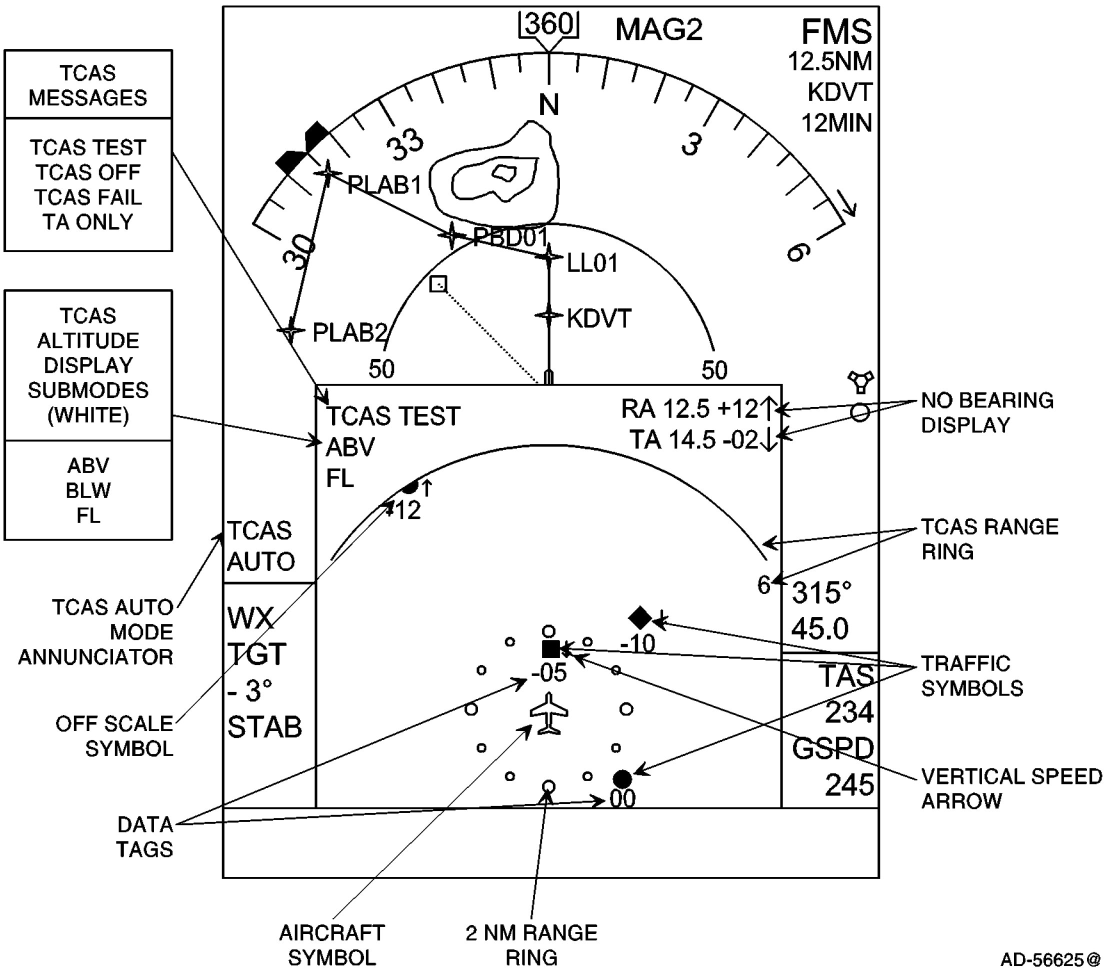

Figure 2-1-59. MFD TCAS Display Symbols

The TCAS window, shown in Figure 2-1-59, has the following symbols:

1 No Bearing Display

Bearing messages (text) are displayed on two lines (or fields) in the upper right side of the TCAS window whenever the system encounters an RA or TA target that has range, but no bearing information for display. The color of each line is based on the type of intruder. The first line contains the message RA NO BRG in red for an RA without bearing and the second line contains the message TA NO BRG in amber for a TA without bearing information.

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2 TCAS Range Ring

The range ring boundary is a white full arc (range ring) shown at the limits of the display window. The distance between the arc and the aircraft symbol is displayed in NM to the right of the arc.

Since the MC-800 controls map/plan mode range and not TCAS, the range ring is proportional to the MFD selected range. The displayed TCAS range is based on information transmitted over an ARINC 429 bus from the TCAS control head. The MFD software (IC-600 IAC) supports 3, 6, 10, 12, 14, 15, 20, 25, 40, and 50 NM range selections in the TCAS mode. All other range selections received over the ARINC bus are defaulted to 6 NM.

3 Traffic Symbols

TCAS uses color-coded symbols and data tags to map traffic and locate threat aircraft on the MFD. Four types of traffic symbols are used: solid square, solid circle, solid diamond, and a hollow (open) diamond. A different color is assigned to each symbol type, as given in Table 2-1-37.

Table 2-1-37. Display Symbols

Graphic Symbol	Color	Display Function
Solid Square	Red	Resolution Advisory (RA)
Solid Circle	Amber	Traffic Advisory (TA)
Solid Diamond	Cyan	Proximate Traffic
Hollow Diamond	Cyan	Other Traffic

Red represents an immediate threat to a TCAS-equipped aircraft. Prompt action is required to avoid the intruder. This color is only used in conjunction with a resolution advisory.

Amber represents a moderate threat to a TCAS-equipped aircraft. A visual search is recommended to prepare for intruder avoidance. Amber is used only in conjunction with traffic advisory.

Cyan represents proximate traffic and other traffic the TCAS surveillance logic has in its track file. White is used only for mode annunciations and for reference graphics, including aircraft home position, range ring, and vertical speed scale.

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4 Traffic Identification

- Resolution Advisory - Intruder aircraft entering the warning area, 20 to 30 seconds from the TCAS collision area are represented as a solid red square. This type of traffic results in an RA.
- Traffic Advisory - Intruder aircraft entering the caution area, 35 to 45 seconds from the TCAS collision area are represented as a solid amber circle. This type of traffic results in a TA.
- Proximate Traffic - Aircraft within display range, and within the selected vertical window, are represented as a solid cyan diamond. Proximate traffic is shown to improve situational awareness in the event of a potential conflict with higher priority RA or TA aircraft.
- Other Traffic - Any transponder-replying traffic not classified as an intruder or proximate traffic, and is within the display range, and is within the selected vertical window, are represented as hollow cyan diamonds (only in view when no RA or TA is in progress). The predicted flight paths of proximate traffic and other traffic do not penetrate the collision area of the aircraft.
- RA and TA Off–Scale Symbols - Threat traffic (RA and TA) that have gone beyond the displayed range are shown as amber half (off scale) symbols. The half symbol is placed at the edge of the active display area, at the correct relative bearing to own aircraft. Proximate traffic and other traffic are not displayed when out of range.

5 Vertical Speed Arrow

The intruder vertical speed indication is an arrow positioned to the right of the associated traffic symbol. If the arrow is pointing upward (↑), it means the intruder aircraft is climbing at a rate greater than 500 fpm, and if the arrow is pointing down (↓), the intruder is descending at a rate greater than 500 fpm. The color of the arrow matches that of the corresponding traffic symbol. The vertical speed arrow is not displayed for traffic in level flight (no vertical rates).

6 2 NM Range Ring

Whenever the selected range is <20 NM, a white range ring made up of 12 dots are placed in a radius of 2 NM around the airplane symbol. The dots are arranged so that one dot is placed at each of the clock hour positions, with the aircraft symbol current heading being12 o'clock.

If the range is $\geq$20 NM, a white half arc is displayed in place of the ring. The half arc is positioned midpoint between the aircraft symbol and the TCAS range ring (white full arc). The range ring is intended to assist in interpreting TCAS traffic information.

7 Aircraft Symbol

A white airplane symbol representing the aircraft's own position is displayed in the lower center of the TCAS window.

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8 Data Tags

Associated with each intruder is a data tag indicating the relative or absolute altitude. The data tag can include the vertical speed arrow. When relative altitude of an intruder aircraft is available, a data tag indicating relative altitude is displayed with the corresponding traffic symbol. The color of the tag is the same as the symbol.

Absolute altitude, or Flight Level (FL) of the intruder aircraft is displayed when selected through a TCAS control head. The IC-600 IAC calculates the absolute altitude by adding the relative altitude provided by the TCAS computer to own aircraft's barometric altitude.

- Relative Altitude - The relative altitude data tag is made up of a two-digit number preceded by a plus (+) or minus (-) sign, either above or below the intruder aircraft symbol. The digits represent the relative altitude of the intruder, in hundreds of feet, as referenced to the TCAS equipped aircraft. A plus (+) means the intruder is above own aircraft, and a minus (-) means the intruder is below. The data tag appears in the same color as the traffic symbol.
- Absolute Altitude - The absolute altitude tag is displayed in place of the relative altitude data tag whenever a RA or TA condition is encountered. Absolute altitude uses three digits to indicate hundreds of feet. The value is rounded to the nearest 100 feet above mean sea level (e.g., 23,500 is displayed as 235), and if appropriate leading zeros are displayed. Positive values have no sign while negative values are followed by a minus (-) sign (i.e., -2100 feet is displayed 21-).

The color of the absolute altitude data tag matches the color of the corresponding traffic symbol. Absolute altitude stays up 10 seconds after the request ends.

9 TCAS Auto Mode Annunciator

When TCAS auto mode is selected, TCAS AUTO mode is annunciated on the display in white. The TCAS window can be brought up automatically whenever appropriate traffic is encountered. The level of traffic that triggers the pop-up window is selected through a TCAS control head. TCAS can direct that only RAs or TAs trigger the window or RAs, TAs, and proximate traffic.

Automatic display of TCAS on the MFD is shown at the last selected TCAS range. However, the first selection of TCAS on the MFD after power-up always presents the 6 NM range.

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10 TCAS Altitude Display Submodes

- Above/Below Target Annunciator - The TCAS above ABV and below BLW target annunciators are displayed below the TCAS message field. Target annunciations are based on relative altitude limits sent by the TCAS computer. TCAS can look well above or below the normal TCAS altitude. The above or below condition is displayed as above ABV or below BLW in white in the upper left corner of the TCAS window.
- Absolute Altitude (Flight Level) Annunciator - When absolute altitude is selected, a white FL flight level annunciator is displayed below the ABV/BLW annunciator.

11 TCAS Messages

TCAS messages are annunciated in the upper left corner of the TCAS window. The annunciations are displayed whenever the MFD window format is in TCAS mode. If TCAS is in the automatic mode, TCAS AUTO is annunciated in white above the WX mode field. The mode messages listed in Table 2–1–38, are given in order of display priority.

Table 2–1–38. MFD TCAS Messages

Message	Color	Description
TCAS TEST	White	Indicates functional test in progress
TCAS OFF	White	Displayed when TCAS is OFF
TCAS FAIL	Amber	Indicates TCAS System Failure
TA ONLY	White	Traffic alert ON
TCAS	White	Displayed if TCAS is selected for display and none of the above TCAS annunciations are currently displayed

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(7) Display Menu Window

(a) Top-Level MFD Menu

At power-up, the top-level menu is displayed, as shown in Figure 2–1–60. The top level menu page allows selection of the three MFD submenu pages and includes the full–time altitude select set function. From here the pilot can select the Vertical Navigation (VNAV) submenu page, the takeoff speed (T/O SPEEDS) submenu page, or the landing speed (LNDG SPEEDS) submenu page, by pressing the bezel button below the menu item.

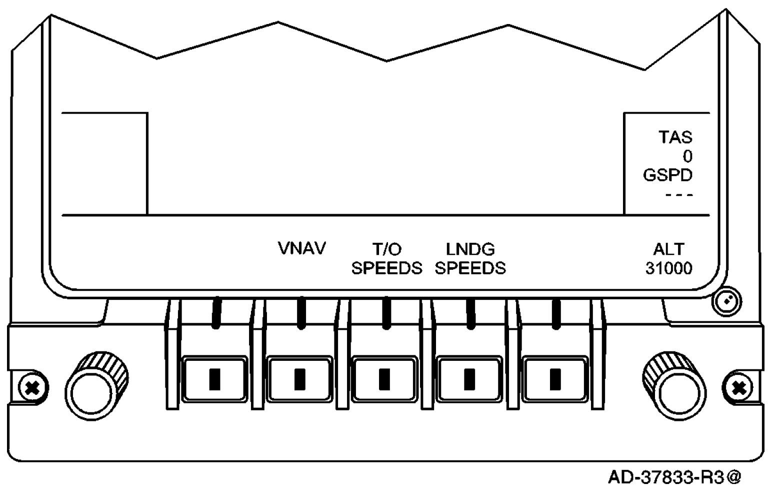

Figure 2–1–60. Top–Level MFD Menu Page

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(b) VNAV Submenu Page

The VNAV submenu page, Figure 2-1-61, allows selection of To/From distance, Station Elevation (ST EL), Vertical Angle (VANG), and selected altitude. When pushed, the RTN key always returns the menu display to the top-level MFD menu page, not the previous submenu page. A digital readout of the predicted Vertical Speed (VS) is also displayed in the menu but cannot be adjusted by the pilot. VS is automatically calculated and displayed based on data entered. The digital readout of the VNAV parameters are all dashed unless the pilot has previously entered values on this menu. VNAV parameters are given in Table 2-1-39.

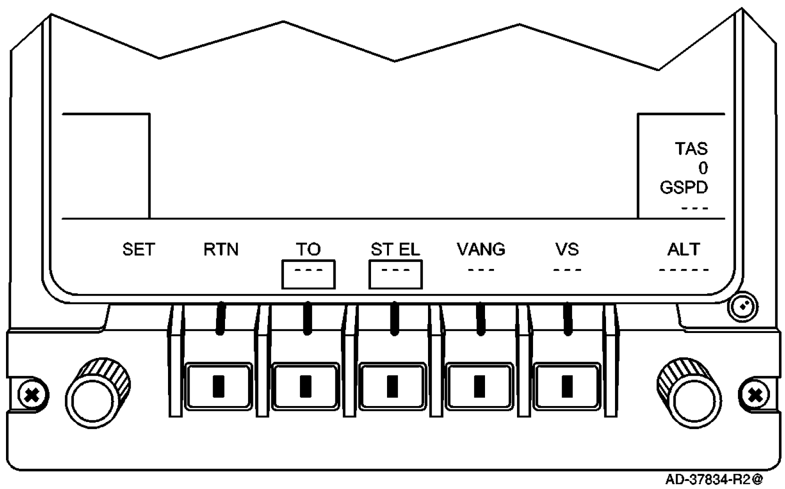

Figure 2-1-61. VNAV Submenu Page

Table 2-1-39. VNAV Data Parameters

Parameter	Units	Range	Resolution
ALT (Altitude)	feet	0 to 50,000	Hundreds of feet
ST EL (Station Elevation)	feet	0 to 10,000	100 feet
TO or FR (To or From)	NM	0.1 to 99.9	Tenths of NM
VANG (Vertical Angle)	degrees	0.1 to 5.9	Tenths of a degree

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1 To/From (TO/FR)

Pushing the bezel button below the TO legend causes a box to be displayed around the dashed distance readout. At this point the pilot has the following three options:

- Push another bezel button that moves the box to the next parameter
- Push the TO bezel button again and change the TO legend to FR
- Turn the SET knob and select a distance TO or FR the VOR station.

Once a distance value has been entered with the SET knob, the pilot has the option of selecting another set parameter (that moves the box to the new parameter) or pushing the distance bezel button again to toggle between TO or From distance. If a TO distance is set and FR is selected and set, the TO distance changes to cyan dashes. If a FR distance is set and TO is selected and set, the FR distance changes to cyan dashes. TO/FR distance is always positive and limited to 99.9 miles.

2 Station Elevation (ST EL)

ST EL is present if the HSI NAV source is a VOR. If a LRN source is selected for display on the HSI, the ST EL legend and digits display are not present. Pushing the bezel button below ST EL legend causes a box to be displayed around the digits. The pilot can set a digital value in the box with the SET knob. After a value has been entered, the pilot can push another bezel button that moves the box to the new parameter.

3 Vertical Angle (VANG)

The VANG option is primarily a display window but also lets the pilot manually increase the angle displayed in the window. Once a valid problem has been defined (this requires a selected altitude, a distance, and a station elevation if VOR is displayed on HSI), the vertical angle becomes valid and is displayed in the VANG position. As the pilot manipulates other parameters (distance or selected altitude), the vertical angle changes accordingly. This includes going to dashes or becoming valid depending on the validity of the problem. Once a valid angle (less than 6 degrees) has been displayed in the window, the pilot has two options:

- Select the VNAV mode on the MS-560 Mode Selector to engage the flight director mode and freeze all VNAV parameters
- Push the VANG bezel button (a box appears around the digital readout of vertical angle), manually increase the vertical angle with the SET knob (maximum limit ±6 degrees), and select VNAV on the MS-560 Mode Selector to arm the VNAV mode and freeze all VNAV parameters.

If a valid vertical angle is being displayed, the predicted vertical speed is also valid and displayed. The predicted vertical speed provides an estimate of the climb or descent rate that is achieved for the existing airspeed and selected vertical angle. The predicted vertical speed is removed as soon as the VNAV mode is captured.

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(c) T/O SPEEDS Submenu Page

The T/O SPEEDS submenu, Figure 2-1-62, lets the pilot select and set three different airspeed references; V1, VR, and V2. Airspeed references are displayed as fixed or moving bugs (1, R, and 2) on the PFD airspeed scale. Table 2-1-40 describes the T/O SPEEDS parameters.

At power-up all Vspeed values are invalid and deselected. (Cyan dashes are displayed under the respective airspeed reference.) Pushing a bezel button for a particular reference speed (V1, VR, or V2) for the first time replaces the dashes with a default Vspeed value (cyan digits). Two white boxes also appear, one small inner box around the default Vspeed value and one large box around the inner box and its title. The word SET above the left-hand rotary knob indicates that data input control has been transferred to this knob.

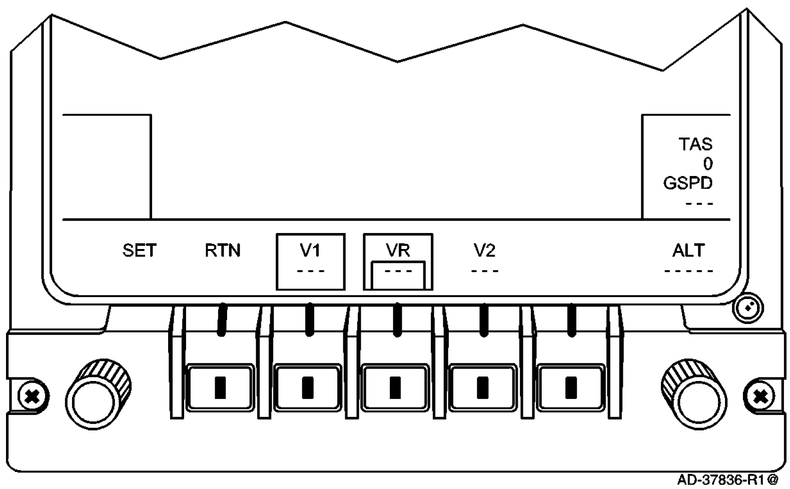

Figure 2-1-62. T/O SPEEDS Submenu Page

The two boxes denote that Vspeed is active and is selected for display. When the SET knob is rotated to dial in the desired Vspeed reference value, incrementing or decrementing digits appear accordingly and the speed bug on the airspeed scale is positioned, if in view. When the desired value is set, a second push of any bezel button except the active Vspeed reference or RTN, boxes the value and its title. The smaller inner white box is removed to indicate that a new reference value for Vspeed display has been entered. Vspeeds are set with the criteria described in Table 2-1-40.

Selecting a speed reference that has only the large box displayed removes the outline box and its respective bug, but the digits remain at the previously set value.

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Table 2-1-40. T/O Vspeed Data Parameters

Parameter	Criteria
T/O Vspeed Order	T/O Vspeed order of V1, VR, V2 is always maintained in value of magnitude
V1	V1 can be set equal to but never higher than VR
VR	VR can be set equal to but never lower than V1
V2	V2 can never be set any lower than VR
V1 Set Start	V1 set starts at 100 knots
VE	VE is fixed at 150 knots: it serves as an enroute and terminal area speed bug
Vspeed Deselect	Vspeeds automatically deselect and turn invalid when actual air speed exceeds 200 knots.

The 1, R, and 2 bugs and the white box around the digits are automatically removed from the PFD anytime airspeed transitions from below-to-above, 200 knots (increasing airspeed). Vspeed can be selected again at any airspeed. However, if the aircraft transitions from below to above 200 knots again, Vspeed is removed from the PFD.

NOTE: Anytime Vspeeds are set, the V-Enroute E bug is displayed at the appropriate position on the airspeed scale.

When the SET knob is used to adjust a speed value with cyan dashes displayed, an initial starting point for each Vspeed is supplied. The starting speed for V1 is 100 knots. The starting point for VR is 100 knots or V1, if V1 has a set value. The starting point for V2 is 100 knots or VR, if it has a set value. Selecting any of the take-off speeds for display on the PFD automatically displays the enroute speed bug .

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(d) LNDG SPEEDS Submenu Page

This submenu page, Figure 2-1-63, lets the pilot select and set two different airspeed references (VREF and VAPP). When selected the references are displayed as fixed or moving bugs (RF and AP) on the PFD airspeed scale. Table 2-1-41 gives the LNDG SPEEDS parameters.

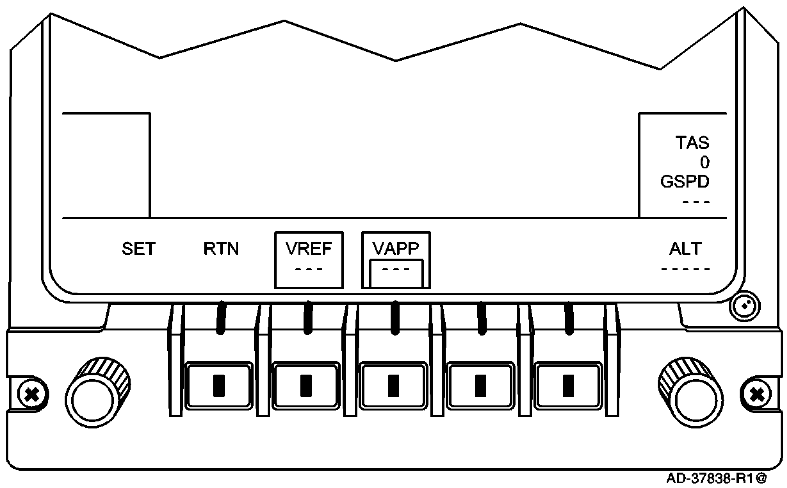

Figure 2-1-63. LNDG SPEEDS Submenu Page

At power-up, cyan dashes are displayed under the respective airspeed reference. Selecting a particular reference speed (VREF and VAPP) for the first time replaces the dashes with a default Vspeed value. Two white boxes also appear, one small inner box around the default Vspeed value and one large box around the inner box and its title. The word SET above the left-hand rotary knob indicates that data input control has been transferred to this knob.

The two boxes denote the Vspeed is active and is selected for display. When the SET knob is rotated to dial in the desired Vspeed reference value, incrementing or decrementing digits appear accordingly, and the RF or AP bug on the PFD airspeed scale is positioned, if in view. When the desired value is set, push any bezel button except the active Vspeed reference or RTN. The smaller inner white box is removed to indicate a new reference value for Vspeed has been entered for display. Repeat this procedure for VAPP. Remember not to use the RTN bezel button to enter the data. Vspeeds (VREF and VAPP) are set with the criteria given in Table 2-1-41.

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Similarly, selecting any one of the other buttons causes two white boxes to appear on the newly selected Vspeed, and a single white box remains around the title and digits of the previously selected Vspeed. Selecting a speed reference that has both boxes displayed causes the outline box and its respective bug to be removed, but the digits remain at the previously set value.

When the SET knob is used to adjust a speed value with cyan dashes displayed, an initial starting point for each Vspeed is supplied. The starting speed for VREF and VAPP is 95 knots.

Table 2-1-41. LNDG Vspeed Data Parameters

Parameter	Criteria
Landing Vspeed Order	Landing Vspeed order of VREF, VAPP is always maintained in value of magnitude
VAPP	VAPP can be set to 40 to 450 knots. The default is 95 knots. If VREF is set first, then VAPP = VREF
VREF Set Start	VREF set starts at 95 knots
Landing Vspeeds	Landing Vspeeds remain displayed until power is removed
V1 Set Start	V1 set starts at 100 knots

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4. Fault Monitoring and Display System Reversionary Modes

The pilot can select which Symbol Generator (SG) is driving the displays and alternate heading, attitude, and air data sources by using the MC-800 MFD Controller MODE switch, DC–550 Display Controller ADC switch, or external cockpit mounted ATT REV, HDG REV, and ADC REV switches.

A. EDS 1 (No. 1 Normal) Failure

As previously noted, a failure of EDS 1 (or its interface) is indicated in one of the following manners:

- Red **X** on the No. 1 PFD
- Red **X** on the MFD
- Red **X** on both the No. 1 PFD and MFD.

The reversionary mode for this failure is to turn the MC-800 MFD Controller MODE knob from the NORM to the SG2 position. The IC-600 IAC No. 2 then drives all three DUs.

B. EDS 2 (No. 2 Normal) Failure

A failure of EDS 2 (or its interface) is indicated by displaying a red **X** on the copilot's PFD.

The reversionary mode for this failure is to turn the MC-800 MFD Controller MODE knob from the NORM to the SG 1 position. The IC-600 IAC No. 1 now drives all three DUs.

(1) Attitude Reversionary

Using the ATT REV switch, the pilot can select attitude sources as given in Table 2–1–42.

Table 2–1–42. Attitude Reversionary Switch Functions

Condition	Pilot	Copilot
Power-up	ATT 1	ATT 2
First Push	ATT 2	ATT 1
Second Push	ATT 1	ATT 2

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(2) Heading Reversionary

Using the HDG REV switch, the pilot can select heading sources as given in Table 2–1–43.

Table 2–1–43. Heading Reversionary Switch Functions

Condition	Pilot	Copilot
Power-up	MAG 1	MAG 2
First Push	MAG 2	MAG 1
Second Push	MAG 1	MAG 2
NOTE: MAG 1 and MAG 2 may be replaced by DG 1 or DG 2, depending on selections made at compass control panel.		

(3) Air Data Computer Reversionary

Using the ADC REV switch or DC–550 Display Controller ADC switch, the pilot can select air data sources as given in Table 2–1–44.

Table 2–1–44. Air Data Computer Reversionary Switch Functions

Condition	Pilot	Copilot
Power-up	ADC 1	ADC 2
First Push	ADC 2	ADC 1
Second Push	ADC 1	ADC 2

C. DU-870 Display Unit

If there is a power failure to the unit or the unit fails, the tube goes blank.

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D. DC-550 Display Controller Failures

In the event the No. 1 DC-550 fails, the following defaults are in effect:

- Full compass on PFD, WX OFF
- SC/CP remains as it was before the DC went invalid
- Ground Speed (GSPD) on PFD
- Elapsed time not selected for display and reset
- MADC source remains as it was before the DC went invalid
- Primary VOR selected for display on PFD
- Primary LRN not selected for display on PFD (always selected for display on MFD)
- If IC-600 IAC No. 1, circle bearing (blue) selecting its primary VOR (VOR1)
- If IC-600 IAC No. 2, circle bearing is OFF
- If IC-600 IAC No. 1, diamond bearing (green) OFF
- If IC-600 IAC No. 2, diamond bearing selecting primary VOR (VOR2)
- Test not selected
- Attitude source remains as it was before the DC-550 went invalid
- Heading source remains as it was before the DC-550 went invalid
- All flight director modes on PFD are not active
- Selected course remains as it was before the DC went invalid
- Selected heading remains as it was before the DC-550 went invalid
- MFD top-level menu selected
- VNAV select remains as it was before the DC-550 went invalid; also all VNAV parameters remain as they were set
- Baro set type remains as it was before DC-550 went invalid
- Vspeed sets remain as they were before the DC-550 went invalid
- Vspeeds selected for display remains as they were before the DC went invalid
- Run-time lamp test OFF
- PFD DU reversion remains as it was before the DC-550 went invalid.

E. MC-800 MFD Controller Failure

If the MC-800 MFD Controller fails, all MFD-controlled selections remain as they were before the controller failed.

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F. DC-550 Display Controller Power-Up Defaults

At power-up (assuming a cold start), the following DC-550 defaults are in effect:

- Full compass on PFD, WX OFF
- Single Cue (SC) aircraft symbol on PFD
- Ground Speed (GSPD) on PFD, always GSPD on MFD (i.e., cannot switch to TTG)
- Elapsed time not selected for display and reset
- Primary ADC selected for display on PFD and MFD
- Primary VOR selected for display on PFD
- Primary LRN not selected for display on PFD (always selected for display on MFD)
- Circle bearing (blue) per bearing switch
- Diamond bearing (green) per bearing switch
- Test not selected
- Primary attitude selected for display on PFD
- Primary heading selected for display on PFD and MFD
- All flight director modes on PFD are not active
- MFD top level menu selected
- Baro set on PFD is INCHES
- Vspeed sets equal to canned default values
- Run-time lamp test OFF
- PFD DU reversion per switch.

Altitude preselect is not initialized at power-up. Instead, it syncs to its set knob once the knob is turned. This syncing is performed by the FD function.

If a warm start, DC–550 button data is restored as it was before the power interrupt, DC–550 switch data follows the appropriate switch.

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TABLE OF CONTENTS – SECTION 2.2

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SECTION 2.2
ATTITUDE AND HEADING REFERENCE SYSTEM

1. General

The PRIMUS 1000 Integrated Avionics System installed in the Citation Ultra aircraft includes dual VG-14A Vertical Gyros (VG) as primary attitude references and dual C-14D Directional Gyros (DG) as primary heading references. Either IC-600 Integrated Avionics Computer (IAC) displays the cross-side attitude and heading source.

The system has the following LRUs:

- VG-14A Vertical Gyro (2)
- C-14D Directional Gyro (2)
- FX-220 Flux Valve (2)
- CS-412 Dual Remote Compensator (1).

The VG-14As supply three-wire pitch and roll analog attitude signals to the IC-600 IACs for primary flight display, autopilot, and for control of the lateral and vertical flight director modes. The VG-14A also outputs a two-wire pitch and roll analog signal for weather radar antenna stabilization.

The C-14D DGs supply three-wire analog magnetic heading data to the IC-600 IACs for primary flight display, autopilot, and flight director modes.

The FX-220 Flux Valves detect the magnitude and direction of the horizontal component of the earth’s magnetic field for use in aligning the C-14D DG to magnetic north.

The CS-412 Dual Remote Compensator supplies the means to compensate the flux valve for N-S and E-W errors that result from the aircraft’s self-generated, magnetic fields. The CS-412 has the compensation adjustments for both C-14D DG systems.

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2. Component Descriptions and Locations

A. VG-14A Vertical Gyro

Figure 2-2-1 shows a graphical view of the VG-14A Vertical Gyro. The VG-14As are located in the avionics nose bay of the aircraft. Table 2-2-1 gives leading particulars for the VG-14A.

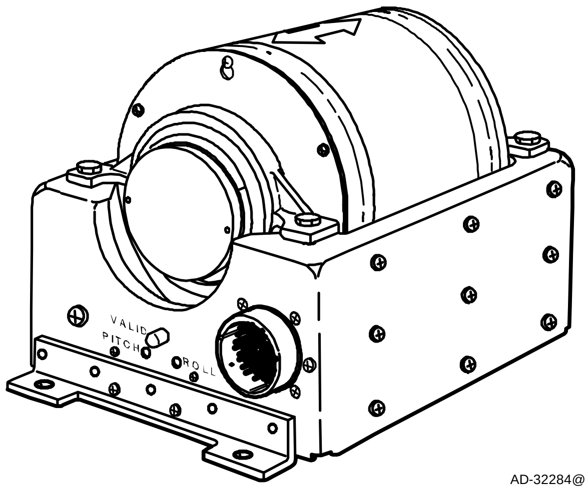

Figure 2-2-1. VG-14A Vertical Gyro

Table 2-2-1. VG-14A Vertical Gyro Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	6.19 in. (157.23 mm)
• Width	6.75 in. (171.45 mm)
• Length	9.38 in. (238.25 cm)
Weight	7.3 lb (3.3 kg)
Power Requirements	115 V ac, 400 Hz, 80 VA start, 40 VA run
Gyro Rotor Speed	22,000 rpm
Gyro Erection Time	2 ±1 minute
Erection Rates:	
• Fast Erection (minimum)	20 deg/min
• Slow Erection (nominal)	2.5 deg/min
Gimbal Freedom:	
• Pitch	±80 deg
• Roll	unlimited
Vertical Accuracy	±0.25 deg

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Table 2-2-1. VG-14A Vertical Gyro Leading Particulars (cont)

Item	Specification
User Replaceable Parts	None
Mating Connector:	
• J1	MS3126F22-55SY
Mounting	Base flange mount

The VG-14A supplies aircraft pitch and roll attitude to the IC-600 IAC using an independent three-wire synchro output for each axis. The pitch and roll attitude signals are used for Electronic Display System (EDS) and flight director/autopilot functions of the IAC. Additional two-wire transformer outputs for pitch and roll are used for radar stabilization.

The gyro gimbal freedom is unlimited (±360 degrees) and the pitch gimbal freedom is ±80 degrees. Gyro verticality is maintained by gravity-sensing liquid switches and torque motors. Adequate electrical power and gyro wheel speed causes the VALID lamp on the gyro base to light and a two-pole relay to energize for autopilot and failure flag interlocks. An internal erection cutoff circuit prevents the gyro from driving to a false vertical sensed by the gravity-sensitive liquid switches, while in a turn. If the gyro goes off-level after initial start-up by more than 6 degrees for any reason, a remote VG FAST ERECT switch must be used to re-erect the gyro.

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B. C-14D Directional Gyro

Figure 2-2-2 shows a graphical view of the C-14D Directional Gyro. The C-14D DGs are located in the avionics nose bay of the aircraft. Table 2-2-2 gives leading particulars for the C-14D DG.

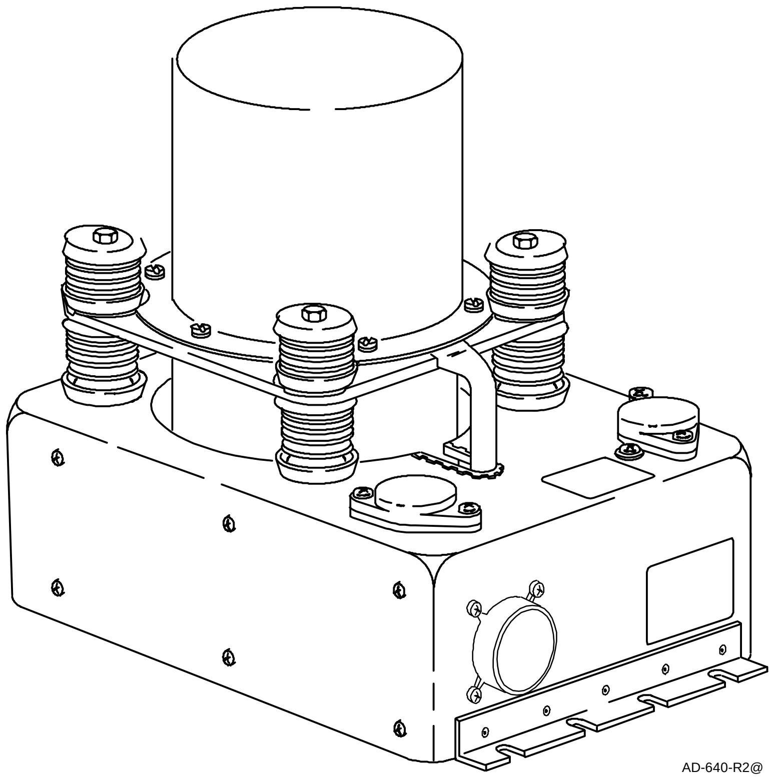

Figure 2-2-2. C-14 Directional Gyro

Table 2-2-2. C-14D Directional Gyro Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	7.22 in. (183.39 mm)
• Height (shock mounts extended)	7.50 in. (190.50 mm)
• Width	6.25 in. (158.75 mm)
• Length	9.03 in. (229.36 cm)
Weight	6.7 lb (3.04 kg)
Power Requirements:	
• Primary	28 V dc, 105 VA start, 65 VA run
• Starting	40 VA
• Running	30 VA

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Table 2-2-2. C-14D Directional Gyro Leading Particulars (cont)

Item	Specification
Gimbal Freedom:	
• Vertical (Azimuth)	360 deg
• Horizontal (Pitch and Roll)	±85 deg
Gyro Erection Time	2 ±1 minute
Slaved Accuracy	±2 deg
Gyro Free Drift (exclusive of earth rate)	15 to 24 deg/hr
Slaving Rate (normal)	2.5 to 5.0 deg/min
Slewing Rate (automatic fast or manual)	30 deg/min
User Replaceable Parts	None
Mating Connector:	
• J1	MS3126F20-41S
Mounting	Base Flange Mount

The C-14D DG is a gimballed gyroscope that supplies aircraft (three-wire synchro) heading information, for EDS display, in the cockpit and flight guidance. Synchros connected to the gyro gimbal measure the angular position of the spin axis of the gyro and convert the angle into an electrical analog signal, transmitted as an output. When installed in the aircraft and aligned with a known direction (usually magnetic north), this output represents actual aircraft heading.

The gyro can be operated in a free (DG) mode or can be slaved to a flux valve. In the DG mode, the spin axis drifts freely at a rate dependent on bearing friction, gyro precession, and earth rotation. Operating in the DG mode requires the drift to be corrected by the pilot on a frequent basis. When slaved to a flux valve, the gyro slaving amplifier maintains a spin axis orientation toward magnetic north as sensed by the flux valve. This slaving gives an accurate long-term heading, eliminating drift correction by the pilot.

Adequate electrical power and gyro wheel speed energizes a two-pole relay for failure flag interlock.

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C. CS-412 Dual Remote Compensator

Figure 2-2-3 shows a graphical view of the CS-412 Dual Remote Compensator. The CS-412 is located in the avionics cabin bay of the aircraft. Table 2-2-3 gives leading particulars for the CS-412.

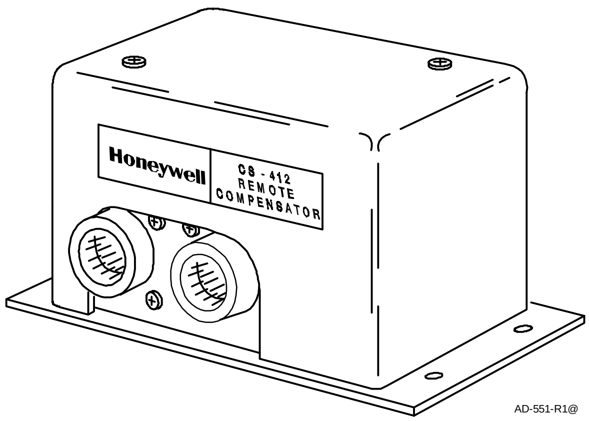

Figure 2-2-3. CS-412 Dual Remote Compensator

Table 2-2-3. CS-412 Dual Remote Compensator Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.99 in. (75.95 mm)
• Width	2.56 in. (65.02 mm)
• Length	5.62 in. (142.75 mm)
Weight (maximum)	1.0 lb (0.45 kg)
Power Requirements	26 V ac, 400 Hz, 2.5 VA
User Replaceable Parts	None
Mating Connector:	
• J1	MS3126F14-19SX
• J2	MS3126F14-19SY
Mounting	Base Flange Mount

The CS-412 Dual Remote Compensator inserts small dc voltages on the flux valve output to minimize compass system deviation caused by local magnetic disturbances from the airframe and electrical systems on board. The CS-412 is capable of compensating two flux valves.

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D. FX-220 Flux Valve

Figure 2–2–4 shows a graphical view of the FX-220 Flux Valve. The FX-220 is located in the vertical stabilizer of the aircraft. Table 2–2–4 gives leading particulars for the FX-220.

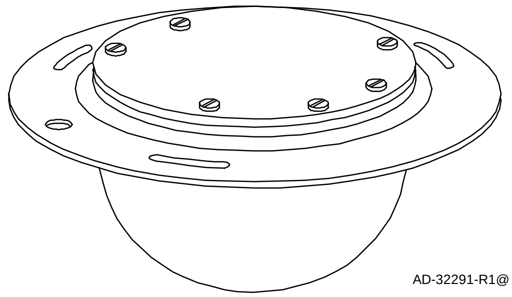

Figure 2–2–4. FX-220 Flux Valve

Table 2–2–4. FX-220 Flux Valve Leading Particulars

Item	Specification
Dimensions (maximum):	
• Bowl Diameter	3.58 in. (90.93 mm)
• Mounting Flange Diameter	4.80 in. (121.92 mm)
• Height	2.88 in. (73.15 mm)
Weight (maximum)	1.5 lb (0.68 kg)
Power Requirements	26 V ac, 400 Hz., 1.1 VA
User Replaceable Parts	None
Mating Terminals (6 required)	HPN 0364-01
Mounting	Nonmagnetic Machine Screws, 6-40 by 3/8 in. Round Head, HPN 319011

The FX-220 Flux Valve senses the direction (horizontal component) of the earth's magnetic field with respect to its prealigned mount in the aircraft. The flux valve outputs the angular difference between the longitudinal axis of the aircraft and magnetic north as a three-wire electrical signal. This signal represents the magnetic heading of the aircraft.

The flux valve heading signal is input through the CS-412 Dual Remote Compensator that nulls magnetic deviation caused by the airframe and electrical systems on board. The compensated magnetic heading is then output to the C-14D Directional Gyro to maintain the gyro spin axis orientation toward magnetic north during slaved operation. From the C-14D Directional Gyro, the stabilized magnetic heading is input by the IC-600 IAC for primary flight display and flight guidance use.

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3. Operation

A. Introduction

The PRIMUS 1000 Digital Flight Guidance System (DFGS) contains dual VG-14A Vertical Gyros to detect actual aircraft pitch and roll attitude, and dual C-14D Directional Gyros (DG) to detect actual aircraft magnetic heading. The directional gyros employ a single CS-412 Dual Remote Compensator and each directional gyro has its own dedicated FX-220 Flux Valve. The flux valve is used to detect the direction and strength of the horizontal component of the earth's magnetic field, and to apply a correction factor to the directional gyro to always keep the gyro's rotor aligned to magnetic north. The dual remote compensator is used to correct the flux valve signal for errors induced, due to the magnetic fields produced by the aircraft and its systems.

The VG-14A No. 1 and C-14D DG No. 1 are the pilot's primary attitude and heading sources, and the copilot's secondary sources for attitude and heading data. The VG-14A No. 2 and C-14D DG No. 2 are the copilot's primary attitude and heading sources, and the pilot's secondary sources for attitude and heading data.

Each flight director uses on-side attitude and heading data to satisfy the flight director commands. The VG-14A No. 1 and C-14D DG No. 1 are the primary attitude and heading inputs for the autopilot. The VG-14A No. 2 and C-14D DG are used for autopilot monitoring. Refer to Figure 2-2-5 and Figure 2-2-6 for the pilot's and copilot's attitude and heading reference interface diagrams. Refer to Table 2-2-5 and Table 2-2-6 for performance accuracy information.

B. VG-14A Vertical Gyro

The VG-14A Vertical Gyro supplies three-wire synchro outputs that are electrical analogs of actual pitch and roll attitudes for EDS and flight guidance. The VG also supplies two-wire outputs of pitch and roll attitude data for weather radar antenna stabilization. Pitch gimbal freedom is ±80 degrees and roll gimbal freedom is ±360 degrees.

(1) Modes of Operation

(a) Initialization

When power is applied to the system, nominally it takes 2 ±1 minute to fully erect. During this time, the attitude fail flag is displayed on the on-side Primary Flight Display (PFD) and the autopilot and yaw damper engage functions are inhibited. When the gyro is fully erect, the attitude fail flag on the on-side PFD is pulled out of view to indicate gyro validity to the flight crew. With the gyro erect, it is within ±0.25 degrees of vertical.

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During the initialization cycle, the gyro has an internal monitor looking at the following conditions for validity:

- Internal power supply voltages are good
- Rotor wheel speed is at least 75% of full speed.

When these conditions are satisfied, a relay inside the gyro energizes that pulls the PFD flag.

(b) Fast Erect Switch

With the gyro in normal operation, drift off of vertical is corrected at a rate of 2.5 degrees/minute. If the gyro has drifted off of vertical and the pilot wants to bring the gyro back to vertical quickly, the external panel mounted FAST ERECT switch is used.

When the switch is pushed, the gyro erects at a minimum rate of 20 degrees/minute and the PFD displays the attitude fail flag. If the autopilot is engaged, the autopilot disengages.

C. C-14D Directional Gyro (DG)

The C-14D DG supplies three-wire synchro magnetic heading information to the IC-600 IAC for EDS display and autopilot/yaw damper operation. The C-14D DG has its own internal static inverter that receives aircraft power of 28 V dc and supplies its own power source of 26 V ac, 400 Hz and 115 V ac, 400 Hz.

The C-14D DG has three basic modes of operation; initialization, slaved, and DG (free).

(1) Modes of Operation

(a) Initialization

When power is applied to the system, nominally it takes 2 ± 1 minute to fully erect. During this time, the heading fail flag is displayed on the on-side PFD. When the gyro is fully erect, the heading fail flag on the on-side PFD is pulled out of view to indicate gyro validity to the flight crew. With the gyro erect and slaved, it is within ± 2 degrees of magnetic heading.

During the initialization cycle, the gyro has an internal monitor looking at the following conditions for validity:

- Internal power supply voltages are good
- Rotor wheel speed is at least 75% of full speed.

When these conditions are satisfied, a relay inside the gyro energizes supplying a heading valid output to the IC-600 IAC and lets the autopilot/yaw damper to be engaged.

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(b) Slaved Operation (AUTO Selection)

In the slaved mode of operation, the inherent drift properties of the gyro are being corrected by the signal from the FX-220 Flux Valve. By combining the short-term accuracy of the gyro with the long-term accuracy of the flux valve, the system supplies good magnetic heading accuracies between 65 degrees north and south latitudes. In addition, by combining the gyro and flux valve signals, drift caused by the earth rotating on its axis is compensated.

(c) DG Mode Operation (MAN Selection)

The DG (free) mode of operation is entered by opening the panel-mounted AUTO/MAN switch. When the switch is pushed, the slaving amplifier circuit within the gyro is disabled, removing the flux valve signal from the gyro. The gyro is operating without any magnetic correction and lets heading drifts between 15 and 24 degrees per hour. This mode is normally entered when flying above 65 degrees in latitude, or when the operator wants to slave the compass card on the PFD to a new heading.

In the DG mode of operation, it is possible to manually move the compass card on the PFD to a new heading reference. This is accomplished as a function of the panel-mounted manual sync switch. Moving the switch to the + position moves the compass card clockwise at a rate of 30 degrees per minute. Moving the switch to the ● position moves the compass card counter-clockwise at the same rate.

D. FX-220 Flux Valve

The FX-220 Flux Valve detects the magnitude and direction of the horizontal component of the earth’s magnetic field and converts this information into an electrical output used to align the directional gyro’s rotor to magnetic north.

Refer to Section 4, Maintenace Practices, of this manual for flux valve installation and indexing information.

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E. CS-412 Dual Remote Compensator

The CS-412 Dual Remote Compensator compensates the flux valve for single-cycle errors created by the aircraft and its electrical systems. This is done by inserting small dc voltages into the flux valve to cancel the effects of the man-made magnetic fields. Each CS-412 can compensate two separate C-14D DGs.

Refer to Section 4, Maintenance Practices, of this manual for proper compensator adjustment information.

Table 2-2-5. VG-14A Vertical Gyro Performance Accuracy

Parameter	Unit of Measure	Range
Roll Freedom	degrees	±360
Pitch Freedom	degrees	±80
Slow Erect	degrees/minute	2.5
Fast Erect	degrees/minute	20 minimum
Roll Output to IC-600	millivolt ac/degree	11.8 sin θ VRMS (≈ 205 mV ac/deg)
Pitch Output to IC-600	millivolt ac/degree	11.8 sin θ VRMS (≈ 205 mV ac/deg)
Roll Radar Output	millivolt ac/degree	11.8 sin θ VRMS (≈ 50 mV ac/deg)
Pitch Radar Output	millivolt ac/degree	11.8 sin θ VRMS (≈ 50 mV ac/deg)

Table 2-2-6. C-14D Directional Gyro Performance Accuracy

Parameter	Unit of Measure	Range
Pitch Freedom	degrees	±85
Roll Freedom	degrees	±85
Vertical Freedom	degrees	±360
Slaved Accuracy	degrees/hour	±2
Free Drift	degrees/hour	15 to 24
Slow Slave	degrees/minute	2.5 to 5.0
Fast Slave	degrees/minute	30
Heading Output to IC-600	millivolt ac/degree	11.8 sin θ VRMS (≈ 200 mV ac/deg)

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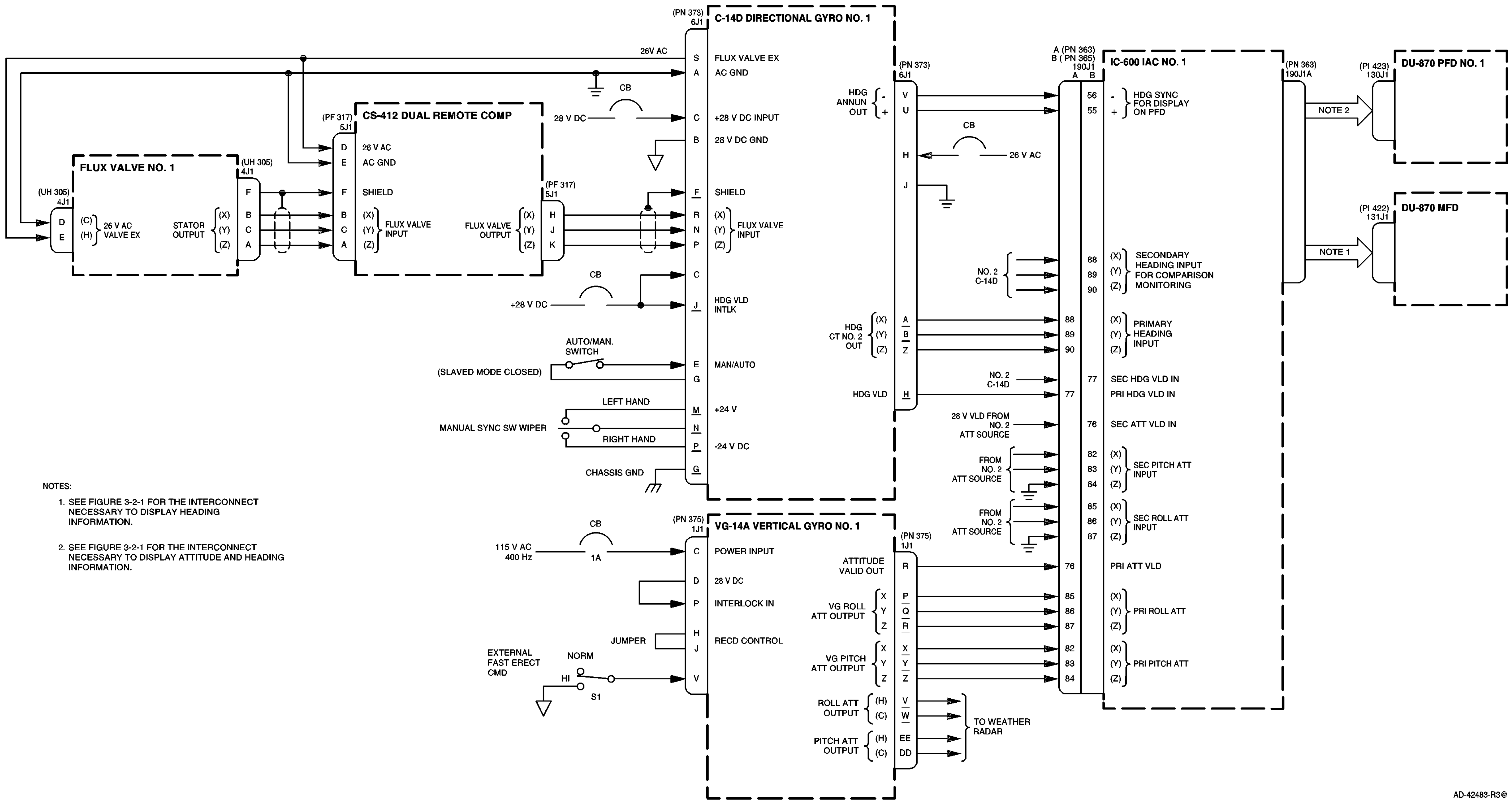

Figure 2-2-5. Pilot's Attitude and Heading Reference Interface Diagram

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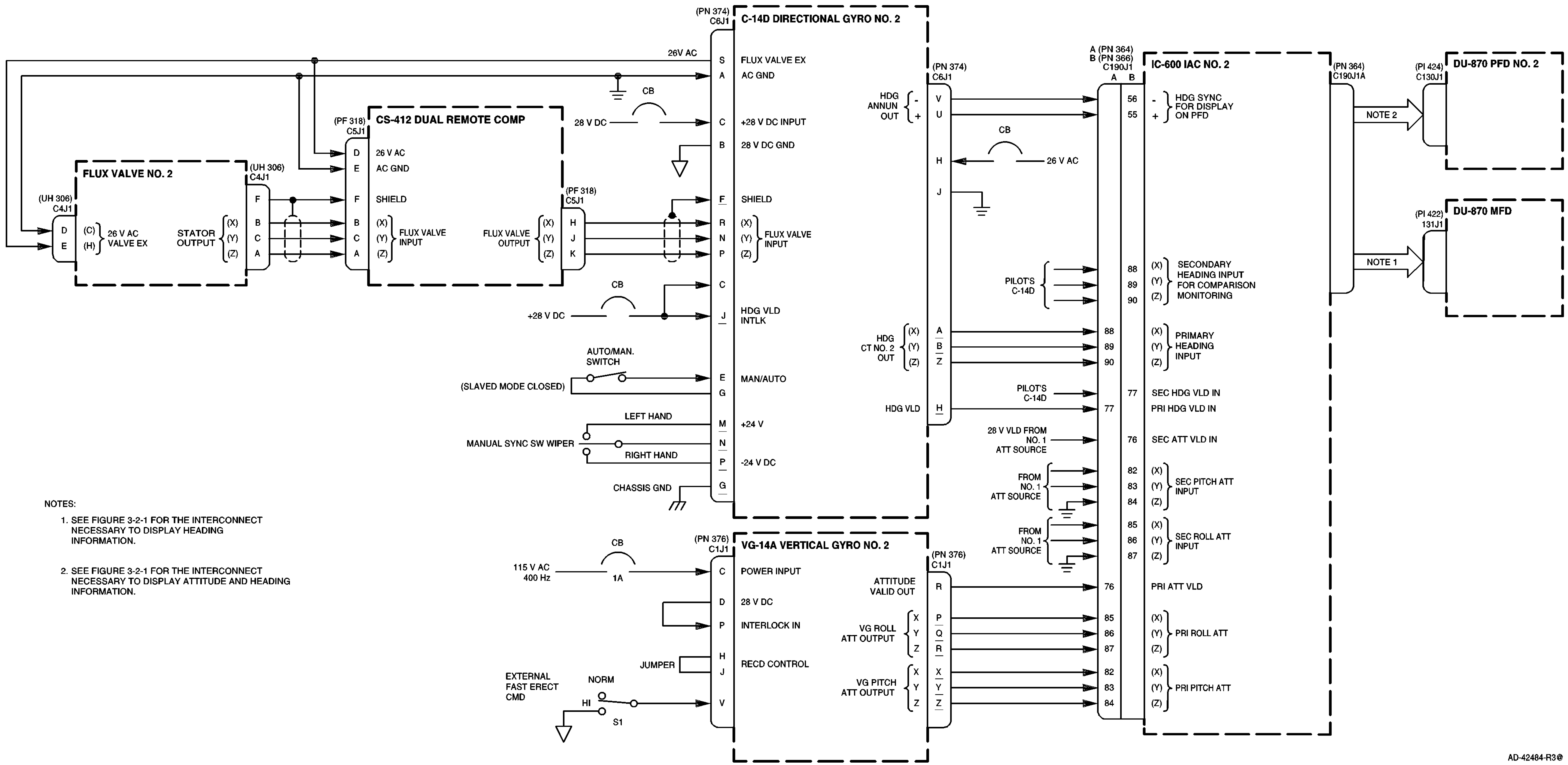

Figure 2-2-6. Copilot's Attitude and Heading Reference Interface Diagram

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4. Fault Monitoring

Fault indications are presented on the primary flight and multifunction displays.

A. Primary Flight Display (PFD)

Figure 2-2-7 shows the fault indications as presented on the PFD. Attitude and heading faults displayed on the PFD are as follows:

(1) Loss of Valid Pitch or Roll Information

- Removal of the pitch tape
- Removal of the roll pointer
- Removal of the flight director bars
- Entire attitude sphere is cyan
- Red ATT FAIL annunciator in the top half of the attitude sphere
- Inhibit of the attitude miscompare annunciator on the on-side failure.

(2) Loss of Valid Heading Information

- Red HDG FAIL annunciation displayed above the airplane symbol in the compass arc along with a white HDG1 or HDG2 identifier to indicate the source of the failed heading data
- Removal of heading bug and digital readout
- Removal of the course/desired track pointer
- Amber dash of the course/desired track digital readout
- Removal of the drift bug
- Removal of the lateral deviation pointer
- Removal of the TO/FROM display
- Inhibit of the heading miscompare annunciator
- Removal of the absolute bearing pointers
- Amber dash of the current heading digital readout in arc mode.

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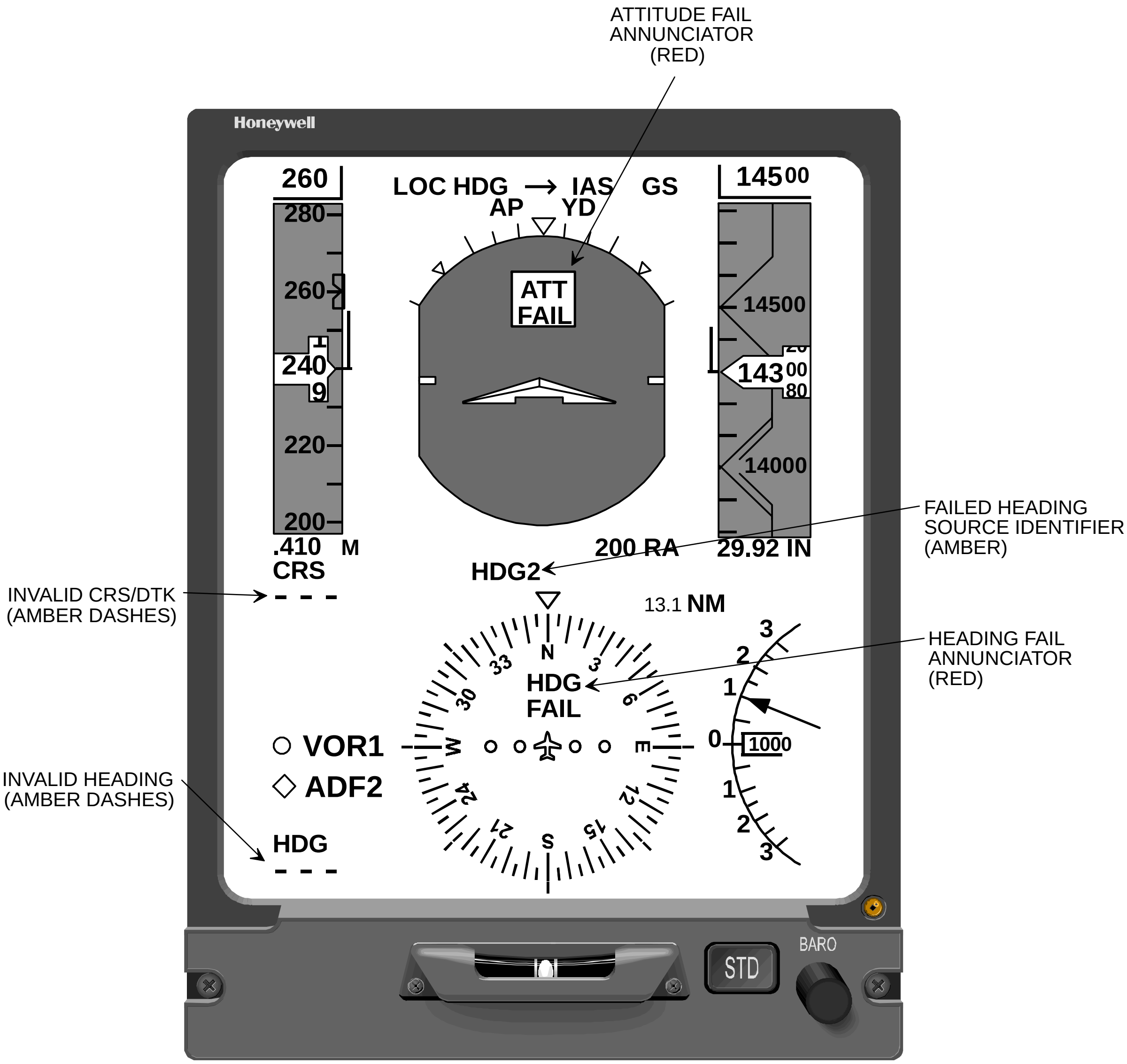

NOTE: THE DISPLAY SHOWN MAY NOT REPRESENT ACTUAL FLIGHT CONDITIONS. AD-53711@

Figure 2-2-7. PFD Attitude and Heading Failure Indications (Phase III View)

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B. Multifunction Display (MFD)

Figure 2–2–8 and Figure 2–2–9 show the heading fault indications as presented on the MFD with loss of valid heading information.

(1) MAP Mode

- Amber dash of the heading digital readout
- Red HDG FAIL annunciation displayed in the top of the compass arc
- Removal of the heading bug and digital readout
- Removal of the drift bug
- Removal of all waypoint symbols
- Removal of all NAVAID symbols
- Removal of all airport symbols
- Removal of holding pattern symbol
- Removal of the lateral deviation display
- Removal of the designator symbol, bearing/distance readout, and LAT/LON readout
- Removal of the range ring
- Removal of the aircraft symbol.

(2) PLAN Mode

- The TO waypoint moves to the center of the display, if not already there.

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Figure 2-2-8. MFD MAP MODE Heading Failure Indications (Phase III View)

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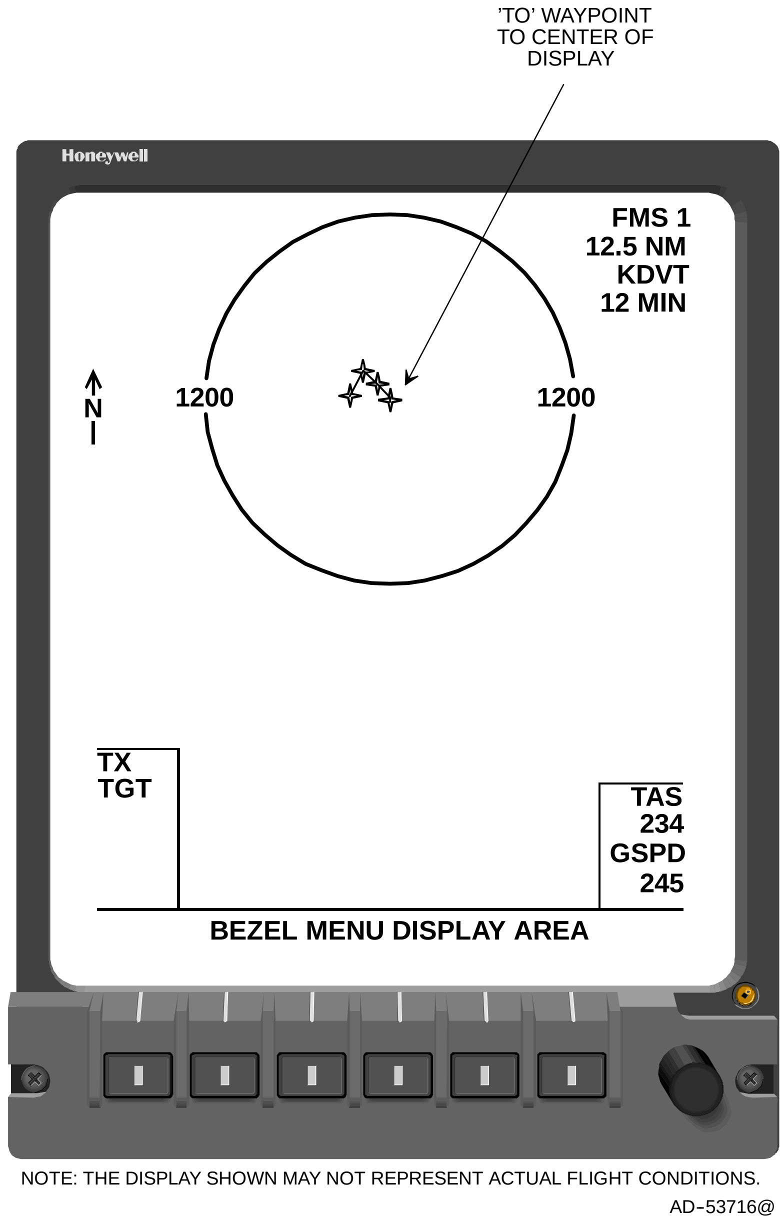

Figure 2-2-9. MFD PLAN MODE When Loss of Heading Valid

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SECTION 2.3
ADZ-850 MICRO AIR DATA SYSTEM

1. General

The PRIMUS 1000 Integrated Avionics System installed in the Citation Ultra aircraft includes two AZ-850 Micro Air Data Computers (MADC). The MADC takes inputs of static air pressure and pitot pressure, total air temperature, and baro set information. The MADC performs the necessary computations and transmits air data information via ARINC 429. Each MADC has four low-speed buses that output the same data.

The MADC supplies baro corrected altitude, true airspeed, Mach, and vertical speed information to the IC-600 IACs for primary flight display (pilot and copilot). The MADC includes Static Source Error Correction (SSEC) and outputs an overspeed warning discrete.

The MADC also supplies pressure altitude to the Traffic Alert and Collision Avoidance System (TCAS), if installed.

Barometric correction is input to the MADC directly from a rotary set knob located on the on-side Primary Flight Display (PFD) bezel. Air data target values are displayed as digital quantities and are shown as moving bugs on the PFD air data displays.

The system has the following LRUs:

- AZ-850 MADC
- BL-870 PFD Bezel Controller.

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2. Component Descriptions and Locations

A. AZ-850 Micro Air Data Computer

Figure 2-3-1 shows a graphical view of the AZ-850 Micro Air Data Computer (MADC). The MADCs are located in the avionics nose bay of the aircraft. Table 2-3-1 gives leading particulars for the MADC.

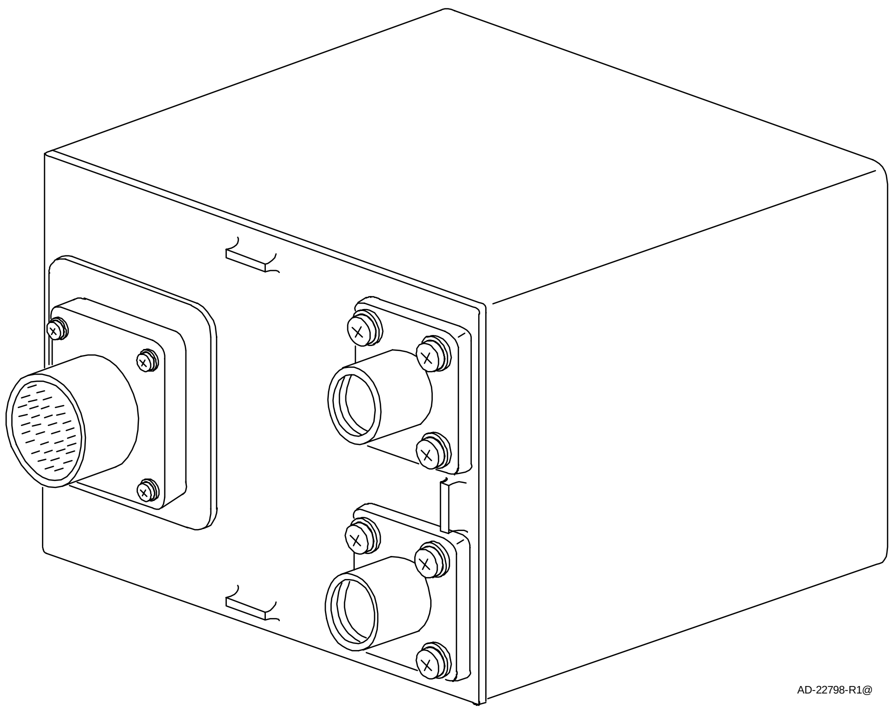

Figure 2-3-1. AZ-850 Micro Air Data Computer

Table 2-3-1. AZ-850 Micro Air Data Computer Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	4.04 in. (102.62 mm)
• Width	6.04 in. (153.42 mm)
• Length	5.71 in. (145.03 mm)
Weight	4.5 lb (2.05 kg)
Power Requirements:	
• Continuous	28 V dc, 16 W (max)
User Replaceable Parts	None

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Table 2-3-1. AZ-850 Micro Air Data Computer Leading Particulars (cont)

Item	Specification
Mating Connectors:	
• Static, straight	MS24393-6 and Nut MS24400-6
• Static, elbow	MS24394-6 and Nut MS24400-6
• Pitot, straight	MS24393-4 and Nut MS24400–4
• Pitot, elbow	MS24394-4 and Nut MS24400-4
• Power	MS27473E20B-35S
Mounting	MT-840 Tray, HPN 7014702-902

The MADC has two pneumatic connectors that let the MADC accept input of static and pitot pressures through MS-type threaded fittings and a single 79-pin electrical connector for connection of all electrical inputs and outputs. The pitot/static and outside temperature probes (not supplied by Honeywell) measure air pressure and air temperature. The operation of these probes is covered in the appropriate manufacturer's literature. The pitot and static sources/probes deliver air pressures to the sensors in the MADC.

The MADC is mounted in a tray and the tray has no electrical or pneumatic connectors.

The following air data values are output by the AZ-850 MADC:

- Barometric altitude
- Pressure altitude
- Indicated Airspeed (IAS)
- Mach number
- Vertical Speed (VS)
- Maximum operating speed (Vmo)
- Static and Total Air Temperature (SAT and TAT)
- True Airspeed (TAS).

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B. BL-870 PFD Bezel Controller

Figure 2-3-3 shows a graphical view of the BL-870 PFD Bezel Controller. The BL-870 is located as part of the PFDs on the instrument panel. Table 2-3-2 gives leading particulars for the BL-870.

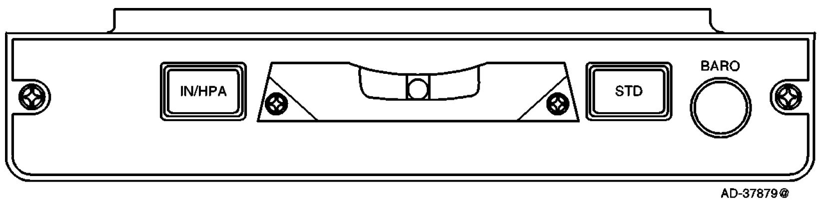

Figure 2-3-2. BL-870 (-921) Bezel Controller (Before Phase III)

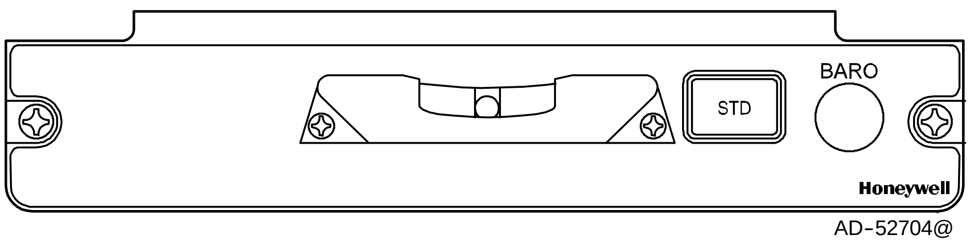

Figure 2-3-3. BL-870 (-931) Bezel Controller (Phase III)

Table 2-3-2. BL-870 PFD Bezel Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.42 in. (36.27 mm)
• Width	6.71 in. (170.51 mm)
• Length	1.10 in. (27.94 mm)
Weight	0.3 lb (0.135 kg)
User Replaceable Parts:	
• Inclinometer	HPN 7003115-905
• Knob (BARO)	HPN 7000895-3
• Setscrew (Hex Socket, 6-32 x 3/16-inch, cup point)	HPN 0455-224

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The bezel controller supplies momentary button selection to the MADC of standard barometric correction. As part of the air data system, the BL-870 PFD Bezel Controller BARO Set Knob lets entry of barometric altimeter correction setting through a two-wire grey code signal output to the MADC for rotary knob baro correction control.

NOTES:

1. When the pilots are displaying cross-side MADC data on their PFD, they do not have control over the displayed BARO setting from their respective display controller.

2. The BARO/SET function is independent from the display controller and does not require the display controller to work to set the data.

3. The IN/HPA momentary button, on the –921 BL–870 Bezel Controller (Before Phase III) or the DC-550 Display Controller (Phase III), lets barometric correction to be displayed in either inches of mercury (inHg) or hectopascals (hPa). The button interfaces with the IC-600 in the IC-600 software changes the state of the button to either inHg or hPa.

Also, as part of the air data system, the BL-870 Bezel Controller STD button returns the barometric altimeter correction to standard value (29.92 inHg or 1013 hPa).

The BARO set knob and STD button interface directly with the on-side MADC. Refer to Figure 2–3–4 and Figure 2–3–5 for block diagrams of the interconnect.

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3. Operation

A. Pilot Air Data System

Figure 2-3-4 shows the pilot's MADC interface. The inputs to the MADC consist of static and pitot pressure, total air temperature, baro set information, aircraft configuration data, Weight-On-Wheels (WOW) discrete, and a functional test discrete. The pressure inputs are using MS-type threaded fittings. The total air temperature input is a 500 ohm ARINC 575 total air temperature probe.

Baro correction is controlled by the BARO knob mounted on the BL-870 PFD bezel controller. The Baro Set range is from 16.00 to 32.00 inHg, or from 542 to 1084 hPa. Selection of inHg or hPa is done through the IN/HPA DC-550 button. Rotation of the BARO set knob sends grey code pulses directly to the on-side MADC, that supply the MADC with barometric correction information, so as to output altitude above Mean Sea Level (MSL). Clockwise (CW) rotation increases inHg in 0.01 increments, or hPa in 1.0 increments. Counterclockwise (CCW) rotation of the knob decreases the selected setting by a like amount.

The standard (STD) button, adjacent to the BARO set knob, commands the MADC to set the barometric correction to 29.921 inHg or 1013.24 hPa.

Aircraft configuration data is supplied by seven discrete inputs. Each input is defined as open or grounded for the type of aircraft. This ensures the proper MADC is installed, and sets the aircraft dependent parameters of Vmo and SSEC.

Side select data is supplied by three discrete inputs. Each input is defined as open or grounded for the side of the aircraft the MADC is installed. This ensures the MADC receives and transmits the appropriate side air data.

The ADC1 or ADC2 test switch located on the maintenance panel behind the pilot's seat is used for functional test.

The WOW input is used to inhibit test during flight.

The ARINC 429 No. 1 output sends air data information to IAC No. 1.

The ARINC 429 No. 2 output sends air data information to IAC No. 2.

The ARINC 429 No. 3 output sends transponder information to to COM Unit No. 1.

The ARINC 429 No. 4 output sends transponder information to to COM Unit No. 2. It is also connected to the optional PRIMUS® 650/870 Weather Radar Air Data input.

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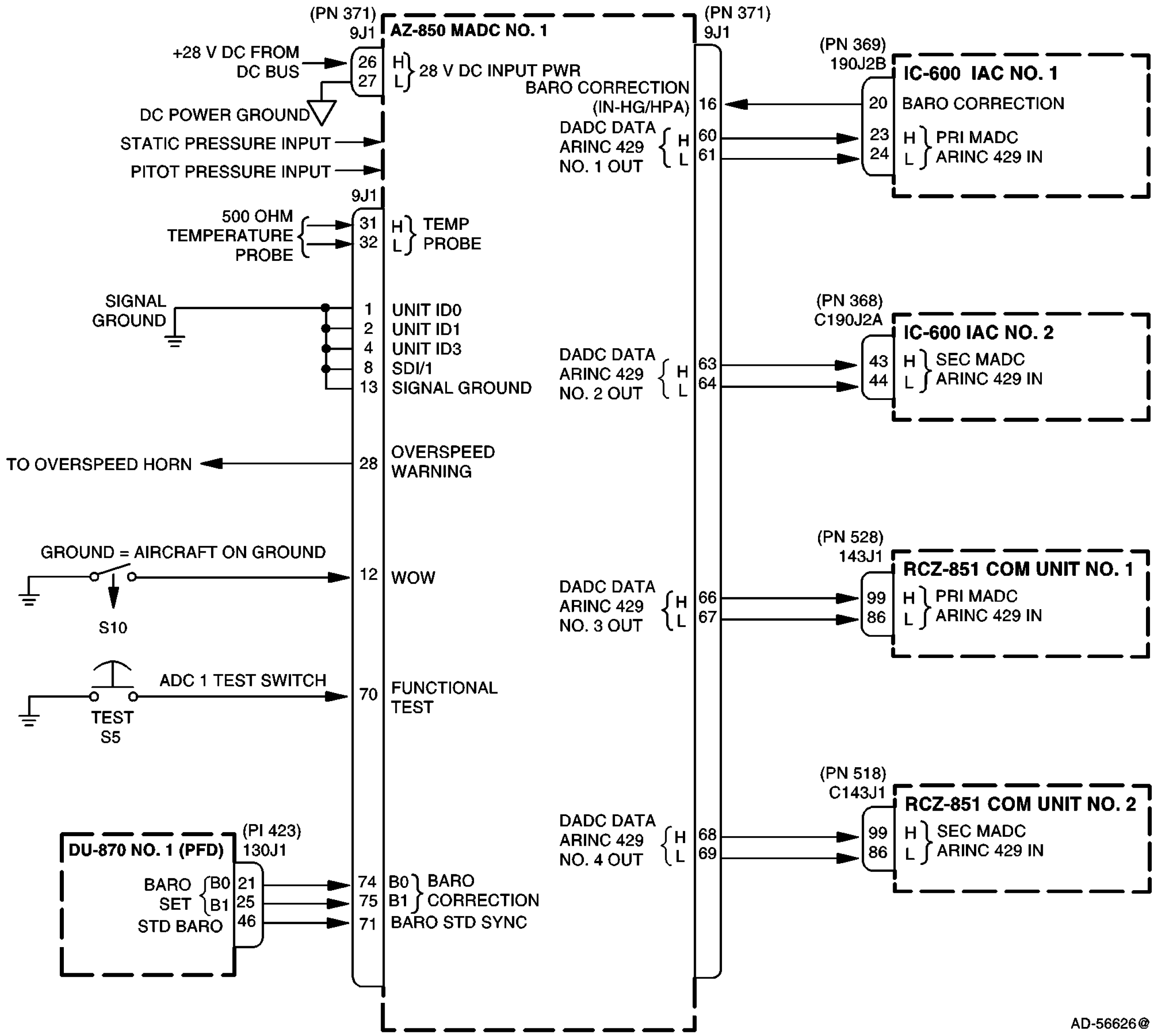

Figure 2-3-4. Pilot's MADC Interface

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B. Copilot’s Air Data System

Figure 2–3–5 shows the copilot’s MADC Interface. The copilot’s system is identical to the pilot’s system, with the following exceptions:

- The BARO knob and the STD button are both located on the copilot’s BL-870 PFD Bezel Controller
- The ARINC 429 No. 1 output connects to IAC No. 2 primary MADC input
- The ARINC 429 No. 2 output connects to IAC No. 1 secondary MADC input
- The ARINC 429 No. 3 output connects to the RCZ-851 COM Unit No. 2 primary input and RCZ-851 COM Unit No. 1 secondary input
- The ARINC 429 No. 4 output connects to the RCZ-851 COM Unit No. 1 primary input and RCZ-851 COM Unit No. 2 secondary input.

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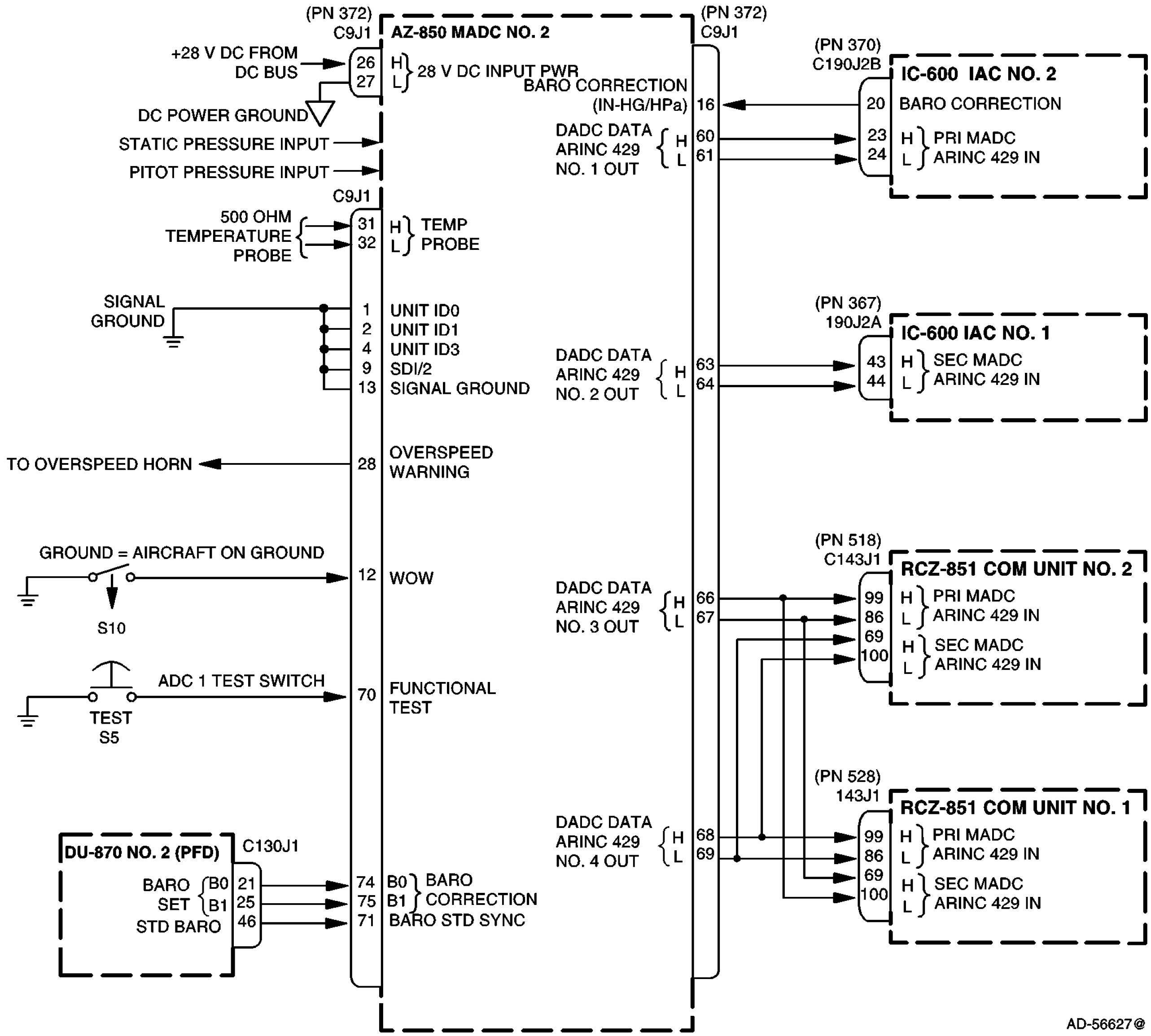

Figure 2-3-5. Copilot's MADC Interface

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C. Modes of Operation

The AZ-850 MADC has three operating modes: normal, initiated test mode, and maintenance test mode as follows:

- The normal mode is for normal aircraft operation.
- The initiated test mode is pushed by setting the maintenance panel to test. This test is interlocked with the WOW switch and is inhibited when airspeed is greater than 50 knots. In the initiated test mode, the MADC outputs are driven to preset values to check the operation of the MADC, interconnects and displays.
- The Maintenance Test Mode displays maintenance pages on the PFD while on the ground (WOW).

See Table 2–3–3 and Table 2–3–4 for performance accuracy and MADC self-test output data.

D. MADC Monitoring

A nonvolatile memory is for the on-the-ground analysis of any in-flight monitor trips. This memory is accessed through the aircraft test connector.

Built in monitoring routines include tests to ensure the following:

- All program memory is addressable and readable
- Pressure sensor outputs are in the correct range
- The aircraft electrical keying is correct
- Power supply outputs are of the correct values
- The inputs to the MADC are reasonable
- The central processing unit is functioning properly.

E. Static Source Error Correction

Static Source Error Correction (SSEC) refers to a correction to account for errors that are long term, measurable, and repeatable. Typical static sensing systems are built as flush openings in the side of the aircraft, or as a protruding probe. The airflow past the static port causes the pressure in the static system to be different from the undisturbed air.

In general terms, a pressure error is caused by anything that causes a variation in the airflow as it passes the static port. Examples are as follows:

- Airflow around the curved fuselage
- Landing gear extended
- Position of flaps
- Aircraft yawing motion
- Angle Of Attack (AOA) changes.

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F. Operational Range

The AZ-850 MADC is capable of supplying airspeed and altitude data over the ranges specified below:

- Altitude ....-1,000 to 60,000 feet
- Indicated Airspeed ....40 to 450 knots
- True Airspeed ....50 to 599 knots.

G. Overspeed Warning

During the normal mode of operation, overspeed warning is a signal to the pilot when the CAS output has exceeded the current value of Vmo. Overspeed warning function in the functional test mode is to illustrate the warning signal operates correctly.

The AZ-850 MADC computes the overspeed warning using calibrated airspeed, Mach, Vmo, Mmo, and pressure altitude. Overspeed warning is computed by comparing the pressure altitude with the break point in the Vmo/Mmo curve, see Figure 2-3-6. The break point is the point that Vmo is constant or linear below and Mmo is constant or linear above. If pressure altitude is at or below the break point in the curve, then the CAS is compared to Vmo to switch overspeed warning ON and OFF. If pressure altitude is above the break point in the curve, then Mach is compared to Mmo to switch overspeed warning ON and OFF.

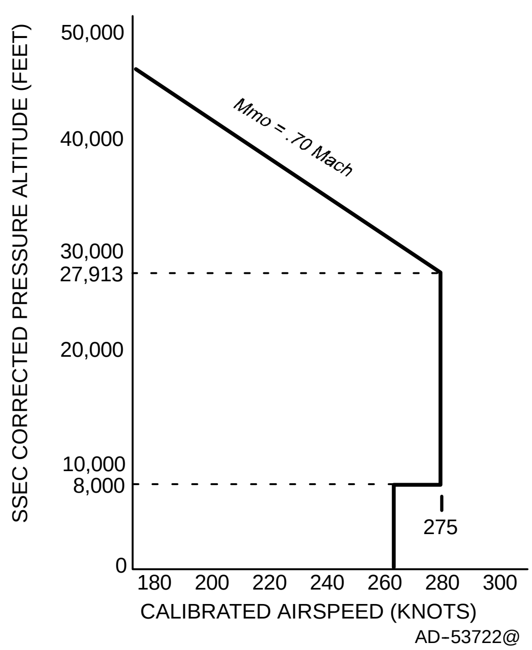

Figure 2-3-6. Vmo/Mmo Curve

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Table 2-3-3. AZ-850 MADC Performance Accuracy

Parameter	Range	Accuracy	SSEC
Barometric Altitude	-1,000 to 60,000 ft	From -1000 ft to sea level:......... ±15 ft From sea level to 20,000 ft:......... ±20 ft From 20,000 ft to 30,000 ft:......... ±40 ft From 30,000 ft to 50,000 ft:......... ±80 ft From 50,000 ft to 60,000 ft:....... ±150 ft	Yes
Altitude Rate	±20,000 fpm	±30 fpm or ±5% (largest)	Yes
Mach	0.380 to 0.99	Variable from ±0.003 to ±0.050 M depending on speed and altitude	Yes
Indicated Airspeed	40 to 450 kts	From 30 to 60 kts:...................... ±5 kts At 80 kts:.................................. ±3 kts From 100 to 200 kts:.................. ±2 kts At 450 kts:................................ ±5 kts	Yes
True Airspeed	50 to 599 kts	At 50 kts .... ±12 kts At 70 kts.................................. ±8 kts From 150 to 599 kts.................. ±4 kts	Yes
Static Air Temperature	-99 to + 60 °C	±1°C	No
Total Air Temperature	-78 to +99 °C	±1°C	No
Baro Corrected Altitude	-1,000 to 60,000 ft	±5 ft or 0.5% (largest)	No
Baro Correction	541 to 1083 hPa 16.0 to 32.0 inHg	± 1.0 hPa ± 0.01 inHg	No

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Table 2-3-4. MADC Functional Test Outputs

Parameter	ARINC 429 VALUE
Pressure Altitude	4,000 ft
Baro Corrected Altitude	1,000 ft
Altitude Rate	5,000 ft/min
Calibrated Airspeed	325 kts
True Airspeed	325 kts
Mach	0.77
Static Air Temperature	-45°C
Total Air Temperature	-16°C
Baro Correction inHg	29.921 inHg
Baro Correction mB	1013.0 mB
Static Pressure	29.92 inHg
Total Pressure	1013.2 mB
Impact Pressure	181.8 mB
Vmo	320 kts
Vmo Warning	Active for 2 seconds
MADC Valid	Inactive
Output Discretes	Active

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4. Fault Monitoring

Fault indications are presented on the primary flight and multifunction displays.

A. Primary Flight Display (PFD)

Figure 2-3-7 shows the fault indications as presented on the PFD. MADC faults displayed on the PFD are as follows.

(1) If Barometric Altitude is Invalid

- The digits, ticks, and chevrons on the altitude tape are removed and a red **X** is placed over the tape
- The selected altitude digits are replaced with five amber dashes
- The selected altitude bug is removed.

(2) If Indicated Airspeed is Invalid

- The digits and ticks on the airspeed tape are removed and a red X is placed over the tape
- The airspeed trend vector is removed
- The Vspeed bugs, if selected, are removed
- The selected airspeed bug and digital readout is removed.

(3) If Vertical Speed (altitude rate) is Invalid

- The vertical speed pointer and digital readout are removed
- The vertical speed target bug and digital display are removed
- A boxed VS is displayed vertically in the center of the vertical speed arc.

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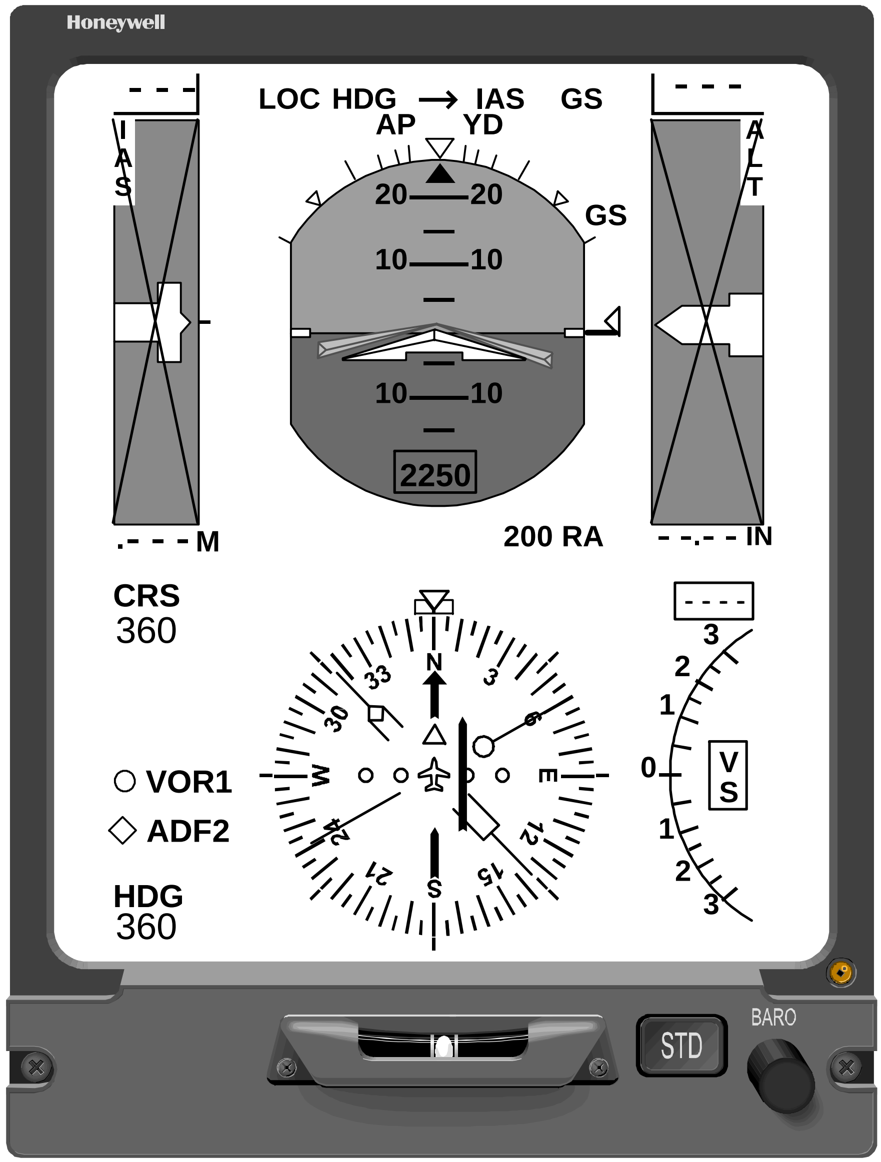

NOTE: THE DISPLAY SHOWN MAY NOT REPRESENT ACTUAL FLIGHT CONDITIONS.

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Figure 2-3-7. PFD MADC Failure Indications (Phase III View)

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B. Multifunction Display (MFD)

Figure 2-3-8 shows the fault indication as presented on the MFD. MADC faults displayed on the MFD are the same for the MAP and PLAN formats.

If TAS is invalid, the digits are replaced with three amber dashes

Figure 2-3-8. MFD MAP MODE MADC Failure Indications (Phase III View)

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List of Illustrations

List of Tables

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SECTION 2.4
PRIMUS® WEATHER RADAR SYSTEM

1. General

The PRIMUS 1000 Integrated Avionics System installed in the Citation Ultra aircraft includes the PRIMUS 650, 660, 870, or 880 Weather Radar system that is made up of one WU-6XX/8XX Receiver Transmitter Antenna (RTA), one WC-6XX/8XX Weather Radar Controller, and parts of the Electronic Display System (EDS). Each system is an X-band digital radar designed for weather location and analysis, and ground mapping.

The radar system detects precipitation in storms along the flight path and a zone 60 degrees left and right of the center line of the aircraft and gives the flight crew a visual indication, in color, of storm intensity and turbulence. In the Weather (WX) detection mode , target returns are displayed at one of five video levels (0, 1, 2, 3, or 4), with 0 represented by a black screen because of weak or no returns, and levels 1, 2, 3, and 4 represented by green, yellow, red, and magenta respectively, to show progressively stronger returns. Areas of potential hazardous turbulence are shown in gray-white.

The Ground Mapping (GMAP) mode enables the pilot to identify coastline, hilly or mountainous regions, cities, or large structures. The reflected signal from various ground surfaces is displayed as magenta, yellow, or cyan (most to least reflective).

The radar information can be displayed on the Primary Flight Displays (PFD) and/or the Multifunction Display (MFD). The radar range, operating mode, and antenna tilt functions are all controlled by the WC-6XX/8XX Weather Radar Controller.

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2. Component Descriptions and Locations

A. WU-6XX/8XX Weather Radar Receiver Transmitter Antenna

Figure 2-4-1 shows a graphical view of a typical weather radar receiver transmitter antenna (RTA). The RTA is located in the avionics nose bay of the aircraft. Table 2-4-1 gives leading particulars for the RTA.

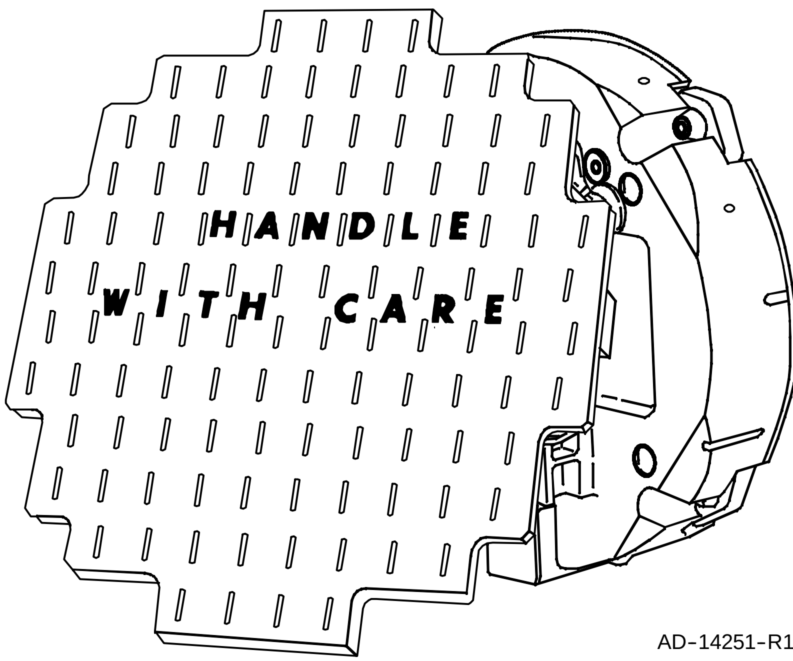

Figure 2-4-1. Typical Weather Radar Receiver Transmitter Antenna

Table 2-4-1. Weather Radar Receiver Transmitter Antenna Leading Particulars

Item	Specification
Dimensions (maximum):	
• Base Diameter	10.04 in. (255.0mm)
• Height (Antenna flat)	10.06 in. (255.5 mm)
• Height (Antenna full arc)	16.04 in. (407.4 mm)
Weight (maximum):	
• WU-650	13.7 lb (6.22 kg)
• WU-870	16.0 lb (7.26 kg)
• WU-660/880	15.7 lb (7.12 kg)
Primary Power	+22 to +32 V dc, 110 W (max)

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Table 2-4-1. Weather Radar Receiver Transmitter Antenna Leading Particulars (cont)

Item	Specification
Antenna:	
• Size	12-inch flat plate radiator
• Stabilization	Line-of-sight, ±30 degrees
• Tilt	±15 degrees
• Scan (Full)	120 degrees (±60 degrees)
• Scan (Sector)	60 degrees (±60 degrees)
Transmitter (WU-650/870):	
• Frequency	9345 ±25 MHz
• Power	1.3 kW (nominal), magnetron
• Pulse Width	1.2, 1.5, 2.4, 4.8, 9, 18, and 27 μSec determined by selected range and mode
• PRF (Pulse Repetition Frequency)	120, 240, 360, and 480 Hz, determined by selected range in WX (weather), 480/1260 in TRB (Turbulence), and 840 in ground clutter reduction (GCR)
Transmitter (WU-660/880):	
• Frequency	9375 ±25 MHz
• Power	10 kW (nominal), magnetron
• Pulse Width	1.0 and 2.0 μSec (nominal) determined by selected range and mode
• Pulse Repetition Frequency (PRF)	120, 240, and 420 Hz, determined by selected range and mode
Receiver (WU-650/870):	
• Noise Figure	8.5 dB, typical
• Intermediate Frequency (IF)	35 MHz
• IF Bandwidth	0.8 MHz (nominal)
• Video Bandwidth	Commensurate with selected pulse width
• STC (Sensitivity Time Control)	Present in all modes
• Minimum Discernible Signal (MDS)	–112.4 dBm (nominal) on 300 NM range

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Table 2-4-1. Weather Radar Receiver Transmitter Antenna Leading Particulars (cont)

Item	Specification
Receiver (WU-660/880):	
• IF	60 MHz, 1st conversion 10.7 MHz, 2nd conversion
• IF Bandwidth	0.725 MHz (nominal)
• Video Bandwidth	Commensurate with selected pulse width
• STC	Present in all modes
• MDS	–115 dBm (nominal) on 300 NM range
Displayed Ranges:	
• WX/MAP	5, 10, 25, 50, 100, 200, and 300 NM full scale with three concentric range rings (cyan for WX, green for MAP)
• Flight Plan	5, 10, 25, 50, 100, 200, 300, 500, and 1000 NM full scale
User Replaceable Parts	None
Mating Connector:	
• WU-650	MS3126F20–41S, HPN 4000809–606
• WU-870	MS3126F22–55S, HPN 4000809–626
• WU-660/880	Glenair PN DD104F1000, HPN 7517883–3

The RTA is an integrated unit that incorporates receiver, transmitter, and antenna into a single unit. A 12-inch flat plate radiator is used on the Citation Ultra aircraft. The remainder of the circuitry is contained in the electronics package that forms the RTA base. Another feature of the base is a scan switch and a transmit ON/OFF switch for ease of adjustments during installation and maintenance.

Elevation and azimuth drive motors, pitch and roll potentiometers, and associated electronics are mounted on the pedestal that holds the antenna. An electrical connector on the pedestal is the sole electrical interface with aircraft primary power and the rest of the radar system. The RTA operates from the aircraft 28 V dc power bus. The RTA is cantilever-mounted on the forward bulkhead, in the nose of the aircraft, behind the radome fabricated to the operating frequency of the radar system.

The weather radar receives a two wire pitch and roll analog signal from the VG-14A Vertical Gyro for weather radar antenna stabilization.

CAUTION: MAXIMUM PERMISSIBLE EXPOSURE LEVEL (MPEL).

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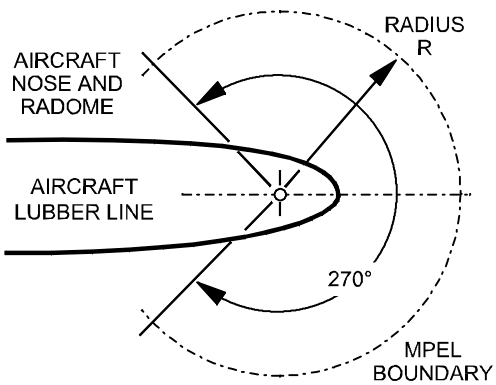
Heating and radiation effects of weather radar can be hazardous to life. Personnel should remain at a distance greater than R (see Figure 2-4-2) from the radiating antenna in order to be outside of the envelope in which radiation exposure levels equal or exceed 10 mW/cm^2, the limit recommended in FAA Advisory Circular AC No. 20-68B, August 8, 1980, Subject: Recommended Radiation Safety Precautions for Ground Operation of Airborne Weather Radar. The radius, R, to the Maximum Permissible Exposure Level (MPEL) boundary is calculated for the radar system on the basis of radiator diameter, rated peak-power output, and duty cycle. The greater of the distances calculated for either the far-field or near-field is based on the recommendations outlined in AC No. 20-68B.

IEEE Standard for Safety Level with Respect to Human Exposure to Radio Frequency Electromagnetic Fields 3 kHz to 300 GHz (IEEE C95.1-1991), recommends an exposure level of no more than 6 mW/cm^2.

Honeywell Inc. recommends operators follow a 6 mW/cm^2 standard. Figure 2-4-2 shows MPEL for 10 mW/cm^2 and 6 mW/cm^2 exposure levels.



RADAR SYSTEM	DIAMETER OF FLAT-PLATE RADIATOR	10 mW/CM^2 RADIUS R OF MPEL BOUNDARY	6 mW/CM^2 RADIUS R OF MPEL BOUNDARY
PRIMUS® 650/870	12 IN / 30.5 CM	6 FT / 1.8 M	9 FT / 2.7 M
PRIMUS® 660/880	12 IN / 30.5 CM	6 FT / 1.8M	7.5FT / 2.3 M

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Figure 2-4-2. Maximum Permissible Exposure Level Boundary

CAUTION: GROUND OPERATIONS.

Danger from ground operation of airborne weather radar includes the possibility of human body damage and ignition of combustible materials by radiated energy. If the radar is to be operated in any mode other than Standby (SBY), while the aircraft is on the ground, the following precautions are recommended:

- Direct nose of aircraft such that antenna scan sector is free of large metallic objects such as hangars or other aircraft for a distance of 100 feet, and tilt antenna fully upwards
- Avoid operation during refueling of aircraft or other refueling operations within 100 feet
- Avoid operation if personnel are standing within range as specified in Figure 2-4-2 in the 270° forward sector of the aircraft.

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B. WC-6XX/8XX Weather Radar Controller

Figure 2-4-3 shows a graphical view of various weather radar controllers. The controller is located on the pedestal in the cockpit of the aircraft. Table 2-4-2 gives leading particulars for the controller.

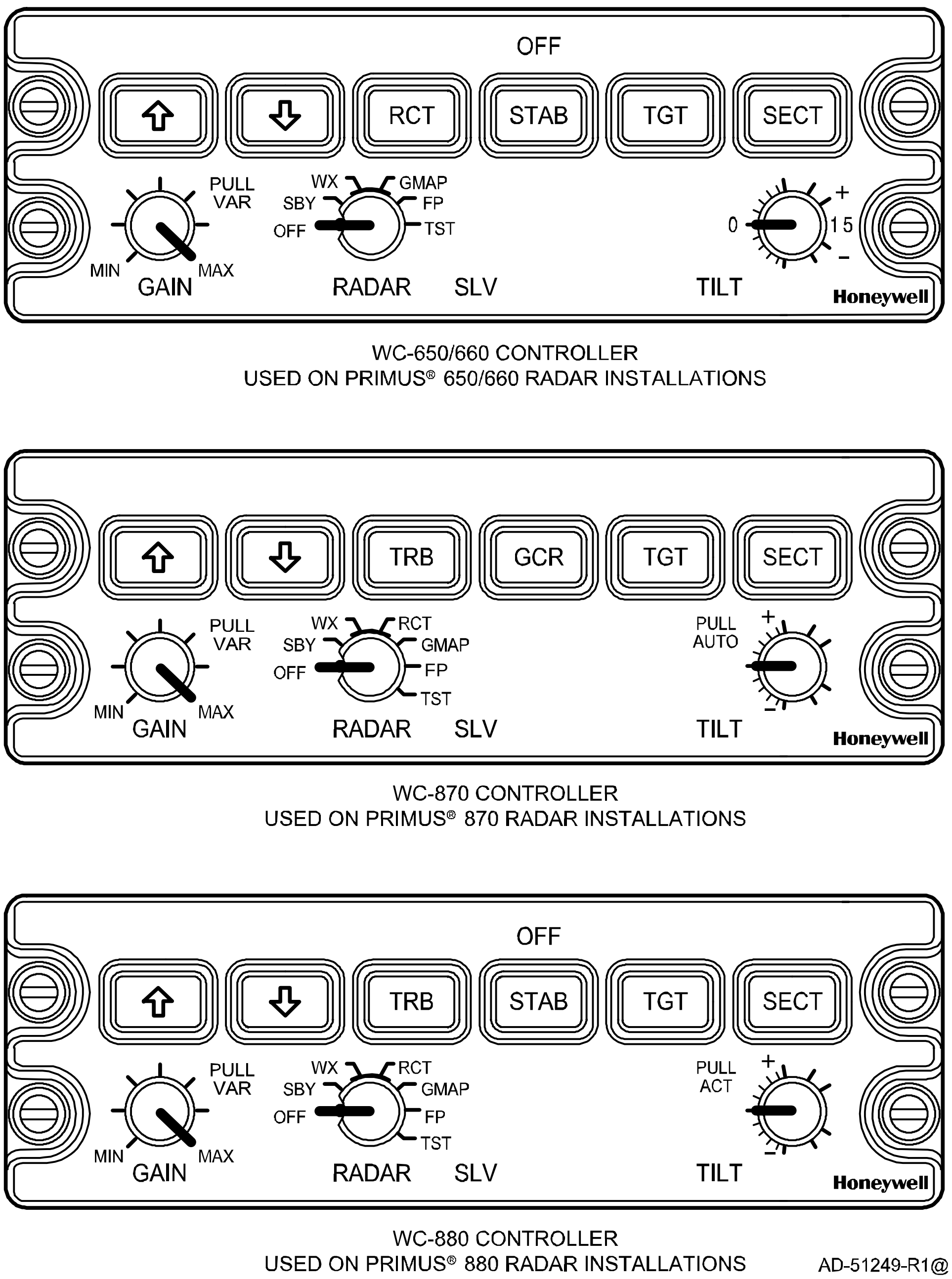

Figure 2-4-3. Various Weather Radar Controllers

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Table 2-4-2. WC-XXX Weather Radar Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.875 in. (47.63 mm)
• Width	5.75 in. (146.05 mm)
• Length (from back of mounting plate)	7.00 in. (177.80 mm)
Weight	2.0 lb (0.91 kg)
Power Requirements:	
• Primary	28 V dc, 0.15 A (0.2 A maximum @ 20 V) (20 V dc minimum to 33 V dc maximum)
• Panel Lighting	5 V ac or dc, 2A 28 V dc, 0.6 A
User Replaceable Parts:	
• Knob, Gain/Tilt	HPN 7011875-903
• Knob, Mode	HPN 7011875-904
• Setscrew (Multi-Spline, 2-56 x 1/8, Cup Point)	HPN 2500148-64
Mating Connector	Cannon Part No. KJ6F14A18SN or equivalent
Mounting	Standard Dzus Rail

The pilot uses the WC-XXX Weather Radar Controller to select the modes, range, and antenna tilt. The radar information is displayed on the PFD and/or MFD. Knob and switch selections on the controller are processed, converted to digital format, and transmitted to the RTA. The controller is panel mounted on Dzus rails with four, one-quarter turn fasteners.

The controller interfaces with the RTA through an Enhanced Serial Control Interface (ESCI) bus. Data representing knob and switch selections are encoded in either two's complement fractional binary notation or binary coded decimal notation and transmitted to the RTA. The bus is connected by a shielded twisted wire pair that carries data in one direction only. ESCI bus transmissions consist of words made up of three bytes of serial information. The first byte is called the (octal) label, that identifies the type of data contained within the word, and the second and third bytes are the data. There are eight labels (A0 thru A7) and 24 bytes of data. These words are updated and transmitted every 60 ms. Bit number 1 is always the first bit transmitted, and bit number 7 is always the last bit transmitted.

The WC-XXX Weather Radar Controller function of each switch and control is given in Table 2-4-3.

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Table 2-4-3. WC-XXX Control Functions

Item	Functional Description
RADAR MODE	A six-position (WC-650/660) or seven-position (WC-870/880) rotary switch that selects the following primary radar modes: • OFF – Removes power from the system. • SBY – Standby; places the system in non-transmitting mode. • WX – Selects the system weather mode. • RCT – (WU-650/660 only) Enables WX compensation and the cyan background REACT (Rain Echo Attenuation Compensation Technique) field to indicate ranges the receiver calibration has been exceeded in WX mode. RCT is selected in the TST mode on alternate sweeps automatically. RCT compensation is available in all modes except GMAP. • GMAP – Places the system in ground map mode. RCT compensation is inactive. • FP – Selects the system flight plan (navigation) display mode. • TST – Selects the system self-test mode.
GAIN	Single-turn rotary control that varies the RTA receiver gain. Control is active when pulled. When pushed, receiver gain is preset and calibrated. Selection of RCT or TGT ALERT overrides the variable gain setting causing receiver gain to be fixed and calibrated. When active (pulled), full CCW rotation supplies straight gain increase over the preset value.
TILT	Single-turn rotary control that varies antenna tilt between 15 degrees up and 15 degrees down. The range between +5 degrees and -5 degrees is expanded for ease of set ability. • AUTO TILT (PULL) – Places elevation control under auto tilt that adjusts antenna tilt in relation to altitude and selected range. Tilt knob can be used for fixed offset corrections of up to ±2.0 degrees. Available on WU-870 RTA only. • ACT TILT (PULL) – Places elevation control under Attitude Compensated Tilt (ACT) that adjusts antenna tilt in relation to altitude and selected range. Tilt knob can be used for fixed offset corrections of up to ±2.0 degrees. Available on WU-880 RTA only.
TRB	Momentary button that selects the Turbulence mode. In this mode, areas of potentially hazardous turbulence are displayed in gray-white color, in addition to normal reflectivity data. TRB can only be engaged in the WX mode and in selected ranges of 50 NM or less. This function is not available in the WU-650/660 RTA.
STAB	Momentary button that selects the stabilization function. Also, used to invoke the stabilization trim mode. This function is not available in the WU-870 RTA. On WC-660/880 controllers, the STAB button is used to override forced standby by pushing it four times within 3 seconds.
GCR	Momentary button that selects Ground Clutter Reduction (GCR) mode. GCR is operational in WX mode and selected ranges of 50 NM or less.
TGT	Momentary button that selects the target alert function.

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Table 2-4-3. WC-XXX Control Functions (cont)

Item	**Functional Description**
SECT	Momentary button that selects either full (120 degrees) or reduced (60 degrees) scan sector.
RCT WC-650/660 only	Momentary button that enables the REACT. RCT is always selected in the TEST mode. RCT compensation is available in all modes except MAP.
Range	A two-button range selection function that permits range selection from 5 to 300 NM full scale in WX, RCT, or GMAP mode or 5 to 1000 NM full scale in the Flight Plan mode. The up arrow button selects increasing range while the down arrow button selects decreasing ranges. These buttons are also used to exit Forced Standby (FSBY). If FSBY is wired to a Weight-On-Wheels (WOW) switch, the unit is in FSBY on the ground unless both RANGE buttons are pushed simultaneously.

NOTE: In a dual-controller installation, there is a Slave (SLV) annunciator that lights on the controller whose mode control is in the OFF position when the mode control on the other controller is in an operating mode (mode other than OFF). If the mode controls on both controllers are in the OFF position, the SLV annunciator on both controllers are OFF.

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3. Operation

A. Introduction

The PRIMUS Weather Radar System is an X-band digital radar designed for weather detection, analysis, and ground mapping. The display of this information is presented on the PFDs, the MFD, or a combination of these displays. With a single weather radar controller all displays are identical.

The weather radar Receiver Transmitter Antenna (RTA) detects storms along the flight path of the aircraft and gives the flightcrew a visual indication, in color, of storm intensity. The Weather (WX) detection mode displays rainfall intensity levels in bright colors against a black background. Areas of heaviest rainfall appear in magenta, significant rainfall is red, medium intensity rainfall is yellow, and weakest rainfall is green.

The surface mapping mode (GMAP) enables the pilot to identify coastline, hilly or mountainous regions, cities, or large structures. The reflected signal from various ground surfaces is displayed as magenta, yellow, or cyan (most to least reflective).

The weather radar controller selects the radar operating mode and controls the antenna tilt by rotary switches on the controller. Radar range is selected by buttons on the controller.

There are five modes of operation associated with the The PRIMUS Weather Radar System as follows:

- Standby (SBY)
- Weather (WX)
- Ground Map (GMAP)
- Flight Plan (FP)
- Test (TST).

The PRIMUS Weather Radar System incorporates features such as REACT (RCT), Target Alert (TGT), and Turbulence (TRB).

Refer to Figure 2–4–4 for the P-650/870 Weather Radar interface diagram and Figure 2–2–6 for the P-660/880 Weather Radar interface diagram.

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B. **Weather Radar System Functions**

The WC-XXX Weather Radar Controller selects the modes, range, and antenna tilt. The radar information is displayed on the PFD and/or MFD. Knob and switch selections on the controller are processed, converted to digital format, and transmitted to the WU-XXX RTA. The function of each switch and control of the controller is previously listed in Table 2-4-3.

The RTA accepts mode, tilt, etc., commands from the controller on a serial control bus. The RTA outputs mode, range, tilt, etc., commands to the IACs on two EDS control buses, and outputs scan converted data to the DUs on two EDS picture buses. Antenna stabilization data is input from the No. 1 Vertical Gyro via a two-wire pitch and roll analog signal. REACT compensation override is grounded so that selection of RCT mode on the weather radar controller overrides the GAIN control setting and forces preset gain.

C. **Modes of Operation**

On power-up, the system automatically comes on in standby. When power is first applied, the radar is in WAIT for 45 seconds, allowing the magnetron to warm up.

(1) Standby (SBY)

Standby is used for keeping the radar in a ready state while taxiing, loading, etc. In SBY, the antenna does not scan, the transmitter is disabled, the display memory is erased, and the antenna is stowed in a tilt-up position. SBY can be selected anytime it is desired to keep power on the system without transmitting.

The system contains a Forced Standby (FSBY) function. This permits the WOW switch to force the radar into standby automatically. When this occurs, the mode FSBY is displayed. When the aircraft is on the ground, the user can override it by pressing both range buttons on the WC-XXX simultaneously.

(2) Weather (WX)

Weather operation is selected by placing the mode control switch to the WX position. If selected prior to the end of the warm-up period, WAIT is displayed until the transmitter warms up (approximately 50 to 90 seconds). WX is displayed in the mode field. Transmitter output power is radiated in the WX mode. In the WX mode, four precipitation levels are displayed, as given in Table 2-4-4.

Table 2-4-4. Target Intensity Levels

Display Level	Rainfall Rate (MM/HR)	Rainfall Rate (IN/HR)	Storm Category
4 Magenta	Greater than 52	Greater than 2.1	Extreme/Intense
3 Red	12 – 52	0.5 – 2.1	Strong
2 Yellow	4 – 12	0.17 – 0.5	Moderate
1 Green	1 – 4	0.04 – 0.17	Weak
0 Black	Less than 1	Less than 0.04	–

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(3) Rain Echo Attenuation Compensation Technique (REACT/RCT)

The REACT/RCT function permits the radar receiver to adjust its own sensitivity automatically to compensate for attenuation losses as the radar pulse passes through weather targets on its way to light other targets. This is done by measuring the intensity of signals, and deducing from them the density, and therefore, the attenuation of the target, and then using this information to adjust the sensitivity. This is done continuously on each radar azimuth radial. There is a maximum value that sensitivity can be set, due to the receiver generating noise, and would fill the display with noise it it were too high. When this maximum value is reached, a cyan field is displayed for the remainder of the displayed range. This gives the pilot an unmistakable warning that attenuation is hiding possible severe weather areas that cannot be accurately detected.

REACT is always selected in TEST mode. REACT is available in all modes except GMAP.

Receiver sensitivity, even in the absence of targets, is gradually increased by the Sensitivity Time Control (STC) and the Extended Sensitivity Time Control (XSTC) circuits with increasing range, to compensate for weakening of targets, due to simple distance. The REACT modifies this action.

(4) Ground Mapping (GMAP)

The ground mapping operation is selected by setting the mode control to the GMAP position. The TILT control is turned down until the desired amount of terrain is displayed. The degree down-tilt depends on the aircraft altitude and the selected range.

The receiver STC characteristics are altered to supply equalization of ground-target reflection versus range. As a result, the selection of preset GAIN generally supplies the desired mapping display. However, the pilot can decrease the gain manually by selecting Variable (VAR) gain and rotating the GAIN control.

Ground mapping gives the pilot the opportunity to interpret the color display patterns that indicate water regions, coast lines, hilly or mountainous regions, cities, and large structures. In GMAP mode, targets of increasing reflectivity are displayed as; cyan, yellow, and magenta.

(5) Flight Plan (FP)

Flight Plan (FP) mode of operation can be used with certain long-range navigation systems. If operational, placing the radar mode in the FP position displays the active flight plan from the long-range navigation system. The maximum range and type of data displayed is dependent on the capabilities of the long-range navigation system.

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(6) Test (TST)

Test (TST)is used to select the special test pattern to give verification of system operation (refer to Figure 2-4-8 thru Figure 2-4-10).

WARNING: OUTPUT POWER IS RADIATED IN TEST MODE.

To inhibit the radar from radiating in the test mode, the XMTR ON switch on the RTA is placed OFF (toward the antenna). The radar is tested as normal, however, an amber FAIL message is displayed. To inhibit the radar antenna from scanning during test, the SCAN ON switch on the RTA is placed OFF (toward the antenna). The radar tests normally, but a SCAN FAIL message is displayed.

CAUTION: ENSURE THE XMTR ON AND SCAN ON SWITCHES ON THE RTA ARE RETURNED TO THEIR NORMAL POSITION (AWAY FROM THE ANTENNA) FOR FLIGHT.

With TST selected; 100-mile range is automatically selected; TEST is displayed in mode field. Transmitter output power is radiated in TEST mode. Any faults present are displayed (refer to Figure 2-4-6 and Figure 2-4-7).

(7) Turbulence (TRB)

With the Turbulence (TRB) submode selected (WU-870/880 RTAs only), the radar processes return signals in order to determine if a turbulence signature is present. Areas of potentially hazardous turbulence are displayed as gray-white. The high power of the PRIMUS 870/880 permits detection of hazardous turbulence in areas of otherwise weakly reflective rainfall. Any areas shown as turbulence should be avoided. TRB can only be engaged in the WX mode and in selected ranges of 50 NM or less.

(8) Stabilization (STAB)

Deselecting stabilization disables stabilization inputs for the antenna. When disabled, the OFF condition is annunciated above the button and pitch and roll inputs to the antenna are zero. The antenna beam is no longer maintained at the selected tilt angle relative to the earth's surface.

On WC-660/880 controllers, the STAB button is used to override forced standby by pushing it four times within 3 seconds.

(9) Target Alert (TGT)

Target Alert (TGT) is a selectable ON/OFF feature to monitor for level 3 or greater targets within an arc of ±7.5 degrees dead ahead. TGT is selectable in any WX range, except 300 NM. For a target to activate the target alert feature, it must have a depth and range characteristic as given in Table 2-4-5.

Table 2-4-5. Target Alert Range and Depth

Selected Range (NM)	Target Depth (NM)	Target Range (NM)
5	2.0	5 – 155
10	2.0	10 – 160

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Table 2-4-5. Target Alert Range and Depth (cont)

Selected Range (NM)	Target Depth (NM)	Target Range (NM)
25	4	25 – 150
50	4	50 – 150
100	4	100 – 175
200	6	200 – 250
300	Inactive	–
FP	2	5 – 155

NOTE: While target alert is functional at the above ranges, it is improbable that a realistic target is strong enough to be detected if its range exceeds five times the displayed range. Also, note the target alert is inactive within the displayed range. Selecting target alert prevents variable gain from being selected.

(10) Sector Scan (SECT)

Sector Scan selects either full (120 degrees) or reduced (60 degrees) scan sector.

(11) Ground Clutter Reduction (GCR)

Ground Clutter Reduction separates the weather targets from ground clutter. The scintillation frequency (the frequency of amplitude variations) for ground return type targets is higher than the scintillation frequency of weather type targets. This occurs because ground targets are, typically, more stable and produce returns with lower frequency amplitude variations when compared to storm cells very active and rapidly changing. GCR is operational in WX mode and selected ranges of 50 NM or less.

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D. Mode and Warning Annunciations

The PRIMUS Weather Radar System has a number of mode and warning annunciations. The location of the WX mode and warning annunciation display fields for the PFD and MFD are illustrated in Figure 2-4-6 and Figure 2-4-7. Table 2-4-6 lists a full description of the different mode and warning annunciations and their line locations; the top being line number 1 and the bottom being line number 4.

If the WX RTA is transmitting, and WX is not selected for display on the PFD and/or MFD formats, the characters TX are annunciated. If WX is in WAIT, STBY, or FSBY modes, TX is not displayed.

Table 2-4-6. PFD and MFD WX Mode and Warning Annunciations

Display			Mode Description
Annunciation	**Color**	**Line No.**	
WAIT	GREEN	1	Power-up approximately 1 minute
STBY	GREEN	1	Normal standby
FSBY	GREEN	1	Forced standby (WOW)
TEST	GREEN	1	Test mode and no faults
WX	GREEN	1	Normal WX on and selected for display
WX	AMBER	1	Invalid WX control bus, invalid WX ranges
WX/T	GREEN	1	Normal WX with Turbulence (P-870 only)
TX	MAGENTA	1	WX is transmitting but not selected for display
STAB	AMBER	4	Stabilization off
TGT	GREEN	2	Target alert enable
TGT	AMBER	2	Target alert enabled and level 3 WX return detected in forward 15 degrees of antenna scan
VAR	AMBER	2	Variable gain
GCR	AMBER	1	Normal WX with ground clutter reduction (P-8XX only)
RCT	GREEN	1	Normal WX with react
R/T	GREEN	1	WX with REACT and Turbulence (P-870 only)
GMAP	GREEN	1	Ground map mode
FPLN	GREEN	1	Flight plan mode
FAIL	AMBER	1	Test mode and faults

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E. Hidden Modes

The PRIMUS Weather Radar System has a number of hidden modes selected by special control operations. They are not intended for use in normal operations. They are as follows:

Stabilization Align Mode

Entry:	Scan OFF/XMTR OFF/STBY
Exit:	Scan ON/XMTR ON
Purpose:	Align Stabilization

Roll Offset Adjustment

Entry:	Select WX and VAR gain Select RCT 4 times in 4 seconds
Exit:	Select RCT 4 times in 4 seconds
Purpose:	Adjust roll offset to compensate installation tolerances causing uneven ground return to be displayed

Forced Standby

Entry:	Ground FSB pins on controller
Exit:	Remove ground (above), or push both range buttons simultaneously
Purpose:	Allow WOW signal to force radar into standby.

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F. PRIMUS 650/870 and 660/880 Weather Radar Interface Diagrams

Refer Figure 2–4–4 and Figure 2–4–5 for weather radar interface diagrams.

(1) Left side VG-14A Vertical Gyro

The gyro supplies a two-wire, 50 mv/Deg, output of pitch attitude data and a two-wire 50 mv/Deg output of roll attitude data for antenna stabilization.

(2) Left side IC-600 IAC

The IAC receives a two-wire, 1 MHz serial bus input of display data from the RTA for EOS display.

(3) Right side IC-600 IAC

The IAC receives a two-wire, 1 MHz serial bus input of display data from the RTA for EOS display.

(4) WC-6XX/8XX Controller

The controller supplies all of the control inputs for the weather radar system.

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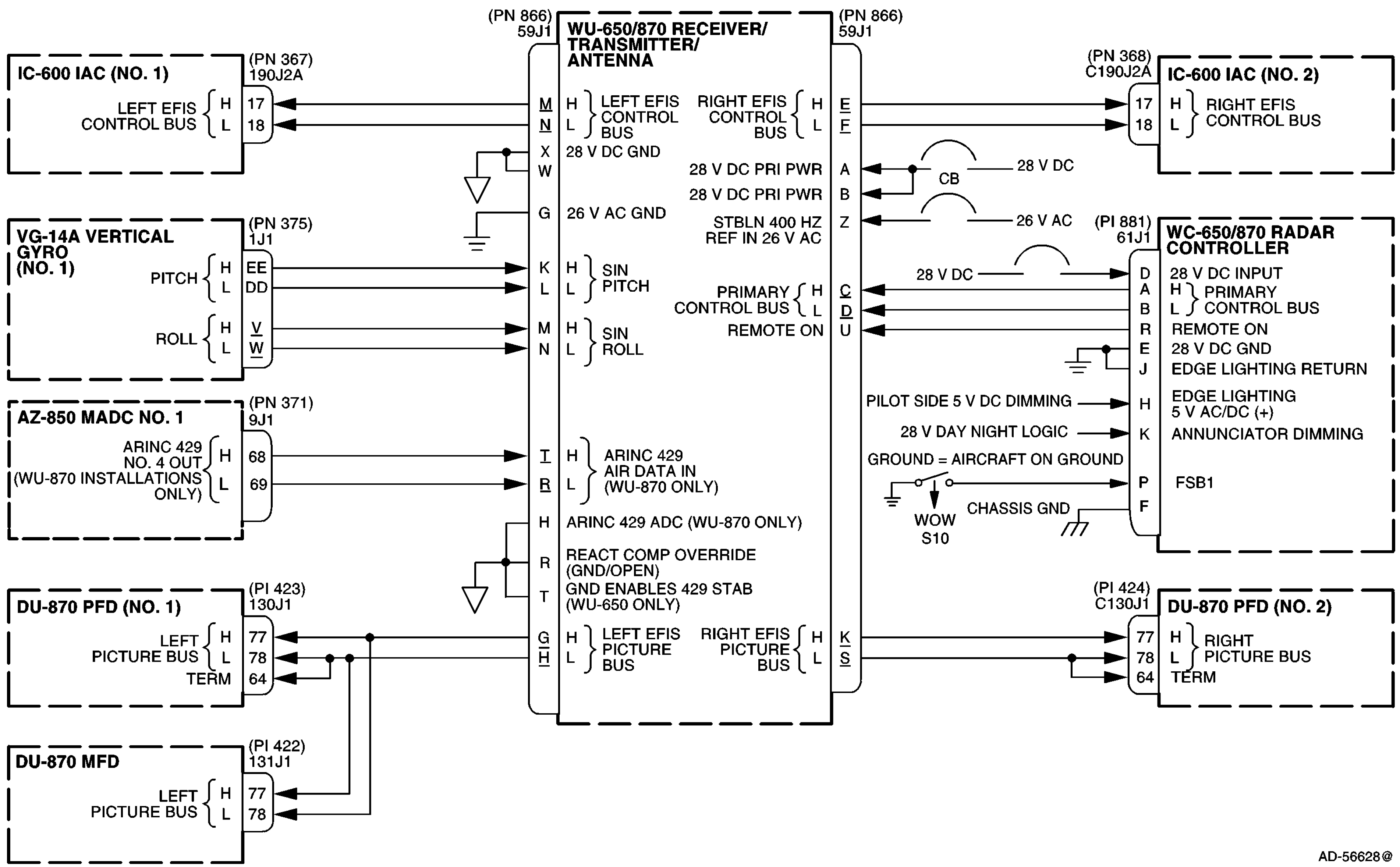

Figure 2-4-4. PRIMUS 650/870 Weather Radar System Interface Diagram

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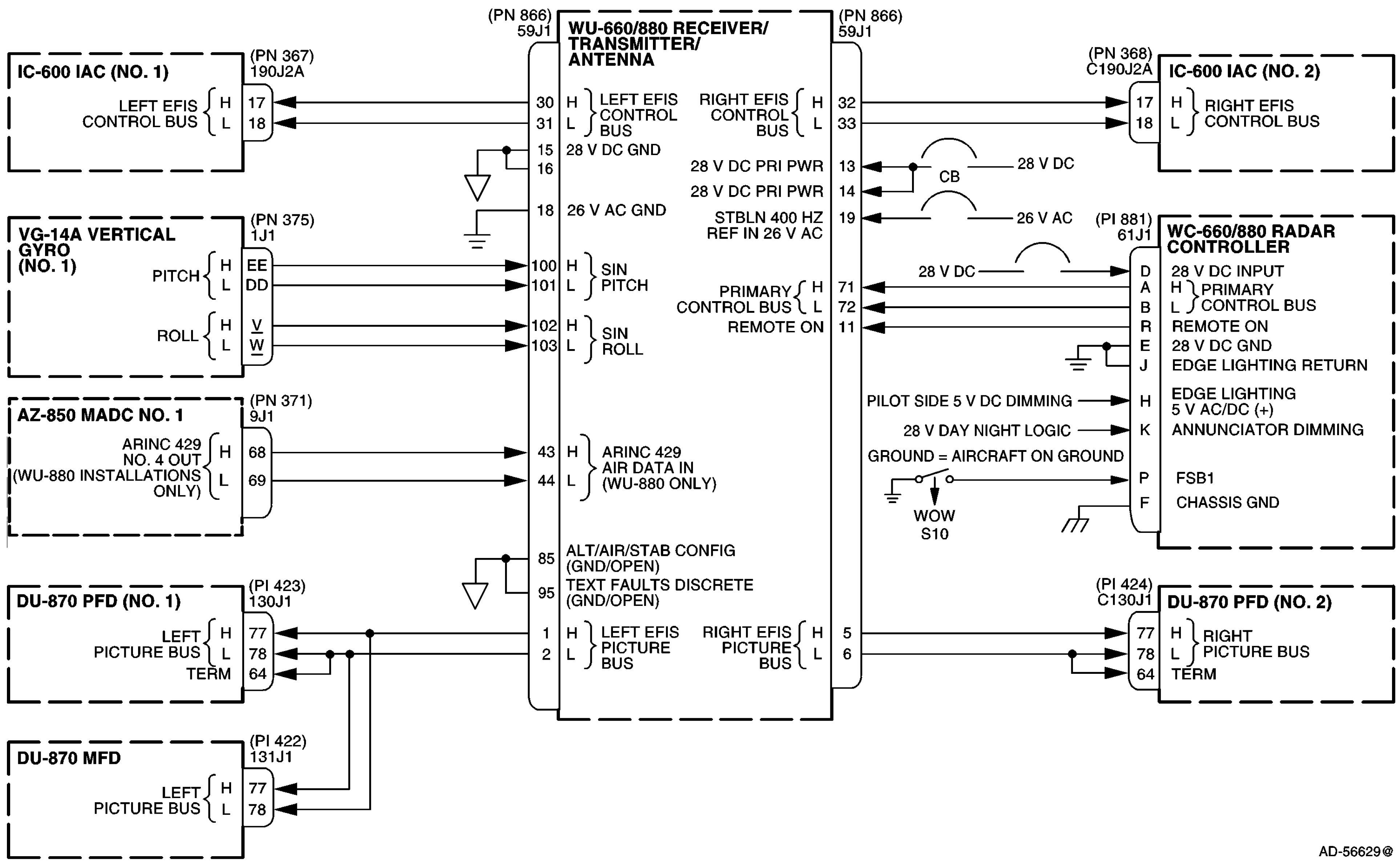

Figure 2-4-5. PRIMUS 660/880 Weather Radar System Interface Diagram

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4. Fault Monitoring

Fault indications are presented on the PFD and MFD displays.

A. Primary Flight Display (PFD)

Figure 2-4-6 shows the fault indication as presented on the PFD. Weather (WX) radar failure, regardless of the display format, (FULL/ARC/WX), annunciates an amber WX on the lower left side of the HSI, on the PFD.

Figure 2-4-6. PFD Weather Radar Failure Indication

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B. Multifunction Display (MFD)

Figure 2-4-7 shows the fault indication as presented on the MFD. Weather radar failure annunciates an amber WX on the lower left side on the MFD.

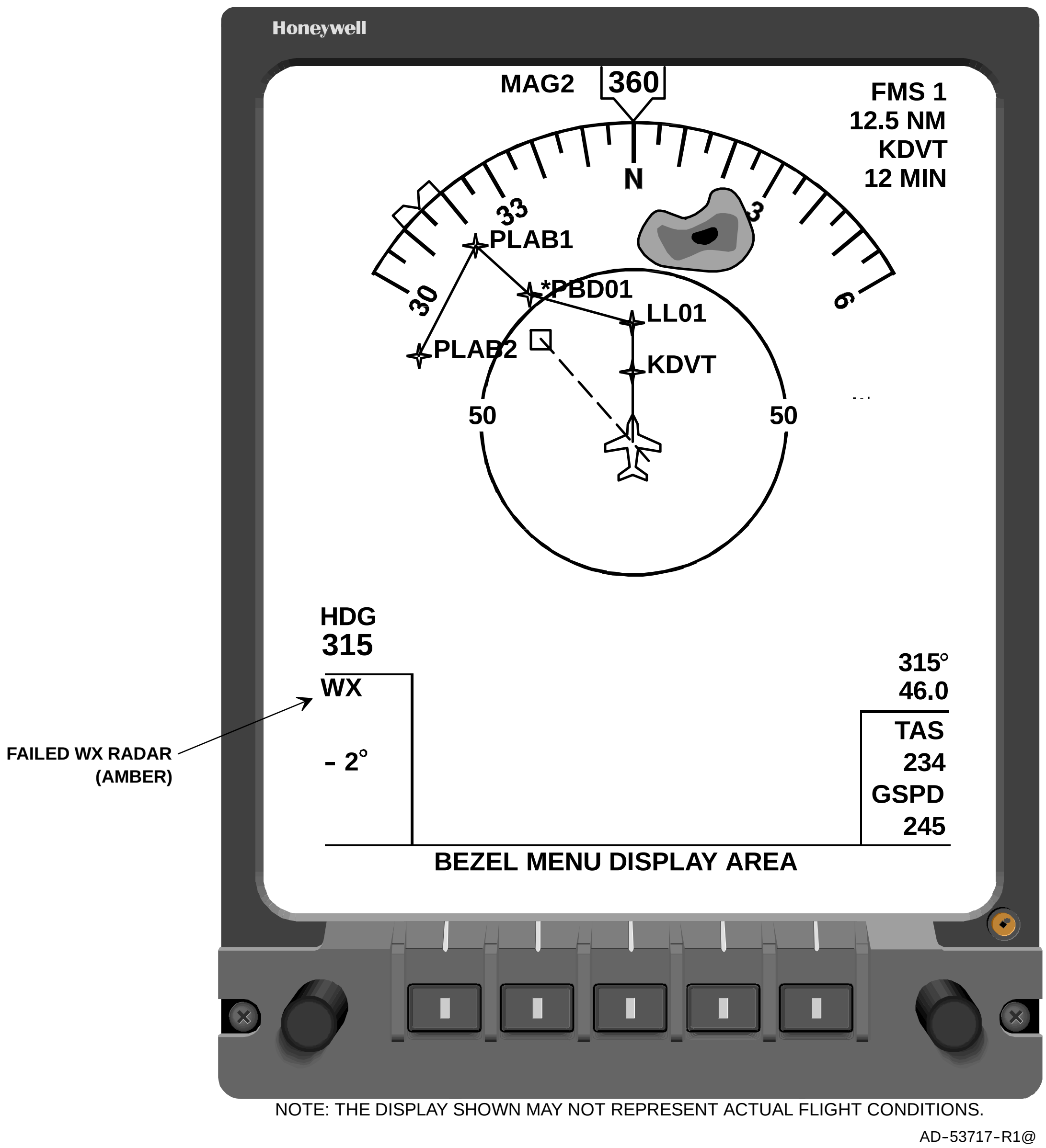

Figure 2-4-7. MFD Weather Radar Failure Indication

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C. PRIMUS 650/870 Weather Radar Test Mode

After an amber WX is annunciated, the fault codes can be read by entering into the TEST mode. Figure 2-4-8 shows the PRIMUS 650/870 MFD Weather Radar Test Mode, and Table 2-4-7 and Table 2-4-8 give the PRIMUS 650 and 870 Fault Codes and Fault Descriptions, respectively.

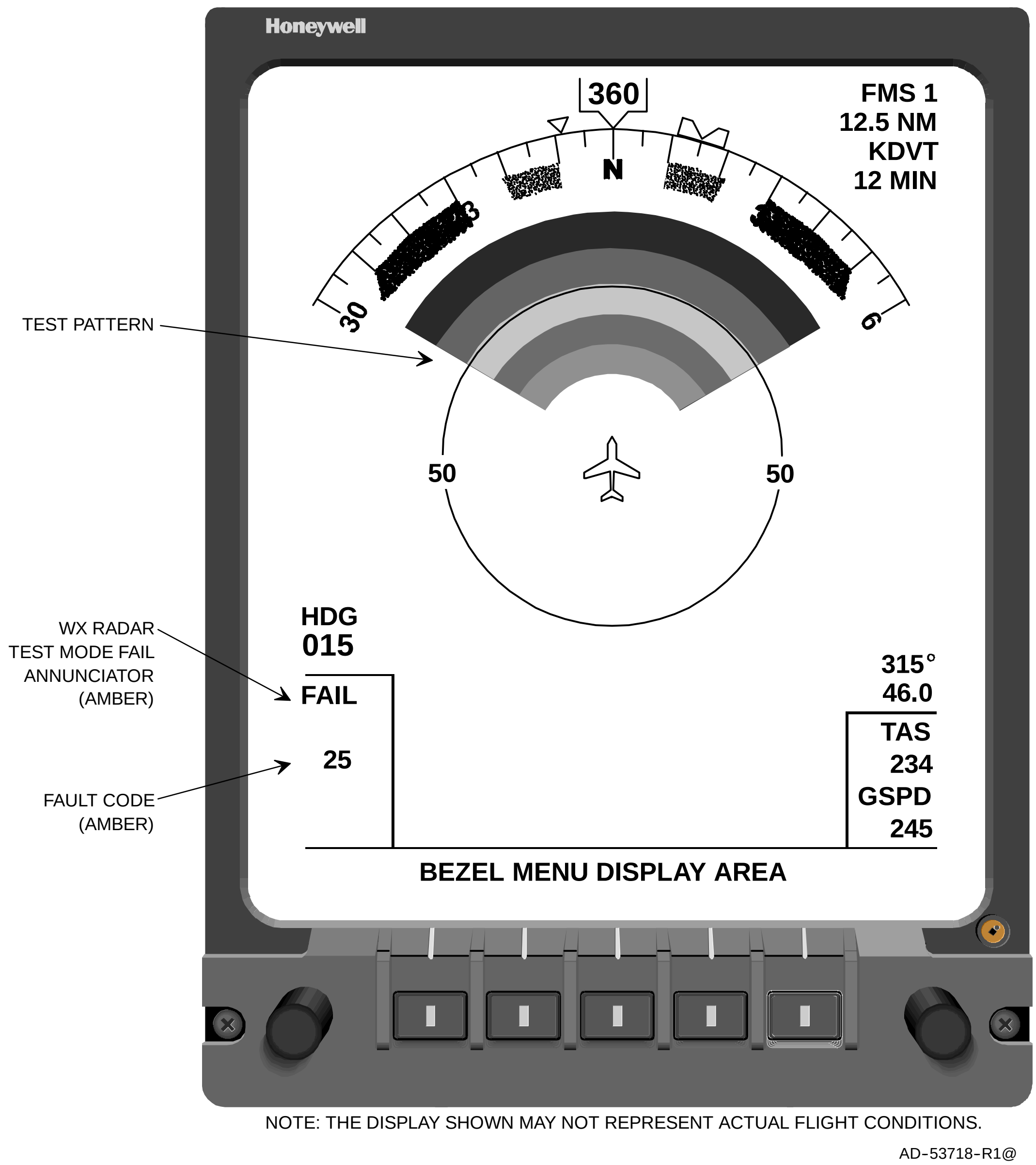

Figure 2-4-8. PRIMUS 650/870 MFD Weather Radar Test Mode Indications

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Table 2-4-7. PRIMUS 650 Fault Codes

Fault Code	Fault Descriptions
01	Antenna not scanning or scanning incorrectly.
02	Antenna stabilization errors
03	Radar receiver fault
04	Radar signal mixer current out of specification; probably due to defective mixer diodes.
05	Radar automatic frequency control fault. can be caused by a defective transmitter. This fault can be observed in TEST by the display of a broken noise band.
06	Indicates abnormal fan current for extended period of time.
07	Central Processor Unit (CPU) (microprocessor) fault in RTA.

NOTE: Some PRIMUS 650 installations can display some other number in the leading zero position of the fault code. Ignore if seen.

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Table 2–4–8. PRIMUS 870 Fault Codes

Fault Code	Fault Descriptions
03	Analog to Digital Converter Failure, > 1 minute
04	DADC Low Speed 429 Failure for > 4 minutes
06	Airspeed (DADC) of Analog) > 700 kts for > 4 minutes
07	Pulse Pair Processor Failure for > 1 minute
13	+15 Volts Failure (± 12.5 V or > 17.5 V for > 1 minute
14	Parallel Altitude change > 1000 feet
16	Magnetron voltage Failure (< 1500 Volts, > 2700 Volts, > 1 minute)
21	Azimuth scanning incorrectly (> 2.5 degrees for > 1 minute)
22	STAB reference (< 1/2 A/D scale for > 4 minutes)
23	Automatic Gain Control Failure (< –1.1 V or > 10.5 V for > 1 minute)
24	Mixer Current Failure for > 1 minute
25	AFC Lock Failure for > 1 minute or 10 unlocks < 1 minute
26	Fan Voltage Abnormal for > 4 minutes
27	VLSI Failure-Loss of VALID READY Interrupt
30	Non-Volatile Memory Failure
31	Antenna Elevation error (> 2 degrees for > 1 minute)
32	NAV Computer High Speed ARINC 429 Failure for > 4 minutes
33	–15 Volts Failure (< –18 V or > –12.5 V for > 1 minute)
35	AFC Sweep Failure (< 1.2 V or > 12.7 V for > 1 minute)
36	Altitude Failure – If input is > 60,000 feet for > 4 minutes
37	RAM Test Failure

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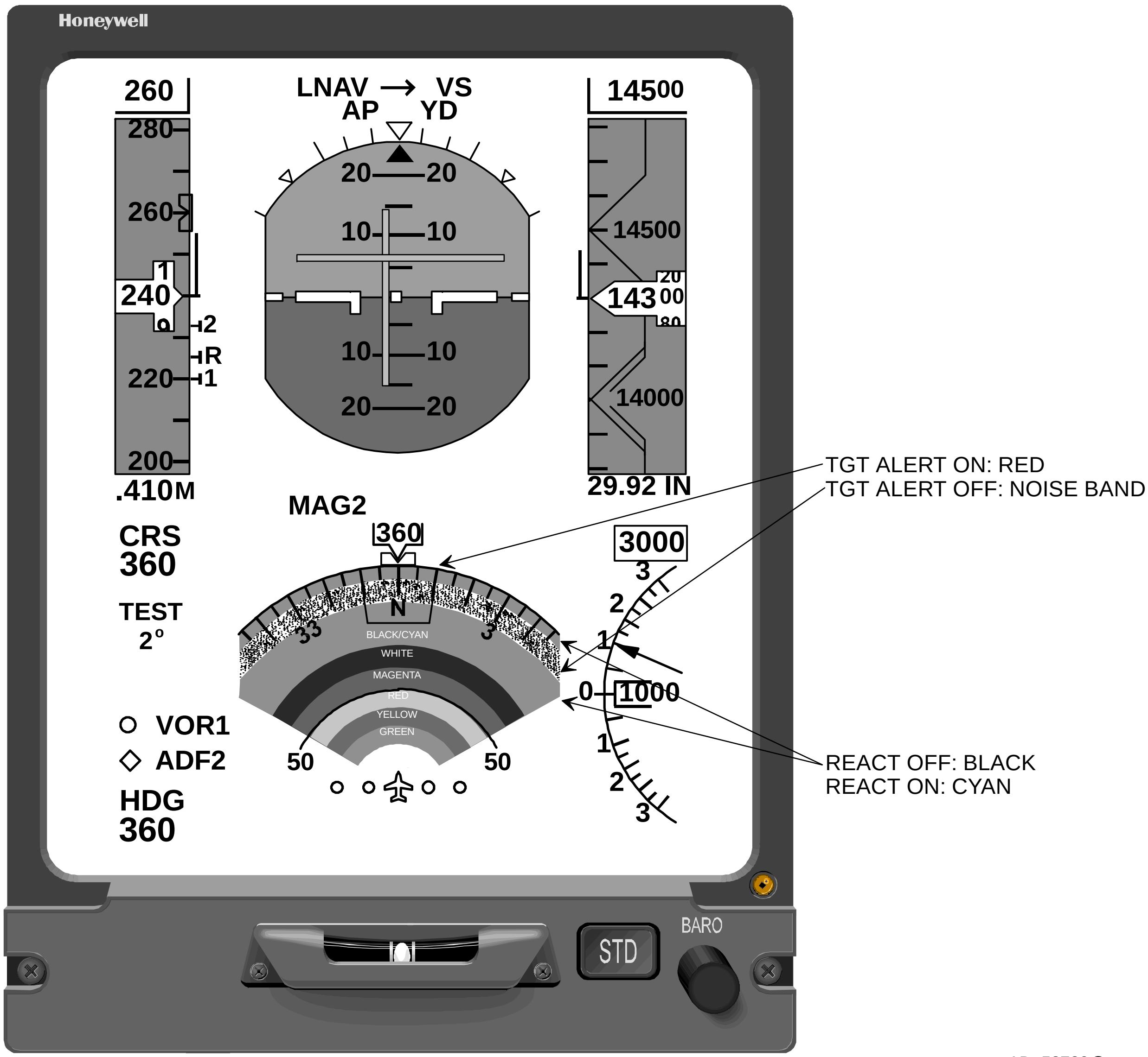
Figure 2-4-9 shows the PRIMUS 650/870 PFD Weather Radar Test Mode.



NOTE: THE DISPLAY SHOWN MAY NOT REPRESENT ACTUAL FLIGHT CONDITIONS.

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Figure 2-4-9. PRIMUS 650/870 PFD Weather Radar Test Mode Indications

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D. PRIMUS 660/880 Weather Radar Test Mode

The PRIMUS 660/880 Weather Radar Systems can provide fault information on one of the following two formats:

- Fault codes
- Text codes.

The selection is made during initial system installation.

When a fault occurs (either in-flight or on-ground), an amber WX overrides the mode annunciation on the PFD and/or MFD displays. The fault annunciation remains until the fault condition clears.

If fault annunciation occurs, the flight crew should select the test mode and note the displayed text fault or fault code and take appropriate action.

Figure 2–4–10 shows the PRIMUS 660/880 MFD Weather Radar Test Mode, and Table 2–4–9 gives the PRIMUS 660/880 Fault Codes and Fault Descriptions.

(1) On-Ground TEST Display (with TEXT FAULTS Enabled)

When TEST is initiated on the ground (weight-on-wheels asserted), six fields are displayed as shown in Figure 2–4–10. The six fields are as follows:

- Pilot Message Field (e.g., STAB UNCAL)
- Line Maintenance Message (e.g., CHK ATT SRC)
- Fault Code/Power-On Count (e.g., CODE:27 POC:0)
- Fault Name (e.g., NO STAB SRC)
- Xmit On/Off (e.g., XMIT ON!)
- Strap Code (e.g., 1F1BB:STRAPS).

Faults (up to 32) from the last 10 power-on cycles are cycled every two antenna sweeps (approximately 8 seconds). That is, a fault is displayed, if, and only if, it occurred within the last 10 power-on cycles and it is among the 32 most recent faults to have occurred.

POC=0 is the current power-on cycle, POC=1 is the last power-on cycle, –2 is 2 power-on cycles ago, etc.

Upon entering TEST mode, if there are no currently active faults, a RADAR OK message is displayed for one sweep. After that, the most recent fault is displayed, cycling to the oldest fault in the eligible list of faults. Upon reaching the last fault, an END OF LIST message is displayed. To recycle through the list again, exit and re-enter the TEST mode.

Input-type faults (NO STAB SRC, NO AIRSPEED, NO ALTITUDE, etc.) are displayed, but not logged, on-ground.

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(2) In-Flight TEST Display (with TEXT FAULTS Enabled)

NOTE: The radar is transmitting when TEST is initiated while in the air.

If the Weight-On-Wheels (WOW) input is not asserted, only the fields that follow are displayed:

- Pilot Message Field (e.g., RADAR UNCAL)
- Line Maintenance Message (e.g., PULL RTA)
- Fault Code.

Only currently active (not cleared) faults are displayed in-flight.

(3) Fault Monitors

Critical functions in the RTA are continuously monitored. Each fault condition has a corresponding Fault Code (FC). Additionally, a FAULT NAME, a PILOT MESSAGE and a LINE MAINTENANCE MESSAGE are associated with each fault condition. These are shown in Figure 2–4–10.

The FAULT NAME describes which fault has been detected.

The PILOT MESSAGE advises the flight crew how to respond to a fault when it occurs in-flight. This can include checking other systems, or to use caution when interpreting certain data displayed, and/or to advise that a minor function such as ACT is unavailable.

The LINE MAINTENANCE MESSAGE advises the ground crew on a suggested action to take, or which LRU(s) to suspect.

The XREF code is a four-bit Central Aircraft Information/Maintenance System (CAIMS) fault code. This code is not visible to the flightcrew. It is used only on aircraft with a CAIMS installed.

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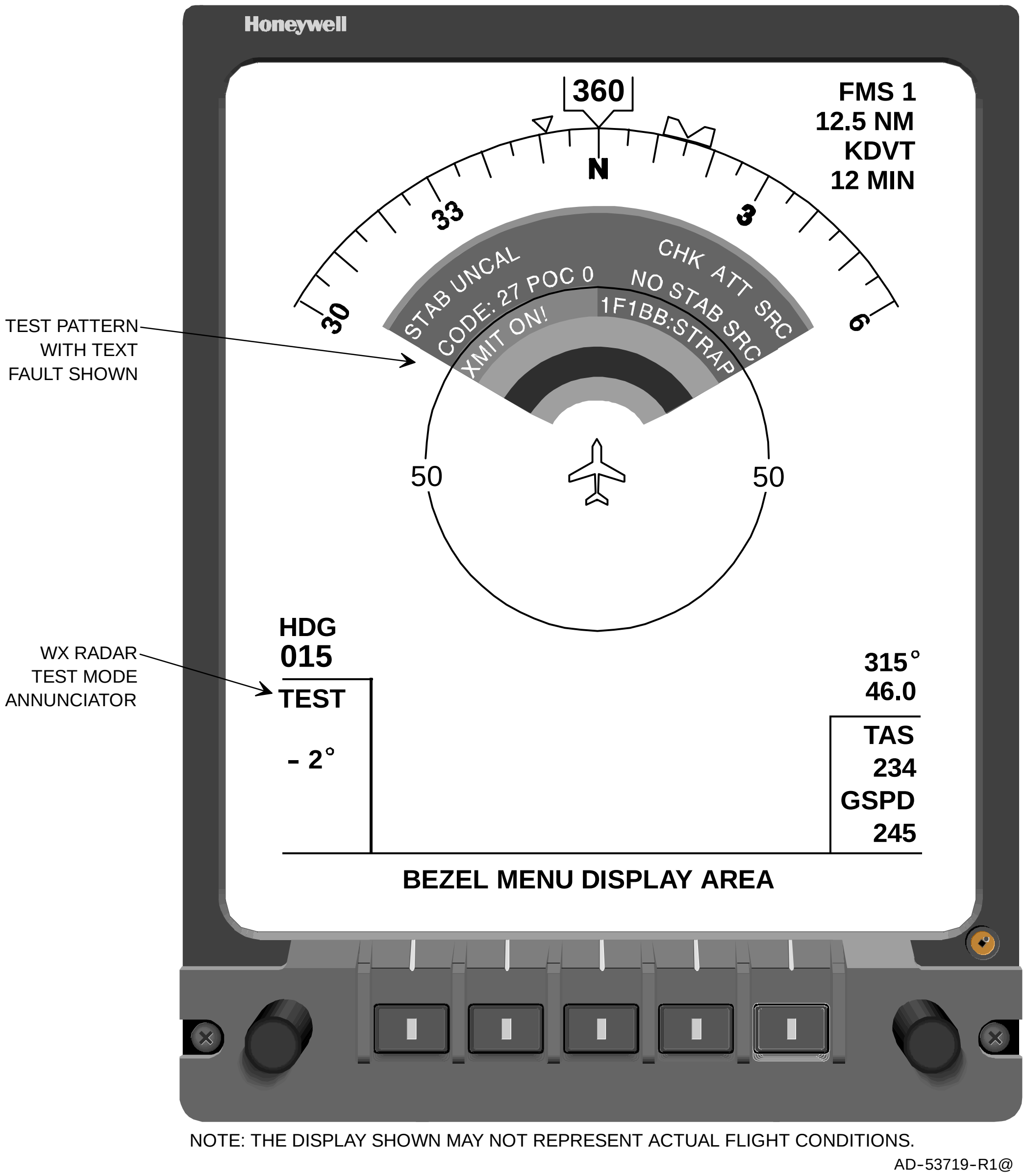

Figure 2-4-10. PRIMUS 660/880 MFD Weather Radar Test Mode Indications

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Table 2-4-9. PRIMUS 660/880 Fault Codes

FC	XREF	FAULT DESCRIPTION	FAULT NAME	PILOT MSG	LINE MAINT	FAULT TYPE
1	4808	STARTUP CODE CRC	FLASH CRC	RADAR FAIL	PULL RTA	POWER ON
	4809	IOP CODE CRC				
	4810	DSP CODE CRC				
	4904	CONFIG TABLE CRC				
	4905	FPGA FIRMWARE CRC				
2	4846	2V ADC REFERENCE	IOP	RADAR FAIL	PULL RTA	CONTINUOUS
	4903	IOP READY				POWER ON
	4908	INT ARINC 429 LOOPBACK				
	4913	INT ARINC 429 COUPLING				
3	4806	EEPROM TIMER CRC	FLASH CRC	RADAR FAIL	PULL RTA	POWER ON
	4842	STAB TRIM CRC	EEPROM	REDO STAB TRIM	REDO STAB TRIM	
	4912	CALIBRATION CRC	IOP	RADAR FAIL	PULL RTA	
4	4812	IOP MAILBOX	MAILBOX RAM	RADAR FAIL	PULL RTA	POWER ON
	4818	DSP MAILBOX				
5	4813	TIMING FPGA RAM	FPGA	RADAR FAIL	PULL RTA	POWER ON
	4814	TIMING FPGA REG				
	4815	IO FPGA				
	4828	FPGA DOWNLOAD				
	4906	IO FPGA REG				
6	4847	STC MONITOR	STC DAC	RADAR FAIL	PULL RTA	POWER ON
7	4830	HVPS MONITOR	HVPS MON	RADAR FAIL	PULL RTA	CONTINUOUS

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Table 2-4-9. PRIMUS 660/880 Fault Codes (cont)

FC	XREF	FAULT DESCRIPTION	FAULT NAME	PILOT MSG	LINE MAINT	FAULT TYPE
10	4816	DSP RAM	–	–	–	POWER ON
	4817	DSP VIDEO RAM				
	4855	DSP WATCHDOG	DSP	RADAR FAIL	PULL RTA	CONTINUOUS
	4900	MAILBOX MISCOMPARE				POWER ON
	4901	DSP HOLDA ASSERTED				
	4902	DSP HOLDA NOT ASSERTED				
11	4825	FILAMENT MONITOR	MAGNETRON	RADAR FAIL	PULL RTA	LATCHED
	4827	SEVERE MAGNETRON				
	4829	PFN TRIM MONITOR	HVPS MON			CONTINUOUS
13	4832	ELEVATION ERROR	EL POSITION	TILT UNCAL	CHK RADOME/RTA	CONTINUOUS
14	4833	AZIMUTH ERROR	AZ POSITION	TILT UNCAL	CHK RADOME/RTA	CONTINUOUS
15	4836	OVER TEMP	OVER TEMP	RADAR CAUTION	PULL RTA	CONTINUOUS
16	4837	XMITTER POWER	XMTR POWER	RADAR UNCAL	PULL RTA	CONTINUOUS
20	4839	NO SCI CONTROL	NO CNTL IN	CHK CNTL SRC	CHK CNTL SRC	PROBE
	4911	NO ARINC 429 CONTROL				
21	4840	AGC LIMITING	AGC	PICTURE UNCAL	PULL RTA	CONTINUOUS
	4927	AGC RX DAC MONITOR		RADAR FAIL		POWER ON
	4928	AGC TX DAC MONITOR				
22	4841	SELFTEST OSC FAILURE	RCVR SELF TEST	PICTURE UNCAL	PULL RTA	CONTINUOUS

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Table 2-4-9. PRIMUS 660/880 Fault Codes (cont)

FC	XREF	FAULT DESCRIPTION	FAULT NAME	PILOT MSG	LINE MAINT	FAULT TYPE
24	4843	MULTIPLE AFC UNLOCKS	AFC	SPOKING LIKELY	PULL RTA	CONTINUOUS
	4845	AFC SWEEPING				
	4929	AFC RX DAC MONITOR				
	4930	AFC TRIM DAC MONITOR		RADAR FAIL		POWER ON
27	4848	AHRS SOURCE	NO STAB SRC	STAB UNCAL	CHK ATT SRC	INSTALLATION
	4852	ANALOG STAB REF				
30	4849	DADC AIRSPEED	NO AIRSPEED	TURB UNCAL	CHK ADC	INSTALLATION
	4932	AHRS GROUNDSPEED			CHK SPEED SRC	
33	4931	DADC ALTITUDE	NO ALTITUDE	NO ACT	CHK ADC	INSTALLATION
	4933	AHRS INERTIAL ALTITUDE			CHK ALT SRC	
34	4853	SCAN SWITCH OFF	SCAN SWITCH	SCAN SWITCH	CHK SWITCH	INSTALLATION
35	4854	XMIT SWITCH OFF	XMIT SWITCH	XMIT SWITCH	CHK SWITCH	INSTALLATION
36	4914	INVALID ALTITUDE/ AIRSPEED/STAB STRAPPING	INVALID STRAPS	RADAR UNCAL	CHK STRAPS	POWER ON
	4915	INVALID CONTROLLER SOURCE STRAPPING				
	4916	CONFIG1 DATABASE VERSION/SIZE MISMATCH	IOP	RADAR FAIL	PULL RTA	–

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SECTION 2.5
PRIMUS® II INTEGRATED RADIO SYSTEM

1. General

The PRIMUS 1000 Integrated Avionics System installed in the Ultra aircraft includes the SRZ-850 Integrated Radio System. This radio system is also known as the PRIMUS II Integrated Radio System. It is a dual system, with system No. 1 on the left and system No. 2 on the right.

The PRIMUS II SRZ-850 Integrated Radio System is made up of two subsystems: the RCZ-851X Integrated Communication Unit and the RNZ-850X Integrated Navigation Unit, with associated controls, displays, and antennas. The Cockpit controls are made up of the RM-850 Radio Management Unit (RMU), AV-850A Audio Control Unit, the CD-850 Clearance Delivery Control Head (CDH), and the DI-851 DME Indicator.

The radio system provides communication and navigation information for the flightcrew. The navigation data is supplied to the Integrated Avionics Computers (IAC) for display on the Electronic Display System (EDS), and for use by the Automatic Flight Control System (AFCS), both are resident within the IACs. Navigation data is also supplied to the Flight Management System (FMS) computer.

The integrated radio system has a number of options selected by the installer using configuration straps. The strap options for the NAV and COM units are programmed on a strap assembly that is aircraft unique and is electrically connected to each unit. Strap options for the RMU and CDH are pin programmed on the unit mating connector. There is no pin programming in the audio system. Strap programming procedures are covered in Section 3, Interconnects, of this manual.

The SRZ-850 Integrated Radio System standard installation is made up of the following LRUs:

- Two RM-850 Radio Management Units (RMU)
- One CD-850 Clearance Delivery Control Head (CDH)
- Two AV-850A Audio Control Units
- Two RCZ-851F Integrated Communications Units (VHF COM and ATCRBS)
- One RNZ-850 Integrated Navigation Unit (VOR, ADF, and DME) - Left side
- One RNZ-850B Integrated Navigation Unit (VOR and DME) - Right side
- One DI-851 Distance Measuring Equipment (DME) Indicator
- One AT-860 Automatic Direction Finder (ADF) Combined Sense/Loop Antenna - Left side.

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2. Component Descriptions and Locations

A. RM-850 Radio Management Unit

Figure 2-5-1 shows a graphical view of a typical RM-850 Radio Management Unit (RMU). The RM-850s are located in the cockpit instrument panel of the of the aircraft. Table 2-5-1 gives leading particulars for the RMU.

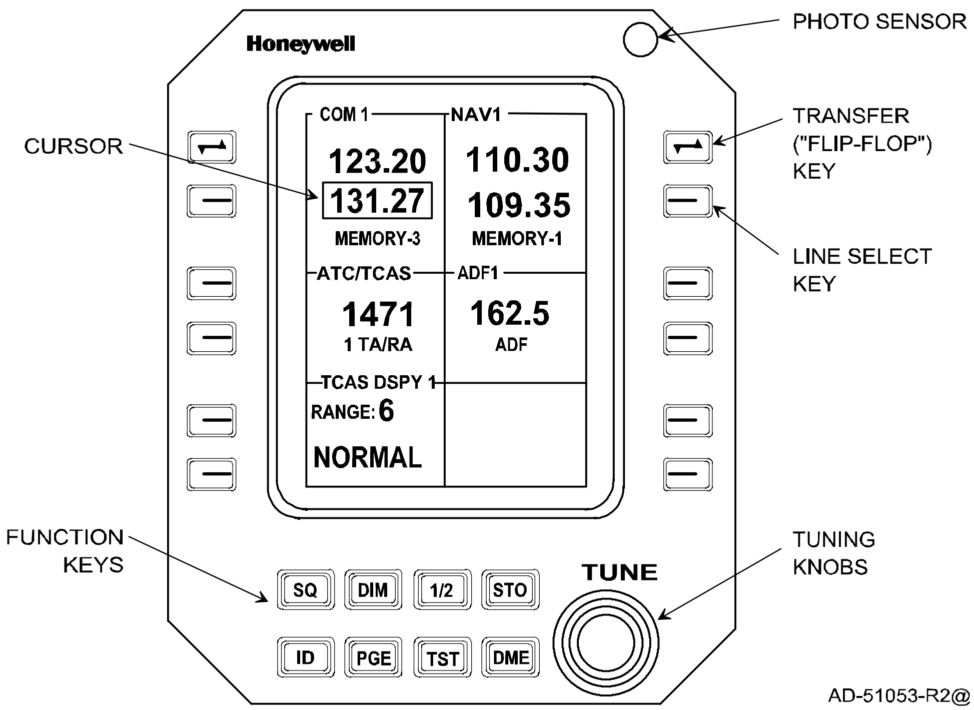

Figure 2-5-1. Typical RM-850 Radio Management Unit

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Table 2-5-1. RM-850 Radio Management Unit Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	5.06 in. (128.5 mm)
• Width	4.06 in. (103.1 mm)
• Length	11.10 in. (281.9 mm)
Weight	7.2 lb (3.27 kg)
Power:	
• Nominal	+28 V dc, 33 W (max)
• Panel Lighting	0–5 V ac/dc, .025 W (max)
User Replaceable Parts:	
• Knob, Large	HPN 7012149
• Knob, Small	HPN 7013773
• Setscrew, 4–40 x 1/8–inch, cup point steel (4)	HPN 2500148–128
Mating Connector	MS3126F20–41S
Mounting Clamp	HPN 7000066–11

The Radio Management Unit (RMU) is the central control unit for the entire radio system. It gives complete capability for controlling the operating mode, frequencies, and codes within all the units of the radio system. Additionally, the RMU has the capability to switch its operation from its primary radio system to the cross–side system. The RMU is a color Cathode Ray Tube (CRT) based controller featuring the proven concept of selecting a function by pushing a line select key adjacent to the parameter to be changed. Any selectable parameter, such as VOR frequency, can be changed by pushing the corresponding line key next to the displayed parameter and then rotating the controller tuning knob. For some functions, additional pushes of the line select key toggles modes or recalls stored numbers.

The RMU is also the input to the radio system for external FMS tuning in that digital signals from the FMS come into the RMU where they act in much the same manner as if the front tuning knob was being operated. This lets the FMS enter into the system in an organized manner, and appears to the system as if the flight crew is tuning the receiver.

Backup navigation data is provided to the RMU via the Radio System Bus (RSB) from both remote navigation units, and/or via RS–422/CSDB data buses from whichever remote navigation unit is married to the Clearance Delivery Control Head (CDH) for emergency backup purposes.

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For ease of operation, the RMU screen is divided into windows. Each window groups the data associated with a particular function of the radio system. Each window (COM, NAV, ATC, ADF, and TCAS) displays the frequency and/or operating mode of the associated function. The RMU also has other display modes, called pages, that perform additional features and functions for the control of the radio system. The ATC/TCAS window formats are determined by the actual installation.

Located on the front of the RMU is a button labeled PGE, that, when pushed, causes the RMU to toggle through different pages of the display. The normal five window display is called the Main Page and is always present under normal operation. The other pages are associated with preset memory location and operation for the NAV and COM windows. Further pages are available by a combination of control buttons and menus to enable the display of various maintenance data from within the radio system. If any page other than the Main Page is being displayed, the bottom left line select key is the Return key. In all cases, pushing the return key changes the display back to the Main Page.

When the TCAS–II system is installed, the RMU windows are as shown in Figure 2–5–1. If TCAS–II is not installed, both bottom windows can be disabled. This is done by first pushing the PGE key, pushing the key adjacent to MAINTENANCE, and pushing the key adjacent to RMU SETUP. On the RMU SETUP page, pushing the line select key at either end of DISPLAY toggles between ENABLED and DISABLED. Pushing the line select key at the lower left returns the display to the Main Page. This selection function is only available when weight–on–wheels is true.

The ATC FLIGHT ID function is designed for use by the airlines. In the Citation Ultra, this function should be disabled. In the event that it is inadvertently enabled, the Flight ID display line at the bottom of the transponder window on the Main Page is present.

As with operation of the cursor in the COM and NAV windows, pushing the key adjacent to the upper half of the transponder window connects the TUNE knobs to the numbers. Large knob = left two numbers, small knob = right two numbers.

Pushing the next lower line select key moves the cursor to the bottom half of the transponder window. This key has a toggle function between active and standby. When active, the mode of operation is changed by rotation of one of the tune knobs.

When TCAS–II is installed, the modes are:

- ATC ON — Replies on Modes S and A with no altitude reporting
- ATC ALT — Replies on Modes A, C, and S with altitude reporting
- TA ONLY — The TCAS traffic advisory mode is enabled
- TA/RA — The TCAS traffic advisory mode and the resolution advisory mode are both enabled.

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When TCAS–I is installed, the modes are:

- ATC ON Replies on Modes A with no altitude reporting
- ATC ALT Replies on Modes A and C with altitude reporting
- TA ONLY The TCAS traffic advisory mode is enabled

When TCAS–I is not installed, the modes are:

- ATC ON Replies on Modes A with no altitude reporting
- ATC ALT Replies on Modes A and C with altitude reporting

There is a secondary function available when the cursor is in the lower transponder window. Pushing the 1/2 key in the lower RMU panel selects the active transponder. With TCAS installed, the banner line at the top of the transponder window indicates ATC/TCAS. The modes are those listed above with TCAS installed.

The remaining two line select keys move the cursor to either the RANGE line or to the vertical window line. Repeated pushing of the RANGE line select key toggles through the range selections (6, 12, 20, 40). The TUNE knob changes the range when the cursor is in the RANGE window. The vertical window displays are: NORMAL, ABOVE, BELOW, and are selected by repeated pushing of the line select key or by rotation of the TUNE knob.

Circuitry within the RMU is designed to control the light intensity and colors of the RMU and supply the ultimate in color tracking across the brightness levels. The CRT brightness is adjusted by pushing the dim button on the front of the panel and using the tuning knob in the same manner as other functions selected. There is also a photo sensor on the front of the RMU that senses the ambient light condition and adjusts the RMU intensity to compensate for varying levels of light as the aircraft maneuvers in the sunlight. This is a feature that keeps the readability of the RMU at a high level while not requiring the pilot to turn the intensity up and down each time the panel passes from shadow to sunlight.

As a safety feature of the RMU, if any of the components of the radio system fail to respond to commands from the RMU, the frequencies or operating commands associated with that particular function are removed from the RMU and replaced with dashes. This alerts the crew that the radio system operation is not normal.

Also available in the RMU is a maintenance mode of operation, when not in flight. During this mode, various pages are used giving maintenance personnel access to the maintenance log data and operating conditions of the radio system. In the Aircraft Maintenance Mode, parameters can be examined by the crew, but not modified in any way. The following paragraphs describe each control on the RMU.

(1) Photo Sensor

The photo sensor senses the ambient light and causes the Cathode Ray Tube (CRT) brightness to be automatically adjusted to compensate for varying levels of light as the aircraft maneuvers into the sunlight.

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(2) Transfer Keys

The transfer key, when pushed, flip-flops the active frequency (Top Line) and the preset frequency (Bottom Line) of the COM or NAV window. Pushing both transfer keys simultaneously while on the ground gives entry into the aircraft maintenance mode. For further information about the Aircraft Maintenance Mode, refer to Section 4, Maintenance Practices, of this manual.

(3) Line Select Keys

The first push of the line select key moves the yellow cursor to surround the data field associated with that particular line select key. This electronically connects the data field to the tuning knobs so frequency or mode can be changed. For some functions, additional pushing of the line select key toggles the modes or recalls stored frequencies. The line select key, if pushed and held for certain functions, lets ADF and ATC memories be recalled. This key is also used to enter and exit direct tune mode for the COM and NAV.

(4) Tuning Knobs

The tuning knobs are used to modify the data field enclosed by the cursor. This can be frequency or mode depending upon the selected data field.

(5) Squelch (SQ) Key

Pushing the SQ key causes the COM radio to open its squelch and lets any noise or signal present in the radio to be heard in the audio system. The squelch key is strictly a toggle. Pushing the key toggles SQ. The letters SQ are annunciated along the top line of the COM window when the squelch is opened by using this key.

(6) Dimming (DIM) Key

Pushing the DIM key connects the RMU brightness control knob supplying adjustment to the display to match overall cockpit brightness.

(7) Cross-Side (1/2) Key

With the cursor in any window, except the ATC or TCAS display, pushing the 1/2 key transfers the entire RMU operation and display to the cross-side system. The legend color changes from white to magenta when the RMU is displaying, and is in control of, data associated with the cross-side system. If the cursor is in the ATC or TCAS display window, pushing this key selects the transponder for operation.

(8) Store (STO) Key

With the cursor placed around the Temporary (TEMP) display, pushing the STO key sets the TEMP COM/NAV preselect frequency in stored memory and assigns it a numbered location. The ADF and ATC each have one memory location. With the cursor placed around that frequency or code, pushing the STO key sets the current ADF frequency or ATC code in stored memory.

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(9) Identification (ID) Key

Pushing the ID key initiates the transponder identification response mode. The ID squawk terminates after 18 seconds. The identification response mode can also be activated with the control yoke–mounted push buttons.

(10) Page (PGE) Key

Pushing the PGE key once changes the RMU display to the RMU Page Menu, except when operating in the Aircraft Maintenance Mode. Pushing the PGE key a second time has no effect. When not on the Main Operating page, the RMU assigns a Return function to the lower left line select key. Pushing this key returns to the Main Operating page.

(11) Test (TST) Key

With the yellow cursor positioned in a window, pushing the TST key initiates the internal self–test circuits for a complete end–to–end test of that component function. The TST key is held down for the duration of the test: about two seconds for COM transceiver, five to seven seconds for DME, ATC, ADF, and about 20 seconds for NAV (VOR/ILS). Releasing the TST key at any time immediately returns the function to normal operation.

(12) Distance Measuring Equipment (DME) Key

The DME key deslaves the DME from the active VOR frequency and allows tuning of a different DME channel without changing active VOR. Successive pushes of the DME key enable display and selection of the DME channels in VHF and TACAN formats.

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B. CD-850 Clearance Delivery Control Head (CDH)

Figure 2-5-2 shows a graphical view of the CD-850 Clearance Delivery Control Head. The CD-850 CDH is located in the cockpit instrument panel of the aircraft. Table 2-5-2 gives leading particulars for the CD-850 CDH.

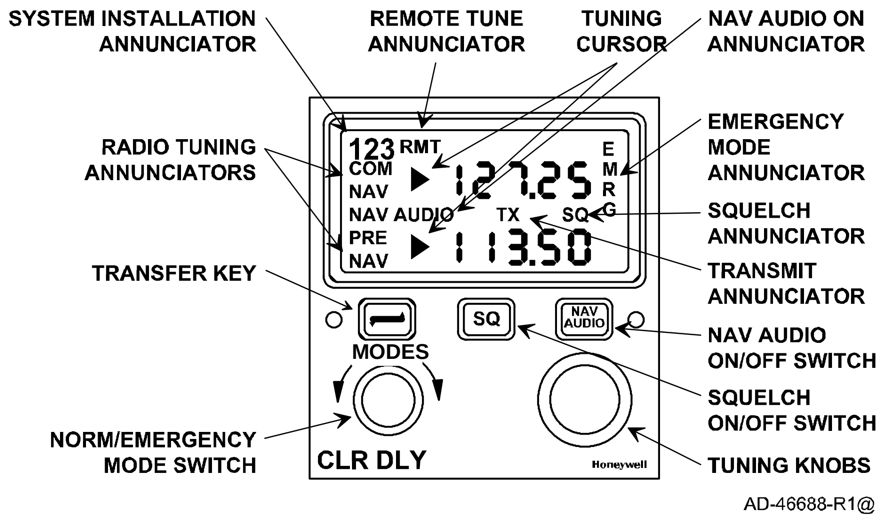

Figure 2-5-2. CD-850 Clearance Delivery Control Head

Table 2-5-2. CD-850 Clearance Delivery Control Head Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.62 in. (66.7 mm)
• Width	2.38 in. (60.3 mm)
• Length	7.54 in. (191.5 mm)
Weight	1.25 lb (0.568 kg)
Power Requirements:	
• Primary	28 V dc, 4 W (max)
• Panel lighting	5 V ac or dc, .025 W (max)
User Replaceable Parts:	
• Knob, Mode	HPN 800B0718
• Knob, Coarse Tuning	HPN 800B0714
• Knob, Fine Tuning	HPN 800B0715
• Setscrew, 4-40 x 3/32-inch (6)	HPN 100A4634-01
Mating Connector	MS3126F20-41SW, HPN 4000809-607
Mounting	Panel Mount

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The CD–850 CDH is an alternate or emergency backup capability for tuning the No. 1 VHF COM Module and the No. 1 VHF NAV Receiver Module. This is done on private line data buses that remain operational in the event the primary Radio System Bus (RSB) tuning is not available or if the pilot/operator wishes to override the bus tuning for any reason. The CDH listens on the RSB and displays the active frequencies of these two modules.

The CDH uses a transflective, dichroic (black dye), LCD to supply enhanced readability and reliability. The panel lettering and buttons are internally lit using aviation blue–white lighting.

The normal and emergency modes are submodes selected by the mode key. The following paragraphs describe each control and annunciator on the CDH.

(1) System Installation Annunciator

Annunciates the radio system (1, 2, or 3) indicating to which system the CDH is connected. In the Citation Ultra, the No. 1 annunciator is ON indicating the CDH is connected to the No. 1 COM and No. 1 NAV.

(2) Remote Tune Annunciator

This annunciator is inactive in the Citation Ultra.

(3) Tuning Cursor

Annunciator is a lit triangle controlled by the transfer key. It indicates which frequency can be changed by the tuning knobs.

(4) NAV AUDIO On Annunciator

Annunciator indicates the NAV audio is selected ON.

(5) Emergency (EMERG) Mode Annunciator

Annunciator indicates the CDH is placed in the emergency back–up mode that locks out all other COM and NAV tuning sources for the No. 1 COM and No. 1 NAV. The No. 1 COM and the No. 1 NAV are tuned exclusively by the CDH. This annunciator is not related to the emergency frequency of 121.5 MHz.

(6) Squelch (SQ) Annunciator

Annunciator indicates the squelch is opened by the SQ ON/OFF switch.

(7) Transmit (TX) Annunciator

Annunciator indicates the COM transmitter is ON.

(8) NAV AUDIO ON/OFF Switch

Alternate action button used to toggle NAV audio ON or OFF.

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(9) Squelch (SQ) ON/OFF Switch

Alternate action button used to toggle COM squelch ON or OFF.

(10) Tuning Knobs

The knobs change the frequency indicated by the tuning cursor. Large knob adjusts the left two numbers and the small knob adjusts the right two numbers.

(11) Normal/Emergency Mode Switch

The rotary switch knob gives alternate selection of the Normal and Emergency modes.

(12) Transfer Key

The transfer key alternately selects either the COM frequency (top) or the NAV frequency (bottom) to be connected to the tuning knobs.

(13) Radio Tuning Annunciators

Annunciators COM and NAV are annunciated individually, together with the tuning cursor, to identify the frequency at the top and bottom lines.

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C. DI-851 DME Indicator

Figure 2-5-3 shows a graphical view of the DI-851 DME Indicator. The DI-851 is located in the cockpit instrument panel of the aircraft. Table 2-5-3 gives leading particulars for the DI-851.

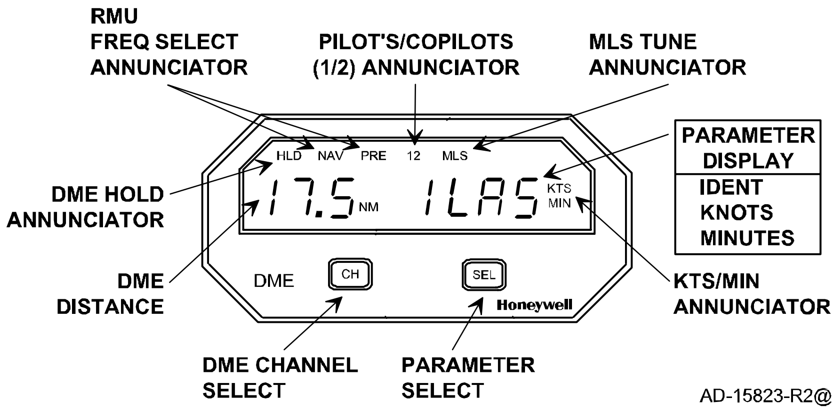

Figure 2-5-3. DI-851 DME Indicator

Table 2-5-3. DI-851 DME Indicator Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.54 in. (39.2 mm)
• Width	3.26 in. (82.8 mm)
• Length (from back of bezel)	6.27 in. (159.3 mm)
Weight	1.05 lb (0.476 kg)
Power Requirements	28 V dc, 2.8 VA nominal
User Replaceable Parts	None
Mating Connector	HPN 7500436-901
Mounting	Panel Mount; clamp, HPN 7001995-1

The DI-851 DME Indicator displays DME-related information to the pilot. This information includes the distance to the ground station in nautical miles, the identification (IDENT) of the ground station (extracted from the Morse code identifier), the computed ground speed of the aircraft in knots, and the time-to-go (time to reach the ground station) in minutes. The indicator can be used with either one or two DME receivers and is capable of displaying data for both the active and preset channels of each DME. The unit also annunciates DME hold status for each channel. All data is input to the indicator via RSB.

The DME digital display is separated into two windows. The window on the left continuously displays distance in nautical miles and the window on the right displays either the station identifier string, ground speed in knots, or time-to-go in minutes.

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The display type is Dichroic LCD with white characters on a black background. The LCD, legends on the two buttons, and the indicator identifier legend are back lit by electroluminescent lighting. The DME indicator display segments can be tested when CH and SEL are pushed together (all segments turn ON). In the Citation Ultra, the lighting intensity is controlled by the aircraft instrument dimming line.

The following paragraphs describe each function or control on the DI–851:

(1) RMU Frequency Select Annunciator

The annunciation NAV is displayed when the DME is associated with the active NAV channel selected on the RMU. If the preset channel is selected, the annunciation is PRE.

(2) Pilot's/Copilot's (1/2) Annunciator

The 1 or 2 is annunciated, depending on whether the pilot's side (1) or the copilot's side (2) channel is selected as determined by the channel (CH) select button.

(3) MLS Tune Annunciator

MLS is displayed when a DME receiver is being tuned by the microwave landing system receiver.

(4) Parameter Display and Select (SEL)

The DME station identifier, the computed groundspeed of the aircraft in knots, or time–to–go (time to reach the ground station) in minutes is displayed as a function of the parameter select (SEL) button. The KTS/MIN annunciator identifies which parameter is being displayed. Each time the SEL button is pushed the display changes as follows:

SEL Button	Parameter	Annunciation
Power–Up	Identifier	Blank
1st Push	Groundspeed	KTS
2nd Push	Time–To–Go	MIN
3rd Push	Identifier	Blank

(5) DME Channel (CH) Select

The Channel (CH) button selects which DME channel to display. At power up, the same channel is displayed that was being displayed at power down. If MLS is not selected, the button toggles between NAV 1, NAV 2, PRE 1, and PRE 2. Annunciators along the top of the display identify the channel being displayed.

The NAV and PRE refer to the frequencies selected for active and preset in the respective RMU.

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D. AV-850A Audio Control Unit

Figure 2-5-4 shows a graphical view of the AV-850A Audio Control Unit. The AV-850A is located in the cockpit instrument panel of the aircraft. Table 2-5-4 gives leading particulars for the AV-850A.

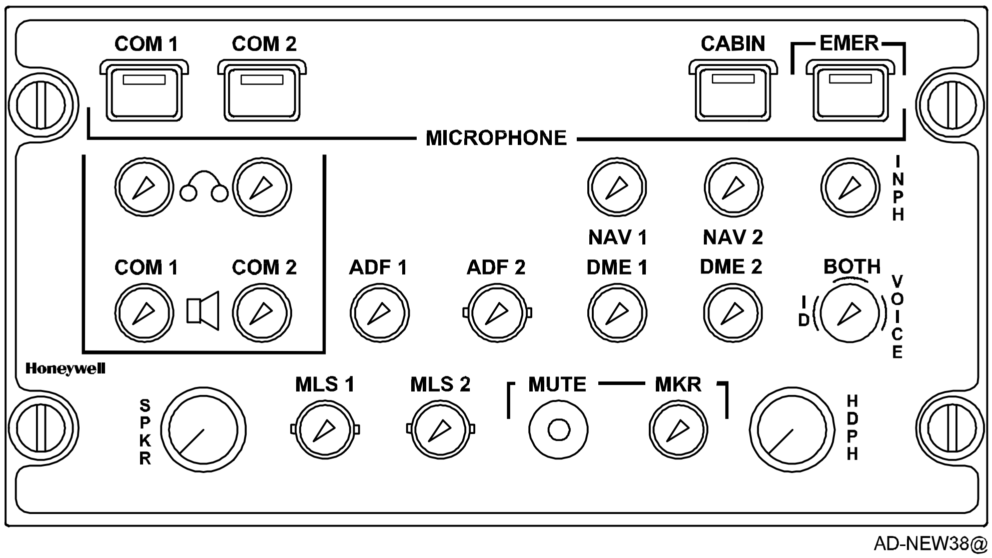

Figure 2-5-4. AV-850A Audio Control Unit

Table 2-5-4. AV-850A Audio Control Unit Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	3.00 in. (76.2 mm)
• Width	5.75 in. (146.1 mm)
• Length	7.10 in. (180.3 mm)
Weight	3.75 lb (1.70 kg)
Power Requirements:	
• Primary	28 V dc, 28 W (max)
• Panel Lighting	5 V ac or dc, .025 W (max)
User Replaceable Parts:	
• Knob, Speaker, or Headphone	HPN 7511039
• Setscrew, 2-56 x 7/8-inch, cup point steel	HPN 2500148-64

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Table 2-5-4. AV-850A Audio Control Unit Leading Particulars (cont)

Item	Specification
Mating Connectors:	
• J1	MS27473E20-A41S, HPN2500981-195
• J2	MS27473E20-A41SB, HPN2500981-197
Mounting	Standard Dzus Rail

The AV-850A Audio Control Unit receives digitized audio from remote radio units through two high-speed digital audio buses. The audio control unit decodes the digital data, controls the gain (volume) of the various channels, adds the channels together, does various filter functions on the audio, and outputs the audio to a digital-to-analog converter. It contains hardware for switching microphones to various radios, and hardware for the interphones as well as the passenger cabin audio and intercoms. Amplifiers are supplied for driving headphones and speakers.

The following paragraphs describe the audio control unit switch and control functions:

(1) COM 1 and COM 2 Microphone Switches

These switches, when pushed, automatically select the desired microphone and at the same time enable the receiver audio associated with that microphone, regardless of the setting of the COM audio ON/OFF controls located under the switch.

COM 1 and COM 2 have separate audio source selectors for the speaker and the headphone.

(2) Cabin (CABIN) Microphone Switch

When the CABIN switch is pushed, the microphone is connected directly to the CABIN amplifier independent of power being applied to the audio panel. Microphone bias voltage is derived from the CABIN amplifier. Cabin sidetone is internally generated within the audio panel and is controlled by the INTERNAL SIDETONE side-panel potentiometer and the HEADPHONE volume control, while the speaker sidetone audio is controlled by the SPEAKER volume control. During audio panel power loss, no CABIN sidetone is available. All other audios are deselected during cabin operation except for the warning audios.

(3) Emergency (EMER) Switch

When the EMER switch is pushed, the microphone is connected directly to VHF COM transceiver No. 1, and the transceivers received audio is connected directly to the aircraft's headphone. The No. 1 VOR/ILS audio is also connected directly to the aircraft's headphone if it is selected by the NAV AUDIO button on the CDH. When EMER is selected, headphone volume is controlled by the master headphone volume control. This mode also disables all other audio control unit modes.

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(4) Audio Source Control

Annunciator indicates that the NAV audio is selected ON.

(5) Emergency (EMERG) Mode Annunciator

Each control (COM, NAV, ADF, DME) combines the function of switch and volume control.

Each source control energizes a particular channel's audio when unlatched (out position) and de-energizes the audio when latched (in position). Rotation of this control adjusts the audio level from minimum at the fully CCW position to maximum at the fully CW position.

(6) Interphone (INPH) Control

The Interphone (INPH) volume control adjusts the headset audio level when the interphone function is used. Normally, interphone audio is available only over the headset. The interphone function ties together the cross-side audio panel and any externally located maintenance audio jacks. The interphone function is either hot mic or push-to-talk.

For some audio panels, when the oxygen mask is being used, interphone audio is provided through the speaker. In the Citation Ultra, oxygen mask mic is activated with an external cockpit mounted switch.

(7) ID/VOICE Control

The ID/Voice control is used to filter the VOR and ADF audio signals. In the ID position (knob pointer left of center), the VOR or ADF audio is filtered to enhance the Morse Code identification. In the VOICE position (knob pointer right of center), the audio is filtered to reduce the Morse Code signal for received VOR/ILS audio. ADF audio passes through without change when VOICE mode is selected. The BOTH position permits the Morse Code identification and voice to be heard simultaneously (no filtering).

(8) SPEAKER and Headphone (HDPH) Master Volume Controls

These controls adjust the overall speaker and headphone volume. They work in series with the individual audio source controls.

COM 1 and COM 2 have separate audio source selectors for the speaker and the headphone.

(9) Marker (MKR) Beacon Volume Control

The MKR volume control is a latched switch used to control the marker audio volume. It differs from the other volume controls in that it can not be turned down below a level adjusted by a potentiometer inside the audio control unit. This prevents the marker audio from being turned down too low to be heard, causing the marker signal to be missed.

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(10) Marker Beacon MUTE Control

The marker beacon receiver sensitivity is controlled by rotating the control. Pushing the control activates the marker mute function used to temporarily silence the marker beacon audio (non–latching). When the marker audio is muted, it remains muted as long as the audio level is above a threshold setting. When the audio level drops below the threshold, a time–out sequence begins that continues to mute the marker audio for a fixed period of time. After the time–out, the marker audio is unmuted.

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E. RCZ-851(X) Integrated Communications Unit

Figure 2-5-5 shows a graphical view of the RCZ-851(X) Integrated Communications Unit. The RCZ-851(X) is located in the avionics nose bay of the aircraft. Table 2-5-5 gives leading particulars for the RCZ-851(X).

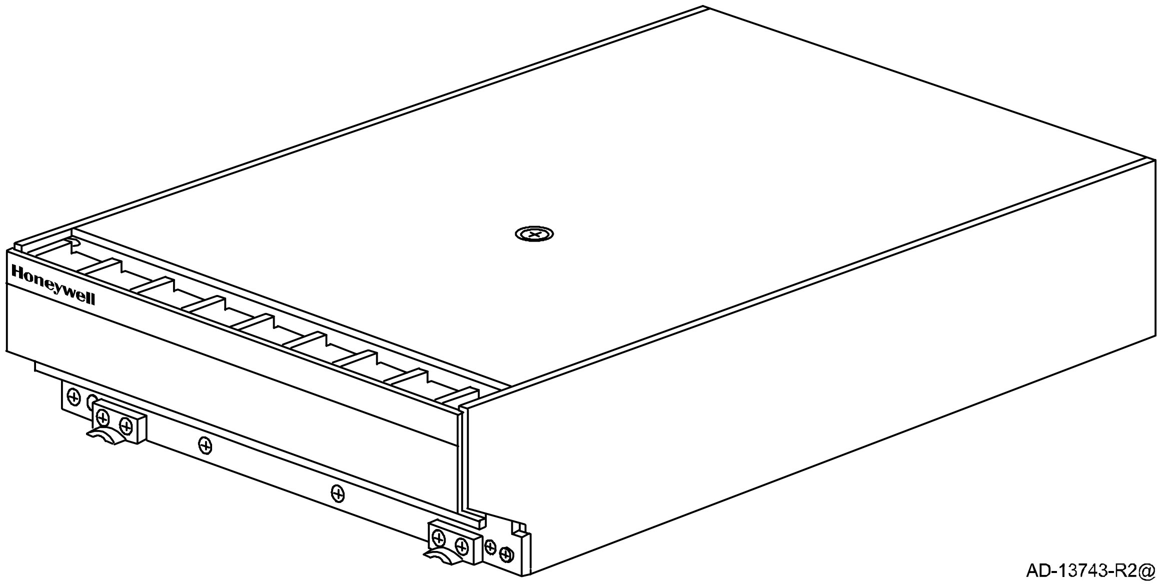

Figure 2-5-5. RCZ-851(X) Integrated Communications Unit

Table 2-5-5. RCZ-851(X) Integrated Communications Unit Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	3.38 in. (85.9 mm)
• Width	8.90 in. (226.1 mm)
• Length	14.01 in. (355.9 mm)
Weight:	
• RCZ-851E/G	10.5 lb (4.77 kg)
Power Requirements:	
• RCZ-851(X)	28 V dc, 227 W (max) (transmit) 28 V dc, 36.5 W (max) (receive)

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Table 2-5-5. RCZ-851(X) Integrated Communications Unit Leading Particulars (cont)

Item	Specification
User Replaceable Parts:	
• XC-850 Cluster Module (RCZ-851E/G)	HPN 7510784-904
• TR-850 Comm Module (RCZ-851E/G)	HPN 7510764-902
• XS-852 Diversity Transponder Module (RCZ-851E)	HPN 7517400-902
• XS-850A ATCRBS Transponder Module (RCZ-851G)	HPN 7517400-904
Mating Connector	HPN 7500294-106
Mounting:	
• Tray	MT-851 Tray, HPN 7510124-920
• Fan	HPN 7500524-002
Strap Option Board Mounting:	
• Strap Board Assembly	HPN 7510280-901
• Strap Chassis	HPN 7510346-901
• Strap Chassis Cover	HPN 7510349
NOTE: One strap chassis holds two strap option boards. This can be any combination, depending on installation.	

The RCZ-851(X) Integrated Communication Unit is a complete, self-contained communication system. It contains the VHF communication transceiver and the air traffic control transponder. Also within the communication unit is a cluster module that contains the circuitry necessary to handle all of the digital outputs of the communications modules and place them on the digital audio and radio system buses. Each one of the modules is self-contained within its own housing, has its own internal power supply, and connects to the cluster module via ribbon cable. Cooling is supplied by a non-critical, rack-mounted, fan. Temperature sensors inside the individual modules report temperature rise to the cluster module, that in turn switches the fan on, and monitors its operation. When the temperature drops sufficiently, the fan is switched OFF.

In the RCZ-851E COM Unit, the cluster module is a single printed circuit board attached to the rear connector nearest to the outside of the rack (J1), and the transponder is the Diversity Mode S.

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In the RCZ-851F COM Unit, the transponder is the Mode S (non-diversity).

In the RCZ-851G COM Unit, the cluster module connector is the same as on the RCZ-851E/F and the transponder is the ATCRBS.

A heat sink is associated with the COM unit and is attached to the front of each of the modules to supply a heat path from the internal structure of the box to the front surface where there is adequate radiating surface in the free area. At the rear of the communication unit are flush mounted antenna connectors and the aircraft harness connector.

The cluster module has its own on-board power supply and receives its primary 28 V input power from both the VHF COM transceiver module and the transponder module so that in the event either of them is energized, the cluster module is energized. The COM cluster module contains audio interface circuitry for the signals from the COM unit. Because of the nature of its operation, the transponder has no audio output circuitry.

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F. RNZ-850(X) Integrated Navigation Unit

Figure 2-5-6 shows a graphical view of the RNZ-850(X) Integrated Navigation Unit. The RNZ-850(X) is located in the avionics nose bay of the aircraft or in some installations the pilot's RNZ-850(X) is located in the tailcone. Table 2-5-5 gives leading particulars for the RNZ-850(X).

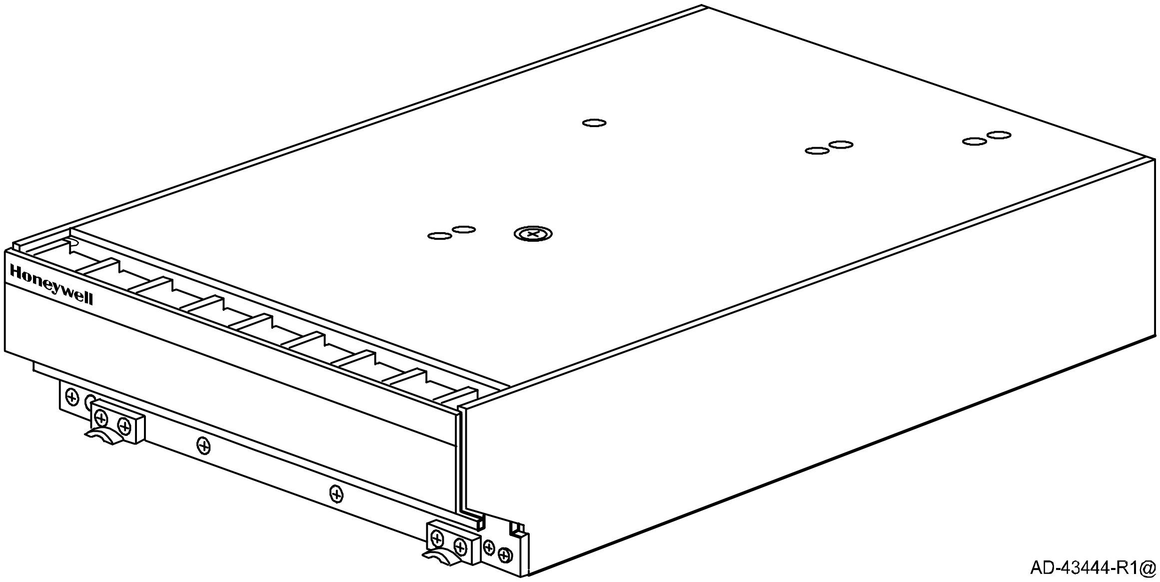

Figure 2-5-6. RNZ-850(X) Integrated Navigation Unit

Table 2-5-6. RNZ-850(X) Integrated Navigation Unit Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	3.38 in. (85.9 mm)
• Width	8.90 in. (226.1 mm)
• Length	14.01 in. (355.9 mm)
Weight:	
• RNZ-850	13.6 lb (6.17 kg)
• RNZ-850B	12.0 lb (5.45 kg)
Power Requirements:	
• RNZ-850	28 V dc, 89 W (max)
• RNZ-850B	28 V dc, 72 W (max)

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Table 2-5-6. RNZ-850(X) Integrated Navigation Unit Leading Particulars (cont)

Item	Specification
User Replaceable Parts:	
• XN-850 Cluster Module (RNZ-850/850B)	HPN 7510164-921
• NV-850 Nav Module (RNZ-850/850B)	HPN 7510134-831
• DM-850 DME Module (RNZ-850/850B)	HPN 7510184-902
• AD-850 ADF Module (RNZ-850)	HPN 7510114-811
Mating Connector	HPN 7500359-911
Mounting:	
• Tray	MT-851 Tray, HPN 7510124-910
• Fan	HPN 7510295-901
Strap Option Board Mounting:	
• Strap Board Assembly	HPN 7510280-901
• Strap Chassis	HPN 7510346-901
• Strap Chassis Cover	HPN 7510349
NOTE: One strap chassis holds two strap option boards. This can be any combination, depending on installation.	

The RNZ-850 Integrated Navigation Unit is a complete, self-contained navigation system. It contains the NV-850 VHF NAV Receiver, the DM-850 DME, and the DF-850 ADF modules. Also within the RNZ-851 is an XN-850 Cluster Module that supplies the interface with the NV-850, DM-850, DF-850 and other units of the integrated radio system, and digitizes the received audio for the digital audio system. Cooling is supplied by a non-critical, rack-mounted fan. Temperature sensors inside the individual modules report temperature rise to the cluster module, which in turn switches the fan ON and monitors its operation. When the temperature drops sufficiently, the fan is switched OFF.

A heat sink is associated with the NAV unit and is attached to the front of each of the modules to supply a heat path from the internal structure of the box to the front surface, where there is adequate radiating surface in the free area. At the rear of the navigation unit are flush mounted antenna connectors and the aircraft harness connector.

The cluster module has its own on-board power supply and receives its primary 28 V input power from either the VHF NAV receiver module, the DME module, or the ADF module so that in the event any of them is energized, the cluster module is energized. The NAV cluster module contains audio interface circuitry for the signals from the VHF NAV and ADF modules. The Morse decoder within the DME module sends one data bit during Morse tones. The cluster module includes this data bit in the digital audio data and the tone is recreated by the audio control unit.

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G. AT-860 ADF Combined Sense/Loop Antenna

Figure 2-5-7 shows a graphical view of the AT-860 ADF Antenna. The AT-860 is located on the exterior of the aircraft. Table 2-5-7 gives leading particulars for the AT-860.

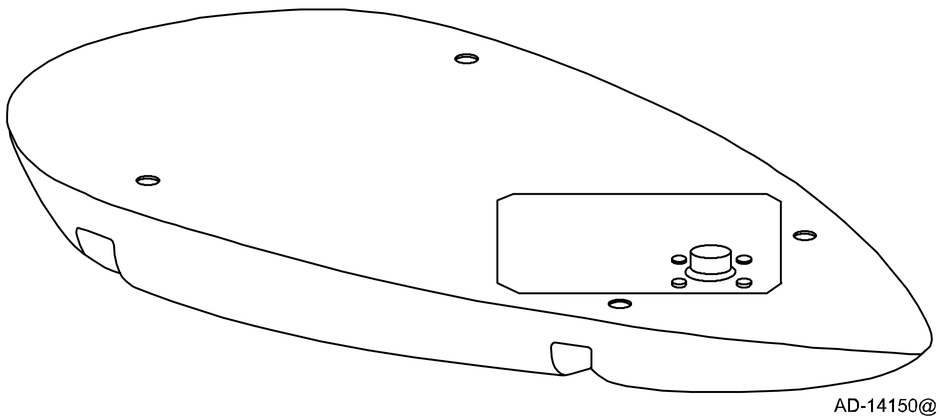

Figure 2-5-7. AT-860 ADF Antenna

Table 2-5-7. AT-860 ADF Antenna Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.51 in. (38.4 mm)
• Width	8.33 in. (211.6 mm)
• Length	16.30 in. (414.0 mm)
Weight	3.7 lb (1.68 kg)
Power Requirements	+15 V dc supplied by RNZ-850, 1.9 W
User Replaceable Parts	None
Mating Connector	Cannon KPT08P12-10S, HPN 7500489-524
Mounting	Exterior of Fuselage
Gasket	HPN 7020801-932

The AT-860 ADF Antenna performs the functions of reception, amplification, and combination of RF signals to yield low-frequency reception and directional information. The antenna also contains a self-test circuit that radiates a 120 kHz signal into the sense and loop antennas. This checks the operation of both the AT-860 ADF Antenna and the DF-850 ADF Receiver Module. Proper operation is indicated by a 1 kHz tone and a bearing indication of 135 degrees relative to the nose of the aircraft.

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3. Operation

A. Introduction

Figure 2-5-8 shows the integrated Radio System Buses (RSB). Command, control, and data communications between LRUs is via RSB. RCB within the COM and NAV units is on a ribbon cable. Digital audio from the NAV and COM units to the audio control units is via digital audio buses. Command and control data from the Clearance Delivery Control Head (CDH) to COM No. 1 and NAV No. 1 is via private line data buses.

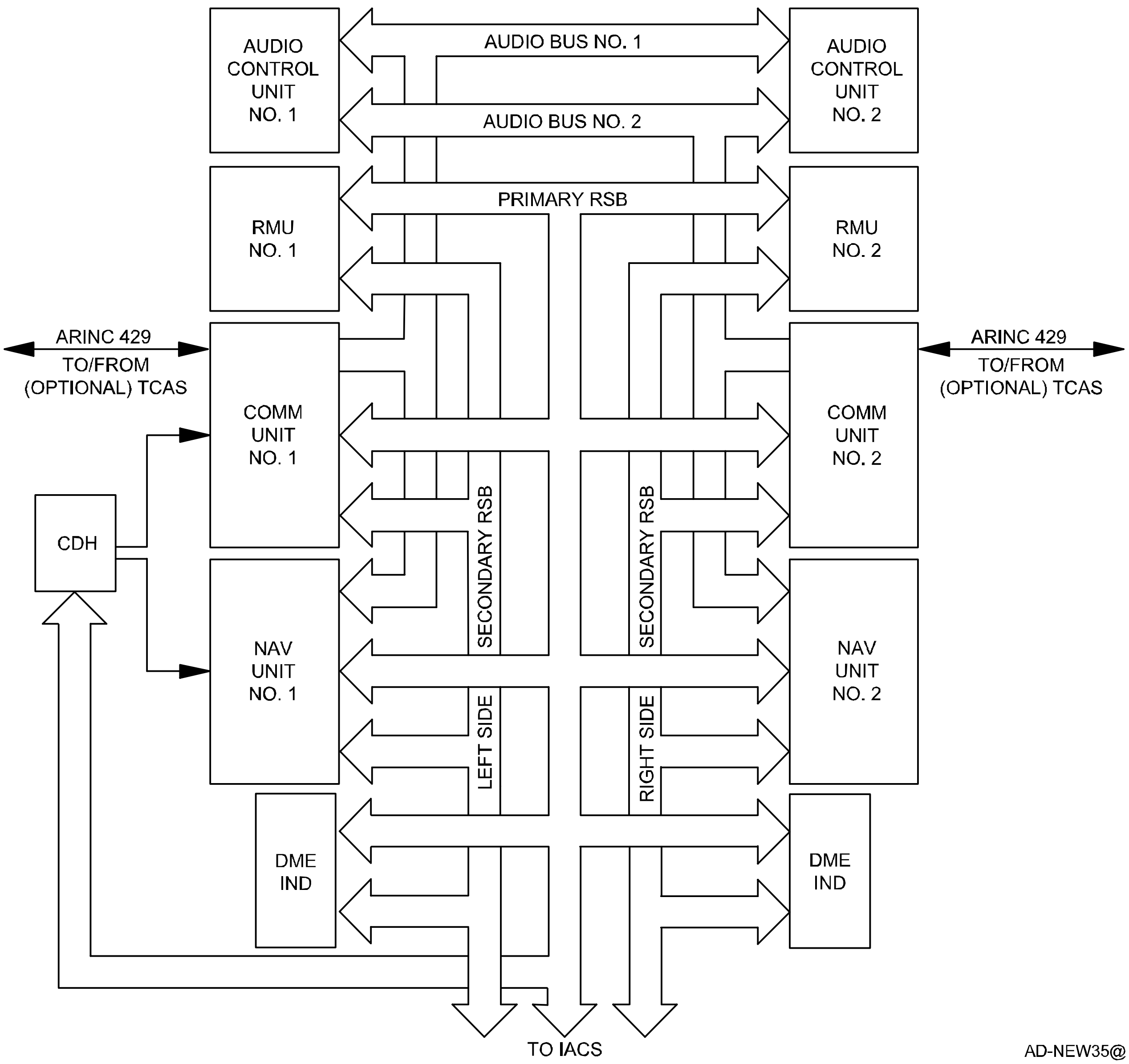

Figure 2-5-8. Radio System Data Buses

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Each remote radio unit contains a number of functional modules. These are packaged as follows:

- RCZ–851E Integrated Communications Unit
  - TR–850 VHF COM Transceiver Module
  - XS–852A Diversity Mode S Transponder Module
  - XC–850 COM Cluster Module (RSB and Digitized Audio Interface)
- RCZ–851F Integrated Communications Unit
  - TR–850 VHF COM Transceiver Module
  - XS–852B Mode S Transponder Module
  - XC–850 COM Cluster Module (RSB and Digitized Audio Interface)
- RCZ–851G Integrated Communications Unit
  - TR–850 VHF COM Transceiver Module
  - XS–850A ATCRBS Transponder Module
  - XC–850 COM Cluster Module (RSB and Digitized Audio Interface)
- RNZ–850 Integrated Navigation Unit
  - NV–850 VHF NAV Receiver Module
  - DM–850 DME Transceiver Module
  - DF–850 ADF Receiver Module
  - XN–850 NAV Cluster Module (RSB and Digitized Audio Interface)
- RNZ–850B Integrated Navigation Unit
  - NV–850 VHF NAV Receiver Module
  - DM–850 DME Transceiver Module
  - XN–850 NAV Cluster Module (RSB and Digitized Audio Interface).

Controls and the associated displays for the radios are available in the following units:

- AV–850A Audio Control Unit
- RM–850 Radio Management Unit (RMU)
- CD–850 Clearance Delivery Control Head (CDH).

The basic radio control functions are as follows:

- VHF COM Mode and Frequency
- VHF NAV Mode and Frequency
- ADF Mode and Frequency
- Transponder Reply Code and Mode
- TCAS Mode, Range, and Vertical Window
- DME (Independent Channeling in the Hold Mode)
- Audio Control Unit.

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Frequency and mode control of the radios can be input by the operator from either the RMU, the FMS, or the CDH. The CDH is somewhat limited since it is only connected to COM No. 1 and NAV No. 1. Microphone selection, radio headset and speaker selection, and volume control are supplied by the audio control unit. Audio switching control is input using controls on the audio control unit itself. The received audio signals are transmitted from the remote units to the audio control unit via a dedicated digital audio bus. The microphone audio output from the audio control unit to the remote mounted transmitters is analog.

Basic to the overall system design are cluster modules in the COM and NAV remote units. The cluster module is an interfacing element that collects data from the RSB, distributes this data to the respective functional modules (ADF, DME, etc.) via RCB, and also collects data via RCB from the functional modules to be broadcast on the RSB. The cluster modules are also responsible for digitizing the received audio and transmitting the digitized data on the digital audio bus.

B. RM-850 Radio Management Unit Interface Diagram

Refer to Figure 2-5-9 for the RM-850 Radio Management Unit interface diagram.

The RMUs broadcast messages addressed to radio functional modules and receive data from the radios via the RSB. Three major functions of the RMU are to output tuning (channel or frequency) control data, output operational mode control data for the radios, and display the tuned active channel or frequency and operational mode.

ATC Ident input is at ground when a crew member pushes either of the yoke-mounted remote ident buttons. The ground is applied to both RMUs, which in turn send the appropriate data command out on the RSB.

Other inputs include power, lighting, and ground connections.

Weight-On-Wheels (WOW) is at ground when the aircraft is on the ground (WOW is true).

On the ground, the RMU initiates a system Power-On Self-Test (POST) when power is first applied to the radio system and at other times with weight-on-wheels when power has been off for more than 10 seconds.

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The first page to appear on the RMU screen is POST in progress. POST lasts 45 seconds. During POST, the following is observed on the horizontal situation indicator display on both PFDs:

- Marker indicators and tones annunciate in the order of 3000 Hz (WHITE IM), 1300 Hz (AMBER MM), and 400 Hz (Blue OM)
- Localizer and glideslope deviation bars indicate centered course for approximately 2 seconds with flags out of view
- Localizer and glideslope deviation bars deflect left (localizer) and up (glideslope) one dot deflection, for approximately 2 seconds with flags out of view
- If the course selector is on zero degrees, VOR deviation bar centers on a course of zero degrees, TO, and RMI indicates zero degrees north for approximately 5 seconds with flags out of view
- DME TEST appears
- 10.0 NM, 120 KT, and 5 minutes TTG
- RMI ADF pointer slews to 135 ± 10 degrees, relative to aircraft heading
- Audio tone is heard through the audio system.

The system also includes a Pilot–Activated Self–Test (PAST) initiated by pushing a line select key to place the cursor in the window for the module to be tested and pushing and holding the TST button.

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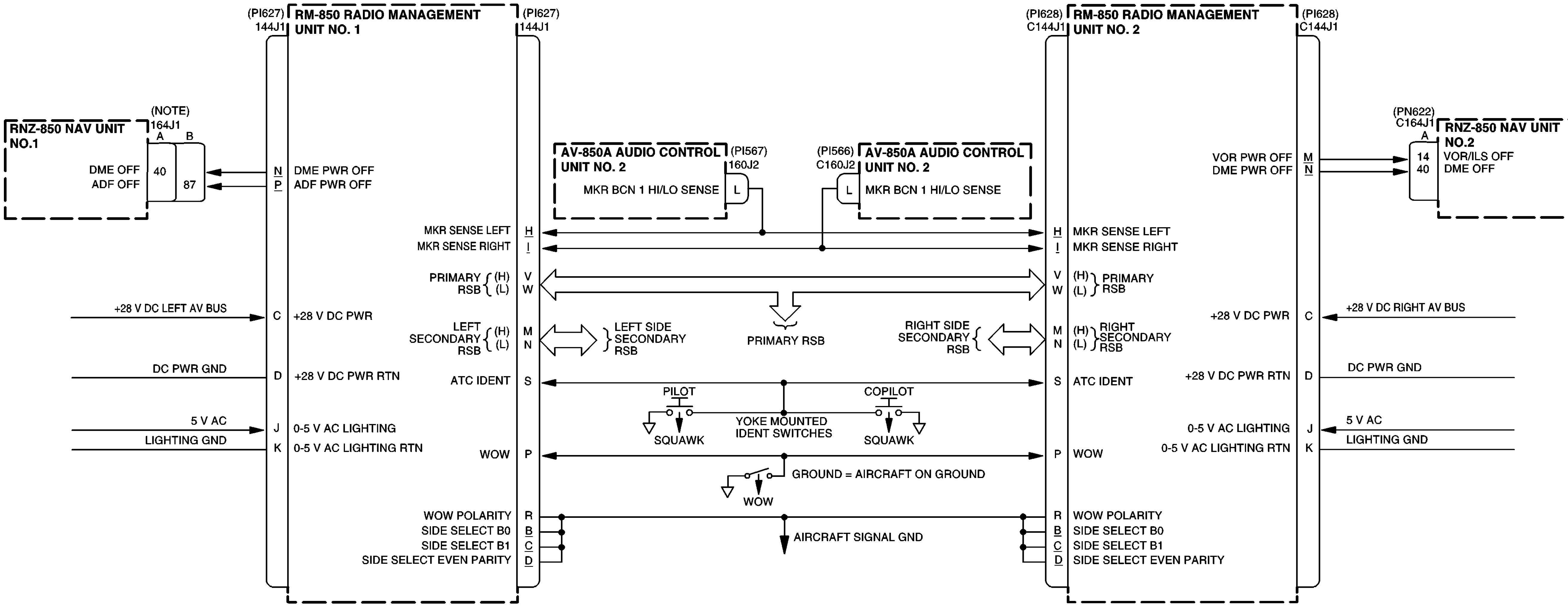

NOTE: CESSNA REF DES IS PT611 (164J1A) AND PT612 (164J1B) FOR TAILCONE INSTALLATIONS OR PN631 (164J1A) AND PN632 (164J1B) FOR NOSE INSTALLATIONS.

Figure 2-5-9. Radio Management Unit Interface Diagram

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C. CD-850 Clearance Delivery Control Head (CDH) Interface

Refer to Figure 2-5-10 for the CD-850 CDH interface diagram.

The NAV ACH SHIFT LOAD and NAV ACH CLOCK inputs come from the NAV module and control when the NAV ACH DATA is sent to the NAV module. The COM ACH DATA is sent to the COM module on a recurring cycle. The difference in timing is because of differences in module software operations.

The WOW input allows the POST to take place only if the aircraft is on the ground when the CDH is turned on.

The RSB input is used to display the active frequencies of the COM1 and NAV1 modules. Should there be an in-flight power failure, the CDH comes back on line displaying the same frequencies that were active prior to the failure.

Other inputs include power, lighting, and ground connections.

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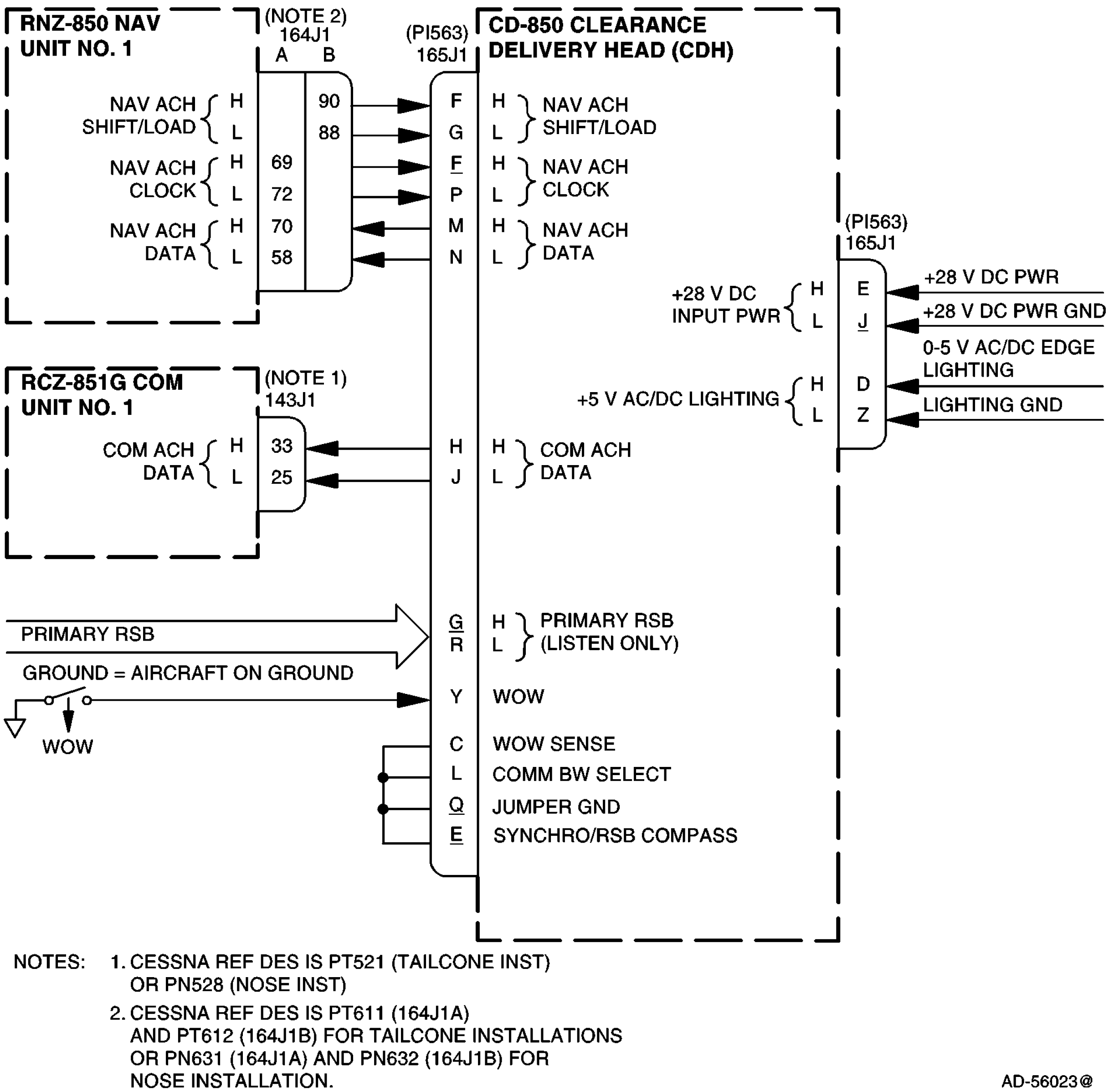

Figure 2-5-10. CD-850 Clearance Delivery Control Head Interface Diagram

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D. DI-851 DME Indicator Interface

Refer to Figure 2-5-11 for the DI-851 DME Indicator interface diagram.

All data is input to the indicators via the RSB. The indicators are receive only devices; there are no outputs. The data is used to display DME-related information.

Other inputs include power, lighting, and ground connections.

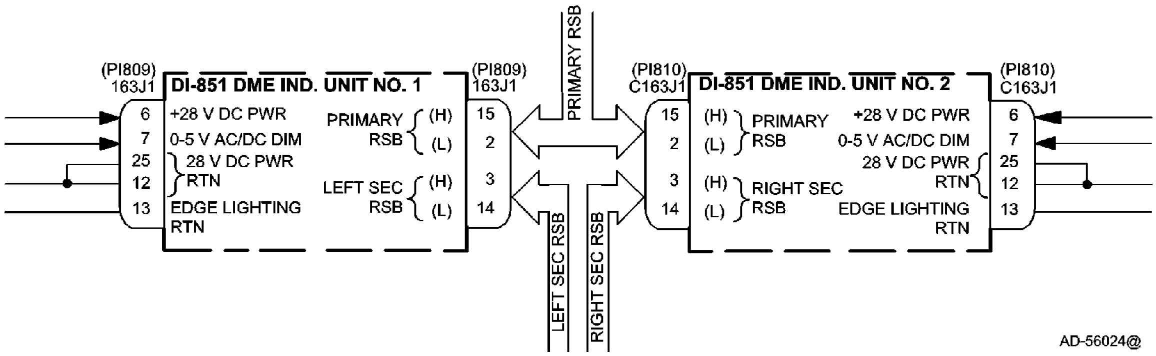

Figure 2-5-11. DME Indicator Interface Diagram

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E. AV-850A Audio Control Unit Interface

Refer to Figure 2-5-12 for the AV-850A Audio Control Unit interface diagram.

The AV-850A Audio Control Unit receives digitized audio from the remote units via two high-speed digital audio buses. Each audio control unit selects the appropriate channels from this digital audio bus and reconstitutes headphone and speaker signals. This allows the system the capability to individually select the radio function that each crew member desires to hear. There is a row of microphone selector buttons along the top edge, that when pushed, selects the desired transmitter/receiver. At the same time,it automatically enables the receive audio associated with that transmitter/receiver, regardless of the condition on the audio ON/OFF buttons. The audio ON/OFF buttons are located on the lower rows of the audio control unit. Pushing the button causes it to latch stowed and the audio associated with that button turns off. Pushing the button again lets it pop out and energize the audio into the speaker and headphone and let the audio level be adjusted by rotating the button. Also included are master volume controls for both speaker and headphone.

The audio control unit also has numerous connections for intercom, crew annunciation, crew communication, hot microphone, cabin address, etc., and full-time emergency warning inputs from aircraft systems. Cross-cockpit audio is supplied so the pilot and copilot remain coordinated with each other in their selection and use of the radio system components.

Digital audio offers the advantage of complete independence from grounding problems within the aircraft and the absolute elimination of ground noise pick-up, whine, and cross-talk. Having the audio digitized also offers the advantage that when recovering the analog information from the digital, each volume control can be independently set by each crew member. For instance, the pilot can have COM1 very loud and COM 2 very soft in his headset while the copilot desires the VOR to be loud, COM1 to be soft and COM 2 to be moderate. This is easily set at the audio control units by adjusting the volumes to their own desire. Also, by having the audio system digitized, various filtering and priority functions can be easily accomplished to enhance the operation and the human interfaces.

The audio control unit has provisions for a combination of emergency operations. In the case of power-down or failure of the audio system, there is one location (in the upper right-hand corner of the audio control unit) where pushing the microphone select (labeled EMER) for the emergency COM bypasses all the circuitry within the audio control unit and places the emergency COM and NAV audio into the headphone circuitry. Emergency audio is analog audio from the COM and NAV modules connected to the CD-850 CDH. This function is also convenient during ground operation when minimum power usage is desired.

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Reference Figure 2–5–12 (sheet 1) for the following:

- Microphone and PTT inputs and outputs
- Interphone audio and PTT
- Emergency analog audio inputs from COM1 and NAV 1
- Speaker outputs
- Cabin address system interconnections.

Reference Figure 2–5–12 (sheet 2) for the following:

- Digital audio bus
- Other inputs include power, lighting, and ground connections.

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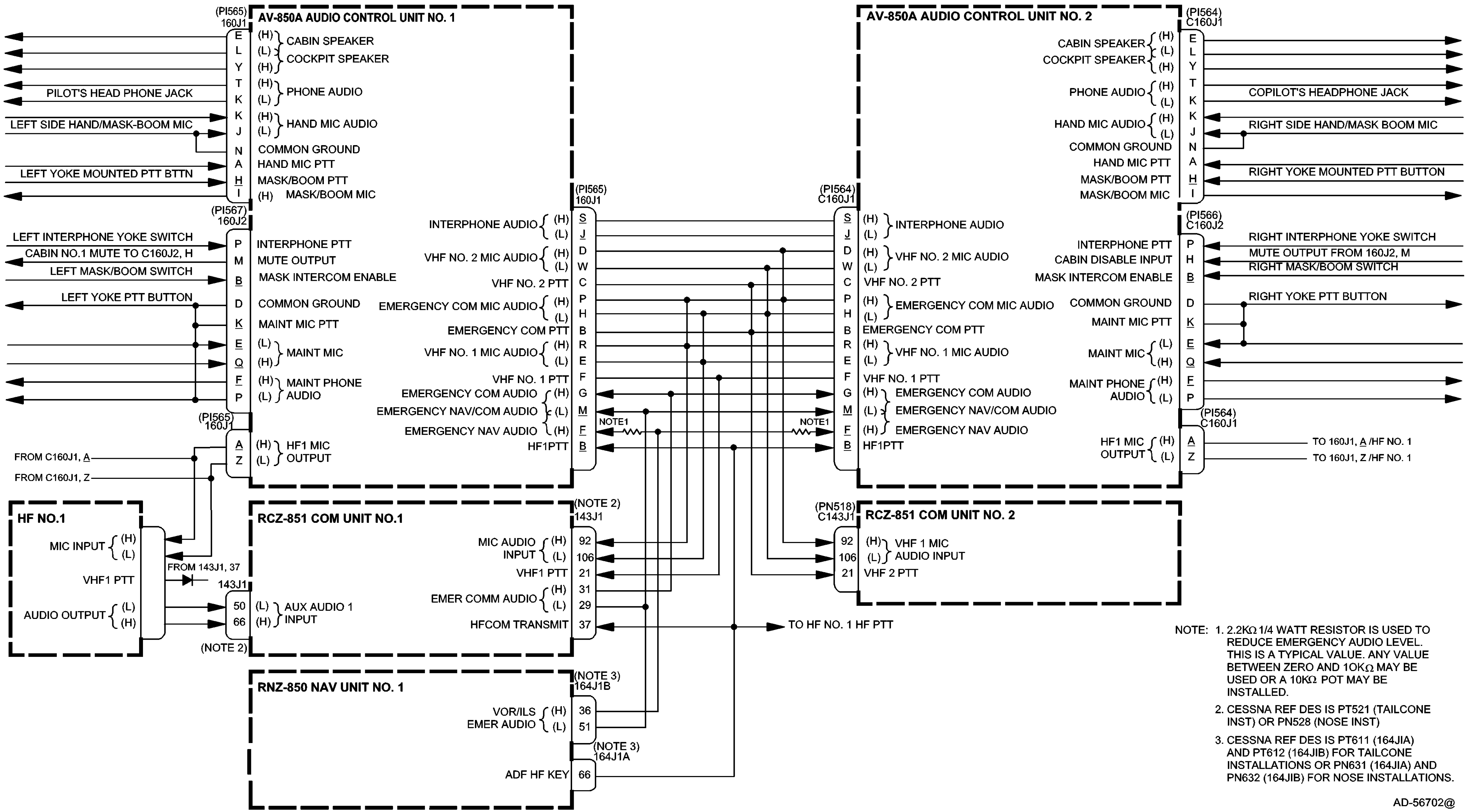

Figure 2-5-12 (Sheet 1). AV-850A Audio Control Unit Interface Diagram

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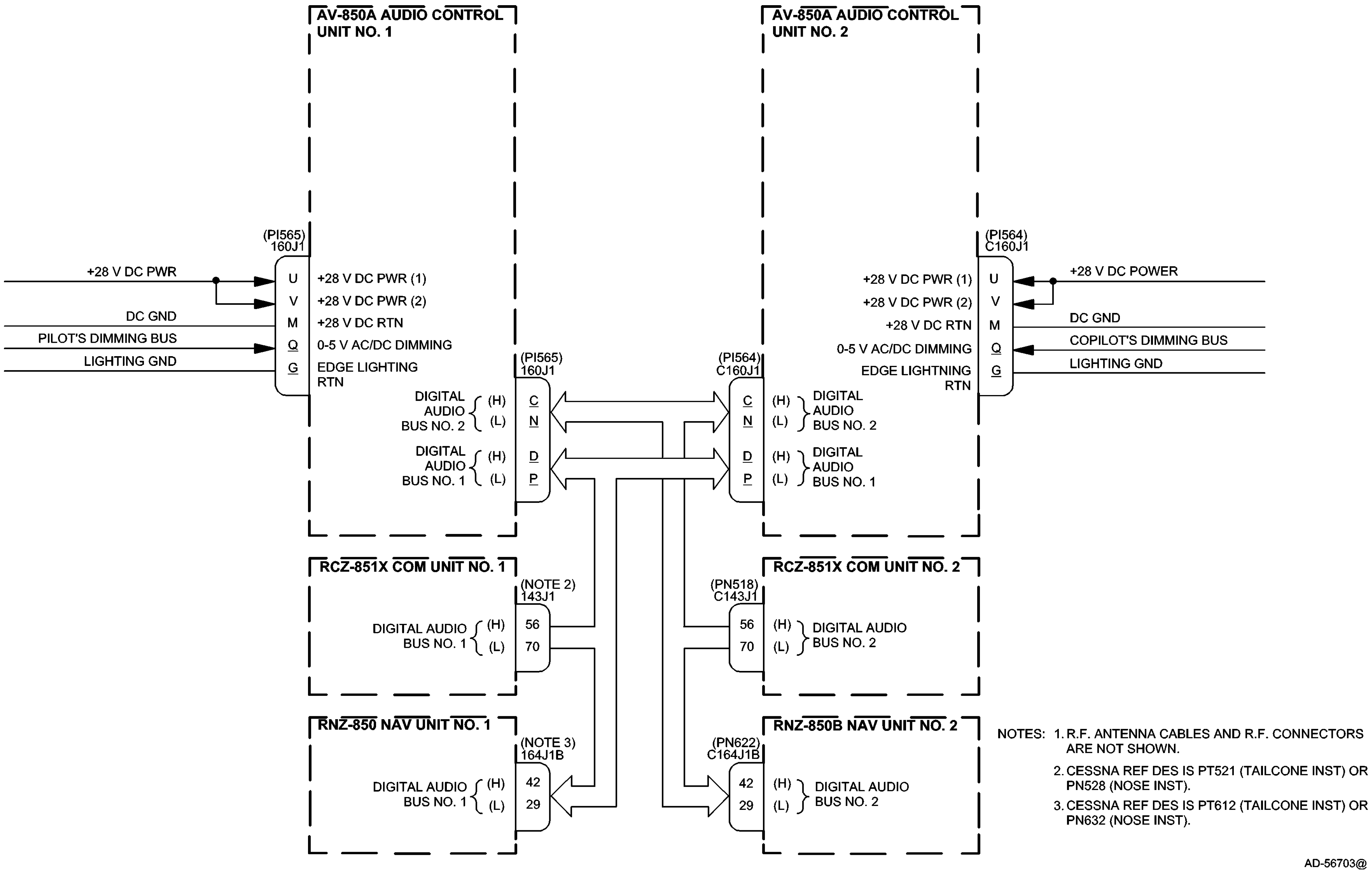

NOTES: 1. R.F. ANTENNA CABLES AND R.F. CONNECTORS ARE NOT SHOWN.
2. CESSNA REF DES IS PT521 (TAILCONE INST) OR PN528 (NOSE INST).
3. CESSNA REF DES IS PT612 (TAILCONE INST) OR PN632 (NOSE INST).

Figure 2-5-12 (Sheet 2). AV-850A Audio Control Unit Interface Diagram

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F. RCZ-851 (X) Integrated Communication Unit Interface

Refer to Figure 2-5-13 for the RCZ-851 (X) Integrated Communication Unit interface diagram.

The common unit connections shown include power, ground, and RSB, all of which have been covered in previous sections.

Command data for the optional TCAS computer unit originate at the RMU and are transmitted via RSB The cluster modules in each RCZ-851 (X) Com Unit receive the data and pass it to the RMU selected active transponder, which sends the data to the TCAS CU via ARINC 429. TCAS reply coordination data is handled in the reverse.

During a cold start power-up, the cluster board sends word load and clock to the strap option board and receives data back. This data is sent to the modules via RCB.

The rack-mounted fan is controlled by the cluster module and is turned on when any module reports a temperature above the threshold. The threshold is different in each module. When the temperature drops below the threshold, the cluster module turns the fan off. The fan is not required for system operation.

Encoded altitude data is transmitted by each MADC via ARINC 429 to both transponders.

The SIMULCOM line goes to ground when either VHF COM transceiver is transmitting. This connection allows the radio side that is still in the receiver mode to desensitize its receiver and not listen/process the transmitting radios transmission.

The WOW is used by the transponder to disable Mode S replies when the aircraft is on the ground.

The mutual suppression bus goes to ground when any of the transmitters on the line is transmitting. This prevents the DME, TCAS, and transponders from interfering with each other during otherwise normal operation.

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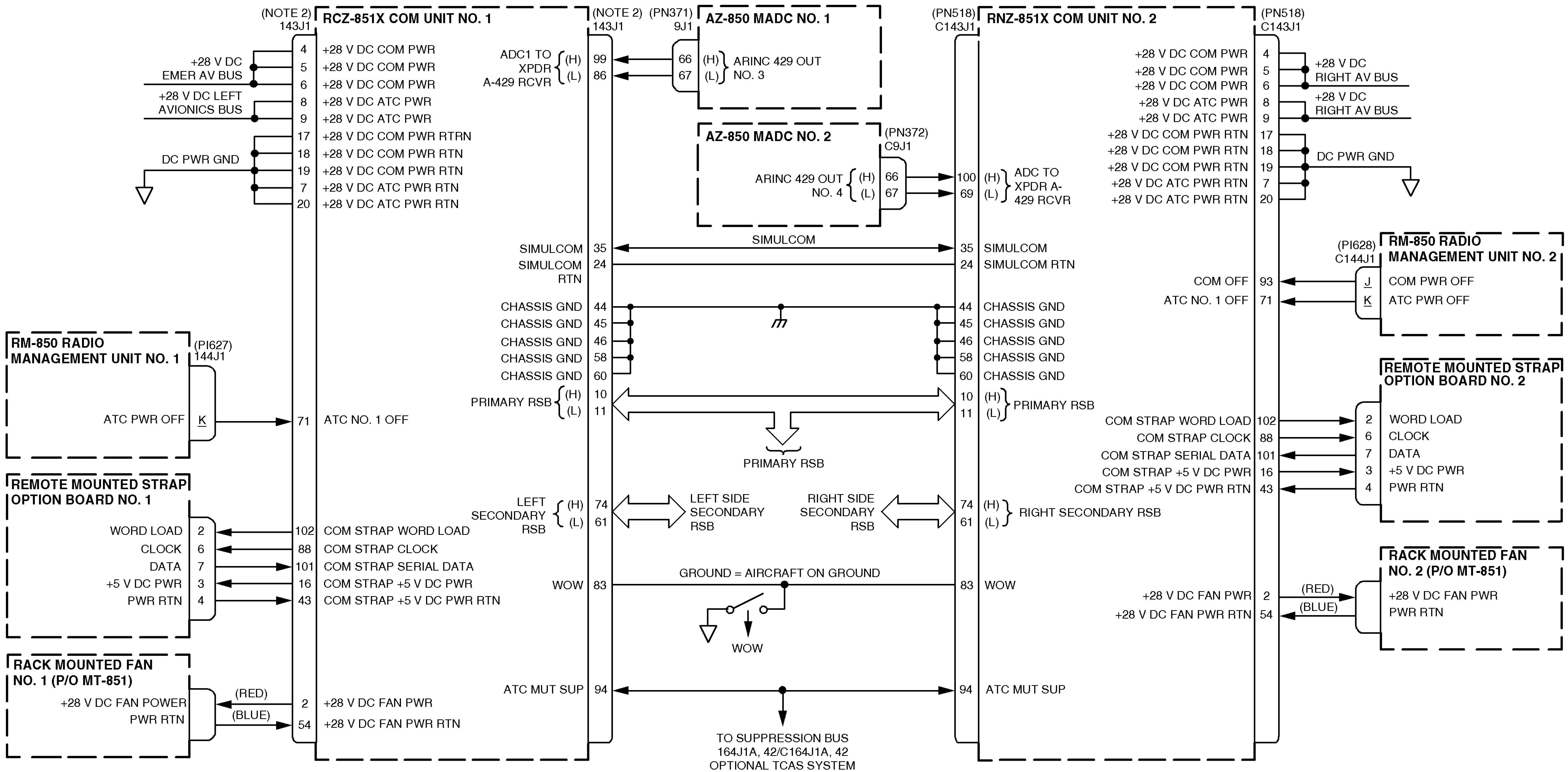

NOTES: 1. R.F. ANTENNA CABLES AND R.F. CONNECTORS NOT SHOWN.
2. CESSNA REF DES IS PT521 (TAILCONE INST) OR PN528 (NOSE INST).

Figure 2-5-13. RCZ-851 (X) Integrated Communications Unit Interface Diagram

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G. RNZ-850/850B Integrated Navigation Unit Interface

Refer to Figure 2-5-14 for the RNZ-850/850B Integrated Navigation Unit interface diagram.

The common unit connections shown include power, ground, and RSB, all of which have been covered in previous sections.

Connections between RCB to MLS and MLS to RCB instruct the cluster module that there is no MLS receiver on board, and therefore, the cluster module can not file failure to communicate messages.

The ADF antenna receives power and modulation signals from the ADF receiver via the cluster module. The signal from the antenna is via tri-axial cable, not shown on this diagram. The ADF antenna contains the self-test signal generator used during self-test procedures.

During a cold start power-up, the cluster board sends word load and clock to the strap option board and receives data back. This data is sent to the modules via RCB.

The rack-mounted fan is controlled by the cluster module and is turned on when any module reports a temperature above the threshold. The threshold is different in each module. When the temperature drops below the threshold, the cluster module turns the fan off. The fan is not required for system operation.

The mutual suppression bus goes to ground when any of the transmitters on the line is transmitting. This prevents the DME, TCAS, and transponders from interfering with each other during otherwise normal operation.

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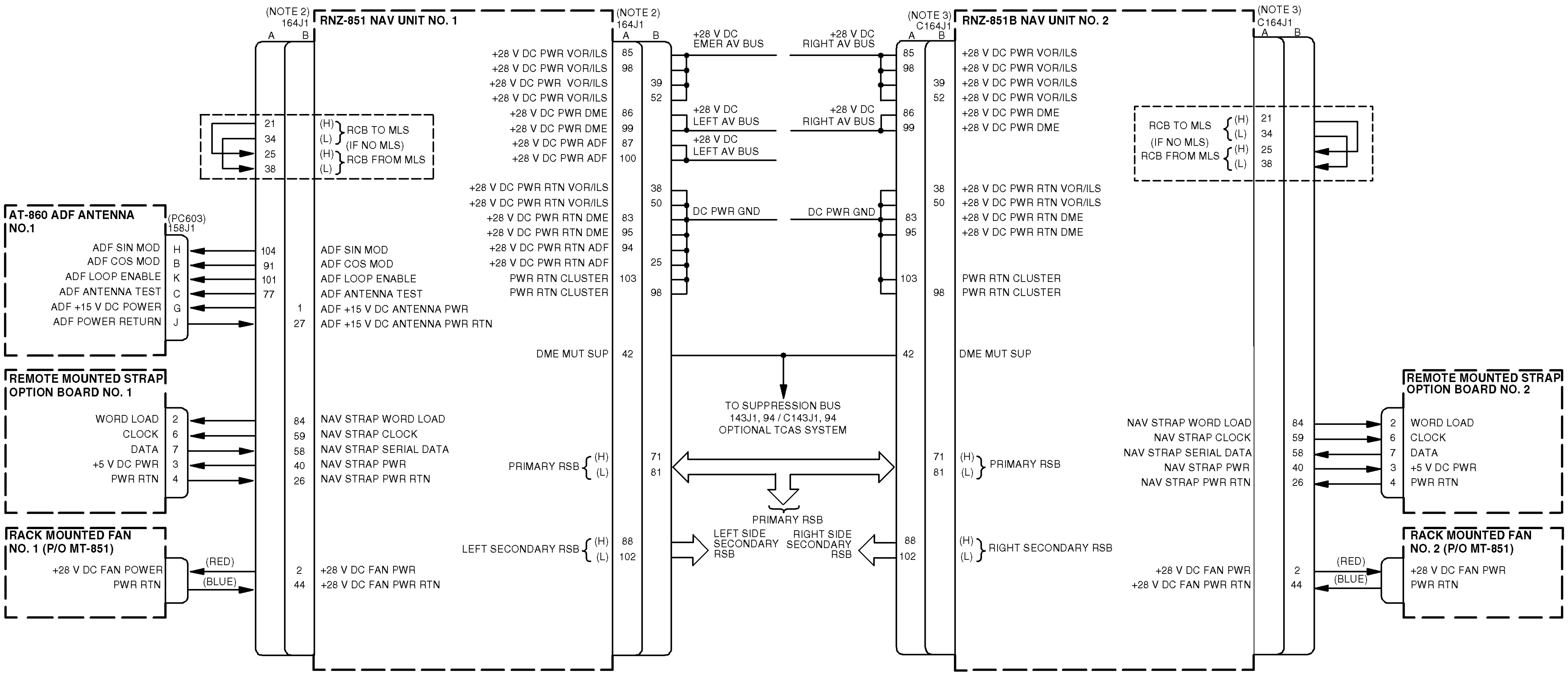

NOTES: 1. R.F. ANTENNA CABLES AND R.F. CONNECTORS NOT SHOWN
2. CESSNA REF DES IS PT611 (164J1A) AND PT612 (164J1B) FOR TAILCONE INSTALLATION OR PN631 (164J1A) AND PN632 (164J1B) FOR NOSE INSTALLATIONS.
3. CESSNA REF DES IS PN622 (C164J1A) OR PN623 (C164J1B).

Figure 2-5-14. RNZ-850/850B Navigation Unit Interface Diagram

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4. Fault Monitoring

Fault indications are shown on the PFD and MFD displays and RMU. Refer to Figure 2-5-15 thru Figure 2-5-17.

A. Primary Flight Display (PFD)

Figure 2-5-15 shows the fault indication as presented on the PFD.

Loss of valid vertical deviation from the NAV receiver causes the following to occur:

- Removal of the vertical deviation pointer
- Scale to be red **X**'d.

Loss of valid lateral deviation from the NAV receiver causes the following to occur:

- Removal of the HSI lateral deviation pointer
- HSI lateral deviation scale to be red **X**'d.

Loss of valid distance information from the DME module causes the following to occur:

- Amber dash of the distance digital readout.

Loss of valid bearing information from the NAV receiver causes the following to occur:

- Removal of the HSI lateral deviation pointer
- HSI lateral deviation scale to be red **X**'d
- Removal of the TO/FROM display
- Removal of the absolute bearing pointers.

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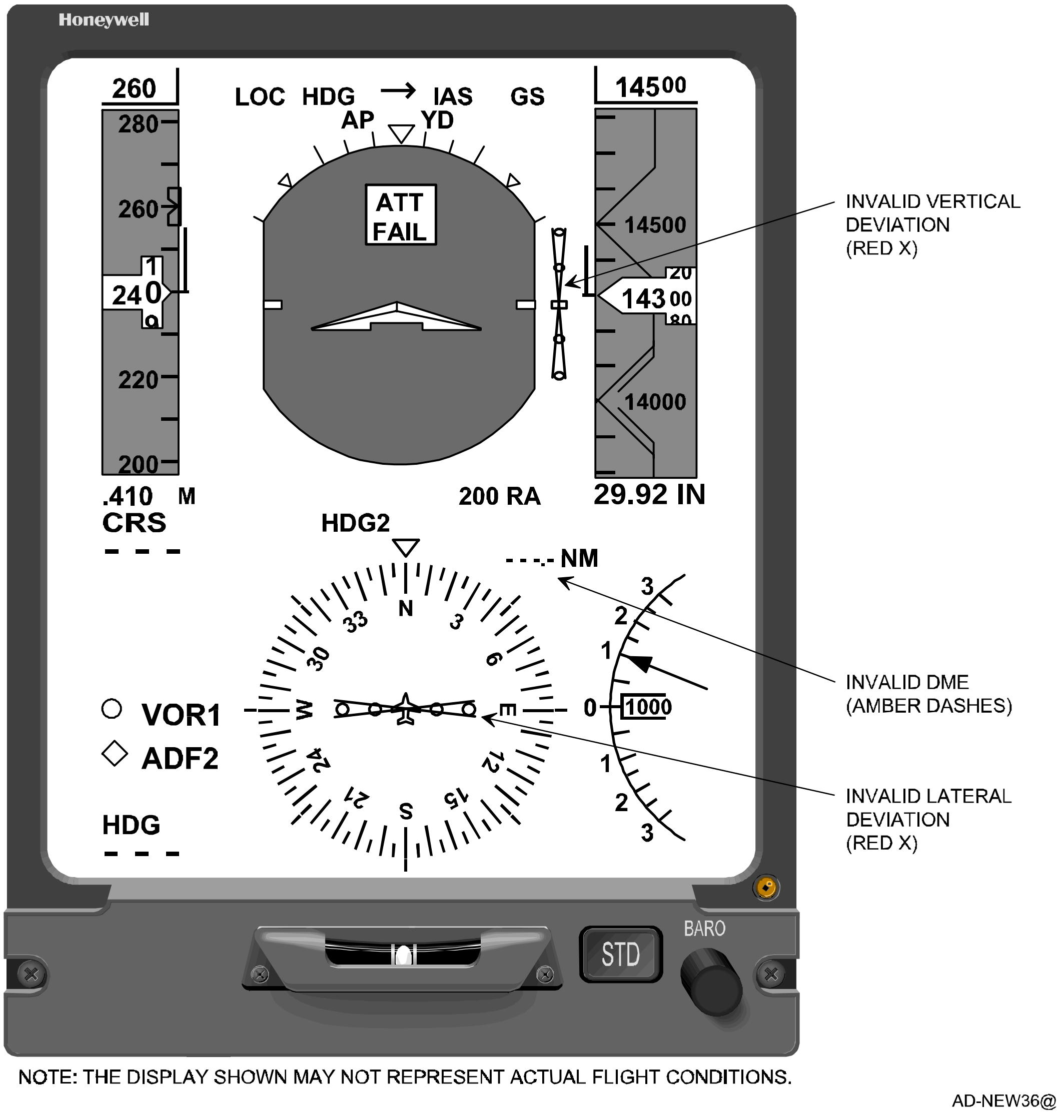

Figure 2-5-15. PFD Radio System Failure Indications

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B. Multifunction Display (MFD)

Figure 2-5-16 shows the fault indication as presented on the MFD.

Loss of valid distance information from the DME Module causes the following to happen:

- Removal of the Morse identifier
- Amber dash of the distance digital readout
- Amber dash of the time-to-go digital readout
- Amber dash of the ground speed digital readout.

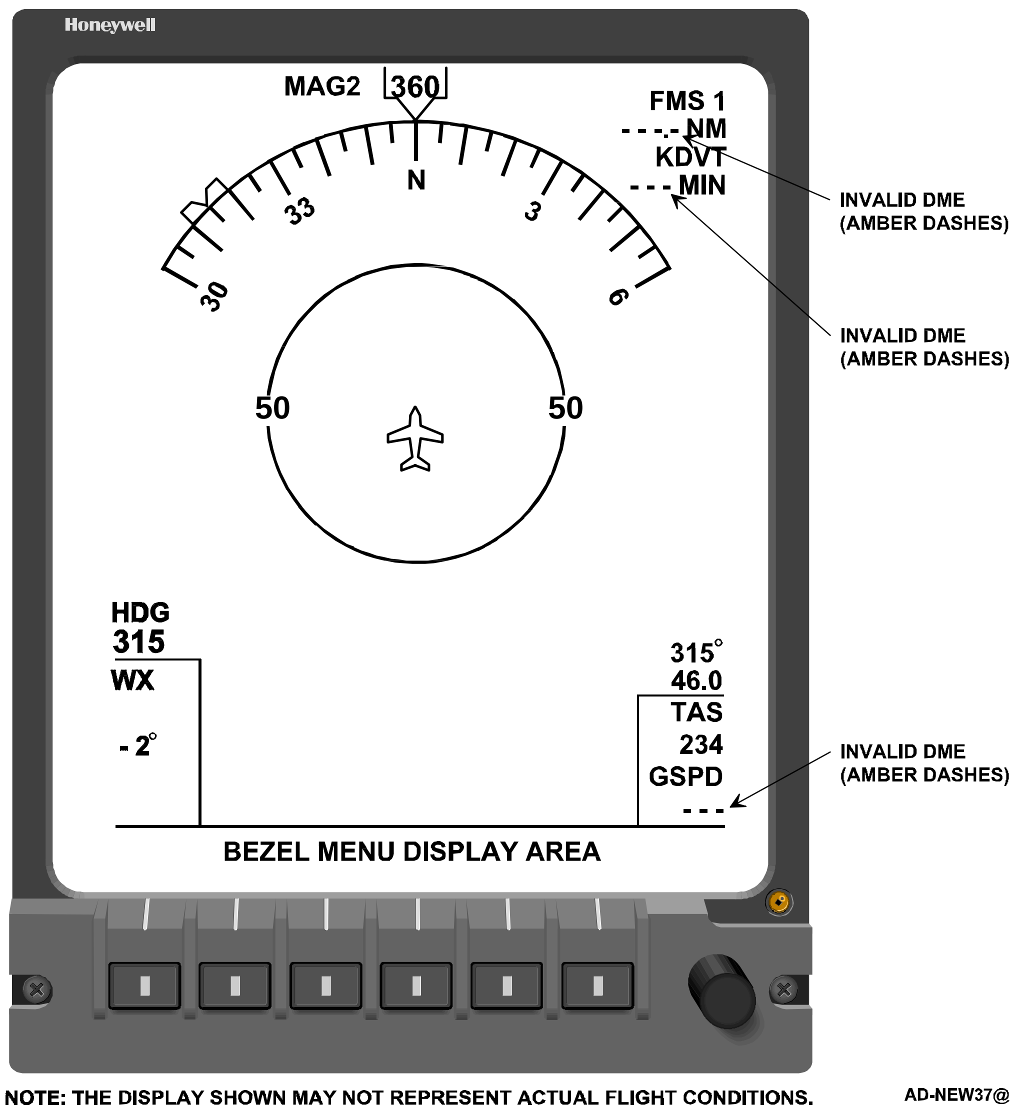

Figure 2-5-16. MFD Radio System Failure Indications

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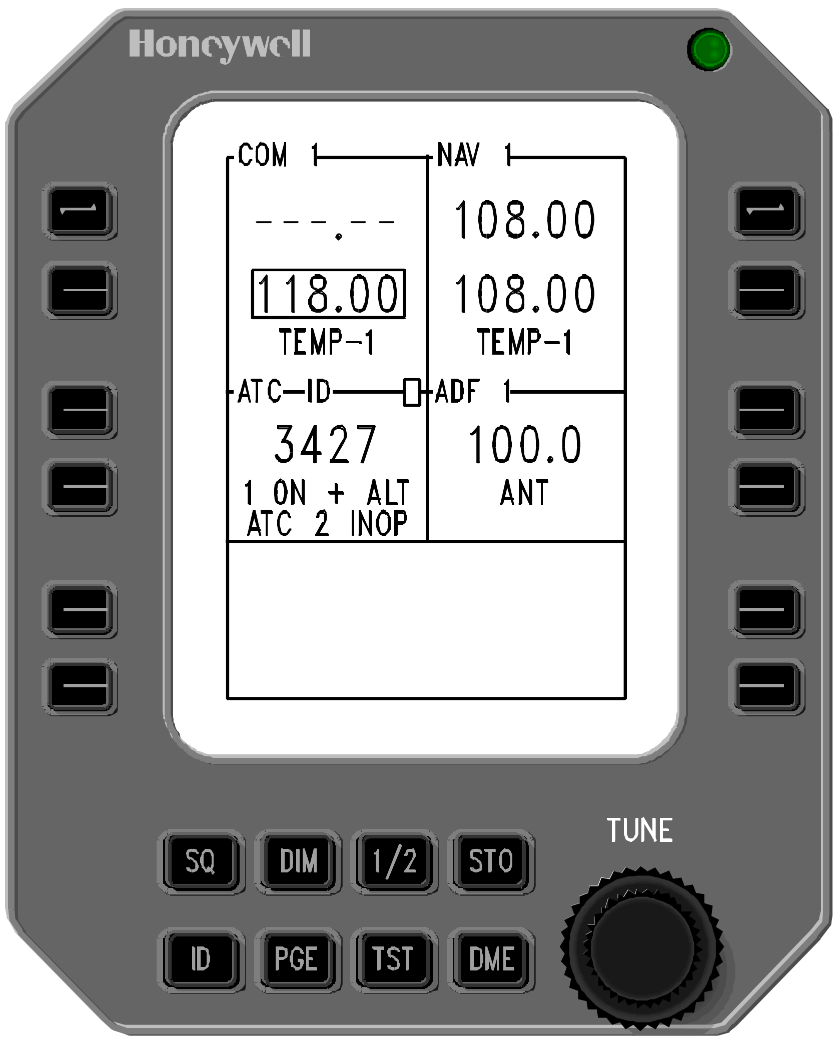
C. Radio Management Unit (RMU) Display

Figure 2-5-17 shows the fault indication as presented on the RMU. Any failure of a module causes the RMU to remove the frequencies or operating commands associated with that particular function and replace them with dashes.

Should a transponder that is operating in the standby mode fail while the other transponder is active, a red ATC1 INOP or ATC2 INOP message appears on the bottom line in the transponder window on the RMU.



NOTE: THE DISPLAY SHOWN MAY NOT REPRESENT ACTUAL FLIGHT CONDITIONS.
AD-48976@

Figure 2-5-17. RMU Failure Indications

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SECTION 2.6
FLIGHT DIRECTOR SYSTEM

1. General

The PRIMUS 1000 Flight Guidance System (FGS) employs two separate Flight Director Systems (FDS). One is housed in the pilot's IC-600 Integrated Avionics Computer (IAC) and the other is housed in the copilot's IC-600 IAC. The flight directors give computed steering commands to the autopilot and to the command bars on the PFDs. With the autopilot not engaged, the pilot can manually fly the steering command. With the autopilot engaged, the flight director computed steering commands are flown by the autopilot. The flight director supplies both lateral and vertical steering commands and one each can be active at the same time to control the aircraft. Other flight director modes can be armed to automatically become active at the proper time.

The PRIMUS 1000 FGS is a split processor system. The primary processor is used for the Electronic Flight Instrument System (EFIS) and flight director functions. The secondary processor supplies servo control of the aileron, elevator, rudder, and elevator trim. The secondary processor is not aware of flight director modes and does not change any gains as a function of flight director modes.

The remote mounted FD1/FD2 switch lets the pilot select which flight director is active and coupled to the autopilot.

Each flight director system consists of the following LRUs:

- MS-560 Mode Selector
- IC-600 Integrated Avionics Computer (IAC)
- PC-400 Autopilot Controller (common to both flight directors)
- DC-550 Display Controller
- RI-553 Remote Instrument Controller (common to both flight directors).

The sensors used by the flight director are as follows:

- AZ-850 Micro Air Data Computer
- VG-14A Vertical Gyro
- C-14D Directional Gyro
- AG-222 Normal Accelerometer
- Radio Altimeter
- NAV and DME Radios
- Flight Management System (FMS).

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For the flight director to compute a steering command, the following has to be considered:

- What is the pilot's desired attitude/position?
- What is the aircraft's actual attitude/position?
- If there is a difference between desired and actual, correct for the difference, and control the speed at which the correction takes place?

Flight director modes use on-side attitude, heading, and air data information for computations. Cross-side attitude data is used for monitoring only.

A. Flight Director Data Management

The flight director only requires pitch and roll attitude for synchronizing the attitude command and for computing command bar outputs. The on-side attitude data is used for synchronization and command bar computations when modes are selected. The IC-600 IAC uses the flight director attitude command to position the command bar on the attitude sphere.

The flight director can couple to either short range NAV (SRN) or the long range NAV (FMS), based on which is being displayed on the PFD. Each flight director uses on-side displayed NAV data.

The flight director uses the air data input as the reference for all vertical modes, except glideslope and gain programming. The altitude hold target, airspeed target, vertical speed target, and selected altitude are all computed by the IC-600 IAC.

B. Flight Director Switching

Flight director switching allows either the pilot's or copilot's flight director to be coupled to the PRIMUS 1000 autopilot. This is accomplished using the remote-mounted FD1/FD2 button. The pilot's IC-600 IAC controls the state of the flight director couple switching.

Flight director couple status determines which flight director is in control for mode engagement. The uncoupled flight director operates independently from the coupled flight director.

Activation of the FD1/FD2 switch resets the selected flight director modes of the flight directors. The pilot must then re-engage the flight director modes he wants active.

The flight directors operate in a coupled/uncoupled arrangement that tracks the air data targets, the heading select reference, and the selected mode annunciations on the PFD between the pilot's and copilot's systems. The position of the FD1/FD2 switch indicates which flight director is coupled. Each flight director computes the reference for the selected altitude, IAS hold target, Mach hold target, vertical speed mode reference, and VNAV parameters for its own flight director. When the coupled and uncoupled flight directors are in the same mode, each flight director synchronizes to its own air data targets computed.

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C. Flight Director Mode Annunciation

The coupled flight director annunciates the selected armed mode on its on-side PFD. When the mode is captured, the on–side PFD annunciates capture. The cross–side flight director operates independently from the coupled flight director.

If the on-side SG reversion function is pushed on the coupled side, the flight director modes are reset. If the on-side SG reversion function is pushed on the cross side flight director, the flight director mode on both flight directors remains active.

If the IC bus becomes invalid, each flight director defaults to the default state and the flight director mode annunciations are independently annunciated on their on-side PFD.

After an IC bus failure, it is impossible to couple the right side flight director to the autopilot. The right side flight director still accepts mode select inputs from its MS-560 Mode Selector and displays mode annunciations on the PFD.

D. Flight Director Command Bar Logic

The flight director command bar (either cross pointer or single cue) goes out of view for invalid data sources related to the mode.

E. Altitude Preselect Function

The altitude preselect function consists of a digital set knob located on the MFD bezel controller. Each discrete movement of the knob causes a 100 foot change in the altitude preselect target. On power-up, the preselect target is invalid until the set knob is rotated. There also are altitude preselect light and horn warning discretes controlled by the IC-600 IAC.

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2. Component Descriptions and Locations

A. IC-600 Integrated Avionics Computer

Two IC-600 Integrated Avionics Computers (IAC) are located in the nose compartment. Figure 2-6-1 shows a graphical view of the IC-600 IAC. Table 2-6-1 gives items and specifications particular to the computer.

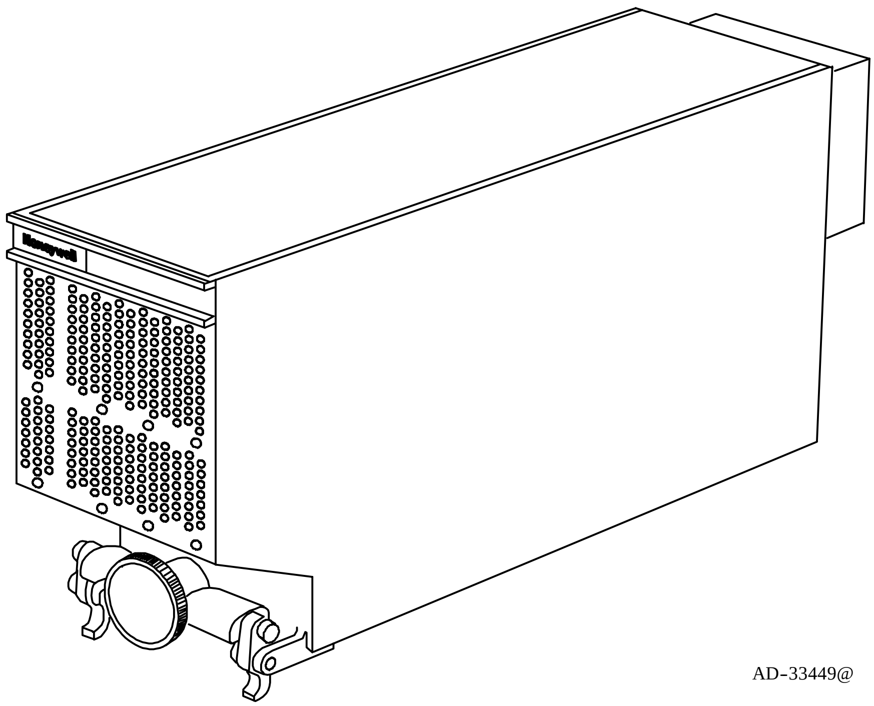

Figure 2-6-1. IC-600 Integrated Avionics Computer (FD Function)

Table 2-6-1. IC-600 Integrated Avionics Computer Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	7.62 in. (193.55 mm)
• Width	4.13 in. (104.90 mm)
• Length	16.45 in. (418.83 mm)
Weight (maximum):	
• With Autopilot	15.5 lb (7.05 kg)
• Without Autopilot	15.0 lb (6.82 kg)

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Table 2-6-1. IC-600 Integrated Avionics Computer Leading Particulars (cont)

Item	Specification
Power Requirements (with autopilot):	
• Continuous	28 V dc, 50 W (max)
• In-Rush	28 V dc (0.5 sec), 200 W (max)
• Servo Power	28 V dc, 210 W (max)/112 W (nom)
Power Requirements (without autopilot):	
• Continuous	28 V dc, 50 W (max)
• In-Rush	28 V dc (0.5 sec) 200 W (max)
User Replaceable Parts	None
Mating Connectors (J1, J2)	ITT Cannon Part No. DPX2MA-A106P-A106P-33B-0001 NOTE: Sunbank backshell (4) required: Part No. J1560-12-2
Mounting	HPN 7017095-902

The primary component of the flight director system is the IC-600 IAC. The pilot's IC-600 IAC is a symbol generator, flight director, and autopilot computer integrated into a single unit. The copilot's IC-600 is identical to the pilot's IC-600 except there is no autopilot function on the copilot's side. All aircraft sensors and navigation sources are connected directly to the IC-600 IAC, since all flight control functions reside inside this computer.

Basic flight director modes are initiated by manual selection through the MS-560 Mode Selector. Once a mode is initiated, automatic transitions can occur from armed to active status or to another mode if the transition initiation requirements are met. The armed mode states only supply a visual indication (PFD annunciation) of mode status relative to a manual selection of some guidance modes, whereas active mode states give both visual mode status indications and pitch/roll steering commands to the PFD and the autopilot when engaged.

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Data used to compute guidance commands are consistent with that displayed on the PFD. This data includes the following:

- Displayed heading and heading flag valid
- Selected course and course error
- Selected heading and heading error
- Lateral and vertical path deviations and flag valids
- DME distance, tuned-to-NAV, and to-from status
- Middle marker data
- NAV source identification (tuned-to-localizer, VOR, LNAV)
- Lateral steering commands and flag valids.

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B. MS-560 Mode Selector

Figure 2-6-2 and Figure 2-6-3 shows a graphical view of the MS-560 Mode Selector. The mode selector is mounted in the glare shield in front of each pilot. Table 2-6-2 gives items and specifications particular to the mode selector.

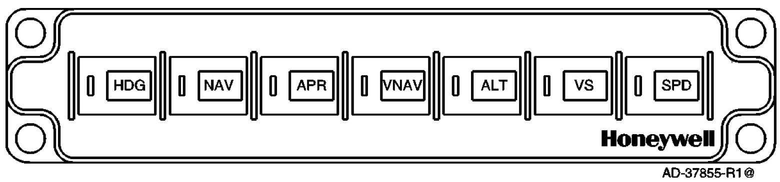

Figure 2-6-2. MS-560 Mode Selector (Before Phase III)

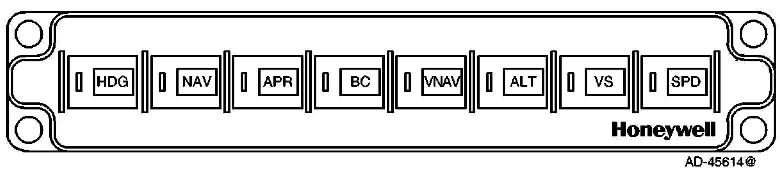

Figure 2-6-3. MS-560 Mode Selector (Phase III)

Table 2-6-2. MS-560 Mode Selector Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.125 in. (28.6 mm)
• Width	5.750 in. (146.0 mm)
• Length	3.380 in. 97.3 mm)
Weight (maximum)	0.80 lb (0.36 kg)
Power Requirements:	
• Panel Lighting	5 V ac or dc
• Mode Annunciation	28 V dc
User Replaceable Parts:	
• Lamp, Clear	HPN 7011974-1
• Lamp, Blue White	HPN 7011974-2

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Table 2-6-2. MS-560 Mode Selector Leading Particulars (cont)

Item	Specification
Mating Connector:	
• J1	M24308/2-283F with locking hardware M24308/125-9 and hood M85049146-2-3
Mounting	Hard Mount

The MS-560 Mode Selector lets the pilot make flight director lateral and vertical mode selections. The front panel has seven or eight buttons. The buttons are connected to normally open switches. Each switch has a mode activation lamp inside. The switches make a momentary ground when pushed. Mode selections are sent to the respective DC-550 Display Controller, and from there to the IC-600 IACs.

Lateral Mode Buttons are as follows:

- HDG – Heading select
- NAV – Lateral navigation (SRN or LRN)
- APR – Localizer and Glideslope
- BC – Back Course Localizer (Phase III only).

Vertical Mode Buttons are as follows:

- VNAV – Vertical Navigation
- ALT – Altitude hold
- VS – Vertical Speed hold
- SPD – Indicated Airspeed/Mach hold.

Automatic Mode is as follows:

- ASEL – Altitude Preselect (not selectable on the MS-560).

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C. DC-550 Display Controller

The DC-550 Display Controller is mounted in the instrument panel next to the pilot's and copilot's PFD. Figure 2-6-4 and Figure 2-6-5 shows a graphical view of the DC-550 Display Controller. Two DC-550 Display Controllers are located in the glareshield. Table 2-6-3 gives items and specifications particular to the controller.

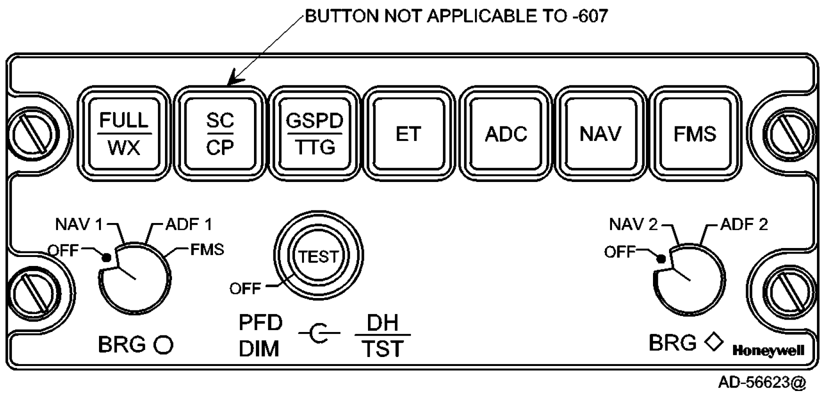

Figure 2-6-4. DC-550 Display Controller (-607 and -707, Before Phase III)

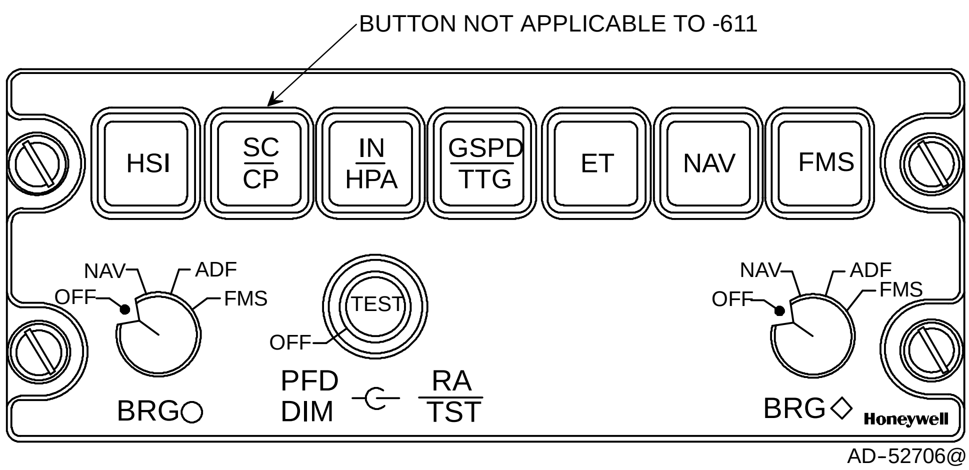

Figure 2-6-5. DC-550 Display Controller (-611 and -723, Phase III)

For the flight director function, the DC-550 Display Controller supplies a data acquisition function for the MS-560 Mode Selector, RI-553 Remote Instrument Controller, and the DU bezel controllers. This data is collected and then transmitted to the IC-600 IAC on a two-wire digital bus.

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Table 2-6-3. DC-550 Display Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.25 in. (57.15 mm)
• Width	5.75 in. (146.05 mm)
• Length	6.87 in. (174.50 mm)
Weight (maximum)	2.0 lb (0.91 kg)
Power Requirements:	
• Primary	28 V dc, 5.0 W (max)
• Lighting	5 V ac, 5.0 W (max)
User Replaceable Parts:	
• Knobs:	
- BRG ○ (Setscrew A)	HPN 7009437
- BRG ◇ (Setscrew A)	HPN 7009437
- RA (Setscrew B)	HPN 7018748-1
- Test Button HUB (Setscrew B)	HPN 7009644-3
• Setscrews:	
- A (Multi-Spline, 2-56 x 1/8-inch, cup point)	HPN 2500148-64
- B (Multi-Spline, 4-40 x 3/16-inch, cup point)	HPN 2500148-130
Mating Connector (J1)	MS27473E20-B35SB
Mounting	Standard Dzus Rail

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D. RI-553 Remote Instrument Controller

The RI-553 Remote Instrument Controller is mounted in the bottom of the pedestal. The RI-553 Remote Instrument Controller lets the pilot select HEADING and COURSE references for lateral flight director modes. The front panel has a single HEADING knob and two COURSE knobs. The knobs are connected to rotary switches that have 16 positions and give a quadrature greycode output. Operation of the knob lets the display increment one unit for each click of knob rotation. Selections are routed to the DC-550 Display Controllers, and from there to both IC-600 IACs. Figure 2-6-6 and Figure 2-6-7 show a graphical view of the RI-553 Remote Instrument Controller. Leading particulars are given in Table 2-6-4.

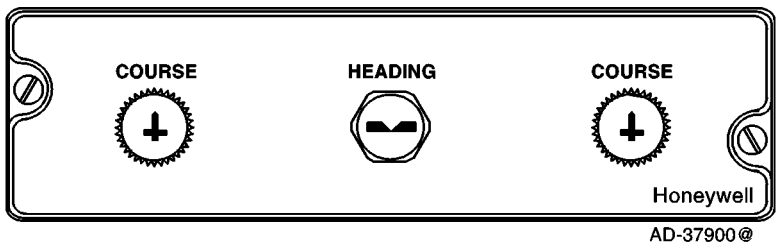

Figure 2-6-6. RI-553 Remote Instrument Controller (-903, Before Phase III)

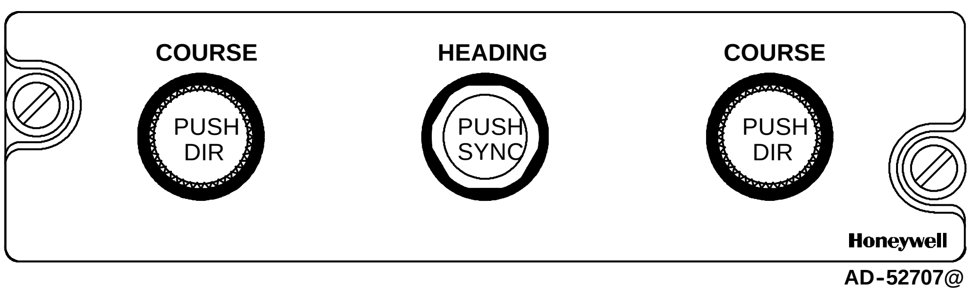

Figure 2-6-7. RI-553 Remote Instrument Controller (-907, Phase III)

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Table 2-6-4. RI-553 Remote Instrument Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.50 in. (38.10 mm)
• Width	5.75 in. (146.05 mm)
• Length	1.01 in. (25.65 mm)
Weight (maximum)	0.80 lb (0.36 kg)
Power Requirements:	
• Panel Lighting	5 V dc, 21.2 W (max)
User Replaceable Parts:	
• Knobs:	
- COURSE (Setscrew A)	HPN 7009644-1
- HEADING (Setscrew A)	HPN 7009681-1
- COURSE PUSH DIR (Setscrew B)	HPN 7015342-16
- HEADING PUSH SYNC (Setscrew B)	HPN 7015342-7
• Setscrews:	
- A (Multi-Spline, 4–40 x 1/8-inch, cup point)	HPN 2500148-128
- B (Multi-Spline, 2–56 x 1/8-inch, cup point)	HPN 2500148-64
Mating Connectors:	
• J1	MS27473E14A-35SC
Mounting	Standard Dzus Rail

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E. PC-400 Autopilot Controller

The PC-400 Autopilot Controller gives the flight director PITCH wheel inputs for specified vertical flight director modes and a low bank angle selection for the heading select mode only. The other functions of the controller have to do with autopilot and yaw damper operation and are discussed in the applicable chapters. The controller is located on the pedestal. Figure 2-6-8 shows a graphical view of the PC-400 Autopilot Controller. Leading particulars for the PC-400 Autopilot Controller are given in Table 2-6-5.

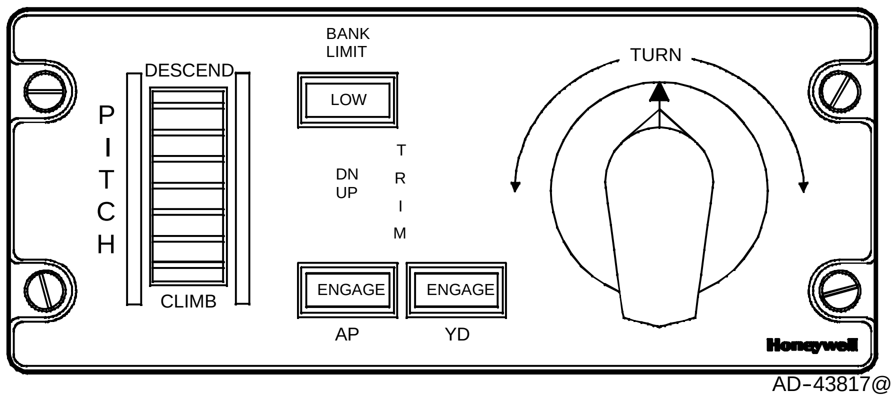

Figure 2-6-8. PC-400 Autopilot Controller

Table 2-6-5. PC-400 Autopilot Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.625 in. (6.67 cm)
• Width	5.750 in. (14.60 cm)
• Length	6.150 in. (15.62 cm)
Weight (maximum)	1.6 lb (0.73 kg)
Power Requirements:	
• Instrument Lighting	5 V ac or dc
• Mode Switches	28 V dc

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Table 2-6-5. PC-400 Autopilot Controller Leading Particulars (cont)

Item	**Specification**
User Replaceable Parts:	
• Knob, Turn	HPN 337136-1
• Setscrew, Bottom (Hex Socket, 8-32 x 5/8”, cup point) .	HPN 0455-284
• Setscrew, Side (Hex Socket, 8-32 x 3/16”, cup point) ...	HPN 0455-274
• Lamp, Clear (Type 7341)	HPN 0635-22
Mating Connector:	
• J1	MS3126F20-41S
Mounting	Standard Dzus Rail

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F. AG-222 Accelerometer

The AG-222 Accelerometer, located in the nose compartment, is a closed-loop, force-rebalanced device with a linear output proportional to the aircraft's vertical acceleration. The output is equal to 1.5V/g. The AG-222 receives ±15 V dc power from its respective IC-600 IAC. The acceleration signal is used in the flight director as a damping term for the following vertical flight director modes:

- ALT hold
- Altitude Preselect
- Glideslope.

Figure 2-6-9 shows a graphical view of the AG-222 Accelerometer. Table 2-6-6 gives items and specifications particular to the accelerometer.

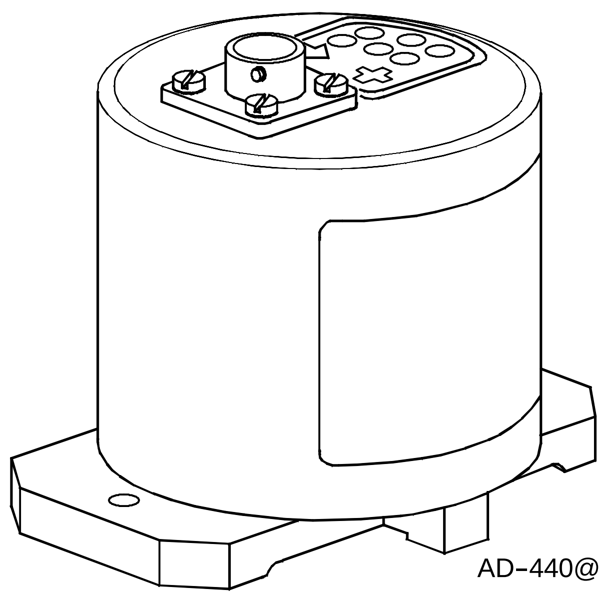

Figure 2-6-9. AG-222 Accelerometer

Table 2-6-6. AG-222 Accelerometer Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.39 in. (6.07 cm)
• Width	1.03 in. (2.62 cm)
• Length	2.25 in. (5.72 cm)
Weight (maximum)	5.0 oz (127gm)
Power Requirements (excitation)	+ 15 and –15 V dc

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Table 2-6-6. AG-222 Accelerometer Leading Particulars (cont)

Item	Specification
User Replaceable Parts	None
Mating Connector	Bendix JT06RE8-35S
Mounting	Hard Mount

3. Operation

A. Flight Director Functions

This paragraph provides an explanation for the IC-600 IAC major flight director functions, referred to throughout the remainder of this section. These functions are listed alphabetically and are titled as follows:

- PFD Command Bar
- GS CAP
- GS Track
- GS Gain Programming
- Lateral Beam Sensor (LBS)
- LOC/BC CAP
- LOC/BC Track
- True Airspeed (TAS) Gain Programming
- Vertical Beam Sensor (VBS)
- VOR CAP
- VOR Track
- VOR OSS
- VOR AOSS.

(1) PFD Command Bars

When a flight director steering command is applied to the command bar input, the bar (either crosspointer or single cue) moves left or right (roll), or up and down (pitch). This gives the required visual command for the pilot to maneuver the aircraft in the proper direction to reach and maintain the desired flight path.

If the information required to fly a lateral or vertical flight director mode becomes invalid, the mode either cancels, or the command cue goes out of view, dependent on what went invalid.

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(2) Glideslope (GS) CAP

The following conditions are necessary for GS capture:

- The localizer mode is either capture or track
- The vertical beam sensor has tripped
- GS deviation is less than 20 mV.

(3) GS Track

GS track occurs after the flight director has captured the vertical path and is tracking the beam. The track phase provides for tighter flying of the GS beam. The track mode occurs after the GS is captured plus 15 seconds.

The following conditions are required for glideslope track:

- GS is captured, plus 15 seconds
- Localizer portion of the approach is in the track phase
- GS deviation is less than 37.5 mV
- Vertical deviation rate is less than 10 feet/second
- Radio altitude is less than 1200 feet.

(4) GS Gain Programming

GS gain programming starts after the VBS trips. The gain is programmed as a function of radio altitude and vertical speed. If the radio altimeter is invalid, gain programming starts at GS capture and is controlled by a runway height estimator. The value estimated assumes a 1500 foot start point and gain is changed as a function of TAS and time. At the middle marker the gain is set to a preset amount for the remainder of the approach.

(5) Lateral Beam Sensor (LBS)

When flying to intercept the VOR or localizer beam, the LBS determines the proper time for the mode to change from the arm to the capture phase of operation. The LBS looks at course error, radio deviation, TAS, and DME, if available.

The LBS compares the magnitude of the course error to the magnitude of the radio deviation and takes TAS and DME into account in its computation. If radio deviation is larger in magnitude than course error, the mode is armed. As the aircraft approaches the beam center, course error is constant and radio deviation is getting smaller. At some point, the magnitude of the radio deviation is less than the magnitude of the course error. It is at this point that the LBS trips and the aircraft turns to line up on the VOR or localizer beam center.

If the intercept angle to the beam is very shallow, the LBS does not trip until the aircraft is near the beam center. For this reason, an override of the LBS occurs when the beam deviation reaches a specified minimum to avoid beam standoff.

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(6) Localizer (LOC)/Back Course (BC) CAP

LOC and BC capture occurs when the following conditions are met:

- Lateral Beam Sensor has tripped
- Beam deviation is less than 35mV.

(7) LOC/BC TRACK

Localizer and back course track signify the aircraft being on beam center and crosswind washout correction can take place.

The track phase occurs when the following conditions are met:

- LOC or BC is captured plus 30 seconds
- Localizer beam rate is less than 30 feet/second
- Localizer beam deviation is less than 20 mV
- Aircraft bank angle is less than 6 degrees.

(8) True Airspeed (TAS) Gain Programming

TAS gain programming is used on the heading select, course select, pitch wheel command, air data commands (except IAS), and GS deviation. TAS gain programming is used to achieve the same aircraft response to flight guidance commands, regardless of the altitude and speed of the aircraft. The TAS computation is derived from altitude, airspeed, and outside air temperature.

(9) Vertical Beam Sensor (VBS)

When flying an ILS approach and the localizer is captured, the VBS determines the proper time for the GS mode to transition from arm to capture. The VBS is armed as a function of the navigation radio being tuned to an ILS frequency and localizer is captured or track. The VBS looks at vertical speed, TAS, and GS deviation. The VBS trips when GS deviation is less than 150 mV and the capture sensor is satisfied. The capture sensor looks at airspeed, glideslope beam rate of change, and normal acceleration to determine the optimum capture point.

In the event the aircraft is paralleling the beam (no beam closure rate), the VBS trips at a vertical deviation less than 20 mV. This resets the previously selected pitch mode and changes aircraft attitude to smoothly capture the glideslope beam.

(10) VOR CAP

VOR capture occurs when the following conditions are met:

- The VOR mode is armed plus 3 seconds
- The lateral beam sensor has tripped.

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(11) VOR Track

VOR track occurs as the aircraft is established on beam center and the following conditions are met:

- VOR capture plus 90 seconds
- Lateral deviation rate is less than 50 feet/second
- Aircraft bank angle is less than 6 degrees.

At this time, crosswind correction is allowed to start.

(12) VOR Over Station Sensor (OSS)

The OSS is used to detect the erratic radio signals encountered in the area above the VOR ground station antenna. When these radio signals reach a predetermined level, they are no longer useful and OSS eliminates them from the control law.

The VOR OSS trips when either one of the following conditions occur:

- Distance to the station is less than (0.25 barometric altitude/cosine 30 degrees) and DME is valid and not hold
- Lateral deviation is greater than 75 mV and beam rate is greater than 8mV/second and DME not valid or DME is hold.

(13) VOR After Over Station Sensor (AOSS)

When the aircraft is flying in the OSS state, VOR beam deviation is constantly monitored to determine when it again is useful and can be included in the control law. The AOSS does this monitoring. AOSS occurs when the following conditions are met:

- Beam deviation is less than 75 mV plus 20 seconds
- Beam rate is less than 25 feet/second.

NOTE: In the VOR approach mode, beam deviation is less than 75 mV, plus 4 seconds.

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B. Flight Director Lateral (Roll) Channel Functional Operation

(1) Flight Director Lateral (Roll) Modes Interface

Figure 2-6-10 shows the LRU interface for the pilot's side flight director lateral modes. Figure 2-6-11 shows the LRU interface for the copilot's side flight director lateral modes.

The function of each LRU for each lateral mode is discussed in the following paragraphs.

(a) VG-14A Vertical Gyro

For all flight director lateral modes, the on-side VG-14A supplies three-wire synchro outputs that are electrical analogs of actual aircraft roll attitude.

The cross-side VG-14A supplies the same terms to the IC-600 IAC, but these signals are used for EDS/flight director and autopilot monitoring purposes only.

(b) C-14D Directional Gyro

For all flight director lateral modes, the C-14D Directional Gyro supplies three-wire synchro outputs that are electrical analogs of the aircraft's magnetic heading. Each C-14D is used for on-side flight director magnetic heading.

(c) AZ-850 Micro Air Data Computer (MADC)

The on-side AZ-850 MADC supplies the on-side IC-600 IAC with an ARINC 429 input of air data values, including True Airspeed (TAS). The TAS signal is used in all lateral flight director modes for gain programming. The response of the aircraft should feel the same, regardless of the aircraft's airspeed and altitude. Since it requires less flight control surface deflection at high speed and high altitude to complete a maneuver then it does at low speed and low altitude, changing the size of the signal as a function of TAS achieves the desired results.

Should the AZ-850 MADC become invalid, a fixed bias TAS of 120 knots is used in the IC-600 IAC. The default value of TAS is set for the approach speed region of flight.

(d) Short Range Navigation (SRN) Radios (Not Honeywell)

The SRN radios supply an RSB output of VOR and Localizer deviation data, as well as DME and marker beacon data to the IC-600 IAC. The DME signal is used in the VOR and VOR approach modes to gain program the VOR signal as a function of the aircraft approaching, or departing the VOR station.

(e) Long Range Navigation (LRN) Unit (Not Honeywell)

The LRN unit supplies an ARINC 429 composite steering command output to the IC-600 IAC. Gain programming for the composite steering command signal is done in the LRN unit. The signal from the LRN to the IC-600 IAC represents the computed desired track over the ground, from the last sequenced waypoint, to the TO waypoint in the active flight plan.

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(f) Radio Altimeter (Not Honeywell)

The radio altimeter provides an analog output of absolute altitude above the terrain. This signal is used by the flight director to gain program the localizer signal. Gain programming is required, due to the directional qualities and beam convergence characteristics of the localizer antenna.

As the aircraft approaches the runway, the localizer signal appears to get stronger and the beam appears to get narrower. By reducing the gain on the signal as a function of the change in radio altitude, the computed steering command does not take the aircraft out of the localizer beam envelope and reduces S turning.

Should the radio altimeter be invalid, localizer gain programming starts as a function of GS capture and runs down as a function of TAS and time. At the middle marker, gain programming is synchronized to a preset value.

(g) MS-560 Mode Selector

The MS-560 Mode Selector lets the pilot engage/disengage all lateral flight director modes. Each MS-560 Mode Selector transmits button data as two-wire, grey-code-formatted data to its on-side DC-550 Display Controller. The DC-550 transmits the button data to its on-side IC-600 IAC over a DC/IC bus. The MS-560 receives a ground input from its on-side IC-600 IAC to light the mode button for an armed or capture condition.

(h) RI-553 Remote Instrument Controller

The RI-553 Remote Instrument Controller gives both pilots the ability to set the heading select bug for the heading select mode, as well as setting the selected course in the VOR, VOR approach, and localizer modes. The output from the RI-553 is two-wire greycode formatted and transmitted to each DC-550 Display Controller. Each DC-550 transmits the data to its on-side IC-600 IAC over a DC/IC bus.

(i) DC-550 Display Controller

The DC-550 Display Controller supplies an RS-422 digital bus interface (DC/IC Bus) between itself and its on-side IC-600 IAC. Heading bug set and selected course inputs are routed through the DC-550, as well as flight director button mode selections, to be put on the digital bus interface to its on-side IC-600 IAC.

(j) PC-400 Autopilot Controller

The only function on the PC-400 Autopilot Controller for lateral flight director modes is the low bank button. The low bank button is for the heading select mode only. When active, it reduces the maximum bank angle in the mode from 27.5 to 14 degrees.

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(k) IC-600 Integrated Avionics Computer (IAC)

The IC-600 IAC performs the following, as a function of which lateral mode is active.

1 Heading Select Mode

When the heading select mode is pushed, the flight director processor in the IC-600 IAC compares actual aircraft heading against desired aircraft heading, as determined by the position of the heading select bug on the coupled side PFD. The difference is the heading select error signal.

With the autopilot not engaged, the heading select error signal is presented on the coupled PFD flight director command bar as a steering command for the pilot to bank the aircraft and fly towards the heading bug. Roll attitude from the on-side VG-14A sums with the error signal in the flight director processor to center the command cue when the proper bank angle has been achieved.

As the aircraft approaches the selected heading, the heading error signal gets smaller in size and the roll attitude signal commands the pilot to roll the aircraft to a wings level condition. With the aircraft flying the selected heading, the following conditions exist:

- Heading select error is zero
- Flight director command bar is centered
- Control wheel is centered
- Aircraft is maintaining the selected heading.

With the autopilot engaged, the coupled side flight director processor generates the commands as stated above, but sends them to the autopilot for automatic flight path steering. On the coupled-side PFD, the flight director command bar can move a little out of center and then return. With the autopilot satisfying the flight director steering command, the command cue is centered.

Input data used by the heading select control law includes selected heading, actual heading, TAS and roll attitude.

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2 Low Bank Submode

The low bank submode lets the pilot select reduced-bank angle limits for the heading select mode. The mode is selected by pushing the low bank button (BNK) on the PC-400 Autopilot Controller. When active, the bank angle limit is reduced from 27.5 to 14 degrees. The mode is only annunciated while the heading select mode is active, but remains selected and reactivates/annunciates if heading select is made active again. The low bank mode is canceled by pushing the BNK button while the annunciator is lighted.

Low bank mode is automatically activated by climbing through 34,000 feet. Automatic canceling of low bank occurs descending through 33,750 feet.

3 VOR/VOR Approach Mode

When the VOR mode is armed, the flight director processor compares actual aircraft heading against selected aircraft course, as determined by the position of the course select pointer on the coupled PFD. The difference is the course error signal.

The Lateral Beam Sensor (LBS) is computing when to capture the VOR beam. At VOR capture, the heading select mode is dropped and the flight director processor generates a command to bank the aircraft and get aligned on the VOR beam center.

With the autopilot not engaged, the VOR error signal is presented on the coupled PFD flight director command bar as a computed steering command for the pilot to bank the aircraft and fly towards the selected course. Roll attitude from the on-side VG-14A sums with the error signal in the flight director processor to center the command cue when the proper bank angle has been achieved.

As the aircraft approaches the selected course, the course error signal gets smaller in size and the roll attitude signal now commands the pilot to roll the aircraft to a wings level condition. With the aircraft flying the selected course, the following conditions exist:

- Course select error is appropriate to maintain VOR beam center
- Radio deviation is zero
- Flight director command bar is centered
- Control wheel is centered
- Aircraft is tracking the selected VOR radial.

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With the autopilot engaged, the flight director processor generates the commands as stated above, but sends them to the autopilot for automatic flight path steering. On the coupled PFD, the flight director command bar can move a little out of center and then return. With the autopilot satisfying the flight director steering command, the flight director command bar is centered.

As the aircraft flies over the VOR station, the flight director processor monitors for entry into the zone of confusion above the VOR station. With DME valid, when the aircraft is VOR track and DME = (barometric altitude/cosine of 30 degrees), the system goes into OSS and ignores the radio input.

With DME not valid, or not available, the system monitors beam deviation and beam rate for the OSS function. Beam deviation must be greater than 75 mV and beam rate of change greater than 7.5 mV/sec. When radio deviation drops below 75 mV, a 20 second clock is started (4 seconds in VAPP). At the end of this time, the radio input is again made part of the VOR equation. The time delay ensures that the aircraft has cleared the zone of confusion.

The input data used by the VOR control law includes selected course, VOR bearing, DME, TAS, baro corrected altitude, and roll attitude.

4 Localizer/Back Course Modes

When the localizer mode is armed, the flight director processor compares actual aircraft heading against selected aircraft course, as determined by the position of the course select pointer on the coupled PFD. The difference is the course error signal.

The LBS is computing when to capture the localizer beam. At localizer capture, the heading select mode is dropped and the flight director processor generates a command to bank the aircraft and get aligned on the localizer beam.

With the autopilot not engaged, the localizer error signal is presented on the coupled PFD flight director command bar as a computed steering command for the pilot to bank the aircraft and fly towards the selected course. Roll attitude from the VG-14A sums with the error signal in the flight director processor to center the command cue when the proper bank angle has been achieved.

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As the aircraft approaches the selected course, the localizer error signal gets smaller in magnitude and the roll attitude signal now commands the pilot to roll the aircraft to a wings level condition. With the aircraft tracking the localizer beam, the following conditions exist:

- Course select error is appropriate to maintain localizer beam center
- Radio deviation is zero
- Command cue is centered
- Control wheel is centered
- Aircraft is tracking the localizer beam.

With the autopilot engaged, the flight director processor generates the commands as stated above, but now sends them to the autopilot for automatic flight path steering. On the coupled PFD, the command cue can move a little out of center and then return. With the autopilot satisfying the flight director steering command, the command cue is centered.

5 LNAV Mode

When the LNAV mode is active, the flight director processor in the IC-600 IAC receives computed steering commands from the LRN unit over an ARINC 429 bus. These commands let the flight director fly the active flight plan as displayed on the LRN control display unit (CDU).

On the coupled PFD, the course select pointer becomes a desired track pointer and is positioned automatically by the LRN.

The input data used by the LNAV control law includes the composite steering command from the LRN unit and roll attitude from the VG-14A.

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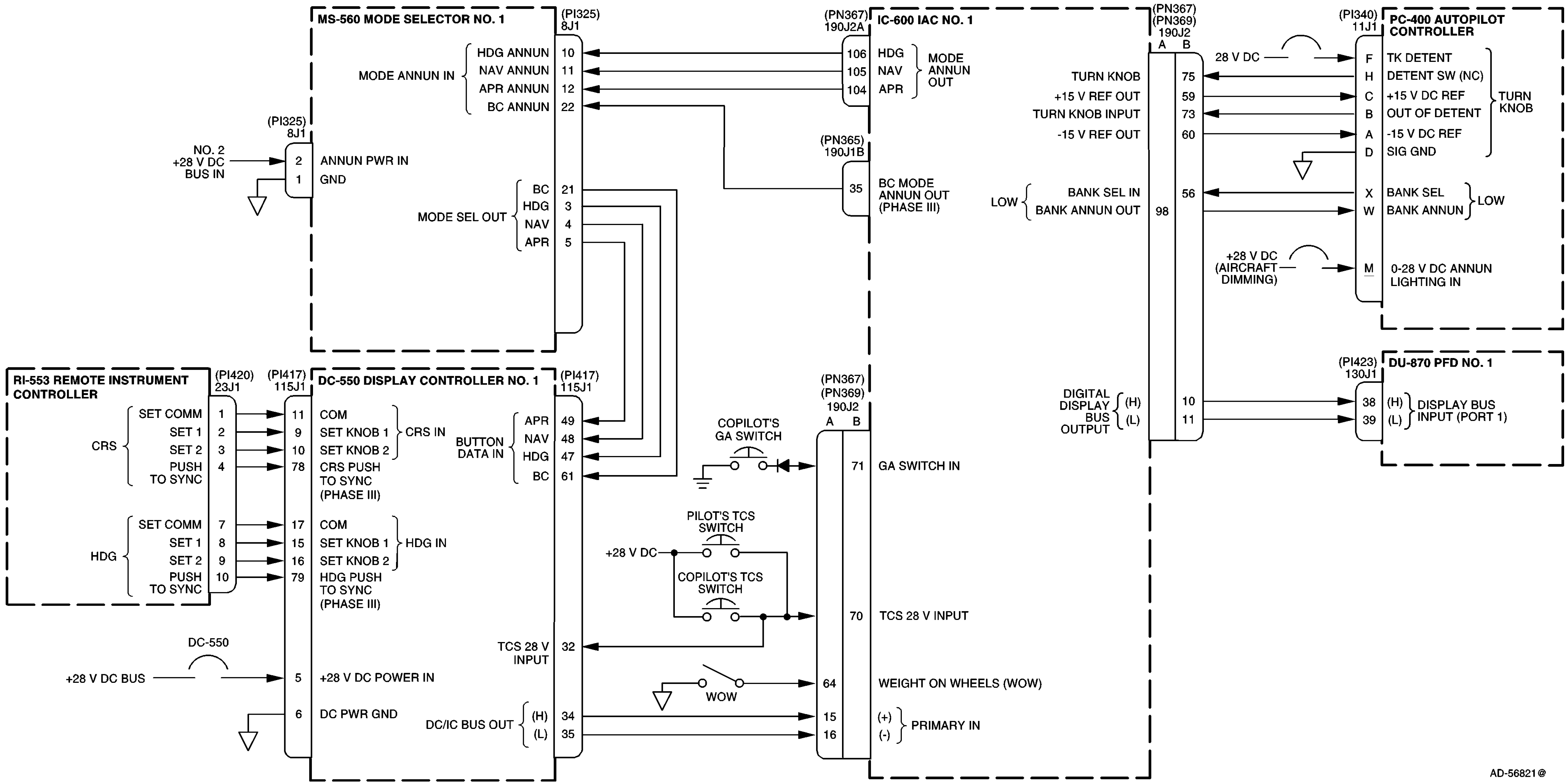

Figure 2-6-10 (Sheet 1). Flight Director Lateral Mode Interface - Pilot's Side

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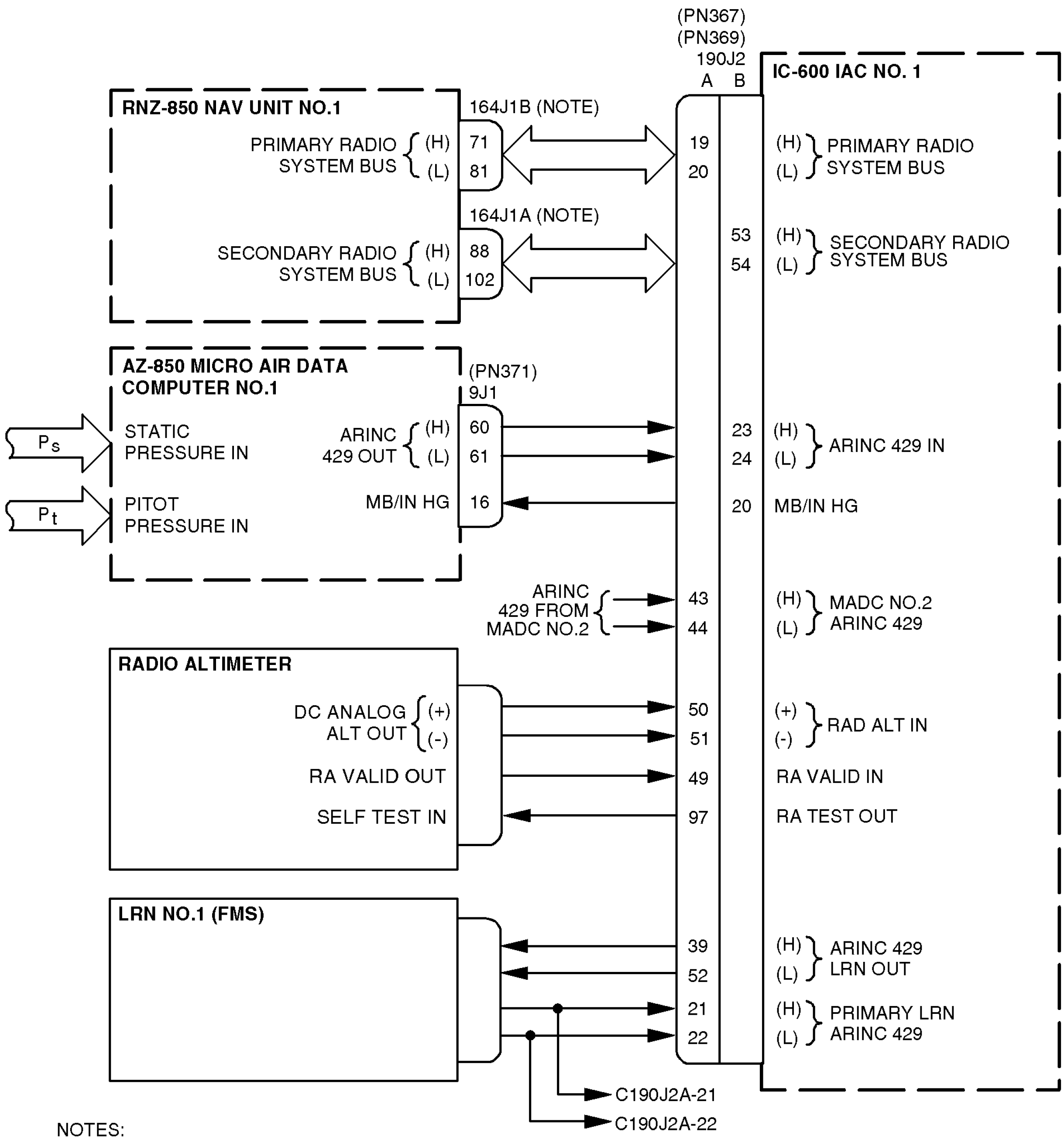

NOTES:

1. CESSNA REF DES IS PT611 (164J1A) AND PT612 (164J1B) FOR TAILCONE INSTALLATION OR PN631 (164J1A) AND PN632 FOR NOSE INSTALLATION.
2. BOTH FLIGHT DIRECTOR COMPUTERS' PORTIONS OF THE IAC HAVE BOTH SHORT RANGE NAV SOURCES AVAILABLE TO THEM.

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Figure 2-6-10 (Sheet 2). Flight Director Lateral Mode Interface - Pilot's Side

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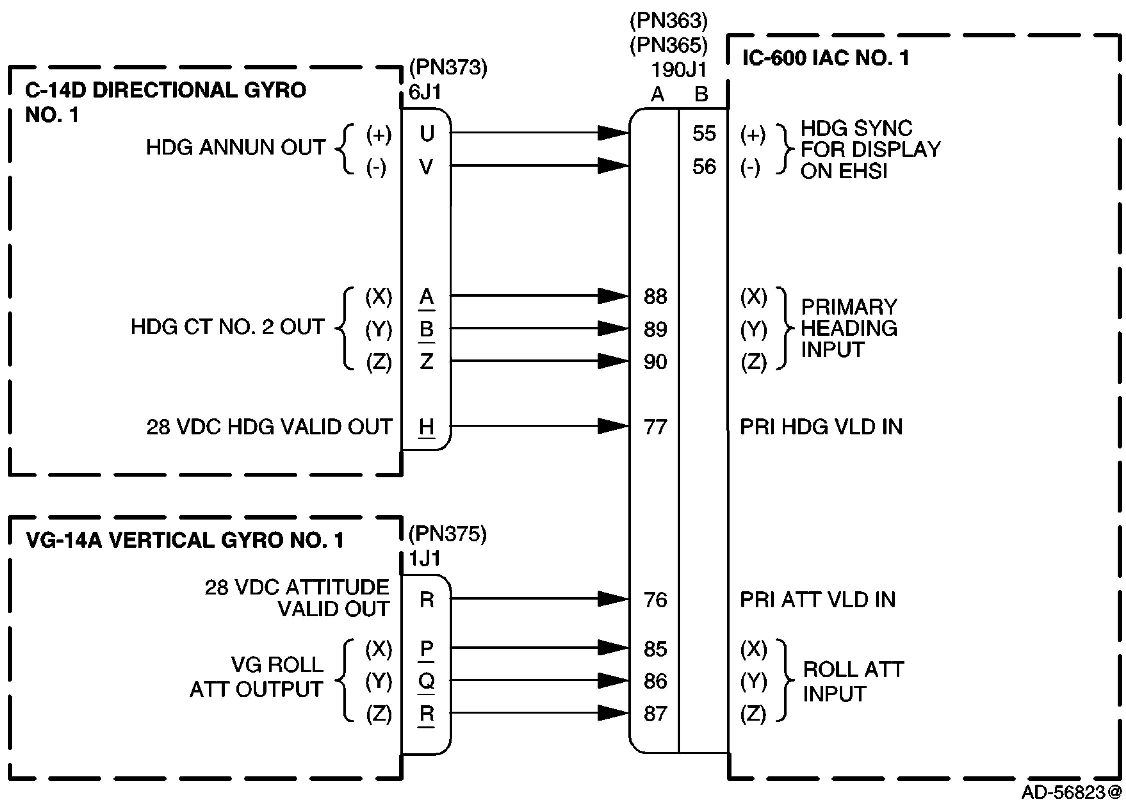

Figure 2-6-10 (Sheet 3). Flight Director Lateral Mode Interface - Pilot's Side

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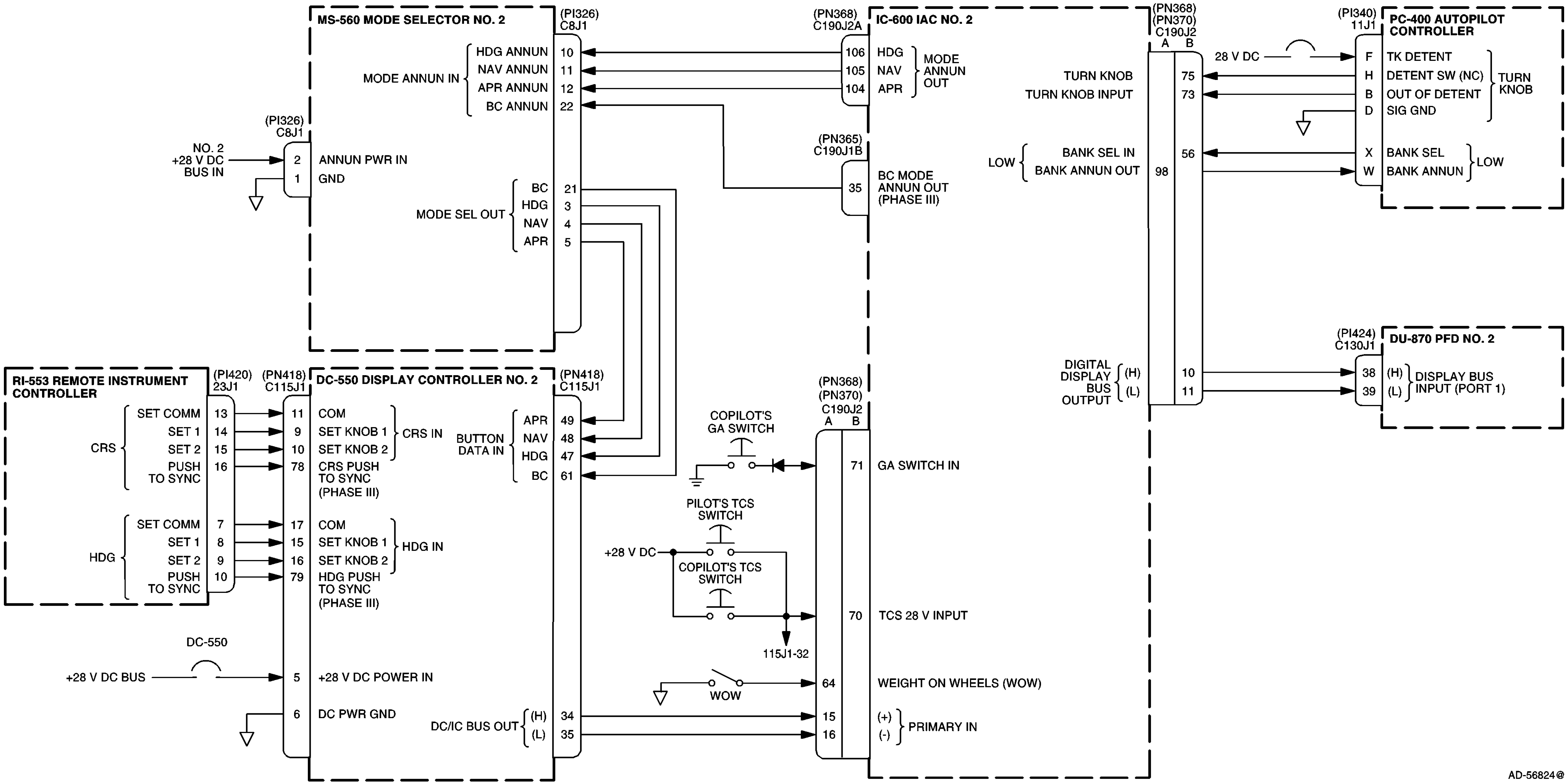

Figure 2-6-11 (Sheet 1). Flight Director Lateral Mode Interface - Copilot’s Side

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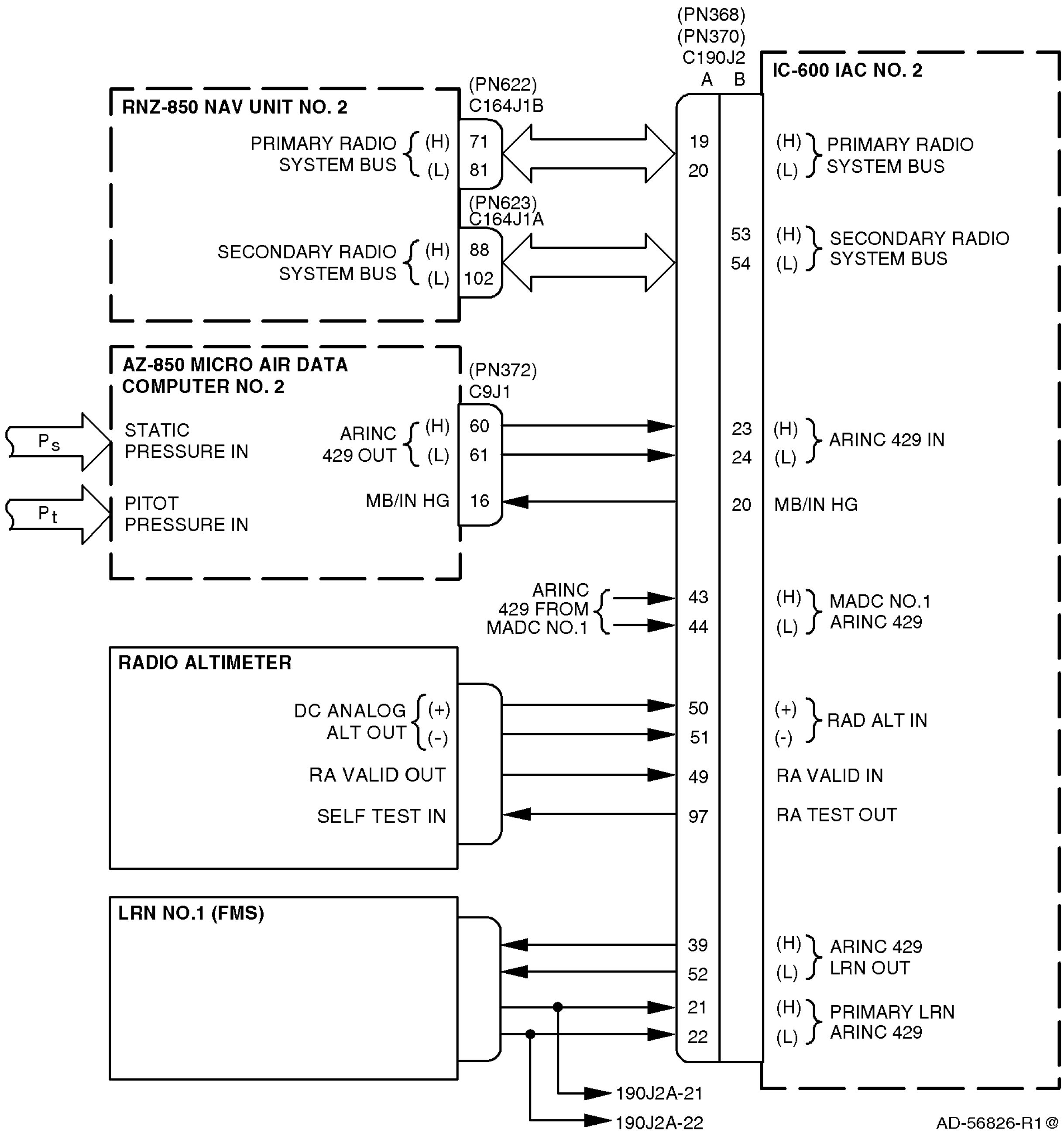

Figure 2-6-11 (Sheet 2). Flight Director Lateral Mode Interface - Copilot's Side

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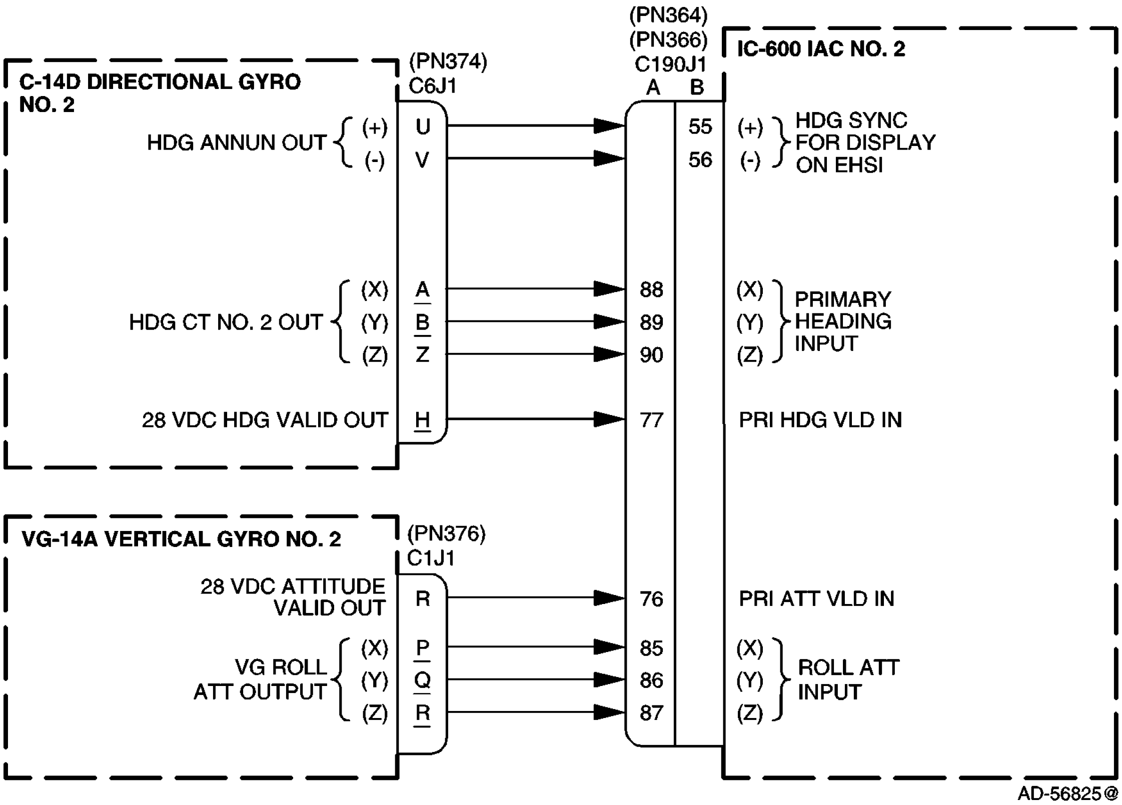

Figure 2-6-11 (Sheet 3). Flight Director Lateral Mode Interface - Copilot's Side

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The descriptions and figures in this section assume the pilot's flight director is master. The PFD figures reflect the phase III configuration.

(2) Heading (HDG) Select Mode

The HDG select mode is used to intercept and maintain a magnetic heading reference. The mode is engaged by pushing the HDG button on the coupled MS-560 Mode Selector. The heading select mode is automatically engaged when the LOC, BC, VOR, LNAV, or VAPP modes are armed. HDG is annunciated on the coupled PFD and the vertical bar on the MS-560 HDG button lights. Engaging the heading select mode resets all previously selected active lateral modes.

The heading bug on each PFD is positioned around the compass card to the heading the pilot desires to intercept, using the HDG knob on the RI-553 Remote Instrument Controller. The heading select error signal, sent to the flight director processor, is the difference between actual aircraft heading and the selected aircraft heading. The flight director processor generates the proper roll command to intercept and maintain the pilot-selected heading.

Heading select mode operating limits are given in Table 2-6-7.

The heading select mode is canceled by:

- Capture of any other lateral steering mode
- Selecting go-around
- SG reversionary selection
- Pushing the HDG button on the coupled MS-560 Mode Selector
- Displayed heading becoming invalid
- The displayed heading source on the coupled PFD is changed
- The displayed attitude source on the coupled PFD is changed
- TURN knob out of detent with autopilot engaged.

Table 2-6-7. Heading Select Mode Operating Limits

Mode	Parameter	Value
Heading Select	Roll Angle limit	± 27.5°
	Low bank limit	± 14.0°
	Roll Rate Limit	4.0°/sec

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(3) Heading Select Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids are as follows:

- Flight director
- On–side VG–14A
- On–side C–14D.

With the above conditions met, pushing either the:

- HDG button on the MS–560 Mode Selector.
- NAV or APR buttons on the MS–560 Mode Selector with a VOR source tuned.
- NAV, APR, or BC buttons on the MS–560 Mode Selector with a LOC source tuned.
- NAV button on the MS–560 Mode Selector with LNAV as the displayed navigation source engages the heading select mode.

(b) Reset/Disengage Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re–engaged.

Disengage means that a condition has occurred that has canceled the mode, due to a fault, and the mode cannot be re–engaged until the fault is cleared.

The heading select mode is automatically reset/disengaged, if any of the following conditions occur:

- Pushing the HDG button on the coupled MS–560 Mode Selector (reset)
- Any lateral flight director mode captured (reset)
- Selecting go–around (reset)
- Changing the displayed heading source on the coupled PFD (reset)
- Any time the flight director system is powered up (reset)
- Activating the FD1/FD2 switch
- Flight director system not valid (disengage)
- On–side VG–14A or C–14D not valid (disengage)
- TURN knob out of detent with autopilot engaged (reset).

NOTE: If the flight director goes invalid, the command cue goes out of view. If the VG–14A goes invalid, the mode clears, and an ATT failure flag is displayed on the PFD. If the C–14D goes invalid, the mode clears, and a HDG flag is displayed on the coupled PFD.

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(4) VOR (NAV) Mode

See Figure 2-6-12 thru Figure 2-6-18 and Table 2-6-8.

The VOR mode provides for automatic intercept, capture and tracking of a selected inbound or outbound VOR radial, using the selected VOR navigation source displayed on the coupled PFD. The navigation source displayed on the coupled PFD is a function of the NAV source buttons located on the on-side DC-550 Display Controller.

Prior to engaging the mode, the pilot performs the following:

- Tune the navigation receiver to the desired VOR frequency
- Select NAV as the navigation source on the on-side DC-550 Display Controller
- Set the course pointer for the coupled PFD for the desired course to be flown
- Set the heading bug on the coupled PFD to the desired intercept heading for the selected course.

With the aircraft outside the normal capture range of the VOR signal (typically the course deviation on the PFD is greater than two dots), the pilot pushes the NAV button on the coupled MS-560 Mode Selector. The HDG and NAV buttons on the MS-560 Mode Selector light. HDG in green and VOR in white are also annunciated on the PFD. The IC-600 IAC is armed to capture the VOR signal and is generating a roll command to fly the heading select mode.

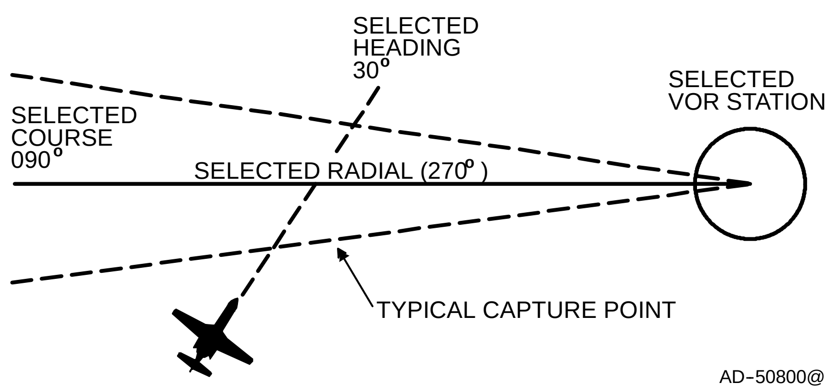

Figure 2-6-12. VOR Arm Pictorial

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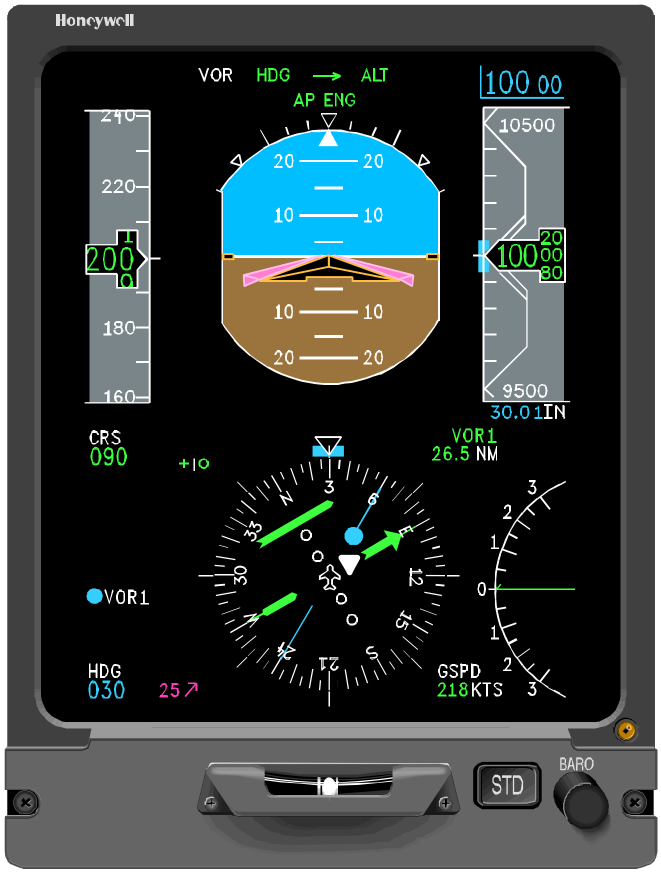

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Figure 2-6-13. VOR (NAV) Mode Armed

When reaching the LBS trip point, the flight director automatically drops the heading select mode and switches to the VOR capture phase. The following is observed on the PFD:

- The white VOR annunciator turns OFF
- The green HDG annunciator turns OFF
- A green VOR is annunciated and is enclosed in a white box for 5 seconds to emphasize the capture phase of operation.

The IC-600 IAC generates the proper roll command to bank the aircraft to capture and track the selected VOR radial.

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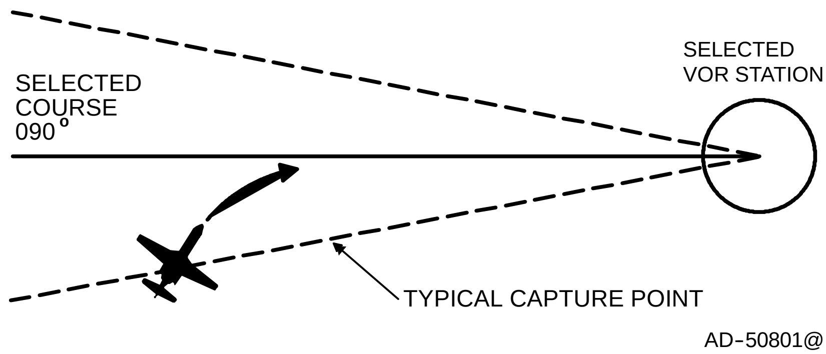

Figure 2–6–14. VOR Capture Pictorial

When the course select pointer was set on the PFD, using the appropriate course knob on the RI–553 Remote Instrument Controller, the course select error signal was established. This signal represents the difference between actual aircraft heading and the desired aircraft course.

The radio signal is routed from the navigation receiver to the IC–600 IAC, where the radio signal is processed and lateral gain programmed.

Lateral gain programming is performed as a function of DME distance to the station (if available) and TAS. Gain programming adjusts for the aircraft either flying toward or flying away from the VOR station. If DME data is not valid or available, an estimated value is used. Prior to VOR capture the DME estimated value is 25.0 miles. After capture, the DME estimated value is 10.0 miles.

NOTE: Avoid, if possible, operating in DME hold during VOR capture and tracking operation. When in DME hold the flight director processor cannot use DME distance for gain programming.

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Figure 2-6-15. VOR (NAV) Mode Capture

When flying a VOR intercept, the optimum intercept angle should be 45 degrees or less. If the intercept angle is greater than 45 degrees, course cut limiting can occur.

The course cut limiter functions primarily when approaching the selected VOR radial at an intercept angle greater than 45 degrees and at a high rate of speed. Its function is to limit steering commands to 45 degrees, that forces a flight path to get on the selected radial sooner to prevent overshooting the VOR beam center. Typically, the roll command makes an initial heading change, then levels out and flies toward the beam, then makes a second heading change to get lined up on the center of the selected radial.

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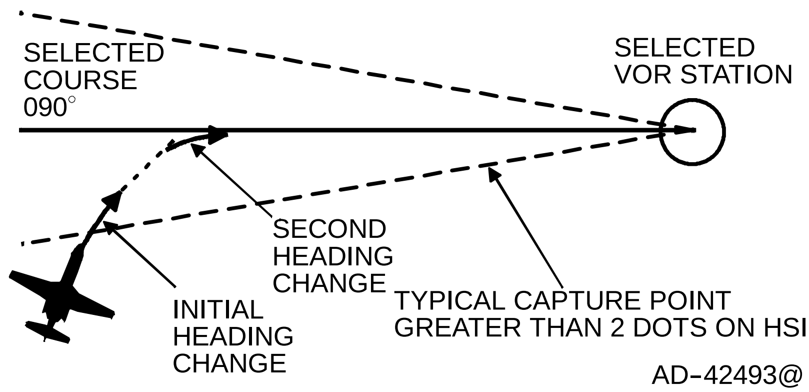

Figure 2-6-16. VOR Course Cut Limiting

When the aircraft satisfies VOR track conditions, the course error signal is removed from the lateral steering command. This leaves radio deviation and DME gain programming (if available) to track the VOR signal and compensate for beam standoff in the presence of a crosswind. The flight director automatically compensates for a crosswind of up to 45 degrees course error.

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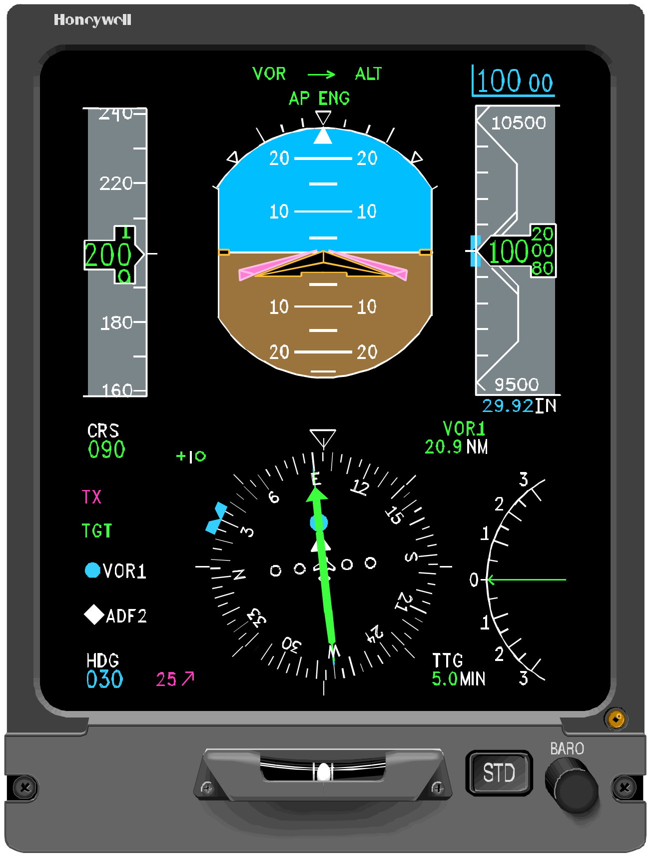

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Figure 2-6-17. VOR Track

As the aircraft approaches the VOR station, it enters a zone of unstable radio signal. This zone of confusion radiates upward from the station in the shape of a truncated cone. In this area, the radio signal becomes highly erratic and it is desirable to remove it from the roll command. The OSS monitors entry into the zone of confusion and removes radio deviation from the roll command. The system also uses the co-located DME signal (if available) to adjust tracking gains.

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When over the VOR station (Figure 2-6-18), the flight director accepts and follows course changes, up to 90 degrees.

The navigation (VOR) mode is canceled by the following:

- Pushing the NAV button on the coupled MS-560 Mode Selector
- Selecting go-around
- Selecting another lateral mode active on the coupled MS-560 Mode Selector
- NAV source change (radio frequency on the selected NAV receiver)
- NAV source invalid for more than 30 seconds
- On-side heading source invalid
- On-side attitude source invalid
- On-side air data source invalid
- SG reversion
- Activation of the FD1/FD2 switch
- TURN knob out of detent with the autopilot engaged.

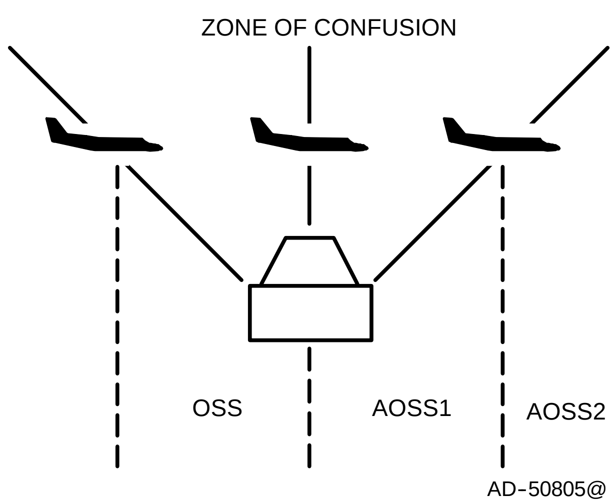

Figure 2-6-18. VOR Overstation

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(5) VOR Approach (VAPP) Mod

The VOR approach mode is set up and flown in a manner similar to enroute VOR. However, instead of selecting the mode with the NAV button on the MS–560 Mode Selector, the APR button is pushed. The APR button lights and VAPP is displayed in white on the coupled PFD. The flight director applies the gains appropriate for an approach. Upon capture of the selected course, the coupled PFD displays VAPP in green. Refer to Table 2–6–8 for mode operating limits.

Table 2–6–8. VOR/VOR Approach Operating Limits

Mode	Parameter	Value
VOR or VAPP	Capture:	
	Beam Intercept Angle	Up to 90°
	Capture Point	Function of DME, beam deviation, beam closure rate, and course error. MIN Trip Point: ± 30 mV dc MAX Trip Point: ± 175 mV dc
	Roll Angle Limit	±27.5°
	Roll Rate Limit	4.0°/sec VOR 4.0°/sec VAPP
	Course Cut Limit	45° during capture
	Roll Angle Limit	±13°
	Roll Rate Limit	1.0°/sec VOR 1.0°/sec VAPP
	Crosswind Correction	Up to 45° course error VOR or VAPP
	Over Station:	
	Course Change	Up to 90°
	Roll Angle Limit	±17°
	Roll Rate Limit	4°/sec

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(6) VOR/VAPP Engage/Reset/Disengage Logic

(a) VOR ARM Engage Logic

Required valids are as follows:

- Flight Director
- On–side VG–14A.
- On–side C–14D.

With the above conditions good, and VOR selected as the NAV source on the on–side DC–550 Display Controller, pushing the NAV button on the coupled MS–560 Mode Selector arms the VOR mode.

(b) VOR Arm Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re–engaged.

Disengage means that a condition has occurred that has canceled the mode due to a fault; the mode cannot be re–engaged until the fault is cleared.

VOR arm is automatically reset if any of the following conditions occur:

- VOR is captured
- Selecting go–around
- NAV source change
- Any other lateral flight director mode active
- pushing the NAV button on the coupled MS–560 Mode Selector
- Changing the displayed heading source
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- TURN knob out of detent with autopilot engaged
- SG reversionary switching.

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(c) VOR Arm Disengage Logic

The VOR arm mode automatically disengages, if any of the following conditions occur:

- Flight Director not valid
- On-side VG-14A or C-14D not valid
- Tune to a localizer frequency
- Displayed NAV source not valid
- SG reversionary switching.

NOTE: Loss of NAV valid causes the flight director command bar to go out of view, while maintaining mode annunciation and heading hold command. If the NAV remains invalid after 5 seconds, the mode is canceled. If NAV valid returns within 5 seconds, the command bar re-appears.

(d) VOR Capture Engage Logic

Required valids:

- Flight Director
- On-side VG-14A
- On-side C-14D
- Displayed NAV source.

With the above conditions good and the VOR mode is armed plus 1 second and the LBS trips, the VOR mode automatically transitions from arm to capture.

(e) VOR Capture Reset Logic

VOR capture automatically resets if any of the following conditions occur:

- Selecting go-around
- Any other lateral mode active
- Pushing the NAV button on the coupled MS-560 Mode Selector
- Pushing the APR button on the coupled MS-560 Mode Selector
- NAV source change
- Changing the displayed heading source
- Changing the displayed attitude source
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- TURN knob out of detent with autopilot engaged.

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(f) VOR Capture Disengage Logic

The VOR mode automatically disengages if any of the following conditions occur:

- Flight Director not valid
- On-side VG-14A or C-14D not valid
- Tune to a localizer frequency
- Displayed NAV source not valid.

(g) VOR Track Logic

VOR track is defined as follows:

- LBS has tripped
- Course error less than 22°
- Bank angle less than 6°
- Beam deviation less than 75 mV.

When all the above conditions have existed simultaneously for 8 seconds, VOR track is latched. As a function of latching, the flight director processor starts cross wind correction.

NOTE: Loss of NAV valid causes the flight director command cue to go out of view. If the NAV remains invalid after 5 seconds, the mode is canceled.

(h) VOR OSS Engage Logic

Required valids are as follows:

- Flight Director
- On-side VG-14A
- On-side C-14D
- Displayed NAV source.

With the above conditions met and VOR is track, the flight director processor monitors for the following:

- Beam deviation greater than 75 mV
- Beam rate of change greater than 7.5 mV/second or with DME valid and not hold (barometric altitude/cosine of 30°) = DME.

If either of these conditions exist, the flight director processor assumes the aircraft is overstation and inhibits the radio input.

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(i) VOR OSS Reset Logic

The following conditions reset VOR OSS mode:

- Selecting go–around
- Any other lateral mode active
- Pushing the NAV button on the coupled MS–560 Mode Selector
- NAV source change
- Changing the displayed heading source
- Changing the displayed attitude source
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- TURN knob out of detent with autopilot engaged.
- SG reversionary switching.

(j) VOR OSS Disengage Logic

The following conditions disengage the VOR OSS mode:

- Flight Director not valid
- On–side VG–14A not valid
- On–side C–14D not valid
- Tune to a localizer frequency
- Displayed NAV source not valid.

The logic for the VOR approach mode is identical to the logic for the VOR mode, except for the following:

- Pushing the APR button instead of the NAV button on the coupled MS–560 Mode Selector.

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(7) Localizer (NAV), Localizer Approach (APR), and Back Course (BC) Modes

See Figure 2-6-19 thru Figure 2-6-28 and Table 2-6-9.

The localizer mode provides for automatic intercept, capture, and tracking of the front course localizer beam to line up on the centerline of the runway in use. The back course localizer mode lets the pilot fly a back course localizer intercept. Prior to mode engagement, the pilot performs the following:

- Tune the on-side navigation receiver to the published front course localizer frequency for the runway in use
- Push the NAV button on the on-side DC-550 Display Controller to select ILS as the navigation source
- Set the course pointer on the coupled PFD for the inbound runway heading
- Set the heading bug for the desired heading to perform the course intercept.

The PFD displays the relative position of the aircraft to the center of the localizer beam and the selected inbound course, as shown in Figure 2-6-19. With the heading bug set for course intercept, the heading select mode is automatically used to perform the intercept. Outside the normal capture range of the localizer signal, pushing the NAV button on the coupled MS-560 Mode Selector causes the coupled PFD to annunciate HDG in green and LOC in white, as shown in Figure 2-6-20.

The aircraft is flying the selected heading intercept, and the flight director is armed for automatic localizer beam capture.

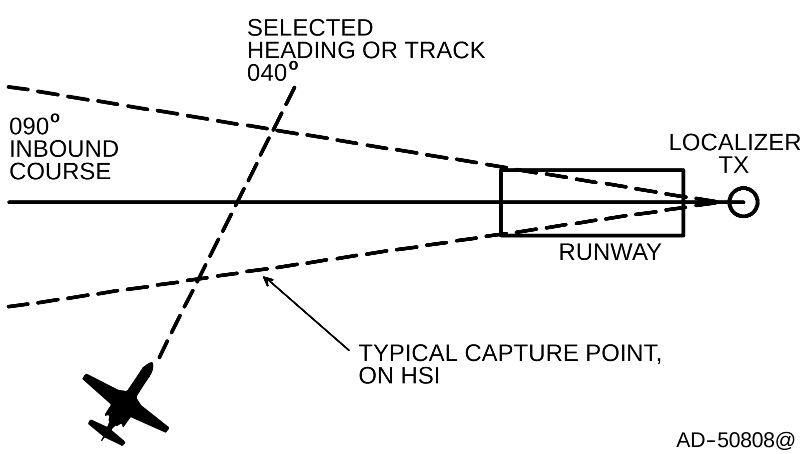

Figure 2-6-19. Localizer ARM Pictorial

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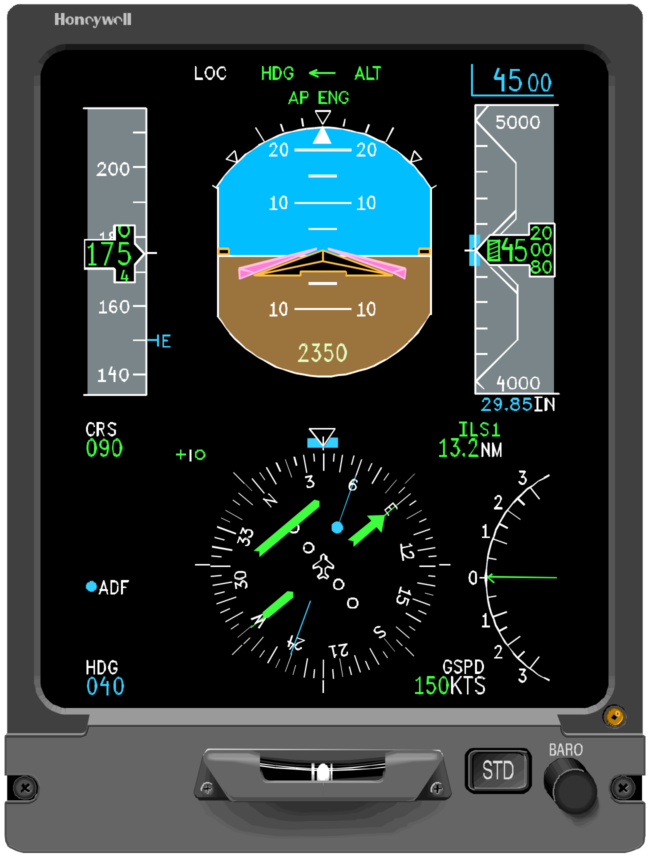

Figure 2-6-20. Localizer (NAV) Mode ARM

With the aircraft approaching the selected course intercept, as shown in Figure 2-6-21, the LBS is monitoring localizer beam deviation, beam rate, and TAS. At the computed time, the LBS trips and captures the localizer signal. The flight director drops the heading select mode and generates the proper roll command to bank the aircraft toward localizer beam center. When the LBS trips, the following is observed on the PFD, as shown in Figure 2-6-22:

- The green HDG annunciation turns OFF
- The white LOC annunciation turns OFF
- The green LOC annunciation comes on enclosed in a white box for 5 seconds to emphasize the capture phase of operation.

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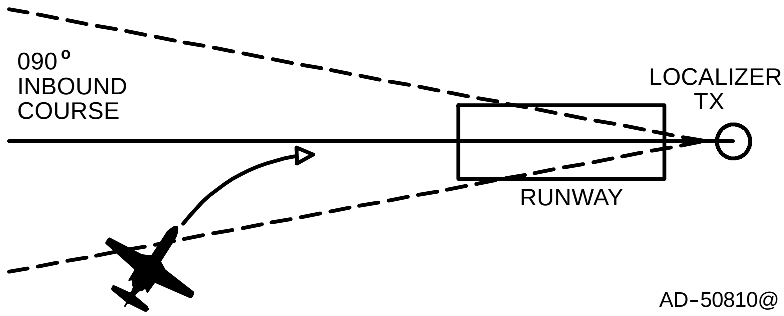

Figure 2-6-21. Localizer Capture Pictorial

The flight director processor generates the proper roll command to bank the aircraft to capture and track the selected localizer signal.

NOTE: When flying a localizer intercept, the optimum intercept angle is 45 degrees or less. If the intercept angle is greater than 45 degrees, course cut limiting can occur as previously described in the VOR mode of operation.

When the course select pointer is set on the PFD using the appropriate course knob on the RI-553 Remote Instrument Controller, the course select error signal is established. This signal represents the difference between actual aircraft heading and selected aircraft course.

Lateral gain programming is required to adjust the gain applied to the localizer signal, due to the aircraft approaching the localizer antenna and beam convergence caused by the directional properties of the localizer antenna. The lateral gain programmer is controlled by the change in radio altitude when the aircraft is below 2400 ft radio altitude and the radio altimeter is valid. If the radio altimeter is not valid, then gain programming occurs as a function of localizer beam capture.

The localizer mode is canceled by the following:

- Pushing the NAV button on the coupled MS-560 Mode Selector
- Selecting go-around
- Any other lateral mode selected
- Changing the coupled PFD displayed navigation source
- Displayed NAV source invalid
- On-side VG-14A or C-14D invalid
- SG reversionary switching
- Activation of the FD1/FD2 switch
- Turn knob out of detent with autopilot engaged.

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Figure 2-6-22. Localizer Capture

When the aircraft meets the localizer capture conditions, the course error signal is removed from the lateral calculations. This leaves localizer gain programming (LOC II) to track the localizer signal, as shown in Figure 2-6-23, and to compensate for localizer beam standoff in the presence of a crosswind. The system automatically compensates for a crosswind of up to 45 degrees course error. Figure 2-6-24 shows the PFD in the localizer tracking mode.

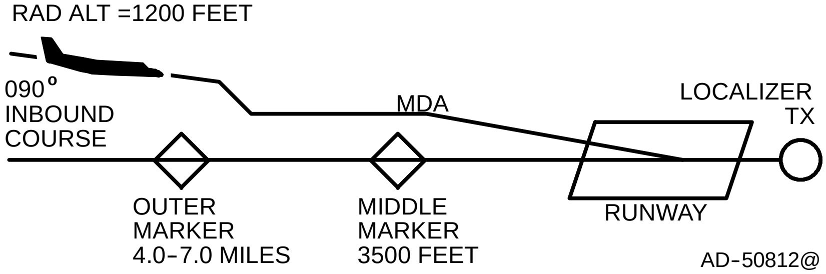

Figure 2-6-23. Localizer Track Pictorial

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Figure 2-6-24. Localizer Track

The back course (BC) mode automatically intercepts, captures, and tracks the back course localizer signal, as shown in Figure 2-6-25. When flying a back course localizer approach, glideslope capture is automatically inhibited. The BC localizer approach is set up and flown identical to a front course localizer approach, with the following differences:

- The heading bug is set for the back course intercept.
- The BC button is pushed on the coupled MS-560 Mode Selector (Phase III aircraft only).

For before phase III aircraft, selecting the BC mode is accomplished by pushing the APR button on the coupled MS-560 Mode Selector, with ILS as the active NAV source on the PFD.

Pushing the BC or APR button on the coupled MS-560 Mode Selector tells the flight director processor to reverse the course and radio inputs 180 degree.

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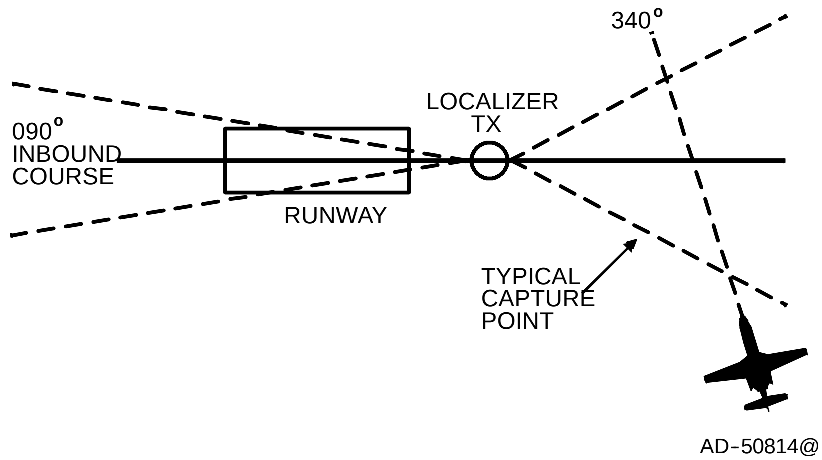

Figure 2-6-25. Back Course Mode Pictorial

With the aircraft outside the normal back course localizer capture limits, the PFD annunciates BC in white and HDG in green as shown in Figure 2-6-26.

Figure 2-6-26. Back Course Arm

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At BC capture, the PFD annunciates BC in green, as shown in Figure 2-6-27. The BC annunciation is enclosed in a white box for 5 seconds.

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Figure 2-6-27. Back Course Capture

At BC capture, the IAC flight control function generates a roll command to capture and track the back course signal, as shown in Figure 2-6-28.

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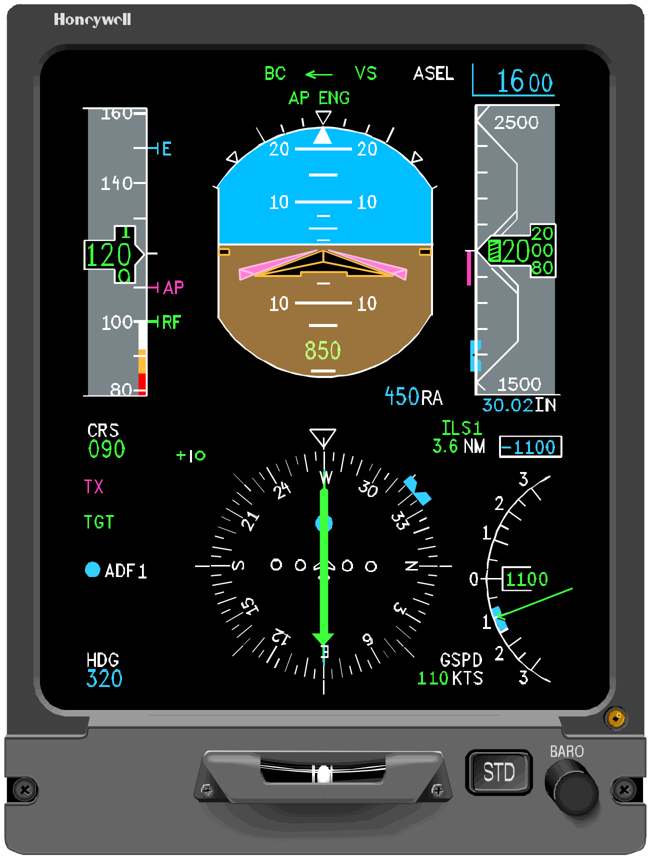

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Figure 2-6-28. Back Course Track

The BC mode is cancelled by any one of the following:

- Pushing the NAV button on the coupled MS-560 Mode Selector
- Pushing the APR button on the coupled MS-560 Mode Selector (Before Phase III)
- Pushing the BC button on the coupled MS-560 Mode Selector (Phase III)
- Selecting heading or go-around modes
- Changing the displayed navigation or heading source
- SG reversionary switching
- Turn knob out of detent with autopilot engaged.

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The Localizer Approach mode is set up and flown identically to the localizer mode with the following differences:

- On the coupled MS-560 Mode Selector, the APR button is pushed instead of the NAV button. This arms both the localizer and glideslope modes for automatic capture to fly a fully coupled ILS approach.
- When the APR button is pushed on the coupled MS-560 Mode Selector, the flight director is set to automatically capture the localizer and glideslope signals. On the PFD, the following annunciators light:
  - HDG in green
  - LOC in white
  - GS in white.

The system is interlocked so that glideslope capture is inhibited unless localizer is captured first. Glideslope capture cannot occur when flying a back course localizer approach.

Input data used by the localizer control law includes selected course, localizer deviation, TAS, radio altitude, middle marker, and roll attitude.

Table 2-6-9. Localizer (LOC) and Back Course (BC) Mode Operating Limits

Mode	Parameter	Value
LOC/BC	LOC or BC Capture:	
	Beam Intercept Angle	Up to 90°
	Capture Point	Function of beam deviation, beam closure rate and localizer course error MIN Trip Point: ± 60 mV dc MAX Trip Point: ± 175 mV dc
	Roll Angle Limit	±27.5°
	Roll Rate Limit	4.0°/sec
	Course Cut Limit	30° during capture
	LOC or BC TRACK:	
	Roll Angle Limit	13°
	Roll rate Limit	5.0°/sec
	Crosswind Correction	Up to 30° course error
	Gain programming	Function of radio altitude

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(8) Localizer/Back Course Mode Engage/Reset/Disengage Logic

(a) LOC/BC ARM Engage Logic

Required valids are as follows:

- Flight Director
- On-side VG-14A Vertical Gyro
- On-side C-14D Directional Gyro
- On-side displayed NAV source.

With the above conditions satisfied and

- NAV selected as the NAV source on the DC-550 Display Controller
- The source tuned to an ILS frequency,

Pushing the NAV button on the coupled MS-560 Mode Selector arms the LOC mode. Pushing the BC button on the coupled MS-560 arms the back course localizer mode. Pushing the APR button on the coupled MS-560 arms the LOC and GS modes.

(b) LOC/BC Arm Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re-engaged.

Disengage means that a condition has occurred that has canceled the mode due to a fault; the mode cannot be re-engaged until the fault is cleared.

LOC/BC arm is automatically reset if any of the following conditions occur:

- LOC/BC is captured
- Selecting go-around
- Pushing the NAV button on the coupled MS-560 Mode Selector
- Changing the displayed heading source on the coupled PFD
- Changing the displayed nav source on the coupled PFD
- Any time the flight guidance system is powered up
- Activation of the FD1/FD2 switch
- TURN knob out of detent with autopilot engaged
- SG reversionary switching.

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(c) LOC/BC Arm Disengage Logic

The LOC/BC arm mode automatically disengages if any of the following conditions occur:

- Flight director not valid
- On–side VG–14A not valid
- On–side C–14D not valid
- Not tuned to a localizer frequency
- Coupled PFD displayed NAV source not valid.

NOTE: If the flight director or the on–side VG–14A or C–14D go invalid, the mode clears, as well as the EDS display (attitude fail or heading fail). If the NAV sensor fails, the mode stays engaged, but the flight director command bar goes out of view.

(d) LOC/BC Capture Engage Logic

Required valids are as follows:

- Flight Director
- On–side VG–14A
- On–side C–14D
- Coupled PFD displayed NAV source.

With the above conditions satisfied and:

- The LOC/BC mode is armed plus 1 second and
- The LBS trips or deviation less than 35 mV,

The LOC/BC mode automatically transitions from arm to capture.

(e) LOC/BC Capture Reset Logic

LOC/BC capture automatically resets if any of the following conditions occur:

- Selecting go–around
- Any other lateral mode active
- Pushing the NAV, BC or APR buttons on the coupled MS–560 Mode Selector
- Changing the displayed heading source on the coupled PFD
- Changing the displayed NAV source on the coupled PFD
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- TURN knob out of detent with autopilot engaged
- SG reversionary switching.

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(f) LOC/BC Capture Disengage Logic

The LOC/BC mode automatically disengages if any of the following conditions occur:

- Flight Director not valid
- On–side VG–14A or C–14D not valid
- Not tuned to a localizer frequency
- Coupled PFD displayed NAV source not valid plus 5 seconds.

NOTE: Loss of NAV valid causes the flight director command bar to go out of view while maintaining mode annunciation. If the NAV remains invalid after 5 seconds, the mode is canceled.

(9) Long Range Navigation

See Figure 2–6–29, Figure 2–6–30, and Table 2–6–10.

When the pilot selects the long range navigation (FMS) source on the DC–550 Display Controller, the NAV mode is flown using a composite steering command from the FMS. No lateral beam sensing is required and gain programming is done in the FMS.

FMS navigation characteristics include the following:

- Instead of using course error and radio deviation, a composite lateral steering command is used from the long range navigation computer by the IC–600 IAC
- The symbol generator function supplies the flight director with the required steering commands
- This lateral steering command is gain programmed in the FMS and therefore is not gain programmed again in the IC–600 IAC.

As a function of the installed FMS, the flight director captures the desired track in one of the two methods described:

(a) Automatic FMS Arm/Capture

Pushing the NAV button on the coupled MS–560 Mode Selector causes the HDG mode to annunciate ON and LNAV is armed. At the proper point, the flight director captures the FMS supplied track and LNAV is annunciated in green on the coupled PFD.

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(b) Immediate FMS Capture

Pushing the NAV button on the coupled MS–560 Mode Selector causes the flight director LNAV mode to annunciate in green on the coupled PFD. The flight director function immediately captures the desired track.

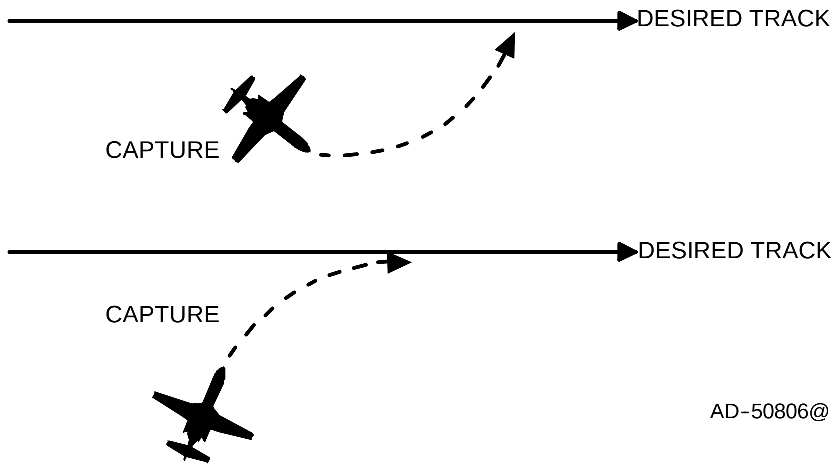

Figure 2–6–29. Long Range Navigation Capture and Tracking Pictorial

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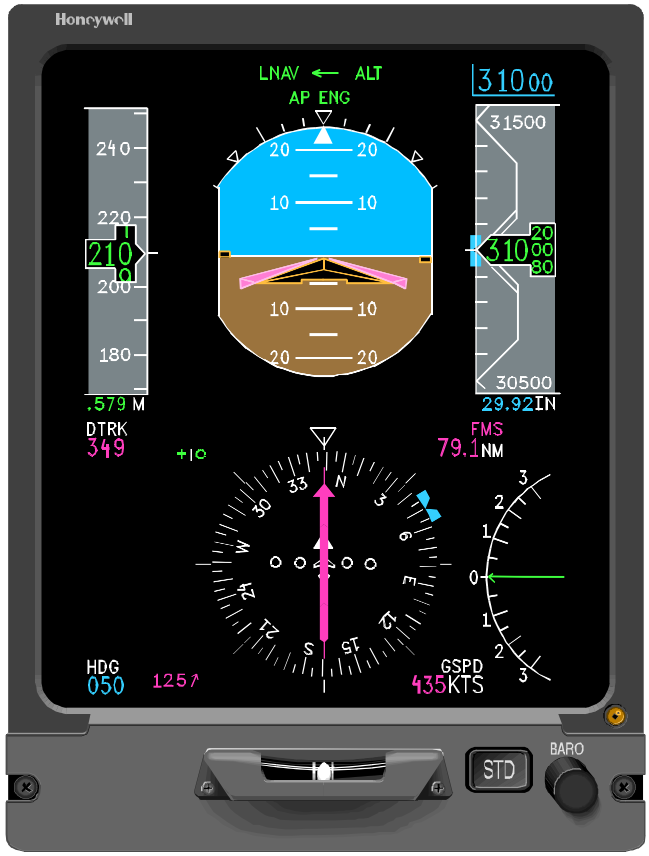

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Figure 2-6-30. Long Range Navigation Tracking

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The LNAV mode is canceled by the following:

- Pushing the NAV button on the coupled MS-560 Mode Selector
- Selecting go-around
- Selecting another navigation source on the DC-550 Display Controller
- Selecting another heading source on the coupled PFD
- Selecting another lateral mode active
- SG reversionary switching
- Activation of the FD1/FD2 switch
- TURN knob out of detent with autopilot engaged.

Table 2-6-10. LNAV Mode Operating Limits

Mode	Parameter	Value
LNAV	Capture:	
	Beam Intercept Angle	Up to 90°
	Capture Point	Function of groundspeed and the angular difference between actual and desired track.
	Roll Angle Limit	±30°
	Roll Rate Limit	5.0°/sec

(10) LNAV Mode Engage/Reset/Disengage Logic

(a) LNAV Capture Logic

Required valids are as follows:

- Flight Director
- On-side VG-14A
- On-side C-14D
- FMS.

With the above conditions satisfied, the LNAV mode armed, and the aircraft is at the computed desired track intercept point, the LNAV mode is captured.

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(b) LNAV Capture Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re-engaged.

LNAV capture is automatically reset if any of the following conditions occur:

- Selecting go-around
- Any other lateral mode active
- Pushing the NAV button on the coupled MS-560 Mode Selector
- NAV source change on coupled PFD
- Changing the displayed heading source on the coupled PFD
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- TURN knob out of detent with autopilot engaged.

(c) LNAV Capture Disengage Logic

Disengage means that a condition has occurred that has canceled the mode due to a fault; the mode cannot be re-engaged until the fault is cleared.

The LNAV mode automatically disengages if any of the following conditions occur:

- Flight director not valid
- On-side VG-14A or C-14D not valid
- Selected FMS source not valid
- On-side MADC not valid
- SG reversionary switching.

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C. Flight Director Vertical (Pitch) Channel Functional Operation

(1) Flight Director Vertical (Pitch) Modes Interface

Figure 2–6–31 shows LRU interface for pilot’s side flight director vertical modes. Figure 2–6–32 shows LRU interface for copilot’s side flight director vertical modes.

The function of each LRU for each vertical mode is discussed in the following paragraphs:

(a) VG–14A Vertical Gyro

For all flight director vertical modes, the on–side VG–14A supplies three-wire synchro outputs that are electrical analogs of actual aircraft pitch attitude for the on-side flight director.

The cross–side VG–14A supplies the same terms to the IC–600 IAC, but these signals are used for EDS/flight director and autopilot monitoring purposes only.

(b) AZ–850 Micro Air Data Computer (MADC)

The on–side AZ–850 MADC supplies the on–side IC–600 IAC with an ARINC 429 input of air data values including true airspeed (TAS). The TAS signal is used in some vertical flight director modes for gain programming. The response of the aircraft should feel the same regardless of the aircraft’s airspeed and altitude. Since it requires less flight control surface deflection at high speed and high altitude to complete a maneuver than it does at low speed and low altitude, changing the size of the signal as a function of TAS achieves the desired results.

Should the AZ–850 MADC become invalid, a fixed bias TAS of 120 knots is used in the IC–600 IAC. The default value of TAS is set for the approach speed region of flight.

Additionally, the AZ–850 MADC supplies the on–side flight director with the following vertical mode references:

- Barometric altitude
- Indicated airspeed/Mach
- Altitude rate (vertical speed).

(c) MS–560 Mode Selector

The MS–560 Mode Selector supplies the means for the pilot to engage/ disengage all vertical flight director modes, with the exception of altitude preselect and go–around. Each MS–560 Mode Selector transmits button data as two wire greycode formatted data to its on–side DC–550 Display Controller. The display controller transmits the button data to its on–side IC–600 IAC over a dedicated DC/IC bus. The MS–560 receives a ground input from its on–side IC–600 IAC to light the mode button for an armed or captured condition.

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(d) DC–550 Display Controller

The DC–550 Display Controller supplies a RS–422 digital bus interface (DC/IC Bus) between itself and its on–side IC–600 IAC to transmit MS–560 button mode selection data.

(e) Radio Altimeter (Not Honeywell)

The radio altimeter supplies an analog output of absolute altitude above the terrain. This signal is used by the flight director to gain program the GS signal. Gain programming is required, due to the directional qualities and beam convergence characteristics of the GS antenna.

As the aircraft approaches the runway, the GS signal appears to get stronger and the beam appears to get narrower. By reducing the gain on the signal, as a function of the change in radio altitude, the computed steering command does not take the aircraft out of the glideslope beam envelope.

Should the radio altimeter be invalid, gain programming starts as a function of GS capture and run down as a function of TAS and time. At the middle marker, gain programming is synchronized to a preset value.

(f) Navigation Receiver

The navigation receiver supplies an ARINC 429 output of GS deviation data, as well as marker beacon data.

(g) Long Range Navigation (LRN) Unit (Not Honeywell)

The LRN unit supplies an ARINC 429 composite steering command output to the IC–600 IAC. Gain programming for the composite steering command is done in the LRN unit.

(h) AG–222 Normal Accelerometer

The AG–222 Normal Accelerometer is a damping term in some vertical flight director modes, to minimize overshooting and undershooting target references.

(i) IC–600 Integrated Avionics Computer (IAC)

The IC–600 IAC performs the following, as a function of which vertical mode is active:

1 Pitch Attitude Hold

When only a lateral flight director mode is active, the IC–600 IAC memorizes the pitch attitude of the aircraft at the time the lateral mode was selected. This becomes the pitch attitude reference displayed on the PFD. There is no annunciation for the pitch attitude hold mode.

Pitch attitude is changed by pushing and holding the TCS button and maneuvering the aircraft to a new position. Releasing the TCS button causes the IC–600 IAC to memorize the new attitude reference.

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2 Vertical Speed Hold

The IC–600 IAC receives vertical speed information from the on–side AZ–850 MADC. This vertical speed information becomes the reference vertical speed in the IC–600 IAC when the mode is engaged.

The vertical speed reference is changed as a function of moving the PITCH wheel on the PC–400 Autopilot Controller, or by pushing and holding the TCS button while flying the aircraft manually to a new vertical speed reference. When the vertical speed mode is engaged, the speed set bug is displayed on the vertical speed scale, and the vertical speed air data command reference is displayed above the vertical speed scale on the PFD.

a Fight Director Only – When the vertical speed mode is engaged and the autopilot is OFF, vertical speed steering commands are presented to the pilot on the coupled PFD command bar. By flying the miniature aircraft symbol to the flight director command bar, the pilot satisfies the flight director command.

b Autopilot Engaged - With the autopilot and the vertical speed mode engaged, vertical speed steering commands are sent to the autopilot for automatic flight path steering.

3 Speed Hold

a Air Data – The IC–600 IAC receives IAS/Mach data from the AZ–850 MADC. This data becomes the SPD reference in the IC–600 IAC when the mode is engaged. The SPD reference is changed by moving the PITCH wheel on the PC–400 Autopilot Controller, or by pushing and holding the TCS button and manually flying the aircraft to a new IAS/Mach reference and releasing the TCS button. When the SPD mode is engaged, the mode synchronizes to the existing aircraft speed. The speed reference is shown as a digital display at the top of the airspeed tape on the PFD. A speed set target bug is also displayed on the airspeed tape.

b Flight Director Only - When the SPD mode is engaged and the autopilot is OFF, SPD steering commands are presented to the pilot on the coupled PFD flight director command bar. By flying the miniature aircraft symbol to the command bar, the pilot satisfies the flight director command.

c Autopilot Engaged – With the autopilot and the SPD mode engaged, selected IAS/Mach steering commands are sent to the autopilot for automatic flight path steering.

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4 Altitude Preselect Mode

The IC–600 IAC receives inputs of uncorrected pressure altitude, baro corrected pressure altitude, and pilot selected altitude. The flight director processor combines the pressure altitude inputs through complimentary filtering to obtain more precise barometric altitude data.

In the IC–600 IAC, the difference between actual aircraft altitude and selected aircraft altitude (ASEL) is defined as the altitude error signal.

The altitude error signal is converted into a computed vertical speed signal. If the aircraft's actual vertical speed is less than the computed vertical speed, then ASEL remains armed. When the aircraft's actual vertical speed is greater than the computed vertical speed, the flight director processor captures the selected altitude and commands the flare maneuver.

There is no button to select the ASEL mode on the MS–560 Mode Selector. ASEL automatically arms when the following conditions exist simultaneously:

- Decreasing altitude error
- Computed vertical speed is greater than actual vertical speed
- Not in altitude hold
- Glideslope is not in capture or track mode
- Vertical speed is greater than 100 FPM for 3 seconds
- The target altitude is at least 250 feet from present altitude.

a Flight Director Only - With the ASEL mode armed, the coupled PFD presents a vertical steering command of whichever other vertical mode is in use. When ASEL transitions from arm to capture, a vertical steering command is presented to the pilot to flare the aircraft onto the selected altitude.

b Autopilot Engaged - With the autopilot engaged and the ASEL mode captured, steering commands are sent to the autopilot for automatic altitude capture.

5 Altitude Hold Mode

The IC–600 IAC receives an input of baro corrected pressure altitude from the on–side AZ–850 MADC. The flight director processor compares actual aircraft altitude against the altitude hold reference to generate the altitude hold error signal.

a Flight Director Only – With the ALT hold mode engaged, the coupled PFD presents a vertical steering command to the pilot to fly the aircraft back to the reference altitude.

b Autopilot Engaged – With the autopilot and the ALT hold mode engaged, the vertical steering command is sent to the autopilot for automatic flightpath steering.

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6 ILS Approach Mode

When the ILS approach mode (APR) is armed, the flight director processor looks at TAS, vertical speed, and glideslope deviation to determine when to capture the glideslope. This is accomplished by the Vertical Beam Sensor (VBS). When the glideslope is captured, the flight director processor automatically drops whichever other vertical mode was engaged and starts tracking the glideslope signal. Should the localizer signal be lost for any reason, the APR mode is also dropped.

With the autopilot not engaged, the glideslope error signal is presented on the coupled PFD command bar as a computed steering command for the pilot to raise or lower the aircraft nose and fly back to glideslope beam center.

With the aircraft tracking the glideslope beam, the following conditions exist:

- Radio deviation is zero
- Command cue is centered
- Control wheel is centered
- Aircraft is tracking the glideslope beam.

With the autopilot engaged, the flight director processor generates the commands stated above and sends them to the autopilot for automatic flight path steering. On the coupled PFD, the command bar can move a little out of center and then return. With the autopilot satisfying the flight director steering command, the command bar is centered.

7 VNAV Mode

The vertical navigation mode (VNAV) supplies a means to define and track a climb or descent path to a vertical waypoint ahead of the aircraft. The waypoint is defined based on a distance reference TO or FROM a VOR station, or an LRN waypoint. At the proper time, the flight director switches from VNAV, to ASEL capture, to ALT HOLD at the waypoint altitude.

8 Go–Around Mode

The GA mode is normally used to transition from an approach to land to a climb out condition in the event of a missed approach. The pilot selects GA mode by pushing the GA button located on the pilot's throttle handle. With GA mode selected, all flight director modes are canceled.

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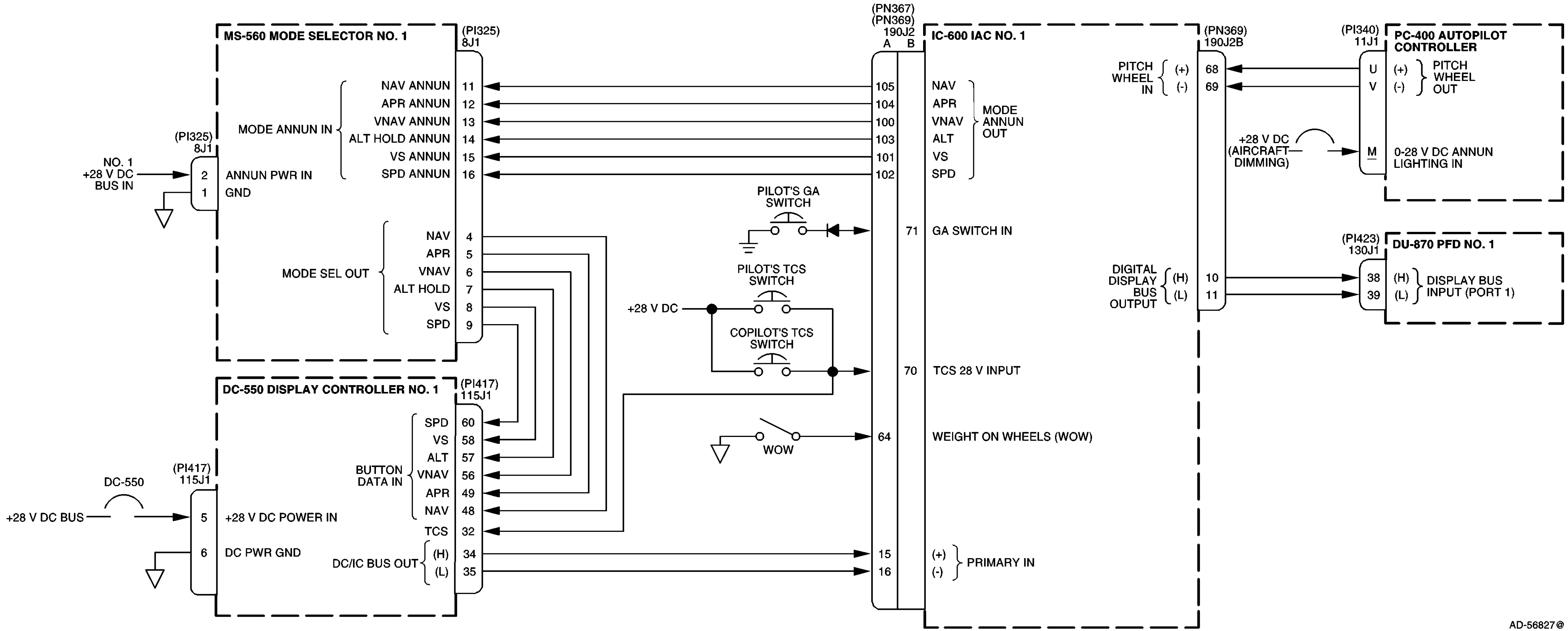

Figure 2-6-31 (Sheet 1). Flight Director Vertical Mode Interface - Pilot's Side

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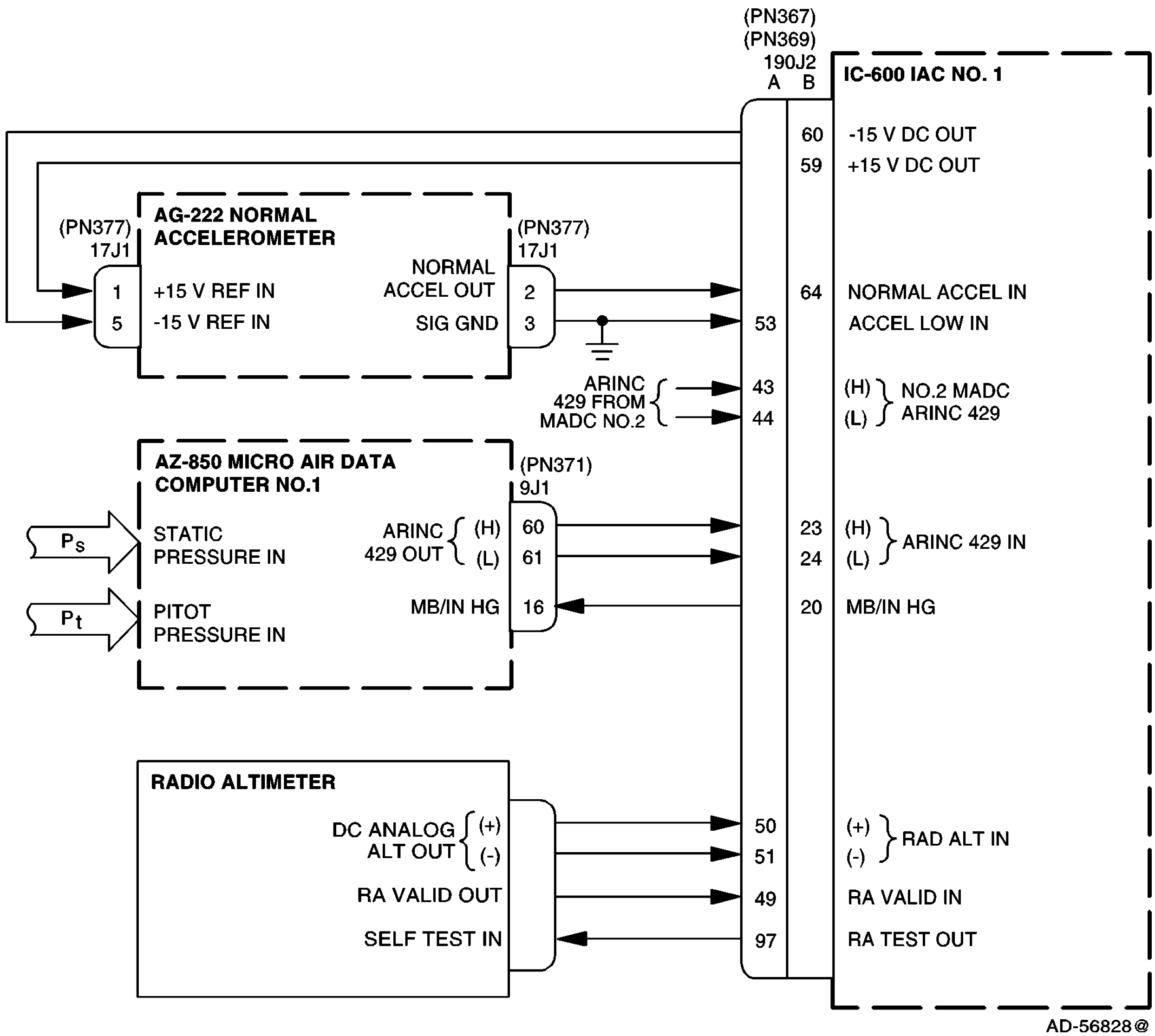

Figure 2-6-31 (Sheet 2). Flight Director Vertical Mode Interface - Pilot's Side

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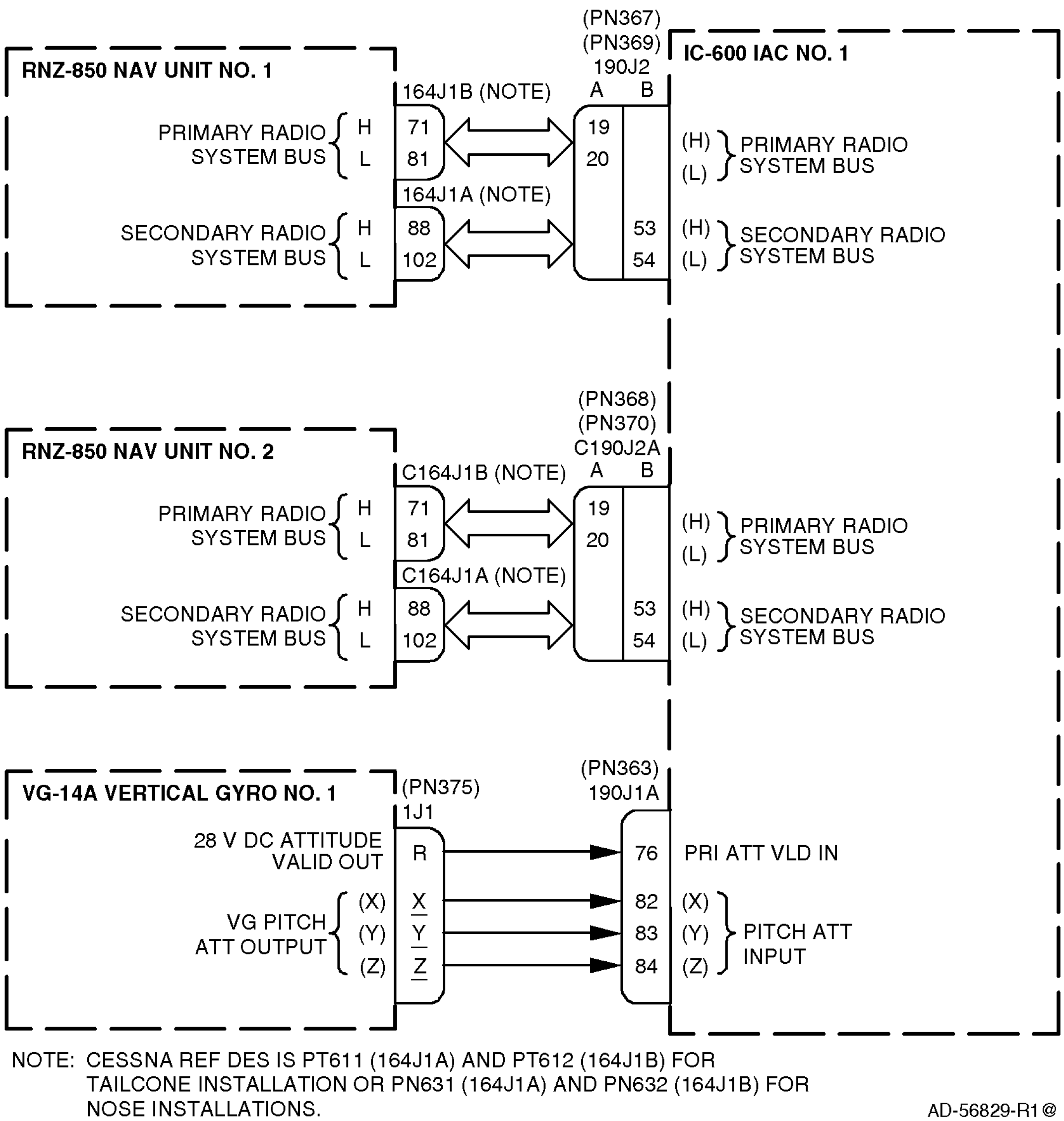

Figure 2-6-31 (Sheet 3). Flight Director Vertical Mode Interface - Pilot's Side

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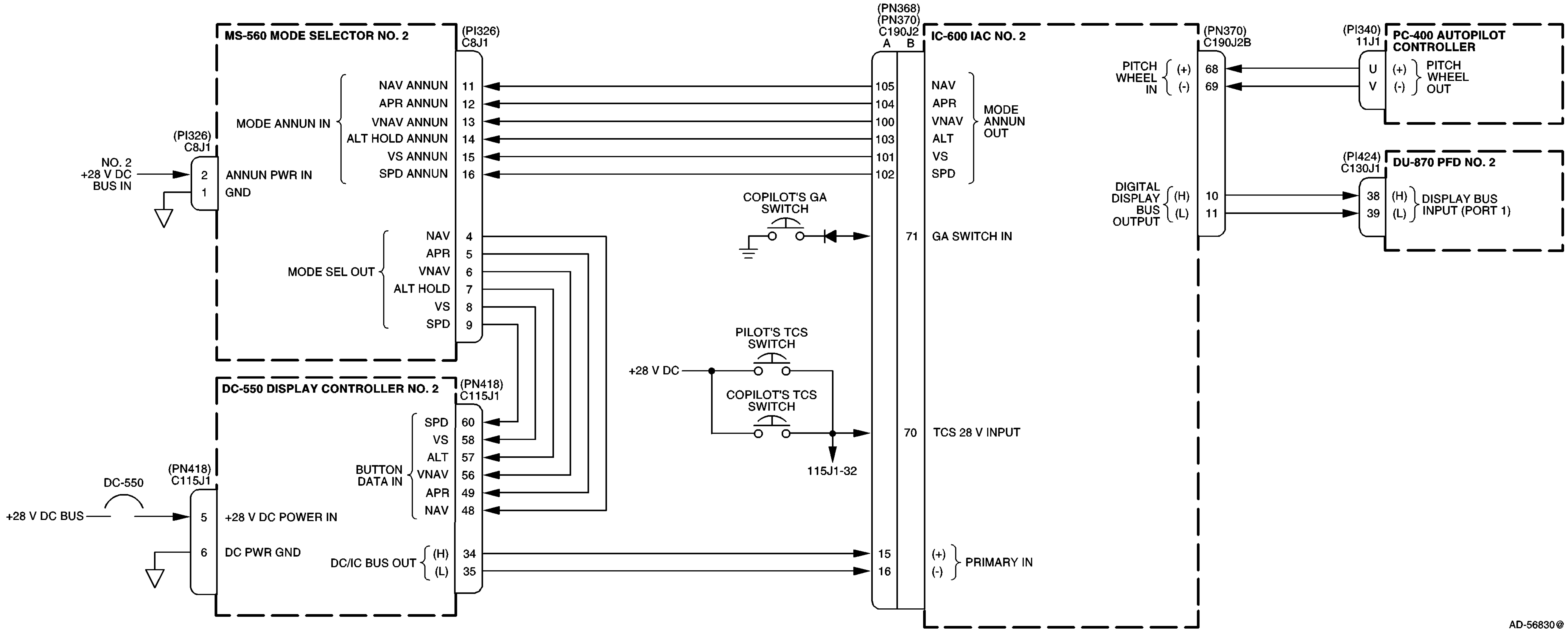

Figure 2-6-32 (Sheet 1). Flight Director Vertical Mode Interface - Copilot’s Side

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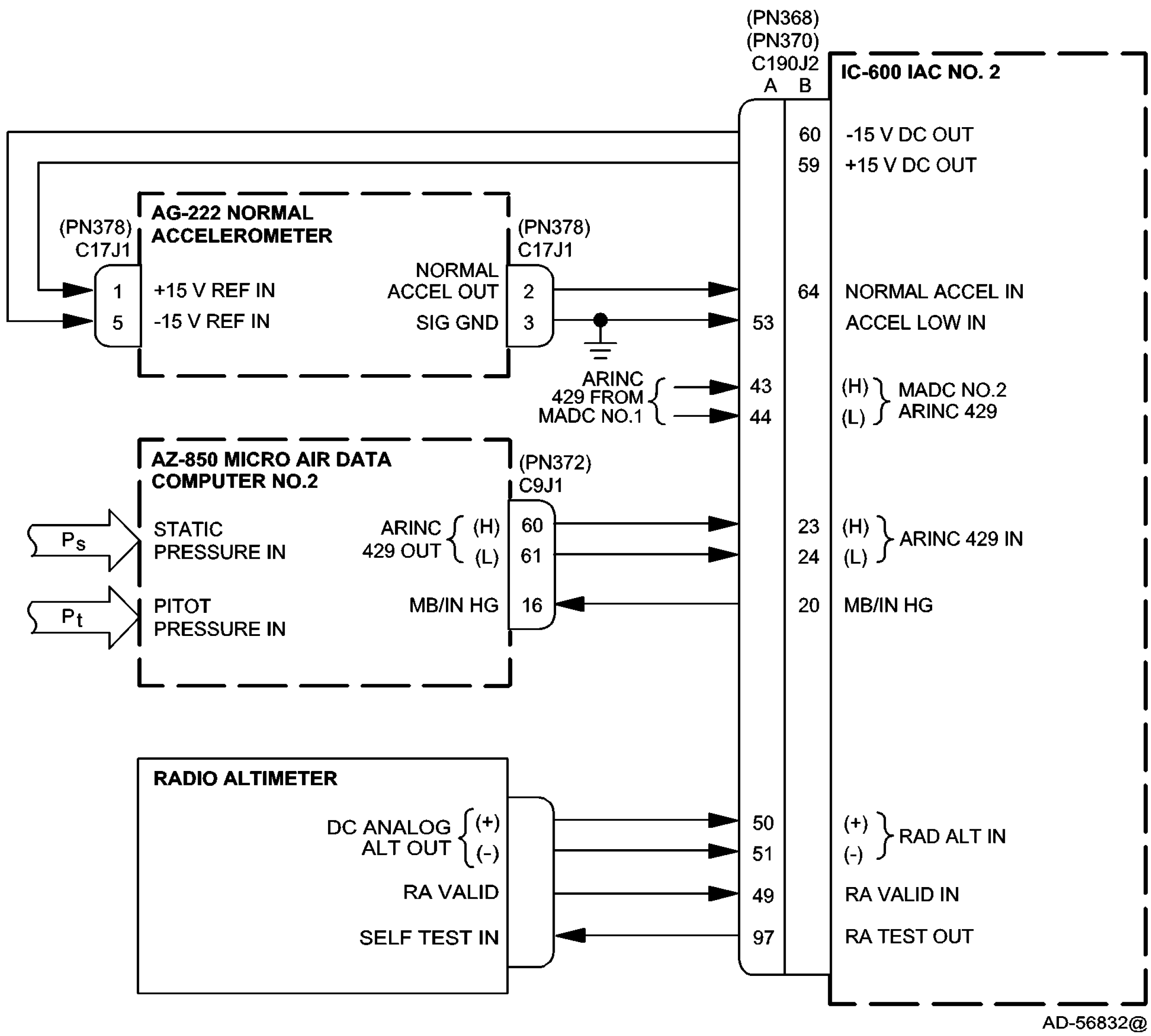

Figure 2-6-32 (Sheet 2). Flight Director Vertical Mode Interface - Copilot’s Side

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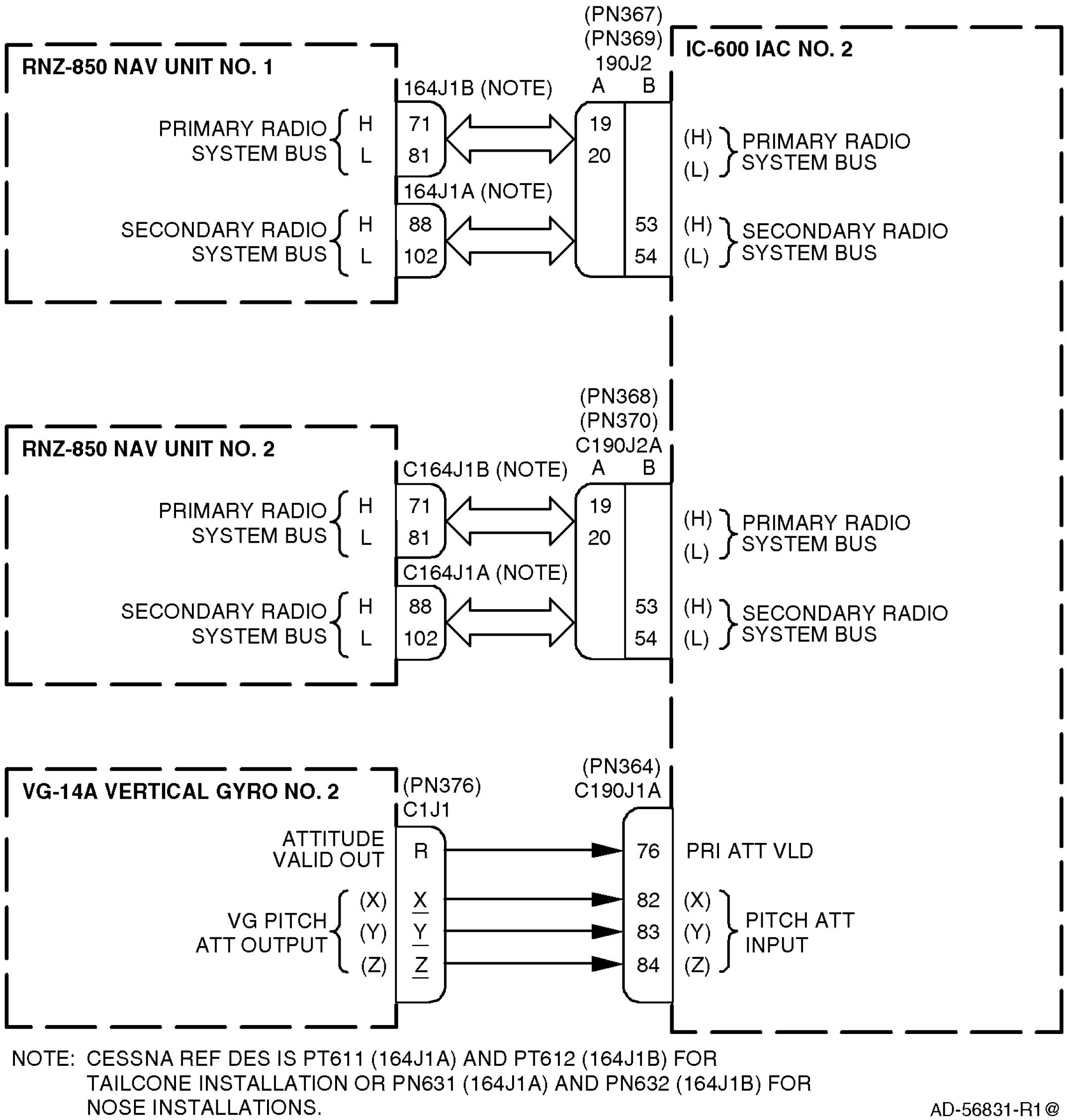

Figure 2-6-32 (Sheet 3). Flight Director Vertical Mode Interface - Copilot's Side

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The description and figures in this section assume the pilot's flight director is master. The PFD figures reflect the phase III configuration. The phase III configuration shows an RA minimums display instead of a DH decision height display.

(2) Pitch Attitude Hold

Table 2–6–11 gives the pitch attitude hold operating limits. Pitch attitude hold is the basic vertical flight director mode. It is pushed when a flight director lateral (roll) mode is selected without an accompanying vertical (pitch) mode. There is no annunciation on the PFD for the PITCH hold mode. The pitch command on the PFD gives the pilot a reference corresponding to the pitch attitude existing at the moment the lateral flight director mode was selected. The pitch reference can be changed with the TCS button located on the pilot's and copilot's control wheel, or by using the pitch wheel on the PC–400 Autopilot Controller with the autopilot engaged.

Pitch attitude hold is canceled by selecting any vertical flight director mode or automatic capture of a vertical mode.

Table 2–6–11. Pitch Attitude Hold Operating Limits

Mode	Parameter	Value
Pitch Hold	Limit After Engagement	$\pm 20^\circ$
	TCS	$\pm 20^\circ$
	Pitch Wheel	$\pm 20^\circ$

(3) Pitch Attitude Hold Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids:

- Flight director
- On–side VG–14A.

With the above conditions satisfied, selecting a lateral flight director mode only, with no vertical flight director mode active, places the flight director in the pitch attitude hold mode of operation.

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(b) Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re-engaged.

The pitch attitude hold mode is automatically reset if any of the following conditions occur:

- Selecting any vertical flight director mode active
- Selecting go-around
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- SG reversionary switching
- No flight director modes active and the autopilot disengaged.

(c) Disengage Logic

Disengage means a condition has occurred that has canceled the mode due to a fault; the mode cannot be re-engaged until the fault is cleared.

The pitch attitude hold mode is automatically disengaged if any of the following conditions occur:

- Flight director not valid
- On-side VG-14A not valid.

(4) Vertical Speed (VS) Hold Mode

See Figure 2-6-33 and Table 2-6-12.

The vertical speed hold mode is used to automatically maintain the aircraft at a pilot-selected vertical speed reference. Mode activation cancels all other vertical modes except altitude preselect arm and glideslope arm. Overspeed protection based on the Vmo/Mmo speed limit is supplied as a submode of vertical speed hold. In the event that Vmo data is invalid, the Vmo/Mmo limit is 277 knots.

With the VS mode active and overspeed protection is used, a MAX SPEED annunciation is displayed on the PFD. Overspeed protection is removed when the VS pitch command is greater than the speed hold submode targeted to the Vmo/Mmo limit.

To initiate the mode, the pilot maneuvers the aircraft to the desired climb or descent attitude, establishes the vertical speed reference, and engages the mode. When the vertical speed mode is engaged, the following occurs:

- The VS button on the MS-560 Mode Selector lights
- VS in green is annunciated on the PFD
- The vertical speed target is displayed above the vertical speed scale on the PFD and the vertical speed bug is displayed on the vertical speed scale.

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The reference vertical speed is changed by moving the PITCH wheel on the PC-400 Autopilot Controller, or by pushing and holding the TCS button and manually flying the aircraft to a new vertical speed reference and releasing the TCS button.

Input data for the vertical speed control law includes vertical speed target, actual aircraft vertical speed, normal acceleration, and pitch attitude.

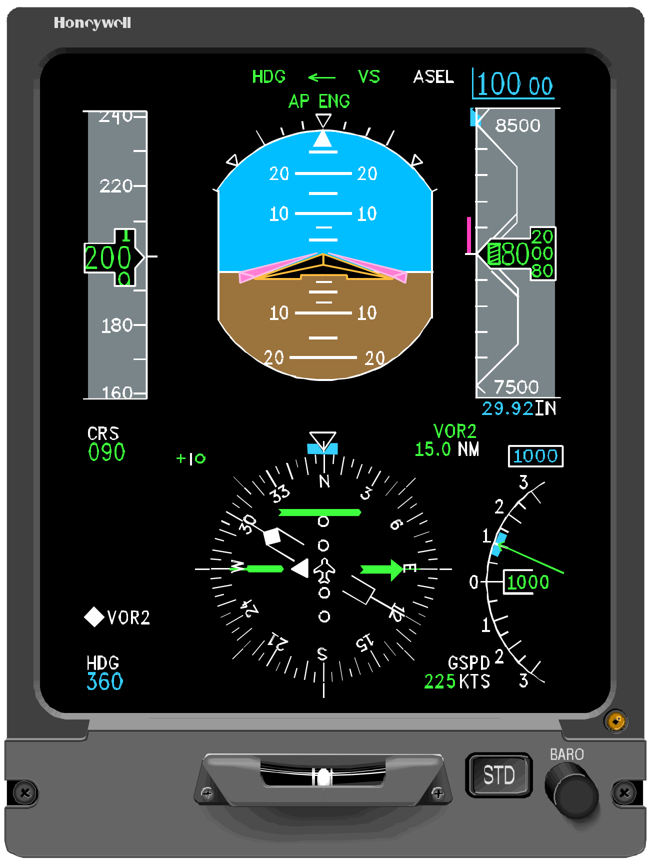

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Figure 2-6-33. Vertical Speed (VS) Hold Mode

Table 2-6-12. Vertical Speed Hold Operating Limits

Mode	Parameter	Value
VS Hold	VS Engage Range	0 to ±6000 ft/min
	VS Hold Engage Error	±30 ft/min
	Pitch Limit	±20°
	Pitch Rate Limit	f(TAS) 0.2 g's max

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(5) Vertical Speed (VS) Hold Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids:

- Flight director
- On-side VG-14A
- On-side MADC.

With the above conditions satisfied, pushing the VS button on the MS-560 Mode Selector engages the VS hold mode.

(b) Reset Logic

Reset means a condition has occurred that has canceled the mode, but it can be re-engaged.

The VS mode automatically resets if any of the following conditions occur:

- Selecting go-around
- Pushing the VS button on the MS-560 Mode Selector
- Selecting any other vertical mode active
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- SG reversionary switching
- Attitude or MADC source change.

(c) Disengage Logic

Disengage means a condition has occurred that has canceled the mode due to a fault; the mode cannot be re-engaged until the fault is cleared.

The VS hold mode automatically disengages if any of the following conditions occur:

- Flight director not valid
- On-side VG-14A not valid
- On-side MADC not valid.

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(6) Speed (SPD) Hold Mode

See Figure 2–6–34 and Table 2–6–13.

The speed hold mode is used to maintain a pilot-selected speed reference while flying to a new altitude reference. The SPD control law is designed to fly to a selected altitude at a selected speed and to supply limited overspeed protection during climbs and descents.

The SPD hold mode is engaged by pushing the SPD button on the MS–560 Mode Selector. This commands the flight director to maintain the IAS/Mach that exists at the time of mode engagement. The speed reference is changed by moving the PITCH wheel on the PC–400 Autopilot Controller, or by pushing and holding the TCS button and manually flying the aircraft to a new speed reference and releasing the TCS button.

If the aircraft is descending and is below 27,900 feet (33,750 feet, before phase III) or the aircraft is not descending and aircraft altitude is less than 30,400 feet (34,000 feet, before phase III) or Mach is less than or equal to 0.52, the speed reference is IAS.

If the aircraft is descending and is above 27,900 feet (33,750 feet before phase III) or the aircraft is not descending and aircraft altitude is greater than 30,400 feet (34,000 feet before phase III), or Mach is greater than 0.52, the speed reference is Mach.

The speed hold mode can be automatically entered to supply overspeed protection during VNAV mode operation. Overspeed protection prevents the aircraft from exceeding Vmo limits imposed by the aircraft manufacturer. When aircraft IAS exceeds Vmo limits plus 5 knots, a Vmo limit is imposed and a MAX SPEED annunciation is displayed on the PFD. In the event that VMO data from the selected MADC is invalid, a VMO value of 277 knots is used.

When the SPD hold mode is engaged, the following occurs:

- The IAS button on the MS–560 Mode Selector lights
- IAS in green is annunciated on the PFD
- The speed target is displayed at the top of the airspeed scale on the PFD and the speed target bug appears on the airspeed scale.

The SPD control law is designed to meet the following requirements:

- Not to exceed 0.1 g's normal acceleration
- Not to exceed Vmo plus 10 knots
- Not to fall below 160 knots during VNAV operation
- Not to fly away from the selected altitude reference
- Not to fly away from the selected speed reference
- Not to exceed 0.1 g longitudinal acceleration.

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Input data for the speed control law includes instantaneous vertical velocity, actual aircraft IAS/Mach, normal acceleration, and pitch attitude.

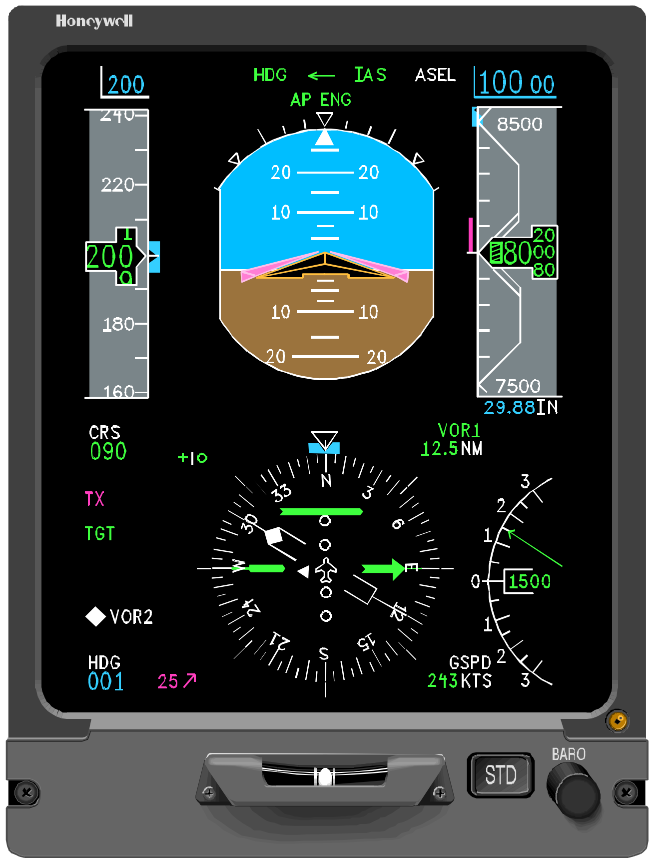

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Figure 2-6-34. Speed Hold Mode

Table 2-6-13. Speed (SPD) Hold Mode Operating Limits

Mode	Parameter	Value
SPD Hold	IAS Engage Range	80 knots to Vmo
	IAS Hold Engage Error	±2 knots
	Pitch Limit	±12°
	Pitch Rate Limit	f(TAS) 0.1 g max
	Mach Engage Range	.20 Mach to Mmo
	Mach Hold Engage Error	±0.01 Mach
	Pitch Limit	±12°
	Pitch Rate Limit	f(TAS) 0.1 g max

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(7) Speed (SPD) Select Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids are as follows:

- Flight director
- On-side VG-14A
- On-side MADC.

With the above conditions satisfied, pushing the SPD button on the MS-560 Mode Selector engages the SPD Hold mode.

(b) Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re-engaged.

The SPD mode is automatically reset if any of the following conditions occur:

- Selecting go-around
- Pushing the SPD button on the MS-560 Mode Selector
- Selecting any other vertical mode active except altitude preselect arm or glideslope arm
- ASEL capture or VNAV capture
- Attitude or MADC source change
- Overspeed protection is cancelled
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- SG reversionary switching.

(c) Disengage Logic

Disengage means that a condition has occurred that has canceled the mode, due to a fault and the mode cannot be re-engaged until the fault is cleared.

The SPD hold mode is automatically disengaged if any of the following conditions occur:

- Flight Director not valid
- On-side VG-14A not valid
- On-side MADC not valid.

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(8) Altitude Preselect (ASEL) Mode

See Figure 2–6–35 and Table 2–6–14.

The ASEL mode is used in conjunction with another vertical mode to climb or descend to a preselected altitude, automatically level off and maintain the barometric altitude reference. Using the ASEL knob on the MFD Bezel Controller, the desired barometric altitude reference is entered in the altitude alert display window above the altitude scale on the PFD.

The ASEL mode automatically arms when the aircraft climbs or descends towards the altitude reference and the following conditions are satisfied:

- ASEL altitude is more than 250 feet from current altitude
- Computed vertical speed is greater than actual vertical speed
- Vertical speed is greater than 100 FPM for 3 seconds
- Aircraft is moving toward the target altitude
- Glideslope is not captured.

When the above conditions are satisfied, ASEL in white is annunciated on the PFD. VS, SPD, VNAV, or pitch hold can be used to fly to the preselected altitude. When reaching the preselect bracket altitude, the system automatically switches to the ALT SEL CAP mode and the previous active pitch mode is canceled. A command is then generated to asymptotically capture the selected altitude.

The bracket altitude is defined as follows:

- When climbing toward the target altitude, the ASEL error is less than 2000 feet and computed vertical speed is less than actual vertical speed
- When descending toward the target altitude, the ASEL error is less than 3600 feet and computed vertical speed is less than actual vertical speed.

The altitude alert operating region is within 1000 feet of the preselected altitude. At 1000 feet from the alert altitude, the box around the alert altitude on the PFD turns amber in color. When the aircraft is within 250 feet of the alert altitude, the box returns to a white color. After capture, the aircraft re–enters the altitude alert region if it departs more than 250 feet from the alert altitude. A momentary audio alert is also supplied when the aircraft is within 1000 feet of the alert altitude and when the aircraft departs the alert altitude by more than 250 feet.

The flare command generated during the altitude capture phase is a referenced VS command generated by a linearized 0.08G approximation of the ASEL error computation.

ASEL capture is annunciated on the PFD by a green ASEL at the vertical capture annunciation location. To indicate the transition to capture, ASEL is enclosed in a white box for 5 seconds.

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The aircraft remains in the ASEL capture mode until both of the following conditions exist:

- ALT error is less than 25 feet
- VS is less than 300 FPM.

At this time, the ASEL mode is dropped and the altitude hold mode automatically is engaged.

The ASEL CAP mode is dropped and ASEL ARM is automatically reselected following ASEL knob motion.

Figure 2-6-35 shows a descent from 18,000 feet using the ALT SEL mode.

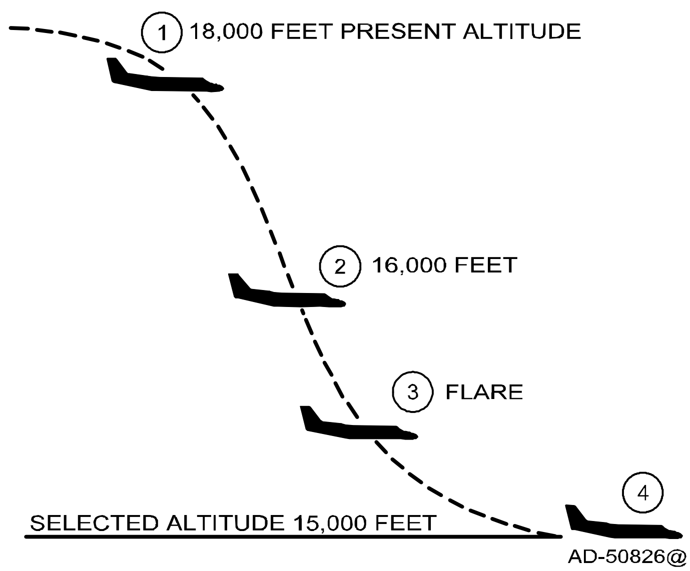

Figure 2-6-35. Altitude Preselect Mode Pictorial

The sequence of events described below are keyed to Figure 2-6-36 thru Figure 2-6-39 to show how the aircraft is flown to a preselected altitude, using the ASEL mode.

- Pilot/Copilot sets the selected altitude with the ASEL knob on the MFD bezel controller. The digital readout of the ASEL altitude is displayed in the ASEL window above the altitude scale on the PFD. (See Figure 2-6-36.)
- Use pitch hold, speed hold (IAS or MACH), VS, or VNAV to descend toward the selected altitude. Altitude preselect is automatically armed and annunciated. (See Figure 2-6-37.)
- The altitude flare point (ASEL CAP) is dependent on vertical speed. (See Figure 2-6-38.)
- ASEL capture is dropped and ALT HOLD is automatically engaged. (See Figure 2-6-39.).

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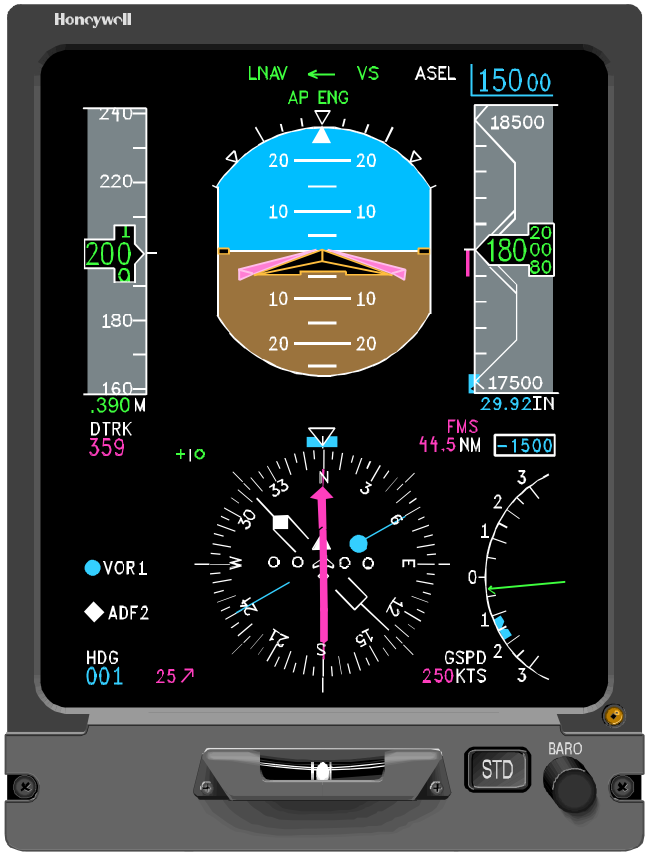

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Figure 2-6-36. Prior to Descent - Altitude Hold Mode

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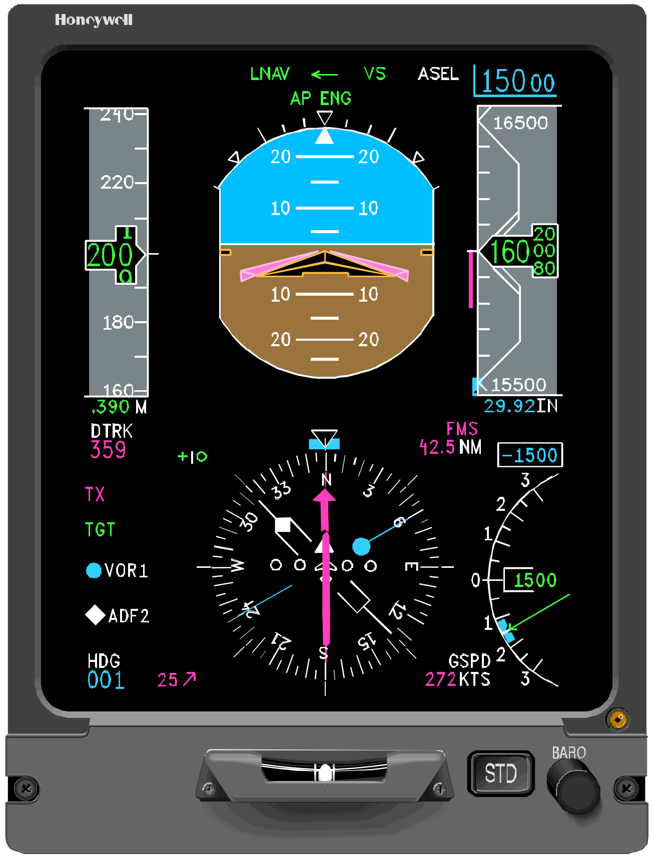

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Figure 2-6-37. During Descent - ASEL Armed Mode

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Figure 2-6-38. Start of Flare - ASEL Capture

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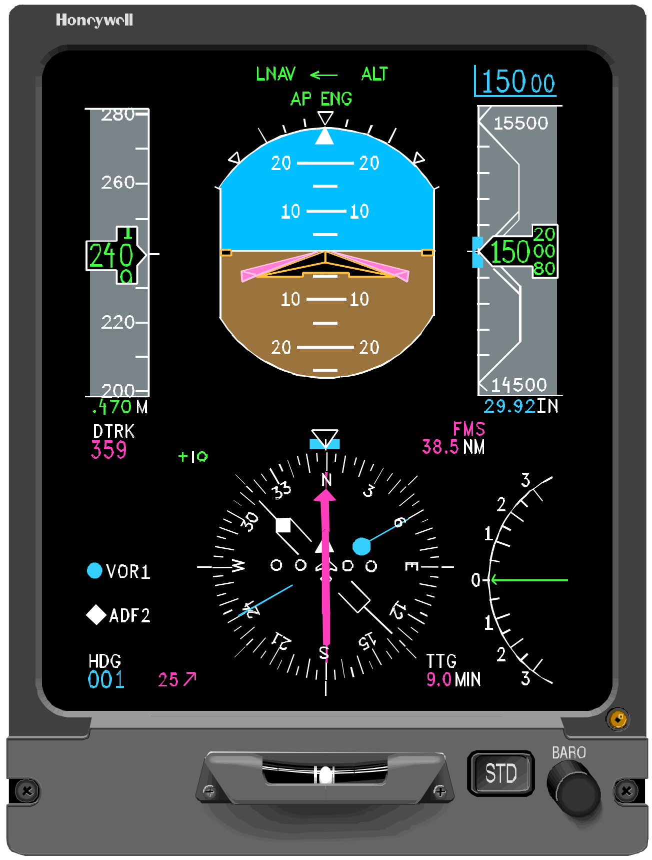

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Figure 2-6-39. Level at New Altitude – Altitude Hold Mode

The ASEL capture mode is canceled by any of the following:

- Moving the ASEL set knob on the MFD bezel controller
- Any other vertical mode selected on or captured (except glideslope arm)
- Selecting go-around.

Table 2-6-14. Altitude Preselect (ASEL) Mode Operating Limits

Mode	Parameter	Value
ALT SEL	ALT SEL Capture Range	–900 to 45,000 ft
	ALT Capture Error	±25 ft
	Pitch Limit	±15°
	Pitch Rate Limit	f(TAS) 0.2 g's max

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(9) Altitude Preselect (ASEL) Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids are as follows:

- Flight Director
- On-side VG-14A
- On-side MADC.

With the above conditions satisfied and all of the following conditions met, the ASEL mode automatically arms:

- Decreasing altitude error
- Computed vertical speed is greater than actual vertical speed
- Not altitude hold
- Glideslope not capture or track
- Vertical speed is greater than 100 FPM for 3 seconds
- The target altitude is at least 250 feet from present altitude.

(b) Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re-engaged.

The ASEL mode is automatically reset if any of the following conditions occur:

- Altitude select capture
- Selecting go-around
- Selecting any other vertical mode active except glideslope arm
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- Setting a new preselect altitude
- SG reversionary switching
- Attitude or air data source change.

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(c) Disengage Logic

Disengage means that a condition has occurred that has canceled the mode due to a fault; the mode cannot be re–engaged until the fault is cleared.

The ASEL mode automatically disengages if any of the following conditions occur:

- Flight director not valid
- On–side VG–14A not valid
- On–side MADC not valid.

(10) Altitude Hold (ALT) Mode

See Figure 2–6–40 and Table 2–6–15.

The altitude hold mode is a vertical axis flight director mode used to maintain a barometric altitude reference. The vertical command for altitude hold is displayed on the flight director pitch command bar on the PFD. To fly using altitude hold, the pilot does the following:

- Establish the aircraft in straight and level flight
- Push the ALT button on the MS–560 Mode Selector.

At this time, the ALT button on the MS–560 lights and the green ALT annunciator is displayed on the PFD while altitude hold is active. The vertical axis of the flight director maintains the barometric altitude at the time of mode engagement. Selecting the ALT mode on cancels any other previously selected vertical mode.

The altitude hold reference is changed by pushing and holding the TCS button and manually flying the aircraft to a new altitude reference and releasing the TCS button.

Altitude hold can also be entered automatically, as a function of ASEL capture, flare and level off.

The ALT hold mode is canceled by any of the following:

- Pushing the ALT button on the MS–560 Mode Selector
- Selecting any other vertical mode active
- Selecting go–around
- SG reversionary switching
- Moving the PITCH wheel on the PC–400 Autopilot Controller with the autopilot engaged.

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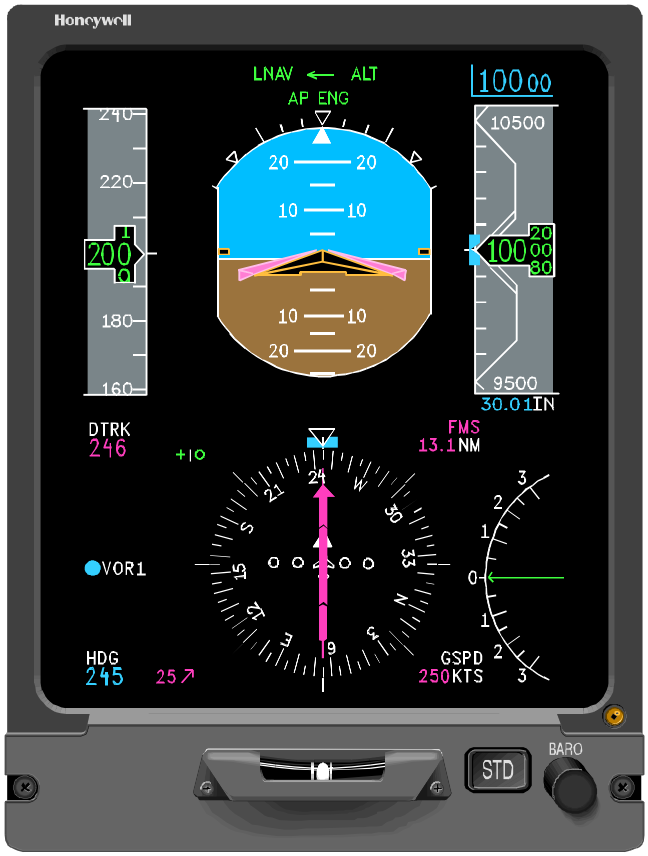

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Figure 2-6-40. Altitude Hold Mode

Table 2-6-15. Altitude Hold (ALT) Mode Operating Limits

Mode	Parameter	Value
ALT	ALT Capture Range	-900 to 45,000 ft
	ALT Hold Capture Error	± 20 ft
	Pitch Limit	± 12°
	Pitch Rate Limit	f(TAS) 0.3 g's max

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(11) Altitude Hold (ALT) Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids are as follows:

- Flight Director
- On–side VG–14A
- On–side MADC.

With the above conditions met, pushing the ALT button on the MS–560 Mode Selector engages the altitude hold mode.

(b) Reset Logic

Reset means a condition has occurred that has canceled the mode, but it can be re–engaged.

The ALT mode is automatically reset if any of the following conditions occur:

- Altitude select arm
- Selecting go–around
- Selecting any other vertical mode active
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- Pitch wheel movement on the PC–400 Autopilot Controller with the autopilot engaged
- SG reversionary switching.

(c) Disengage Logic

Disengage means a condition has occurred that has canceled the mode due to a fault; the mode cannot be re–engaged until the fault is cleared.

The ALT mode automatically disengages if any of the following conditions occur:

- Flight Director not valid
- On–side VG–14A not valid
- On–side MADC not valid.

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(12) ILS Approach (GS) Mode

See Figure 2-6-41 thru Figure 2-6-46, and Table 2-6-16.

The vertical portion of the approach mode is used for the automatic intercept, capture and tracking of the glideslope beam. The beam is used to guide the aircraft down to the runway in a linear descent, as shown in Figure 2-6-41. Typical glideslope beam angles vary between two and three degrees, dependent on local terrain. When the glideslope mode is used as the vertical portion of the localizer approach mode, it permits the pilot to fly a fully coupled ILS approach. The mode is interlocked, so glideslope capture is inhibited until localizer capture has occurred.

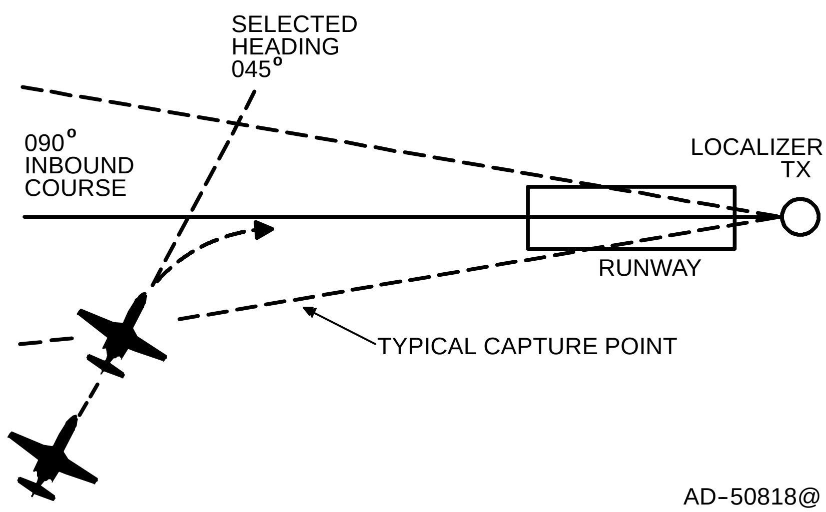

Figure 2-6-41. ILS Approach Arm Pictorial

The ILS approach mode is initiated by pushing the APR button on the MS-560 Mode Selector, with ILS as the on-side NAV source. The PFD, as shown in Figure 2-6-42, annunciates the following modes:

- LOC in white
- GS in white.

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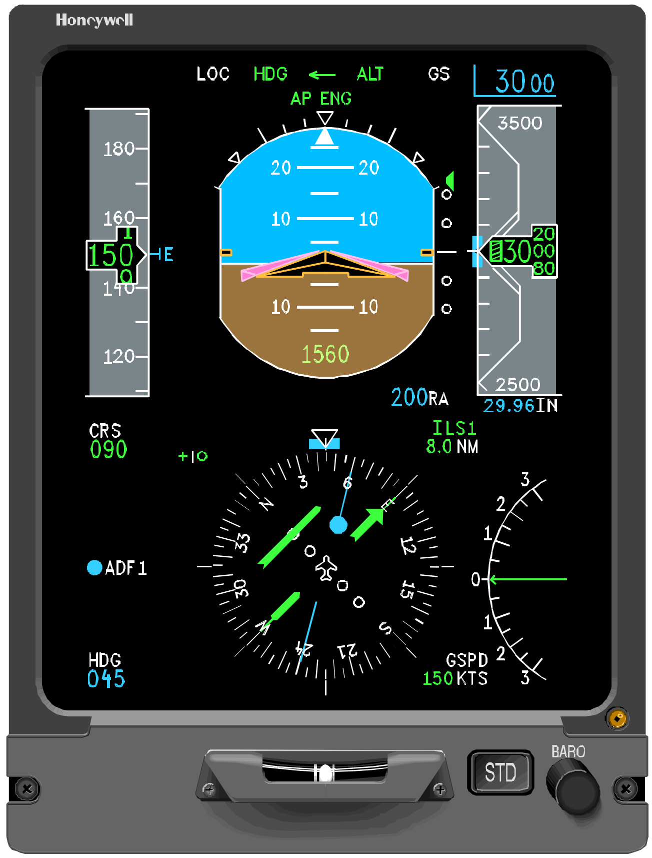

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Figure 2-6-42. ILS Approach (GS and LOC) Arm

With the localizer captured and outside the normal glideslope capture limits, the PFD, as shown in Figure 2-6-43, annunciates the following modes:

- LOC in green (Enclosed in a white box for 5 seconds)
- GS in white
- Any other vertical mode in use at this time is also displayed.

The NAV and APR mode selector buttons on the MS-560 Mode Selector are also annunciated.

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Figure 2-6-43. ILS Approach Mode-Localizer Capture

As the aircraft approaches the glideslope beam, as shown in Figure 2–6–44, the VBS monitors TAS, vertical speed, and glideslope deviation in determining the correct capture point. At glideslope capture, the flight director drops any other vertical mode that was in use, and automatically generates a pitch command to smoothly track the glideslope beam.

At this time, the PFD annunciates LOC in green and GS in green, as shown in Figure 2–6–45. This annunciation is enclosed with a white box for 5 seconds.

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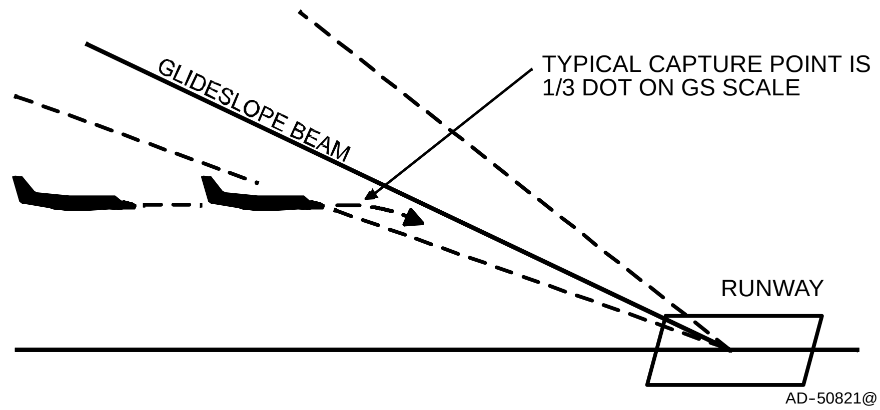

Figure 2-6-44. ILS Approach (GS) Tracking Pictorial

Figure 2-6-45. ILS Approach (GS) Tracking

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Gain programming is performed on the glideslope signal to compensate for the aircraft closing on the glideslope antenna, and beam convergence caused by the directional properties of the glideslope antenna, as shown in Figure 2-6-46. Glideslope programming is normally accomplished as a function of the change in radio altitude on the approach.

If radio altitude is not valid or not available, glideslope gain programming starts at glideslope capture and runs down as a function of TAS and time. At the middle marker, the gain is synchronized to a preset value for the remainder of the approach.

Input data used in the glideslope control law includes glideslope deviation, radio altitude, airspeed, vertical speed, and middle marker.

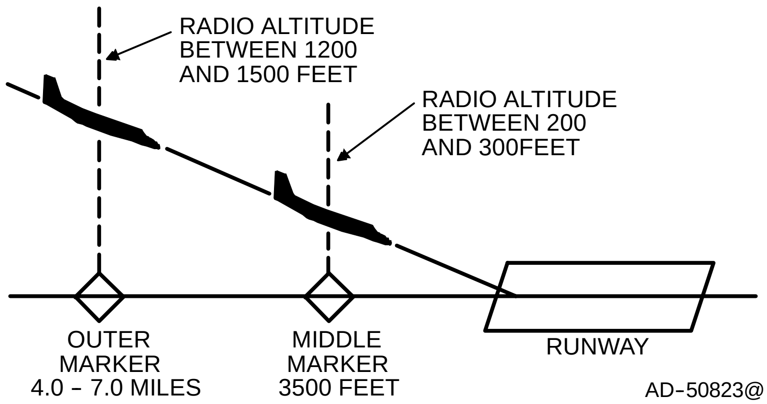

Figure 2-6-46. ILS Approach (GS) Gain Programming

The ILS approach mode is canceled by the following:

- Pushing the APR or NAV buttons on the MS-560 Mode Selector
- Loss of localizer or glideslope nav data
- Selecting go-around
- Changing navigation or heading sources
- SG reversion
- Selecting any other lateral or vertical mode active.

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Table 2-6-16. ILS Approach Mode Operating Limits

Mode	Parameter	Value
GS	Glideslope Capture	< 150 mV glideslope deviation
	Capture Point	Function of GS deviation, vertical speed, and TAS
	Pitch Command Limit	$\pm 10°$
	Pitch Rate Limit	f(TAS) 0.3 g's max
	Gain Programming	Function of radio altitude, TAS, and GS deviation

(13) ILS Glideslope (GS) Mode Engage/Reset/Disengage Logic

(a) GS Arm Engage Logic

Required valids:

- Flight director
- On-side VG-14A
- On-side NAV source.

With the above conditions satisfied and the NAV source tuned to an ILS frequency, pushing the APR button on the MS-560 Mode Selector arms the ILS GS mode.

(b) GS Arm Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re-engaged.

GS arm is automatically reset if any of the following conditions occur:

- Selecting go-around
- Pushing the NAV, APR, BC or HDG buttons on the MS-560 Mode Selector
- NAV or attitude source change
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- SG reversionary switching.

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(c) ILS GS Disengage Logic

Disengage means a condition has occurred that has canceled the mode due to a fault; the mode cannot be re-engaged until the fault is cleared.

The GS arm mode is automatically disengaged if any of the following conditions occur:

- Flight director not valid
- On-side VG-14A not valid
- On-side NAV not tuned to an ILS frequency.

(d) ILS GS Capture Logic

Required valids:

- Flight director system
- On-side VG-14A
- On-side NAV source.

With the above conditions satisfied, glideslope mode armed and the VBS has tripped, the ILS GS mode automatically transitions from arm to capture.

(e) ILS GS Capture Reset Logic

ILS GS capture is automatically reset if any of the following conditions occur:

- Selecting go-around
- Selecting another lateral or vertical mode active
- Attitude or NAV source change
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- SG reversionary switching.

(f) ILS GS Capture Disengage Logic

The ILS GS capture mode automatically disengaged if any of the following conditions occur:

- Flight director not valid
- Not tuned to an ILS frequency
- On-side VG-14A not valid
- NAV source not valid for 5 seconds.

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(g) ILS GS Track Engage Logic

Required valids are as follows:

- Flight director
- On–side VG–14A
- On–side NAV source.
- Radio altimeter.

With the above conditions satisfied, glideslope is captured and localizer is track and radio altitude is less than 1200 ft, the ILS GS mode automatically transitions from capture to track.

ILS GS track automatically is reset for the same conditions as ILS GS capture reset.

The ILS GS track mode automatically disengages for the same reasons as ILS GS capture disengage.

NOTE: If glideslope deviation becomes invalid, the command cue goes out of view, but the mode annunciator stays on. If the glideslope deviation remains invalid for more than 5 seconds, the GS mode is canceled.

(14) Vertical Navigation (VNAV) Mode

See Figure 2–6–47, Figure 2–6–48, and Table 2–6–17.

The Vertical Navigation Mode (VNAV) can only be used with the VNAV control menu on the MFD to define a climb or descent profile to a vertical waypoint ahead of the aircraft. The vertical waypoint is defined on the basis of a distance reference TO or FROM a VOR station or LRN waypoint. At the proper time, the VNAV mode automatically transitions to ASEL capture and then to altitude hold at the waypoint altitude.

To set up the VNAV profile, the pilot performs the following:

- Select the navigation source (VOR or FMS)
- Set, capture and track the lateral course or desired track
- If VOR/DME is being used, verify the DME is not in HOLD
- On the MFD bezel menu set the following:
  - Waypoint altitude
  - VOR station or waypoint elevation above sea level
  - Select TO or FROM and set the along track distance.

At this point, if a valid VNAV profile has been established, the computed VNAV angle (VANG) is displayed on the MFD menu. If desired, the pilot can change the displayed VANG by boxing the value and turning the set knob on the MFD. The VANG can be set between 0.1 and 6.0 degrees in 0.1 degree increments.

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Once the VNAV profile has been defined, the pilot pushes the VNAV button on the MS–560 Mode Selector. The VNAV mode immediately goes into capture and the aircraft flies the VANG to the defined waypoint altitude. If the pilot has selected an intercept point ahead of the aircraft by increasing the VANG, the flight director stays in the current vertical mode until the intercept point is reached.

With VNAV captured, one minute prior to reaching the waypoint altitude flare point the altitude horn sounds. With ASEL captured and within 25 feet of the waypoint altitude and vertical speed less than 300 feet per minute, altitude hold automatically comes on.

At any time while the VNAV mode is captured, the VNAV parameters are frozen. Changing the ASEL altitude cancels the VNAV mode. After the aircraft is level at the waypoint altitude and in altitude hold, the VNAV profile is erased.

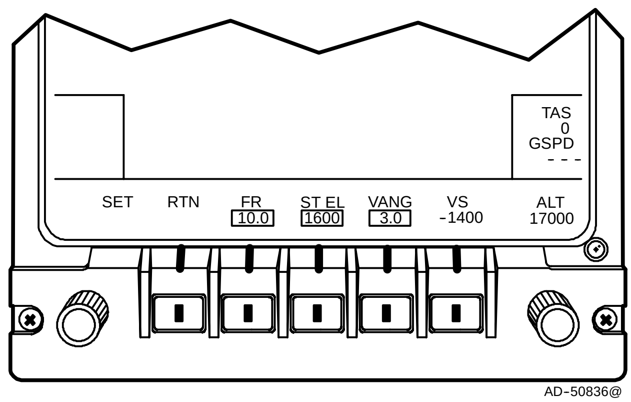

Figure 2–6–47. VNAV Mode Menu Select

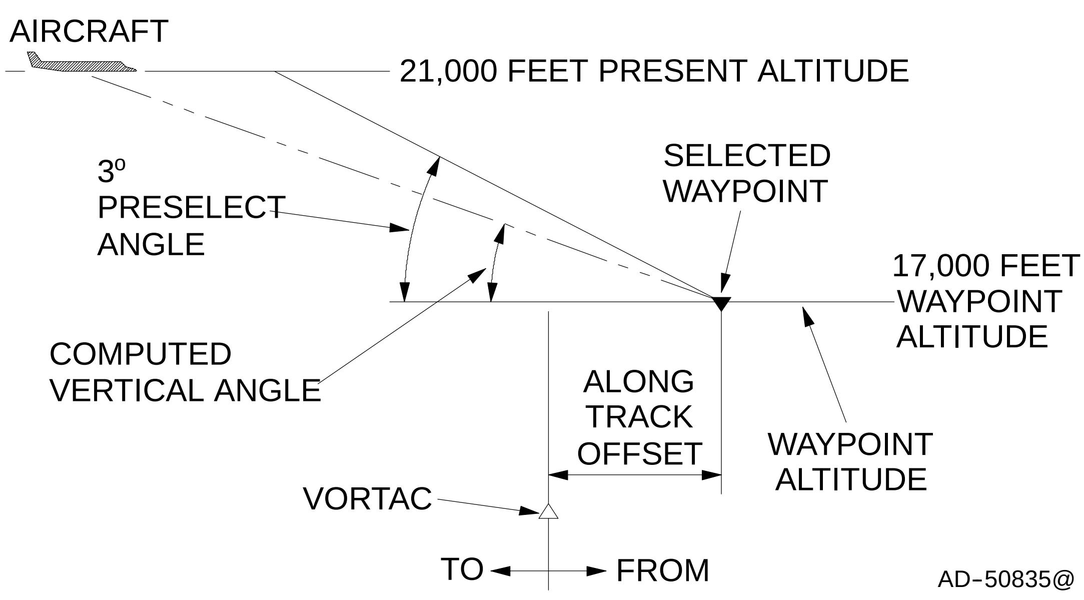

Figure 2–6–48. VNAV Preselect Plan View

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Table 2-6-17. Vertical Navigation (VNAV) Mode Operating Limits

Mode	Parameter	Value
VNAV	Altitude Range Path	0 to 45,000 feet
	Angle Range	±6° in 0.1° increments
	Elevation Range	0 to 10,000 feet
	Bias Range	±99.9 NM from VOR
	Pitch Command Limit	±12°
	Pitch Rate Limit	f(TAS) 0.1 g max

(15) Vertical Navigation (VNAV) Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids are as follows:

- Flight director system
- On-side VG-14A
- On-side MADC
- On-side NAV source (VOR/DME or LRN).

With the above conditions satisfied and a valid profile defined, pushing the VNAV button on the MS-560 Mode Selector arms the VNAV mode.

(b) Reset Logic

The VNAV mode is automatically reset if any of the following conditions occur:

- Pushing the VNAV button on the MS-560 Mode Selector
- Selecting go-around
- Selecting another vertical mode active
- Attitude or NAV source change
- Overspeed condition transition to SPD mode
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- SG reversionary switching.

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(c) Disengage Logic

The VNAV mode is automatically disengaged if any of the following conditions occur:

- Flight director not valid
- On–side MADC not valid
- On–side VG–14A not valid
- NAV source not valid
- ASEL knob movement.

(16) Go–Around (GA) Mode (Wings Level)

The GA mode (see Figure 2–6–49) is normally used to transition from a missed approach to land, to a climbout condition, or on takeoff, the mode is selected to command the best climb angle with an engine out condition. The mode is selected by pushing the GA button located on the pilot's throttle handle. With GA selected, all flight director modes are reset and the autopilot is disengaged. The GA command is wings level laterally and an 8 degree up climb angle.

The GA mode is canceled by any of the following:

- Selection of any vertical flight director mode
- ASEL capture
- Pushing TCS
- Autopilot engagement.

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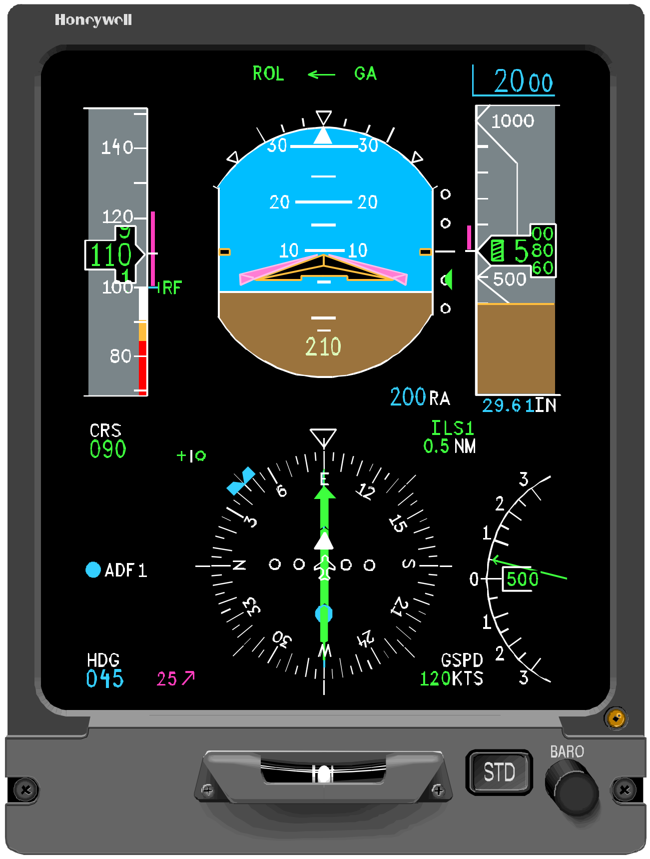

AD–50837@

Figure 2-6-49. Go-Around Mode

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(17) Go–Around (GA) Mode Engage/Reset/Disengage Logic

(a) Engage Logic

Required valids are as follows:

- Flight director
- On–side VG–14A.

With the above conditions satisfied, pushing the remote GA button on the pilot's throttle engages the GA mode.

(b) Reset Logic

Reset means that a condition has occurred that has canceled the mode, but it can be re–engaged.

The GA mode is automatically reset if any of the following conditions occur:

- Selecting any other vertical mode active
- Pushing TCS
- Engaging the autopilot
- Any time the flight director system is powered up
- Activation of the FD1/FD2 switch
- Transition to capture phase of altitude preselect mode.

(c) Disengage Logic

Disengage means a condition has occurred that has canceled the mode due to a fault; the mode cannot be re–engaged until the fault is cleared.

The GA mode automatically disengages if any of the following conditions occur:

- Flight director not valid
- On–side VG–14A not valid.

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4. Fault Monitoring

Loss of valid flight director (FD) data from the IC–600 IAC causes the following indications shown in Figure 2–6–50:

- An amber FD FAIL warning annunciator is displayed at the top left of the ADI in the FD lateral annunciator location.
- The flight director cue and all FD mode annunciators are removed.

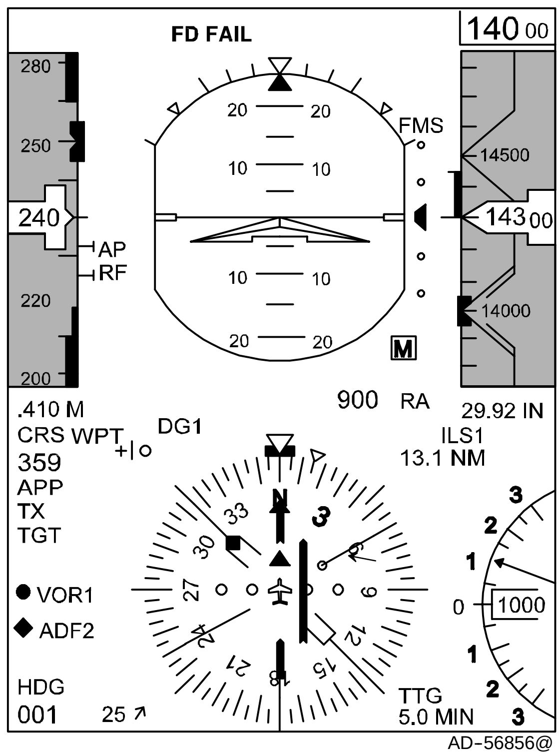

Figure 2–6–50. FD Failure Indications

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SECTION 2.7 AUTOPILOT/YAW DAMPER SYSTEM

1. General

The PRIMUS 1000 Flight Guidance System (FGS) features a single autopilot/yaw damper system designed around a distributed processor architecture that uses independent hardware elements to perform the aircraft control and monitor functions. The monitor function is performed in the primary (flight director/EDS) processor within the IC-600 Integrated Avionics Computer (IAC) No. 1, while the aircraft control function is performed in the secondary (autopilot/yaw damper) processor.

This architecture ensures that any single failure does not cause a condition that prevents continued safe flight and landing of the aircraft. In the event of a primary processor failure, the secondary processor becomes unavailable for use, since the monitor functions are housed in the primary processor. However, if the secondary processor fails, the functions of the primary processor are still available.

The No. 1 IC-600 IAC houses the autopilot/yaw damper Circuit Card Assemblies (CCA). Only the No. 1 IC-600 IAC is connected to the servos; consequently, this configuration supplies single autopilot/yaw damper operation.

The PRIMUS 1000 autopilot/yaw damper system requires that both VG-14A Vertical Gyros and one C-14D Directional Gyro in the aircraft be operating and valid. The autopilot/yaw damper is not designed for single VG-14A operation.

The primary processor supplies dedicated disconnect hardware for the monitor function. This lets either processor force a disconnect of the autopilot and yaw damper. All automatic disconnects resulting from monitor trips are stored in non-volatile memory for later recall during ground maintenance test.

A. Autopilot

The PRIMUS 1000 Autopilot (AP) is housed in the pilot's IC-600 IAC and is of a fail-passive design, featuring digital attitude and servo loops. The autopilot supplies attitude stabilization and tracking of pitch and roll steering commands from the flight director. The AP is not aware of which flight director mode(s), if any, are active. The AP simply tracks the pitch and roll steering commands as attitude changes.

The AP supplies aircraft stabilization around a pilot-selected reference. With the autopilot engaged, short-term transient disturbances are automatically corrected. As the aircraft is moved away from its reference by a disturbance, the autopilot works to stop the aircraft from moving away and returns it to its reference position/attitude.

The pitch axis autopilot trim function resides in the pilot's IC-600 IAC and works to maintain aircraft pitch attitude against long-term attitude disturbances, such as fuel burn and passenger movement. Activation of the manual electric trim switches causes the autopilot to disengage.

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For the autopilot to do its job, it requires the following data:

- What is the pilot's desired attitude reference?
- What is the aircraft's actual attitude?
- If there is a difference between desired and actual attitude, correct for the difference and control the rate at which the correction takes place.

B. Yaw Damper

The Yaw Damper (YD) computes servo commands based on sensor input data only. It supplies yaw rate damping and makes no effort to control the flight path of the aircraft. While the YD can be engaged without the autopilot, the AP cannot be engaged without the YD.

Servo position reference is synchronized to zero at engagement and is constantly washed out to ensure that steady-state rudder forces are zero. If the rudder trim position changes due to pilot input or aircraft configuration changes, the rudder washes out the steady-state force and rudder servo re-synchronization occurs.

C. AP/YD System

The PRIMUS 1000 Autopilot/Yaw Damper (AP/YD) system is made up of the following LRUs:

- IC-600 IAC (Pilot's)
- PC-400 Autopilot Controller
- RG-204 Rate Gyro
- SM-200 Servos and Servo Brackets (aileron, elevator, rudder)
- Aircraft Pitch Trim System (Cessna System).

The autopilot/yaw damper requires inputs from the following sensors:

- VG-14A (Pilot's and Copilot's)
- C-14D Directional Gyro
- AZ-850 Micro Air Data Computer
- RG-204 Rate Gyro.

Autopilot modes of operation are listed below:

- Heading hold
- Roll hold
- Pitch altitude hold
- Flight director coupled.

The AP/YD off discrete output logic supplies a 2.0-second AP off output for the warning horn for normal autopilot disconnects, and a continuous output for any automatic disconnect. The continuous output can be reset by holding the AP disconnect on the control wheel for more than 1 second.

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2. Component Descriptions and Locations

A. IC-600 Integrated Avionics Computer

Two IC-600 Integrated Avionics Computers (IAC) are located in the nose compartment. Figure 2-7-1 shows a graphical view of the IC-600 IAC. Table 2-7-1 gives items and specifications particular to the computer.

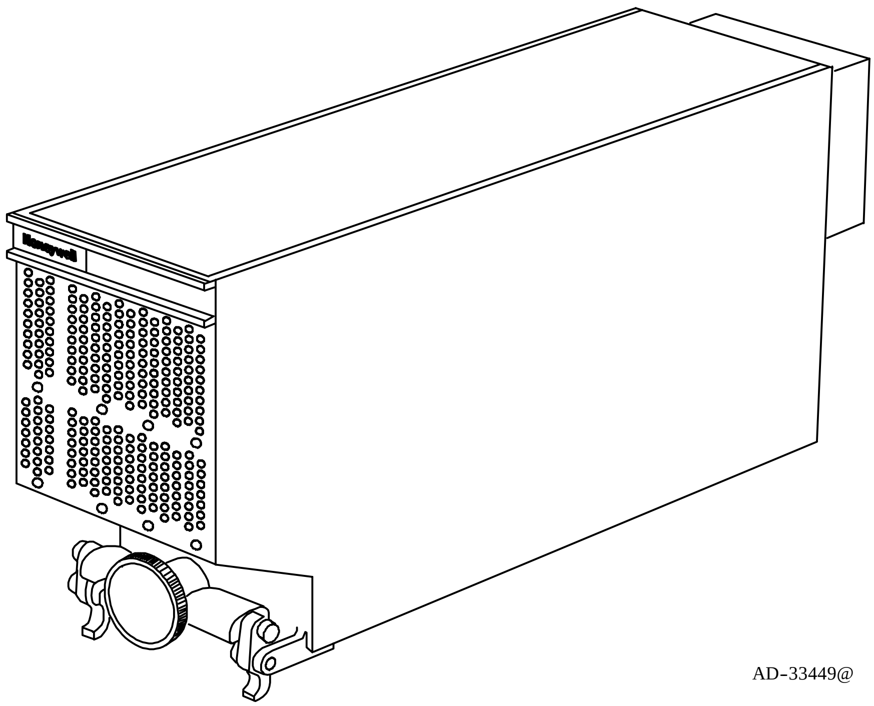

Figure 2-7-1. IC-600 Integrated Avionics Computer (AP/YD Function)

Table 2-7-1. IC-600 Integrated Avionics Computer Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	7.62 in. (193.55 mm)
• Width	4.13 in. (104.90 mm)
• Length	16.45 in. (418.83 mm)
Weight (maximum):	
• With Autopilot	15.5 lb (7.05 kg)
• Without Autopilot	15.0 lb (6.82 kg)

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Table 2-7-1. IC-600 Integrated Avionics Computer Leading Particulars (cont)

Item	Specification
Power Requirements (with autopilot):	
• Continuous	28 V dc, 50 W (max)
• In-Rush	28 V dc (0.5 sec), 200 W (max)
• Servo Power	28 V dc, 210 W (max)/112 W (nom)
Power Requirements (without autopilot):	
• Continuous	28 V dc, 50 W (max)
• In-Rush	28 V dc (0.5 sec), 200 W (max)
User Replaceable Parts	None
Mating Connectors (J1, J2)	ITT Cannon Part No. DPX2MA-A106P-A106P-33B-0001 NOTE: Sunbank backshell (4) required: Part No. J1560-12-2
Mounting	HPN 7017095-902

The primary component of the PRIMUS 1000 AP/YD system is the pilot's IC-600 IAC. The AP/YD processor in the pilot's IC-600 IAC supplies pitch and roll attitude commands through control of elevator, aileron and trim servos, as well as yaw rate terms to the rudder servo. The autopilot tracks pitch and roll attitude commands from the flight director computed flight path steering. The FD1/FD2 switch on the instrument panel permits the pilot to select which flight director(pilot/copilot) is coupled to the autopilot.

In addition to supplying stabilization around a pilot-defined reference, the autopilot processor also supplies the following:

- Power-up/Start-up initialization
- Engage/Disengage logic
- Airspeed gain computations
- I/O data management
- ARINC 429 communications
- Continuous testing functions.

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B. PC-400 Autopilot Controller

The PC-400 Autopilot Controller is located on the pedestal. The PC-400 Autopilot (AP) Controller is used to engage/disengage the AP and Yaw Damper (YD), as well manual control of the AP through PITCH wheel and TURN knob inputs. Figure 2-7-2 shows a graphical view of the PC-400 AP Controller. Leading particulars for the PC-400 AP Controller are given in Table 2-7-2.

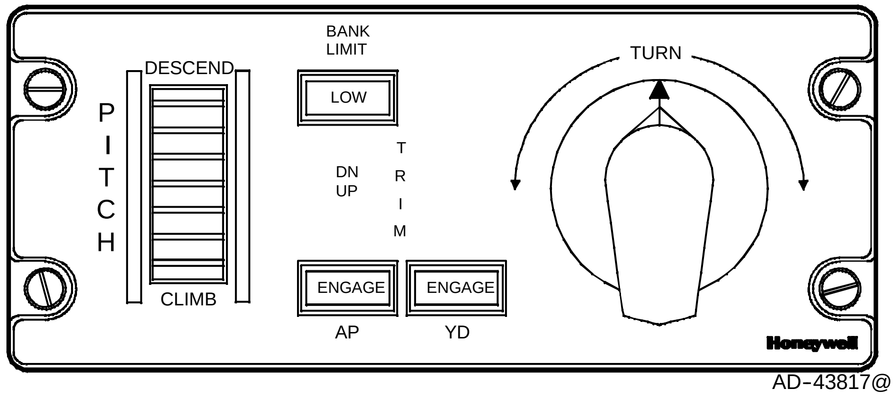

Figure 2-7-2. PC-400 Autopilot Controller

Table 2-7-2. PC-400 Autopilot Controller Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	2.625 in. (6.67 cm)
• Width	5.750 in. (14.60 cm)
• Length	6.150 in. (15.62 cm)
Weight (maximum)	1.6 lb (0.73 kg)
Power Requirements:	
• Instrument Lighting	5 V ac or dc
• Mode Switches	28 V dc
User Replaceable Parts:	
• Knob, Turn	HPN 337136-1
• Setscrew, Bottom (Hex Socket, 8-32 x 5/8”, cup point)	HPN 0455-284
• Setscrew, Side (Hex Socket, 8-32 x 3/16”, cup point)	HPN 0455-274
• Lamp, Clear (Type 7341)	HPN 0635-22
Mating Connector:	
• J1	MS3126F20-41S
Mounting	Standard Dzus Rail

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(1) Autopilot (AP) Button

Pushing the AP button engages the autopilot and yaw damper simultaneously. When engaged, both the AP and YD buttons light. With the autopilot and yaw damper engaged, pushing the AP button again disengages the autopilot only. The yaw damper stays engaged.

(2) Yaw Damper (YD) Button

Pushing the YD button engages the yaw damper only. When engaged, the YD button is lit. With the yaw damper engaged, pushing the YD button again disengages the yaw damper. With the autopilot and yaw damper both engaged, pushing the YD button disengages both the autopilot and yaw damper.

(3) BANK LIMIT Button

The BANK LIMIT button is for the flight director heading select mode only. Pushing the bank limit button with the heading select mode active lowers the maximum bank angle for the mode to 14°. When the lower bank limit is active, LOW is annunciated on the switch. Pushing the bank limit switch when LOW is lighted removes the lower bank angle limit and LOW is no longer lighted.

(4) UP or DN Annunciations

The UP or DN annunciators light to indicate a sustained request for elevator trim. The annunciators remain lit as long as the request for trim is present.

(5) PITCH Wheel

With the autopilot engaged, moving the PITCH wheel changes the pitch attitude of the aircraft proportional to the amount of PITCH wheel rotation and in the direction of PITCH wheel rotation. Moving the PITCH wheel with altitude hold on or ASEL capture, cancels these modes and the aircraft follows the PITCH wheel. When Vertical Speed (VS) or Speed (SPD) is the selected flight director mode, moving the PITCH wheel changes the VS or SPD reference. The PITCH wheel input to the flight guidance system is inhibited when ILS approach is active and the Glideslope (GS) is either in the capture or track phase of operation.

(6) TURN Knob

Moving the TURN knob out of its center detent position with the autopilot engaged commands a turn in the direction of TURN knob rotation and proportional to the amount of rotation. With the autopilot engaged, moving the TURN knob out of center cancels any active lateral flight director mode. The TURN knob must be in its center detent position to engage the autopilot.

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C. RG-204 Rate Gyro

The RG-204 Rate Gyro, located in the nose compartment, supplies yaw rate data to the pilot's IC-600 IAC for yaw damping. Yaw rate data is proportional to the rate of angular displacement about an axis perpendicular to the mounting surface. Figure 2-7-3 shows a graphical view of the RG-204 Rate Gyro. Leading particulars for the RG-204 Rate Gyro are given in Table 2-7-3.

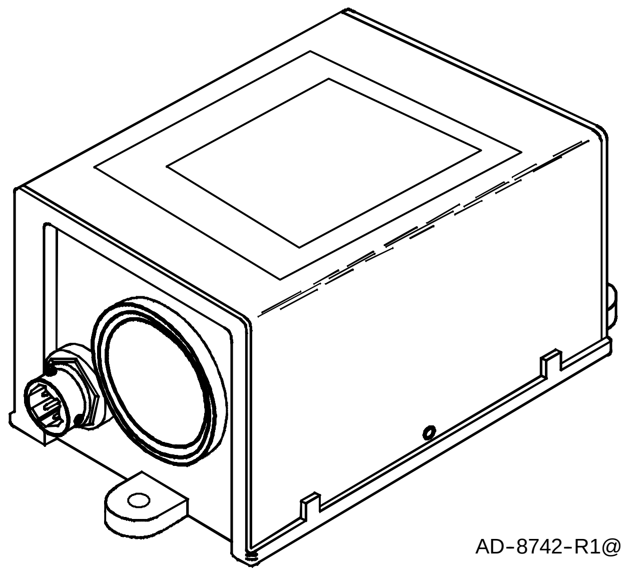

Figure 2-7-3. RG-204 Rate Gyro

Table 2-7-3. RG-204 Rate Gyro Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	1.82 in. (46.2 cm)
• Width	2.04 in. (51.8 cm)
• Length	3.32 in. (84.3 cm)
Weight (maximum)	1.0 lb (0.45 kg)
Power Requirements:	
• Excitation	6.5 V ac, 400 Hz, single phase, 6.5 VA (operating)
• Run-up Time	90 seconds (maximum)
User Replaceable Parts	None
Sense, polarity (input axis down), cw rate (rate viewed from top)	Positive
Mating Connector	TED MFG Part No. B1700
Mounting	Hard Mount

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D. SM–200 Servo Drive and SB–201 Servo Bracket

The SB–201 Servo Bracket is firmly bolted to the aircraft airframe and the drum is connected to the aircraft's primary control rigging through cables. The SM–200 Servo Drive, with a spline output on the clutch, mates with the drum and bracket and can be removed from the drum and bracket without disturbing the aircraft rigging. Figure 2–7–4 shows a graphical view of the SM–200 Servo Drive and SB–201 Servo Bracket. Table 2–7–4 gives items and specifications particular to the drive and bracket. Table 2–7–5 gives the servo dash numbers and gear ratios.

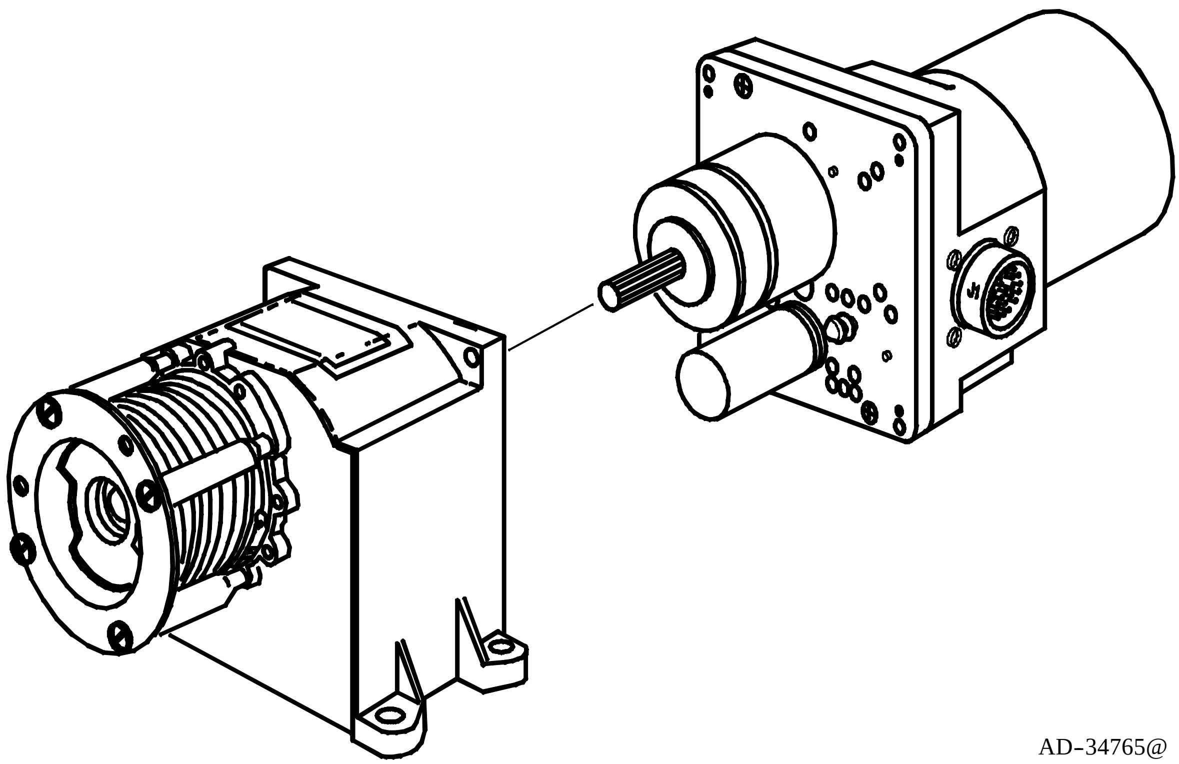

Figure 2–7–4. SM–200 Servo Drive and SB–201 Servo Bracket

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Table 2-7-4. SM-200 Servo Drive and SB-201 Servo Bracket Leading Particulars

Item	Specification
Dimensions (maximum):	
• Height	3.970 in. (100.8 mm)
• Width	5.065 in. (128.8 mm)
• Length	8.825 in. (224.3 mm)
Weight (maximum)	5.6 lb (2.55 kg)
Power Requirements:	
• Clutch	28 V dc, 19 W (max)
• Motor Stall	28 V dc, 56 W
Stall Torque	Up to 160 in.-lb
Resistance Values:	
• Clutch	57.5 ± 6 ohms
• Tachometer	140 ohms (max)
• Motor	20.7 ± 2.6 ohms
NOTE: Motor resistance value is calculated by accurately measuring applied voltage and load current. When attempting to measure this resistance with an ohmmeter, the value can vary between 18 and several hundred ohms, depending upon brush position and the quantity of brush dust.	
User Replaceable Parts:	
• Drive to Bracket Retaining Screws (4)	HPN 4011086
• Cable Keepers (4)	HPN 2518330
• Retaining Plate (1)	HPN 2518332
• Screw, Cable Capture	HPN 2554911-1
• Screw, Plate Retaining	HPN 0457-242
Mating Connector:	
• J1	PT06E-14-19S(SR)
Mounting	Hard Mount

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The SM-200 servo drive translates electrical inputs into clutched rotational mechanical outputs. Tachometer rate signals are supplied back to the IC-600 IAC servo amplifier to null the command signal.

Table 2-7-5. SM-200 Servo Drive Dash Number Differences

Dash No.	Power Gear Ratio	Synchro Gear Ratio	Clutch Hi Pin	Clutch Lo Pin
-904	18.6:1	151.1:1	F	G
-906	38.9:1	151.1:1	F	J

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3. Operation

The PRIMUS 1000 autopilot/yaw damper interface is shown in Figure 2-7-5. This shows major signal flow between autopilot/yaw damper LRUs. For complete wiring interface data, refer to Section 3, System Interconnects, of this manual.

A. Modes of Operation

The PRIMUS 1000 autopilot has five modes of operation. These modes are as follows:

- Heading hold and wings level
- Roll hold
- Pitch attitude hold
- Flight director coupled
- Turn knob.

(1) Heading Hold and Wings Level

Heading Hold is defined as the basic lateral default autopilot mode that is annunciated as ROL on the PFD. It is defined as follows:

- Autopilot engaged
- Bank angle less than 6 degrees
- No lateral flight director mode active.

When the conditions listed above are satisfied, the autopilot rolls the aircraft to a wings level attitude. When the aircraft's roll attitude is less than 3 degrees plus 3 seconds, the heading hold mode is automatically engaged. On the master PFD, ROL annunciates.

(2) Roll Hold

The roll hold mode is recognized as being active when the following conditions exist:

- Autopilot engaged
- No lateral flight director mode active
- The aircraft's bank angle is greater than 6 degrees but less than 34 degrees.
- Touch Control Steering (TCS) is used to initiate the roll maneuver.

When all of the above conditions are satisfied, the autopilot maintains the prescribed bank angle. If TCS is released at bank angles greater than 34 degrees, the autopilot rolls the aircraft to 34 degrees and maintains the bank angle.

If TCS is released at bank angles less than 6 degrees, the autopilot reverts to a wings level condition and then heading hold, which annunciates as ROL on the PFD.

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(3) Pitch Attitude Hold

Pitch attitude hold is the basic vertical mode of the autopilot, that annunciates as PIT on the master PFD. It automatically becomes active when the following occurs:

- The autopilot is engaged or
- A lateral flight director mode is active and no vertical flight director mode is active.

The position of the pitch command bar on the master PFD supplies the pilot with a reference of aircraft pitch attitude at the moment the autopilot is engaged. This pitch attitude reference can be changed as a function of TCS or use of the PITCH wheel on the PC–400 Autopilot Controller.

While in pitch attitude hold, pushing and holding the TCS button on the control column disengages the elevator and aileron servo clutches and synchronizes the autopilot pitch reference to existing aircraft pitch attitude. The pilot can manually fly the aircraft to a new pitch attitude reference and the autopilot memory synchronizes to it. Releasing the TCS button re-engages the elevator and aileron servo clutches and the pitch axis of the autopilot supplies stabilization around this new reference.

(4) Flight Director Couple and Lift Compensation

With the autopilot engaged, any time a flight director mode is selected on, the computed steering command (attitude change) is transmitted to the autopilot. The autopilot, in turn, develops a servo loop command to drive the appropriate flight control surface to satisfy the flight director input. This coupling of flight director and autopilot permits hands-off automatic flight path steering throughout the aircraft's flight regime.

Just as pilots are taught to keep the nose of the aircraft up when making a turn, the autopilot must have the same ability. When banking an aircraft to make a turn, lift is lost on one wing. This loss of lift results in the aircraft losing altitude. To compensate for this manually, the pilot applies a slight back pressure to the control column to hold the nose up and not lose altitude in the turn.

The autopilot accomplishes this automatically through a design feature called lift compensation. This is done creating a term that is equal to the cosine of the bank angle subtracted from 1.0 and applying this term to the pitch axis of the autopilot. This in effect keeps the nose of the aircraft in the proper attitude to not lose altitude as the turn is made.

(5) Turn Knob

Rotation of the TURN knob out of its center detent position results in a roll command that annunciates ROL on the master PFD. The roll angle is proportional to and in the direction of TURN knob rotation. The TURN knob controls a detent switch and potentiometer to supply roll commands to the IC–600 IAC. The TURN knob must be in detent (center position) before the autopilot can be engaged. Rotation of the TURN knob out of detent cancels any lateral flight director mode that was active. Returning the TURN knob to its center detent position does not automatically re-engage flight director modes.

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(6) Pitch Wheel

Rotation of the PITCH wheel annunciates PIT on the master PFD and results in a change of pitch attitude proportional to the rotation of the wheel and in the direction of wheel movement. The PITCH wheel supplies rate-limited, pitch commands in pitch hold mode. The PITCH wheel supplies a tachometer output that is applied to the Pilot's IC–600 IAC. Pitch wheel operation is inhibited when flying a flight director coupled approach and the glideslope mode is in the capture or track phase of operation. PITCH wheel movement cancels the ALT hold and ASEL modes.

(7) Touch Control Steering (TCS)

TCS lets the pilot momentarily disengage the autopilot and manually fly the aircraft to a new pitch/roll attitude reference. TCS does not have any effect on the yaw damper.

The TCS switches are located on the pilot's and copilot's control wheels. When either switch is pushed and held, the following occurs:

- Autopilot clutches (aileron and elevator) disengage
- Autopilot pitch axis memory synchronizes to current aircraft position. When the pilot completes the maneuver and releases the TCS switch, the autopilot clutch re–engages and the autopilot holds the new pitch attitude reference. Depending upon the bank angle at TCS release, the autopilot goes into either wings level or roll hold mode, if no other flight director modes are active.

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NOTES:
1. ALL RELAYS SHOWN IN UNENERGIZED POSITION.
2. S4 AND S5 MUST CARRY ENGAGE CIRCUIT CURRENTS AS SHOWN TO MAINTAIN AUTOPILOT SAFETY. THE COMPONENTS MUST BE RATED TO SWITCH 28 V DC AT 3 AMPS INDUCTIVE MINIMUM.
3. WOW - BOTH LANDING GEARS IN PARALLEL.

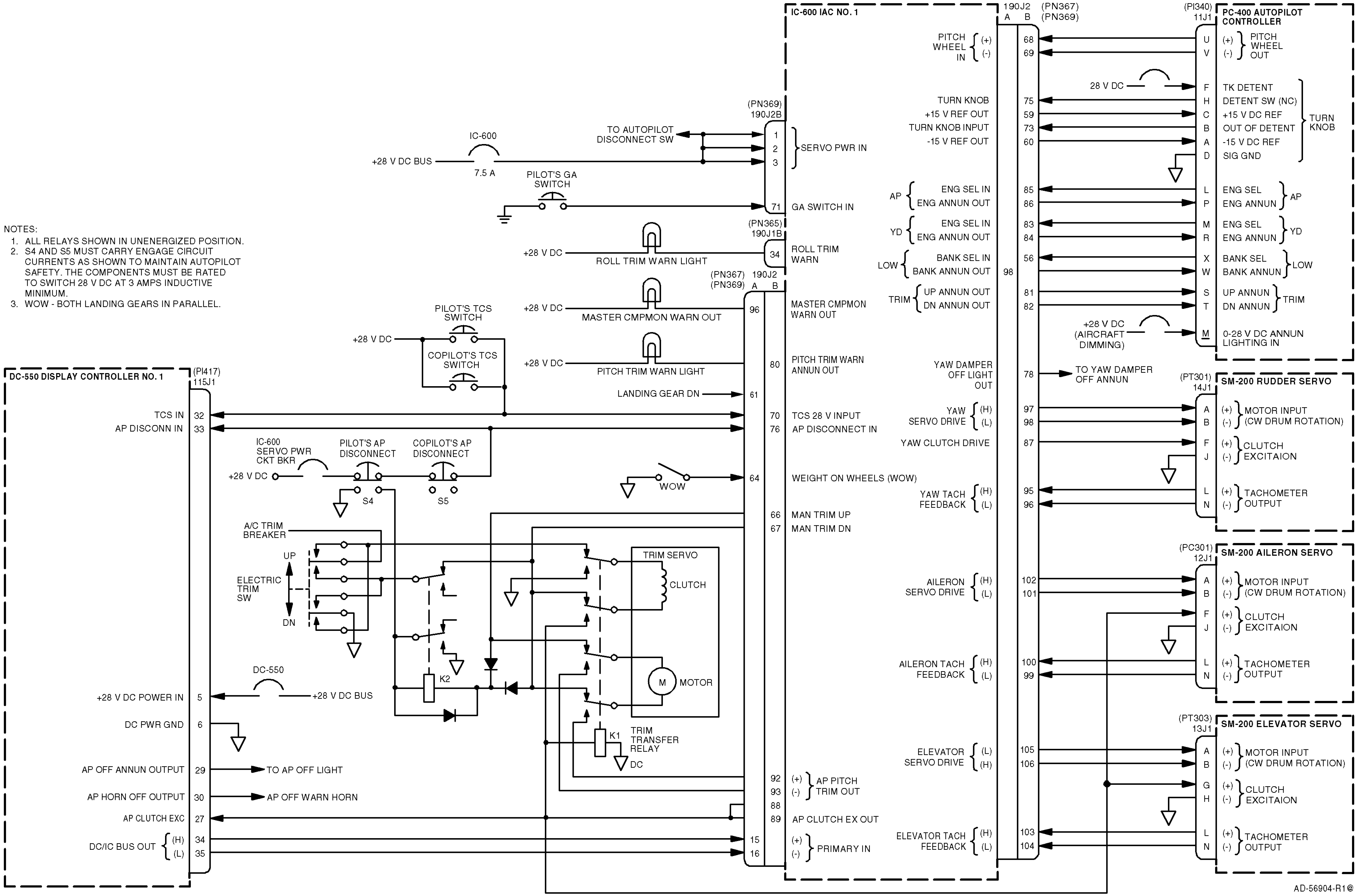

Figure 2-7-5 (Sheet 1). Autopilot/Yaw Damper Interface

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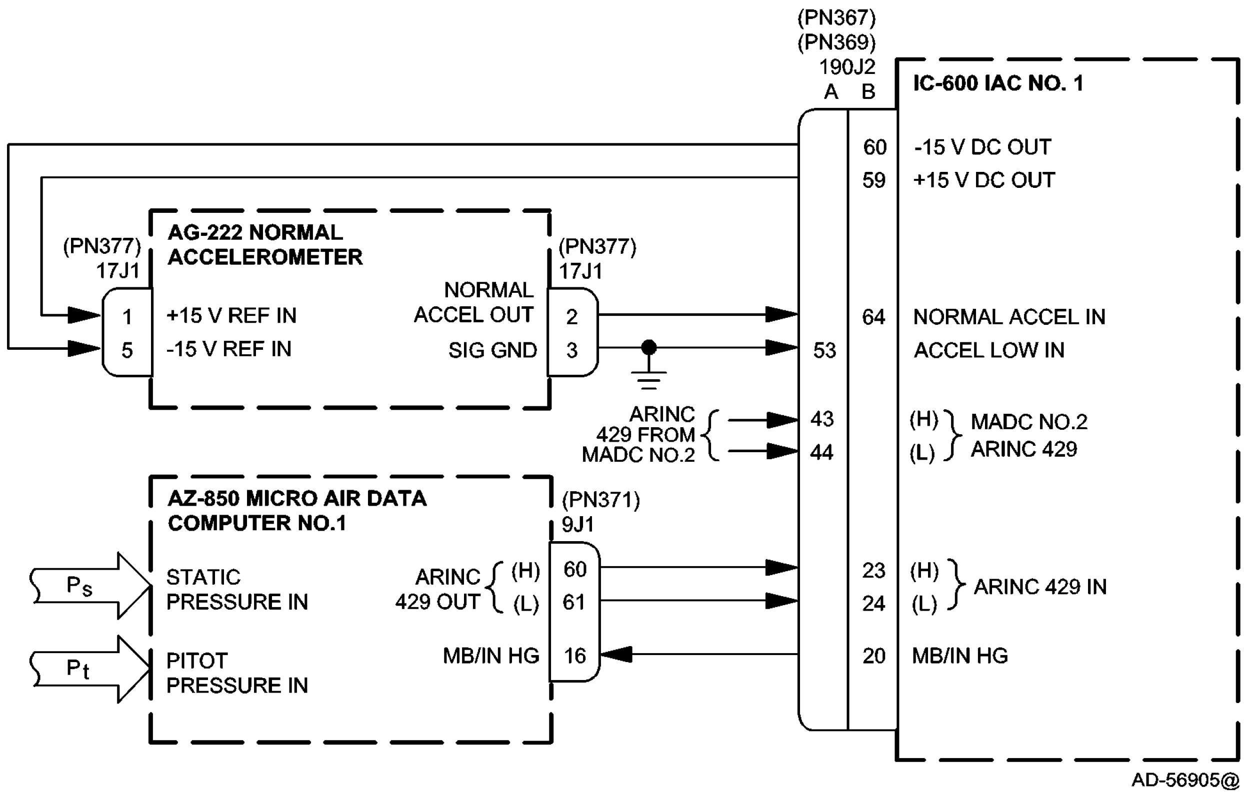

Figure 2-7-5 (Sheet 2). Autopilot/Yaw Damper Interface

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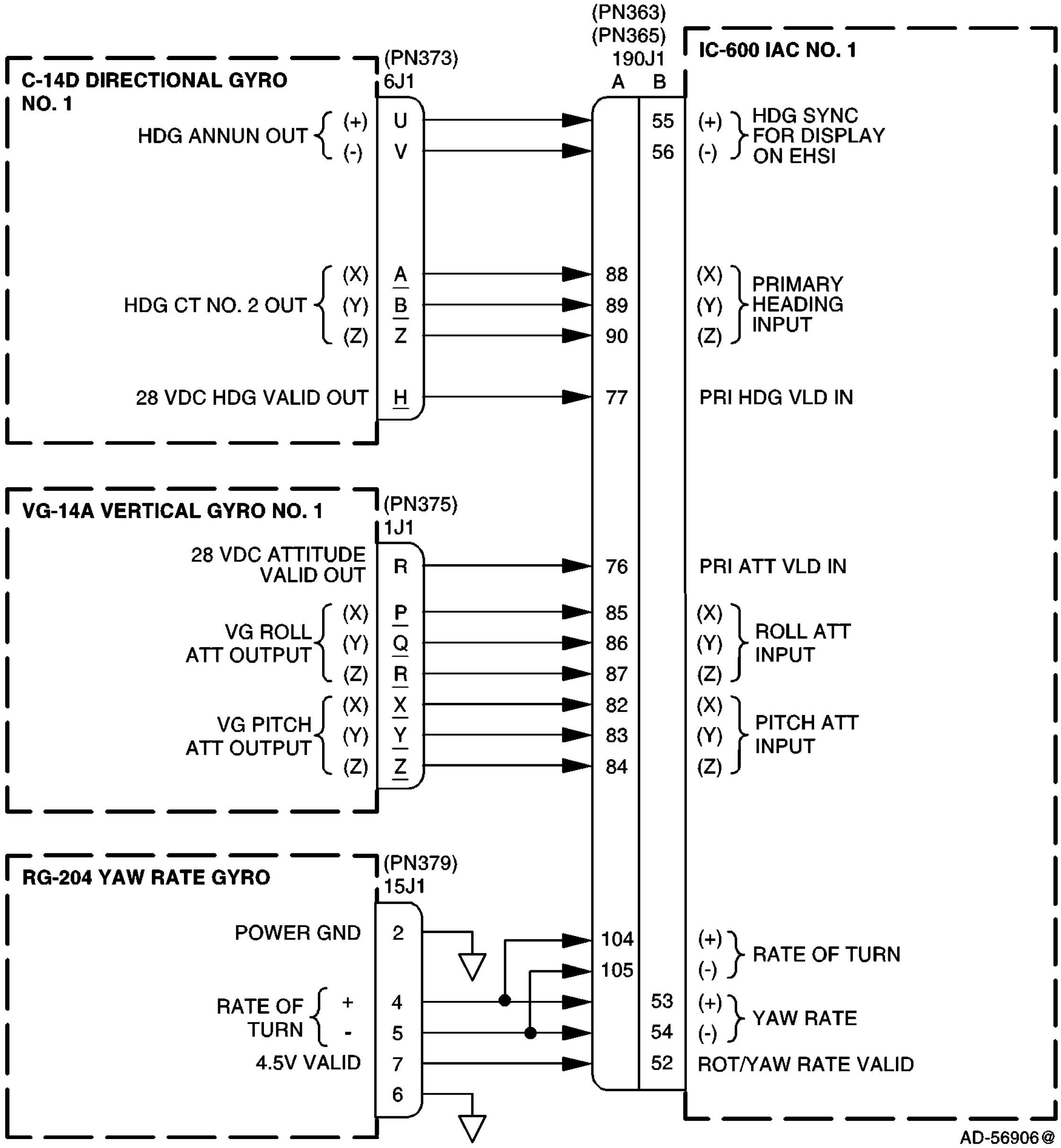

Figure 2-7-5 (Sheet 3). Autopilot/Yaw Damper Interface

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B. Autopilot/Yaw Damper Engage Logic

The PRIMUS 1000 Autopilot/Yaw Damper (AP/YD) is a fail–passive system that requires two valid VG–14A vertical gyros and a single valid C–14D Directional Gyro for autopilot and YD engagement (see Figure 2–7–6). The pilot's VG–14A and C–14D are the primary sources for the autopilot/yaw damper and monitor. The copilot's VG–14A is used as the reference for comparison monitoring functions.

Autopilot and yaw damper engagement is controlled from the PC–400 AP Controller. The AP quick disconnect switches, electric trim switch, and Touch Control Steering (TCS) switches, located on the control wheels also affect autopilot engagement, as does the manual electric pitch trim switch.

Pushing the AP ENGAGE select switch engages the autopilot and yaw damper if all engage logic is valid. Pushing the YD ENGAGE select switch engages only the yaw damper. Pushing the AP ENGAGE select switch, when the autopilot is engaged, disengages the autopilot only. Pushing the YD ENGAGE select switch with the autopilot and/or the yaw damper engaged, disengages both.

Autopilot pitch trim is engaged and disengaged as a function of autopilot engage/disengage.

(1) Yaw Damper Engagement

See Figure 2–7–6.

To engage the rudder servo clutch, AND gate 1 must have a high output. To satisfy this requirement, latch 2 must have its Q output high, and AND gate 3 must have a high output.

Latch 2 goes high as a function of pushing the YD ENGAGE button, or the AP ENGAGE button on the PC–400 Autopilot Controller.

AND gate 3 goes high as a function of the following:

- Yaw rate valid from the RG–204 Rate Gyro
- Stall warning is not active
- Internal monitor discretes are valid
- Attitude valid from both pilot and copilot's VG–14A
- AP DISC switch is not active
- Servo power is NOT less than 10 V for more than 0.25 sec
- Aircraft ID pins are correctly configured.

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(2) Autopilot Engagement

See Figure 2–7–6.

To engage the aileron and elevator servo clutches, AND gate 2 must have a high output. To accomplish this, latch 1 must have its Q output high, TCS must not be active, and AND gate 4 must have a high output.

Latch 1 goes high as a function of pushing the AP ENGAGE button on the PC–400 Autopilot Controller. AND gate 4 goes high as a function of the following:

- Stall warning is not active
- Internal monitor discretes are valid
- Attitude valid from both pilot's and copilot's VG–14A
- AP DISC switch is not active
- Servo power is not less than 10 V for more than 0.25 sec
- GA is not active
- Aircraft ID pins are correctly configured
- TURN knob is in detent position.

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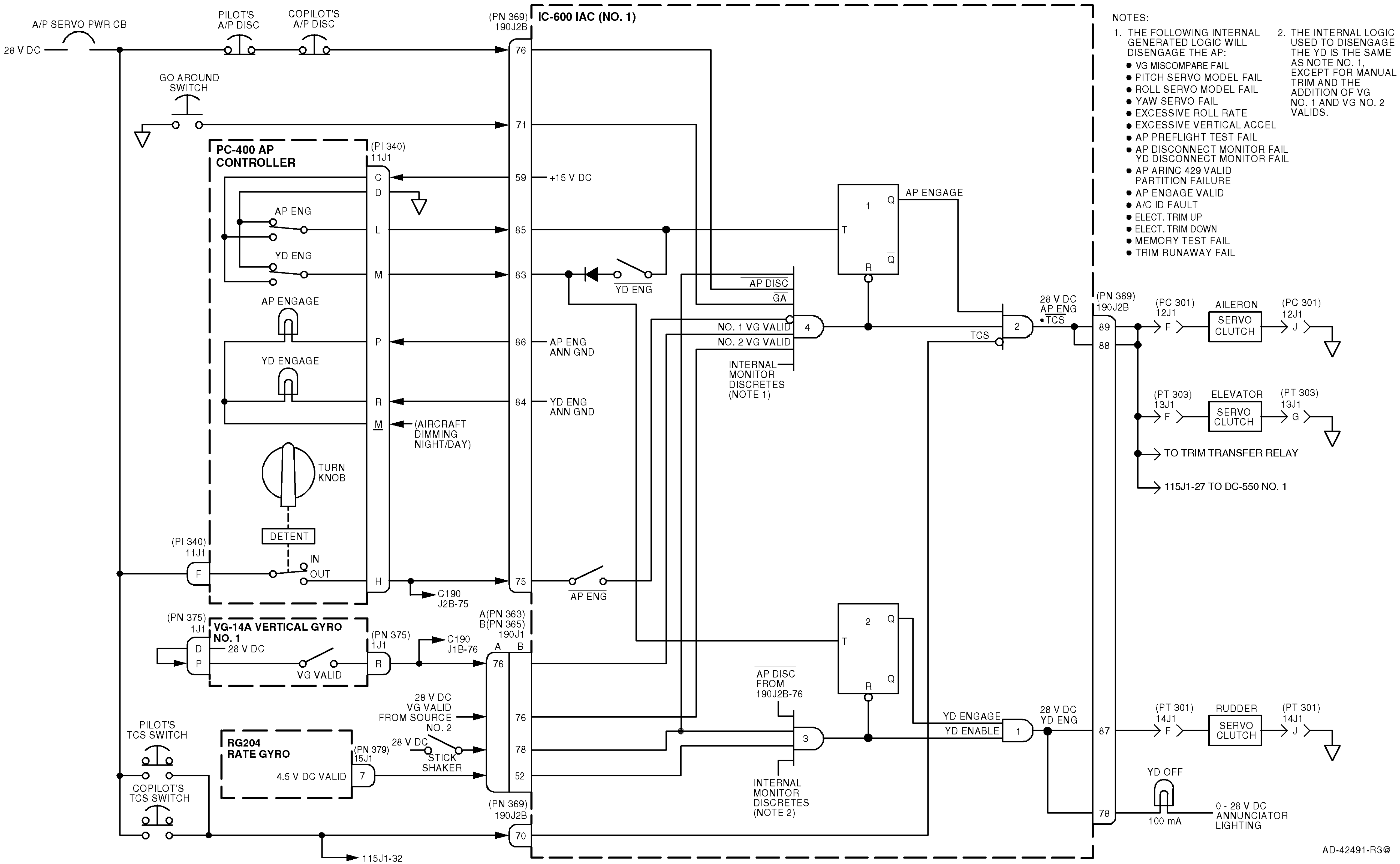

Figure 2-7-6. Autopilot/Yaw Damper Engage Logic

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C. Roll Axis Autopilot Servo Loop

The autopilot roll axis servo loop (See Figure 2-7-7 and Table 2-7-6) is the same for all lateral steering modes. Since there is only one autopilot system and one servo in the roll axis, it does not matter if the steering command is heading select or localizer, the path to the servo is the same. The autopilot control loop is connected in parallel to the aircraft's primary control rigging through cables.

The roll axis servo receives a drive signal from the IC-600 IAC , which is the autopilot command to drive the ailerons. As the servo motor drives, it in turn moves the control rigging, which in turn moves the ailerons. As the ailerons move, a feedback signal from the servo is fed back to the IC-600 IAC and represents aircraft response to the autopilot command. When response equals command, the aileron drive signal goes to zero. When the autopilot command is satisfied, it goes to zero and the feedback signal drives the ailerons back to its original position.

(1) SM-200 Roll Servo Drive and Bracket

The SM-200 translates electrical input signals into a clutched mechanical output. The output is used to drive the ailerons in response to roll axis autopilot commands. A description of servo functions follows:

(a) Servo Clutch

The servo clutch is engaged as a function of autopilot engagement, or release of TCS if the autopilot was previously engaged. The clutch disengages anytime the autopilot is disconnected, or the TCS switch is pushed and held with the autopilot previously engaged.

(b) Servo Torque Motor

The servo torque motor receives DC current from the IC-600 IAC pitch axis. With the servo clutch engaged, the torque motor output drives a power gear train through mechanical coupling. The gear train output in turn supplies the drive that moves the ailerons to the desired position. With the autopilot not engaged, any input drive to the servo motor is not coupled to the ailerons.

(c) DC Tach Generator

The DC tach generator is mechanically connected to the servo torque motor and supplies an output back to the IC-600 IAC any time the servo torque motor drives, which represents the rate that the ailerons are being moved. The DC tach generator supplies two functions:

- Supplies an aileron rate of travel signal to the IC-600 IAC, which is used as a damping term. When the ailerons are commanded to a position, they should move to that position smoothly and stop still, not move or hunt about that position.
- In the IC-600 IAC, the DC tach generator signal is also integrated to derive aileron position feedback. This signal is used to ensure the aileron torque motor has driven the ailerons as commanded.

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(2) IC-600 Integrated Avionics Computer (IAC)

The IC-600 IAC receives sensor data and command inputs and processes this data in accordance with any lateral steering mode that is active. Since this is a digital computer, this processing is accomplished through software. In order to supply a current to drive the servo torque motor, this digitally processed signal must be changed into analog form.

Additionally, to ensure safe operation, certain functions and values of certain parameters are monitored in the IC-600 IAC to ensure that the autopilot is automatically disconnected should a safety critical malfunction occur. A description of the IC-600 roll axis autopilot servo drive follows.

(a) Roll Axis Attitude Loop

The roll axis attitude loop processes the autopilot command, roll attitude, and derived roll rate of change to establish the aileron servo drive command. Both roll attitude and derived roll rate terms are gain programmed as a function of IAS.

The flight director roll command is limited by the autopilot to ±35 degrees of bank and rate of change to 7 degrees per second. The rate limited roll attitude reference command is used as an input to the aileron servo loop.

(b) Aileron Servo Loop

The aileron servo loop uses the roll attitude loop command to compute an aileron servo pulse width command with the autopilot engaged. If the autopilot is not engaged, the aileron servo pulse width is zero.

Aileron servo position is derived by integrating the aileron servo DC tach generator feedback signal. The DC tach generator signal is also used as a damping term in positioning the ailerons. Aileron servo current is passed through a current limiter and servo driver before being sent to the servo amplifier.

(c) Current Limiter

Current limiting is performed on the servo command signal to ensure that the proper servo drive values are established.

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(d) Servo Amplifier

The servo amplifier acts as a switch that supplies drive current to the aileron servo torque motor. A servo enable discrete is applied as a function of autopilot engagement. The servo requires 1-ampere current drive capability. The servo amplifier supplies a 480 Hz pulse width modulated, 28-volt bipolar output. The pulse width command output is compared with a 480 Hz saw–tooth signal to generate the pulse width control for the servo driver. The servo loop software executes at 240 Hz so that the servo amplifier output is the same for two complete duty cycles.

The primary processor supplies a discrete output that enables the aileron servo amplifier. If this discrete is not available, the servo amplifier is forced to a zero duty cycle. Also a latched heartbeat monitor and a latched power supply monitor (both not shown), are required to enable the servo amplifier driver.

For the primary processor servo amplifier enable to be active, the following are required:

- All monitors must be valid
- Both attitude sources VG-14A gyros must be valid
- Communications with the secondary processor must be valid
- All internal processor valids must be valid.

Table 2–7–6. Autopilot Roll Axis Operating Limits

Mode	Parameter	Value
Autopilot	MAX Bank Limit	±35°
	MAX Rate Limit	7.0°/sec
Limit After Engagement	±35°	If the aircraft is rolled to an angle > 35° using TCS, the autopilot rolls the aircraft to 35° and maintain.
Heading Hold	Bank Angle	Less than 3°, plus 3 seconds.
Roll Hold	Bank Angle	The bank angle is held if the bank is greater than 6° but less than 35° and the bank was initiated using TCS.
Turn Knob	Bank angle	Max bank angle is 35°. Max roll rate is 3°/sec.

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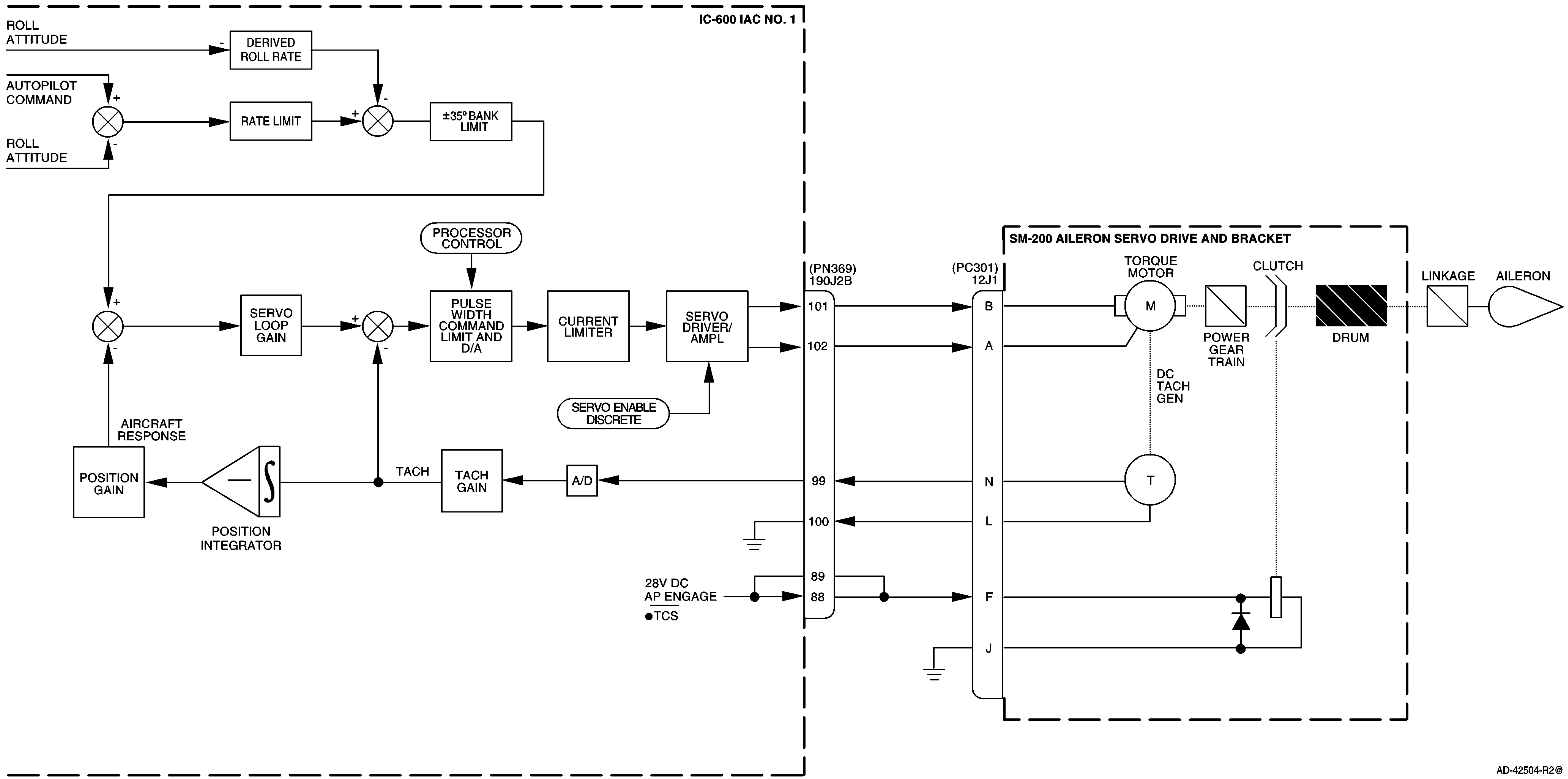

Figure 2-7-7. Autopilot Roll Axis Servo Loop

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D. Pitch Axis Autopilot Servo Loop

The pitch autopilot servo loop (see Figure 2–7–8 and Table 2–7–7) is the same for all vertical steering modes. Since there is only one autopilot system and one servo in the pitch axis, it does not matter if the steering command is altitude hold or vertical speed hold, the path to the servo is the same. The autopilot servo loop is connected in parallel to the aircraft's primary control rigging through cables.

The pitch axis servo receives a drive signal from the IC–600 IAC, which is the autopilot's command to drive the elevator. As the servo motor drives, it in turn moves the control rigging, which moves the elevator. As the elevator moves, a feedback signal from the servo is sent to the IC–600 IAC and represents aircraft response to the autopilot command. When response equals command, the elevator drive signal goes to zero. When the autopilot command is satisfied, it goes to zero and the feedback signal drives the elevator back to its starting position.

(1) SM–200 Elevator Servo Drive and Bracket

The SM–200 translates electrical input signals into a clutched mechanical output. This output is used to drive the elevator in response to pitch axis autopilot commands. A description of servo functions follows:

(a) Servo Clutch

The servo clutch is engaged as a function of autopilot engagement, or release of TCS, if the autopilot was previously engaged. The clutch disengages anytime the autopilot is disconnected, or the TCS switch is pushed and held.

(b) Servo Torque Motor

The servo torque motor receives DC current from the IC–600 IAC pitch axis. With the servo clutch engaged, the torque motor output drives a power gear train through mechanical coupling. The gear train output in turn supplies the drive to move the elevator to the desired position. With the autopilot not engaged, any input drive to the servo motor is not coupled to the elevator.

(c) DC Tach Generator

The DC tach generator is mechanically connected to the servo torque motor and supplies an output back to the IC–600 IAC anytime the servo torque motor drives, that represents the rate that the elevator is being moved. The DC tach generator supplies two functions, as follows:

- Supplies an elevator rate of travel signal to the IC–600 IAC. This signal is used as a damping term. When the elevator is commanded to a position, it should move to that position smoothly and stop still, not move or hunt about that position.
- In the IC–600 IAC the DC tach generator signal is also integrated to derive elevator position feedback. This signal is used to ensure that the elevator torque motor has driven the elevator as properly commanded.

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(2) IC–600 Integrated Avionics Computer (IAC)

The IC–600 IAC receives sensor data and command inputs and processes this data in accordance with any vertical steering mode that is active. Since this is a digital computer, this processing is accomplished through software. In order to supply a current to drive the servo torque motor, this digitally–processed signal must be changed into analog form.

Additionally, to ensure safe operation, certain functions and values of certain parameters are monitored in the IC–600 IAC to ensure that the autopilot is automatically disconnected, should a safety critical malfunction occur. A description of the IC–600 pitch axis autopilot servo drive follows:

(a) Pitch Axis Attitude Loop

The pitch axis attitude loop processes the autopilot command, pitch attitude, and derived pitch rate of change to establish the elevator servo drive command. Both pitch attitude and derived pitch rate terms are gain programmed as a function of IAS.

The flight director pitch command is limited by the autopilot to ±20 degrees and rate of change is a variable as a function of airspeed. The rate limited pitch attitude reference command is used as an input to the elevator servo loop.

(b) Elevator Servo Loop

The elevator servo loop uses the pitch attitude loop command to compute an elevator servo pulse width command with the autopilot engaged. If the autopilot is not engaged, the elevator servo pulse width is zero.

Elevator servo position is derived by integrating the elevator servo DC tach generator feedback signal. The DC tach generator signal is also used as a damping term in positioning the elevator. Elevator servo current is passed through a current limiter and servo driver before being sent to the servo amplifier.

(c) Current Limiter

Current limiting is performed on the servo command signal to ensure that the proper servo drive values are established.

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(d) Servo Amplifier

The servo amplifier acts as a switch to supply drive current to the elevator servo torque motor. A servo enable discrete is applied as a function of autopilot engagement. The servo requires 1–ampere current drive capability. The servo amplifier supplies a 480 Hz pulse width modulated, 28 volt bipolar output. The pulse width command output is compared with a 480 Hz saw–tooth signal to generate the pulse width control for the servo driver. The servo loop software executes at 240 Hz so that the servo amplifier output is the same for two complete duty cycles.

The primary processor supplies a discrete output that enables the aileron servo amplifier. If this discrete is not available, the servo amplifier is forced to a zero duty cycle. Also, a latched heartbeat monitor and a latched power supply monitor (both not shown) are required to enable the servo amplifier driver.

For the primary processor servo amplifier enable to be active, the following are required:

- All monitors must be valid
- Both attitude sources VG–14A gyros must be valid
- Communications with the secondary processor must be valid
- All internal processor valids must be valid.

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E. Pitch Axis Autopilot Trim

The autopilot processor performs elevator trim control based on elevator servo current demand. Elevator trim engagement is controlled by the autopilot engage logic and the trim clutch is wired to the same clutch output as the aileron and elevator servo clutches.

The trim motor is driven in a manner to move the elevator trim tab to reduce the air load on the elevator servo. The trim drive is a 0.625 Hz pulse width modulated 28 V dc output. The pulse width is controlled as a function of airspeed.

Elevator trim rate is programmed with TAS to supply variable trim rate based on flight conditions. The use of TAS for gain programming allows the long-term elevator response (trim rate) to decrease with increasing altitude.

When elevator servo current exceeds a predetermined threshold for a given period of time, this is considered to be a steady-state error and trim runs. Out of the UP/DOWN sensor is a positive or negative current. This arms one input to an AND gate. The trim drive is also applied to a time delay and after the time delay is met, an output is applied to both AND gates. One AND gate is turned on and lets the trim motor run. As the trim motor runs, the trim tab is positioned to aerodynamically hold the elevator in position, and the elevator is re–positioned to reduce the electrical load on the servo. When this load falls below the threshold level, trim stops running.

When the up/down sensor allows an output, an internal clock runs for 10 seconds. If a trim malfunction has occurred and the trim system has not sufficiently reduced elevator servo current, the other trim threshold sensor allows an output to annunciate an out-of-trim condition on the PC–400 Autopilot Controller. This annunciation informs the pilot that the aircraft is out of trim.

To manually trim the aircraft, the pilot takes control of the aircraft, disengages the autopilot, and retrims the aircraft.

Table 2–7–7. Pitch Channel Axis Operating Limits

Mode	Parameter	Value
AP	Pitch Limit	$\pm 20°$
TCS	Pitch Control Limit	Up to $\pm 30°$

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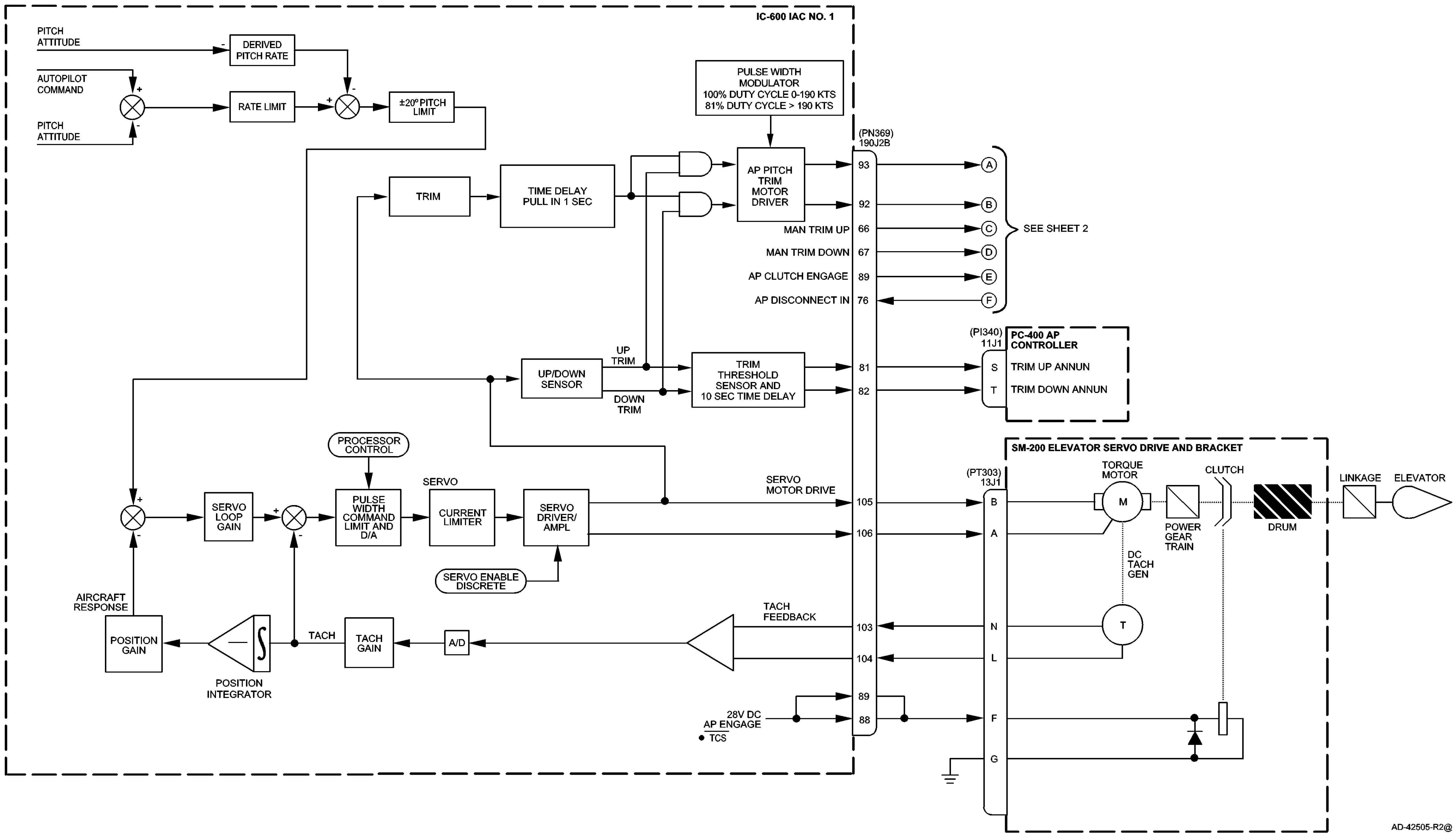

Figure 2-7-8 (Sheet 1). Autopilot Pitch Axis Servo Loop

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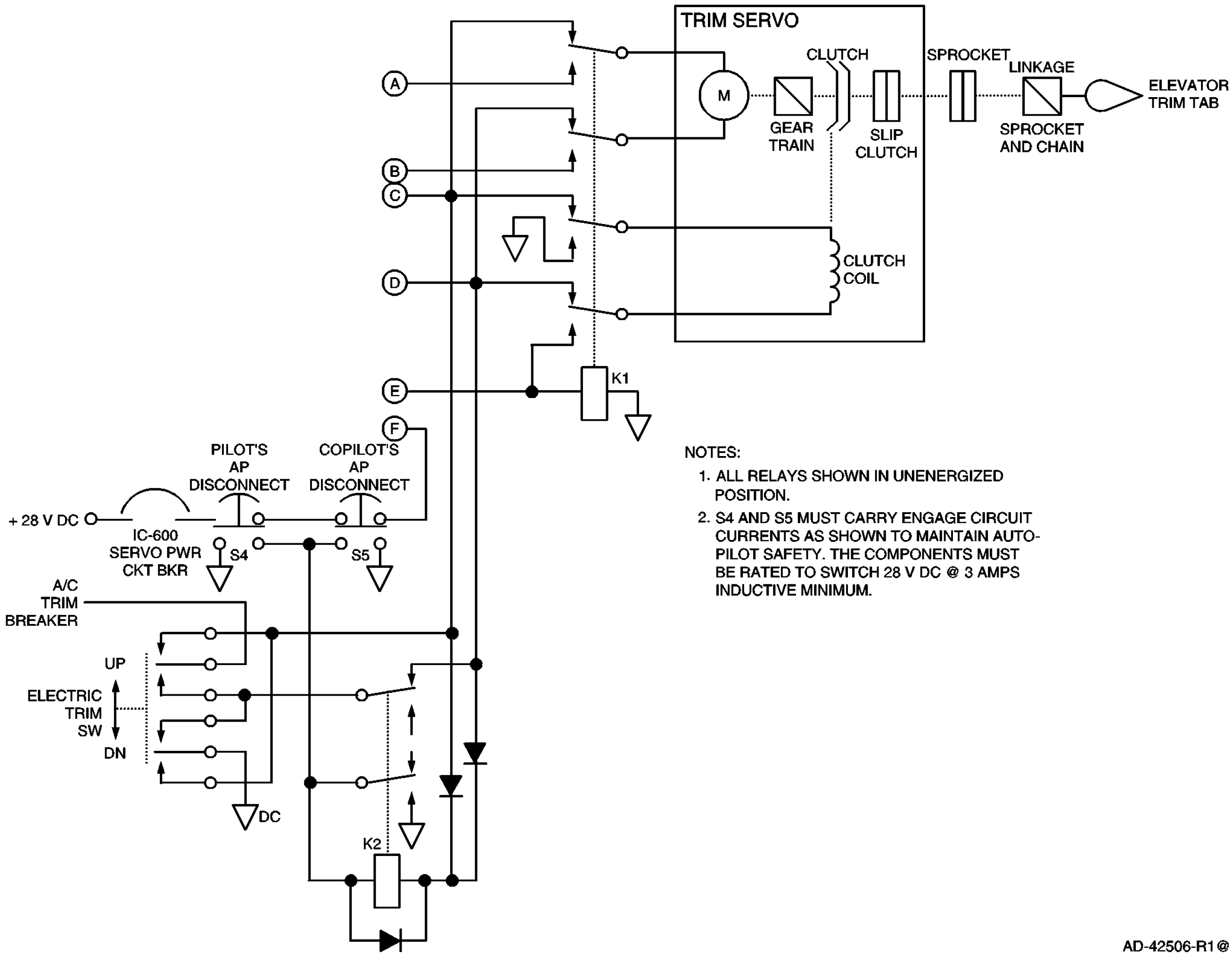

Figure 2-7-8 (Sheet 2). Autopilot Pitch Axis Servo Loop

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F. Rudder Axis Yaw Damper Servo Loop

The yaw damper servo loop (see Figure 2–7–9) is independent from the autopilot in that it can be engaged without the autopilot being engaged. The yaw damper does not receive any commands from the flight director. The yaw damper supplies the following two functions in the aircraft:

- Yaw damping for transient wind gusts
- Turn coordination with the roll axis of the autopilot.

The rudder axis servo is connected in parallel with the aircraft's primary rigging through cables. The rudder axis servo receives a drive signal from the IC–600 IAC, which is the yaw damper command to drive the rudder. As the servo motor drives, it moves the control rigging, which in turn moves the rudder. As the rudder moves, a feedback signal from the servo is sent to the IAC and represents aircraft response to the yaw damper command. When the response equals command, the rudder drive signal goes to zero. When the yaw damper command is satisfied, it goes to zero and the feedback signal drives the rudder back to its starting position.

(1) IC–600 Integrated Avionics Computer (IAC)

The IC–600 IAC receives sensor data and command inputs and processes this data. Since this is a digital computer, this processing is accomplished through software. In order to supply a current to drive the servo torque motor, this digitally processed signal is changed into analog form.

Additionally, to ensure safe operation, certain functions and values of certain parameters are monitored in the IAC to ensure that the yaw damper is automatically disconnected, should a safety-critical malfunction occur. A description of the IC–600 IAC rudder axis yaw damper servo drive follows.

(a) Yaw Axis Attitude Rate Loop

Actual aircraft yaw rate from the RG–204 Rate Gyro and actual aircraft roll attitude from the pilot's VG–14A are summed to generate a computed yaw term to drive the rudder. Roll attitude is TAS programmed to achieve the proper signal gain as altitude and airspeed change.

(b) Rudder Servo Loop

The rudder servo loop uses the computed yaw attitude rate loop command to compute a rudder servo pulse width command with the yaw damper engaged. If the yaw damper is not engaged, the rudder servo pulse width is zero.

Rudder servo position is derived by integrating the rudder servo SDC tach generator feedback signal. The DC tach generator signal is also used as a damping term in positioning the rudder. Rudder servo current is passed through a current limiter and servo driver before sending to the servo amplifier.

(c) Current Limiter

Current limiting is performed on the servo command signal to ensure that the proper servo drive values are established.

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(d) Servo Amplifier

The servo amplifier acts as a switch to supply drive current to the servo torque motor. Servo enable is applied as a function of yaw damper engagement. The servo requires 1–ampere current drive capability. The servo amplifier supplies a 480 Hz pulse-width-modulated, 28 V bipolar output. The pulse width command output is compared with a 480 Hz saw–tooth signal to generate the pulse width control for the servo driver. The servo loop software executes at 240 Hz so that the servo amplifier output is the same for two complete duty cycles.

(e) Rudder Washout

The yaw damper is primarily responsive to short-term rate signals. Since the servo loop is an electrical–mechanical operating system, it is possible that the yaw rate attitude loop command and servo feedback signals do not exactly cancel. To eliminate this stand–off condition, any long-term output of the servo amplifier is fed to the rudder washout integrator. The output of the integrator is inverted and sent back into the servo loop to eliminate the stand–off condition.

Rudder washout also lets the pilot manually re–trim the rudder with the yaw damper engaged.

(f) Tach Integrator

Position feedback is achieved by taking the rudder servo tachometer signal, which is a rate of travel term, and integrating it. Integrating rate of travel over time derives distance travelled, or position.

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(2) SM–200 Servo Drive and Bracket

The SM–200 translates electrical input signals into a clutched mechanical output. This output is used to drive the rudder in response to yaw axis commands. A description of servo functions follows.

(a) Servo Clutch

The servo clutch is engaged as a function of autopilot or yaw damper engagement. The clutch disengages anytime the yaw damper is disconnected.

(b) Servo Torque Motor

The servo torque motor receives DC current from the IC–600 IAC yaw axis. With the servo clutch engaged, the torque motor output drives a power gear train through mechanical coupling. The gear train output in turn supplies the drive to move the rudder to the desired position. With the yaw damper not engaged, any input drive to the servo motor is not coupled to the rudder.

(c) DC Tach Generator

The DC tach generator is mechanically connected to the servo torque motor and supplies an output back to the IC–600 IAC anytime the servo torque motor drives. The DC tach generator supplies the following two functions:

- Supplies a rate of travel feedback signal to the IC–600 IAC. This signal is used as a damping term. When the rudder is commanded to a position, it should move to that position smoothly and stop still, not move or hunt about that position.
- In the IC–600 IAC the DC tach generator signal is also integrated to derive rudder position feedback. This signal is used to ensure that the rudder torque motor has driven the rudder as properly commanded.

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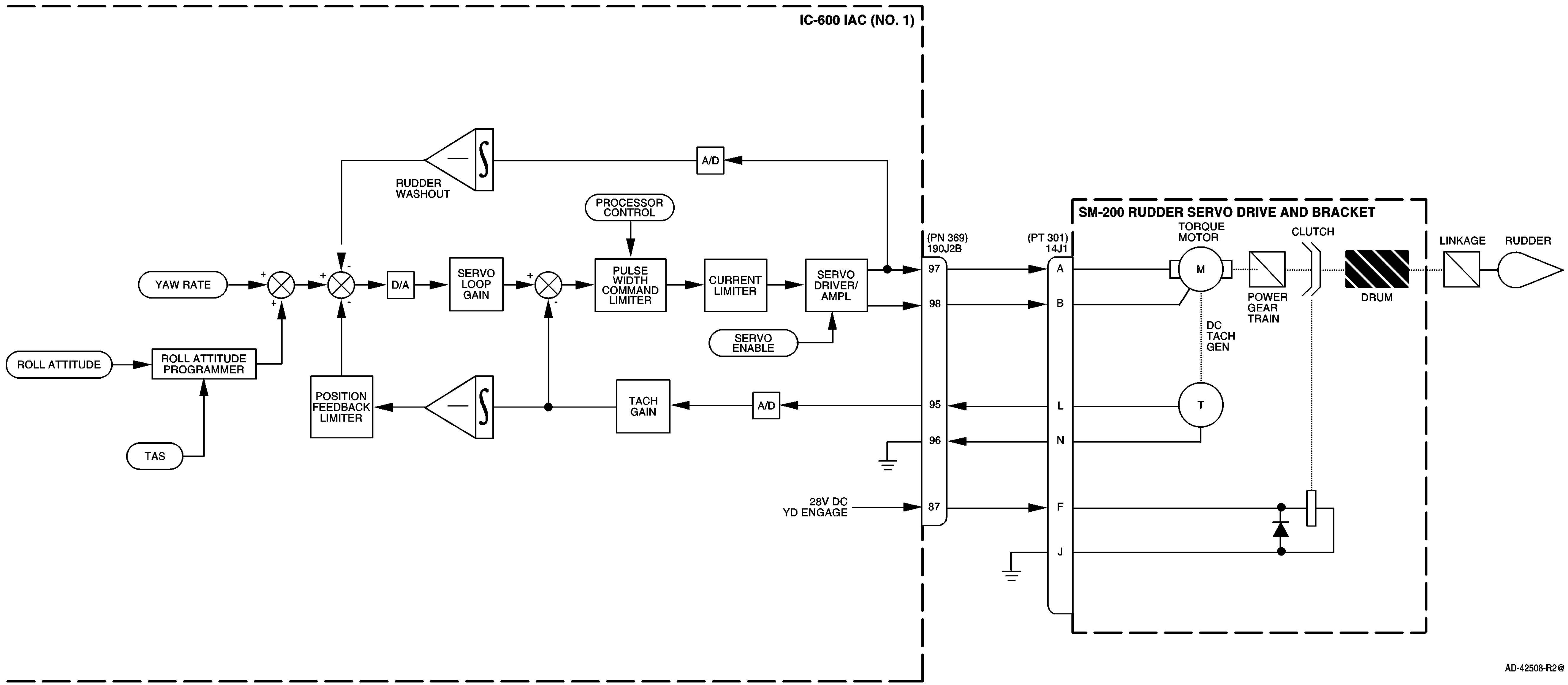

Figure 2-7-9. Autopilot Yaw damper Servo Loop

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4. Fault Monitoring

A. Autopilot/Yaw Damper Monitoring Overview

The Autopilot/Yaw Damper (AP/YD) monitoring function is supplied by the IC-600 IAC primary processor. The primary processor uses independent hardware for sensor input and servo feedback data used by the monitoring function. This separation ensures that hardware failures do not effect the autopilot control function.

The primary processor supplies dedicated disconnect hardware for the monitoring function. This gives the monitors the capability of disengaging the autopilot and yaw damper independent of the autopilot processor hardware. All automatic disconnects that result from monitor trips, store an event code in non-volatile memory for subsequent recall during ground maintenance testing (weight–on–wheels).

The disengage path is tested during autopilot power-up to ensure that latent failures do not inhibit monitor operation. The servo amplifier disable path (heartbeat monitor, power supply monitor, monitor processor valid) are all individually tested at power-up. These tests consist of driving the pitch, roll and yaw servos, and validating proper tachometer feedback and current sensing.

The monitors use computed TAS and IAS to model gain programmers and the pitch g limit. If the air data is not valid, the following default values are used:

- TAS = 300 kts
- IAS = 220 kts.

B. Hardover/Slowover Malfunction Protection

The distributed processor architecture of the PRIMUS 1000 system is designed to prevent hazards, such as autopilot hardovers. This protection ensures that failures in either processor are defeated or minimized by the monitors and/or limiters in the other processor. In general, failures of the primary processor (flight director) do not result in an abrupt aircraft response because the attitude command path is limited to a normal control response envelope in the secondary processor (autopilot). This is insured by a ± 25 degree magnitude limit and a ± 0.3g rate limit in the pitch axis and a ± 35 degree magnitude limit and a ± 7 degree/sec rate limit in the roll axis in the autopilot processor. Failures of the autopilot processor are detected by the monitors in the primary processor and result in an autopilot/yaw damper disconnect, well in advance of exceeding autopilot hazard criteria.

The pitch and roll attitude command magnitude limits also supply secondary slowover protection. Primary protection is dependent on pilot recognition. During CAT 2 approaches, an excessive deviation monitor also supplies slowover protection.

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C. System Response to Failures

In the event of an autopilot processor fault, the monitor disconnects the autopilot prior to any significant aircraft response. Upon monitor disconnect, a red AP OFF is displayed on the master PFD.

D. Monitor Description

(1) Pitch Servo Position Monitor

The pitch servo position monitor models the pitch attitude loop and servo loop and generates a predicted elevator servo position. The predicted servo position is compared against actual position feedback. The actual servo feedback is generated by lagging the servo tachometer feedback in the monitor process. The monitor trip level is programmed with IAS to permit a somewhat uniform aircraft response exposure. Any failure that results in exceeding the monitor trip level for a period of 0.3 seconds results in an automatic disconnect of the autopilot and yaw damper.

(2) Primary Pitch Attitude Comparison

The primary pitch attitude comparison monitor compares the on-side primary pitch attitude used in the primary processor with the pitch attitude used in the secondary processor. This monitor validates the hardware path between processors and ensures that the pitch attitude computations of both processors agree.

A trip of the pitch comparator monitor prevents autopilot/yaw damper engagement and causes a latched disengage if the autopilot/yaw damper were engaged at the time of the monitor trip.

If the pitch comparator exceeds a 3–degree threshold for 0.5 seconds, the monitor trips.

(3) Secondary Pitch Attitude Comparison Monitor

The secondary pitch attitude comparison monitor compares the on-side primary pitch attitude with the on-side secondary pitch attitude. This monitor validates the attitude source used by the pitch servo position monitor.

(4) Normal Acceleration Monitor

The normal acceleration monitor supplies an additional means of detecting autopilot malfunctions. The sensor input for this monitor is supplied by the AG-222 Normal Accelerometer. The monitor disconnects the autopilot and yaw damper if normal acceleration changes by more than ± 0.6 g's for more than 0.4 seconds.

(5) Roll Servo Position Monitor

The roll servo position monitor models the roll attitude loop and servo loop and generates a predicted aileron servo position. The predicted servo position is compared against actual position feedback. The actual servo feedback is generated by lagging the servo tachometer feedback in the monitor process. The monitor trip level is programmed with IAS, allowing a somewhat uniform aircraft response exposure. Any failure that results in exceeding the monitor trip level for a period of 0.3 seconds results in an automatic disconnect of the autopilot and yaw damper.

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(6) Primary Roll Attitude Comparison Monitor

The primary roll attitude comparison monitor compares the on-side primary roll attitude used in the primary processor with the roll attitude used in the secondary processor. This monitor validates the hardware path between processors and ensures the roll attitude computations of both processors agree.

A trip of the roll comparator monitor prevents autopilot and yaw damper engagement and causes a latched disengage if the autopilot/yaw damper were engaged at the time of the monitor trip.

If the roll comparator exceeds a 3 degree threshold for 0.5 seconds, the monitor trips.

(7) Secondary Roll Attitude Comparison Monitor

The secondary roll attitude comparison monitor compares the on-side primary roll attitude with the on-side secondary roll attitude. This monitor validates the attitude source used by the roll servo position monitor.

(8) Roll Rate Monitor

The roll rate monitor supplies an additional means of detecting autopilot malfunctions. The monitor disconnects the autopilot and yaw damper if actual roll rate exceeds 12 degrees/sec for more than 0.5 seconds.

(9) Yaw Servo Position Monitor

The yaw servo position monitor models the yaw rate loop and servo loop and generates a predicted elevator servo position. The predicted servo position is compared against actual position feedback. The actual servo feedback is generated by lagging the servo tachometer feedback in the monitor process. The monitor trip level is programmed with IAS, allowing a somewhat uniform aircraft response exposure. Any failure that results in exceeding the monitor trip level for a period of 0.6 seconds results in an automatic disconnect of the autopilot and yaw damper.

(10) Auto Trim Runaway Monitor

The auto trim runaway monitor detects any condition that results in the autopilot processor commanding trim while the elevator servo current does not indicate a need for trim. The auto trim runaway monitor disconnects the autopilot and yaw damper immediately upon detecting a trim runaway condition.

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(11) Auto Trim Inoperative Monitor

The trim inoperative monitor supplies a warn annunciator in view of the pilot (CAS message) indicating that the elevator is not properly trimmed. This monitor does not disconnect the autopilot.

(12) Autopilot/Yaw Damper Disconnect Monitor

The autopilot and yaw damper disconnect monitor detect a failure of the system to disengage the autopilot and yaw damper in response to the autopilot disconnect switch being pushed. This monitor ensures that the disconnect discrete and AP and YD engage status are valid. If self engagement within 0.6 seconds of a disconnect is detected, the processor outputs an invalid state on the servo amplifier drive enable. This action prevents the IAC from applying any torque to the autopilot and yaw damper servos.

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SECTION 3
SYSTEM INTERCONNECTS

This section provides interconnect information as an aide in troubleshooting the PRIMUS 1000 Integrated Avionics System. The interconnect information is based on Honeywell Engineering Bulletin EB7020278, Revision E. For specific avionics wiring information, refer to the wiring diagrams in the Citation Ultra Aircraft Maintenance Manual (AMM).

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Table 3-1. Interconnect Information

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Table 3-1. Interconnect Information (cont)

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Table 3-1. Interconnect Information (cont)

List of Figures (cont)

List of Tables

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Table 3-1. Interconnect Information (cont)

4. ELECTRICAL INTERCONNECT INFORMATION

This section contains the component wiring for the electronic flight instrument system and its interconnection to various other aircraft systems.

4.1 General Requirements

4.1.1 AC Power

The aircraft ac power supply must be single phase, 115 ± 5 volts, 400 ± 20 Hz sine wave with a maximum total harmonic distortion of 5 percent. Under all load conditions, amplitude modulation of the power supply shall not exceed 2 percent at any frequency. (Percent modulation is defined as one-half of the peak-to-peak modulation envelope divided by the carrier amplitude and multiplied by one hundred.) Within its load rating, the power supply's output impedance shall be less than 0.3 ohm for sinusoidal load variations at all frequencies below 10 Hz.

4.1.2 DC Power

The aircraft dc power supply must be 28 volts ± 10 percent.

NOTE: For further information about aircraft power supplies, refer to Radio Technical Commission for Aeronautics specification DO-160C.

4.1.3 Interconnect

4.1.3.1 Wiring

The interconnect cabling shall be routed to minimize coupling with high voltage and high current circuits.

4.1.3.2 Interconnect Format

Each connection is typically shown as indicated in the figure below. Wire terminations prefaced by the letter "C" indicate the copilot's side if applicable.

```
    Function                    Connector Pin                        Connects To
Dim Control          +            2J1-30  (24)   ---------S--T--S-------   23J1-b
Dim Control          -          ↑     -31  (24)   ---------S--T--S-------   23J1-c
         Unit Connector Designation •        ↑           ↑  ↑
                          Minimum Wire Gage •     Shield-•   •-Twisted
```

NOTE: In the above example the shield should be grounded at both ends.

Interconnect Format

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Table 3-1. Interconnect Information (cont)

4.1.3.3 Grounds

GOOD GROUNDS ARE A KEY FACTOR IN A GOOD INSTALLATION. The following special requirements shall be met:

A Chassis grounds will not be connected to each LRU. Instead all chassis ground will be made by contact of the LRU chassis and the rack to the airframe. This is necessary in order to reduce susceptibility to High Energy Intensity Fields (HIRF).

B ALL SHIELDED SIGNAL WIRES shall have the shields tied at both ends. The shields shall not be terminated with pigtails. They shall be terminated by backshell connections to the LRU. (REF 4.1.3.4)

C Twisted wires shall have at least eight full turns per foot.

D All dc power grounds shall be tied together, all ac power grounds shall be tied together, all signal grounds shall be tied together, all discrete returns shall be tied together and all lighting grounds shall be tied together. DC power, AC power, signal discrete and lighting ground groups are then tied together at a single point and connected to the airframe. Insure ground block connection to the airframe has capability to maintain ground reference under maximum current conditions. The diagram below illustrates this grounding method. Signal grounds are to be shielded with their respective signal wire. See wire hook up for details.

It is very important that this grounding technique be adhered to. Do not tie the various ground wires to multiple aircraft frame points and depend on the aircraft structure itself to provide a low impedance path for the individual grounds.

E If ground blocks are not adjacent to the unit and ground wires are several feet long, it may be necessary to splice larger gauge wire to the ground wire outputs to reduce voltage drop in these long ground wires. Voltage drops on all ground wires from LRU's to aircraft frame shall be less than 1.0 volts.

F Pins 190J2B-6, 7 and 9 of the IC-600 and pins 12, 13, and 14J1-C of the servos must be terminated at one common point which is also tied to aircraft ground. The wire used to connect the IC-600 to the common point must be of sufficient gauge to maintain less than 1/4 ohm resistance in this path.

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Table 3-1. Interconnect Information (cont)

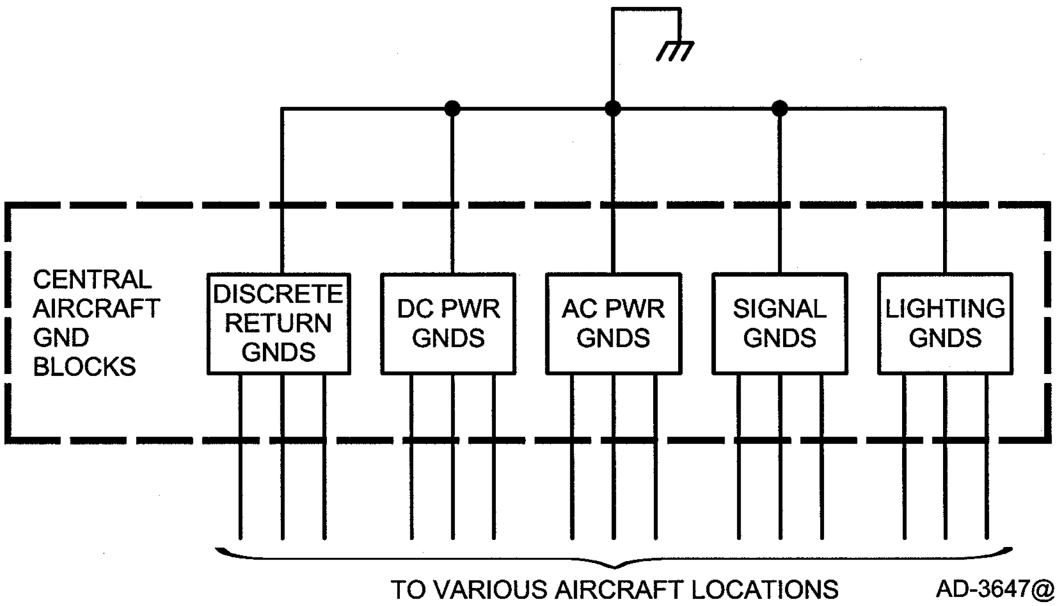

Figure 4-1. Aircraft Grounding Block Diagram

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Table 3-1. Interconnect Information (cont)

4.1.3.4 Shield Grounds

Single Point Versus Multi Point Shield Grounding

The majority of the shielded wires in the P1000 system have the shields grounded at both ends. This is called multi point grounding and is specified to minimize the adverse effects of HIRF and lighting.

Due to technical considerations, multi point grounding cannot be used for all shielded wires. In these special cases only one end of each continuous shielded cable segment is grounded. This is called single point grounding. Deciding which cable segment end to ground on a single point ground cable should be based on the ease of locating a good shield ground in the particular installation (i.e., the end which provides the easiest grounding method should be grounded.) If either end can be grounded easily, then the transmitter end should be grounded.

The interconnect portion of this document specifies if one or both ends of a shielded cable requires grounding. If a shield end requires grounding it is shown connected to a ground symbol. If a shield end is required to be floating it is shown as a no connection (NC).

Shields must not be connected to any LRU or bulkhead connector pin.

Examples of both single and multi point shield grounding methods without bulkhead connectors are shown in Figures 4.1A through 4.1D. Bulkhead connector shield handling is detailed next in this section.

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Table 3-1. Interconnect Information (cont)

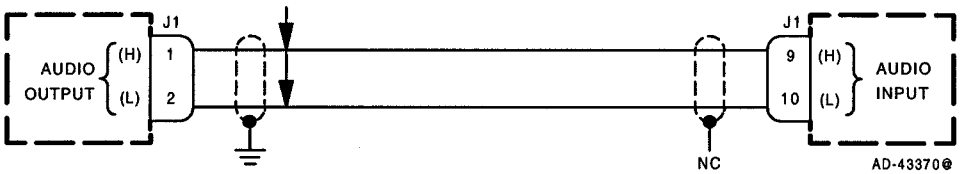

Figure 4.1A. Example #1, Single Point Shield Grounding W/O Bulkhead Conn

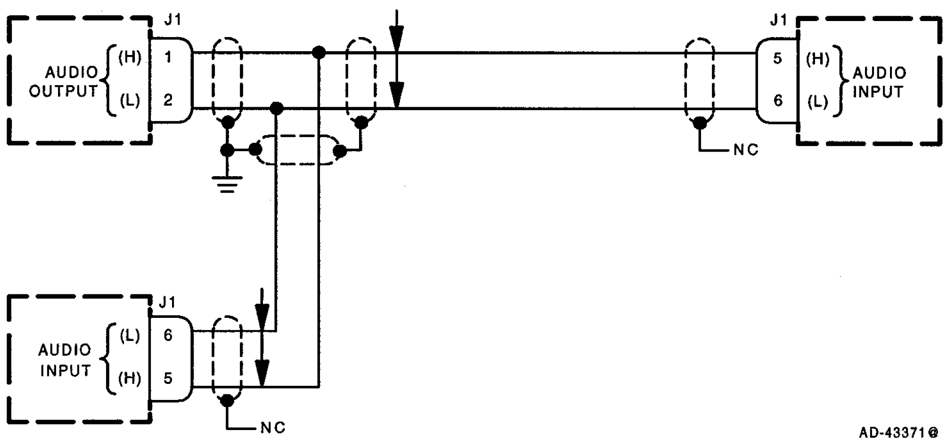

Figure 4.1B. Example #2, Single Point Shield Grounding W/O Bulkhead Conn

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Table 3-1. Interconnect Information (cont)

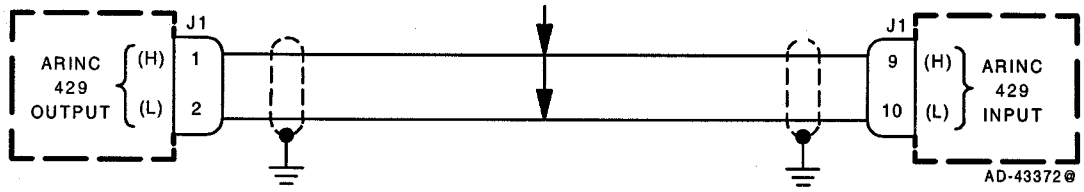

Figure 4.1C. Example #3, Multi Point Shield Grounding W/O Bulkhead Conn

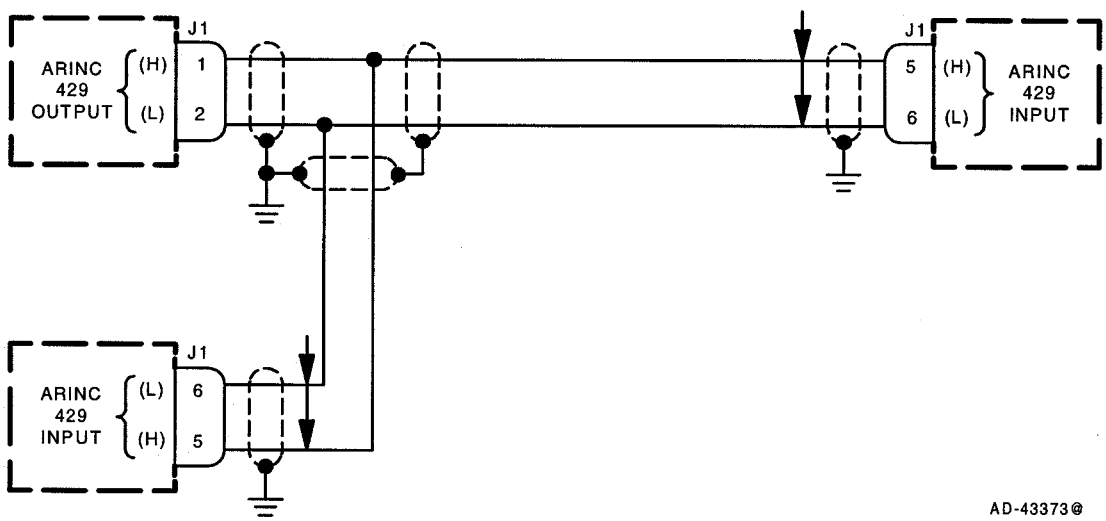

Figure 4.1D. Example #4, Multi Point Shield Grounding W/O Bulkhead Conn

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Table 3-1. Interconnect Information (cont)

Bulkhead Connector Shield Handling

The treatment of shields at bulkhead connectors is dependent on whether the shielded cable segment requires single or multi point shield grounding. Shielded cables that require multi point shield grounding require that the shields be grounded at both sides of the bulkhead connectors. Shielded cables that require single point shield grounding are usually floating on both sides of the bulkhead connector. This is done because it is usually easier to ground a single point shield at the cable ends opposite the bulkhead connectors.

Examples of bulkhead connector shield handling with both single and multi point shield grounding methods is shown in Figures 4.1E through 4.1H.

Shield Grounding Methods

This section details the preferred method of shield grounding at all LRU's and bulkhead connectors. This grounding method represents just one method. Other methods may also be used but they must provide equivalent shield grounding effectiveness.

Shield Grounding Method for Rack Mount Units

This subsection describes the preferred shield grounding method for the following rack mount units:

DU-870	Display Unit
IC-600	Integrated Computer

The shield grounding method for rack mount units is detailed in Figure 4.1I.

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Table 3-1. Interconnect Information (cont)

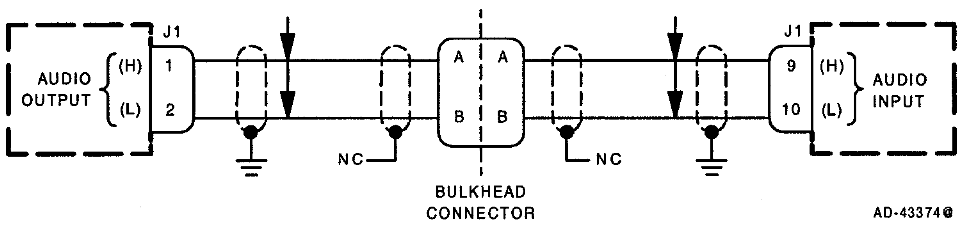

Figure 4.1E. Example #1, Single Point Shield Grounding with Bulkhead Conn

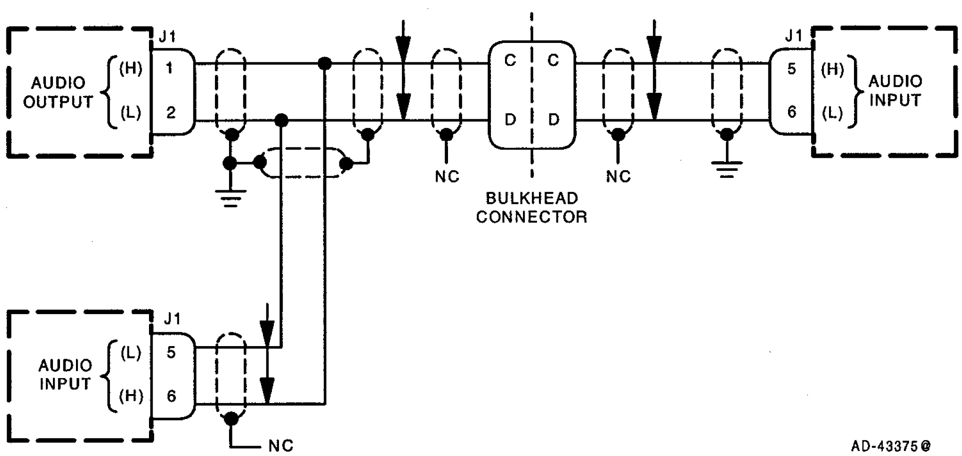

Figure 4.1F. Example #2, Single Point Shield Grounding with Bulkhead Conn

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Table 3-1. Interconnect Information (cont)

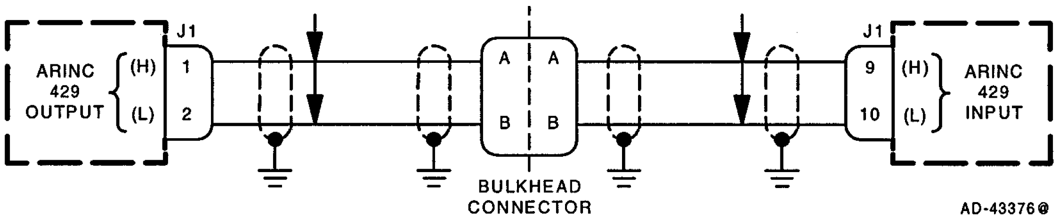

Figure 4.1G. Example #3, Multi Point Shield Grounding with Bulkhead Conn

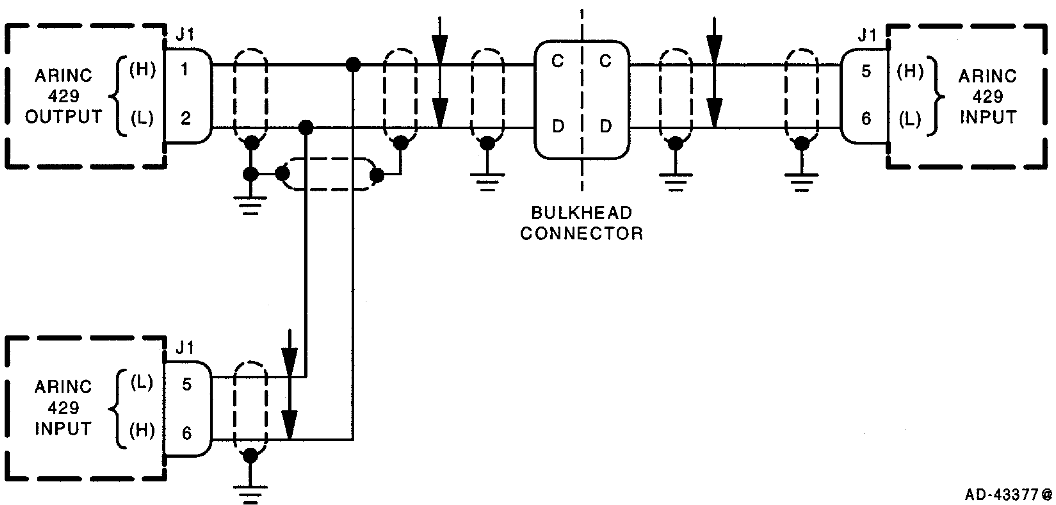

Figure 4.1H. Example #4, Multi Point Shield Grounding with Bulkhead Conn

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Table 3-1. Interconnect Information (cont)

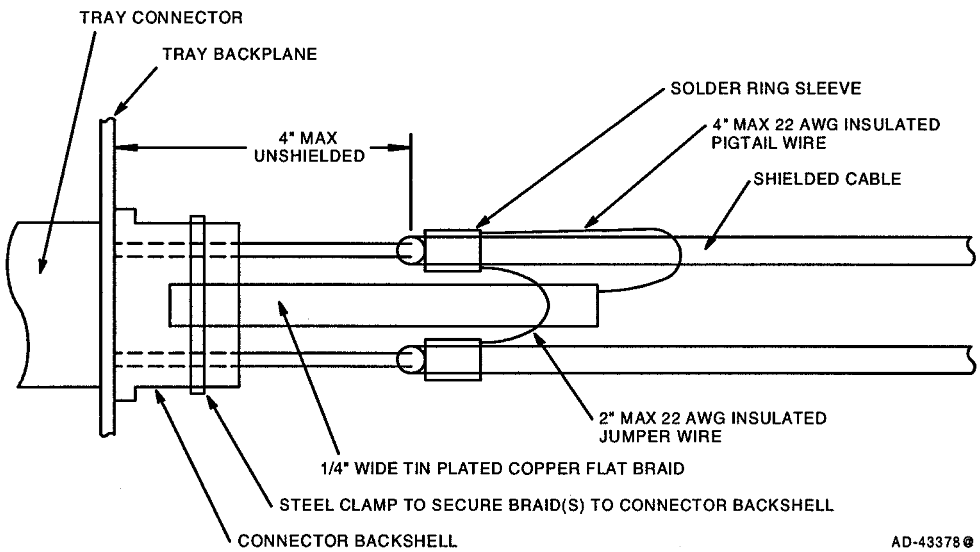

Figure 4.1l. Shield Grounding Example for Rack Mount Connectors

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Table 3-1. Interconnect Information (cont)

NOTE FOR FIGURE 4.1I

1. The shield grounding example shows 2 shielded cable shields grounded at a connector backshell using a length of flat braid.
2. Each pigtail wire provides a ground for a maximum of 2 shielded cables (do not use any more than one jumper wire per pigtail wire).
3. The pigtail wires are attached to the end of the braid by crimp or solder.
4. Each braid shall have a maximum of 6 pigtail wires connected to it. Because of the jumper wire each braid can ground up to 12 shielded cables.
5. If more than 12 shielded cables require grounding at a connector, use additional braids as required.
6. Cover the exposed braid between the backshell and the pigtail wires with insulating tubing.
7. The use of backshells is not mandatory. If backshells are not used the 1/4 inch wide shield ground braid should be grounded at the rear of the mounting tray using a lug terminal.
8. If backshells are used, verify proper electrical bonding (< 0.1 ohm) between the backshell and the mounting tray.

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Table 3-1. Interconnect Information (cont)

Shield Grounding Method for Panel/Pedestal Mounted Units

This subsection describes the preferred shield grounding method for the following panel/pedestal mounted units:

WC-660/880	WX Controller
DC-550	Display Controller
PC-400	Autopilot Controller

The shield grounding method for panel/pedestal mounted units is detailed in Figure 4.1J.

Shield Grounding Method for Bulkhead Connectors and for Non-Panel Mounted/Non-Rack Mounted Units

This subsection describes the preferred shield grounding method for the following units and for bulkhead connectors:

AZ-850	Air Data Computer
SM-200	Ail, Elev, Rud Servos
WU-660/880	WX RT

The shield grounding method for non-panel mounted/non-rack mounted units and bulkhead connectors is detailed in Figure 4.1K.

NOTE: The AZ-850 is included in this classification because its mounting tray does not have an integral mating connector.

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Table 3-1. Interconnect Information (cont)

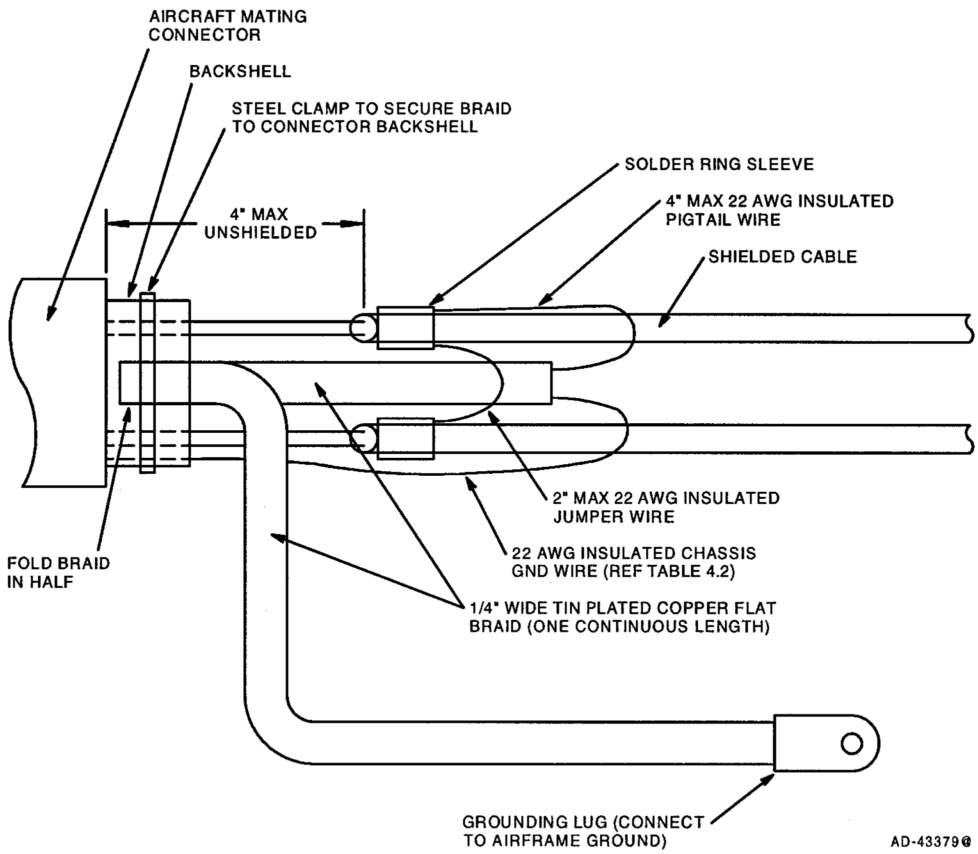

Figure 4.1J. Shield Grounding Example for Panel/Pedestal Mounted Units

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Table 3-1. Interconnect Information (cont)

NOTES FOR FIGURE 4.1J

1. The shield grounding example shows 2 shielded cable shields grounded at a connector backshell and to aircraft ground using a length of flat braid.
2. Braid length from connector backshell to grounding lug shall be 18 inches max.
3. Each pigtail wire provides a ground for a maximum of 2 shielded cables (do not use any more than one jumper wire per pigtail wire).
4. The pigtail wires are attached to the end of the braid by crimp or solder.
5. Each braid shall have a maximum of 6 pigtail wires connected to it (7 wires if chassis gnd wire is connected). Because of the jumper wire each braid can ground up to 12 shielded cables (one braid is sufficient for each panel/pedestal mounted unit).
6. Cover the exposed braid between the backshell and the pigtail wires plus between the grounding lug and the backshell with insulating tubing.
7. Connector strain reliefs can be used in lieu of backshells. Tie braid to strain relief using a mounting lug crimped or soldered to the braid (NOTE: Backshells are preferable over strain reliefs).
8. The use of connector strain reliefs or backshells is not mandatory. If neither is used the 1/4 inch wide shield ground braid is run directly from the wire harness to aircraft ground with a maximum length of 18 inches.
9. If backshells or strain reliefs are used, verify proper electrical bonding (<0.1 ohm) between the backshell/strain relief and the connector.

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Table 3-1. Interconnect Information (cont)

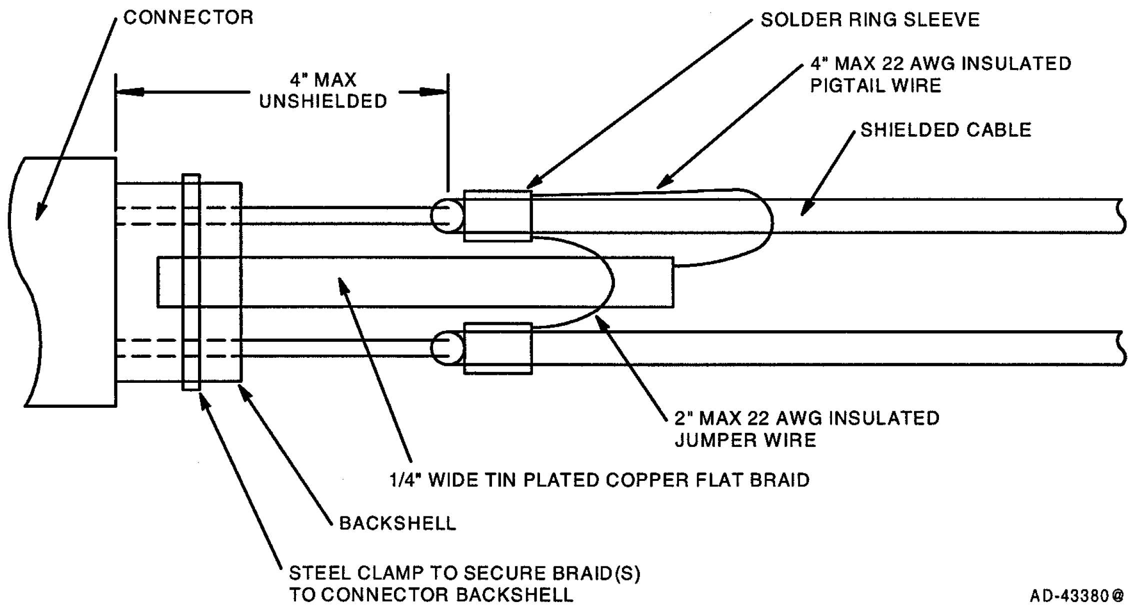

Figure 4.1K. Shield Grounding Example for Bulkhead Connectors and for Non-Panel Mounted/Non-Rack Mounted Units

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Table 3-1. Interconnect Information (cont)

NOTES FOR FIGURE 4.1K

1. The shield grounding example shows 2 shielded cable shields grounded at a connector backshell using a length of flat braid.
2. Each pigtail wire provides a ground for a maximum of 2 shielded cables (do not use any more than one jumper wire per pigtail wire).
3. The pigtail wires are attached to the end of the braid by crimp or solder.
4. Each braid shall have a maximum of 6 pigtail wires connected to it. Because of the jumper wire each braid can ground up to 12 shielded cables.
5. If more than 12 shielded cables require grounding at a connector use additional braids as required.
6. Cover the exposed braid between the backshell and the pigtail wires with insulating tubing.
7. Connector strain reliefs can be used in lieu of backshells. Tie braid to strain relief using a mounting lug crimped or soldered to braid end (NOTE: Backshells are preferable over strain reliefs).
8. Bulkhead connector shield grounding assumes that the bulkhead connectors are properly bonded to the bulkhead itself and that the bulkhead material is conductive and electrically bonded to the airframe.
9. The use of connector strain reliefs or backshells is not mandatory. If neither is used the 1/4 inch wide shield ground braid should be grounded to airframe ground with as short as run as possible but no longer than 12 inches from the harness breakout point.

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Table 3-1. Interconnect Information (cont)

4.1.3.5 High Intensity Radiated Fields

HIRF susceptibility can be reduced or eliminated by proper shielding and bonding techniques. This EB specifies which wires need to be shielded. Section 5 of this EB discusses the need for proper bonding, wire routing, and shielding.

Shields will need to be terminated outside the LRUs. There are several ways to handle this. Honeywell recommends backshell connectors, with about 12 inches of overbraid needed to properly isolate the cables and a special mounting tray, see Table 2-1, for the IC-600. This is not the only way. This is just our recommendation. Any acceptable method will work.

Band Type shield termination's are available from:

SunBank Electronics, Inc
1740 Commerce Way
Paso Robles, CA 93446
OR
ESC, Inc
14115 Chadron Ave
Hawthorne, CA 90251

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Table 3-1. Interconnect Information (cont)

4.2 Interconnect Requirements

4.2.1 Polarities

Installing the system in accordance with the interconnect information the phasing between the autopilot sensors and aircraft controls will be as follows:

- Roll right CW drum rotation viewed from drum end
- Pitch up CW drum rotation viewed from drum end
- Yaw right CW drum rotation viewed from drum end

If it is impossible to maintain the above relationships, servo drive drum rotation direction can be changed by interchanging the connections to pin "A" with pin "B" and pin "L" with pin "N" on the appropriate servo. If the trim servo polarity must be changed the connections to pin "B" and pin "C" are reversed.

4.2.2 Engage Interlock

The IC-600 is electrically keyed to prevent the wrong computer from being installed and operated in an aircraft.

4.2.3 Servo Drive Electrical Keying

The engage clutch of the servo drive is electrically keyed as a function of power gear ratio to prevent the wrong servo from being installed.

4.2.4 Autopilot Off Annunciator

The circuit shown in Figure 4-10 can be used to annunciate autopilot disengage. If the autopilot disengages for any reason other than using the disengage switches, the "autopilot off" light will illuminate and will stay illuminated. Pressing the disengage button will reset the annunciator. Every time the autopilot disengages the horn will give a 1.5 sec warning.

4.2.5 Aircraft Relays

If the requirement exists for aircraft relays to be driven in parallel with the annunciator lights in the FD/AP Mode Selector, diode isolation is required. Suppression diodes should be installed across the relay coil and a diode must be installed in series with the mode selector as shown in Figure 4-2. Failure to install the diodes may result in unselected modes lighting as a function of dimming the annunciator lighting.

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Table 3-1. Interconnect Information (cont)

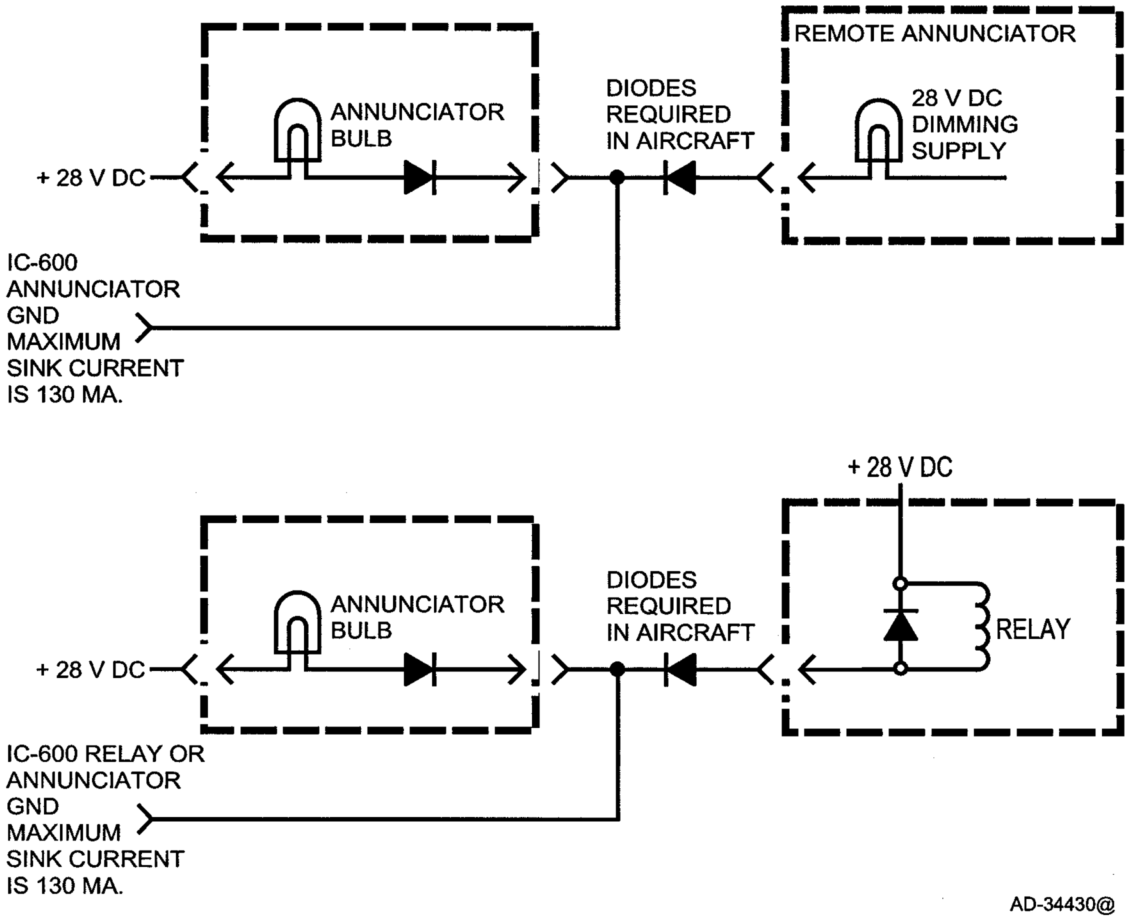

Figure 4-2. Aircraft Diode Isolation

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Table 3-1. Interconnect Information (cont)

4.3 IC-600/Display Unit Bus Interface

The IC-600/DU buses provide PFD and MFD data from the ICs to the DUs. The IC/DU bus layout is shown below. The following paragraphs define the electrical interface requirements for the IC-600/Display Unit interconnect.

- The IC-600/DU transmission lines shall have a characteristic impedance of 125 ± 5 ohms. The characteristic capacitance shall be 12 ± 2 picofarads/foot. Raychem 2524E0114 (with thermorad jacket) cable, Filotex Part No. 69654 cable, or equivalent can be used. (This is ASCB type cable.)
- DUs are to be connected to a bus as shown in Figure 4-2 (Terminated DU) or Figure 4-3 (Unterminated DU).

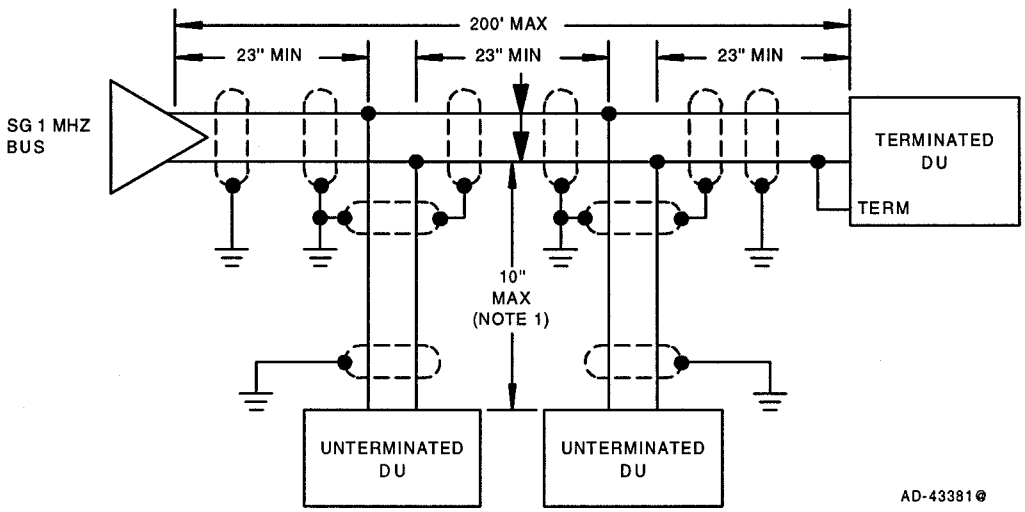

Figure 4-2A. IC/DU Bus Interface (Terminated DU)

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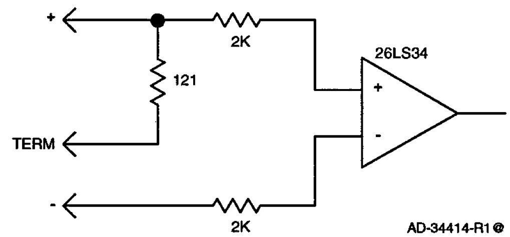
Table 3-1. Interconnect Information (cont)

- Each DU has provisions for bus termination. The + and - inputs are always used. The TERM - input is used to terminate the bus within the display unit.



NOTE: If a terminating DU is removed from the panel, all remaining DUs utilizing that particular bus may fail to operate or may operate intermittently. Therefore, optional termination resistors can be incorporated into the aircraft wiring to allow dispatch of the terminating DU. The termination resistors should be noninductive 127 ohm, +-1%, 1/3 watt, metal film. The cable length between the last stub and the termination resistor shall be a minimum of 23 inches. This optional termination method is shown in Figure 4-3. Provide overbraid protection for exposed wires and resistor at the termination point.

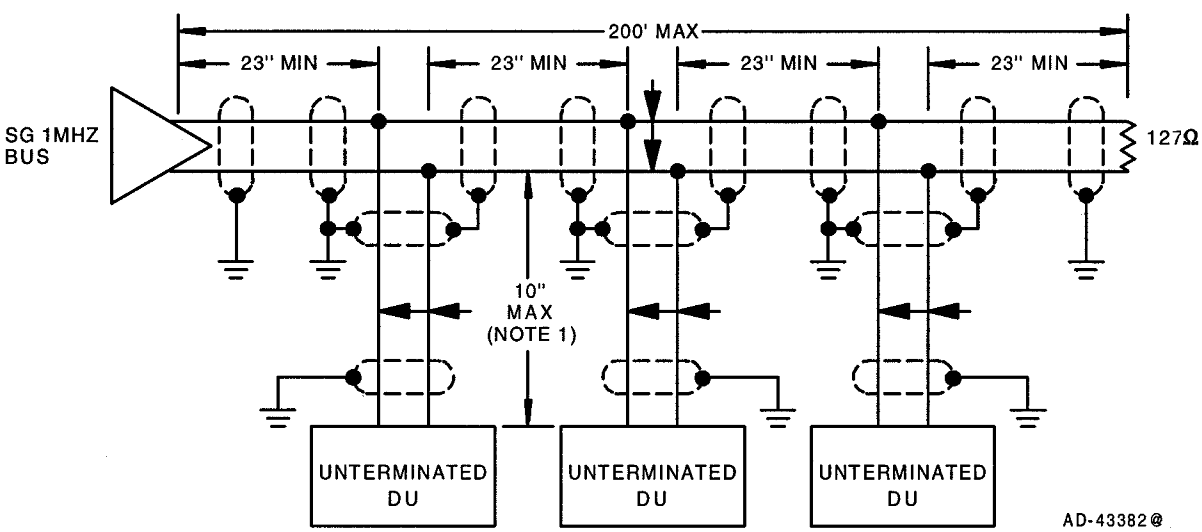


Figure 4-3. IC/DU Bus Interface (Unterminated DU)

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Table 3-1. Interconnect Information (cont)

- The maximum cable length from an IC-600 to a DU is 200 feet.
- There shall be a minimum of 23 inches of cable between adjacent stubs (Ref Figure 4-3).
- The preferred method of constructing a DU stub connection is the same as for the ASCB stub. Using this method the unshielded stub length can be up to 6 inches.
- Butt splices with solder rings will be utilized for all stub interconnections.
- The bus shield connections at each stub shall be accomplished with a butt splice which will provide a maximum shield to shield connection of 0.3 inch. If a stub shield is used, connect the stub shield to the bus shield as shown in Figure 4-3 with a butt splice or minimum length (less than 2 inches) 20 AWG wire. All exposed wires at the splice and wires used to connect shields at the splice shall be covered with an overbraid material. The overbraid material shall then be tied to the shield or airframe ground.
- The Bus shields shall be grounded to the airframe ground at each LRU connector as specified in Section 4.2 with a minimum length of 20 AWG wire. Refer to Section 4.1.3.4 for proper shield grounding points and overbraid or backshell protection.
- It is very important that the IC-600/DU buses in a redundant system be installed with consideration for damage failure modes. Therefore, buses should be bundled separately wherever possible, should not pass through common connectors for feedthroughs, and should not be installed in high risk areas such as wing leading edges, engine shrapnel path, etc.

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Table 3-1. Interconnect Information (cont)

4.4 WX/Display Unit Bus Interface

The WX/DU buses provide Weather Radar data from the WX unit to the DUs. The WX/DU bus layout is shown below. The following paragraphs define the electrical interface requirements for the WX/Display Unit interconnect.

- The WX/DU transmission lines shall have a characteristic impedance of 70 ± 10% ohms. The characteristic capacitance shall be 30 picofarads/foot max. Honeywell Part No. 3718911-1 cable or equivalent shall be used. (Note: ASCB type cable cannot be used.)
- DUs are to be connected to a bus as shown in Figure 4-4. Only the DU at the end of the cable shall be terminated.

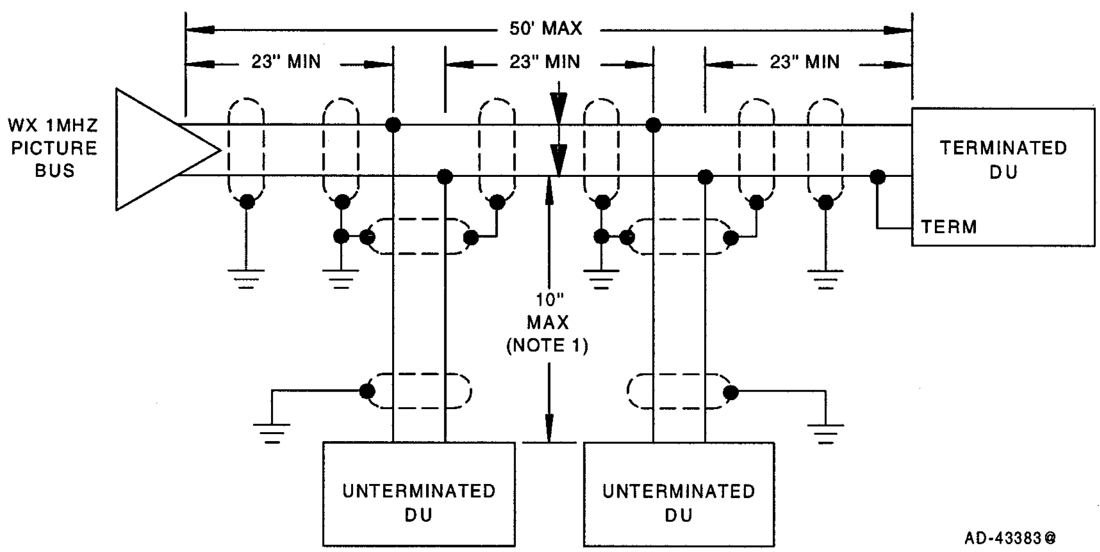

Figure 4-4. DU/WX Bus Interface (Terminated DU)

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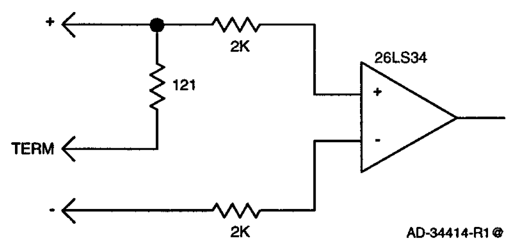
Table 3-1. Interconnect Information (cont)

- Each DU has provisions for bus termination. The + and - inputs are always used. The TERM - input is used to terminate the bus within the display unit.



NOTE: If a terminating DU is removed from the panel, all remaining DUs utilizing that particular bus may fail to operate or may operate intermittently. Therefore, optional termination resistors can be incorporated into the aircraft wiring to allow dispatch of the terminating DU. The termination resistors should be <u>noninductive</u> 127 ohm, ±1%, 1/3 watt, metal film. The cable length between the last stub and the termination resistor shall be a minimum of 23 inches. This optional termination method is shown in Figure 4-5. Provide overbraid protection for exposed wires and resistor at the termination point.

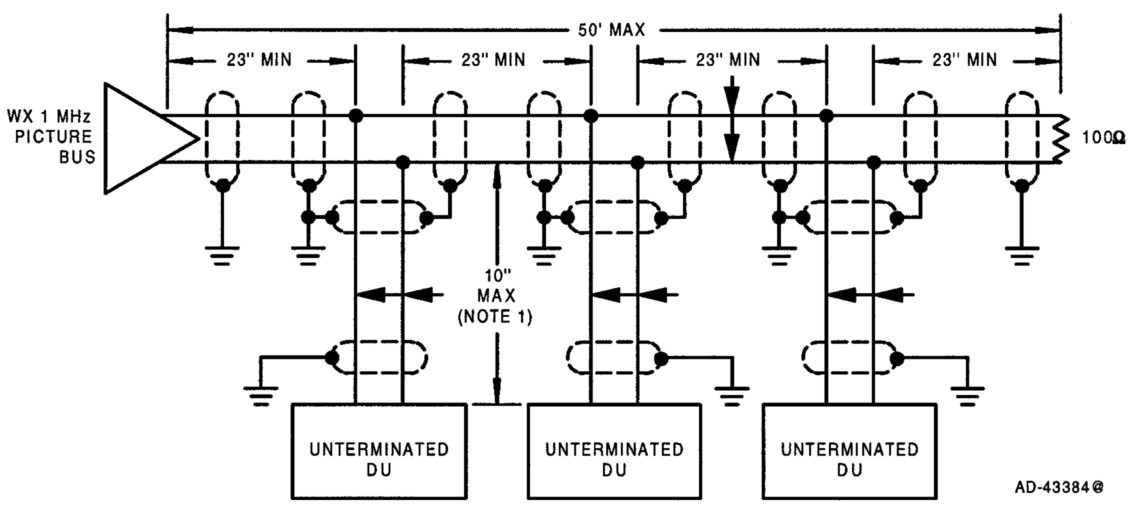


Figure 4-5. DU/WX Bus Interface (Unterminated DU)

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Table 3-1. Interconnect Information (cont)

- The maximum cable length from the WX to a DU is 50 feet.
- There shall be a minimum of 23 inches of cable between adjacent stubs (Ref Figure 4-5).
- The preferred method of constructing a DU stub connection is the same as for the ASCB stub. Using this method the unshielded stub length can be up to 6 inches.
- Butt splices with solder rings will be utilized for all stub interconnections.
- The bus shield connections at each stub shall be accomplished with a butt splice which will provide a maximum shield to shield connection of 0.3 inch. If a stub shield is used, connect the stub shield to the bus shield as shown in Figure 4-5 with a butt splice or minimum length (less than 2 inches) 20 AWG wire. All exposed wires at the splice and wires used to connect shields at the splice shall be covered with an overbraid material. The overbraid material shall then be tied to the shield or airframe ground.
- The Bus shields shall be grounded to the airframe ground at each LRU connector as specified in Section 4.2 with a minimum length of 20 AWG wire. Refer to Section 4.1.3.4 for proper shield grounding points and overbraid or backshell protection.
- It is very important that the IC/DU buses in a redundant system be installed with consideration for damage failure modes. Therefore, buses should be bundled separately wherever possible, should not pass through common connectors for feedthroughs, and should not be installed in high risk areas such as wing leading edges, engine shrapnel path, etc.

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Table 3-1. Interconnect Information (cont)

PILOT'S VERTICAL GYRO
VG-14A

IO BP	Description		Connector Pin			Connects To
	TEST POINT		1J1-A		-----NC	
	POWER GND		-B	(22)	---------S-T-S-------	AC GND
	115 V AC, 400 HZ INPUT		-C	(22)	---------S-T-S------- GND GND	FIG. 4-8
	27 V DC OUTPUT		-D	(24)	---------------------	1J1-P
	26 V AC, 400 HZ OUTPUT (55 VA MAX)		-E		-----NC	
	5V, 400 HZ OUTPUT		-F		-----NC	
	EXTERNAL PECO CONTROL GND		-G		-----NC	
	RECO CONTROL		-H	(24)	---------------------	JUMPER
	RECO CONTROL		-J	(24)	---------------------	JUMPER
	PECO CONTROL		-K		-----NC	
	CHASSIS GND		-L		-----NC	
	PECO CONTROL		-M		-----NC	
	ATTITUDE VALID	NC	-N		-----NC	
	ATTITUDE VALID	W	-P	(24)	---------------------	1J1-D
	ATTITUDE VALID	NO	-R	(24)	---------S---S------- GND GND	190J1A-76, C190J1B-76
	SPARE		-S			
	SPARE		-T			
	SPARE		-U			
	EXTERNAL FAST ERECT CMD		-V	(24)	---------------------	FIG. 4-17
	SPARE		-W			
	SPARE		-X			
	SPARE		-Y			
	SPARE		-Z			
	SPARE		-a			
	SPARE		-b			
	TEST POINT		-c			
	TEST POINT		-d			
	SPARE		-e			
	SPARE		-f			
	SPARE		-g			
	SPARE		-h			
	SPARE		-i			
	SPARE		1J1-j			

NOTE: CONNECTIONS SHOWN FOR VG-14A CONNECTOR POINTING AFT.

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Table 3-1. Interconnect Information (cont)

PILOT'S VERTICAL GYRO
VG-14A

IO BP	Description		Connector Pin			Connects To
	RECO GND OUTPUT >6° OUTPUT		1J1-k		-----NC	
	PECO GND OUTPUT		-m		-----NC	
	EXTERNAL RECO CONTROL		-n		-----NC	
	ROLL ATTITUDE Y	X	-p	(24)	---------S-T-S-------	190J1A-85, C190J1B-85
	ROLL ATTITUDE Y		-q	(24)	---------S-T-S-------	190J1A-86, C190J1B-86
	ROLL ATTITUDE Y	Z	-r	(24)	---------S-T-S------- GND GND	190J1A-87, C190J1B-87
		C	-s		-----NC	
	ROLL TO F/D	C	-t		-----NC	
		H	-u		-----NC	
	ROLL TO RADAR 50 MV/DEG	H	-v	(24)	---------S-T-S-------	59J1-M
	ROLL TO RADAR 50 MV/DEG	C	-w	(24)	---------S-T-S------- GND GND	59J1-N
	PITCH ATTITUDE	X	-x	(24)	---------S-T-S-------	190J1A-82, C190J1B-82
	PITCH ATTITUDE	Y	-y	(24)	---------S-T-S-------	190J1A-83, C190J1B-83
	PITCH ATTITUDE	Z	-z	(24)	---------S-T-S------- GND GND	190J1A-84, C190J1B-84
		C	-AA		-----NC	
	PITCH TO F/D	C	-BB		-----NC	
		H	-CC		-----NC	
	PITCH TO RADAR 50 MV/DEG	C	-DD	(24)	---------S-T-S-------	59J1-L
	PITCH TO RADAR 50 MV/DEG	H	-EE	(24)	---------S-T-S------- GND GND	59J1-K
	ATTITUDE VALID	W	-GG		-----NC	
	ATTITUDE VALID	NC	-FF			
	ATTITUDE VALID	NO	1J1-HH		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S FLUX VALVE
FX-220

```
IO
BP  Description                 Connector Pin                                       Connects To

    FV STATOR            Z        4J1-A  (24)  ---------S---S-------  5J1-A
    FV STATOR            X           -B  (24)  ---------S---S-------  5J1-B
    FV STATOR            Y           -C  (24)  ---------S---S-------  5J1-C
                                                    GND─┘    └─GND

    26V, 400 HZ          C           -D  (24)  ---------------------  AC GND
    26V, 400 HZ          H           -E  (24)  ------------.--------  6J1-S
                                  4J1-F  (24)  -----.       └-------  5J1-D
                                                    └--- 5J1-F
```

PILOT'S DUAL REMOTE COMPENSATOR
CS-412

```
    FROM FLUX VALVE      Z        5J1-A  (24)  ---------S---S-------  4J1-A
    FROM FLUX VALVE      X           -B  (24)  ---------S---S-------  4J1-B
    FROM FLUX VALVE      Y           -C  (24)  ---------S---S-------  4J1-C
                                                    GND─┘    └─GND
    26V, 400 HZ                      -D  (24)  ------------.--------  6J1-S
                                                            └-------  4J1-E

    PWR GND                          -E  (24)  ---------------------  AC GND
    SHIELD GND                       -F  (24)  ---------------------  4J1-F
    SPARE                            -G
    FLUX VALVE OUTPUT    X           -H  (24)  ---------S---S-------  6J1-R
    FLUX VALVE OUTPUT    Y           -J  (24)  ---------S---S-------  6J1-N
    FLUX VALVE OUTPUT    Z           -K  (24)  ---------S---S-------  6J1-P
                                                    GND─┘    └─GND

    CHASSIS GND                      -L        -----NC
    SPARE                            -M
    SPARE                            -N
    SPARE                            -P
    SPARE                            -R
    SPARE                            -S
    SPARE                            -T
    SPARE                            -U
    SPARE                         5J1-V
```


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Table 3-1. Interconnect Information (cont)

PILOT'S DIRECTIONAL GYRO
C-140

IO BP	Description		Connector Pin			Connects To
	AC POWER GND		6J1-A	(22)	---------------------	AC GND
	28 V DC GND		-B	(22)	---------------------	DC GND
	+28 V DC INPUT		-C	(22)	---------------------	FIG. 4-6
			-D			
	FREE SLAVE SW	(+)	-E	(24)	---------------------	FIG. 4-17
			-F			
	FREE SLAVE SW	(-)	-G	(24)	---------------------	FIG. 4-17
	HDG NO. 1 ROTOR 26V	H	-H	(22)	---------S-T-S-------	FIG. 4-8
	400HZ				| | |	
	HDG NO. 1 ROTOR 26V	C	-J	(22)	---------S-T-S-------	AC GND
	400HZ				GND┘ └GND	
	HDG NO. 1 STATOR	Z	-K	(24)	---------S-T-S-------	C190J1B-90
	HDG NO. 1 STATOR	X	-L	(24)	---------S-T-S-------	C190J1B-88
	HDG NO. 1 STATOR	Y	-M	(24)	---------S-T-S-------	C190J1B-89
					GND┘ └GND	
	FLUX VALVE	Y	-N	(24)	---------S-T-S-------	5J1-J
	FLUX VALVE	Z	-P	(24)	---------S-T-S-------	5J1-K
	FLUX VALVE	X	-R	(24)	---------S-T-S-------	5J1-H
					GND┘ └GND	
	26 V AC FLUX VALVE	EX	-S	(24)	-----------●---------	4J1-E
	115 V AC OUT		-T		|---------	5J1-D
	ANNUNCIATOR	+	-U	(24)	---------------------	190J1B-55
	ANNUNCIATOR	-	-V	(24)	---------------------	190J1B-56
	5 V AC OUTPUT		-W			
	HDG NO. 2 ROTOR 26 V	H	-X	(22)	---------S-T-S-------	FIG. 4-8
	400 HZ				| | |	
	HDG NO. 2 ROTOR 26 V	C	-Y	(22)	---------S-T-S-------	AC GND
	400 HZ				GND┘ | └GND	
					|	
	HDG NO. 2 STATOR	Z	-Z	(24)	---------S-T-S-------	190J1A-90
	(ANTI BACKLASH)				| | |	
	HDG NO. 2 STATOR	X	-a	(24)	---------S-T-S-------	190J1A-88
	(ANTI BACKLASH)				| | |	
	HDG NO. 2 STATOR	Y	6J1-b	(24)	---------S-T-S-------	190J1A-89
	(ANTI BACKLASH)				GND┘ └GND	

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Table 3-1. Interconnect Information (cont)

PILOT'S DIRECTIONAL GYRO
C-140

IO BP	Description		Connector Pin			Connects To
	INTERLOCK NO. 1	NC	6J1-c			
	INTERLOCK NO. 1	NO	-d		-----NC	
	INTERLOCK NO. 1	C	-e		-----NC	
	FLUX VALVE SHIELD		-f			
	CHASSIS GND	-g				
	INTERLOCK NO. 2	C	-h	(24)	---------------------	190J1A-77, C190J1B-77
	INTERLOCK NO. 2	NC	-I			
	INTERLOCK NO. 2	NO	-j	(24)	---------------------	FIG. 4-6
	26 V AC OUTPUT	H	-k		-----NC	
	42 VA MAX				LH	
	SYNC SWITCH	.	-m	(24)	-----------------▼	MANUAL SYNC
	SYNC SWITCH	W	-n	(24)	------------o	SWITCH S3
	SYNC SWITCH	+	-p	(24)	-----------------▲	
	FREQUENCY/PHASE LOCK		-q		RH	
	SPARE		-r			
	SPARE		-s			
	SPARE		6J1-t			

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Table 3-1. Interconnect Information (cont)

PILOT'S MODE SELECTOR
MS-560

IO BP	Description	Connector Pin			Connects To
	LHGT/MODE GND	8J1-1	(22)	---------------------	DC PWR GND
	28 V MODE ANN PWR	-2	(22)	---------------------	FIG. 4-6
	HDG SEL	-3	(24)	---------------------	115J1-47
	NAV SEL	-4	(24)	---------------------	115J1-48
	APR SEL	-5	(24)	---------------------	115J1-49
	VNAV SEL	-6	(24)	---------------------	115J1-56
	ALT HOLD SEL	-7	(24)	---------------------	115J1-57
	VS SEL	-8	(24)	---------------------	115J1-58
	IAS SEL	-9	(24)	---------------------	115J1-60
	HDG ANN GND	-10	(24)	---------------------	190J2A-106
	NAV ANN GND	-11	(24)	---------------------	190J2A-105
	APR ANN GND	-12	(24)	---------------------	190J2A-104
	VNAV ANN GND	-13	(24)	---------------------	190J2A-100
	ALT HOLD ANN GND	-14	(24)	---------------------	190J2A-103
	VS ANN GND	-15	(24)	---------------------	190J2A-101
	IAS ANN GND	-16	(24)	---------------------	190J2A-102
	0-5 V BACKGRD LGHT	-17	(22)	---------------------	FIG. 4-7
	0-28 V BACKGRD LGHT	-18		-----NC	
	LGHT/MODE GND	-19	(22)	---------------------	DC PWR GND
	CHASSIS GND	-20		-----NC	
	BC SEL	-21	(24)	---------------------	115J1-61
	BBC ANN GND	-22	(24)	---------------------	190J1B-35
	SPARE	-23			
	SPARE	-24			
	SPARE	8J1-25			

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Table 3-1. Interconnect Information (cont)

PILOT'S MICRO AIR DATA COMPUTER (MADC)
AZ-850

IO BP	Description	Connector Pin			Connects To
	UNIT ID0 (GND/OPEN)	9J1-1	(24)	---------------------	SIGNAL GND
	UNIT ID1 (GND/OPEN)	-2	(24)	---------------------	SIGNAL GND
	UNIT ID2 (GND/OPEN)	-3		-----NC	
	UNIT ID3 (GND/OPEN)	-4	(24)	---------------------	SIGNAL GND
	UNIT ID4 (GND/OPEN)	-5		-----NC	
	UNIT ID5 (GND/OPEN)	-6		-----NC	
	UNIT ID6 (GND/OPEN)	-7		-----NC	
	SDI/1 (GND/OPEN)	-8	(24)	---------------------	SIGNAL GND
	SDI/2 (GND/OPEN)	-9		-----NC	
	SDI/3 (GND/OPEN)	-10		-----NC	
	SPARE	-11			
	WOW (GND/OPEN)	-12		---------------------	FIG. 4-12
	SIGNAL GROUND	-13	(24)	---------------------	SIGNAL GND
	SPARE	-14			
	SPARE IN 1 (GND/OPEN)	-15			
	MB/IN HG	-16	(24)	---------------------	190J2B-20
	SPARE IN 3 (GND/OPEN)	-17			
	SPARE IN 4 (GND/OPEN)	-18			
	SPARE IN 1 (28 V DC/OPEN)	-19			
	SPARE IN 2 (28 V DC/OPEN) > 34,250 FT PALT TRIP(GND/OPEN)	-20			
		-21		-----NC	
	SPARE OUT 2	-22			
	SPARE OUT 3	-23			
	SPARE OUT 4	-24			
	SPARE OUT 5	-25			
	+28 V DC POWER	-26	(22)	---------------------	FIG. 4-6
	+28 V DC POWER RETURN	-27	(22)	---------------------	DC POWER GND
	OVERSPEED WARNING DISC(GND/OPEN)	-28		---------------------	FIG. 4-15
	MADC VALID DISC (GND/OPEN)	9J1-29		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S MICRO AIR DATA COMPUTER (MADC)
AZ-850

IO BP	Description		Connector Pin			Connects To
	ASCB #1 PRI	(H)	9J1-30		-----NC	
	TEMP PROBE	(H)	-31	(24)	---------S-T-S-------	500 OHM
	TEMP PROBE	(L)	-32	(24)	---------S-T-S-------	TEMP. PROBE
					GND GND	
	SPARE		-33			
	ASCB #1 PRI	(L)	-34		-----NC	
	AOA HI		-35		-----NC	
	AOA ARM		-36		-----NC	
	AOA LO		-37		-----NC	
	CALIBRATION ENABLE (GND/OPEN)		-38		-----NC	
	SPARE		-40			
	SPARE		-41			
	ATC SELECT (GND/OPEN)		-42		-----NC	
	ATC A1		-43		-----NC	
	ATC A2		-44		-----NC	
	ATC A4		-45		-----NC	CONNECT
	ATC B1		-46		-----NC	FOR TRANSPONDERS
	ATC B2		-47		-----NC	REQUIRING ENCODED
	ATC B4		-48		-----NC	ALTITUDE
	ATC C1		-49		-----NC	(USE 24 AWG WIRE)
	ATC C2		-50		-----NC	
	ATC C4		-51		-----NC	
	ATC D4		-52		-----NC	
	SPARE		-53			
	SPARE		-54			
	RS-232 DATA RCVR		-55		---------------------	NC
	RS-232 COMMON		-56		---------------------	NC
	RS-232 DATA XMTR		-57		---------------------	NC
	VMO SELECT (GND/OPEN)		-58		-----NC	
	ASCB #1 BU	(H)	-59		-----NC	
	DADC DATA	(H)	-60	(24)	---------------------	190J2B-23(59J1-43, P880 ONLY)
	A-429 XMTR (#1)	(L)	-61	(24)	---------------------	190J2B-24(59J1-44, P-880 ONLY)
	ASCB #2 BU	(L)	-62		-----NC	
	DADC DATA	(H)	9J1-63	(24)	---------------------	C190J2A-43

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Table 3-1. Interconnect Information (cont)

PILOT'S MICRO AIR DATA COMPUTER (MADC)
AZ-850

IO BP	Description		Connector Pin			Connects To
	A-429 XMTR (#2)	(L)	9J1-64	(24)	---------------------	C190J2A-44
	ASCB #2 PRI	(H)	-65		-----NC	
	DADC DATA	(H)	-66		-----NC	
	A-429 XMTR (#3)	(L)	-67		-----NC	
	DADC DATA	(H)	-68		-----NC	
	A-429 XMTR (#4)	(L)	-69		-----NC	
	FUNCTIONAL TEST		-70		---------------------	FIG. 4-16
	BARO STD SYNC		-71	(24)	---------------------	130J1-46
	SSEC DISABLE		-72		-----NC	
	SPARE		-73			
	BARO-CORRECTION BO		-74	(24)	---------------------	130J1-21
	BARO-CORRECTION B1		-75	(24)	---------------------	130J1-25
	SPARE		-76		-----NC	
	ASCB #2 PRI	(L)	-77		-----NC	
	SPARE		-78			
	SPARE		9J1-79			

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Table 3-1. Interconnect Information (cont)

AUTOPILOT CONTROLLER
PC-400

IO BP	Description		Connector Pin			Connects To
	-15 V DC (TURN KNOB REF)		11J1-A	(24)	---------S---S-------	190J2B-60, 17J1-5
	(TURN KNOB OUT OF DET)		-B	(24)	---------S---S------- GND GND	190J2B-73
	+15 V DC (TURN KNOB REF)		-C	(24)	---------------------	190J2B-59, 17J1-1
	SIGNAL GND		-D	(24)	---------------------	SIGNAL GND
	TK DETENT		-F	(24)	---------------------	FIG. 4-6, IC-600 SERVO PWR
	DETENT SWITCH	(NO)	-G		-----NC	
	DETENT SWITCH	(NC)	-H	(24)	---------------------	190J2B-75, C190J2B-75
	0-28 V DC/AC LHTNG		-J		-----NC	
	AP ENG SEL		-L	(24)	---------------------	190J2B-85
	YD ENG SEL		-M	(24)	---------------------	190J2B-83
	AP ENG ANN		-P	(24)	---------------------	190J2B-86
	YD ENG ANN		-R	(24)	---------------------	190J2B-84
	TRIM UP ANN		-S	(24)	---------------------	190J2B-81
	TRIM DN ANN		-T	(24)	---------------------	190J2B-82
	PITCH WHL	+	-U	(24)	---------S-T-S-------	190J2B-68, C190J2B-68
	PITCH WHL	-	-V	(24)	---------S-T-S------- GND GND	190J2B-69, C190J2B-69
	LOW BANK ANN		-W	(24)	---------------------	190J2A-98, C190J2A-98
	LOW BANK SEL		-X	(24)	---------------------	190J2B-56, C190J2B-56
	SPARE		-Y			
	SPARE		11J1-Z			

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Table 3-1. Interconnect Information (cont)

AUTOPILOT CONTROLLER
PC-400

IO BP	Description		Connector Pin			Connects To
	-15 V DC (TURN KNOB REF)		11J1-A	(24)	---------S---S-------	190J2B-60, 17J1-5
	(TURN KNOB OUT OF DET)		-B	(24)	---------S---S------- GND GND	190J2B-73
	+15 V DC (TURN KNOB REF)		-C	(24)	---------------------	190J2B-59, 17J1-1
	SIGNAL GND		-D	(24)	---------------------	SIGNAL GND
	TK DETENT		-F	(24)	---------------------	FIG. 4-6, IC-600 SERVO PWR
	DETENT SWITCH	(NO)	-G		-----NC	
	DETENT SWITCH	(NC)	-H	(24)	---------------------	190J2B-75, C190J2B-75
	0-28 V DC/AC LHTNG		-J		-----NC	
	AP ENG SEL		-L	(24)	---------------------	190J2B-85
	YD ENG SEL		-M	(24)	---------------------	190J2B-83
	AP ENG ANN		-P	(24)	---------------------	190J2B-86
	YD ENG ANN		-R	(24)	---------------------	190J2B-84
	TRIM UP ANN		-S	(24)	---------------------	190J2B-81
	TRIM DN ANN		-T	(24)	---------------------	190J2B-82
	PITCH WHL	+	-U	(24)	---------S-T-S-------	190J2B-68, C190J2B-68
	PITCH WHL	-	-V	(24)	---------S-T-S------- GND GND	190J2B-69, C190J2B-69
	LOW BANK ANN		-W	(24)	---------------------	190J2A-98, C190J2A-98
	LOW BANK SEL		-X	(24)	---------------------	190J2B-56, C190J2B-56
	SPARE		-Y			
	SPARE		11J1-Z			

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Table 3-1. Interconnect Information (cont)

AUTOPILOT CONTROLLER PC-400

IO BP	Description		Connector Pin			Connects To
	-15 V DC (TURN KNOB REF)		11J1-A	(24)	---------S---S-------	190J2B-60, 17J1-5
	(TURN KNOB OUT OF DET)		-B	(24)	---------S---S------- GND GND	190J2B-73
	+15 V DC (TURN KNOB REF)		-C	(24)	---------------------	190J2B-59, 17J1-1
	SIGNAL GND		-D	(24)	---------------------	SIGNAL GND
	TK DETENT		-F	(24)	---------------------	FIG. 4-6, IC-600 SERVO PWR
	DETENT SWITCH	(NO)	-G		-----NC	
	DETENT SWITCH	(NC)	-H	(24)	---------------------	190J2B-75, C190J2B-75
	0-28 V DC/AC LHTNG		-J		-----NC	
	AP ENG SEL		-L	(24)	---------------------	190J2B-85
	YD ENG SEL		-M	(24)	---------------------	190J2B-83
	AP ENG ANN		-P	(24)	---------------------	190J2B-86
	YD ENG ANN		-R	(24)	---------------------	190J2B-84
	TRIM UP ANN		-S	(24)	---------------------	190J2B-81
	TRIM DN ANN		-T	(24)	---------------------	190J2B-82
	PITCH WHL	+	-U	(24)	---------S-T-S-------	190J2B-68, C190J2B-68
	PITCH WHL	-	-V	(24)	---------S-T-S------- GND GND	190J2B-69, C190J2B-69
	LOW BANK ANN		-W	(24)	---------------------	190J2A-98, C190J2A-98
	LOW BANK SEL		-X	(24)	---------------------	190J2B-56, C190J2B-56
	SPARE		-Y			
	SPARE		11J1-Z			

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Table 3-1. Interconnect Information (cont)

AUTOPILOT CONTROLLER
PC-400

IO BP	Description	Connector Pin		Connects To
	SPARE	11J1-a		
	SPARE	-b		
	SPARE	-c		
	SPARE	-d		
	SPARE	-e		
	SPARE	-f		
	0-5 DC/AC LHTNG	-g	(22) ---------------------	FIG. 4-7
	SPARE	-h		
	SPARE	-i		
	CHASSIS GND	-j	-----NC	
	SPARE	-k		
	0-28 V DC ANN LHTNG	-m	(22) ---------------------	FIG. 4-6
	LIGHTING RTN	-n	(22) ---------------------	DC GND
	SPARE	-p		
	SPARE	-q		
	SPARE	-r		
	SPARE	-s		
	SPARE	11J1-t		

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Table 3-1. Interconnect Information (cont)

AILERON SERVO
SM-200

IO BP	Description	Connector Pin			Connects To
	MOTOR INPUT(CCW DRUM + ROTATION)	12J1-A	(20)	---------S-T-S-------	190J2B-102
	MOTOR INPUT(CCW DRUM - ROTATION)	-B	(20)	---------S-T-S------- GND GND	190J2B-101
	SERVO POWER GND	-C		-----NC	
	POSITION SYNCHRO EXC H 26 V AC, 400 HZ	-D		-----NC	
	POSITION SYNCHRO EXC C 26 V AC, 400 HZ	-E		-----NC	
		-F		---------------------	190J2B-88, 190J2B-89, 115J1-27, 13J1-F
	CLUTCH EXCITATION	-G		-----NC	
	CLUTCH EXCITATION	-H		-----NC	
		-J		---------------------	DC PWR GND
	TACH SHIELD	-K			
	TACHOMETER OUTPUT + (CCW DRUM ROTATION)	-L	(24)	---------S-T-S-------	190J2B-100
	TACHOMETER OUTPUT - (CCW DRUM ROTATION)	-N	(24)	---------S-T-S------- GND GND	190J2B-99
	POSITION SYNCHRO X OUTPUT	-P		-----NC	
	POSITION SYNCHRO Y OUTPUT	-R		-----NC	
	POSITION SYNCHRO Z OUTPUT	-S		-----NC	
	SPARE	-M			
	SPARE	-T			
	SPARE	-U			
	SPARE	12J1-V			

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Table 3-1. Interconnect Information (cont)

AILERON SERVO
SM-200

IO BP	Description	Connector Pin			Connects To
	MOTOR INPUT(CCW DRUM + ROTATION)	12J1-A	(20)	---------S-T-S-------	190J2B-102
				| | |	
	MOTOR INPUT(CCW DRUM - ROTATION)	-B	(20)	---------S-T-S-------	190J2B-101
				GND┘ └GND	
	SERVO POWER GND	-C		-----NC	
	POSITION SYNCHRO EXC H 26 V AC, 400 HZ	-D		-----NC	
	POSITION SYNCHRO EXC C 26 V AC, 400 HZ	-E		-----NC	
		-F		---------------------	190J2B-88, 190J2B-89, 115J1-27, 13J1-F
	CLUTCH EXCITATION	-G		-----NC	
	CLUTCH EXCITATION	-H		-----NC	
		-J		---------------------	DC PWR GND
	TACH SHIELD	-K			
	TACHOMETER OUTPUT + (CCW DRUM ROTATION)	-L	(24)	---------S-T-S-------	190J2B-100
				| | |	
	TACHOMETER OUTPUT - (CCW DRUM ROTATION)	-N	(24)	---------S-T-S-------	190J2B-99
				GND┘ └GND	
	POSITION SYNCHRO X OUTPUT	-P		-----NC	
	POSITION SYNCHRO Y OUTPUT	-R		-----NC	
	POSITION SYNCHRO Z OUTPUT	-S		-----NC	
	SPARE	-M			
	SPARE	-T			
	SPARE	-U			
	SPARE	12J1-V			

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Table 3-1. Interconnect Information (cont)

ELEVATOR SERVO
SM-200

IO BP	Description	Connector Pin			Connects To
	MOTOR INPUT(CCW DRUM + ROTATION)	13J1-A	(20)	---------S-T-S-------	190J2B-106
	MOTOR INPUT(CCW DRUM - ROTATION)	-B	(20)	---------S-T-S------- GND GND	190J2B-105
	SERVO POWER GND	-C		-----NC	
	POSITION SYNCHRO EXC H 26 V AC, 400 HZ	-D		-----NC	
	POSITION SYNCHRO EXC C 26 V AC, 400 HZ	-E		-----NC	
	CLUTCH EXCITATION	-F	(22)	---------------------	190J2B-88, 190J2B-89, 115J1-27, 12J1-F
		-G	(22)	---------------------	DC PWR GND
		-H		-----NC	
		-J		-----NC	
	TACH SHIELD	-K			
	TACHOMETER OUTPUT + (CCW DRUM ROTATION)	-L	(24)	---------S-T-S-------	190J2B-104
	TACHOMETER OUTPUT - (CCW DRUM ROTATION)	-N	(24)	---------S-T-S------- GND GND	190J2B-103
	POSITION SYNCHRO X OUTPUT	-P		-----NC	
	POSITION SYNCHRO Y OUTPUT	-R		-----NC	
	POSITION SYNCHRO Z OUTPUT	-S		-----NC	
	SPARE	-M			
	SPARE	-T			
	SPARE	-U			
	SPARE	13J1-V			

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Table 3-1. Interconnect Information (cont)

RUDDER SERVO
SM-200

IO BP	Description	Connector Pin			Connects To
	MOTOR INPUT(CCW DRUM + ROTATION)	14J1-A	(20)	---------S-T-S-------	190J2B-98
	MOTOR INPUT(CCW DRUM {- ROTATION)	-B	(20)	---------S-T-S------- GND GND	190J2B-97
	SERVO POWER GND	-C		-----NC	
	POSITION SYNCHRO EXC H 6 V AC, 400 HZ	-D		-----NC	
	POSITION SYNCHRO EXC C 6 V AC, 400 HZ	-E		-----NC	
		-F	(22)	---------------------	190J2B-87
		-G		-----NC	
	CLUTCH EXCITATION	-H		-----NC	
		-J	(22)	---------------------	DC PWR GND
	TACH SHIELD	-K			
	TACHOMETER OUTPUT + CCW DRUM ROTATION)	-L	(24)	---------S-T-S-------	190J2B-96
	TACHOMETER OUTPUT - CCW DRUM ROTATION)	-N	(24)	---------S-T-S------- GND GND	190J2B-95
	POSITION SYNCHRO X OUTPUT	-P		-----NC	
	POSITION SYNCHRO Y OUTPUT	-R		-----NC	
	POSITION SYNCHRO Z OUTPUT	-S		-----NC	
	SPARE	-M			
	SPARE	-T			
	SPARE	-U			
	SPARE	14J1-V			

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Table 3-1. Interconnect Information (cont)

YAW RATE GYRO
RG-204

IO BP	Description		Connector Pin			Connects To
	26 V AC, 400HZ		15J1-1	(22)	----------S-T-S-------	FIG. 4-8
	POWER GND		-2	(22)	----------S-T-S------- GND GND	AC GND
	CHASSIS GND		-3		-----NC	
	RATE OF TURN (RT TURN)	+	-4	(24)	----------S-T-S-------	190J1B-54, 190J1A-105
	RATE OF TURN (RT TURN)	-	-5	(24)	----------S-T-S------- GND GND	190J1B-53, 190J1A-104
	RATE OF TURN VALID (4.5V)	-	-6	(24)	---------------------	DC GND
	RATE OF TURN VALID (4.5V)	+	15J1-7	(24)	----------S----------- GND	190J1B-52

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Table 3-1. Interconnect Information (cont)

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Table 3-1. Interconnect Information (cont)

PILOT'S NORMAL ACCELEROMETER
AG-222

IO BP	Description	Connector Pin			Connects To
	+15 V DC POWER	17J1-1	(24)	----------------------	190J2B-59
	OUTPUT 1.5V/G	-2	(24)	----------------------	190J2B-64
	ACCEL RTN	-3	(24)	----------------------	190J2A-53, 190J2A-61
	+15 V DC POWER	-1	(24)	---------S-T-S-------	190J2B-59, 11J1-C
	-15 V DC POWER	-5	(24)	---------S-T-S------- GND	190J2B-60, 11J1-A
	TEST	17J1-6		-----NC	

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Table 3-1. Interconnect Information (cont)

REMOTE INSTRUMENT CONTROLLER
RI-553

IO BP	Description	Connector Pin			Connects To
	COURSE SET COMM	23J1-1	(24)	---------S-T-S-------	115J1-11
	COURSE SET 1	-2	(24)	---------S-T-S-------	115J1-9
	COURSE SET 2	-3	(24)	---------S-T-S-------	115J1-10
				GND GND	
	COURSE PUSH TO SYNC	-4	(24)	--------------------	115J1-78
	SPARE	-5			
	SPARE	-6			
	HDG SET COMM	-7	(24)	---------S-T-S-------	115J1-17, C115J1-17
	HDG SET 1	-8	(24)	---------S-T-S-------	115J1-15, C115J1-15
	HDG SET 2	-9	(24)	---------S-T-S-------	115J1-16, C115J1-16
				GND GND	
	HDG PUSH TO SYNC	-10	(24)	--------------------	115J1-79, C115J1-79
	SPARE	-11			
	SPARE	-12			
	COURSE SET COMM	-13	(24)	---------S-T-S-------	C115J1-11
	COURSE SET 1	-14	(24)	---------S-T-S-------	C115J1-9
	COURSE SET 2	-15	(24)	---------S-T-S-------	C115J1-10
				GND GND	
	COURSE PUSH TO SYNC	-16	(24)	--------------------	C115J1-78
	SPARE	-17			
	SPARE	-18			
	SPARE	-19			
	SPARE	-20			
	SPARE	-21			
	SPARE	-22			
	SPARE	-23			
	SPARE	-24			
	SPARE	-25			
	SPARE	-26			
	SPARE	-27			
	SPARE	-28			
	0-5 V BACKGRD LGHT	23J1-29	(24)	--------------------	FIG. 4-7

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Table 3-1. Interconnect Information (cont)

REMOTE INSTRUMENT CONTROLLER
RI-553

IO BP	Description	Connector Pin			Connects To
	SPARE	23J1-30			
	0-28 V BACKGRD LGHT	-31		-----NC	
	SPARE	-32			
	LIGHTING GND	-33	(22)	---------------------	DC GND
	SPARE	-34			
	CHASSIS GND	-35		-----NC	
	SPARE	-36			
	SPARE	23J1-37			

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Table 3-1. Interconnect Information (cont)

WU-660/880 RECEIVER-TRANSMITTER ANTENNA

IO BP	Description		Connector Pin			Connects To
(O)	LEFT WXPD BUS	(P)	59J1-1	(24)	---------S-T-S-------	FIG. 4-22
(O)	LEFT WXPD BUS	(N)	-2	(24)	---------S-T-S-------	FIG. 4-22
					GND┘ └GND	
(O)	CENTER WXPD BUS	(P)	-3	(24)	-----NC	
(O)	CENTER WXPD BUS	(N)	-4	(24)	-----NC	
(O)	RIGHT WXPD BUS	(P)	-5	(24)	---------S-T-S-------	FIG. 4-23
(O)	RIGHT WXPD BUS	(N)	-6	(24)	---------S-T-S-------	FIG. 4-23
					GND┘ └GND	
(O)	453 OUT	HI	-7	(24)	-----NC	
(O)	453 OUT	HI	-8	(24)	-----NC	
	RESERVED		-9		-----NC	
(O)	SUPPRESSION PULSE		-10	(22)	-----NC	
(I)	REMOTE ON		-11	(22)	---------------------	61J1-R
	RESERVED		-12		-----NC	
(P)	+27.5 V DC PRIMARY POWER		-13	(22)	---------------------	FIG. 4-6
(P)	+27.5 V DC PRIMARY POWER		-14	(22)	---------------------	FIG. 4-6
(P)	POWER GROUND		-15	(22)	---------------------	DC PWR GND
(P)	POWER GROUND		-16	(22)	---------------------	DC PWR GND
	PROGRAM GROUND		-17		-----NC	
(I)	STAB REFERENCE COMMON		-18	(22)	-----NC	
(I)	26 V STAB REFERENCE	HI	-19	(22)	-----NC	
	RESERVED		-20		-----NC	
(I)	115 V STAB REFERENCE	HI	-21	(22)	-----NC	
(I)	429 AHRS #1 A		-22	(24)	---------S-T-S-------	AHRS #1
(I)	429 AHRS #1 B		-23	(24)	---------S-T-S-------	AHRS #1
					GND┘ └GND	
(I)	429 CONTROL 1 A		-24	(24)	-----NC	
(I)	429 CONTROL 1 B		-25	(24)	-----NC	
(I)	429 CONTROL 2 A		-26	(24)	-----NC	
(I)	429 CONTROL 2 B		-27	(24)	-----NC	
(I)	429 CONTROL 3 A		-28	(24)	-----NC	
(I)	429 CONTROL 3 B		59J1-29	(24)	-----NC	

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Table 3-1. Interconnect Information (cont)

WU-660/880 RECEIVER-TRANSMITTER ANTENNA

IO BP	Description		Connector Pin			Connects To
(O)	LEFT EFIS SCI BUS	(P)	59J1-30	(24)	---------S-T-S-------	190J2A-17
(O)	LEFT EFIS SCI BUS	(N)	-31	(24)	---------S-T-S-------	190J2A-18
					GND┘ └GND	
(O)	RIGHT EFIS SCI BUS	(P)	-32	(24)	---------S-T-S-------	C90J2A-17
(O)	RIGHT EFIS SCI BUS	(N)	-33	(24)	---------S-T-S-------	C90J2A-18
					GND┘ └GND	
	RESERVED		-34		-----NC	
	RESERVED		-35		-----NC	
	RESERVED		-36		-----NC	
	PROGRAM GROUND		-37		-----NC	
	RESERVED		-38		-----NC	
	RESERVED		-39		-----NC	
	RESERVED		-40		-----NC	
	RESERVED		-41		-----NC	
	RESERVED		-42		-----NC	
(I)	429 AIR DATA IN A		-43	(24)	---------S-T-S-------	9J1-60 (P-880 ONLY)
(I)	429 AIR DATA IN B		-44	(24)	---------S-T-S-------	9J1-61 (P-880 ONLY)
					GND┘ └GND	
(I)	429 AHRS #2 A		-45	(24)	---------S-T-S-------	AHRS #2 (opt)
(I)	429 AHRS #2 B		-46	(24)	---------S-T-S-------	AHRS #2 (opt)
					GND┘ └GND	
(I)	429 SPARE 2 IN A		-47		-----NC	
(I)	429 SPARE 2 IN B		-48		-----NC	
(I)	429 CAIMS IN A		-49	(24)	-----NC	
(I)	429 CAIMS IN B		-50	(24)	-----NC	
(O)	429 CAIMS OUT A		-51	(24)	-----NC	
(O)	429 CAIMS OUT B		-52	(24)	-----NC	
(O)	429 SPARE 1 OUT A		-53		-----NC	
(O)	429 SPARE 1 OUT B		-54		-----NC	
(O)	429 SPARE 2 OUT A		-55		-----NC	
(O)	429 SPARE 2 OUT B		-56		-----NC	
	SPARE 0 DISCRETE		-57		-----NC	
	SPARE 1 DISCRETE		-58		-----NC	
	SPARE 2 DISCRETE		-59		-----NC	
(I)	API DISABLE (NO)		-60	(22)	---------------------	GND
(I)	STAB TRIM ENABLE	(NO)	-61	(22)	-----NC	
	RESERVED		-62		-----NC	
	RESERVED		59J1-63		-----NC	

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Table 3-1. Interconnect Information (cont)

WU-660/880 RECEIVER-TRANSMITTER ANTENNA

IO BP	Description		Connector Pin			Connects To
(I)	PARALLEL ALTITUDE	B2	59J1-64	(22)	-----NC	
(I)	PARALLEL ALTITUDE	B1	-65	(22)	-----NC	
(I)	PARALLEL ALTITUDE	A4	-66	(22)	-----NC	
(I)	PARALLEL ALTITUDE	A2	-67	(22)	-----NC	
(I)	PARALLEL ALTITUDE	A1	-68	(22)	-----NC	
(I)	PARALLEL ALTITUDE	D4	-69	(22)	-----NC	
	RESERVED		-70		-----NC	
(B)	LEFT SCI BUS	(P)	-71	(24)	---------S-T-S-------	61J1-A
(B)	LEFT SCI BUS	(N)	-72	(24)	---------S-T-S-------	61J1-B
					GND GND	
(B)	RIGHT SCI BUS	(P)	-73	(24)	-----NC	
(B)	RIGHT SCI BUS	(N)	-74	(24)	-----NC	
(B)	RS232 IN		-75	(24)	-----NC	
(B)	RS232 OUT		-76	(24)	-----NC	
	FACTORY PROGRAM MODE		-77		-----NC	
(I)	ANALOG A/S SIGNAL		-78	(24)	-----NC	
(I)	ANALOG A/S RETURN		-79	(24)	-----NC	
(I)	ANALOG A/S REFERENCE		-80	(24)	-----NC	
(I)	ANALOG A/S REFERENCE RTN		-81	(24)	-----NC	
(I)	ANALOG ALTITUDE SIGNAL		-82	(24)	-----NC	
(I)	ANALOG ALTITUDE RETURN		-83	(24)	-----NC	
	FACTORY TEST 1		-84		-----NC	
(I)	ALT/AIR/STAB CONFIG	0	-85	(22)	---------------------	SIGNAL GND
(I)	ALT/AIR STAB CONFIG	1	-86	(22)	-----NC	
(I)	ALT/AIR STAB CONFIG	2	-87	(22)	-----NC	
(I)	ALT/AIR STAB CONFIG	3	-88	(22)	-----NC	
(I)	200 MV/DEGREE STAB	(NO)	-89	(22)	-----NC	
(I)	WEIGHT ON WHEELS	(NO)	-90	(22)	---------------------	WOW (P-880 ONLY)
(I)	SCI/708 ENABLE 0	(NO)	-91	(22)	-----NC	
(I)	SCI/708 ENABLE 1	(NO)	-92	(22)	-----NC	
(I)	ANALOG A/S SELECT		-93	(22)	-----NC	
(I)	453 DATA ENABLE	(NO)	59J1-94	(22)	-----NC	

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Table 3-1. Interconnect Information (cont)

WU-660/880 RECEIVER-TRANSMITTER ANTENNA

IO BP	Description		Connector Pin		Connects To
(I)	TEST FAULTS (NO)		59J1-95 (22)	---------------------	SIGNAL GND FOR TEXT DEFAULTS
(I)	ANTENNA SIZE 0		-96 (22)	-----NC	
(I)	ANTENNA SIZE 1		-97 (22)	-----NC	
(I)	ANTENNA SIZE 2		-98 (22)	-----NC	
	RESERVED		-99	-----NC	
(I)	PITCH STAB INPUT	HI	-100 (24)	-----NC	
(I)	PITCH STAB INPUT	LO	-101 (24)	-----NC	
(I)	ROLL STAB INPUT	HI	-102 (24)	-----NC	
(I)	ROLL STAB INPUT	LO	-103 (24)	-----NC	
	FACTORY TEST 2		59J1-104	-----NC	

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Table 3-1. Interconnect Information (cont)

WC-660/880 RADAR CONTROLLER

IO BP	Description	Connector Pin			Connects To
(B)	SCI BUS (P)	61J1-A	(24)	---------S-T-S-------	59J1-71 (RTA)
(B)	SCI BUS (N)	-B	(24)	---------S-T-S-------	59J1-72 (RTA)
	SCI BUS SHIELD	-M	(22)	---------┘ └GND	
	RESERVED	-C	(22)	-----NC	
(P)	+28 V DC	-D	(20)	---------------------	FIG. 4-6
	+28 RTN	-E	(20)	---------------------	DC PWR GND
	CHASSIS GND	-F	(20)	-----NC	
(P)	_28 V PANEL LIGHTING	-G	(20)	-----NC	
(P)	5 V PANEL LIGHTING	-H	(20)	---------------------	FIG. 4-7
(P)	PANEL COMMON	-J	(20)	---------------------	LIGHTING COMMON
(P)	ANNUNCIATOR DIM	-K	(22)	---------------------	DAY/NIGHT
(I)	RANGE UP (NO)	-L	(22)	-----NC	
(I)	RANGE DN (NO)	-N	(22)	-----NC	
(I)	WEIGHT-ON-WHEELS	-P	(22)	---------------------	FIG. 4-12
(O)	REMOTE ON	-R	(22)	---------------------	59J1-11 (RTA)
	RESERVED	-S		-----NC	
	OFF IN	-T	(22)	-----NC	
	RESERVED	61J1-U		-----NC	

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Table 3-1. Interconnect Information (cont)

WC-660/880 RADAR CONTROLLER

IO BP	Description	Connector Pin			Connects To
	RESERVED	61J2-A		-----NC	
	RESERVED	-B		-----NC	
	RESERVED	-C		-----NC	
	RESERVED	-D		-----NC	
	PWR ON (NO)	-E	(22)	-----NC	
	RESERVED	-F		-----NC	
	RESERVED	-G		-----NC	
	LX-S (NO)	-H	(22)	-----NC	
	LX (NO)	-J	(22)	-----NC	
	LX-CT (NO)	-K	(22)	-----NC	
	CP RTN	-L	(22)	-----NC	
	CP RTN	-M	(22)	-----NC	
	RESERVED	-N		-----NC	
	RESERVED	-P		-----NC	
	RESERVED	-R		-----NC	
	RESERVED	-S		-----NC	
	RESERVED	-T		-----NC	
	RESERVED	61J2-U		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY CONTROLLER
DC-550

IO BP	Description		Connector Pin			Connects To
	SIGNAL GND		115J1-1	(22)	----------------------	SIGNAL GND
	LGHTG 28 V	(H)	-2		-----NC	
	LGHTG 5 V	(H)	-3	(22)	----------------------	FIG. 4-7
	LGHTG COM		-4	(22)	----------------------	DC GND
	+28 V DC POWER		-5	(22)	----------------------	FIG. 4-6
	DC POWER GND		-6	(22)	----------------------	DC PWR GND
	#8 PUSH BUTN (HDG REV MOM)		-7	(24)	----------------------	PILOT'S HDG REV SWITCH, FIG. 4-25
	#9 PUSH BUTN (ATT REV MOM)		-8	(24)	------------------	PILOT'S ATT REV SWITCH, FIG. 4-25
	#1 SET KNOB 1		-9	(24)	---------S-T-S-------	23J1-2
	#1 SET KNOB 2	CRS	-10	(24)	---------S-T-S-------	23J1-3
	#1 SET KNOB COM		-11	(24)	---------S-T-S-------	23J1-1
					GND GND	
	#2 SET KNOB 1	MFD ALT	-12	(24)	---------S-T-S-------	131J1-21,C115J1-12 SEE FIG. 4-27 FOR 1 DU SYSTEM
	#2 SET KNOB 2	MFD ALT	-13	(24)	---------S-T-S-------	131J1-25, C115J1-13 SEE FIG. 4-27 FOR 1 DU SYSTEM
	#2 SET KNOB COM	MFD ALT	-14	(24)	---------S-T-S-------	131J1-63, C115J1-14 SEE FIG. 4-27 FOR 1 DU SYSTEM
					GND GND	
	#3 SET KNOB 1		-15	(24)	---------S-T-S-------	23J1-8, C115J1-15
	#3 SET KNOB 2	HDG	-16	(24)	---------S-T-S-------	23J1-9, C115J1-16
	#3 SET KNOB COM		-17	(24)	---------S-T-S-------	23J1-7, C115J1-17
					GND GND	
	#4 SET KNOB 1		-18		-----NC	
	#4 SET KNOB 2		-19		-----NC	
	#4 SET KNOB COM		-20		-----NC	
	#5 SET KNOB 1		-21	(24)	-----------T-S-------	NC
	#5 SET KNOB 2		-22	(24)	-----------T-S-------	NC
	#5 SET KNOB COM		115J1-23	(24)	-----------T-S-------	NC
					GND	

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY CONTROLLER
DC-550

IO BP	Description		Connector Pin			Connects To
	#6 SET KNOB 1		115J1-24	(24)	---------S-T-S-------	131J1-62, C115J1-24 SEE FIG. 4-28 FOR 2 DU SYSTEM
	#6 SET KNOB 2		-25	(24)	---------S-T-S-------	131J1-67, C115J1-25 SEE FIG. 4-28 FOR 2 DU SYSTEM
	#6 SET KNOB COM		-26	(24)	---------S-T-S------- GND GND	131J1-63, C115J1-26 SEE FIG. 4-28 FOR 2 DU SYSTEM
	28V AUTOPILOT CLUTCH		-27		---------------------	190J2B-89, -88, 12J1-F
	SPARE		-28			
	AUTOPILOT OFF LIGHT		-29		---------------------	FIG. 4-10
	AUTOPILOT OFF HORN		-30		---------------------	FIG. 4-10
	SPARE		-31			
	TCS		-32		---------------------	FIG. 4-10
	28V AUTOPILOT DISCONNECT		-33		---------------------	FIG. 4-9
	DC/SG BUS	(H)	-34	(24)	---------S-T-S-------	190J2A-15
	DC/SG BUS	(L)	-35	(24)	---------S-T-S------- GND GND	190J2A-16
	DC/MG BUS	(H)	-36		-----NC	
	DC/MG BUS	(L)	-37		-----NC	
	ADI DIM	(H)	-38		-----NC	
	ADI DIM	(L)	-39		-----NC	
	HSI DIM	(H)	-40		-----NC	
	HSI DIM	(L)	-41		-----NC	
	LIGHT + HORN DISABLE		-42		---------------------•	190J2B-79
	MOMENTARY LIGHT DISABLE		-43		---------------------•	190J2B-79
	MOMENTARY HORN DISABLE		-44		---------------------	190J2B-77
	SPARE		-45			
	LAMP TEST GND		-46		-----NC	
	#10 PUSH BUTTN	(HDG)	-47	(24)	---------------------	8J1-3
	#11 PUSH BUTTN	(NAV)	-48	(24)	---------------------	8J1-4
	#12 PUSH BUTTN	(APP)	-49	(24)	---------------------	8J1-8
	PFD DIM	(H)	-50		---------------------	130J1-1
	PFD DIM	(W)	-51		---------------------	130J1-14
	PFD DIM	(L)	115J1-52		---------------------	130J1-13

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY CONTROLLER
DC-550

IO BP	Description		Connector Pin			Connects To
	DH/RA SET	(H)	115J1-53	(24)	---------S-T-S-------	190J2A-12
	DH/RA SET	(W)	-54	(24)	---------S-T-S-------	190J2A-13
	DH/RA SET	(L)	-55	(24)	---------S-T-S-------	190J2A-10
					GND GND	
	#13 PUSH BUTTN (VNAV)		-56	(24)	---------------------	8J1-6
	#14 PUSH BUTTN	(ALT)	-57	(24)	---------------------	8J1-7
	#15 PUSH BUTTN	(VS)	-58	(24)	---------------------	8J1-8
	PFD OFF GND		-59		---------------------	FIG. 4-24
	#16 PUSH BUTTN	(SPD)	-60	(24)	---------------------	8J1-9
	#17 PUSH BUTTN	(BC)	-61	(24)	---------------------	8J1-21
	#18 PUSH BUTTN (MFD BEZEL #1)		-62	(24)	---------------------	131J1-46, C115J1-62
	HSI ON GND		-63		-----NC	
	#19 PUSH BUTTN (MFD BEZEL #2)		-64	(24)	---------------------	131J1-47, C115J1-64
	#20 PUSH BUTTN (MFD BEZEL #3)		-65	(24)	---------------------	131J1-50, C115J1-65
	#21 PUSH BUTTN (MFD BEZEL #4)		-66	(24)	---------------------	131J1-51, C115J1-66
	SPARE		-67		-----NC	
	#22 PUSH BUTTN (MFD BEZEL #5)		-68	(24)	---------------------	131J1-60, C115J1-68
	#23 PUSH BUTTN (MFD BEZEL #6)		-69		-----NC	
	#24 PUSH BTTN		-70		---------------------	130J1-47 (2 DU CONFIGURATION)
	#25 PUSH BUTTN (ADC REV MOM)		-71	(24)	---------------------	PILOT'S ADC REV SWITCH, FIG. 4-25
	#1 SWITCH (LAMP TEST IN)		-72	(24)	---------------------	EXT LAMP TEST SWITCH, C115J1-72
	#2 SWITCH		-73		-----NC	
	#3 SWITCH		-74		-----NC	
	#4 SWITCH		-75		-----NC	
	#5 SWITCH		-76		-----NC	
	#6 SWITCH		-77		-----NC	
	#7 SWITCH (CRS PUSH TO SYNC)		-78	(24)	---------------------	23J1-4
	#8 SWITCH (HDG PUSH TO SYNC)		115J1-79	(24)	---------------------	23J1-10, C115J1-79

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Table 3-1. Interconnect Information (cont)

PILOT'S MFD CONTROLLER
MC-800 **(NOT INSTALLED FOR TWO DISPLAY SYSTEM)**

IO BP	Description		Connector Pin			Connects To
	+28 V DC PWR		126J1-1	(22)	---------------------	FIG. 4-6
	DC PWR GND		-2	(22)	---------------------	DC POWER GND
	SIGNAL GROUND		-3	(22)	---------------------	SIGNAL GND
	CHASSIS GROUND		-4	(22)	---------------------	CHASSIS GND
	0-28 V DC LIGHTING POWER	(H)	-5		-----NC	
	0-5 V AC/DC LIGHTING PWR	(H)	-6	(22)	---------------------	FIG. 4-7
	LIGHTING POWER COMMON		-7	(22)	---------------------	LIGHTING GND
	REMOTE PAGE BUTTON INPUT		-8		-----NC	
	REMOTE RECAL BUTTON INPUT		-9		-----NC	
	REMOTE SKIP BUTTON INPUT		-10		-----NC	
	REMOTE ENTER BUTTON INPUT		-11		-----NC	
	REMOTE NORMAL CHECKLIST		-12		-----NC	
	REMOTE EMERGENCY CHECKLIST		-13		-----NC	
	DI 1 DISCRETE IN		-14		-----NC	
	DI 1 DISCRETE IN		-15		-----NC	
	REMOTE SWITCH COMMON		-16		-----NC	
	RESERVED		-17		-----NC	
	RESERVED		-18		-----NC	
	RESERVED		-19		-----NC	
	RESERVED		-20		-----NC	
	RESERVED		-21		-----NC	
	RESERVED		-22		-----NC	
	RESERVED		-23		-----NC	
	IC DATA BUS	(H)	-24	(24)	---------S-T-S-------	190J1B-15, C190J1B-15
	IC DATA BUS	(L)	-25	(24)	---------S-T-S------- GND GND	190J1B-16, C190J1B-16
	RESERVED		-26		-----NC	
	RESERVED		-27		-----NC	
	MFD DISPLAY DIM	(H)	-28		-----NC	
	MFD DISPLAY DIM	(L)	-29		-----NC	
	RESERVED		-30		-----NC	
	RESERVED		126J1-31		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S MFD CONTROLLER
MC-800 **(NOT INSTALLED FOR TWO DISPLAY SYSTEM)**

IO BP	Description	Connector Pin		Connects To
	MFD DIM H	126J1-32 (24)	----------S-T-S-------	131J1-13
	MFD DIM W	-33 (24)	----------S-T-S-------	131J1-14
	MFD DIM L	-34 (24)	----------S-T-S-------	131J1-1
			GND (shield) NC	
	LEFT SG BACKUP	-35 (24)	---------------------	FIG. 4-24, FIG. 4-20
	RIGHT SG BACKUP	-36 (24)	---------------------	FIG. 4-24, FIG. 4-20
	SPARE	126J1-37	-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description		Connector Pin			Connects To
	BRIGHTNESS POT	(H)	130J1-1	(24)	---------S-T-S-------	115J1-50
	BRIGHTNESS POT	(L)	-13	(24)	---------S-T-S-------	115J1-52
	BRIGHTNESS POT	(W)	-14	(24)	---------S-T-S-------	115J1-51
					GND┘ └NC	
	WX DIMMING	(H)	-2		-----NC	
	WX DIMMING	(L)	-3		-----NC	
	RESERVED		-4			
	RESERVED		-5			
	RESERVED		-6			
	RESERVED		-7			
	SPARE		-8			
	RESERVED		-9			
	RESERVED		-10			
	RESERVED		-11			
	RESERVED		-12			
	BRIGHTNESS POT	(L)	-13		SEE 130J1-1	
	BRIGHTNESS POT	(W)	-14		SEE 130J1-1	
	WX DIMMING	(W)	-15		-----NC	
	RESERVED		-16			
	RESERVED		-17			
	RESERVED		-18			
	BUS 3	(H)	-19		---------------------	FIG. 4-24
	BUS 3	(L)	-20		---------------------	FIG. 4-24
	BARO KNOB	(B0)	-21	(24)	---------S-T-S-------	9J1-74
	BARO KNOB	(B1)	-25	(24)	---------S-T-S-------	9J1-75
					GND┘ └GND	
	DU PWR DN (GND/OPEN)		-22	(24)	---------------------	FIG. 4-24
	0-5 V AC EDGE	(H)	-23	(22)	---------------------	FIG. 4-7
	LIGHTING	(L)	-24	(22)	---------------------	LIGHTING GND
	BARO KNOB	(B1)	-25		SEE 130J1-21	
	REMOTE LT SENSOR	(H)	-26		-----NC	
	REMOTE LT SENSOR	(L)	-27		-----NC	
	DLS	(H)	-28		-----NC	
	ALS	(H)	-29		-----NC	
	RESERVED		-30			
	HDLC OUT +		-31	(24)	---------S-T-S-------	190J2B-14
	HDLC OUT -		130J1-32	(24)	---------S-T-S-------	190J2B-15
					GND┘ └NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description		Connector Pin			Connects To
	BUS 3 TERM	(L)	130J1-33		-----NC	
	RESERVED		-34			
	BUS 2	(H)	-35		---------------------	FIG. 4-24
	BUS 2	(L)	-36		---------------------	FIG. 4-24
	DU VALID (GND/OPEN)		-37		-----NC	
	BUS 1	(H)	-38		---------------------	FIG. 4-24
	BUS 1	(L)	-39		---------------------	FIG. 4-24
	REMOTE LT SENSOR GND		-40		-----NC	
	DLS	(L)	-41		-----NC	
	ALS	(L)	-42		-----NC	
	RESERVED		-43			
	RESERVED		-44			
	BUS 4 TERM	(L)	-45		-----NC	
	STD BARO (GND/OPEN)		-46	(24)	---------------------	9J1-71
	VSPD SET BTTN		-47	(24)	---------------------	115J1-70 (NC FOR 3 DU SYSTEM)
	RESERVED		-48			
	BUS 2 TERM	(L)	-49		---------------------	FIG. 4-24
	RESERVED		-50			
	RESERVED		-51			
	BUS 1 TERM		-52		-----NC	
	REMOTE LT SENSOR PWR	(H)	-53		-----NC	
	REMOTE LT SENSOR PWR	(L)	-54		-----NC	
	RESERVED		-55			
	RESERVED		-56			
	RESERVED		-57			
	BUS 4	(H)	-58		---------------------	FIG. 4-24
	BUS 4	(L)	-59		---------------------	FIG. 4-24
	RESERVED		-60		-----NC	
	WX BUS 2 TERM	(L)	-61		-----NC	
	RESERVED		-62		-----NC (SEE FIG. 4-28 FOR 2 DU SYSTEM)	
	SIGNAL GROUND		-63	(24)	---------------------	SIGNAL GND
	WX BUS TERM	(L)	-64		---------------------	FIG. 4-22
	DU OVERTEMP (GND/OPEN)		-65		-----NC	
	DU WRAPAROUND A-429 XMTR	(H)	-66		-----NC	
	RESERVED		-67		-----NC (SEE FIG. 4-28 FOR 2 DU SYSTEM)	
	RESERVED		130J1-68			

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description		Connector Pin			Connects To
	WX BUS 3	(H)	130J1-69	(24)	---------------------	SEE NOTE
	WX BUS 3	(L)	-70	(24)	---------------------	SEE NOTE
	RESERVED		-71			
	RESERVED		-72			
	SPARE		-73			
	WX BUS 2	(H)	-74	(24)	---------------------	SEE NOTE
	WX BUS 2	(L)	-75	(24)	---------------------	SEE NOTE
	SPARE		-76			
	WX BUS 1	(H)	-77		---------------------	FIG. 4-22
	WX BUS 1	(L)	-78		---------------------	FIG. 4-22
	DU WRAPAROUND A-429 XMTR	(L)	-79		-----NC	
	SIGNAL GROUND		-80	(24)	---------------------	SIGNAL GND
	RESERVED		-81			
	RESERVED		-82			
	WX BUS 3 TERM	(L)	-83		-----NC	
	RESERVED		-84			
	SPARE		-85			
	SPARE		-86			
	PORT SEL 3 (GND/OPEN)		-87	(24)	---------------------	FIG. 4-24
	PORT SEL 2 (GND/OPEN)		-88	(24)	---------------------	FIG. 4-24
	PORT SEL 1 (GND/OPEN)		-89	(24)	---------------------	FIG. 4-24
	I.D. #3 (GND/OPEN)		-90		-----NC	
	I.D. #2 (GND/OPEN)		-91		-----NC	
	I.D. #1 (GND/OPEN)		-92		-----NC	
	RESERVED		-93			
	CHASSIS GND		-94		-----NC	
	RESERVED		-95			
	RESERVED		-96			
	RESERVED		-97			
	RESERVED		-98			
	SOFTWARE ENABLE (GND/OPEN)		130J1-99		-----NC	

NOTE: It is recommended that all unused bus inputs(+ and -) be tied to airframe ground as close to the DU as possible. If this is not possible, the + and - inputs should be tied together.

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description	Connector Pin		Connects To
	SOFTWARE ENABLE (GND/OPEN)	130J1-100	-----NC	
	+28 V DC POWER	-101 (20)	----------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER	-102 (20)	----------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER	-103 (20)	----------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER RETURN	-104 (20)	----------------------	DC POWER GND
	+28 V DC POWER RETURN	-105 (20)	----------------------	DC POWER GND
	+28 V DC POWER RETURN	130J1-106 (20)	----------------------	DC POWER GND

NOTE: USE HPN PIN 7018408 WITH EXTRACTION TOOL: M81969/14-01 (REF. TABLE 2-1).

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (MFD)
DU-870 **(NOT INSTALLED FOR TWO DISPLAY SYSTEM)**

IO BP	Description		Connector Pin			Connects To
	BRIGHTNESS POT	(H)	131J1-1	(24)	---------S-T-S-------	126J1-34
	BRIGHTNESS POT	(L)	-13	(24)	---------S-T-S-------	126J1-32
	BRIGHTNESS POT	(W)	-14	(24)	---------S-T-S-------	126J1-33
					GND NC	
	WX DIMMING	(H)	-2		-----NC	
	WX DIMMING	(L)	-3		-----NC	
	RESERVED		-4			
	RESERVED		-5			
	RESERVED		-6			
	RESERVED		-7			
	SPARE		-8			
	RESERVED		-9			
	RESERVED		-10			
	RESERVED		-11			
	RESERVED		-12			
	BRIGHTNESS POT	(L)	-13		SEE 131J1-1	
	BRIGHTNESS POT	(W)	-14		SEE 131J1-1	
	WX DIMMING	(W)	-15		-----NC	
	RESERVED		-16			
	RESERVED		-17			
	RESERVED		-18			
	BUS 3	(H)	-19		---------------------	FIG. 4-24
	BUS 3	(L)	-20		---------------------	FIG. 4-24
	SET KNOB	(B0)	-21	(24)	---------S-T-S-------	115J1-12, C115J1-12
	SET KNOB	(B1)	-25	(24)	---------S-T-S-------	115J1-13, C115J1-13
					GND GND	
	DU PWR DN (GND/OPEN)		-22		-----NC	
	0-5 V AC EDGE	(H)	-23	(22)	---------------------	FIG. 4-7
	LIGHTING	(L)	-24	(22)	---------------------	LIGHTING GND
	SET KNOB	(B1)	-25		SEE 131J1-21	
	REMOTE LT SENSOR	(H)	-26		-----NC	
	REMOTE LT SENSOR	(L)	-27		-----NC	
	DLS	(H)	-28		-----NC	
	ALS	(H)	-29		-----NC	
	RESERVED		-30			
	HDLC OUT +		-31	(24)	---------S-T-S-------	190J2A-45,
					| | |	C190J2B-16
	HDLC OUT -		131J1-32	(24)	---------S-T-S-------	190J2A-47,
					GND GND	C190J2B-17

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (MFD)
DU-870 **(NOT INSTALLED FOR TWO DISPLAY SYSTEM)**

IO BP	Description		Connector Pin			Connects To
	BUS 3 TERM	(L)	131J1-33		-----NC	
	RESERVED		-34			
	BUS 2	(H)	-35		---------------------	FIG. 4-24
	BUS 2	(L)	-36		---------------------	FIG. 4-24
	DU VALID (GND/OPEN)		-37		-----NC	
	BUS 1	(H)	-38		---------------------	FIG. 4-24
	BUS 1	(L)	-39		---------------------	FIG. 4-24
	REMOTE LT SENSOR GND		-40		-----NC	
	DLS	(L)	-41		-----NC	
	ALS	(L)	-42		-----NC	
	RESERVED		-43			
	RESERVED		-44			
	BUS 4 TERM	(L)	-45		-----NC	
	PB 1 (GND/OPEN)		-46	(24)	---------------------	115J1-62, C115J1-62
	PB 2 (GND/OPEN)		-47	(24)	---------------------	115J1-64, C115J1-64
	RESERVED		-48			
	BUS 2 TERM	(L)	-49		-----NC	
	PB 3 (GND/OPEN		-50		---------------------	115J1-65, C115J1-65
	PB 4 (GND/OPEN		-51		---------------------	115J1-66, C115J1-66
	BUS 1 TERM		-52		-----NC	
	REMOTE LT SENSOR PWR	(H)	-53		-----NC	
	REMOTE LT SENSOR PWR	(L)	-54		-----NC	
	RESERVED		-55			
	RESERVED		-56			
	RESERVED		-57			
	BUS 4	(H)	-58		---------------------	FIG. 4-24
	BUS 4	(L)	-59		---------------------	FIG. 4-24
	PB 5 (GND/OPEN)		-60		---------------------	115J1-68, C115J1-68
	WX BUS 2 TERM	(L)	-61		-----NC	
	SET KNOB 2 (BO)		-62	(24)	---------------------	115J1-24, C115J1-24
	SIGNAL GROUND		-63	(24)	---------------------	115J1-26, C115J1-26, 115J1-14, C115J1-14
	WX BUS 1 TERM	(L)	-64		-----NC	
	DU OVERTEMP (GND/OPEN)		-65		-----NC	
	DU WRAPAROUND A-429 XMTR	(H)	-66		-----NC	
	SET KNOB 2 (B1)		-67	(24)	---------------------	115J1-25, C115J1-25
	RESERVED		131J1-68			

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (MFD)
DU-870 **(NOT INSTALLED FOR TWO DISPLAY SYSTEM)**

IO BP	Description		Connector Pin			Connects To
	WX BUS 3	(H)	131J1-69	(24)	---------------------	SEE NOTE
	WX BUS 3	(L)	-70	(24)	---------------------	SEE NOTE
	RESERVED		-71			
	SPARE		-72			
	SPARE		-73			
	WX BUS 2	(H)	-74	(24)	---------------------	SEE NOTE
	WX BUS 2	(L)	-75	(24)	---------------------	SEE NOTE
	SPARE		-76			
	WX BUS 1	(H)	-77		---------------------	FIG. 4-22
	WX BUS 1	(L)	-78		---------------------	FIG. 4-22
	DU WRAPAROUND A-429 XMTR	(L)	-79		-----NC	
	SIGNAL GROUND		-80	(24)	---------------------	SIGNAL GND
	RESERVED		-81			
	RESERVED		-82			
	WX BUS 3 TERM	(L)	-83		-----NC	
	MFD BEZEL #6 PB		-84		-----NC	
	SPARE		-85			
	SPARE		-86			
	PORT SEL 3 (GND/OPEN)		-87	(24)	---------------------	FIG. 4-24
	PORT SEL 2 (GND/OPEN)		-88	(24)	---------------------	FIG. 4-24
	PORT SEL 1 (GND/OPEN)		-89	(24)	---------------------	FIG. 4-24
	I.D. #3 (GND/OPEN)		-90	(24)	---------------------	131J1-80
	I.D. #2 (GND/OPEN)		-91		-----NC	
	I.D. #1 (GND/OPEN)		-92	(24)	---------------------	131J1-80
	RESERVED		-93			
	CHASSIS GND		-94		-----NC	
	RESERVED		-95			
	RESERVED		-96			
	RESERVED		-97			
	RESERVED		-98			
	SOFTWARE ENABLE (GND/OPEN)		131J1-99		-----NC	

NOTE: It is recommended that all unused bus inputs(+ and -) be tied to airframe ground as close to the DU as possible. If this is not possible, the + and - inputs should be tied together.

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY UNIT (MFD)
DU-870 **(NOT INSTALLED FOR TWO DISPLAY SYSTEM)**

IO BP	Description	Connector Pin		Connects To
	SOFTWARE ENABLE (GND/OPEN)	131J1-100	-----NC	
	+28 V DC POWER	-101 (20)	---------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER	-102 (20)	---------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER	-103 (20)	---------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER RETURN	-104 (20)	---------------------	DC POWER GND
	+28 V DC POWER RETURN	-105 (20)	---------------------	DC POWER GND
	+28 V DC POWER RETURN	131J1-106 (20)	---------------------	DC POWER GND

NOTE: USE HPN PIN 7018408 WITH EXTRACTION TOOL: M81969/14-01 (REF. TABLE 2-1).

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Table 3-1. Interconnect Information (cont)

PILOT'S COMMUNICATIONS UNIT RCZ-851E

Description		Connector Pin			Connects To
DLP A/B TO XPDR	(L)	143J1-1		-----NC	
A-429 RCVR	(H)	-13		-----NC	
+28 VDC FAN POWER		-2	(24)	---------------------	COOLING FAN - RED
SPARE		-3			
+28 VDC COMM POWER		-4	(22)	---------------------	FIGURE 4-6
+28 VDC COMM POWER		-5	(22)	---------------------	FIGURE 4-6
+28 VDC COMM POWER		-6	(22)	---------------------	FIGURE 4-6
+28 VDC XPDR POWER RETURN		-7	(22)	---------------------	DC POWER GND
+28 VDC XPDR POWER		-8	(22)	---------------------	FIGURE 4-6
+28 VDC XPDR POWER		-9	(22)	---------------------	FIGURE 4-6
RSB PRIMARY	(H)	-10		---------S-T-S-------	FIGURE 4-28
RSB PRIMARY	(L)	-11		---------S-T-S-------	FIGURE 4-28
				GND GND	
SELCAL/ACARS	(L)	-12		-----NC	
SELCAL/ACARS	(H)	-22		-----NC	
DLP A/B TO XPDR	(H)	-13		-----NC	
A-429 RCVR	(L)	-1		-----NC	
COM +28V ACH PWR		-14		-----NC	
RCB RCVR (#1)	(L)	-15		-----NC	
RCB RCVR (#1)	(H)	-28		-----NC	
COMM STRAP +5 VDC		-16		---------------------	FIGURE 4-29
+28 VDC COMM POWER RETURN		-17	(22)	---------------------	DC POWER GND
+28 VDC COMM POWER RETURN		-18	(22)	---------------------	DC POWER GND
+28 VDC COMM POWER RETURN		-19	(22)	---------------------	DC POWER GND
+28 VDC XPDR POWER RETURN		-20	(22)	---------------------	DC POWER GND
VHF1 PTT (GND/OPEN)		-21		---------------------	FIGURE 4-30
SELCAL/ACARS	(H)	-22		-----NC	
SELCAL/ACARS	(L)	143J1-12		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S COMMUNICATIONS UNIT RCZ-851E

```
Description                   Connector Pin                                  Connects To

SPARE                         143J1-23
SIMULCOM RET                       -24  (24)  ---------S-T-S-------   C143J1-24
                                                       |  |  |
SIMULCOM                           -35  (24)  ---------S-T-S-------   C143J1-35
                                                  GND--┘     └--GND


COM ACH DATA         (L)           -25  (24)  ---------S-T-S-------   165J1-J
COM ACH DATA         (H)           -33  (24)  ---------S-T-S-------   165J1-H
                                                  GND--┘     └--GND

XPDR TO DLP A/B      (L)           -26        -----NC
A-429 XMTR           (H)           -27        -----NC

RCB RCVR (#1)        (H)           -28        -----NC
RCB RCVR (#1)        (L)           -15        -----NC

EMER AUDIO           (L)           -29  (24)  ---------S-T-S-------   FIGURE 4-31
EMER AUDIO           (H)           -31  (24)  ---------S-T-S-------   FIGURE 4-31
                                                  GND--┘     └--GND
REC PHONE AUDIO      (H)           -30        -----NC

EMER AUDIO           (H)           -31  (24   ---------S-T-S-------   FIGURE 4-31
EMER AUDIO           (L)           -29  (24   ---------S-T-S-------   FIGURE 4-31
                                                  GND--┘     └--GND
SPARE                              -32
COM ACH DATA         (H)           -33  (24)  ---------S-T-S-------   165J1-H
COM ACH DATA         (L)           -25  (24)  ---------S-T-S-------   165J1-J
                                                  GND--┘     └--GND

AUX AUD 4            (L)           -34        -----NC
AUX AUD 4            (H)           -6         -----NC
SIMULCOM                           -35  (24)  ---------S-T-S-------   C143J1-35
                                                       |  |  |
SIMULCOM RET                       -24  (24)  ---------S-T-S-------   C143J1-24
                                                  GND--┘     └--GND

AUDIO STATUS 3                     -36        -----NC
(GND/OPEN)

HF COM XMIT                        -37   (24) ---------------------   FIGURE 4-32
(GND/OPEN)

AUX AUD 2            (H)           -38        -----NC
AUX AUD 2            (L)      143J1-49        -----NC
```


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Table 3-1. Interconnect Information (cont)

PILOT'S COMMUNICATIONS UNIT
RCZ-851E

Description		Connector Pin			Connects To
HF COM DISABLE (GND/OPEN)		143J1-39		-----NC	
GND (AUDIO SHIELDS)		-40		-----NC	
COM +28V ACH RTN		-41		-----NC	
AUDIO BUS SHIELD		-42		-----NC	
COM STRAP +5 VDC RTN		-43		---------------------	FIGURE 4-29
GND		-44		---------------------	SHIELD GROUND
GND		-45		---------------------	SHIELD GROUND
GND		-46		---------------------	SHIELD GROUND
SPARE		-47			
AUDIO STATUS 3 (GND/OPEN)		-48		-----NC	
AUX AUD 2	(L)	-49		-----NC	
AUX AUD 2	(H)	-38		-----NC	
HF1 COM AUD	(L)	-50	(24)	---------S-T-S-------	FIGURE 4-33
HF1 COM AUD	(H)	-66	(24)	---------S-T-S-------	FIGURE 4-33
				NC┘ └GND	
AUX AUD 3	(L)	-51		-----NC	
AUX AUD 3	(H)	-52		-----NC	
RCB RCVR (#2)	(L)	-53		-----NC	
RCB RCVR (#2)	(H)	-68		-----NC	
+28 VDC FAN POWER RETURN		-54	(24)	---------------------	COOLING FAN - BLUE
XPDR TO TCAS	(H)	-55	(24)	---------S-T-S-------	FIGURE 4-34
A-429 XMTR	(L)	-87	(24)	---------S-T-S-------	FIGURE 4-34
				GND┘ └GND	
AUDIO BUS #1	(H)	-56		---------S-T-S-------	FIGURE 4-35
AUDIO BUS #1	(L)	-70		---------S-T-S-------	FIGURE 4-35
				GND┘ └GND	
SIDETONE PHONE AUDIO	(H)	-57		-----NC	
GND		-58		---------------------	SHIELD GROUND
AGC ANALOG TP		-59		-----NC	
GND		-60		---------------------	SHIELD GROUND
LEFT SEC RSB	(L)	-61		---------S-T-S-------	FIGURE 4-28
LEFT SEC RSB	(H)	143J1-74		---------S-T-S-------	FIGURE 4-28
				GND┘ └GND	

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Table 3-1. Interconnect Information (cont)

PILOT'S COMMUNICATIONS UNIT RCZ-851E

Description		Connector Pin			Connects To
AUX AUD 4	(H)	143J1-62		-----NC	
AUX AUD 4	(L)	-34		-----NC	
SPARE		-63			
SPARE		-64			
SPARE		-65			
HF1 COM AUD	(H)	-66	(24)	---------S-T-S-------	FIGURE 4-33
HF1 COM AUD	(L)	-50	(24)	---------S-T-S-------	FIGURE 4-33
CHASSIS GND		-67		-----NC	
RCB RCVR (#2)	(H)	-68		-----NC	
RCB RCVR (#2)	(L)	-53		-----NC	
ADC2 TO XPDR	(L)	-69		-----NC	
A-429 RCVR	(H)	-100		-----NC	
AUDIO BUS #1	(L)	-70		---------S-T-S-------	FIGURE 4-35
AUDIO BUS #1	(H)	-56		---------S-T-S-------	FIGURE 4-35
				GND┘ └GND	
XPDR #1 OFF (GND/OPEN)		-71	(24)	---------------------	144J1-k
RESERVED		-72			
SPARE		-73			
LEFT SEC RSB	(H)	-74		---------S-T-S-------	FIGURE 4-28
LEFT SEC RSB	(L)	-61		---------S-T-S-------	FIGURE 4-28
				GND┘ └GND	
SPARE		-75			
AUDIO STATUS 1 (GND/OPEN)		-76		-----NC	
SPARE		-77			
SPARE		-78			
SPARE		-79			
ALT SRC SEL2 (GND/OPEN)		-80		-----NC	
RCB XMTR (#1)	(H)	-81		-----NC	
RCB XMTR (#1)	(L)	-95		-----NC	
RCB XMTR (#2)	(H)	-82		-----NC	
RCB XMTR (#2)	(L)	143J1-96		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S COMMUNICATIONS UNIT
RCZ-851E

Description		Connector Pin		Connects To
WOW (GND/OPEN)		143J1-83 (24)	---------------------	FIGURE 4-12
XPDR TO DLP C/D	(L)	-84	-----NC	
A-429 XMTR	(H)	-97	-----NC	
DLP C/D TO XPDER	(L)	-85	-----NC	
A-429 RCVR	(H)	-98	-----NC	
ADC1 TO XPDR	(L)	-86 (24)	---------S-T-S-------	9J1-67
A-429 RCVR	(H)	-99 (24)	---------S-T-S-------	9J1-66
			GND┘ └GND	
XPDR TO TCAS	(L)	-87 (24)	---------S-T-S-------	FIGURE 4-34
A-429 XMTR	(H)	-55 (24)	---------S-T-S-------	FIGURE 4-34
			GND┘ └GND	
COM STRAP CLK		-88	---------------------	FIGURE 4-29
COM STRAP SIDE A0		-89	---------------------	FIGURE 4-29
TCAS TO XPDR	(H)	-90 (24)	---------S-T-S-------	FIGURE 4-34
A-429 RCVR	(L)	-104 (24)	---------S-T-S-------	FIGURE 4-34
			GND┘ └GND	
XPDR ACTIVE (GND/OPEN)		-91	-----NC	
VHF 1 MIC	(H)	-92 (24)	---------S-T-S-------	FIGURE 4-30
VHF 1 MIC	(L)	-106 (24)	---------S-T-S-------	FIGURE 4-30
			GND┘ └NC	
COMM OFF (GND/OPEN)		-93	-----NC	
MUT SUP		-94 (24)	---------S---S-------	FIGURE 4-36
			GND┘ └GND	
RCB XMTR (#1)	(L)	-95	-----NC	
RCB XMTR (#1)	(H)	-81	-----NC	
RCB XMTR (#2)	(L)	-96	-----NC	
RCB XMTR (#2)	(H)	-82	-----NC	
XPDR TO DLP C/D	(H)	-97	-----NC	
A-429 XMTR	(L)	-84	-----NC	
DLP C/D TO XPDER	(H)	-98	-----NC	
A-429 RCVR	(L)	143J1-85	-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S COMMUNICATIONS UNIT
RCZ-851E

```
Description                 Connector Pin                                     Connects To

ADC1 TO XPDR        (H)     143J1-99  (24)  ---------S-T-S-------    9J1-66
A-429 RCVR          (L)           -86 (24)  ---------S-T-S-------    9J1-67
                                                 GND-┘    └-GND

ADC2 TO XPDR        (H)     143J1-100       -----NC
A-429 RCVR          (L)            -69      -----NC

COM STRAP DATA                     -101 (24) ---------------------   FIGURE 4-29
COM STRAP LOAD                     -102 (24) ---------------------   FIGURE 4-29
COM STRAP SIDE                     -103 (24) ---------------------   FIGURE 4-29

TCAS TO XPDR        (L)            -104 (24) ---------S-T-S-------   FIGURE 4-34
A-429 RCVR          (H)             -90 (24) ---------S-T-S-------   FIGURE 4-34
                                                 GND-┘    └-GND
RESERVED                           -105

VHF 1 MIC           (H)     143J1-106 (24)  ---------S-T-S-------    FIGURE 4-30
VHF 1 MIC           (L)           -92 (24)  ---------S-T-S-------    FIGURE 4-30
                                                 GND-┘    └-GND
```


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Table 3-1. Interconnect Information (cont)

**PILOT'S COMMUNICATIONS UNIT
RCZ-851E**

Description	Connector Pin		Connects To
TRANSPONDER ANTENNA	143J2	-(RG-214/U)-S---S-- GND┘ └GND	BOTTOM ANT #1 (SEE NOTE BELOW)
COM ANTENNA	143J3	-(RG-142/U)-S---S-- GND┘ └GND	COM ANT #1
DIVERSITY ANTENNA	143J6	-(RG-214/U)-S---S-- GND┘ └GND	TOP ANT #1 (SEE NOTE BELOW)

NOTE: MAXIMUM COAX LENGTH IS 30 FEET.

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Table 3-1. Interconnect Information (cont)

PILOT'S RADIO MANAGEMENT UNIT
RMU-850

Description		Connector Pir.			Connects To
28 VDC LIGHTING		144J1-A		-----NC	
28 VDC LIGHTING RETURN		-B		-----NC	
+28 VDC POWER		-C	(22)	---------------------	FIGURE 4-6
+28 VDC POWER RETURN		-D	(22)	---------------------	DC POWER GND
RS422 CONTROL BUS	(H)	-E	(24)	---------S-T-S-------	FROM
RS422 CONTROL BUS	(L)	-F	(24)	---------S-T-S------- GND GND	FMS #1
5 VDC LIGHTING		-G		-----NC	
5 VDC LIGHTING RETURN		-H		-----NC	
0-5 VAC LIGHTING		-J	(24)	---------------------	FIGURE 4-7
0-5 VAC LIGHTING RETURN		-K	(24)	--------------------	LIGHTING GND
CHASSIS GROUND		-L		-----NC	
LEFT SEC RSB	(H)	-M		---------S-T-S-------	FIGURE 4-28
LEFT SEC RSB	(L)	-N		---------S-T-S------- GND GND	FIGURE 4-28
WOW (GND/OPEN)		-P	(24)	---------------------	FIGURE 4-12
WOW POLARITY (GND/OPEN)		-R		---------------------	SIGNAL GROUND
ATC IDENT (GND/OPEN)		-S	(24)	---------------------	FIGURE 4-37
NAV PAST 2 DISABLE (GND/OPEN)		-T		-----NC	
STRAP COMMON		-U		-----NC	
PRIMARY RSB	(H)	-V		---------S-T-S-------	FIGURE 4-28
PRIMARY RSB	(L)	-W		---------S-T-S------- GND GND	FIGURE 4-28
NAV PAST 1 DISABLE (GND/OPEN)		-X		-----NC	
ON/OFF PAGE DISABLE (GND/OPEN)		-Y		-----NC	
TCAS RANGE DISABLE (GND/OPEN)		144J1-Z		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S RADIO MANAGEMENT UNIT
RMU-850

Description	Connector Pin			Connects To
FMS SELECT (GND/OPEN)	144J1-a		-----NC	
SIDE SEL B0 (GND/OPEN)	-b	(24)	---------------------	SIGNAL GROUND
SIDE SEL B1 (GND/OPEN)	-c	(24)	---------------------	SIGNAL GROUND
SIDE SEL EV PARITY (GND/OPEN)	-d	(24)	---------------------	SIGNAL GROUND
TEST ENABLE (GND/OPEN)	-e		-----NC	
COM FREQ XF (GND/OPEN)	-f		-----NC	
COM MEM SEL (GND/OPEN)	-g		-----NC	
MKR SENSE LEFT	-h	(24)	---------------------	160J2-L, C144J1-h
MKR SENSE RIGHT	-i	(24)	---------------------	C160J2-L, C144J1-i
COM POWER OFF (GND/OPEN)	-j		-----NC	
ATC POWER OFF (GND/OPEN)	-k	(24)	---------------------	143J1-71
VOR POWER OFF (GND/OPEN)	-m		-----NC	
DME POWER OFF (GND/OPEN)	-n	(24)	---------------------	164J1A-40
ADF POWER OFF (GND/OPEN)	-p	(24)	---------------------	164J1B-87
MLS POWER OFF (GND/OPEN)	-q		-----NC	
SPARE	-r			
SPARE	-s			
SPARE	144J1-t			

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Table 3-1. Interconnect Information (cont)

ADF ANTENNA NO. 1

```
Description              Connector Pin                                Connects To

ADF MOD SHLD             158J1-A        -----NC

ADF COS MOD                  -B   (24)  ------------S-T-S----   164J1A-91
ADF SIN MOD                  -H   (24)  ------------S-T-S----   164J1A-104
                                                    |   └GND
                                                    |   |
ADF ANT TEST                 -C   (24)  ------------|---|----   164J1A-77
ADF OUTER SHLD               -D         -----NC     |   |
ADF INNER SHLD               -E         --------GND-|--------   SEE NOTE BELOW
ADF RF INPUT                 -F         -(TRIAX)-IS-OS-------   164J2-1
                                                    |
ADF +15 VDC                  -G   (24)  ------------|--------   164J1B-1
                                                    |
ADF SIN MOD                  -H   (24)  ------------S-T-S----   164J1A-104
ADF COS MOD                  -B   (24)  ------------S-T-S----   164J1A-91
                                                        └GND

ADF +15 VDC RETURN           -J   (24)  ---------------------   164J1B-27

ADF LOOP EN              158J1-K  (24)  ---------------------   164J1A-101
```

NOTE:
ADF ANTENNA TRIAXIAL CABLE SHALL BE TROMPETER PN TRC-50-2 OR EQUIVALENT. THE TRIAXIAL CABLE OUTER SHIELD IS GROUNDED AT THE ADF ANTENNA END ONLY TO THE AIR FRAME AND TO THE ADF MODULATION SHIELD. THE GROUND WIRE SHALL BE 20 AWG AND THE LENGTH SHALL NOT EXCEED 10 INCHES.

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Table 3-1. Interconnect Information (cont)

PILOT'S AUDIO PANEL
AV-850A

Description		Connector Pin			Connects To
HAND MIC PTT (GND/OPEN)		160J1-A	(24)	---------------------	FIGURE 4-38
EMERGENCY COM PTT (GND/OPEN)		-B	(24)	---------------------	FIGURE 4-39
VHF 2 PTT (GND/OPEN)		-C	(24)	---------------------	FIGURE 4-39
VHF 2 MIC	(H)	-D	(24)	---------S-T-S-------	FIGURE 4-39
VHF 2 MIC	(L)	-W	(24)	---------S-T-S-------	FIGURE 4-39
				NC GND	
VHF 1 MIC	(L)	-E	(24)	---------S-T-S-------	FIGURE 4-30
VHF 1 MIC	(H)	-R	(24)	---------S-T-S-------	FIGURE 4-30
				NC GND	
VHF 1 PTT (GND/OPEN)		-F	(24)	---------------------	FIGURE 4-30
EMER COM AUDIO	(H)	-G	(24)	---------S-T-S-------	FIGURE 4-31
EMER COM/NAV AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
				NC GND	
EMER COM MIC	(L)	-H	(24)	---------S-T-S-------	FIGURE 4-39
EMER COM MIC	(H)	-P	(24)	---------S-T-S-------	FIGURE 4-39
				NC GND	
HAND MIC/MASK-BOOM MIC	(L)	-J	(24)	---------------------	FIGURE 4-38
HAND MIC	(H)	K	(24	---------S---S-------	FIGURE 4-38
				GND NC	
CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-40
COCKPIT SPKR	(H)	-Y	(22)	---------S-T-S-------	FIGURE 4-40
				GND NC	
CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-41
CABIN SPKR	(H)	-e	(22)	---------S-T-S-------	FIGURE 4-41
				NC GND	
+28 VDC POWER RETURN		160J1-M	(22)	---------------------	DC POWER GND

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Table 3-1. Interconnect Information (cont)

PILOT'S AUDIO PANEL
AV-850A

Description		Connector Pin			Connects To
COMMON GND		160J1-N	(24)	---------------------	FIGURE 4-38
EMER COM MIC	(H)	-P	(24)	---------S-T-S-------	FIGURE 4-39
EMER COM MIC	(L)	-H	(24)	---------S-T-S-------	FIGURE 4-39
				NC┘ └GND	
VHF 1 MIC	(H)	-R	(24)	---------S-T-S-------	FIGURE 4-30
VHF 1 MIC	(L)	-E	(24)	---------S-T-S-------	FIGURE 4-30
				NC┘ └GND	
RESERVED		-S			
RESERVED		-T			
+28 VDC POWER		-U	(22)	---------------------	FIGURE 4-6
+28 VDC POWER		-V	(22)	---------------------	FIGURE 4-6
VHF 2 MIC	(L)	-W	(24)	---------S-T-S-------	FIGURE 4-39
VHF 2 MIC	(H)	-D	(24)	---------S-T-S-------	FIGURE 4-39
				NC┘ └GND	
RESERVED		-X			
COCKPIT SPKR	(H)	-Y	(22)	---------S-T-S-------	FIGURE 4-40
CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-40
				GND┘ └NC	
HF 1 MIC	(L)	-Z	(24)	---------S-T-S-------	FIGURE 4-33
HF 1 MIC	(H)	-a	(24)	---------S-T-S-------	FIGURE 4-33
				NC┘ └GND	
HF 1 PTT (GND/OPEN)		-b	(24)	---------------------	FIGURE 4-32
DIG AUDIO BUS 2	(H)	-c		---------S-T-S-------	FIGURE 4-35
DIG AUDIO BUS 2	(L)	-n		---------S-T-S-------	FIGURE 4-35
				GND┘ └GND	
DIG AUDIO BUS 1	(H)	-d		---------S-T-S-------	FIGURE 4-35
DIG AUDIO BUS 1	(L)	-p		---------S-T-S-------	FIGURE 4-35
				GND┘ └GND	
CABIN SPKR	(H)	-e	(22)	---------S-T-S-------	FIGURE 4-41
CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-41
				NC┘ └GND	
EMER NAV AUDIO	(H)	-f	(24)	---------S-T-S-------	FIGURE 4-31
EMER COM/NAV AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
				NC┘ └GND	
EDGE LIGHTING RTN	(L)	160J1-g	(24)	---------------------	LIGHTING GND

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Table 3-1. Interconnect Information (cont)

PILOT'S AUDIO PANEL AV-850A

Description		Connector Pin			Connects To
MASK/BOOM PTT (GND/OPEN)		160J1-h	(24)	---------------------	FIGURE 4-38
MASK/BOOM MIC	(H)	-i	(24)	---------S---S-------	FIGURE 4-38
				GND┘ └NC	
INTERPHONE AUDIO	(L)	-j	(24)	---------S-T-S-------	C160J1-j
				| | |	
INTERPHONE AUDIO	(H)	-s	(24)	---------S-T-S-------	C160J1-s
				GND┘ └GND	
PHONE AUDIO	(L)	-k	(24)	---------------------	FIGURE 4-38
PHONE AUDIO	(H)	-t	(24)	---------S---S-------	FIGURE 4-38
				GND┘ └NC	
EMER COM AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
EMER COM/NAV AUDIO	(H)	-G	(24)	---------S-T-S-------	FIGURE 4-31
				NC┘ └GND	
EMER NAV AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
EMER COM/NAV AUDIO	(H)	-f	(24)	---------S-T-S-------	FIGURE 4-31
				NC┘ └GND	
DIG AUDIO BUS 2	(L)	-n		---------S-T-S-------	FIGURE 4-35
DIG AUDIO BUS 2	(H)	-c		---------S-T-S-------	FIGURE 4-35
				GND┘ └GND	
DIG AUDIO BUS 1	(L)	-p		---------S-T-S-------	FIGURE 4-35
DIG AUDIO BUS 1	(H)	-d		---------S-T-S-------	FIGURE 4-35
				GND┘ └GND	
0-5 V AC/DC DIMMING		-q	(24)	---------------------	FIGURE 4-7
+28 VDC DIMMING		-r		-----NC	
INTERPHONE AUDIO	(H)	-s	(24)	---------S-T-S-------	C160J1-s
				| | |	
INTERPHONE AUDIO	(L)	-j	(24)	---------S-T-S-------	C160J1-j
				GND┘ └GND	
PHONE AUDIO	(H)	160J1-t	(24)	---------------------	FIGURE 4-38
PHONE AUDIO	(L)	-k	(24)	---------------------	FIGURE 4-38

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Table 3-1. Interconnect Information (cont)

PILOT'S AUDIO PANEL
AV-850A

Description		Connector Pin			Connects To
WARNING 5 AUDIO	(H)	160J2-A		-----NC	
WARNING 5 AUDIO	(L)	-a		-----NC	
WARNING 1 AUDIO	(L)	-B	(24)	---------S-T-S-------	TCAS SYSTEM
WARNING 1 AUDIO	(H)	-W	(24)	---------S-T-S-------	TCAS SYSTEM
				NC GND	
MASK/BOOM MIC	(L)	-C		-----NC	
COMMON GND		-D	(24)	---------------------	FIGURE 4-38 & FIGURE 4-42
MASK MIC	(H)	-E		-----NC	
SPARE		-F			
WARNING 2 AUDIO	(L)	-G		-----NC	
WARNING 2 AUDIO	(H)	-X		-----NC	
CABIN DISABLE (GND/OPEN)		-H		-----NC	
WARNING 3 AUDIO	(L)	-J		-----NC	
WARNING 3 AUDIO	(H)	-m		-----NC	
RESERVED		-K			
MARKER BEAC 1 HI/LO SENS		-L	(24)	---------------------	144J1-h, C144J1-h
STERO MUTE (GND/OPEN)		-M	(24)	---------------------	FIGURE 4-41
RESERVED		-N			
MAINT PHONE AUDIO	(L)	-P	(24)	---------------------	FIGURE 4-42
MAINT PHONE AUDIO	(H)	-f	(24)	---------S---S-------	FIGURE 4-42
				GND NC	
RESERVED		-R			
PAGE MIC PTT (GND/OPEN)		-S		-----NC	
PAGE MIC	(L)	-T		-----NC	
PAGE MIC	(H)	-s		-----NC	
RESERVED		-U			
VOICE RECORDER	(H)	160J2-V		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S AUDIO PANEL
AV-850A

Description		Connector Pin			Connects To
VOICE RECORDER	(L)	160J2-r		-----NC	
WARNING 1 AUDIO	(H)	-W	(24)	---------S-T-S-------	TCAS SYSTEM
WARNING 1 AUDIO	(L)	-B	(24)	---------S-T-S------- (NC, GND)	TCAS SYSTEM
WARNING 2 AUDIO	(H)	-X		-----NC	
WARNING 2 AUDIO	(L)	-G		-----NC	
BOOM MIC	(H)	-Y		-----NC	
WARNING 4 AUDIO	(L)	-Z		-----NC	
WARNING 4 AUDIO	(H)	-t		-----NC	
WARNING 5 AUDIO	(L)	-a		-----NC	
WARNING 5 AUDIO	(H)	-A		-----NC	
MASK INTERCOM ENABLE (GND/OPEN)		-b	(24)	---------------------	FIGURE 4-38
MARKER BEAC MUTE (GND/OPEN)		-c		-----NC	
RESERVED		-d			
MAINT MIC	(L)	-e	(24)	---------------------	FIGURE 4-42
MAINT MIC	(H)	-q	(24)	---------S---S------- (GND, NC)	FIGURE 4-42
MAINT PHONE AUDIO	(H)	-f	(24)	---------------------	FIGURE 4-42
MAINT PHONE AUDIO	(L)	-P	(24)	---------S---S------- (GND, NC)	FIGURE 4-42
PAGE	(H)	-g		-----NC	
PAGE	(L)	-h		-----NC	
RESERVED		-i			
RESERVED		-j			
MAINT MIC PTT (GND/OPEN)		-k	(24)	---------------------	FIGURE 4-42
WARNING 3 AUDIO	(H)	-m		-----NC	
WARNING 3 AUDIO	(L)	-J		-----NC	
RESERVED		160J2-n		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S AUDIO PANEL
AV-850A

Description		Connector Pin			Connects To
INTERPHONE PTT (GND/OPEN)		160J2-p	(24)	----------------------	FIGURE 4-38
MAINT MIC	(H)	-q	(24)	----------------------	FIGURE 4-42
MAINT MIC	(L)	-e	(24)	---------S---S-------	FIGURE 4-42
				GND┘ └NC	
VOICE RECORDER	(L)	-r		-----NC	
VOICE RECORDER	(H)	-V		-----NC	
PAGE MIC	(H)	[illegible]		-----NC	
PAGE MIC	(L)	-T		-----NC	
WARNING 4 AUDIO	(H)	160J2-t		-----NC	
WARNING 4 AUDIO	(L)	-Z		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S DME INDICATOR
DI-851

Description		Connector Pin			Connects To
RESERVED		163J1-1			
RSB PRIMARY	(L)	-2	(24)	---------S-T-S-------	FIGURE 4-28
RSB PRIMARY	(H)	-15	(24)	---------S-T-S-------	FIGURE 4-28
				GND GND	
LEFT SEC RSB	(H)	-3	(24)	---------S-T-S-------	FIGURE 4-28
LEFT SEC RSB	(L)	-14	(24)	---------S-T-S-------	FIGURE 4-28
				GND GND	
RESERVED		-4			
RESERVED		-5			
+28 VDC POWER		-6	(22)	---------------------	FIGURE 4-6
0-5 V AC/DC DIMMING		-7	(24)	---------------------	FIGURE 4-7
SPARE		-8			
SPARE		-9			
RESERVED		-10			
SPARE		-11			
+28 VDC POWER RETURN		-12	(22)	---------------------	DC POWER GND
EDGE LIGHTING RETURN		-13	(24)	---------------------	LIGHTING GND
LEFT SEC RSB	(L)	-14	(24)	---------S-T-S-------	FIGURE 4-28
LEFT SEC RSB	(H)	-3	(24)	---------S-T-S-------	FIGURE 4-28
				GND GND	
RSB PRIMARY	(H)	-15	(24)	---------S-T-S-------	FIGURE 4-28
RSB PRIMARY	(L)	-2	(24)	---------S-T-S-------	FIGURE 4-28
				GND GND	
SPARE		-16			
SPARE		-17			
SPARE		-18			
SPARE		-19			
SPARE		-20			
SPARE		-21			
SPARE		-22			
SPARE		-23			
SPARE		-24			
+28 VDC POWER RETURN		163J1-25	(22)	---------------------	DC POWER GND

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
CLU SPARE		164J1A-1			
DME NOT HOLD (GND/OPEN)		-2		-----NC	
DME HOLD (GND/OPEN)		-3		-----NC	
DME SPARE		-4			
DME 568 DATA	(H)	-5		-----NC	
DME 568 DATA	(L)	-15		-----NC	
DME SPARE		-6			
ADF RS 422 DATA SHIELD		-7		-----NC	
AUX1 RCB TX1		-8		-----NC	
AUX1 RCB TX2		-9		-----NC	
ADF 26VAC 400 HZ RTN		-10		-----NC	
ADF 26VAC 400 HZ RTN		-11		-----NC	
ADF SYNCHRO Y		-12		-----NC	
CLU SPARE		-13			
VOR/ILS OFF (GND/OPEN)		-14		-----NC	
DME 568 DATA	(L)	-15		-----NC	
DME 568 DATA	(H)	-5		-----NC	
DME RS-422 SD2	(L)	-16	(24)	---------S-T-S-------	TO FMS #1
DME RS-422 SD2	(H)	-54	(24)	---------S-T-S-------	TO FMS #1
				GND GND	
DME 568 CLK	(L)	-17		-----NC	
DME 568 CLK	(H)	-19		-----NC	
DME CH 1 AUDIO		-18		-----NC	
DME 568 CLK	(H)	-19		-----NC	
DME 568 CLK	(L)	-17		-----NC	
MLS RCB SHLD		-20		-----NC	
MLS 1 RCB XMTR	(H)	-21	(24)	---------------------	164J1A-25
MLS 1 RCB XMTR	(L)	-34	(24)	---------------------	164J1A-38
ADF SYNCHRO X		164J1A-22		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
ADF 26VAC 400 HZ		164J1A-23		-----NC	
CHANGE INHIBIT (GND/OPEN)		-24		-----NC	
MLS 1 RCB RCVR	(H)	-25	(24)	---------------------	164J1A-21
MLS 1 RCB RCVR	(L)	-38	(24)	---------------------	164J1A-34
DME 568 SYNC	(H)	-26		-----NC	
DME 568 SYNC	(L)	-45		-----NC	
CLU SPARE		-27			
DME MUT SUP RTN		-28		-----NC	
DME SPARE		-29			
DME SPARE		-30			
CLU SPARE		-31			
DME SPARE		-32			
ADF SYNCHRO Z (GND)		-33		-----NC	
MLS 1 RCB XMTR	(L)	-34	(24)	---------------------	164J1A-38
MLS 1 RCB XMTR	(H)	-21	(24)	---------------------	164J1A-25
CLU SPARE		-35			
CLU SPARE		-36			
CLU SPARE		-37			
MLS 1 RCB RCVR	(L)	-38	(24)	---------------------	164J1A-34
MLS 1 RCB RCVR	(H)	-25	(24)	---------------------	164J1A-21
ADF AUDIO SHIELD		-39		-----NC	
DME OFF (OPEN/GND)		-40	(24)	---------------------	144J1-n
AUX 1 AUDIO	(H)	-41		-----NC	
AUX 1 AUDIO	(L)	-55		-----NC	
DME MUT SUP		-42	(24)	---------S---S------- GND GND	FIGURE 4-36
DME SPARE		-43			
DME RS-422 SD1	(L)	-44		-----NC	
DME RS-422 SD1	(H)	-57		-----NC	
DME 568 SYNC	(L)	165J1A-45		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
DME 568 SYNC	(H)	164J1A-26		-----NC	
DME VALID (28 V/OPEN)		-46		-----NC	
ADF DC COS		-47		-----NC	
CLU SPARE		-48			
CLU SPARE		-49			
ADF AUDIO HI		-50		-----NC	
CLU SPARE		-51			
ADF AUDIO LO		-52		-----NC	
CLU SPARE		-53			
DME RS-422 SD2	(H)	-54	(24)	---------S-T-S-------	TO FMS #1
DME RS-422 SD2	(L)	-16	(24)	---------S-T-S-------	TO FMS #1
				GND GND	
AUX 1 AUDIO	(L)	-55		-----NC	
AUX 1 AUDIO	(H)	-41		-----NC	
DME SPARE		-56			
DME RS-422 SD1	(H)	-57		-----NC	
DME RS-422 SD1	(L)	-44		-----NC	
NAV AUX DATA	(L)	-58	(24)	---------S-T-S-------	165J1-N
NAV AUX DATA	(H)	-70	(24)	---------S-T-S-------	165J1-M
				GND GND	
VOR/ILS RS-422 SD1	(L)	-59		-----NC	
VOR/ILS MKR LAMP (28 V/OPEN)	(M)	-60		-----NC	
ADF DC SIN/SIN		-61		-----NC	
CLU SPARE		-62			
CLU SPARE		-63			
AUX2 RCB TX1		-64		-----NC	
AUX2 RCB TX2		-65		-----NC	
ADF HF KEY		-66	(24)	--------------------	FIGURE 4-32
AUX 2 AUDIO	(H)	-67		-----NC	
AUX 2 AUDIO	(L)	-68		-----NC	
NAV AUX CLK	(H)	164J1A-69	(24)	---------S-T-S-------	165J1-f
NAV AUX CLK	(L)	-72	(24)	---------S-T-S-------	165J1-P
				GND GND	

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
NAV AUX DATA	(H)	164J1A-70	(24)	---------S-T-S-------	165J1-M
NAV AUX DATA	(L)	-58	(24)	---------S-T-S-------	165J1-N
				GND┘ └GND	
DME 40 MV/MI		-71		-----NC	
NAV AUX CLK	(L)	-72	(24)	---------S-T-S-------	165J1-P
NAV AUX CLK	(H)	-69	(24)	---------S-T-S-------	165J1-f
				GND┘ └GND	
VOR/ILS MKR LAMP (28 V/OPEN)	(I)	-73		-----NC	
GS SUPERFLAG		-74		-----NC	
AUX1 RCB RX1		-75		-----NC	
CLU SPARE		-76			
ADF ANTENNA TEST		-77	(24)	--------------------	158J1-C
AUX1 RCB RX2		-78		-----NC	
ADF MOD SHIELD		-79		-----NC	
GND PS IN		-80		-----NC	
AUX GND		-81		-----NC	
CLU SPARE		-82			
DME 28 VDC RETURN		-83	(22)	--------------------	DC POWER GND
VOR/ILS RS-422 SD2	(L)	-84	(24)	---------S-T-S-------	TO FMS #1
VOR/ILS RS-422 SD2	(H)	J1B-102	(24)	---------S-T-S-------	TO FMS #1
				GND┘ └GND	
VOR/ILS +28 VDC POWER		-85	(22)	--------------------	FIGURE 4-6
DME +28 VDC POWER		-86	(22)	--------------------	FIGURE 4-6
ADF +28 VDC POWER		-87	(22)	--------------------	FIGURE 4-6
LEFT SEC RSB	(H)	-88	(24)	---------S-T-S-------	FIGURE 4-28
LEFT SEC RSB	(L)	-102	(24)	---------S-T-S-------	FIGURE 4-28
				GND┘ └GND	
CLU SPARE		-89			
CLU SPARE		-90			
ADF COS MOD		164J1A-91	(24)	---------S-T-S-------	158J1-B
ADF SIN MOD		-104	(24)	---------S-T-S-------	158J1-H
				GND┘ └GND	

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
AUX2 RCB RX1		164J1A-92		-----NC	
AUX2 RCB RX2		-93		-----NC	
ADF 28 VDC RETURN		-94	(22)	---------------------	DC POWER GND
DME 28 VDC RETURN		-95	(22)	---------------------	DC POWER GND
CLU SHLD GND		-96		-----NC	
DME CH 2 AUDIO	(H)	-97		-----NC	
VOR/ILS +28 VDC POWER		-98	(22)	---------------------	FIGURE 4-6
DME +28 VDC POWER		-99	(22)	---------------------	FIGURE 4-6
ADF +28 VDC POWER		-100	(22)	---------------------	FIGURE 4-6
ADF LOOP EN		-101	(24)	---------------------	158J1-K
LEFT SEC RSB	(L)	-102	(24)	---------S-T-S-------	FIGURE 4-28
LEFT SEC RSB	(H)	-88	(24)	---------S-T-S-------	FIGURE 4-28
				GND GND	
CLUSTER GND		-103	(22)	-(NOTE 1)------------	DC POWER GND
ADF SIN MOD		-104	(24)	---------S-T-S-------	158J1-B
ADF COS MOD		-91	(24)	---------S-T-S-------	158J1-H
				GND GND	
ADF MOD SHIELD		-105		-----NC	
CLU SPARE		164J1A-106			

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
ADF +15 VDC		164J1B-1	(24)	---------------------	158J1-G
28 VDC FAN POWER		-2	(24)	---------------------	COOLING FAN (RED)
CLU SPARE		-3			
CLU SPARE		-4			
SPARE STAT IN (DIG AUD)		-5			
SPARE STAT IN (DIG AUD)		-6			
SYNC COMP X		-7		-----NC	
AUX +28 VDC		-8		-----NC	
OBS D,G		-9		-----NC	
OBS F		-10		-----NC	
OBI	SIN	-11		-----NC	
OBI	COS	-12		-----NC	
MLS MORSE ID RETURN		-13		-----NC	
CLU SPARE		-14			
CLU SPARE		-15			
CLU SPARE		-16			
CLU SPARE		-17			
CLU SPARE		-18			
CLU SPARE		-19			
400 HZ 26VAC H REF		-20		-----NC	
VOR/ILS RNAV VIDEO	(H)	-21		-----NC	
VOR/ILS RNAV VIDEO	(L)	-22		-----NC	
400 HZ RTN		-23		-----NC	
VOR/LOC AUDIO	CT	-24		-----NC	
VOR/LOC AUDIO	HI	-36		-----NC	
VOR/LOC AUDIO	LO	-51		-----NC	
ADF 28 VDC RETURN		-25	(22)	---------------------	DC POWER GND
NAV STRAP GND		-26	(24)	---------------------	FIGURE 4-29
ADF +15 VDC RETURN		-27	(24)	---------------------	158J1-J
CLU SPARE		-28			
DIG AUDIO BUS 1	(L)	-29		---------S-T-S-------	FIGURE 4-35
DIG AUDIO BUS 1	(H)	164J1B-42		---------S-T-S-------	FIGURE 4-35
				GND┘ └GND	

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description	Connector Pin		Connects To
SPARE STAT IN (DIG AUD)	164J1B-30	-----NC	
AUD AUX SQUELCH	-31	-----NC	
MLS MORSE ID (H)	-32	-----NC	
SYNC COMP Y	-33	-----NC	
OBS B	-34	-----NC	
OBS C	-35	-----NC	
VOR/ILS EMER AUDIO (H)	-36 (24)	---------S-T-S-------	FIGURE 4-31
VOR/ILS EMER AUDIO (L)	-51 (24)	---------S-T-S-------	FIGURE 4-31
		GND GND	
OBI q SIN GND	-37	-----NC	
VOR/ILS POWER RETURN	-38 (22)	---------------------	DC POWER GND
VOR/ILS +28 VDC POWER	-39 (22)	---------------------	FIGURE 4-6
NAV STRAP +5 VDC	-40 (24)	---------------------	FIGURE 4-29
SPARE	-41		
DIG AUDIO BUS 1 (H)	-42	---------S-T-S-------	FIGURE 4-35
DIG AUDIO BUS 1 (L)	-29	---------S-T-S-------	FIGURE 4-35
		GND GND	
CLU SPARE	-43		
FAN 28 VDC POWER RETURN	-44 (24)	---------------------	COOLING FAN (BLUE)
AUDIO AUX XMT	-45	-----NC	
SPARE	-46		
SYNC COMP Z	-47	-----NC	
OBS A	-48	-----NC	
OBS E	-49	-----NC	
VOR/ILS POWER RETURN	-50 (22)	---------------------	DC POWER GND
VOR/ILS EMER AUDIO (L)	-51 (24)	---------S-T-S-------	FIGURE 4-31
VOR/ILS EMER AUDIO (H)	-36 (24)	---------S-T-S-------	FIGURE 4-31
		GND GND	
VOR/ILS +28 VDC POWER	164J1B-52 (22)	---------------------	FIGURE 4-6

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
CLU SPARE		164J1B-53			
CLU SPARE		-54			
CLU SPARE		-55			
EFIS/MLS RIGHT		-56		-----NC	
NAV STRAP SIDE SPARE		-57	(24)	---------------------	FIGURE 4-29
NAV STRAP DATA		-58	(24)	--------------T------	FIGURE 4-29
NAV STRAP CLK		-59	(24)	--------------T------	FIGURE 4-29
NAV STRAP WD LOAD		-84	(24)	--------------T------	FIGURE 4-29
GS FLAG		-60		-----NC	
VOR SYNCHRO Z		-61		-----NC	
SYNC FLAG +28V		-62		-----NC	
MARKER AUDIO CT		-63		-----NC	
ILS MODE		-64		-----NC	
VOR TO/FROM +		-65		-----NC	
MARKER AUDIO HI		-66		-----NC	
DIG AUDIO BUS SHLD		-67		-----NC	
ADF 26VAC 400HZ		-68		-----NC	
CLU SPARE		-69			
CLU SPARE		-70			
RSB PRIMARY	(H)	-71		---------S-T-S-------	FIGURE 4-28
RSB PRIMARY	(L)	-81		---------S-T-S-------	FIGURE 4-28
				GND GND	
ADF SYNTH CLOCK		-72		-----NC	
ADF RS 422 TXD B		-73		-----NC	
ADF RS 422 TXD A		-100		-----NC	
VOR/ILS MKR LAMP(O) (28 V/OPEN)		-74		-----NC	
VOR DEV COMMON		-75		-----NC	
ILS MODE LOGIC		-76		-----NC	
SPARE			-77		
VOR/LOC DEV +		-78		-----NC	
GS DEV +		-79		-----NC	
NAV STRAP SIDE SELECT		164J1B-80	(24)	---------------------	FIGURE 4-29

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT
RNZ-850

Description		Connector Pin			Connects To
RSB PRIMARY	(L)	164J1B-81		---------S-T-S-------	FIGURE 4-28
RSB PRIMARY	(H)	-71		---------S-T-S-------	FIGURE 4-28
				GND┘ └GND	
SPARE		-82			
SPARE		-83			
NAV STRAP WD LOAD		-84	(24)	------------T--------	FIGURE 4-29
NAV STRAP SIDE		-57	(24)	------------T--------	FIGURE 4-29
SPARE					
NAV STRAP DATA		-58	(24)	------------T--------	FIGURE 4-29
NAV STRAP CLK		-59	(24)	------------T--------	FIGURE 4-29
SEC RSB BUS SHIELD		-85		-----NC	
CLU SPARE		-86			
ADF OFF		-87	(24)	---------------------	144J1-p
NAV AUX SHIFT LD	(L)	-88	(24)	---------S-T-S-------	165J1-G
NAV AUX SHIFT LD	(H)	-90	(24)	---------S-T-S-------	165J1-F
				GND┘ └GND	
VOR RS-422 SD 1	(H)	-89		-----NC	
NAV AUX SHIFT LD	(H)	-90	(24)	---------S-T-S-------	165J1-F
NAV AUX SHIFT LD	(L)	-88	(24)	---------S-T-S-------	165J1-G
				GND┘ └GND	
VOR/LOC SUPERFLAG		-91		-----NC	
VOR/LOC FLAG		-92		-----NC	
MARKER AUDIO LO		-93		-----NC	
CLU SPARE		-94			
PRIMARY RSB BUS SHIELD		-95		-----NC	
EFIS/MLS LEFT		-96		-----NC	
CLU SPARE		-97			
CLU GND		-98	(22)	---------------------	DC POWER GND
ADF LOCK		-99		-----NC	
ADF RS 422 TXD A		-100		-----NC	
ADF RS 422 TXD B		-73		-----NC	
V/I SPARE		164J1B-101			

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Table 3-1. Interconnect Information (cont)

PILOT'S NAVIGATION UNIT RNZ-850

Description		Connector Pin		Connects To
VOR/ILS	(H)	164J1B-102 (24)	----------S-T-S-------	TO FMS #1
RS-422 SD2	(L)	J1A-84 (24)	----------S-T-S-------	TO FMS #1
			GND ┘ └ GND	
VOR SYNCHRO Y		-103	-----NC	
VOR SYNCHRO X		-104	-----NC	
CLU SPARE		-105		
TO/FROM & FLAG COMMON		164J1B-106	-----NC	
ADF RF INPUT 1		164J2-1	-(TRIAX)-IS----OS----	158J1-F
ADF RF INPUT 2			NC ┘ └ GND	
VOR/LOC ANT		164J3	-----RG-142/U--------	VOR/LOC 1 ANT
GS ANT		164J4	-----RG-142/U--------	GS 1 ANT
MKR BEAC ANT		164J5	-----RG-142/U--------	MKR BEAC 1 ANT
DME ANT		164J6	-----RG-142/U--------	DME 1 ANT

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Table 3-1. Interconnect Information (cont)

CLEARANCE DELIVERY UNIT
CD-850

Description		Connector Pin			Connects To
ON/OFF		165J1-A		-----NC	
COM AUDIO	(H)	-B		-----NC	
COM AUDIO	(L)	-t		-----NC	
SQUAT SW SENS		-C	(24)	---------------------	165J1-q
5 V AC/DC LIGHTING	(H)	-D	(24)	---------------------	FIGURE 4-7
+28 VDC POWER		-E	(22)	---------------------	FIGURE 4-6
NAV AUX SHIFT/LOAD	(H)	-F	(24)	---------S-T-S-------	164J1B-90
NAV AUX SHIFT/LOAD	(L)	-G	(24)	---------S-T-S-------	164J1B-88
				GND GND	
COM AUX	(H)	-H	(24)	---------S-T-S-------	143J1-33
COM AUX	(L)	-J	(24)	---------S-T-S-------	143J1-25
				GND GND	
NAV SHIELD GND		-K		-----NC	
WIDEBAND SELECT INPUT		-L	(24)	---------------------	165J1-q
NAV AUX	(H)	-M	(24)	---------S-T-S-------	164J1A-70
NAV AUX	(L)	-N	(24)	---------S-T-S-------	164J1A-58
				GND GND	
NAV AUX CLOCK	(L)	-P	(24)	---------S-T-S-------	164J1A-72
NAV AUX CLOCK	(H)	-f	(24)	---------S-T-S-------	164J1A-69
				GND GND	
RSB PRIMARY	(L)	-R		---------S-T-S-------	FIGURE 4-28
RSB PRIMARY	(H)	-g		---------S-T-S-------	FIGURE 4-28
				GND GND	
NAV AUDIO	(L)	-S		-----NC	
NAV AUDIO	(H)	-h		-----NC	
ROTOR MOD FILTER		-T		-----NC	
0/300 DEG ELECT OFFSET		-U		-----NC	
VSMA 7.9V/11.8V		-V		-----NC	
POST FAIL ANNUN		-W		-----NC	
CD/COM/NAV SELECT	A	165J1-X		-----NC	

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Table 3-1. Interconnect Information (cont)

CLEARANCE DELIVERY UNIT
CD-850

Description		Connector Pin			Connects To
WOW (GND/OPEN)		165J1-Y	(24)	---------------------	FIGURE 4-12
LIGHTING COMMON		-Z	(24)	---------------------	LIGHTING GND
28 VDC LIGHTING	(H)	-a		-----NC	
AUDIO OUTPUT	(H)	-b		-----NC	
AUDIO OUTPUT	(L)	-c		-----NC	
NAV AUX SHIELD		-d		-----NC	
SYNCHRO/RSB COMPASS		-e	(24)	---------------------	165J1-q
NAV AUX CLOCK	(H)	-f	(24)	---------S-T-S-------	164J1A-72
NAV AUX CLOCK	(L)	-P	(24)	---------S-T-S-------	164J1A-69
				GND┘ └GND	
RSB PRIMARY	(H)	-g		---------S-T-S-------	FIGURE 4-28
RSB PRIMARY	(L)	-R		---------S-T-S-------	FIGURE 4-28
				GND┘ └GND	
NAV AUDIO	(H)	-h		-----NC	
NAV AUDIO	(L)	-S		-----NC	
RMI REL/MAG BEARING		-i		-----NC	
+28 VDC POWER RETURN		-j	(22)	---------------------	DC POWER GND
COM AUDIO SHIELD		-k		-----NC	
CD/COM/NAV SELECT B		-m		-----NC	
SIDE SELECT		-n		-----NC	
COM AUX SHIELD		-p		-----NC	
JUMPER GROUND		-q	(24)	-------	165J1-C, 165J1-L, 165J1-e
NAV AUX CLOCK SHIELD		-r		-----NC	
NAV AUDIO SHIELD		-s		-----NC	
COM AUDIO	(L)	165J1-t		-----NC	
COM AUDIO	(H)	-B		-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin		Connects To
	RESERVED	190J1A-1	-----NC	
	RESERVED	-2	-----NC	
	SPARE	-3		
	RESERVED	-4	-----NC	
	RESERVED	-5	-----NC	
	SPARE	-6		
	RESERVED	-7	-----NC	
	RESERVED	-8	-----NC	
	SPARE	-9		
	RESERVED	-10	-----NC	
	RESERVED	-11	-----NC	
	SPARE	-12		
	RESERVED	-13	-----NC	
	RESERVED	-14	-----NC	
	SPARE	-15		
	RESERVED	-16	-----NC	
	RESERVED	-17	-----NC	
	SPARE	-18		
	RESERVED	-19	-----NC	
	RESERVED	-20	-----NC	
	RESERVED	-21	-----NC	
	SPARE	-22		
	RESERVED	-23	-----NC	
	RESERVED	-24	-----NC	
	RESERVED	-25	-----NC	
	RESERVED	-26	-----NC	
	RESERVED	-27	-----NC	
	RESERVED	-28	-----NC	
	RESERVED	-29	-----NC	
	SPARE	-30		
	RESERVED	-31	-----NC	
	RESERVED	-32	-----NC	
	SPARE	-33		
	RESERVED	-34	-----NC	
	RESERVED	-35	-----NC	
	SPARE	-36		
	RESERVED	-37	-----NC	
	RESERVED	-38	-----NC	
	SPARE	-39		
	RESERVED	-40	-----NC	
	RESERVED	-41	-----NC	
	SPARE	-42		
	RESERVED	-43	-----NC	
	RESERVED	-44	-----NC	
	SPARE	190J1A-45		

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin			Connects To
	RESERVED	190J1A-46		-----NC	
	RESERVED	-47		-----NC	
	RESERVED	-48		-----NC	
	SPARE	-49			
	RESERVED	-50		-----NC	
	RESERVED	-51		-----NC	
	RESERVED	-52		-----NC	
	RESERVED	-53		-----NC	
	RESERVED	-54		-----NC	
	RESERVED	-55		-----NC	
	RESERVED	-56		-----NC	
	SPARE	-57			
	RESERVED	-58		-----NC	
	RESERVED	-59		-----NC	
	SPARE	-60			
	RESERVED	-61		-----NC	
	RESERVED	-62		-----NC	
	SPARE	-63			
	RESERVED	-64		-----NC	
	RESERVED	-65		-----NC	
	SPARE	-66			
	SPARE	-67			
	SPARE	-68			
	SPARE	-69			
	SPARE	-70			
	SPARE	-71			
	SPARE	-72			
	SPARE	-73			
	SPARE	-74			
	SPARE	-75			
	PRIMARY ATTITUDE 28V VALID	-76	(24)	---------S---S------- GND GND	1J1-R
	PRIMARY HEADING 28V VALID	-77	(24)	---------S---S------- GND GND	6J1-h
	RESERVED	-78			
	PRIMARY ADF BRG 28V VALID	-79		-----NC	(FOR BENDIX KING RADIOS REFER TO FIG. 4-26)
	RESERVED	-80			
	RESERVED	190J1A-81			

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin		Connects To
	PRIMARY PITCH X	190J1A-82 (24)	---------S-T-S-------	1J1-x
	PRIMARY PITCH Y	-83 (24)	---------S-T-S-------	1J1-y
	PRIMARY PITCH Z	-84 (24)	---------S-T-S-------	1J1-z
			GND GND	
	PRIMARY ROLL X	-85 (24)	---------S-T-S-------	1J1-p
	PRIMARY ROLL Y	-86 (24)	---------S-T-S-------	1J1-q
	PRIMARY ROLL Z	-87 (24)	---------S-T-S-------	1J1-r
			GND GND	
	PRIMARY HDG X	-88 (24)	---------S-T-S-------	6J1-a
	PRIMARY HDG Y	-89 (24)	---------S-T-S-------	6J1-b
	PRIMARY HDG Z	-90 (24)	---------S-T-S-------	6J1-Z
			GND GND	
	RESERVED	-91		
	RESERVED	-92		
	RESERVED	-93		
	RESERVED	-94		
	PRIMARY ADF BRG SIN COM	-95	-----NC	
	PRIMARY ADF BRG SIN	-96	-----NC	FOR BENDIX KING
	PRIMARY ADF BRG X	-97	-----NC	RADIO INSTALLA-
	PRIMARY ADF BRG Y	-98	-----NC	TIONS, SEE FIG.
	PRIMARY ADF BRG COS	-99	-----NC	4-26
	PRIMARY ADF BRG Z	-100	-----NC	
	PRIMARY ADF BRG COS COM	-101	-----NC	
	SPARE	-102		
	SPARE	-103		
	RATE OF TURN +	-104 (24)	---------S-T-S-------	15J1-5, 190J1B-53
	RATE OF TURN --	-105 (24)	---------S-T-S-------	15J1-4, 190J1B-54
			GND GND	
	RESERVED	190J1A-106		

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	PRIMARY DME CLK +		190J1B-1		-----NC	
	PRIMARY DME DATA +		-2		-----NC	
	PRIMARY DME COMMON		-3		-----NC	
	PRIMARY DME ENABLE		-4		-----NC	
	PRIMARY DME HOLD		-5		-----NC	
	SEC DME CLK +		-6		-----NC	
	SEC DME DATA +		-7		-----NC	
	SEC DME COMMON		-8		-----NC	
	SEC DME ENABLE		-9		-----NC	
	SEC DME HOLD		-10		-----NC	
	RESERVED		-11			
	RESERVED		-12			
	RESERVED		-13			
	RESERVED		-14			
	IC DATA BUS	(H)	-15	(24)	---------S-T-S-------	126J1-24, C190J1B-15
	IC DATA BUS	(L)	-16	(24)	---------S-T-S------- GND GND	126J1-25, C190J1B-16
	RESERVED		-17			
	RESERVED		-18			
	RESERVED		-19			
	RESERVED		-20			
	CONFIG (RESERVED)		-21		-----NC	
	CONFIG (LOW SPEED LRN BUS #1)		-22	(24)	---------------------	TABLE 4-2
	CONFIG (LOW SPEED LRN BUS #2)		-23	(24)	---------------------	TABLE 4-2
	CONFIG (NO HW WX)		-24	(24)	---------------------	TABLE 4-2
	CONFIG (SINGLE CUE/CROSS POINT)		-25	(24)	---------------------	TABLE 4-2
	CONFIG (TWO DISPLAY SYSTEM)		-26	(24)	---------------------	TABLE 4-2
	CONFIG (JAA OPTION)		-27	(24)	---------------------	TABLE 4-2
	CONFIG (PHASE III)		-28	(24)	---------------------	TABLE 4-2
	CONFIG (DUAL LRN)		-29	(24)	---------------------	TABLE 4-2
	SG REVERSION INPUT		-30	(24)	---------------------	FIG. 4-24
	SPARE		-31		-----NC	
	BARO SET INPUT (WIPER)		-32		-----NC	
	SPARE		-33		-----NC	
	ROLL TRIM WARN ANNUNCIATOR		190J1B-34	(22)	---------------------	ROLL TRIM WARN LIGHT, FIG. 4-21

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin			Connects To
	BC DISCRETE OUT	190J1B-35	(22)	---------------------	8J1-22, GROUND PROXIMITY WARNING SYSTEM
	IC FAN FAIL	-36	(22)	---------------------	PILOT'S IC FAN FAIL LIGHT, FIG. 4-21
	RESERVED	-37			
	RESERVED	-38		-----NC	
	RESERVED	-39		-----NC	
	RESERVED	-40			
	AOA 28 V VALID	-41	(24)	---------------------	FIG. 4-11
	RESERVED	-42		-----NC	
	RESERVED	-43		-----NC	
	SEC DME TTN (DME HOLD)	-44		-----NC	
	SEC NAV 28 V VALID	-45		-----NC	
	SEC SRN LATERAL DEV +	-46		-----NC	
	SEC SRN LATERAL DEV -	-47		-----NC	
	FMS SINGLE POINT VNAV ENABLE	-48		-----NC	
	SEC GS 28 V VALID	-49		-----NC	
	SEC GS DEV +	-50		-----NC	
	SEC GS DEV -	-51		-----NC	
	ROT/YAW RATE 5 V VALID	-52	(24)	---------S-T-S-------	15J1-7
	ROT/YAW RATE +	-53	(24)	---------S-T-S-------	15J1-5, 190J1A-104
	ROT/YAW RATE -	-54	(24)	---------S-T-S-------	15J1-4, 190J1A-105
				GND┘ └GND	
	COMPASS SYNC +	-55	(24)	---------S-T-S-------	6J1-U
	COMPASS SYNC -	-56	(24)	---------S-T-S-------	6J1-V
				GND┘ └GND	
	INNER MARKER BEC +	-57		-----NC	
	INNER MARKER BEC -	-58		-----NC	
	MIDDLE MARKER +	-59		-----NC	
	MIDDLE MARKER -	-60		-----NC	
	OUTER MARKER +	-61		-----NC	
	OUTER MARKER -	-62		-----NC	
	OSC TEST IN +	-63		-----NC	
	OSC TEST IN -	-64		-----NC	
	AOA DCVAR INPUT +	-65	(24)	---------------------	FIG. 4-11
	AOA DCVAR INPUT -	-66	(24)	---------------------	FIG. 4-11
	RESERVED	-67			
	RESERVED	-68			
	RESERVED	190J1B-69			

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin			Connects To
	RESERVED	190J1B-70			
	RESERVED	-71			
	RESERVED	-72			
	RESERVED	-73			
	RESERVED	-74			
	RESERVED	-75			
	SEC ATTITUDE 28 V VALID	-76	(22)	---------------------	C1J1-R, C190J1A-76
	SEC HEADING 28 V VALID	-77	(22)	---------------------	C6J1-h, C190J1A-77
	STICK SHAKER	-78	(24)	---------------------	STICK SHAKER
	SEC ADF BRG 28 V VALID	-79		-----NC	(FOR BENDIX KING RADIOS SEE FIG. 4-26)
	SEC AC REF +	-80	(24)	---------S-T-S-------	FIG. 4-8
	SEC AC REF -	-81	(24)	---------S-T-S-------	AC GND
				GND GND	
	SEC PITCH X	-82	(24)	---------S-T-S-------	C1J1-x, C190J1A-82
	SEC PITCH Y	-83	(24)	---------S-T-S-------	C1J1-y, C190J1A-83
	SEC PITCH Z	-84	(24)	---------S-T-S-------	C1J1-z, C190J1A-84
				GND GND	
	SEC ROLL X	-85	(24)	---------S-T-S-------	C1J1-p, C190J1A-85
	SEC ROLL Y	-86	(24)	---------S-T-S-------	C1J1-q, C190J1A-86
	SEC ROLL Z	-87	(24)	---------S-T-S-------	C1J1-r, C190J1A-87
				GND GND	
	SEC HDG X	-88	(24)	---------S-T-S-------	C6J1-L, C190J1A-88
	SEC HDG Y	-89	(24)	---------S-T-S-------	C6J1-M, C190J1A-89
	SEC HDG Z	-90	(24)	---------S-T-S-------	C6J1-K, C190J1A-90
				GND GND	
	RESERVED	-91			
	RESERVED	-92			
	RESERVED	-93			
	SPARE	-94			
	SEC ADF BRG SIN COM	-95		-----NC	
	SEC ADF BRG SIN	-96		-----NC	FOR BENDIX KING
	SEC ADF BRG X	-97		-----NC	RADIO INSTALLA-
	SEC ADF BRG Y	-98		-----NC	TIONS, SEE FIG.
	SEC ADF BRG COS	190J1B-99		-----NC	4-26

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin		Connects To
	SEC ADF BRG Z	190J1B-100	-----NC	
	SEC ADF BRG COS COM	-101	-----NC	
	RESERVED	-102	-----NC	
	RESERVED	-103	-----NC	
	RESERVED	-104	-----NC	
	RESERVED	-105	-----NC	
	RESERVED	190J1B-106	-----NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	DGC +28 V DC POWER		190J2A-1	(20)	---------------------	FIG. 4-6
	DGC +28 V DC POWER		-2	(20)	---------------------	FIG. 4-6
	DGC +28 V DC POWER		-3	(20)	---------------------	FIG. 4-6
	DGC DC POWER GND		-4	(20)	---------------------	DC PWR GND
	DGC DC POWER GND		-5	(20)	---------------------	DC PWR GND
	DGC DC POWER GND		-6	(20)	---------------------	DC PWR GND
	LAMP RETURN		-7	(22)	---------------------	DC PWR GND
	DGC SIGNAL GND		-8	(22)	---------------------	SIGNAL GND
	DGC SIGNAL GND		-9	(22)	---------------------	SIGNAL GND
	10 V RTN		-10	(24)	---------S-T-S-------	115J1-55
	-10 V REF OUT		-11	(24)	---NC	
	+10 V REF OUT		-12	(24)	---------S-T-S-------	115J1-53
	DECISION HEIGHT/RAD ALT INPUT W		-13	(24)	---------S-T-S------- GND┘ └GND	115J1-54
	SPARE		-14		-----NC	
	PRIMARY DC-550	+	-15	(24)	---------S-T-S-------	115J1-34
	PRIMARY DC-550	-	-16	(24)	---------S-T-S------- GND┘ └GND	115J1-35
	LEFT EFIS CONTROL BUS	(P)	-17	(24)	---------S-T-S-------	59J1-m NC FOR NO HW WX OPTION
	LEFT EFIS CONTROL BUS	(N)	-18	(24)	---------S-T-S------- GND┘ └GND	59J1-n NC FOR NO HW WX OPTION
	PRIMARY RSB	(H)	-19		-----NC	
	PRIMARY RSB	(L)	-20		-----NC	
	PRI ARINC 429 LRN	(H)	-21	(24)	---------S-T-S-------	C190J2A-21 FROM LRN FIG. 4-20
	PRI ARINC 429 LRN	(L)	-22	(24)	---------S-T-S------- GND┘ └GND	C190J2A-22 FROM LRN FIG. 4-20
	ARINC 429 ADF #1	(H)	-23	(24)	---------S-T-S-------	C190J2A-81 TO PILOT'S RADIOS
	ARINC 429 ADF #1(J2A-23, -24 ARE NC FOR BENDIX KING RADIOS)	(L)	-24	(24)	---------S-T-S------- GND┘ └GND	C190J2A-82 TO PILOT'S RADIOS
	RESERVED		-25			
	SEC ARINC 429 LRN	(L)	190J2A-26	(24)	---------------------	SEE FIG. 4-20

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	ARINC 429 DME #2	(H)	190J2A-27	(24)	---------S-T-S-------	C190J2B-31 TO CO-PILOT'S RADIOS
	ARINC 429 DME #2 (J2A-27, -28 ARE NC FOR SINGLE DME	(L)	-28	(24)	---------S-T-S------- GND GND	C190J2B-32 TO CO-PILOT'S RADIOS
	RESERVED		-29			
	RESERVED		-30			
	ARINC 429 VOR/LOC #1	(H)	-31	(24)	---------S-T-S-------	C190J2B-13 FROM PILOT'S RADIOS
	ARINC 429 VOR/LOC #1	(L)	-32	(24)	---------S-T-S------- GND GND	C190J2B-26 FROM PILOT'S RADIO
	RESERVED		-33			
	RESERVED		-34			
	RESERVED		-35			
	RESERVED		-36			
	SPARE		-37			
	SPARE		-38			
	429 LRN OUT	(HI)	-39	(24)	-----------------	SEE FIG. 4-20
	SEC ARINC 429 LRN	(H)	-40	(24)	-----------------	SEE FIG. 4-20
	EGPWS	(H)	-41	(24)	---------S-T-S-------	EGPWS
	EGPWS	(L)	-42	(24)	---------S-T-S------- GND GND	EGPWS
	ARINC 429 ADC #2	(H)	-43	(24)	---------S-T-S-------	C9J1-63
	ARINC 429 ADC #2	(L)	-44	(24)	---------S-T-S------- GND GND	C9J1-64
	DU HDLC INPUT2 BUS	(H)	-45	(24)	---------S-T-S-------	C190J2B-16, 131J1-31 NC FOR 2 DU SYSTEM
	DU HDLC INPUT2 BUS	(L)	-46		-----NC	
	DU HDLC INPUT2 BUS	(T)	-47	(24)	---------S-T-S------- GND GND	C190J2B-17, 131J1-32, NC FOR 2 DU SYSTEM
	RESERVED		-48			
	RADAR ALT 28 V VALID		-49	(24)	---------------------	RAD ALT VALID
	RADAR ALT + (SEE NOTE)		-50	(24)	---------S-T-S-------	C190J2A-50, FROM RAD ALT
	RADAR ALT -		190J2A-51	(24)	---------S-T-S------- GND GND	C190J2A-51, FROM RAD ALT

NOTE: For RA with negative outputs reverse connection into IC-600.

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	429 LRN OUT	(LO)	190J2A-52	(24)	---------------------	SEE FIG. 4-20
	ACCEL RTN		-53	(24)	---------------------	17J1-3
	LEFT SIDE SELECT		-54	(24)	---------------------	SIG GND
	RESERVED		-55			
	RESERVED		-56			
	DGC-DGC/FTSU BUS	(H)	-57	(24)	---------S-T-S-------	FIG 4-19
	DGC-DGC/FTSU BUS	(L)	-58	(24)	---------S-T-S------- GND GND	FIG 4-19
	RESERVED		-59			
	RESERVED		-60			
	LANDING GEAR DOWN		-61	(24)	---------------------	FIG. 4-17
	PRIMARY DG/MAG		-62	(24)	---------------------	FIG. 4-17
	SECONDARY DG/MAG		-63	(24)	---------------------	FIG. 4-17
	WEIGHT ON WHEELS	(WOW)	-64	(24)	---------------------	FIG. 4-12
	PGM ENABLE		-65		-----NC	
	SYS CONFIG IDENT 1		-66	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 2		-67	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 3		-68	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 4		-69	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 5		-70	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 6		-71	(24)	---------------------	TABLE 4-1
	A/C TYPE IDENT 1		-72		-----NC	
	A/C TYPE IDENT 2		-73	(24)	---------------------	190J2A-90
	A/C TYPE IDENT 3		-74		-----NC	
	A/C TYPE IDENT 4		-75	(24)	---------------------	190J2A-90
	A/C TYPE IDENT 5		-76		-----NC	
	TEST IDENT 1		-77		-----NC	
	TEST IDENT 2		-78		-----NC	
	TEST IDENT 3		-79		-----NC	
	TEST IDENT 4		-80		-----NC	
	SECONDARY ARINC 429 ADF	(H)	-81	(24)	---------S-T-S-------	C190J2A-23 FROM CO-PILOT'S RADIOS
	SECONDARY ARINC 429 ADF	(L)	-82	(24)	---------S-T-S------- GND GND	C190J2A-24 FROM CO-PILOT'S RADIOS
	(J2A-81, -82 ARE NC FOR BENDIX KING RADIOS) (J2A-81, -82 ARE NC FOR SINGLE ADF)					
	RESERVED		-83			
	RESERVED		-84			
	RESERVED		-85			
	RESERVED		190J2A-86			

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	RESERVED		190J2A-87			
	RESERVED		-88			
	RESERVED		-89			
	DIN GROUND		-90	(24)	---------------------	PROG GND
	RS232 SERIAL DATA	OUT	-91		---------------------	FIG. 4-19
	RS232 SERIAL DATA	IN	-92		---------------------	FIG. 4-19
	RS232 SERIAL DATA	GND	-93		---------------------	FIG. 4-19
	ALT ALERT HORN OUT		-94	(24)	---------------------	FIG. 4-13
	DECISION HEIGHT/ MINIMUM ALTITUDE WARN	OUT	-95	(24)	---------------------	FIG. 4-13
	MASTER CMPMON WARN	OUT	-96	(24)	---------------------	CMPMON LIGHT, FIG. 4-21
	TEST OUT GND		-97	(24)	---------------------	TO RAD ALT CIRCUIT
	BANK ANNUNC OUT		-98	(24)	---------------------	11J1-W, C190J2A-98
	COUPLE ANNUNC OUT		-99	(24)	---------------------	FIG. 4-18
	VNAV ANNUNC OUT		-100	(24)	---------------------	8J1-13
	VS MODE ANNUNC OUT		-101	(24)	---------------------	8J1-15
	SPD MODE ANNUNC OUT		-102	(24)	---------------------	8J1-16
	ALT MODE ANNUNC OUT		-103	(24)	---------------------	8J1-14
	APR MODE ANNUNC OUT		-104	(24)	---------------------	8J1-12
	NAV MODE ANNUNC OUT		-105	(24)	---------------------	8J1-11
	HDG MODE ANNUNC OUT		190J2A-106	(24)	---------------------	8J1-10

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	SERVO + 28 V POWER		190J2B-1	(20)	---------------------	FIG. 4-6
	SERVO + 28 V POWER		-2	(20)	---------------------	FIG. 4-6
	SERVO + 28 V POWER		-3	(20)	---------------------	FIG. 4-6
	SERVO + 28 V POWER		-4	(20)	---------------------	FIG. 4-6
	RESERVED		-5			
	SERVO DC POWER GND		-6	(20)	---------------------	DC PWR GND
	SERVO DC POWER GND		-7	(20)	---------------------	DC PWR GND
	SERVO DC POWER GND		-8	(20)	---------------------	DC PWR GND
	SERVO DC POWER GND		-9	(20)	---------------------	DC PWR GND
	DU HDLC OUTPUT BUS	(H)	-10	(24)	---------------------	FIG. 4-24
	DU HDLC OUTPUT BUS	(L)	-11	(24)	---------------------	FIG. 4-24
	ARINC 429 FDR OUT	(H)	-12	(24)	--TSP----------------	TO FLIGHT DATA RECORDER
	ARINC 429 VOR/LOC #2	(H)	-13	(24)	--TSP----------------	FROM COPILOT'S RADIOS, C190J2A-31
	DU HDLC INPUT1 BUS	(H)	-14	(24)	---------S-T-S-------	130J1-31
	DU HDLC INPUT1 BUS	(L)	-15	(24)	---------S-T-S------- GND GND	130J1-32
	DU HDLC INPUT3 BUS	(H)	-16		-----NC	
	DU HDLC INPUT3 BUS	(L)	-17		-----NC	
	SRN #1 SEL OUT		-18			
	SRN #2 SEL OUT		-19			
	BARO CORRECTION (hPa/inHg)		-20	(24)	---------------------	9J1-16
	CHK PFD 1 ANNUNCIATOR OUT		-21	(22)	---------------------	EXT LIGHT, FIG. 4-21
	RESERVED		-22			
	ARINC 429 ADC #1	(H)	-23	(24)	---------S-T-S-------	9J1-60
	ARINC 429 ADC #1	(L)	-24	(24)	---------S-T-S------- GND GND	9J1-61
	ARINC 429 FDR OUT	(L)	-25	(24)	--TSP----------------	TO FLIGHT DATA RECORDER
	ARINC 429 VOR/LOC #2	(L)	-26	(24)	--TSP----------------	FROM COPILOT'S RADIOS, C190J2A-32
	ARINC 429 TACAN #1	(H)	-27			
	ARINC 429 TACAN #1	(L)	-28			
	ARINC 429 TCAS IN	(H)	-29		---------------------	C190J2B-29 FROM TCAS
	ARINC 429 TCAS IN	(L)	-30		---------------------	C190J2B-30 FROM TCAS
	ARINC 429 DME #1	(H)	190J2B-31	(24)	---------------------	C190J2A-27 FROM PILOT'S RADIOS

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	ARINC 429 DME #1	(L)	190J2B-32	(24)	---------------------	C190J2A-28 FROM PILOT'S RADIOS
	RESERVED		-33			
	RESERVED		-34			
	ALT ALERT ANNUNC OUT		-35	(22)	---------------------	EXT LIGHT, FIG. 4-21
	PRIMARY AC REF +		-36	(24)	---------S-T-S-------	FIG. 4-8
	PRIMARY AC REF	-	-37	(24)	---------S-T-S------- GND GND	AC GND
	RESERVED		-38			
	RESERVED		-39			
	RESERVED		-40			
	RESERVED		-41			
	RESERVED		-42			
	RESERVED		-43			
	RESERVED		-44			
	RESERVED		-45			
	RESERVED		-46			
	RESERVED		-47			
	RESERVED		-48			
	RESERVED		-49			
	RESERVED		-50			
	RESERVED		-51			
	AP LAMP RETURN		-52	(22)	---------------------	DC PWR GND
	SECONDARY RSB	(H)	-53		-----NC	
	SECONDARY RSB	(L)	-54		-----NC	
	COUPLE PB INPUT		-55	(24)	---------------------	FIG. 4-18
	BANK PB INPUT		-56	(24)	---------------------	11J1-X, C190J2B-56
	RESERVED		-57			
	RESERVED		-58			
	+15 V ACCEL/ADS REF	OUT	-59	(24)	---------------------	11J1-C, 17J1-1
	-15 V ACCEL/ADS REF	OUT	-60	(24)	---------------------	11J1-A, 17J1-5
	15 V RETURN		-61	(24)	---------------------	DC GND
	LATERAL ACCEL INPUT		-62		-----NC	
	LAT ACCEL TEST OUTPUT		-63		-----NC	
	NORMAL ACCEL INPUT		-64	(24)	---------------------	17J1-2
	LONGT ACCEL INPUT		-65		-----NC	
	MAN TRIM UP		-66	(24)	---------------------	FIG. 4-9
	MAN TRIM DN		-67	(24)	---------------------	FIG. 4-9
	PITCH WHEEL IN +		-68	(24)	---------S-T-S-------	11JI-U, C190J2B-68
	PITCH WHEEL IN -		190J2B-69	(24)	---------S-T-S------- GND GND	11J1-V, C190J2B-69

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER IC-600

IO BP	Description	Connector Pin		Connects To
	TCS 28 V INPUT	190J2B-70 (24)	---------------------	FIG. 4-10
	GO AROUND (GA) SWITCH	-71 (24)	---------------------	FIG. 4-14
	STEP INPUT (FLIGHT TEST ONLY)	-72	-----NC	
	TURN KNOB INPUT	-73 (24)	---------S---S------- GND GND	11J1-B
	SPARE	-74		
	TURN KNOB OUT OF DETNT	-75 (24)	---------------------	11J1-H, C190J2B-75
	AP DISCONNECT 28 V IN	-76 (22)	---------------------	FIG. 4-10, 190J2B-90
	MOMENTARY HORN DISABLE	-77 (22)	---------------------	115J1-44
	YD OFF ANNUNC OUT	-78 (22)	---------------------	FIG. 4-10
	LIGHT AND HORN DISABLE	-79 (22)	---------------------	115J1-42,115J1-43
	PITCH TRIM WARN ANNUNC OUT	-80 (22)	---------------------	PITCH TRIM WARN LIGHT, FIG. 4-21
	TRIM UP ANNUNC OUT	-81 (24)	---------------------	11J1-S
	TRIM DN ANNUNC OUT (PITCH ONLY)	-82 (24)	---------------------	11J1-T
	YD ENGAGE SELECT PB IN	-83 (24)	---------------------	11J1-M
	YD ENGAGE ANNUNC OUT	-84 (24)	---------------------	11J1-R
	AP ENGAGE SEL PB IN	-85 (24)	---------------------	11J1-L
	AP ENGAGE ANNUNC OUT	-86 (24)	---------------------	11J1-P
	28 V YD CLUTCH	-87 (22)	---------------------	14J1-G
	28 V AP CLUTCH	-88 (22)	---------------------•	
	28 V AP CLUTCH	-89 (22)	---------------------•	12J1-F, 13J1-F, 115J1-27
	AP DISCONNECT 28 VIN	-90 (22)	---------------------	190J2B-76
	FMS SELECT (GND/OPEN)	-91		GND = GNS-X SERIES OPEN = UNIVERSAL
	PITCH TRIM OUT +	-92 (22)	---------S-T-S-------	FIG. 4-9
	PITCH TRIM OUT -	-93 (22)	---------S-T-S------- GND GND	FIG. 4-9
	RIGHT SELECT	-94 (24)	--NC	
	RUDDER SERVO TACH FB IN +	-95 (24)	---------S-T-S-------	14J1-N
	RUDDER SERVO TACH FB IN -	190J2B-96 (24)	---------S-T-S------- GND GND	14J1-L

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Table 3-1. Interconnect Information (cont)

PILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	RUDDER SERVO OUT	(H)	190J2B-97	(20)	---------S-T-S-------	14J1-B
	RUDDER SERVO OUT	(L)	-98	(20)	---------S-T-S-------	14J1-A
					GND┘ └GND	
	AILERON SERVO TACH FB	IN +	-99	(24)	---------S-T-S-------	12J1-N
					| | |	
	AILERON SERVO TACH FB	IN -	-100	(24)	---------S-T-S-------	12J1-L
					GND┘ └GND	
	AILERON SERVO OUT	(H)	-101	(20)	---------S-T-S-------	12J1-B
	AILERON SERVO OUT	(L)	-102	(20)	---------S-T-S-------	12J1-A
					GND┘ └GND	
	PITCH SRVO TACH FB IN +		-103	(24)	---------S-T-S-------	13J1-N
					| | |	
	PITCH SRVO TACH FB IN -		-104	(24)	---------S-T-S-------	13J1-L
					GND┘ └GND	
	PITCH SERVO OUT	(H)	-105	(20)	---------S-T-S-------	13J1-B
	PITCH SERVO OUT	(L)	190J2B-106	(20)	---------S-T-S-------	13J1-A
					GND┘ └GND	

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Table 3-1. Interconnect Information (cont)

COPILOT'S VERTICAL GYRO
VG-14A

IO BP	Description		Connector Pin			Connects To
	TEST POINT		C1J1-A		-----NC	
	POWER GND		-B	(22)	---------S-T-S-------	AC GND
	115 V AC, 400 HZ INPUT		-C	(22)	---------S-T-S------- GND GND	FIG. 4-8
	27 V DC OUTPUT		-D	(24)	---------------------	C1J1-P
	26 V AC, 400 HZ OUTPUT (55 VA MAX)		-E		-----NC	
	5V, 400 HZ OUTPUT		-F		-----NC	
	EXTERNAL PECO CONTROL GND		-G		-----NC	
	RECO CONTROL		-H	(24)	---------------------	JUMPER
	RECO CONTROL		-J	(24)	---------------------	JUMPER
	PECO CONTROL		-K		-----NC	
	CHASSIS GND		-L		-----NC	
	PECO CONTROL		-M		-----NC	
	ATTITUDE VALID	NC	-N		-----NC	
	ATTITUDE VALID	W	-P	(24)	---------------------	C1J1-D
	ATTITUDE VALID	NO	-R	(24)	---------S---S------- GND GND	C190J1A-76, 190J1B-76
	SPARE		-S			
	SPARE		-T			
	SPARE		-U			
	EXTERNAL FAST ERECT CMD		-V	(24)	---------------------	FIG. 4-17
	SPARE		-W			
	SPARE		-X			
	SPARE		-Y			
	SPARE		-Z			
	SPARE		-a			
	SPARE		-b			
	TEST POINT		-c			
	TEST POINT		-d			
	SPARE		-e			
	SPARE		-f			
	SPARE		-g			
	SPARE		-h			
	SPARE		-i			
	SPARE		C1J1-j			

NOTE: CONNECTIONS SHOWN FOR VG-14A CONNECTOR POINTING AFT.

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Table 3-1. Interconnect Information (cont)

COPILOT'S VERTICAL GYRO
VG-14A

Description	IO BP	Connector Pin			Connects To
RECO GND OUTPUT >6° OUTPUT		C1J1-k		-----NC	
PECO GND OUTPUT		-m		-----NC	
EXTERNAL RECO CONTROL		-n		-----NC	
ROLL ATTITUDE Y	X	-p	(24)	---------S-T-S-------	C190J1A-85, 190J1B-85
ROLL ATTITUDE Y		-q	(24)	---------S-T-S-------	C190J1A-86, 190J1B-86
ROLL ATTITUDE Y	Z	-r	(24)	---------S-T-S------- GND GND	C190J1A-87, 190J1B-87
	C	-s		-----NC	
ROLL TO F/D	C	-t		-----NC	
	H	-u		-----NC	
ROLL TO RADAR 50 MV/DEG	H	-v		-----NC	
ROLL TO RADAR 50 MV/DEG	C	-w		-----NC	
PITCH ATTITUDE	X	-x	(24)	---------S-T-S-------	C190J1A-82, 190J1B-82
PITCH ATTITUDE	Y	-y	(24)	---------S-T-S-------	C190J1A-83, 190J1B-83
PITCH ATTITUDE	Z	-z	(24)	---------S-T-S------- GND GND	C190J1A-84, 190J1B-84
	C	-AA		-----NC	
PITCH TO F/D	C	-BB		-----NC	
	H	-CC		-----NC	
PITCH TO RADAR 50 MV/DEG	C	-DD		-----NC	
PITCH TO RADAR 50 MV/DEG	H	-EE		-----NC	
ATTITUDE VALID	W	-GG		-----NC	
ATTITUDE VALID	NC	-FF			
ATTITUDE VALID	NO	C1J1-HH		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT’S FLUX VALVE
FX-220

Description	IO BP	Connector Pin			Connects To
FV STATOR	Z	C4J1-A	(24)	---------S---S-------	5J2-A
FV STATOR	X	-B	(24)	---------S---S-------	5J2-B
FV STATOR	Y	-C	(24)	---------S---S-------	5J2-C
				GND┘ └GND	
26V, 400 HZ	C	-D	(24)	---------------------	AC GND
26V, 400 HZ	H	-E	(24)	-------------.-------	C6J1-S
		C4J1-F	(24)	-----. └-------	5J2-D
				└--- C5J1-F	

COPILOT'S DUAL REMOTE COMPENSATOR
CS-412

Description	IO BP	Connector Pin			Connects To
FROM FLUX VALVE	Z	5J2-A	(24)	---------S---S-------	C4J1-A
FROM FLUX VALVE	X	-B	(24)	---------S---S-------	C4J1-B
FROM FLUX VALVE	Y	-C	(24)	---------S---S-------	C4J1-C
				GND┘ └GND	
26V, 400 HZ		-D	(24)	-------------.-------	C6J1-S
				└-------	C4J1-E
PWR GND		-E	(24)	---------------------	AC GND
SHIELD GND		-F	(24)	---------------------	C4J1-F
SPARE		-G			
FLUX VALVE OUTPUT	X	-H	(24)	---------S---S-------	C6J1-R
FLUX VALVE OUTPUT	Y	-J	(24)	---------S---S-------	C6J1-N
FLUX VALVE OUTPUT	Z	-K	(24)	---------S---S-------	C6J1-P
				GND┘ └GND	
CHASSIS GND		-L		-----NC	
SPARE		-M			
SPARE		-N			
SPARE		-P			
SPARE		-R			
SPARE		-S			
SPARE		-T			
SPARE		-U			
SPARE		5J2-V			

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Table 3-1. Interconnect Information (cont)

COPILOT'S DIRECTIONAL GYRO
C-140

```
IO
BP  Description                  Connector Pin                                Connects To

    AC POWER GND                   C6J1-A   (22)  ---------------------  AC GND
    28 V DC GND                        -B   (22)  ---------------------  DC GND
    +28 V DC INPUT                     -C   (22)  ---------------------  FIG. 4-6
                                       -D
    FREE SLAVE SW        (+)           -E   (24)  ---------------------  FIG. 4-17
                                       -F
    FREE SLAVE SW        (-)           -G   (24)  ---------------------  FIG. 4-17

    HDG NO. 1 ROTOR 26V  H             -H   (22)  ---------S-T-S-------  FIG. 4-8
    400HZ                                                  | | |
    HDG NO. 1 ROTOR 26V  C             -J   (22)  ---------S-T-S-------  AC GND
    400HZ                                              GND-┘   └-GND

    HDG NO. 1 STATOR     Z             -K   (24)  ---------S-T-S-------  190J1B-90
    HDG NO. 1 STATOR     X             -L   (24)  ---------S-T-S-------  190J1B-88
    HDG NO. 1 STATOR     Y             -M   (24)  ---------S-T-S-------  190J1B-89
                                                       GND-┘   └-GND

    FLUX VALVE           Y             -N   (24)  ---------S-T-S-------  5J2-J
    FLUX VALVE           Z             -P   (24)  ---------S-T-S-------  5J2-K
    FLUX VALVE           X             -R   (24)  ---------S-T-S-------  5J2-H
                                                       GND-┘   └-GND

    26 V AC FLUX VALVE   EX            -S   (24)  ------------•--------  C4J1-E
    115 V AC OUT                       -T                     |--------  5J2-D
    ANNUNCIATOR          +             -U   (24)  ---------------------  C190J1B-55
    ANNUNCIATOR          -             -V   (24)  ---------------------  C190J1B-56
    5 V AC OUTPUT                      -W
    HDG NO. 2 ROTOR      H             -X   (22)  ---------S-T-S-------  FIG. 4-8
    HDG NO. 2 ROTOR      C             -Y   (22)  ---------S-T-S-------  AC GND
                                                       GND-┘ | └-GND
                                                             |
    HDG NO. 2 STATOR     Z             -Z   (24)  ---------S-T-S-------  C190J1A-90
    (ANTI BACKLASH)                                        | | |
    HDG NO. 2 STATOR     X             -a   (24)  ---------S-T-S-------  C190J1A-88
    (ANTI BACKLASH)                                        | | |
    HDG NO. 2 STATOR     Y         C6J1-b   (24)  ---------S-T-S-------  C190J1A-89
    (ANTI BACKLASH)                                    GND-┘   └-GND
```


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Table 3-1. Interconnect Information (cont)

COPILOT'S DIRECTIONAL GYRO
C-140

IO BP	Description		Connector Pin			Connects To
	INTERLOCK NO. 1	NC	C6J1-c			
	INTERLOCK NO. 1	NO	-d		-----NC	
	INTERLOCK NO. 1	C	-e		-----NC	
	FLUX VALVE SHIELD		-f			
	CHASSIS GND	-g				
	INTERLOCK NO. 2	C	-h	(24)	---------------------	C190J1A-77, 190J1B-77
	INTERLOCK NO. 2	NC	-i			
	INTERLOCK NO. 2	NO	-j	(24)	---------------------	FIG. 4-6
	26 V AC OUTPUT	H	-k		-----NC	
	42 VA MAX				LH	
	SYNC SWITCH	.	-m	(24)	-----------------▼	MANUAL SYNC
	SYNC SWITCH	W	-n	(24)	------------o	SWITCH S3
	SYNC SWITCH	+	-p	(24)	-----------------▲	
	FREQUENCY/PHASE LOCK		-q		RH	
	SPARE		-r			
	SPARE		-s			
	SPARE		C6J1-t			

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Table 3-1. Interconnect Information (cont)

COPILOT'S MODE SELECTOR
MS-560

IO BP	Description	Connector Pin			Connects To
	LHGT/MODE GND	C8J1-1	(22)	---------------------	DC PWR GND
	28 V MODE ANN PWR	-2	(22)	---------------------	FIG. 4-6
	HDG SEL	-3	(24)	---------------------	C115J1-47
	NAV SEL	-4	(24)	---------------------	C115J1-48
	APR SEL	-5	(24)	---------------------	C115J1-49
	VNAV SEL	-6	(24)	---------------------	C115J1-56
	ALT HOLD SEL	-7	(24)	---------------------	C115J1-57
	VS SEL	-8	(24)	---------------------	C115J1-58
	IAS SEL	-9	(24)	---------------------	C115J1-60
	HDG ANN GND	-10	(24)	---------------------	C190J2A-106
	NAV ANN GND	-11	(24)	---------------------	C190J2A-105
	APR ANN GND	-12	(24)	---------------------	C190J2A-104
	VNAV ANN GND	-13	(24)	---------------------	C190J2A-100
	ALT HOLD ANN GND	-14	(24)	---------------------	C190J2A-103
	VS ANN GND	-15	(24)	---------------------	C190J2A-101
	IAS ANN GND	-16	(24)	---------------------	C190J2A-102
	0-5 V BACKGRD LGHT	-17	(22)	---------------------	FIG. 4-7
	0-28 V BACKGRD LGHT	-18		-----NC	
	LGHT/MODE GND	-19	(22)	---------------------	DC PWR GND
	CHASSIS GND	-20		-----NC	
	BC SEL	-21	(24)	---------------------	C115J1-61
	BBC ANN GND	-22	(24)	---------------------	C190J1B-35
	SPARE	-23			
	SPARE	-24			
	SPARE	C8J1-25			

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Table 3-1. Interconnect Information (cont)

COPILOT'S MICRO AIR DATA COMPUTER (MADC)
AZ-850

IO BP	Description	Connector Pin			Connects To
	UNIT ID0 (GND/OPEN)	C9J1-1	(24)	---------------------	SIGNAL GND
	UNIT ID1 (GND/OPEN)	-2	(24)	---------------------	SIGNAL GND
	UNIT ID2 (GND/OPEN)	-3		-----NC	
	UNIT ID3 (GND/OPEN)	-4	(24)	---------------------	SIGNAL GND
	UNIT ID4 (GND/OPEN)	-5		-----NC	
	UNIT ID5 (GND/OPEN)	-6		-----NC	
	UNIT ID6 (GND/OPEN)	-7		-----NC	
	SDI/1 (GND/OPEN)	-8	(24)	---------------------	SIGNAL GND
	SDI/2 (GND/OPEN)	-9		-----NC	
	SDI/3 (GND/OPEN)	-10		-----NC	
	SPARE	-11			
	WOW (GND/OPEN)	-12		---------------------	FIG. 4-12
	SIGNAL GROUND	-13	(24)	---------------------	SIGNAL GND
	SPARE	-14			
	SPARE IN 1 (GND/OPEN)	-15			
	MB/IN HG	-16	(24)	---------------------	C190J2B-20
	SPARE IN 3 (GND/OPEN)	-17			
	SPARE IN 4 (GND/OPEN)	-18			
	SPARE IN 1 (28 V DC/OPEN)	-19			
	SPARE IN 2 (28 V DC/OPEN) > 34,250 FT PALT TRIP(GND/OPEN)	-20			
		-21		-----NC	
	SPARE OUT 2	-22			
	SPARE OUT 3	-23			
	SPARE OUT 4	-24			
	SPARE OUT 5	-25			
	+28 V DC POWER	-26	(22)	---------------------	FIG. 4-6
	+28 V DC POWER RETURN	-27	(22)	---------------------	DC POWER GND
	OVERSPEED WARNING DISC(GND/OPEN)	-28		---------------------	FIG. 4-15
	MADC VALID DISC (GND/OPEN)	C9J1-29		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S MICRO AIR DATA COMPUTER (MADC)
AZ-850

IO BP	Description		Connector Pin			Connects To
	ASCB #1 PRI	(H)	C9J1-30		-----NC	
	TEMP PROBE	(H)	-31	(24)	---------S-T-S-------	500 OHM
	TEMP PROBE	(L)	-32	(24)	---------S-T-S-------	TEMP. PROBE
					GND GND	
	SPARE		-33			
	ASCB #1 PRI	(L)	-34		-----NC	
	AOA HI		-35		-----NC	
	AOA ARM		-36		-----NC	
	AOA LO		-37		-----NC	
	CALIBRATION ENABLE (GND/OPEN)		-38		-----NC	
	SPARE		-40			
	SPARE		-41			
	ATC SELECT (GND/OPEN)		-42		-----NC	
	ATC A1		-43		-----NC	
	ATC A2		-44		-----NC	
	ATC A4		-45		-----NC	CONNECT
	ATC B1		-46		-----NC	FOR TRANSPONDERS
	ATC B2		-47		-----NC	REQUIRING ENCODED
	ATC B4		-48		-----NC	ALTITUDE
	ATC C1		-49		-----NC	(USE 24 AWG WIRE)
	ATC C2		-50		-----NC	
	ATC C4		-51		-----NC	
	ATC D4		-52		-----NC	
	SPARE		-53			
	SPARE		-54			
	RS-232 DATA RCVR		-55		-----NC	
	RS-232 COMMON		-56		-----NC	
	RS-232 DATA XMTR		-57		-----NC	
	VMO SELECT (GND/OPEN)		-58		-----NC	
	ASCB #1 BU	(H)	-59		-----NC	
	DADC DATA	(H)	-60	(24)	---------------------	C190J2B-23
	A-429 XMTR (#1)	(L)	-61	(24)	---------------------	C190J2B-24
	ASCB #2 BU	(L)	-62		-----NC	
	DADC DATA	(H)	-63	(24)	---------------------	190J2A-43
	A-429 XMTR (#2)	(L)	-64	(24)	---------------------	190J2A-44
	ASCB #2 PRI	(H)	-65		-----NC	
	DADC DATA	(H)	C9J1-66		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S MICRO AIR DATA COMPUTER (MADC)
AZ-850

IO BP	Description		Connector Pin			Connects To
	A-429 XMTR (#3)	(L)	C9J1-67		-----NC	
	DADC DATA	(H)	-68		-----NC	
	A-429 XMTR (#4)	(L)	-69		-----NC	
	FUNCTIONAL TEST		-70		---------------------	FIG. 4-16
	BARO STD SYNC		-71	(24)	---------------------	C130J1-46
	SSEC DISABLE		-72		-----NC	
	SPARE		-73			
	BARO-CORRECTION BO		-74	(24)	---------------------	C130J1-21
	BARO-CORRECTION B1		-75	(24)	---------------------	C130J1-25
	SPARE		-76		-----NC	
	ASCB #2 PRI	(L)	-77		-----NC	
	SPARE		-78			
	SPARE		C9J1-79			

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Table 3-1. Interconnect Information (cont)

COPILOT'S NORMAL ACCELEROMETER
AG-222

IO BP	Description	Connector Pin			Connects To
	-15 V DC POWER	C17J1-5	(24)	---------S-T-S-------	C190J2B-60
	+15 V DC POWER	-1	(24)	---------S-T-S-------	C190J2B-59
				GND GND	
	OUTPUT 1.5V/G	-2	(24)	---------------------	C190J2B-64
	ACCEL RTN	-3	(24)	---------S-T-S-------	C190J2A-53
	TEST	C17J1-6		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY CONTROLLER
DC-550

IO BP	Description		Connector Pin			Connects To
	SIGNAL GND		C115J1-1	(22)	----------------------	SIGNAL GND
	LGHTG 28 V	(H)	-2		-----NC	
	LGHTG 5 V	(H)	-3	(22)	---------------------	FIG. 4-7
	LGHTG COM		-4	(22)	---------------------	DC GND
	+28 V DC POWER		-5	(22)	---------------------	FIG. 4-6
	DC POWER GND		-6	(22)	---------------------	DC PWR GND
	#8 PUSH BUTN (HDG REV MOM)		-7	(24)	---------------------	COPILOT'S HDG REV SWITCH, FIG. 4-25
	#9 PUSH BUTN (ATT REV MOM)		-8	(24)	-----------------	COPILOT'S ATT REV SWITCH, FIG. 4-25
	#1 SET KNOB 1		-9	(24)	---------S-T-S-------	23J1-14
	#1 SET KNOB 2	CRS	-10	(24)	---------S-T-S-------	23J1-15
	#1 SET KNOB COM		-11	(24)	---------S-T-S------- GND GND	23J1-13
	#2 SET KNOB 1	MFD ALT	-12	(24)	---------S-T-S-------	131J1-21, 115J1-12 SEE FIG. 4-27 FOR 2 DU SYSTEM
	#2 SET KNOB 2	MFD ALT	-13	(24)	---------S-T-S-------	131J1-25, 115J1-13 SEE FIG. 4-27 FOR 2 DU SYSTEM
	#2 SET KNOB COM	MFD ALT	-14	(24)	---------S-T-S------- GND GND	131J1-63, 115J1-14 SEE FIG. 4-27 FOR 2 DU SYSTEM
	#3 SET KNOB 1		-15	(24)	---------S-T-S-------	23J1-8, 115J1-15
	#3 SET KNOB 2	HDG	-16	(24)	---------S-T-S-------	23J1-9, 115J1-16
	#3 SET KNOB COM		-17	(24)	---------S-T-S------- GND GND	23J1-7, 115J1-17
	#4 SET KNOB 1		-18		-----NC	
	#4 SET KNOB 2		-19		-----NC	
	#4 SET KNOB COM		-20		-----NC	
	#5 SET KNOB 1		-21		-----NC	
	#5 SET KNOB 2	SPD	-22		-----NC	
	#5 SET KNOB COM		C115J1-23		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY CONTROLLER
DC-550

```
IO
BP  Description                  Connector Pin                                       Connects To

    #6 SET KNOB 1                C115J1-24  (24)  ---------S-T-S-------  131J1-62, 115J1-24
                                                           | | |         SEE FIG. 4-28 FOR 2
                                                           | | |         DU SYSTEM
    #6 SET KNOB 2                      -25  (24)  ---------S-T-S-------  131J1-67, 115J1-25
                                                           | | |         SEE FIG. 4-28 FOR 2
                                                           | | |         DU SYSTEM
    #6 SET KNOB COM                    -26  (24)  ---------S-T-S-------  131J1-63 SEE FIG.
                                                       GND-┘   └-GND     4-28 FOR 2 DU
                                                                         SYSTEM

    28V AUTOPILOT CLUTCH               -27        -----NC
    SPARE                              -28
    AUTOPILOT OFF LIGHT                -29        -----NC
    AUTOPILOT OFF HORN                 -30        -----NC
    SPARE                              -31
    TCS                                -32        -----NC
    28V AUTOPILOT                      -33        -----NC
    DISCONNECT
    DC/SG BUS           (H)            -34  (24)  ---------S-T-S-------  C190J2A-15
    DC/SG BUS           (L)            -35  (24)  ---------S-T-S-------  C190J2A-16
                                                       GND-┘   └-GND

    DC/MG BUS           (H)            -36        -----NC
    DC/MG BUS           (L)            -37        -----NC
    ADI DIM             (H)            -38        -----NC
    ADI DIM             (L)            -39        -----NC
    HSI DIM             (H)            -40        -----NC
    HSI DIM             (L)            -41        -----NC
    LIGHT + HORN DISABLE               -42        -----NC
    MOMENTARY LIGHT                    -43        -----NC
    DISABLE
    MOMENTARY HORN                     -44        -----NC
    DISABLE
    SPARE                              -45

    LAMP TEST GND                      -46        -----NC
    #10 PUSH BUTTN      (HDG)          -47  (24)  ---------------------  C8J1-3
    #11 PUSH BUTTN      (NAV)          -48  (24)  ---------------------  C8J1-4
    #12 PUSH BUTTN      (APP)          -49  (24)  ---------------------  C8J1-8
    PFD DIM             (H)            -50        ---------------------  C130J1-1
    PFD DIM             (W)            -51        ---------------------  C130J1-14
    PFD DIM             (L)      C115J1-52        ---------------------  C130J1-13
```


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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY CONTROLLER DC-550

IO BP	Description		Connector Pin			Connects To
	DH/RA SET	(H)	C115J1-53	(24)	---------S-T-S-------	C190J2A-12
	DH/RA SET	(W)	-54	(24)	---------S-T-S-------	C190J2A-13
	DH/RA SET	(L)	-55	(24)	---------S-T-S-------	C190J2A-10
					GND GND	
	#13 PUSH BUTTN (VNAV)		-56	(24)	---------------------	C8J1-6
	#14 PUSH BUTTN	(ALT)	-57	(24)	---------------------	C8J1-7
	#15 PUSH BUTTN	(VS)	-58	(24)	---------------------	C8J1-8
	PFD OFF GND		-59		---------------------	FIG. 4-24
	#16 PUSH BUTTN	(SPD)	-60	(24)	---------------------	C8J1-9
	#17 PUSH BUTTN	(BC)	-61	(24)	---------------------	C8J1-21
	#18 PUSH BUTTN (MFD BEZEL #1)		-62	(24)	---------------------	131J1-46, 115J1-62
	HSI ON GND		-63		-----NC	
	#19 PUSH BUTTN (MFD BEZEL #2)		-64	(24)	---------------------	131J1-47, 115J1-64
	#20 PUSH BUTTN (MFD BEZEL #3)		-65	(24)	---------------------	131J1-50, 115J1-65
	#21 PUSH BUTTN (MFD BEZEL #4)		-66	(24)	---------------------	131J1-51, C115J1-66
	SPARE		-67	(24)	---------------------	FIG. 4-24
	#22 PUSH BUTTN (MFD BEZEL #5)		-68	(24)	---------------------	131J1-60, 115J1-68
	#23 PUSH BUTTN (MFD BEZEL #6)		-69		-----NC	
	#24 PUSH BTTN		-70		-----NC	
	#25 PUSH BUTTN (ADC REV MOM)		-71	(24)	---------------------	COPILOT'S ADC REV SWITCH, FIG. 4-25
	#1 SWITCH (LAMP TEST IN)		-72	(24)	---------------------	EXT LAMP TEST SWITCH, GND = ON
	#2 SWITCH		-73		-----NC	
	#3 SWITCH		-74		-----NC	
	#4 SWITCH		-75		-----NC	
	#5 SWITCH		-76		-----NC	
	#6 SWITCH		-77		-----NC	
	#7 SWITCH (CRS PUSH TO SYNC)		-78	(24)	---------------------	23J1-16
	#8 SWITCH (HDG PUSH TO SYNC)		C115J1-79	(24)	---------------------	23J1-10, 115J1-79

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description		Connector Pin			Connects To
	BRIGHTNESS POT	(H)	C130J1-1	(24)	---------S-T-S-------	C115J1-50
	BRIGHTNESS POT	(L)	-13	(24)	---------S-T-S-------	C115J1-52
	BRIGHTNESS POT	(W)	-14	(24)	---------S-T-S-------	C115J1-51
					GND NC	
	WX DIMMING	(H)	-2		-----NC	
	WX DIMMING	(L)	-3		-----NC	
	RESERVED		-4			
	RESERVED		-5			
	RESERVED		-6			
	RESERVED		-7			
	SPARE		-8			
	RESERVED		-9			
	RESERVED		-10			
	RESERVED		-11			
	RESERVED		-12			
	BRIGHTNESS POT	(L)	-13		SEE C130J1-1	
	BRIGHTNESS POT	(W)	-14		SEE C130J1-1	
	WX DIMMING	(W)	-15		-----NC	
	RESERVED		-16			
	RESERVED		-17			
	RESERVED		-18			
	BUS 3	(H)	-19		---------------------	FIG. 4-24
	BUS 3	(L)	-20		---------------------	FIG. 4-24
	BARO KNOB	(B0)	-21	(24)	---------S-T-S-------	9J1-74
	BARO KNOB	(B1)	-25	(24)	---------S-T-S-------	9J1-75
					GND GND	
	DU PWR DN (GND/OPEN)		-22	(24)	---------------------	FIG. 4-24
	0-5 V AC EDGE	(H)	-23	(22)	---------------------	FIG. 4-7
	LIGHTING	(L)	-24	(22)	---------------------	LIGHTING GND
	BARO KNOB	(B1)	-25		SEE C130J1-21	
	REMOTE LT SENSOR	(H)	-26		-----NC	
	REMOTE LT SENSOR	(L)	-27		-----NC	
	DLS	(H)	-28		-----NC	
	ALS	(H)	-29		-----NC	
	RESERVED		-30			
	HDLC OUT +		-31	(24)	---------S-T-S-------	C190J2B-14
	HDLC OUT -		C130J1-32	(24)	---------S-T-S-------	C190J2B-15
					GND NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description		Connector Pin			Connects To
	BUS 3 TERM	(L)	C130J1-33		-----NC	
	RESERVED		-34			
	BUS 2	(H)	-35		---------------------	FIG. 4-24
	BUS 2	(L)	-36		---------------------	FIG. 4-24
	DU VALID (GND/OPEN)		-37		-----NC	
	BUS 1	(H)	-38		---------------------	FIG. 4-24
	BUS 1	(L)	-39		---------------------	FIG. 4-24
	REMOTE LT SENSOR GND		-40		-----NC	
	DLS	(L)	-41		-----NC	
	ALS	(L)	-42		-----NC	
	RESERVED		-43			
	RESERVED		-44			
	BUS 4 TERM	(L)	-45		-----NC	
	STD BARO (GND/OPEN)		-46	(24)	---------------------	C9J1-71
	VSPD SET BTTN		-47	(24)	---------------------	C115J1-70 (NC FOR 3 DU SYSTEM)
	RESERVED		-48			
	BUS 2 TERM	(L)	-49		---------------------	FIG. 4-24
	RESERVED		-50			
	RESERVED		-51			
	BUS 1 TERM		-52		-----NC	
	REMOTE LT SENSOR PWR	(H)	-53		-----NC	
	REMOTE LT SENSOR PWR	(L)	-54		-----NC	
	RESERVED		-55			
	RESERVED		-56			
	RESERVED		-57			
	BUS 4	(H)	-58		---------------------	FIG. 4-24
	BUS 4	(L)	-59		---------------------	FIG. 4-24
	RESERVED		-60		-----NC	
	WX BUS 2 TERM	(L)	-61		-----NC	
	RESERVED		-62		-----NC (SEE FIG. 4-28 FOR 2 DU SYSTEM)	
	SIGNAL GROUND		-63	(24)	---------------------	SIGNAL GND
	WX BUS TERM	(L)	-64		---------------------	FIG. 4-23
	DU OVERTEMP (GND/OPEN)		-65		-----NC	
	DU WRAPAROUND A-429 XMTR	(H)	-66		-----NC	
	RESERVED		-67		-----NC (SEE FIG. 4-28 FOR 2 DU SYSTEM)	
	RESERVED		C130J1-68			

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description		Connector Pin			Connects To
	WX BUS 3	(H)	C130J1-69	(24)	---------------------	SEE NOTE
	WX BUS 3	(L)	-70	(24)	---------------------	SEE NOTE
	RESERVED		-71			
	RESERVED		-72			
	SPARE		-73			
	WX BUS 2	(H)	-74	(24)	---------------------	SEE NOTE
	WX BUS 2	(L)	-75	(24)	---------------------	SEE NOTE
	SPARE		-76			
	WX BUS 1	(H)	-77		---------------------	FIG. 4-23
	WX BUS 1	(L)	-78		---------------------	FIG. 4-23
	DU WRAPAROUND A-429 XMTR	(L)	-79		-----NC	
	SIGNAL GROUND		-80	(24)	---------------------	SIGNAL GND
	RESERVED		-81			
	RESERVED		-82			
	WX BUS 3 TERM	(L)	-83		-----NC	
	RESERVED		-84			
	SPARE		-85			
	SPARE		-86			
	PORT SEL 3 (GND/OPEN)		-87	(24)	---------------------	FIG. 4-24
	PORT SEL 2 (GND/OPEN)		-88	(24)	---------------------	FIG. 4-24
	PORT SEL 1 (GND/OPEN)		-89	(24)	---------------------	FIG. 4-24
	I.D. #3 (GND/OPEN)		-90		-----NC	
	I.D. #2 (GND/OPEN)		-91		-----NC	
	I.D. #1 (GND/OPEN)		-92		-----NC	
	RESERVED		-93			
	CHASSIS GND		-94		-----NC	
	RESERVED		-95			
	RESERVED		-96			
	RESERVED		-97			
	RESERVED		-98			
	SOFTWARE ENABLE (GND/OPEN)		C130J1-99		-----NC	

NOTE: It is recommended that all unused bus inputs(+ and -) be tied to airframe ground as close to the DU as possible. If this is not possible, the + and - inputs should be tied together.

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY UNIT (PFD)
DU-870

IO BP	Description	Connector Pin		Connects To
	SOFTWARE ENABLE (GND/OPEN)	C130J1-100	-----NC	
	+28 V DC POWER	-101 (20)	---------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER	-102 (20)	---------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER	-103 (20)	---------------------	FIG. 4-6, SEE NOTE
	+28 V DC POWER RETURN	-104 (20)	---------------------	DC POWER GND
	+28 V DC POWER RETURN	-105 (20)	---------------------	DC POWER GND
	+28 V DC POWER RETURN	C130J1-106 (20)	---------------------	DC POWER GND

NOTE: USE HPN PIN 7018408 WITH EXTRACTION TOOL: M81969/14-01 (REF. TABLE 2-1).

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Table 3-1. Interconnect Information (cont)

COPILOT'S COMMUNICATIONS UNIT
RCZ-851E

IO BP	Description		Connector Pin			Connects To
(I)	DLP A/B TO XPDR	(L)	C143J1-1		-----NC	
(I)	A-429 RCVR	(H)	-13		-----NC	
(O)	+28 VDC FAN POWER		-2	(24)	---------------------	COOLING FAN - RED
	SPARE		-3			
(P)	+28 VDC COMM POWER		-4	(22)	---------------------	FIGURE 4-6
(P)	+28 VDC COMM POWER		-5	(22)	---------------------	FIGURE 4-6
(P)	+28 VDC COMM POWER		-6	(22)	---------------------	FIGURE 4-6
(P)	+28 VDC XPDR POWER RETURN		-7	(22)	---------------------	DC POWER GND
(P)	+28 VDC XPDR POWER		-8	(22)	---------------------	FIGURE 4-6
(P)	+28 VDC XPDR POWER		-9	(22)	---------------------	FIGURE 4-6
(B)	RSB PRIMARY	(H)	-10		---------S-T-S-------	FIGURE 4-28
(B)	RSB PRIMARY	(L)	-11		---------S-T-S-------	FIGURE 4-28
					GND GND	
(B)	SELCAL/ACARS	(L)	-12		-----NC	
(B)	SELCAL/ACARS	(H)	-22		-----NC	
(I)	DLP A/B TO XPDR	(H)	-13		-----NC	
(I)	A-429 RCVR	(L)	-1		-----NC	
(O)	COM +28V ACH PWR		-14		-----NC	
(B)	RCB RCVR (#1)	(L)	-15		-----NC	
(B)	RCB RCVR (#1)	(H)	-28		-----NC	
(O)	COMM STRAP +5 VDC		-16		---------------------	FIGURE 4-29
(P)	+28 VDC COMM POWER RETURN		-17	(22)	---------------------	DC POWER GND
(P)	+28 VDC COMM POWER RETURN		-18	(22)	---------------------	DC POWER GND
(P)	+28 VDC COMM POWER RETURN		-19	(22)	---------------------	DC POWER GND
(P)	+28 VDC XPDR POWER RETURN		-20	(22)	---------------------	DC POWER GND
(I)	VHF1 PTT (GND/OPEN)		-21		---------------------	FIGURE 4-30
(B)	SELCAL/ACARS	(H)	-22		-----NC	
(B)	SELCAL/ACARS	(L)	C143J1-12		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S COMMUNICATIONS UNIT
RCZ-851E

IO BP	Description		Connector Pin		Connects To
	SPARE		C143J1-23		
(I/O)	SIMULCOM RET		-24	(24) ---------S-T-S-------	143J1-24
(I/O)	SIMULCOM		-35	(24) ---------S-T-S------- GND GND	143J1-35
(B)	COM ACH DATA	(L)	-25	-----NC	
(B)	COM ACH DATA	(H)	-33	-----NC	
(O)	XPDR TO DLP A/B	(L)	-26	-----NC	
(O)	A-429 XMTR	(H)	-27	-----NC	
(B)	RCB RCVR (#1)	(H)	-28	-----NC	
(B)	RCB RCVR (#1)	(L)	-15	-----NC	
(O)	EMER AUDIO	(L)	-29	-----NC	
(O)	EMER AUDIO	(H)	-31	-----NC	
(O)	REC PHONE AUDIO	(H)	-30	-----NC	
(O)	EMER AUDIO	(H)	-31	-----NC	
(O)	EMER AUDIO	(L)	-29	-----NC	
	SPARE		-32		
(B)	COM ACH DATA	(H)	-33	-----NC	
(B)	COM ACH DATA	(L)	-25	-----NC	
(I)	AUX AUD 4	(L)	-34	-----NC	
(I)	AUX AUD 4	(H)	-62	-----NC	
(I/O)	SIMULCOM		-35	(24) ---------S-T-S-------	143J1-35
(I/O)	SIMULCOM RET		-24	(24) ---------S-T-S------- GND GND	143J1-24
(I)	AUDIO STATUS 3 (GND/OPEN)		-36	-----NC	
(I)	HF COM XMIT (GND/OPEN)		-37	-----NC	
(I)	AUX AUD 2	(H)	C143J1-38	-----NC	
(I)	AUX AUD 2	(L)	-49	-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S COMMUNICATIONS UNIT
RCZ-851E

IO BP	Description		Connector Pin			Connects To
(I)	HF COM DISABLE (GND/OPEN)		C143J1-39		-----NC	
(I)	GND (AUDIO SHIELDS)		-40		-----NC	
(I)	COM +28V ACH RTN		-41		-----NC	
(I)	AUDIO BUS SHIELD		-42		-----NC	
(O)	COM STRAP +5 VDC RTN		-43		---------------------	FIGURE 4-29
(I)	GND		-44		---------------------	SHIELD GROUND
(I)	GND		-45		---------------------	SHIELD GROUND
(I)	GND		-46		---------------------	SHIELD GROUND
	SPARE		-47			
(I)	AUDIO STATUS 3 (GND/OPEN)		-48		-----NC	
(I)	AUX AUD 2	(L)	-49		-----NC	
(I)	AUX AUD 2	(H)	-38		-----NC	
(I)	HF2 COM AUD	(L)	-50		-----NC	
(I)	HF2 COM AUD	(H)	-66		-----NC	
(I)	AUX AUD 3	(L)	-51		-----NC	
(I)	AUX AUD 3	(H)	-52		-----NC	
(B)	RCB RCVR (#2)	(L)	-53		-----NC	
(B)	RCB RCVR (#2)	(H)	-68		-----NC	
(O)	+28 VDC FAN POWER		-54	(24)	---------------------	COOLING FAN - RETURN BLUE
(O)	XPDR TO TCAS	(H)	-55	(24)	---------S-T-S-------	FIGURE 4-34
(O)	A-429 XMTR	(L)	-87	(24)	---------S-T-S-------	FIGURE 4-34
					GND┘ └GND	
(B)	AUDIO BUS #2	(H)	-56		---------S-T-S-------	FIGURE 4-35
(B)	AUDIO BUS #2	(L)	-70		---------S-T-S-------	FIGURE 4-35
					GND┘ └GND	
(O)	SIDETONE PHONE AUDIO	(H)	-57		-----NC	
(I)	GND		-58		---------------------	SHIELD GROUND
(O)	AGC ANALOG TP		-59		-----NC	
(I)	GND		C143J1-60		---------------------	SHIELD GROUND

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Table 3-1. Interconnect Information (cont)

COPILOT'S COMMUNICATIONS UNIT
RCZ-851E

IO BP	Description		Connector Pin			Connects To
(B)	RIGHT SEC RSB	(L)	C143J1-61		---------S-T-S-------	FIGURE 4-28
(B)	RIGHT SEC RSB	(H)	-74		---------S-T-S-------	FIGURE 4-28
					GND┘ └GND	
(I)	AUX AUD 4	(H)	-62		-----NC	
(I)	AUX AUD 4	(L)	-34		-----NC	
	SPARE		-63			
	SPARE		-64			
	SPARE		-65			
(I)	HF2 COM AUD	(H)	-66		-----NC	
(I)	HF2 COM AUD	(L)	-50		-----NC	
(I)	CHASSIS GND		-67		-----NC	
(B)	RCB RCVR (#2)	(H)	-68		-----NC	
(B)	RCB RCVR (#2)	(L)	-53		-----NC	
(I)	ADC2 TO XPDR	(L)	-69	(24)	---------S-T-S-------	C9J1-67
(I)	A-429 RCVR î	(H)	-100	(24)	---------S-T-S-------	C9J1-66
					GND┘ └GND	
(B)	AUDIO BUS #2	(L)	-70		---------S-T-S-------	FIGURE 4-35
(B)	AUDIO BUS #2	(H)	-56		---------S-T-S-------	FIGURE 4-35
					GND┘ └GND	
(I)	XPDR #1 OFF (GND/OPEN)		-71	(24)	--------------------	C144J1-k
	RESERVED		-72			
	SPARE		-73			
(B)	RIGHT SEC RSB	(H)	-74		---------S-T-S-------	FIGURE 4-28
(B)	RIGHT SEC RSB	(L)	-61		---------S-T-S-------	FIGURE 4-28
					GND┘ └GND	
	SPARE		-75			
(I)	AUDIO STATUS 2 (GND/OPEN)		-76		-----NC	
	SPARE		-77			
	SPARE		-78			
	SPARE		-79			
(I)	ALT SRC SEL2 (GND/OPEN)		C143J1-80	(24)	--------------------	SIGNAL GND

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Table 3-1. Interconnect Information (cont)

COPILOT'S COMMUNICATIONS UNIT
RCZ-851E

IO BP	Description		Connector Pin			Connects To
(B)	RCB XMTR (#1)	(H)	C143J1-81		-----NC	
(B)	RCB XMTR (#1)	(L)	-95		-----NC	
(B)	RCB XMTR (#2)	(H)	-82		-----NC	
(B)	RCB XMTR (#2)	(L)	-96		-----NC	
(I)	WOW (GND/OPEN)		-83	(24)	---------------------	FIGURE 4-12
(O)	XPDR TO DLP C/D	(L)	-84		-----NC	
(O)	A-429 XMTR	(H)	-97		-----NC	
(I)	DLP C/D TO XPDER	(L)	-85		-----NC	
(I)	A-429 RCVR	(H)	-98		-----NC	
(I)	ADC1 TO XPDR	(L)	-86		-----NC	
(I)	A-429 RCVR	(H)	-99		-----NC	
(O)	XPDR TO TCAS	(L)	-87	(24)	---------S-T-S-------	FIGURE 4-34
(O)	A-429 XMTR	(H)	-55	(24)	---------S-T-S-------	FIGURE 4-34
					GND┘ └GND	
(O)	COM STRAP CLK		-88		---------------------	FIGURE 4-29
(O)	COM STRAP SIDE A0		-89		---------------------	FIGURE 4-29
(I)	TCAS TO XPDR	(H)	-90	(24)	---------S-T-S-------	FIGURE 4-34
(I)	A-429 RCVR	(L)	-104	(24)	---------S-T-S-------	FIGURE 4-34
					GND┘ └GND	
(O)	XPDR ACTIVE (GND/OPEN)		-91		-----NC	
(I)	VHF 2 MIC	(H)	-92	(24)	---------S-T-S-------	FIGURE 4-30
(I)	VHF 2 MIC	(L)	-106	(24)	---------S-T-S-------	FIGURE 4-30
					GND┘ └GND	
(I)	COMM OFF (GND/OPEN)		-93	(24)	---------------------	C144J1-j
(I/O)	MUT SUP		-94	(24)	---------S---S-------	FIGURE 4-36
					GND┘ └GND	
(B)	RCB XMTR (#1)	(L)	-95		-----NC	
(B)	RCB XMTR (#1)	(H)	-81		-----NC	
(B)	RCB XMTR (#2)	(L)	-96		-----NC	
(B)	RCB XMTR (#2)	(H)	C143J1-82		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S COMMUNICATIONS UNIT
RCZ-851E

IO BP	Description		Connector Pin		Connects To
(O)	XPDR TO DLP C/D	(H)	C143J1-97	-----NC	
(O)	A-429 XMTR	(L)	-84	-----NC	
(I)	DLP C/D TO XPDER	(H)	-98	-----NC	
(I)	A-429 RCVR	(L)	-85	-----NC	
(I)	ADC1 TO XPDR	(H)	-99	-----NC	
(I)	A-429 RCVR	(L)	-86	-----NC	
(I)	ADC2 TO XPDR	(H)	-100 (24)	---------S-T-S-------	C9J1-66
(I)	A-429 RCVR	(L)	-69 (24)	---------S-T-S-------	C9J1-67
				GND GND	
(I)	COM STRAP DATA		-101 (24)	---------------------	FIGURE 4-29
(O)	COM STRAP LOAD		-102 (24)	---------------------	FIGURE 4-29
(O)	COM STRAP SIDE		-103 (24)	---------------------	FIGURE 4-29
(I)	TCAS TO XPDR	(L)	-104 (24)	---------S-T-S-------	FIGURE 4-34
(I)	A-429 RCVR	(H)	-90 (24)	---------S-T-S-------	FIGURE 4-34
				GND GND	
	RESERVED		-105		
(I)	VHF 1 MIC	(H)	C143J1-106 (24)	---------S-T-S-------	FIGURE 4-30
(I)	VHF 1 MIC	(L)	-92 (24)	---------S-T-S-------	FIGURE 4-30
				GND GND	

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Table 3-1. Interconnect Information (cont)

COPILOT'S COMMUNICATIONS UNIT
RCZ-851E

IO BP	Description	Connector Pin		Connects To
	TRANSPONDER ANTENNA	C143J2	--(RG-214/U)-S---S--- GND GND	BOTTOM ANT #2 (SEE NOTE BELOW)
	COM ANTENNA	C143J3	--(RG-142/U)-S---S--- GND GND	COM ANT #12
	DIVERSITY ANTENNA	C143J6	--(RG-214/U)-S---S--- GND GND	TOP ANT #1 (SEE NOTE BELOW)

NOTE: MAXIMUM COAX LENGTH IS 30 FEET.

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Table 3-1. Interconnect Information (cont)

COPILOT'S RADIO MANAGEMENT UNIT
RMU-850

IO BP	Description		Connector Pin			Connects To
(P)	28 VDC LIGHTING		C144J1-A		-----NC	
(P)	28 VDC LIGHTING RETURN		-B		-----NC	
(P)	+28 VDC POWER		-C	(22)	---------------------	FIGURE 4-6
(P)	+28 VDC POWER RETURN		-D	(22)	---------------------	DC POWER GND
(B)	RS422 CONTROL BUS	(H)	-E	(24)	---------S-T-S-------	FROM FMS #2
(B)	RS422 CONTROL BUS	(L)	-F	(24)	---------S-T-S-------	FROM FMS #2
					GND GND	
(P)	5 VDC LIGHTING		-G		-----NC	
(P)	5 VDC LIGHTING RETURN		-H		-----NC	
(P)	0-5 VAC LIGHTING		-J	(24)	---------------------	FIGURE 4-7
(P)	0-5 VAC LIGHTING RETURN		-K	(24)	---------------------	LIGHTING GND
(I)	CHASSIS GROUND		-L		-----NC	
(B)	RIGHT SEC RSB	(H)	-M		---------S-T-S-------	FIGURE 4-28
(B)	RIGHT SEC RSB	(L)	-N		---------S-T-S-------	FIGURE 4-28
					GND GND	
(I)	WOW (GND/OPEN)		-P	(24)	---------------------	FIGURE 4-12
(I)	WOW POLARITY (GND/OPEN)		-R		---------------------	SIGNAL GROUND
(I)	ATC IDENT (GND/OPEN)		-S	(24)		FIGURE 4-37
(I)	NAV PAST 2 DISABLE (GND/OPEN)		-T		-----NC	
(I)	STRAP COMMON		-U		-----NC	
(B)	PRIMARY RSB	(H)	-V		---------S-T-S-------	FIGURE 4-28
(B)	PRIMARY RSB	(L)	-W		---------S-T-S-------	FIGURE 4-28
					GND GND	
(I)	NAV PAST 1 DISABLE (GND/OPEN)		-X		-----NC	
(I)	ON/OFF PAGE DISABLE (GND/OPEN)		C144J1-Y		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S RADIO MANAGEMENT UNIT
RMU-850

IO BP	Description	Connector Pin			Connects To
(I)	TCAS RANGE DISABLE (GND/OPEN)	C144J1-Z		-----NC	
(I)	FMS SELECT (GND/OPEN)	-a		-----NC	
(I)	SIDE SEL (GND/OPEN) B0	-b		-----NC	
(I)	SIDE SEL (GND/OPEN) B1	-c	(24)	---------------------	SIGNAL GROUND
(I)	SIDE SEL EV PARITY (GND/OPEN)	-d		-----NC	
(I)	TEST ENABLE (GND/OPEN)	-e		-----NC	
(I)	COM FREQ XF (GND/OPEN)	-f		-----NC	
(I)	COM MEM SEL (GND/OPEN)	-g		-----NC	
(I)	MKR SENSE LEFT	-h	(24)	---------------------	160J2-L, 144J1-h
(I)	MKR SENSE RIGHT	-i	(24)	---------------------	C160J2-L, 144J1-i
(O)	COM POWER OFF (GND/OPEN)	-j	(24)	---------------------	C143J1-93
(O)	ATC POWER OFF (GND/OPEN)	-k	(24)	---------------------	C143J1-71
(O)	VOR POWER OFF (GND/OPEN)	-m	(24)	---------------------	C164J1A-14
(O)	DME POWER OFF (GND/OPEN)	-n	(24)	---------------------	C164J1A-40
(O)	ADF POWER OFF (GND/OPEN)	-p	(24)	---------------------	C164J1B-87
(O)	MLS POWER OFF (GND/OPEN)	-q		-----NC	
	SPARE	-r			
	SPARE	-s			
	SPARE	C144J1-t			

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Table 3-1. Interconnect Information (cont)

COPILOT'S AUDIO PANEL
AV-850A

IO BP	Description		Connector Pin			Connects To
(I)	HAND MIC PTT (GND/OPEN)		C160J1-A	(24)	---------------------	FIGURE 4-43
(O)	EMERGENCY COM PTT (GND/OPEN)		-B	(24)	---------------------	FIGURE 4-39
(O)	VHF 2 PTT (GND/OPEN)		-C	(24)	---------------------	FIGURE 4-39
(O)	VHF 2 MIC	(H)	-D	(24)	---------S-T-S-------	FIGURE 4-39
(O)	VHF 2 MIC	(L)	-W	(24)	---------S-T-S-------	FIGURE 4-39
					NC┘ └GND	
(O)	VHF 1 MIC	(L)	-E	(24)	---------S-T-S-------	FIGURE 4-30
(O)	VHF 1 MIC	(H)	-R	(24)	---------S-T-S-------	FIGURE 4-30
					NC┘ └GND	
(O)	VHF 1 PTT (GND/OPEN)		-F	(24)	---------------------	FIGURE 4-30
(I)	EMER COM AUDIO	(H)	-G	(24)	---------S-T-S-------	FIGURE 4-31
(I)	EMER COM/NAV AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
					NC┘ └GND	
(O)	EMER COM MIC	(L)	-H	(24)	---------S-T-S-------	FIGURE 4-39
(O)	EMER COM MIC	(H)	-P	(24)	---------S-T-S-------	FIGURE 4-39
					NC┘ └GND	
(I)	HAND MIC/MASK-BOOM MIC	(L)	-J	(24)	---------------------	FIGURE 4-43
(I)	HAND MIC	(H)	-K	(24)	---------S---S-------	
					GND┘ └NC	
(O)	CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-40
(O)	COCKPIT SPKR	(H)	-Y	(22)	---------S-T-S-------	FIGURE 4-40
					GND┘ └NC	
(O)	CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-41
(O)	CABIN SPKR	(H)	-e	(22)	---------S-T-S-------	FIGURE 4-41
					NC┘ └GND	
(P)	+28 VDC POWER RETURN		-M	(22)	---------------------	DC POWER GND
(I)	COMMON GND		C160J1-N	(24)	---------------------	FIGURE 4-43

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Table 3-1. Interconnect Information (cont)

COPILOT'S AUDIO PANEL
AV-850A

IO BP	Description		Connector Pin			Connects To
(O)	EMER COM MIC	(H)	C160J1-P	(24)	---------S-T-S-------	FIGURE 4-39
(O)	EMER COM MIC	(L)	-H	(24)	---------S-T-S-------	FIGURE 4-39
					NC┘ └GND	
(O)	VHF 1 MIC	(H)	-R	(24)	---------S-T-S-------	FIGURE 4-30
(O)	VHF 1 MIC	(L)	-E	(24)	---------S-T-S-------	FIGURE 4-30
					NC┘ └GND	
	RESERVED		-S			
	RESERVED		-T			
(P)	+28 VDC POWER		-U	(22)	--------------------	FIGURE 4-6
(P)	+28 VDC POWER		-V	(22)	--------------------	FIGURE 4-6
(O)	VHF 2 MIC	(L)	-W	(24)	---------S-T-S-------	FIGURE 4-39
(O)	VHF 2 MIC	(H)	-D	(24)	---------S-T-S-------	FIGURE 4-39
					NC┘ └GND	
	RESERVED		-X			
(O)	COCKPIT SPKR	(H)	-Y	(22)	---------S-T-S-------	FIGURE 4-40
(O)	CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-40
					GND┘ └NC	
(O)	HF 1 MIC	(L)	-Z	(24)	---------S-T-S-------	FIGURE 4-33
(O)	HF 1 MIC	(H)	-a	(24)	---------S-T-S-------	FIGURE 4-33
					NC┘ └GND	
(O)	HF 1 PTT (GND/OPEN)		-b	(24)	--------------------	FIGURE 4-32
(B)	DIG AUDIO BUS 2	(H)	-c		---------S-T-S-------	FIGURE 4-35
(B)	DIG AUDIO BUS 2	(L)	-n		---------S-T-S-------	FIGURE 4-35
					GND┘ └GND	
(B)	DIG AUDIO BUS 1	(H)	-d		---------S-T-S-------	FIGURE 4-35
(B)	DIG AUDIO BUS 1	(L)	-p		---------S-T-S-------	FIGURE 4-35
					GND┘ └GND	
(O)	CABIN SPKR	(H)	-e	(22)	---------S-T-S-------	FIGURE 4-41
(O)	CABIN/COCKPIT SPKR	(L)	-L	(22)	---------S-T-S-------	FIGURE 4-41
					NC┘ └GND	
(I)	EMER NAV AUDIO	(H)	-f	(24)	---------S-T-S-------	FIGURE 4-31
(I)	EMER COM/NAV AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
					NC┘ └GND	
(I)	EDGE LIGHTING RTN	(L)	C160J1-g	(24)	--------------------	LIGHTING GND

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Table 3-1. Interconnect Information (cont)

COPILOT'S AUDIO PANEL
AV-850A

IO BP	Description		Connector Pin			Connects To
(I)	MASK/BOOM PTT (GND/OPEN)		C160J1-h	(24)	---------------------	FIGURE 4-43
(I)	MASK/BOOM MIC	(H)	-i	(24)	---------S---S-------	FIGURE 4-43
					GND┘ └NC	
(I/O)	INTERPHONE AUDIO	(L)	-j	(24)	---------S-T-S-------	160J1-j
					| | |	
(I/O)	INTERPHONE AUDIO	(H)	-s	(24)	---------S-T-S-------	160J1-s
					GND┘ └GND	
(O)	PHONE AUDIO	(L)	-k	(24)	---------------------	FIGURE 4-43
(O)	PHONE AUDIO	(H)	-t	(24)	---------S---S-------	FIGURE 4-43
					GND┘ └GND	
(I)	EMER COM AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
(I)	EMER COM/NAV AUDIO	(H)	-G	(24)	---------S-T-S-------	FIGURE 4-31
					NC┘ └GND	
(I)	EMER NAV AUDIO	(L)	-m	(24)	---------S-T-S-------	FIGURE 4-31
(I)	EMER COM/NAV AUDIO	(H)	-f	(24)	---------S-T-S-------	FIGURE 4-31
					NC┘ └GND	
(B)	DIG AUDIO BUS 2	(L)	-n		---------S-T-S-------	FIGURE 4-35
(B)	DIG AUDIO BUS 2	(H)	-c		---------S-T-S-------	FIGURE 4-35
					GND┘ └GND	
(B)	DIG AUDIO BUS 1	(L)	-p		---------S-T-S-------	FIGURE 4-35
(B)	DIG AUDIO BUS 1	(H)	-d		---------S-T-S-------	FIGURE 4-35
					GND┘ └GND	
(P)	0-5 V AC/DC DIMMING		-q	(24)	---------S-T-S-------	FIGURE 4-7
(P)	+28 VDC DIMMING		-r		-----NC	
(I/O)	INTERPHONE AUDIO	(H)	-s	(24)	---------S-T-S-------	160J1-s
					| | |	
(I/O)	INTERPHONE AUDIO	(L)	-j	(24)	---------S-T-S-------	160J1-j
					GND┘ └GND	
(O)	PHONE AUDIO	(H)	C160J1-t	(24)	---------------------	FIGURE 4-43
(O)	PHONE AUDIO	(L)	-k	(24)	---------S---S-------	FIGURE 4-43
					GND┘ └NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S AUDIO PANEL
AV-850A

IO BP	Description		Connector Pin			Connects To
(I)	WARNING 5 AUDIO	(H)	C160J2-A		-----NC	
(I)	WARNING 5 AUDIO	(L)	-a		-----NC	
(I)	WARNING 1 AUDIO	(L)	-B	(24)	---------S-T-S-------	TCAS SYSTEM
(I)	WARNING 1 AUDIO	(H)	-W	(24)	---------S-T-S-------	TCAS SYSTEM
					NC GND	
(I)	MASK/BOOM MIC	(L)	-C		-----NC	
(I)	COMMON GND		-D	(24)	---------------------	FIGURE 4-43
(I)	MASK MIC	(H)	-E		-----NC	
	SPARE		-F			
(I)	WARNING 2 AUDIO	(L)	-G		-----NC	
(I)	WARNING 2 AUDIO	(H)	-X		-----NC	
(I)	CABIN DISABLE (GND/OPEN)		-H		-----NC	
(I)	WARNING 3 AUDIO	(L)	-J		-----NC	
(I)	WARNING 3 AUDIO	(H)	-m		-----NC	
	RESERVED		-K			
(O)	MARKER BEAC 1 HI/LO SENS		-L	(24)	---------------------	144J1-h, C144J1-h
(O)	STERO MUTE (GND/OPEN)		-M	(24)	---------------------	FIGURE 4-41
	RESERVED		-N			
(O)	MAINT PHONE AUDIO	(L)	-P		-----NC	
(O)	MAINT PHONE AUDIO	(H)	-f		-----NC	
	RESERVED		-R			
(I)	PAGE MIC PTT (GND/OPEN)		-S		-----NC	
(I)	PAGE MIC	(L)	-T		-----NC	
(I)	PAGE MIC	(H)	-s		-----NC	
	RESERVED		-U			
(O)	VOICE RECORDER	(H)	C160J2-V		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S AUDIO PANEL
AV-850A

IO BP	Description		Connector Pin			Connects To
(O)	VOICE RECORDER	(L)	C160J2-r		-----NC	
(I)	WARNING 1 AUDIO	(H)	-W	(24)	---------S-T-S-------	TCAS SYSTEM
(I)	WARNING 1 AUDIO	(L)	-B	(24)	---------S-T-S------- (NC, GND)	TCAS SYSTEM
(I)	WARNING 2 AUDIO	(H)	-X		-----NC	
(I)	WARNING 2 AUDIO	(L)	-G		-----NC	
(I)	BOOM MIC	(H)	-Y		-----NC	
(I)	WARNING 4 AUDIO	(L)	-Z		-----NC	
(I)	WARNING 4 AUDIO	(H)	-t		-----NC	
(I)	WARNING 5 AUDIO	(L)	-a		-----NC	
(I)	WARNING 5 AUDIO	(H)	-A		-----NC	
(I)	MASK INTERCOM ENABLE (GND/OPEN)		-b	(24)	---------------------	FIGURE 4-43
(O)	MARKER BEAC MUTE (GND/OPEN)		-c		-----NC	
	RESERVED		-d			
(I)	MAINT MIC	(L)	-e		-----NC	
(I)	MAINT MIC	(H)	-q		-----NC	
(O)	MAINT PHONE AUDIO	(H)	-f		-----NC	
(O)	MAINT PHONE AUDIO	(L)	-P		-----NC	
(O)	PAGE	(H)	-g		-----NC	
(O)	PAGE	(L)	-h		-----NC	
	RESERVED		-i			
	RESERVED		-j			
(I)	MAINT MIC PTT (GND/OPEN)		-k		-----NC	
(I)	WARNING 3 AUDIO	(H)	-m		-----NC	
(I)	WARNING 3 AUDIO	(L)	-J		-----NC	
	RESERVED		-n		-----NC	
(I)	INTERPHONE PTT (GND/OPEN)		C160J2-p	(24)	---------------------	FIGURE 4-43

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Table 3-1. Interconnect Information (cont)

COPILOT'S AUDIO PANEL
AV-850A

IO BP	Description		Connector Pin		Connects To
(I)	MAINT MIC	(H)	C160J2-q	-----NC	
(I)	MAINT MIC	(L)	-e	-----NC	
(O)	VOICE RECORDER	(L)	-r	-----NC	
(O)	VOICE RECORDER	(H)	-V	-----NC	
(I)	PAGE MIC	(H)	-s	-----NC	
(I)	PAGE MIC	(L)	-T	-----NC	
(I)	WARNING 4 AUDIO	(H)	C160J2-t	-----NC	
(I)	WARNING 4 AUDIO	(L)	-Z	-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DME INDICATOR
DI-851

IO BP	Description		Connector Pin			Connects To
	RESERVED		C163J1-1			
(B)	RSB PRIMARY	(L)	-2	(24)	---------S-T-S-------	FIGURE 4-28
(B)	RSB PRIMARY	(H)	-15	(24)	---------S-T-S-------	FIGURE 4-28
					GND GND	
(B)	RIGHT SEC RSB	(H)	-3	(24)	---------S-T-S-------	FIGURE 4-28
(B)	RIGHT SEC RSB	(L)	-14	(24)	---------S-T-S-------	FIGURE 4-28
					GND GND	
	RESERVED		-4			
	RESERVED		-5			
(P)	+28 VDC POWER		-6	(22)	---------------------	FIGURE 4-6
(P)	0-5 V AC/DC DIMMING		-7	(24)	---------------------	FIGURE 4-7
	SPARE		-8			
	SPARE		-9			
	RESERVED		-10			
	SPARE		-11			
(P)	+28 VDC POWER RETURN		-12	(22)	---------------------	DC POWER GND
(I)	EDGE LIGHTING RETURN		-13	(24)	---------------------	LIGHTING GND
(B)	RIGHT SEC RSB	(L)	-14	(24)	---------S-T-S-------	FIGURE 4-28
(B)	RIGHT SEC RSB	(H)	-3	(24)	---------S-T-S-------	FIGURE 4-28
					GND GND	
(B)	RSB PRIMARY	(H)	-15	(24)	---------S-T-S-------	FIGURE 4-28
(B)	RSB PRIMARY	(L)	-2	(24)	---------S-T-S-------	FIGURE 4-28
					GND GND	
	SPARE		-16			
	SPARE		-17			
	SPARE		-18			
	SPARE		-19			
	SPARE		-20			
	SPARE		-21			
	SPARE		-22			
	SPARE		-23			
	SPARE		-24			
(P)	+28 VDC POWER RETURN		C163J1-25	(22)	---------------------	DC POWER GND

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNITLER
RNZ-850B

IO BP	Description		Connector Pin			Connects To
	CLU SPARE		C164J1A-1			
(O)	DME NOT HOLD (GND/OPEN)		-2		-----NC	
(O)	DME HOLD (GND/OPEN)		-3		-----NC	
	DME SPARE		-4			
(O)	DME 568 DATA	(H)	-5		-----NC	
(O)	DME 568 DATA	(L)	-15		-----NC	
	DME SPARE		-6			
	RESERVED		-7			
(O)	AUX1 RCB TX1		-8		-----NC	
(O)	AUX1 RCB TX2		-9		-----NC	
	RESERVED		-10			
	RESERVED		-11			
	RESERVED		-12			
	CLU SPARE		-13			
(I)	VOR/ILS OFF (GND/OPEN)		-14	(24)	---------------------	C144J1-m
(O)	DME 568 DATA	(L)	-15		-----NC	
(O)	DME 568 DATA	(H)	-5 -		-----NC	
(O)	DME RS-422 SD2	(L)	-16	(24)	---------S-T-S-------	TO FMS #2
(O)	DME RS-422 SD2	(H)	-54	(24)	---------S-T-S-------	TO FMS #2
					GND GND	
(O)	DME 568 CLK	(L)	-17		-----NC	
(O)	DME 568 CLK	(H)	-19		-----NC	
(O)	DME CH 1 AUDIO		-18		-----NC	
(O)	DME 568 CLK	(H)	-19		-----NC	
(O)	DME 568 CLK	(L)	-17		-----NC	
(I)	MLS RCB SHLD		-20		-----NC	
(O)	MLS 1 RCB XMTR	(H)	-21	(24)	---------------------	C164J1A-25
(O)	MLS 1 RCB XMTR	(L)	-34	(24)	---------------------	C164J1A-38
	RESERVED		-22			
	RESERVED		164J1A-23			

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNITLER
RNZ-850B

IO BP	Description		Connector Pin			Connects To
(I)	CHANGE INHIBIT (GND/OPEN)		164J1A-24		-----NC	
(I)	MLS 1 RCB RCVR	(H)	-25	(24)	---------------------	C164J1A-21
(I)	MLS 1 RCB RCVR	(L)	-38	(24)	---------------------	C164J1A-34
(O)	DME 568 SYNC	(H)	-26		-----NC	
(O)	DME 568 SYNC	(L)	-45		-----NC	
	CLU SPARE		-27			
(O)	DME MUT SUP RTN		-28		-----NC	
	DME SPARE		-29			
	DME SPARE		-30			
	CLU SPARE		-31			
	DME SPARE		-32			
	RESERVED		-33			
(O)	MLS 1 RCB XMTR	(L)	-34	(24)	---------------------	C164J1A-38
(O)	MLS 1 RCB XMTR	(H)	-21	(24)	---------------------	C164J1A-25
	CLU SPARE		-35			
	CLU SPARE		-36			
	CLU SPARE		-37			
(I)	MLS 1 RCB RCVR	(L)	-38	(24)	---------------------	C164J1A-34
(I)	MLS 1 RCB RCVR	(H)	-25	(24)	---------------------	C164J1A-21
	RESERVED		-39			
(I)	DME OFF (OPEN/GND)		-40	(24)	---------------------	C144J1-n
(I)	AUX 1 AUDIO	(H)	-41		-----NC	
(I)	AUX 1 AUDIO	(L)	-55		-----NC	
(I/O)	DME MUT SUP		-42	(24)	---------S---S------- GND GND	FIGURE 4-36
	DME SPARE		-43			
(O)	DME RS-422 SD1	(L)	-44		-----NC	
(O)	DME RS-422 SD1	(H)	-57		-----NC	
(O)	DME 568 SYNC	(L)	-45		-----NC	
(O)	DME 568 SYNC	(H)	164J1A-26		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNITLER
RNZ-850B

IO BP	Description		Connector Pin			Connects To
(O)	DME VALID (28 V/OPEN)		164J1A-46		-----NC	
	RESERVED		-47			
	CLU SPARE		-48			
	CLU SPARE		-49			
	RESERVED		-50			
	CLU SPARE		-51			
	RESERVED		-52			
	CLU SPARE		-53			
(O)	DME RS-422 SD2	(H)	-54	(24)	---------S-T-S-------	TO FMS #2
(O)	DME RS-422 SD2	(L)	-16	(24)	---------S-T-S-------	TO FMS #2
					GND GND	
(I)	AUX 1 AUDIO	(L)	-55		-----NC	
(I)	AUX 1 AUDIO	(H)	-41		-----NC	
	DME SPARE		-56			
(O)	DME RS-422 SD1	(H)	-57		-----NC	
(O)	DME RS-422 SD1	(L)	-44		-----NC	
(I)	NAV AUX DATA	(L)	-58		-----NC	
(I)	NAV AUX DATA	(H)	-70		-----NC	
(O)	VOR/ILS RS-422 SD1	(L)	-59		-----NC	
(O)	VOR/ILS MKR LAMP (M) (28 V/OPEN)		-60		-----NC	
	RESERVED		-61			
	CLU SPARE		-62			
	CLU SPARE		-63			
(O)	AUX2 RCB TX1		-64		-----NC	
(O)	AUX2 RCB TX2		-65		-----NC	
	RESERVED		-66			
(I)	AUX 2 AUDIO	(H)	-67		-----NC	
(I)	AUX 2 AUDIO	(L)	-68		-----NC	
(O)	NAV AUX CLK	(H)	-69		-----NC	
(O)	NAV AUX CLK	(L)	-72		-----NC	
(I)	NAV AUX DATA	(H)	-70		-----NC	
(I)	NAV AUX DATA	(L)	164J1A-58		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNITLER
RNZ-850B

IO BP	Description		Connector Pin			Connects To
(O)	DME 40 MV/MI		164J1A-71		-----NC	
(O)	NAV AUX CLK	(L)	-72		-----NC	
(O)	NAV AUX CLK	(H)	-69		-----NC	
(O)	VOR/ILS MKR LAMP (28 V/OPEN)	(I)	-73		-----NC	
(O)	GS SUPERFLAG		-74		-----NC	
(I)	AUX1 RCB RX1		-75		-----NC	
	CLU SPARE		-76			
	RESERVED		-77			
(I)	AUX1 RCB RX2		-78		-----NC	
	RESERVED		-79			
(I)	GND PS IN		-80		-----NC	
(I)	AUX GND		-81		-----NC	
	CLU SPARE		-82			
(P)	DME 28 VDC RETURN		-83	(22)	---------------------	DC POWER GND
(O)	VOR/ILS RS-422 SD2	(L)	-84	(24)	---------S-T-S-------	TO FMS #2
(O)	VOR/ILS RS-422 SD2	(H)	J1B-102	(24)	---------S-T-S-------	TO FMS #2
					GND GND	
(P)	VOR/ILS +28 VDC POWER		-85	(22)	---------------------	FIGURE 4-6
(P)	DME +28 VDC POWER		-86	(22)	---------------------	FIGURE 4-6
	RESERVED		-87			
(B)	RIGHT SEC RSB	(H)	-88	(24)	---------S-T-S-------	FIGURE 4-28
(B)	RIGHT SEC RSB	(L)	-102	(24)	---------S-T-S-------	FIGURE 4-28
					GND GND	
	CLU SPARE		-89			
	CLU SPARE		-90			
	RESERVED		-91			
(I)	AUX2 RCB RX1		-92		-----NC	
(I)	AUX2 RCB RX2		-93		-----NC	
(P)	ADF 28 VDC RETURN		-94	(22)	---------------------	DC POWER GND
(P)	DME 28 VDC RETURN		-95	(22)	---------------------	DC POWER GND
(I)	CLU SHLD GND		-96		-----NC	
(O)	DME CH 2 AUDIO	(H)	164J1A-97		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNITLER
RNZ-850B

IO BP	Description		Connector Pin			Connects To
(P)	VOR/ILS +28 VDC POWER		164J1A-98	(22)	---------------------	FIGURE 4-6
(P)	DME +28 VDC POWER		-99	(22)	---------------------	FIGURE 4-6
	RESERVED		-100			
	RESERVED		-101			
(B)	RIGHT SEC RSB	(L)	-102	(24)	---------S-T-S-------	FIGURE 4-28
(B)	RIGHT SEC RSB	(H)	-88	(24)	---------S-T-S------- GND GND	FIGURE 4-28
(I)	CLUSTER GND		-103	(22)	-(NOTE 1)------------	DC POWER GND
	RESERVED		-104			
	RESERVED		-105			
	CLU SPARE		C164J1A-106			

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNIT
RNZ-850B

IO BP	Description		Connector Pin			Connects To
	RESERVED		C164J1B-1			
(O)	28 VDC FAN POWER		-2	(24)	---------------------	COOLING FAN (RED)
	CLU SPARE		-3			
	CLU SPARE		-4			
	SPARE STAT IN (DIG AUD)		-5			
	SPARE STAT IN (DIG AUD)		-6			
(I)	SYNC COMP X		-7		-----NC	
(I)	AUX +28 VDC		-8		-----NC	
(O)	OBS D,G		-9		-----NC	
(O)	OBS F		-10		-----NC	
(O)	OBI q SIN		-11		-----NC	
(O)	OBI q COS		-12		-----NC	
(I)	MLS MORSE ID RETURN		-13		-----NC	
	CLU SPARE		-14			
	CLU SPARE		-15			
	CLU SPARE		-16			
	CLU SPARE		-17			
	CLU SPARE		-18			
	CLU SPARE		-19			
(P)	400 HZ 26VAC H REF		-20		-----NC	
(O)	VOR/ILS RNAV VIDEO	(H)	-21		-----NC	
(O)	VOR/ILS RNAV VIDEO	(L)	-22		-----NC	
(P)	400 HZ RTN		-23		-----NC	
(O)	VOR/LOC AUDIO	CT	-24		-----NC	
(O)	VOR/LOC AUDIO	HI	-36		-----NC	
(O)	VOR/LOC AUDIO	LO	-51		-----NC	
	RESERVED		-25			
(O)	NAV STRAP GND		-26	(24)	---------------------	FIGURE 4-29
	RESERVED		-27			
	CLU SPARE		-28			
(B)	DIG AUDIO BUS 2	(L)	-29		---------S-T-S-------	FIGURE 4-35
(B)	DIG AUDIO BUS 2	(H)	-42		---------S-T-S-------	FIGURE 4-35
				V	GND GND	
(I)	SPARE STAT IN (DIG AUD)		C164J1B-30		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNIT
RNZ-850B

IO BP	Description		Connector Pin			Connects To
(I)	AUD AUX SQUELCH		C164J1B-31		-----NC	
(I)	MLS MORSE ID	(H)	-32		-----NC	
(I)	SYNC COMP Y		-33		-----NC	
(O)	OBS B		-34		-----NC	
(O)	OBS C		-35		-----NC	
(O)	VOR/ILS EMER AUDIO	(H)	-36		-----NC	
(O)	VOR/ILS EMER AUDIO	(L)	-51		-----NC	
(O)	OBI q SIN GND		-37		-----NC	
(P)	VOR/ILS POWER RETURN		-38	(22)	---------------------	DC POWER GND
(P)	VOR/ILS +28 VDC POWER		-39	(22)	---------------------	FIGURE 4-6
(O)	NAV STRAP +5 VDC		-40	(24)	---------------------	FIGURE 4-29
	SPARE		-41			
(B)	DIG AUDIO BUS 2	(H)	-42		---------S-T-S-------	FIGURE 4-35
(B)	DIG AUDIO BUS 2	(L)	-29		---------S-T-S------- GND GND	FIGURE 4-35
	CLU SPARE		-43			
(O)	FAN 28 VDC POWER RETURN		-44	(24)	---------------------	COOLING FAN (BLUE)
(I)	AUDIO AUX XMT		-45		-----NC	
	SPARE		-46			
(I)	SYNC COMP Z		-47		-----NC	
(O)	OBS A		-48		-----NC	
(O)	OBS E		-49		-----NC	
(P)	VOR/ILS POWER RETURN		-50	(22)	---------------------	DC POWER GND
(O)	VOR/ILS EMER AUDIO	(L)	-51		-----NC	
(O)	VOR/ILS EMER AUDIO	(H)	-36		-----NC	
(P)	VOR/ILS +28 VDC POWER		-52	(22)	---------------------	FIGURE 4-6
	CLU SPARE		-53			
	CLU SPARE		-54			
	CLU SPARE		-55			
(I)	EFIS/MLS RIGHT		C164J1B-56		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNIT
RNZ-850B

IO BP	Description		Connector Pin			Connects To
(I)	NAV STRAP SIDE SPARE		C164J1B-57	(24)	---------------------	FIGURE 4-29
(I)	NAV STRAP DATA		-58	(24)	-----------T---------	FIGURE 4-29
(O)	NAV STRAP CLK		-59	(24)	-----------T---------	FIGURE 4-29
(O)	NAV STRAP WD LOAD		-84	(24)	-----------T---------	FIGURE 4-29
(O)	GS FLAG		-60		-----NC	
(O)	VOR SYNCHRO Z		-61		-----NC	
(I)	SYNC FLAG +28V		-62		-----NC	
(O)	MARKER AUDIO CT		-63		-----NC	
(O)	ILS MODE		-64		-----NC	
(O)	VOR TO/FROM +		-65		-----NC	
(O)	MARKER AUDIO HI		-66		-----NC	
(I)	DIG AUDIO BUS SHLD		-67		-----NC	
	RESERVED		-68			
	CLU SPARE		-69			
	CLU SPARE		-70			
(B)	RSB PRIMARY	(H)	-71		---------S-T-S-------	FIGURE 4-28
(B)	RSB PRIMARY	(L)	-81		---------S-T-S-------	FIGURE 4-28
					GND GND	
	RESERVED		-72			
	RESERVED		-73			
(O)	VOR/ILS MKR LAMP (28 V/OPEN)	(O)	-74		-----NC	
(O)	VOR DEV COMMON		-75		-----NC	
(O)	ILS MODE LOGIC		-76		-----NC	
	SPARE		-77			
(O)	VOR/LOC DEV +		-78		-----NC	
(O)	GS DEV +		-79		-----NC	
(I)	NAV STRAP SIDE SELECT		-80	(24)	---------------------	FIGURE 4-29
(B)	RSB PRIMARY	(L)	-81		---------S-T-S-------	FIGURE 4-28
(B)	RSB PRIMARY	(H)	-71		---------S-T-S-------	FIGURE 4-28
					GND GND	
	SPARE		-82			
	SPARE		-83			
(O)	NAV STRAP WD LOAD		-84	(24)	-----------T---------	FIGURE 4-29
(I)	NAV STRAP SIDE SPARE		-57	(24)	-----------T---------	FIGURE 4-29
(I)	NAV STRAP DATA		-58	(24)	-----------T---------	FIGURE 4-29
(O)	NAV STRAP CLK		C164J1B-59	(24)	-----------T---------	FIGURE 4-29

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNIT
RNZ-850B

IO BP	Description		Connector Pin			Connects To
(I)	SEC RSB BUS SHIELD		C164J1B-85		-----NC	
	CLU SPARE		-86			
	RESERVED		-87			
(O)	NAV AUX SHIFT LD	(L)	-88		-----NC	
(O)	NAV AUX SHIFT LD	(H)	-90		-----NC	
(O)	VOR RS-422 SD 1	(H)	-89		-----NC	
(O)	NAV AUX SHIFT LD	(H)	-90		-----NC	
(O)	NAV AUX SHIFT LD	(L)	-88		-----NC	
(O)	VOR/LOC SUPERFLAG		-91		-----NC	
(O)	VOR/LOC FLAG		-92		-----NC	
(O)	MARKER AUDIO LO		-93		-----NC	
	CLU SPARE		-94			
(I)	PRIMARY RSB BUS SHIELD		-95		-----NC	
(I)	EFIS/MLS LEFT		-96		-----NC	
	CLU SPARE		-97			
(I)	CLU GND		-98	(22)	---------------------	DC POWER GND
	RESERVED		-99			
	RESERVED		-100			
	V/I SPARE		-101			
(O)	VOR/ILS RS-422 SD2	(H)	-102	(24)	---------S-T-S-------	TO FMS #2
(O)	VOR/ILS RS-422 SD2	(L)	J1A-84	(24)	---------S-T-S-------	TO FMS #2
					GND GND	
(O)	VOR SYNCHRO	Y	-103		-----NC	
(O)	VOR SYNCHRO	X	-104		-----NC	
	CLU SPARE		-105			
	RESERVED		C164J1B-106			

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Table 3-1. Interconnect Information (cont)

COPILOT'S NAVIGATION UNIT
RNZ-850B

IO BP	Description	Connector Pin		Connects To
	VOR/LOC ANT	C164J3	------RG-142/U--------	VOR/LOC 2 ANT
	GS ANT	C164J4	------RG-142/U--------	GS 2 ANT
	MKR BEAC ANT	C164J5	------RG-142/U--------	MKR BEAC 2 ANT
	DME ANT	C164J6	------RG-214/U--------	DME 2 ANT

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin		Connects To
	RESERVED	C190J1A-1	-----NC	
	RESERVED	-2	-----NC	
	SPARE	-3		
	RESERVED	-4	-----NC	
	RESERVED	-5	-----NC	
	SPARE	-6		
	RESERVED	-7	-----NC	
	RESERVED	-8	-----NC	
	SPARE	-9		
	RESERVED	-10	-----NC	
	RESERVED	-11	-----NC	
	SPARE	-12		
	RESERVED	-13	-----NC	
	RESERVED	-14	-----NC	
	SPARE	-15		
	RESERVED	-16	-----NC	
	RESERVED	-17	-----NC	
	SPARE	-18		
	RESERVED	-19	-----NC	
	RESERVED	-20	-----NC	
	RESERVED	-21	-----NC	
	SPARE	-22		
	RESERVED	-23	-----NC	
	RESERVED	-24	-----NC	
	RESERVED	-25	-----NC	
	RESERVED	-26	-----NC	
	RESERVED	-27	-----NC	
	RESERVED	-28	-----NC	
	RESERVED	-29	-----NC	
	SPARE	-30		
	RESERVED	-31	-----NC	
	RESERVED	-32	-----NC	
	SPARE	-33		
	RESERVED	-34	-----NC	
	RESERVED	-35	-----NC	
	SPARE	-36		
	RESERVED	-37	-----NC	
	RESERVED	-38	-----NC	
	SPARE	-39		
	RESERVED	-40	-----NC	
	RESERVED	-41	-----NC	
	SPARE	-42		
	RESERVED	-43	-----NC	
	RESERVED	-44	-----NC	
	SPARE	C190J1A-45		

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER IC-600

IO BP	Description	Connector Pin			Connects To
	RESERVED	C190J1A-46		-----NC	
	RESERVED	-47		-----NC	
	RESERVED	-48		-----NC	
	SPARE	-49			
	RESERVED	-50		-----NC	
	RESERVED	-51		-----NC	
	RESERVED	-52		-----NC	
	RESERVED	-53		-----NC	
	RESERVED	-54		-----NC	
	RESERVED	-55		-----NC	
	RESERVED	-56		-----NC	
	SPARE	-57			
	RESERVED	-58		-----NC	
	RESERVED	-59		-----NC	
	SPARE	-60			
	RESERVED	-61		-----NC	
	RESERVED	-62		-----NC	
	SPARE	-63			
	RESERVED	-64		-----NC	
	RESERVED	-65		-----NC	
	SPARE	-66			
	SPARE	-67			
	SPARE	-68			
	SPARE	-69			
	SPARE	-70			
	SPARE	-71			
	SPARE	-72			
	SPARE	-73			
	SPARE	-74			
	SPARE	-75			
	PRIMARY ATTITUDE 28V VALID	-76	(24)	---------S---S------- GND┘ └GND	C1J1-R, 190J1B-76
	PRIMARY HEADING 28V VALID	-77	(24)	---------S---S------- GND┘ └GND	C6J1-h, 190J1B-77
	RESERVED	-78			
	PRIMARY ADF BRG 28V VALID	-79		-----NC	
	RESERVED	-80			
	RESERVED	C190J1A-81			

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER IC-600

IO BP	Description	Connector Pin		Connects To
	PRIMARY PITCH X	C190J1A-82 (24)	---------S-T-S-------	C1J1-x, 190J1B-82
	PRIMARY PITCH Y	-83 (24)	---------S-T-S-------	C1J1-y, 190J1B-83
	PRIMARY PITCH Z	-84 (24)	---------S-T-S-------	C1J1-z, 190J1B-84
			GND GND	
	PRIMARY ROLL X	-85 (24)	---------S-T-S-------	C1J1-p, 190J1B-85
	PRIMARY ROLL Y	-86 (24)	---------S-T-S-------	C1J1-q, 190J1B-86
	PRIMARY ROLL Z	-87 (24)	---------S-T-S-------	C1J1-r, 190J1B-87
			GND GND	
	PRIMARY HDG X	-88 (24)	---------S-T-S-------	C6J1-a, 190J1B-88
	PRIMARY HDG Y	-89 (24)	---------S-T-S-------	C6J1-b, 190J1B-89
	PRIMARY HDG Z	-90 (24)	---------S-T-S-------	C6J1-Z, 190J1B-90
			GND GND	
	RESERVED	-91		
	RESERVED	-92		
	RESERVED	-93		
	RESERVED	-94		
	PRIMARY ADF BRG SIN COM	-95	-----NC	
	PRIMARY ADF BRG SIN	-96	-----NC	
	PRIMARY ADF BRG X	-97	-----NC	
	PRIMARY ADF BRG Y	-98	-----NC	
	PRIMARY ADF BRG COS	-99	-----NC	
	PRIMARY ADF BRG Z	-100	-----NC	
	PRIMARY ADF BRG COS COM	-101	-----NC	
	SPARE	-102		
	SPARE	-103		
	SPARE	-104		
	SPARE	-105		
	RESERVED	C190J1A-106		

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER IC-600

IO BP	Description		Connector Pin			Connects To
	PRIMARY DME CLK +		C190J1B-1		-----NC	
	PRIMARY DME DATA +		-2		-----NC	
	PRIMARY DME COMMON		-3		-----NC	
	PRIMARY DME ENABLE		-4		-----NC	
	PRIMARY DME HOLD		-5		-----NC	
	SEC DME CLK +		-6		-----NC	
	SEC DME DATA +		-7		-----NC	
	SEC DME COMMON		-8		-----NC	
	SEC DME ENABLE		-9		-----NC	
	SEC DME HOLD		-10		-----NC	
	RESERVED		-11			
	RESERVED		-12			
	RESERVED		-13			
	RESERVED		-14			
	IC DATA BUS	(H)	-15	(24)	---------S-T-S-------	126J1-24, 190J1B-15
	IC DATA BUS	(L)	-16	(24)	---------S-T-S------- GND GND	126J1-25, 190J1B-16
	RESERVED		-17			
	RESERVED		-18			
	RESERVED		-19			
	RESERVED		-20			
	CONFIG (RESERVED)		-21		-----NC	
	CONFIG (LOW SPEED LRN BUS #1)		-22	(24)	---------------------	TABLE 4-2
	CONFIG (LOW SPEED LRN BUS #2)		-23	(24)	---------------------	TABLE 4-2
	CONFIG (NO HW WX)		-24	(24)	---------------------	TABLE 4-2
	CONFIG (SINGLE CUE/CROSS POINT)		-25	(24)	---------------------	TABLE 4-2
	CONFIG (TWO DISPLAY SYSTEM)		-26	(24)	---------------------	TABLE 4-2
	CONFIG (JAA OPTION)		-27	(24)	---------------------	TABLE 4-2
	CONFIG (PHASE III)		-28	(24)	---------------------	TABLE 4-2
	CONFIG (DUAL LRN)		-29	(24)	---------------------	TABLE 4-2
	SG REVERSION INPUT		-30	(24)	---------------------	FIG. 4-24
	SPARE		-31		-----NC	
	BARO SET INPUT (WIPER)		-32		-----NC	
	SPARE		-33		-----NC	
	ROLL TRIM WARN ANNUNCIATOR		C190J1B-34		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin		Connects To
	BC DISCRETE OUT	C190J1B-35 (22)	---------------------	C8J1-22, GROUND PROXIMITY WARNING SYSTEM
	IC FAN FAIL	-36 (22)	---------------------	COPILOT'S IC FAN FAIL LIGHT, FIG. 4-21
	RESERVED	-37		
	RESERVED	-38	-----NC	
	RESERVED	-39	-----NC	
	RESERVED	-40		
	AOA 28 V VALID	-41 (24)	---------------------	FIG. 4-11
	RESERVED	-42	-----NC	
	RESERVED	-43	-----NC	
	SEC DME TTN (DME HOLD)	-44	-----NC	
	SEC NAV 28 V VALID	-45	-----NC	
	SEC SRN LATERAL DEV +	-46	-----NC	
	SEC SRN LATERAL DEV -	-47	-----NC	
	FMS SINGLE POINT VNAV ENABLE	-48	-----NC	
	SEC GS 28 V VALID	-49	-----NC	
	SEC GS DEV +	-50	-----NC	
	SEC GS DEV -	-51	-----NC	
	ROT/YAW RATE 5 V VALID	-52	-----NC	
	ROT/YAW RATE +	-53	-----NC	
	ROT/YAW RATE -	-54	-----NC	
	COMPASS SYNC +	-55 (24)	---------S-T-S-------	C6J1-U
	COMPASS SYNC -	-56 (24)	---------S-T-S------- GND GND	C6J1-V
	INNER MARKER BEC +	-57	-----NC	
	INNER MARKER BEC -	-58	-----NC	
	MIDDLE MARKER +	-59	-----NC	
	MIDDLE MARKER -	-60	-----NC	
	OUTER MARKER +	-61	-----NC	
	OUTER MARKER -	-62	-----NC	
	OSC TEST IN +	-63		
	OSC TEST IN -	-64		
	AOA DCVAR INPUT +	-65 (24)	---------S-T-S-------	FIG. 4-11
	AOA DCVAR INPUT -	-66 (24)	---------S-T-S-------	FIG. 4-11
	RESERVED	-67		
	RESERVED	-68		
	RESERVED	C190J1B-69		

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	RESERVED		C190J1B-70			
	RESERVED		-71			
	RESERVED		-72			
	RESERVED		-73			
	RESERVED		-74			
	RESERVED		-75			
	SEC ATTITUDE 28 V	VALID	-76	(22)	---------------------	1J1-R, 190J1A-76
	SEC HEADING 28 V	VALID	-77	(22)	---------------------	6J1-h, 190J1A-77
	STICK SHAKER		-78		-----NC	
	SEC ADF BRG 28 V	VALID	-79		-----NC	
	SEC AC REF +		-80	(24)	---------S-T-S-------	FIG. 4-8
	SEC AC REF -		-81	(24)	---------S-T-S-------	AC GND
					GND GND	
	SEC PITCH X		-82	(24)	---------S-T-S-------	1J1-x, 190J1A-82
	SEC PITCH Y		-83	(24)	---------S-T-S-------	1J1-y, 190J1A-83
	SEC PITCH Z		-84	(24)	---------S-T-S-------	1J1-z, 190J1A-84
					GND GND	
	SEC ROLL X		-85	(24)	---------S-T-S-------	1J1-p, 190J1A-85
	SEC ROLL Y		-86	(24)	---------S-T-S-------	1J1-q, 190J1A-86
	SEC ROLL Z		-87	(24)	---------S-T-S-------	1J1-r, 190J1A-87
					GND GND	
	SEC HDG X		-88	(24)	---------S-T-S-------	6J1-L, 190J1A-88
	SEC HDG Y		-89	(24)	---------S-T-S-------	6J1-M, 190J1A-89
	SEC HDG Z		-90	(24)	---------S-T-S-------	6J1-K, 190J1A-90
					GND GND	
	RESERVED		-91			
	RESERVED		-92			
	RESERVED		-93			
	SPARE		-94			
	SEC ADF BRG SIN COM		-95		-----NC	
	SEC ADF BRG SIN		-96		-----NC	
	SEC ADF BRG X		-97		-----NC	
	SEC ADF BRG Y		-98		-----NC	
	SEC ADF BRG COS		-99		-----NC	
	SEC ADF BRG Z		-100		-----NC	
	SEC ADF BRG COS COM		-101		-----NC	
	RESERVED		-102		-----NC	
	RESERVED		-103		-----NC	
	RESERVED		-104		-----NC	
	RESERVED		-105		-----NC	
	RESERVED		190J1B-106		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	DGC +28 V DC POWER		C190J2A-1	(20)	---------------------	FIG. 4-6
	DGC +28 V DC POWER		-2	(20)	---------------------	FIG. 4-6
	DGC +28 V DC POWER		-3	(20)	---------------------	FIG. 4-6
	DGC DC POWER GND		-4	(20)	---------------------	DC PWR GND
	DGC DC POWER GND		-5	(20)	---------------------	DC PWR GND
	DGC DC POWER GND		-6	(20)	---------------------	DC PWR GND
	LAMP RETURN		-7	(22)	---------------------	DC PWR GND
	DGC SIGNAL GND		-8	(22)	---------------------	SIGNAL GND
	DGC SIGNAL GND		-9	(22)	---------------------	SIGNAL GND
	10 V RTN		-10	(24)	---------S-T-S-------	C115J1-55
	-10 V REF OUT		-11	(24)	---NC | | |	
	+10 V REF OUT		-12	(24)	---------S-T-S-------	C115J1-53
	DECISION HEIGHT/RAD ALT INPUT W		-13	(24)	---------S-T-S-------	C115J1-54
					GND GND	
	SPARE		-14		-----NC	
	PRIMARY DC-550	+	-15	(24)	---------S-T-S-------	C115J1-34
	PRIMARY DC-550	-	-16	(24)	---------S-T-S-------	C115J1-35
					GND GND	
	LEFT EFIS CONTROL BUS	(P)	-17	(24)	---------S-T-S-------	59J1-e NC FOR NO WX OPTION
	LEFT EFIS CONTROL BUS	(N)	-18	(24)	---------S-T-S-------	59J1-f NC FOR NO WX OPTION
					GND GND	
	PRIMARY RSB	(H)	-19		-----NC	
	PRIMARY RSB	(L)	-20		-----NC	
	PRI ARINC 429 LRN	(H)	-21	(24)	---------S-T-S-------	190J2A-21 FROM LRN FIG. 4-20
	PRI ARINC 429 LRN	(L)	-22	(24)	---------S-T-S-------	190J2A-22 FROM LRN FIG. 4-20
					GND GND	
	ARINC 429 ADF #1	(H)	-23	(24)	---------S-T-S-------	190J2A-81 TO COPILOT'S RADIOS
	ARINC 429 ADF #1(J2A-23, -24 ARE NC FOR BENDIX KING RADIOS)	(L)	-24	(24)	---------S-T-S-------	190J2A-82 TO COPILOT'S RADIOS
					GND GND	
	RESERVED		-25			
	RESERVED		C190J2A-26			

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER IC-600

IO BP	Description		Connector Pin			Connects To
	SECONDARY ARINC 429 DME	(H)	C190J2A-27	(24)	---------S-T-S-------	190J2B-31 TO CO-PILOT'S RADIOS
	SECONDARY ARINC 429 DME (J2A-27, -28 NC FOR SINGLE DME	(L)	-28	(24)	---------S-T-S------- GND GND	190J2B-32 TO CO-PILOT'S RADIOS
	RESERVED		-29			
	RESERVED		-30			
	ARINC 429 VOR/LOC #1	(H)	-31	(24)	---------S-T-S-------	190J2B-13 FROM COPILOT'S RADIOS
	ARINC 429 VOR/LOC #1	(L)	-32	(24)	---------S-T-S------- GND GND	190J2B-26 FROM COPILOT'S RADIO
	RESERVED		-33			
	RESERVED		-34			
	RESERVED		-35			
	RESERVED		-36			
	SPARE		-37			
	SPARE		-38			
	429 LRN OUT	(HI)	-39	(24)	-----------------	SEE FIG. 4-20
	RESERVED		-40			
	EGPWS	(H)	-41	(24)	---------S-T-S-------	EGPWS
	EGPWS	(L)	-42	(24)	---------S-T-S------- GND GND	EGPWS
	ARINC 429 ADC #2	(H)	-43	(24)	---------S-T-S-------	9J1-63
	ARINC 429 ADC #2	(L)	-44	(24)	---------S-T-S------- GND GND	9J1-64
	DU HDLC INPUT2 BUS	(H)	-45		-----NC	
	DU HDLC INPUT2 BUS	(L)	-46		-----NC	
	DU HDLC INPUT2 BUS	(T)	-47		-----NC	
	RESERVED		-48			
	RADAR ALT 28 V VALID		-49	(24)	---------------------	RAD ALT VALID, 190J2A-49
	RADAR ALT + (SEE NOTE)		-50	(24)	---------S-T-S-------	TO RAD ALT, 190J2A-50
	RADAR ALT -		-51	(24)	---------S-T-S------- GND GND	TO RAD ALT 190J2A-51
	429 LRN OUT	(LO)	-52	(24)	---------------------	SEE FIG. 4-20
	ACCEL RTN		-53	(24)	---------------------	C17J1-3
	LEFT SIDE SELECT		C190J2A-54		-----NC	

NOTE: For RA with negative outputs reverse connection into IC-600.

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	RESERVED		C190J2A-55			
	RESERVED		-56			
	DGC-DGC/FTSU BUS	(H)	-57	(24)	---------S-T-S-------	FIG 4-19
	DGC-DGC/FTSU BUS	(L)	-58	(24)	---------S-T-S-------	FIG 4-19
					GND┘ └GND	
	RESERVED		-59			
	RESERVED		-60			
	LANDING GEAR DOWN		-61	(24)	---------------------	FIG. 4-17
	PRIMARY DG/MAG		-62	(24)	---------------------	FIG. 4-17
	SECONDARY DG/MAG		-63	(24)	---------------------	FIG. 4-17
	WEIGHT ON WHEELS	(WOW)	-64	(24)	---------------------	FIG. 4-12
	PGM ENABLE		-65		-----NC	
	SYS CONFIG IDENT 1		-66	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 2		-67	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 3		-68	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 4		-69	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 5		-70	(24)	---------------------	TABLE 4-1
	SYS CONFIG IDENT 6		-71	(24)	---------------------	TABLE 4-1
	A/C TYPE IDENT 1		-72		-----NC	
	A/C TYPE IDENT 2		-73	(24)	---------------------	C190J2A-90
	A/C TYPE IDENT 3		-74		-----NC	
	A/C TYPE IDENT 4		-75	(24)	---------------------	C190J2A-90
	A/C TYPE IDENT 5		-76		-----NC	
	TEST IDENT 1		-77		-----NC	
	TEST IDENT 2		-78		-----NC	
	TEST IDENT 3		-79		-----NC	
	TEST IDENT 4		-80		-----NC	
	SECONDARY ARINC 429 ADF	(H)	-81	(24)	---------S-T-S-------	190J2A-23 FROM CO-PILOT'S RADIOS
					| | |	
	SECONDARY ARINC 429 ADF	(L)	-82	(24)	---------S-T-S-------	190J2A-24 FROM CO-PILOT'S RADIOS
					GND┘ └GND	
	(J2A-81, -82 ARE NC FOR BENDIX KING RADIOS)					
	(J2A-81, -82 ARE NC FOR SINGLE ADF)					
	RESERVED		-83			
	RESERVED		-84			
	RESERVED		-85			
	RESERVED		-86			
	RESERVED		-87			
	RESERVED		-88			
	RESERVED		C190J2A-89			

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	DIN GROUND		C190J2A-90	(24)	---------------------	PROG GND
	RS232 SERIAL DATA	OUT	-91		---------------------	FIG. 4-19
	RS232 SERIAL DATA	IN	-92		---------------------	FIG. 4-19
	RS232 SERIAL DATA	GND	-93		---------------------	FIG. 4-19
	ALT ALERT HORN OUT		-94	(24)	---------------------	FIG. 4-13
	DECISION HEIGHT WARN	OUT	-95	(24)	---------------------	FIG. 4-13
	MASTER CMPMON WARN	OUT	-96	(24)	---------------------	CMPMON LIGHT, FIG. 4-21
	TEST OUT GND		-97	(24)	---------------------	TO RAD ALT CIRCUIT
	BANK ANNUNC OUT		-98	(24)	---------------------	11J1-W, 190J2A-98
	COUPLE ANNUNC OUT		-99	(24)	---------------------	FIG. 4-18
	√NAV ANNUNC OUT		-100	(24)	---------------------	C8J1-13
	VS MODE ANNUNC OUT		-101	(24)	---------------------	C8J1-15
	SPD MODE ANNUNC OUT		-102	(24)	---------------------	C8J1-16
	ALT MODE ANNUNC OUT		-103	(24)	---------------------	C8J1-14
	APR MODE ANNUNC OUT		-104	(24)	---------------------	C8J1-12
	NAV MODE ANNUNC OUT		-105	(24)	---------------------	C8J1-11
	HDG MODE ANNUNC OUT		C190J2A-106	(24)	---------------------	C8J1-10

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin			Connects To
	SERVO + 28 V POWER		190J2B-1	(20)	----------------------	NC
	SERVO + 28 V POWER		-2	(20)	----------------------	NC
	SERVO + 28 V POWER		-3	(20)	----------------------	NC
	SERVO + 28 V POWER		-4	(20)	----------------------	NC
	RESERVED		-5			
	SERVO DC POWER GND		-6	(20)	----------------------	NC
	SERVO DC POWER GND		-7	(20)	----------------------	NC
	SERVO DC POWER GND		-8	(20)	----------------------	NC
	SERVO DC POWER GND		-9	(20)	----------------------	NC
	DU HDLC OUTPUT BUS	(H)	-10	(24)	----------------------	FIG. 4-24 (DU'S)
	DU HDLC OUTPUT BUS	(L)	-11	(24)	----------------------	FIG. 4-24 (DU'S)
	RESERVED		-12			
	ARINC 429 VOR/LOC #2	(H)	-13	(24)	---------S-T-S-------	190J2B-31 FROM PILOT'S RADIOS
	ARINC 429 VOR/LOC #2	(L)	-26	(24)	---------S-T-S------- GND GND	190J2B-32 FROM PILOT'S RADIOS
	DU HDLC INPUT1 BUS	(H)	-14	(24)	---------S-T-S-------	C130J1-31
	DU HDLC INPUT1 BUS	(L)	-15	(24)	---------S-T-S------- GND GND	C130J1-32
	DU HDLC INPUT3 BUS	(H)	-16	(24)	---------S-T-S-------	131J1-31, 190J2A-45 NC FOR 2 DU SYSTEM
	DU HDLC INPUT3 BUS	(L)	-17	(24)	---------S-T-S------- GND GND	131J1-32, 190J2A-47 NC FOR 2 DU SYSTEM
	SRN #1 SEL OUT		-18			
	SRN #2 SEL OUT		-19			
	BARO CORRECTION (hPa/inHg)		-20	(24)	----------------------	C9J1-16
	CHK PFD 2 ANNUNCIATOR OUT		-21	(22)	----------------------	EXT LIGHT, FIG. 4-21
	RESERVED		-22			
	ARINC 429 ADC #1	(H)	-23	(24)	----------------------	C9J1-60
	ARINC 429 ADC #1	(L)	-24	(24)	----------------------	C9J1-61
	ARINC 429 TACAN #1	(H)	-25			
	ARINC 429 VOR/LOC #2	(L)	-26		SEE C190J2B-13	
	ARINC 429 TACAN #1	(L)	-27			
	RESERVED		-28			
	TCAS	(H)	-29		---------S-T-S-------	190J2B-29 FROM TCAS
	TCAS	(L)	C190J2B-30		---------S-T-S-------	190J2B-30 FROM TCAS

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER IC-600

IO BP	Description		Connector Pin			Connects To
	ARINC 429 DME #1	(H)	C190J2B-31	(24)	---------S-T-S-------	190J2A-27 TO COPILOT'S RADIOS
	ARINC 429 DME #1	(L)	-32	(24)	---------S-T-S------- GND GND	190J2A-28 TO COPILOT'S RADIOS
	RESERVED		-33			
	RESERVED		-34			
	ALT ALERT ANNUNC OUT		-35	(22)	---------------------	EXT LIGHT, FIG. 4-21
	PRIMARY AC REF +		-36	(24)	---------S-T-S-------	FIG. 4-8
	PRIMARY AC REF -		-37	(24)	---------S-T-S------- GND GND	AC GND
	RESERVED		-38			
	RESERVED		-39			
	RESERVED		-40			
	RESERVED		-41			
	RESERVED		-42			
	RESERVED		-43			
	RESERVED		-44			
	RESERVED		-45			
	RESERVED		-46			
	RESERVED		-47			
	RESERVED		-48			
	RESERVED		-49			
	RESERVED		-50			
	RESERVED		-51			
	AP LAMP RETURN		-52		-----NC	
	SECONDARY RSB	(H)	-53		-----NC	
	SECONDARY RSB	(L)	-54		-----NC	
	COUPLE PB INPUT		-55		-----NC	
	BANK PB INPUT		-56	(24)	---------------------	11J1-X, 190J2B-56
	RESERVED		-57			
	RESERVED		-58			
	+15 V ACCEL/ADS REF	OUT	-59	(24)	---------------------	C17J1-1
	-15 V ACCEL/ADS REF	OUT	-60	(24)	---------------------	C17J1-5
	15 V RETURN		-61	(24)	---------------------	DC GND
	LATERAL ACCEL INPUT		-62		-----NC	
	LAT ACCEL TEST OUTPUT		-63		-----NC	
	NORMAL ACCEL INPUT		-64	(24)	---------------------	C17J1-2
	LONGT ACCEL INPUT		-65		-----NC	
	MAN TRIM UP		-66		-----NC	
	MAN TRIM DN		C190J2B-67		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description	Connector Pin			Connects To
	PITCH WHEEL IN +	C190J2B-68	(24)	---------S-T-S-------	11JI-U, 190J2B-68
	PITCH WHEEL IN -	-69	(24)	---------S-T-S------- GND GND	11J1-V, 190J2B-69
	TCS 28 V INPUT	-70	(24)	---------------------	FIG. 4-10
	GO AROUND (GA) SWITCH	-71	(24)	---------------------	FIG. 4-14
	SPARE	-72			
	TURN KNOB INPUT	-73		-----NC	
	SPARE	-74			
	TURN KNOB OUT OF DETNT	-75	(24)	---------------------	11J1-H, 190J2B-75
	AP DISCONNECT 28 V IN	-76		-----NC	
	MOMENTARY HORN DISABLE	-77		-----NC	
	YD OFF ANNUNC OUT	-78		-----NC	
	LIGHT AND HORN DISABLE	-79		-----NC	
	PITCH TRIM WARN ANNUNC OUT	-80		-----NC	
	TRIM UP ANNUNC OUT	-81		-----NC	
	TRIM DN ANNUNC OUT	-82		-----NC	
	YD ENGAGE SELECT PB IN	-83		-----NC	
	YD ENGAGE ANNUNC OUT	-84		-----NC	
	AP ENGAGE SEL PB IN	-85		-----NC	
	AP ENGAGE ANNUNC OUT	-86		-----NC	
	28 V YD CLUTCH	-87		-----NC	
	28 V AP CLUTCH	-88		-----NC	
	28 V AP CLUTCH	-89		-----NC	
	AP DISCONNECT 28 VIN	-90		-----NC	
	FMS SELECT (GND/OPEN)	-91			GND = GNS-X SERIES OPEN = UNIVERSAL
	PITCH TRIM OUT +	-92		-----NC	
	PITCH TRIM OUT -	-93		-----NC	
	RIGHT SELECT	-94	(24)	---------------------	DC GND
	RUDDER SERVO TACH FB IN +	-95		-----NC	
	RUDDER SERVO TACH FB IN -	-96		-----NC	
	RUDDER SERVO OUT (H)	-97		-----NC	
	RUDDER SERVO OUT (L)	-98		-----NC	
	AILERON SERVO TACH IN FB	-100		-----NC	
	AILERON SERVO OUT (H)	-101		-----NC	
	AILERON SERVO OUT (L)	C190J2B-102		-----NC	

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Table 3-1. Interconnect Information (cont)

COPILOT'S DISPLAY GUIDANCE COMPUTER
IC-600

IO BP	Description		Connector Pin		Connects To
	PITCH SRVO TACH FB	IN +	C190J2B-103	-----NC	
	PITCH SRVO TACH FB	IN -	-104	-----NC	
	PITCH SERVO OUT	(H)	-105	-----NC	
	PITCH SERVO OUT	(L)	C190J2B-106	-----NC	

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Table 3-1. Interconnect Information (cont)

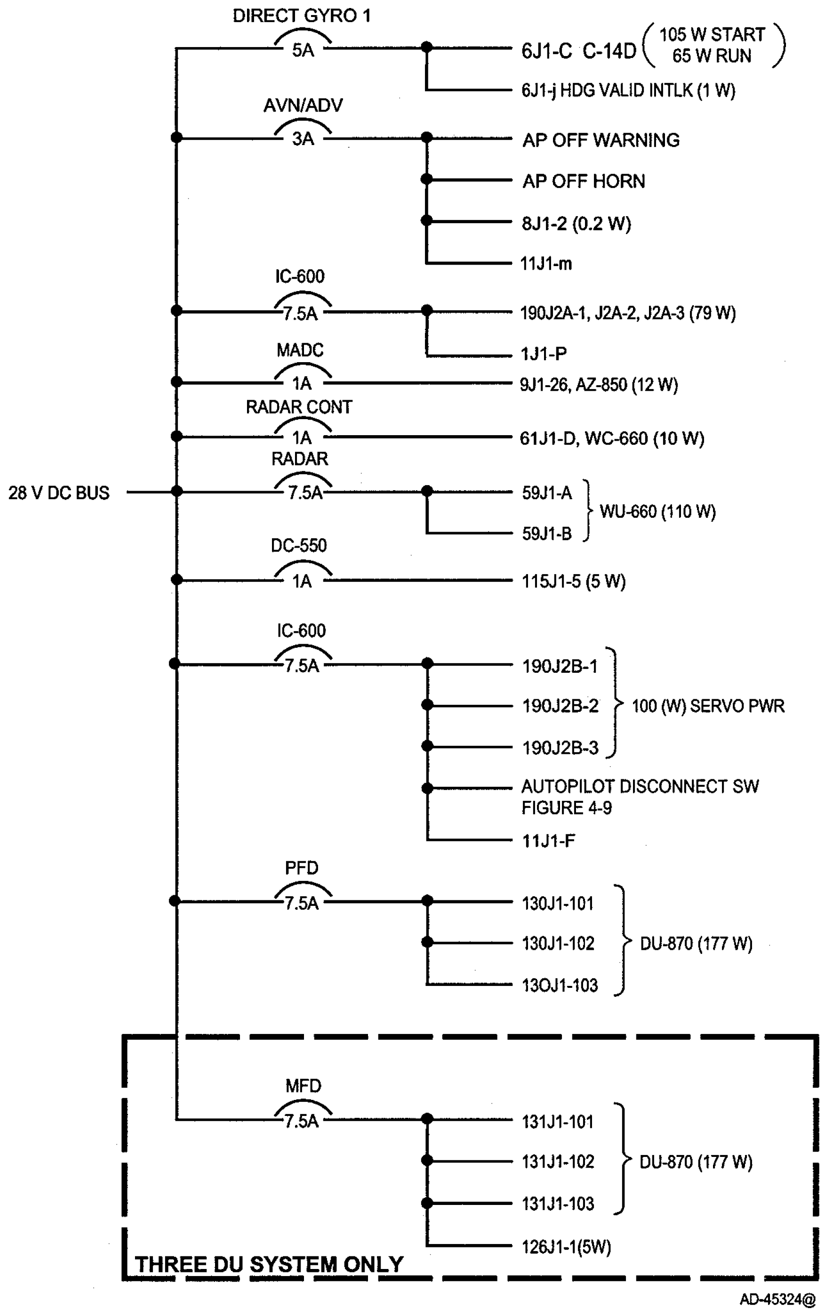

Figure 4-6. Pilot's 28 V dc Bus (Sheet 1 of 2)

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Table 3-1. Interconnect Information (cont)

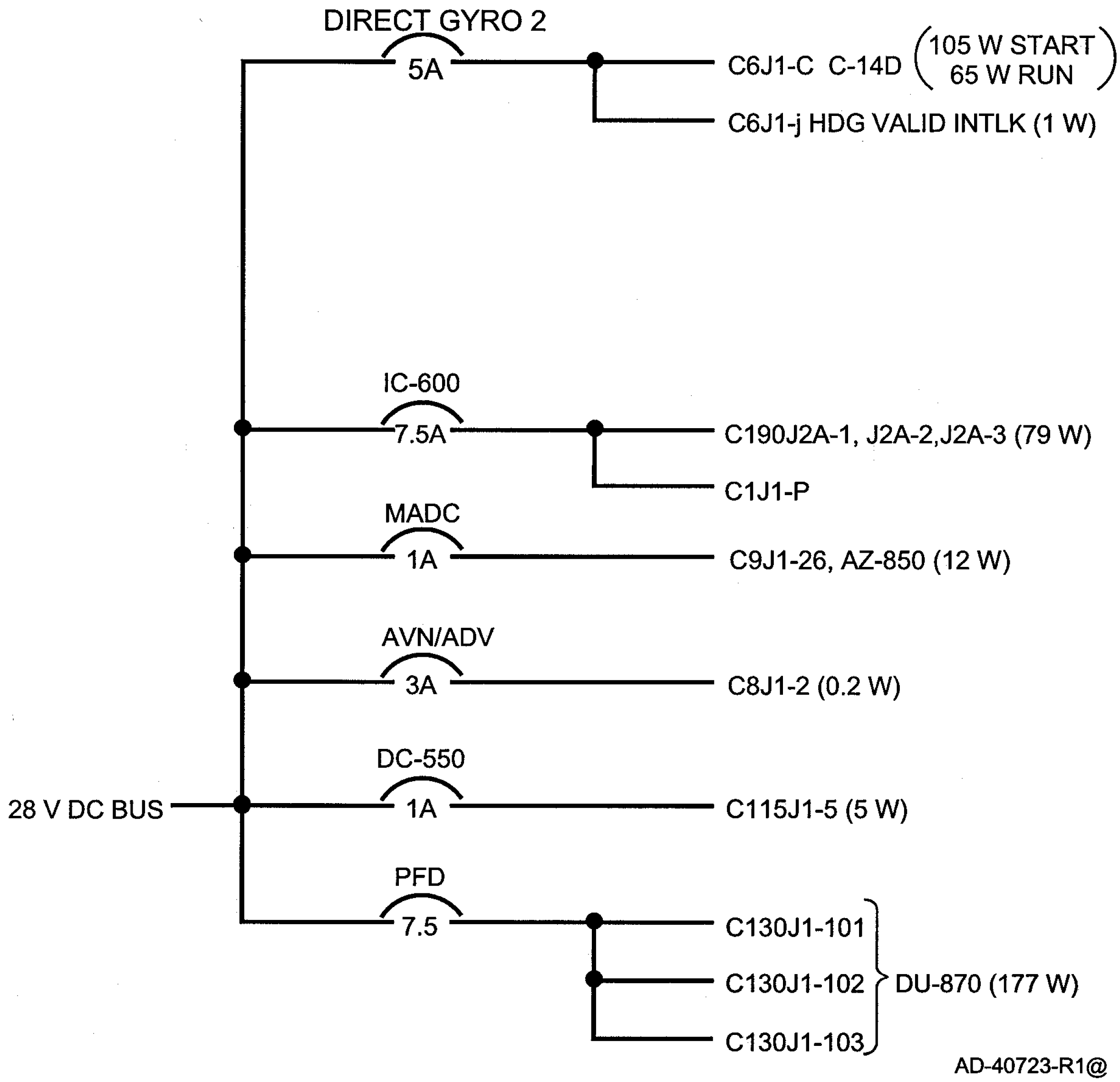

Figure 4-6. Copilot's 28 V dc Bus (Sheet 2)

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Table 3-1. Interconnect Information (cont)

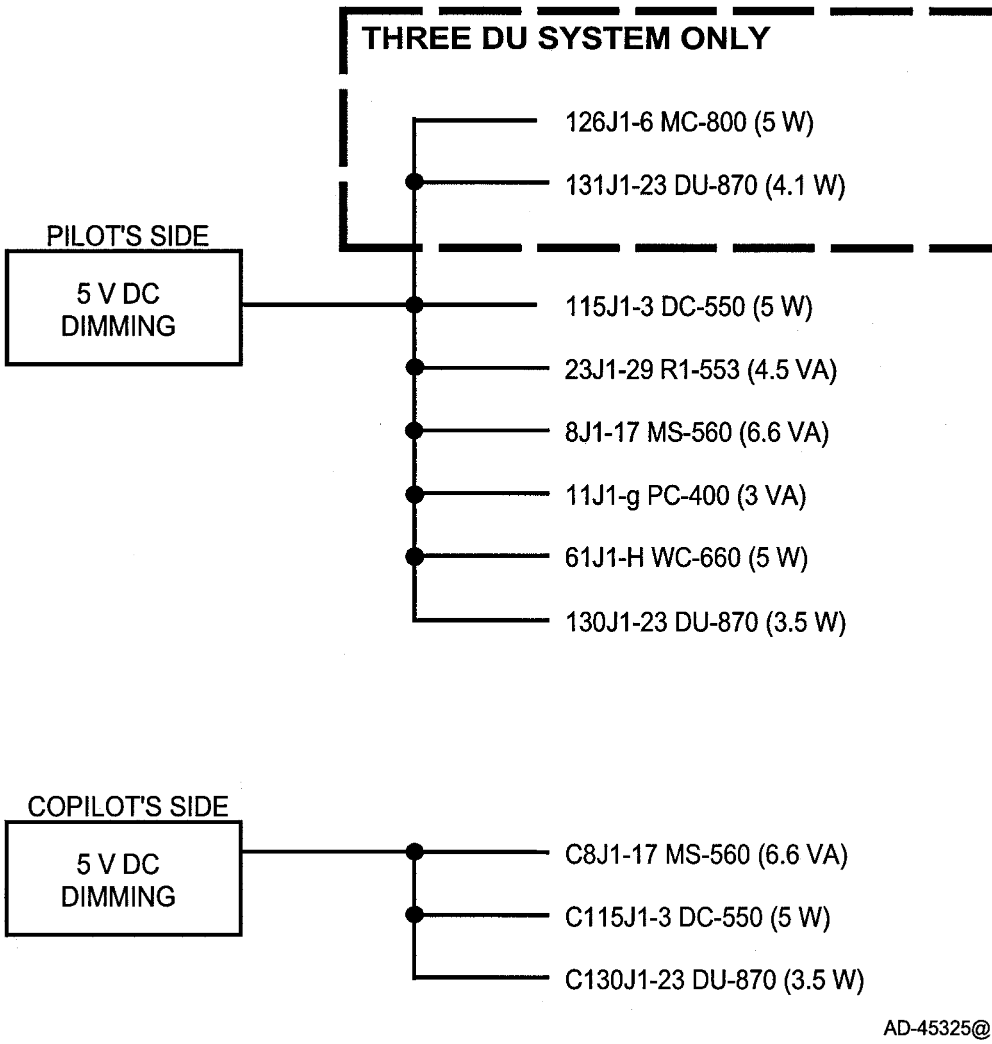

Figure 4-7. Edge Lighting

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Table 3-1. Interconnect Information (cont)

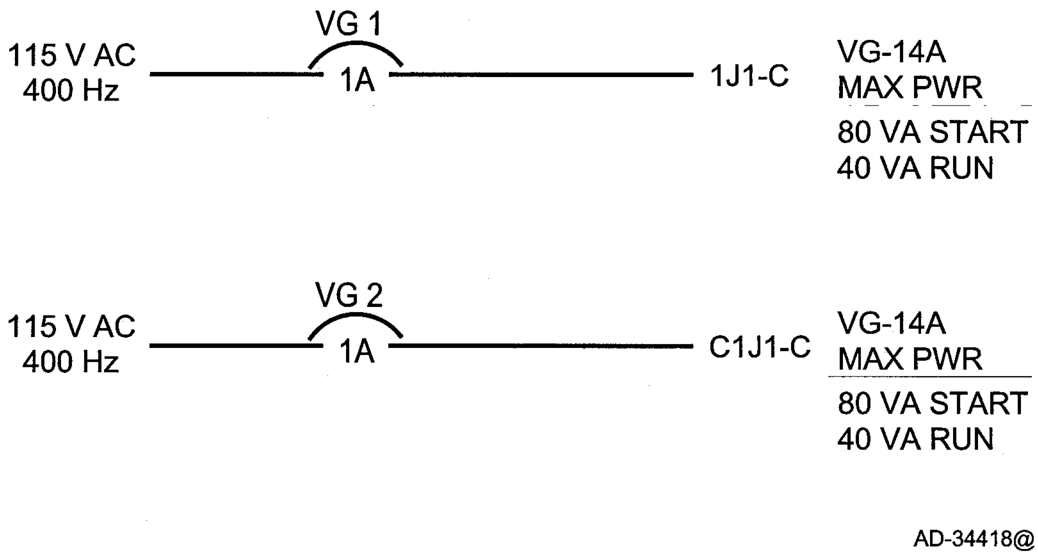

Figure 4-8. AC Power Requirements (Sheet 1 of 3)

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Table 3-1. Interconnect Information (cont)

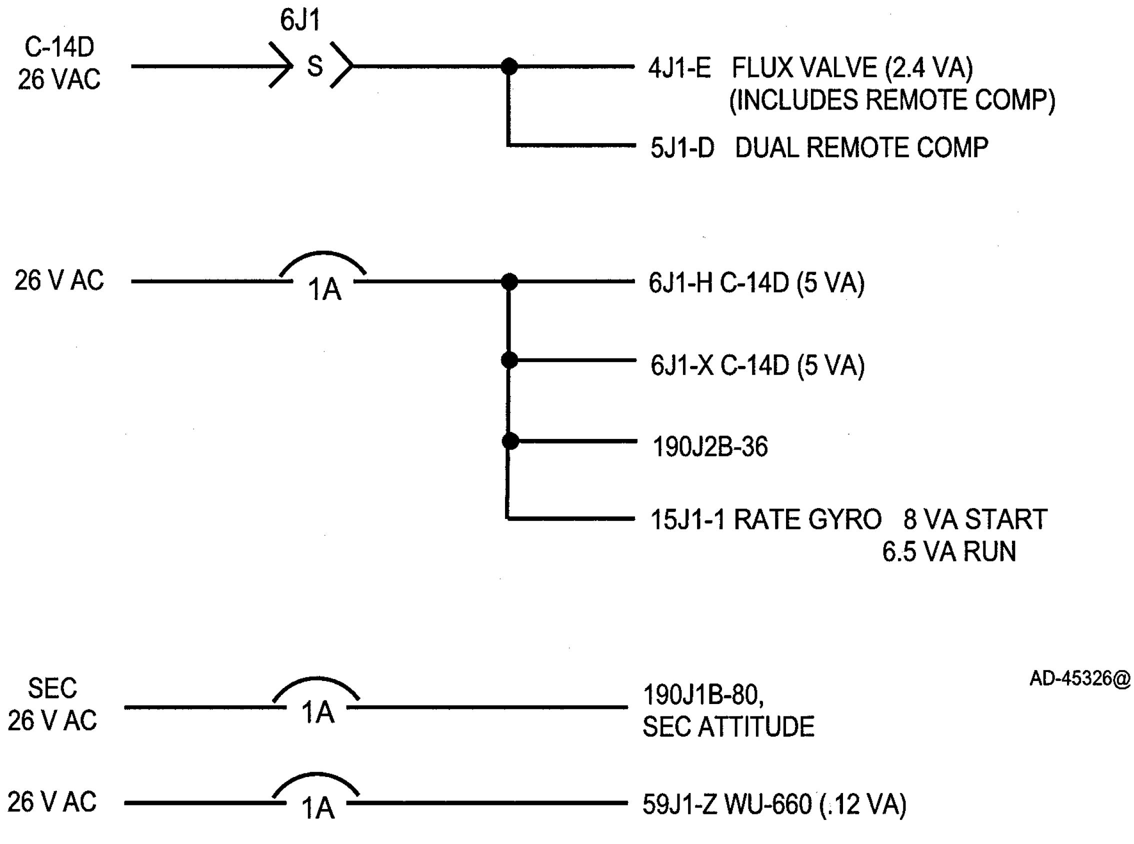

Figure 4-8. Pilot's AC Power Requirements (Sheet 2)

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Table 3-1. Interconnect Information (cont)

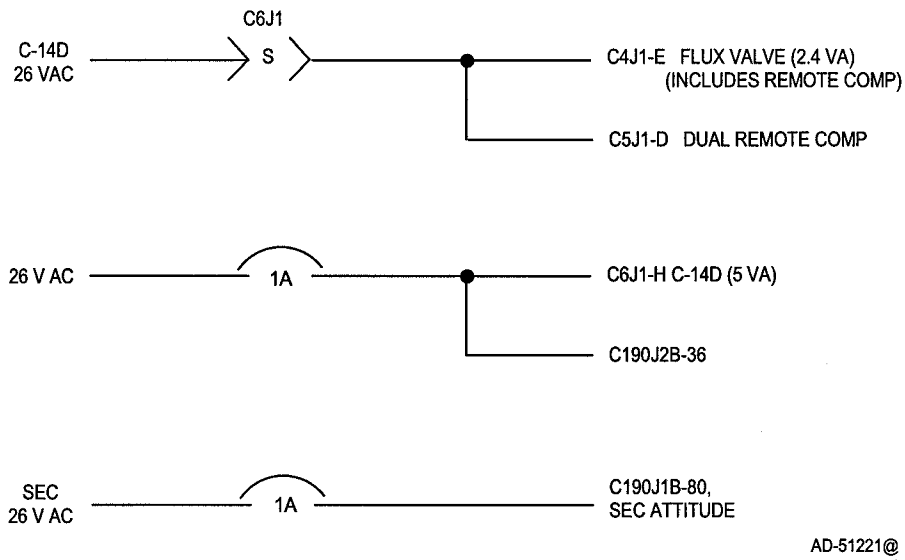

Figure 4-8. Copilot's AC Power Requirements (Sheet 3)

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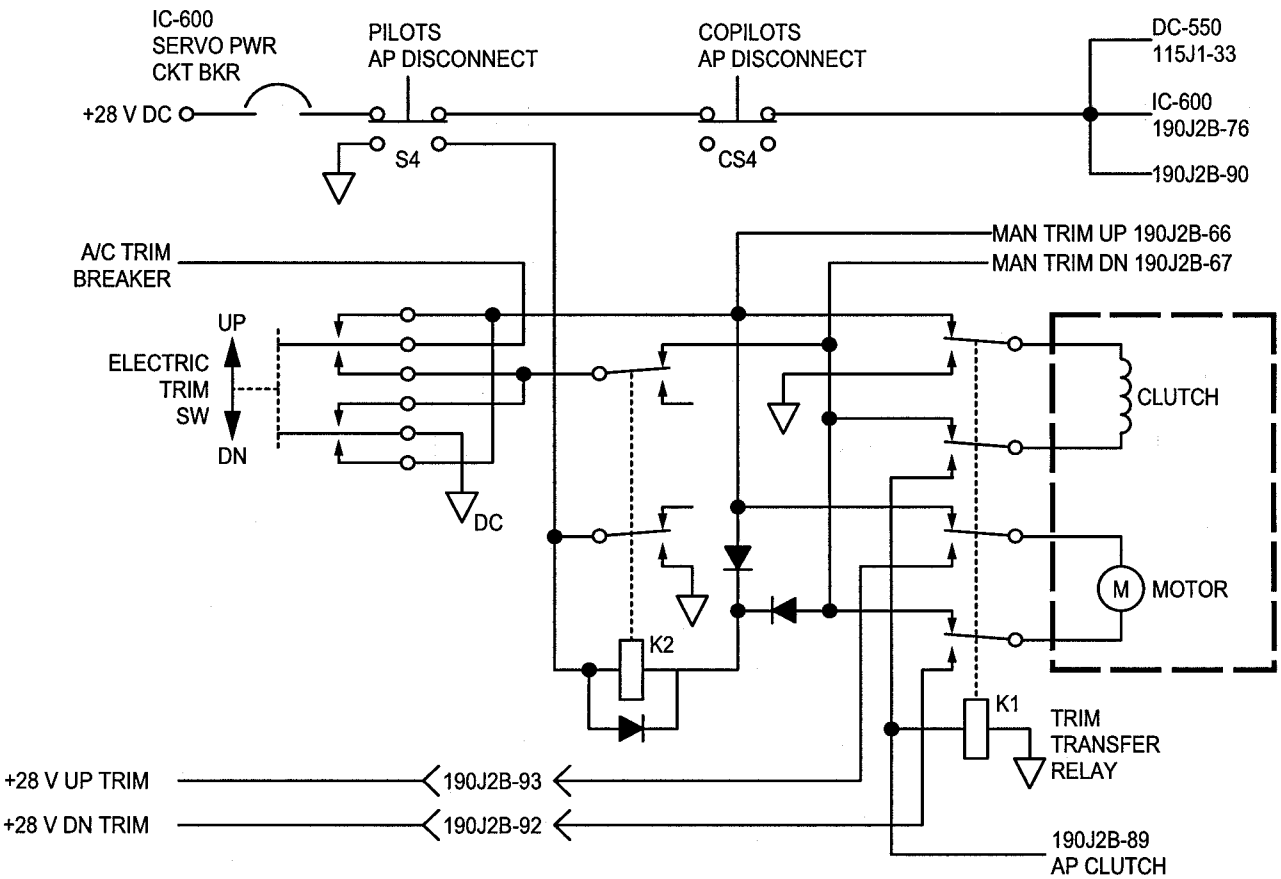
Table 3-1. Interconnect Information (cont)



NOTES:
1. ALL RELAYS SHOWN IN UNENERGIZED POSTION.
2. S4 AND CS4 MUST CARRY ENGAGE CIRCUIT CURRENTS AS SHOWN TO MAINTAIN AUTOPILOT SAFETY. THE COMPONENTS MUST BE RATED TO SWITCH 28 V DC @ 3 AMPS INDUCTIVE MINIMUM.

Figure 4-9. Engage/Trim Interlock

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Table 3-1. Interconnect Information (cont)

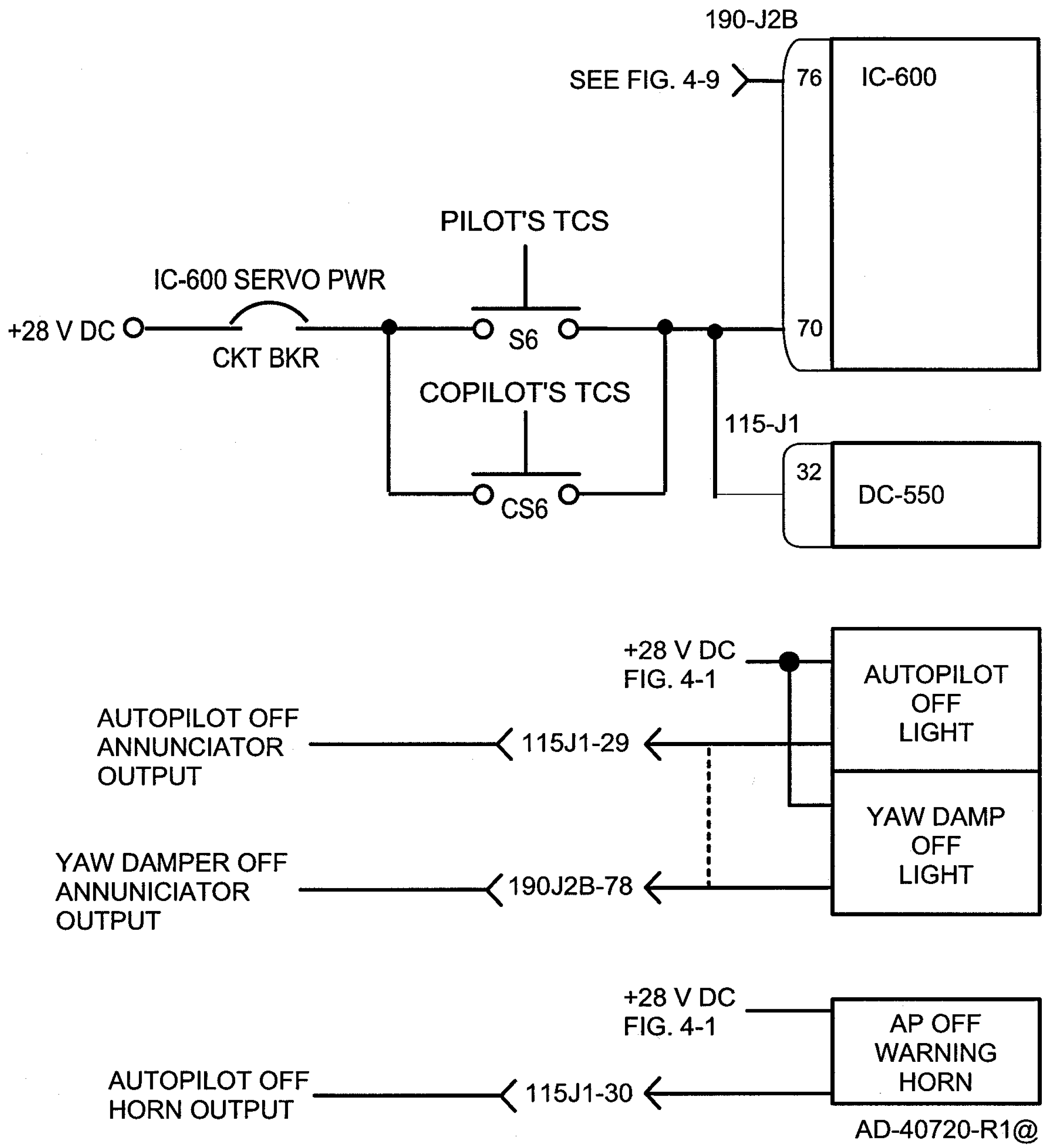

Figure 4-10. AP/TCS AP/YD Off Warn

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Table 3-1. Interconnect Information (cont)

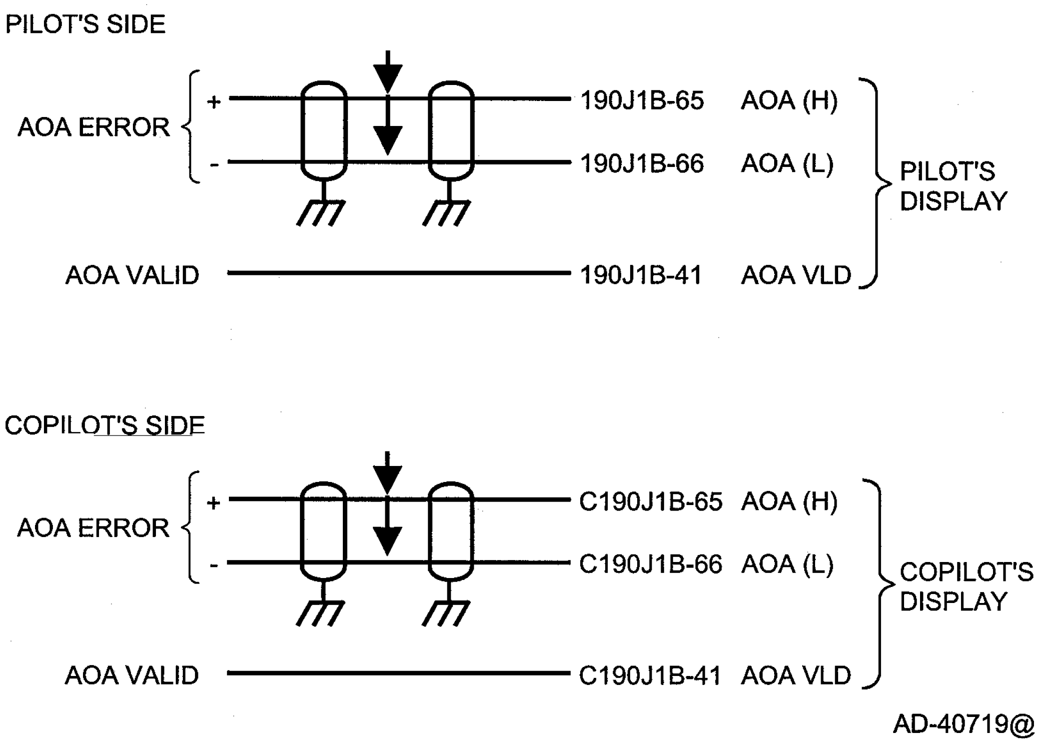

Figure 4-11. AOA/Speed Command

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Table 3-1. Interconnect Information (cont)

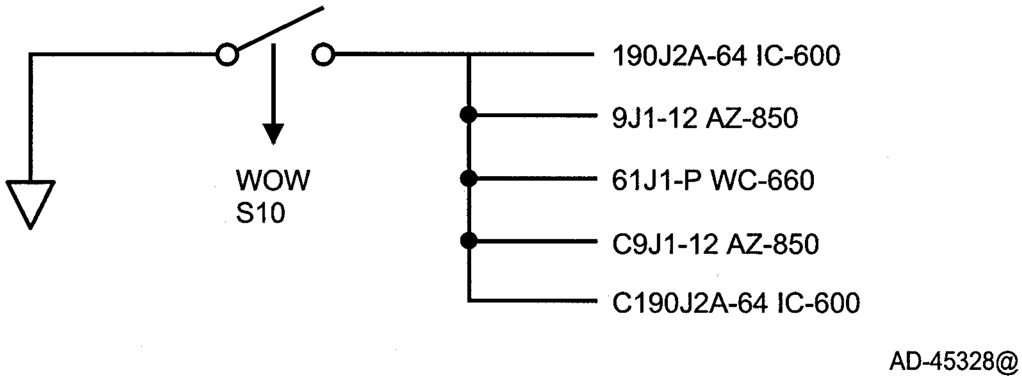

Figure 4-12. Weight On Wheels Switch

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Table 3-1. Interconnect Information (cont)

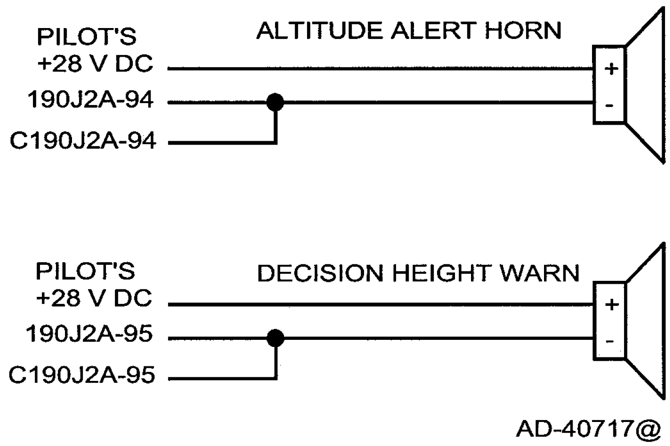

Figure 4-13. Decision Height Warn/Altitude Alert System

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Table 3-1. Interconnect Information (cont)

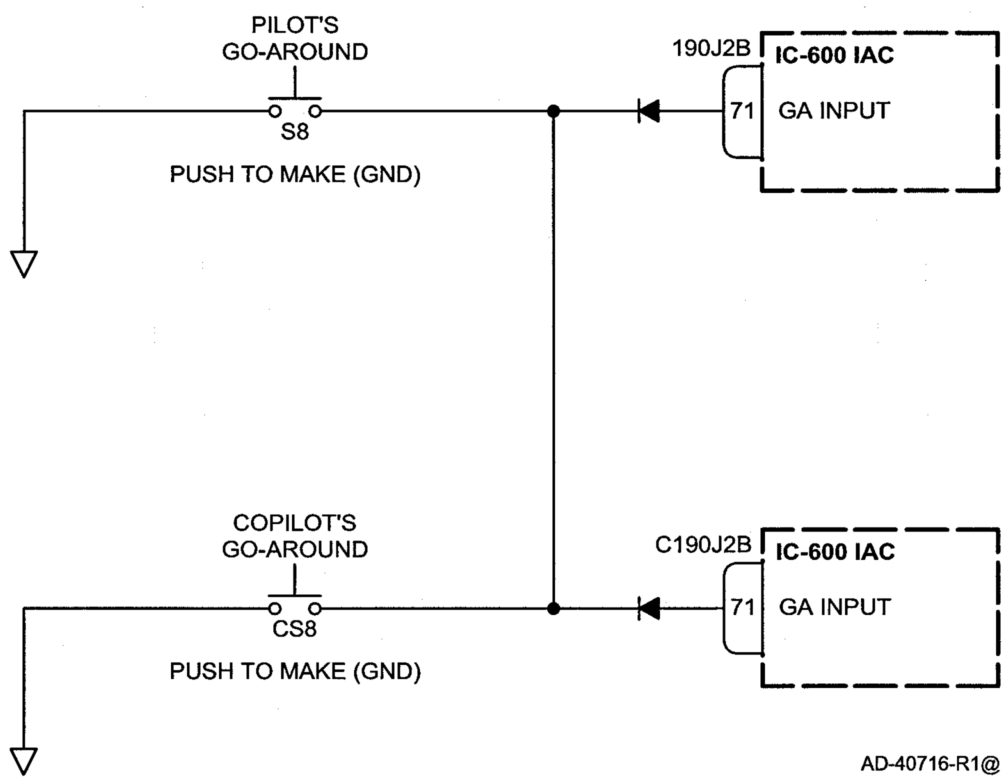

Figure 4-14. Go Around Switch Path

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Table 3-1. Interconnect Information (cont)

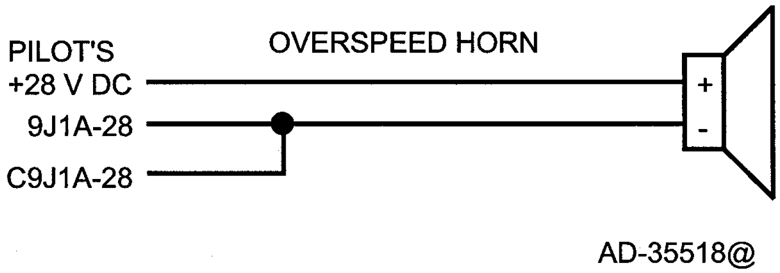

Figure 4-15. Overspeed Horn

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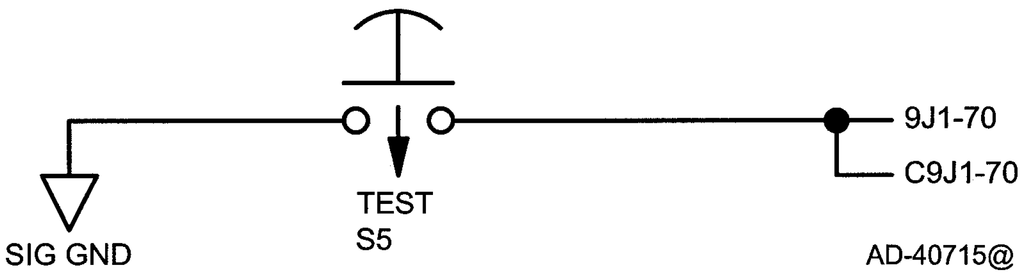
Table 3-1. Interconnect Information (cont)



NOTE: All wire is 24 AWG.

Figure 4-16. MADC Test Switch

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Table 3-1. Interconnect Information (cont)

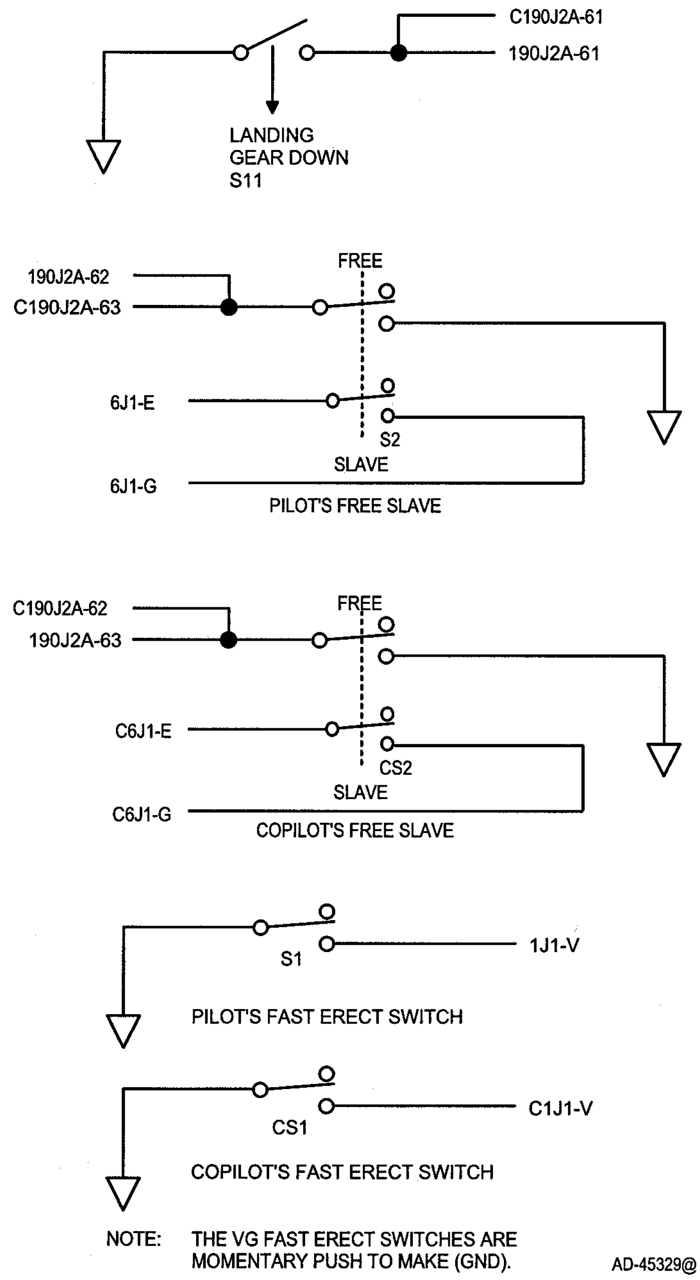

Figure 4-17. Landing Gear/Free Slave/Fast Erect

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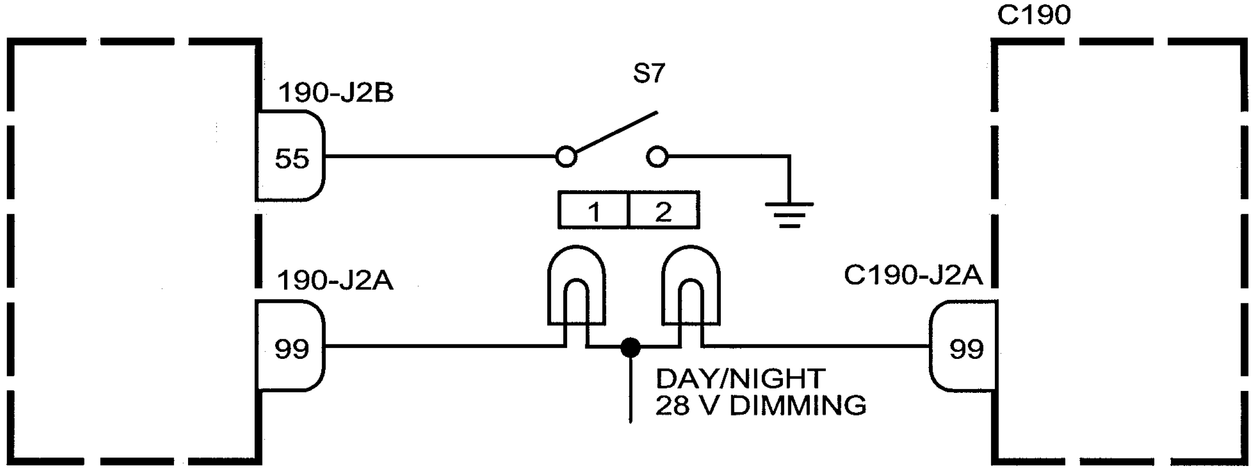
Table 3-1. Interconnect Information (cont)



NOTE:THE SWITCH IS MOMENTARY, NORMALLY OPEN, AND SWITCHES ON PUSH.
FD 1 IS IN CONTROL ON POWER UP.

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Figure 4-18. Coupler Annunciator

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Table 3-1. Interconnect Information (cont)

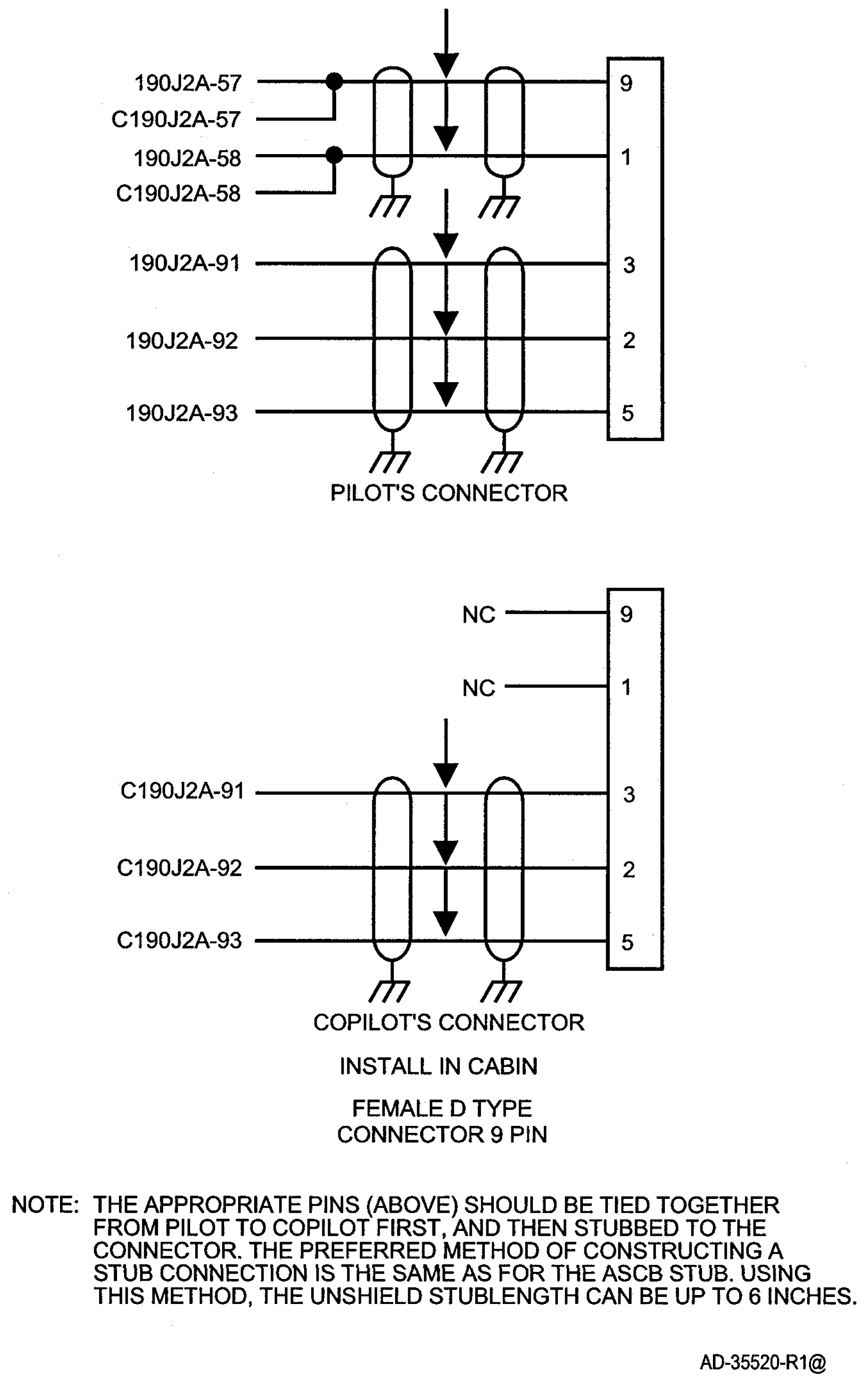

Figure 4-19. FTSU/RS-232 Cabin Connector

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Table 3-1. Interconnect Information (cont)

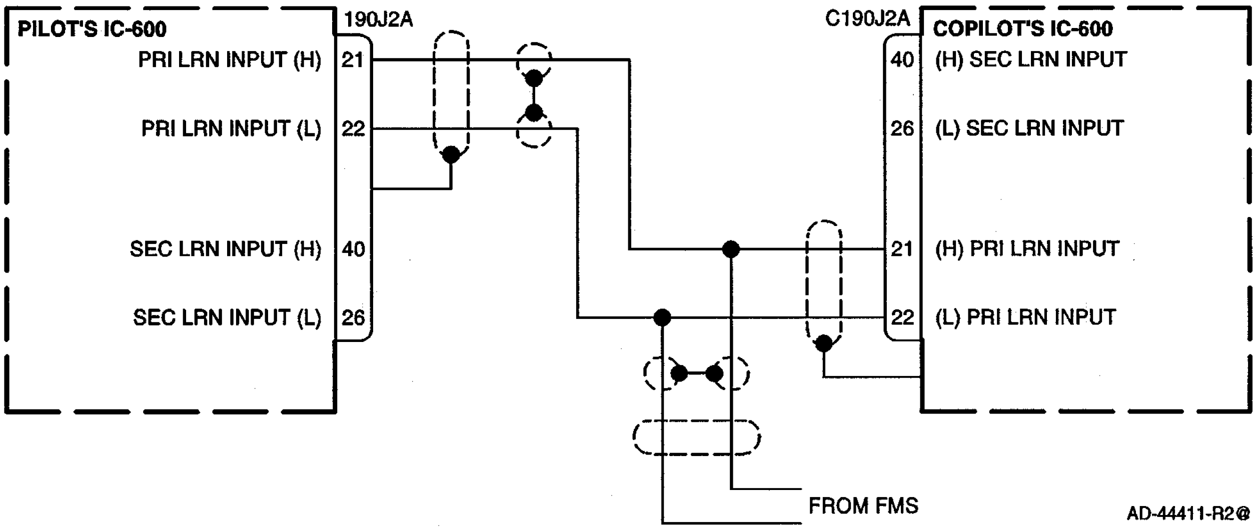

Figure 4-20. Long Range NAV Interface (Single FMS, FMS-IC) (Sheet 1 of 4)

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Table 3-1. Interconnect Information (cont)

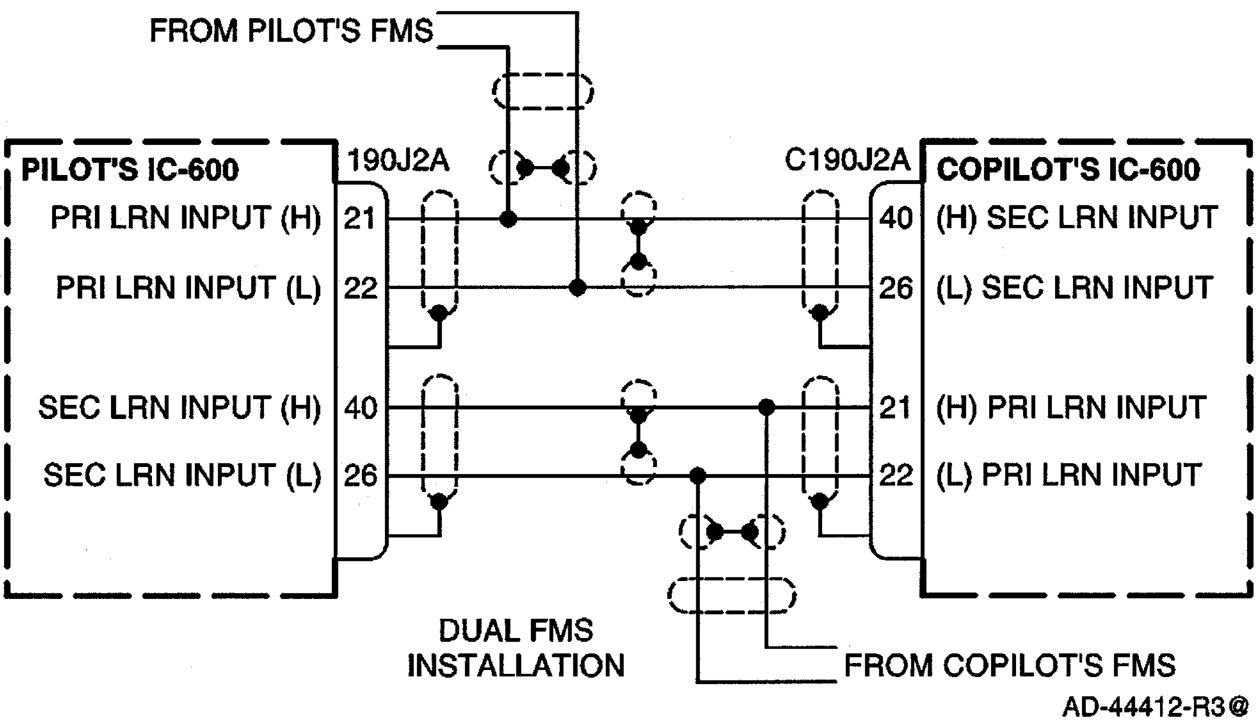

Figure 4-20. Long Range NAV Interface (Single FMS, FMS-IC) (Sheet 2)

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Table 3-1. Interconnect Information (cont)

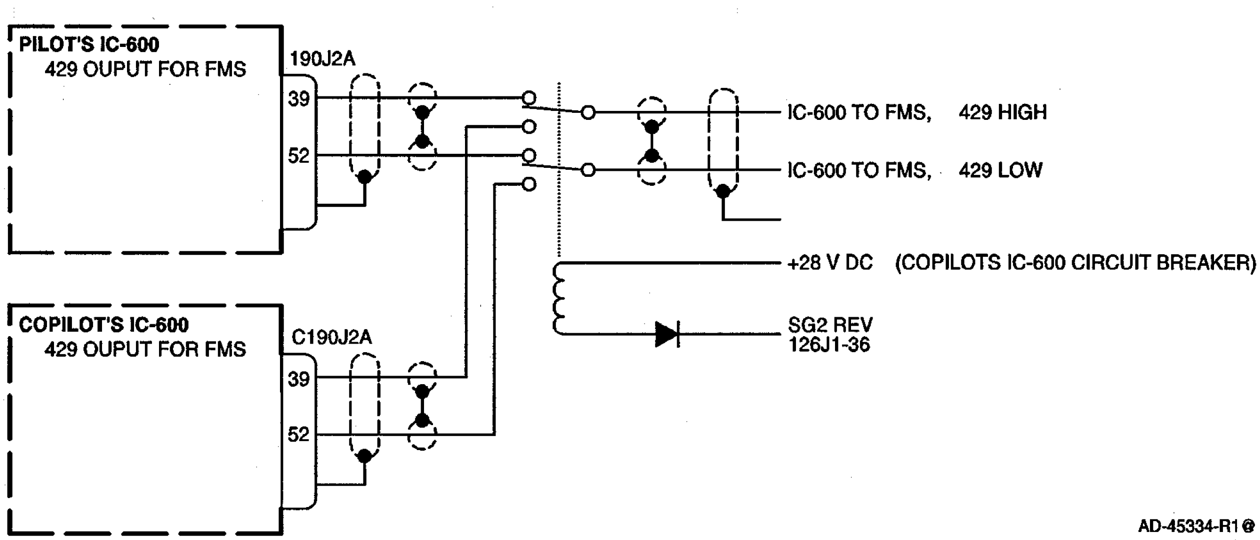

Figure 4-20. Long Range NAV Interface (Single FMS, FMS-IC) (Sheet 3)

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Table 3-1. Interconnect Information (cont)

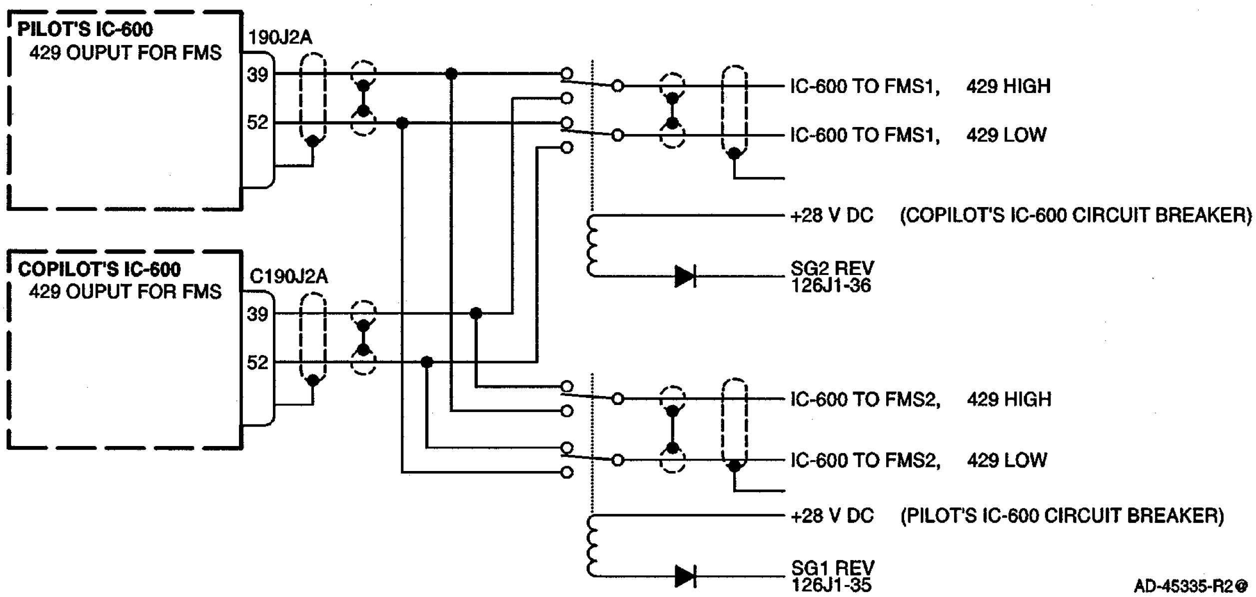

Figure 4-20. Long Range NAV Interface (Single FMS, FMS-IC) (Sheet 4)

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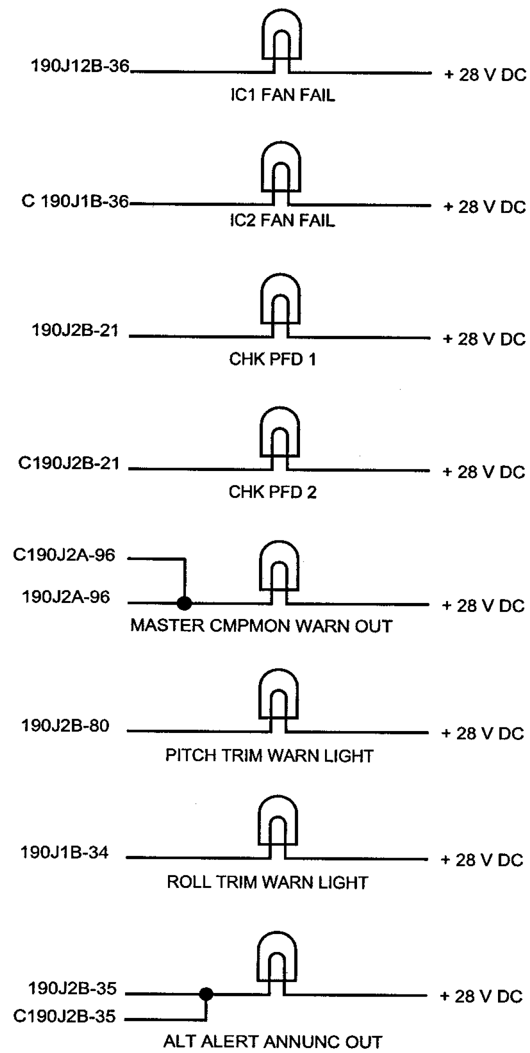
Table 3-1. Interconnect Information (cont)



NOTE: SEPERATE EXTERNAL LIGHTS MAY BE USED FOR COPILOT'S SIDE OR THEY MAY BE TIED TO THE PILOT'S SIDE FOR THE MASTER CMPMON.
IC1 AND IC2 FAN FAIL ANNUNCIATORS NOT REQUIRED WHEN MFD IS INSTALLED. (REQUIRED FOR 2 DU SYSTEM ONLY.)

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Figure 4-21. Discrete Annunciations

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Table 3-1. Interconnect Information (cont)

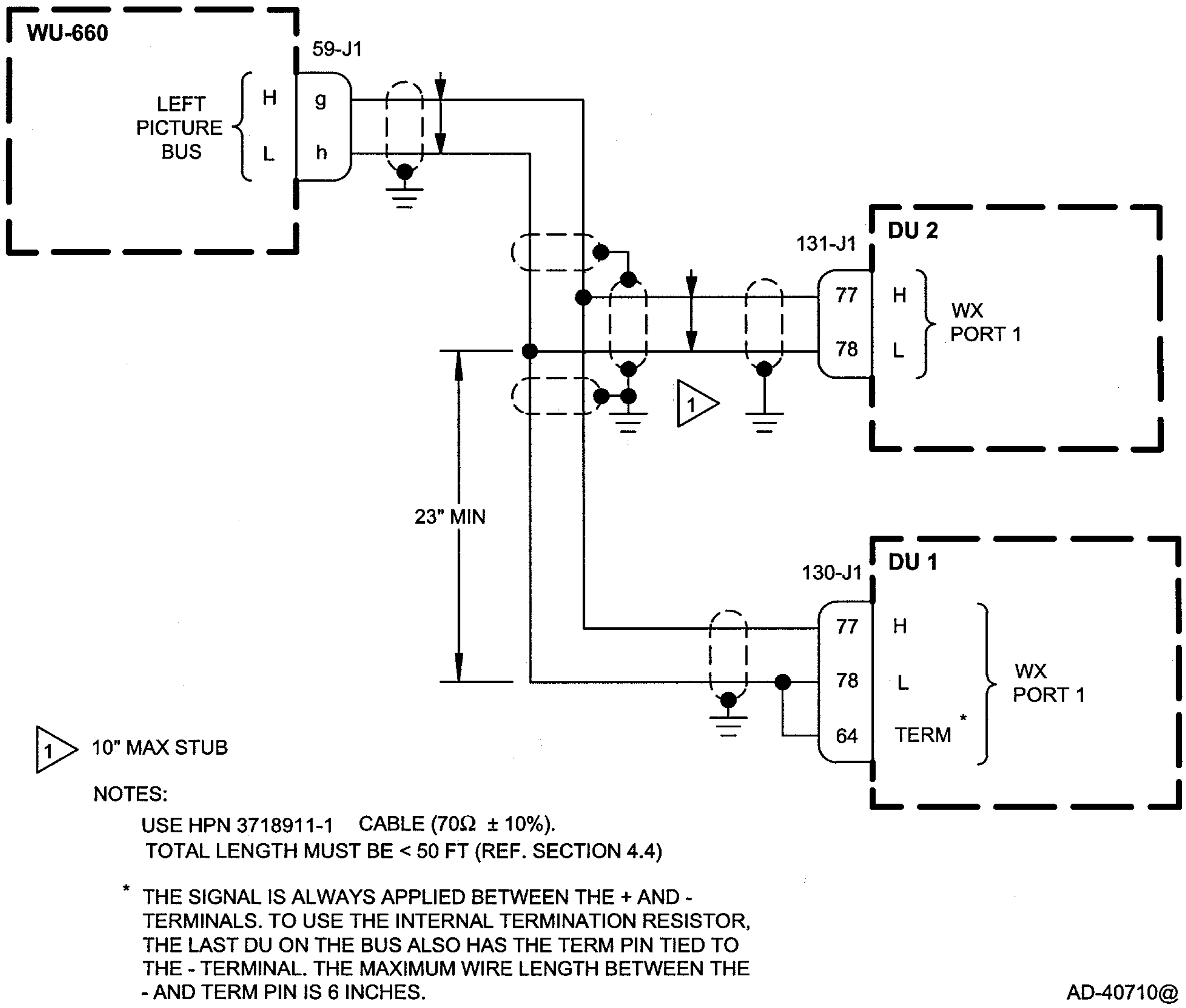

Figure 4-22. Left WX/DU Picture Bus

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Table 3-1. Interconnect Information (cont)

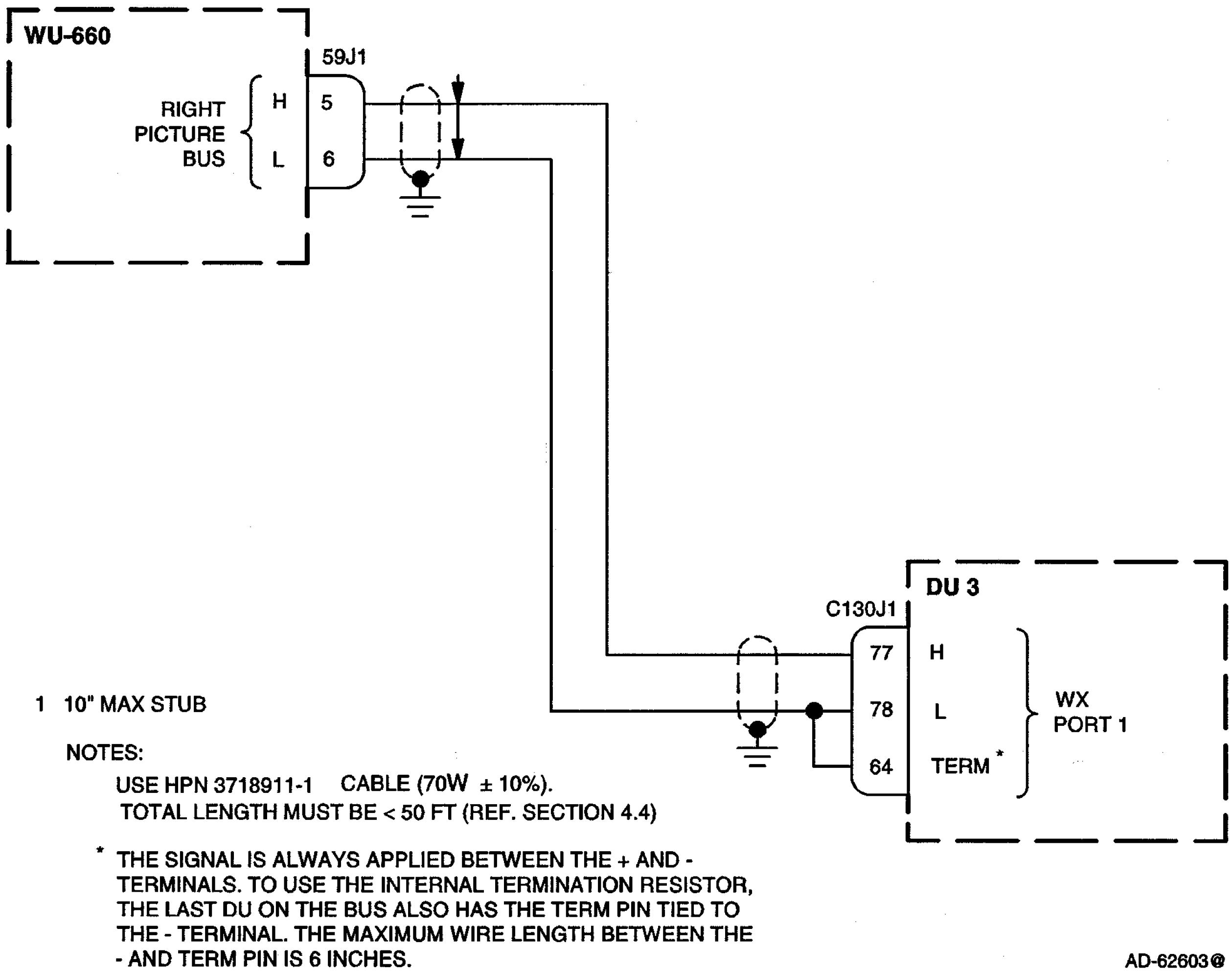

Figure 4-23. Right WX/DU Picture Bus

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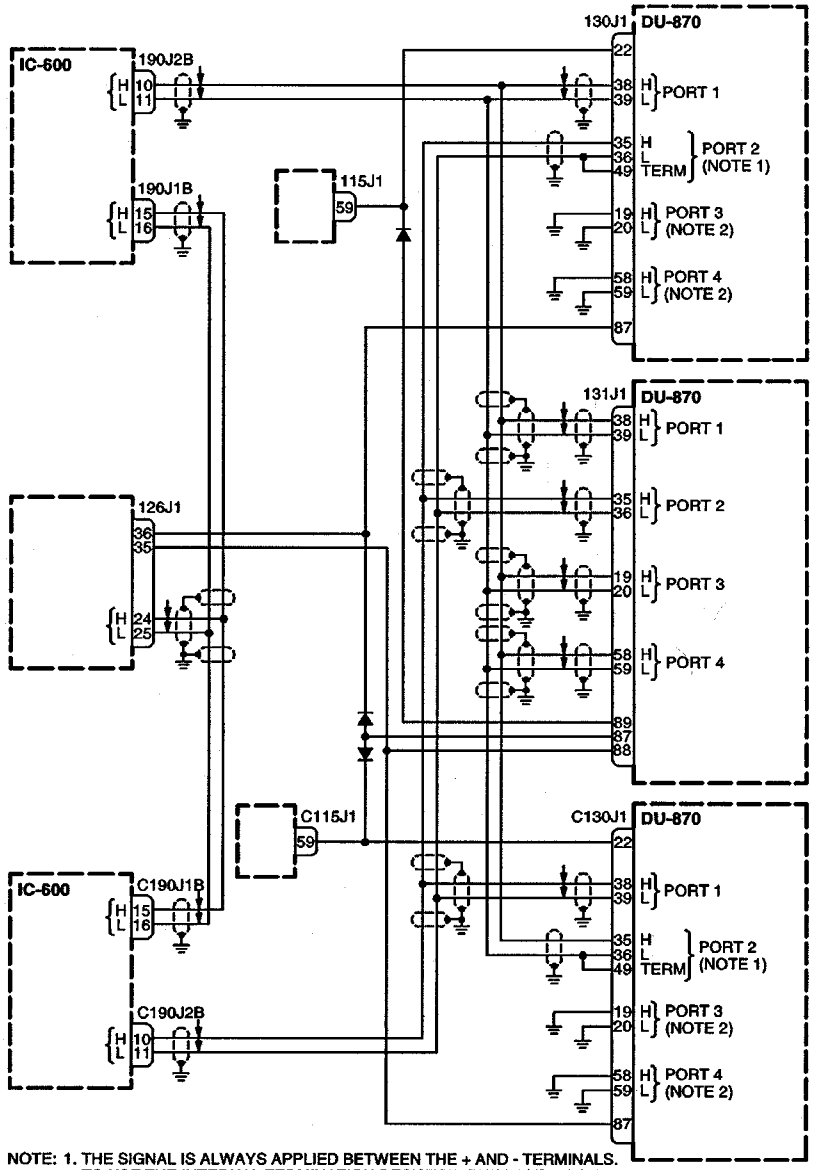
Table 3-1. Interconnect Information (cont)



NOTE: 1. THE SIGNAL IS ALWAYS APPLIED BETWEEN THE + AND - TERMINALS. TO USE THE INTERNAL TERMINATION RESISTOR, THE LAST DU ON THE BUS ALSO HAS THE TERM PIN TIED TO THE - TERMINAL. THE MAX WIRE LENGTH BETWEEN THE - AND TERM PIN IS 6 INCHES. (REF SECTION)

2. IT IS RECOMMENDED THAT ALL UNUSED BUS INPUTS (+ AND -) BE TIED TO AIRFRAME GROUND AS CLOSE TO THE DU AS POSSIBLE. IF THIS IS NOT POSSIBLE, THE + AND - INPUTS SHOULD BE TIED TOGETHER.

AD-40708-R2@

Figure 4-24. IC/DU Bus (Three DU-870 Installation) (Sheet 1 of 2)

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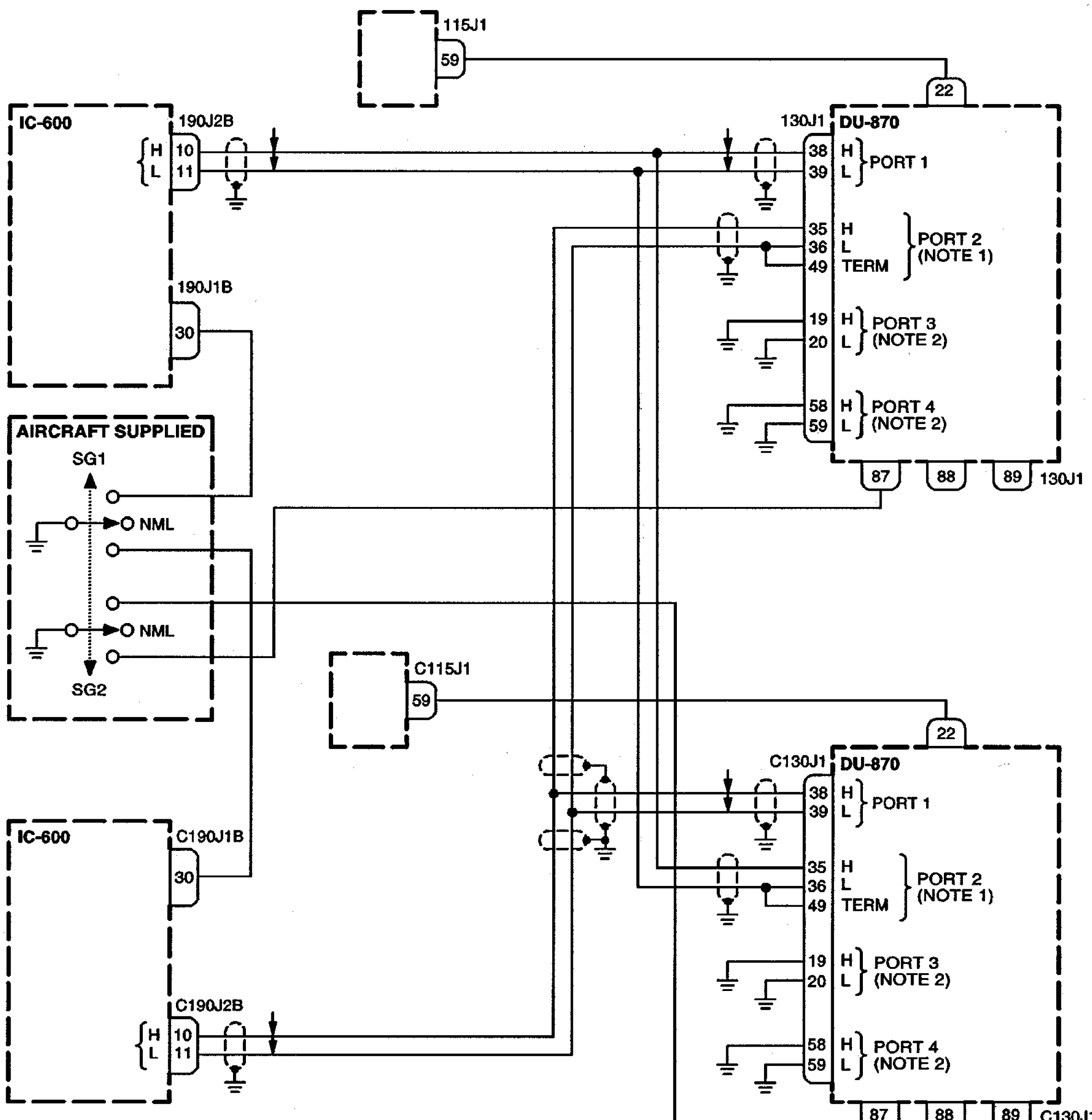
Table 3-1. Interconnect Information (cont)



NOTE: 1. THE SIGNAL IS ALWAYS APPLIED BETWEEN THE + AND - TERMINALS. TO USE THE INTERNAL TERMINATION RESISTOR, THE LAST DU ON THE BUS ALSO HAS THE TERM PIN TIED TO THE - TERMINAL. THE MAX WIRE LENGTH BETWEEN THE - AND TERM PIN IS 6 INCHES. (REF SECTION)
2. IT IS RECOMMENDED THAT ALL UNUSED BUS INPUTS (+ AND -) BE TIED TO AIRFRAME GROUND AS CLOSE TO THE DU AS POSSIBLE. IF THIS IS NOT POSSIBLE, THE + AND - INPUTS SHOULD BE TIED TOGETHER.

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Figure 4-24. Two DU-870 PFD Only IC/DU Bus (Sheet 2)

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Table 3-1. Interconnect Information (cont)

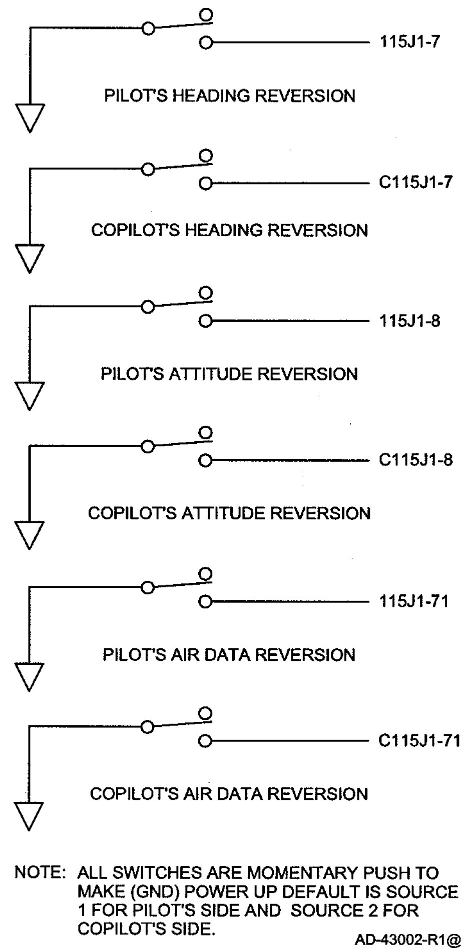

Figure 4-25. Reversion Switching

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Table 3-1. Interconnect Information (cont)

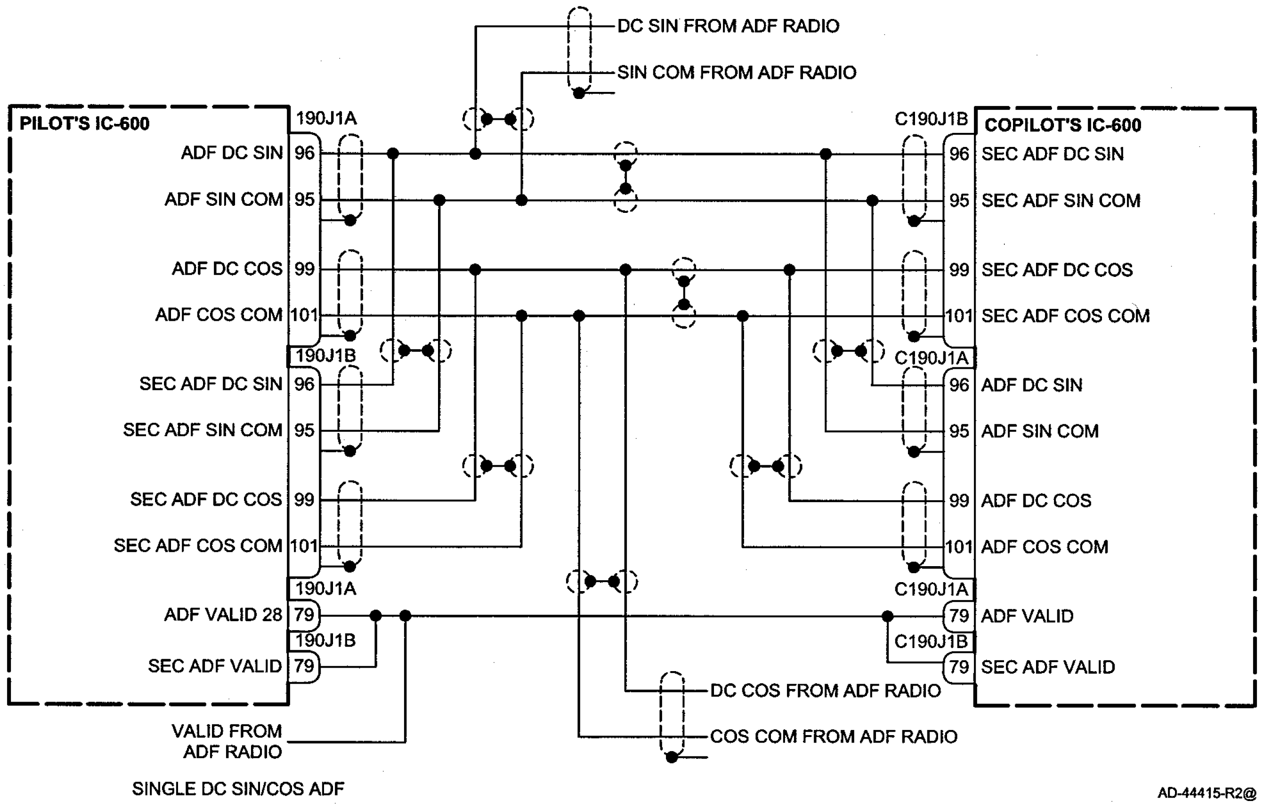

Figure 4-26. ADF Installation (Sheet 1 of 3)

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Table 3-1. Interconnect Information (cont)

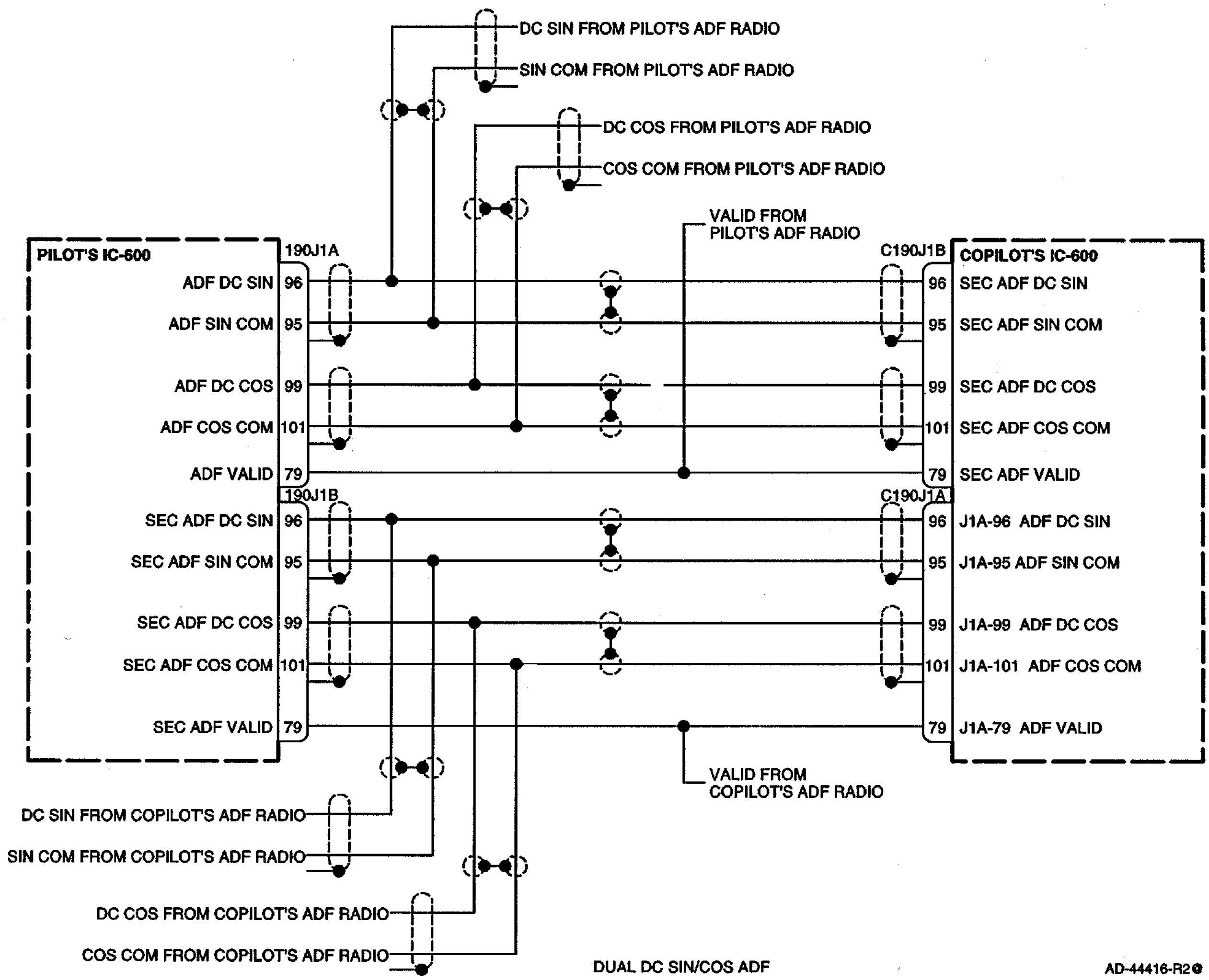

Figure 4-26. ADF Installation (Sheet 2)

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Table 3-1. **Interconnect Information** (cont)

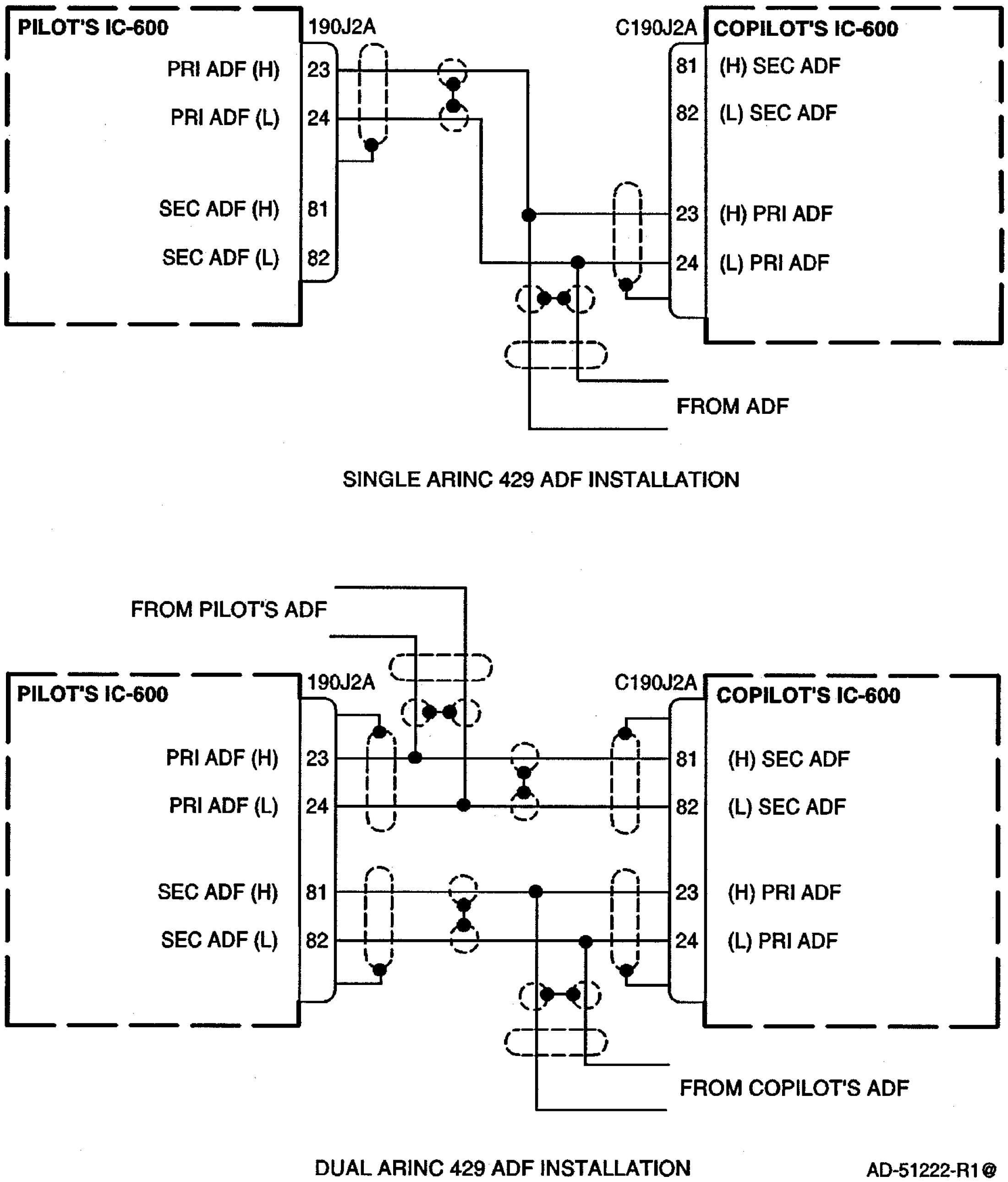

Figure 4-26. ADF Installation (Sheet 3)

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Table 3-1. Interconnect Information (cont)

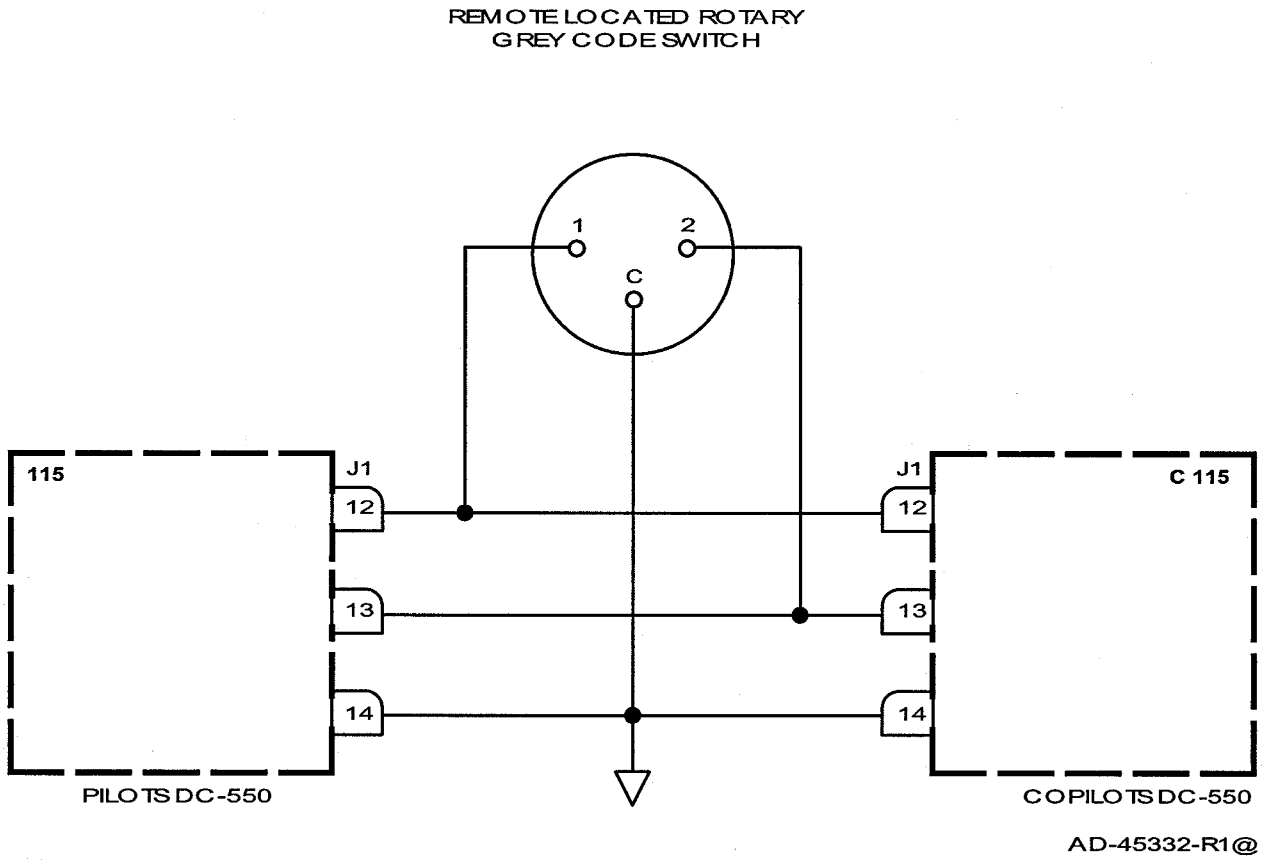

Figure 4-27. Altitude Preselect (Two DISPLAY SYSTEM)

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Table 3-1. Interconnect Information (cont)

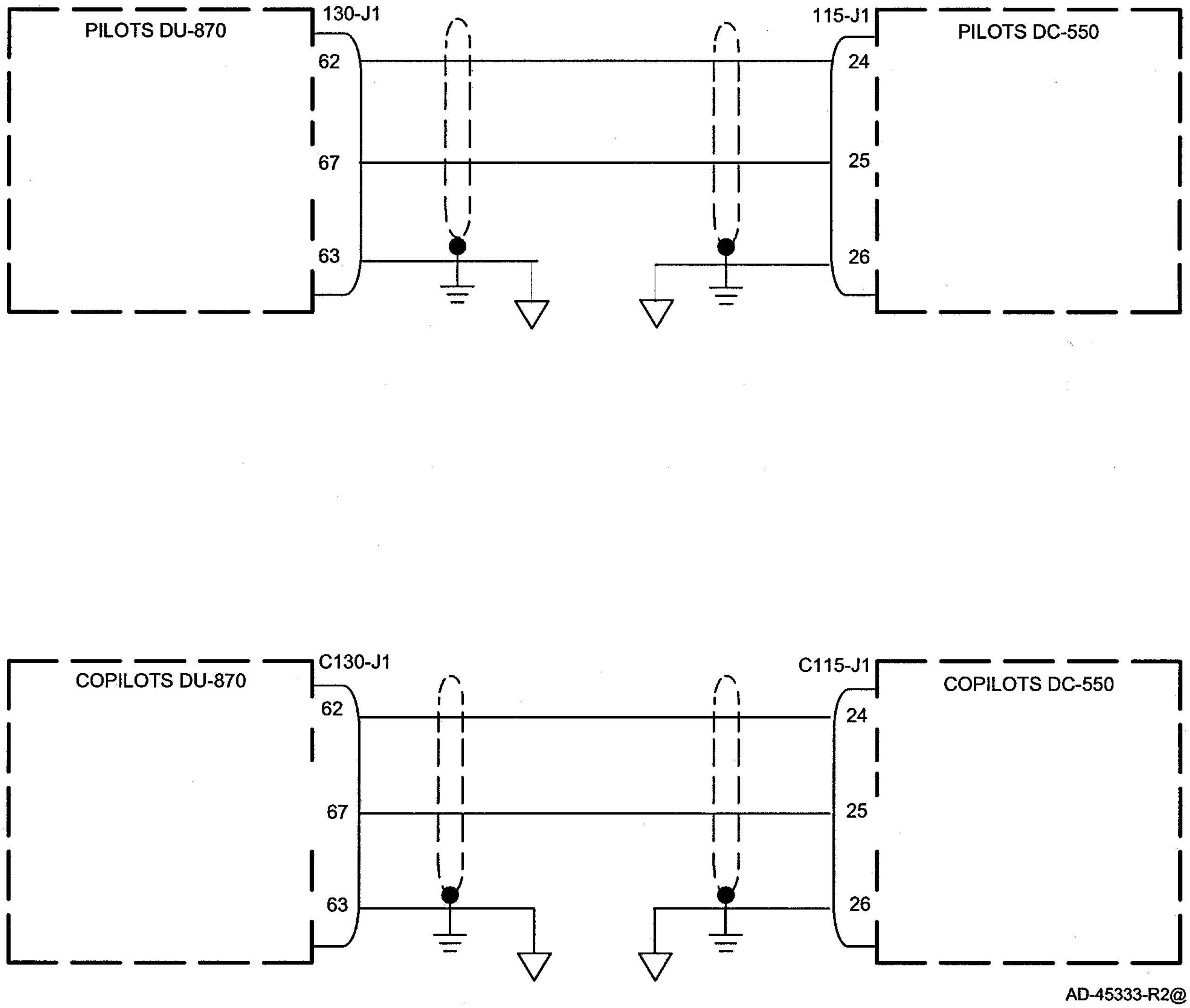

Figure 4-28. VSPD Set (Two DISPLAY SYSTEM)

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Table 3-1. Interconnect Information (cont)

Table 4-1. System Configuration

FUNCTION	PIN 190J2A					
	-66	-67	-68	-69	-70	-71
NO RAD ALT	-	-	-	-	OPEN	OPEN
KRA-405	-	-	-	-	GND	OPEN
AA-300	-	-	-	-	OPEN	GND
ALT-55	-	-	-	-	GND	GND
429 RADIOS	-	OPEN	-	-	-	-
RSB RADIOS	-	GND	-	-	-	-
DUAL IC	-	-	GND	-	-	-
SINGLE IC	-	-	OPEN	-	-	-
TCAS ENABLED	GND	-	-	-	-	-
DUAL ADF	-	-	-	GND	-	-
SINGLE ADF	-	-	-	OPEN	-	-

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Table 3-1. Interconnect Information (cont)

Table 4-2. Configuration Program Pins

FUNCTION	PIN 190J1B-								
	-21	-22	-23	-24	-25	-26	-27	-28	-29
RESERVED	-	-	-	-	-	-	-	-	-
LOW SPEED LRN BUS #1	-	GND	-	-	-	-	-	-	-
LOW SPEED LRN BUS #2	-	-	GND	-	-	-	-	-	-
NO WX INSTALLED	-	-	-	GND	-	-	-	-	-
CROSS POINTER POWER UP SELECT	-	-	-	-	GND	-	-	-	-
TWO DU870 PFD ONLY INSTALLATION	-	-	-	-	-	GND	-	-	-
CXX (UC-35A): DUAL DME JAA OPTION	-	-	-	-	-	-	GND	-	-
PHASE III	-	-	-	-	-	-	-	GND = PHSEIII OPEN = PHSE II	-
DUAL LRN	-	-	-	-	-	-	-	-	GND

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Table 3-1. Interconnect Information (cont)

5. HIGH INTENSITY RADIATED FIELDS

5.1 Scope

This section describes in more detail what was mentioned in paragraph 4.1.3.5. The following pages have excerpts from Honeywell's document "Prevention of Electromagnetic Susceptibility & Emissions". This section discusses grounding and shielding techniques that are appropriate to aircraft wiring. This is intended as a guide for proper HIRF design. Variations of this are OK as long as proper isolation techniques are employed.

5.2 Grounds

Ground is the terminology applied to a conductor plane that is used as the reference point for a circuit or a number of circuits. The ground conductor plane often serves as a common circuit to complete the path back to the power source. Because this ground plane is often felt to have no voltage potential when referenced to itself, the impression of no potential between locations on a grounded conductor is commonly stated. It is important to understand that the ground plane is like any other conductor, it will exhibit an ohmic voltage drop between points when current flows. Therefore, if current is flowing in the ground plane conductor, potential voltage differences will exist between ground plane locations. This current may also have a significant RF content; either from other sources directly connected to the ground plane or induced from an electromagnetic field. The most fundamental method of controlling the amount of voltage potential developed in a ground plane is to minimize the impedance of that ground plane.

5.2.1 Earth Ground

The surface of the earth is considered the lowest common ground plane for all ground based electrical equipment. The power distribution system is generally "grounded" to the earth at each power using location. Obviously, earth ground is of little use to airborne equipment operating on an aircraft in flight.

5.2.2 Airframe Ground

Aircraft constructed of metal generally use the airframe as the lowest common reference point for the electrical systems in use on the aircraft. The aircraft power generation system is connected to the airframe (at a point very near to the power generation/distribution equipment) and each LRU used in the avionics system should have its chassis connected to the airframe at (within 6") the installation location. The purpose of this ground shall be to ensure that the LRU chassis is at the same potential as the local airframe to prevent a possible electrical shock hazard. Additionally, this chassis to airframe ground will provide a low impedance path for RF energy from the LRU chassis external shield, effectively shunting RF away from the internal circuitry. Note that this "ground" is not for the purpose of a return path for the LRUs primary power input from the aircraft.

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Table 3-1. Interconnect Information (cont)

5.2.3 Chassis Ground

As indicated in paragraph 5.2.2, the LRUs chassis is considered to be its structural body, including the metal covers. For safety considerations and RF energy flow, the chassis should be connected by an extremely low impedance path to the airframe ground at the LRU location. This connection will serve as the main diversionary path for current in a lightning encounter and should be capable of carrying high currents for a short period of time (< 50 ms). Also note that this impedance shall remain low at RF frequencies.

5.2.4 Power Return

Each LRU shall connect to its primary power through a wire pair, i.e., +28 V dc, 400 Hz ac, and their returns. The return wire shall run all the way back to the aircraft power source where it shall be terminated to the aircraft power system common point. (Which may be connected at that point to airframe ground). Under no circumstances will a LRU use the airframe ground at its local installation point as the power return circuit. This will minimize the LRU power supply coupling airframe electrical noise into the LRU. Using the airframe as part of the power return circuit would result in unacceptably high currents through the airframe which could cause corrosion at dissimilar metal points and large voltage potential differences on the airframe ground plane.

5.2.5 Ground Connections

Figure 5-1 is included to illustrate the recommendations for the various ground and power return connections.

5.2.5.1 Power Return Connection (Item A, Figure 5-1)

Item A shows the power return connection to the LRU. Each LRU shall use a separate wire (appropriate sized for current requirements) for the 28 V dc or 400 Hz power return back to the aircraft power distribution point. Note that the power return enters the LRU through a pi-type filter (sized for a corner frequency of 1 kHz or 4 kHz) and a generic crowbar type overvoltage device. The power-return is not ohmically connected to the chassis, although it certainly is RF connected.

5.2.5.2 Chassis Ground Connection (Item B, Figure 5-1)

Item B shows the direct low-impedance connection for the LRU chassis to the airframe ground at the LRU location (6 inches max). Note that during normal operation (no high voltage spikes) the LRU dc power return is not connected to the LRU chassis. Designers should also consider the connection between the actual LRU, its mount, and the mount to the airframe. The use of spring finger RF gasket material between the LRU and its mount is an excellent way to achieve a good low impedance path between the LRU and its mount. The LRU to airframe impedance shall be less than 15 milliohms.

NOTE: Impedance from LRU chassis to airframe includes mounting tray and its fasteners to airframe.

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Table 3-1. Interconnect Information (cont)

5.2.5.3 Shield Ground Connection (Item C, Figure 5-1)

Item C illustrates the proper shield ground connection. The shields should be tied to the chassis (external side) or the airframe. The only way to pass the HIRF requirements will be with a complete shield enclosure that joins a metal backshell of the connector and connects with low impedance to the LRU chassis. Any shield termination that uses "pigtails" to tie the shields to the chassis leaves unshielded wires exposed and further adds the drain wire as a radiating element, therefore, this document cannot in good conscience recommend the pigtail method of shield termination.

If other conditions exist which make compliance with some form of full metal backshell shield termination impossible, use of a minimum length drain wire is absolutely imperative. (< 1.5 inches). Use of a bonding bolt or bobbin is a good way to accomplish this. Under no circumstances should the shield be terminated through a connector pin into the LRU interior where it could re-radiate to the internal electronics or vice-versa.

5.2.6 Ground Summary

LRU chassis shall be connected to airframe with < 15 Mohms (LRU chassis through mount to airframe).

Shields shall terminate to LRU chassis through full metal backplane type connector shell. In other words, the wire shields shall remain continuous until being terminated at the external chassis of the LRU.

Each LRU shall use a power return wire connection, not the airframe.

5.3 Shielding

Shielding refers to the practice of covering wires with a conductive housing which will reflect and absorb electromagnetic fields. Note that a much more substantial shield (high permeability material such as metal or steel) is required to absorb low frequency magnetic fields (which result from high currents in nearby conductors).

Section 5.3.1 shall be devoted to the subject of wire shielding practices.

5.3.1 Shielding Criteria

Wire shielding is a controversial subject and this document will simply discuss the salient facts and make our recommendations which shall be followed until a circumstance arises which dictates a change in the policy. First and foremost, it should be noted that shielding of circuits wires is necessary, but it is no panacea. Although shielding is theoretically capable of providing 140 dB of isolation from electromagnetic fields, the real amount rarely exceeds 60 dB.

5.3.1.1 Shield Material

The shielding material is the first limiting factor. Most wire shields are made of a woven braid of wire which will transmit light which means that em waves can also penetrate it. Some shields are made of aluminum foil and their limiting factor is the poor contact between the wrapped sheets of foil and their poor performance after some aging.

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Table 3-1. Interconnect Information (cont)

Selection of a high quality shielding on the cables is imperative to good shielding performance, both initially and in the longterm.

5.3.1.2 Shield Termination

The shield should be terminated through a short (low-impedance) path to airframe or chassis ground, and should never be taken inside the LRU chassis for grounding internally, as this introduces a path for EMI into or out of the LRU. In this case of radio receivers and transmitters, which will bring the coax shield into the LRU because the shield is a return path conductor, however, the shield shall be grounded at the entry to the LRU. Because the wire shield should be continuous, every effort should be made to keep the shield intact all the way to the connector of the LRU. The ideal way to accomplish this is through the use of a metal backshell connector to which the shield is connected and which, in turn, connects to the outer skin of the LRU chassis.

Any other method of shield termination (i.e., pigtails) cannot, in conscience, be recommended by this document. The required shielding to protect from the HIRF threat is much too high for such techniques to work. Any LRU that has any connection, direct or indirect, to systems that must work during the HIRF encounter, is capable of being the gateway for the susceptibility into the critical system. Therefore, those LRUs would be putting the certification of the system at grave risk by continuing to rely on a pigtail system of shield termination.

5.3.1.3 Shield Grounding, One or Both Ends

Because of the high levels of the HIRF and Lightning Threats, a continuous shield of all wires is deemed necessary. The bandwidth off the HIRF threat is quite wide, making it impossible to draw conclusions about the frequency of an emission or susceptibility threat. Therefore, this document specifies that all shields be connected to airframe or chassis ground on both ends.

The writer recognizes the increased probability of a low-frequency susceptibility threat (due to the shield conducting aircraft power components) from grounding both sides of the shield. If such a threat materializes, the offending shield can be cut from one side. This same caveat also applies to low-level audio signals, where it is common practice to float the shields. It is also recognized that this practice is in contrast with the official Honeywell policy for shield grounding the ASCB. This document will recommend grounding the ASCB shield at each LRU and a test will be undertaken to verify that the ASCB is unaffected by such a practice. (Extreme cases may require double shields, one grounded at only one end, the other at both ends. (ADF triax, for example).

5.3.2 Shield Summary

All LRU wiring will be shielding with the exception of power, power return, ground, and discretes.

All shields will be terminated to the outside of the LRU chassis or to the airframe at a close point < 1.5 inches.

Shield terminations shall be to a metal backshell type of connection or its electrical equivalent.

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Table 3-1. Interconnect Information (cont)

All shields (with the exception of audio and similar low frequency signals) shall be terminated to chassis or airframe ground at both ends.

5.4 Wire Routing Considerations

Several factors relating to aircraft wiring and its routing will have significant impact on meeting emission and susceptibility threats. These factors include selective bundling of wires and routing of wiring in close proximity to ground planes.

5.5 Wire Bundling Concerns

The wiring for very susceptibility sensitive systems, i.e., Comms and Audio, shall not be bundled with other emissions prone wiring. This ruling also implies that such wiring should not be installed in close proximity to emissions prone equipment. A specific example would be the location of VHF Com coax and audio wiring in the center of an EFIS wire harness.

5.6 Wire Routing for HIRF Protection

Recent research has shown that placing wires in close proximity to a ground plane, i.e., airframe skin, is capable of providing a significant improvement in susceptibility resistance. In both the A320 and the Starship, this technique was applied, with reasonable results. This does not mean that this technique is a panacea and that shielding and filtering can be dropped.

5.7 Pickup Loop Control

IN all cases, it is extremely important to minimize the physical area of all circuits for the purposes of reducing the size of pickup loops in the wiring. This applies to aircraft and LRU internal wiring both. As an example, a discrete which is referenced to airframe ground shall have the discrete wire routed as close as practical to the airframe along its entire route, minimizing the pickup loop area.

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Table 3-1. Interconnect Information (cont)

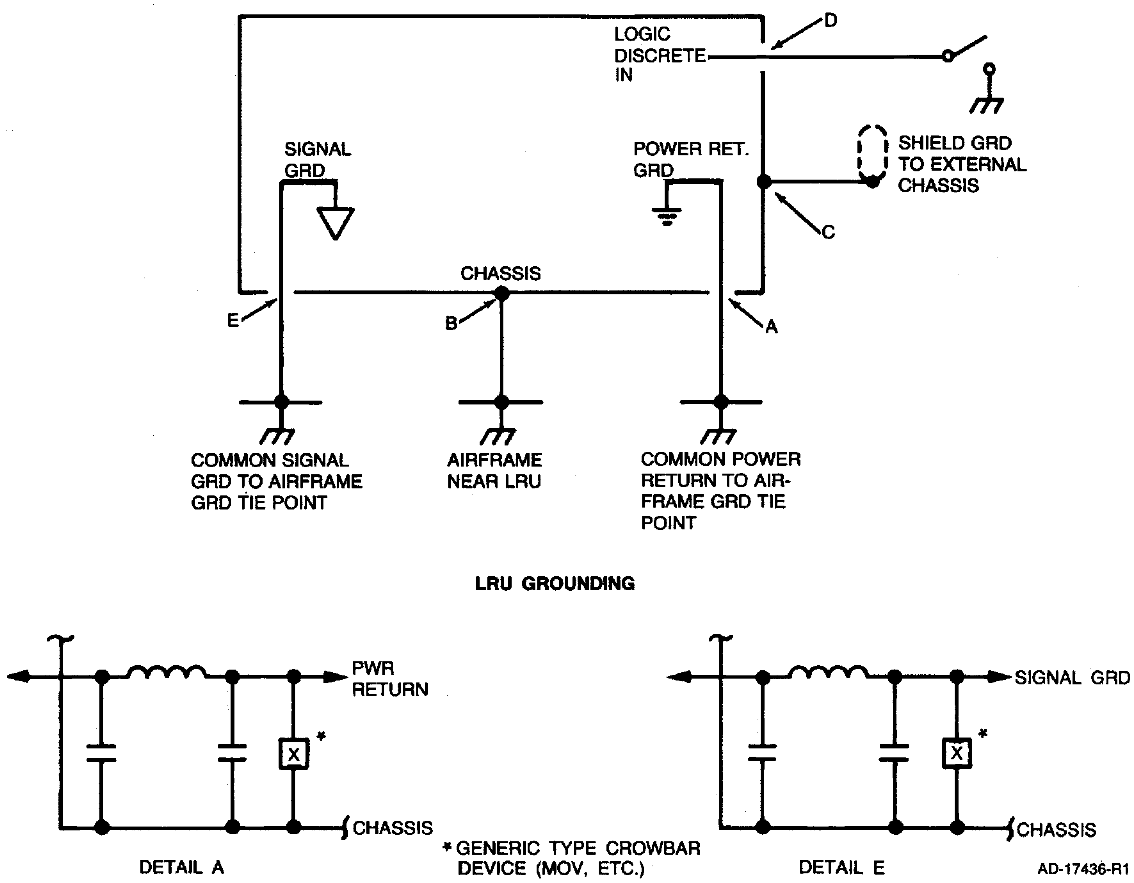

Figure 5-1. LRU Grounding

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Table 3-1. Interconnect Information (cont)

APPENDIX A
INSTALLATION OF PRIMUS 650 WEATHER RADAR

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Table 3-1. Interconnect Information (cont)

PILOT'S WEATHER RADAR R/T/A
WU-650

```
IO
BP  Description                      Connector Pin                              Connects To

    28 V DC PRIMARY                   59J1-A  (20) --------------------- FIG. 4-6
    POWER
    28 V DC PRIMARY                       -B  (20) --------------------- FIG. 4-6
    POWER
    DC PWR GND                            -X  (20) --------------------- DC PWR GND
    DC PWR GND                            -W  (20) --------------------- DC PWR GND
    ALTERNATE CONTROL      (HI)           -a       -----NC
    BUS
    ALTERNATE CONTROL      (LO)           -b       -----NC
    BUS
    PRIMARY CONTROL BUS    (HI)           -c  (24) ---------S-T-S------- 61J1-A
    PRIMARY CONTROL BUS    (LO)           -d  (24) ---------S-T-S------- 61J1-B
                                                        GND┘   └GND

    CONTROL BUS SHIELD                    -p       -----NC
    REMOTE ON                             -U  (24) --------------------- 61J1-R
    GND FOR DUAL CONTROL                  -T       -----NC
    TRANSMIT ON                           -C       -----NC
    KEY                                   -V       -----NC
    SPARE                                 -F       -----NC
    EA ROM ERASE                          -E       -----NC
    SPARE                                 -Y       -----NC
    GND FOR INVERTED MT                   -S       -----NC

    REACT COMPENSATION                    -R  (24) --------------------- GND
    OVERRIDE

    GND FOR 200 MV/DEG                    -P       -----NC
    SHIELD GND                            -J  (24) -----------┐
    SIN PITCH              (HI)           -K  (24) -----------T-S------- 1J1-EE
    SIN PITCH              (LO)           -L  (24) -----------T-S------- 1J1-DD
                                                                |
    SIN ROLL               (HI)           -M  (24) ---------S-T-S------- 1J1-v
    SIN ROLL               (LO)           -N  (24) ---------S-T-S------- 1J1-w
                                                        GND┘   └GND

    STBLN 400 HZ REF IN    10 V           -H       -----NC
    STBLN 400 HZ REF IN    26 V           -Z  (20) --------------------- FIG. 4-8
    STBLN 400 HZ REF IN    115 V          -D       -----NC
    STBLN 400 HZ REF IN    COM        59J1-G  (24) -------------_------- AC GND
                                                                └GND
```


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Table 3-1. Interconnect Information (cont)

PILOT'S WEATHER RADAR R/T/A
WU-650

```
IO
BP  Description                     Connector Pin                                     Connects To

    LEFT EFIS CONTROL    (P)        59J1-m   (24)  ---------S-T-S-------  190J2A-17
    BUS                                                      |  |  |
    LEFT EFIS CONTROL    (N)            -n   (24)  ---------S-T-S-------  190J2A-18
    BUS                                                GND--┘     └--GND

    CENTER CONTROL BUS   (P)            -t         -----NC
    CENTER CONTROL BUS   (N)            -r         -----NC

    RIGHT EFIS CONTROL   (P)            -e   (24)  ---------S-T-S-------  C190J2A-17
    BUS                                                      |  |  |
    RIGHT EFIS CONTROL   (N)            -f   (24)  ---------S-T-S-------  C190J2A-18
    BUS                                                GND--┘     └--GND

    PICTURE BUS SHIELD   GND            -q   (24)  -----------┐
    LEFT EFIS PICTURE    (P)            -g   (24)  ---------S-T-S-------  FIG. 4-22
    BUS                                                      |  |  |
    LEFT EFIS PICTURE    (N)            -h   (24)  ---------S-T-S-------  FIG. 4-22
    BUS                                                      |     └--GND
    CENTER PICTURE BUS   (P)            -i         -----NC   |
    CENTER PICTURE BUS   (N)            -j         -----NC   |
    RIGHT EFIS PICTURE   (P)            -k   (24)  ---------S-T-S-------  FIG. 4-23
    BUS                                                      |  |  |
    RIGHT EFIS PICTURE   (N)        59J1-s   (24)  ---------S-T-S-------
    BUS                                                GND--┘     └--GND
```


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Table 3-1. Interconnect Information (cont)

PILOT'S WEATHER RADAR CONTROLLER
WC-650 (For P-8XX WX Installation See APPX-B)

IO BP	Description		Connector Pin			Connects To
	SERIAL CONTROL	(HI)	61J1-A	(24)	----------S-T-S--------	59J1-c
	SERIAL CONTROL	(LO)	-B	(24)	----------S-T-S--------	59J1-d
					| └	59J1-p
	CONTROL BUS SHIELD	GND	-M	(24)	----------┘	
	SPARE		-C		-----NC	
	28 V DC INPUT		-D	(22)	---------------------	FIG. 4-6
	28 V DC GND		-E	(22)	---------------------	DC PWR GND
	CHASSIS GND		-F	(22)	---------------------	CHASSIS GND
	EDGE LIGHTING 28 V DC	(+)	-G		-----NC	
	EDGE LIGHTING 5 V AC/DC	(+)	-H	(24)	---------------------	FIG. 4-7
	EDGE LIGHTING RETURN		-J	(24)	---------------------	LIGHTING GND
	ANNUNCIATOR DIMMING		-K	(24)	---------------------	28V DAY NIGHT LOGIC
	SPARE		-L		-----NC	
	CONTROL BUS SHIELD	GND	-M		SEE 61J1-A	
	SPARE		-N		-----NC	
	FSB1		-P	(24)	---------------------	FIG 4-12
	REMOTE ON		-R	(24)	---------------------	59J1-U
	FSB2		-S		-----NC	
	OFF IN		-T		-----NC	
	OFF OUT		61J1-U		-----NC	

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Table 3-1. Interconnect Information (cont)

APPENDIX B
INSTALLATION OF PRIMUS 870 WEATHER RADAR

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Table 3-1. Interconnect Information (cont)

Table B-1. System Components

Unit No.	Component	Part No.	Installation Drawing	Mating Connector	Mounting Hardware
59	WU-870 RT/Antenna	7012640-921	7012641	MS3126F22-555	Bulkhead Mount
59	WU-870 RT/Antenna (Required for Germany)	7012640-941			
61	WC-870 Radar Controller	7008471-803	7008796	MS27473E14B-13S	Dzus Mount

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Table 3-1. Interconnect Information (cont)

PILOT'S WEATHER RADAR R/T/A
WU-870

IO BP	Description		Connector Pin			Connects To
	28 V DC PRIMARY POWER		59J1-A	(20)	---------------------	FIG. 4-6
	28 V DC PRIMARY POWER		-B	(20)	---------------------	FIG. 4-6
	DC PWR GND		-X	(20)	---------------------	DC PWR GND
	DC PWR GND		-W	(20)	---------------------	DC PWR GND
	ALTERNATE CONTROL BUS	(HI)	-a		------NC	
	ALTERNATE CONTROL BUS	(LO)	-b		------NC	
	PRIMARY CONTROL BUS	(HI)	-c	(24)	---------S-T-S-------	61J1-A
	PRIMARY CONTROL BUS	(LO)	-d	(24)	---------S-T-S------- GND GND	61J1-B
	CONTROL BUS SHIELD		-p		------NC	
	REMOTE ON		-U	(24)	---------------------	61J1-R
	WEIGHT ON WHEELS	(WOW)	-T		------NC	
	TRANSMIT ON		-C		------NC	
	A/S SIGNAL		-V		------NC	
	A/S SIGNAL RTN		-F		------NC	
	A/S REF		-E		------NC	
	A/S SELECT		-Y		------NC	
			-S		-----NC	
	REACT COMPENSATION OVERRIDE		-R	(24)	---------------------	GND
	GND FOR 200 MV/DEG		-P		------NC	
	SHIELD GND		-J	(24)	------------•	
	SIN PITCH	(HI)	-K	(24)	---------S-T-S-------	1J1-EE
	SIN PITCH	(LO)	-L	(24)	---------S-T-S-------	1J1-DD
	SIN ROLL	(HI)	-M	(24)	---------S-T-S-------	1J1-v
	SIN ROLL	(LO)	-N	(24)	---------S-T-S------- GND GND	1J1-w
	429 ADC		-H	(24)	---------------------	GND
	STBLN 400 HZ REF IN 26 V		-Z	(20)	---------------------	FIG. 4-8 (SHT 2)
	STBLN 400 HZ REF IN 115V		-D		------NC	
	STBLN 400 HZ REF IN COM		59J1-G	(24)	---------------------	AC GND
					-----	GND

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Table 3-1. Interconnect Information (cont)

PILOT'S WEATHER RADAR R/T/A
WU-870

IO BP	Description		Connector Pin			Connects To
	LEFT EFIS CONTROL BUS	(P)	59J1-m	(24)	---------S-T-S-------	190J2A-17
	LEFT EFIS CONTROL BUS	(N)	-n	(24)	---------S-T-S------- GND GND	190J2A-18
	ADC ARINC 429	(H)	-t	(24)	---------S-T-S-------	9J1-68
	ADC ARINC 429	(L)	-r	(24)	---------S-T-S------- GND GND	9J1-69
	RIGHT EFIS CONTROL BUS	(P)	-e	(24)	---------S-T-S-------	C190J2A-17
	RIGHT EFIS CONTROL BUS	(N)	-f	(24)	---------S-T-S------- GND GND	C190J2A-18
	PICTURE BUS SHIELD GND		-q	(24)	------•	
	LEFT EFIS PICTURE BUS	(P)	-g	(24)	---------S-T-S-------	FIG. 4-22
	LEFT EFIS PICTURE BUS	(N)	-h	(24)	---------S-T-S------- GND GND	FIG. 4-22
	CENTER PICTURE BUS	(P)	-i		------NC	
	CENTER PICTURE BUS	(N)	-j		------NC	
	RIGHT EFIS PICTURE BUS	(P)	-k	(24)	---------S-T-S-------	FIG. 4-23
	RIGHT EFIS PICTURE BUS	(N)	-s	(24)	---------S-T-S------- GND GND	FIG. 4-23
	PARALLEL ALTITUDE BUS	(D4)	-u		------NC	
	PARALLEL ALTITUDE BUS	(A1)	-v		------NC	
	PARALLEL ALTITUDE BUS	(A2)	-w		------NC	
	PARALLEL ALTITUDE BUS	(A4)	-x		------NC	
	PARALLEL ALTITUDE BUS	(B1)	-y		------NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S WEATHER RADAR R/T/A
WU-870

IO BP	Description	Connector Pin		Connects To
	SPARE	59J1-AA	------NC	
	SPARE	-BB	------NC	
	SPARE	-CC	------NC	
	SPARE	-DD	------NC	
	SPARE	-EE	------NC	
	SPARE	-FF	------NC	
	SPARE	-GG	------NC	
	SPARE	59J1-HH	------NC	

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Table 3-1. Interconnect Information (cont)

PILOT'S WEATHER RADAR CONTROLLER
WC-870

IO BP	Description		Connector Pin			Connects To
	SERIAL CONTROL	(HI)	61J1-A	(24)	---------S-T-S-------	59J1-c
	SERIAL CONTROL	(LO)	-B	(24)	---------S-T-S-------	59J1-d
					└------	59J1-p
	CONTROL BUS SHIELD GND		-M	(24)	------ ┘	
	SPARE		-C		------NC	
	28 V DC INPUT		-D	(22)	---------------------	FIG. 4-6
	28 V DC GND		-E	(22)	---------------------	DC PWR GND
	CHASSIS GND		-F	(22)	---------------------	CHASSIS GND
	EDGE LIGHTING 28 V DC	(+)	-G		------NC	
	EDGE LIGHTING 5 V AC/DC	(+)	-H	(24)	---------------------	FIG. 4-7
	EDGE LIGHTING RETURN		-J	(24)	---------------------	LIGHTING GND
	ANNUNCIATOR DIMMING		-K	(24)	---------------------	28V DAY NIGHT LOGIC
	SPARE		-L		------NC	
	CONTROL BUS SHIELD GND		-M		SEE 61J1-A	
	SPARE		-N		------NC	
	FSB1		-P	(24)	---------------------	FIG 4-12
	REMOTE ON		-R	(24)	---------------------	59J1-U
	FSB2		-S		------NC	
	OFF IN		-T		------NC	
	OFF OUT		61J1-U		------NC	

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SECTION 4
MAINTENANCE PRACTICES

1. General

This section provides instructions for removing, reinstalling, and adjusting each Line Replaceable Unit (LRU) of the PRIMUS 1000 Integrated Avionics System that has been previously installed by the aircraft manufacturer or completion center. Where applicable, instructions for replacing lamps, knobs and set screws are included. Adjustment information is called out as required.

CAUTION: SHOULD ANY INSTALLATION CRITICAL CASES ARISE WITH THE REINSTALLATION OF ANY UNIT, YOU MUST COMPLY 100 PERCENT WITH THE INSTRUCTION.

CAUTION: TO PREVENT DAMAGE TO EQUIPMENT, TURN AIRCRAFT POWER OFF WHEN REMOVING OR INSTALLING LRUS.

The following paragraphs describe general information when removing or installing antennas.

NOTE: For all antennas not supplied by Honeywell, removal and installation should be in accordance with manufacturer's installation instructions.

A. Antenna Weather Protection

(1) Some antennas require gaskets, and others have O–rings. When reinstalling antennas, new gaskets or O–rings should be used.

(2) A weather sealant should be applied around the periphery of the antenna base to prevent seepage of water and condensation and preclude corrosion. If a sealant or aerodynamic smoother is used around the periphery of the antenna base, it should be applied after the antenna has been bolted down. The sealant used should be nonadhering to let the antenna to be removed at a later time if necessary. Chromatic tape is recommended.

NOTE: When mounting antennas on a pressurized fuselage, a leveling and sealing compound such as Pro-Seal 870B–1/2 should be used between the entire mounting surface of the antenna and the fuselage. Use of this compound, in addition to the installation gasket, compensates for surface irregularities and voids between the antenna and the fuselage. A mold releasing agent can be used on the fuselage prior to installation to prevent the leveling compound from adhering to the fuselage.

(3) To prevent water seepage on top mounted antennas, it can be necessary to apply Silastic sealant (RTV–3145 or equivalent) to the mounting screw heads.

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B. Antenna Hardware

(1) Clean the airframe at the antenna mounting area to remove any foreign material.

(2) Because of the insulation qualities of gaskets and leveling compounds, the mounting screws are required to supply the electrical bonding between the antennas and the aircraft (typically 15 milliohms or less is required). Therefore, the technician doing the reinstallation must be sure that any hardware being reused is clean and free of corrosion. If in doubt, use new hardware.

(3) Gaskets and O–rings deform during initial installation. While it is possible to reuse gaskets and O–rings, it is highly recommended that new gaskets or O–rings be used.

C. General Antenna Removal Instructions

NOTE: These procedures apply to all antennas. To prevent damage to the antennas, do not apply pressure to or pry on plastic housings.

(1) Pull the appropriate circuit breakers.

(2) After removing and saving the hardware, cut the bond line of any installer–applied sealant between the antenna and the aircraft skin.

(3) Pull the antenna away from the aircraft skin far enough to disconnect the cable connector(s).

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2. Equipment and Materials

WARNING: BEFORE USING A MATERIAL, KNOW THE HAZARD CODE AND GET THE NECESSARY PROTECTION. REFER TO THE PAGE ABOUT HAZARD CODES FOR MATERIALS IN THE FRONT OF THIS MANUAL.

Maintenance materials identified with a Honeywell Material Number (HMN) are given in Table 4-1.

Table 4-1. HMN Materials

Name	Description	Source
HMN 97D0878 **HAZARD CODE 210D**	Retaining compound - Loctite Assure No.425 surface curing threadlocker	Loctite Corp, Newington, CT
HMN 97P5778 **HAZARD CODE 110D**	Adhesive-sealant, high strength, noncorrosive, RTV, silicone (MIL-A-46146, Type III) - No. DC-3145 (translucent) RTV	Dow Corning Corp, Midland, MI
HMN 98C0978 ***HAZARD CODE 230D***	Sealant, corrosion inhibitive (MIL-S-81733, Type II-1/2 - for extrusion application in the time of 1/2 hour) — Pro-Seal 870B-1/2	Courtaulds Aerospace formerly Products Research and Chemical Corp, Coating and Sealants Div, Glendale, CA
NOTES: 1. Equivalent alternatives are permitted for materials in this list. 2. The HMN codes in the list of materials identify the Honeywell Material Number (HMN) given to each material.		

Refer to the applicable leading particulars table in SECTION 2 of this manual for replacement gaskets, lamps, knobs and set screw part numbers.

Augat, Part No. T-114-1, IC puller is used as a switch button puller when replacing lamps on the MS-560 Mode Selector or PC-400 Autopilot Controller.

Uploading/Downloading of the checklist files requires the equipment that follows:

- IBM compatible laptop personal computer (PC)
- ECP-800 Programmable Checklist, Part No. 7021060-901 (includes 9-pin RS-232 cable)

No additional special equipment or materials other than those commonly used in the shop are required to install the units in existing trays and clamps, and to adjust the system. Do not over-tighten mounting screws. Where torque values are not given, it is acceptable to finger tighten the mounting screws.

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3. Procedure for the AG-222 Accelerometer

A. Removal and Installation Procedure

NOTE: Before removing the accelerometer, note the direction of the arrow on the accelerometer to ensure proper reinstallation of the accelerometer.

(1) Remove the AG-222 Accelerometer.

(a) Disconnect cable connector.

(b) Remove and set aside the hardware securing accelerometer to the airframe.

(2) Reinstall the AG-222 Accelerometer.

(a) Make sure the arrow on the accelerometer is pointed in the proper direction.

(b) Secure accelerometer to the airframe using the previously set aside hardware.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Not Applicable.

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4. Procedure for the AT–860 ADF Antenna

NOTES:

1. The AT–860 ADF Antenna is a totally self–contained low profile antenna that requires no adjustment during operation. It combines both the loops and the sense antennas in one package, and therefore does not require a separate long wire sense antenna.

2. It is very important the metal base of the antenna be electrically bonded (less than 2.5 milliohms) to the metal skin of the airframe to supply a ground plane for the antenna elements. When a mounting gasket is used, the mounting bolts must supply electrical contact with the metal spacers that form the mounting holes in the antenna through the mounting nuts to the airframe.

A. Removal and Reinstallation Procedures

NOTE: Refer to the general instruction in paragraph 1.A.

(1) Remove the AT-860 ADF Antenna.

(a) Loosen, remove and set aside four No. 10 sockethead cap screws.

(b) Unseal and remove the antenna.

(c) Disconnect the cable connectors.

(2) Reinstall the AT-860 ADF Antenna.

(a) Place the new gasket, Honeywell Part No. 7020801–947, on the antenna.

(b) Connect the cable connectors.

(c) Mount the antenna and apply the appropriate sealant.

(d) Install the four No. 10 corrosion resistant steel socket–head cap screws that were removed and previously set aside.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

Not applicable.

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5. Procedure for the AV–850A Audio Panel

A. Removal and Reinstallation Procedures

(1) Remove the AV–850A Audio Panel.

(a) Disengage the Dzus fasteners on the unit.

(b) Slide the unit out of the aircraft mounting location and disconnect the cable connectors.

(2) Reinstall the AV–850A Audio Panel.

(a) Mate the unit connectors with the aircraft cable connectors and slide the unit into the mounting location.

(b) Engage the Dzus fasteners on the unit.

B. Adjustment Procedures

(1) Adjust the AV–850A Audio Panel.

NOTE: All adjustments for the AV–850A Audio Panel are set at the factory for typical operating conditions. Most installations should not require adjustment of the audio panel. If an adjustment is necessary, perform that adjustment in accordance with the following procedures. Table 4–2 contains a list of audio panel adjustable functions and the applicable potentiometer associated with that function. Figure 4–1 shows adjustment locations for the AV–850A Audio Panel.

(a) Warning Adjustments

The warning inputs are factory set for a nominal input signal of 10 milliwatts into 600 ohms. Should adjustment become necessary, proceed as follows.

1 Warning 1 Level Adjust

Apply an input signal to the WARNING 1 AUDIO input. While listening to the cockpit speaker or phones, adjust the WARNING 1 LEVEL ADJUST potentiometer (A1R40) for the desired output level.

2 Warning 2 Level Adjust

Apply an input signal to the WARNING 2 AUDIO input. While listening to the cockpit speaker or phones, adjust the WARNING 2 LEVEL ADJUST potentiometer (A1R41) for the desired output level.

3 Warning 3 Level Adjust

Apply an input signal to the WARNING 3 AUDIO input. While listening to the cockpit speaker or phones, adjust the WARNING 3 LEVEL ADJUST potentiometer (A1R42) for the desired output level.

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4 Warning 4 Level Adjust

Apply an input signal to the WARNING 4 AUDIO input. While listening to the cockpit speaker or phones, adjust the WARNING 4 LEVEL ADJUST potentiometer (A1R43) for the desired output level.

5 Warning 5 Level Adjust

Apply an input signal to the WARNING 5 AUDIO input. While listening to the cockpit speaker or phones, adjust the WARNING 5 LEVEL ADJUST potentiometer (A1R44) for the desired output level.

(b) Maintenance System Adjustments

The Maintenance System is adjusted for typical microphones and headphones and does not normally need adjusting. Should adjustment become necessary, proceed as follows:

1 Maintenance Mic 1 Level

Adjust the audio panel INPH and PHONE controls for a comfortable headphone listening level while listening to interphone audio transmitted from the cross-side audio panel. Connect a microphone to the MAINT 1 MIC input of the audio panel. Ground the MAINT 1 ENABLE input of the audio panel. Adjust the MNT 1 MIC potentiometer (A3R11) for the desired level using the cross-side audio panel as a reference. Perform maintenance phone level adjustment as described in paragraph 5.B.(1)(b)3.

2 Maintenance 2 Mic Level

Adjust the audio panel INPH and PHONE controls for a comfortable headphone listening level while listening to interphone audio transmitted from the cross-side audio panel. Connect a microphone to the MAINT 2 MIC input of the audio panel. Ground the MAINT 2 ENABLE input of the audio panel. Adjust the MNT 2 MIC potentiometer (A3R60) for the desired level using the cross-side audio panel as a reference. Perform maintenance phone level adjustment as described below.

3 Maintenance Phone Level

Connect headphones to the MAINT PHONE output of the audio panel. Adjust the MNT PH potentiometer (A3R19) to obtain the desired maintenance phone level while listening to interphone audio.

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(c) Passenger Address (PA) System Adjustments

The PA output is factory adjusted to generate 10 mW into 600 ohms. Should adjustment become necessary, proceed as follows:

- Push the PA microphone select button
- While the Push–To–Talk (PTT) button is engaged, adjust the PA LVL potentiometer (A2R40) for the desired level in the cabin.

(d) Miscellaneous Adjustments

1 Cockpit Mic Level

The Cockpit Mic Level potentiometer (A1R17) is adjusted for typical microphones and does not normally need adjusting.

NOTE: This adjustment is for signals internal to the audio panel only. Changing this adjustment does not change the modulation characteristics of a COM radio.

2 Comm/Mkr Minimum Gain

The purpose of this adjustment is to set the minimum level that an autoselected COM receiver (a receiver that was selected automatically because the COM transmitter was selected) can have. It also sets the minimum gain that a selected marker beacon receiver can have. Turning OFF the audio of an autoselected COM or the marker beacon require the devices to be deselected manually.

Push the COM 1 microphone select switch. While listening to COM 1, adjust the volume controls for a comfortable listening level. Rotate the COM 1 receiver volume control fully counterclockwise, then deselect the COM (button recessed). Adjust the MIN GAIN potentiometer (A1R54) for the desired level.

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3 Mkr Mute Level

The marker beacon mute Level is factory adjusted to work properly with the RNZ-850 NAV Unit and normally does not need to be adjusted.

The marker beacon mute algorithm in the audio panel relies on both timing and marker beacon audio level to determine when to un-mute the marker beacon audio. The timing parameters are not adjustable. This procedure adjusts the audio level threshold.

Apply a signal modulated with one of the marker tones (inner, middle, or outer) to the marker beacon receiver. Adjust the signal strength so the selected marker indicator is just lit.

Turn the MKR MUTE potentiometer (A1R53) fully clockwise. Momentarily push the marker mute button to mute the marker signal. Begin adjusting the MKR MUTE potentiometer counterclockwise in small increments and wait at least 5 seconds after each increment. If the signal does not reappear within 5 seconds, continue to turn the potentiometer in small increments until the signal does reappear. (Wait 5 seconds after each increment). This establishes the correct marker mute level.

4 Phone Squelch

Push the PA microphone select button. Latch in all switch/pots except for INPH and MUTE.

Adjust the SQUELCH potentiometer (A1R68) while listening to the headphone output and transmitting on the Interphone.

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5 Voice Recorder Output Level

The voice recorder output potentiometer (A3R35) is factory adjusted for 10 mW into 600 ohms. Interfacing the output to a voice recorder with input levels other than this does require adjustment of the audio panel. Refer to applicable voice recorder instructions on how to set input level.

6 Minimum Speaker Gain

Push the COM 1 microphone select switch. While listening to COM 1, adjust the COM 1 and SPEAKER volume controls for a comfortable listening level. Rotate the SPEAKER volume control fully counterclockwise. Latch out the MIC/MASK selector. Adjust the MIN SPKR potentiometer (A3R48) for the desired level.

(e) Sidetone Adjustments

1 Headphone Sidetone Level

The differential level between the COM receiver level and the COM sidetone level when listening in the headphone is set by the selected COM receiver.

While listening to a COM transmission such as ATIS, adjust the COM and HEADPHONE volume control for a comfortable listening level. While transmitting on an unused frequency, adjust the COM sidetone level for a comfortable listening level. See Figure 4-1 for the location of the COM sidetone level for an RCZ-851.

2 Speaker Sidetone Level

While listening to the cockpit speaker and transmitting on a COM transceiver, adjust SPEAKER SIDETONE for the desired speaker sidetone level.

3 Internal Sidetone Level

While listening to the cockpit speaker and transmitting on the CABIN address system, adjust the INT ST potentiometer (A3R46) for the desired speaker sidetone level. This is normally adjusted to the same sidetone level as the COMs.

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C. Repair Procedures

Replacement of the control knobs.

(1) Only the large SPEAKER and HEADPHONE knobs are field replaceable. The small knobs require removal of the front panel, and should only be serviced in an approved shop.

(2) Use a 0.060–inch O.D., 6 flute Bristol wrench to loosen the setscrews.

(3) Slide the knob off the shaft.

(4) Turn the shaft fully counterclockwise.

(5) On new knobs, make sure the setscrews are out far enough to let the knob slide onto the shaft. Apply retaining compound to setscrews.

(6) Slide the knob onto the shaft with the pointer at the 8 o'clock position.

(7) Tighten the setscrews.

(8) Check to make sure the knob is not rubbing against the front panel, and the pointer is at the 8 o'clock position when rotated fully counterclockwise.

Table 4–2. AV–850A Audio Control Unit Adjustments

Function	Label	AV–850A Adjustments
Cabin PA Level	PA LVL	A2R40
Cockpit Mic Level	MIC LVL	A1R17
Comm/Mkr Minimum Gain	MIN GAIN	A1R54
Internal Sidetone	INT ST	A3R46
Maintenance 1 Mic Level	MNT 1 MIC	A3R11
Maintenance 2 Mic Level	MNT 2 MIC	A3R60
Maintenance Phone Level	MNT PH	A3R19
Marker Mute Level	MKR MUTE	A1R53
Minimum Speaker Gain	MIN SPKR	A3R48
Phone Squelch	SQUELCH	A1R68
Voice Recorder Output Level	CVR	A3R35
Warning 1 Level	WRNG 1	A1R40
Warning 2 Level	WRNG 2	A1R41
Warning 3 Level	WRNG 3	A1R42
Warning 4 Level	WRNG 4	A1R43
Warning 5 Level	WRNG 5	A1R44
	ST	A2R38*
NOTE: * A2R38 is software disabled when ST control is on front panel.		

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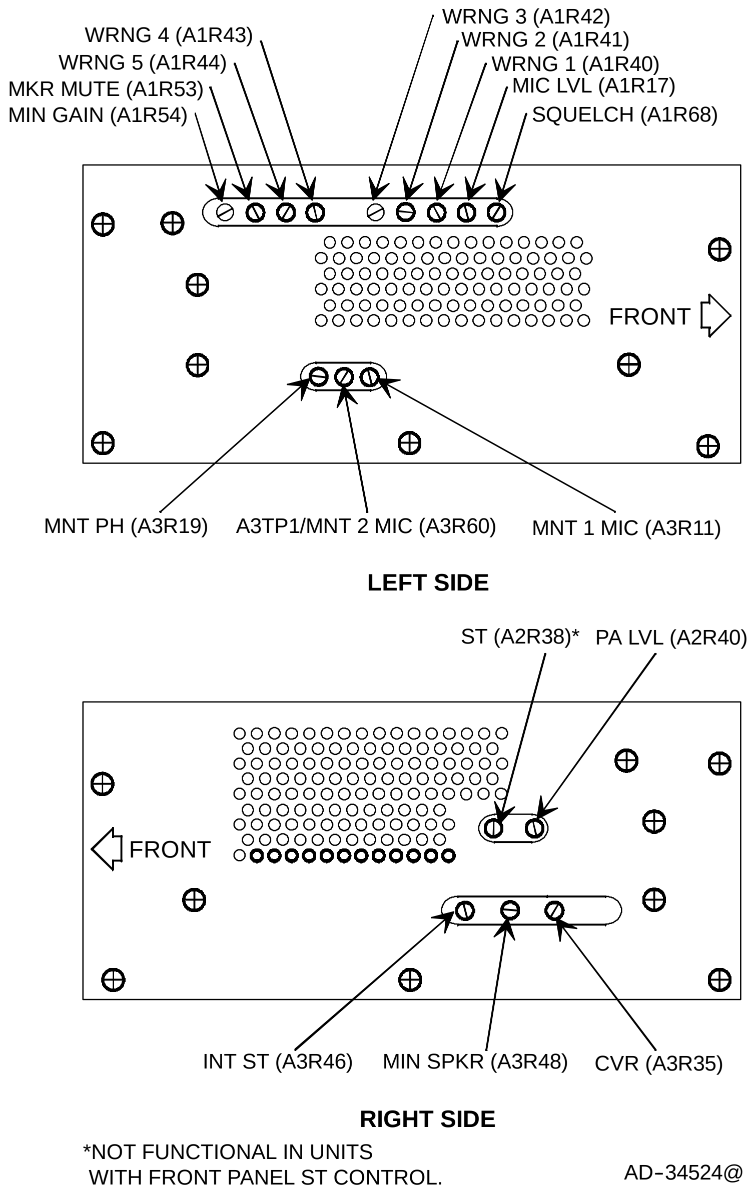

Figure 4-1. AV-850A Audio Control Unit Adjustment Locations

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6. Procedure for the AZ–850 Micro Air Data Computer (MADC)

A. Removal and Reinstallation Procedures

(1) Remove the MADC.

(a) Disconnect the pitot and static lines. Cap or cover the hose end connectors to keep debris out of the system.

(b) Disconnect the cable connector.

(c) Using a 3/16–inch Allen wrench, loosen the jackscrew until the hold–down hook releases the MADC.

(d) Slide the MADC out of the tray.

(2) Reinstall the MADC.

(a) Slide the MADC into the mounting tray.

(b) Make sure the rear boss engages the mounting tray slot.

(c) Make sure the hold–down hook engages the boss on the MADC. Using a 3/16–inch Allen wrench, tighten the jackscrew.

(d) Mate the cable connector and the unit connector.

(e) Connect the pitot and static lines and perform the appropriate pitot/static leak check as instructed in the Aircraft Maintenance Manual.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

Not applicable.

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7. Procedure for the BL–870/871 Bezel Assembly

A. Removal and Reinstallation Procedures

(1) Remove the BL-870/871 Bezel Assembly.

(a) Loosen the two captive holding screws at the ends of the bezel assembly.

(b) Gently pull the bezel assembly straight away from the display unit separating the bezel and the display unit connectors.

(2) Reinstall the BL-870/871 Bezel Assembly.

(a) Align the bezel assembly on the display unit so the bezel and display unit connectors mate.

(b) Tighten the captive screws.

B. PFD Bezel Assembly Inclinometer Level Adjustment Procedures

(1) Loosen the two screws on the inclinometer.

(2) Adjust the inclinometer until level and tighten the screws.

C. Repair Procedures

Replacement of BL–870/871 Bezel Assembly set knobs.

(1) Loosen both the setscrews in the knob with a 1/16–inch Allen wrench.

(2) Slide the knob off the shaft.

(3) On new knobs, make sure the setscrews are out far enough to let the knob to slide onto the shaft. Apply retaining compound to the setscrews.

(4) Slide the knob onto the shaft.

(5) Make sure the space between the knob and the bezel is approximately 0.030 in. (0.8 mm).

(6) Tighten both No. 6–32 setscrews with the Allen wrench.

(7) Visually check the spacing between the knob and the bezel to make sure the knob has not slipped during installation.

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8. Procedure for C-14D Directional Gyro

A. Removal and Installation Procedure

CAUTION: A GYRO CAN BE DAMAGED BY MOVING IT AFTER ELECTRICAL POWER IS REMOVED BUT BEFORE THE GYRO ROTOR STOPS. THE GYRO ROTOR WON'T COME TO A STOP FOR APPROXIMATELY 15 MINUTES AFTER ELECTRICAL POWER IS REMOVED.

CAUTION: WHEN REMOVING OR INSTALLING A GYRO FROM ITS MOUNT, DO SO GENTLY WITH NO QUICK MOTION. THE GYRO SHOULD NOT BE TWISTED IN ITS ISOLATOR SHOCK MOUNTS. ANY EXCESSIVE TWISTING DOES CAUSE THE GYRO TO REMAIN OFFSET FROM ITS NEUTRAL POSITION FOR A SHORT PERIOD OF TIME.

(1) Remove C–14D Directional Gyro.

(a) Disconnect the cable connector.

(b) Remove and save the hardware securing the gyro to the airframe.

(2) Reinstall C-14D Directional Gyro.

(a) Secure the gyro to the airframe with the previously saved hardware.

(b) Mate the cable connector with the gyro connector.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Not Applicable.

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9. Procedure for the CD–850 Clearance Delivery Control Head (CDH)

A. Removal and Reinstallation Procedures

(1) Remove the CD–850 CDH.

(a) Using an 3/32–inch Allen wrench, loosen the unit mounting clamp screws accessible through holes at the sides of the front panel.

(b) Slide the CDH out of the panel and disconnect the cable connector.

(2) Reinstall the CD–850 CDH.

(a) Mate the cable connector with the unit connector and slide the display into the panel.

(b) Using a 3/32–inch Allen wrench, tighten the unit mounting clamp screws.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

Replacement of the control knobs.

NOTE: Each control knob is held in place by two No. 4–40 X 3/32–inch hex setscrews. The setscrews in the small tuning knob are reached through access holes in the large tuning knob.

(1) Rotate the large tuning knob as necessary to reach the setscrews in the small tuning knob.

(2) Using the appropriately sized Allen wrench, loosen both setscrews in the knob.

(3) Slide the knob off the shaft.

(4) On new knobs, make sure the setscrews are out far enough to let the knob to slide onto the shaft. Apply retaining compound to the setscrews.

(5) Slide the large tuning knob onto the shaft.

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(6) Make sure the space between the knob and the bezel is approximately 0.030 inch (0.8 mm).

(7) Tighten both setscrews with the Allen wrench.

(8) Recheck spacing between the knob and the bezel to make sure that knob has not slipped during installation.

(9) Slide the small tuning knob onto the shaft, making sure that the small tuning knob does not rub against the large tuning knob.

(10) Align the access holes in the large tuning knob with the setscrews in the small tuning knob.

(11) Tighten both setscrews with the Allen wrench.

(12) Recheck to make sure the small tuning knob has not slipped during installation and is not rubbing against the large tuning knob.

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10. Procedure for CS–412 Dual Remote Compensator

A. Removal and Reinstallation Procedures

(1) Remove CS–412 Dual Remote Compensator.

(a) Disconnect the aircraft cable connectors from the unit connectors.

(b) Remove and save the hardware securing the compensator to the airframe.

(2) Reinstall CS–412 Dual Remote Compensator.

(a) Secure the compensator to airframe with the previously saved hardware.

(b) Mate the cable connectors with the unit connectors.

NOTES:

1. If this removal and reinstallation was to facilitate other maintenance, and/or does not include a CS–412 that is different from the CS–412 that was removed, no further adjustments are required..

2. If the CS–412 being installed is different from the CS–412 that was removed, a compass swing procedure and CS–412 compensator adjustments must be performed.

B. Adjustment Procedure

NOTE: Before making the following adjustments to the CS–412 Dual Remote Compensator, perform the flux valve index error adjustment in accordance with paragraph 14. B.

(1) Remove the compensator cover and adjust the compensation potentiometers to their center positions.

(2) Using a compass rose, place the aircraft on a North heading and let the compass dial to settle.

(3) Compensate for any difference between actual heading and compass dial indication by loosening the locking nut and adjusting N–S (North–South) potentiometer on the compensator. Tighten the locking nut.

(4) Place the aircraft on an East heading and let the compass dial to settle.

(5) Compensate for any difference between actual heading and compass dial indication by loosening the locking nut and adjusting the E–W (East–West) potentiometer on the compensator. Tighten the locking nut.

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(6) Place the aircraft on a South heading and allow the compass dial to settle.

(7) Compensate for half of any difference between actual heading and compass dial indication by loosening the locking nut and adjusting N–S potentiometer on the compensator. Tighten the locking nut.

(8) Place the aircraft on a West heading and allow the compass dial to settle.

(9) Compensate for any difference between actual heading and compass dial indication by loosening the locking nut and adjusting the E–W potentiometer on the compensator. Tighten the locking nut.

(10) The compensator should now be fully adjusted for proper compensation. As a check, swing the aircraft in 30–degree increments and note the readings on the compass dial. All readings should be within 1 degree of the actual heading. If errors are greater than 1 degree, repeat the index error adjustment and the above adjustments for greater accuracy.

NOTE: MC–1 or MC–2 Magnetic Compass Calibrator Sets can be used for index error and compensator adjustment in lieu of the above procedure.

C. Repair Procedure

Not Applicable.

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11. Procedure for the DC–550 Display Controller

A. Removal and Reinstallation Procedures

(1) Remove the DC–550 Display Controller.

(a) Disengage the Dzus fasteners on the unit.

(b) Slide the unit out of the aircraft mounting location and disconnect the cable connector.

(2) Reinstall the DC–550 Display Controller.

(a) Mate the cable connector with the unit connector and slide the unit into the aircraft mounting location.

(b) Engage the Dzus fasteners on the unit.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

(1) Replace bearing control knobs.

(a) Use a 1/32–inch Allen wrench to loosen both setscrews in the knob.

(b) Slide the knob off the shaft.

(c) On new knob, make sure the setscrews are out far enough to let the knob slide onto the shaft. Apply retaining compound to setscrews.

(d) Slide knob onto the shaft. Do not tighten the setscrews.

(e) Make sure the space between the knob and the bezel is approximately 0.030 inch (0.8mm).

(f) Use a 1/32–inch Allen wrench to tighten the setscrews in the knob.

(g) Visually check the spacing between the knob and the bezel to make sure the knob has not slipped during installation.

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(2) Replace DH/TEST and PFD DIM knobs.

(a) Use a 1/32–inch Allen wrench to loosen both setscrews in the DH/TEST knob.

(b) Slide the knob off the shaft.

(c) Use a .048–inch Bristol wrench to loosen both setscrews in the test switch hub.

(d) Slide the test switch hub off the shaft.

(e) Use a 1/32–inch Allen wrench to loosen both setscrews in the PFD DIM knob.

(f) Slide the knob off the shaft.

(g) On new knob, make sure the setscrews are out far enough to let the knob slide onto the shaft. Apply retaining compound to setscrews.

(h) Slide the PFD DIM knob onto the shaft. Do not tighten the setscrews.

(i) Make sure the space between the PFD DIM knob and the bezel is approximately 0.030 inch (0.8mm).

(j) Use a 1/32–inch Allen wrench to tighten the setscrews in the PFD DIM knob.

(k) Visually check the spacing between the knob and the bezel to make sure the knob has not slipped during installation.

(l) Slide the test switch hub onto the shaft.

(m) Use a 0.048–inch Bristol wrench to tighten the setscrews in the test switch hub.

(n) Slide the DH/TEST knob onto the shaft.

(o) Use a 1/32–inch Allen wrench to tighten the setscrews.

(p) Make sure the DH/TEST knob has not slipped during installation and is not rubbing against the inside of the PFD DIM knob.

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12. Procedure for DI-851 DME Indicator

A. Removal and Installation Procedure

(1) Remove DI-851 DME Indicator.

(a) Loosen the two larger screws on instrument panel located at upper-right and lower-left corners of indicator.

(b) Slide indicator out of panel and disconnect aircraft cable connector.

(2) Reinstall DI-851 DME Indicator.

(a) Mate indicator connector with aircraft cable connector and slide unit into panel.

(b) Tighten screws on panel at upper–right and lower-left corners of unit.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Not Applicable.

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13. Procedure for the DU–870 Display Units

A. Removal and Reinstallation Procedures

(1) Remove the DU–870 Display Unit.

(a) Loosen the two captive holding screws at the ends of the bezel assembly.

(b) Gently pull the bezel assembly straight away from the display unit separating the bezel and the display unit connector. Set the bezel assembly aside.

(c) Using a 3/16–inch Allen wrench, loosen the jackscrew and separate the unit and tray connector(s).

(d) Gently lift the front of the display unit until the jackscrew latch clears the slot in the mounting tray.

(e) Slide the display unit out of the tray.

(2) Reinstall the DU–870 Display Unit.

CAUTION: WHEN PLACING THE UNIT ON THE MOUNTING TRAY, DO NOT FORCE FIT. IF MATING IS DIFFICULT, REMOVE THE UNIT AND CHECK FOR CONNECTOR PINS THAT CAN BE BENT OR OUT OF ALIGNMENT. ALSO, VISUALLY CHECK THE ALIGNMENT OF THE RECEPTACLE ON THE MOUNTING TRAY.

(a) Slide the display unit into the panel tray, lifting the front of the display unit as necessary to make sure the jackscrew latch engages the slot in the mounting tray.

(b) Slide the display unit backwards until its connectors are fully engaged with the mating connectors of the mounting tray.

(c) Tighten the jackscrew with a 3/16–inch Allen wrench.

(d) Reinstall the bezel assembly.

1 Align the bezel assembly on the display unit.

2 Tighten the captive screws.

B. Adjustment Procedures

Not applicable.

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C. Repair Procedures

Cleaning of the display unit faceplate filter.

NOTE: The display unit faceplate is protected by a filter that reduces reflections. It is sturdy, but it is not indestructible.

(1) Inspect the outside surface for foreign material and variations in optical quality.

(2) Particles of grit, dirt, or sand are to be removed with pressurized dry air or a soft camel-hair brush.

(3) Dampen a clean piece of lint-free cloth with isopropyl alcohol or ammoniated cleaner. Do not use household paper towels.

(4) Carefully rub the unclean portion of the filter with the damp cloth.

(5) Repeat paragraph (3) above as necessary until the filter is clean.

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14. Procedure for FX-220 Flux Valve

NOTE: Whenever a flux valve is removed and replaced, a compass swing must be performed to attain the desired long-term heading accuracy. The compass swing includes an index error adjustment of the flux valve, and compensator adjustment of the remote compensator.

A. Removal and Reinstallation Procedures

(1) Remove FX-220 Flux Valve.

(a) Gain access to the flux valve by removing the wing access panel.

(b) Remove and save the three nonmagnetic screws securing the flux valve to the mounting bracket.

(c) Remove and save the six nonmagnetic screws holding the terminal cover to the flux valve.

(d) Remove the cover from the flux valve and set it aside.

NOTE: Put as little strain as possible on the lead connections when withdrawing the flux valve.

(e) One at a time, remove the screws that hold the six terminal lugs to the terminal board on the flux valve, remove lugs and reinstall screws in the terminal board. Label the leads to the flux valve terminal board to ensure proper reconnection.

(2) Reinstall FX-220 Flux Valve.

(a) One at a time, remove the screws from the flux valve terminal board, connect and secure the flux valve leads to the terminal board. Make sure to make proper connections according to the lead label affixed in step (1)(e) above.

(b) Place the flux valve terminal cover on the flux valve.

(c) Secure the cover with the previously saved nonmagnetic screws.

(d) Install the flux valve in the mounting bracket and secure it with the three previously saved 6-40 x 3/8-inch, round head, nonmagnetic machine screws, HPN 319011. Do not tighten screws.

NOTE: Do not use magnetic type screws to mount the flux valve.

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B. Adjustment Procedures (Index Error)

(1) Apply aircraft electrical power to the attitude and heading reference system and allow several minutes for the gyros to reach operating speed and for the system to slave to the current magnetic heading.

NOTE: The aircraft should be in its normal flight position with the electrical system and radio equipment operating.

(2) Position the aircraft on a compass rose and turn it to each of the four cardinal headings.

(3) Allow sufficient time for the heading indicator to settle, and record the differences in readings between the heading indicator and the compass rose as plus or minus, depending on whether the dial readings are greater or less than the compass rose readings.

(4) Instead of a compass rose, a magnetic sighting compass can be used. To take a reading, the compass is located at a considerable distance fore or aft of the aircraft and is moved back and forth from a line of sight coinciding with the aircraft centerline. When a sight is taken facing aft, 180 degrees must be added or subtracted from the sighting compass reading. When facing fore, the compass reads directly.

(5) Add the errors algebraically and divide by four. The result is the index error.

(6) Loosen the nonmagnetic screws holding the flux valve flange to its mounting surface and rotate the flange of the unit to cancel out the index error. If the error is positive (plus), the flange should be rotated in the counterclockwise direction (giving a minus reading on the flange) as observed from above the unit.

(7) If the error is negative (minus), rotate the flange in the clockwise direction (giving a plus reading on the flange) as observed from above the unit

(8) Tighten the mounting screws and recheck the readings at the four cardinal headings. Recalculate the index error to make sure it is zero.

(9) If the index error is not zero, readjust the flux valve flange until this error is canceled.

(10) Any remaining errors in excess of ± 1 degree caused by extraneous magnetic fields should be counteracted by readjusting the CS–412 Dual Remote Compensator. See paragraph 10. B. of this section for specific instructions.

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15. Procedure for the IC–600 Integrated Avionics Computer (IAC)

A. Removal and Reinstallation Procedures

(1) Remove the IC–600 IAC.

(a) Loosen the mounting tray hold–down knob.

(b) Slowly pull forward on the unit handle to separate the unit and tray connectors and slide the unit out of the tray.

(2) Reinstall the IC–600 IAC.

NOTE: Make sure the correct part number IAC is being installed. Pilot's side (IAC No. 1) uses Part No. 7017000–801XX and copilot's side (IAC No. 2) uses Part No. 7017000–811XX.

(a) Slide the unit into the mounting tray.

CAUTION: WHEN PLACING THE UNIT ON THE MOUNTING TRAY, DO NOT FORCE FIT. IF MATING IS DIFFICULT, REMOVE THE UNIT AND CHECK FOR CONNECTOR PINS THAT CAN BE BENT OR OUT OF ALIGNMENT. ALSO, VISUALLY CHECK THE ALIGNMENT OF THE RECEPTACLE ON THE MOUNTING TRAY.

(b) Slide the unit backwards until its connectors are fully engaged with the mating connectors of the mounting tray.

(c) If necessary, gently lift the front of the unit to make sure the hold–down assembly mates properly with the tray hold–down hooks.

(d) Tighten the hold–down knob.

B. Checklist Loading Procedures

The MFD checklist is stored in each IC–600 Integrated Avionics Computer.

(1) The aircraft must be on the ground (WOW) and powered up in standby.

(2) Connect a personal computer (PC) to the applicable 9 pin aircraft connector, using a RS–232 interconnect cable supplied with the ECP-800 Programmable Checklist. There are two aircraft connectors: one connected to the pilot's IC-600 and one connected to the copilot's IC-600.

NOTES:

1. The PC must have the ECP-800 Programmable Checklist Software, Honeywell Part No. 7021060-901, and the desired checklist available for use. Refer to the ECP–800 Programmable Checklist Manual for details.

2. If the PC has Windows 3.1 or 95, do not access the ECP–800 software from the Windows prompt. Instead, use the DOS prompt to start the checklist software.

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(3) Apply power to the avionics. Observe the RA SET area on the PFD is valid.

(4) Using the on-side DC-550 Display Controller, use the RA knob to set 890 RA on the PFD.

(5) Push and hold the display controller TEST button for a minimum of 10 seconds and, while holding the TEST button momentarily, push the display controller ET button. The following display (Figure 4-2) appears on the onside PFD:

CHECKLIST LOADING

PROGRAMMABLE CHECKLIST
EQUIPMENT IS REQUIRED

SCREEN BLANKS

CYCLE IC-600 CIRCUIT
BREAKER TO RECOVER

DC550 BUTTONS 890 RA
NAV ENTER CKLST

AD-51524@

Figure 4-2. Checklist Loading Page

(6) Momentarily push the NAV button on the onside DC-550 Display Controller. The PFD momentarily blanks and a large red X is displayed. The red **X** remains until paragraph 15.B.(9).

(7) Use the electronic programmable checklist software on the PC to output the checklist and upload it to the onside IAC.

NOTE: If a checklist is already in the IAC, error code 5100 is displayed on the PC. Follow the instructions on the PC.

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(8) When the upload is complete, follow the instructions on the PC to finish.

(9) Pull the appropriate IAC circuit breaker to power down the IAC.

(10) Remove the RS–232 cable from the aircraft connector.

(11) Push in the appropriate IAC circuit breaker to power up the IAC.

(12) When the IAC is powered up, verify that the checklist can be selected by pushing either the NORM or EMER buttons, selectable on the onside MFD bezel menu.

(13) Review the checklist for accuracy.

(14) The procedure is complete. If applicable, perform procedure to load checklist in other IAC.

C. Repair Procedures

Not applicable.

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16. Procedure for MC-800 MFD Controller

A. Removal and Installation Procedure

(1) Remove MC-800 MFD Controller.

(a) Disengage the Dzus fasteners on the unit.

(b) Slide the unit out of the aircraft mounting location and disconnect the cable connector.

(2) Reinstall MC-800 MFD Controller.

(a) Mate the cable connector with the unit connector and slide the unit into the aircraft mounting location.

(b) Engage the Dzus fasteners on the unit.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Replace Control Knobs.

(1) Use a 0.048-inch Bristol wrench to loosen both setscrews on the DIM knob.

(2) Slide the knob off the shaft.

(3) Use a .048-inch Bristol wrench to loosen both setscrews on the MODE knob.

(4) Slide the knob off the shaft.

(5) On new knobs, make sure the setscrews are out far enough to allow the knob(s) to slide onto the shaft(s). Apply retaining compound to setscrews.

(6) Slide the MODE knob onto the shaft.

(7) Make sure the space between the MODE knob and the bezel is approximately 0.030 inch (0.8mm).

(8) Use a 0.048-inch Bristol wrench to tighten the setscrews.

(9) Visually check the spacing between the knob and the bezel to make sure the knob has not slipped during installation.

(10) Slide the DIM knob onto the shaft.

(11) Use a 0.048-inch Bristol wrench to tighten the setscrews.

(12) Make sure the DIM knob has not slipped during installation, and that it is not rubbing against the inside of the MODE knob.

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17. Procedure for MS-560 Mode Selector

A. Removal and Installation Procedure

(1) Remove MS-560 Mode Selector.

(a) Remove and save the four machine screws securing the MS-560 to the instrument panel.

(b) Slide the unit out of the aircraft mounting location and disconnect the cable connector.

(2) Reinstall MS-560 Mode Selector.

(a) Mate the cable connector with the unit connector.

(b) Slide the unit into the instrument panel.

(c) Secure the unit with the previously saved hardware.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Replace Button Lamps.

CAUTION: THE BUTTON COVERS ARE HELD CAPTIVE TO THE SWITCHES WITH SPRING WIRE. BE CAREFUL NOT TO PULL THE COVER OUT TOO FAR, AS DAMAGE TO THE SWITCH CAN RESULT.

NOTE: Access to these lamps does not require removal of the bezel.

(1) Remove the button cover by pulling straight out, using an IC puller. If no puller is available, an orange stick can be used. Do not use anything metallic, such as a thin screwdriver, because of the danger of damage to the switches and/or the bezel.

NOTE: Each button has two lamps. The lamp at the left is clear, and the lamp at the right is blue-white.

(2) Remove the lamp by pulling it straight out of the button cover.

(3) Slide the new lamp into the button cover.

(4) Align the button cover on the switch.

(5) Push the button cover into the switch until it clicks into place.

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18. Procedure for the PC-400 Autopilot Controller

A. Removal and Reinstallation Procedures

(1) Remove the PC-400 Autopilot Controller.

(a) Disengage the Dzus fasteners on the unit.

(b) Slide the unit out of the aircraft mounting location and disconnect the cable connector.

(2) Reinstall the PC-400 Autopilot Controller.

(a) Mate the cable connector with the unit connector and slide the unit into the aircraft mounting location.

(b) Engage the Dzus fasteners on the unit.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

(1) Replace TURN Knob.

(a) Use a 5/64-inch Allen wrench to loosen both setscrews in the knob.

(b) Slide the knob off the shaft.

(c) On new knob, make sure the setscrews are out far enough to allow the knob to slide onto the shaft. Apply retaining compound to setscrews.

(d) Slide the knob onto the shaft.

(e) Make sure the space between the knob and the front panel is approximately 0.030 inch (0.8mm).

(f) Tighten the setscrews.

(g) Visually check the spacing between the knob and the front panel to ensure that the knob has not slipped during installation.

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(2) Replace Button Lamps.

CAUTION: THE BUTTON COVERS ARE HELD CAPTIVE TO THE SWITCHES WITH SPRING WIRE. BE CAREFUL NOT TO PULL THE COVER OUT TOO FAR, AS DAMAGE TO THE SWITCH CAN RESULT.

NOTE: Access to these lamps does not require removal of knobs or bezel.

(a) Remove the button cover by pulling straight out, using an IC puller. If no puller is available, an orange stick can be used. Do not use anything metallic, such as a thin screwdriver, because of the danger of damage to the switches and/or the bezel.

NOTE: Each button cover contains one clear lamp at the right and a dummy lamp at the left.

(b) Remove the lamp by pulling it straight out of the button cover.

(c) Insert the new lamp into the button cover.

(d) Align the button cover on the switch.

(e) Push the button cover into the switch until it clicks into place.

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19. Procedure for the RCZ–851(X) Integrated Communications Unit

A. Removal and Reinstallation Procedures

(1) Remove the RCZ–851(X) Integrated Communications Unit.

(a) Cut the safety wire and loosen the thumbnuts.

(b) Slowly pull forward on the unit handle to separate the unit and tray connectors and slide the unit out of the tray.

(2) Reinstall the RCZ–851(X) Integrated Communications Unit.

CAUTION: WHEN PLACING THE UNIT ON THE MOUNTING TRAY, DO NOT FORCE FIT. IF MATING IS DIFFICULT, REMOVE THE UNIT AND CHECK FOR CONNECTOR PINS THAT CAN BE BENT OR OUT OF ALIGNMENT. ALSO, VISUALLY CHECK THE ALIGNMENT OF THE RECEPTACLE ON THE MOUNTING TRAY.

(a) Place the unit on the mounting tray. Slide the unit backward until its connectors are fully engaged with the mating connectors of the mounting tray.

(b) Tighten the thumbnuts and attach the safety wire.

NOTE: Instructions for the removal and reinstallation of a COM module are contained with the replacement module.

B. Adjustment Procedure

NOTE: All adjustments on the COM Unit are set at the factory for typical operating conditions. Most COM Unit installations should not require any adjustments. If an adjustment is necessary, perform the adjustment in accordance with the following procedures. See Figure 4–3 for the adjustment locations.

(1) Microphone Level Adjustment

Because of differences in microphone characteristics, it can be necessary to reset the MIC Level Adjustment to obtain the desired modulation level.

(2) Sidetone Level Adjustment

The sidetone level on the COM Unit is preset at the factory. If a change in sidetone level is desired, the adjustment should first be attempted on the audio panel. Refer to paragraph 5.B. of this section. If the desired level cannot be obtained by audio panel adjustments, adjust the sidetone level on the COM unit to obtain desired sidetone level.

(3) Master Audio Adjustment

The Master Audio Adjustment controls sidetone and receiver audio. This adjustment should not be changed, as any adjustment adversely affects audio input levels in the AV–850A Audio Panel.

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C. Repair Procedures

Not applicable.

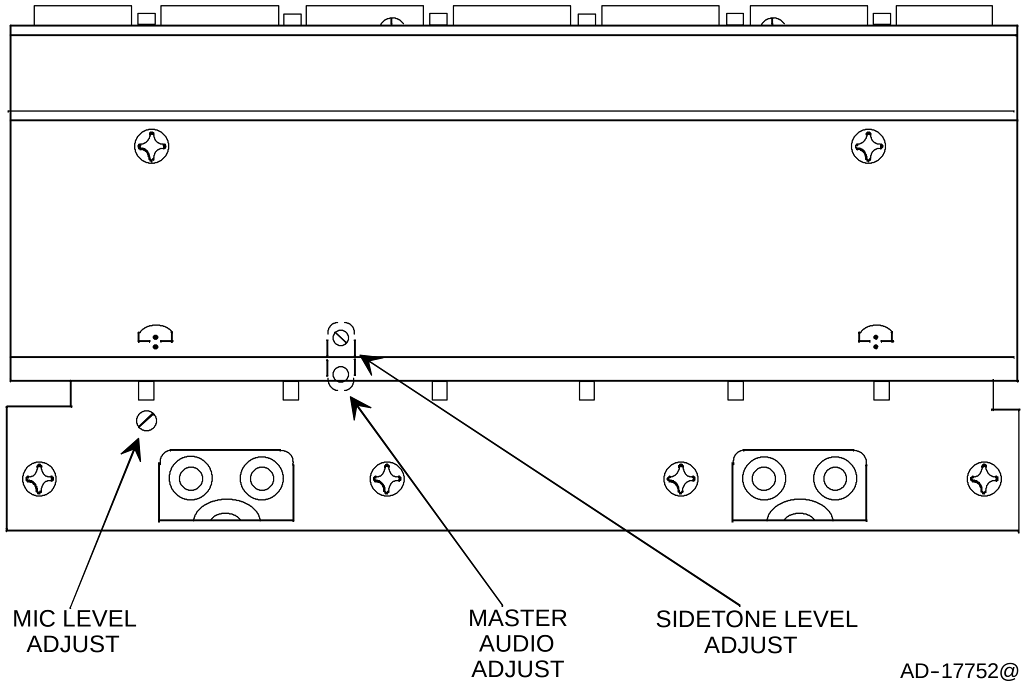

Figure 4-3. COM Unit Adjustment Locations

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20. Procedure for RG-204 Rate Gyro

A. Removal and Installation Procedure

(1) Remove RG-204 Rate Gyro.

(a) Disconnect the cable connector.

(b) Remove and save the hardware securing the gyro to the airframe.

(2) Reinstall RG-204 Rate Gyro.

(a) Secure the gyro to the airframe using the previously saved hardware.

(b) Mate the cable connector with the gyro connector.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Not Applicable.

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21. Procedure for RI-553 Remote Instrument Controller

A. Removal and Installation Procedure

(1) Remove RI-553 Remote Instrument Controller.

(a) Disengage the Dzus fasteners on the unit.

(b) Slide the unit out of the aircraft mounting location and disconnect the cable connector.

(2) Reinstall RI-553 Remote Instrument Controller.

(a) Mate the cable connector with the unit connector and slide the unit into the aircraft mounting location.

(b) Engage the Dzus fasteners on the unit.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Replace HEADING or COURSE Knobs.

(1) Use a 0.048-inch Bristol wrench to loosen both setscrews on the knob(s).

(2) Slide the knob(s) off the shaft(s).

NOTE: The left and right knobs are COURSE knobs, and the center knob is a HEADING knob.

(3) On new knobs, make sure the setscrews are out far enough to allow the knob to slide onto the shaft. Apply retaining compound to setscrews.

(4) Slide the knob onto the shaft.

(5) Make sure the space between the knob and the bezel is approximately 0.030 inch (0.8mm).

(6) Use a 0.048-inch Bristol wrench to tighten the setscrews.

(7) Visually check the spacing between the knob(s) and the bezel to make sure the knob(s) have not slipped during installation.

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22. Procedure for the RM-850 Radio Management Unit (RMU)

A. Removal and Reinstallation Procedures

(1) Remove the RM-850 RMU.

(a) Loosen the clamp screws on the panel at each top corner of the unit.

(b) Without turning the screws, push them straight into the panel. This releases the clamp.

(c) Slide the RMU out of the panel and disconnect the cable connector.

(2) Reinstall the RM-850 RMU.

(a) Mate the cable connector with the RMU connector.

(b) Slide the RMU into the panel.

(c) Tighten clamp screws at each top corner of the unit.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

Replacement of the tuning knobs.

(1) Use a 0.060-inch O.D., 6 flute, Bristol wrench to loosen the setscrews.

(2) Remove the defective knob.

(3) On new knobs, make sure the setscrews are out far enough to allow the knob to slide onto the shaft. Apply retaining compound to setscrews.

(4) Slide the large tuning knob onto the shaft.

(5) Make sure the space between the knob and the bezel is approximately 0.025 inch (0.6 mm).

(6) Tighten both setscrews with the Bristol wrench.

(7) Recheck spacing between the knob and the bezel to make sure that knob has not slipped during installation.

(8) Slide the small tuning knob onto the shaft, making sure the small tuning knob does not rub against the large tuning knob.

(9) Align the access holes in the large tuning knob with the setscrews in the small tuning knob.

(10) Tighten both setscrews with the Bristol wrench.

(11) Recheck to make sure the small tuning knob has not slipped during installation and is not rubbing against the large tuning knob.

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23. Procedure for the RNZ–850(X) Integrated Navigation Unit

A. Removal and Reinstallation Procedures

(1) Remove the RNZ–850(X) Integrated Navigation Unit.

(a) Cut the safety wire and loosen the thumbnuts.

(b) Slowly pull forward on the unit handle to separate the unit and tray connectors and slide the unit out of the tray.

(2) Reinstall the RNZ–850(X) Integrated Navigation Unit.

CAUTION: WHEN PLACING THE UNIT ON THE MOUNTING TRAY, DO NOT FORCE FIT. IF MATING IS DIFFICULT, REMOVE THE UNIT AND CHECK FOR CONNECTOR PINS THAT CAN BE BENT OR OUT OF ALIGNMENT. ALSO, VISUALLY CHECK THE ALIGNMENT OF THE RECEPTACLE ON THE MOUNTING TRAY.

(a) Place the unit on the mounting tray. Slide the unit backward until its connectors are fully engaged with the mating connectors of the mounting tray.

(b) Tighten the thumbnuts and attach the safety wire.

NOTE: Instructions for the removal and reinstallation of a NAV module are contained with the replacement module.

B. Adjustment Procedures

All adjustments on the NAV Unit are set at the factory for typical operating conditions. Most NAV Unit installations should not require any adjustments. If an adjustment is necessary, perform the adjustment in accordance with the following procedures. NAV units have holes in the top cover and the holes are labeled. See Figure 4–4 for NAV Unit adjustment locations.

Some procedures below refer to digital and analog audio signals. The digital audio is the normal audio from the AV–850A Audio Panel. The analog audio signals are the traditional audio signals used in aircraft. VOR/LOC analog audio is used for the emergency backup audio system.

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(1) LOC Audio Level Adjustment

The LOC audio adjustment controls the VOR/LOC receiver emergency audio level out of the AV-850A. This adjustment does not affect the digital audio level from the AV-850A. Emergency audio for the VOR/LOC is a backup system for the digital audio and is connected on the side of the aircraft that has the CD-850 Clearance Delivery Control Head (CDH) installed.

Before making any adjustments of the LOC audio level, perform the following procedure to determine if adjustment is needed.

(a) Set the HEADPHONE volume control on the AV-850A Audio Panel to its typical operating position and push in the EMER button on the AV-850A.

(b) Push the NAV AUDIO button on the CD-850 CDH and verify that NAV AUDIO is shown on the CDH display.

(c) Tune the CDH to a VOR station, either in flight or on the ground and verify a flag-out-of-view condition on an indicator.

(d) Listen to the VOR emergency audio with a set of headphones.

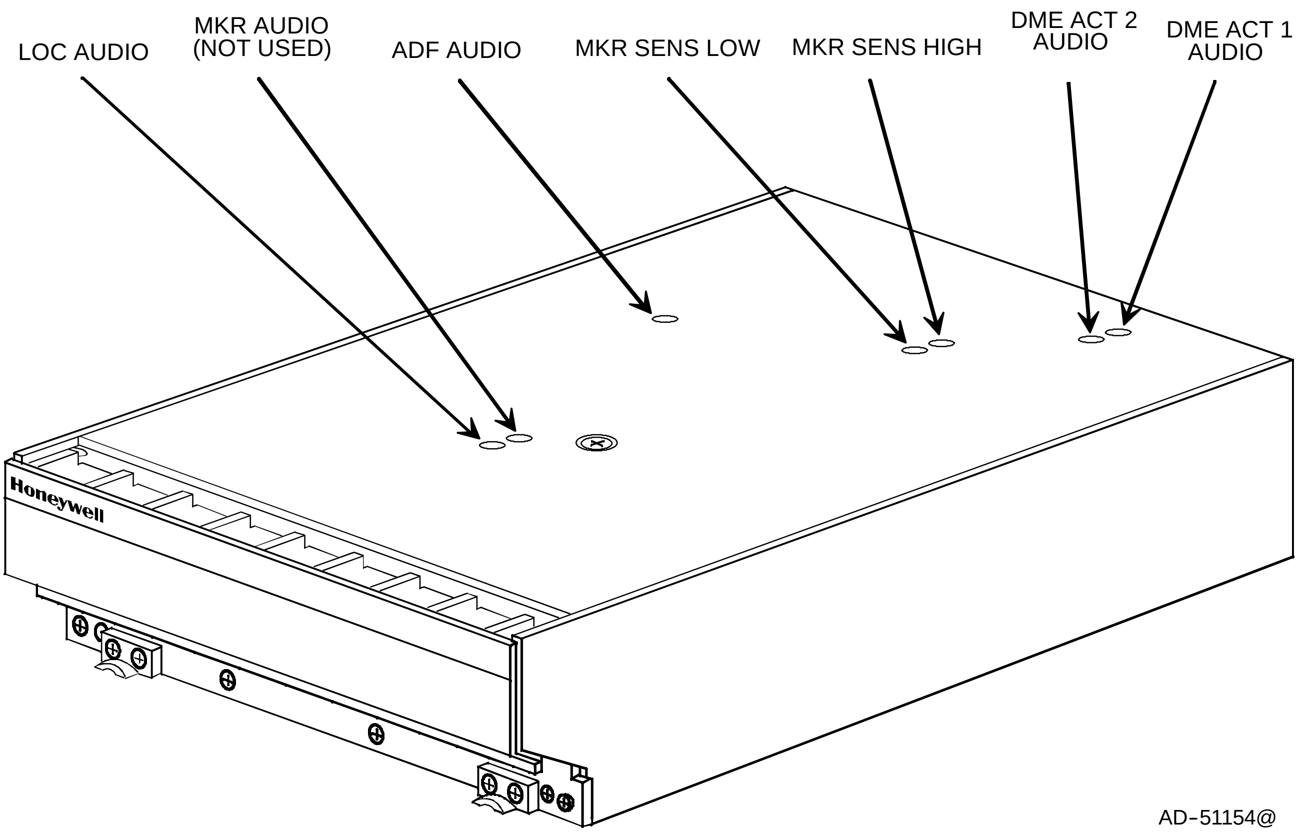

Figure 4-4. NAV Unit Adjustment Locations

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(e) Adjust the audio level as follows:

- Find the LOC AUDIO adjustment on top of the NAV unit and increase or decrease audio level as desired
- For an increase of audio level, turn the adjustment clockwise
- For a decrease of audio level, turn the adjustment counterclockwise.

(2) MKR High and Low Sensitivity Threshold Adjustments

The MKR high and low sensitivity adjustments control how long the marker lamps are ON and how long the marker audio is heard when crossing a marker ground station. These adjustments do not affect the marker digital or analog audio output levels, only the duration of the marker audio and display.

The high sensitivity mode is typically used for enroute flying, i.e., high altitudes and the low sensitivity mode is typically used during approach, i.e., low altitudes, typically when flying an ILS.

To determine if either high or low sensitivity needs adjustment, perform the following flight test procedure:

(a) Electromagnetic Compatibility

With all aircraft avionics systems operating in flight, verify by observation that no adverse effects are present.

(b) Marker Beacon Performance Checks

1 In low sensitivity mode, the marker beacon annunciator light should be lit for a distance of 2,000 to 3,000 feet when flying at an altitude of 1,000 feet AGL on the localizer centerline in all flap and gear configurations.

NOTE: To determine distances of 2,000 to 3,000 feet, time the marker beacon light duration, determine ground speed and then use the formulas listed below:

$$\text{Upper limit (seconds)} = \frac{1775}{\text{Ground Speed in Knots}}$$

$$\text{Lower limit (seconds)} = \frac{1183}{\text{Ground Speed in Knots}}$$

2 In high sensitivity mode, the marker beacon annunciator light and audio remain on longer than when in low sensitivity.

3 The audio signal should be of adequate strength and sufficiently free from interference to supply positive identification.

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4 As an alternate procedure, cross the outer marker at normal ILS approach altitudes and determine adequate marker aural and visual indication.

NOTE: When adjusting marker high and low sensitivity thresholds, the high sensitivity adjustment must always be set to the desired threshold before low sensitivity adjustment is performed.

5 Find the adjustments on top of the NAV unit. To cause the marker lamps and audio to stay ON for a shorter length of time, turn the MKR SENS HIGH or MKR SENS LOW adjustment clockwise.

(3) ADF Audio Level Adjustment

The ADF AUDIO adjustment controls the ADF receiver analog audio level. This adjustment does not affect the digital audio output level from the AV–850A Audio Panel.

(a) For an increase of audio level, turn the adjustment clockwise.

(b) For a decrease of audio level, turn the adjustment counterclockwise.

(4) DME Audio Level Adjustment

The DME audio adjustments control the DME analog audio levels. These adjustments do not affect the digital output level from the AV–850A Audio Panel.

(a) For an increase of audio level, turn the adjustment clockwise.

(b) For a decrease of audio level, turn the adjustment counterclockwise.

C. Repair Procedures

Not applicable.

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24. Procedure for the RNZ–850/RCZ–851 Strap Board Assembly

CAUTION: THE STRAP BOARD ASSEMBLY CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE (ESD). GROUND YOURSELF BEFORE HANDLING THE ASSEMBLY, AND ALWAYS HANDLE IT BY THE EDGES.

NOTE: The Integrated Radio System contains a total of four strap board assemblies: one COM and one NAV assembly contained in each remotely mounted strapping assembly.

A. Removal and Reinstallation Procedures

(1) Remove the RNZ–850/RCZ–851 Strap Board Assembly.

(a) Remove the two screws and cover from the strapping assembly.

(b) Remove and set aside the three roundhead screws and lockwashers securing the COM or NAV strap board assembly.

(c) Gently pull out on the assembly and disconnect the flat connector from the assembly.

(2) Reinstall the RNZ–850/RCZ–851 Strap Board Assembly.

CAUTION: BE VERY CAREFUL WHEN CUTTING CONFIGURATION STRAPS SO AS NOT TO DAMAGE THE STRAP BOARD ASSEMBLY.

NOTE: If the strap board assembly is removed from the aircraft and replaced with an assembly from customer–owned shelf stock or was obtained from Honeywell, the configuration straps have to be cut in accordance with the list in Section 3 of this manual.

(a) Handle the strap board assembly by its edges and attach the flat connector to the assembly.

(b) Secure the assembly using the three roundhead screws and lockwashers that were removed and previously set aside.

(c) Check the harness grommet is positioned at the bottom of slot in chassis.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

Not applicable.

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25. Procedure for the SM–200 Servo Drive and SB–201 Drum and Bracket Assembly

A. Removal and Reinstallation Procedures

(1) Remove the SM–200 Servo Drive.

(a) Disconnect the cable connector from the servo drive.

(b) Cut the safety wire and remove and set aside the four screws and lock washers securing the servo drive to the drum and bracket assembly.

(c) Slide the servo drive out of the drum and bracket assembly.

(2) Reinstall the SM–200 Servo Drive.

(a) Slide the servo drive into the rear of the drum and bracket assembly and secure with four screws, Honeywell Part No. 4011086, and lock washers previously set aside. Safety wire all four screws with Low Mu Monel wire, 0.020–inch diameter.

(b) Mate the servo drive connector with the cable connector.

(3) Remove the SB–201 Drum and Bracket Assembly.

(a) Remove the servo drive in accordance with paragraph 25.A.(1).

(b) Release the bridle cable tension.

(c) Cut the safety wire on the four screws securing the retaining plate. Remove and set aside the screws and the retaining plate.

(d) Remove and set aside the four cable keepers, Honeywell Part No. 2518330.

(e) Cut the safety wire. Remove and set aside two screws securing the swagged cable terminals to the drum.

(f) Unwrap the bridle cables from the drum.

(g) Remove and set aside four nuts, bolts, and washers securing the drum and the bracket assembly to the airframe.

(h) Lift the drum and bracket assembly away from the airframe.

(4) Reinstall the SB–201 Drum and Bracket Assembly.

(a) Mount the drum and bracket assembly rigidly to the airframe with four bolts and four lockwashers and nuts previously set aside.

INSTALLATION CRITICAL

TO ENSURE CABLE TERMINAL CAPTURE, USE ONLY 0.138–32–NC–2A STAINLESS STEEL DRILLED SCREWS, HONEYWELL PART NO. 2554911–1. STANDARD FILLISTER–HEAD SCREWS CAN NOT PROPERLY RETAIN THE CABLE TERMINAL.

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(b) Wrap the bridle cables around the servo bracket drum. Secure the swagged cable terminals to the servo bracket drum with the screws previously removed; or if a new servo, use the screws supplied with the new servo. Safety wire the screws through adjacent holes in the drum with Low Mu Monel wire, 0.020-inch diameter and 4 inches long.

(c) Adjust the control system and the bridle cables to the proper tension as instructed in the aircraft maintenance manual.

INSTALLATION CRITICAL

TO MAKE SURE THE CABLE CANNOT JAM BETWEEN THE DRUM AND KEEPERS, THE DISTANCE BETWEEN THE KEEPERS AND DRUM IS MEASURED AFTER THE KEEPERS AND RETAINING PLATE ARE INSTALLED. THE DISTANCE BETWEEN THE DRUM AND KEEPERS MUST NOT EXCEED 0.040 INCH AND MUST NOT BE LESS THAN 0.005 INCH. THE 3/32-INCH CABLE DIAMETER IS VERIFIED. THESE ARE CRITICAL INSTALLATION REQUIREMENTS.

(d) Install two of the four cable keepers previously removed, on the servo bracket at the points of cable tangency to the drum. The other two keepers must be located at 90 degrees from the first two.

(e) Install the retaining plate, Honeywell Part No. 2518332, on the slotted end of the cable keepers using the four 5/16-inch long, No. 8-32, drilled fillister-head screws removed in paragraph 25.A.(3)(c). Safety wire these four screws with Low Mu Monel wire, 0.032-inch in diameter and 4 inches long.

(f) Reinstall the servo drive in accordance with paragraph 25.A.(2).

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

Not applicable.

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26. Procedure for VG-14A Vertical Gyro

A. Removal and Installation Procedure

(1) Remove VG-14A Vertical Gyro.

(a) Disconnect the cable connector.

(b) Remove and save the hardware securing the gyro to the airframe.

(2) Reinstall VG-14A Vertical Gyro.

(a) Secure the gyro to the airframe with the previously saved hardware.

(b) Mate the cable connector with the unit connector.

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Not Applicable.

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27. Procedure for the WC–6X0/8X0 Weather Radar Controller

A. Removal and Reinstallation Procedures

(1) Remove the WC–6X0/8X0 Weather Radar Controller.

(a) Disengage the Dzus fasteners on the unit.

(b) Slide the unit out of the aircraft mounting location and disconnect the cable connector.

(2) Reinstall the WC-6X0/8X0 Weather Radar Controller.

(a) Mate the cable connector with the unit connector and slide the unit into the aircraft mounting location.

(b) Engage the Dzus fasteners on the unit.

B. Adjustment Procedures

Not applicable.

C. Repair Procedures

Replacement of the control knobs.

(1) Use a 0.048–inch O.D., 6 flute, Bristol wrench to loosen the setscrews.

(2) Slide the knob off the shaft.

(3) On new knobs, make sure the setscrews are out far enough to allow the knob to slide onto the shaft. Apply retaining compound to setscrews.

(4) Slide the knob onto the shaft.

(5) Make sure the space between the knob and the front panel is approximately 0.030 inch (0.8 mm).

(6) Tighten the setscrews.

(7) Visually check the spacing between the knob and the front panel to make sure the knob has not slipped during installation.

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28. Procedure for the WU-6X0/8X0 Antenna and Receiver Transmitter Unit

A. Removal and Reinstallation Procedures

(1) Remove the WU-6X0/8X0 Antenna and Receiver Transmitter Unit.

(a) Disconnect the cable connector from the unit.

(b) Remove and set aside the hardware used to attach the unit to the airframe.

(2) Reinstall the WU-6X0/8X0 Antenna and Receiver Transmitter Unit.

(a) Attach the unit to the airframe with the hardware previously set aside.

(b) Mate the aircraft cable connector with the unit connector.

B. WU-650/870 Adjustment Procedures

(1) Elevation Feedback Adjustment

NOTE: This procedure must be done by two persons: one in the cockpit and one at the unit.

WARNING: POSITION THE AIRCRAFT RADAR SYSTEM TO FACE AWAY FROM BUILDINGS, LARGE METAL STRUCTURES, OR OTHER AIRCRAFT IN CLOSE PROXIMITY BEFORE TURNING IT ON. THEY ARE LIKELY TO RETURN LARGE AMOUNTS OF REFLECTED ENERGY AND CAUSE DAMAGE TO THE SYSTEM.

WARNING: DO NOT OPERATE RADAR WITHIN 50 FEET OF OTHER AIRCRAFT OR OBJECTS, OR CLOSER THAN 100 FEET TO REFUELING OPERATIONS.

WARNING: NEVER LOOK DIRECTLY INTO THE ANTENNA (WHILE IT IS OPERATING) FOR PROLONGED PERIODS OF TIME AT A CLOSE RANGE. SERIOUS EYE TISSUE DAMAGE CAN RESULT DUE TO THE HEATING EFFECT OF RADAR ENERGY. THE MAXIMUM PERMISSIBLE EXPOSURE LEVEL (MPEL) BOUNDARY IS A RADIUS OF 9 FT (3.66 M) FOR WU-650/870 UNITS.

(a) Before applying power to the radar, set the SCAN and XMTR toggle switches on the unit housing to OFF (toward antenna).

(b) Level the pitch and roll axes of the aircraft relative to the earth’s surface.

(c) Verify that the mounting surface of the unit is aligned to the pitch and roll reference axes of the aircraft within ± 0.25 degree.

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(d) Apply aircraft power as necessary.

(e) On the WC–XXX Radar Controller, make the following selections:

- RADAR = SBY
- TILT = 0 degrees
- GAIN = Push knob in for preset gain.

(f) During the 45 second wait period, the unit sets the azimuth and elevation to 0.0 degrees independent of any external inputs. The following check/adjustment should be done only during this wait period. Make sure the flat–plate antenna is at 0.0 ± 0.5 degree with respect to the unit mounting surface. If not, adjust the elevation feedback potentiometer R1, so the antenna is at 0.0 ± 0.25 degrees with respect to the unit mounting surface.

NOTE: The elevation feedback potentiometer R1 is located on the right side (viewed looking back at the aircraft) of the yoke/gimbal assembly on the RTA (near the magnetron). The potentiometer does have a black body (early units had a blue–bodied potentiometer). To adjust the potentiometer, loosen the screws on the two shoulder washers that hold the potentiometer body tight against the mounting plate. Adjust the potentiometer and then retighten the screws, making sure the tilt remains at 0.0 ± 0.25 degrees.

(2) Pitch Gain Adjustment

(a) Ensure that SCAN and XMTR switches on the unit housing are set to OFF and controller RADAR switch is set to SBY. The unit is now in pitch and roll calibration mode. (In dual control installations, switch one controller OFF.)

(b) On controller, select preset GAIN. This forces a 0–degree condition in azimuth by the processor. Azimuthal position of the antenna does not matter in calibration mode.

(c) Adjust TILT control on controller for 0 degree on the face of the flat–plate radiator with an inclinometer.

(d) Adjust vertical reference for 25 degrees of nose–up pitch and 0 degree of roll.

NOTE: Great care should be exercised when handling gyros to avoid brinelling the suspension bearings.

NOTE: The pitch (top hole) and roll (bottom hole) gain potentiometers are accessible through holes in the stand next to the unit main connector.

(e) Adjust the top potentiometer (PITCH) A4A1R2 if necessary so the antenna tilts down 25 degrees in elevation or the amount of nose–up pitch injected, while manual GAIN is in preset.

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(3) Roll Gain Adjustment

(a) On controller select variable GAIN.

(b) Adjust the vertical reference for 0 degree of pitch and 25 degrees right wing down.

(c) Adjust the bottom potentiometer (ROLL) A4A1R3, if necessary, so the antenna tilts up 25 degrees in elevation or the amount of right roll injected.

(d) On controller, set the GAIN control to preset and RADAR switch to OFF, and on unit set the SCAN and XMTR switches to ON.

(e) Reinstall the vertical reference in its aircraft mounting location.

(4) Adjust Roll Offset Compensation.

NOTE: This procedure is done while airborne. The roll offset is preset at the factory so the procedure is necessary only if a roll offset error is detected.

(a) At an altitude of 10,000 feet (3,048 meters) or greater above the ground, establish a wings–level cruise attitude.

(b) On the WC–650/870 Radar Controller, select WX Mode, 100 NM range, variable GAIN, and RCT OFF. Observe the VAR is displayed in the WX mode box on the MFD.

(c) Adjust the antenna tilt down until a fairly solid band of ground clutter is visible.

(d) On WC–650 Controllers only, push the RCT button once and then three more times within 4 seconds.

On WC–870 Controllers only, select RCT button ON-OFF-ON-OFF within three seconds by setting RADAR knob between RCT and WX.

VAR should not be displayed. This puts the radar in the roll compensation mode.

(e) Push the RCT button once more or set RADAR knob between RCT and WX again and make sure that VAR is not displayed. If it is, repeat this step.

(f) Adjust the GAIN control on the WC–650/870 Radar Controller until the ground clutter display is symmetrical.

(g) Do not touch the manual GAIN control once the display is adjusted properly.

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(h) Push the RCT button once and then three more times within 4 seconds or select RCT ON-OFF-ON-OFF within three seconds by setting RADAR knob between RCT and WX. This causes the WU–650/870 to exit the roll compensation mode. When VAR is displayed again, the roll compensation mode has been exited.

(i) Set the variable or preset GAIN as desired.

(j) This compensation data is now stored in nonvolatile memory in the WU–650/870 and is not erased when power is removed from the system.

C. WU-660 Adjustment Procedures

(1) Stabilization Trim Adjustments

The PRIMUS 660 Digital Weather Radar System is delivered from the Honeywell factory or repair facility adjusted for correct pitch and roll stabilization and should be ready for use. However, due to the tolerances of some vertical reference sources, the user can elect to make a final adjustment whenever the radar or vertical reference is replaced on the aircraft, or if stabilization problems are observed in flight.

The four stabilization trim adjustments and their effects are summarized in Table 4–3.

Generally, it is recommended that the trim adjustments be performed only if noticeable effects are being observed.

The PRIMUS 660 is designed to use in flight stabilization adjustments. This is faster, easier, and more accurate than the on ground adjustments used in earlier radar systems.

Table 4–3. Stabilization Trim Adjustments

Trim Adjustment	Flight Condition	Effect on Ground Return Display (Over Level Terrain)
ROLL OFFSET	STRAIGHT AND LEVEL	NON–SYMMETRICAL DISPLAY
PITCH OFFSET	STRAIGHT AND LEVEL	GROUND DISPLAYS DO NOT FOLLOW CONTOUR OF RANGE ARCS
ROLL GAIN	CONSTANT ROLL ANGLE >20°	NON–SYMMETRICAL DISPLAY
PITCH GAIN	CONSTANT PITCH ANGLE >5°	GROUND DISPLAYS DO NOT FOLLOW CONTOUR OF RANGE ARCS

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There are two stabilization trim modes available on the display. If the STAB TRIM ENABLE strap (59J1-61) is open, only adjustment of the roll offset is available. If the STAB TRIM ENABLE strap is grounded, roll offset, pitch offset, roll gain and pitch gain are available for adjustment.

If two controllers are installed in the aircraft when the in–flight adjustments are done, one must be OFF.

The in–flight adjustments should be done over terrain as level as possible. The pitch and roll offset adjustments should be done when the aircraft is in straight and level flight. The roll gain adjustment should be done when the aircraft is in a steady roll attitude of at least 20 degrees. The pitch gain adjustment should be done when the aircraft is in a steady pitch attitude of 5 degrees or greater.

(2) Roll Offset Adjustment

(a) At an altitude ≥10,000 feet above ground level and in the 100 NM range, adjust the antenna tilt down until a fairly solid band of ground clutter is visible. Adjust the tilt until the green region of the ground returns start at about 80 NM.

(b) To enter the Stabilization Trim mode, push the STAB key four times within 3 seconds in WX mode (single–control only). A display with text instructions should be displayed. The display has text overlays on the radar data so the ground returns can be seen to make the adjustments.

(c) Pull out the GAIN knob to make a roll offset adjustment. The offset range is from –2.0 to +2.0 degrees and is adjustable by the GAIN knob. The polarity of the GAIN knob is such that clockwise rotation of the knob causes the antenna to move down when scanning on the right side.

(d) While flying straight and level, adjust the GAIN knob until ground clutter display is symmetrical.

(e) Push the GAIN knob in. When the GAIN knob is pushed in, the display returns to the previous message.

(f) Push the STAB key to go to the next menu (Pitch Offset).

NOTE: Installations that have the STAB TRIM ENABLE strap (59J1–61) open do not let you go to the next menu.

(g) If no additional adjustments are to be made, set the MODE switch to any other position to exit the mode and save the values in non–volatile memory.

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(3) Pitch Offset Adjustment

(a) From the Roll Offset entry menu, push the STAB key once to bring up the Pitch Offset entry menu on the display.

(b) To change the pitch offset value shown on the display, pull out the GAIN knob and rotate it. The offset range is from –2.0 to +2.0 degrees.

(c) While flying straight and level, adjust so the contour of the ground returns follow the contour of the range arcs as closely as possible.

(d) When change is completed, push the GAIN knob in. The display returns to the previous message.

(e) Push the STAB key to go to the next menu (Roll Gain).

(4) Roll Gain Adjustment

(a) From the Pitch Offset entry menu, push the STAB key once to bring up the Roll Gain entry menu.

(b) To change the roll gain value shown on the display, pull out the GAIN knob and rotate it. The roll gain adjustment range is from 90 to 110 percent.

(c) While flying with a steady roll angle of at least 20 degrees, adjust the gain for a symmetrical display of ground returns.

(d) When change is completed, push the GAIN knob in. The display returns to the previous message.

(e) Push the STAB key to go to the next menu (Pitch Gain).

(5) Pitch Gain Adjustment

(a) To change the pitch gain value shown on the display, pull out the GAIN knob and rotate it. The pitch gain adjustment range is from 90 to 110%.

(b) From the Roll Gain entry menu, push the STAB key once to bring up the Pitch Gain entry menu.

(c) While flying with a steady pitch angle of 5 degrees or greater, adjust the gain so the contour of the ground returns follow the contour of the range arcs as closely as possible.

(d) When change is completed, push GAIN knob in. The display returns to the previous message.

(e) Set MODE switch to any other position to exit the mode and save the values in non–volatile memory.

(f) Monitor the ground returns displayed by the radar during several pitch and roll maneuvers. Verify that the ground returns stay somewhat constant during changes in aircraft orientations. If not, repeat the adjustment procedure.

D. Repair Procedures

Not applicable.

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SECTION 5
SHIPPING/HANDLING AND STORAGE

Refer to manual, Pub. No. 09–1100–01, for detailed procedures for preparing all System components for storage or shipment.

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SECTION 6
HONEYWELL SUPPORT

1. Worldwide Exchange/Rental Program for Corporate Operators

Honeywell's SPEX® program is a worldwide exchange/rental service for corporate operators. It provides an extensive service for LRU end–item products, complementing our worldwide support center network. An inventory of more than 8000 spare components ensures that your Honeywell–equipped aircraft will be returned to service promptly and economically. This service is available both during and after warranty.

A. Exchange

Upon receipt of an exchange request, Honeywell ships a fully certified unit. The SPEX–provided unit becomes the property of the customer. The customer returns the faulty unit in exchange, to the designated Honeywell Support Center, where it becomes the property of Honeywell. All exchange units are updated with the latest performance reliability MODs on an attrition basis while in the repair cycle.

B. Rental

Upon receipt of a rental request, Honeywell ships a fully–certified unit. The customer then ships the faulty unit to an authorized support center for service. When the faulty unit has been serviced and installed, the rental unit is returned to the designated Honeywell Support Center.

C. Warranty

The SPEX 12–month warranty commences upon the purchase of an exchange unit by the customer at catalog list price.

Any exchange or repair action taken during the New Product or SPEX warranty period does not extend or otherwise affect the warranty expiration date.

Services provided for a failed unit under New Product warranty include:

- Free repair and/or free rental (during repair of unit), or
- Free exchange.

Services provided for a failed unit under SPEX warranty include:

- Free repair and billable rental, or
- Free exchange.

Services provided for a failed unit under repair warranty includes free rental if the customer paid for a billable rental during the initial repair of the failed unit.

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D. Warranty Statement

Honeywell warrants that any article provided under the SPEX program at the time of delivery conforms to all applicable specifications and drawings, and is free of defects in material and workmanship. Honeywell's obligation under this warranty, however, shall be limited to repair of, or at Honeywell's option, replacement of any article which is returned to Honeywell within the stipulated twelve–month warranty period.

For further information regarding exchange or rental units, refer to Honeywell Pub. No. A65–8200–001 or visit our Web site at http://www.cas.honeywell.com and then select Business and Commuter Aviation Systems. From the Quick Reference menu, select Support and Sales Directory.

E. Routine Repair Piece Part Orders

Customers desiring to place routine repair piece part orders, determine order status, upgrade an existing order, or request price and delivery for piece parts should contact the Customer Service Representative in Phoenix, Arizona at:

- Telephone Number . . . . (602) 436–2166
- Fax Number . . . . (602) 436–1500.

F. Exchange and Rental Ordering

(1) Telephone Numbers

Place an order by calling one of the following numbers:

• Inside U.S.A., Dallas, TX	1–800–872–7739
• Outside U.S.A., Dallas, TX	(214) 402–4300
• Canada, Ottawa, ONT	1–800–267–9947
• United Kingdom, Basingstoke	44–1256–51111
• France, Toulouse	33–6171–9662
• Germany, Gauting	49–89–89317–226
(After normal working hours:	49–89–850–3695)
• Singapore	65–542–1313
• Australia, Tullamarine	61–3–330–1411
• Brazil, Sao Paulo	55–11–535–0513.

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(2) Ordering Information

When placing an order, Honeywell needs the following information:

- Part number with dash number of faulty unit
- Serial number of faulty unit
- Aircraft type, serial number, and registration number
- Aircraft owner
- Reported complaint with faulty unit
- Service requested (Exchange or Rental)
- Shipping address
- If faulty unit is in warranty
  - Type of warranty (New or SPEX)
  - Date warranty started
- If faulty unit is NOT in warranty, provide billing address
- If faulty unit is covered under a maintenance contract
  - Type of contract
  - Contract I.D. number
- Purchase order number.

NOTES:

1. Units are shipped same day or within 24 hours.

2. Shipments within the U.S.A. are shipped Next Day Air, P.M. Delivery, unless otherwise specified.

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(3) Return Shipping Procedures

(a) Shipping Container

All components returned to Honeywell must be packed in the same (or Honeywell approved equivalent) container in which the component was received. Components which are received in IMPROPER containers may be subject to DAMAGE charges.

NOTE: Please ship the return unit to the support center indicated on the document provided. Include completed multi-page exchange & rental tag attached to unit, and any additional information, if required.

(b) Shipping Instructions

1 For North America Customers:

Ship via Federal Express Standard Air, two-day delivery. If not served by Federal Express, ship via airline direct airfreight, not via a freight forwarder. Shipment via a surface carrier may result in assessment of LATE RETURN CHARGES.

2 For Europe and Africa Customers

Return unit to the Honeywell Customer Support Center that issued the replacement or with prior arrangement to any one of the following addresses:

- Honeywell Aerospace
  1, Rue Marcel Doret
  31700 Blagnac
  c/o SCAC Air Service
  6, Allee Henri Potez
  31702 Blagnac
- Honeywell Avionics Systems Ltd.
  c/o Burlington Air Express
  Unitiair Centre, Great South West Road
  Feltam, Middlesex TW 14 8NT
  England, U.K.

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3 For Other International Customers

Return unit to the Honeywell Customer Support Center that issued the replacement. Shipments returning to the United States should be via Burlington Air Express. If you are not served by Burlington Air Express, ship via Emery Airfreight or by direct airline airfreight. Consign shipments to:

Honeywell Inc.
c/o F. H. Kaysing Co.
U.S. Customs House Broker
Mid Continent Airport
Wichita, Kansas 67209
U.S.A.

NOTE: Do not insure or declare an insurance value on the bill of lading. Honeywell is self–insured.

2. Test Equipment

Specialized test equipment is not required for normal flight line maintenance of Honeywell avionics. Certain standard, commercially available avionics aids such as ramp (signal) checkers, oscilloscopes, meters, etc., may be useful for more detailed troubleshooting. A breakout box can also be helpful for certain equipment; availability of this item can be discussed with a Honeywell Customer Engineer.

3. Customer Engineering

A key element in Honeywell's corporate operations support is our worldwide customer engineering organization. The members of this group are strategically located around the world. These individuals have earned an excellent reputation within the avionics industry as the result of their high level of education, experience, dedication and responsiveness.

Customer engineering is ready to provide corporate operators with on–site technical assistance, provisioning consultation, training and regulatory agency coordination. In addition, customer engineers provide engineering interface assistance for other interrelated equipment on the aircraft, and support your maintenance engineers and technicians. Continuing assistance is provided through telephone consultation, or at your facility, as requirements dictate.

For the name, address, and telephone number of the Honeywell customer engineer nearest to your facility, please call (602) 436–8981 or your nearest Honeywell support center.

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4. Training

Honeywell's dedicated customer training staff is available to assist corporate operators in acquiring the technical skills and knowledge needed to operate and maintain Honeywell products.

Customer training conducts formal courses on corporate aircraft systems/products at Honeywell's Customer Training Center in Phoenix, Arizona, and at selected locations worldwide. Courses are scheduled annually based on customer interest and new aircraft delivery projections. A regularly updated Honeywell Customer Training Schedule brochure gives full details of all training courses offered.

Honeywell offers the following level of training courses:

- Flight Crew Familiarization
- Line Maintenance Familiarization
- Component Level Repair.

For full details and information on Honeywell training courses or a copy of the Honeywell Customer Training Schedule, contact the Customer Training Department in Phoenix, Arizona at:

- Tel: (602) 436–8972
- Fax: (602) 436–8310.

5. Honeywell Support Centers

For a complete listing of all Honeywell Support Centers, refer to the Corporate Operators Customer Support and Sales Directory, Pub. No. 60–7390–17 or visit our Web site at http://www.cas.honeywell.com/cs/supportcenters/suptcntr.htm.

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SECTION 7
SYSTEM TEST AND FAULT ISOLATION

Refer to manual, Pub. No. A15–1146–075, for PRIMUS 1000 Integrated Avionics System test and fault isolation procedures.

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