ON-SITE SERVICE MANUAL

HP 8642 SYNTHESIZED SIGNAL GENERATOR

HP 8642
SYNTHESIZED SIGNAL GENERATOR
ON-SITE SERVICE MANUAL
(Including Options 001, 002 and 003)

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed:

2427A

rev.24MAY86

For additional important information about serial numbers, see INSTRUMENTS COVERED BY THIS MANUAL in Section 6, General Information.

EAST 24001 MISSION AVENUE, TAF C-34, SPOKANE, WASHINGTON, U.S.A., 99220

Service Manual Part No. 08642-90020

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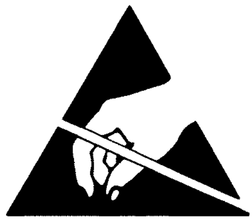

ATTENTION
Static Sensitive Devices

This instrument was constructed in an ESD (electro-static discharge) protected environment. This is because most of the semiconductor devices used in this instrument are susceptible to damage by static discharge.

Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity of a static charge. The results can cause degradation of device performance, early failure, or immediate destruction.

These charges are generated in numerous ways such as simple contact, separation of materials, and normal motions of persons working with static sensitive devices.

When handling or servicing equipment containing static sensitive devices, adequate precautions must be taken to prevent device damage or destruction.

Only those who are thoroughly familiar with industry accepted techniques for handling static sensitive devices should attempt to service circuitry with these devices.

In all instances, measures must be taken to prevent static charge build-up on work surfaces and persons handling the devices.

For further information on ESD precautions, refer to "SPECIAL HANDLING CONSIDERATIONS FOR STATIC SENSITIVE DEVICES" in Section VIII Service Section.

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYERS'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

SAFETY CONSIDERATIONS

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product is a Safety Class I instrument (provided with a protective earth terminal).

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage and the correct fuse is installed.

SAFETY EARTH GROUND

An uninterruptible safety ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set.

SAFETY SYMBOLS

⚠ Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).

Indicates hazardous voltages.

⏚ Indicates earth (ground) terminal.

WARNING The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

SAFETY CONSIDERATIONS

WARNING

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection).

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the power source.

Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.). Do not use repaired fuses or short circuited fuseholders.

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GENERAL INFORMATION

Introduction

1-1. INTRODUCTION

This On-site Service Manual contains information required for a qualified service technician or engineer to perform module level repair on the HP 8642A/B Synthesized Signal Generator. (For component level troubleshooting information, refer to the HP 8642A/B Synthesized Signal Generator Service Manual.) The HP 8642A/B Synthesized Signal Generator will generally be referred to as "HP 8642" or "instrument" in this manual.

1-2. GLOSSARY

The following is a list of terms which are new and/or important to the understanding of the information presented in this manual. Each term or phrase contained in this glossary has been underlined at the point where it is first introduced in this section.

Calibration. When a module is replaced in the HP 8642, the instrument is recalibrated by down loading the calibration data provided for the replacement module into the instrument. (No manual adjustments or additional test equipment is necessary.)

Calibration Data. Control data created for an individual module which enables it to meet all of its performance standards (some modules do not require calibration data for their operation).

Down-load. Refers to the transfer of calibration data from an A20 Calibration Module to the instrument.

HP 8642A/B. Two models of the HP 8642 are currently being produced: The HP 8642B replaces the A16 Attenuator Module, contained in the HP 8642A, with the A19 Doubler (frequency)/Attenuator Module. (All other circuitry is the same in both models.)

Instrument Level Diagnostics (ILD). Comprehensive testing designed to check the over-all operation of the instrument.

Module. An electrical assembly within the HP 8642 which can be replaced on site; that is, those assemblies contained in the On-site Service Kit.

Module Level Diagnostics (MLD). Module specific test routines designed to fully interrogate the operation of a module.

Module Swap Principle. States that when individual modules that have been calibrated and tested to meet their own input and output performance standards are connected in an instrument, the instrument can also be considered fully calibrated and capable of meeting all of its performance specifications. This principle has been validated by comprehensive testing during development of the HP 8642.

On-site. The location of the instrument when in normal operation.

Substitution (module). The process of connecting a known good substitute module into the circuit in order to by-pass a suspect module.

Task Sequence Diagrams. Inference diagrams designed to provide the user with a systematic approach to testing. Each diagram consists of Task Arrows (indicating the task to be performed), Result Blocks (describing each possible test result condition), and Gotogons (used when necessary to direct the user to some other location in the manual).

Up-load. Refers to the transfer of calibration data from the instrument to the A20 Calibration Module.

Verification. a.) Testing done to determine the integrity of a specified portion of circuitry. b.) Post repair testing to confirm that the failure detected prior to the repair has been eliminated.

1-3. ON-SITE SERVICE TRAINING

The remainder of this section contains information about the HP 8642 and this manual that you should know before making an on-site service call. The information is presented in three parts:

- **ON-SITE SERVICE STRATEGY**
- **HP 8642 SERVICE DESIGN**
- **PUTTING IT ALL TOGETHER**

NOTE

It is important that you become familiar with the information in this section before making an on-site service call.

1-4. ON-SITE SERVICE STRATEGY

The strategy for on-site service of the HP 8642 is to provide an instrument and support plan which will enable a trained service person to successfully repair at least 80% of the field failures within 2 hours of beginning service on-site. (Repair times may be longer for those with no prior training or experience on the HP 8642.)

1-5. HP 8642 SERVICE DESIGN

The following paragraphs describe the instrument's service features that will enable you to make an on-site repair.

Modular Design. Each major electrical function in the instrument is contained within a single module. On-site troubleshooting is to the module level using techniques similar to those used for troubleshooting a system of individual instruments.

Figure 1-100, RF Section Signal Flow Diagram, shown on the first foldout at the back of this section, shows all the modules contained in the RF section and each signal path that connects them. (Note the absence of any feedback paths between the modules.) (A brief theory of operation and a simplified block diagram for each module are included in the **Diagnostics** section of this manual.)

COMMENTS

It is not essential to understand the internal operation of each module in order to make an on-site repair.

The physical location of each module within the instrument is shown by a **Top View Diagram** *located on the inside top cover of the instrument. Color is used in the* **Top View Diagram** *and in this manual to designate the three sections of the instrument: Blue - RF (analog) Section; green - Control Section; and red - Power Supply Section.*

Accessible Signals. A single distribution assembly uses ribbon cable connections located on the tops of the modules to pass all signals from the Power Supply Section and Control Section to the RF Modules. Most signal path checks required for on-site service of the HP 8642 can be made with only the top cover removed.

Built-in Test Capability. The instrument has both a DC Voltmeter and an RF Power Meter built into it.

Complete instructions for using the internal voltmeter and power meter are included in the diagnostics procedures. **Table 1-1** lists the measurement parameters for the voltmeter and power meter when used in their manual modes of operation. (Due to the relatively low accuracy of the built-in voltmeter and power meter, both are primarily used to establish the presence of desired signals rather than their absolute accuracy.)

Table 1-1. Measurement Capabilities

	Range	Accuracy
Voltmeter	−55 to +15 Vdc	±.5%
Power Meter	−10 to 0 dBm 0 to +10 dBm +10 to +20 dBm	±5 dB ±3 dB ±2 dB

System Controller. The HP 8642 can control peripheral devices (such as a printer) via its HP-IB. (Refer to the **HP-IB/Remote Diagnostics** section for further information on using the HP 8642's HP-IB capabilities for on-site support.)

Internal Diagnostics. The HP 8642 can provide extensive critical data about its own operating condition. This data is provided in the form of alpha-numerically coded service messages. (The service messages can be displayed on the front panel or output to a printer via HP-IB.) The instrument's over-all operating condition, as well as the operating condition of individual modules, can be checked using the self-diagnostic routines contained in the firmware of the HP 8642.

The following internal diagnostics provide both fault detection and fault isolation for the HP 8642.

Automatic Fault Detection

The following Diagnostics provide automatic fault detection for the instrument.

Power-Up Self Check. This test sequence runs automatically each time the instrument is powered up and provides a functional check of the instrument's over-all operation.

Fault Detection. During normal operation, critical sense points within the instrument alert the internal controller when a malfunction occurs. The controller reacts by queuing up the appropriate error message(s) in the instrument's message buffer. The controller will cause the entire front panel display to blink until the malfunction is repaired and the message buffer has been cleared.

User Initiated Diagnostics

The following diagnostics provide fault isolation capability for the instrument.

Instrument Level Self Test. This test sequence is designed to provide an extensive check of the instrument's over-all operating condition. The objective of this diagnostic is to identify the module of highest probable cause. (The test sequence begins with a test of the Control Section to verify its ability to test the rest of the instrument.)

Module Level Diagnostics. These individual tests allow you to check the operation of any module in the instrument. The objective of these tests is to isolate the malfunction to circuitry within a suspect module or to external circuitry on which the module depends for its operation.

On-Site Service Kit

Two transit cases contain a complete set of the modules in the HP 8642. They also contain an A20 Calibration Module (carrying calibration data stored on EEPROM's) for each module that requires calibration data for its operation.

NOTE

Loading the calibration data provided with a replacement module, into the Control Section of the instrument, enables the replacement module to meet all of its calibrated performance standards without requiring any manual circuit adjustments or additional equipment.

Many spare parts and tools required for on-site repair are also included in the kit. For a complete listing of the parts contained in the On-Site Service Kit, refer to the **REPLACEABLE PARTS** section of this manual. For a complete listing of tools that are not contained in the On-Site Service Kit but are sometimes needed for on-site service, refer to paragraph **5-2. TOOLS**, in the **MECHANICAL PROCEDURES** section.

1-6. ON-SITE SERVICE OVERVIEW

The following outline is the process *model* used to develop on-site troubleshooting for the instrument.

1. **PRE-SITE PREPARATION**
   - Query User
   - Check contents of Service Kit

2. **INSTRUMENT LEVEL DIAGNOSTICS**
   - Begin troubleshooting to identify module of highest probable cause.

3. **MODULE LEVEL DIAGNOSTICS**
   - Test suspect module to isolate detected failure to the module itself or to another module on which the suspect module depends for its operation.

4. **REPLACING A MODULE**
   - Install Module
   - Down-load calibration data
   - Verify repair

1-7. HOW TO BEGIN TROUBLESHOOTING THE HP 8642

Pre-Site Preparation

1. Find the tab labelled **Pre-Site Preparation**. This section contains guidelines for contacting the user prior to making the on-site call. A pre-site telephone call will help you to answer the following questions:

   - Does the failure seem to be on-site repairable?
   - What, if any, additional test equipment will be needed?

Instrument Level Diagnostics

1. Find the tab labelled **Instrument Level Diagnostics.**

2. Pull out the foldout at the back of the **Instrument Level Diagnostics** section and locate the Task Sequence Diagrams shown under **INSTRUMENT LEVEL DIAGNOSTICS**. These diagrams guide you through the process of determining the appropriate module to troubleshoot first.

3. Also, find the **MODULE TROUBLESHOOTING ORDER** chart on the foldout. This chart lists all the modules in the instrument in the order in which they should be tested.

   NOTE

   The troubleshooting order is based on signal dependency between the modules as shown in **Figure 1-100** *(on the first foldout) at the back of this section. Determining the correct module to troubleshoot* **first** *is often necessary since a defect in one module will often cause subsequent modules to indicate malfunctions as well.*

4. Fold the **Instrument Level Diagnostics** foldout back into the manual.

1-8. HOW TO ISOLATE THE DETECTED FAILURE

Module Level Diagnostics

1. Find the tab labelled "**A13**" in the **Diagnostics** section. (All the module level tests for the **A13 Module** are contained in this section.)

2. Pull out the foldout at the back of the **A13** section.

3. Find **A13 MODULE SUBSTITUTION** on the foldout. The Task Sequence Diagram shown in this block guides you through the process of testing the operation of the suspect module by substituting a known good module, from the On-site Service Kit, into the circuit.

NOTE

In most cases, the module substitution test only requires connecting input and output cables to the known good module without installing it in the instrument.

4. Find **A13 INPUTS VERIFICATION** on the foldout. If the same failure conditions were indicated with a known good module substituted into the circuit (or if a known good module was not available) the next step is to check each input to the module. These Task Sequence Diagrams guide you through the process of checking each RF, control and power supply input signal to the **A13 Module**.

5. Find the **A13 MODULE CABLE CONNECTIONS LOCATOR** on the foldout. This is a top view diagram of the HP 8642 that shows **A13's** location in the instrument and the location of each cable connection on **A13** which is involved in on-site repair.

6. Find the **A13 MODULE I/O SIGNALS DIAGRAM** shown on the right of the foldout. This provides a system overview of all parts on which the **A13 Module** directly depends for its operation.

7. The procedures for completing each task shown in the Task Sequence Diagrams are provided on the text pages immediatly preceding the foldout. Find the procedure listed
A13.12
for


This test is designed to check the voltage level on each power supply input to the **A13 Module**.

8. Familiarize yourself with the test now by reading the first sentence or phrase after each step number. The instructions are formatted so that scanning the procedures in this way will give you a preview of the test (previewing each test will help you to perform the test procedure quickly and accurately).

9. Fold the **A13 Module** foldout back into the manual.

10. Pull out the foldout at the end of the **A12 Module** section. The Task Sequence Diagrams on this foldout provide an example of how the process model is modified when necessary to provide the best test strategy for each module. Here (and also on the **A11 Module**), the inputs are checked first because of an added risk factor involved in the **A12 Module** substitution technique.

11. Find the Task Sequence Diagram entitled **1. A12 RF INPUT CHECK** on the foldout. Note the Result Blocks that indicate specific error codes for determining which task to perform next. (The slash S (/S), placed at the end of the word "ERROR/S" in these Result Blocks, implies that the test path should be taken if you observe any one or more of the error codes in the given range.)

12. Fold the **A12 Module** foldout back into the manual.

Exceptional Cases

Due to limitations of the diagnostic routines and the built-in test equipment, the test procedures contained in this manual are not able to isolate all possible failures in the instrument. The last portion of the **DIAGNOSTICS** section, **Exceptional Cases**, contains help for troubleshooting many of these failures.

1-9. HOW TO KEEP TRACK OF TEST RESULTS

To enable you to track the test process and monitor the effects circuit manipulation has on specified tests, we recommend that you record the results of each test performed. The **HP 8642 ON-SITE TEST RECORD** sheet, located at the end of the **Pre-Site Preparation** section, provides a convenient means for recording all test data. (A single copy of the test record sheet is provided in this manual for use as a master copy for reproducing additional copies.)

The top portion of the record sheet provides space for recording information obtained from the user during the pre-site investigation. (Further information on contacting the user is provided in the **Pre-Site Preparation** section.)

The main portion of the record sheet is setup for recording test data. Space has been left on the back of the page for your comments. (Please indicate the difficulty or success you experience in performing the on-site service.) After the on-site service has been completed, please send the test record sheet to us at the mailing address shown at the bottom of the test record sheet. (Your feedback will help us to provide documentation that best meets your needs.)

1-10. ON-SITE MANUAL OVERVIEW

The following descriptions provide a brief overview of the contents and purpose of each section in this manual.

Introduction. Contains a brief overview of the on-site service strategy, a description of the HP 8642's service features, and guidelines for using this manual. You should become familiar with the training information in this section before making an HP 8642 on-site service call.

Pre-Site Preparation. Provides guidelines for preparing for an on-site service call including: Contacting the user, evaluating the failure, and selecting any necessary test equipment.

Diagnostics. Presents the on-site diagnostic test procedures in a systematic approach to module level troubleshooting. The **Diagnostics** section is sub-divided to provide individual troubleshooting strategies for each section of the instrument.

Replacing a Module. Contains a systematic approach for replacing each module in the instrument, including procedures for digital calibration of the instrument following a module replacement.

Mechanical Procedures. Contains a complete list of procedures for every assembly and disassembly task required for on-site service of the HP 8642. A table of **Mechanical Procedures**, located on a foldout at the back of the section, *serves as a directory* to the procedures for each assembly.

HP-IB/Remote Diagnostics. Contains descriptions and procedures for using the instrument's HP-IB capabilities as an aid to on-site service.

General Information. Contains general information related to on-site service support for the HP 8642.

Replaceable Parts. Contains ordering information for the parts contained in the On-Site Service Kit.

Service Notes. This section is intended for storage of Service Notes and other information pertinent to on-site service of the HP 8642.

1-11. PUTTING IT ALL TOGETHER

The remaining portion of this section describes how the HP 8642, the On-Site Service Kit, and this manual are used together to perform an on-site service. The description involves an analogy that demonstrates the key principles of the on-site service strategy for the instrument. This analogy may seem unusual but it is relatively brief. It will take about five minutes to cover, and will provide valuable insights into the on-site support process and service techniques for the HP 8642.

On-Site Service - Year 2085

The following analogy between an HP 8642 and a satellite system in need of repair, demonstrates the on-site repair process.

Imagine you are on board an intergalactic patrol ship which has been given the task of maintaining a system of communication satellites positioned throughout the three charted galaxies: Blue Galaxy, Green Galaxy, and Red Galaxy.

The Diagnostics Computer, on board your ship, has just indicated that a satellite malfunction has been detected somewhere in the system.

You have several tools to assist you in isolating the malfunction, including a System Service Manual. The System Service Manual contains instructions and diagrams which will aid you in performing and interpreting the diagnostics tests built into the satellite system.

COMMENTS

Coincidentally, the instructions and diagrams found in the System Service Manual bear a striking resemblance to those found in the HP 8642's On-site Service Manual.

To gain the greatest insight into the isolation process as you proceed through this analogy, it will help you to know ahead of time that the **S12 Satellite** *is the defective satellite.*

The isolation process is divided into two levels: **SYSTEM LEVEL DIAGNOSTICS** and **SATELLITE LEVEL DIAGNOSTICS.**

1-12. INTRODUCTION TO SYSTEM LEVEL DIAGNOSTICS

This is the **System Level Diagnostics** section. It contains test procedures for checking the operation of the entire system.

The objective of this section is to identify the appropriate satellite to begin troubleshooting first.

COMMENT

> *This section is analogous to the* **Instrument Level Diagnostics** *section in this manual.*

Test Instructions

1. **Pull out the second foldout at the end of this section now.**

2. Find **SYSTEM LEVEL DIAGNOSTICS** on the foldout.

COMMENT

> *The two Task Sequence Diagrams shown under* **SYSTEM LEVEL DIAGNOSTICS**, *are provided to direct you through the testing process. The first diagram,* **1. OVER-ALL SYSTEM CHECK**, *begins with a Task Arrow which indicates the title and task number of the first task to perform,* **SL.01.**

3. Begin now by performing the **TEST SYSTEM** procedure, **SL.01**, provided on the next page.

Type:	Systems Test	**SL.01**
Run Time:	N/A	
Set-up Time:	N/A	

COMMENT

A title block, like the one shown above, is placed at the beginning of each procedure in this manual. In actual use it will provide you with the run time and set-up time for each task as well as a brief description of the type of task to be performed.

The on-board Diagnostics Computer, which keeps you continuously informed about the systems operating condition, also provides you with the capability of conducting a comprehensive test of the entire satellite system.

The following procedure simulates the running of the **System Level Self Test**. Proceed through steps 1 through 4 now.

<u>**Run Test**</u>

1. Begin Testing:
   - To begin the test, you have entered the command into the computer which initiates the **System Level Self Test.**

2. After completing the test, the computer returns the following test results:

   DIAGNOSTIC DONE

   Test Failures Indicated For:

   Satellite S13
   Satellite S14
   Satellite S19

3. To determine next task:
   - Return to the foldout and find the **SL.01**, **TEST SYSTEM**, task arrow again.
   - Follow the paths on the diagram that lead from **SL.01** to the three result blocks. (These result blocks indicate the three test result possiblities for the **SL.01** task.)

COMMENT

By comparing the test results indicated in step **2** *above to the result description in each result block shown for task* **SL.01**, *it becomes apparent that the*

result block

best describes the results of this test.

4. Continue task sequence:
   - Follow the path through the result block to the gotogon labelled **GO TO STEP 2**.

COMMENT

Step **2. TROUBLESHOOTING ORDER** *is the second diagram shown on the foldout below* **SYSTEM LEVEL DIAGNOSTICS**. *As always, begin testing with the first task shown on the diagram,* **SL.02**.

   - Turn now to the following page and begin the procedure provided for **SL.02**.

Type:	Identify Probable Cause	**SL.02**
Run Time:	N/A	
Set-up Time:	N/A	

The objective of this procedure is to determine which of the satellites that indicated failures (**S13**, **S14**, or **S19**) is the appropriate satellite to begin troubleshooting first.

COMMENT

The diagram shown below indicates the location of each satellite within the Blue Galaxy. The satellites are linked by a feed-forward signal path (indicated by the broken lines on the diagram). This creates a linear dependency between the satellites in which any given satellite's operation is not only dependent on its own internal circuitry, but also on the integrity of the signal sent to that satellite from the preceding satellite in the signal path. This same linear dependency exists between the RF Modules in the HP8642 (as shown in **Figure 1-100***).*

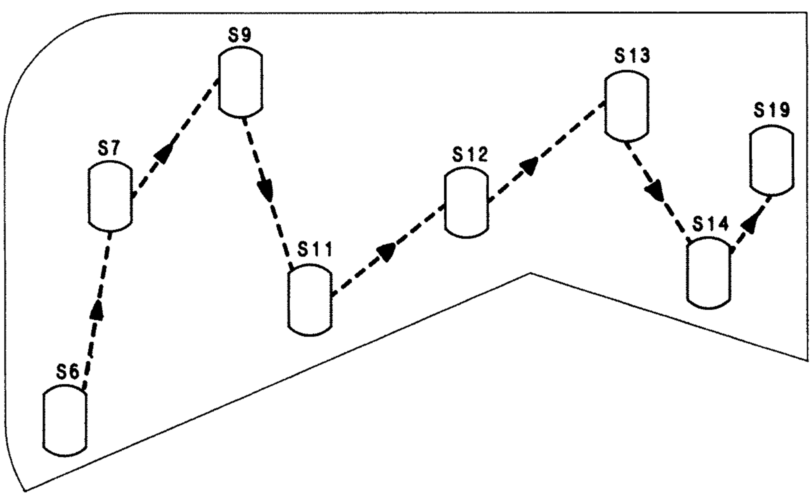


Figure 1-1. Signal Flow Between Satellites in the Blue Galaxy

1. Determine troubleshooting order:

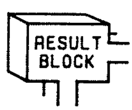
   - The following chart indicates the appropriate troubleshooting order for all satellites within the Blue Galaxy, based on their interdependency.

Troubleshooting Order for Blue Galaxy

Satellite	Troubleshooting Order Number
S6	1
S7	2
S9	3
S11	4
S12	5
S13	6
S14	7
S19	8

COMMENT

*Based on the interdependancy of the satellites which indicated failures (***S13***,* **S14***, and* **S19***) it becomes appropriate to test the operating condition of* **S13** *before further testing the* **S14** *or* **S19** *satellites.*

2. Return to foldout:
   - Once again, determine the next task to perform by comparing the results of this task to the conditions shown in each of the three 

for **SL.02**.

COMMENT

Now that a suspect satellite has been identified, it is time to move to the next level of fault isolation, **Satellite Level Diagnostics (SLD)**. *As shown in the diagram, the path that connects to the correct block,* **S13 PROBABLE CAUSE**, *also leads to a gotogon labelled* **GO TO S13 SLD.**

   - Proceed to the next page where the instructions are given for performing the Satellite Level Diagnostics for the **S13 Satellite**.

1-13. INTRODUCTION TO S13 SATELLITE LEVEL DIAGNOSTICS

This is the **S13 Satellite Level Diagnostics** section. The test procedures in this section are used to further interrogate the **S13 Satellite**. The objective is to isolate the failure indicated for this satellite to the satellite's own internal circuitry or to an external signal source on which the satellite depends for its operation.

COMMENT

This section is analogous to the Module Level Diagnostics which are provided for each module.

<u>S13 Test Instructions</u>

1. Find **S13 SATELLITE LEVEL DIAGNOSTICS** on the foldout.

2. Use the Task Sequence Diagram, shown under **S13 SATELLITE LEVEL DIAGNOSTICS**, to direct you through the testing process.

3. Begin now by performing the first task shown on the diagram, **S13.01**.

Type:	Satellite Substitution	**S13.01**
Run Time:	N/A	
Set-up Time:	N/A	

The most efficient way of isolating a detected failure is to remove the suspect part from the system and recheck the systems operation.

You are able to do this by positioning one of the substitute satellites, currently stored in the patrol ship, near **S13**. The substitute satellite is capable of intercepting **S13's** incoming signals, processing them, and transmitting the appropriate output signal to the next satellite, **S14**.

Run Test

1. Characterize failure:
   - A comprehensive satellite level test is run on the failing **S13** satellite *before* making the substitution and all test results are recorded.

2. Make substitution:
   - Substitute satellite is placed in position to intercept **S13's** input signals.

3. Rerun satellite level test:
   - Test is rerun with suspect satellite now substituted *out* of system.
   - The following are the error code lists generated by the **S13** satellite level tests performed *before* and *after* substitution:

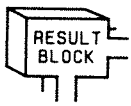
   Error codes indicated *before* substitution:
   .M06, .M07, .M10, .M11, .M77

   Error codes indicated *after* substitution:
   .M06, .M07, .M10, .M11, .M77

4. Compare test data taken *before* and *after* substitution:

COMMENT

By comparing test data (error codes) returned before and after the substitution, it becomes apparent that the system displays the exact same failure characteristics with the suspect satellite out of the system as it did with it in.

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

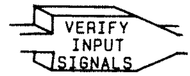
 for **S13.01, SUBSTITUTE SATELLITE.**

COMMENT

The result block labelled **SAME S13 ERRORS** *best describes the results of this test. Follow the path through to determine the next task to perform.*

Type: Power Levels Test
Run Time: N/A
Set-up Time: N/A

S13.02



Since the same failure condition was indicated with a known good **S13** Satellite substituted into the system, it now appears that the detected **S13** failure is being caused by an in-comming signal which prevents **S13** from operating correctly. To isolate the failure source, it becomes necessary to check the integrity of each input signal to **S13**.

Run Test

1. Identify input signals:

COMMENT

The **S13 SATELLITE I/O SIGNALS DIAGRAM**, *shown on the foldout, shows all signals which pass to and from* **S13**. *(***S5**, *the system's Central Distribution Link, distributes all control and power source signals throughout the system.)*

2. Check input signals:
   - The first signal tested is the signal sent to **S13** from **S12**.

COMMENT

Upon testing this signal, you find its power level to be far below the minimum required level.

3. Check **S12** further:
   - Upon arriving at **S12**'s location, an initial visual inspection reveals that **S12**'s output antenna has sustained physical damage.

COMMENT

The diagnostics did not indicate an **S12** *failure because the test points located in* **S12**'s *circuitry, which sense and transmit information about* **S12**'s *operation, are not able to sense the operating condition of its output antenna.*

The satellite's output antenna is analogous to a certain amount of circuitry in the output stage of each module in the HP 8642. Fault detection for this circutry is provide by the sense points in the following module.

4. Confirm **S12** failure:
   - The substitution procedure is now used to test **S12**.

COMMENT

Testing indicates **no** *failures with* **S12** *substituted out of system. This verifies that the failures indicated for* **S13** *were being caused by the bad signal sent from the* **S12 Satellite**.

5. Replace **S12**:
   - The defective **S12 Satellite** is now completely removed from the system and a replacement satellite is inserted in its place.
   - The **System Level Self Test** is then rerun, providing verification that the entire system is again up and fully operational.

COMMENT

Repair of the defective **S12 Satellite** *can now be made without further effect to the system's operation. After the* **S12 Satellite** *has been repaired, it will be placed in the patrol ship's stock to replace the satellite used to repair the system.*

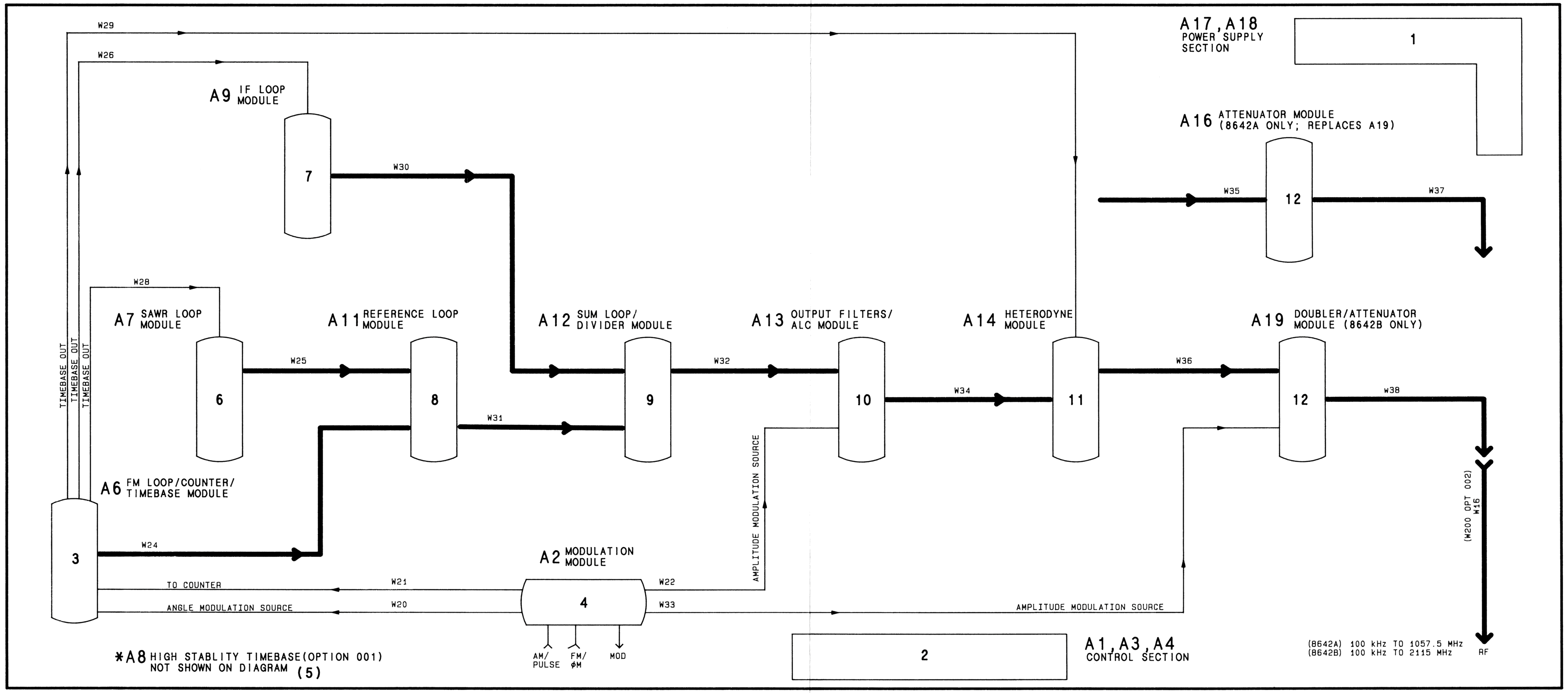


Figure 1-100. RF Section Signal Flow Diagram.

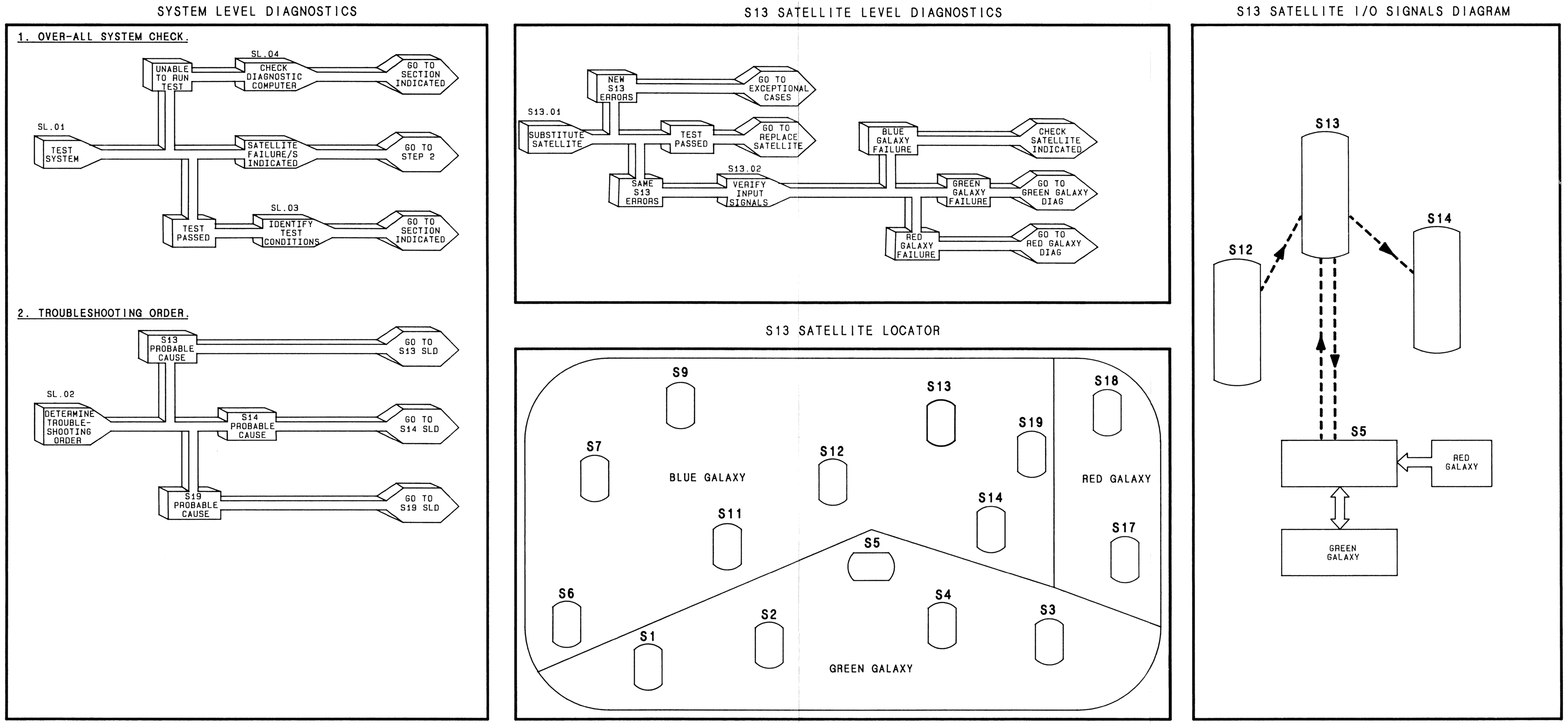


Figure 1-101. Satellite Diagnostics Analogy

Pre-Site Preparation

2-1. INTRODUCTION

This section contains information to help prepare you for an on-site service call for the HP 8642. Read this section to determine:

- What information about the HP 8642 should you know *before* making an on-site service call?
- What information about the failure should you know *before* making an on-site service call?
- What equipment will you need to take on the on-site service call?

2-2. ON-SITE SERVICE STRATEGY

It is important that you understand the on-site service strategy for the HP 8642 before making an on-site service call. An explanation of the service strategy, a description of the instrument's service features which make on-site service possible, and a guide to using this manual are found in the first section of this manual, **INTRODUCTION**.

If you have *not* taken the HP 8642 On-Site Service Training Course, it is essential that you read the training information provided in the **INTRODUCTION** Section of this manual before proceeding in this section. If you have taken the HP 8642 On-Site Service Training Course, but have forgotten some of the material which was covered, read the **INTRODUCTION** Section now as a refresher to the fundamentals of performing an on-site repair.

2-3. CONTACT USER

To help you prepare for an on-site service call we recommend that you contact the HP 8642 user prior to arriving on-site. This pre-site contact will help you make the following determinations about the failure.

- What is the nature of the failure?
- Does the failure fit into the category of on-site repairable problems?
- What, if any, additional test equipment will be needed?

The **HP 8642 ON-SITE TEST RECORD** sheet, found in this manual, provides space for recording the user's description of the failure. (Refer to the **INTRODUCTION** Section for additional information on using the test record sheet.)

User Comments

To make the determinations listed under **2-3. CONTACT USER**, ask the following questions.

1. Does the **HP** 8642 power-up to an operational condition? (If not, how does the instrument respond when connected to a known good power source with the (POWER) switch in its **ON** (recessed) position; i.e., does the instrument show any signs of life at all?)

2. Does the HP 8642 generate any error message(s) as a result of the failure? (If not, how was the failure detected and how does it affect the HP 8642's operation?)

3. Does the failure occur consistently (rather than intermittently)?

Additional Information

If circumstances permit, it is useful to guide the user through the **Instrument Level Diagnostics** procedure found in the **DIAGNOSTICS** Section of this manual. Continue with the diagnostics as far as circumstances permit. Use the on-site test record sheet to record the test results.

2-4. HOW TO EVALUATE THE USER'S COMMENTS

After you have contacted the user, look over the failure data to determine if it appears the failure can be repaired on-site. The following guidelines are provided to help you make this determination.

1. If the answer was *yes* to the three questions listed under **User Comments**, or if you were able to use the diagnostic procedures to identify a suspect section or module within the HP 8642:

   - The probability of completing an on-site repair is high, and the probable need for additional test equipment, other than the On-Site Service Kit, is low.

2. If the failure condition *does not* provide a yes answer to all three of the questions listed under **User Comments**, and if you were not able to use the diagnostics to isolate the failure to a section or module within the instrument:

- Check the following list of failure conditions for the one that best describes the instrument's failure. Then reference to the **Repair Recommendation** provided for that condition.

Condition 1. Instrument does not power-up to an operational condition.

Condition 2. Failure *does not* cause instrument to generate any error message.

Condition 3. Failure *does* cause instrument to generate an error message, but failure occurs intermittently.

Repair Recommendations for Condition 1

If the instrument does not power-up to an operating condition, the probability for completing an on-site repair is still high. However, you will probably need a Digital-Multimeter, as well as the On-Site Service Kit, to perform the repair. Follow the procedures provided in the Instrument Level Diagnostics Section to begin isolating this problem.

Repair Recommendations for Condition 2

Many failure conditions which are not detected by the HP 8642 during its normal operation can be detected by the diagnostic procedures provided in this manual. Failure conditions which cannot be detected by the diagnostics provided for the HP 8642 reduce the probability of completing an on-site repair. (For further information on servicing a failure of this type, refer to the **Exceptional Cases** section of this manual.)

Repair Recommendations for Condition 3

Failures which occur intermittently impede the HP 8642's ability to provide reliable failure data. However, there are certain techniques which, when used in conjunction with the diagnostic routines, permit effective troubleshooting of the instrument. (See the **Exceptional Cases** portion of the **DIAGNOSTICS** Section which describes the techniques for troubleshooting intermittent failures.)

2-5. CHECK THE ON-SITE SERVICE KIT

To be sure that you will have all the tools and parts you need to service the HP 8642 once you arrive on-site, check the contents of both kit cases before you leave. (Both cases contain a parts locator that identifies each part and its location in the case.) Check for any defective modules which may have been left in the case after a previous on-site repair (defective modules should be designated by a red flag inserted in the slot along with the module).

Due to the limited quantity of test record sheets provided in this manual, we suggest you set aside this copy to use as a master for reproducing additional copies.

HP 8642 ON-SITE TEST RECORD

Pre-Site Phone Call Made to: ______________________ Time of Call: __________

User Comments: ______________________
1. Power-up Condition: ______________________
2. Error Messages: ______________________
3. Failure Description: ______________________

Equipment Needed:
☑ On-Site Service Kit

Additional Equipment:
☐ Power Measuring Device
☐ Oscilloscope
☐ DMM
☐ Other __________

DIAGNOSTICS

On-Site Service Call Made By: ______________________ Time of Arrival: __________

Instrument Level Diagnostics (ILD)

Instrument Level Self Test: ☐ Unable to run ☐ Passed ☐ Failed
Module(s) or Section Indicated: ______________________
Failure Description (error messages): ______________________

Instrument Level Self Test: ☐ Unable to run ☐ Passed ☐ Failed
Module(s) or Section Indicated: ______________________
Failure Description: ______________________

Instrument Level Self Test: ☐ Unable to run ☐ Passed ☐ Failed
Module(s) or Section Indicated: ______________________
Failure Description: ______________________

Module Level Diagnostics (MLD)

Task Number: __________ ☐ Passed ☐ Failed
Failure Description (error messages): ______________________

Task Number: __________ ☐ Passed ☐ Failed
Failure Description: ______________________

Task Number: __________ ☐ Passed ☐ Failed
Failure Description: ______________________

Task Number: __________ ☐ Passed ☐ Failed
Failure Description: ______________________

Task Number: __________ ☐ Passed ☐ Failed
Failure Description: ______________________

Task Number: __________ ☐ Passed ☐ Failed
Failure Description: ______________________

Module Level Diagnostics (Cont'd)

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

REPLACING A MODULE

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

Task Number: ______________ ☐ Passed ☐ Failed
Failure Description: ______________

COMMENTS

Module ID Number: ______________ Time Finished: ______________
Your Comments: ______________

Please return to: Hewlett-Packard—Technical Writing, 1620 Signal Drive, TAF C-34, Spokane, Washington 99220 (509) 922-4001 ext. 3407

Instrument Level Diagnostics

3A-1. INTRODUCTION

WARNING

The HP 8642 is extremely heavy. Do not lift or carry the instrument without assistance.

If the instrument is rack mounted, do not pull the instrument from the rack without assistance.

The **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** are the first level of troubleshooting for the **HP 8642**. The objective of this group of tests is to isolate the source of a detected failure to the correct section of the instrument: **Power Supply, Control** or **RF Section**. The **ILD** should be used to determine the appropriate place in the instrument to begin module level troubleshooting.

NOTE

Testing at this level requires two BNC coax cables not supplied in the On-Site Service Kit.

Test Instructions

1. **The last page in this group of tests is a foldout and should be pulled out now.**
2. Find **INSTRUMENT LEVEL DIAGNOSTICS** on the foldout.
3. Use the Task Sequence Diagram, shown under **INSTRUMENT LEVEL DIAGNOSTICS** to direct you through the testing process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown on the diagram.

Type:	Instrument Level Self Test	**IL.01**
Run Time:	6 min 30 sec	
Set-up Time:	1 min	

The **Instrument Level Self Test (ILST)** is designed to check the operation of each module in the instrument.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**". (See foldout for setup diagram.)
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When test is complete
   "**DIAG DONE HIT MSSGS .VI**" will appear:
   - Use [MSSG] to scroll through messages.
   - Record each **module number** indicated. (See Front Panel Diagram on foldout to locate **module number** in display message.)

COMMENT

*If "***NO MESSAGES .00***" appears:*
Then all modules have **passed** *the Instrument Level Self Test. (The Instrument Level Self Test indicates test failures only.)*

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each for **TEST INSTRUMENT**.

Type:	Supply Lines Check	**IL.02**
Run Time:	2 min	
Set-up Time:	2 min	

1. Remove Top Cover. (See table on foldout in **MECHANICAL PROCEDURES** to locate Top Cover removal information.)

2. Connect **external DC** voltmeter **ground lead** to instrument's chassis.

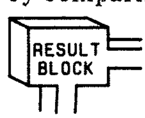
3. Measure **Power Supply** output voltage levels on **A17 Module** at test points **TP1 through 5**. (See Top View Diagram on inside of Top Cover for test point locations and voltage levels.) Voltages should be within approximately **1%** of those shown with test points on Top View Diagram.

4. The tuning screws located next to **A17TP1 through 5**, can be used to fine tune voltage levels which are slightly high or low.

COMMENT

The voltages measured at A17TP1 through 5 are being fed back from sense points on the A5 Assembly. A correct measurement verifies the presence of the voltage on the A5 Distribution Assembly.

5. Record the results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **CHECK POWER SUPPLY.**

Type:	Identify Conditions	**IL.03**
Run Time:	N/A	
Set-up Time:	N/A	

The operating conditions which will cause the **Instrument Level Self Test** to pass are listed below. Find the **condition** which describes your circumstances.

Condition 1: **Instrument Level Self Test (ILST)** did not detect a known failure.

Condition 2: **Instrument Level Self Test (ILST)** was run to confirm correct operation of instrument.

Condition 1

Output Power Level Failure: To isolate output power level problems which occur at power levels above **−10dBm** and are greater than **10 dB** out of specification, go to **A14 MODULE LEVEL DIAGNOSTICS (MLD)** section. For output power level problems which occur only at settings below **−10dBm** or are less than **10 dB** out of specification, go to **EXCEPTIONAL CASES** section.

Other Failures: To isolate failures which can be detected by the internal diagnostics when the **HP 8642** is set to a specific operating condition, go to the **MLD** section for the module indicated by the instrument. If two or more failures are indicated, go to the **MLD** section for the failing module with the lowest **Troubleshooting Order Number** (see **MODULE TROUBLESHOOTING ORDER** on the foldout).

To troubleshoot failures which cannot be detected by the internal diagnostics, go to **EXCEPTIONAL CASES** section.

Intermittant Failures: To troubleshoot intermittant failures, turn to **EXCEPTIONAL CASES** section.

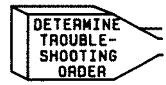
Execution Errors: Certain incompatible operating conditions will cause service messages to come up. Check for operating modes which do not comply.with the **HP 8642**'s operating specifications. (Refer to **Section III, OPERATIONS**, in the **HP 8642A/B SYNTHESIZED SIGNAL GENERATOR OPERATING MANUAL** for detailed operating information.)

Condition 2

Repair Confirmation: If **Instrument Level Self Test** was able to detect failure before repair was made; a passing test now indicates repair has corrected failure. If **ILST** was not able to detect failure prior to repair, check instrument in operating condition which indicated failure.

Operation Check: The **ILST** checks 80% of the instrument's overall operation.

Type:	Module Priority	**IL.04**
Run Time:	N/A	
Set-up Time:	N/A	



A troubleshooting priority level has been established for each module. **Failing modules must be tested in their order of priority**.

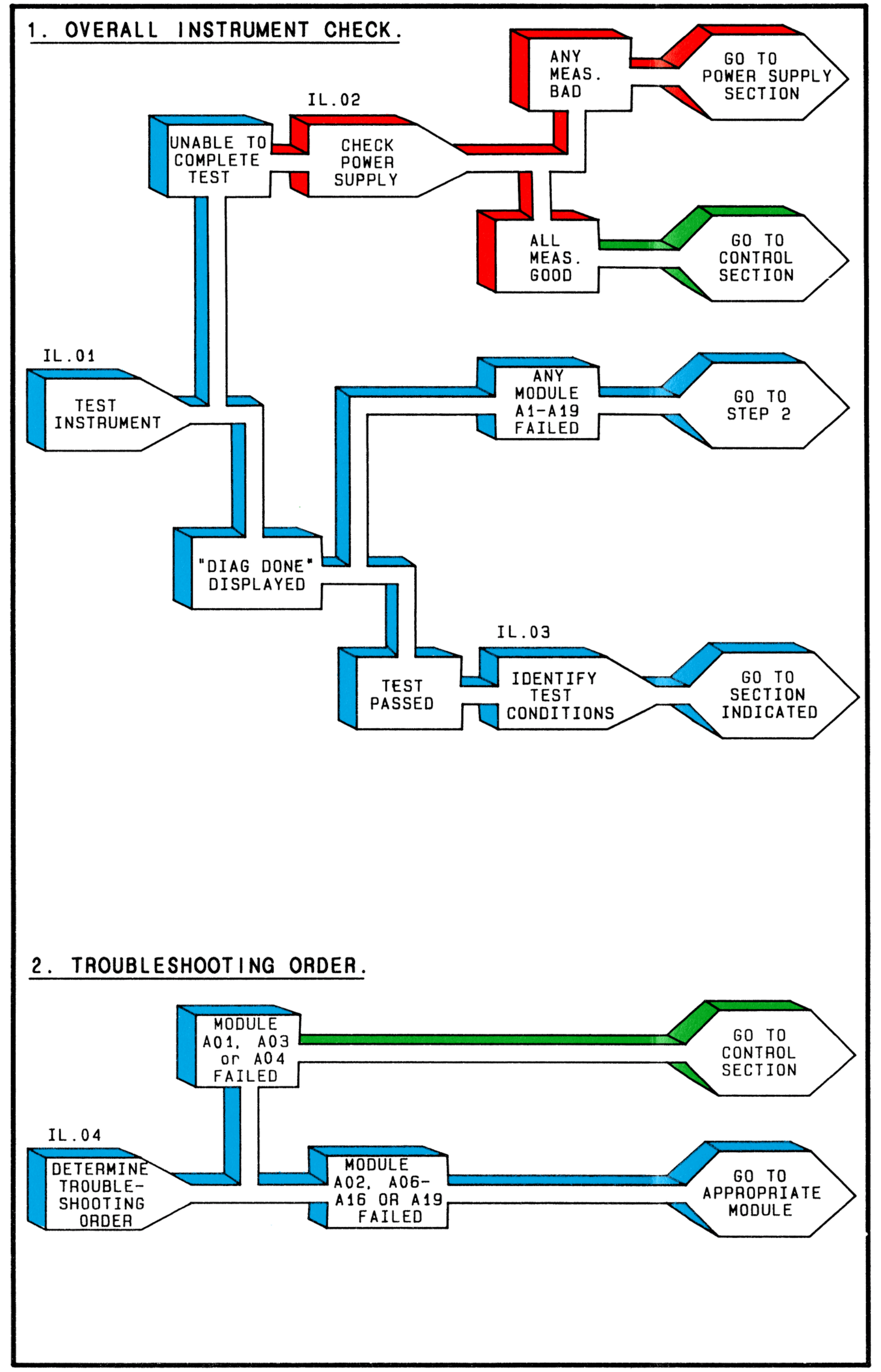
1. Find **MODULE TROUBLESHOOTING ORDER** on foldout. This table lists all **HP 8642** modules covered by on-site diagnostics. The modules are listed in the order which you should troubleshoot them.

2. If the **Instrument Level Self Test** has indicated two or more **failing** modules, use the table to determine which **failing** module has lowest **Troubleshooting Order** number.

3. Use index tabs to locate **Module Level Diagnostics** for **failing** module with lowest **Troubleshooting Order** number.

4. Return to Task Sequence Diagram on foldout.

INSTRUMENT LEVEL DIAGNOSTICS



MODULE TROUBLESHOOTING ORDER

Modules	Troubleshooting Order Number	Instrument Section
A17 Power Supply Regulators/ Attenuator Drivers Module	1	Power Supply Section
A18 Power Supply Rectifier/ Filters Module		
A01 Keyboard/LCD Display Module	2	Control Section
A03 Processor/Memory Module		
A04 Latch Module		
A06 FM Loop/Counter/ Timebase Module	3	RF Section
A02 Modulation Module	4	
A08 10 MHz High Stability Timebase Assembly (Opt. 001)	5	
A07 SAWR Loop Module	6	
A09 IF Loop Module	7	
A11 Reference Loop Module	8	
A12 Sum Loop/Divider Module	9	
A13 Output Filters/ALC Module	10	
A14 Heterodyne Module	11	
A16 Attenuator Module (8642A Only)	12	
A19 Doubler/Attenuator Module (8642B Only)		

8642 FRONT PANEL AND DISPLAY

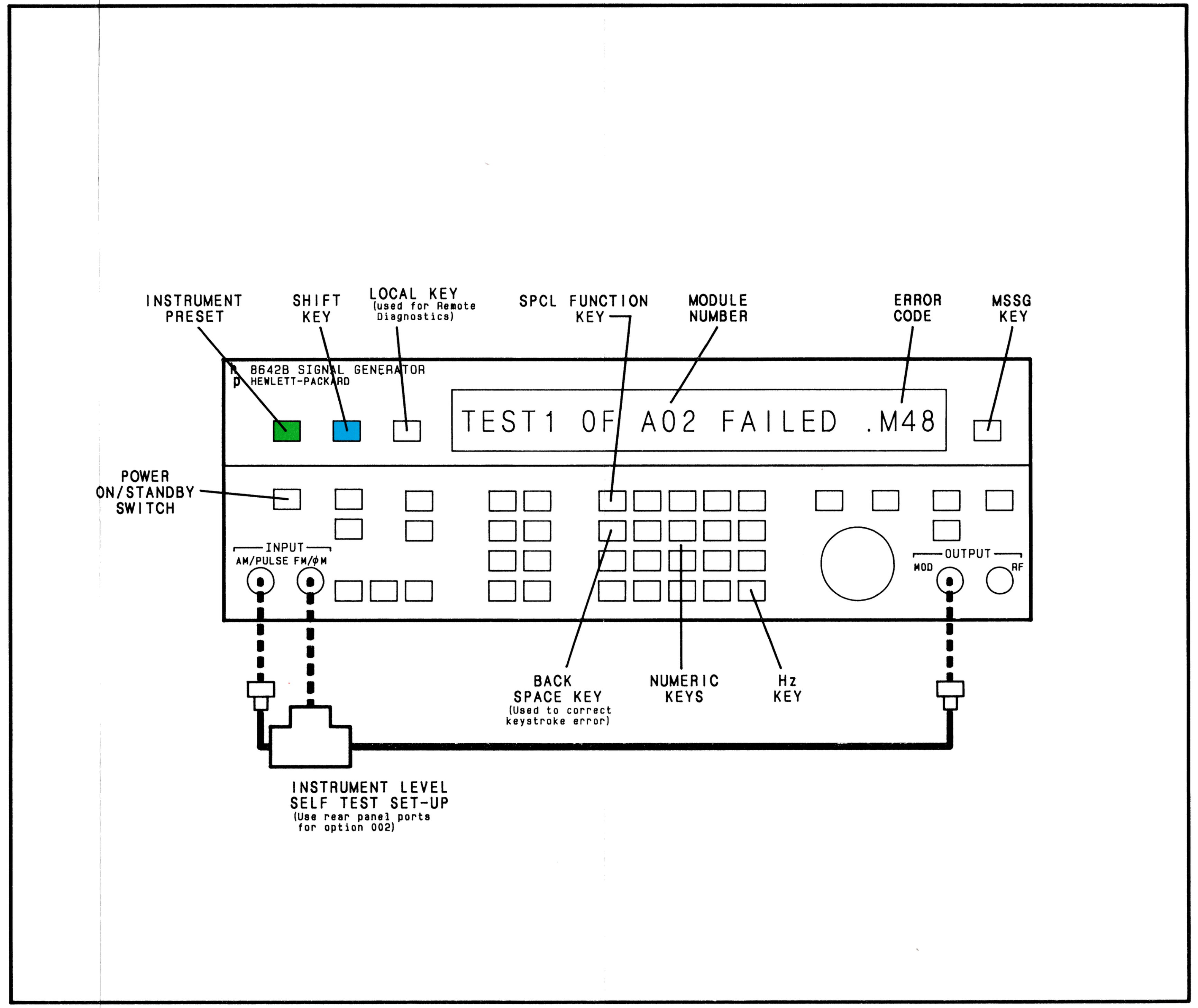


Figure 3A-100. Instrument Level Diagnostics.

Power Supply
Section

3B-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **Power Supply Section** modules: **A17 Power Supply Regulators/Attenuator Drivers Module** and **A18 Power Supply Rectifier/Filter Module.** The objective is to isolate the failure to a module or to a part on which this section depends for operation.

WARNING

Servicing instructions are for use by service trained personnel only. to avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

Some procedures described in this manual are performed with power supplied to the instrument while protective covers are removed. Energy levels at certain points may, if contacted, cause personal injury.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250v fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.) Do not use repaired fuses or short circuited fuseholders.

The left rear portion of the chassis becomes hot during operation. A cooling period may be desired before servicing modules in this area. To avoid personal injury, avoid contact with the A17 heatsink.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to the table on the foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. Testing in this section is divided into two catagories: **A17 Module** failures, including **Attenuator Drivers, Heterodyne Switch Control**, and **Reverse Power Protection Control** and **Power Supply** failures.

3. **A17 Module**: If you were directed here because of a drivers failure detected while testing the **A14, A16** or **A19** modules, or if the **Instrument Level Self Test** indicated an **A17** failure, turn to page **3B-4** to begin troubleshooting.

4. **Power Supply**: If you are here because of an apparent **Power Supply** failure, turn to the next page to begin troubleshooting.

3B-2. INTRODUCTION

The first step in troubleshooting a **Power Supply Section** failure is to isolate the defective module or cable.

Troubleshooting Instructions

1. There are two foldouts located at the end of this section. The first foldout, **Figure 3B-100**, is used for troubleshooting **Power Supply** failures and should be pulled out now.
2. Find **POWER SUPPLY DIAGNOSTICS** on the foldout.
3. The Task Sequence Diagrams, shown under **POWER SUPPLY DIAGNOSTICS** are separated into two checks: **1. A18 RECTIFIERS/FILTERS CHECK** and **2. A17 REGULATORS CHECK.**
4. Use the Task Sequence Diagrams to guide you through the verification process. Each Task Arrow shown in a diagram indicates a task title and a task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
5. After completeing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
6. Begin now by performing the first task shown under **1. A18 RECTIFIERS/FILTERS CHECK.**

NOTE

The **POWER SUPPLY I/O SIGNALS DIAGRAM** *shows all parts which these modules depend on for operation.*

3B-3. INTRODUCTION

The first step in troubleshooting failures indicated for the **Attenuator Drivers, Heterodyne Switch Control** or **Reverse Power Protection Control** portions of the **A17 Module**, is to check each control signal into this module.

A17 Inputs Verification Instructions

1. The last page in this section is a foldout, **Figure 3B-200**. It is used for troubleshooting the drivers portion of A17 and **should be pulled out now.**
2. Find **A17 INPUTS VERIFICATION** on the foldout.
3. Use the Task Sequence Diagrams shown under **A17 INPUTS VERIFICATION** to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task number and task title. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown on the diagram.

COMMENT

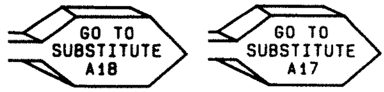
You will find the **A17 MODULE DIAGNOSTICS** *procedures at the end of this section following the* **POWER SUPPLY DIAGNOSTICS** *procedures.*

NOTE

The **A17 MODULE I/O SIGNALS DIAGRAM** *shows all parts on which the drivers portion of this module depends for operation.*

PS.01

3B-4. INTRODUCTION



Substitution of a known good module is used to further test a suspect module.

A17 & A18 Substitution Instructions

1. Find **A17 & A18 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A17 & A18 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram for the module you have been directed to substitute.

Type:	Voltage Measurements	**PS.02**
Run time:	1 min.	
Set-up time:	2 min.	

External DC Voltmeter is used to check power supply levels at **A17TP1 through 5**.

Run Test

1. Connect instrument's power plug to a **known good** power source.

2. Switch [POWER] to ON (recessed position).

3. Connect **external DC** voltmeter **ground lead** to instrument's chassis.

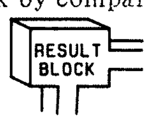
4. Measure **Power Supply** output voltage levels on **A17 Module** at test points **TP1 through 5**. (See **A17 & A18 MODULES CABLE CONNECTION LOCATOR** on foldout to locate test points on **A17**.) Voltages should be within approximately 1% of those shown in chart on foldout.

5. The tuning screws located next to **A17TP1 through 5**, can be used to fine tune voltage levels which are **>1%** high or low.

COMMENT

The voltages measured at A17TP1 through 5 are being fed back from sense points on the A5 Assembly. A correct measurement verifies the presence of the voltage on the A5 Distribution Assembly.

6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST Vdc**.

Type:	Fuse Check	**PS.03**
Run time:	4	
Set-up time:	2 min.	

External DC voltmeter is used to test fuses and rectifier output levels.

1. Remove **A18 Module's** Top Cover located in right-rear corner of instrument (one screw).

2. Connect power to instrument and switch POWER to **ON** (recessed position).

3. Measure voltage levels:
   - Use external DC voltmeter to measure voltage levels, with respect to ground, at fuses **A18F1 through 5**.
   - Leave fuses in instrument and measure voltage levels at both ends of each fuse holder for **F1 through 5**.
   - Voltage levels should be within ranges shown in following chart and should read the same at both ends of each fuse.

Fuse Voltages, Vdc				
F1	F2	F3	F4	F5
+15 to +30	-30 to -20	+8 to+13	-13 to -8	+60 to +80

- If **all** fuse holders measured **good** at both ends, proceed directly to step **5**.
- If **any** fuse holders measured **bad** at both ends, proceed directly to step **5**, otherwise continue testing.

CAUTION

Disconnect line power to instrument when removing or replacing fuses.

4. Replace blown fuses:
   - Use plastic Fuse Puller, from On-Site Service Kit, to remove fuses.

NOTE

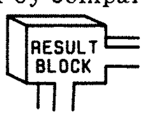
Use side-notched end of Fuse Puller to hook fuse and pull it from instrument. Use end-notched end of Fuse Puller to place fuses in fuse holders or to pick up fuses dropped into instrument.

   - Replace blown fuses with a good fuse of proper rating from the On-Site Service Kit. (Fuse ratings are shown on Top View Diagram on inside of instrument's Top Cover at each fuse location.)
   - Reconnect power to instrument, switch [POWER] to **ON** position and repeat procedure beginning at step **3**.

5. Record test results.

COMMENT

If this test has directed you to replace a blown fuse, and if as a result of changing the fuse all levels now measure good, do not return to the foldout. Instead, return to the **INSTRUMENT LEVEL DIAGNOSTICS** *section and rerun the* **ILST**.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST FUSES**.

Type:	I/O Signals Check	**PS.04**
Run time:	2 min.	
Set-up time:	1 min.	

External DC voltmeter and **ohmmeter** are used to check signal levels at **A17J1**.

Run Test

1. Disconnect line power to instrument.

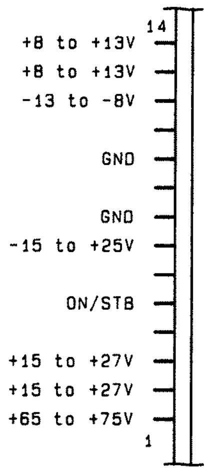
2. Check **Power Switch**:
   - Connect one test lead of **ohmmeter** to **GND (A4TP2)**. (See **A17 & A18 MODULES CABLE CONNECTION LOCATOR** on foldout.)
   - Connect other test lead to Power Switch control line (**A17J1** pin **5**). (See **A17 & A18 MODULES CABLE CONNECTION LOCATOR** on the foldout to locate **A17J1**.) **Figure 3B-1**. shows signal locations for **A17J1**.
   - Switch [POWER] to **ON** (recessed position). Resistance should measure between **0** and **10** ohms.
   - Switch [POWER] to **Standby**, resistance should be greater than **500** ohms.
   - If switch line **is not** responding as described above proceed directly to step **6**, otherwise continue testing.

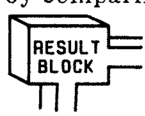
3. Disconnect ohmmeter from **A17J1** and reconnect power to instrument.

4. Switch [POWER] to **ON** position.

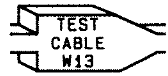
5. Measure voltage levels:
   - Connect voltmeter's ground lead to **GND (A4TP2)**.
   - Measure **DC** voltages at connector **A17J1** on solder-side of **A17 Module**. Voltage level ranges and locations are shown in **Figure 3B-1**.

Figure 3B-1. Connector A17J1 Signal Locator
(Solder-Side View)



6. Record test results.
7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **CHECK A17J1**.

Type:	Cable Check	**PS.05**
Run time:	2 min.	
Set-up time:	30 sec.	

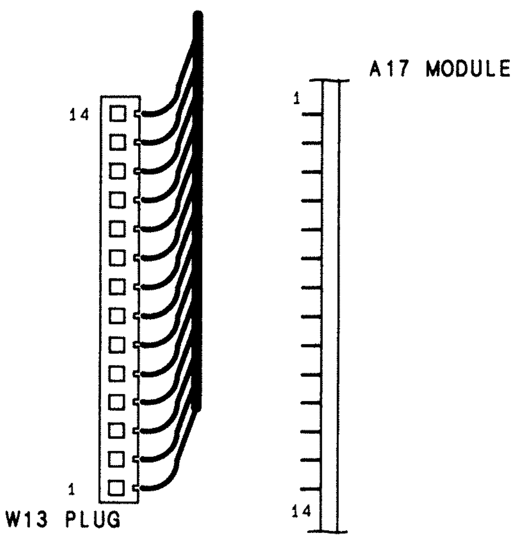
Cable **W13** is tested by checking continuity between cable ends and **A17J1**.

Run Test

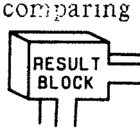
1. Remove power from instrument and disconnect cable **W13** from **A18** Module at **A18J3**.

2. Check continuity through each suspect line by connecting test leads from **ohmmeter** to each end of **W13**.
   - Connect one test probe to **A17J1** pin connection on solder-side of **A17 Module**.
   - Insert the other probe into end of cable **W13**. Select socket with same number as **A17J1** pin connection. (See **Figure 3B-2** to determine pin 1 location.)

Figure 3B-2. Cable W13 Connection Locator



3. Record test results.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W13**.

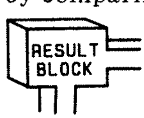
Type:	Power Switch Test	**PS.06**
Run time:	1 min.	
Set-up time:	6 min.	

Run Test

1. Check **Power Switch**:
   - Open Front Panel. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate opening instructions.)
   - Check resistance between **Power Switch** output, on **A1 Module** at **A1A1 J1** pin **30**, and ground. Resistance should measure less than **2 ohms** in **ON** (recessed) position and greater than **500 ohms** in **Standby** position. (See Figure 3C-3 in **Control Section Diagnostics** for connector diagram.)
   - If switch responds as described, proceed to step **2**, otherwise continue testing.
   - If switch does not respond as described, disconnect cable **W15** from **A1 Module** at **A1A1 J1** and retest switch. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A1 Module** removal information.)
   - If switch still does not respond correctly, proceed to step **3**, otherwise reconnect **W15** to **A1** and continue testing.

2. Check switch path:
   - Remove right side cover from instrument. (Refer to table on foldout in **MECHANICAL PROCEDURES** for removal information.)
   - Disconnect cable **W10** from **A17 Module** at **A17J2**.
   - Plug end of **W10 into 34 pin** test connector, from On-Site Service Kit.
   - Measure resistance at pin **34** of **W10P2**. (Resistance should measure the same as in step **1**.)

3. Record test results.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SWITCH**.

Type:	Voltage Check	**PS.07**
Run time:	2 min.	
Set-up time:	2 min.	

External DC voltmeter is used to test rectifier output levels with **A18 Module** isolated from **A17 Module**.

Run Test

1. Switch instrument to **Standby** and **disconnect** line power from instrument.

2. Disconnect cable **W13** from **A18 Module** at **A18J3** (see **A17 & A18 MODULE CABLE CONNECTION LOCATOR** on foldout for **A18J3** location).
   - Pull straight up on **W13** to disconnect it from **A18J3**.

3. Reconnect power to instrument.

4. Measure voltage levels:
   - Use external DC voltmeter to measure voltage levels, with respect to ground, at fuses **A18F1 through 5**.
   - Leave fuses in instrument and measure voltage levels at both ends of each fuse holder for **F1 through 5**.
   - Voltage levels should be within ranges shown in following chart and should read the same at both ends of each fuse.

Fuse Voltages, Vdc				
F1	F2	F3	F4	F5
+15 to +30	−30 to −20	+8 to+13	−13 to −8	+60 to +80

- If **all** fuse holders measured **good** at both ends, proceed directly to step **6**.
- If **any** fuse holders measured **bad** at both ends, proceed directly to step **6**, otherwise continue testing.

CAUTION

Disconnect line power to instrument when removing or replacing fuses.

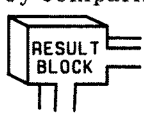
5. Replace blown fuses:
   - Use plastic Fuse Puller, from On-Site Service Kit, to remove fuses.

NOTE

Use side-notched end of Fuse Puller to hook fuse and pull it from instrument. Use end-notched end of Fuse Puller to place fuses in fuse holders or to pick up fuses dropped into instrument.

   - Replace blown fuses with a good fuse of proper rating from the On-Site Service Kit. (Fuse ratings are shown on Top View Diagram on inside of instrument's Top Cover at each fuse location.)
   - Reconnect power to instrument, switch POWER to **ON** position and repeat procedure beginning at step **3**.

6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **ISOLATE A18**.

Type:	4; AC Voltage Measurements	**PS.08**
Run time:	2 min.	TEST
Set-up time:	7 min.	AC POWER

External AC voltmeter is used to check voltages to **A18 Module** from Transformer, **T1**.

Run Test

1. Switch instrument to **Standby** and disconnect line power from instrument.

WARNING

Removing rear bottom cover exposes Filter cap screw heads. Voltage potentials are still present at these screws even when power has been removed.

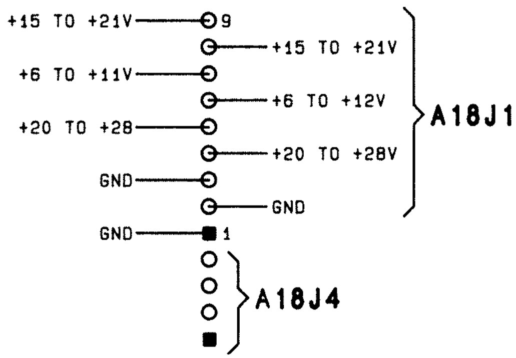
2. Remove instrument's rear bottom cover. (Refer to table on foldout in **MECHANICAL PROCEDURES** for removal information).

WARNING

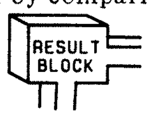
Power Transformer **T1** *should be isolated from AC voltmeter. We recommend you use a portable voltmeter that is not connected to the same power main as the instrument.*

3. Measure voltage levels:
   - Connect voltmeter's ground lead to instrument's chassis.
   - Reconnect line power to instrument.
   - Measure **AC** voltages at **A18J1** (see **A17 & A18 MODULE CABLE CONNECTION LOCATOR** on the foldout to locate **A18J1**). See **Figure 3B-3** for voltage levels.

Figure 3B-3 Connector A18J1 Signal Locator
(Solder-Side of Board)



4. Record test results.

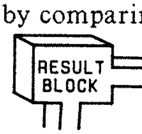
5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST AC POWER**.

Type:	Supply Lines Test	**PS.09**
Run time:	1 min.	
Set-up time:	6 min.	

This test uses **Power Supply Test Connector** from On-Site Service Kit to isolate **Power Supply Section** from rest of instrument.

Run Test

1. Switch [POWER] to **Standby** and **disconnect** power plug.
2. Remove right side cover from instrument. (Refer to table on foldout in **MECHANICAL PROCEDURES** for removal information).
3. Disconnect cable **W10** from **A17 Module** at **A17J2**. (See **A17 & A18 MODULES CABLE CONNECTION LOCATOR** for **A17J2** location.)
4. Connect Power **Supply Test Connector** (HP 08642-80053) and 50 pin ribbon cable, from On-Site Service Kit, to **A17 Module** at **A17J2**.
5. Connect line power to instrument.
6. Turn **Power Supply** on:
   - Connect black alligator clip and retractable clip probe to black test lead from On-Site Service Kit.
   - Connect alligator clip to **GND** (**A4TP2**). (See **A17 &A18 MODULE CABLE CONNECTION LOCATOR** on foldout for **GND** location.)
   - Connect retractable clip probe to test connector at **TP1**.
7. Measure voltage levels at test points **A17TP1 through 5**. (See **A17 &A18 MODULE CABLE CONNECTION LOCATOR** on foldout for **A17TP1 through 5** locations.) Voltage levels should be within approximately 1% of those shown in chart on foldout.
8. Remove test connector:
   - Disconnect ground from **TP1** on test connector.
   - Disconnect **Power Supply Test Connector** and ribbon cable from **A17 Module.**
   - Reconnect cable **W10** to **A17 Module**.
9. Record test results.
10. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

 for **ISOLATE POWER SUPPLY**.

Type:	Distribution Test	**PS.10**
Run time:	1 min. per set-up	
Set-up time:	Up to 15 min.	

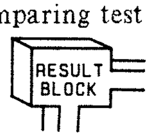
This test determines if **Power Supply Section** failure is due to over loading by **Control** or **RF** Sections.

Run Test

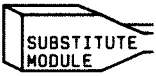
1. Switch [POWER] to **Standby**.

   CAUTION

   Be sure to use adequate Electrostatic Discharge (ESD) precautions when handling A3 and A4 Modules.

2. Remove **A3** and **A4** modules from instrument (see Top View Diagram on inside Top Cover to locate **A3** and **A4**).
3. Switch [POWER] to **ON**.
4. Measure voltage levels at test points **A17TP1 through 5**.
   - If all voltage levels measure within **1%** of those shown in chart on foldout, proceed directly to step **10**, otherwise continue testing.
5. Switch [POWER] to **Standby**.
6. Beginning at left side of **A5 Distribution Assembly**, disconnect ribbon cable **W1** from **A5 Assembly** at **A5J1**. (See **A17 & A18 MODULES CABLE CONNECTIONS LOCATOR** on foldout to locate **J1** on **A5 Assembly**.) Refer to table on foldout in **MECHANICAL PROCEDURES** for information on disconnecting cables from **A5**.
7. Switch [POWER] to **ON**.
8. Measure voltage levels at test points **A17TP1 through 5**.
9. Repeat steps **5** through **8** for each ribbon cable connected to **A5** (except **W10**) or until **Power Supply** unloads.
10. Record test results. (If **Power Supply** unloads, suspect last cable and module disconnected from **A5** just before unloading occurred.)
11. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each  for **IDENTIFY CAUSE**.

Type:	Module Substitution	**PS.11**
Run time:	0	
Set-up time:	20 min.	

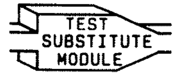


Connect Substitute Module

1. Refer to table shown on foldout in **MECHANICAL PROCEDURES** to locate removal and replacement procedures for module you have been directed to substitute.

2. Return to foldout.

Type:	Substitute Module Test	**PS.12**
Run time:	1 min.	
Set-up time:	2 min.	



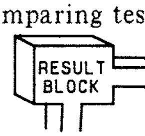
External DC Voltmeter is used to check power supply levels at **A17TP1 through 5**.

Run Test

1. Connect instrument's line power plug to a **known good** power source.
2. Switch [POWER] to **ON** position.
3. Connect **external DC** voltmeter **ground lead** to **instrument's chassis**.
4. Measure **Power Supply** output voltage levels on **A17 Module** at test points **TP1 through 5**. (See **A17 & A18 MODULES CABLE CONNECTION LOCATOR** on foldout for test point locations and voltage levels.) Voltages should be within approximately 1% of those shown in chart.
5. The tuning screws located next to **A17TP1 through 5**, can be used to fine tune voltage levels which are slightly **>1%** high or low.

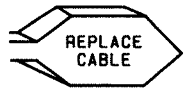
COMMENT

The voltages measured at A17TP1 through 5 are being fed back from sense points on the A5 Assembly. A correct measurement verifies the presence of the voltage on the A5 Distribution Assembly.

6. Record test results.
7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB MODULE**.

Type:	Cable Substitution
Run time:	5 min.
Set-up time:	1 min.

PS.13



1. Testing has shown cable **W13** to be suspect (refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a replacement cable).

2. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

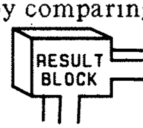
Type:	Control Signals Test	**A17.01**
Run time:	1 min.	
Set-up time:	0	

Run Test

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears, to override 20 second reset test.)

2. SHIFT SPCL 3 3 6 2 HZ

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A17**. If "**TEST 1 OF A17 (PASSED** or **FAILED)**" is not displayed, rerun test.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST A17 CONTROL BITS**.

Type:	3; Bit Transmission	A17.02
Run time:	12 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A17 Module** on **Attenuator Driver** control lines.

COMMENT

If any control line level measures bad, it is not necessary to test remaining lines; proceed directly to step **14**.

Run Test

1. Switch [POWER] to **Standby**:
   - Remove right side cover from instrument (refer to table on foldout in **MECHANICAL PROCEDURES** for information).
   - Disconnect cable **W9** from **A17 Module** at **A17J3**.
   - Plug end of cable **W9** into **50 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W9P2**.

CAUTION

To prevent damage to the Control Section, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit. Connect alligator clip to **VM IN (A4TP1)**. (See **A17 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

3. Switch [POWER] to **ON**.
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

Attenuator Driver Control Lines

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

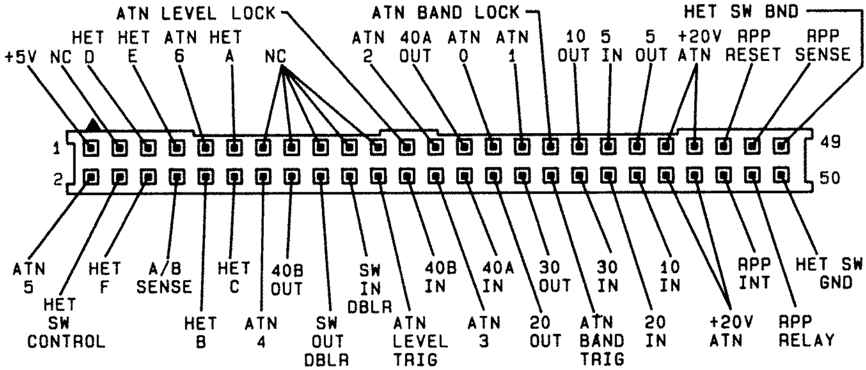
5. Enter **Bit Select Keys**, as indicated in **Table 3B-1. W9P2 Control Bits**, for **Control Line** to be tested.

6. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3B-1**. (See **Figure 3B-4. Cable Plug W9P2 Signal Locator**.)

Table 3B-1. W9P2 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 5 and 10)	Pin Number (Step 6)
1	ATN BAND TRIG	[5] [9] [HZ]	34
2	ATN LEVEL TRIG	[6] [2] [HZ]	22
3	ATN 0	[6] [4] [HZ]	29
4	ATN 1	[6] [5] [HZ]	31
5	ATN 2	[6] [6] [HZ]	25
6	ATN 3	[6] [7] [HZ]	26
7	ATN 4	[6] [8] [HZ]	14
8	ATN 5	[6] [9] [HZ]	2
9	ATN 6	[7] [0] [HZ]	9

Figure 3B-4. Cable Plug W9P2 Signal Locator



7. [2] [5] [HZ]
   (To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
   ([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify low state.)

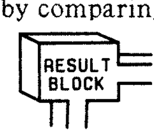
10. Enter **Bit Select Keys**, as indicated in **Table 3B-1. W9P2 Control Bits,** for same **Control Line**.

11. [2] [5] [HZ]
    (To enable voltmeter.)

12. Voltage should read approximately **-0.5 to +1.5** Vdc.
    ([5] [HZ] to repeat measurement.)

13. Repeat procedure for each **Control Line** shown in **Table 3B-1.**

14. Record test results.

15. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

for **TEST ATN CONTROL BITS**.

Type:	3; Bit Transmission	**A17.03**
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A17** on **Reverse Power Reset** line.

Run Test

1. Switch [POWER] to **Standby**:
   - Remove right side cover from instrument (refer to table on foldout in **MECHANICAL PROCEDURES** for removal information).
   - Disconnect cable **W9** from module at **A17J3**.
   - Plug end of **W9** into **50 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W9P2**.

CAUTION

Do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and **retractable hook** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A17 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

3. Switch [POWER] on.
   [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

Reverse Power Protection Reset

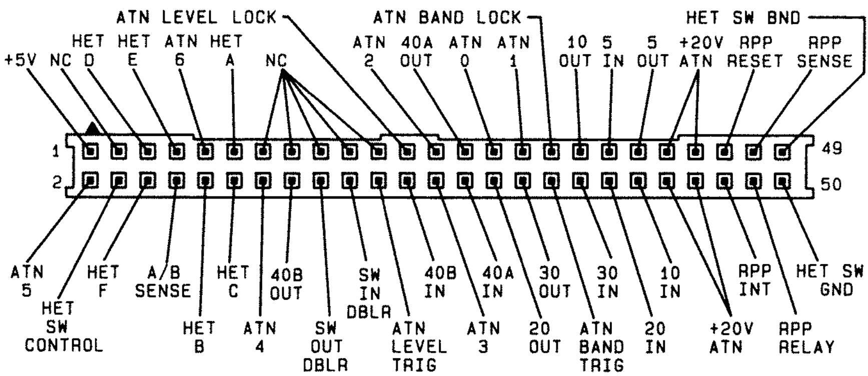
Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [1]
   (To specify high state.)

5. [6] [3] [HZ]
(To select bit.)

6. Connect **VM** probe to test connector line **RPP Reset** (pin **45**). (See **Figure 3B-6. Cable Plug W9P2 Signal Locator**.)

Figure 3B-6. Cable Plug W9P2 Signal Locator



7. [2] [5] [HZ]
(To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

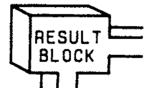
9. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

10. [6] [3] [HZ]
(To select bit.)

11. [2] [5] [HZ]
(To enable voltmeter.)

12. Voltage should read approximately **−0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

13. Record test results.

14. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST RPP RESET** BIT.

Type:	3; Bit Transmission	**A17.04**
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (VM) is used to measure TTL level changes transmitted to **A17** on **Heterodyne Switch** control line.

Run Test

1. Switch [POWER] to **Standby**:
   - Remove right side cover from instrument. (Refer to table on foldout in **MECHANICAL PROCEDURES** for removal information).
   - Disconnect cable **W9** from module at **A17J3**.
   - Plug end of **W9** into **50 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W9P2**.

CAUTION

To prevent damage to the Control Section, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and **retractable hook** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A17 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.
   [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

Heterodyne Switch Control Line

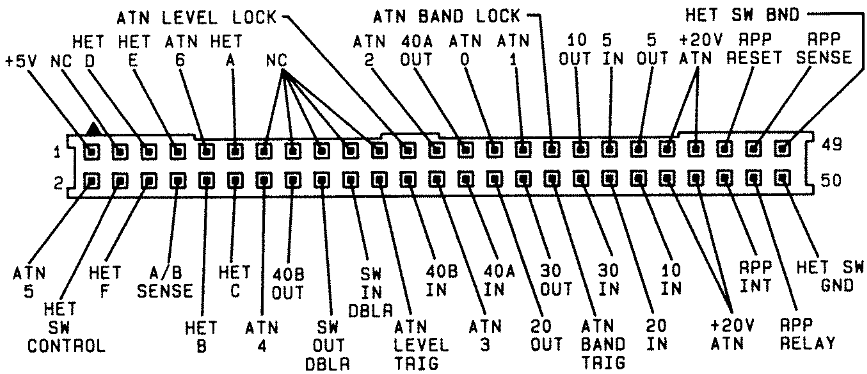
Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [1]
   (To specify high state.)

5. [7] [1] [HZ]
(To select bit.)

6. Connect VM probe to test connector line **HET SW CONTROL** (pin **4**). (See **Figure 3B-5. Cable Plug W9P2 Signal Locator.**)

Figure 3B-5. Cable Plug W9P2 Signal Locator



7. [2] [5] [HZ]
(To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

10. [7] [1] [HZ]
(To select bit.)

11. [2] [5] [HZ]
(To enable voltmeter.)

12. Voltage should read approximately **−0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

13. Record test results.

14. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each RESULT BLOCK for **TEST HET CONTROL BIT**.

Type:	Module Substitution	A17.05
Run time:	0	
Set-up time:	22 min.	

Connect Substitute Module

1. Refer to table shown on foldout in **MECHANICAL PROCEDURES** to locate **A17 Module** removal and replacement procedures.

2. Return to **A17 MODULE SUBSTITUTION** on foldout.

Type:	Substitute Module Test	**A17.06**
Run time:	Conditional	
Set-up time:	Conditional	

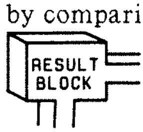
The **A17** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which best fits your module.

Condition 1: **A17 INPUTS VERIFICATION** indicated **A17** failure.

Condition 2: **Instrument Level Self Test** indicated **A17** failure.

Condition 3: **Module Level Diagnostics (MLD)** for **A14**, **A16**, or **A19** indicated **A17** failure.

Condition 1

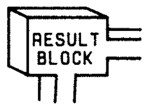
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until "**100.000000MZ -140.0DM**" appears, to override 20 second reset test.)
2. [SHIFT] [SPCL] [3] [3] [6] [2] [HZ]
3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A17**. If "**TEST 1 OF A17 (PASSED** or **FAILED)**" is not displayed, rerun test.
4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A17**.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until "**100.000000MZ -140.0DM**" appears, to override 20 second reset test.)
2. [SHIFT] [SPCL] [3] [3] [0] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **ILD** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**".
   - [HZ] to continue test.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record any error code(s) displayed for **A17**.

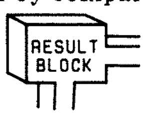
5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SUB A17**.

<u>**Condition 3**</u>

1. Rerun test which indicated **A17** failure.

2. Record test result.

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SUB A17**.

3B-5. A17 REGULATORS/ATTENUATOR DRIVERS MODULE A18 RECTIFIER/FILTER MODULE

COMMENT

It is not essential to understand the internal operation of a module to make an on-site repair.

Power Supply

The HP 8642 requires five regulated power supplies for operation: **+50**, **+15**, **+5**, **-5**, and **-15 Vdc**. The **A18 Module** full-wave rectifies the outputs from the Power Transformer **T1**. Each supply line is low-pass filtered and fused on the **A18 Module**. The **+15** and **-15** volt lines are switched open when the [POWER] key on the Front Panel is switched to the **Standby** position. The rectifiers and filters remain active whenever line power is connected to the instrument.

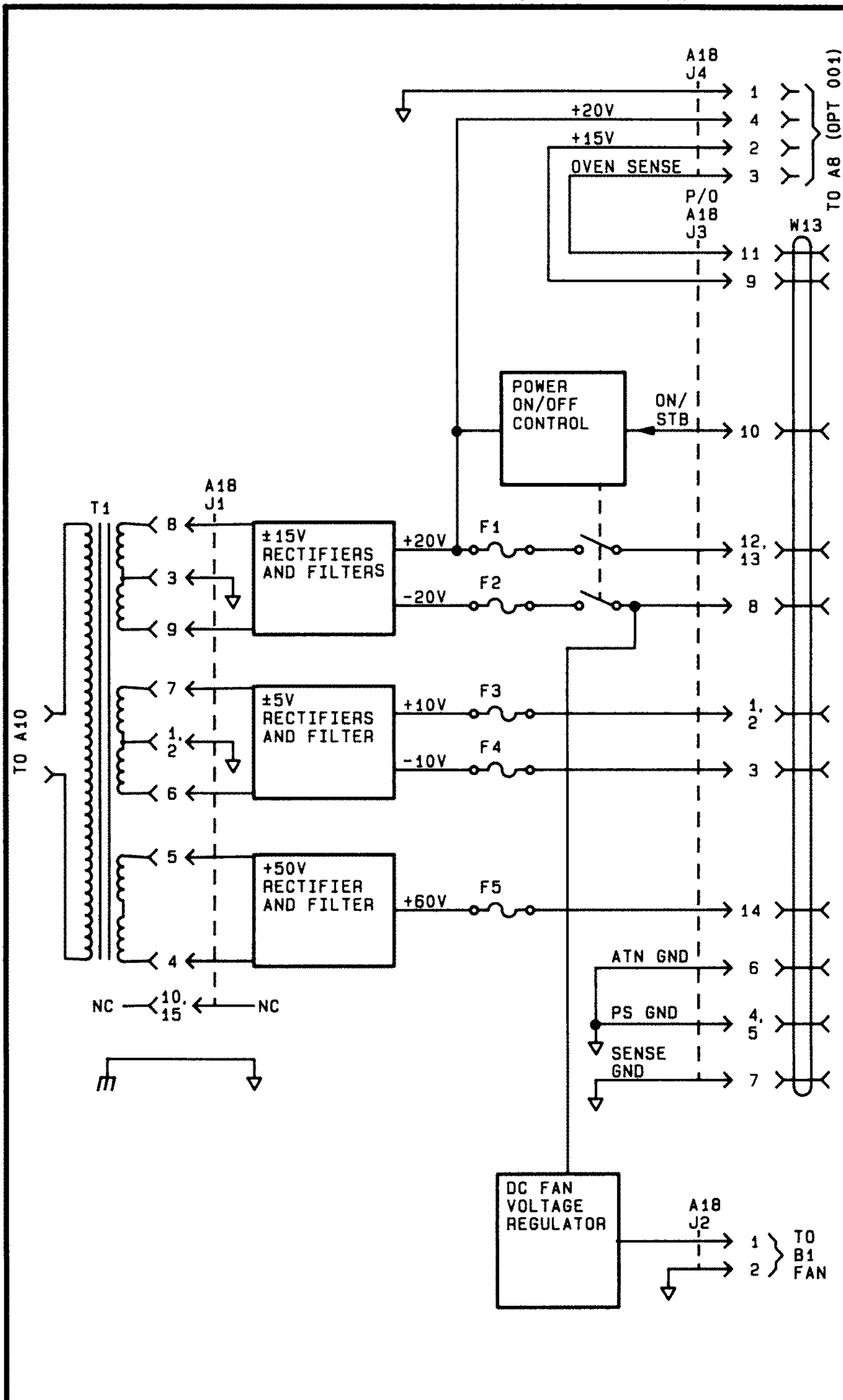
Series-pass type regulators on the **A17 Module** provide level regulation for each supply line. Bias and reference voltages for each regulator are provided by the **+15** and **-15** volt supplies. The output level of each regulator is sensed on the **A5 Assembly** and fedback to control the series-pass element. This requires the supply signal to be present on the **A5 Distribution Assembly** for the regulator to operate. Each regulator is provided with over-voltage protection at its output.

A17 Drivers

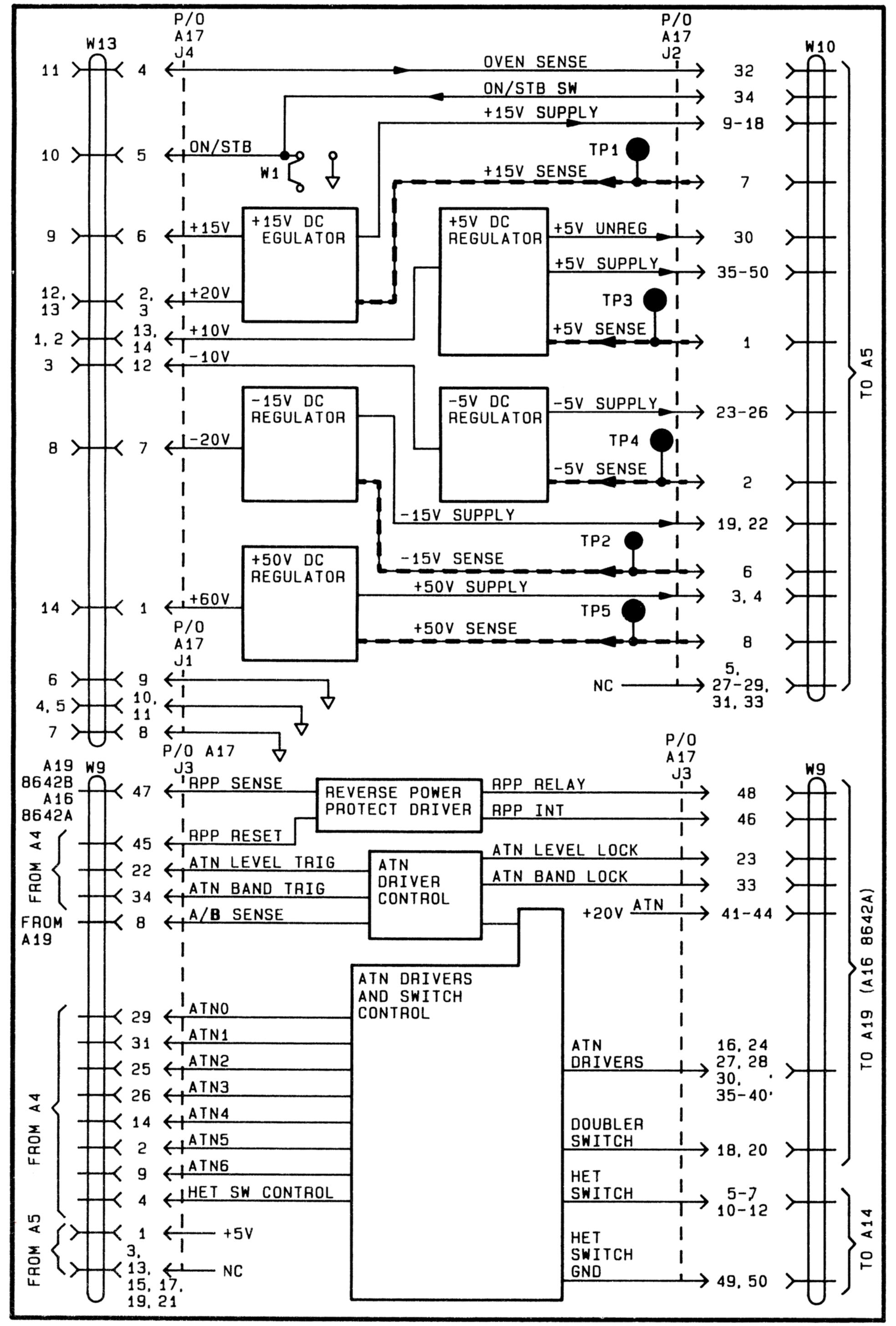
The drivers portion of the **A17 Module** provides the proper drive signals to control the attenuators and RF switches in the instrument. It also drives the relay for the reverse power protection circuit. The **A17 Module** senses **which** attenuator module it is driving and provides continuous state signals to the **A16 Module** and pulsed, drive signals to the **A16** (**option 003**) and **A19** modules.

See the **A17** and **A18 MODULES SIMPLIFIED BLOCK DIAGRAMS** for further understanding of the internal operation of these modules.

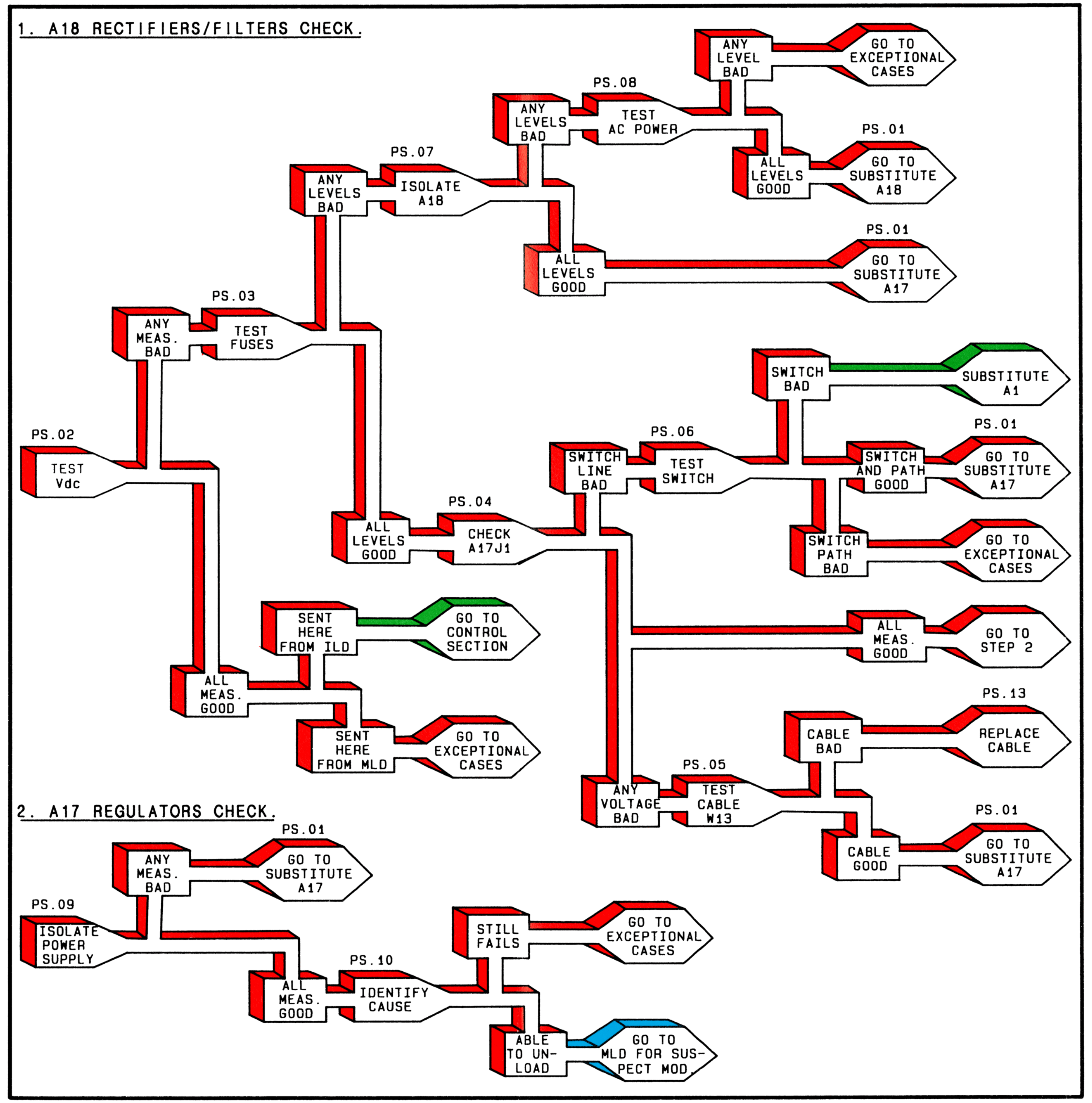
A18 MODULE SIMPLIFIED BLOCK DIAGRAM



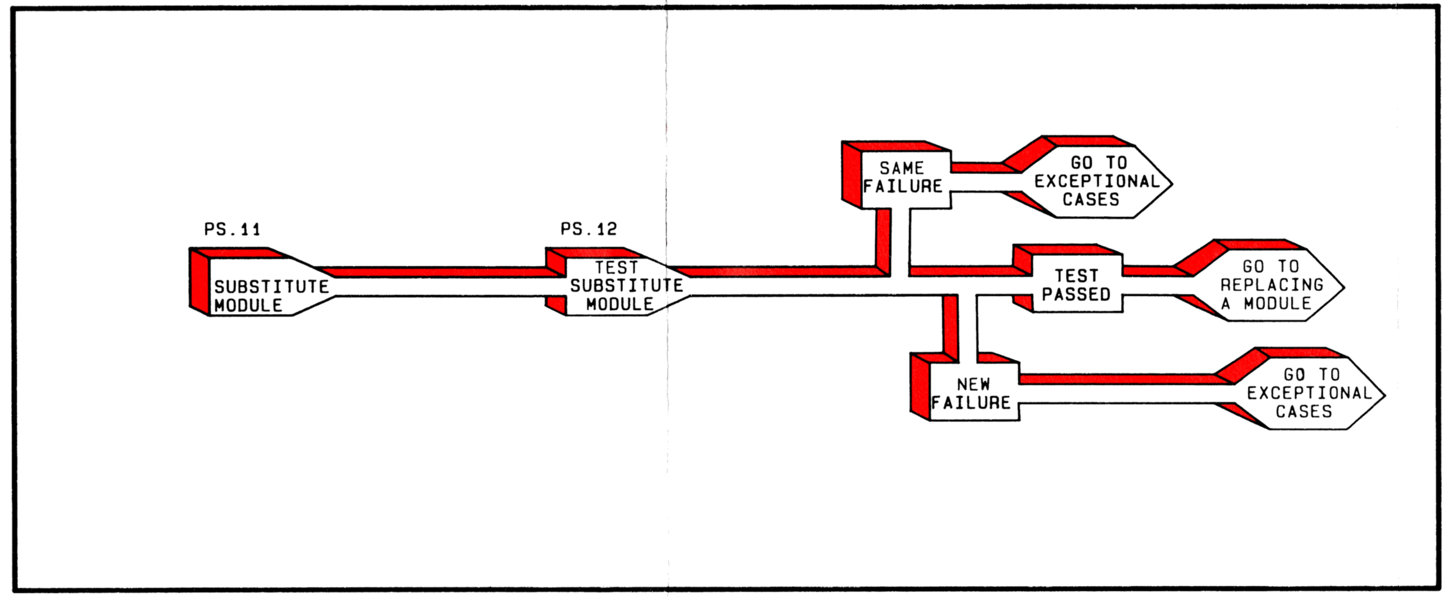
A17 MODULE SIMPLIFIED BLOCK DIAGRAM



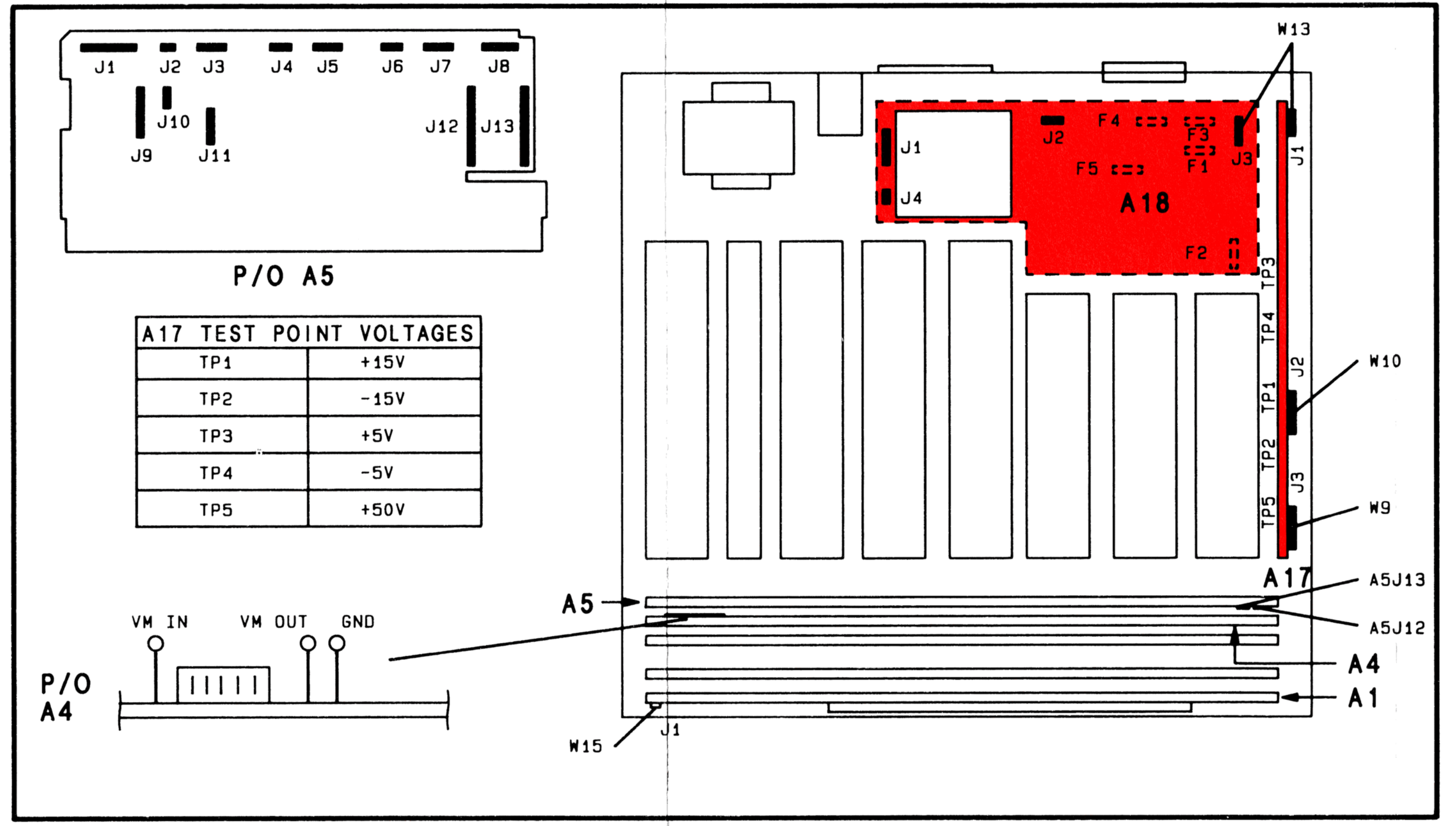
POWER SUPPLY DIAGNOSTICS



A17 & A18 MODULE SUBSTITUTION



A17 & A18 MODULES CABLE CONNECTION LOCATOR



A17 TEST POINT VOLTAGES	
TP1	+15V
TP2	-15V
TP3	+5V
TP4	-5V
TP5	+50V

POWER SUPPLY I/O SIGNALS DIAGRAM

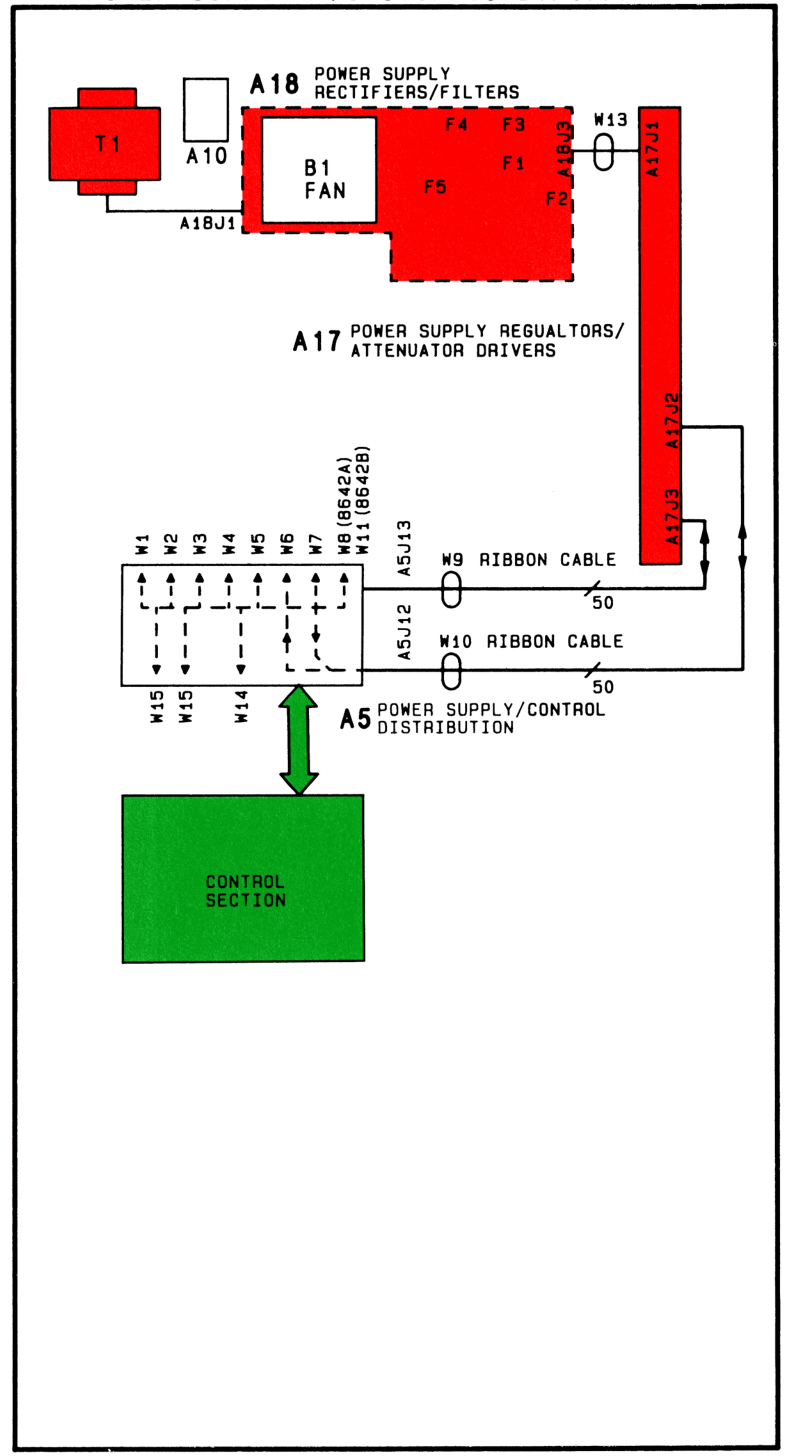
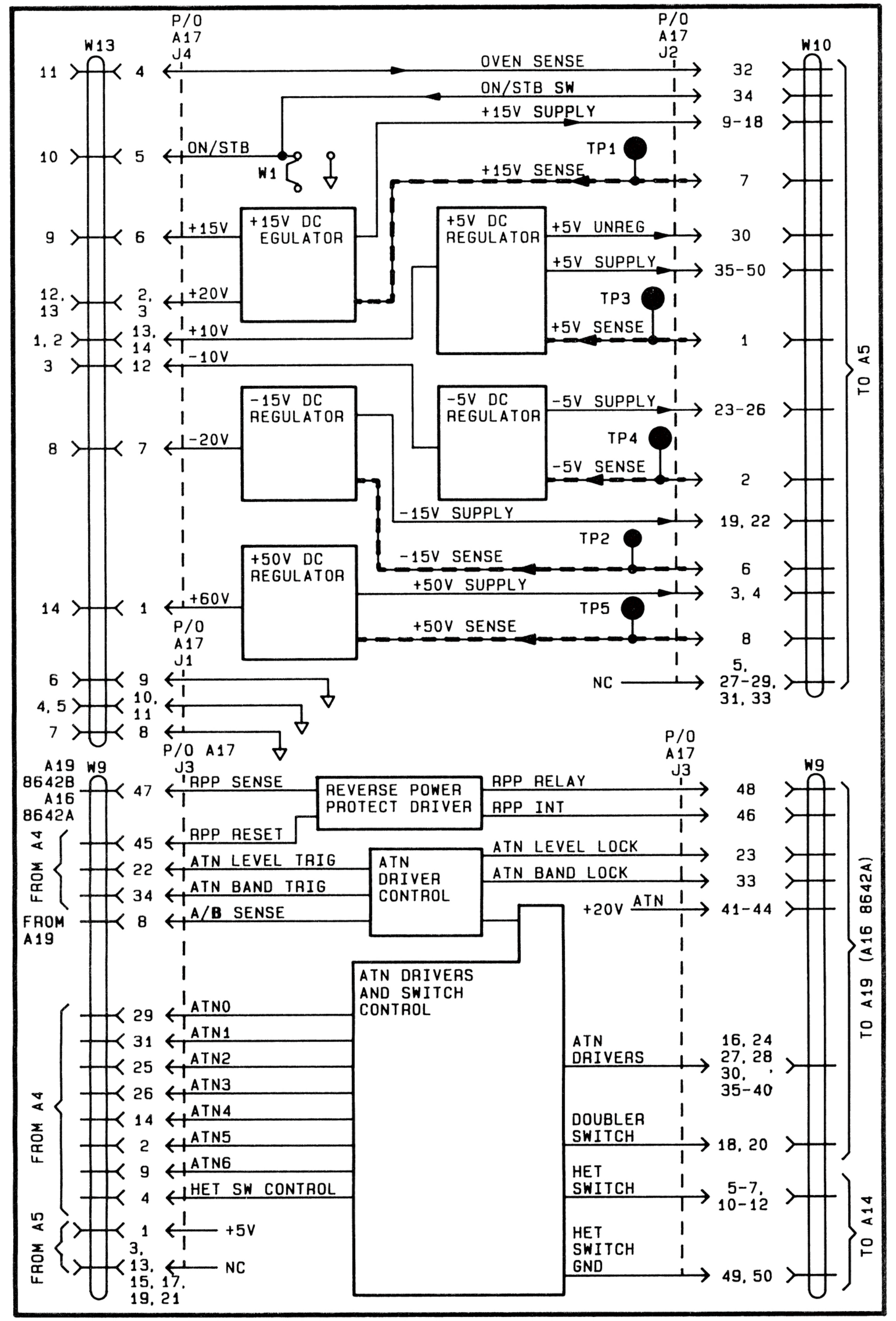
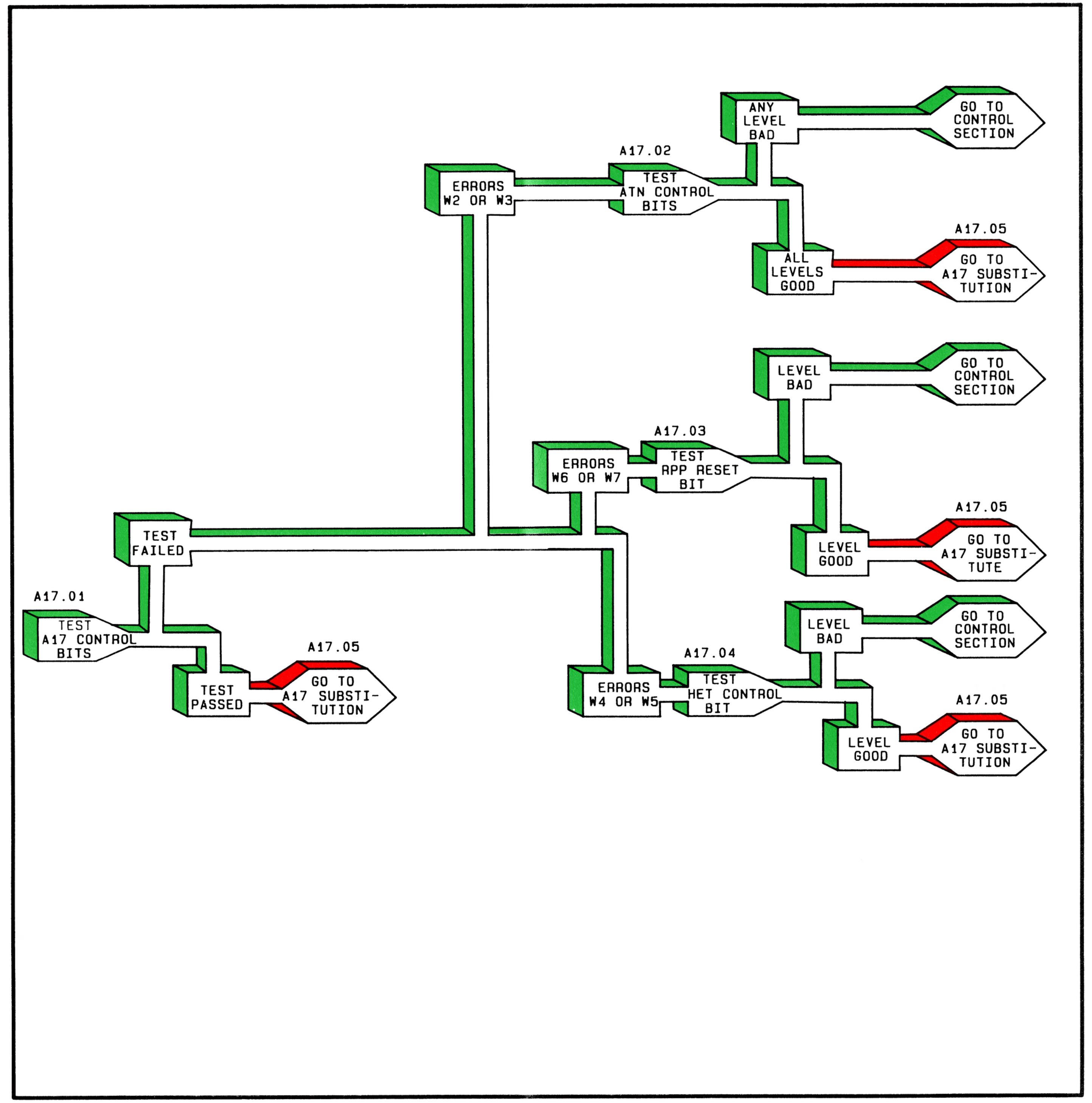


Figure 3B-100. A18 Rectifier/Filters Module and P/O A17 Power Supply Regulators/Attenuator Drivers Module Diagnostics.

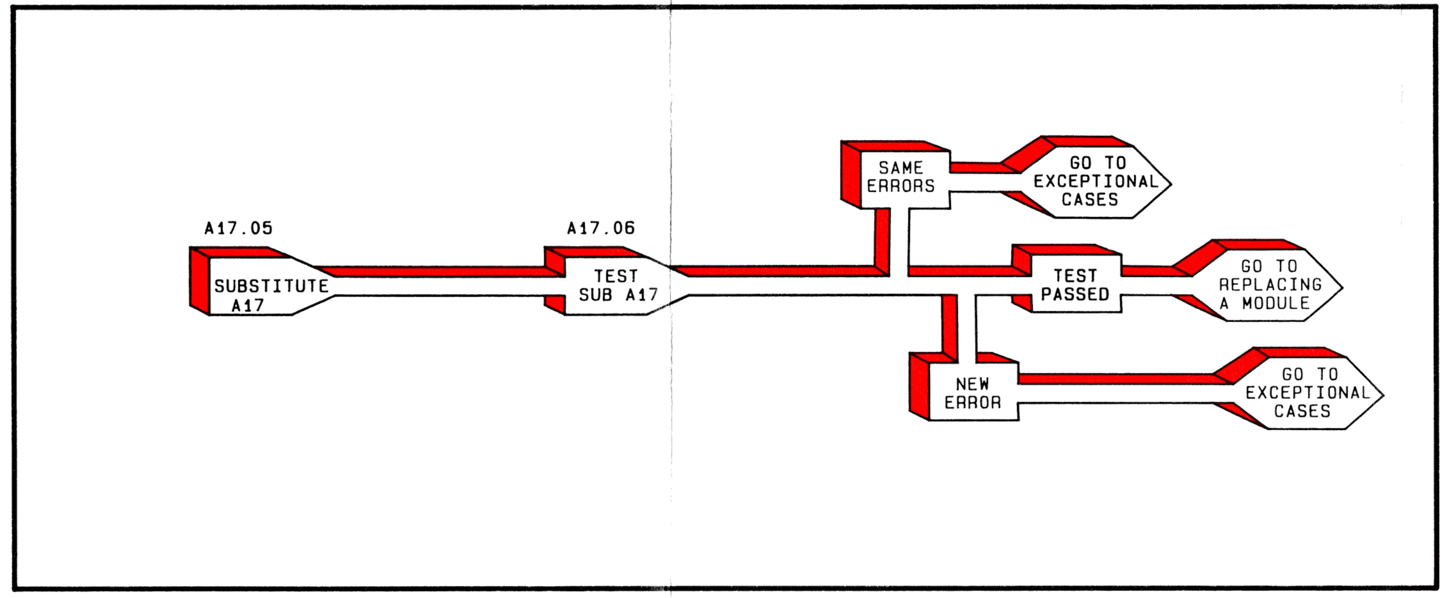
A17 MODULE SIMPLIFIED BLOCK DIAGRAM



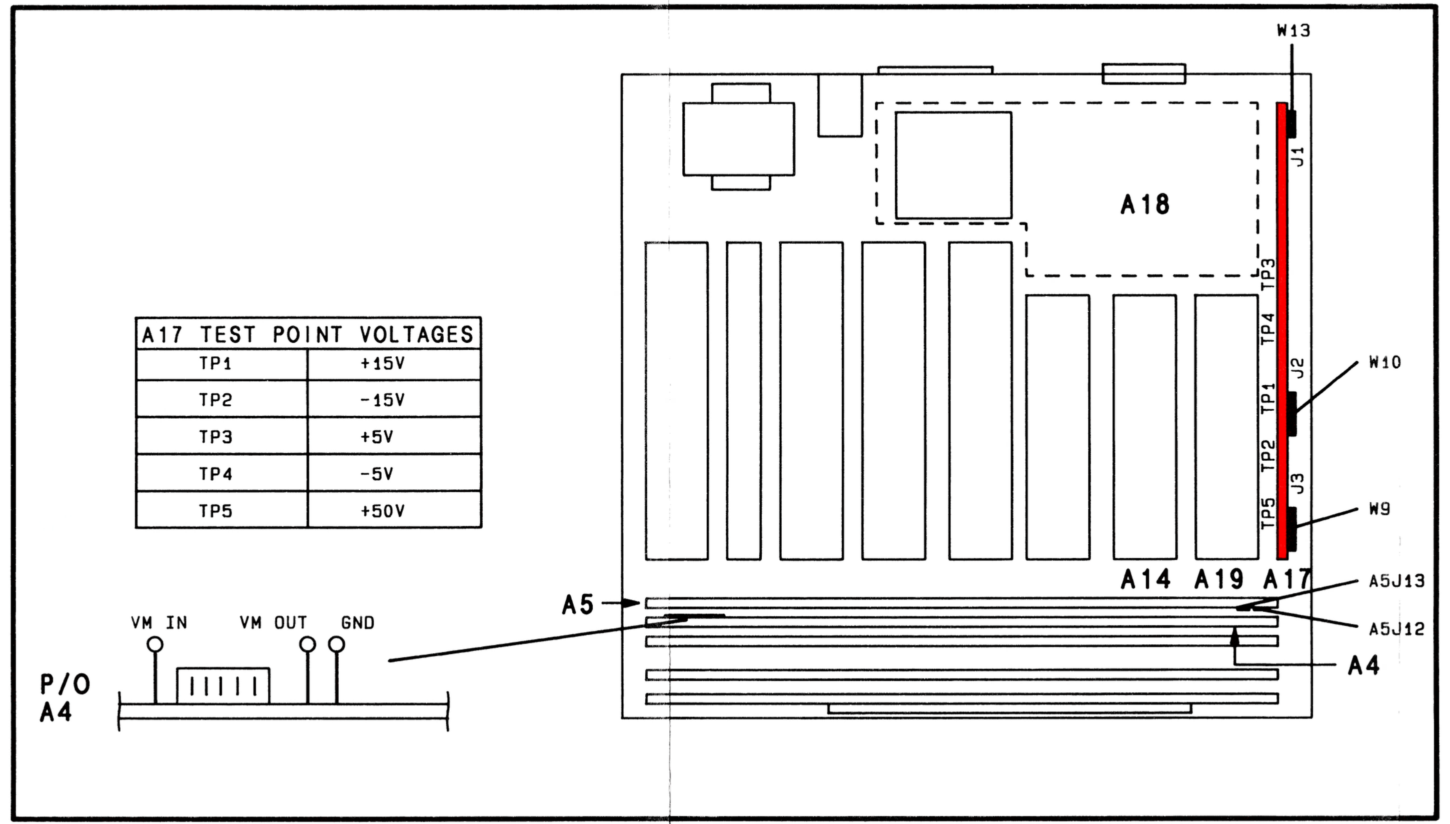
A17 INPUTS VERIFICATION



A17 MODULE SUBSTITUTION



A17 MODULE CABLE CONNECTION LOCATOR



A17 TEST POINT VOLTAGES	
TP1	+15V
TP2	-15V
TP3	+5V
TP4	-5V
TP5	+50V

A17 MODULE I/O SIGNALS DIAGRAM

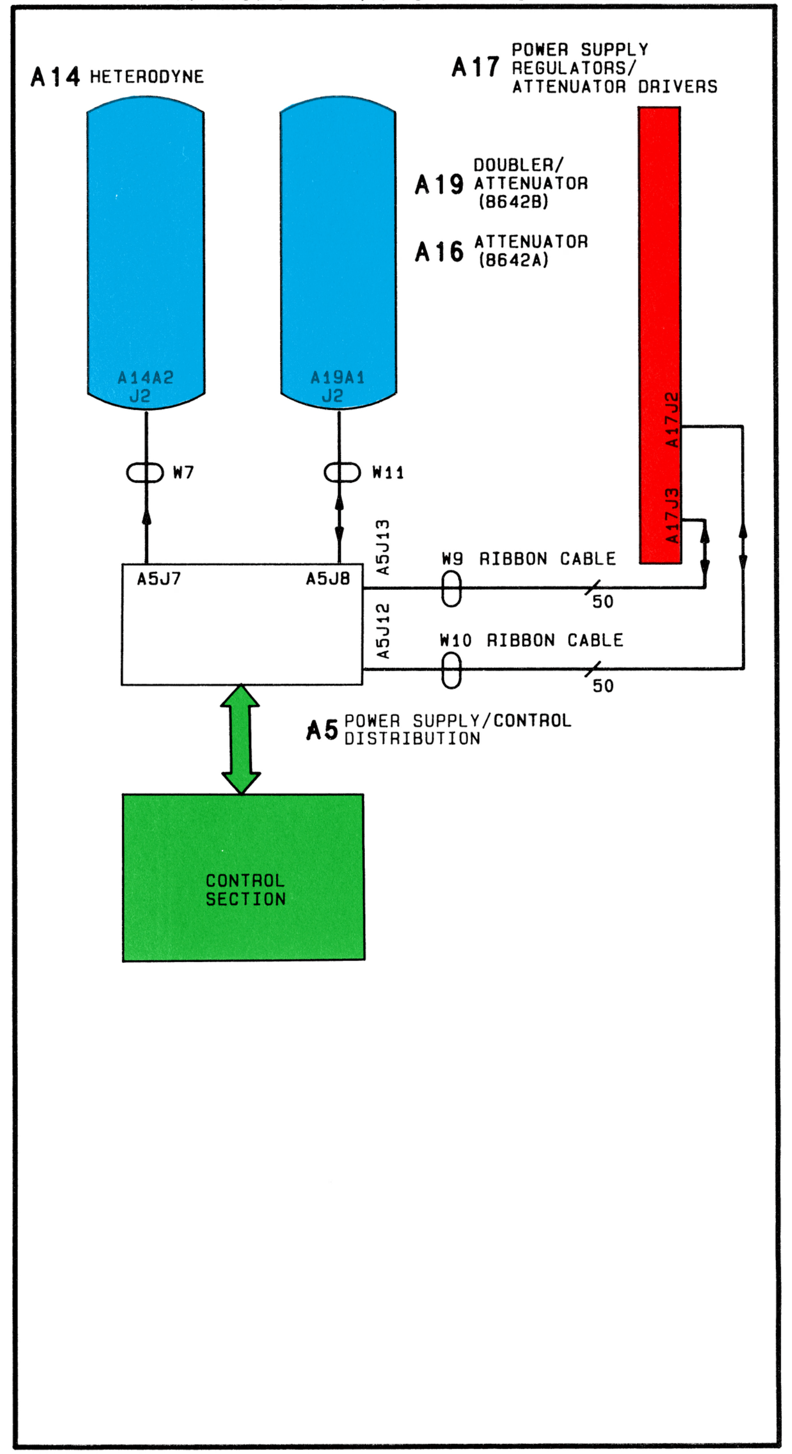


Figure 3B-200. P/O A17 Power Supply Regulators/Attenuator Drivers Module Diagnostics.

Control Section

3C-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS (MLD)** contained in this section are used to further interrogate the **Control Section** Modules: **A1 Keyboard/LCD Display Module, A3 Processor/Memory Module, and A4 Latch Module.** The objective is to isolate the failure indicated for this section to a module or to a part on which the **Control Section** depends for operation.

NOTES

At this level of testing, it is assumed that the Power Supply is operational. If there is any doubt, turn to the **Power Supply** *Section to begin troubleshooting.*

If **Test 4 of A3 failed** *(error message* **.U506***) check that* **A3S2**, *is in its* **PROTECTED** *position. (See CONTROL SECTION CONNECTOR LOCATOR diagram on the foldout at the end of this section to locate A3S2.) If* **A3S2** *is not in its* **PROTECTED** *position, move it to that position now and rerun the* **Instrument Level Diagnostics** *If* **A3S2** *is in its* **PROTECTED** *position, procede with the Control Section Diagnostics.*

<u>**Test Instructions**</u>

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to the table shown on the foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Testing in this section is divided into **three** parts, one part for each of the three Control Section modules: **A4**, **A3**, **A1**.

4. Begin the **Control Section Diagnostics** by reading the next page.

3C-2. INTRODUCTION

The **first step in isolating a Control Section failure** is to substitute in a known good **A4 Module** from the On-site Service Kit.

<u>A4 Substitution Instructions</u>

1. Find **A4 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A4 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the page indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

NOTE

The **CONTROL SECTION I/O SIGNALS DIAGRAM** *shows all parts which the control modules depend on for operation.*

CTL.01

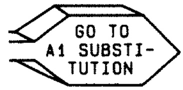
3C-3. INTRODUCTION

To isolate a **Control Section** failure to the **A3 Module**, substitute in a known good module from the On-Site Service Kit.

A3 Substitution Instructions

1. Find **A3 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A3 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they appear in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

CTL.02



3C-4. INTRODUCTION

To isolate a **Control Section** failure to the **A1 Module**, substitute in a known good module from the On-site Service Kit.

A1 Substitution Instructions

1. Find **A1 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A1 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered in the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

Type:	4, Voltage Measurements	**CTL.03**
Run time:	2 min.	
Set-up time:	0 min.	

External DC voltmeter is used to test power supply levels at **A4 Module**.

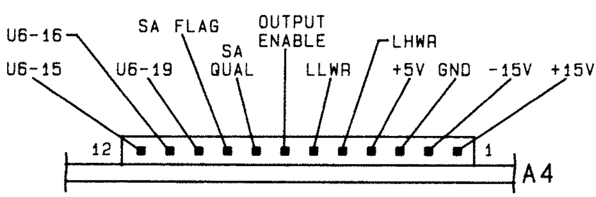
Run Test

1. Turn instrument on.

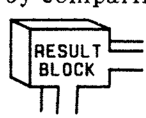
2. Connect **external DC** voltmeter ground lead to **A4 Module** at **A4TP2 (GND)**. (See **CONTROL SECTION CONNECTOR LOCATOR** on foldout to locate ground post.)

3. Measure power supply voltage levels:
   - Connect test probe to **A4 Service Test Points , pins 1, 2 and 4** (see **Figure 3C-1. A4J1 Service Test Point Signal Locator**).

Figure 3C-1. A4J1 Service Test Points Signal Locator



4. Record test results.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST A4 Vdc**.

Type:	Module Tests	**CTL.04**
Run time:	Conditional	
Set-up time:	Conditional	

The **Control Section** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your instrument.

Condition 1: **Instrument Level Diagnostics (ILD)** indicated **Control Section** failure.

Condition 2: **Module Level Diagnostics** (**MLD**) for another module indicated **Control Section** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **Control Section** failure.

Condition 1

NOTE

If you were sent to the Control Section because the instrument was unable to complete the **Instrument Level Self Test**, *return to the foldout now and proceed with the* **A4** *substitution process.*

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue test.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record test results.

5. Return to foldout.

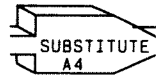
Condition 2

1. Rerun test which indicates **Control Section** failure.
2. Record test results.
3. Return to foldout.

Condition 3

1. Set instrument to operating condition which causes **Control Section** failure.
2. Record instrument set-up and error message(s).
3. Return to foldout.

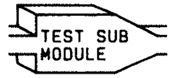
Type:	Module Substitution	**CTL.05**
Run time:	0	
Set-up time:	2 min.	



Substitute Module

1. Switch instrument to **Standby**.
2. Remove **A4 Module** from instrument. (Refer to table on foldout in **MECHANICAL PROCEDURES** for location of removal information.)
3. Replace **A4 Module** with a **known good module** from On-Site Service Kit.
4. Turn instrument on.
5. Return to foldout.

Type:	Module Tests	**CTL.06**
Run time:	Conditional	
Set-up time:	Conditional	



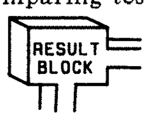
Test operation of **substitute module** by repeating test(s) performed on module before substitution.

Condition 1: **Instrument Level Diagnostics (ILD)** indicated **Control Section** failure.

Condition 2: **Module Level Diagnostics (MLD)** for another module indicated **Control Section** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **Control Section** failure.

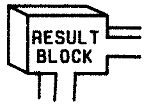
Condition 1

1. [SHIFT] [SPCL] [3] [3] [0] [HZ].
2. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue test.
3. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record test results.
4. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB MODULE**.

Condition 2

1. Rerun test which indicates **Control Section** failure.

2. Record test results.

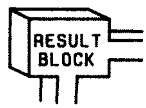
3. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SUB MODULE**.

Condition 3

1. Set instrument to operating condition which causes **Control Section** failure.

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SUB MODULE**.

Type: 4; Voltage Measurements
Run time: 2 min.
Set-up time: 0 min.

CTL.07

External DC voltmeter is used to test power supply levels at **A3 Module**.

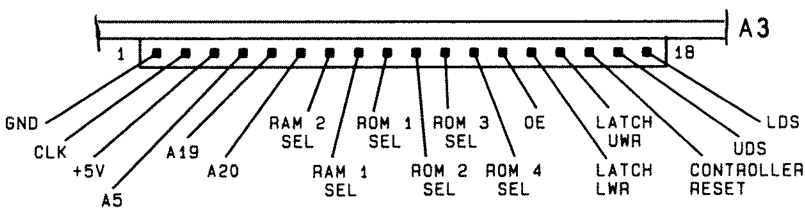
Run Test

1. Turn instrument on.

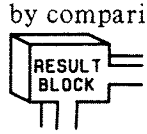
2. Connect **external DC** voltmeter ground lead to **A4 Module** at **A4TP2 (GND)**. (See **CONTROL SECTION CONNECTOR LOCATOR** on foldout to locate ground post.)

3. Measure power supply voltage levels:
   - Connect test probe to **A3 Service Test Points** (see **Figure 3C-2. A3J4 Service Test Point Signal Locator**).

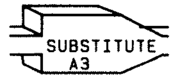
Figure 3C-2. A3J4 Service Test Point Signal Locator



4. Record test results.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST A3 Vdc**.

Type:	Module Substitution	**CTL.08**
Run time:	1 min.	
Set-up time:	3 min.	



In order for the instrument to operate correctly with substitute **A3 Module**, it is necessary to transfer Calibration Data from instrument's **A20 Calibration Module** to substitute **A3 Module**.

Substitute Module

1. Switch instrument to **Standby**.

2. Remove **A3 Module** form instrument. (Refer to foldout in **MECHANICAL PROCEDURES** to locate removal information.)

3. Replace **A3 Module** with a **known good module** from On-Site Service Kit.

Down-Load Cal Data

CAUTION

Use adequate Electrostatic Discharge Techniques when handling the A20 Calibration Module.

4. Remove **A20 Calibration Module** from **Rear Panel**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate removal information.)

CAUTION

*Check that switch S1 on A20 Module is switched up to its "**PROTECTED**" position.*

The Calibration Data stored on the A20 Module and in the instrument will be destroyed by misapplied electrical signals.

5. Switch instrument to **Standby**.

6. Connect **A20** Module to **A3 Module** at **A3J3** (see **CONTROL SECTION CONNECTOR LOCATOR** on foldout).

7. Turn instrument on.

8. When "**100.000000 MZ -140.00 DM**" appears:
   - Slide switch on left side of **A3S2** (on **A3 Module**) back toward rear of instrument (see **CONTROL SECTION CONNECTOR LOCATOR** on foldout).

9. [SHIFT] [SPCL] [3] [7] [5] [HZ]

10. When "**TRANSFER VERIFIED .U613**" appears:
    - Slide **A3S2** forward, toward front of instrument to **protect A3 Module's** memory.

11. Switch instrument to **Standby** and remove **A20 Module**. **Replace A20 Module on Rear Panel of instrument.**

12. Return to foldout.

Type:	4, Voltage Measurements	**CTL.09**
Run time:	2 min.	
Set-up time:	6 min.	

External DC Voltmeter is used to check power supply levels at inputs to **A1 Module**.

Run Test

1. Turn instrument on.

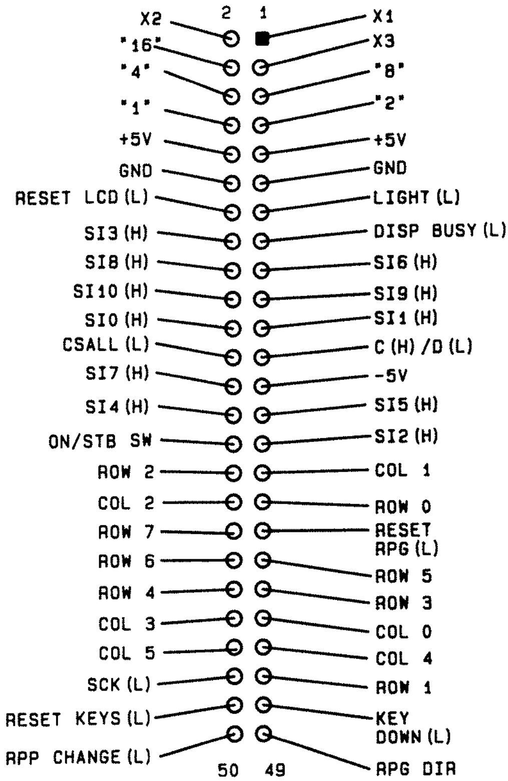
2. Connect **external DC** voltmeter ground lead to **A4 Module** at **A4TP2 (GND)**. (See **CONTROL SECTION CONNECTOR LOCATOR** on foldout to locate ground post.)

CAUTION

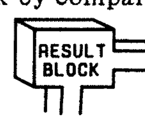
Opening the Front Panel without following the instructions presented in the MECHANICAL PRECEDURES section may cause damage to the Front Panel.

3. Measure voltage levels at **A1A1 J1**:
   - Open Front Panel. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate Front Panel information).
   - Access signals from solder-side of **A1A1 J1**. (See **CONTROL SECTION CONNECTOR LOCATOR** on foldout to locate **A1A1 J1**.)
   - Voltage levels and locations are shown in **Figure 3C-3**.

Figure 3C-3. Connector A1A1 J1 Signal Locator



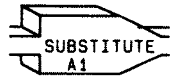
4. Record test results.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

for **TEST A1 Vdc.**

Type: Module Substitution
Run time: 0
Set-up time: 10 min.

CTL.10



Substitute Module

1. Switch instrument to **Standby** and disconnect power plug.

2. Remove **A1 Module** from instrument. (Refer to table on foldout in **MECHANICAL PROCEDURES** for location of removal information).

3. Replace module with a known good **A1 Module** from On-Site Service Kit.

COMMENT

To set-up the substitute A1 Module for testing, simply connect cables at A1A1 J1 and A1A1 J3 on substitute module and attach module to front panel with four nuts (1 at each corner).

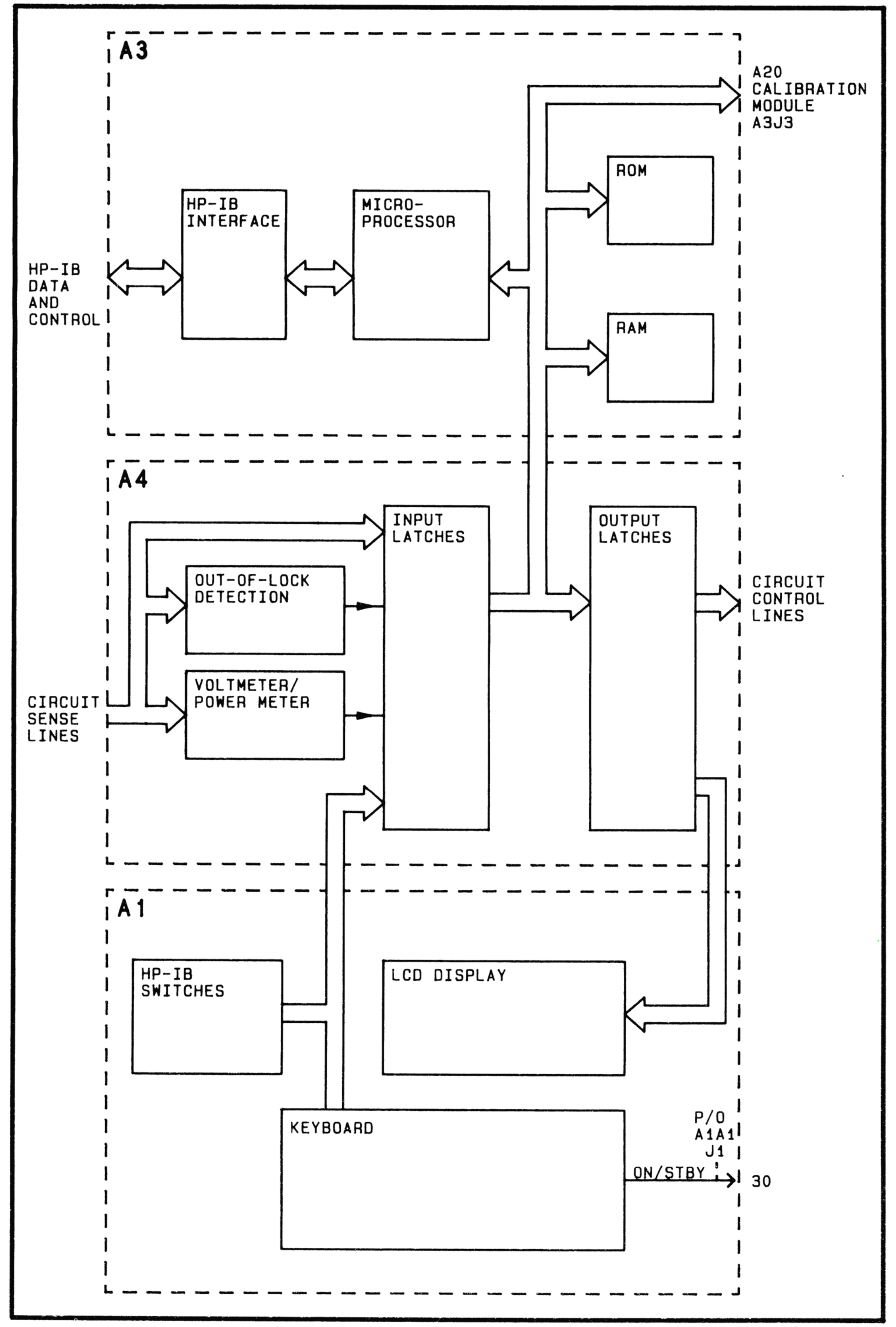
4. Return to foldout.

Type:	Module Substitution	**CTL.11**
Run time:	0	
Set-up time:	2-4 min.	

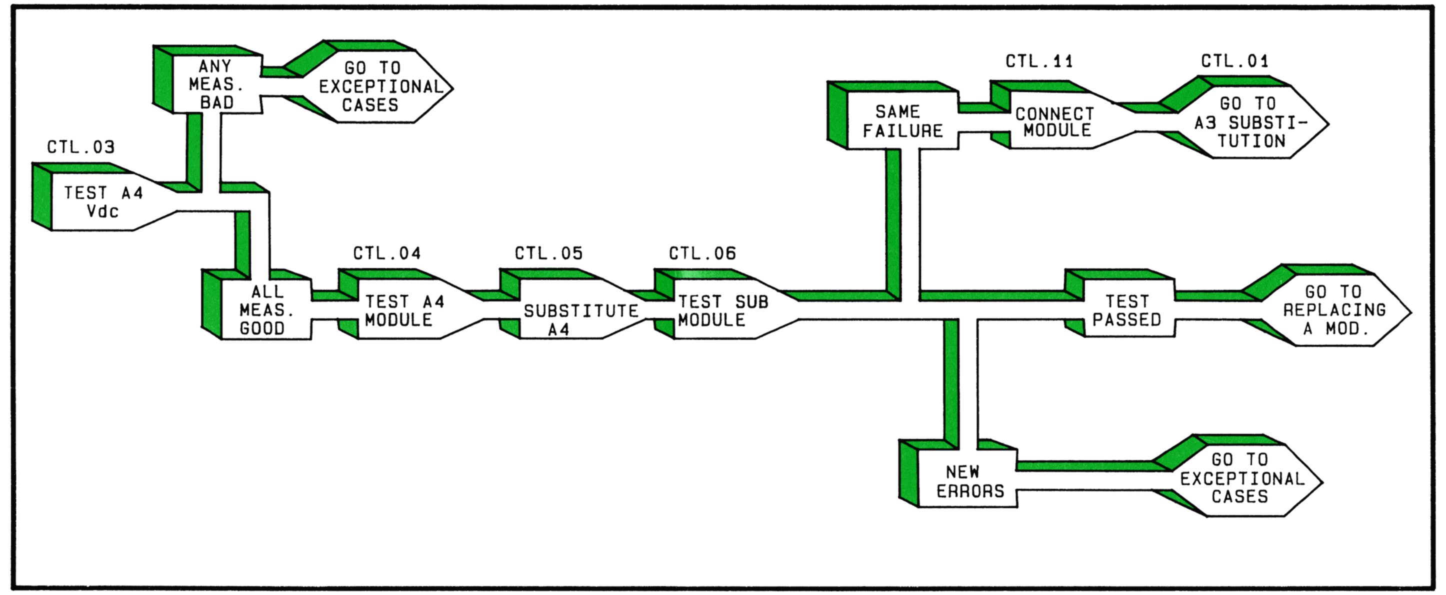
Replace Module

1. Switch instrument to **Standby** (if you are replacing A1 **Module** disconnect line power also).
2. Remove **substitute** module from instrument and return to On-Site Service Kit.
3. Replace instrument's module in instrument. (Refer to foldout in **MECHANICAL PROCEDURES** to locate replacement information.)
4. Turn instrument on.
5. Return to foldout.

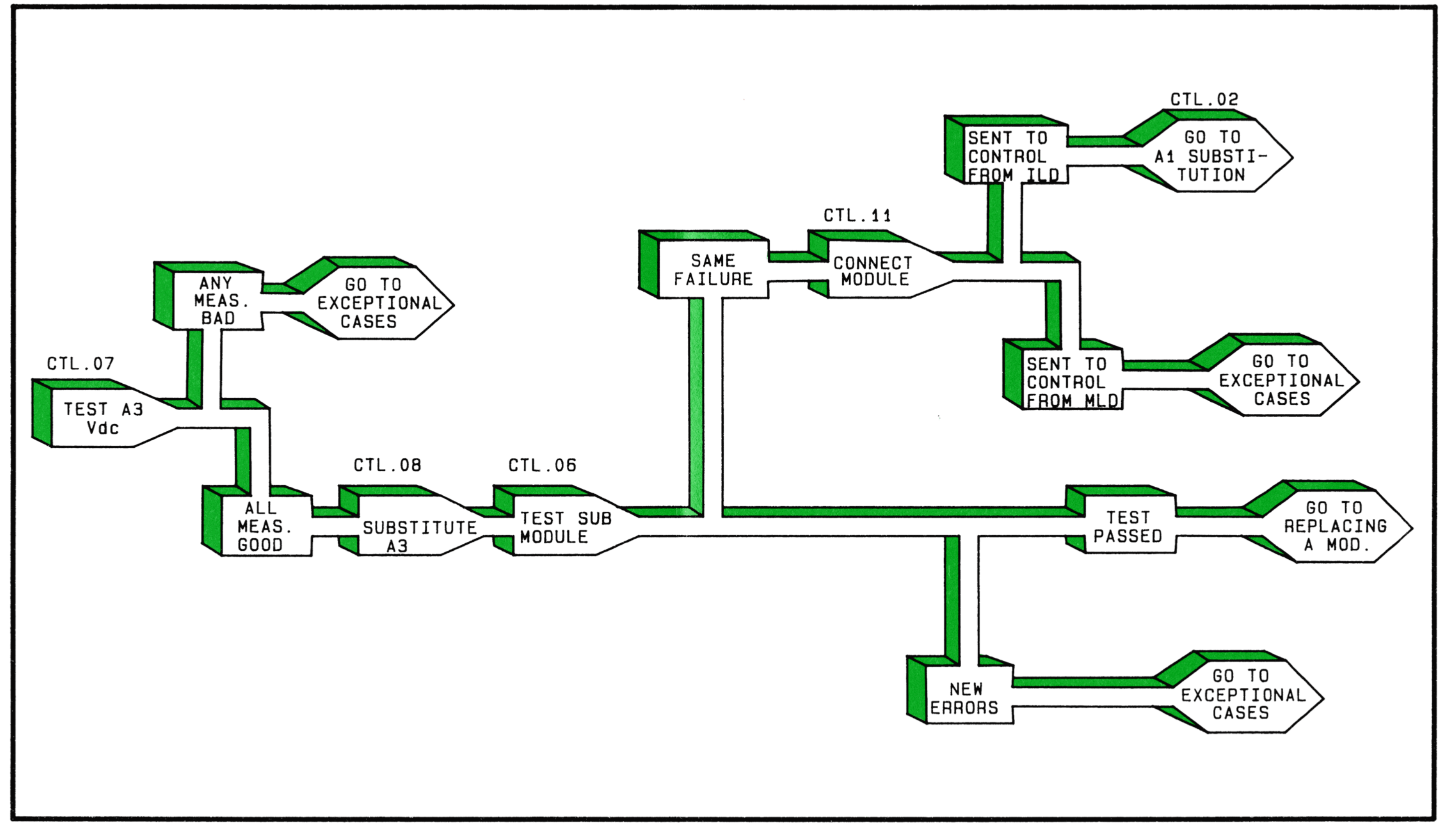
A1, A3, A4 MODULE SIMPLIFIED BLOCK DIAGRAM



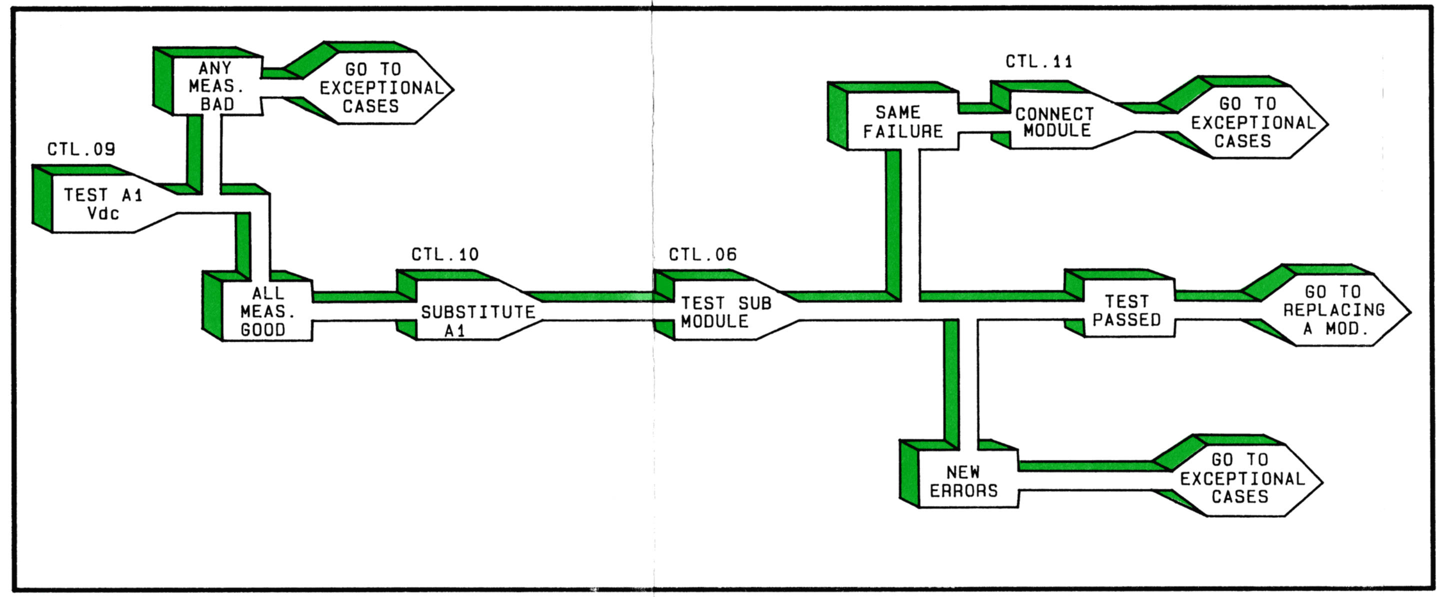
A4 MODULE SUBSTITUTION



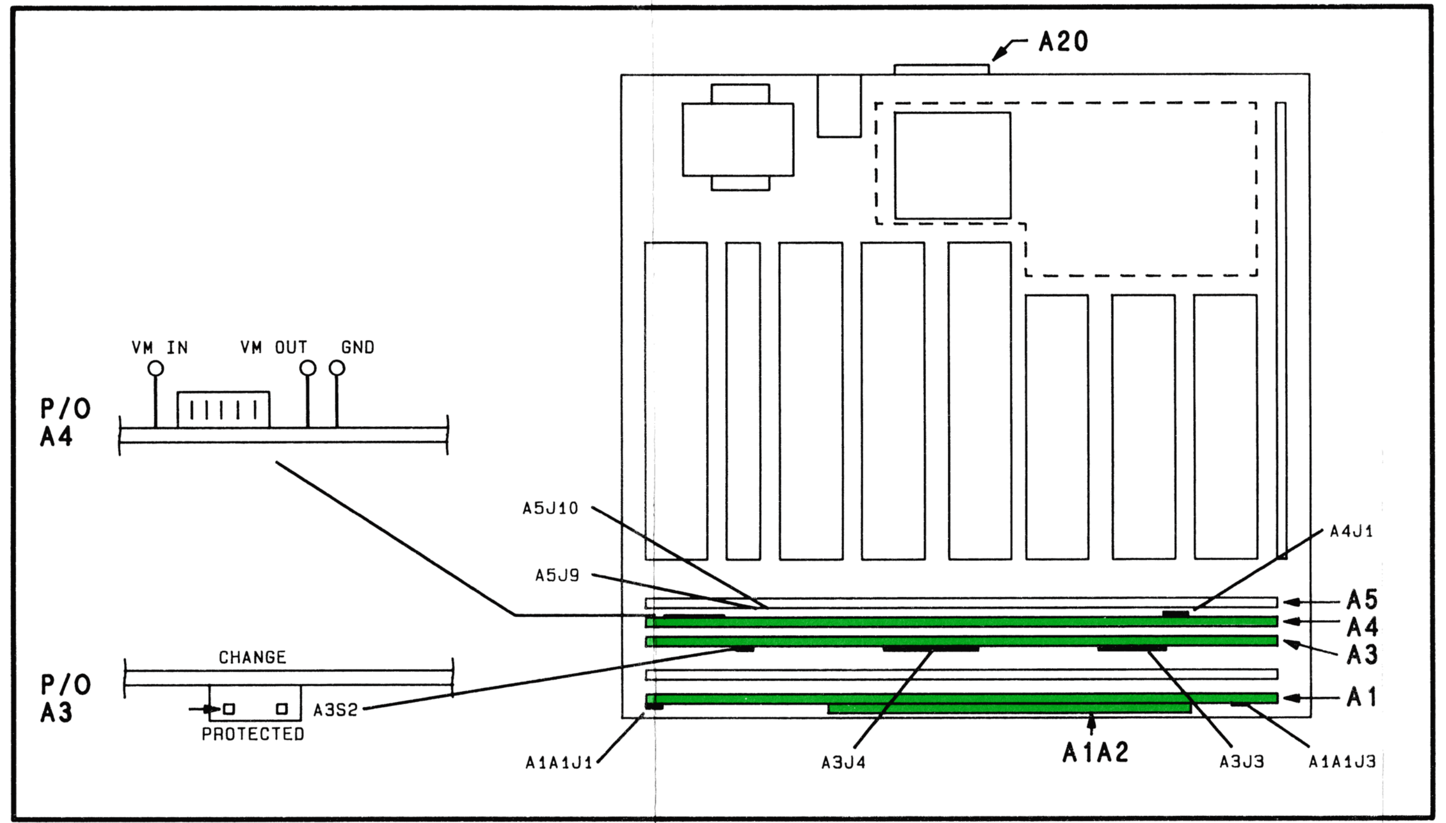
A3 MODULE SUBSTITUTION



A1 MODULE SUBSTITUTION



CONTROL SECTION CONNECTOR LOCATOR



CONTROL SECTION I/O SIGNALS DIAGRAM

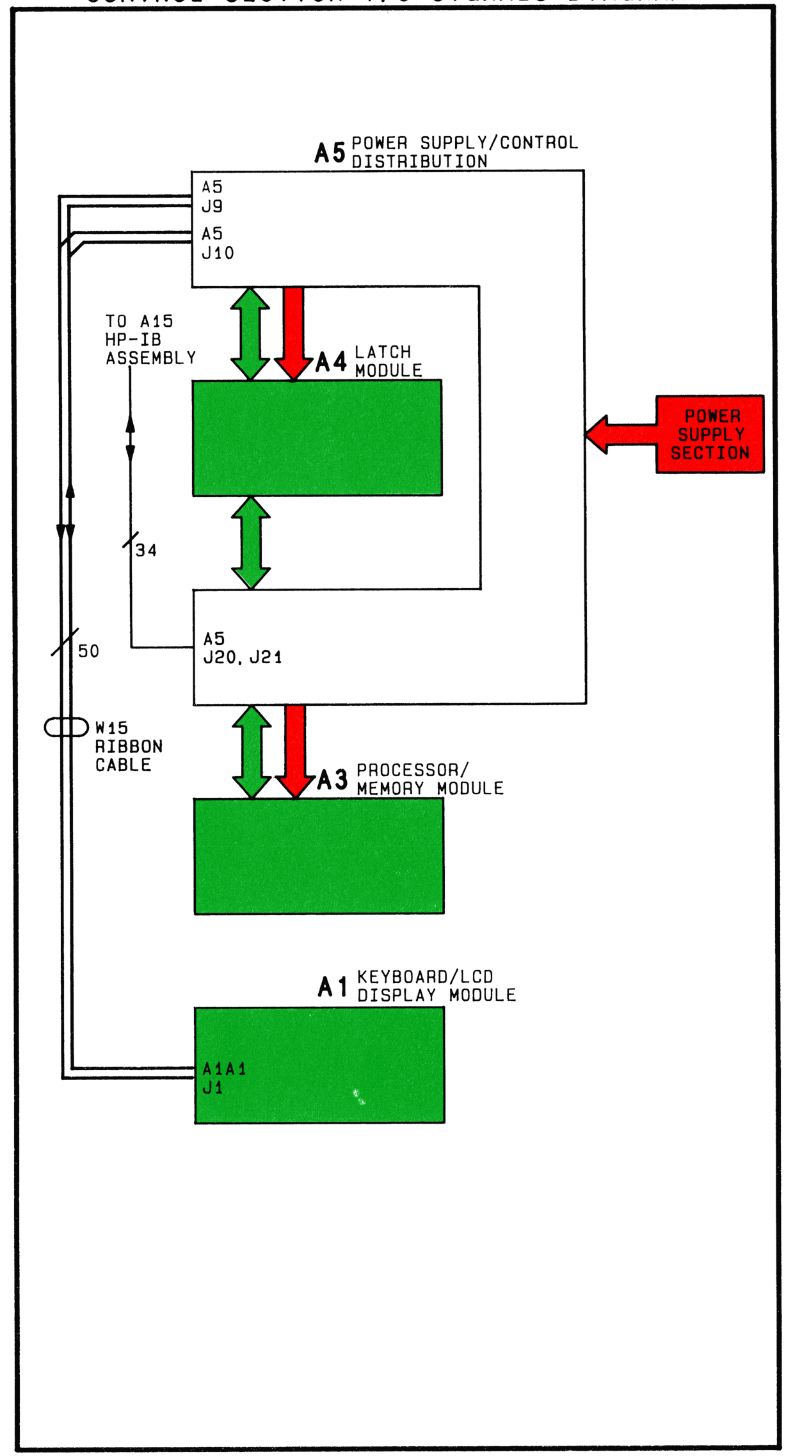


Figure 3C-100. A1,A3 AND A4 Control Section Diagnostics.

RF Section

A2

3E-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (MLD) contained in this section are used to further interrogate the **A2 Module**. The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01, A03** *or* **A04**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptible to short circuiting.

Test Instructions

1. The instrument's **Front Panel** must be opened to run many of these tests. (Refer to the table on the foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Proceed to the next page to begin the **A2 MLD**.

3E-2. INTRODUCTION

NOTE

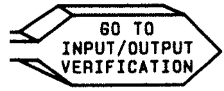
If a known good module is not available, proceed to the next page **A2 INPUTS/OUTPUTS VERIFICATION**.

The first step in isolating an A2 failure is to substitute in a known good module from the On-Site Service Kit.

A2 Substitution Instructions

1. Find **A2 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A2 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according ot the order in which they appear in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

A2.01



3E-3. INTRODUCTION

If a known good **A2 Module** is not available, or if you were not able to isolate the failure using the **A2 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams (shown under **A2 INPUTS/OUTPUTS VERIFICATION**) should be used to check each signal path into the A2 Module.

A2 Inputs/Outputs Verification Instructions

1. Find **A2 INPUTS/OUTPUTS VERIFICATION** on the foldout.

2. The Task Sequence Diagrams, shown under **A2 INPUTS/OUTPUTS VERIFICATION**, are separated into four checks: **Modulation Input/Output Ports, Audio to Instrument, Control** signals, and **Power Supply** signals.

3. Use the Task Sequence Diagrams to guide you through the verification process. Each Task Arrow shown in a diagram contains a task number and task title. The tasks are numbered according to the order in which they appear in this section. Turn to the task indicated and complete the procedure.

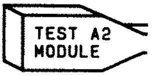
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.

5. Begin now by performing the first task shown under **1. MODULATION I/O PORTS CHECK.**

NOTE

The **A2 MODULE I/O SIGNALS DIAGRAM** *shows all parts directly associated with modulation.*

Type:	1; Modulation Self Test	A2.02
Run time:	1 min.	
Set-up time:	1 min.	



Run Test

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

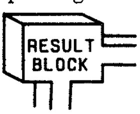
2. SHIFT SPCL 3 3 1 6 HZ.

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**". (See foldout in **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** for set-up diagram.)
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a cable from Tee to "**AM/PULSE INPUT**".
   - HZ to continue test.

4. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A2**.

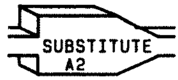
COMMENT

If any error codes are displayed for modules A01, A03, or A04, you need to isolate those failure(s) before performing the A2 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST A2 MODULE**.

Type:	Module Substitution	A2.03
Run time:	0	
Set-up time:	5 min	



The following describes the technique for connecting a known good A2 Module **without removing** the A2 Module in the instrument.

Connect Substitute Module

1. Switch instrument to **Standby**.

2. Disconnect all cables to **A2 Module**; **W14**, **W17 through 22**, and **W33**. (See **A2 MODULE CABLE CONNECTION LOCATOR** on foldout.)
   - Clip cable ties holding cable bundle to module ties.

3. Without removing **A2 Module** from instrument, carefully lay substitute **A2 Module** against **A2 Module** in instrument.

4. Connect cables **W14**, **W17 through 22** and **W33** to substitute module.

5. Pivot **substitute A2 Module** away from **A2 Module** in instrument.
   - Support from cables should allow substitute module to be placed in a free standing position.

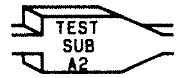
CAUTION

If circuit side of substitute A2 is permitted to contact A2 Module in instrument, damage could result to either module. If Front Panel contacts substitute A2 Module, damage could result to substitute A2 Module.

6. Carefully turn instrument on.

7. Return to foldout.

Type:	Substitute Module Test	**A2.04**
Run time:	1 min.	
Set-up time:	1 min.	



Test operation of **substitute A2 Module** by repeating test performed on **A2 Module** before substitution.

CAUTION

Do not allow Front Panel to swing against substitute A2 Module while instrument is turned on.

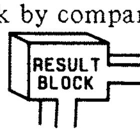
Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [1] [6] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Use same set-up as in previous test.

4. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A2**.

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A2**.

Type:	Additional A2 Tests	**A2.05**
Run time:	Conditional	
Set-up time:	Conditional	

The **A2 Module** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Diagnostics** indicated **A2** failure.

Condition 2: Failure indicated for another module appears to be **modulation related**.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A2** failure.

<u>**Condition 1**</u>

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [0] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see foldout in **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**".
   - [HZ] to continue test.

4. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A2**.

COMMENT

If any error codes are displayed for modules A01, A03, or A04, you need to isolate those failure(s) before performing the A2 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIANOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. Rerun test which generates modulation related failures.
2. Record test results.
3. Return to foldout.

Condition 3

1. Set instrument to operating condition which causes **A2 failure**.
2. Record instrument set-up and error message(s).
3. Return to foldout.

Type:	Additional Substitute A2 Tests	A2.06
Run time:	Conditional	
Set-up time:	Conditional	

Test operation of **subtitute A2 Module** by repeating test(s) performed on **A2 Module** before substitution.

Condition 1: **Instrument Level Diagnostics** indicated A2 failure.

Condition 2: Failure indicated for another module appears to be **modulation related.**

Condition 3: Instrument must be **set to a specific operating condition** to detect **A2** failure.

<u>**Condition 1**</u>

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

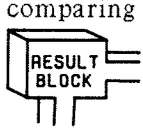
2. [SHIFT] [SPCL] [3] [3] [0] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see foldout in **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**".
   - [HZ] to continue test.

4. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for A2.

COMMENT

If any error codes are displayed for modules A01, A03, or A04, you need to isolate those failure(s) now.

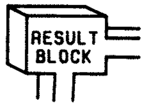
5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SUB A2 FURTHER**.

<u>Condition 2</u>

1. Rerun test which generates modulation related failures

2. Record test results.

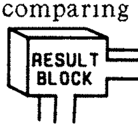
3. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A2 FURTHER.**

<u>Condition 3</u>

1. Set instrument to operating condition which causes **A2 failure**.

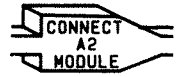
2. Record instrument set-up and error message(s).

3. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A2 FURTHER.**

Type:	Cable Connection
Run time:	0 min.
Set-up time:	5 min.

A2.07



Connect Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W14**, **W17 through W22** and **W33** from substitute **A2 Module**.
3. Reconnect cables **W14**, **W17 through W22** and **W33** to **A2 Module** and replace cable ties holding cable bundles to module with ties provided in On-Site Service Kit.
4. Turn instrument on.
5. Return substitute **A2 Module** to On-Site Service Kit.
6. Return to foldout.

Type:	1; Modulation Self Test	A2.08
Run time:	1 min.	
Set-up time:	1 min.	

This is the same test used to test **A2 Module** during module substitution process. If you made an accurate record of test results for that test, it is not necessary to rerun test now; instead proceed directly to step **5**.

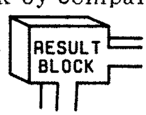
Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [1] [6] [HZ]

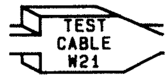
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see foldout in **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**".
   - [HZ] to continue test.

4. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A2**.

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST MOD PORTS**.

Type:	1; Modulation Self Test	**A2.09**
Run time:	1 min.	
Set-up time:	6 min.	



Cable **W21** is tested by by-passing it during testing.

Run Test

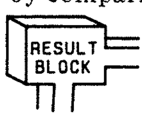
1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "100.000000MZ -140.0DM" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [1] [6] [HZ]

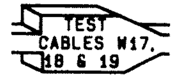
3. When **"WAITING FOR SET-UP 1 .V24"** appears:
   - Connect **"FM/ΦM INPUT"**, **"MOD OUTPUT"** and **"AM/ PULSE INPUT"** same as previous test.

4. Test cable **W21**:
   - Disconnect cable **W21** from **A2 Module** at **A2J8** (see **A2 MODULE CABLE CONNECTION LOCATOR** on fold-out) and from **A6 Module** at **A6A2 J3** (see **Top View Diagram** on inside of Top Cover to locate **W21** connection on **A6 Module**). (See table on foldout in **MECHANICAL PROCEDURES** to locate Top Cover removal information.)
   - Substitute test coax cable from On-Site Service Kit between **A2J8** and **A6 Module** at **A6A2 J3**.
   - [HZ] to continue.

5. When **"DIAG DONE HIT MSSGS .V1"** appears:
   - Reconnect cable **W21** to modules **A2** and **A6**.
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A2**.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W21.**

Type:	1; Modulation Self Test	**A2.10**
Run time:	1 min.	
Set-up time:	8 min.	



Cables **W17**, **W18** and **W19** are tested by separately by-passing each cable and rerunning test.

Test Cable W19

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [1] [6] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect BNC Tee connector from "**FM/ΦM INPUT**"; leave BNC cables connected to "**MOD OUTPUT**" and "**AM/PULSE INPUT**" as in previous test.
   - Connect BNC-to-SMC adapter, SMC barrel adapter, and test coax cable (from On-Site Service Kit) to Tee connector.

4. Connect substitute cable:
   - Disconnect cable **W19** from **A2 Module** at **A2J5**. (See **A2 MODULE CABLE CONNECTIONS LOCATOR** on foldout to locate **A2J5**.)
   - Connect the coax cable from Tee connector to **A2 Module** at **A2J5**.
   - [HZ] to continue.

5. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Reconnect cable **W19** to **A2 Module**.
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A2**.

Test Cable W17

6. Repeat steps **1** and **2**.

7. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect BNC cable from "**MOD OUTPUT**" and connect to "**FM/ΦM INPUT**".

8. Connect substitute cable:
   - Disconnect cable **W17** from **A2 Module** at **A2J7**.
   - Connect loose end of test cable to **A2 Module** at **A2J7**.
   - [HZ] to continue test.

9. When "**DIAG DONE   HIT MSSGS .V1**" appears:
   - Reconnect cable **W17** to **A2 Module**.
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A2**.

Test cable W18

10. Repeat steps **1** and **2**.

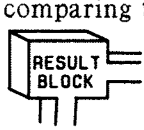
11. When "**WAITING FOR SET-UP 1   .V24**" appears:
    - Disconnect BNC cable from "**AM/PULSE INPUT**" and connect to "**MOD OUTPUT**".

12. To connect substitute cable:
    - Disconnect cable **W18** from **A2 Module** at **A2J2**.
    - Connect loose end of test cable to **A2 Module** at **A2J2**.
    - [HZ] to continue test.

13. When "**DIAG DONE   HIT MSSGS .V1**" appears:
    - Reconnect cable **W18** to **A2 Module**.
    - Use [MSSG] to scroll through messages.
    - Record error code(s) displayed for **A2**.

NOTE

If tests did not pass for any of the cable substitution attempts, you should have gotten the same error set for each test. If you did not get the same errors, recheck cable connections and rerun test.

14. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLES W17, 18 and 19.**

Type:	2; Audio Output Levels	A2.11
Run time:	30 sec.	
Set-up time:	6 min.	

Run Test

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "100.000000MZ -140.0DM" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [1] [7] [HZ]

3. When **"WAITING FOR SET-UP 1 .V24"** appears:
   - Disconnect cable **W22** from **A13 Module** at **A13A2 J4** (See Top View Diagram inside Top Cover to locate **W22** on **A13**).
   - Connect cable **W22** to **"AM/PULSE INPUT"** using BNC cable and BNC-to-SMC adapter with barrel adapter from On-Site Service Kit.
   - If an **HP 8642A** is being tested, disconnect cable W19 at A2J5 and connect a test cable from A2J5 to A2J4. (See table on foldout in **MECHANICAL PROCEDURES** section to locate Front Panel opening procedure.) Push [HZ] now and proceed to step 4.

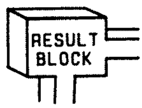
Extending the A19 Module exposes the circuit side of the A17 Power Supply Regulators/Attenuator Drivers Module. Do not permit the loose end of W33 to contact the A17 Module.

   - If an **HP 8642B** is being tested, disconnect cable **W33** from **A19 Module** at **A19A1 J6**. To access **A19A1 J6**, extend **A19 Module**. (See table on foldout in **MECHANICAL PROCEDURES** for module extending information).
   - Connect cable **W33** to **"FM/ΦM INPUT"** using cabling method described for **W22**.
   - [HZ] to continue.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cables **W22**, (**W33 HP 8642B only**) and (W19 HP 8642A only) to modules.
   - Disconnect cable **W20** from **A6 Module** at **A6A1 J4**.
   - Connect cable **W20** to "**AM/PULSE INPUT**".
   - Connect "**FM/ΦM INPUT**" to "**MOD OUTPUT**".
   - HZ to continue.

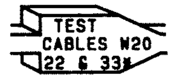
5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W20** to **A6 Module**.
   - HZ to continue.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A2**.
   - If "**TEST 2 OF A02 (PASSED** or **FAILED)**" is not displayed, rerun test.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST AUDIO TO A6, 13 and 19**.

Type:	2; Audio Output Levels	A2.12
Run time:	30 sec.	
Set-up time:	5 min.	



Cables **W20**, **W22**, and **W23** are tested by substituting in a test cable for each of these cables during testing.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [1] [7] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W22** from **A2 Module** at **A2J3** (see **MODULE CABLE CONNECTION LOCATOR** on foldout to locate **W22**). (See table on foldout in **MECHANICAL PROCEDURES** for opening Front Panel information.)
   - Using BNC cable and BNC-to-SMC adapter, SMC barrel, and SMC coax cable from On-Site Service Kit, connect **A2 Module** (at **A2J3**) to "**AM/PULSE INPUT**".
   - If an **HP 8642A** is being tested, push [HZ] now and proceed to step **4**.
   - If an **HP 8642B** is being tested, disconnect cable **W33** from **A2 Module** at **A2J4**.
   - Using same cabling method described for **W22**, connect **A2 Module** (at **A2J4**) to "**FM/ΦM INPUT**"

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cables **W22** and (**W33 HP 8642B only**) to **A2 Module**.
   - Disconnect cable **W20** from **A2 Module** at **A2J6**.
   - Connect **A2 Module** (at **A2J6**) to "**AM/PULSE INPUT**".
   - Connect "**FM/ΦM INPUT**" to "**MOD OUTPUT**".
   - [HZ] to continue.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W20** to **A2 Module.**
   - [HZ] to continue.

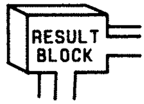
6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A2.**
   - If "**TEST 2 OF A02 (PASSED** or **FAILED)**" is not displayed, rerun test.

7. If test failed, proceed directly to step **8**, otherwise continue testing.
   - A passing test indicates that one of the by-passed cables (**W20, W22** or **W23**) was cause of failure.
   - To isolate defective cable, rerun test two more times connecting cables as follows:

     Test 1: Connect cables **W22** and **W33** as described in step **3** of this test (by-passed). Connect **W20** as described in step **4** of previous test (not by-passed).

     Test 2: Connect cable **W22** as described in previous test (not by-passed). Connect **W33** and **W20** as described in this test (by-passed).
   - Use the following chart to determine defective cable:

Test 1	Test 2	Defective Cable(s)
F	P	W20
P	F	W22
F	F	Cables W20 and W22
P	P	W33

8. When testing is complete, return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLES W20, 22 and 33.**

Type:	3; Bit Transmission	**A2.13**
Run time:	6 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A2 Module** on Clock and Data control lines D0 through D7.

COMMENTS

Check control line inputs to A2 by performing test procedure for control lines shown in **Table 3E-1**.

If any control line measures bad, it is not necessary to test remaining lines; proceed to step **14.**

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W14** from module at **A2J1**.
   - Plug end of **W14** into **20 pin** test connector, from On-site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W14P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A2 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

3. Turn instrument on.

Clock and Data Control Lines

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

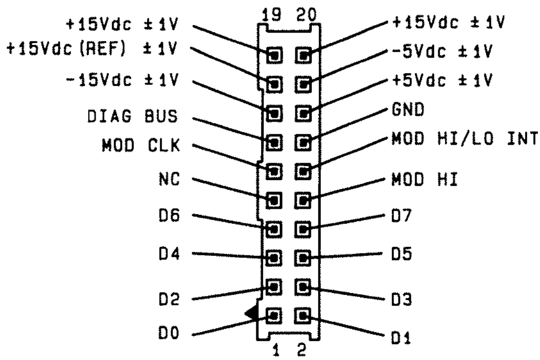
5. Enter **Bit Select Keys** as indicated in **Table 3E-1. W14P2 Control Bits**, for **Control Line** to be tested.

6. Connect **VM** probe **Control Line** at **Pin Number** indicated in **Table 3E-1.** (See **Figure 3E-1. Cable Plug W14P2 Signal Locator.**)

Table 3E-1. W14P2 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 5 and 10)	Pin Number (Step 6)
1	MOD CLK	[6] [0] [HZ]	11
2	D0	[4] [8] [HZ]	1
3	D1	[4] [9] [HZ]	2
4	D2	[5] [0] [HZ]	3
5	D3	[5] [1] [HZ]	4
6	D4	[5] [2] [HZ]	5
7	D5	[5] [3] [HZ]	6
8	D6	[5] [4] [HZ]	7
9	D7	[5] [5] [HZ]	8

Figure 3E-1. Cable Plug W14P2 Signal Locator



7. [2] [5] [HZ]
   (To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
   ([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify low state.)

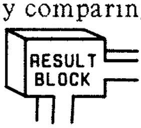
10. Enter **Bit Select Keys** as indicated in **Table 3E-1. W14P2 Control Bits**, for same **Control Line**.

11. [2] [5] [HZ]
    (To enable voltmeter.)

12. Voltage should read approximately **-0.5 to +1.5 Vdc.**
    ([5] [HZ] to repeat measurement.)

13. Repeat procedure for each **Control Line** shown in **Table 3E-1**.

14. Record test results.

15. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

for **TEST CONTROL BITS**.

Type:	Voltage Measurements	**A2.14**
Run time:	2 min.	
Set-up time:	6 min.	

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A2** **Module**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W14** from **A2** at **A2J1**.
   - Plug end of **W14** into **20 pin** test connector, from On-site Service Kit.

   NOTE

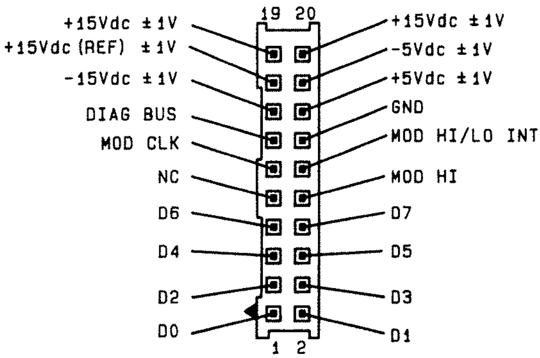
   Find arrowhead on test connector and align with arrowhead on cable plug **W14P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A2 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

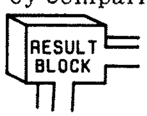
3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (see **Figure 3E-2. Cable Plug W14P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

Figure 3E-2. Cable Plug W14P2 Signal Locator

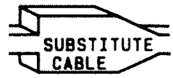


5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST Vdc**.

Type:	Cable Substitution	**A2.15**
Run Time:	5 min.	
Set-up Time:	1 min.	

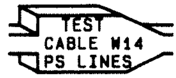


1. Testing has shown cable **W20**, **W21**, **W22**, or **W33** to be defective, temporarily replace with a test cable from the On-Site Service Kit. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

3. Return to foldout.

Type:	Cable Check	A2.16
Run time:	N/A	
Set-up time:	N/A	



1. Replacement of cable **W14** is not considered an on-site procedure due to extensive disassembly required.
2. To further test **W14**, verify integrity of signal source by proceeding as directed on foldout.
3. Reconnect cable **W14** to **A2 Module**.
4. Return to foldout.

3E-4. A2 MODULATION MODULE

COMMENT

It is not to essential to understand the internal operation of a module to make an on-site repair.

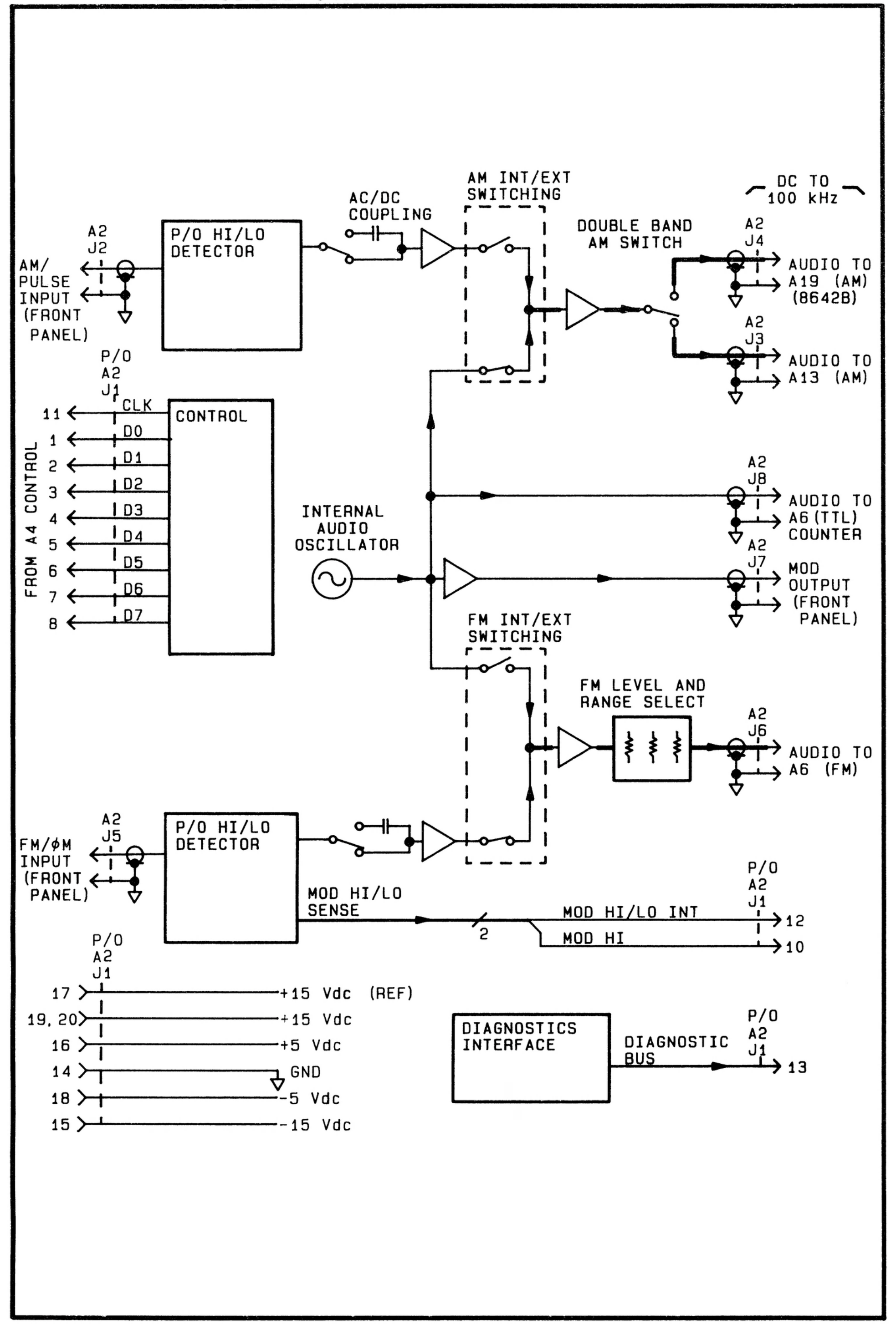
The **A2 Module** generates an audio signal from **10 Hz** to **100 kHz**. This signal is provided to the **A6 FM Loop** frequency and phase modulation and to the **A13 Output Loop** for amplitude modulation. In the HP 8642B this signal is sent to the **A19 Doubler** for amplitude modulation in the Doubler Band (**1057.5** to **2115 MHz**).

The output of **A2's Internal Audio Oscillator** is also sent to the **A6 Counter**. The frequency count generated by the counter is passed to the **A3 Processor**. The Processor compares the frequency count with the specified setting for the audio oscillator and fine tunes the oscillator until the frequency count matches the specified frequency setting.

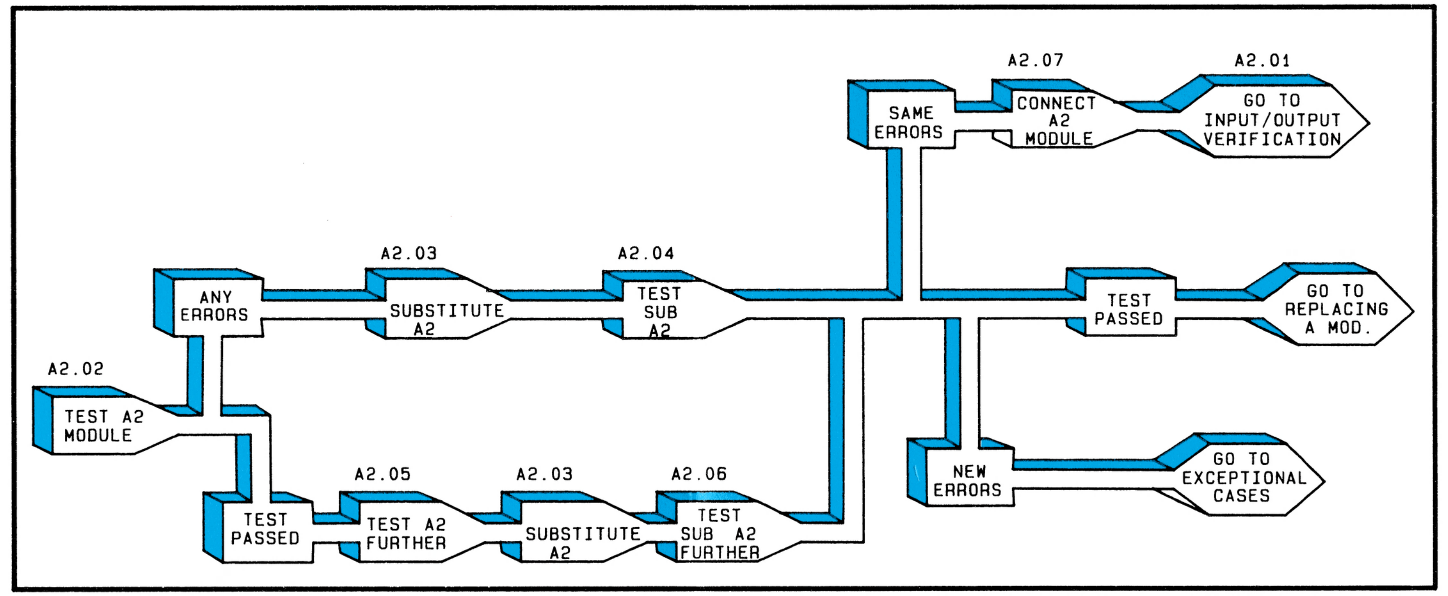
The **A2 Module** accepts **external** modulation signals via the "**AM/PULSE**" and "**FM/ΦM**" input ports.

See the **A2 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A2 Module's** internal operation.

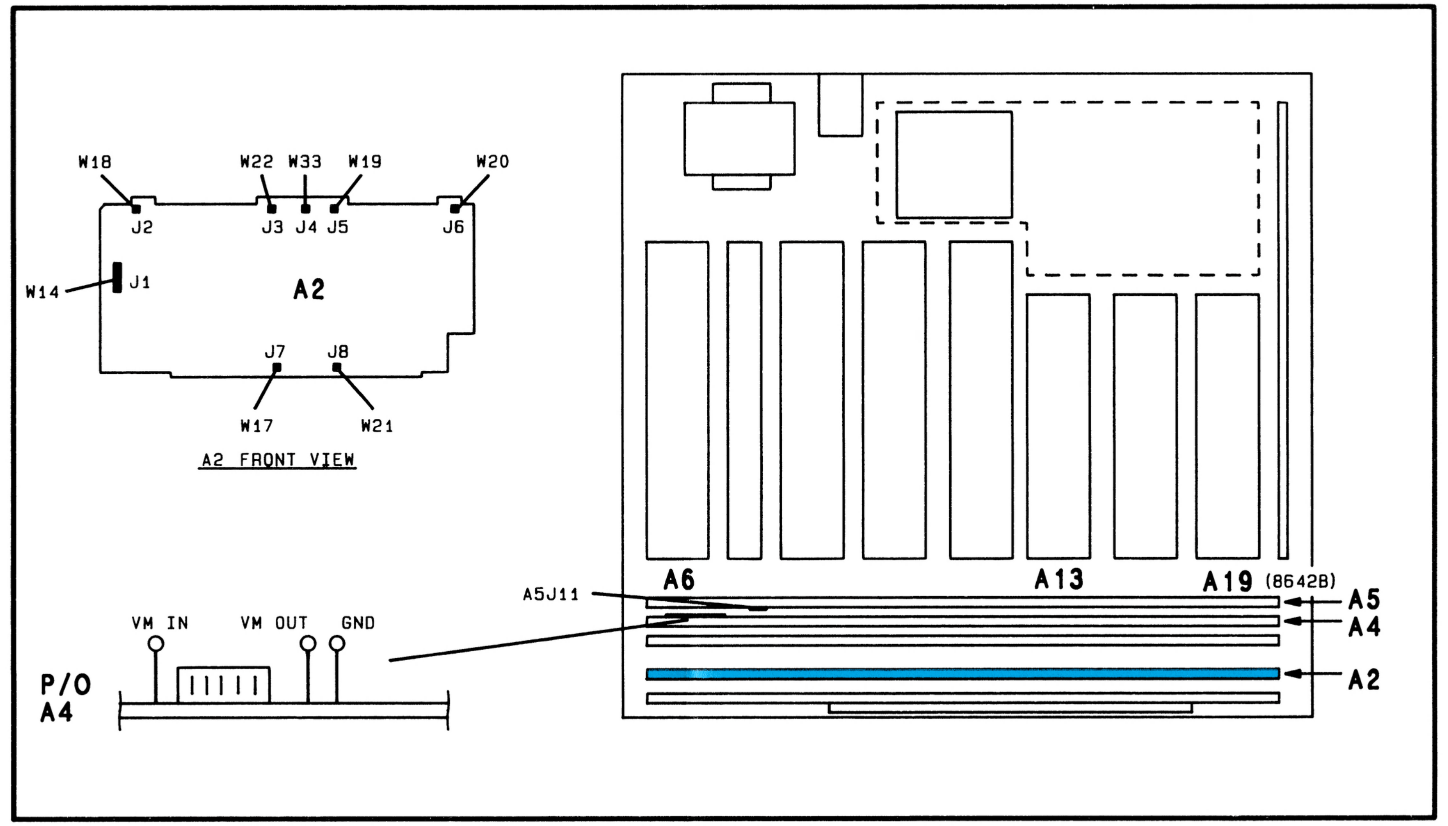
A2 MODULE SIMPLIFIED BLOCK DIAGRAM



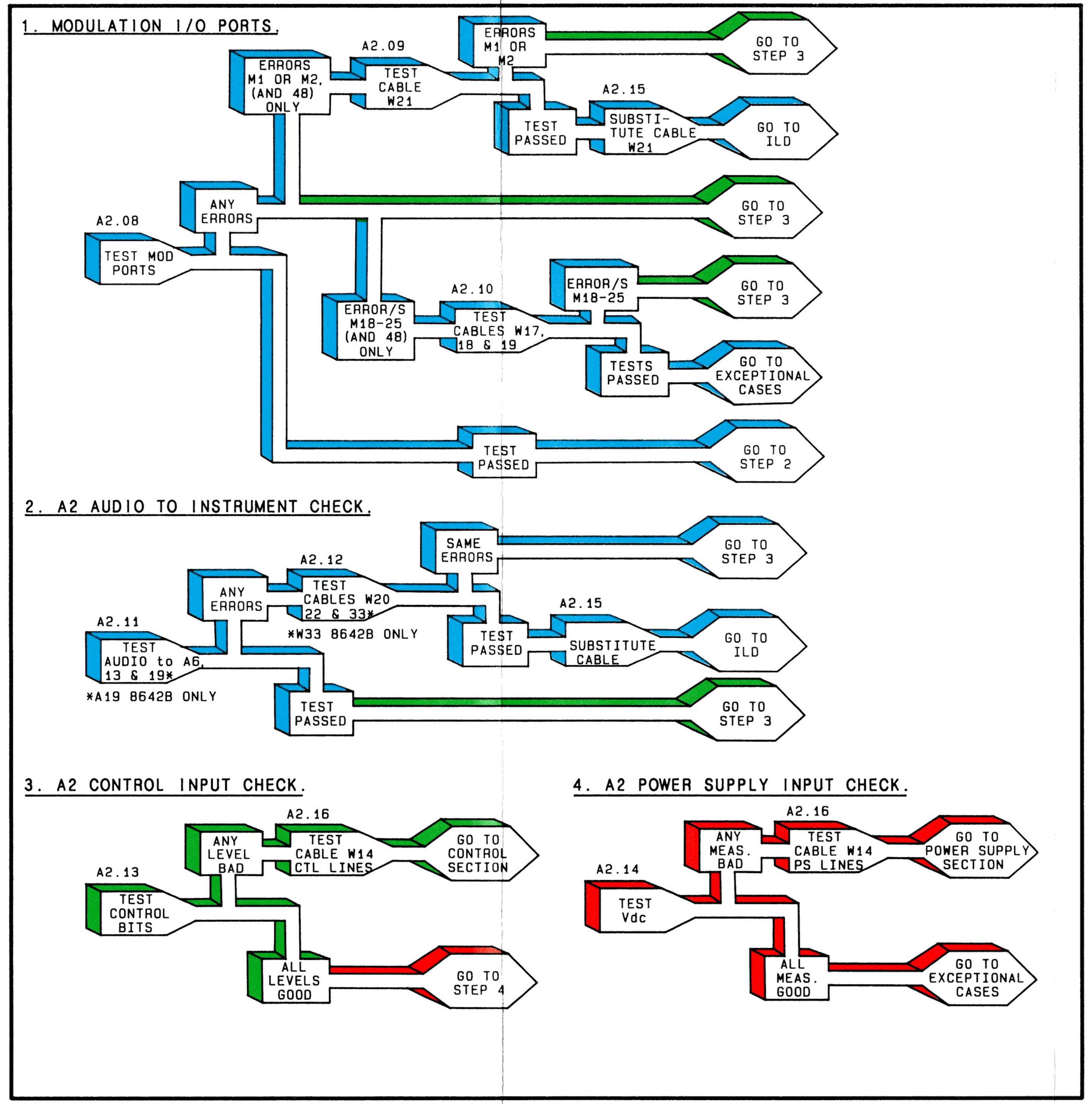
A2 MODULE SUBSTITUTION



A2 MODULE CABLE CONNECTION LOCATOR



A2 INPUTS/OUTPUTS VERIFICATION



A2 MODULE I/O SIGNALS DIAGRAM

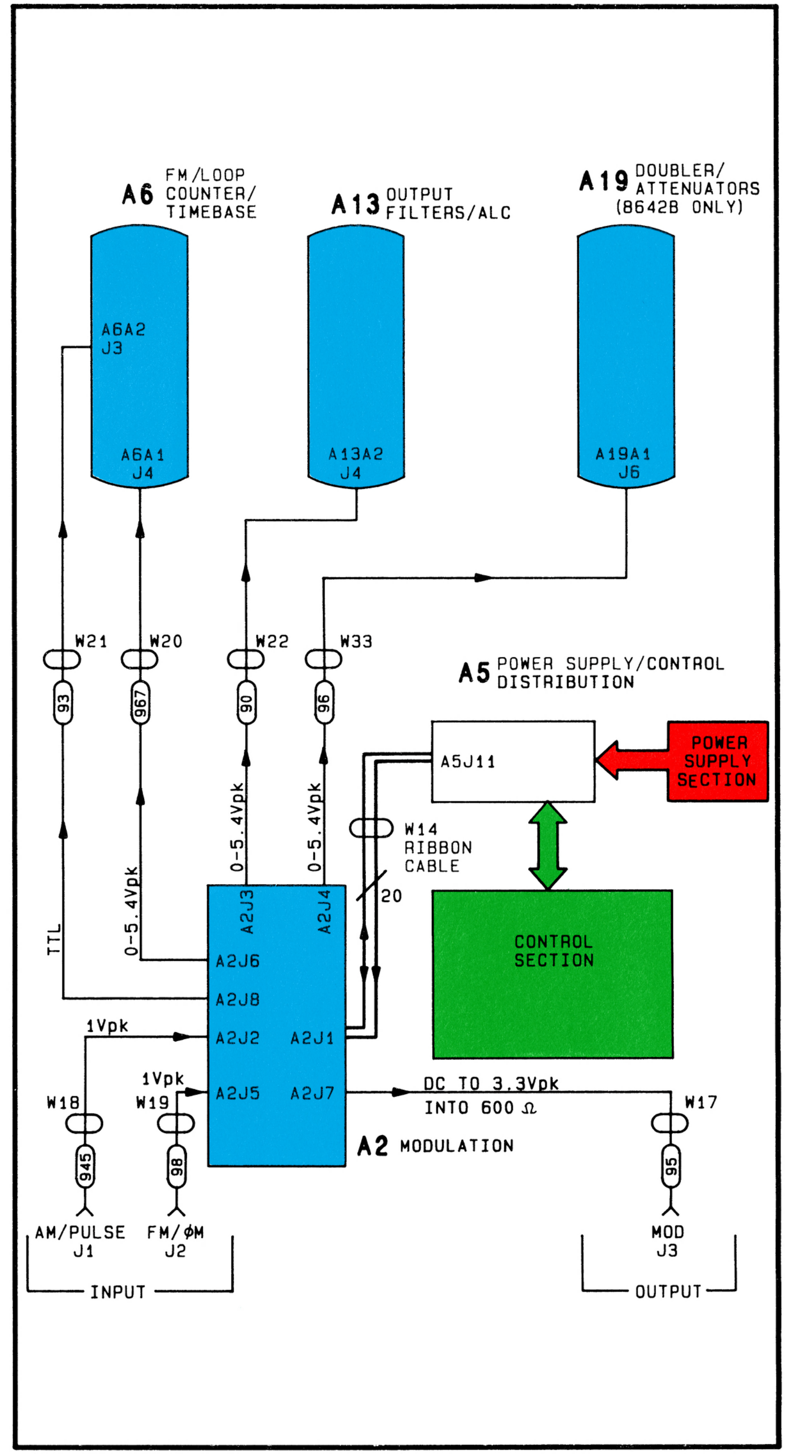


Figure 3E-100. A2 Modulation Module Diagnostics.

A6

3F-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A6 Module**. The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01**, **A03** or **A04**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptible to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Turn to the next page to begin the **A6 MLD**.

3F-2. INTRODUCTION

The **first step in isolating an A6 failure** is to substitute in a known good module from the On-site Service Kit.

NOTE

If a known good A6 module is not available and you were directed here either by:

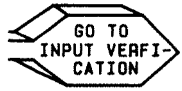
a.) The **Instrument Level Diagonostics**, *proceed to the next page and perform the A6 INPUTS VERIFICATION.*

b.) The **A7, A9, A11 or A14 Module** *diagnostics, the probability that the A6 Module is defective is high enough to make verification of its inputs unnecessary. Proceed with the substitution process as soon as a known good module is available.*

A6 Substitution Instructions

1. Find **A6 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A6 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

A6.01



3F-3. INTRODUCTION

If a known good **A6 Module** is not available, or if you were not able to isolate the failure using the **A6 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams (shown under **A6 INPUTS VERIFICATION**) should be used to check each signal path into the A6 Module.

A6 Inputs Verification Instructions

1. Find **A6 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A6 INPUTS VERIFICATION**, are separated into three checks: **Control**, **Power Supply** and **RF** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A6 CONTROL INPUT CHECK**.

NOTE

The **A6 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A6 Module** *depends on for operation.*

Type:	1; Loop Lock/Unlock	**A6.02**
Run time:	1 min.	
Set-up time:	0	

Run Test

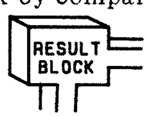
1. INSTR PRESET SHIFT
   (Hold shift key until "**100.000000MZ -140.0DM**" appears, to override 20 second reset test.)

2. SHIFT SPCL 3 3 2 0 HZ.

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A6**. If "**TEST 1 OF A06 (PASSED or FAILED)**" is not displayed, rerun test.

COMMENT

If any error codes are displayed for modules A01, A03 or A04, you need to isolate those failure(s) before performing the A6 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST A6 MODULE**.

Type:	Module Substitution	A6.03
Run time:	0	
Set-up time:	7 min.	

The following describes the technique for connecting a known good A6 Module **without removing** the A6 module in the instrument.

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W1**, **W20**, **W21**, **W23**, **W24**, **W26**, **W27**, **W28** and **W29** from **A6 Module** (see **A6 MODULE CABLE CONNECTION LOCATOR** on foldout).
3. Without removing **A6 Module** from instrument, carefully lay substitute **A6 Module** on top of modules **A7**, **A9** and **A11**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

4. Connect cables **W1**, **W20**, **W21**, **W23**, **W24**, **W26**, **W27**, **W28** and **W29** to substitute module.
5. Turn instrument on.
6. Return to foldout.

Type:	Substitute Module Test	**A6.04**
Run time:	1 min.	
Set-up time.	0	

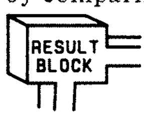
Test operation of **substitute A6 Module** by repeating test performed on A6 Module before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [2] [0] [HZ].

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A6.** If "**TEST 1 OF A06 (PASSED or FAILED)**" is not displayed, rerun test.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A6**.

Type:	Additional A6 Tests	**A6.05**
Run time:	Conditional	
Set-up time:	Conditional	

The **A6** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A6** failure.

Condition 2: **RF Power Test** for another module indicated **A6** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A6** failure.

<u>**Condition 1**</u>

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A6** error codes.

COMMENT

If any error codes are displayed for modules A01, A03 or A04, you need to isolate those failure(s) before performing the A6 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. SHIFT SPCL 3 3 2 2 HZ

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W28** from module at **A6A2 J8.**
   - Connect **YELLOW PM** cable to module at **A6A2 J8**.
   - HZ to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W28** to module at **A6A2 J8**.
   - Disconnect cable **W26** from module at **A6A2 J6**.
   - Connect **PM** cable to module at **A6A2 J6**.
   - HZ to continue test.

5. When "**WAITING FOR SET-UP 3 .V26**" appears:
   - Reconnect cable **W26** to module at **A6A2 J6**.
   - Disconnect cable **W29** from module at **A6A2 J9**.
   - Connect **PM** cable to module at **A6A2 J9**.
   - HZ to continue test.

6. When "**WAITING FOR SET-UP 4 .V27**" appears:
   - Reconnect cable **W29** to module at **A6A2 J9**.
   - Disconnect cable **W23** from module at **A6A2 J5**.
   - Connect **PM** cable to module at **A6A2 J5**.
   - HZ to continue test.

7. When "**WAITING FOR SET-UP 5 .V28**" appears:
   - Reconnect cable **W23** to module at **A6A2 J5**.
   - Disconnect cable **W24** from module at **A6A1 J2**.
   - Connect **PM** cable to module at **A6A1 J2**.
   - HZ to continue test.

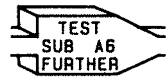
8. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W24** to module at **A6A1 J2.**
   - HZ to continue test.

9. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A6**. If "**TEST 2A OF A06 (PASSED or FAILED)**" is not displayed, rerun test.

10. Return to foldout.

Condition 3

1. Set instrument to operating condition which causes A6 failure.
2. Record instrument set-up and error message(s).
3. Return to foldout.

Type:	Additional Substitute A6 Tests	**A6.06**
Run time:	Conditional	
Set-up time:	Conditional	

Test operation of **substitute A6 Module** by repeating test(s) performed on A6 Module before substitution.

Condition 1: **Instrument Level Self Test** indicated **A6** failure.

Condition 2: **RF Power Test** for another module indicated **A6** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A6** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

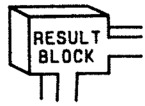
2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**".
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A6** error codes.

COMMENT

If any error codes are displayed for modules A01, A03 or A04, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A6 FURTHER**.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [2] [2] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W28** from module at **A6A2 J8.**
   - Connect **YELLOW PM** cable to module at **A6A2 J8.**
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W28** to module at **A6A2 J8**.
   - Disconnect cable **W26** from module at **A6A2 J6**.
   - Connect **PM** cable to module at **A6A2 J6**.
   - [HZ] to continue test.

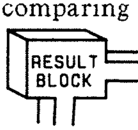
5. When "**WAITING FOR SET-UP 3 .V26**" appears:
   - Reconnect cable **W26** to module at **A6A2 J6**.
   - Disconnect cable **W29** from module at **A6A2 J9**.
   - Connect **PM** cable to module at **A6A2 J9**.
   - [HZ] to continue test.

6. When "**WAITING FOR SET-UP 4 .V27**" appears:
   - Reconnect cable **W29** to module at **A6A2 J9**.
   - Disconnect cable **W23** from module at **A6A2 J5**.
   - Connect **PM** cable to module at **A6A2 J5**.
   - [HZ] to continue test.

7. When "**WAITING FOR SET-UP 5 .V28**" appears:
   - Reconnect cable **W23** to module at **A6A2 J5**.
   - Disconnect cable **W24** from module at **A6A1 J2**.
   - Connect **PM** cable to module at **A6A1 J2**.
   - [HZ] to continue test.

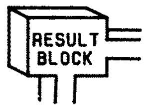
8. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W24** to module at **A6A1 J2.**
   - [HZ] to continue test.

9. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A6**. If "**TEST 2A OF A06 (PASSED or FAILED)**" is not displayed, rerun test.)

10. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

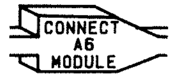
for **TEST SUB A6 FURTHER**.

Condition 3

1. Set instrument to operating condition which causes **A6 failure**.
2. Record instrument set-up and error message(s).
3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A6 FURTHER**.

Type:	Cable Connection	**A6.07**
Run time:	0	
Set-up time:	5 min.	



Connect Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W1**, **W20**, **W21**, **W23**, **W24**, **W26**, **W27**, **W28** and **W29** from substitute **A6 Module**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

3. Reconnect cables **W1**, **W20**, **W21**, **W23**, **W24**, **W26**, **W27**, **W28** and **W29** to **A6 Module**.
4. Turn instrument on.
5. Return **substitute** A6 Module to On-Site Service Kit.
6. Return to foldout.

Type:	3; Bit Transmission	**A6.08**
Run time:	3 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A6 Module** on Clock, Data and Control lines.

COMMENT

If any control line level is bad, it is not necessary to test remaining lines; proceed to step **34**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W1** from module at **A6A1 J1**.
   - Plug end of **W1** <u>**into**</u> **26 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W1P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A6 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.

FM Control Lines

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

NOTE

*A "**0**" will appear in display indicating that these data bits will be set low. However, the bits are* **inverted** *in the Control Section before they are sent to A6.*

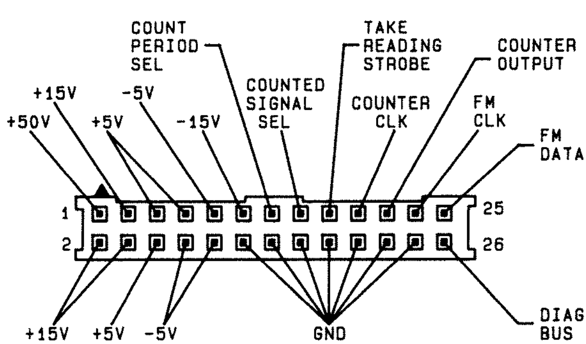
5. Enter **Bit Select Keys**, as indicated in **Table 3F-1. W1P2 Control Bits**, for **Control Line** to be tested.

6. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3F-1**. (See **Figure 3F-1. Cable Plug W1P2 Signal Locator**.)

Table 3F-1. W1P2 Conrol Bits

Test Order	Control Line	Bit Select Keys (Steps 5 and 10)	Pin Number (Step 6)
1	FM CLK	[4] [6] [HZ]	23
2	FM DATA	[4] [7] [HZ]	25

Figure 3F-1. Cable Plug W1P2 Signal Locator



7. [2] [5] [HZ]
(To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

A "1" will appear in display indicating that these data bits will be set high. However, the bits are **inverted** *in the Control Section before they are sent to A6.*

10. Enter **Bit Select Keys**, as indicated in **Table 3F-1**, for same **Control Line**.

11. [2] [5] [HZ]
(To enable voltmeter.)

12. Voltage should read approximately **-0.5 to +1.5 Vdc**.
([5] [HZ] to repeat measurement.)

13. Repeat procedure for each **Control Line** shown in **Table 3F-1** before proceding to step **14**.

<u>**Counter Control Lines**</u>

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

15. Enter **Bit Select Keys**, as indicated in **Table 3F-2. W1P2 Control Bits**, for **Control Line** to be tested.

16. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3F-2**. (See **Figure 3F-1. Cable Plug W1P2 Signal Locator**.)

Table 3F-2. W1P2 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 15 and 20)	Pin Number (Step 16)
1	COUNTER CLK	[7] [2] [HZ]	19
2	TAKE READING STROBE	[7] [3] [HZ]	17
3	COUNT PERIOD SELECT	[7] [4] [HZ]	13
4	COUNTED SIGNAL SELECT	[7] [5] [HZ]	15

17. [2] [5] [HZ]
    (To enable voltmeter.)

18. Voltage should read approximately **+2.5 to +5.5 Vdc**.
    ([5] [HZ] to repeat measurement.)

Check Low State

19. [SHIFT] [SPCL] [3] [6] [0] [2]
    (To specify low state.)

20. Enter **Bit Select Keys**, as indicated in **Table 3F-2**, for same **Control Line**.

21. [2] [5] [HZ]
    (To enable voltmeter.)

22. Voltage should read approximately **-0.5 to +1.5 Vdc**.
    ([5] [HZ] to repeat measurement.)

23. Repeat procedure for each **Control Line** shown in **Table 3F-2** before proceeding to step **24**.

24. Switch instrument to **Standby**:
    - Disconnect **W1** from module at **A6A2 J1**.
    - Plug end of **W1 into 14 pin** test connector, from On-Site Service Kit, into end of **W1**. (See **Figure 3F-2. Cable Plug W1P3 Signal Locator**.)

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W1P3**.

- Turn instrument on.

<u>**Timebase Control Line**</u>

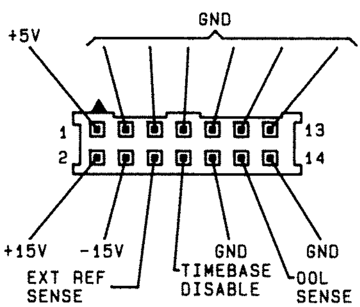
Check High State

25. [SHIFT] [SPCL] [3] [6] [0] [1]
    (To specify high state.)

26. [1] [4] [HZ]
    (To select bit.)

27. Connect **VM** probe to test connector at **TIMEBASE DISABLE** (pin **8**). (See **Figure 3F-2. Cable Plug W1P3 Signal Locator**.)

Figure 3F-2. Cable Plug W1P3 Signal Locator



28. [2] [5] [HZ]
    (To enable voltmeter.)

29. Voltage should read approximately **+2.5** to **+5.5** Vdc.
    ([5] [HZ] to repeat measurement.)

Check Low State

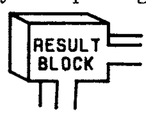
30. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

31. [1] [4] [HZ]
(To select bit.)

32. [2] [5] [HZ]
(To enable voltmeter.)

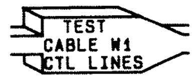
33. Voltage should read approximately **−0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

34. Record test results.

35. Return to foldout:
- Determine next task by comparing test results to conditions shown in each 

for **TEST CONTROL BITS**.

Type:	3; Bit Transmission	**A6.09**
Run time:	3 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A6 Module** on Clock, Data and Control lines.

Run Test

1. Switch instrument to **Standby**.

2. Extend **A6 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W1** from **A5 Module** at **A5J1**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A6 Module** extension and **A5** cable disconnection information.)
   - After cable **W1** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A6 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Turn instrument on.

COMMENT

It is only necessary to perform test on failing control line.

FM Control Lines

Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

NOTE

*A "**0**" will appear in display indicating that these data bits will be set low. However, the bits are* **inverted** *in the Control Section before they are sent to A6.*

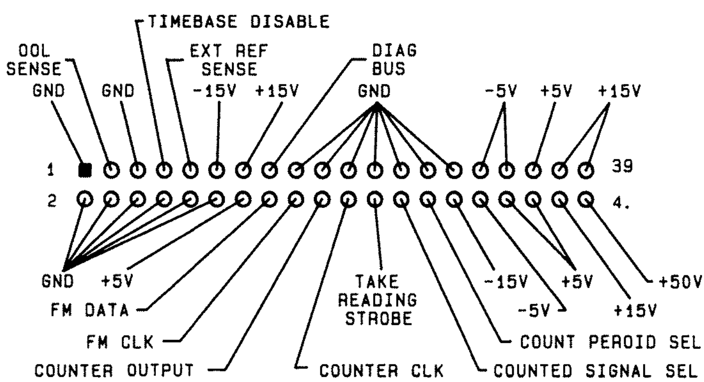
6. Enter **Bit Select Keys,** as indicated in **Table 3F-3. A5J1 Control Bits,** for **Control Line** to be tested.

7. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3F-3.** (See **Figure 3F-3. A5J1 Signal Locator.**)

Table 3F-3. A5J1 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 6 and 11)	Pin Number (Step 7)
1	FM CLK	[4] [6] [HZ]	18
2	FM DATA	[4] [7] [HZ]	16

Figure 3F-3. A5J1 Signal Locator
(Solder-Side View)



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

10. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

*A "***1***" will appear in display indicating that these data bits will be set high. However, the bits are* **inverted** *in the Control Section before they are sent to A6.*

11. Enter **Bit Select Keys**, as indicated in **Table 3F-3**, for same **Control Line**.

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **-0.5 to +1.5 Vdc.**
([5] [HZ] to repeat measurement.)

<u>**Counter/Timebase Control Lines**</u>

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

15. Enter **Bit Select Keys**, as indicated in **Table 3F-4. A5J1 Control Bits**, for **Control Line** to be tested.

16. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3F-4**. (See **Figure 3F-3. A5J1 Signal Locator**.)

Table 3F-4. A5J1 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 15 and 20)	Pin Number (Step 16)
1	COUNTER CLK	[7] [2] [HZ]	22
2	TAKE READING STROBE	[7] [3] [HZ]	24
3	COUNT PERIOD SELECT	[7] [4] [HZ]	28
4	COUNTED SIGNAL SELECT	[7] [5] [HZ]	26
5	TIMEBASE DISABLE	[1] [4] [HZ]	7

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

19. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

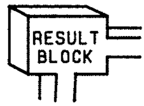
20. Enter **Bit Select Keys**, as indicated in **Table 3F-4**, for same **Control Line**.

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **−0.5 to +1.5 Vdc.**
([5] [HZ] to repeat measurement.)

23. Repeat procedure for each **Control Line** shown in **Table 3F-4**.

24. Record test results.

25. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLE W1 CTL LINES**.

Type: 4, Voltage Measurements
Run time: 2 min.
Set-up time: 2 min.

A6.10

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A6 Module**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W1** from **A6** at **A6A1 J1**.
   - Plug end of **W1** into **26 pin** test connector, from On-Site Service Kit.

NOTE

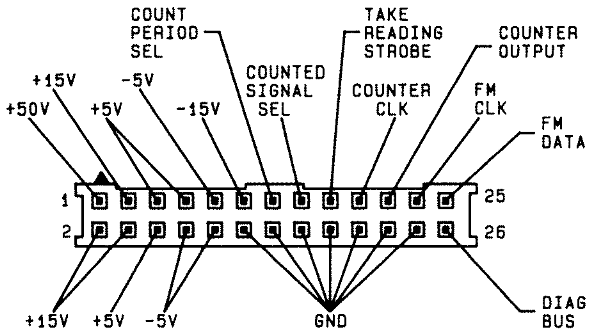
Find arrowhead on test connector and align with arrowhead on cable plug **W1P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A6 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line. (See **Figure 3F-3. Cable Plug W1P2 Signal Locator.**)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3F-3. Cable Plug W1P2 Signal Locator



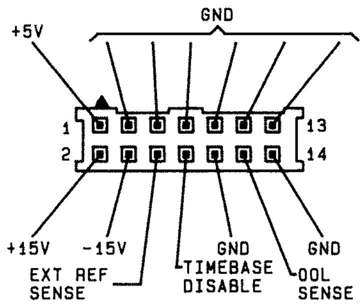
5. Switch instrument to Standby:
   - Disconnect **W1** from **A6** at **A6A2 J1**.
   - Plug end of **W1** into **14 pin** test connector, from On-Site Service Kit.

NOTE

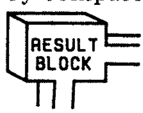
Find arrowhead on test connector and align with arrowhead on cable plug **W1P3**.

6. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line. (See **Figure 3F-4. Cable Plug W1P3 Signal Locator.**)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3F-4. Cable Plug W1P3 Signal Locator

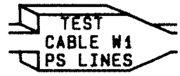


7. Record test results.

8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST Vdc**.

Type:	4, Voltage Measurements	**A6.11**
Run time:	2 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to check power supply levels at **A5J1**.

Run Test

1. Switch instrument to **Standby**.

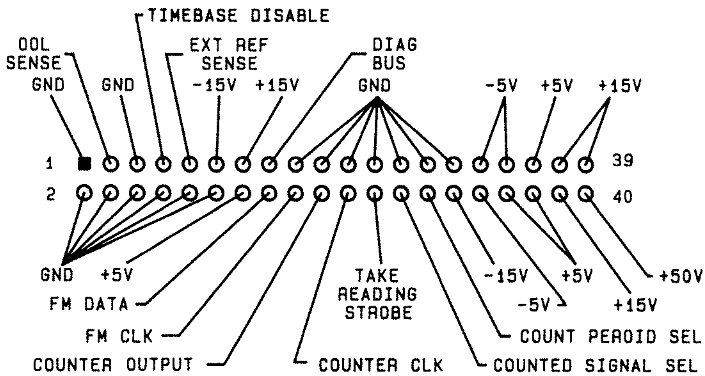
2. Extend **A6 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W1** from **A5 Module** at **A5J1**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A6 Module** extension and **A5** cable disconnection information.)
   - After cable **W1** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A6 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

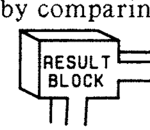
4. Turn instrument on and enter:
   SHIFT SPCL 3 2 5 HZ
   (To enable Internal Voltmeter.)

5. Measure voltage levels at **A5J1**:
   - Access signals from solder-side of **A5J1**. (See **Figure 3F-5. A5J1 Signal Locator**.)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3F-5. A5J1 Signal Locator
(Solder-Side View)



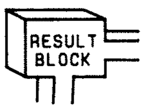
6. Record test results.

7. Return to folout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLE W1 PS LINES**.

Type:	External Reference Check	A6.12
Run Time:	10 sec.	
Set-up Time:	0	

Run Test

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)
2. SHIFT SPCL 3 5 9 HZ.
3. Record test results.
4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST EXT. REF.**

Type:	1; Loop Lock/Unlock	**A6.13**
Run Time:	1 min.	
Set-up Time:	0	

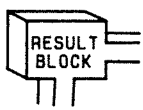
Run Test

1. Disconnect external reference from Rear Panel at **EXT REF INPUT** (**J4**).

2. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

3. [SHIFT] [SPCL] [3] [3] [2] [0] [HZ].

4. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A6**. If "**TEST 1 OF A06 (PASSED or FAILED)**" is not displayed, rerun test.

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST LOOP**.

Type:	External Reference	**A6.14**
Run time:	N/A	
Set-up time:	N/A	

Test results indicate that the external reference signal is not stable enough for the **A6 Module** to lock to.

1. Use another reference source if available or operate instrument unreferenced.

2. Return to foldout and proceed as directed to confirm correct operation of the rest of instrument.

Type:	Cable Substitution	**A6.15**
Run time:	0 min.	
Set-up time:	4 min.	

Testing has shown cable **W1** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

NOTE

Cable **W1** *is a single cable which splits and connects both* **A6A1 J1** *and* **A6A2 J1** *to* **A5J1**.

CAUTION

When connecting ribbon cable to A6 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

<u>**Reconnect W1**</u>

1. Switch instrument to **Standby** to connect cable **W1** to **A5** Module and **A6** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable **W1** to **A5J1**.)

2. Return to foldout.

Type:	Cable Connection	**A6.16**
Run time:	0 min.	
Set-up time:	4 min.	

CAUTION

When connecting ribbon cable to A6 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W1

1. Switch instrument to **Standby** to reconnect cable **W1** to **A5 Module** or **A6** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on reconnecting cable **W1** to **A5J1**.)

2. Return to foldout.

3F-4. A6 FM/COUNTER/TIMEBASE MODULE

COMMENT

It is not to essential to understand the internal operation of a module to make an on-site repair.

A6 FM LOOP

The **A6 FM Loop** is the angle modulation source for the instrument. A **135 MHz** voltage controlled oscillator (VCO), phase locked to the timebase, can be either frequency or phase modulated by the audio signal sent from the **A2 Module**.

For **DCFM** operation, the VCO tune path is switched to a stable DC voltage source within the **A6 Module**.

The A6 FM LOOP OUTPUT is the reference signal for the **A11 Module**.

A6 TIMEBASE

The **A6 Timebase** provides the timebase reference for the instrument. In normal operation, the various timebase signals required for operation are derived from a free running **45 MHz** oscillator.

For improved stability, the 45 MHz oscillator can be phase locked to an external source (**1, 2, 5, or 10** MHz) or to the **10 MHz** signal provided by the **A8 High Stability Timebase Module (installed in Option 001 instruments**).

A6 COUNTER

The **A6 Counter** counts audio frequencies produced by the internal modulation source in the **A2 Module**. The counter output is sent to the instrument's **Control Section** which provides the tune control for A2's audio oscillator.

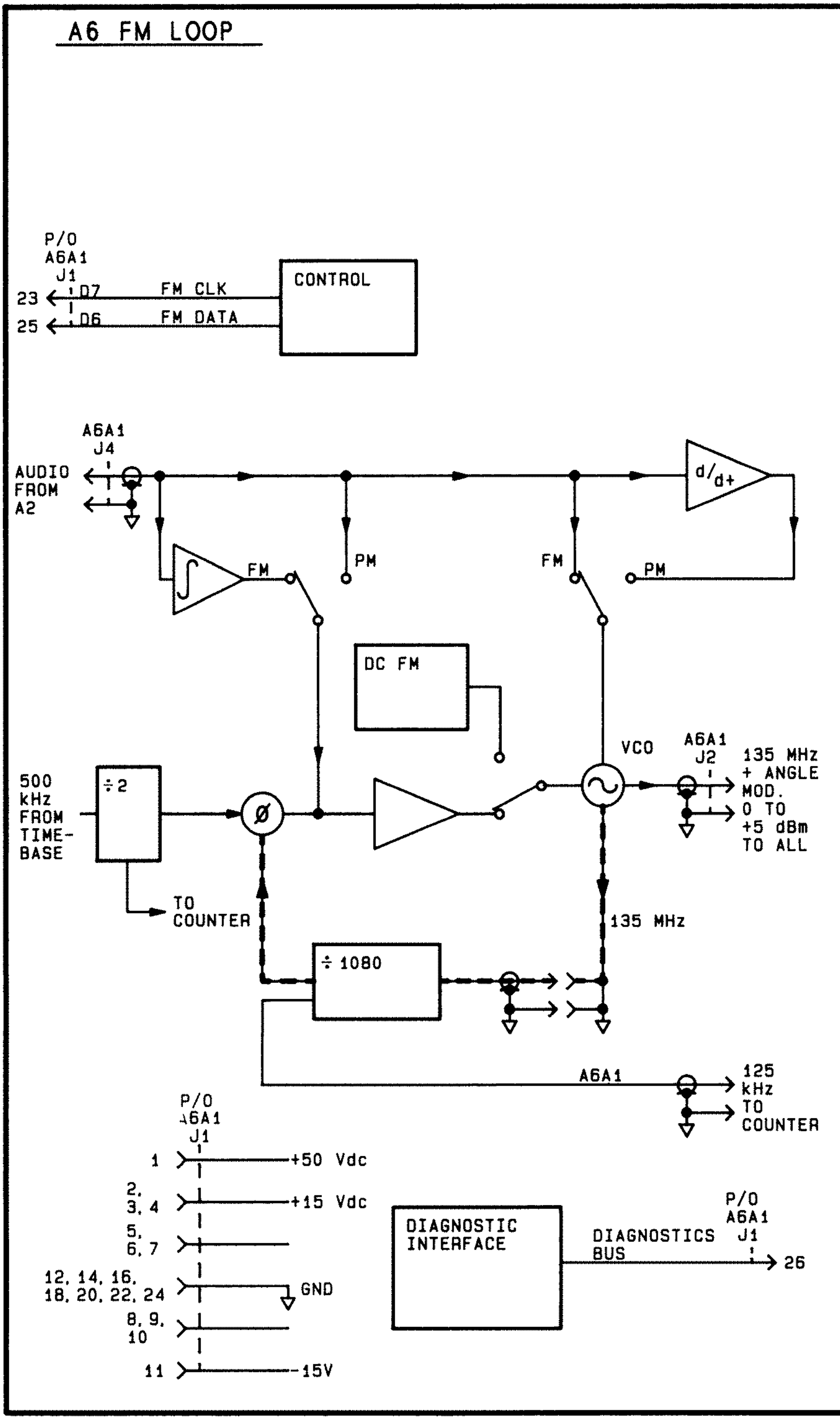
Audio frequencies **greater** than 10 kHz are counted directly. The Timebase output signal is divided and used as the gate clock.

Audio frequencies **below** 10 kHz are counted indirectly. The audio signal is used as the gate clock to count the 45 MHz timebase signal.

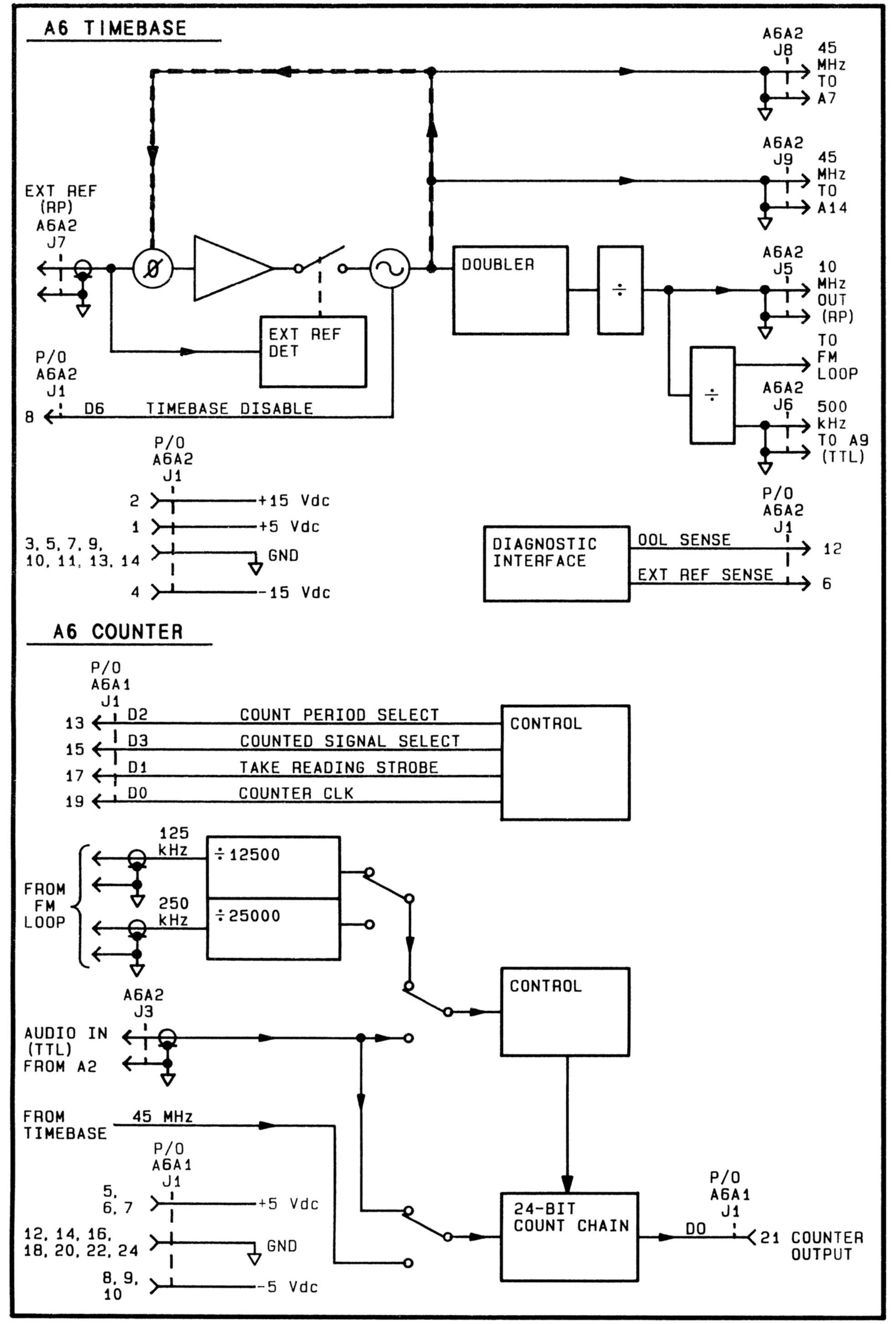
The counter also counts the frequency of the FM Loop, when it is in **DCFM** mode.

See the **A6 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A6 Module's** internal operation.

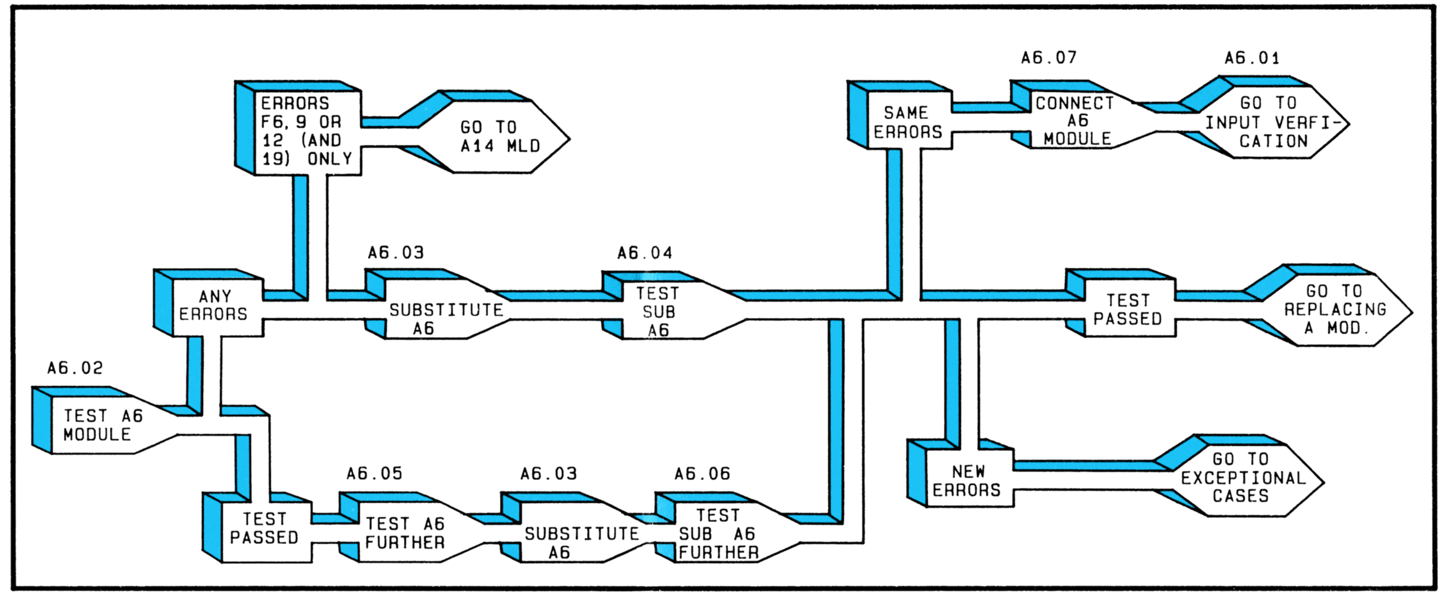
A6 MODULE SIMPLIFIED BLOCK DIAGRAM



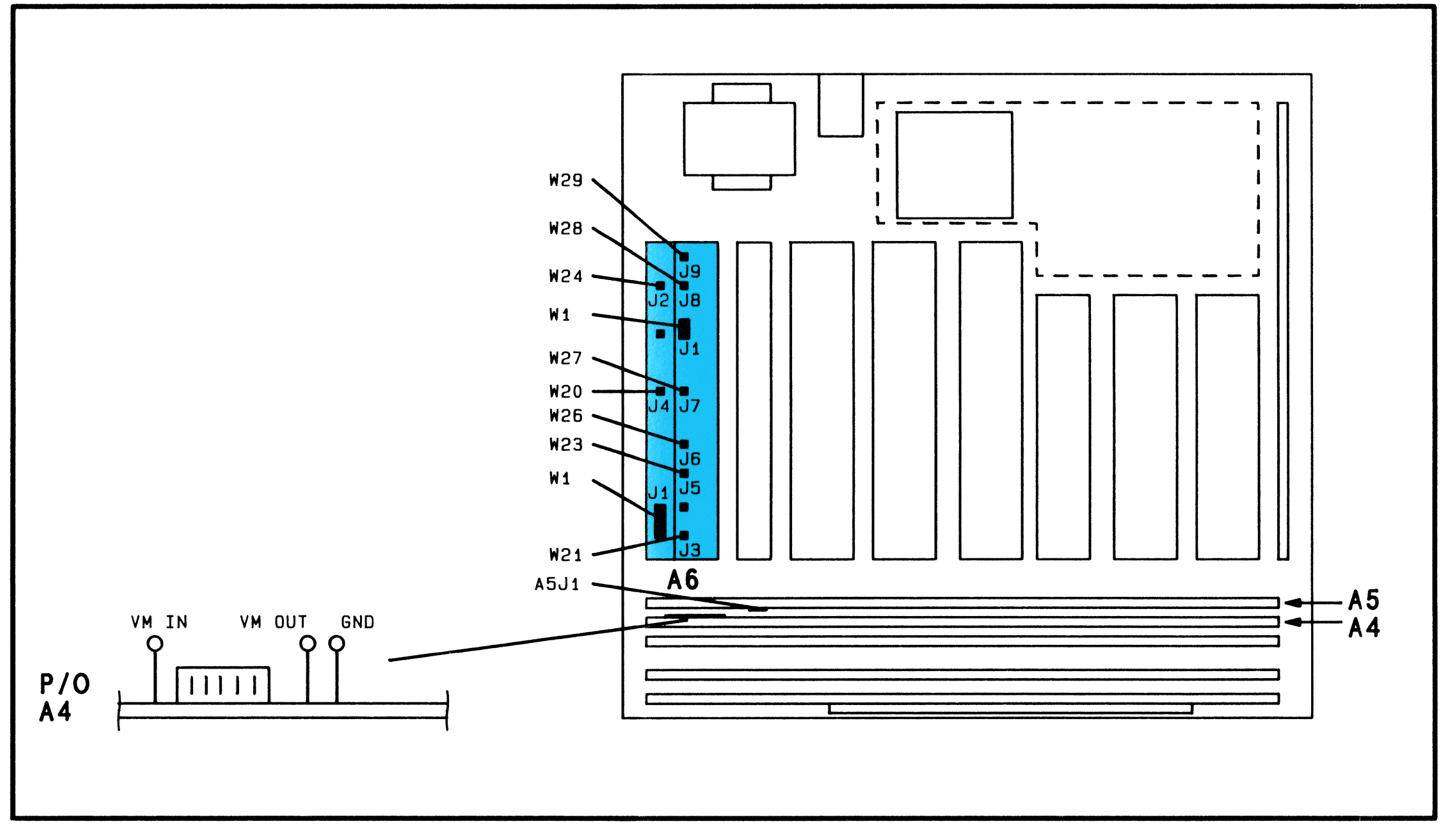
A6 MODULE SIMPLIFIED BLOCK DIAGRAM



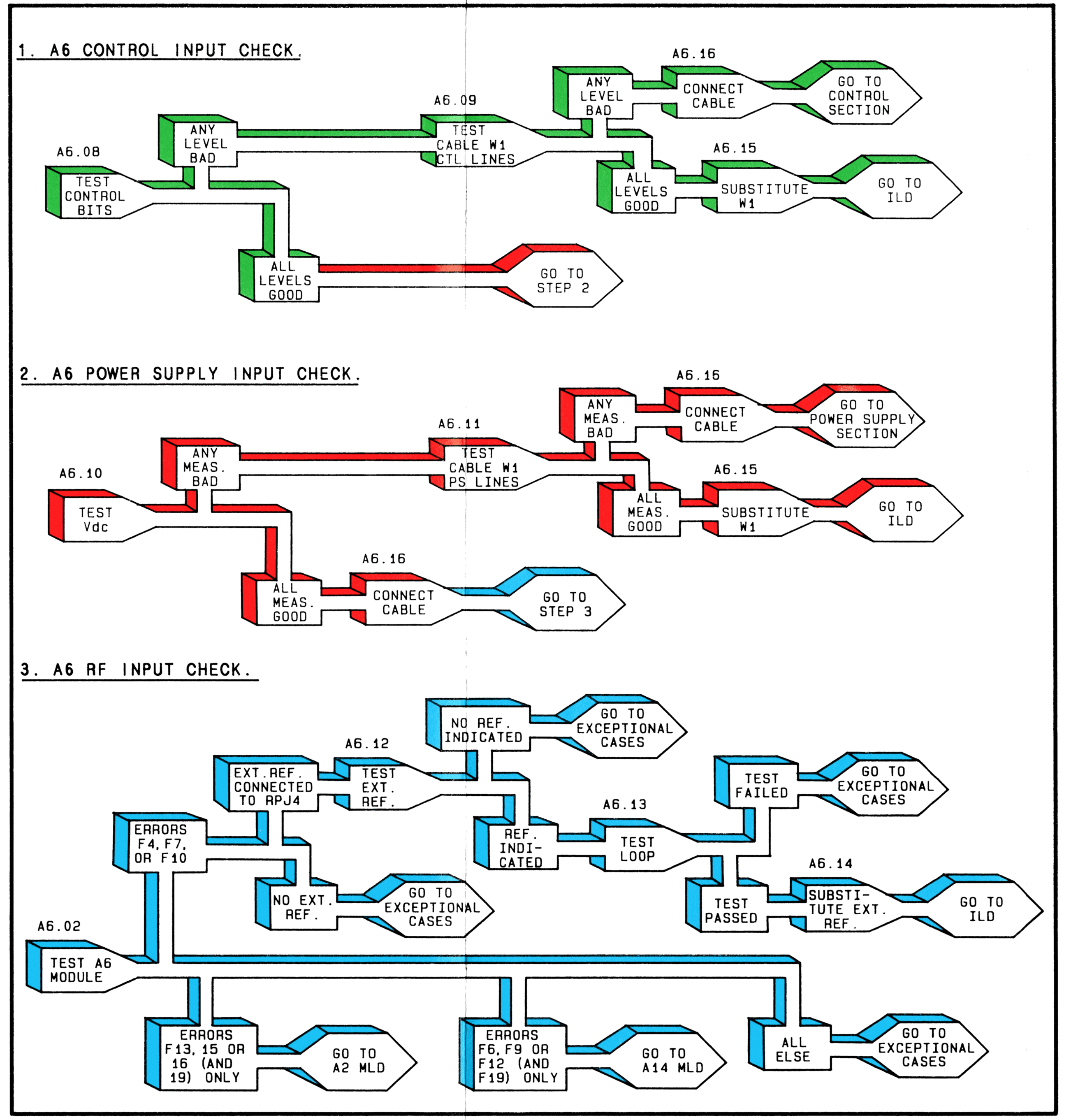
A6 MODULE SUBSTITUTION



A7 MODULE CABLE CONNECTION LOCATOR



A6 INPUTS VERIFICATION



A6 MODULE I/O SIGNALS DIAGRAM

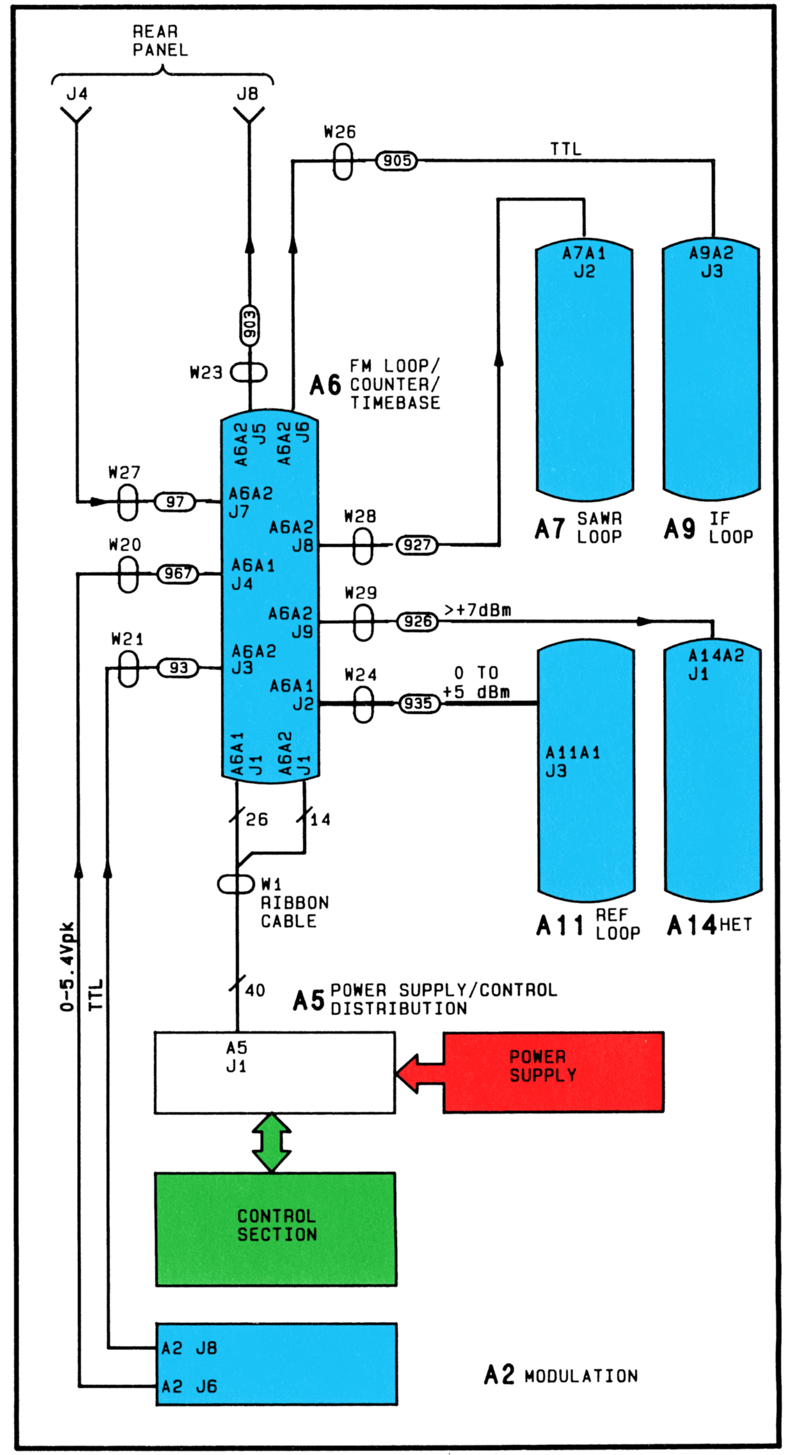


Figure 3F-100. A6 FM Loop/Counter/Timebase Module Diagnostics.

A7

3G-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A7 Module.** The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-A06**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.*)

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptable to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Turn to the next page to begin the **A7 MLD**.

3G-2. INTRODUCTION

The **first step in isolating an A7 failure** is to substitute in a known good module from the On-site Service Kit.

NOTE

If a known good A7 module is not available and you were directed here either by:

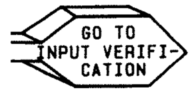
a.) The **Instrument Level Diagnostics**, *proceed to the next page and perform the A7 INPUTS VERIFICATION.*

b.) The **A11 Module** *diagnostics, the probability that the A7 Module is defective is high enough to make verification of its inputs unnecessary. Proceed with the substitution process as soon as a known good module is available.*

A7 Substitution Instructions

1. Find **A7 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A7 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

A7.01



3G-3. INTRODUCTION

If a known good **A7 Module** is not available or, if you were not able to isolate the failure using the **A7 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams (shown under **A7 INPUTS VERIFICATION**) should be used to check each signal path into the **A7 Module**.

A7 Inputs Verification Instructions

1. Find **A7 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A7 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A7 RF INPUT CHECK**.

NOTE

The **A7 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A7 Module** *depends on for operation.*

Type:	1; Loop Lock/Unlock	**A7.02**
Run time:	1 min.	
Set-up time:	0	

Run Test

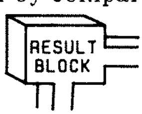
1. [INSTR PRESET] [SHIFT]
(Hold shift key until
"**100.000000MZ -140.0DM**" appears,
to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [2] [5] [HZ].

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A7**. If "**TEST 1 OF A07 (PASSED or FAILED)**" is not displayed, rerun test.

COMMENT

If any error codes are displayed for modules A01-A06, you need to isolate those failure(s) before performing the A7 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST A7 MODULE**.

Type:	Module Substitution	**A7.03**
Run time:	0	
Set-up time:	5 min.	

The following describes the technique for connecting a known good A7 Module **without removing** the A7 module in the instrument.

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W2**, **W25** and **W28** from **A7 Module** (see **A7 MODULE CABLE CONNECTION LOCATOR** on foldout).
3. Without removing **A7 Module** from instrument, carefully lay substitute **A7 Module** on top of modules **A9**, **A11** and **A12**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

4. Connect cables **W2**, **W25** and **W28** to substitute module.
5. Turn instrument on.
6. Return to foldout.

Type:	Substitute Module Test	**A7.04**
Run time:	1 min.	
Set-up time:	0	

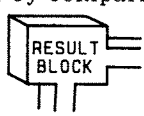
Test operation of **substitute A7 Module** by repeating test performed on A7 Module before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [2] [5] [HZ].

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A7**. If "**TEST 1 OF A07 (PASSED or FAILED)**" is not displayed, rerun test.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A7**.

Type:	Additional A7 Tests	**A7.05**
Run time:	Conditional	
Set-up time:	Conditional	

The **A7** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A7** failure.

Condition 2: **A11 Module RF Power Test** indicated **A7** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A7** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record A7 error codes.

COMMENT

If any error codes are displayed for modules A01-A06, you need to isolate those failure(s) before performing the A7 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. (INSTR PRESET) (SHIFT)
(Hold shift key until
"**100.000000MZ -140.0DM**" appears,
to override 20 second reset test.)

2. (SHIFT) (SPCL) (3) (3) (2) (6) (HZ)

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W28** from module at **A7A1 J2**.
   - Connect **YELLOW PM** cable and adapter to cable **W28**.
   - (HZ) to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W28** to module at **A7A1 J2**.
   - Disconnect cable **W25** from module at **A7A1 J3**.
   - Connect **PM** cable to module at **A7A1 J3**.
   - (HZ) to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W25** to module at **A7A1 J3**.
   - (HZ) to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use (MSSG) to scroll through messages.
   - Record error code(s) displayed for **A7**. If "**TEST 2A OF A07 (PASSED or FAILED)**" is not displayed, rerun test.

7. Return to foldout.

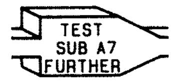
Condition 3

1. Set instrument to operating condition which causes **A7 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout.

Type:	Additional Substitute A7 Tests	**A7.06**
Run time:	Conditional	
Set-up time:	Conditional	



Test operation of **substitute A7 Module** by repeating test(s) performed on A7 Module before substitution.

Condition 1: **Instrument Level Self Test** indicated **A7** failure.

Condition 2: **A11 Module RF Power Test** indicated **A7** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A7** failure.

<u>**Condition 1**</u>

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

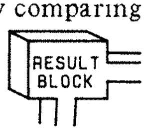
2. SHIFT SPCL 3 3 0 HZ.

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - HZ to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use MSSG to scroll through messages.
   - Record A7 error codes.

COMMENT

If any error codes are displayed for modules A01-A06, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A7 FURTHER**.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

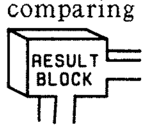
2. [SHIFT] [SPCL] [3] [3] [2] [6] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W28** from module at **A7A1 J2.**
   - Connect **YELLOW PM** cable and adapter to cable **W28**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W28** to module at **A7A1 J2**.
   - Disconnect cable **W25** from module at **A7A1 J3**.
   - Connect **PM** cable to module at **A7A1 J3**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W25** to module at **A7A1 J3.**
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A7**. If "**TEST 2A OF A7 (PASSED or FAILED)**" is not displayed, rerun test.)

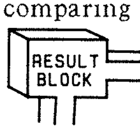
7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A7 FURTHER**.

Condition 3

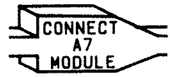
1. Set instrument to operating condition which causes **A7 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A7 FURTHER**.

Type:	Cable Connection	**A7.07**
Run time:	0	
Set-up time:	5 min.	



Connect Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W2**, **W25** and **W28** from substitute **A7 Module**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

3. Reconnect cables **W2**, **W25** and **W28** to **A7 Module**.
4. Turn instrument on.
5. Return **substitute** A7 Module to On-Site Service Kit.
6. Return to foldout.

Type:	2A; RF Power Levels	**A7.08**
Run time:	30 sec.	
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

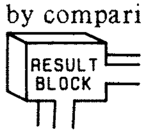
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

3. [3] [2] [6] [HZ].

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W28** from module at **A7A1 J2**.
   - Connect **YELLOW PM** cable and adapter to cable **W28**.
   - [HZ] to continue test.

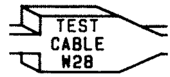
5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W28** to module at **A7A1 J2**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A7**. If "**TEST 2A OF A07 (PASSED or FAILED)**" is not displayed, rerun test.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST RF POWER**.

Type: 2A; RF Power Levels
Run time: 30 sec.
Set-up time: 2 min.

A7.09



RF signal level is measured using Internal Power Meter (**PM**).

Run Test

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

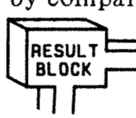
2. SHIFT SPCL 3 6 8 1 2 HZ
   (To check input levels only.)

3. 3 2 6 HZ

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W28** from module at **A6A2 J8**. (See Top View Diagram inside **Top Cover** to locate **W28** connection on **A6 Module**.)
   - Connect **YELLOW PM** cable to module at **A6A2 J8**.
   - HZ to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W28** to module at **A6A2 J8**.
   - HZ to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A7**. If "**TEST 2A OF A07 (PASSED or FAILED)**" is not displayed, rerun test.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W28.**

Type:	3; Bit Transmission	**A7.10**
Run time:	3 min.	
Set-up time:	2 min.	

Internal Voltmeter **(VM)** is used to measure TTL level changes transmitted to **A7 Module** on SAWR oscillator select lines **A** and **B**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W2** from module at **A7A1 J1**.
   - Plug end of **W2** **into** **14 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W2P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A7 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

SAWR Select Line A

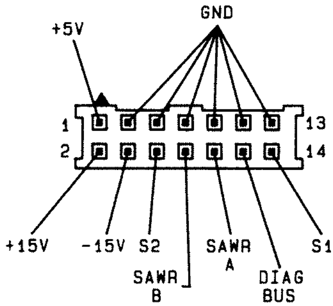
Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [1]
   (To specify high state.)

5. [3] [0] [HZ]
   (To select bit.)

6. Connect **VM** probe to test connector line **A** (pin **10**). (See **Figure 3G-1. Cable Plug W2P2 Signal Locator.**)

Figure 3G-1. Cable Plug W2P2 Signal Locator



7. [2] [5] [HZ]
   (To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
   ([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify low state.)

10. [3] [0] [HZ]
    (To select bit.)

11. [2] [5] [HZ]
    (To enable voltmeter.)

12. Voltage should read approximately **-0.5** to **+1.5 Vdc.**
    ([5] [HZ] to repeat measurement.)

SAWR Select Line B

Check High State

13. [SHIFT] [SPCL] [3] [6] [0] [1]
    (To specify high state.)

14. [3] [1] [HZ]
    (To select bit.)

15. Connect **VM** probe to test connector line **B** (pin **8**). **(See Figure 3G-1. Cable Plug W2P2 Signal Locator.)**

16. [2] [5] [HZ]
(To enable voltmeter.)

17. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

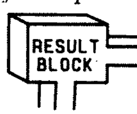
18. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

19. [3] [1] [HZ]
(To select bit.)

20. [2] [5] [HZ]
(To enable voltmeter.)

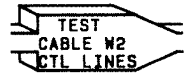
21. Voltage should read approximately **-0.5 to +1.5 Vdc.**
([5] [HZ] to repeat measurement.)

22. Record test results.

23. Return to foldout:
- Determine next task by comparing test results to conditions shown in each 

for **TEST CONTROL BITS.**

Type:	3; Bit Transmission	**A7.11**
Run time:	3 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A7 Module** on SAWR oscillator select lines **A** and **B**.

Run Test

1. Switch instrument to **Standby**.
2. Extend **A7 Module** on extender posts, from On-Site Service Kit, and disconnect cable **W2** from **A5 Assembly** at **A5J2**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A7 Module** extension and **A5** cable disconnection information.)
3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A7 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)
4. Turn instrument on.

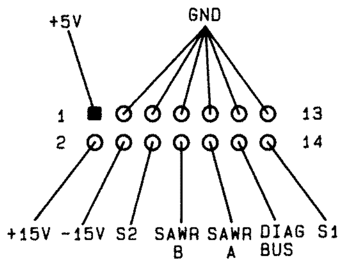
SAWR Select Line A

Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [1]
   (To specify high state.)
6. [3] [0] [HZ]
   (To select bit.)

7. Connect **VM** probe to solder-side of **A5J2** line **A** (pin **10**). (See **Figure 3G-2. A5J2 Signal Locator**.)

Figure 3G-2. A5J2 Signal Locator
(Solder-Side View)



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

10. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

11. [3] [0] [HZ]
(To select bit.)

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

SAWR Select Line B

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

15. [3] [1] [HZ]
(To select bit.)

16. Connect **VM** probe to solder-side of **A5J2** line **B** (pin **8**). (**See Figure 3G-2. A5J2 Signal Locator**.)

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

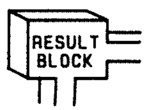
19. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

20. [3] [1] [HZ]
(To select bit.)

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

23. Record test results.

24. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W2 CTL LINES**.

Type:	4, Voltage Measurements	**A7.12**
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A7 Module**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W2** from **A7** at **A7A1 J1**.
   - Plug end of **W2** into **14 pin** test connector, from On-Site Service Kit.

   NOTE

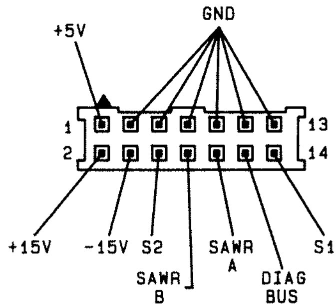
   Find arrowhead on test connector and align with arrowhead on cable plug **W2P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A7 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

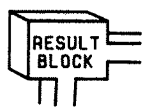
3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (see **Figure 3G-3. Cable Plug W2P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

Figure 3G-3. Cable Plug W2P2 Signal Locator



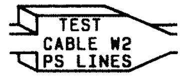
5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST Vdc**.

Type: 4, Voltage Measurements
Run time: 2 min.
Set-up time: 3 min.

A7.13



Internal Voltmeter (**VM**) is used to check power supply levels at **A5J2**.

Run Test

1. Switch instrument to **Standby**.

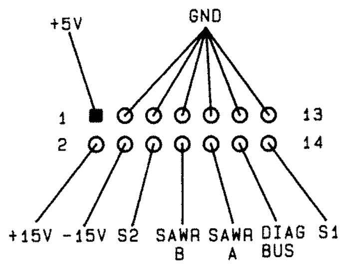
2. Extend **A7 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W2** from **A5 Assembly** at **A5J2**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A7 Module** extension and **A5** cable disconnection information.)
   - After cable **W2** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A7 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

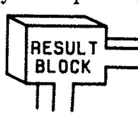
4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

5. Measure voltage levels at **A5J2**:
   - Access signals from solder-side of **A5J2**. (See **Figure 3G-4. A5J2 Signal Locator**.)
   - [5] [HZ] (To make each voltage measurement.)

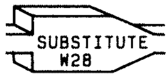
Figure 3G-4. A5J2 Signal Locator
(Solder-Side View)



6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W2 PS LINES**.

Type:	Cable Substitution	**A7.14**
Run Time:	5 min.	
Set-up Time:	1 min.	

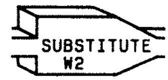


1. Testing has shown cable **W28** to be suspect, temporarily replace with a test cable from the On-Site Service Kit. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in the HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

3. Return to foldout.

Type:	Cable Substitution	**A7.15**
Run time:	0 min.	
Set-up time:	3 min.	



Testing has shown cable **W2** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS**, in the HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

CAUTION

When connecting ribbon cable to A7 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W2

1. Switch instrument to **Standby** to connect cable **W2** to **A5** Assembly and **A7** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable **W2** to **A5J2**.)
2. Return to foldout.

Type:	Cable Connection	**A7.16**
Run time:	0 min.	
Set-up time:	3 min.	

CAUTION

When connecting ribbon cable to A7 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

<u>Reconnect W2</u>

1. Switch instrument to **Standby** to reconnect cable **W2** to **A5** Assembly or **A7** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on reconnecting cable **W2** to **A5J2**.)

2. Return to foldout.

3G-4. A7 SAWR LOOP MODULE

COMMENT

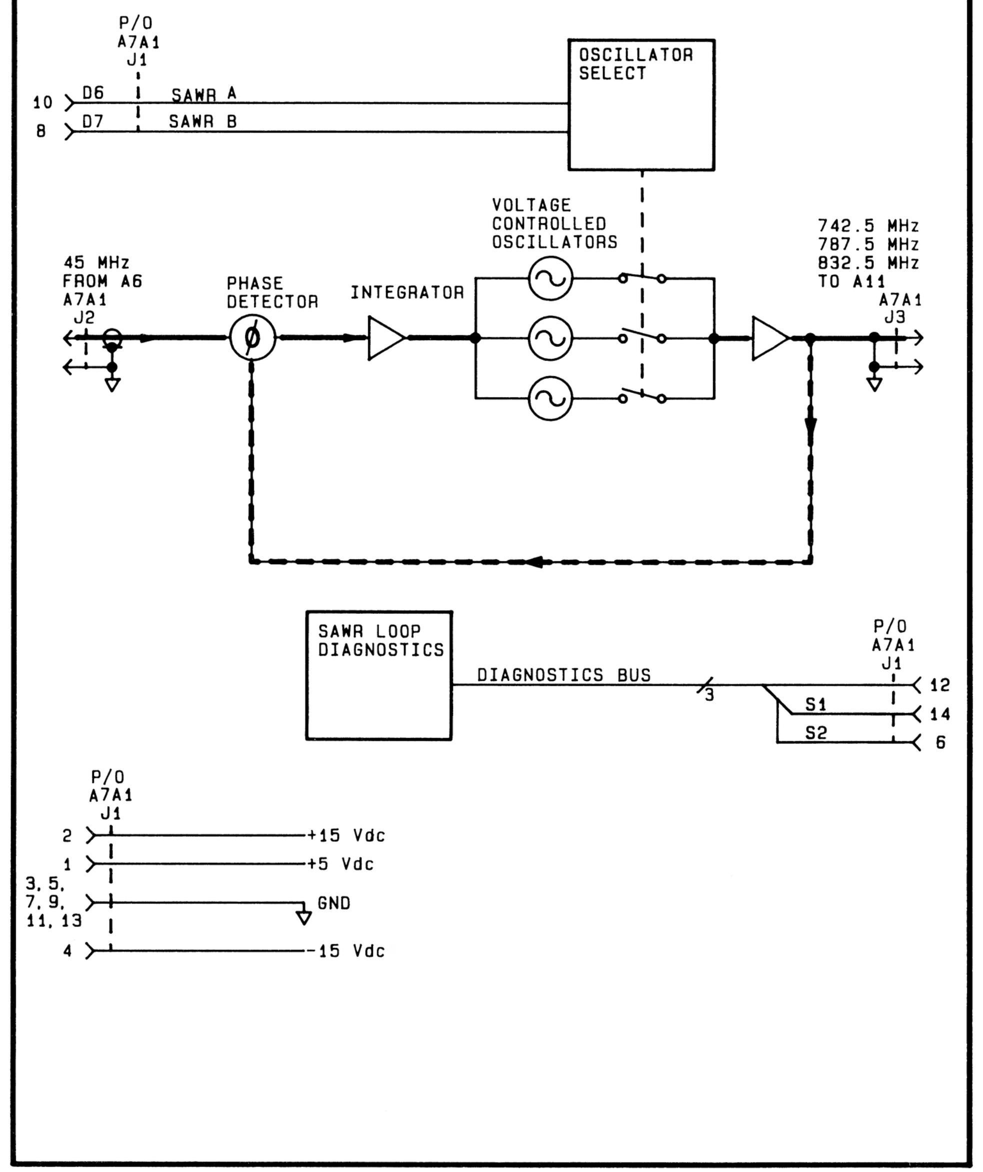
It is not to essential to understand the internal operation of a module to make an on-site repair.

The **A7 Module** contains a phase locked loop circuit. Oscillator select lines **A** and **B** are decoded to select one of three Surface Acoustic Wave Resonator (SAWR) oscillators. The oscillators are referenced to the **A6** Timebase output (**45 MHz**).

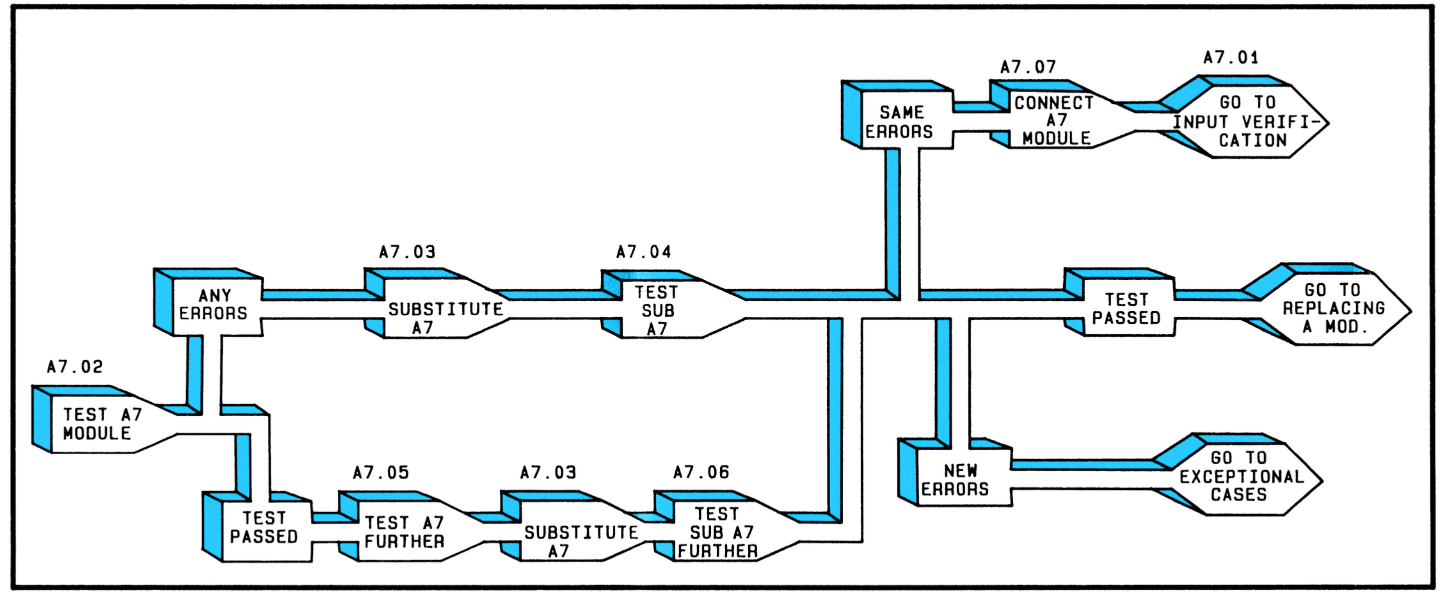
The **A7 Module** output: **742.5**, **787.5**, and **832.5 Mhz**, is the UHF reference for the **A11 Reference Loop Module**.

See the **A7 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A7 Module's** internal operation.

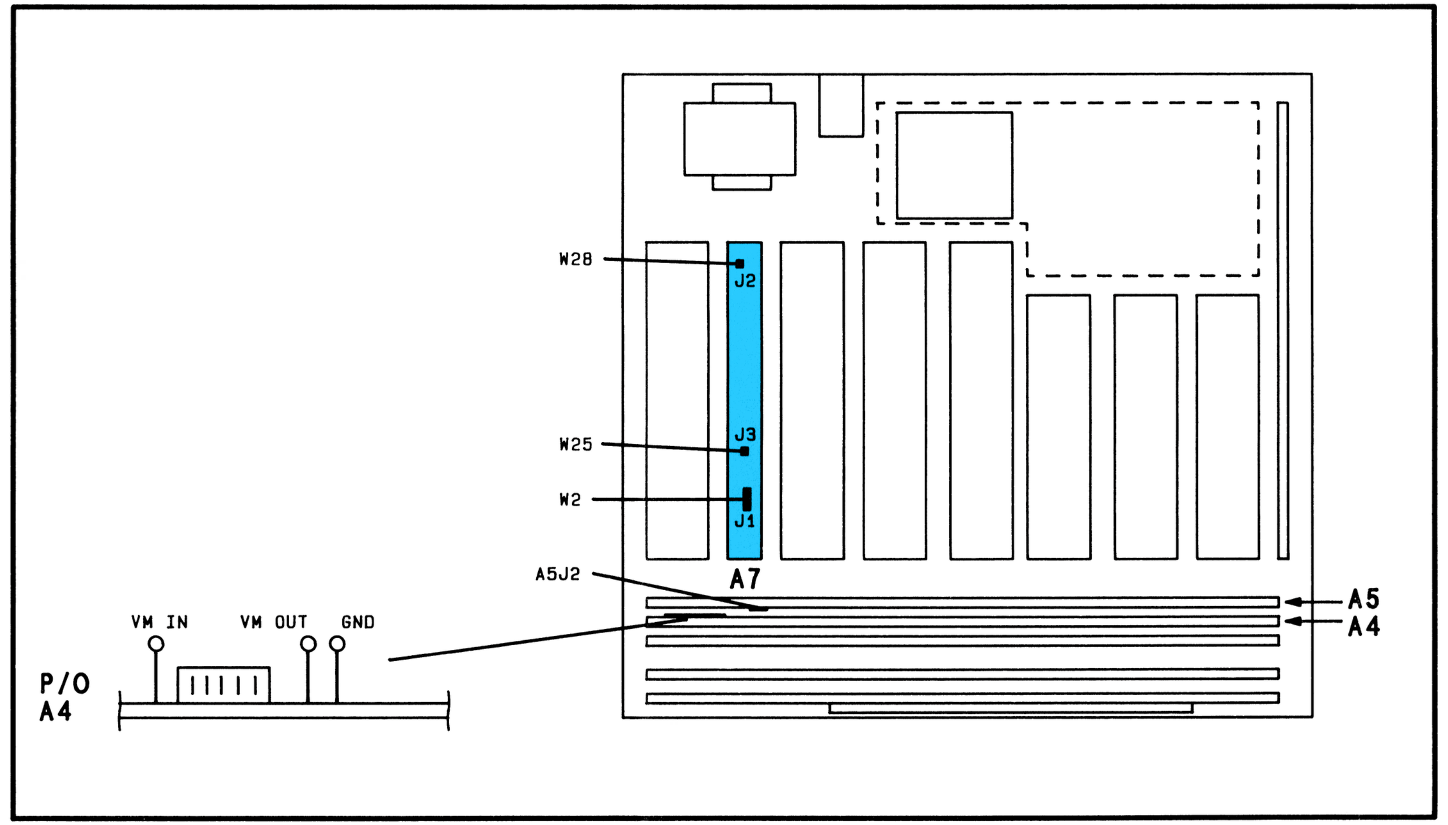
A7 MODULE SIMPLIFIED BLOCK DIAGRAM



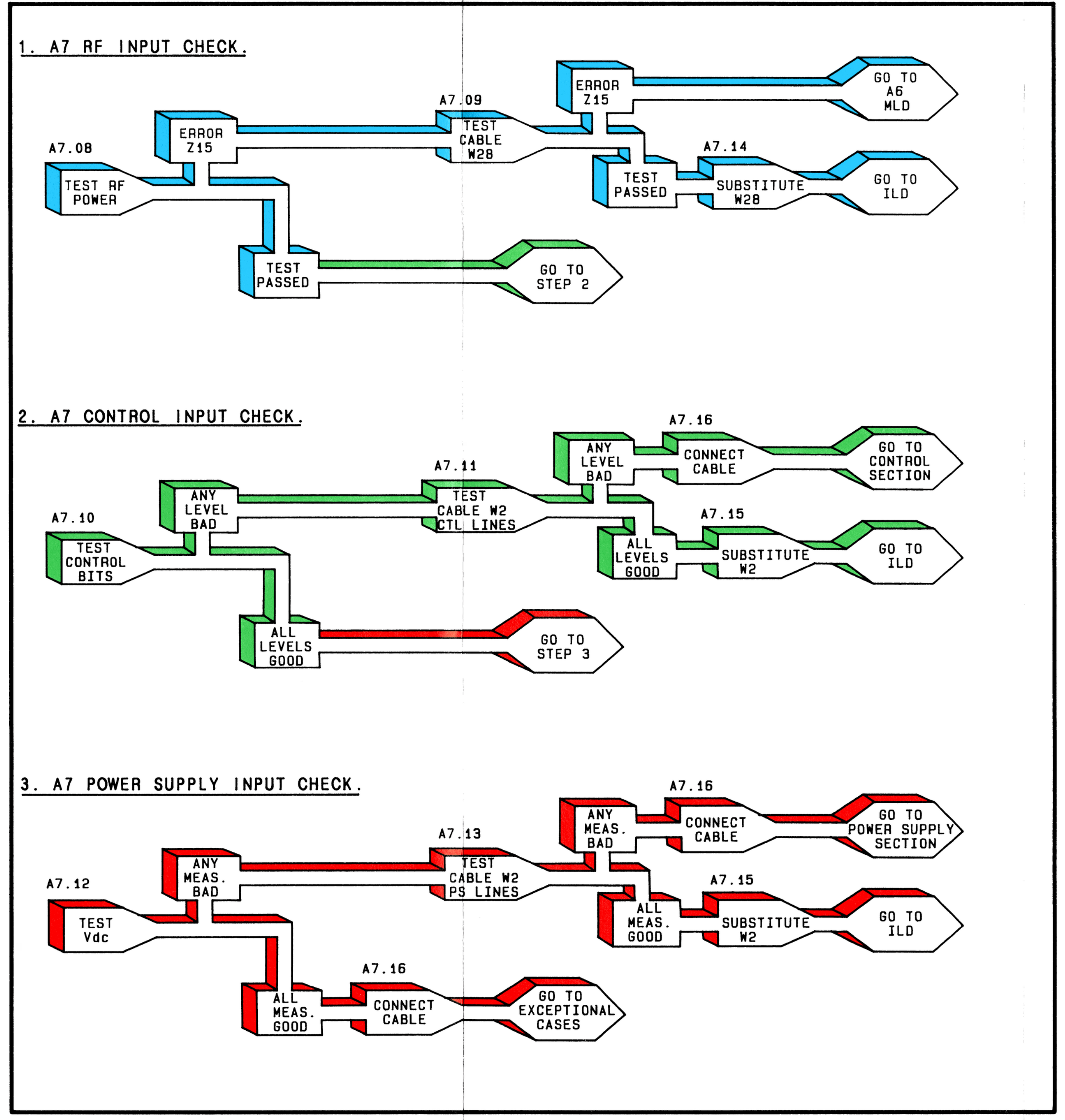
A7 MODULE SUBSTITUTION



A7 MODULE CABLE CONNECTION LOCATOR



A7 INPUTS VERIFICATION



A7 MODULE I/O SIGNALS DIAGRAM

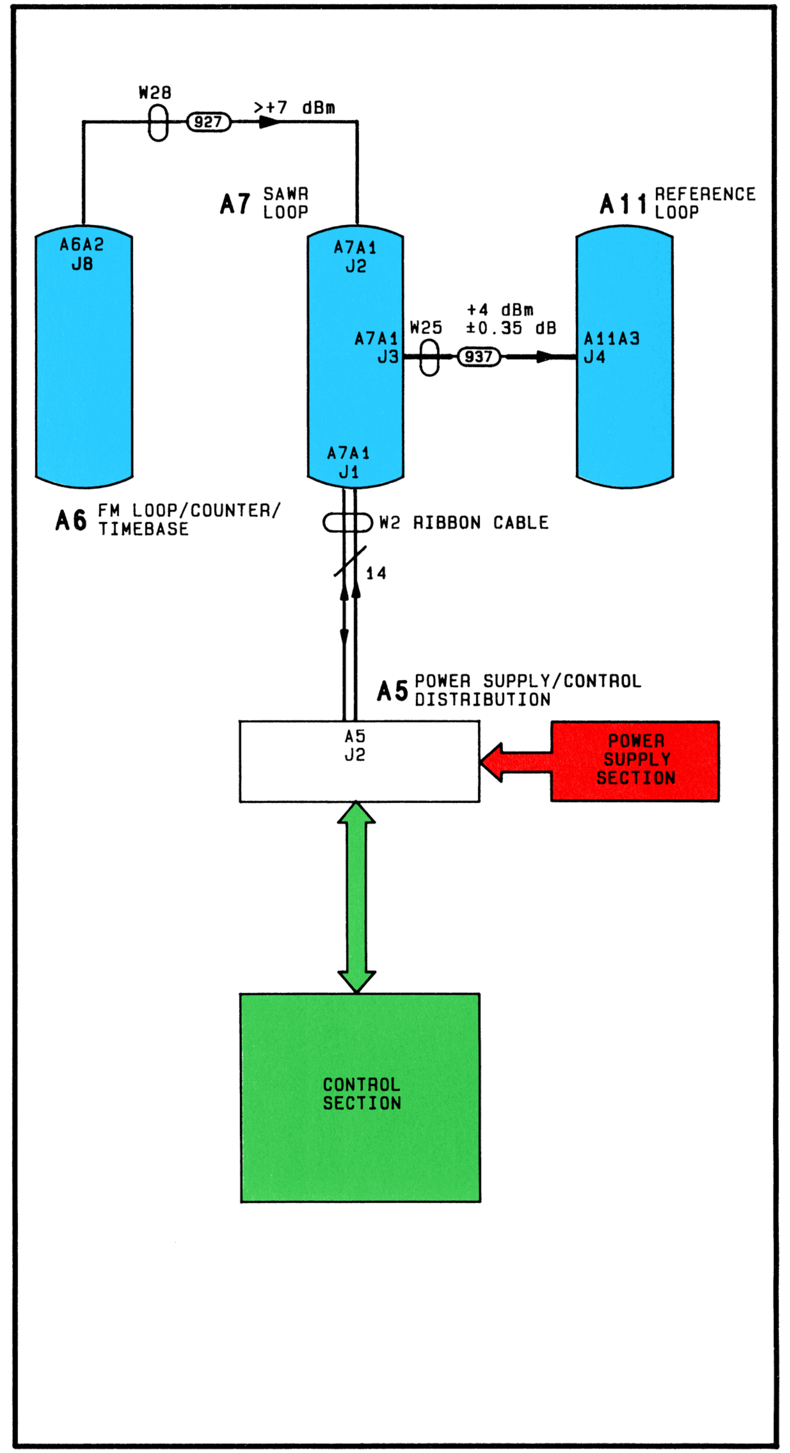


Figure 3G-100. A7 SAWR Loop Module Diagnostics.

A9

3H-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A9 Module**. The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-A07**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptible to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to the table shown on the foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Turn to the next page to begin the **A9 MLD**.

3H-2. INTRODUCTION

The **first step in isolating an A9 failure** is to substitute in a known good module from the On-site Service Kit.

NOTE

If a known good A9 module is not available and you were directed here either by:

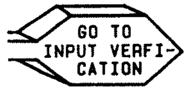
a.) The **Instrument Level Diagnositics**, *proceed to the next page and perform the A9 INPUTS VERIFICATION.*

b.) The **A12 Module** *diagnostics, the probability that the A9 Module is defective is high enough to make verification of its inputs unnecessary. Proceed with the substitution process as soon as a known good module is available.*

A9 Substitution Instructions

1. Find **A9 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A9 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

A9.01



3H-3. INTRODUCTION

If a known good **A9 Module** is not available, or if you were not able to isolate the failure using the **A9 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams, shown under **A9 INPUTS VERIFICATION**, should be used to check each signal path into the A9 Module.

A9 Inputs Verification Instructions

1. Find **A9 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A9 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the page indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A9 RF INPUT CHECK**.

NOTE

The **A9 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A9 Module** *depends on for operation.*

Type:	1; Loop Lock/Unlock	**A9.02**
Run time:	2 min. 40 sec.	
Set-up time:	0	

Run Test

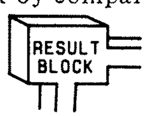
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [3] [5] [HZ].

3. When "**DIAG DONE   HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A9**.

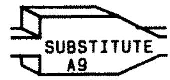
COMMENT

If any error codes are displayed for modules A01-A07, you need to isolate those failure(s) before performing the A9 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST A9 MODULE**.

Type:	Module Substitution	**A9.03**
Run time:	0	
Set-up time:	5 min.	



The following describes the technique for connecting a known good A9 Module **without removing** the A9 Module in the instrument.

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W3**, **W26** and **W30** from **A9 Module** (see **A9 MODULE CABLE CONNECTION LOCATOR** on foldout).
3. Without removing **A9 Module** from instrument, carefully lay substitute **A9 Module** on top of modules **A11**, **A12** and **A13**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

4. Connect cables **W3**, **W26** and **W30** to substitute module.
5. Turn instrument on.
6. Return to foldout.

Type:	Substitute Module Test	**A9.04**
Run time:	1 min.	
Set-up time:	0	

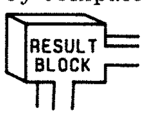
Test operation of **substitute A9 Module** by repeating test performed on A9 Module before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [3] [5] [HZ].

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A9**.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A9**.

Type:	Additional A9 Tests	A9.05
Run time:	Conditional	
Set-up time:	Conditional	

The **A9** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A9** failure.

Condition 2: **A12 Module RF Power Test** indicated **A9** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A9** failure.

<u>**Condition 1**</u>

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SETUP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A9** error codes.

COMMENT

If any error codes are displayed for modules A01-A07, you need to isolate those failure(s) before performing the A9 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [3] [7] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W26** from module at **A9A2 J3**.
   - Connect **YELLOW PM** cable and adapter to cable **W26**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W26** to module at **A9A2 J3**.
   - Disconnect cable **W30** from module at **A9A1 J4**.
   - Connect **PM** cable to module at **A9A1 J4**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W30** to module at **A9A1 J4**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A9**.

7. Return to foldout.

Condition 3

1. Set instrument to operating condition which causes **A9 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout.

Type:	Additional Substitute A9 Tests	A9.06
Run time:	Conditional	
Set-up time:	Conditional	

Test operation of **substitute A9 Module** by repeating test(s) performed on A9 Module before substitution.

Condition 1: **Instrument Level Self Test** indicated **A9** failure.

Condition 2: **A12 Module RF Power Test** indicated **A9** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A9** failure.

<u>**Condition 1**</u>

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

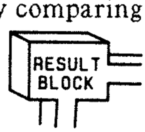
2. SHIFT SPCL 3 3 0 HZ.

3. When "**WAITING FOR SETUP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - HZ to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use MSSG to scroll through messages.
   - Record **A9** error codes.

COMMENT

If any error codes are displayed for modules A01-A07, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A9 FURTHER**.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

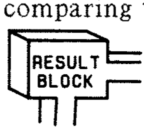
2. [SHIFT] [SPCL] [3] [3] [3] [7] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W26** from module at **A9A2 J3**.
   - Connect **YELLOW PM** cable and adapter to cable **W26**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W26** to module at **A9A2 J3**.
   - Disconnect cable **W30** from module at **A9A1 J4**.
   - Connect **PM** cable to module at **A9A1 J4**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W30** to module at **A9A1 J4.**
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A9**.

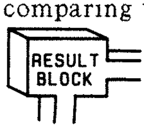
7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A9 FURTHER**.

Condition 3

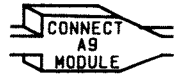
1. Set instrument to operating condition which causes **A9 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A9 FURTHER**.

Type:	Cable Connection	**A9.07**
Run time:	0	
Set-up time:	5 min.	



Connect Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W3**, **W26** and **W30** from substitute **A9 Module**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

3. Reconnect cables **W3**, **W26** and **W30** to **A9 Module**.
4. Turn instrument on.
5. Return **substitute** A9 Module to On-Site Service Kit.
6. Return to foldout.

Type:	2A; RF Power Levels	**A9.08**
Run time:	2 min. 30 sec.	
Set-up time:	3 min.	

RF signal level is measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

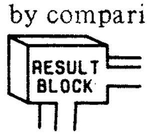
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

3. [3] [3] [7] [HZ].

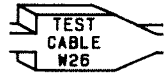
4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W26** from module at **A9A2 J3**.
   - Connect **YELLOW PM** cable and adapter to cable **W26**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W26** to module at **A9A2 J3**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A9**.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST RF POWER**.

Type:	2A; RF Power Levels	**A9.09**
Run time:	2 min. 30 sec.	
Set-up time:	3 min.	



RF signal level is measured using Internal Power Meter (**PM**).

Run Test

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

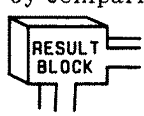
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

3. [3] [3] [7] [HZ]

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W26** from **A6 Module** at **A6A2 J6**. (See Top View Diagram inside **Top Cover** to locate **W26** connection on **A6 Module**.)
   - Connect **YELLOW PM** cable to module at **A6A2 J6**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W26** to module at **A6A2 J6**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A9**.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W26**.

Type:	3; Bit Transmission	**A9.10**
Run time:	0 min.	
Set-up time:	5 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A9 Module** Data and Clock lines.

COMMENT

If any control line level measures bad, it is not necessary to test remaining lines; proceed directly to step **23**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W3** from module at **A9A2 J1**.
   - Plug end of **W3** <u>into</u> **26 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W3P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A9 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.

Data and Clock Control Lines

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

NOTE

A "0" will appear in display indicating that these data bits will be set low. However, the bits are **inverted** *in the Control Section before they are sent to A9.*

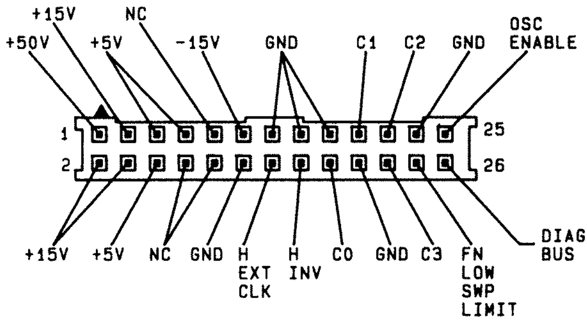
5. Enter **Bit Select Keys**, as indicated in **Table 3H-1. W3P2 Control Bits**, for **Control Line** to be tested.

6. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3H-1.** (See **Figure 3H-1. Cable Plug W3P2 Signal Locator.**)

Table 3H-1. W3P2 Control Bits

Test Order	**Control Line**	**Bit Select Keys** (Steps 5 and 10)	**Pin Number** (Step 6)
1	C0	[3] [2] [HZ]	18
2	C1	[3] [3] [HZ]	19
3	C2	[3] [4] [HZ]	21
4	C3	[3] [5] [HZ]	22
5	H INV	[3] [6] [HZ]	16
6	H EXT CLK	[3] [7] [HZ]	14

Figure 3H-1. Cable Plug W3P2 Signal Locator



7. [2] [5] [HZ]
(To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

*A "**1**" will appear in display indicating that these data bits will be set high. However, the bits are* **inverted** *in the Control Section before they are sent to A9.*

10. Enter **Bit Select Keys,** as indicated in **Table 3H-1. W3P2 Control Bits**, for same **Control Line**.

11. [2] [5] [HZ]
(To enable voltmeter.)

12. Voltage should read approximately **-0.5** to **+1.5 Vdc.**
([5] [HZ] to repeat measurement.)

13. Repeat procedure for each **Control Line** shown in **Table 3H-1.**

Oscillator Enable

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

15. [3] [8] [HZ]
(To select bit.)

16. Connect **VM** probe to test connector line **OSC ENABLE** (pin **25**).

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

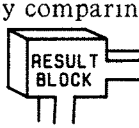
19. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

20. [3] [8] [HZ]
(To select bit.)

21. [2] [5] [HZ]
(To enable voltmeter.)

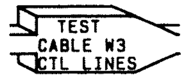
22. Voltage should read approximately **−0.5 to +1.5 Vdc.**
([5] [HZ] to repeat measurement.)

23. Record test results.

24. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CONTROL BITS**.

Type:	3; Bit Transmission	**A9.11**
Run time:	3 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A9 Module** Clock and Data lines.

Run Test

1. Switch instrument to **Standby**.

2. Extend **A9 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W3** from **A5 Assembly** at **A5J3**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A9 Module** extension and **A5** cable disconnection information.)
   - After cable **W3** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A9 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Turn instrument on.

NOTE

It is only necessary to perform this test on failing control line.

Data and Clock Control Lines

Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify high state.)

NOTE

*A "***0***" will appear in display indicating that these data bits will be set low. However, the bits are* **inverted** *in the Control Section before they are sent to A9.*

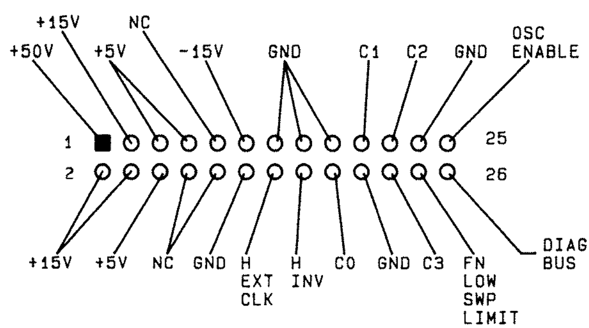
6. Enter **Bit Select Keys**, as indicated in **Table 3H-2. A5J3 Control Bits**, for **Control Line** to be tested.

7. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3H-2**. (See **Figure 3H-2. Cable Plug A5J3 Signal Locator**.)

Table 3H-2. A5J3 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 6 and 11)	Pin Number (Step 7)
1	C0	[3] [2] [HZ]	18
2	C1	[3] [3] [HZ]	19
3	C2	[3] [4] [HZ]	21
4	C3	[3] [5] [HZ]	22
5	H INV	[3] [6] [HZ]	16
6	H EXT CLK	[3] [7] [HZ]	14

Figure 3H-2. Cable Plug A5J3 Signal Locator



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

10. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

A "1" will appear in display indicating that these data bits will be set high. However, the bits are **inverted** *in the Control Section before they are sent to A9.*

11. Enter **Bit Select Keys**, as indicated in **Table 3H-2. W3P2 Control Bits**, for same **Control Line**.

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **-0.5 to +1.5 Vdc**.
([5] [HZ] to repeat measurement.)

__**Oscillator Enable**__

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

15. [3] [8] [HZ]
(To select bit.)

16. Connect **VM** probe to test connector line **OSC ENABLE** (pin **25**).

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5** Vdc.
([5] [HZ] to repeat measurement.)

Check Low State

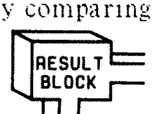
19. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

20. [3] [8] [HZ]
(To select bit.)

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **-0.5 to +1.5** Vdc.
([5] [HZ] to repeat measurement.)

23. Record test results.

24. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W3 CTL LINES**.

Type:	4, Voltage Measurements	A9.12
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A9 Module**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W3** from **A9** at **A9A2 J1**.
   - Plug end of **W3** into **26 pin** test connector, from On-Site Service Kit.

   NOTE

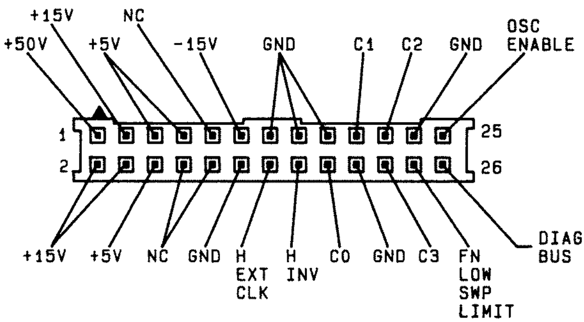
   Find arrowhead on test connector and align with arrowhead on cable plug **W3P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A9 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

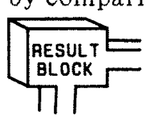
3. Turn instrument on and enter:
   SHIFT SPCL 3 2 5 HZ
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (see **Figure 3H-3. Cable Plug W3P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

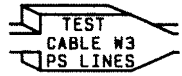
Figure 3H-3. Cable Plug W3P2 Signal Locator



5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST Vdc**.

Type:	4, Voltage Measurements	**A9.13**
Run time:	2 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to check power supply levels at **A5J3**.

Run Test

1. Switch instrument to **Standby**.

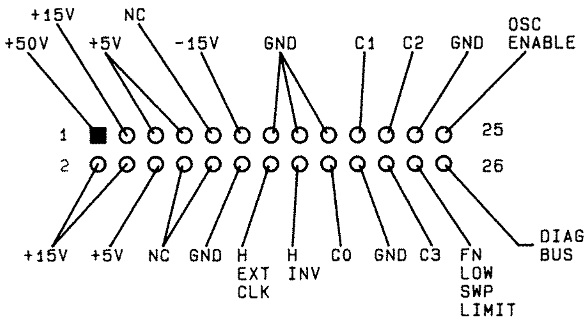
2. Extend **A9 Module** on extender posts, from On-Site Service Kit, and disconnect cable **W3** from **A5 Assembly** at **A5J3**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A9 Module** extension and **A5** cable disconnection information.)

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A9 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

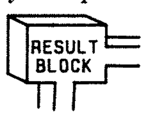
4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

5. Measure voltage levels at **A5J3**:
   - Access signals from solder-side of **A5J3**. (See **Figure 3H-4. A5J3 Signal Locator**.)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3H-4. A5J3 Signal Locator
(Solder-Side View)



6. Record test results.

7. Return to folout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W3 PS LINES**.

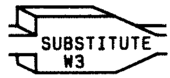
Type:	Cable Substitution	**A9.14**
Run Time:	5 min.	
Set-up Time:	1 min.	

1. Testing has shown cable **W26** to be suspect, temporarily replace with a test cable from the On-Site Service Kit. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in the HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

3. Return to foldout.

Type:	Cable Substitution	**A9.15**
Run time:	0 min.	
Set-up time:	3 min.	



Testing has shown cable **W3** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS**, in the HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

CAUTION

When connecting ribbon cable to A9 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W3

1. Switch instrument to **Standby** to connect cable **W3** to **A5** Assembly and **A9** Module. (Refer to **MECHANICAL PROCEDURES** for information on connecting cable **W3** to **A5J3**.)
2. Return to foldout.

Type:	Cable Connection	**A9.16**
Run time:	0 min.	
Set-up time:	3 min.	

CAUTION

When connecting ribbon cable to A9 Module, find arrowhead on the cable plug and align with arrow-head on the board connector.

Reconnect W3

1. Switch instrument to **Standby** to reconnect cable **W3** to **A5** Assembly or **A9** Module. (Refer to **MECHANICAL PROCEDURES** for information on reconnecting cable **W3** to **A5J3**.)

2. Return to foldout.

3H-4. A9 IF LOOP MODULE

COMMENT

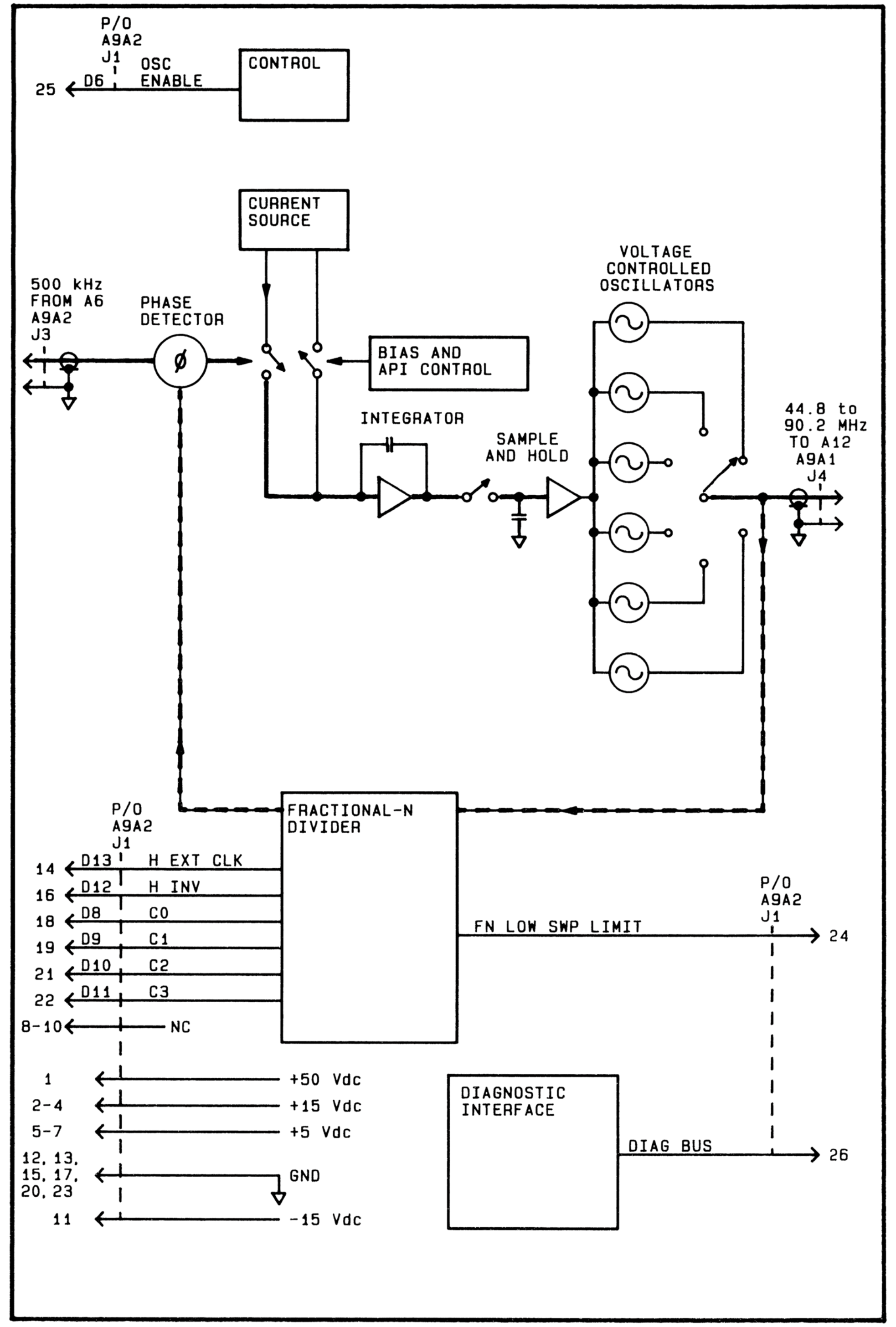
It is not to essential to understand the internal operation of a module to make an on-site repair.

The **A9 Module** contains a phase locked loop which is referenced to the **A6 Module** timebase output **(500 kHz)**. A fractional-N divider in the loop's feedback path and compensating circuitry in the oscillator tune path allow frequency steps of **.05 Hz** at the output.

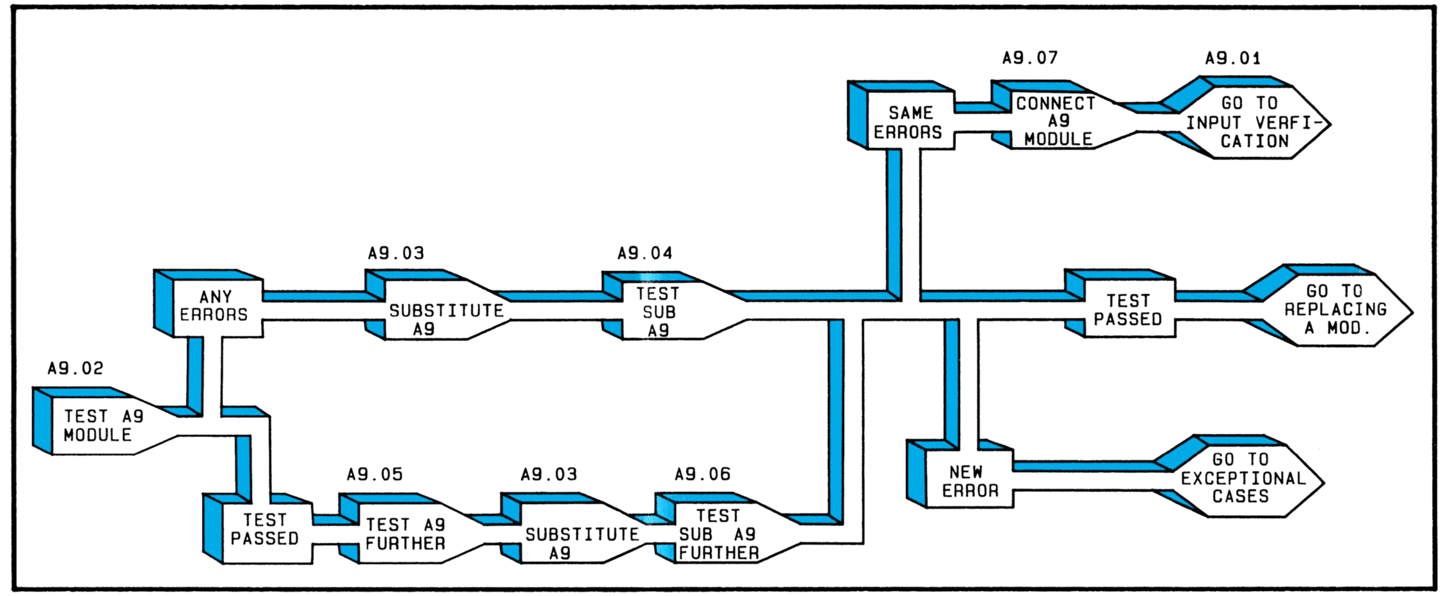
The fractional-N control signals are decoded to select one of six voltage controlled oscillators to produce the output frequency range of **45** to **90** MHz. The **A9 Module** output provides the reference signal for the **A12 Module**.

See the **A9 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A9 Module's** internal operation.

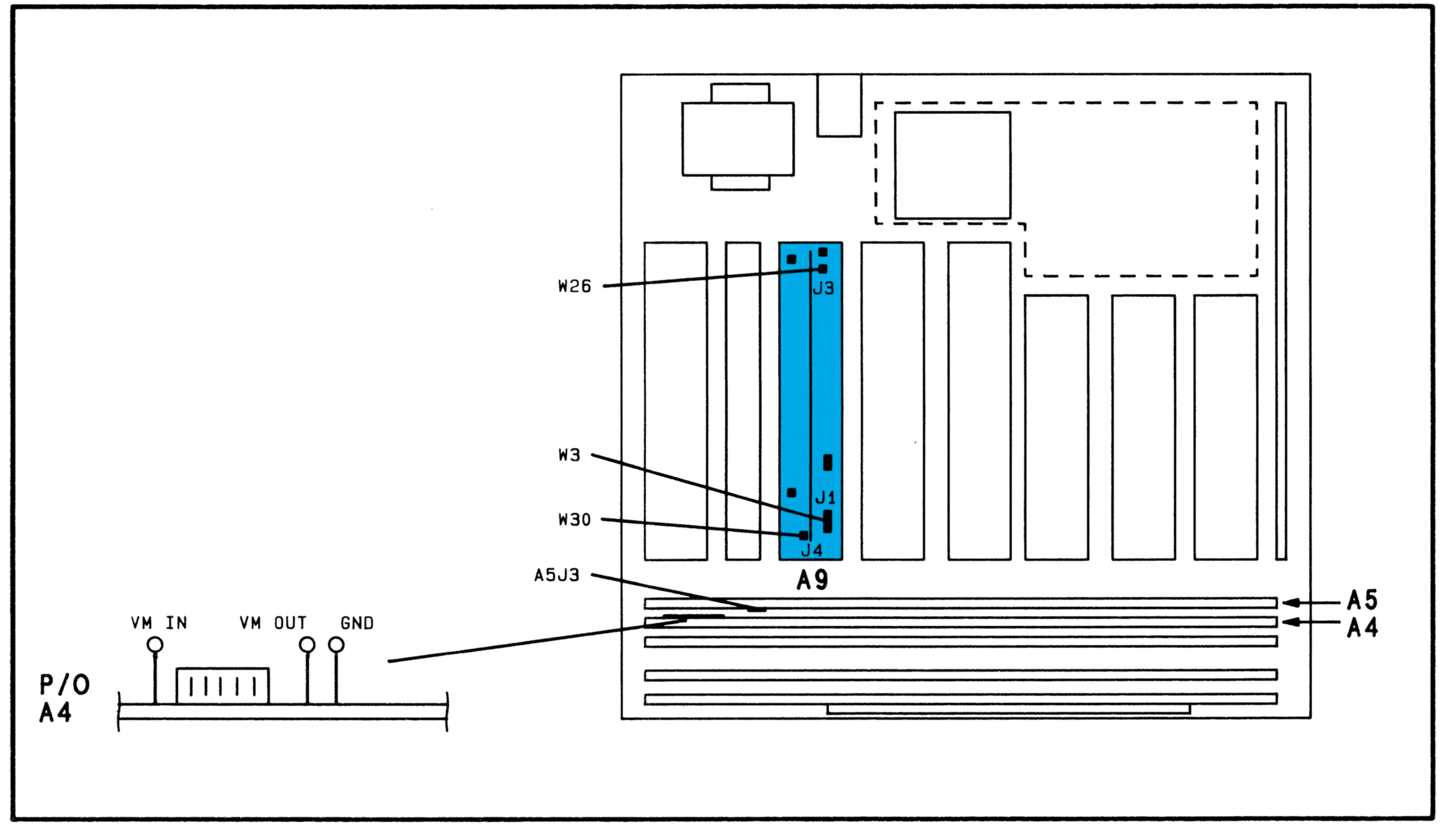
A9 MODULE SIMPLIFIED BLOCK DIAGRAM



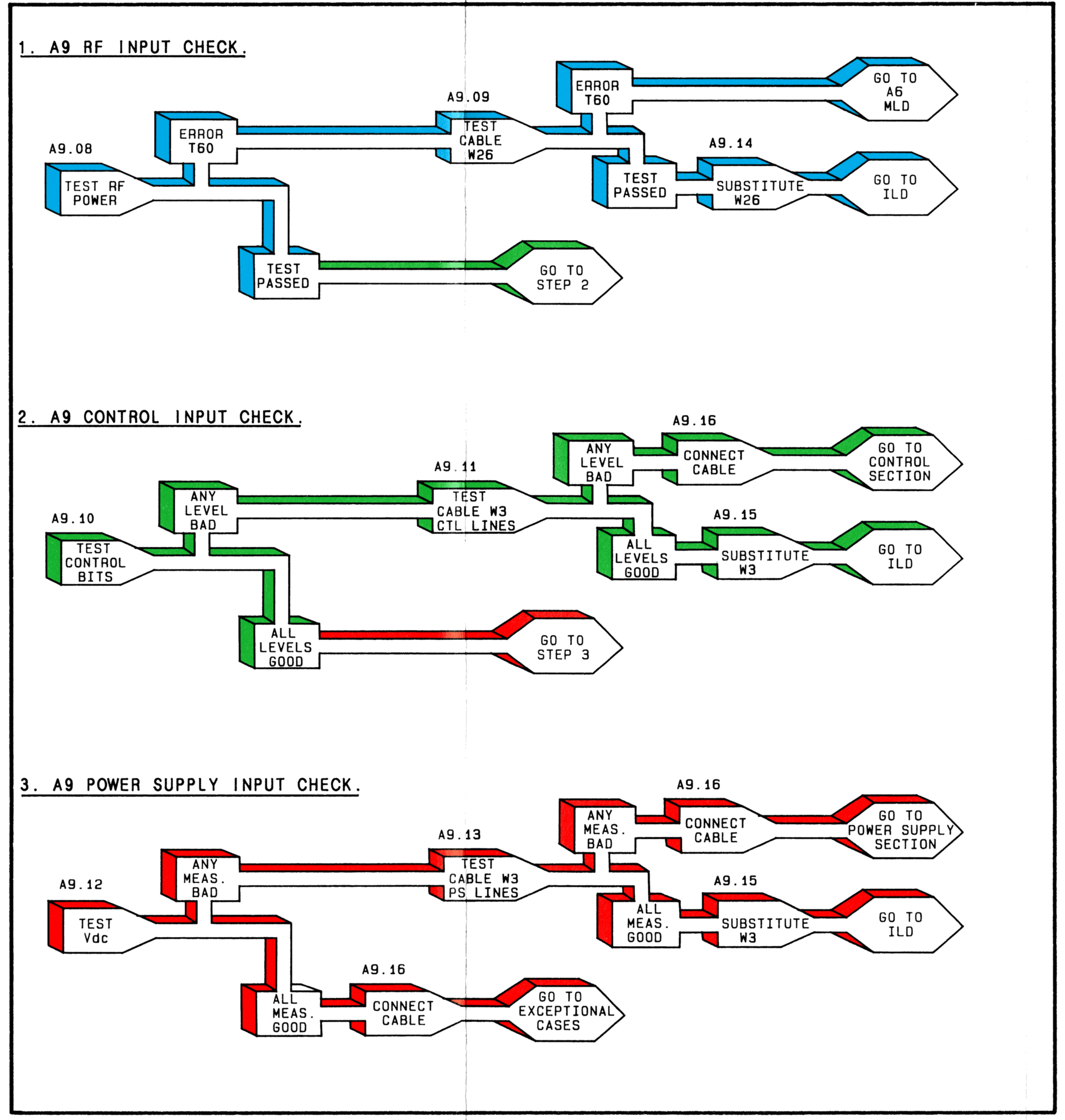
A9 MODULE SUBSTITUTION



A9 MODULE CABLE CONNECTION LOCATOR



A9 INPUTS VERIFICATION



A9 MODULE I/O SIGNALS DIAGRAM

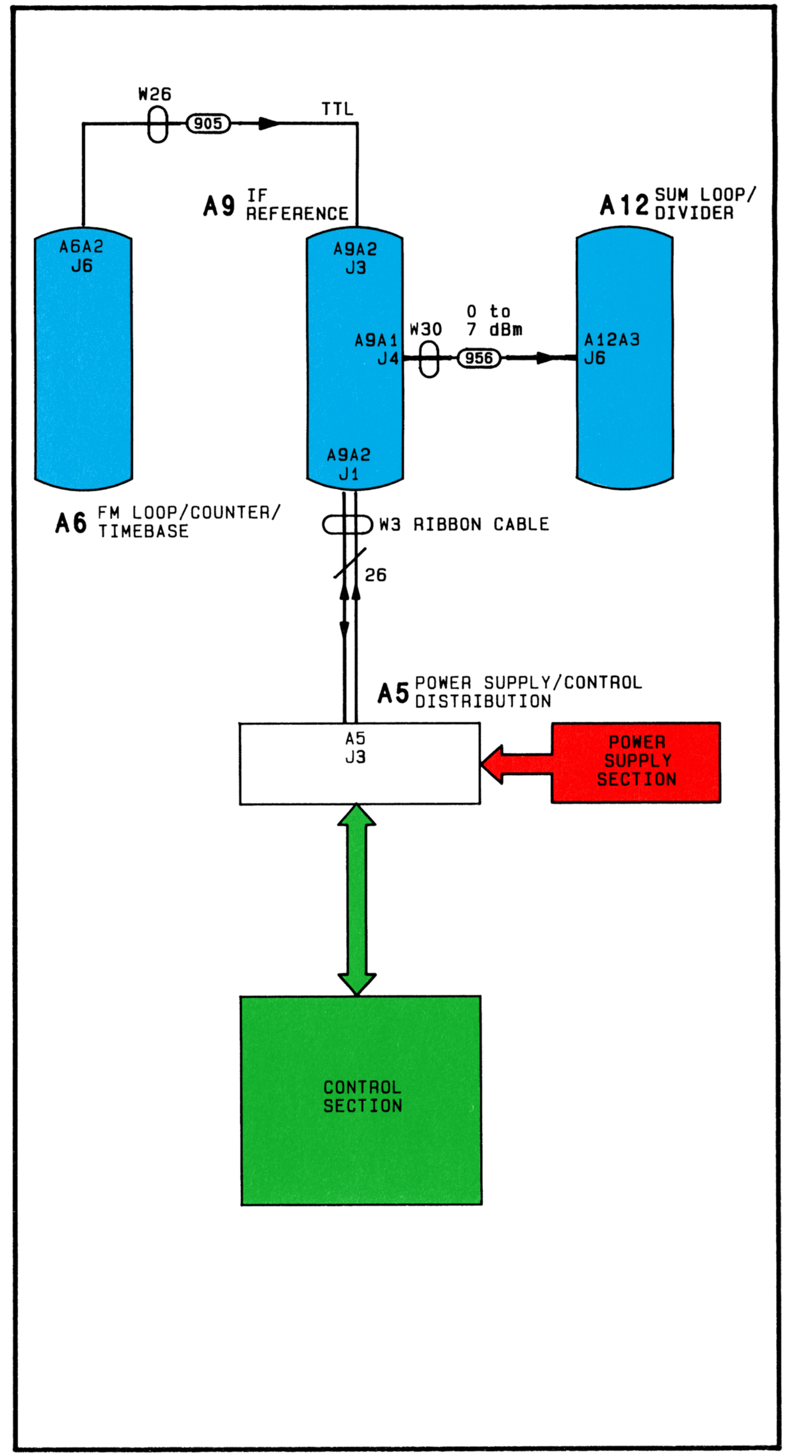


Figure 3H-100. A9 IF Reference Module Diagnostics.

A11

3I-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS (MLD)** contained in this section are used to further interrogate the **A11 Module**. The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-A09**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptable to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to the table shown on the foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Turn to the next page to begin the **A11 MLD**.

3I-2. INTRODUCTION

The first step in isolating a failure in the **A11 Module** is to verify correct operation of each input signal. Use the **A11 INPUTS VERIFICATION** procedure to check each signal path into the A11 Module.

NOTE

If you were directed here by the **A12 Module** *diagnostics, the probability that the A11 Module is defective is high enough to make verification of its inputs unnecessary. Proceed to the next page,* **A11 MODULE SUBSTITUTION**.

A11 Inputs Verification Instructions

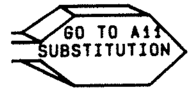
1. Find **A11 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A11 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A11 RF INPUT CHECK**.

NOTE

The **A11 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A11 Module** *depends on for operation.*

A11.01

3I-3. INTRODUCTION



NOTE

If a known good module is not available:

a.) If you were sent here by the **Instrument Level Diagnostics**, *proceed to paragraph* **30-4** *in the* **Exceptional Cases** *section.*

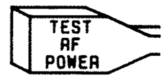
b.) If you were sent here by the **A12 Module** *diagnostics, obtain a replacement A11 Module and proceed with the A11 Module Substitution process.*

If you were unable to isolate the failure using the **A11 INPUTS VERIFICATION** procedure, then follow the Task Sequence Diagram, shown under **A11 MODULE SUBSTITUTION**, to substitute in a known good module from the On-site Service Kit.

A11 Substitution Instructions

1. Find **A11 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A11 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

Type:	2A; RF Power Levels	**A11.02**
Run time:	20 sec.	
Set-up time:	3 min.	



RF signal level is measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [6] [8] [1] [3] [HZ]
   (To check input levels only.)

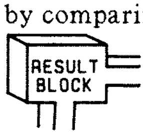
3. [3] [3] [1] [HZ].

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W25** from module at **A11A3 J4.**
   - Connect **YELLOW PM** cable and adapter to cable **W25**.
   - [HZ] to continue test.

5. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W25** to module at **A11A3 J4.**
   - Disconnect cable **W24** from module at **A11A1 J3**.
   - Connect **YELLOW PM** cable and adapter to cable **W24**.
   - [HZ] to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W24** to module at **A11A1 J3.**
   - [HZ] to continue test.

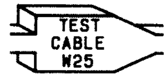
7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.

8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST RF POWER**.

Type: 2A; RF Power Levels
Run time: 10 sec.
Set-up time: 2 min.

A11.03



RF signal level is measured using Internal Power Meter (**PM**).

Run Test

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

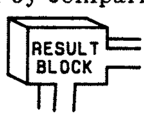
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

3. [3] [3] [1] [HZ]

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W25** from **A7 Module** at **A7A1 J3**. (See Top View Diagram inside **Top Cover** to locate **W25** connection on **A7 Module**.)
   - Connect **YELLOW PM** cable to module at **A7A1 J3**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W25** to module at **A7A1 J3**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W25**.

Type:	2A; RF Power Levels	**A11.04**
Run time:	15 sec.	TEST CABLE W24
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

Run Test

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)
2. [SHIFT] [SPCL] [3] [6] [8] [1] [3] [HZ]
   (To check input levels only.)
3. [3] [3] [1] [HZ]
4. When "**WAITING FOR SET-UP 1   .V24**" appears:
   - Disconnect cable **W25** from module at **A7A1 J3**. (See Top View Diagram inside **Top Cover** to locate **W25** connection on **A7 Module**.)
   - Connect **YELLOW PM** cable to module at **A7A1 J3**.
   - [HZ] to continue test.
5. When "**WAITING FOR SET-UP 2   .V25**" appears:
   - Reconnect cable **W25** to module at **A7A1 J3**.
   - Disconnect cable **W24** from module at **A6A1 J2**.
   - Connect **YELLOW PM** cable to module at **A6A1 J2**.
   - [HZ] to continue test.
6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W24** to module at **A6A1 J2**.
   - [HZ] to continue test.
7. When "**DIAG DONE   HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each RESULT BLOCK for **TEST CABLE W24**.

Type:	3; Bit Transmission	**A11.05**
Run time:	3 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A11 Module** on Clock and Data control lines.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W4** from module at **A11A1 J1**.
   - Plug end of **W4** into **16 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W4P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A11 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.

Clock Line

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify high state.)

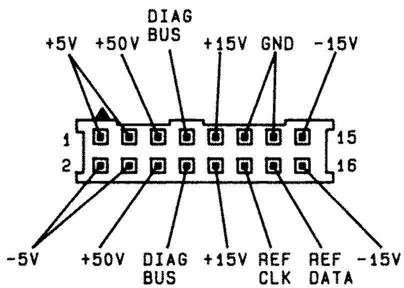
NOTE

*A "***0***" will appear in display indicating that the data bit will be set low. However, the bit is* **inverted** *in the Control Section before it is sent to A11.*

5. [4] [2] [HZ]
   (To select bit.)

6. Connect **VM** probe to test connector line **REF CLK** (pin **12**). (See **Figure 3I-1. Cable Plug W4P2 Signal Locator.**)

Figure 3I-1. Cable Plug W4P2 Signal Locator



7. [2] [5] [HZ]
   (To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
   ([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [1]
   (To specify low state.)

NOTE

*A "***1***" will be appear in display indicating that the data bit will be set high. However, the bit is* **inverted** *in the Control Section before it is sent to A11.*

10. [4] [2] [HZ]
    (To select bit.)

11. [2] [5] [HZ]
    (To enable voltmeter.)

12. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
    ([5] [HZ] to repeat measurement.)

Data Line

Check High State

13. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

14. [4] [3] [HZ]
(To select bit.)

15. Connect **VM** probe to test connector line **REF DATA** (pin **14**). (See **Figure 3I-1. Cable Plug W4P2 Signal Locator.**)

16. [2] [5] [HZ]
(To enable voltmeter.)

17. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

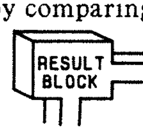
18. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

19. [4] [3] [HZ]
(To select bit.)

20. [2] [5] [HZ]
(To enable voltmeter.)

21. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

22. Record test results.

23. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CONTROL BITS**.

Type:	3; Bit Transmission	**A11.06**
Run time:	3 min.	
Set-up time:	3 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A11 Module** on Clock and Data control lines.

Run Test

1. Switch instrument to **Standby**.
2. Extend **A11 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W4** from **A5 Assembly** at **A5J4**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A11 Module** extension and **A5** cable disconnection information.)
   - After cable **W4** has been disconnected from **A5**, lower module back into instrument.
3. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A11 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)
4. Turn instrument on.

Clock Line

Check High State

5. SHIFT SPCL 3 6 0 2
   (To specify high state.)

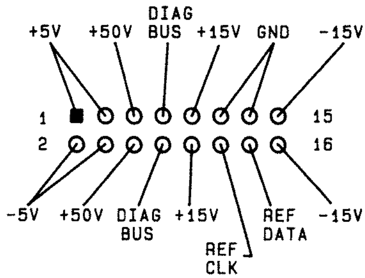
NOTE

*A "**0**" will appear in display indicating that the data bit will be set low. However, the bit is* **inverted** *in the Control Section before it is sent to A11.*

6. 4 2 HZ
   (To select bit.)

7. Connect **VM** probe to solder-side of **A5J4**, line **REF CLK** (pin **12**). (See **Figure 3I-2. A5J4 Signal Locator.**)

Figure 3I-2. A5J4 Signal Locator
(Solder-Side View)



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

10. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

*A "**1**" will be dispalyed indicating that the data bit will be set high. However, the bit is* **inverted** *in the Control Section before it is sent to A11.*

11. [4] [2] [HZ]
(To select bit.)

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

Data Line

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

15. [4] [3] [HZ]
(To select bit.)

16. Connect **VM** probe to solder-side of **A5J4**, line **REF DATA** (pin **14**). (See **Figure 3I-2. A5J4 Signal Locator.**)

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

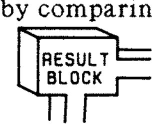
19. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

20. [4] [3] [HZ]
(To select bit.)

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

23. Record test results.

24. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W4 CTL LINES**.

Type:	4, Voltage Measurements	**A11.07**
Run time:	3 min.	
Set-up time:	2 min.	

Internal Voltmeter (VM) is used to check power supply levels at inputs to **A11 Module**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W4** from **A11** at **A11A1 J1**.
   - Plug end of **W4** into **16 pin** test connector, from On-Site Service Kit.

   NOTE

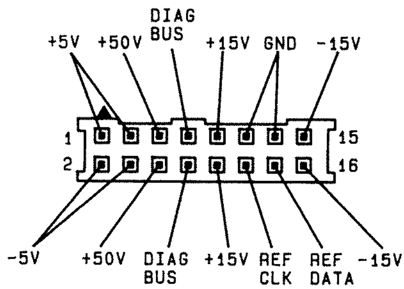
   Find arrowhead on test connector and align with arrowhead on cable plug **W4P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A11 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

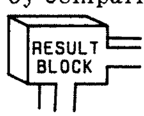
3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (see **Figure 3I-3. Cable Plug W4P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

Figure 3I-3. Cable Plug W4P2 Signal Locator



5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST Vdc**.

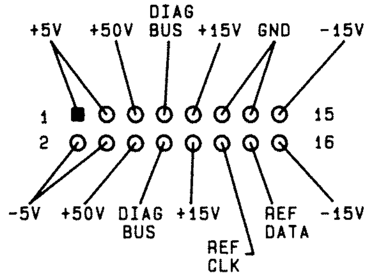
Type:	4, Voltage Measurements	**A11.08**
Run time:	3 min.	
Set-up time:	3 min.	

Internal Voltmeter (VM) is used to check power supply levels at **A5J4**.

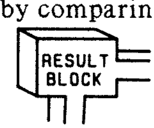
Run Test

1. Switch instrument to **Standby**.
2. Extend **A11 Module** on extender posts, from On-Site Service Kit,to disconnect cable **W4** from **A5 Assembly** at **A5J4**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A11 Module** extension and **A5** cable disconnection information.)
   - After cable **W4** has been disconnected from **A5**, lower module back into instrument.
3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A11 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)
4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)
5. Measure voltage levels at **A5J4**:
   - Access signals from solder-side of **A5J4**. (See **Figure 3I-4. A5J4 Signal Locator**.) It may be necessary to extend the **A11 Module** to access the solder-side of **A5J4**. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information.)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3I-4. A5J4 Signal Locator
(Solder-Side View)



6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLE W4 PS LINES**.

Type: 1; Loop Lock/Unlock
Run time: 15 sec.
Set-up time: 0

A11.09

Run Test

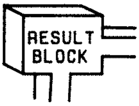
1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. SHIFT SPCL 3 3 2 9 HZ.

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A11**. If "**TEST 1 OF A11 (PASSED** or **FAILED)**" is not displayed, rerun test.

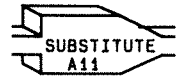
COMMENT

If any error codes are displayed for modules A01-A09, you need to isolate those failure(s) before performing the A11 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST A11 MODULE.**

Type:	Module Substitution	**A11.10**
Run time:	0	
Set-up time:	5 min.	



The following describes the technique for connecting a known good A11 Module **without removing** the A11 module in the instrument.

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W4**, **W24**, **W25** and **W31** from **A11 Module** (see **A11 MODULE CABLE CONNECTION LOCATOR** on foldout).
3. Without removing **A11 Module** from instrument, carefully lay substitute **A11 Module** on top of modules **A6**, **A7** and **A9**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

4. Connect cables **W4**, **W24**, **W25** and **W31** to substitute module.

Down-Load Cal Data

CAUTION

Use adequate Electrostatic Discharge Techniques when handling the A20 Calibration Module.

5. Remove from On-Site Service Kit **A20 Calibration Module** provided for substitute A11 Module.

CAUTION

*Check that switch S1 on A20 Module is switched up to its "***PROTECTED***" position.*

6. With instrument switched to **Standby**, connect **A20** Module to **A3 Module** at **A3J3** (see **A11 MODULE CABLE CONNECTION LOCATOR** on foldout).

7. Turn instrument on.

8. When "**100.000000 MZ -140.00 DM**" appears:
   - Slide switch on left side of **A3S2** on **A3 Module** back toward rear of instrument (see **A11 MODULE CABLE CONNECTION LOCATOR** on foldout).

9. [SHIFT] [SPCL] [3] [7] [3] [1] [HZ]

10. When "**TRANSFER VERIFIED .U613**" appears:
    - Slide **A3S2** forward toward front of instrument to **protect A3** Module's memory.

11. Switch Instrument to **Standby** and remove **A20 Module. Replace A20 Module in On-Site Service Kit.**

12. Return to foldout.

Type:	Substitute Module Test	**A11.11**
Run time:	1 min.	
Set-up time:	0	

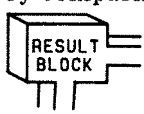
Test operation of **substitute A11 Module** by repeating test performed on A11 Module before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
(Hold shift key until
"**100.000000MZ   -140.0DM**" appears,
to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [2] [9] [HZ].

3. When "**DIAG DONE   HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A11**. If "**TEST 1 OF A11** (**passed** or **failed**)" is not displayed, rerun test.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A11**.

Type:	Additional A11 Tests	**A11.12**
Run time:	Conditional	
Set-up time:	Conditional	

The **A11** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A11** failure.

Condition 2: **A12 Module RF Power Test** indicated **A11** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A11** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.
2. [SHIFT] [SPCL] [3] [3] [0] [HZ].
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.
4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record A11 error codes.

COMMENT

If any error codes are displayed for modules A01-A09, you need to isolate those failure(s) before performing the A11 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. SHIFT SPCL 3 3 3 1 HZ

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W25** from module at **A11A3 J4.**
   - Connect **YELLOW PM** cable and adapter to cable **W25**.
   - HZ to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W25** to module at **A11A3 J4**.
   - Disconnect cable **W24** from module at **A11A1 J3**.
   - Connect **PM** cable to module at **A11A1 J3**.
   - HZ to continue test.

5. When "**WAITING FOR SET-UP 3 .V26**" appears:
   - Reconnect cable **W24** to module at **A11A1 J3**.
   - Disconnect cable **W31** from module at **A11A3 J2**.
   - Connect **PM** cable to module at **A11A3 J2**.
   - HZ to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W31** to module at **A11A3 J2.**
   - HZ to continue test.

7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A11**.

8. Return to foldout.

Condition 3

1. Set instrument to operating condition which causes **A11 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout.

Type:	Additional Substitute A11 Tests	**A11.13**
Run time:	Conditional	
Set-up time:	Conditional	

Test operation of **substitute A11 Module** by repeating test(s) performed on A11 Module before substitution.

Condition 1: **Instrument Level Self Test** indicated **A11** failure.

Condition 2: **A12 Module RF Power Test** indicated **A11** failure.

Condition 3: Instrument must be set to a specific operating condition to detect **A11** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

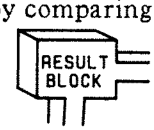
2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A11** error codes.

COMMENT

If any error codes are displayed for modules A01-A09, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A11 FURTHER.**

Condition 2

1. INSTR PRESET SHIFT
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. SHIFT SPCL 3 3 3 1 HZ

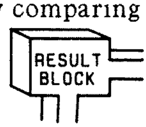
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W25** from module at **A11A3 J4.**
   - Connect **YELLOW PM** cable and adapter to cable **W25.**
   - HZ to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W25** to module at **A11A3 J4.**
   - Disconnect cable **W24** from module at **A11A1 J3.**
   - Connect **PM** cable to module at **A11A1 J3.**
   - HZ to continue test.

5. When "**WAITING FOR SET-UP 3 .V26**" appears:
   - Reconnect cable **W24** to module at **A11A1 J3.**
   - Disconnect cable **W31** from module at **A11A3 J2.**
   - Connect **PM** cable to module at **A11A3 J2.**
   - HZ to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W31** to module at **A11A3 J2.**
   - HZ to continue test.

7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A11.**

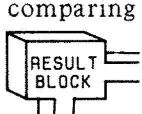
8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST SUB A11 FURTHER.**

Condition 3

1. Set instrument to operating condition which causes **A11** failure.

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST SUB A11 FURTHER.**

Type:	Module Replacement	**A11.14**
Run time:	10 sec.	
Set-up time:	5 min.	

Connect Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W4**, **W24**, **W25** and **W31** from substitute **A11 Module**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

3. Reconnect cables **W4**, **W24**, **W25** and **W31** to **A11 Module**.
4. Return **substitute** A11 Module to On-Site Service Kit.

Down-Load Cal Data

CAUTION

Use adequate Electrostatic Discharge Techniques when handling the A20 Calibration Module.

5. After making sure that **A20 Module** for substitute **A11 Module** has been returned to On-Site Service Kit, remove **A20 Calibration Module** from Rear Panel (see **MECHANICAL PROCEDURES** for removal information).

CAUTION

*Check that switch S1 on A20 Module is switched up to its "***PROTECTED***" position.*

6. With instrument switched to **Standby**, connect **A20 Module** to **A3 Module** at **A3J3**.

7. Turn instrument on.

8. When "**100.000000 MZ -140.00 DM**" appears:
   - Slide switch on left side of **A3S2** on **A3 Module** back toward rear of instrument.

9. SHIFT SPCL 3 7 3 1 HZ

10. When "**TRANSFER VERIFIED .U613**" appears:
    - Slide **A3S2** forward toward front of instrument to **protect A3 Module's** memory.

11. Switch Instrument to **Standby** and remove **A20 Module**. **Replace A20 Module on Rear Panel.**

12. Return to foldout.

Type:	Cable Substitution	**A11.15**
Run Time:	5 min.	
Set-up Time:	1 min.	

1. Testing has shown cable **W24** or **W25** to be suspect, temporarily replace it with a test cable from the On-Site Service Kit. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

3. Return to foldout.

Type:	Cable Substitution	**A11.16**
Run time:	0 min.	
Set-up time:	3 min.	

Testing has shown cable **W4** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

CAUTION

When connecting ribbon cable to A11 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

<u>**Reconnect W4**</u>

1. Switch instrument to **Standby** to connect cable **W4** to **A5** Assembly and **A11** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable **W4** to **A5J2**.)

2. Return to foldout.

Type:	Cable Connection	**A11.17**
Run time:	0 min.	
Set-up time:	3 min.	

CAUTION

When connecting ribbon cable to A11 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W4

1. Switch instrument to **Standby** to reconnect cable **W4** to **A5** Assembly or **A11** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on reconnecting cable **W4** to **A5J2**.)
2. Return to foldout.

3I-4. A11 REFERENCE LOOP MODULE

COMMENT

It is not to essential to understand the internal operation of a module to make an on-site repair.

The **A11 Module** contains a phase lock loop which combines the **A6 FM Loop** output signal (the angle modulation source of the instrument) with the **A7 SAWR Loop** output (one of three UHF reference frequencies) to produce **six** UHF reference frequencies.

The output of the **A11 Module** is divided into two bands. Each band is generated by a separate voltage controlled oscillator (VCO).

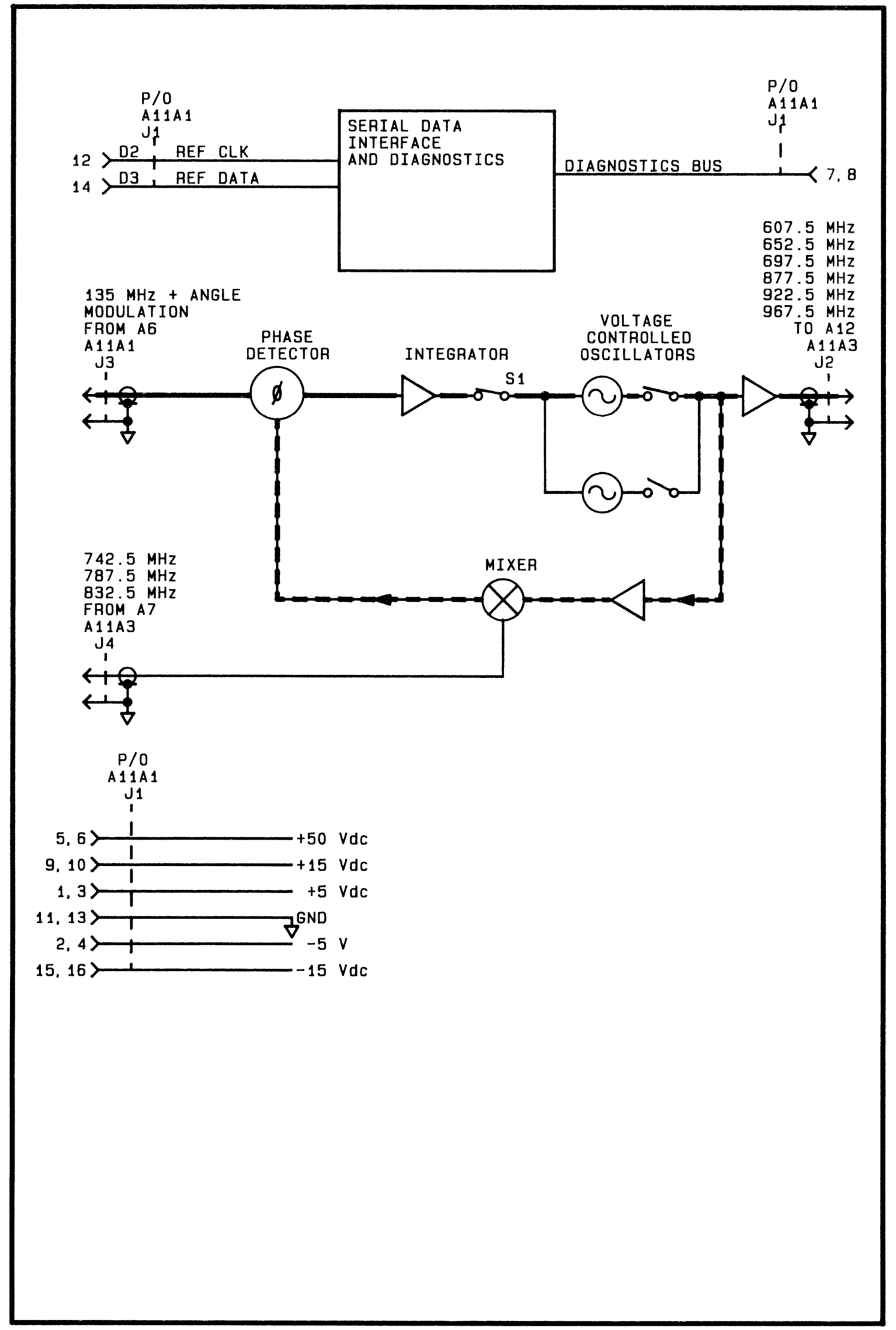
Each of the three upper band frequencies is equal to the sum of the **A6 Module** output signal (135 MHz, plus FM or PM) and one of the three **A7 Module** output frequencies (742.5, 787.5 or 822.5 MHz).

The three lower band frequencies are equal to the difference between the **A6** and **A7 Modules** output frequencies; i.e., 607.5 = 742.5 - 135.

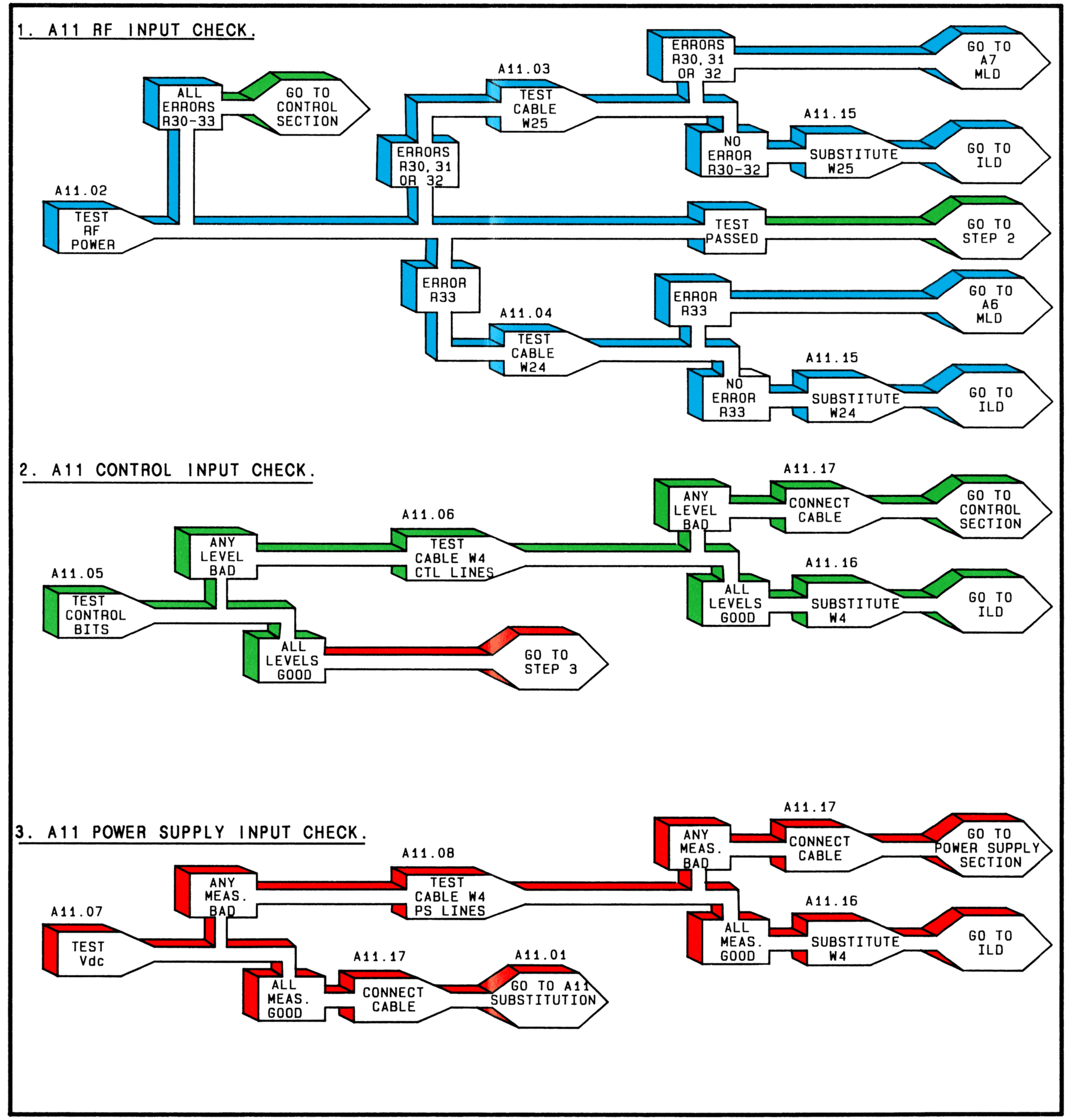
The **A11 Module** output is the UHF reference for the **A12 Sum Loop/Divider Module**.

See the **A11 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A11 Modules** internal operation.

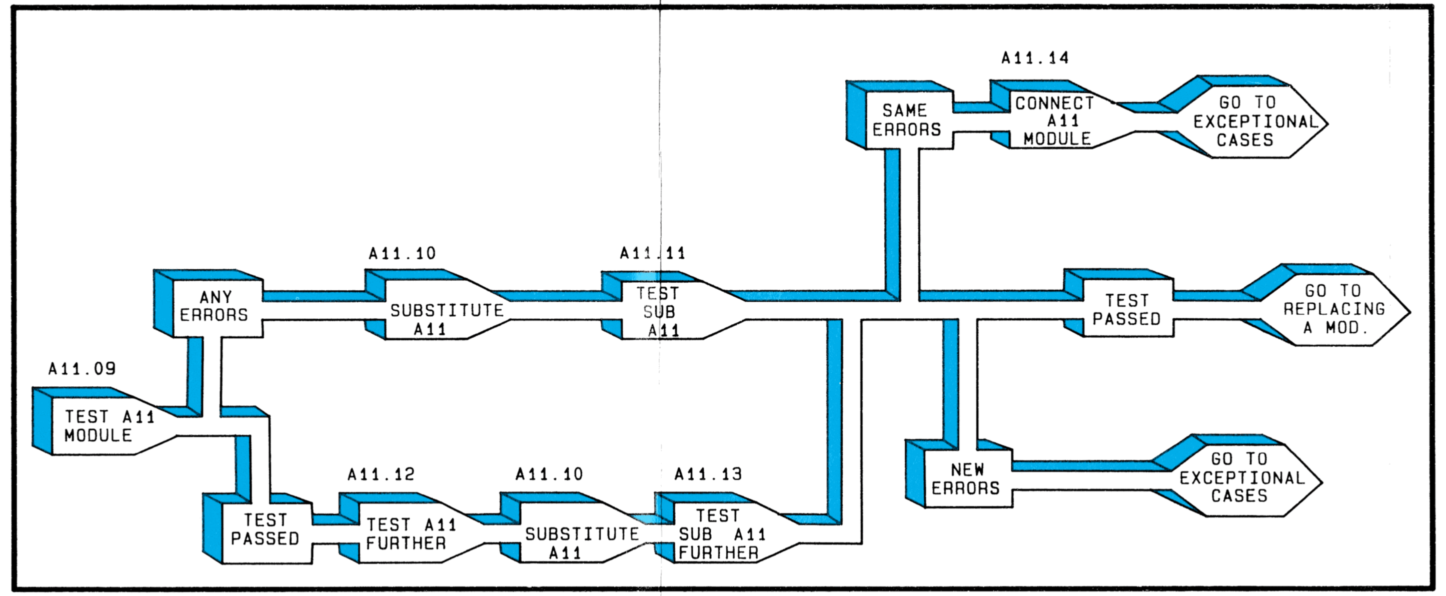
A11 MODULE SIMPLIFIED BLOCK DIAGRAM



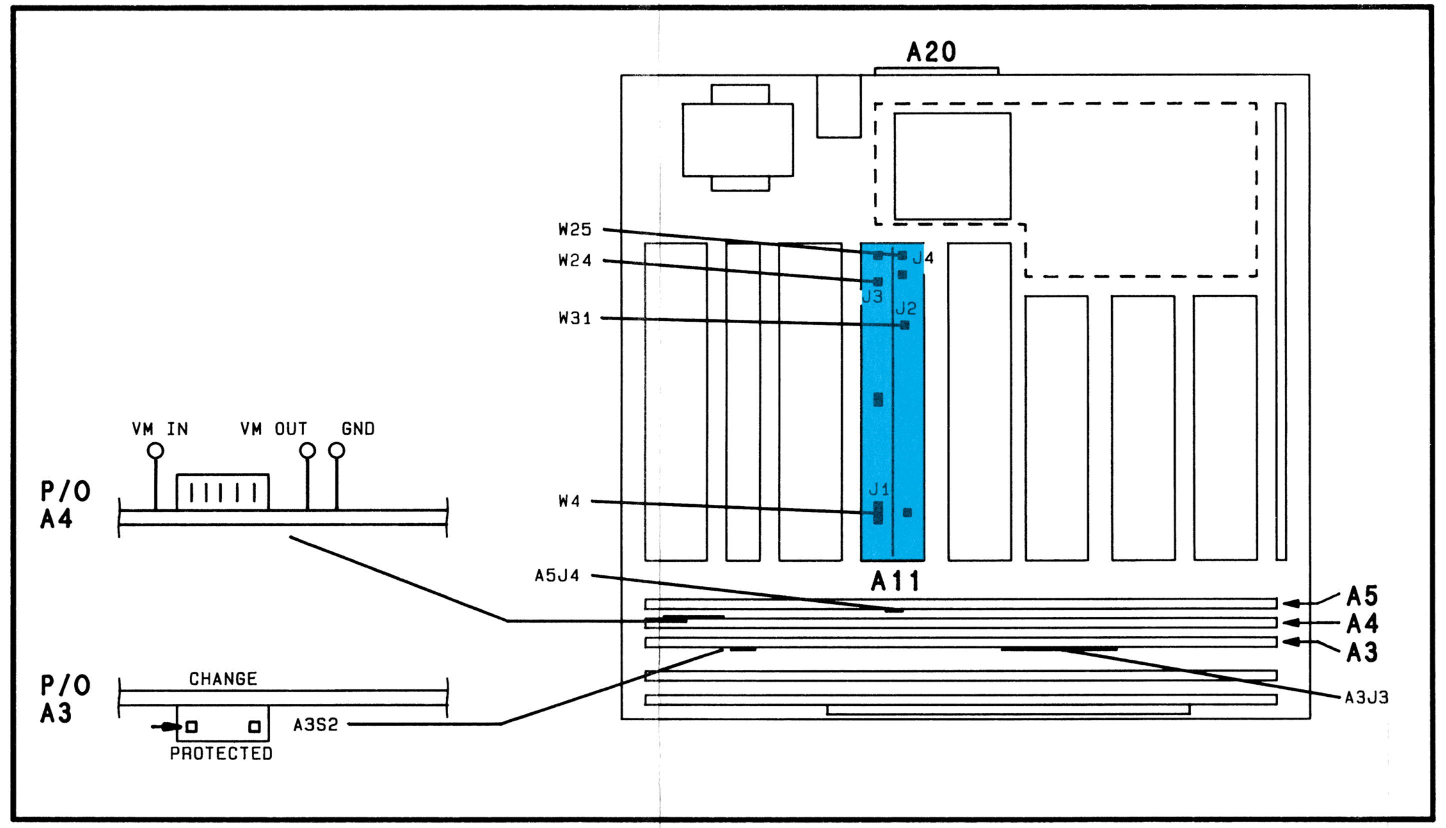
A11 INPUTS VERIFICATION



A11 MODULE SUBSTITUTION



A11 MODULE CABLE CONNECTION LOCATOR



A11 MODULE I/O SIGNALS DIAGRAM

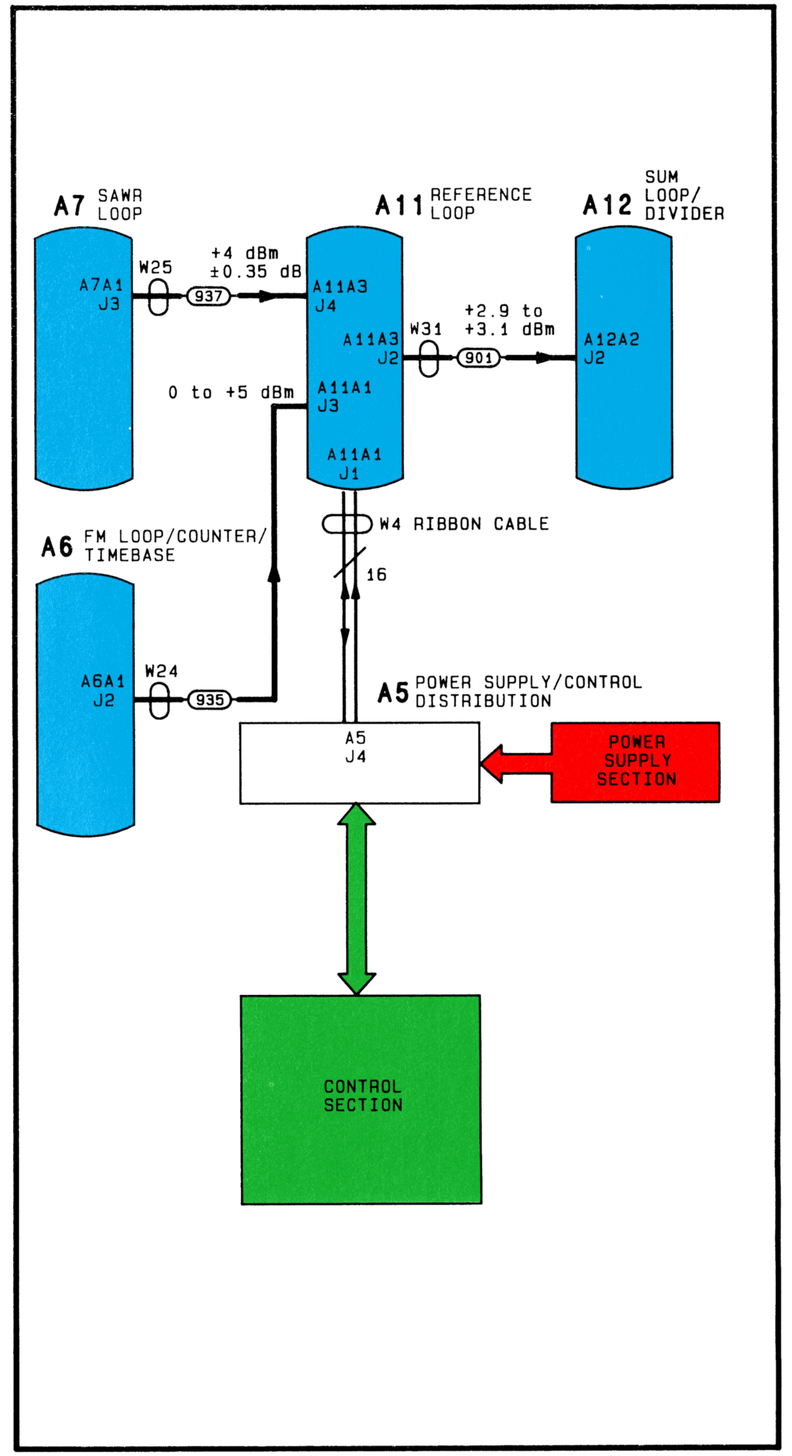


Figure 31-100. A11 Reference Loop Module Diagnostics.

A12

3J-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A12 Module**. The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-A11**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptible to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to the table shown on the foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Turn to the next page to begin the **A12 MLD**.

3J-2. INTRODUCTION

The first step in isolating a failure in the **A12 Module** is to verify correct operation of each input signal. Use the **A12 INPUTS VERIFICATION** procedure to check each signal path into the **A12 Module**.

NOTE

If you were directed here by the **A13 Module** *diagnostics, the probability that the A12 Module is defective is high enough to make verification of its inputs unnecessary. Proceed to the next page,* **A12 MODULE SUBSTITUTION**.

__A12 Inputs Verification Instructions__

1. Find **A12 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A12 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the page indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A12 RF INPUT CHECK**.

NOTE

The **A12 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A12 Module** *depends on for operation.*

A12.01

3J-3. INTRODUCTION

If you were unable to isolate the failure using the **A12 INPUTS VERIFICATION** procedure, then follow the Task Sequence Diagram, shown under **A12 MODULE SUBSTITUTION**, to substitute in a known good module from the On-Site Service Kit.

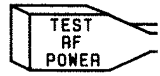
NOTE

If a known good module is not available, proceed to **Exceptional Case 2** *(Condition 2) in the* **EXCEPTIONAL CASES** *Section.*

A12 Substitution Instructions

1. Find **A12 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A12 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

Type:	2A; RF Power Levels	**A12.02**
Run time:	4 min.	
Set-up time:	3 min.	



RF signal level is measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [6] [8] [1] [3] [HZ]
   (To check input levels only.)

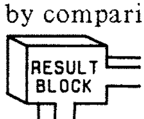
3. [3] [4] [5] [HZ].

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W31** from module at **A12A2 J2.**
   - Connect **YELLOW PM** cable and adapter to cable **W31**.
   - [HZ] to continue test.

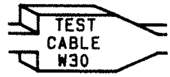
5. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W31** to module at **A12A2 J2.**
   - Disconnect cable **W30** from module at **A12A3 J6**.
   - Connect **YELLOW PM** cable and adapter to cable **W30**.
   - [HZ] to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W30** to module at **A12A3 J6.**
   - [HZ] to continue test.

7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record test results.

8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST RF POWER**.

Type:	2A; RF Power Levels	**A12.03**
Run time:	4 min.	
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [6] [8] [1] [3] [HZ]
   (To check input levels only.)

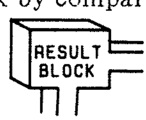
3. [3] [4] [5] [HZ]

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W31** from **A11 Module** at **A11A3 J2**. (See Top View Diagram inside **Top Cover** to locate **W31** connection on **A11 Module**.)
   - Connect **YELLOW PM** cable to module at **A11A3 J2**.
   - [HZ] to continue test.

5. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W31** to module at **A11A3 J2**.
   - Disconnect cable **W30** from module at **A9A1 J4**.
   - Connect **YELLOW PM** cable to module at **A9A1 J4**.
   - [HZ] to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W30** to module at **A9A1 J4**.
   - [HZ] to continue test.

7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record test results.

8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W30**.

Type:	2A; RF Power Levels	A12.04
Run time:	4 min.	
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

<u>**Run Test**</u>

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

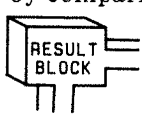
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

3. [3] [4] [5] [HZ]

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W31** from **A11 Module** at **A11A3 J2**. (See Top View Diagram inside **Top Cover** to loçate **W31** connection on **A11 Module**.)
   - Connect **YELLOW PM** cable to module at **A11A3 J2**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W31** to module at **A11A3 J2**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W31.**

Type:	3; Bit Transmission	**A12.05**
Run time:	5 min.	
Set-up time:	5 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A12 Module** on Clock, Data and Divider control lines.

COMMENT

If any control line level is bad, it is not necessary to test remaining lines; proceed to step **24**.

<u>Run Test</u>

1. Switch instrument to **Standby**:

NOTE

A12 Module must be lifted slightly to disconnect W5. Release module retaining clips (at each end of module) from slide posts. Lift module up high enough to disconnect W5.

- Disconnect cable **W5** from module at **A12A3 J1**.
- Plug end of **W5** <u>into</u> **26 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W5P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A12 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.

Clock and Data Control Lines

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [2]
(To set bit high).

NOTE

*A "**0**" will appear in display indicating that the data bits will be set low. However, the bits are* ***inverted*** *in the Control Section before they are sent to A12.*

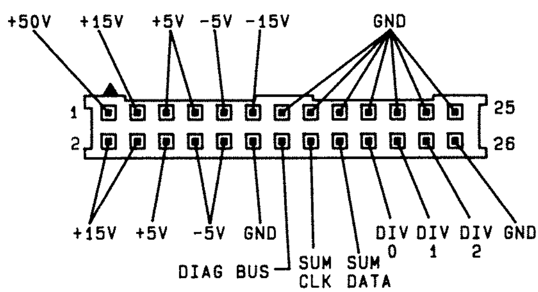
5. Enter **Bit Select Keys**, as indicated in **Table 3J-1. W5P2 Control Bits**, for **Control Line** to be tested.

6. Connect **VM** probe **Control Line** at **Pin Number** indicated in **Table 3J-1**. (See **Figure 3J-1. Cable Plug W5P2 Signal Locator**.)

Table 3J-1. W5P2 Control Bits

Test Order	**Control Line**	**Bit Select Keys** (Steps 5 and 10)	**Pin Number** (Step 6)
1	SUM CLK	[4] [4] [HZ]	16
2	SUM DATA	[4] [5] [HZ]	18

Figure 3J-1. Cable Plug W5P2 Signal Locator



7. [2] [5] [HZ]
   (To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
   ([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [1]
   (To set bit low.)

NOTE

A "1" will appear in display indicating that the data bits will be set high. However, the bits are **inverted** *in the Control Section before they are sent to A12.*

10. Enter **Bit Select Keys,** as indicated in **Table 3J-1. W5P2 Control Bits,** for same **Control Line.**

11. [2] [5] [HZ]
    (To enable voltmeter.)

12. Voltage should read approximately **-0.5** to **+1.5 Vdc.**
    ([5] [HZ] to repeat measurement.)

13. Repeat procedure for each **Control Line** shown in **Table 3J-1.**

Divider Control Lines

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [1]
    (To set bit high.)

NOTE

This bit is **not inverted** *in the Control Section before it is sent to A12.*

15. Enter **Bit Select Keys,** as indicated in **Table 3J-2. W5P2 Control Bits,** for **Control Line** to be tested.

16. Connect **VM** probe **Control Line** at **Pin Number** indicated in **Table 3J-2.** (See **Figure 3J-1. Cable Plug W5P2 Signal Locator.**)

Table 3J-2. W5P2 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 15 and 20)	Pin Number (Step 16)
1	DIV 0	[2] [7] [HZ]	20
2	DIV 1	[2] [8] [HZ]	22
3	DIV 2	[2] [9] [HZ]	24

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
([5] [HZ] to repeat message.)

Check Low State

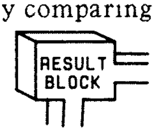
19. [SHIFT] [SPCL] [3] [6] [0] [2]
(To set bit low.)

20. Enter **Bit Select Keys**, as indicated in **Table 3J-2. W5P2 Control Bits**, for same **Control Line**.

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **-0.5** to **+1.5 Vdc.**
([5] [HZ] to repeat measurement.)

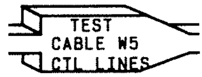
23. Record test results.

24. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CONTROL BITS**.

Type: 3; Bit Transmission
Run time: 5 min.
Set-up time: 2 min.

A12.06



Internal Voltmeter (VM) is used to measure TTL level changes transmitted to **A12** Module on Clock, Data and Divider control lines.

Run Test

1. Switch instrument to **Standby**.
2. Extend **A12 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W5** from **A5 Assembly** at **A5J5**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A12 Module** extension and **A5** cable disconnection information.)
   - After cable **W5** has been disconnected from **A5**, lower module back into instrument.
3. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A12 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)
4. Turn instrument on.

COMMENT

It is only necessary to perform test on failing control line.

Clock and Data Control Lines

Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

NOTE

*A "**0**" will appear in display indicating that the data bits will be set low. However, the bits are* **inverted** *in the Control Section before they are sent to A12.*

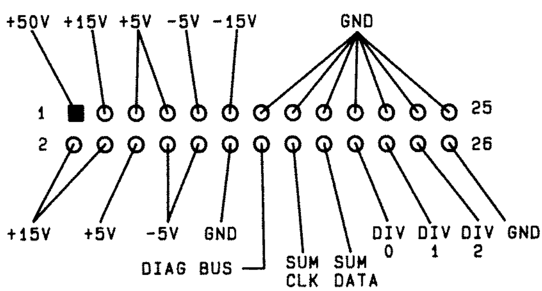
6. Enter **Bit Select Keys**, as indicated in **Table 3J-3. A5J5 Control Bits**, for **Control Line** to be tested.

7. Connect **VM** probe **Control Line** at **Pin Number** indicated in **Table 3J-3**. (See **Figure 3J-2. A5J5 Signal Locator**.)

Table 3J-3. A5J5 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 6 and 11)	Pin Number (Step 7)
1	SUM CLK	4 4 HZ	16
2	SUM DATA	4 5 HZ	18

Figure 3J-2. A5J5 Signal Locator
(Solder-Side View)



8. 2 5 HZ
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
(5 HZ to repeat measurement.)

Check Low State

10. SHIFT SPCL 3 6 0 1
(To specify low state.)

NOTE

*A "**1**" will appear in display indicating that the data bits will be set high. However, the bits are* **inverted** *in the Control Section before they are sent to A12.*

11. Enter **Bit Select Keys**, as indicated in **Table 3J-3. A5J5 Control Bits**, for same Control Line.

12. 2 5 HZ
(To enable voltmeter.)

13. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
(5 HZ to repeat measurement.)

__Divider Control Lines__

Check High State

14. SHIFT SPCL 3 6 0 1
(To set bit high.)

NOTE

This bit is **not inverted** *in the Control Section before it is sent to A12.*

15. Enter **Bit Select Keys**, as indicated in **Table 3J-4. A5J5 Control Bits**, for **Control Line** to be tested.

16. Connect **VM** probe **Control Line** at **PIN NUMBER** indicated in **Table 3J-4.** (See **Figure 3J-2. A5J5 Signal Locator**.)

Table 3J-4. A5J5 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 15 and 20)	Pin Number (Step 16)
1	DIV 0	[2] [7] [HZ]	20
2	DIV 1	[2] [8] [HZ]	22
3	DIV 2	[2] [9] [HZ]	24

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
([5] [HZ] to repeat message.)

Check Low State

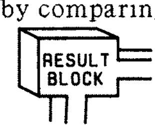
19. [SHIFT] [SPCL] [3] [6] [0] [2]
(To set bit low.)

20. Enter **Bit Select Keys**, as indicated in **Table 3J-4. A5J5 Control Bits**, for same **Control Line**.

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

23. Record test results.

24. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W5 CTL LINES.**

A12.07

Type:	4, Voltage Measurements
Run time:	3 min.
Set-up time:	3 min.

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A12 Module**.

Run Test

1. Switch instrument to **Standby**:

NOTE

A12 Module must be lifted slightly to disconnect W5. Release module retaining clips (at each end of module) from slide posts. Lift module up high enough to disconnect W5.

- Disconnect **W5** from **A12** at **A12A3 J1**.
- Plug end of **W5** <u>**into**</u> **26 pin** test connector, from On-Site Service Kit.

NOTE

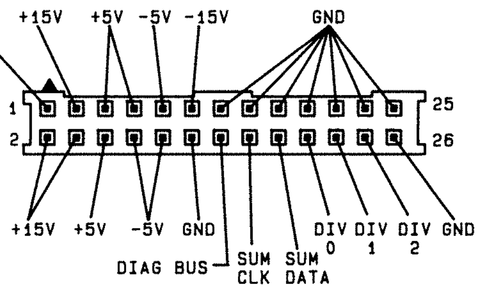
Find arrowhead on test connector and align with arrowhead on cable plug **W5P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A12 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

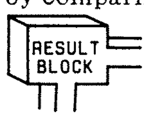
3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (see **Figure 3J-3. Cable Plug W5P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

Figure 3J-3. Cable Plug W5P2 Signal Locator



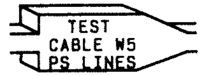
5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST Vdc**.

A12.08

Type: 4, Voltage Measurements
Run time: 3 min.
Set-up time: 3 min.



Internal Voltmeter (**VM**) is used to check power supply levels at **A5J5**.

Run Test

1. Switch instrument to **Standby**.

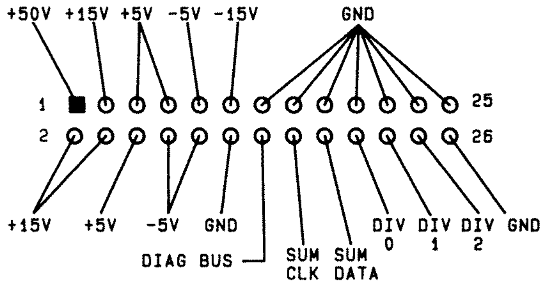
2. Extend **A12 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W5** from **A5 Assembly** at **A5J5**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A12 Module** extension and **A5** cable disconnection information.)
   - After cable **W5** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A12 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

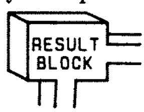
4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

5. Measure voltage levels at **A5J5**:
   - Access signals from solder-side of **A5J5**. (See **Figure 3J-4. A5J5 Signal Locator**.)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3J-4. A5J5 Signal Locator
(Solder-Side View)



6. Record test results.

7. Return to folout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLE W5 PS LINES.**

Type:	1; Loop Lock/Unlock	**A12.09**
Run time:	40 sec.	
Set-up time:	0	

Run Test

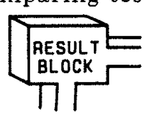
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [4] [1] [HZ].

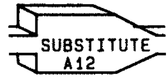
3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A12**.

COMMENT

If any error codes are displayed for modules A01-A11, you need to isolate those failure(s) before performing the A12 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST A12 MODULE**.

Type:	Module Substitution	**A12.10**
Run time:	10 sec.	
Set-up time:	5 min.	



The following describes the technique for connecting a known good A12 Module **without removing** the A12 module in the instrument.

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W5**, **W30**, **W31** and **W33** from **A12 Module** (see **A12 MODULE CABLE CONNECTION LOCATOR** on foldout).
3. Without removing **A12 Module** from instrument, carefully lay substitute **A12 Module** on top of modules A7, **A9** and **A11**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

4. Connect cables **W5**, **W30**, **W31** and **W33** to substitute module.

Down-Load Cal Data

CAUTION

Use adequate Electrostatic Discharge Techniques when handling the A20 Calibration Module.

5. Remove from On-Site Service Kit, **A20 Calibration Module** provided for substitute A12 Module.

CAUTION

*Check that switch S1 on A20 Module is switched up to its "**PROTECTED**" position.*

6. With instrument switched to **Standby**, connect **A20 Module** to **A3 Module** at **A3J3** (see **A12 MODULE CABLE CONNECTION LOCATOR** on foldout).

7. Turn instrument on.

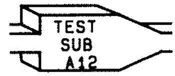
8. When "**100.000000 MZ   -140.00 DM**" appears:
   - Slide switch on left side of **A3S2** on **A3 Module** back toward rear of instrument (see **A12 MODULE CABLE CONNECTION LOCATOR** on foldout).

9. [SHIFT] [SPCL] [3] [7] [3] [2] [HZ]

10. When "**TRANSFER VERIFIED   .U613**" appears:
    - Slide **A3S2** forward toward front of instrument to **protect A3 Module's** memory.

11. Switch Instrument to **Standby** and remove **A20 Module**. **Replace A20 Module in On-Site Service Kit.**

12. Return to foldout.

Type:	Substitute Module Test	**A12.11**
Run time:	1 min.	
Set-up time:	0	

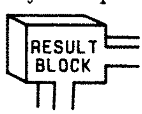
Test operation of **substitute A12 Module** by repeating test performed on A12 Module before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [4] [1] [HZ].

3. When "**DIAG DONE   HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A12**.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A12**.

Type:	Additional A12 Tests	**A12.12**
Run time:	Conditional	
Set-up time:	Conditional	

The **A12** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A12** failure.

Condition 2: **A13 Module RF Power Test** indicated **A12** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A12** failure.

__Condition 1__

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A12** error codes.

COMMENT

If any error codes are displayed for modules A01-A11, you need to isolate those failure(s) before performing the A12 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [4] [5] [HZ]

3. When "**WAITING FOR SET-UP 1   .V24**" appears:
   - Disconnect cable **W31** from module at **A12A2 J2**.
   - Connect **YELLOW PM** cable and adapter to cable **W31**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2   .V25**" appears:
   - Reconnect cable **W31** to module at **A12A2 J2**.
   - Disconnect cable **W30** from module at **A12A3 J6**.
   - Connect **PM** cable and adapter to **W30**.
   - [HZ] to continue test.

5. When "**WAITING FOR SET-UP 3   .V26**" appears:
   - Reconnect cable **W30** to module at **A12A3 J6**.
   - Disconnect cable **W32** from module at **A12A3 J3**.
   - Connect **PM** cable to module at **A12A3 J3**.
   - [HZ] to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W32** to module at **A12A3 J3**.
   - [HZ] to continue test.

7. When "**DIAG DONE   HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A12**.

8. Return to foldout.

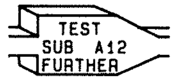
Condition 3

1. Set instrument to operating condition which causes **A12 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout.

Type:	Additional Substitute A12 Tests	**A12.13**
Run time:	Conditional	
Set-up time:	Conditional	



Test operation of **substitute A12 Module** by repeating test(s) performed on A12 Module before substitution.

Condition 1: **Instrument Level Self Test** indicated **A12** failure.

Condition 2: **A13 Module RF Power Test** indicated **A12** failure.

Condition 3: Instrument must be set **to a specific operating condition** to detect **A12** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

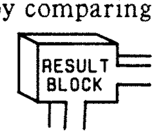
2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A12** error codes.

COMMENT

If any error codes are displayed for modules A01-A11, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A12 FURTHER**.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [4] [5] [HZ]

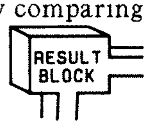
3. When "**WAITING FOR SET-UP 1   .V24**" appears:
   - Disconnect cable **W31** from module at **A12A2 J2**.
   - Connect **YELLOW PM** cable and adapter to cable **W31**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2   .V25**" appears:
   - Reconnect cable **W31** to module at **A12A2 J2**.
   - Disconnect cable **W30** from module at **A12A3 J6**.
   - Connect **PM** cable and apapter to **W30**.
   - [HZ] to continue test.

5. When "**WAITING FOR SET-UP 3   .V26**" appears:
   - Reconnect cable **W30** to module at **A12A3 J6**.
   - Disconnect cable **W32** from module at **A12A3 J3**.
   - Connect **PM** cable to module at **A12A3 J3**.
   - [HZ] to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W32** to module at **A12A3 J3**.
   - [HZ] to continue test.

7. When "**DIAG DONE   HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A12**.

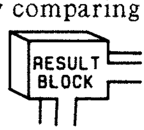
8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST SUB A12 FURTHER**.

Condition 3

1. Set instrument to operating condition which causes **A12 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST SUB A12 FURTHER**.

Type:	Module Replacement	**A12.14**
Run time:	10 sec.	
Set-up time:	5 min.	

Connect Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W5**, **W30**, **W31** and **W33** from substitute **A12 Module**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

3. Reconnect cables **W5**, **W30**, **W31** and **W33** to **A12 Module**.
4. Return **substitute** A12 Module to On-Site Service Kit.

Down-Load Cal Data

CAUTION

Use adequate Electrostatic Discharge Techniques when handling the A20 Calibration Module.

5. After making sure that **A20 Module** for substitute A12 Module has been returned to On-Site Service Kit, remove **A20 Calibration Module** from Rear Panel (see **MECHANICAL PROCEDURES** for removal information).

CAUTION

*Check that switch S1 on A20 Module is switched up to its "***PROTECTED***" position.*

6. With instrument switched to **Standby**, connect **A20 Module** to **A3 Module** at **A3J3**.

7. Turn instrument on.

8. When "**100.000000 MZ -140.00 DM**" appears:
   - Slide switch on left side of **A3S2** on **A3 Module** back toward rear of instrument.

9. [SHIFT] [SPCL] [3] [7] [3] [2] [HZ]

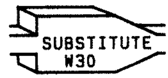
10. When "**TRANSFER VERIFIED .U613**" appears:
    - Slide **A3S2** forward toward front of instrument to **protect A3** Module's memory.

11. Switch Instrument to **Standby** and remove **A20 Module**. **Replace A20 Module on Rear Panel.**

12. Return to foldout.

Type: Cable Connection
Run time: 5 min.
Set-up time: 1 min.

A12.15

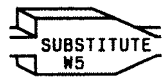


1. Testing has shown **W30** or **W31** to be suspect, temporarily replace it with a test cable from the On-Site Service Kit. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

3. Return to foldout.

Type:	Cable Substitution	**A12.16**
Run time:	0 min.	
Set-up time:	3 min.	



Testing has shown cable **W5** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

CAUTION

When connecting ribbon cable to A12 Module, find arrowhead on the cable plug and align with arrow-head on the board connector.

Reconnect W5

1. Switch instrument to **Standby** to connect cable **W5** to **A5** Assembly and **A12** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable **W5** to **A5J5**.)
2. Return to foldout.

Type:	Cable Substitution	**A12.17**
Run Time:	6 min.	
Set-up Time:	8 min.	

CAUTION

When connecting ribbon cable to A12 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

<u>Reconnect W5</u>

1. Switch instrument to **Standby** to reconnect cable **W5** to **A5** Assembly or **A12** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on reconnecting cable **W5** to **A5J5**.)

2. Return to foldout.

3J-4. A12 SUM LOOP/DIVIDER MODULE

COMMENT

It is not essential to understand the internal operation of a module to make an on-site repair.

Sum Loop

The **A12 Module** contains a phase lock loop which combines the **A9 IF Loop** output (**45** to **90 MHz** in **.5 Hz** steps) with the **A11 Reference Loop** output (one of six UHF reference frequencies) to produce the fundamental frequency band of the instrument (**528.75** to **1057.5 MHz**).

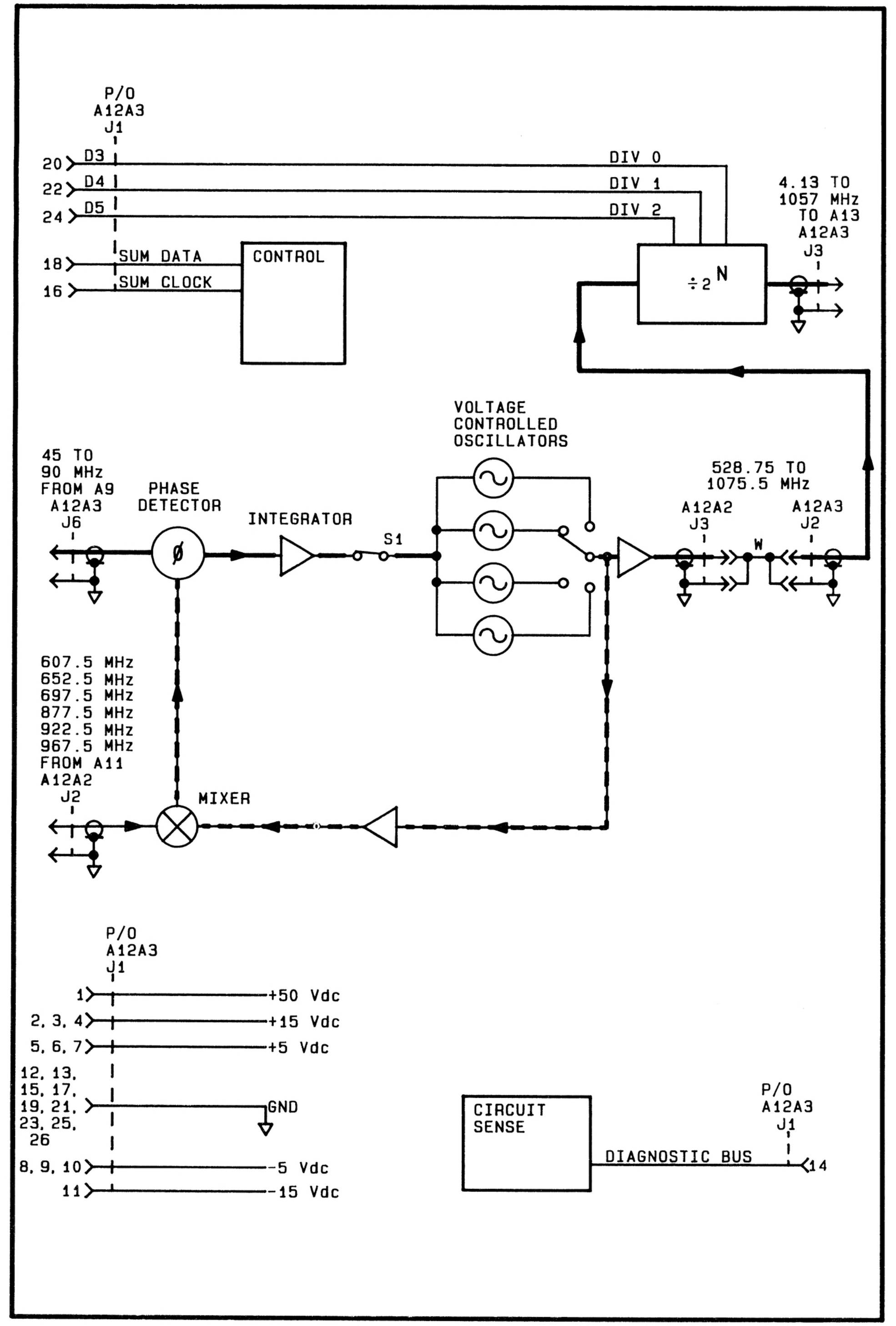
The frequency range of the **Sum Loop** is divided into four bands. Each band is generated by a separate voltage controlled oscillator (VCO).

Divider

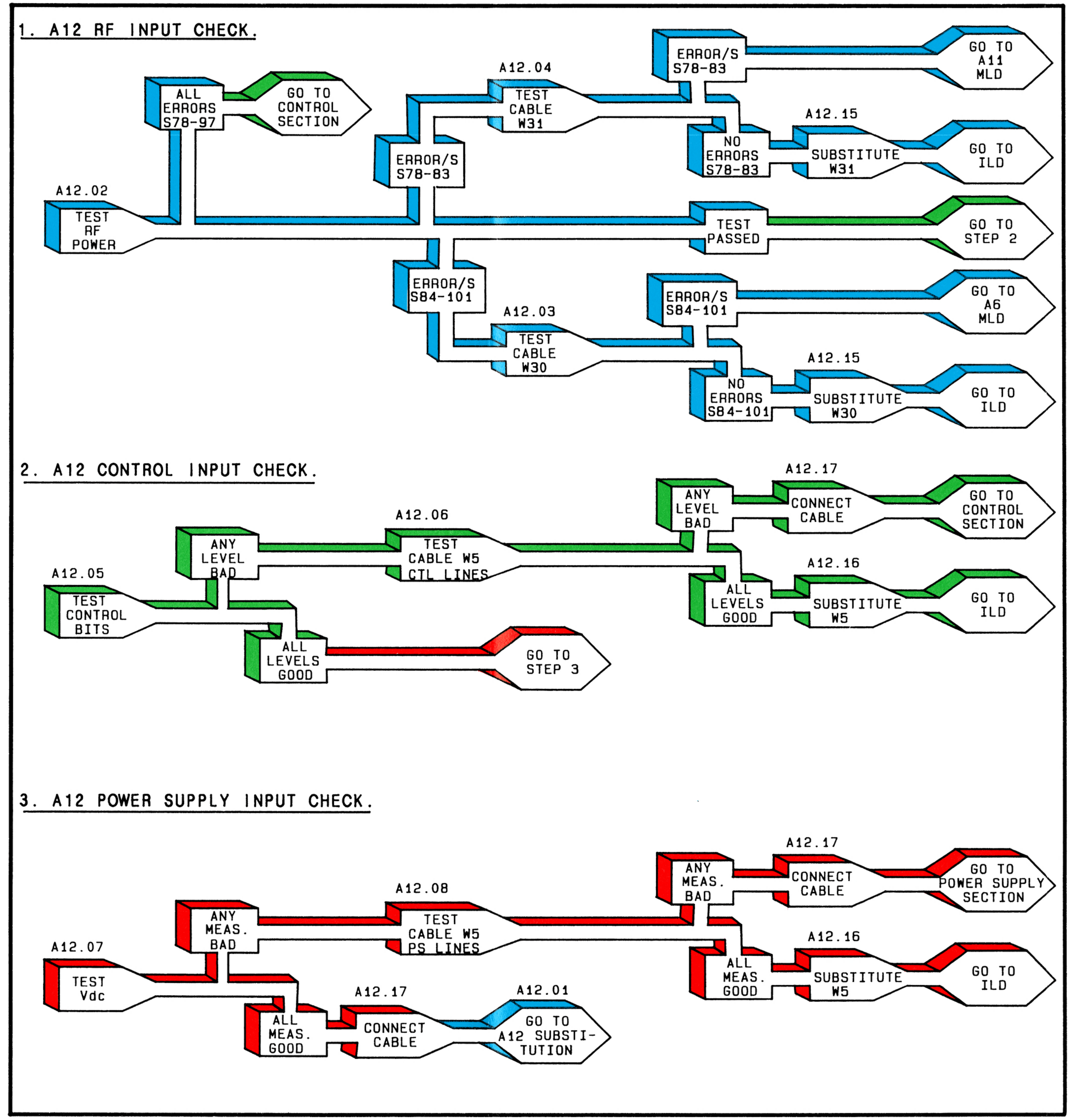
The **A12 Module** also contains a selectable divider circuit. The **Sum Loop** output passes directly to the RF input of the **Divider**. The **Divider** output (**4.1** to **1057.5 MHz**) is produced by dividing the fundamental frequency band by **2** raised the N^{th} power, where N is an integer between **0** and **7**.

See the **A12 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A12 Module**'s internal operation.

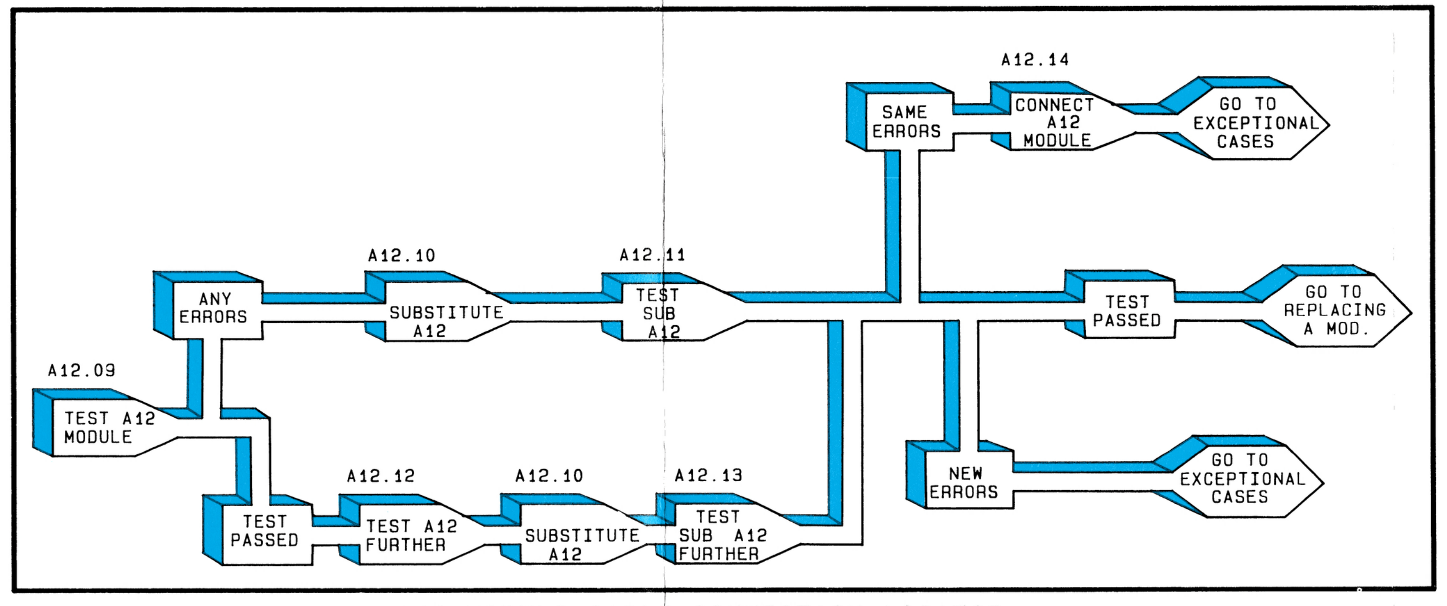
A12 MODULE SIMPLIFIED BLOCK DIAGRAM



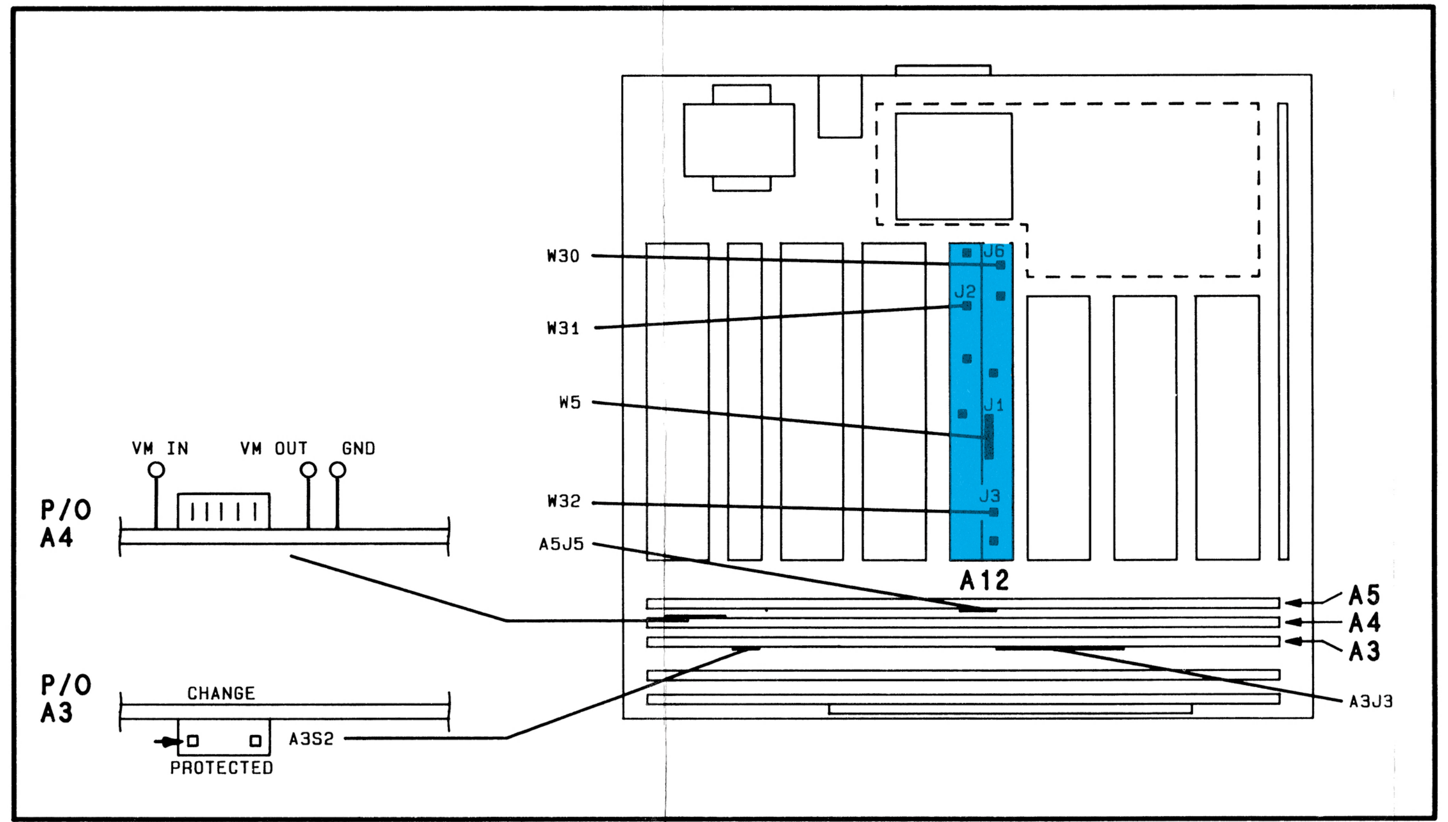
A12 INPUTS VERIFICATION



A12 MODULE SUBSTITUTION



A12 MODULE CABLE CONNECTION LOCATOR



A12 MODULE I/O SIGNALS DIAGRAM

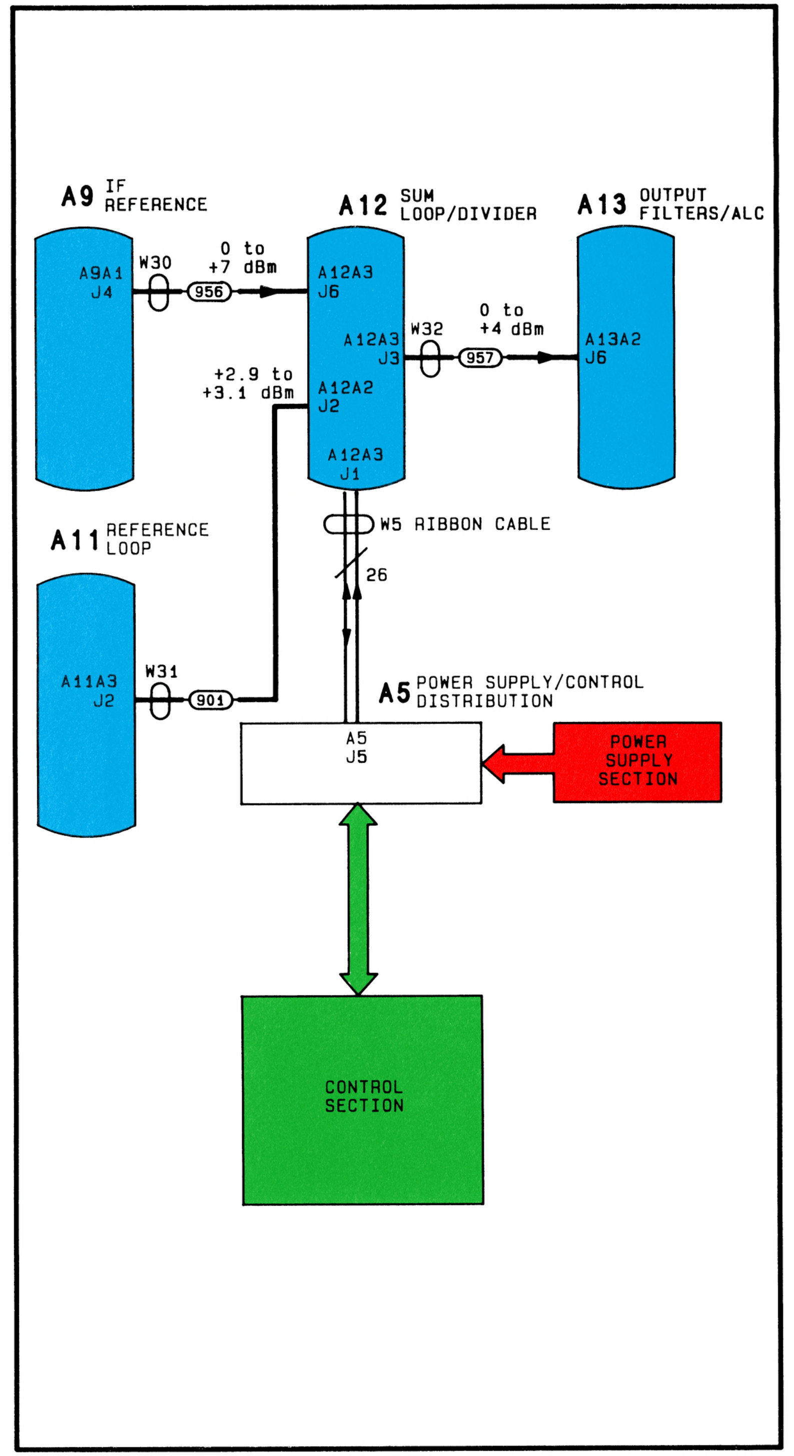


Figure 3J-100. A12 Sum Loop/Divider Module Diagnostics.

A13

3K-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A13 Module**. The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-A12**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptable to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to the table shown on the foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Turn to the next page to begin the **A13 MLD**.

3K-2. INTRODUCTION

NOTE

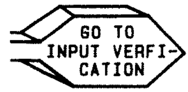
If a known good module is not available, proceed to the next page **A13 INPUTS VERIFICATION**.

The **first step in isolating an A13 failure** is to substitute in a known good module from the On-site Service Kit.

A13 Substitution Instructions

1. Find **A13 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A13 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they appear in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

A13.01



3K-3. INTRODUCTION

If a known good **A13 Module** is not available, or if you were not able to isolate the failure using the **A13 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams (shown under **A13 INPUTS VERIFICATION**) should be used to check each signal path into the A13 Module.

A13 Inputs Verification Instructions

1. Find **A13 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A13 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they appear in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A13 RF INPUT CHECK**.

NOTE

The **A13 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A13 Module** *depends on for operation.*

Type:	1; Loop Lock/Unlock	**A13.02**
Run time:	30 sec.	
Set-up time:	0	

Run Test

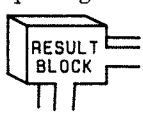
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [4] [9] [HZ].

3. When "**DIAG DONE   HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A13**. If "**TEST 1 OF A13 (PASSED** or **FAILED)**" is not displayed, rerun test.

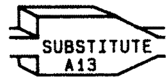
COMMENT

If any error codes are displayed for modules A01-A12, you need to isolate those failure(s) before performing the A13 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

   for **TEST A13 MODULE**.

Type:	Module Substitution	**A13.03**
Run time:	0	
Set-up time:	5 min.	



The following describes the technique for connecting a known good A13 Module **without removing** the A13 Module in the instrument.

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W6**, **W22**, **W32** and **W34** from **A13 Module** (see **A13 MODULE CABLE CONNECTION LOCATOR** on foldout).
3. Without removing **A13 Module** from instrument, carefully lay substitute **A13 Module** on top of modules **A9**, **A11** and **A12**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

4. Connect cables **W6**, **W22**, and **W32** to substitute module.
5. Substitute a flexible coax cable, SMC-to-SMA adapters, and barrel adapters from On-Site Service Kit for cable **W34**, to connect output of substitute module to **A14 Module**.
6. Turn instrument on.
7. Return to foldout.

Type:	Substitute Module Test	**A13.04**
Run time:	1 min.	
Set-up time:	0	

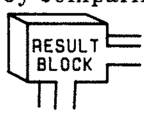
Test operation of **substitute A13 Module** by repeating test performed on A13 Module before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [4] [9] [HZ].

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A13**. If "**TEST 1 OF A13 (PASSED OR FAILED)**" is not displayed, rerun test.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A13**.

Type:	Additional A13 Tests	**A13.05**
Run time:	Conditional	
Set-up time:	Conditional	

The **A13** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A13** failure.

Condition 2: **A14 Module RF Power Test** indicated **A13** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A13** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record A13 error codes.

COMMENT

If any error codes are displayed for modules A01-A12, you need to isolate those failure(s) before performing the A13 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. INSTR PRESET SHIFT
(Hold shift key until
"**100.000000MZ -140.0DM**" appears,
to override 20 second reset test.)

2. SHIFT SPCL 3 3 5 1 HZ

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W32** from module at **A13A2 J6**.
   - Connect **YELLOW PM** cable and adapter to cable **W32**.
   - HZ to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W32** to module at **A13A2 J6**.
   - Disconnect cable **W34** from module at **A13A2 J3**.
   - Connect **PM** cable, SMC-to-SMA adapter, and barrel adapter from On-Site Service Kit to module at **A13A2 J3**.
   - HZ to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W34** to module at **A13A2 J3**.
   - HZ to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use MSSG to scroll through messages.
   - Record error code(s) displayed for **A13**.

7. Return to foldout.

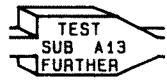
Condition 3

1. Set instrument to operating condition which causes **A13 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout.

Type:	Additional Substitute A13 Tests	**A13.06**
Run time:	Conditional	
Set-up time:	Conditional	



Test operation of **substitute A13 Module** by repeating test(s) performed on A13 Module before substitution.

Condition 1: **Instrument Level Self Test** indicated **A13** failure.

Condition 2: **A14 Module RF Power Test** indicated **A13** failure.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A13** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.

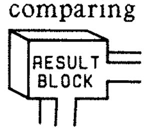
2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1   .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE   HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A13** error codes.

COMMENT

If any error codes are displayed for modules A01-A12, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A13 FURTHER**.

Condition 2

1. [INSTR PRESET] [SHIFT]
(Hold shift key until
"**100.000000MZ -140.0DM**" appears,
to override 20 second reset test.)

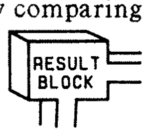
2. [SHIFT] [SPCL] [3] [3] [5] [1] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W32** from module at **A13A2 J6.**
   - Connect **YELLOW PM** cable and adapter to cable **W32.**
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W32** to module at **A13A2 J6.**
   - Disconnect cable **W34** from module at **A13A2 J3.**
   - Connect **PM** cable and adapters to module at **A13A2 J3.**
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W34** to module at **A13A2 J3.**
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A13.**

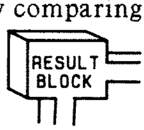
7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SUB A13 FURTHER.**

Condition 3

1. Set instrument to operating condition which causes **A13 failure.**

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SUB A13 FURTHER.**

Type:	Cable Connection	**A13.07**
Run time:	0	
Set-up time:	5 min.	

Connect Module

1. Switch instrument to **Standby**.
2. Disconnect cables **W6, W22, W32** and substitute output cable from substitute **A13 Module**.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

3. Reconnect cables **W6, W22, W32** and **W34** to **A13 Module**.
4. Turn instrument on.
5. Return **substitute** A13 Module to On-Site Service Kit.
6. Return to foldout.

Type:	2A; RF Power Levels	**A13.08**
Run time:	1 min. 30 sec.	
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

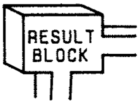
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

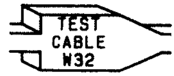
3. [3] [5] [1] [HZ].

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W32** from module at **A13A2 J6**.
   - Connect **YELLOW PM** cable and adapter to cable **W32**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W32** to module at **A13A2 J6**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A13**.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST RF POWER**.

Type:	2A; RF Power Levels	**A13.09**
Run time:	1 min. 30 sec.	
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

<u>Run Test</u>

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

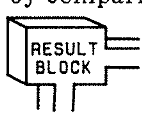
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

3. [3] [5] [1] [HZ]

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W32** from **A12 Module** at **A12A3 J3**. (See Top View Diagram inside **Top Cover** to locate **W32** connection on **A12 Module**.)
   - Connect **YELLOW PM** cable to module at **A12A3 J3**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W32** to module at **A12A3 J3**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A13**.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W32**.

Type:	3; Bit Transmission	**A13.10**
Run time:	3 min.	
Set-up time:	2 min.	

Internal Voltmeter (VM) is used to measure TTL level changes transmitted to **A13** Module on Clock and Data control lines.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W6** from module at **A13A2 J1**.
   - Plug end of **W6** <u>into</u> **16 pin** test connector, from On-Site Service Kit.

   NOTE

   Find arrowhe test connector and align with arrowhead lug **W6P2**.

   CAUTION

   To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A13 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

Clock Line

Check High State

4. [SHIFT] [SPCL] [3] [5] [0] [2]
(To specify high state.)

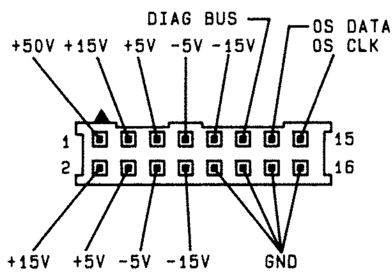
NOTE

A "0" will appear in display indicating that the data bit will be set low. However, the bit is **inverted** *in the Control Section before it is sent to A13.*

5. [4] [0] [HZ]
(To select bit.)

6. Connect **VM** probe to test connector line **OS CLK** (pin **15**). (See **Figure 3K-1. Cable plug W6P2 Signal Locator.**)

Figure 3K-1. Cable Plug W6P2 Signal Locator



7. [2] [5] [HZ]
(To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

9. SHIFT SPCL 3 6 0 1
(To specify low state.)

NOTE

A "1" will appear in display indicating that the data bit will be set high. However, the bit is **inverted** *in the Control Section before it is sent to A13.*

10. 4 0 HZ
(To select bit.)

11. 2 5 HZ
(To enable voltmeter.)

12. Voltage should read approximately **-0.5** to **+1.5 Vdc.**
(5 HZ to repeat measurement.)

<u>**Data Line**</u>

Check High State

13. SHIFT SPCL 3 6 0 2
(To specify high state.)

14. 4 1 HZ
(To select bit.)

15. Connect **VM** probe to test connector line **OS DATA** (pin **13**). **(See Figure 3-xx. Cable Plug W6P2 Signal Locator.)**

16. 2 5 HZ
(To enable voltmeter.)

17. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
(5 HZ to repeat measurement.)

Check Low State

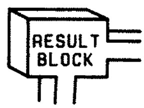
18. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

19. [4] [1] [HZ]
(To select bit.)

20. [2] [5] [HZ]
(To enable voltmeter.)

21. Voltage should read approximately **−0.5 to +1.5 Vdc.**
([5] [HZ] to repeat measurement.)

22. Record test results.

23. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CONTROL BITS**.

Type:	3; Bit Transmission	**A13.11**
Run time:	3 min.	
Set-up time:	3 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A13 Module** on Clock and Data control lines.

Run Test

1. Switch instrument to **Standby**.

2. Extend **A13 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W6** from **A5 Assembly** at **A5J6**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A13 Module** extension and **A5** cable disconnection information.)
   - After cable **W6** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A13 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Turn instrument on.

Clock Line

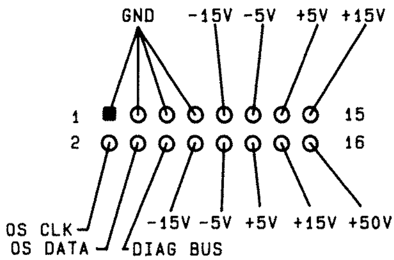
Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify high state.)

6. [4] [0] [HZ]
   (To select bit.)

7. Connect **VM** probe to solder-side of **A5J6** line **OS CLK** (pin 2). (See **Figure 3K-2. A5J6 Signal Locator.**)

Figure 3K-2. A5J6 Signal Locator
(Solder-Side View)



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
([5] [HZ] to repeat measurement.)

Check Low State

10. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

11. [4] [0] [HZ]
(To select bit.)

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **-0.5** to **+1.5 Vdc.**
([5] [HZ] to repeat measurement.)

Data Line

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

15. [4] [1] [HZ]
(To select bit.)

16. Connect **VM** probe to solder-side of **A5J6** line **OS DATA** (pin **4**). (See **Figure 3K-2. A5J6 Signal Locator**.)

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5** Vdc.
([5] [HZ] to repeat measurement.)

Check Low State

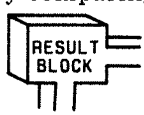
19. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

20. [4] [1] [HZ]
(To select bit.)

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **-0.5** to **+1.5** Vdc.
([5] [HZ] to repeat measurement.)

23. Record test results.

24. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W6 CTL LINES**.

Type:	4, Voltage Measurements	**A13.12**
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (VM) is used to check power supply levels at inputs to **A13** Module.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W6** from **A13** at **A13A2 J1**.
   - Plug end of **W6** <u>into</u> **16** pin test connector, from On-Site Service Kit.

NOTE

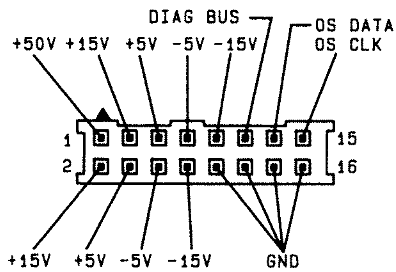
Find arrowhead on test connector and align with arrowhead on cable plug **W6P2**.

2. Connect VM probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A13 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

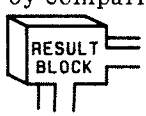
3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (see **Figure 3K-3. Cable Plug W6P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

Figure 3K-3. Cable Plug W6P2 Signal Locator

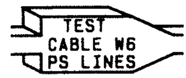


5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST Vdc**.

Type:	4, Voltage Measurements	**A13.13**
Run time:	2 min.	
Set-up time:	3 min.	



Internal Voltmeter (VM) is used to check power supply levels at **A5J6**.

Run Test

1. Switch instrument to **Standby**.

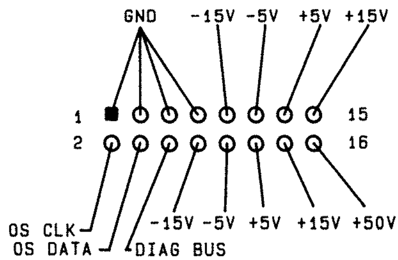
2. Extend **A13 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W6** from **A5 Assembly** at **A5J6**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A13 Module** extension and **A5** cable disconnection information.)
   - After cable **W6** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A13 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

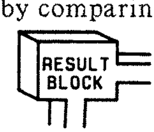
4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

5. Measure voltage levels at **A5J6**:
   - Access signals from solder-side of **A5J6**. (See **Figure 3K-4. A5J6 Signal Locator.**)
   - $\boxed{5}$ $\boxed{\text{HZ}}$ (To make each voltage measurement.)

Figure 3K-4. A5J6 Signal Locator
(Solder-Side View)



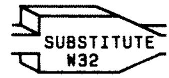
6. Record test results.

7. Return to folout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W6 PS LINES**.

A13.14

Type:	Cable Substitution
Run Time:	5 min.
Set-up Time:	1 min.

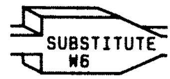


1. Testing has shown cable **W32** to be suspect, temporarily replace with a test cable from the On-Site Service Kit. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

3. Return to foldout.

Type:	Cable Substitution	**A13.15**
Run time:	0 min.	
Set-up time:	3 min.	



Testing has shown cable **W6** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

CAUTION

When connecting ribbon cable to A13 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W6

1. Switch instrument to **Standby** to connect cable **W6** to **A5** Assembly and **A13** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable **W6** to **A5J6**.)

2. Return to foldout.

A13.16

Type:	Cable Connection
Run time:	0 min.
Set-up time:	3 min.

CAUTION

When connecting ribbon cable to A13 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W6

1. Switch instrument to **Standby** to reconnect cable **W6** to **A5** Assembly or **A13** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on reconnecting cable **W6** to **A5J6**.)

2. Return to foldout.

3K-4. A13 OUTPUT FILTERS/ALC MODULE

COMMENT

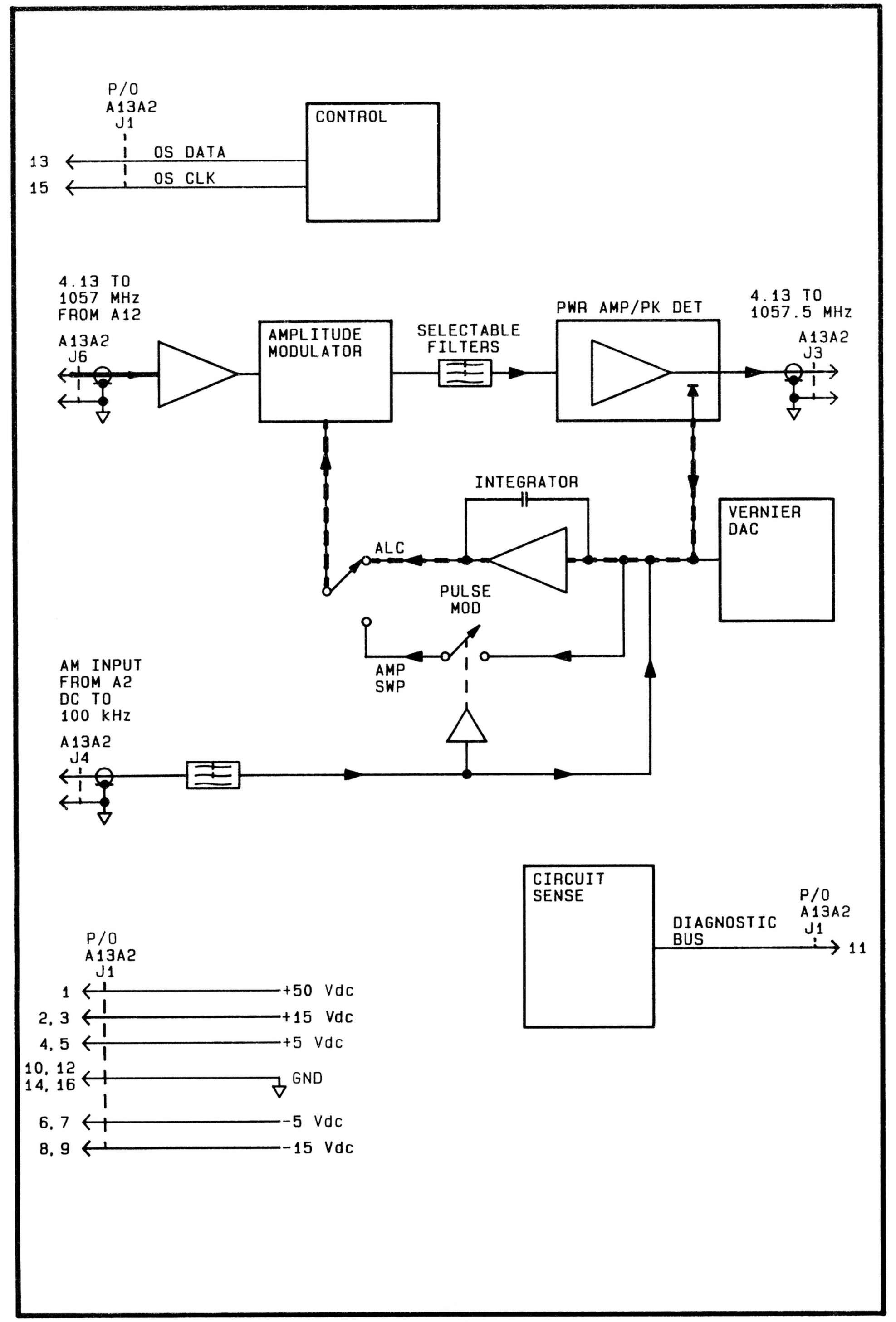
It is not to essential to understand the internal operation of a module to make an on-site repair.

The **A13 Module** contains an **Automatic Level Control (ALC)** circuit. The **ALC** loop adjusts the level of the RF signal to between **+5** and **+21.5 dBm** in **0.1 dB** steps. An audio signal, sent from the **A2 Module**, is applied to the **ALC** loop's feedback path to provide amplitude and pulse modulation for all output, frequency bands, (except the Doubler Band in the HP 8642B.)

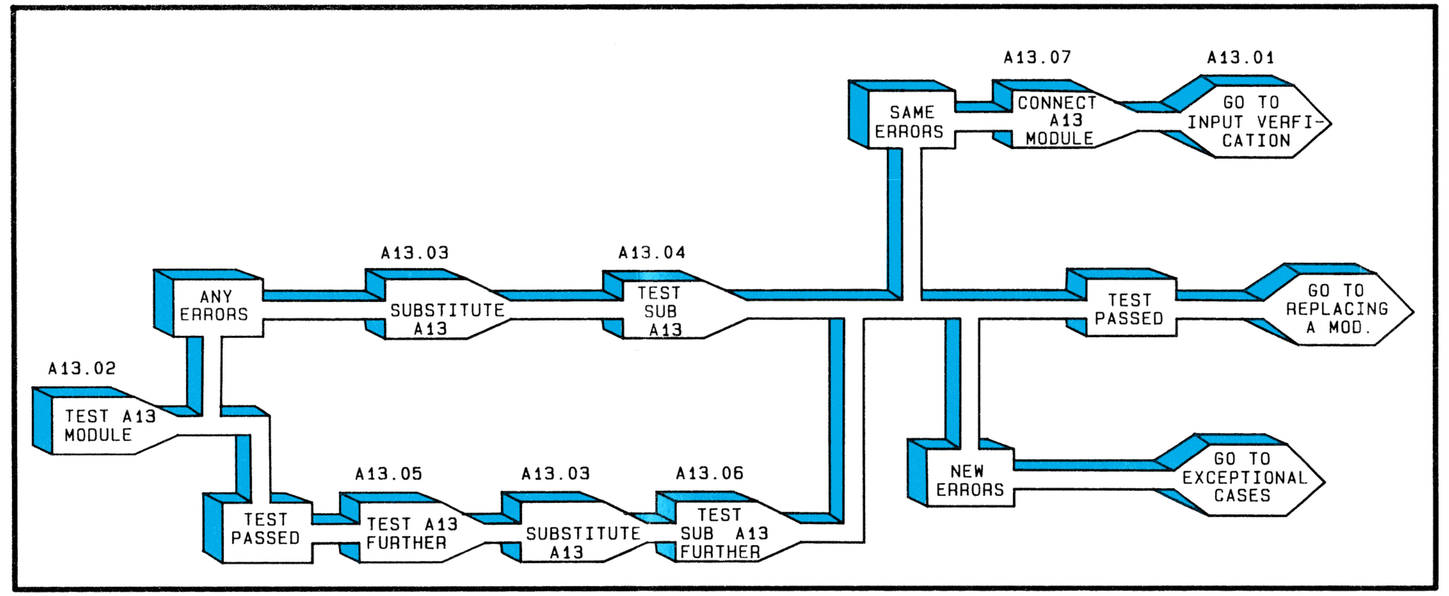
An array of selectable, low-pass filters in the RF signal path filters the harmonics produced by the divider in the **A12 Module**.

See the **A13 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A13 Module's** internal operation.

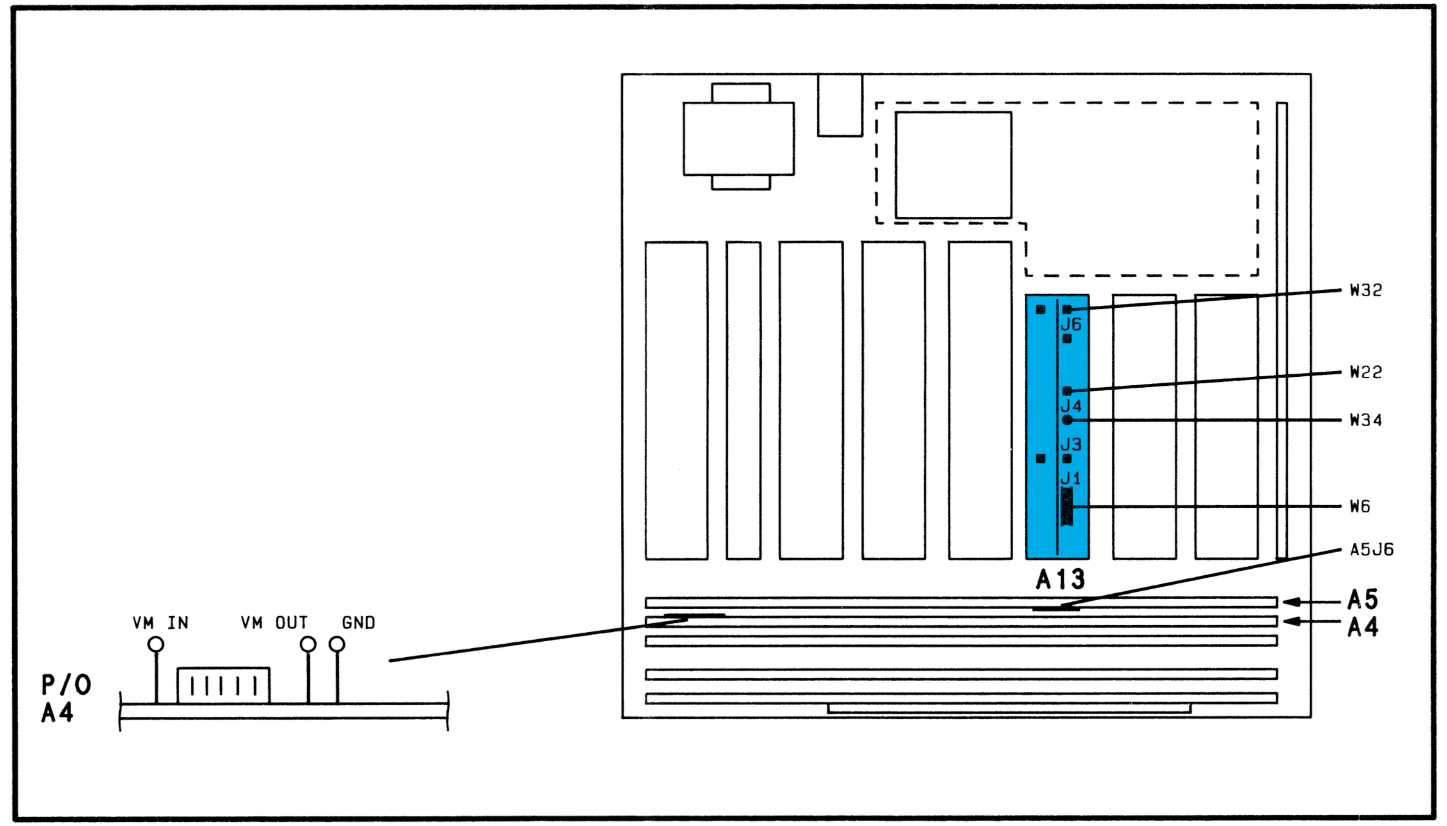
A13 MODULE SIMPLIFIED BLOCK DIAGRAM



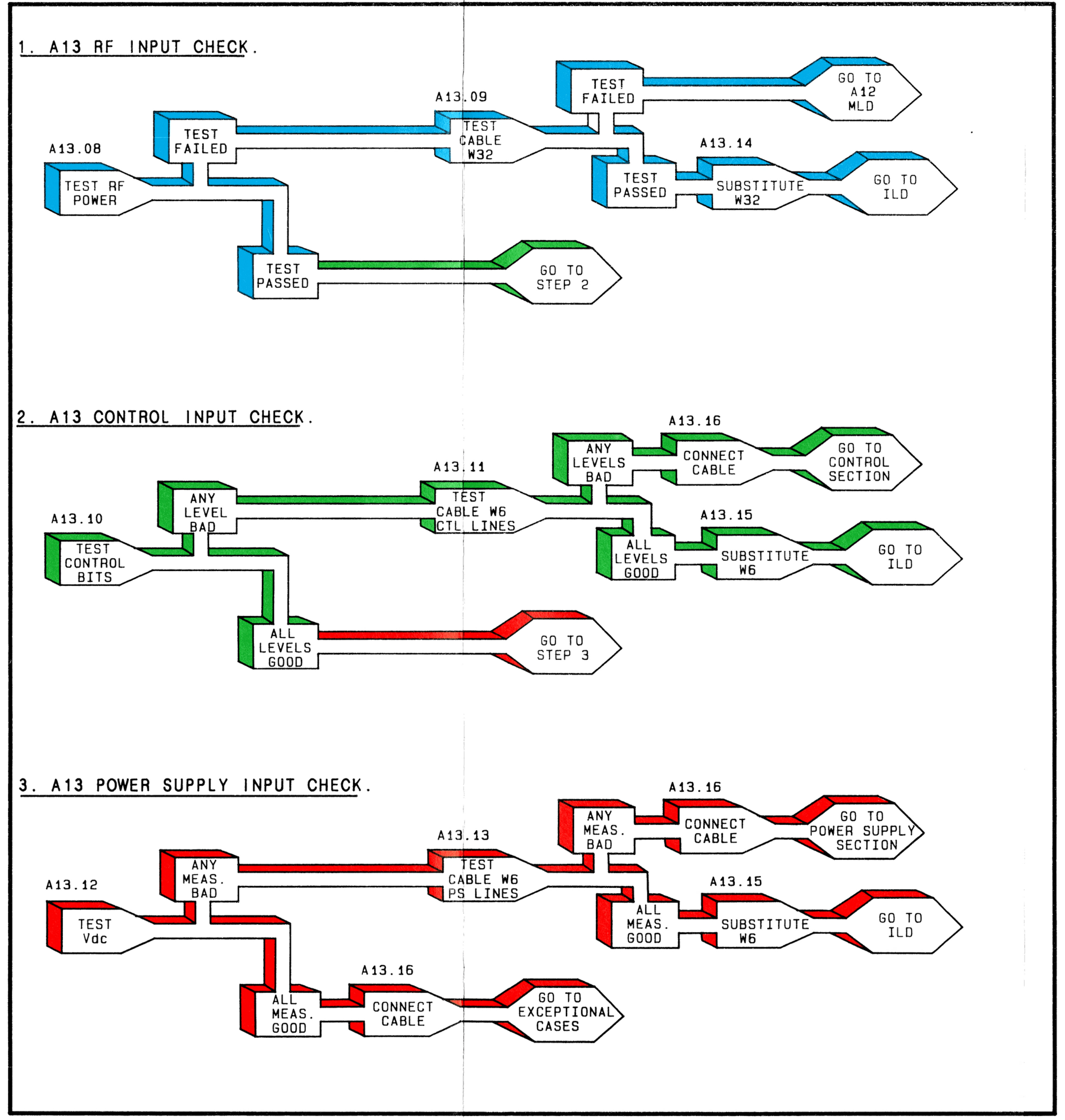
A13 MODULE SUBSTITUTION



A13 MODULE CABLE CONNECTION LOCATOR



A13 INPUTS VERIFICATION



A13 MODULE I/O SIGNALS DIAGRAM

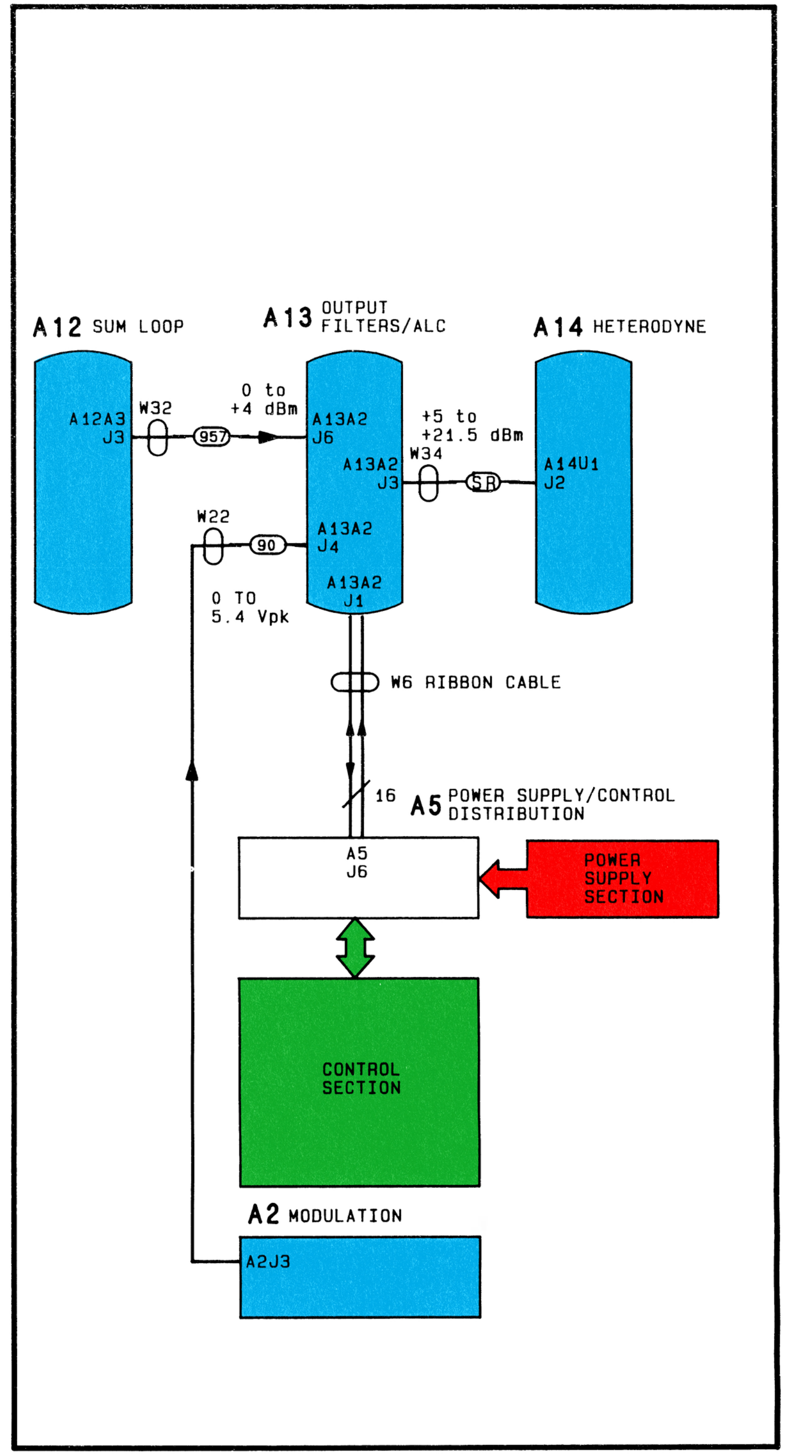


Figure 3K-100. A13 Output Filters/ALC Module Diagnostics.

A14

3L-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A14 Module**. The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-A04** *and* **A07-A13**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptible to short circuiting.

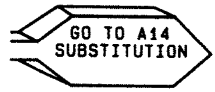
<u>Test Instructions</u>

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. If you have been directed here to troubleshoot an **RF power level** failure, turn to page **3-4** to begin diagnostics, otherwise, proceed to the next page to begin the **A14 MLD**.

A14.01



3L-2. INTRODUCTION

NOTE

If a known good module is not available, proceed to the next page **A14 INPUTS VERIFICATION**.

<u>A14 Substitution Instructions</u>

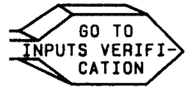
1. Find **A14 MODULE SUBSTITUTION** on the foldout.

2. Use the Task Sequence Diagram, shown under **A14 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.

3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.

4. Begin now by performing the first task shown on the diagram.

A14.02



3L-3. INTRODUCTION

If a known good **A14 Module** is not available, or if you were not able to isolate the failure using the **A14 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams (shown under **A14 INPUTS VERIFICATION**) should be used to check each signal path into the **A14 Module**.

A14 Inputs Verification Instructions

1. Find **A14 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A14 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the page indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A14 RF INPUT CHECK**.

NOTE

The **A14 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A14 Module** *depends on for operation.*

3L-4. INTRODUCTION

The **first step in isolating an RF** power **level failure** is to check the power levels into and out of the **A14 Module**.

Power Diagnostics Instructions

1. Find **A14 RF POWER LEVEL DIAGNOSTICS** on the foldout.
2. Use the Task Sequence Diagram, shown under **A14 RF POWER LEVEL DIAGNOSTICS**, to direct you through the testing process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the page indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

Type:	2A; RF Power Levels	**A14.03**
Run time:	1 min. 35 sec.	
Set-up time:	3 min.	

RF signal levels are measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [5] [6] [HZ]

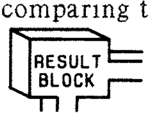
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W29** from **A14 Module** at **A14A2 J1**.
   - Connect **YELLOW PM** cable and adapter to cable **W29**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W29** to module at **A14A2 J1**.
   - Disconnect cable **W34** from **A13 Module** at **A13A2 J3**.
   - Connect **PM** cable to **A13 Module** at **A13A2 J3** using adapter and barrel adapter from On-Site Service Kit.
   - [HZ] to continue test.

5. When "**WAITING FOR SET-UP 3 .V26**" appears:
   - Reconnect cable **W34** to **A13 Module** at **A13A2 J3**.
   - Disconnect cable **W36** from **A14 Module** at **A14U1 J3**.
   - Connect **PM** cable to **A14 Module** at **A14U1 J3**.
   - [HZ] to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W36** to module at **A14U1 J3**.
   - [HZ] to continue test.

7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A14**.

8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST POWER LEVELS**.

Type:	2A; RF Power Levels	**A14.04**
Run time:	1 min. 35 sec.	
Set-up time:	3 min.	

Cable **W34** is tested by substituting in a test cable from the On-Site Service Kit.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [5] [6] [HZ]

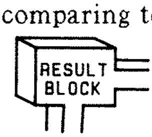
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W29** from **A14 Module** at **A14A2 J1.**
   - Connect **YELLOW PM** cable and adapter to cable **W29**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W29** to module at **A14A2 J1**.
   - Disconnect cable **W34** from **A13** and **A14** modules at **A13A2 J3** and **A14U1 J3**.
   - Connect **PM** cable to **A13 Module** at **A13A2 J3** using adapter and barrel adapter from On-Site Service Kit.
   - [HZ] to continue test.

5. When "**WAITING FOR SET-UP 3 .V26**" appears:
   - Connect test cable (flexible) to **A13** and **A14** modules at **A13A2 J3** and **A14U1 J3**.
   - Disconnect cable **W36** from **A14 Module** at **A14U1 J3**.
   - Connect **PM** cable to **A14 Module** at **A14U1 J3**.
   - [HZ] to continue test.

6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W36** to module at **A14U1 J3.**
   - [HZ] to continue test.

7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A14**.

8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W34**.

Type:	1; Loop Lock/Unlock	**A14.05**
Run time:	1 min.	
Set-up time:	0	

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [2] [0] [HZ].

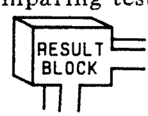
3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A6**. If "**TEST 1 OF A06 (PASSED OR FAILED)**" is not displayed, rerun test.

NOTE

The **A14 Module's** *loop test is included in this* **A6 Module** *test.*

COMMENT

If any error codes are displayed for modules A01-A04 or A07-A13, you need to isolate those failure(s) before performing the A14 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST A14 MODULE.**

Type:	Module Substitution	**A14.06**
Run time:	0	
Set-up time:	5 min.	

The following describes the technique for connecting a **known** good A14 Module.

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Remove **A14 Module** and install substitute module (refer to table on foldout in **MECHANICAL PROCEDURES** to locate removal and replacement information.)
3. Turn instrument on.
4. Return to foldout.

Type:	Substitute Module Test	**A14.07**
Run time:	1 min.	
Set-up time:	0	

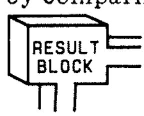
This procedure tests operation of **substitute A14 Module** by repeating test performed on **A14 Module** before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [2] [0] [HZ].

3. When "**DIAG DONE   HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A6**. If "**TEST 1 OF A06 (PASSED OR FAILED)**" is not displayed, rerun test.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A14**.

Type:	Additional A14 Tests	**A14.08**
Run time:	Conditional	
Set-up time:	Conditional	

The **A14** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A14** failure.

Condition 2: **A14 Module** failed **POWER LEVEL DIAGNOSTICS**.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A14** failure.

<u>Condition 1</u>

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record any **A06** and **A14** error codes.

COMMENT

If any error codes are displayed for modules A01-A04 or A07-A13, you need to isolate those failure(s) before performing the A14 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

1. Use results from **TEST RF POWER** to check substitute module.
2. Rerun test now if necessary to ensure all test results have been recorded accurately.
3. Return to foldout.

Condition 3

1. Set instrument to operating condition which causes **A14 failure**.
2. Record instrument set-up and error message(s).
3. Return to foldout.

Type:	Additional Substitute A14 Tests	**A14.09**
Run time:	Conditional	
Set-up time:	Conditional	

This proedure tests operation of **substitute A14 Module** by repeating test(s) performed on **A14 Module** before substitution.

Condition 1: **Instrument Level Self Test** indicated **A14** failure.

Condition 2: **A14 Module** failed **POWER LEVEL DIAGNOSTICS**.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A14** failure.

<u>**Condition 1**</u>

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.

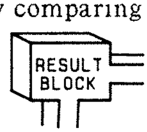
2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A6** or **A14** error codes.

COMMENT

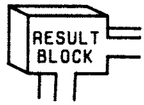
If any error codes are displayed for modules A01-A04 or A07-A13, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A14 FURTHER.**

Condition 2

1. Use results from **A14.03** to check substitute module.

2. Rerun test now if necessary to ensure all test results have been recorded accurately.

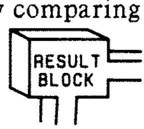
3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST SUB A14 FURTHER.**

Condition 3

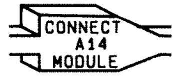
1. Set instrument to operating condition which causes **A14** failure.

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST SUB A14 FURTHER.**

Type:	Cable Connection	**A14.10**
Run time:	0	
Set-up time:	5 min.	



Connect Module

1. Switch instrument to **Standby**.

2. Disconnect cables **W7**, **W29**, **W34** and **W36** from substitute **A14 Module**.

3. Return **substitute** A14 Module to On-Site Service Kit.

CAUTION

When connecting ribbon cable, find arrowhead on cable connector and align with arrowhead on board connector.

4. Reconnect **W7** to module at **A14A3 J6** and lower module back into instrument.

5. Reconnect cables **W7**, **W29**, **W34** and **W36** to **A14 Module**.

6. Turn instrument on.

7. Return to foldout.

Type:	2A; RF Power Levels	**A14.11**
Run time:	1 min.	
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [6] [8] [1] [3] [HZ]
   (To check input levels only.)

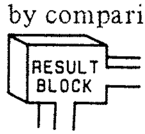
3. [3] [5] [6] [HZ].

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W29** from module at **A14A2 J1**.
   - Connect **YELLOW PM** cable and adapter to cable **W29**.
   - [HZ] to continue test.

5. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W29** to module at **A14A2 J1**.
   - Disconnect cable **W34** from **A13 Module** at **A13A2 J3**.
   - Connect **PM** cable to **A13 Module** at **A13A2 J3** using adapter and barrel adapter from On-Site Service Kit.
   - [HZ] to continue test.

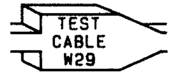
6. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W34** to module at **A13A2 J3**.
   - [HZ] to continue test.

7. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A14**.

8. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST RF POWER**.

Type:	2A; RF Power Levels	**A14.12**
Run time:	10 sec.	
Set-up time:	1 min.	



RF signal level is measured using Internal Power Meter (**PM**).

Run Test

1. [INSTR PRESET] [SHIFT]
   Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

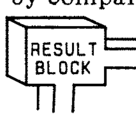
2. [SHIFT] [SPCL] [3] [6] [8] [1] [2] [HZ]
   (To check input levels only.)

3. [3] [5] [6] [HZ]

4. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W29** from **A6** module at **A6A2 J9**. (See Top View Diagram inside **Top Cover** to locate **W29** connection on **A6 Module**.)
   - Connect **YELLOW PM** cable and adapter to **A6** module at **A6A2 J9**.
   - [HZ] to continue test.

5. When "**RECONNECT ALL CABLES .V29**" appears:
   - Reconnect cable **W29** to **A6** module at **A6A2 J9**.
   - [HZ] to continue test.

6. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A14**.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLE W29**.

Type:	3; Bit Transmission	**A14.13**
Run time:	3 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A14 Module** on MUX and Band select lines.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W7** from module at **A14A2 J2**.
   - Plug end of **W7** into **16 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W7P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN** (**A4TP1**). (See **A14 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

MUX and Band Select Lines

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

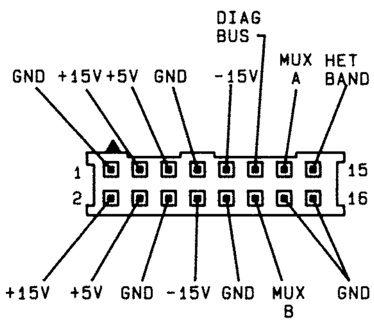
5. Enter **Bit Select Keys** as indicated in **Table 3L-1. W7P2 Control Bits**, for **Control Line** to be tested.

6. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3L-1.** (See **Figure 3L-1. Cable Plug W7P2 Signal Locator.**)

Table 3L-1. W7P2 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 5 and 10)	Pin Number (Step 6)
1	MUX A	[9] [HZ]	13
2	MUX B	[1] [1] [HZ]	12
3	HET BAND	[2] [6] [HZ]	15

Figure 3L-1. Cable Plug W7P2 Signal Locator



7. [2] [5] [HZ]
   (To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
   ([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify low state.)

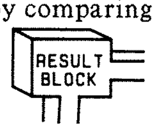
10. Enter **Bit Select Keys** as indicated in **Table 3L-1. W7P2 Control Bits**, for same **Control Line**.

11. [2] [5] [HZ]
    (To enable voltmeter.)

12. Voltage should read approximately **-0.5 to +1.5 Vdc.**
    ([5] [HZ] to repeat measurement.)

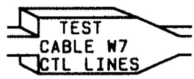
13. Repeat Procedure for each **Control Line** shown in **Table 3L-1.**

14. Record test results.

15. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

for **TEST CONTROL BITS**.

Type:	3; Bit Transmission	**A14.14**
Run time:	3 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A14 Module** on MUX and Band select lines.

Run Test

1. Switch instrument to **Standby**.

2. Extend **A14 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W7** from **A5 Assembly** at **A5J7**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A14 Module** extension and **A5** cable disconnection information.)
   - After cable **W7** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A14 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Turn instrument on.

NOTE

It is only necessary to perform this test on failing control line.

MUX and Band Select Lines

Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [1]
   (To specify high state.)

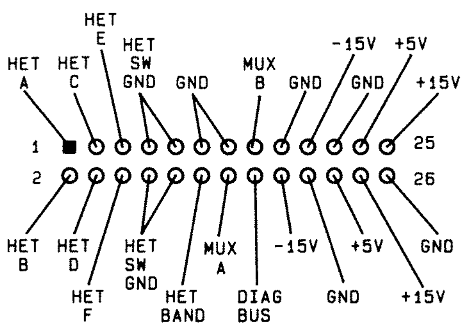
6. Enter **Bit Select Keys** as indicated in **Table 3L-2. A5J7 Control Bits**, for **Control Line** to be tested.

7. Connect **VM** probe to **Control Line** at **Pin Number** indicated in **Table 3L-2.** (See **Figure 3L-2. A5J7 Signal Locator.**)

Table 3L-2. A5J7 Control Bits

Test Order	Control Line	Bit Select Keys (Steps 6 and 11)	Pin Number (Step 7)
1	MUX A	[9] [HZ]	14
2	MUX B	[1] [1] [HZ]	15
3	HET BAND	[2] [6] [HZ]	12

Figure 3L-2. A5J7 Signal Locator
(Solder-Side View)



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc.** ([5] [HZ] to repeat measurement.)

Check Low State

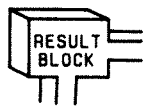
10. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

11. Enter **Bit Select Keys** as indicated in **Table 3L-2. A5J7 Control Bits**, for same **Control Line**.

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

14. Record test results.

15. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W7 CTL LINES.**

Type:	Driver Transmission	**A14.15**
Run time:	3 min.	
Set-up time:	4 min.	

Internal Voltmeter (**VM**) is used to measure level changes transmitted to **A14 Module** on **Switch Driver** control lines.

Run Test

1. Switch instrument to **Standby**:
   - **A14 Module** will have to be extended to access **A14A3 J6**. (See table on foldout in **MECHANICAL PROCEDURES** to locate module extension instructions.)
   - Disconnect cable **W7** from module at **A14A3 J6**.
   - Plug end of **W7 into 10 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W7P3**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A14 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

3. Turn instrument on.
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

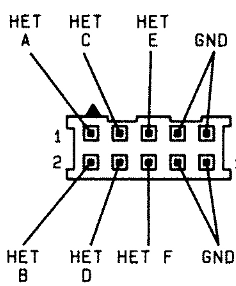
NOTE

*A "**0**" will appear in display indicating that the data bit will be set low. However, the bit is* **inverted** *before it is sent to A14.*

5. [7] [1] [HZ]
(To select bits.)

6. Connect **VM** probe to test connector **HET A** (pin **1**). (See **Figure 3L-3. Cable plug W7P3 Signal Locator**.)

Figure 3L-3. Cable Plug W7P3 Signal Locator



7. [2] [5] [HZ]
(To enable voltmeter.)

8. Voltage should read approximately **+20 Vdc**.

9. Check each driver line (pins **1-6**), by connecting **VM** probe to each pin and keying [5] [HZ]. Voltage should read approximately **+20 Vdc** on each line.

Check Low State

10. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

*A "***1***" will appear in display indicating that the data bit will be set high. However, the bit is* **inverted** *before it is sent to A14.*

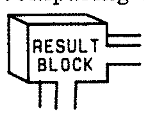
11. [7] [1] [HZ]
(To select bits.)

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **0 Vdc.**
([5] [HZ] to repeat measurement.)

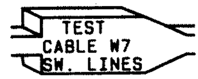
14. Check each driver line by connecting **VM** probe to each pin and keying [5] [HZ]. Voltage should read approximately **0 Vdc** on each line.

15. Record test results.

16. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST SWITCH DRIVE.**

Type:	Driver Transmission	**A14.16**
Run time:	3 min.	
Set-up time:	3 min.	



Internal Voltmeter (VM) is used to measure TTL level changes transmitted to **A14 Module Switch Driver** control lines.

Run Test

1. Switch instrument to **Standby**.

2. Extend **A14 Module** on extender posts, from On-site Service Kit, to disconnect cable **W7** from **A5 Assembly** at **A5J7**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A14 Module** extension and **A5** cable disconnection information.)
   - After cable **W7** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A14 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Turn instrument on.

Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify high state.)

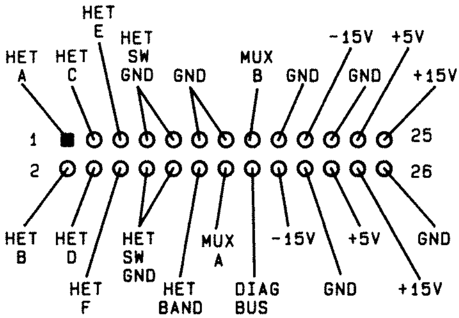
NOTE

*A "***0***" will appear in display indicating that the data bit will be set low. However, the bit is* **inverted** *in the Control Section before it is sent to A14.*

6. [7] [1] [HZ]
   (To select bit.)

7. Connect **VM** probe to solder-side of **A5J7** line **HET A** (pin **1**). (See **Figure 3L-4. A5J7 Signal Locator**.)

Figure 3L-4. A5J7 Signal Locator
(Solder-Side View)



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+20 Vdc**.

10. Check each driver line (pins **1-6**) by connecting VM probe to each pin and keying [5] [HZ].

Check Low State

11. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

*A "**1**" will appear in display indicating that the data bit will be set high. However, the bit is* **inverted** *in the Control Section before it is sent to A14.*

12. [7] [1] [HZ]
(To select bit.)

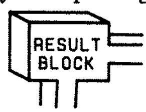
13. Connect **VM** probe to solder-side of **A5J7** line **HET A** (pin **1**).

14. [2] [5] [HZ]
    (To enable voltmeter.)

15. Voltage should read approximately **0 Vdc.**
    ([5] [HZ] to repeat measurement.)

16. Check each driver line (pins **1-6**).

17. Record test results.

18. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W7 SW LINES.**

Type:	4, Voltage Measurements	**A14.17**
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A14 Module**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W7** from **A14** at **A14A2 J2**.
   - Plug end of **W7** into **16 pin** test connector, from On-Site Service Kit.

NOTE

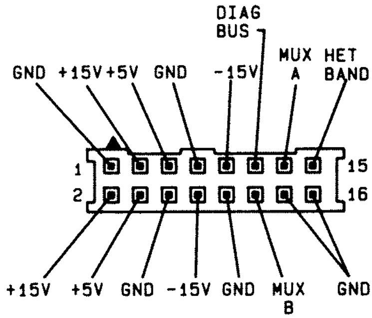
Find arrowhead on test connector and align with arrowhead on cable plug **W7P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A14 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

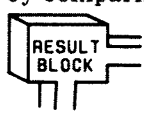
3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (see **Figure 3L-5. Cable Plug W7P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

Figure 3L-5. Cable Plug W7P2 Signal Locator

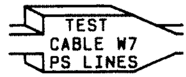


5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST Vdc**.

Type:	4, Voltage Measurements	**A14.18**
Run time:	2 min.	
Set-up time:	3 min.	



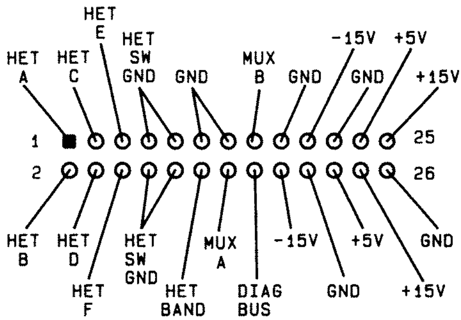
Internal Voltmeter (**VM**) is used to check power supply levels at **A5J2**.

Run Test

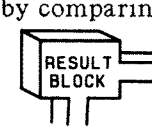
1. Switch instrument to **Standby**.
2. Extend **A14 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W7** from **A5 Assembly** at **A5J2**. (See table on foldout in **MECHANICAL PROCEDURES** to locate **A14 Module** extension and **A5** cable disconnection information.)
   - After cable **W7** has been disconnected from **A5**, lower module back into instrument.
3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A14 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)
4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

5. Measure all voltage levels at **A5J7**:
   - Access signals from solder-side of **A5J7**. (See **Figure 3L-6. A5J7 Signal Locator**.)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3L-6. A5J7 Signal Locator
(Solder-Side View)



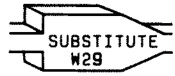
6. Record test results.

7. Return to folout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W7 PS LINES.**

Type: Cable Substitution
Run Time: 5 min.
Set-up Time: 1 min.

A14.19



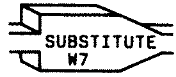
1 Testing has shown cable **W29** or **W34** to be suspect, temporarily replace **W29** with a test cable from the On-Site Service Kit. Cable **W34** should be replaced by a **semi-rigid** cable. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

3. Return to foldout.

Type: Cable Substitution
Run time: 0 min.
Set-up time: 3 min.

A14.20



Testing has shown cable **W7** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a permanent replacement cable.

CAUTION

When connecting ribbon cable to A14 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W7

1. Switch instrument to **Standby** to connect cable **W7** to **A5** Assembly and **A14** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable **W7** to **A5J7**.)

2. Return to foldout.

Type:	Cable Connection	**A14.21**
Run time:	0 min.	
Set-up time:	3 min.	

CAUTION

When connecting ribbon cable to A14 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W7

1. Switch instrument to **Standby** to reconnect cable **W7** to **A5** Assembly or **A14** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on reconnecting cable **W7** to **A5J7**.)

2. Return to foldout.

3L-5. A14 HETERODYNE MODULE

COMMENT

It is not essential to understand the internal operation of a module to make an on-site repair.

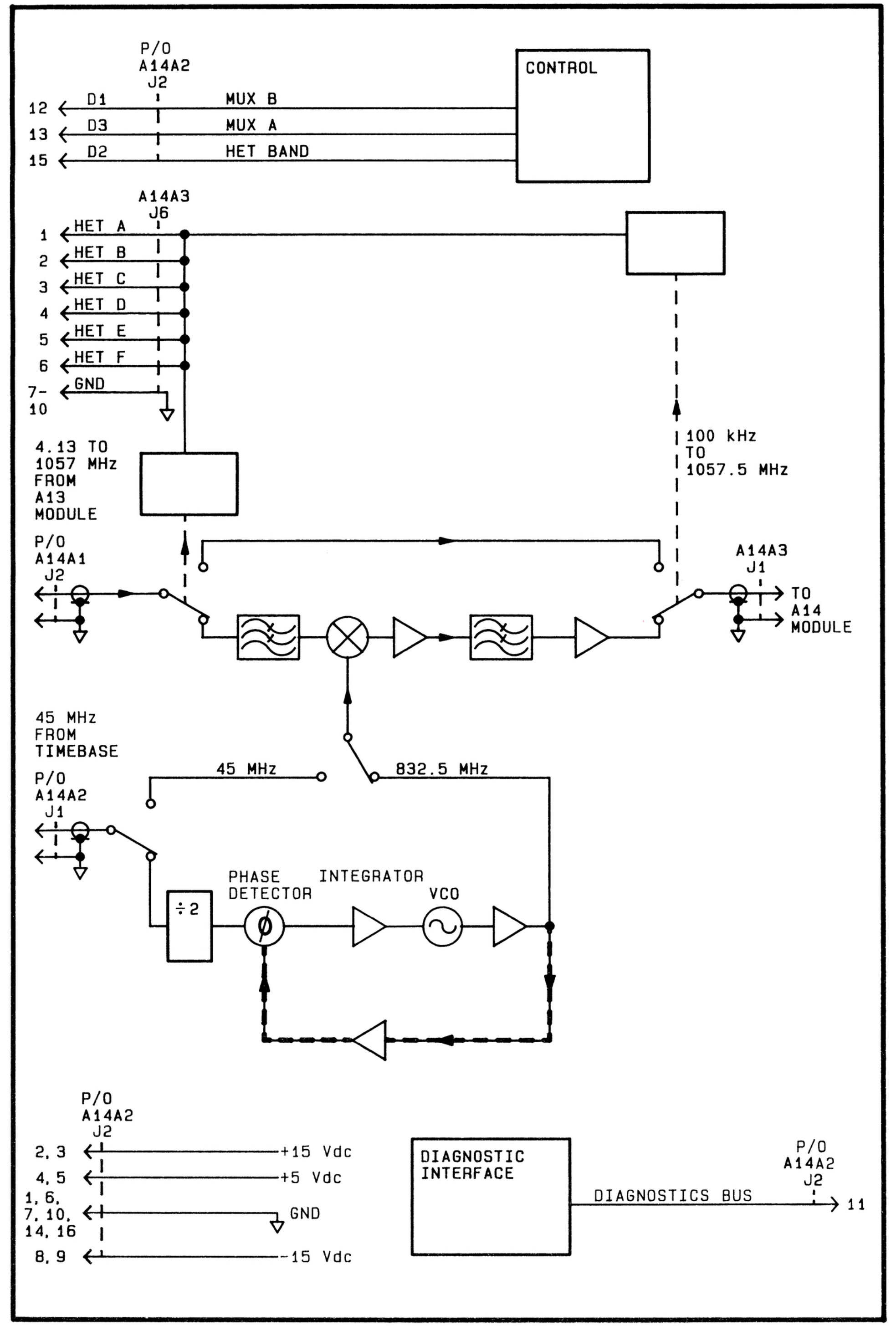
The **A14 Module** switches the RF Signal sent from the **A13 Module**, between a through path and the heterodyne path. The heterodyne path down converts the main band signal by mixing it with either **45 MHz** or **832.5 MHz** to produce the two heterodyne bands. Together these two bands provide the output frequency range **100 kHz** to **4.12 MHz**.

The **45 MHz** signal is a **timebase** output sent from the **A6 Module**. The **832.5 MHz** signal is generated by a voltage controlled oscillator within **A14** which is phase locked to the **45 MHz** timebase signal.

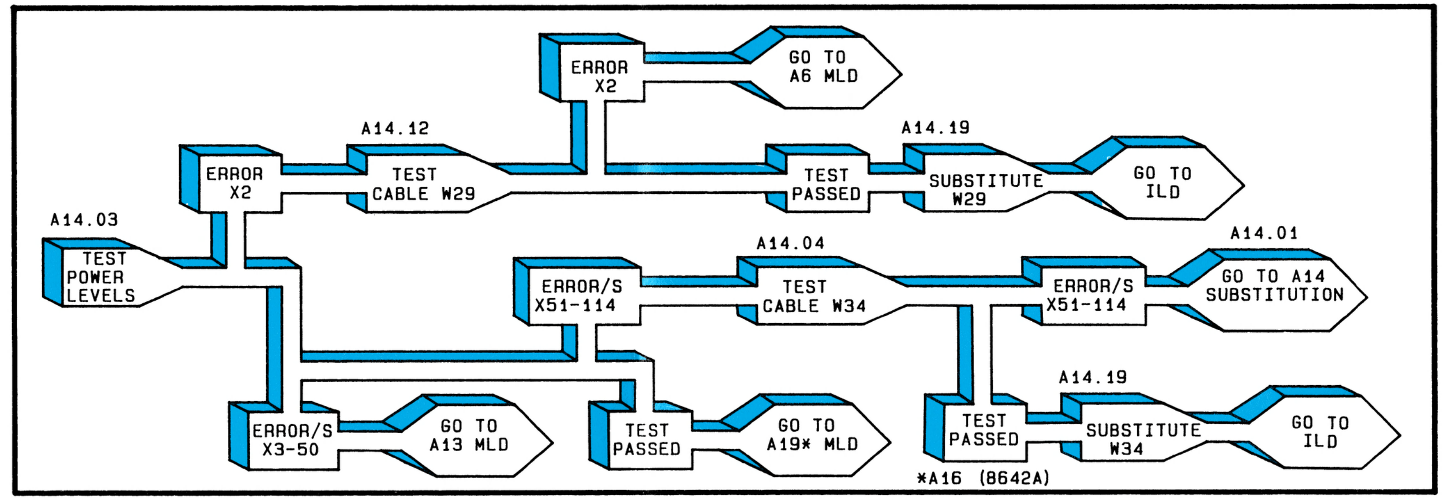
The **Switch Drive**, for controlling the path selection switches, is provided by the **A17 Module** in the Power Supply Section.

See the **A14 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A14 Module's** internal operation.

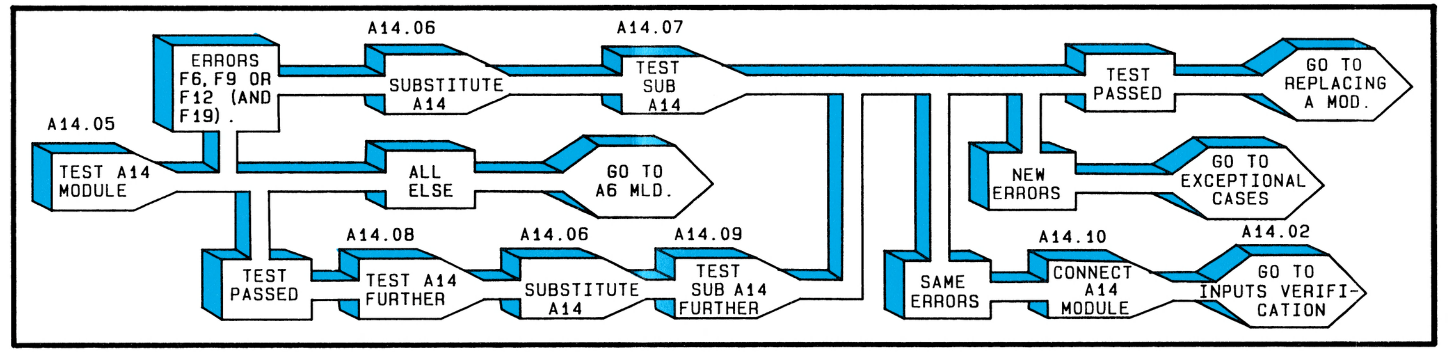
A14 MODULE SIMPLIFIED BLOCK DIAGRAM



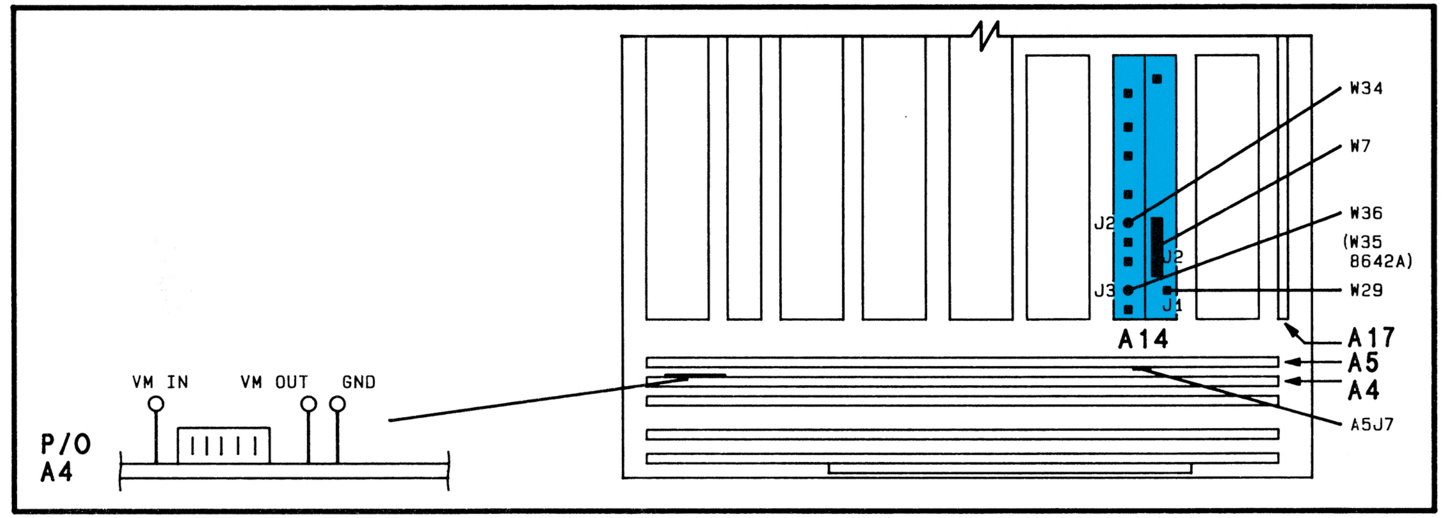
A14 RF POWER LEVEL DIAGNOSTICS



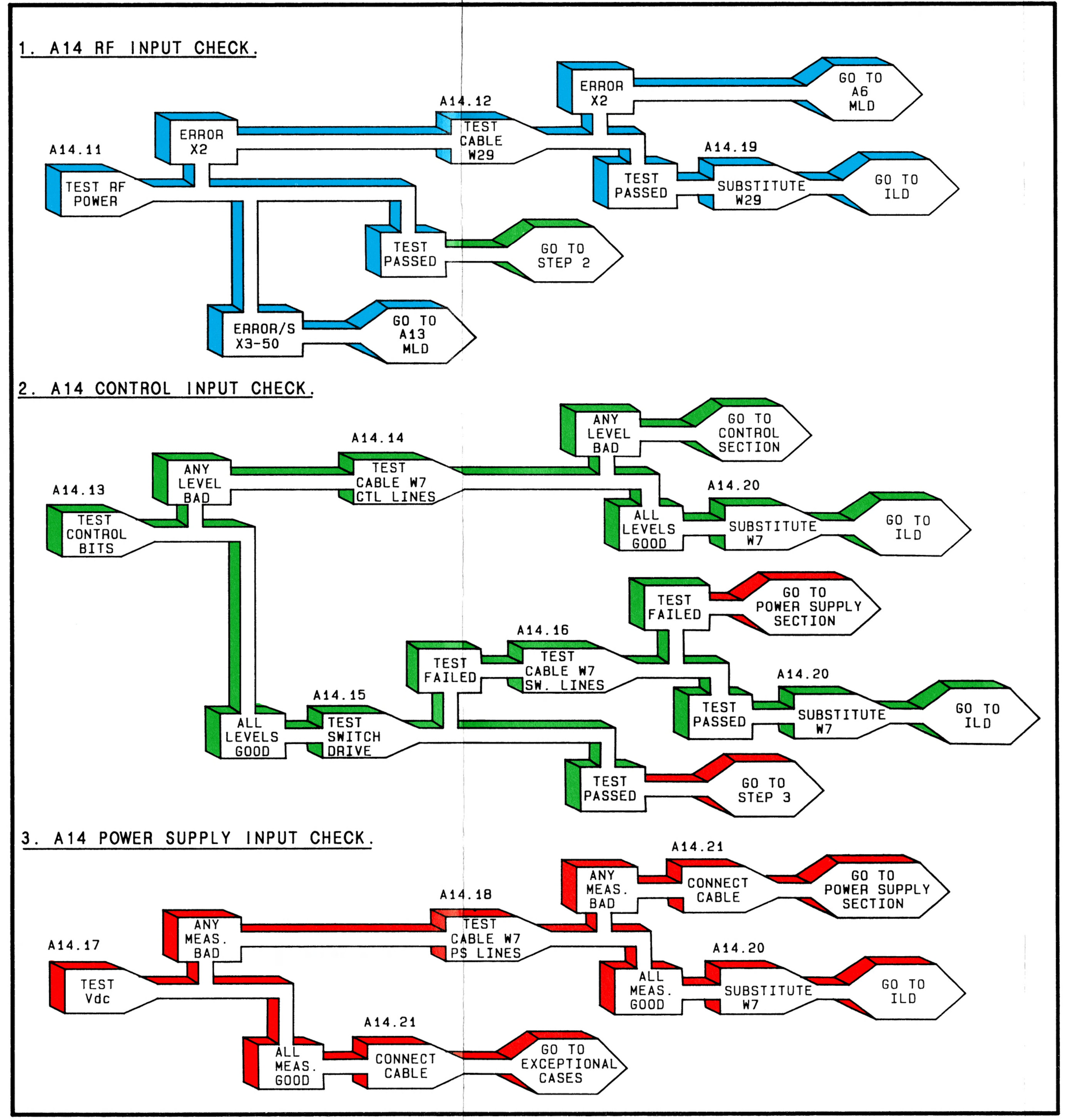
A14 MODULE SUBSTITUTION



A14 MODULE CABLE CONNECTION LOCATOR



A14 INPUTS VERIFICATION



A14 MODULE I/O SIGNALS DIAGRAM

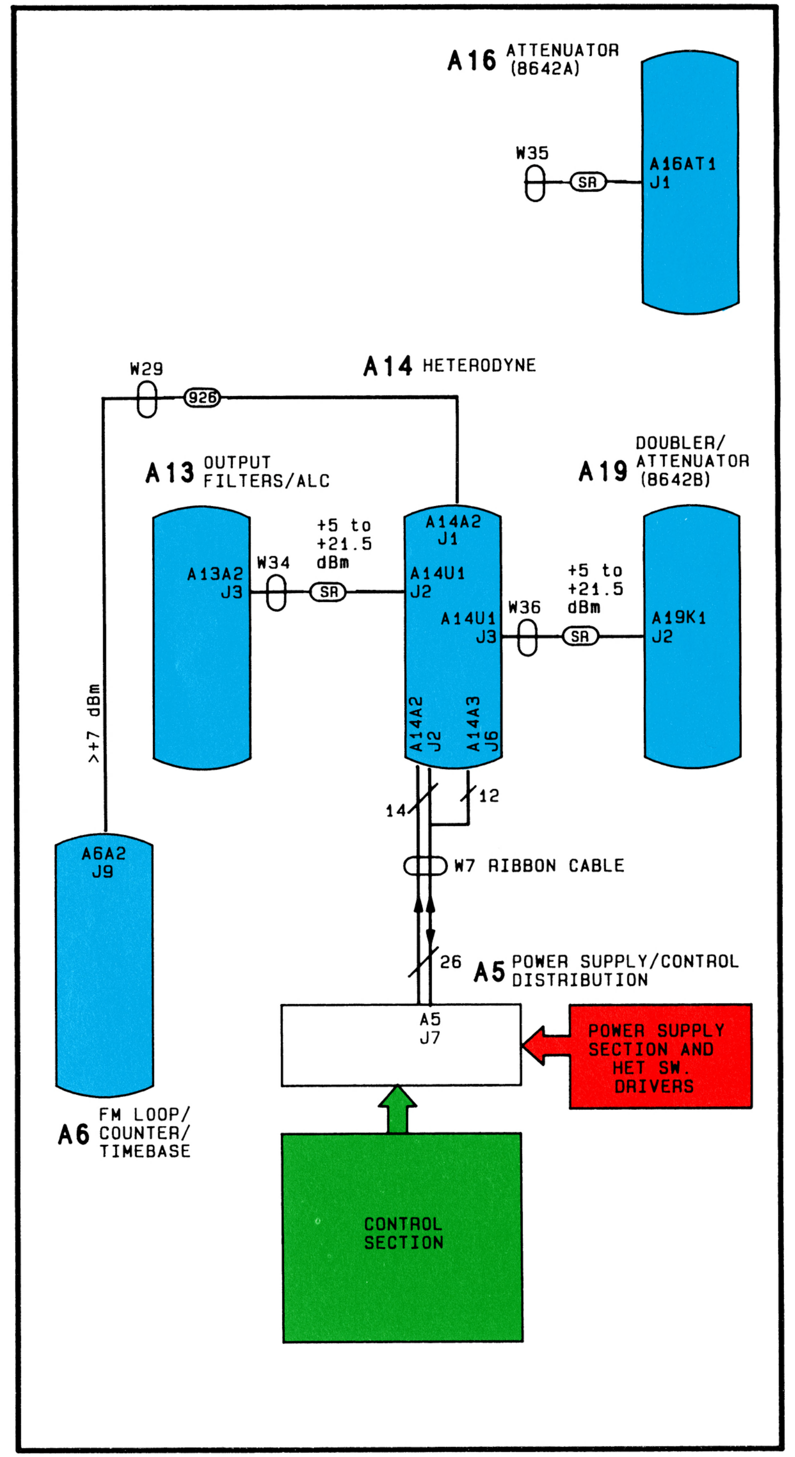


Figure 3L-100. A14 Heterodyne Module Diagnostics.

A16

3M-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A16 Module** and the **A16 (Option 003) Module** (both in the **HP 8642A** only). The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-14** or **A17**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptable to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. The information provided in this section applies directly to both the **A16 Module** and the **A16 (Option 003) Module** except where otherwise noted.

4. Turn to the next page to begin the **A16 MLD**.

3M-2. INTRODUCTION

NOTE

If a known good module is not available, proceed to the next page, **A16 INPUTS VERIFICATION.**

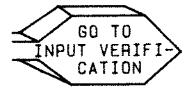
The **first step in isolating an A16 failure** is to substitute in a known good module from the On-site Service Kit.

A16 Substitution Instructions

1. Find **A16 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A16 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

A16.01

3M-3. INTRODUCTION



If a known good **A16 Module** is not available or, if you were not able to isolate the failure using the **A16 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams (shown under **A16 INPUTS VERIFICATION**) should be used to check each signal path into the **A16 Module**.

A16 Inputs Verification Instructions

1. Find **A16 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A16 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. A16 POWER SUPPLY INPUT CHECK**.

NOTE

The **A16 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A16 Module** *depends on for operation.*

Type:	2A; RF Power Levels	**A16.02**
Run time:	1 min.	
Set-up time:	2 min.	

RF signal level is measured using Internal Power Meter (**PM**).

CAUTION

Do not permit end of Internal Power Meter cable to short circuit instrument by coming in contact with any exposed circuitry.

Run Test

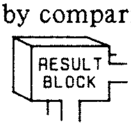
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [6] [3] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W35** (**W300** - **Option 003**) from **A14** Module at **A14U1 J3**.
   - Connect **YELLOW PM** cable and adapters to **A14** Module at **A14U1 J3**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W35** (**W300** - **Option 003**) to **A14** Module at **A14U1 J3**.
   - Disconnect **W37** (**W301** - **Option 003**) cable from **A16** Module at **A16AT1 J2** (**A16A2 J2** - **Option 003**).
   - Connect **PM** cable and adapters to module at **A16AT1 J2** (**A16A2 J2** - **Option 003**).
   - [HZ] to continue test.

5. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Reconnect cable **W37** (**W301** - **Option 003**) to module at **A16AT1 J2** (**A16A2 J2** - **Option 003**).
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A16**.

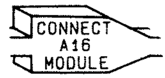
6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST RF POWER**.

Type:	Module Substitution	**A16.03**
Run time:	0	
Set-up time:	7 min.	

Connect Substitute Module

1. Switch instrument to **Standby**.
2. Remove **A16 Module** and install substitute module (refer to table on foldout in **MECHANICAL PRECEDURES** to locate **A16** removal and replacement information).
3. Turn instrument on.
4. Return to foldout.

Type:	Module Substitution	**A16.04**
Run time:	0	
Set-up time:	7 min.	



Connect Module

1. Switch instrument to **Standby**.
2. Remove substitute **A16 Module** and replace instrument's **A16 Module**.
3. Return **substitute** A16 Module to On-Site Service Kit.
4. Return to foldout.

Type:	4, Voltage Measurements	**A16.05**
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A16 Module**.

<u>Run Test</u>

1. Switch instrument to **Standby**:
   - Disconnect **W8 (W11 - Option 003)** from **A16** at **A16A1 J1** (**A16A1 J2 - Option 003**).
   - Plug end of **W8** (**W11 - Option 003**) <u>into</u> **34 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A16 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line (including **+20V ATN/SW** lines on **W11P2, Option 003**). See cable plug signal locators below.
   - [5] [HZ] (To make each voltage measurement.)

Figure 3M-1. Cable Plug W8P2 Signal Locator

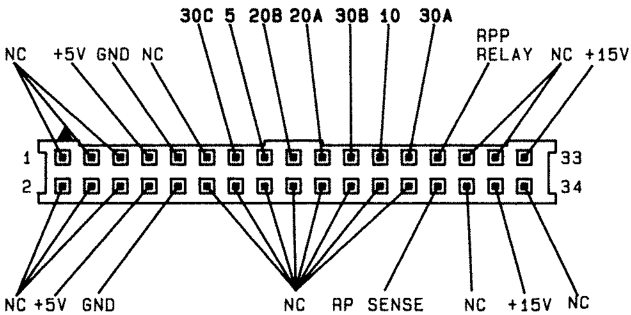
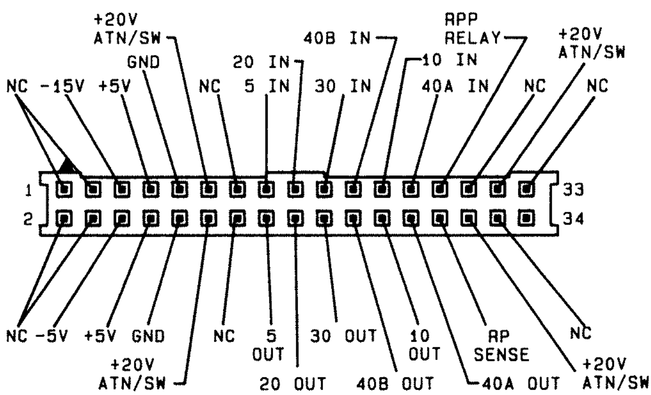
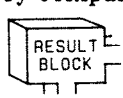


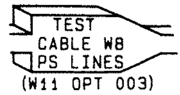
Figure 3M-2. Option 003 Cable Plug W11P2 Signal Locator



5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST Vdc**.

Type:	4, Voltage Measurements	**A16.06**
Run time:	2 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to check power supply levels at A5J8.

Run Test

1. Switch instrument to **Standby**.

2. Extend **A16 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W8** (**W11 - Option 003**) from **A5 Assembly** at **A5J8**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A16 Module** extension and **A5** cable disconnection information.)
   - After cable **W8** (**W11 Option 003**) has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A16 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

5. Measure voltage levels at **A5J8**:
   - Access signals from solder-side of **A5J8**. (See A5J8 Signal Locators.)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3M-3. A5J8 Signal Locator
(Solder-Side View)

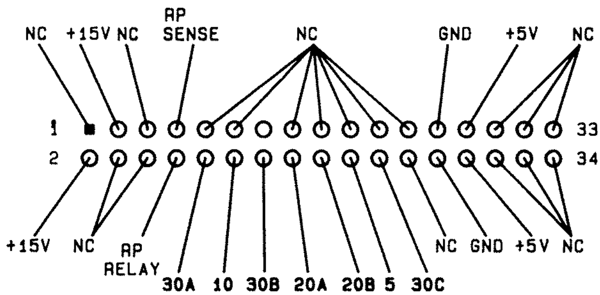
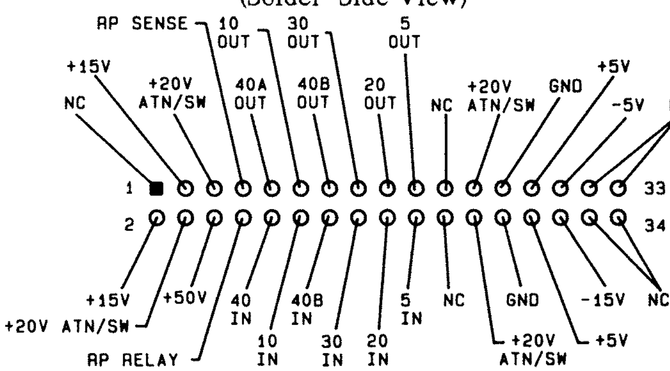
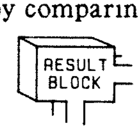


Figure 3M-4. Option 003 A5J8 Signal Locator
(Solder-Side View)



6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W8 PS LINES**.

Type:	3; Driver Transmission	**A16.07**
Run time:	1 min.	
Set-up time:	3 min.	

Attenuator drive lines are checked for correct state change when instrument is switched from zero attenuation to full attenuation.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W8** from **A16** at **A16AT1 J1**.
   - Plug end of **W8** <u>into</u> **34 pin** test connector, from On-Site Service Kit.

NOTE

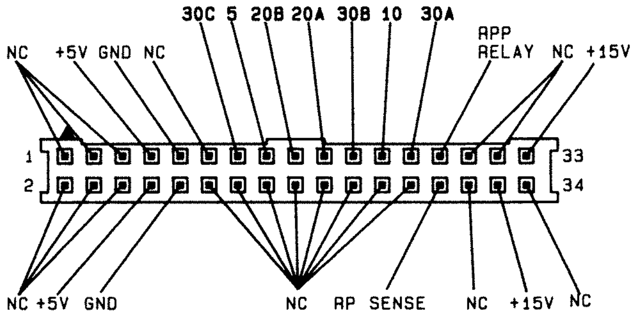
Find arrowhead on test connector and align with arrowhead on cable plug **W8P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A16 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Switch instrument **ON**.

4. Check zero attenuation state:
   - [AMPTD] [1] [0] [DBM]
   - [SHIFT] [SPCL] [3] [2] [5] [HZ]
     (To enable internal voltmeter.)
   - Connect VM probe to test connector pin for each attenuator drive line. (See **Figure 3M-5. Cable Plug W8P2 Signal Locator**. Drive lines are designated by bold print on the figure.)
   - [5] [HZ] (To make each measurement.)
   - Approximately 5 Vdc (TTL high) should be present on each drive line.

Figure 3M-5. Cable Plug W8P2 Signal Locator



5. Check full attenuation state:
   - [AMPTD] [-] [1] [4] [0] [DBM]
   - [SHIFT] [SPCL] [3] [2] [5] [HZ]
   - [5] [HZ] (To check level at each drive line again.)
   - Approximately 0 Vdc (TTL low) should be present on each drive line.

6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each RESULT BLOCK for **TEST ATN DRIVE LINES.**

Type:	3; Driver Transmission	**A16.08**
Run time:	1 min.	
Set-up time:	3 min.	

Attenuator drive lines are checked, at **A5J8**, for correct state change when instrument is switched from zero attenuation to full attenuation.

Run Test

1. Switch instrument to **Standby**.

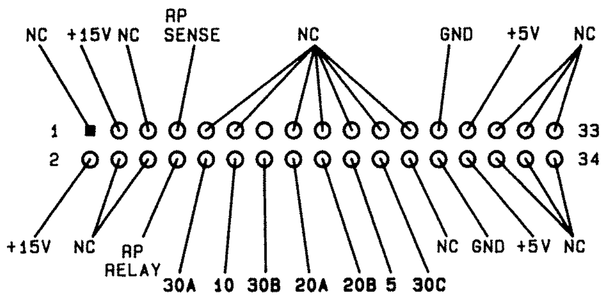
2. Extend **A16 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W8** from **A5** Assembly at **A5J8**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A16 Module** extension and **A5** cable disconnection information.)
   - After cable **W8** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A16 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Switch instrument **ON**.

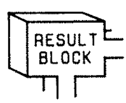
5. Check zero attenuation state:
   - AMPTD 1 0 DBM
   - SHIFT SPCL 3 2 5 HZ (To enable internal voltmeter.)
   - Connect VM probe to test connector pin for each attenuator drive line. (See **Figure 3M-5. A5J8 Signal Locator.**)
   - 5 HZ (To make each measurement.)
   - Approximately 5 Vdc (TTL high) should be present on each drive line.

Figure 3M-6. A5J8 Signal Locator



5. Check full attenuation state:
   - AMPTD - 1 4 0 DBM
   - SHIFT SPCL 3 2 5 HZ
   - 5 HZ (To check level at each drive line again.)
   - Approximately 0 Vdc (TTL low) should be present on each drive line.

6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W8.**

Type:	3; Driver Transmission	**A16.09**
Run time:	1 min.	
Set-up time:	0	

Attenuator drive lines to **A16 (Option 003) Module** are checked by separately selecting relays and listening for attenuator pads to **click** in and out.

NOTE

Instrument's **Top Cover** *should be removed to perform this test.*

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. Set instrument to zero attenuation:
   - [AMPTD] [1] [0] [DBM]

3. Check relay drivers:
   - Select **Amplitude Setting** for **Attenuator Relay** to be tested (from **Table 3M-1. Attenuator Relay Selection**) and listen for pad to **click** in.
   - Select [1] [0] [DBM] and listen for attenuator pad to **click** out.
   - Repeat process for each relay listed in **Table 3M-1.**

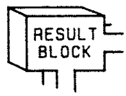
Table 3M-1. Attenuator Relay Selection

Test Order	Amplitude Setting	Attenuator Relay
1	[0] [DBM]	5 dB pad
2	[-] [5] [DBM]	10 dB pad
3	[-] [1] [5] [DBM]	20 dB pad
4	[-] [2] [5] [DBM]	30 dB pad

NOTE

This procedure does not check the two **40 dB** *relay drivers. They can be checked using an external power measuring device connected at the output of A16 (Option 003). Check power out at settings of -60.1 dBm to -100 dBm (40 dB pad A) and -100.1 to -140 dBm (40 dB pad B).*

4. Record test results.

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST ATN DRIVE LINES**.

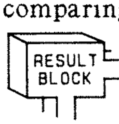
Type:	RF Power	**A16.10**
Run time:	1 min.	
Set-up time:	2 min.	

Internal Power Meter (PM) is used to test output power levels.

CAUTION

If an external power measuring instrument is available, use it to make power measurements.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)
2. [SHIFT] [SPCL] [3] [3] [6] [3] [HZ]
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W35** (**W300 - Option 003**) from **A14 Module** at **A14U1 J3**.
   - Connect **YELLOW PM** cable to **A14 Module** at **A14U1 J3**.
   - [HZ] to continue test.
4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W35** (**W300 - Option 003**) to **A14 Module** at **A14U1 J3**.
   - Connect **PM** cable and adapters to instrument's **RF Output** port **CP1**.
   - [HZ] to continue test.
5. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A16**.
6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST OUTPUT POWER**.

Type:	RF Power	**A16.11**
Run time:	1 min.	
Set-up time:	2 min.	

Internal Power Meter (PM) is used to test output power levels.

Run Test

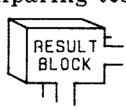
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [6] [3] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W35** (**W300 - Option 003**) from **A14 Module** at **A14U1 J3**.
   - Connect **YELLOW PM** cable and adapters to **A14 Module** at **A14U1 J3**.
   - [HZ] to continue test.

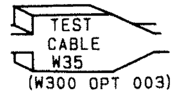
4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W35 (W300 - Option 003)** to **A14 Module** at **A14U1 J3**.
   - Disconnect **W37** (**W301 - Option 003**) cable from **A16 Module** at **A16AT1 J2** (**A16A2 J2 - Option 003**).
   - Connect **PM** cable and adapters to module at **A16AT1 J2** (**A16A2 J2 - Option 003**).
   - [HZ] to continue test.

5. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Reconnect cable **W37** (**W301 - Option 003**) cable to module at **A16AT1 J2** (**A16A2 J2 - Option 003**).
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A16**.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

     for **TEST A16 OUTPUT**.

Type:	RF Power	**A16.12**
Run time:	1 min.	
Set-up time:	2 min.	



Internal Power Meter (PM) is used to test output power levels.

Run Test

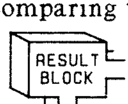
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [6] [3] [HZ]

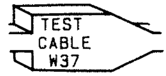
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W35 (W300 - Option 003)** from **A14** **Module** at **A14U1 J3**.
   - Connect **YELLOW PM** cable and adapters to **A14** **Module** at **A14U1 J3**.
   - [HZ] to continue test.

4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Disconnect cable **W35 (W300 - Option 003)** from **A16** **Module** at **A16AT1 J1**.
   - Connect flexible coax cable and adapters from On-Site Service Kit to modules at **A14U1 J3** and **A16AT1 J1** **(A16A2 J2 - Option 003)**.
   - Disconnect **W37 (W300 - Option 003)** cable from **A16** **Module** at **A16AT1 J2 (A16A2 J2 - Option 003)**.
   - Connect **PM** cable and adapters to module at **A16AT1** **J2 (A16A2 J2 - Option 003)**.
   - [HZ] to continue test.

5. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - Reconnect cable **W37 (W300 - Option 003)** to module at **A16AT1 J2 (A16A2 J2 - Option 003)**.
   - If power test still fails, reconnect semi-rigid cable **W35** **(W300 - Option 003)** to **A14** and **A16** modules.
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A16**.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLE** **W35**.

Type:	RF Power	**A16.13**
Run time:	1 min.	
Set-up time:	2 min.	(W301 OPT 003)

Internal Power Meter (PM) is used to test output power levels.

Run Test

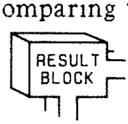
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [6] [3] [HZ]

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Disconnect cable **W35 (W300 - Option 003)** from **A14 Module** at **A14U1 J3**.
   - Connect **YELLOW PM** cable to **A14 Module** at **A14U1 J3**.
   - [HZ] to continue test.

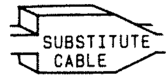
4. When "**WAITING FOR SET-UP 2 .V25**" appears:
   - Reconnect cable **W35 (W300 - Option 003)** to **A14 Module** at **A14U1 J3**.
   - Disconnect **W37 (W300 - Option 003)** cable from **A16 Module** at **A16AT1 J2 (A16A2 J2 - Option 003)** and from cable **W16** at **W16P2 (W200** on **Option 002**, rear panel, instruments).
   - Connect flexible coax cable, from On-Site Service Kit, to **A16 Module** and cable **W16**.
   - Connect **PM** cable and adapters to instrument's **RF Output** port **CP1**.
   - [HZ] to continue test.

5. When "**DIAG DONE HIT MSSGS .V1**" appears:
   - If power test still fails, reconnect semi-rigid cable **W37 (W300 - Option 003)** to **A16** and **W16**.
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A16**.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W37**.

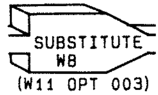
Type: Cable Substitution
Run Time: 5 min.
Set-up Time: 1 min.

A16.14



1. Testing has shown cable **W35** or **W37** (**W300** or **W301 - Option 003**) to be suspect, replace with a semi-rigid cable. Rerun **INSTRUMENT LEVEL DIAGNOSTICS** (**ILD**) to confirm repair.
2. Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a replacement cable.
3. Return to foldout.

Type:	Cable Substitution	**A16.15**
Run time:	0 min.	
Set-up time:	3 min.	



Testing has shown cable **W8 (W11 - Option 003)** to be suspect, temporarily replace with a spare ribbon cable if available. Re-run **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS** in HP 8642A/B Operating and Service Manual for information to order a permanent replacement cable.

CAUTION

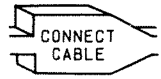
When connecting ribbon cable to A16 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W8 (W11 - Option 003)

1. Switch instrument to **Standby** to connect cable to **A5** Assembly and **A16** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable to **A5J8**.)

2. Return to foldout.

Type:	Cable Connection	**A16.16**
Run time:	0 min.	
Set-up time:	3 min.	



CAUTION

When connecting ribbon cable to A16 Module, find arrowhead on the cable plug and align with arrow-head on the board connector.

<u>Reconnect W8 (W11- Option 003)</u>

1. Switch instrument to **Standby** to reconnect cable **W8 (W11- Option 003)** to **A5** Assembly or **A16** Module. (Refer to table on foldout in **MECHANICAL PRO-CEDURES** for information on reconnecting cable **W8 (W11- Option 003)** to **A5J8**.)

2. Return to foldout.

3M-4. A16 ATTENUATOR MODULE

The **A16 Attenuator Module** is included in the HP 8642A only. This module provides both level attenuation for the RF signal and reverse power protection for the RF Output port.

The attenuator and reverse power control signals are sent to the **A16 Module** from the **A17 Module** in the **Power Supply Section.**

The RF output signal from the **A16 Module** is routed directly to the HP 8642A's RF Output port.

3M-5. A16 (OPTION 003) ATTENUATOR MODULE

COMMENT

It is not to essential to understand the internal operation of a module to make an on-site repair.

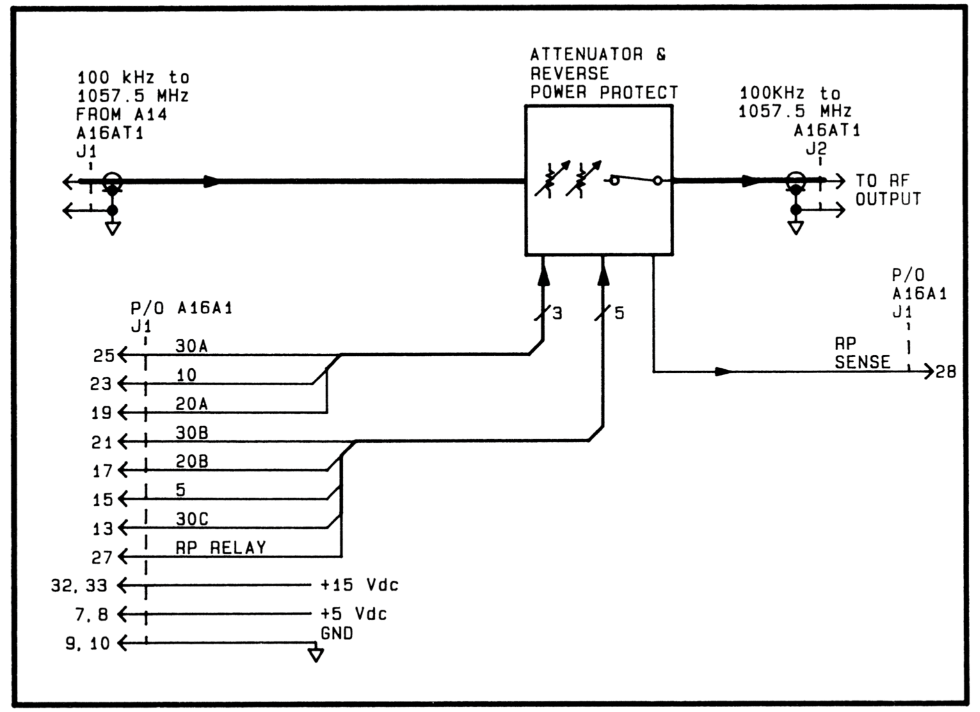
The **A16 (Option 003) Attenuator Module** is included in the **HP 8642A** only. This module provides level attenuation for the RF output signal. Two attenuator assemblies connected in series provide level attenuation to **−140 dBm**. The second attenuator assembly includes reverse power protection circuitry for the **RF Output** port. The attenuator and reverse power control signals are sent to the **A16 (Option 003) Module** from the **A17 Module** in the **Power Supply Section**.

The RF output signal from the **A16 Module** is routed directly to the **HP 8642A's RF Output** port.

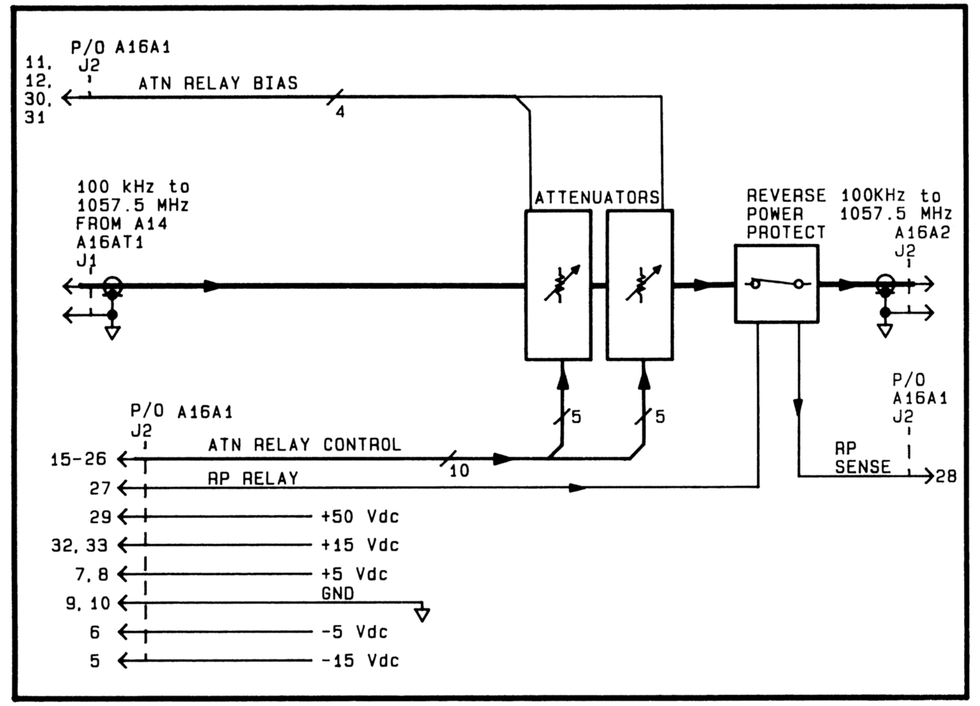
With an **A16 (Option 003) Module** installed the output power level for an **HP 8642A** is increased to **+20 dBm** for the frequency range **264.3** to **528.7 MHz** and to **+19 dBm** for the frequency range **528.7** to **1057.5 MHz**.

See the **A16 (OPTION 003) MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A16 (Option 003) Module's** internal operation.

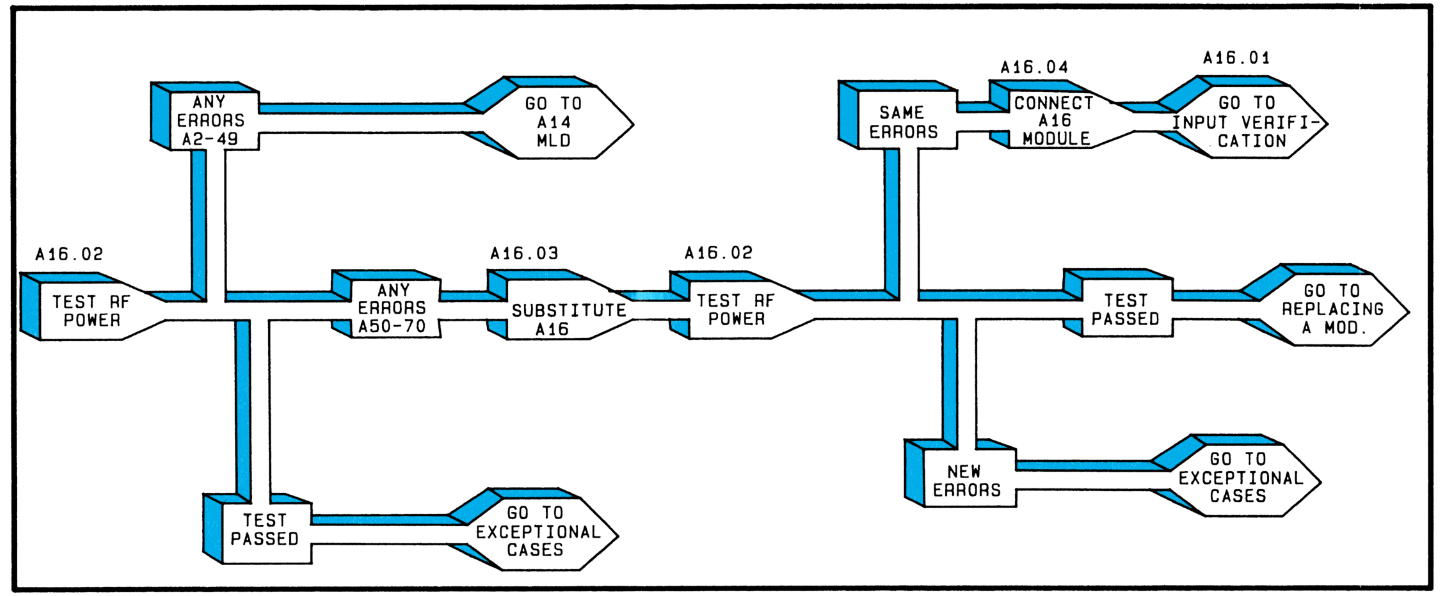
A16 MODULE SIMPLIFIED BLOCK DIAGRAM



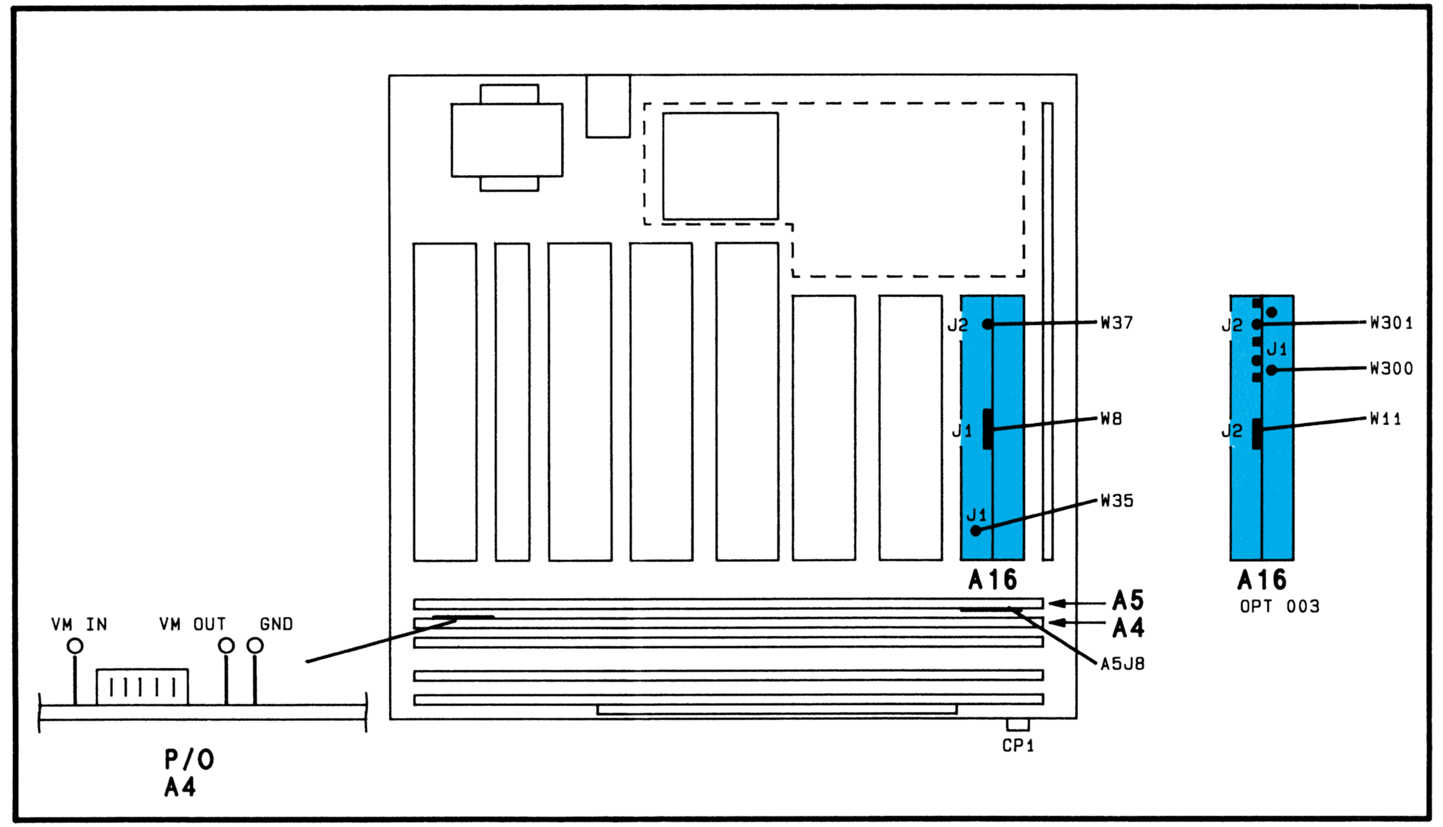
A16 (OPTION 003) MODULE SIMPLIFIED BLOCK DIAGRAM



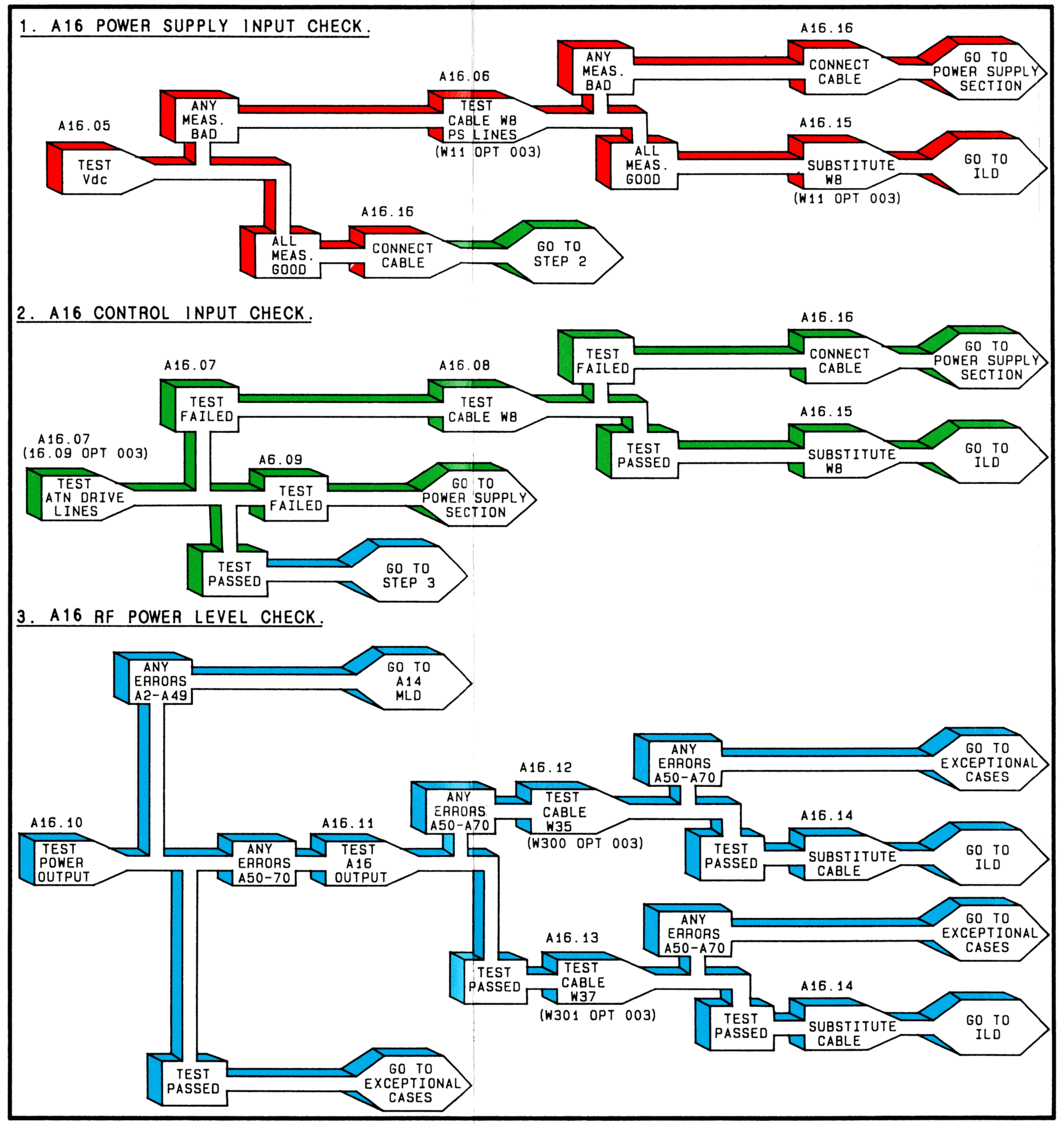
A16 MODULE SUBSTITUTION



A16 MODULE CABLE CONNECTION LOCATOR



A16 INPUTS VERIFICATION



A16 MODULE I/O SIGNALS DIAGRAM

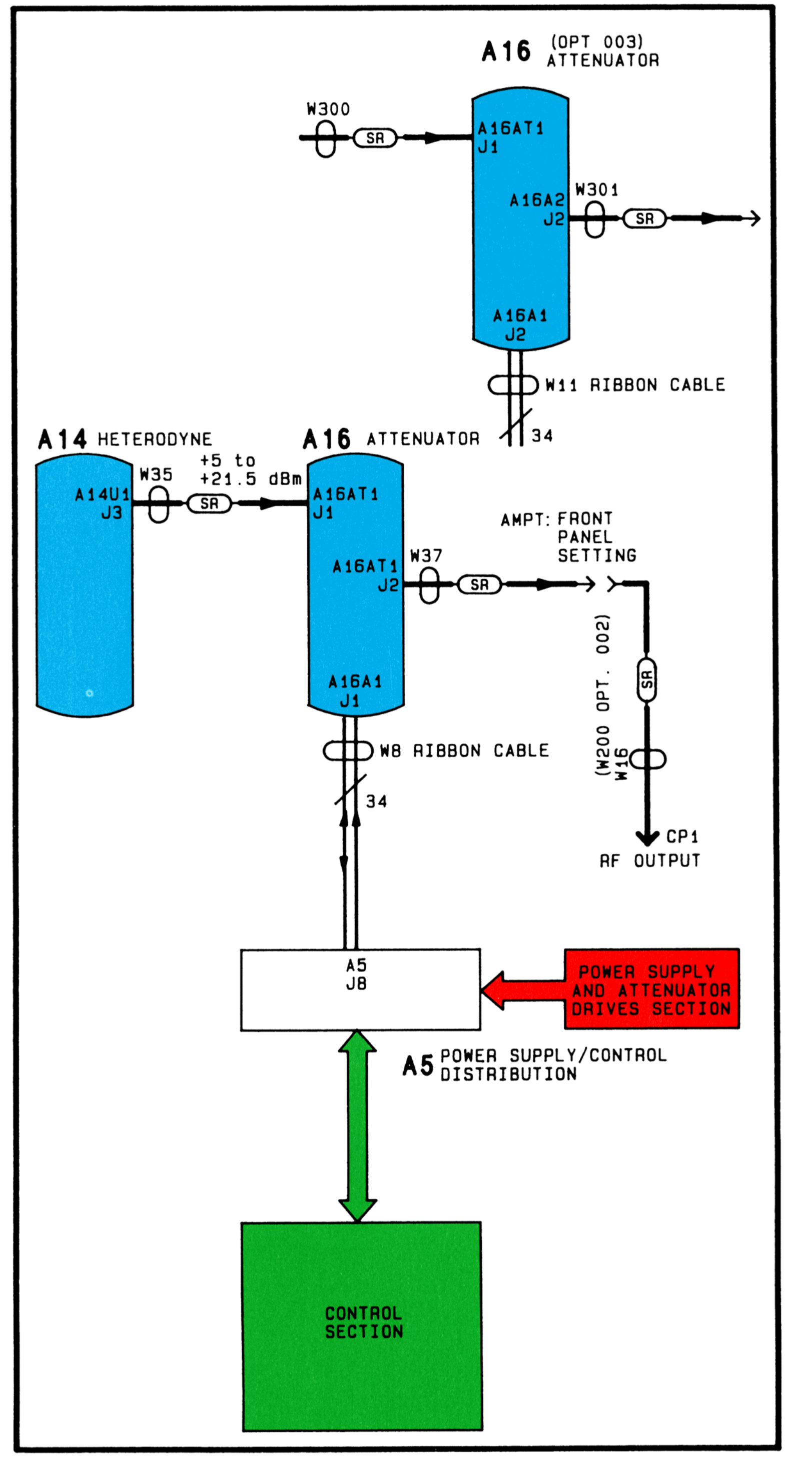


Figure 3M-100. A16 Attenuator Module Diagnostics.

3N-1. INTRODUCTION

The **MODULE LEVEL DIAGNOSTICS** (**MLD**) contained in this section are used to further interrogate the **A19 Module** (**HP 8642B only**). The objective is to isolate the failure indicated for this module to the module itself or to a part on which it depends for operation.

NOTE

At this level of testing, recommendations for further action are made on the assumption that the **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** *showed* **no** *failures for modules* **A01-A17**. *(For information on using the on-site diagnostics, refer to the* **INTRODUCTION** *section of this manual.)*

CAUTION

When tightening the coax cable connectors, do not exceed a torque of 1.0 Nm or .74 ft-lbs (slightly tighter than finger tight).

When coax cables are disconnected from instrument, do not allow loose ends to come in contact with any exposed circuitry susceptable to short circuiting.

Test Instructions

1. The instrument's **Top Cover** must be removed to run many of these tests. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate instructions.)

2. **The last page in this group of tests is a foldout and should be pulled out now.**

3. Turn to the next page to begin the **A19 MLD**.

3N-2. INTRODUCTION

NOTE

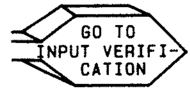
If a known good module is not available, proceed to the next page, **A19 INPUTS VERIFICATION**.

The **first step in isolating an A19 failure** is to substitute in a known good module from the On-site Service Kit.

A19 Substitution Instructions

1. Find **A19 MODULE SUBSTITUTION** on the foldout.
2. Use the Task Sequence Diagram, shown under **A19 MODULE SUBSTITUTION**, to direct you through the substitution process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
3. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
4. Begin now by performing the first task shown on the diagram.

A19.01



3N-3. INTRODUCTION

If a known good **A19 Module** is not available or, if you were not able to isolate the failure using the **A19 MODULE SUBSTITUTION** procedure, the Task Sequence Diagrams (shown under **A19 INPUTS VERIFICATION**) should be used to check each signal path into the **A19 Module**.

<u>A19 Inputs Verification Instructions</u>

1. Find **A19 INPUTS VERIFICATION** on the foldout.
2. The Task Sequence Diagrams, shown under **A19 INPUTS VERIFICATION**, are separated into three checks: **RF**, **Control** and **Power Supply** signals.
3. Use the Task Sequence Diagrams to direct you through the verification process. Each Task Arrow shown in a diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown under **1. POWER SUPPLY INPUT CHECK**.

NOTE

The **A19 MODULE I/O SIGNALS DIAGRAM** *shows all parts which the* **A19 Module** *depends on for operation.*

Type:	1; Loop Lock/Unlock	**A19.02**
Run time:	40 sec.	
Set-up time:	0	

Run Test

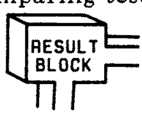
1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [5] [8] [HZ].

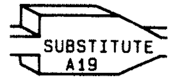
3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A19**.

COMMENT

If any error codes are displayed for modules A01-A17 you need to isolate those failure(s) before performing the A19 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **TEST A19 MODULE**.

Type:	Module Substitution	**A19.03**
Run time:	0	
Set-up time:	7 min.	



Connect Substitute Module

1. Switch instrument to **Standby**.
2. Remove **A19 Module** and install substitute module (refer to table on foldout in **MECHANICAL PRECEDURES** to locate removal and replacement information).
3. Turn instrument on.
4. Return to foldout.

Type:	Substitute Module Test	**A19.04**
Run time:	40 sec.	
Set-up time:	0	

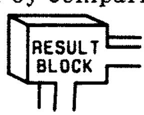
Test operation of **substitute A19 Module** by repeating test performed on A19 Module before substitution.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [5] [8] [HZ].

3. When "**DIAG DONE HIT MSSG .V1**" appears:
   - Use [MSSG] to scroll through messages.
   - Record error code(s) displayed for **A19**. If "**TEST 1 OF A19 (PASSED or FAILED)**" is not displayed, rerun test.

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A19**.

Type:	Additional A19 Tests	**A19.05**
Run time:	Conditional	
Set-up time:	Conditional	

The **A19** failure conditions for arriving at this task are described below. Follow the procedure for the **condition** which fits your module.

Condition 1: **Instrument Level Self Test** indicated **A19** failure.

Condition 2: Instrument has a power level failure and **A14 Module RF Power Level Test** indicated power level good out of **A14**.

Condition 3: Instrument must be set to a **specific operating condition** to detect **A19** failure.

<u>**Condition 1**</u>

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue test.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A19** error codes.

COMMENT

If any error codes are displayed for modules A01-A17, you need to isolate those failure(s) before performing the A19 MODULE SUBSTITUTION. (Refer to INSTRUMENT LEVEL DIAGNOSTICS to determine correct order for troubleshooting modules.)

5. Return to foldout.

Condition 2

NOTE

If an external power measuring instrument is available, use it to make power measurements.

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. Connect Power Meter (**PM**):
   - Connect Yellow **PM** cable and adapters to instrument's **RF Output** port **CP1**.

3. To use Internal Power Meter:
   - [SHIFT] [SPCL] [2] [4] [HZ]
   - [4] [HZ] to repeat measurement.
   - Key sequence must be repeated for each amplitude or frequency setting change.

NOTE

Internal Power Meter should read within **+-3** *dB of amplitude setting. The internal power meter cannot measure power levels less than* **-10 dBm**.

4. Measure power level:
   - Set instrument's frequency to **2 GHz**.
   - Measure power at amplitude settings of **+10, +5, 0** and **-5 dBm.**
   - Repeat measurement tor same amplitude settings at **990** and **4 MHz**.
   - Supplement these measurements with additional readings at other instrument settings if desired.

5. Record test results.

6. Return to foldout.

Condition 3

1. Set instrument to operating condition which causes **A19 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout.

Type:	Additional Substitute A19 Tests	**A19.06**
Run time:	Conditional	
Set-up time:	Conditional	

Test operation of **substitute A19 Module** by repeating test(s) performed on A19 Module before substitution.

Condition 1: **Instrument Level Self Test** indicated **A19** failure.

Condition 2: Instrument has a power level failure and **A14 Module RF Power Level Test** indicated power level good out of **A14**.

Condition 3: Instrument must be **set to a specific operating condition** to detect **A19** failure.

Condition 1

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

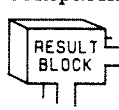
2. [SHIFT] [SPCL] [3] [3] [0] [HZ].

3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**" (see **INSTRUMENT LEVEL DIAGNOSTICS** foldout for set-up diagram).
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - [HZ] to continue test.

4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use [MSSG] to scroll through messages.
   - Record **A19** error codes.

COMMENT

If any error codes are displayed for modules A01-A17, you need to isolate those failure(s) now.

5. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST SUB A19 FURTHER**.

Condition 2

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. Connect Power Meter:
   - Connect Yellow **PM** cable and adapters to instrument's **RF Output** port **CP1**.

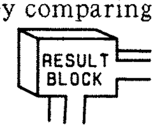
3. To use Internal Power Meter:
   - [SHIFT] [SPCL] [2] [4] [HZ]
   - [4] [HZ] to repeat measurement.
   - Key sequence must be repeated for each amplitude or frequency setting change.

NOTE

Internal Power Meter should read within **+-3 dB** *of amplitude setting. The internal power meter cannot measure power levels less than* **-10 dBm**.

4. Measure power level:
   - Set instrument's frequency to **2 GHz**.
   - Measure power at amplitude settings of **+10**, **+5**, **0** and **-5 dBm**.
   - Repeat measurements for same amplitude settings at **990** and **4 MHz**.
   - Supplement these measurements with additional readings at other instrument settings if desired.

5. Record test results.

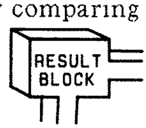
6. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A19 FURTHER**.

Condition 3

1. Set instrument to operating condition which causes **A19 failure**.

2. Record instrument set-up and error message(s).

3. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST SUB A19 FURTHER**.

Type: Module Substitution
Run time: 0
Set-up time: 7 min.

A19.07

Connect Module

1. Switch instrument to **Standby**.
2. Remove substitute **A19 Module** and replace instrument's **A19 Module**.
3. Return **substitute** A19 Module to On-Site Service Kit.
4. Return to foldout.

Type:	4, Voltage Measurements	**A19.08**
Run time:	2 min.	
Set-up time:	2 min.	

Internal Voltmeter (**VM**) is used to check power supply levels at inputs to **A19 Module**.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect **W11** from **A19** at **A19A1 J2**.
   - Plug end of **W11** <u>into</u> **34 pin** test connector, from On-Site Service Kit.

NOTE

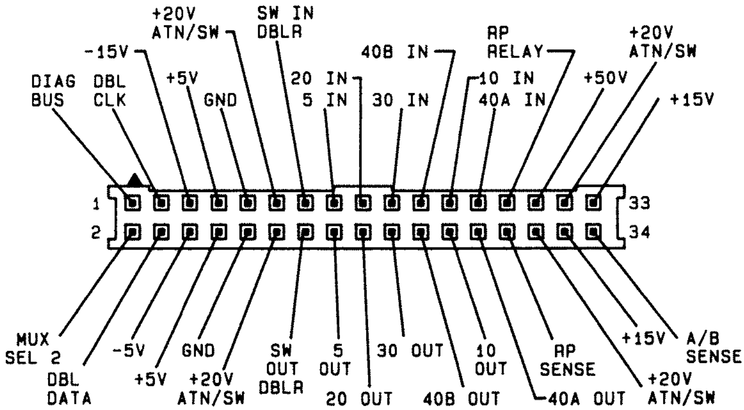
Find arrowhead on test connector and align with arrowhead on cable plug **W11P2**.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A19 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

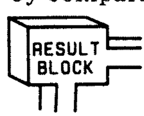
3. Turn instrument on and enter:
   SHIFT SPCL 3 2 5 HZ
   (To enable Internal Voltmeter.)

4. Measure voltage levels:
   - Connect **VM** probe to test connector pin for each power supply line including **+20V ATN/SW** lines. (See **Figure 3N-1. Cable Plug W11P2 Signal Locator**).
   - [5] [HZ] (To make each voltage measurement.)

Figure 3N-1. Cable Plug W11P2 Signal Locator

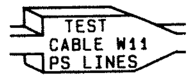


5. Record test results.

6. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST Vdc**.

Type:	4, Voltage Measurements	**A19.09**
Run time:	2 min.	
Set-up time:	3 min.	



Internal Voltmeter (**VM**) is used to check power supply levels at **A5J2**.

<u>Run Test</u>

1. Switch instrument to **Standby**.

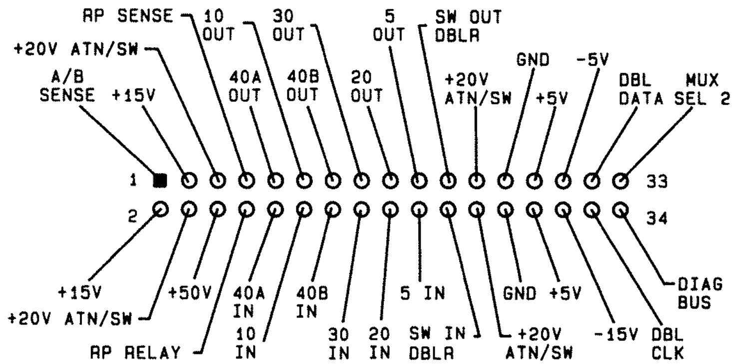
2. Extend **A19 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W11** from **A5 Assembly** at **A5J8**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A19 Module** extension and **A5** cable disconnection information.)
   - After cable **W11** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A19 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

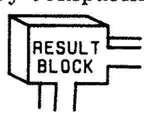
4. Turn instrument on and enter:
   [SHIFT] [SPCL] [3] [2] [5] [HZ]
   (To enable Internal Voltmeter.)

5. Measure voltage levels at **A5J8**:
   - Access signals from solder-side of **A5J8**. (See **Figure 3N-2. A5J8 Signal Locator**.)
   - [5] [HZ] (To make each voltage measurement.)

Figure 3N-2. A5J8 Signal Locator
(Solder-Side View)



6. Record test results.

7. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST CABLE W11 PS LINES**.

Type:	3; Driver Transmission	**A19.10**
Run time:	1 min.	
Set-up time:	0	

Attenuator drive lines are checked by separately selecting relays and listening for attenuator pads to **click** in and out.

NOTE

Instrument's **Top Cover** *should be removed to perform this test.*

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. Set instrument to zero attenuation:
   - [AMPTD] [1] [0] [DBM]

3. Check relay drivers:
   - Select **Amplitude Setting** for **Attenuator Relay** to be tested (from **Table 3N-1. A19 Attenuator Relay Selection**) and listen for pad to **click** in.
   - Select [1] [0] [DBM] and listen for attenuator pad to **click** out.
   - Repeat process for each relay listed in **Table 3N-1.**

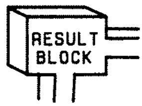
Table 3N-1. Attenuator Relay Selection

Test Order	Amplitude Setting	Attenuator Relay
1	[0] [DBM]	5 dB pad
2	[-] [5] [DBM]	10 dB pad
3	[-] [1] [5] [DBM]	20 dB pad
4	[-] [2] [5] [DBM]	30 dB pad

NOTE

This procedure does not check the two **40 dB** *relay drivers. They can be checked using an external power measuring device connected at the output of A19. Check power out at settings of -60.1 dBm to -100 dBm (40 dB pad A) and -100.1 to -140 dBm (40 dB pad B).*

4. Record test results.

5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **TEST ATN DRIVE LINES.**

Type: 3; Bit Transmission
Run time: 3 min.
Set-up time: 2 min.

A19.11

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A19 Module** on Clock and Data control Lines.

Run Test

1. Switch instrument to **Standby**:
   - Disconnect cable **W11** from module at **A19A1 J2**.
   - Plug end of **W11** into **34 pin** test connector, from On-Site Service Kit.

NOTE

Find arrowhead on test connector and align with arrowhead on cable plug **W11P2**.

CAUTION

To prevent damage to the Power Supply and Control sections, do not permit the exposed pins on the test connector to short circuit.

2. Connect **VM** probe:
   - Connect red alligator clip and retractable hook probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A19 MODULE CABLE CONNECTION LOCATOR** on fold-out for **VM IN** location.)

3. Turn instrument on.
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

Clock Line

Check High State

4. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify high state.)

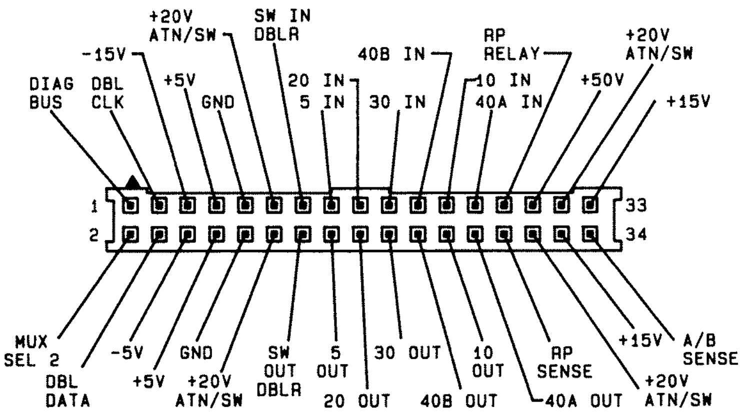
NOTE

*A "***0***" will appear in display indicating that the data bit will be set low. However, the bit is* **inverted** *in the Control Section before it is sent to A19.*

5. [2] [4] [HZ]
(To select bit.)

6. Connect **VM** probe to test connector line **DBL CLK** (pin **32**). (See **Figure 3N-1. Cable Plug W11P2 Signal Locator**.)

Figure 3N-3. Cable Plug W11P2 Signal Locator



7. [2] [5] [HZ]
(To enable voltmeter.)

8. Voltage should read approximately **+2.5** to **+5.5 Vdc**. ([5] [HZ] to repeat measurement.)

Check Low State

9. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

NOTE

*A "**1**" will appear in display indicating that the data bit will be set high. However, the bit is* **inverted** *in the Control Section before it is sent to A19.*

10. [2] [4] [HZ]
(To select bit.)

11. [2] [5] [HZ]
(To enable voltmeter.)

12. Voltage should read approximately **-0.5 to +1.5 Vdc**. ([5] [HZ] to repeat measurement.)

Data Line

Check High State

13. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

14. [2] [5] [HZ]
(To select bit.)

15. Connect **VM** probe to test connector line **DBL DATA** (pin **31**). (**See Figure 3N-3. Cable Plug W11P2 Signal Locator.**)

16. [2] [5] [HZ]
(To enable voltmeter.)

17. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
([5] [HZ] to repeat measurement.)

Check Low State

18. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

19. [2] [5] [HZ]
(To select bit.)

20. [2] [5] [HZ]
(To enable voltmeter.)

21. Voltage should read approximately **−0.5 to +1.5 Vdc.**
([5] [HZ] to repeat measurement.)

Multiplexer Select Line

Check High State

22. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

23. [8] [HZ]
(To select bit.)

24. Connect **VM** probe to test connector line **MUX SEL 2** (pin **33**). (**See Figure 3N-3. Cable Plug W11P2 Signal Locator.**)

25. [2] [5] [HZ]
(To enable voltmeter.)

26. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

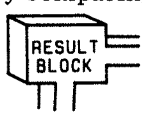
27. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

28. [8] [HZ]
(To select bit.)

29. [2] [5] [HZ]
(To enable voltmeter.)

30. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

31. Record test results.

32. Return to foldout:
    - Determine next task by comparing test results to conditions shown in each 

 for **TEST CONTROL BITS**.

Type:	3; Bit Transmission	**A19.12**
Run time:	3 min.	
Set-up time:	3 min.	

Internal Voltmeter (**VM**) is used to measure TTL level changes transmitted to **A19 Module** on SAWR oscillator select lines **A** and **B**.

Run Test

1. Switch instrument to **Standby**.

2. Extend **A19 Module** on extender posts, from On-Site Service Kit, to disconnect cable **W11** from **A5 Assembly** at **A5J8**. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate **A19 Module** extension and **A5** cable disconnection information.)
   - After cable **W11** has been disconnected from **A5**, lower module back into instrument.

3. Connect **VM** probe:
   - Connect red alligator clip and **pointed tip** probe to red test lead provided in On-Site Service Kit.
   - Connect alligator clip to **VM IN (A4TP1)**. (See **A19 MODULE CABLE CONNECTION LOCATOR** on foldout for **VM IN** location.)

4. Turn instrument on.

Clock Line

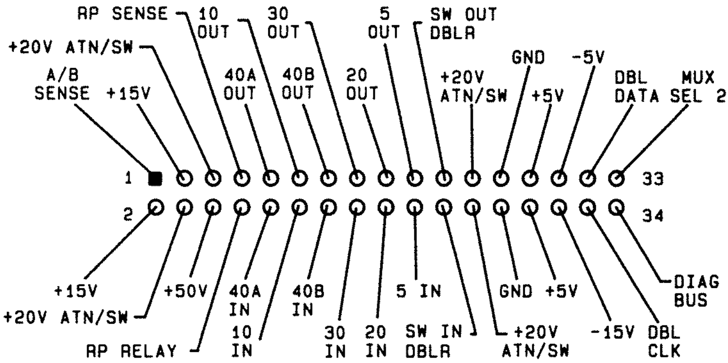
Check High State

5. [SHIFT] [SPCL] [3] [6] [0] [2]
   (To specify high state.)

6. [2] [4] [HZ]
   (To select bit.)

7. Connect **VM** probe to solder-side of **A5J8** line **DBL CLK** (pin **32**). (See **Figure 3N-4. A5J8 Signal Locator.**)

Figure 3N-4. A5J8 Signal Locator
(Solder-Side View)



8. [2] [5] [HZ]
(To enable voltmeter.)

9. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

10. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

11. [2] [4] [HZ]
(To select bit.)

12. [2] [5] [HZ]
(To enable voltmeter.)

13. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

<u>**Data Line**</u>

Check High State

14. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify high state.)

15. [2] [5] [HZ]
(To select bit.)

16. Connect **VM** probe to solder-side of A5J8 line **DBL DATA** (pin **31**). (**See Figure 3N-4. A5J8 Signal Locator**.)

17. [2] [5] [HZ]
(To enable voltmeter.)

18. Voltage should read approximately **+2.5** to **+5.5 Vdc**.
([5] [HZ] to repeat measurement.)

Check Low State

19. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify low state.)

20. [2] [5] [HZ]
(To select bit.)

21. [2] [5] [HZ]
(To enable voltmeter.)

22. Voltage should read approximately **-0.5** to **+1.5 Vdc**.
([5] [HZ] to repeat measurement.)

Multiplexer Select Line

Check High State

23. [SHIFT] [SPCL] [3] [6] [0] [1]
(To specify high state.)

24. [8] [HZ]
(To select bit.)

25. Connect **VM** probe to solder-side of **A5J8** line **MUX SEL 2** (pin **33**). (**See Figure 3N-4. A5J8 Signal Locator.**)

26. [2] [5] [HZ]
(To enable voltmeter.)

27. Voltage should read approximately **+2.5** to **+5.5 Vdc.**
([5] [HZ] to repeat measurement.)

Check Low State

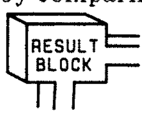
28. [SHIFT] [SPCL] [3] [6] [0] [2]
(To specify low state.)

29. [8] [HZ]
(To select bit.)

30. [2] [5] [HZ]
(To enable voltmeter.)

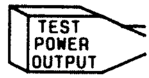
31. Voltage should read approximately **-0.5 to +1.5 Vdc.**
([5] [HZ] to repeat measurement.)

32. Record test results.

33. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W11 CTL LINES.**

Type:	RF Power	**A19.13**
Run Time:	4 min.	
Set-up Time:	3 min.	



Internal Power Meter (PM) is used to test output power levels.

NOTE

If an external power measuring instrument is available, use it to make power measurements.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. Connect Power Meter:
   - Connect Yellow **PM** cable and adapters to instrument's **RF Output** port **CP1**.

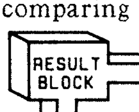
3. To use Internal Power Meter:
   - [SHIFT] [SPCL] [2] [4] [HZ]
   - [4] [HZ] to repeat measurement.
   - Key sequence must be repeated for each amplitude or frequency setting change.

NOTE

Internal Power Meter should read within **+-3 dB** *of amplitude setting. The internal power meter cannot measure power levels less than* **-10 dBm**.

4. Measure power level:
   - Set instrument's frequency to **2 GHz**.
   - Measure power at amplitude settings of **+10**, **+5**, **0** and **-5 dBm.**
   - Repeat measurements for same amplitude settings at **990** and **4 MHz**.
   - Supplement these measurements with additional readings at other instrument settings if desired.

5. Record test results.

6. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

for **TEST POWER OUTPUT**.

Type:	RF Power	**A19.14**
Run Time:	4 min.	
Set-up Time:	3 min.	

Internal Power Meter (PM) is used to test output power levels.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. Connect Power Meter:
   - Disconnect cable **W38** from **A19 Module** at **A19A2 J2**.
   - Connect power meter to module at **A19A2 J2**.

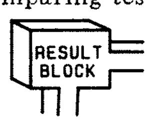
3. To use Internal Power Meter:
   - [SHIFT] [SPCL] [2] [4] [HZ]
   - [4] [HZ] to repeat measurement.
   - Key sequence must be repeated for each amplitude or frequency setting change.

NOTE

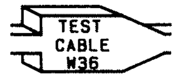
Internal Power Meter should read within **+-3 dB** *of amplitude setting. The internal power meter cannot measure power levels less than* **-10 dBm**.

4. Measure power level:
   - Set instrument's frequency to **2 GHz**.
   - Measure power at amplitude settings of **+10, +5, 0** and **-5 dBm.**
   - Repeat measurements for same amplitude settings at **990** and **4 MHz.**
   - Supplement these measurements with additional readings at other instrument settings if desired.

5. Record test results.

6. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST A19 OUTPUT.**

Type:	RF Power	A19.15
Run Time:	4 min.	
Set-up Time:	4 min.	



Internal Power Meter (PM) is used to test output power levels.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ -140.0DM**" appears,
   to override 20 second reset test.)

2. Connect Power Meter:
   - Disconnect cable **W38** from **A19 Module** at **A19A2 J2**.
   - Connect power meter to module at **A19A2 J2**.

3. To use Internal Power Meter:
   - [SHIFT] [SPCL] [2] [4] [HZ]
   - [4] [HZ] to repeat measurement.

NOTE

Internal Power Meter should read within **+-3 dB** *of amplitude setting. The internal power meter cannot measure power levels less than* **-10 dBm**.

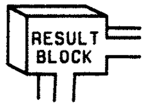
4. Measure power level:
   - Set instrument's frequency to **2 GHz**.
   - Measure power at amplitude settings of **+10**, **+5**, **0** and **-5 dBm**.
   - Repeat measurements for same amplitude settings at **990** and **4 MHz**.

5. Substitute cable **W36**:
   - Disconnect cable **W36** from **A14** and **A19** modules at **A14U1 J3** and **A19K1 J2**.
   - Connect flexible coax cable from On-Site Service Kit to modules at **A14U1 J3** and **A19K1 J2**.

6. Measure power level:
   - Repeat measurements made in step **4**.

7. Record test results.

8. If power level still fails, reconnect semi-rigid cable **W36** to **A14** and **A19** modules.

9. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each 

for **TEST CABLE W36**.

Type:	RF Power	**A19.16**
Run Time:	5 min.	
Set-up Time:	5 min.	

Internal Power Meter (PM) is used to test output power levels.

Run Test

1. [INSTR PRESET] [SHIFT]
   (Hold shift key until
   "**100.000000MZ   -140.0DM**" appears,
   to override 20 second reset test.)

2. Connect Power Meter:
   - Connect Yellow **PM** cable and adapters to instrument's **RF Output** port **CP1**.

3. Substitute cable **W38**:
   - Disconnect cable **W38** from **A19 Module** at **A19A2 J2** and from cable **W16** at **W16P2** (**W200** on **Option 002**, rear panel, instruments).
   - Connect flexible coax cable from On-Site Service Kit to **A19 Module** and cable **W16**.

4. To use Internal Power Meter:
   - [SHIFT] [SPCL] [2] [4] [HZ]
   - [4] [HZ] to repeat measurement.
   - Key sequence must be repeated for each amplitude or frequency setting change.

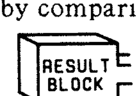
NOTE

Internal Power Meter should read within **+-3 dB** *of amplitude setting. The internal power meter cannot measure power levels less than* **-10 dBm**.

5. Measure power level:
   - Set instrument's frequency to **2 GHz**.
   - Measure power at amplitude settings of **+10, +5, 0** and **-5 dBm**.
   - Repeat measurements for same amplitude settings at **990** and **4 MHz**.

6. Record test results.

7. If power level still fails, reconnect semi-rigid cable **W38** to **A19 Module** and cable **W16** (**W200 Option 002** instruments).

8. Return to foldout.
   - Determine next task by comparing test results to conditions shown in each  for **TEST CABLE W38**.

Type: Cable Substitution
Run Time: 5 min.
Set-up Time: 1 min.

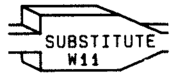
A19.17

1. Testing has shown cable **W36** or **W38** to be suspect, replace with a semi-rigid. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

2. Refer to **REPLACEABLE PARTS**, in HP 8642A/B Operating and Service Manual, for information to order a replacement cable.

3. Return to foldout.

Type:	Cable Substitution	**A19.18**
Run time:	0 min.	
Set-up time:	3 min.	



Testing has shown cable **W11** to be suspect, temporarily replace with a spare ribbon cable if available. Rerun **INSTRUMENT LEVEL DIAGNOSTICS (ILD)** to confirm repair.

Refer to **REPLACEABLE PARTS** in HP 8642A/B Operating and Service Manual for information to order a permanent replacement cable.

CAUTION

When connecting ribbon cable to A19 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

Reconnect W11

1. Switch instrument to **Standby** to connect cable **W11** to **A5** Assembly and **A19** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on connecting cable **W11** to **A5J8**.)

2. Return to foldout.

Type:	Cable Connection	**A19.19**
Run time:	0 min.	
Set-up time:	3 min.	

CAUTION

When connecting ribbon cable to A19 Module, find arrowhead on the cable plug and align with arrowhead on the board connector.

<u>Reconnect W11</u>

1. Switch instrument to **Standby** to reconnect cable **W11** to **A5** Assembly or **A19** Module. (Refer to table on foldout in **MECHANICAL PROCEDURES** for information on reconnecting cable **W11** to **A5J8**.)

2. Return to foldout.

3N-4. A19 DOUBLER MODULE

COMMENT

It is not to essential to understand the internal operation of a module to make an on-site repair.

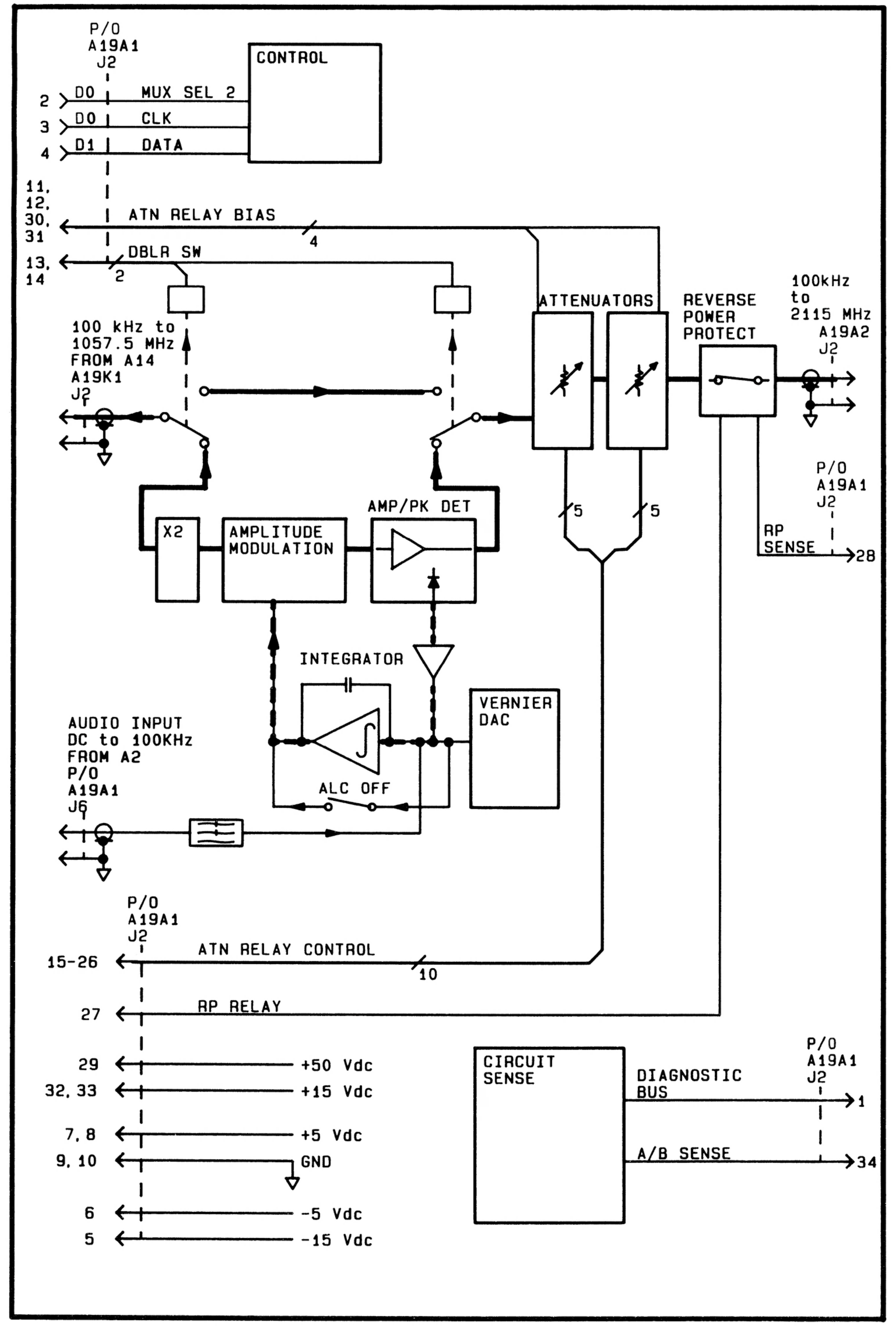
The **A19 Doubler Module** is included in the **HP 8642B** only. This module provides both frequency doubling and level attenuation for the RF output signal. Two attenuator assemblies connected in series provide level attenuation to **-140 dBm**. The second attenuator assembly includes reverse power protection circuitry for the **RF Output** port. The RF switch, attenuator and reverse power control signals are sent to the **A19 Module** from the **A17 Module** in the **Power Supply Section**.

The RF Signal from the **A14 Module** is switched between a through path (for output frequencies from **100 kHz** to **1057 MHz**) and a frequency doubler path. In the doubler frequency band (**1058** to **2115** MHz) the RF signal is amplitude modulated by the **A19 Module** using the audio signal sent from the **A2 Modulation Module**.

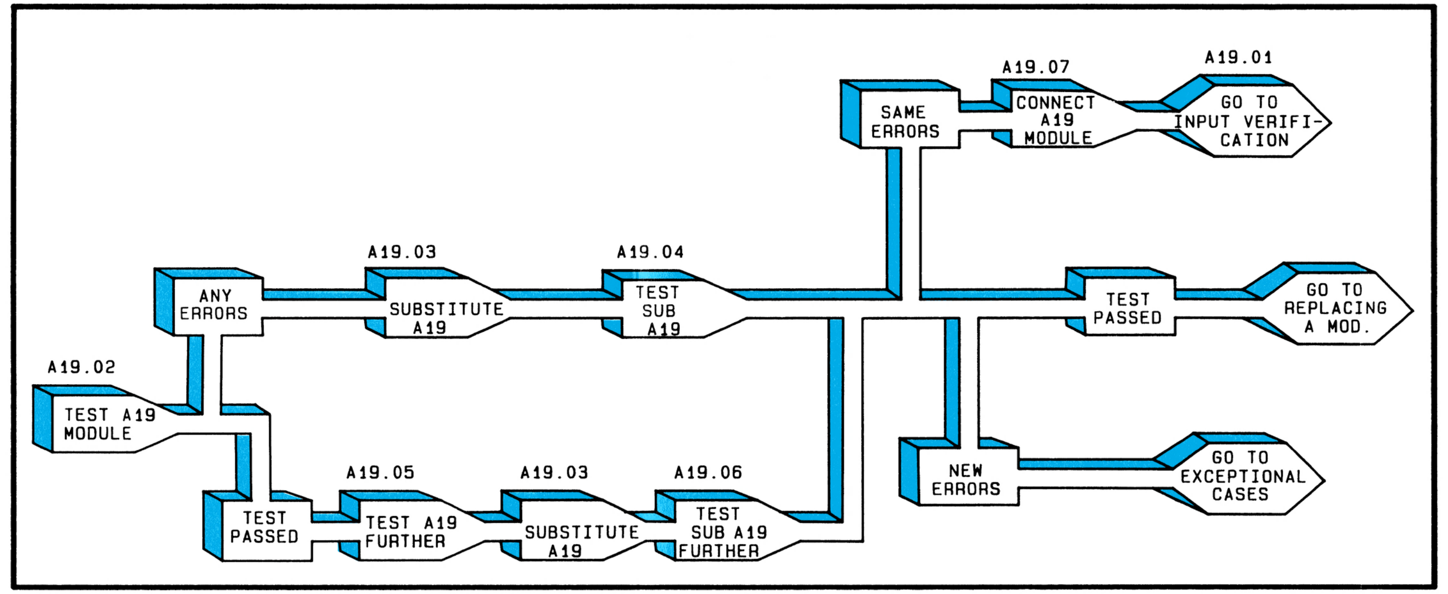
The RF output signal from the **A19 Module** is routed directly to the **HP 8642B's RF Output** port.

See the **A19 MODULE SIMPLIFIED BLOCK DIAGRAM** for further understanding of the **A19 Module's** internal operation.

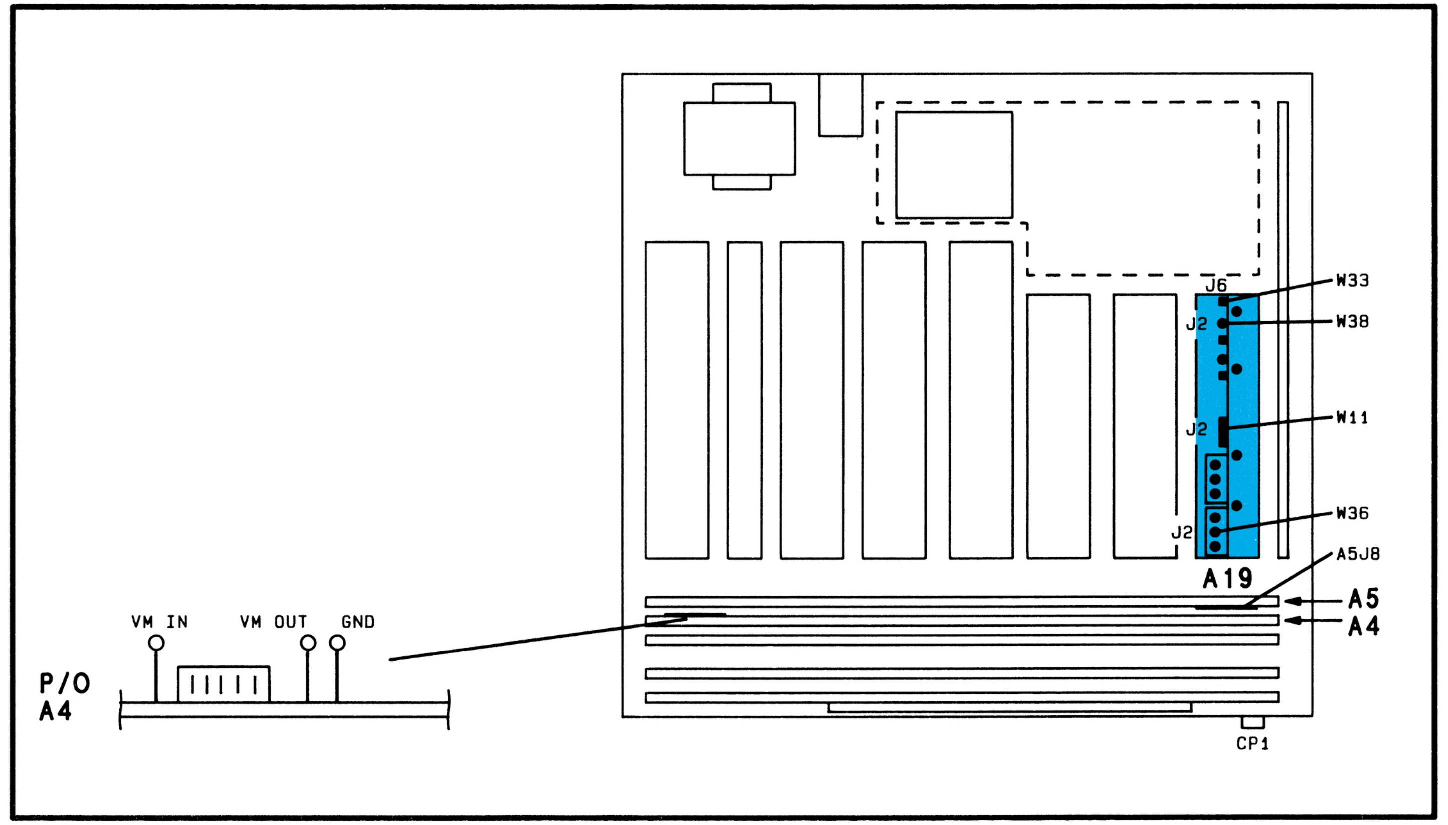
A19 MODULE SIMPLIFIED BLOCK DIAGRAM



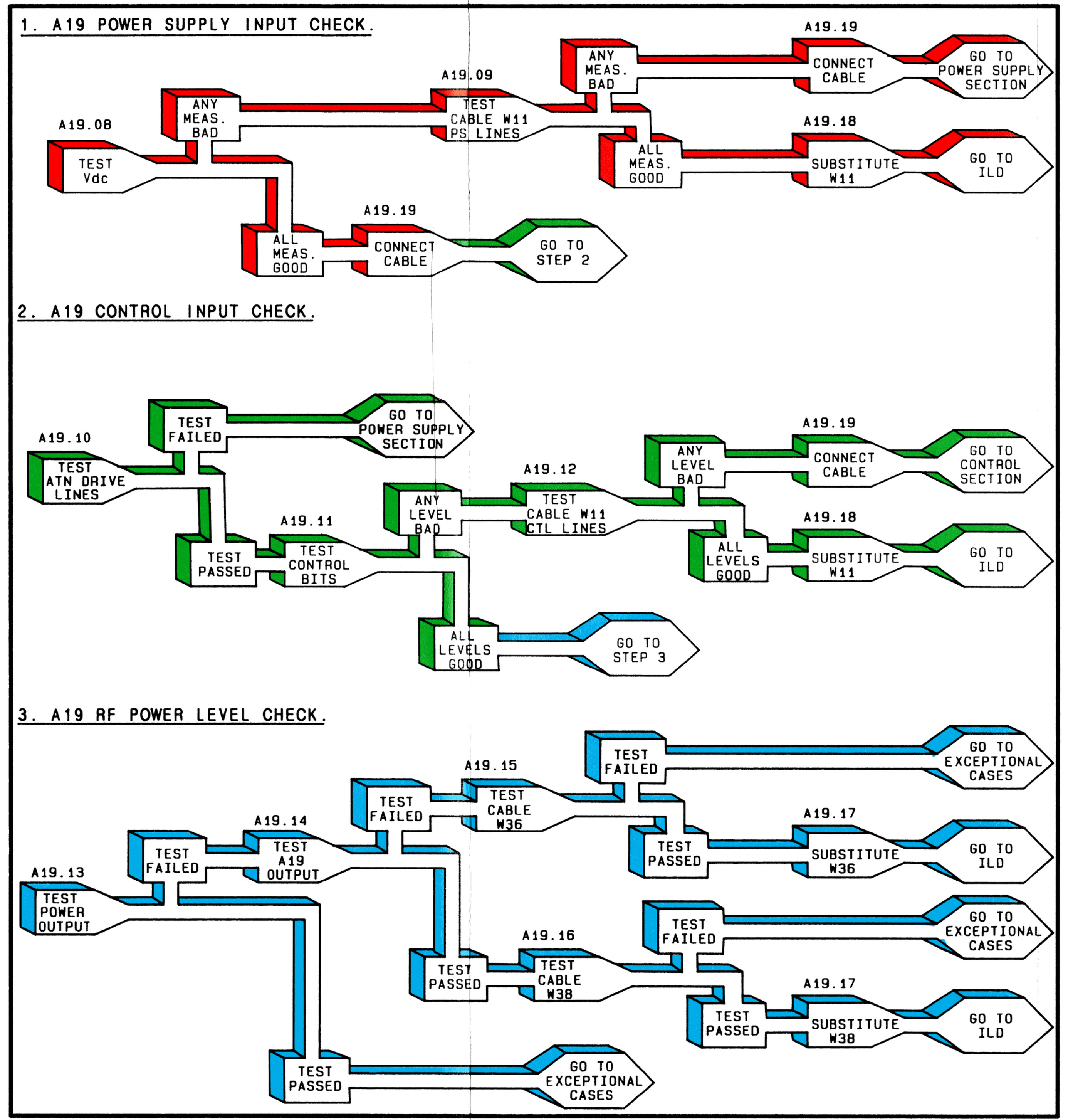
A19 MODULE SUBSTITUTION



A19 MODULE CABLE CONNECTION LOCATOR



A19 INPUTS VERIFICATION



A19 MODULE I/O SIGNALS DIAGRAM

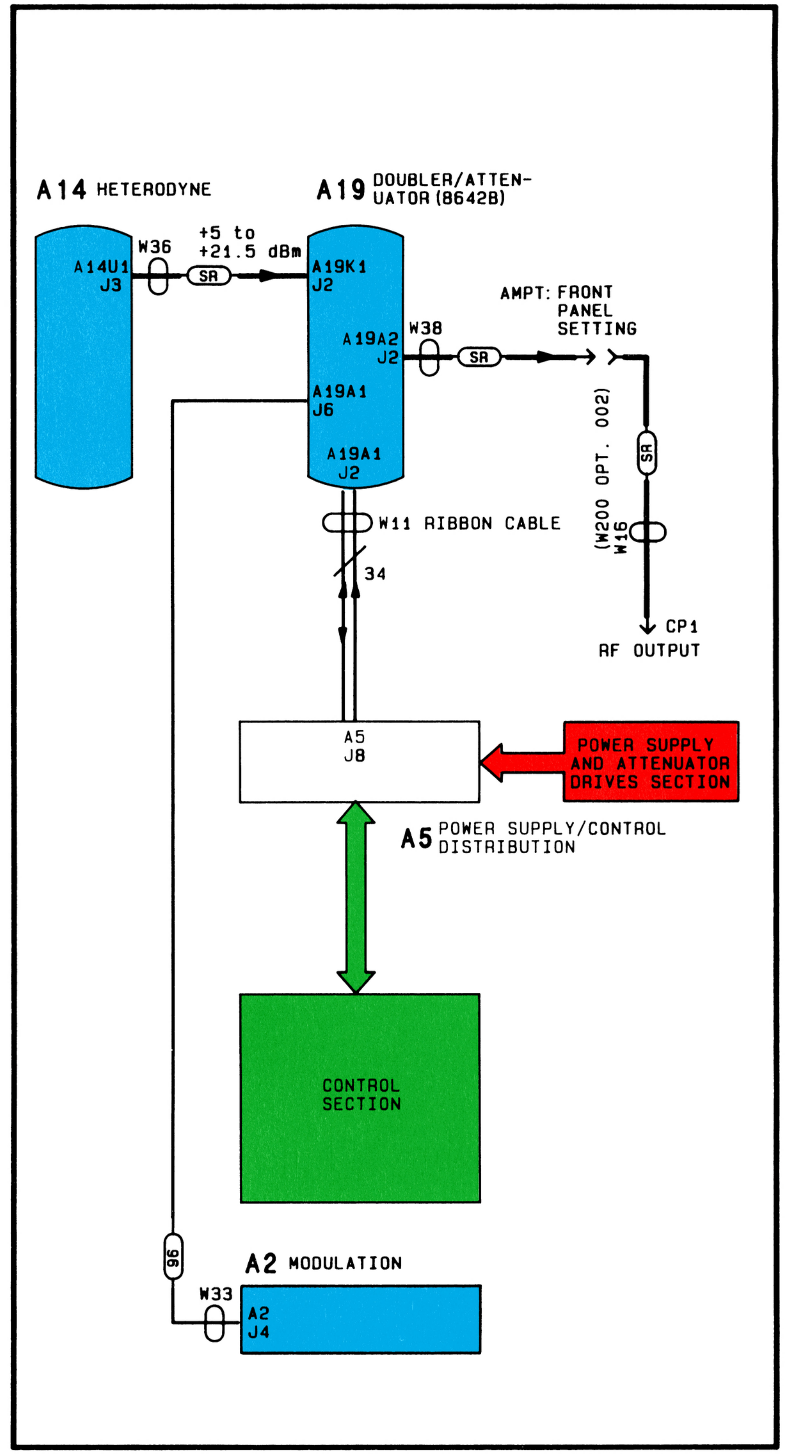


Figure 3N-100. A19 Doubler/Attenuator Module Diagnostics.

Exceptional Cases

3O-1. INTRODUCTION

This section contains suggestions for isolating HP 8642 failures which are beyond the 80% coverage provided by the troubleshooting techniques in the **Diagnostics** Section of this manual.

COMMENT

The material in this section places a higher reliance on the training and experience of the user. Certain suggestions and techniques presented in this section may seem vague to those without prior service training or experience on the HP 8642.

3O-2. EXCEPTIONAL CASE DESCRIPTIONS

To use this section, begin by identifying the **Exceptional Case Description** which best describes your circumstance. Then reference to the Troubleshooting Suggestions provided for that particular **Exceptional Case**.

Exceptional Case 1

You were directed here from the **DIAGNOSTICS** Section by a gotogon labelled,

(refer to paragraph **3O-4**).

Exceptional Case 2

You are here because of an output power level problem which is less than 10 dB out of specification or which occurs only at output amplitude settings of below -10 dBm (refer to paragraph **3O-5**).

Exceptional Case 3

Miscellaneous failure conditions not covered directly by the **DIAGNOSTICS** Section procedures (refer to paragraph **3O-6**).

3O-3. TROUBLESHOOTING SUGGESTIONS

Reference to the appropriate **Exceptional Case** to find the troubleshooting suggestions which apply to your circumstances.

3O-4. EXCEPTIONAL CASE 1

NOTE

Before proceding with any of the troubleshooting suggestions, check all cable connections on the suspect module. Verify that the connections are correct at both ends of each cable that connects to the suspect module. (Refer to the Top View diagram on the inside top cover of the instrument for cable connection information.)

Condition 1: Failure not isolated after performing module substitution and verifying all inputs.

Condition 2: Failure not isolated after verifying all inputs; however, a known good substitute module is not available.

Condition 3: The substitute module produced "new" failure data.

Condition 4: Miscellaneous failure conditions that are not covered by conditions 1, 2, or 3.

Condition 1: Troubleshooting

If you have an On-Site Service Kit, or access to a set of known good modules, the most efficient way to isolate a fault, under the present circumstances, is to systematically substitute the parts on which the suspect module depends for its operation.

COMMENTS

If you do not have access to known good modules, refer to the troubleshooting suggestions provided for Condition 2.

If you were directed here by the A2, A17, or A18 module diagnostics, proceed directly to step **3**.

1. Identify modules to be substituted:
   - Turn back to the diagnostics section for the suspect module and pull out the foldout.
   - Find the I/O Signals Diagram shown on the foldout. This diagram shows all RF modules which send their output signals directly to the suspect module. These are the modules you will be substituting.

2. Substitute RF Modules:
   - Repeat the Module Substitution procedure provided for the suspect module except this time when you are directed to substitute a known good module for the suspect module, substitute instead a known good module for one of the input modules shown on the **I/O Signals Diagram**.
   - Repeat procedure for each input module, or until failure is isolated. (If known good test cables are available, use them to connect substitute module into circuit.)

3. Substitute Control Modules:
   - If failure has not yet been isolated, go to the Control Section diagnostics and perform the Module Substitution procedures for the **A4** and **A3** modules.

COMMENTS

If you were sent to this section by the A14, A16, A16 (Option 003), or A19 diagnostics, substitute the A17 Module also.

If you were sent to this section by the A17.06 test for the A17 Module, substitute A16 (HP 8642A) or A19 Module (HP 8642B) also.

Condition 2: **Troubleshooting**

COMMENTS

Verification of all inputs to a module that either a.) the **Instrument Level Diagnostics** *has designated as the appropriate failing module to troubleshoot or b.) whose output signal was shown to be bad during testing for another module, provides an 80% probability that the failure is within that module. To increase the probability to 95%, perform the following steps.*

1. Recheck all **RF** inputs:
   - Using an external power measuring device, rather than the built-in Power Meter, recheck each RF input to the suspect module.

NOTE

RF Power levels are provided on the I/O Signals Diagram shown on the foldout for the suspect module.

2. Recheck control inputs:
   - Follow the control input check Task Sequence Diagram shown on the foldout for the suspect module; however, use an external voltmeter to make the test measurements.

3. Recheck power supply inputs:
   - Follow the power supply input check, Task Sequence Diagram shown on the foldout for the suspect module; however, use an external voltmeter to make the test measurements.

Condition 3: **Troubleshooting**

NOTE

If the test, that was run to check the substitute module, passed, and the "new errors" indicated failures for a module(s) other than the module under test, you have just isolated one of two (or more) failures present in the instrument. Proceed to the **REPLACING A MODULE** Section *and perform the replacement procedures for the module under test. (Then return to the* **Instrument Level Diagnostics** *section to begin isolating the remaining failures.)*

If the test that was run to check the substitute module, failed, perform the following steps.

1. Check cable connections:
   - Verify that all cables are correctly connected to the substitute module.

2. Check "known good" substitute module:
   - If possible, verify operation of substitute module by substituting it into another HP 8642.
   - If available, use a second known good module for the substitution procedure.

NOTE

There are no further troubleshooting suggestions for the **A1**, **A3**, **A4**, **A17** *or* **A18** *modules. (For component level troubleshooting information refer to the HP 8642's Operating and Service Manual.)*

3. Check for multiple failures:
   - If the inputs to the suspect module have not yet been checked, return to the **DIAGNOSTICS** Section and perform the inputs verification procedures for the suspect module.
   - If all inputs to the suspect module have been verified, refer to **EXCEPTIONAL CASE 1, Condition 2: Troubleshooting** for further troubleshooting suggestions.

Condition 4: **Troubleshooting**

Table 3O-1 provides troubleshooting information for Exceptional Case 1 failure conditions that are not covered by the troubleshooting suggestions provided for Conditions 1, 2, or 3.

Table 30-1. Troubleshooting Suggestions for Condition 4

Module	Test	Comment
A1	CTL.09	Disconnect W15 and recheck Vdc at W15 plug.
	CTL.11	Failure isolated to signal path (A5 or W15).
A2	A2.10	Failure isolated to W17, W18 or W19 (replacements not included in on-site kit.)
A3 and A4	CTL.03 CTL.07	Remove A3 and A4, verify that Vdc levels at A5 connectors are correct *before* substituting A3 or A4. (Refer to Table 3-5 on foldout for pin numbers.)
	CTL.11	Control line transmission problem; A5 possible cause.
A6	A6.02	If errors F4, F7 and F10 occur with no ext. ref. connected and A6 substitution indicated same errors, perform A4 substitution procedure in control section diagnostics.
	A6.12	Check power level and frequency accuracy of external reference signal.
	A6.13	If substitute A6 caused same errors, perform A4 substitution procedure provided in control section of this manual.
A16	A16.10	Instrument is unable to detect a power level problem. If a power level problem is suspected, use an external power measuring device to verify power levels.
	A16.13	Failure isolated to signal tranmission path; cable W16 (W200 Opt. 002).
A19	A19.17	Failure isolated to signal transmission path; W16 (W200 Opt. 002).
Power Supply	PS.02	Failure isolated to signal path; A5 possible cause.
	PS.06	Failure isolated to switch path, W15, A5 and W10. (These parts are not recommended for on-site replacement.)
	PS.08	Failure isolated to portion of power supply not considered on-site serviceable.
	PS.10	Failure isolated to signal path; A5 probable cause.

3O-5. EXCEPTIONAL CASE 2

To isolate a power level accuracy problem which is less than 10 dB out of specification or which occurs only at output amplitude settings of below -10 dBm, an external power measuring device is needed.

Pull out the foldout at the back of this section. Use the **RF Modules I/O Signals Diagram** as an aid in isolating the power failure. (To locate the cable connections on the modules, refer to the Top View diagram shown on the inside of the HP 8642's top cover.)

COMMENT

The output of the A13 Module is a good place to begin making power measurements if you use a half-split approach to fault isolation.

3O-6. EXCEPTIONAL CASE 3

Table 3O-2 provides troubleshooting suggestions for miscellaneous exceptional cases that are not covered by the information provided for Exceptional Cases 1 or 2.

Table 30-2. Exceptional Case 3 Troubleshooting Suggestions

Failure Condition	Troubleshooting Suggestions
Intermittent Failures	Intermittent failures can greatly reduce the HP 8642's ability to provide reliable test data; module substitution may be the best approach to isolating failures of this nature.*
Modulation Related	FM and AM both affected-substitute A2, then A4. FM only affected-substitute A6. AM or pulse only affected-substitute A13, then check input connection and cables. AM only in Doubler Band affected-substitute A19.
Spurs	Module substitution is highly recommended.* Try tracking the spur back to its source using external test equipment to test the output of each module. (Note that spurs are typically caused by unwanted angle modulation on the carrier signal. The offset frequency of the spur (from the carrier) is equal to the frequency of the unwanted modulation signal. Look for signal sources and mixes in the instrument that equal the spur's offset frequency.)

Table 30-2. Exceptional Case 3 Troubleshooting Suggestions (Cont'd)

Failure Condition	Troubleshooting Suggestions
Phase Noise	Module substitution is highly recommended.* Begin the isolation process by using external test equipment to check the A12 module's input and output signals. (Note that a frequency divider (such as in A12) reduces the carrier's phase noise component proportionally by the factor of the frequency division. e.g., ÷4 reduces noise level by 12 dB.)
Frequency Accuracy	Module substitution is highly recommended.* Check accuracy of output signals from modules; check timebase output from A6.
Sweep Output	Follow the substitution procedures for the A4 and A3 modules listed in the Control Section of this manual.
Store/Recall	Follow the substitution procedures listed in the Control Section of this manual for A3.
Front Panel Display/Keyboard	Follow the substitution procedure listed in the Control Section of this manual for A1.
Multiple Failures	Follow the troubleshooting procedures provided in the Diagnostics Section of this manual beginning with Instrument Level Diagnostics.
Failures Not Detected By Instrument	Module substitution is highly recommended. Use external test equipment to track failure as far as possible.* Substitute module of highest probable cause. If substitution does not isolate the failure, check each input signal to the suspect module. (For module substitution and input verification information, refer to the diagnostic section provided in this manual for the suspect module.)

*Refer to Table 30-3, on the foldout at the back of this section for information on additional techniques that may be helpful for troubleshooting this failure.

Table 30-3. Service Special Functions for Exceptional Cases

Service Special Functions can only be invoked when in the service mode of operation. To enter service mode select: **SHIFT SPCL 3**. Each key sequence must be terminated with the **Hz** key. (For example, to enter *Controller mode* and enable *Continuous Cycle* : **SHIFT SPCL 3 8 8 Hz 3 1 2 5 Hz.**)

Function Description	Key Sequence
Signal Measurements Makes measurements using built-in power and volt meters.	**2** 4 (Power measurement) **2** 5 (Voltage measurement)
Module By-pass Tests instrument's operation with a specified module by-passed out of signal path. (Setup information for each module by-pass is provided below module labels on foldout at back of this section.)	A7 Enter: **3 2 8** A9 Enter: **3 3 9** A11 Enter: **3 3 3** A12 Enter: **3 4 7** A13 Enter: **3 5 3**
Controller Mode Configures HP 8642 to act as a system controller. When connected to a printer, instrument will output the results of a selected diagnostic routine to the printer. (Refer to the HP-IB/REMOTE section for further information.)	**8 8** (**8 9** turns controller mode off)
Printer Address Specifies HP-IB address of a printer to be controlled by HP 8642; range 0–30. (01 is default address if not specified.)	**8 1** (Followed by Printer Address)
Continuous Cycle Continuously cycles through a specified diagnostic (switch to Standby to abort). HP 8642 must be connected to a printer and configured to *Controller mode* before Continuous cycle can be invoked. (See example shown in the box above this table.).	**3 1** **Instrument Level Self Test (330):** **0 0** **3 1** **All Other Diagnostic Routines:** Follow with the last two digits of the diagnostic routine's key sequence.
Stop on Error Stops diagnostic routine when a specified error occurs. (Instrument is left in operating condition in which error occurred.) This mode can be used in conjunction with Continuous cycle as a means of trapping intermittent failures.	**6 8 0** (Followed by Error Message Code) Error Message Code = Alpha Character Code + numeric value of message. Alpha Character Codes: A = 65000, B = 66000 ... K = 75000 ... R = 82000 ... For example, to stop on error .T07: enter **6 8 0 8 4 0 0 7**. **Hz** key continues test.

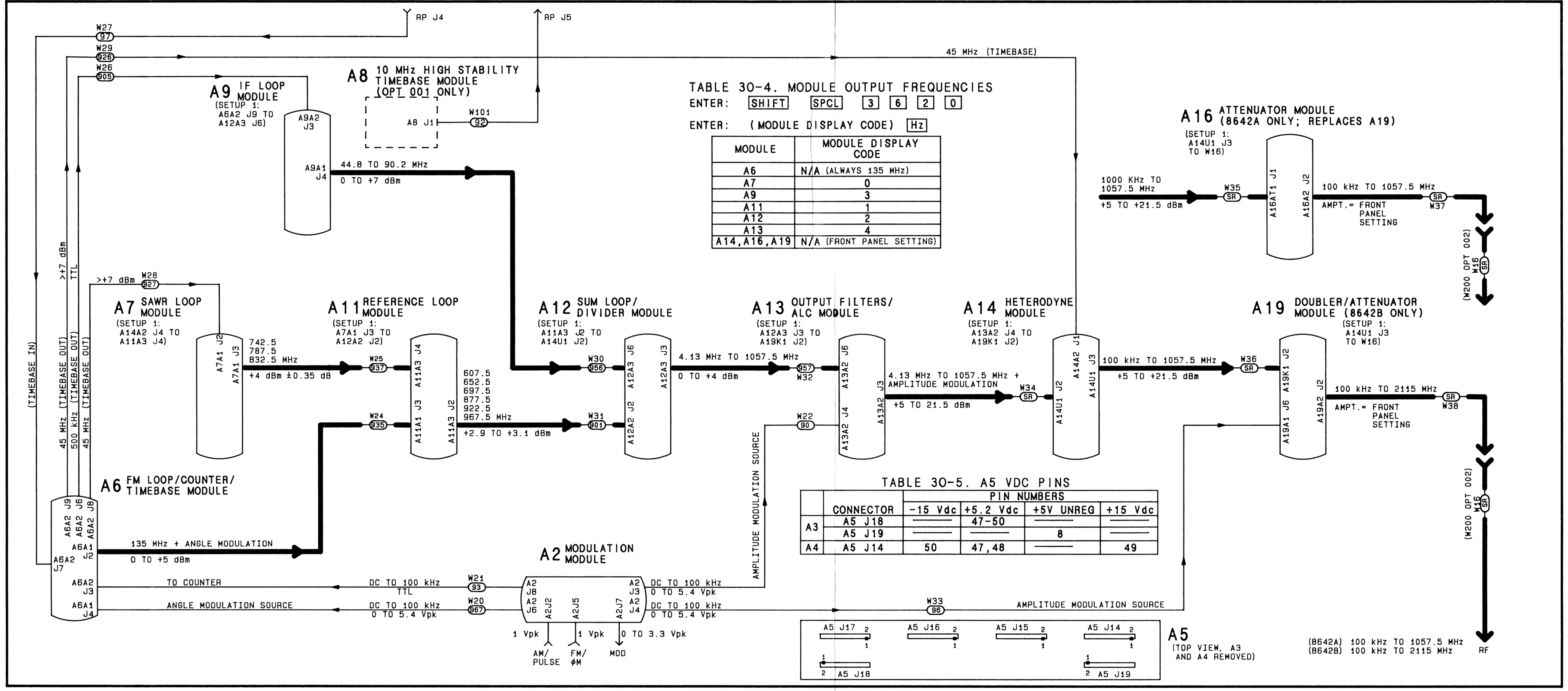


TABLE 30-4. MODULE OUTPUT FREQUENCIES

ENTER: SHIFT SPCL 3 6 2 0

ENTER: (MODULE DISPLAY CODE) Hz

MODULE	MODULE DISPLAY CODE
A6	N/A (ALWAYS 135 MHz)
A7	0
A9	3
A11	1
A12	2
A13	4
A14,A16,A19	N/A (FRONT PANEL SETTING)

TABLE 30-5. A5 VDC PINS

		PIN NUMBERS			
	CONNECTOR	-15 Vdc	+5.2 Vdc	+5V UNREG	+15 Vdc
A3	A5 J18	—	47-50	—	—
	A5 J19	—	—	8	—
A4	A5 J14	50	47,48	—	49

Figure 30-100. Exceptional Cases Troubleshooting Diagram.

Replacing a Module

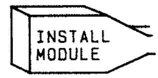
4-1. INTRODUCTION

This section contains information for performing a module replacement on-site. Module replacement is the last step in the on-site repair process and should only be performed after the replacement module has been tested using the **module substitution** techniques described in **Module Level Diagnostics** (refer to the section tabbed for the module your are replacing to find the **module substitution** procedure). For further information on using the on-site diagnostics, refer to the **INTRODUCTION** section of the manual.

Replacment Instructions

1. **The last page in this section is a foldout and should be pulled out now.**
2. Find **MODULE REPLACEMENT** on the foldout.
3. Use the Task Sequence Diagram, shown under **MODULE REPLACEMENT** to direct you through the testing process. Each Task Arrow shown in the diagram indicates a task title and task number. The tasks are numbered according to the order in which they are arranged in this section. Turn to the task indicated and complete the procedure.
4. After completing the procedure, return to the Task Sequence Diagram on the foldout and determine the next task to be performed.
5. Begin now by performing the first task shown on the diagram, **RM.01**.

Type:	Mechanical Procedure	**RM.01**
Run Time:	N/A	
Set-up Time:	Refer to Section V	



NOTE

If you are replacing module **A3, A4, A14, A16, A17, A18,** *or* **A19***, and have performed the module substitution test, the module should already be installed in instrument. Check that cable connections and module retaining clips are secure and return to foldout.*

1. Replace module:
   - **MECHANICAL PROCEDURES** section provides replacement procedures for all on-site replaceable modules. Refer to table on foldout in **MECHANICAL PROCEDURES** to locate module replacement information.

2. Reconnect Cables:
   - Connect cable to replacement module (see **INSTRUMENT WIRING DIAGRAM** on foldout for cable connection and routing information).

3. Return to foldout.

Type: Cal Data Transfer
Run Time: 2 min.
Set-up Time: 4 min.

RM.02

NOTE

The following modules do not require Calibration Data: **A1**, **A4**, **A7**, **A8**, **A9**, **A17**, *and* **A18**. *If you are replacing one of these modules, this procedure does not apply; return to foldout now.*

Set-Up Cal Board

1. Remove **A20 Calibration Module**, provided with replacement module, from On-Site Service Kit.

2. Switch [POWER] to **Standby** and connect **Cal Board** to **A3 Module** at **A3J3**. (See **INSTRUMENT WIRING DIAGRAM** on foldout for **A3J3** location.)

3. Switch instrument **ON**.

NOTE

If you are replacing module **A3**, **A11**, *or* **A12** *and performed a* **Calibration Data Down-Load** *as part of the substitution procedure, proceed directly to* **Up-Load Cal Data**, *following step* **7**, *of this procedure.*

Down-Load Cal Data

COMMENT

This portion of the procedure down-loads the calibration data for the replacement module into the instrument. This data replaces the cal data for the defective module.

Sliding switch **A3S2** *to its rear position* **unprotects** *the HP 8642 EEPROMs. To prevent any damage to the instrument's memory, carefully perform the steps in this procedure in the order which they are given.*

COMMENT

If you get off track, immediately return **A3S2** *to its* **protect** *position, switch the instrument to* **Standby** *then back* **ON**, *and begin again at step* **4**.

4. When "**100.000000MZ -140.0DM** appears:
   - Slide A3S2 back toward rear of instrument. (See **INSTRUMENT WIRING DIAGRAM** on foldout to locate A3S2.)

NOTE

If your are replacing the **A19 Module**, *you need to perform steps* **5** *and* **6** *three times; one time for each of the three separate Cal Data Select Key sequences shown for* **A19**.

5. [SHIFT] [SPCL] [3] [7] [3]

6. Enter **Cal Data Select Keys**, shown on foldout in **CAL DATA TRANSFER TABLE**, for module being replaced.

7. When "**TRANSFER VERIFIED .U613**" appears:
   - Slide **A3S2** toward front of instrument to **protect** instrument's memory.

<u>Up-Load Cal Data</u>

This portion of the procedure creates a **new backup A20 Calibration Module** for the instrument by up-loading all of the instrument's current Cal Data onto the replacement **A20 Module**.

CAUTION

Moving switch **A20S1** *on the* **A20 Module** *down to its* **CHANGE** *position unprotects the A20 EEPROMs. To prevent any damage to the A20 EEPROMs, carefully perform the steps in this procedure in the order which they are given.*

COMMENT

If you get off track, immediately return **A20S1** *to its* **PROTECTED** *position, switch the instrument to* **Standby** *then back* **ON**, *and begin again at step* **8**.

8. Move **A20S1** down to its **CHANGE** position.

9. [SHIFT] [SPCL] [3] [7] [4] [HZ]
   (To up-load entire instrument's cal data)

10. When "**08 SECTIONS STORED .U610**" (HP 8642A) or "**10 SECTIONS STORED .U610**" (HP 8642B) appears:
    - Move **A20S1** up to its **PROTECTED** position.
    - [HZ] to end routine.
11. Switch [POWER] to **Standby**.
12. Remove old back-up **CALIBRATION MODULE A20** from Rear Panel of instrument. (Refer to table on foldout in **MECHANICAL PROCEDURES** to locate removal instructions.)
13. **Put A20 Module** from rear of instrument in On-Site Service Kit with defective module. (Place red defective marker in slot with module.)
14. Remove **new** back-up **A20 Module** from **A3J3** and store in back of instrument. (Refer to **MECHANICAL PROCEDURES** for **A20** replacement instructions.)
15. Return to foldout.

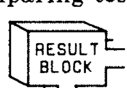
Type:	Instrument Level Self Test	**RM.03** 
Run Time:	3 min 30 sec	
Set-up Time:	1 min	

Over-all operation of module and instrument is tested by running the **Instrument Level Self Test (ILST)**.

NOTE

If the **ILST** *did not detect the failure when run as part of* **Instrument Level Diagnostics**, *repeat the test(s) which did indicate a failing condition.*

Run ILST

1. INSTR PRESET SHIFT
   (Hold shift key until "**100.000000MZ -140.0DM**" appears, to override 20 second reset test.
2. SHIFT SPCL 3 3 0 HZ.
3. When "**WAITING FOR SET-UP 1 .V24**" appears:
   - Connect BNC Tee connector, from On-Site Service Kit, to "**FM/ΦM INPUT**". (See foldout in **INSTRUMENT LEVEL DIAGNOSTICS** section for set-up diagram.)
   - Connect a coax cable from Tee connector to "**MOD OUTPUT**".
   - Connect a coax cable from Tee to "**AM/PULSE INPUT**"
   - HZ to continue.
4. When "**DIAG DONE HIT MSSGS .VI**" appears:
   - Use MSSG to scroll through messages.
   - Record any **module numbers** indicated.
5. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **CONFIRM REPAIR**.

Type:	Module Exchange	**RM.04**
Run Time:	N/A	
Set-up Time:	N/A	

The on-site service process is not finished until all defective parts contained in the On-Site Service Kit have been replaced or repaired.

1. Reassemble any portions of instrument still apart. (Be sure all cable connections are secure.)

2. Flag defective module(s):
   - Red "defective" cards have been placed inside On-Site Service Kit. Place one in slot with defective module so that is is visible when kit is open.

3. Make immediate arrangements for defective part(s) to be repaired and/or replaced in On-Site Service Kit. (Refer to **REPLACEABLE PARTS** for ordering and **module exchange** information.)

4. Return to foldout.

Type:	Data Analysis	**RM.05**
Run Time:	N/A	
Set-up Time:	N/A	

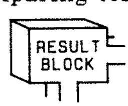
COMMENT

The **Module Replacment** *process is based on the assumption that you were sent to this section after performing a module substitution that passed using the replacement module. If this is not the case, proceed to* **RM.07**.

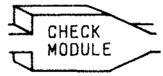
1. Analyze failure data:
   - If the ILST was run to confirm the repair, did the test indicate failures for the module being replaced or were failures indicated only for a module(s) other than the one being replaced?
   - If other testing was used to confirm the repair, does the malfunction still appear to be caused by the same module? (If test results are identical to those indicated for the suspect module prior to replacement, the problem is probably in a different module.)

COMMENT

It is possible that you have repaired one of two (or more) failures in the instrument.

2. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each  for **ANALYZE FAILURE DATA.**

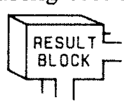
Type:	Mechanical Inspection	**RM.06**
Run Time:	3 min. 30 sec.	
Set-up Time:	Conditional	



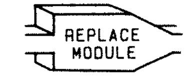
1. Check each cable connection:
   - Make sure each cable connected to module is connected securely **at the correct port**. (See **HP 8642A/B Table of Cable Connections** on inside of Top Cover to quickly reference cable connections.)
   - Check cable connections for any other cables disconnected during testing.
   - Check for bent pins on ribbon cable connectors.

2. Check Cal Data transfer:
   - If module required transfer of calibration data, refer to **CAL DATA TRANSFER TABLE** and verify that the correct **Cal Data Select Keys** were used to down-load the data.

3. Re-run confirmation test:
   - Try re-running same confirmation test(s).

4. Return to foldout:
   - Determine next task by comparing test results to conditions shown in each 

 for **CHECK MODULE.**

Type:	Module Replacement	**RM.07**
Run Time:	Conditional	
Set-up Time:	Conditional	

This procedure replaces the **original** module in instrument for further testing.

1. Replace instrument's module in instrument:
   - Refer to table on foldout in **MECHANICAL PROCEDURES** for location of module replacement instructions.
   - Replace substitute module in On-Site Service Kit.

2. Transfer Cal data:
   - If cal data for the substitute module has been down-loaded to instrument, proceed with step **3**; otherwise, return to foldout now.

3. Switch [POWER] to **Standby**.

4. Remove instrument's **A20 Calibration Module** from On-Site Service Kit and connect it to **A3 Module** at **A3J3**.

5. Switch instrument **ON**.

__Down-Load Cal Data__

COMMENT

This portion of the procedure down-loads the calibration data for the entire instrument. This data replaces the cal data in the instrument for the substitute module.

CAUTION

Sliding switch **A3S2** *to its rear position* **unprotects** *the HP 8642 EEPROMs. To prevent any damage to the HP 8642 memory, carefully perform the steps in this procedure in the order which they are given.*

COMMENT

If you get off track, return **A3S2** *to its* **protect** *position, switch the instrument to* **Standby** *then back* **ON**, *and begin again at step* **6**.

6. When "**100.000000MZ -140.0DM** appears:
   - Slide **A3S2** back toward rear of instrument. (See **INSTRUMENT WIRING DIAGRAM** on foldout to locate A3S2.)

7. [SHIFT] [SPCL] [3] [7] [5] [HZ]

8. When "**TRANSFER VERIFIED .U613**" appears:
   - Slide **A3S2** toward front of instrument to **protect** instrument's memory.
   - [HZ] to end routine.

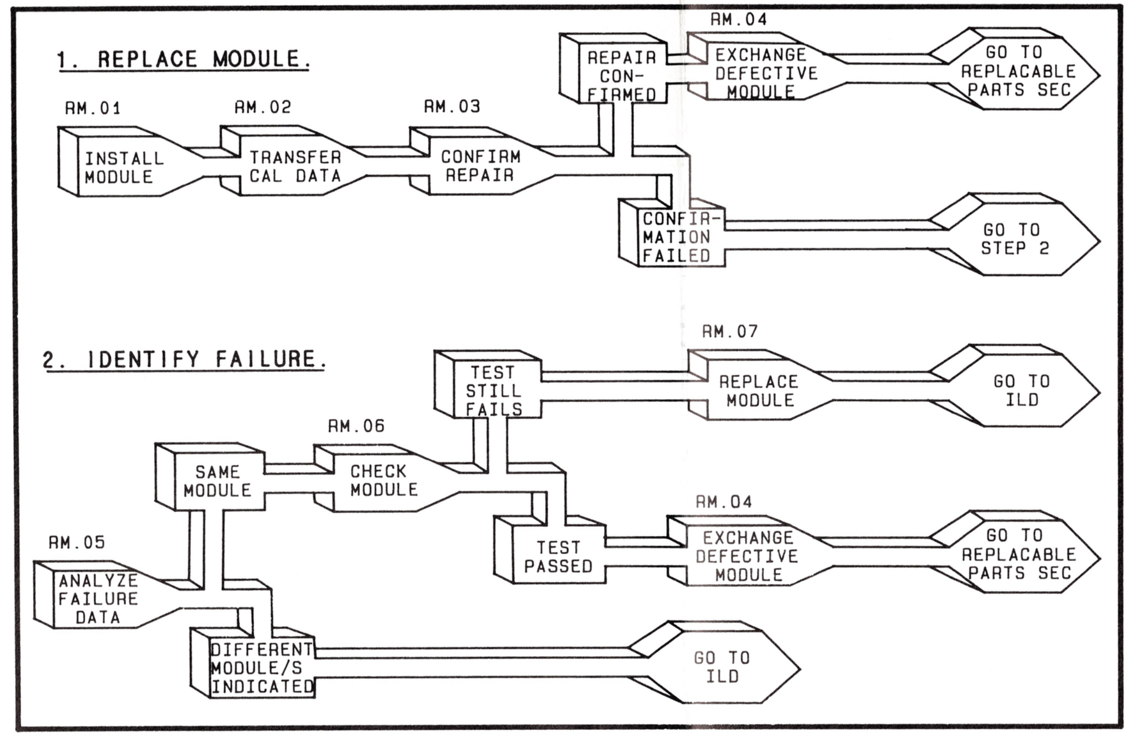
9. Switch [POWER] to **Standby**.

10. Remove **A20 Module** from Rear Panel of instrument and return it to On-Site Service Kit.

11. Remove instrument's **A20 Module** from **A3J3** and return it to Rear Panel of instrument.

12. Return to foldout.

MODULE REPLACEMENT



CAL DATA TRANSFER TABLE

Modules		Cal Data Select Keys
A1	Keyboard/LCD Display Module	No Data Required
A2	Modulation Module	9 HZ
A3	Processor/Memory Module	7 5 Hz
A4	Latch Module	No Data Required
A6	FM Loop/Counter/Timebase Module	3 HZ
A7	SAWR Loop Module	No Data Required
A8	10 MHz High Stability Timebase Assembly (Opt. 001)	No Data Required
A9	IF Loop Module	No Data Required
A11	Reference Loop Module	1 HZ
A12	Sum Loop/Divider Module	2 HZ
A13	Output Filters/ALC Module	4 HZ
A14	Heterodyne Module	8 HZ
A16	Attenuator Module (8642A Only)	6 HZ
A17 & A18	Power Supply Modules	No Data Required
A19	Doubler/Attenuator Module (8642B Only)	5 HZ 6 HZ 7 HZ
A20	Down-load All Modules	7 5 HZ
RPP	Reverse Power Protection	7 HZ

INSTRUMENT WIRING DIAGRAM

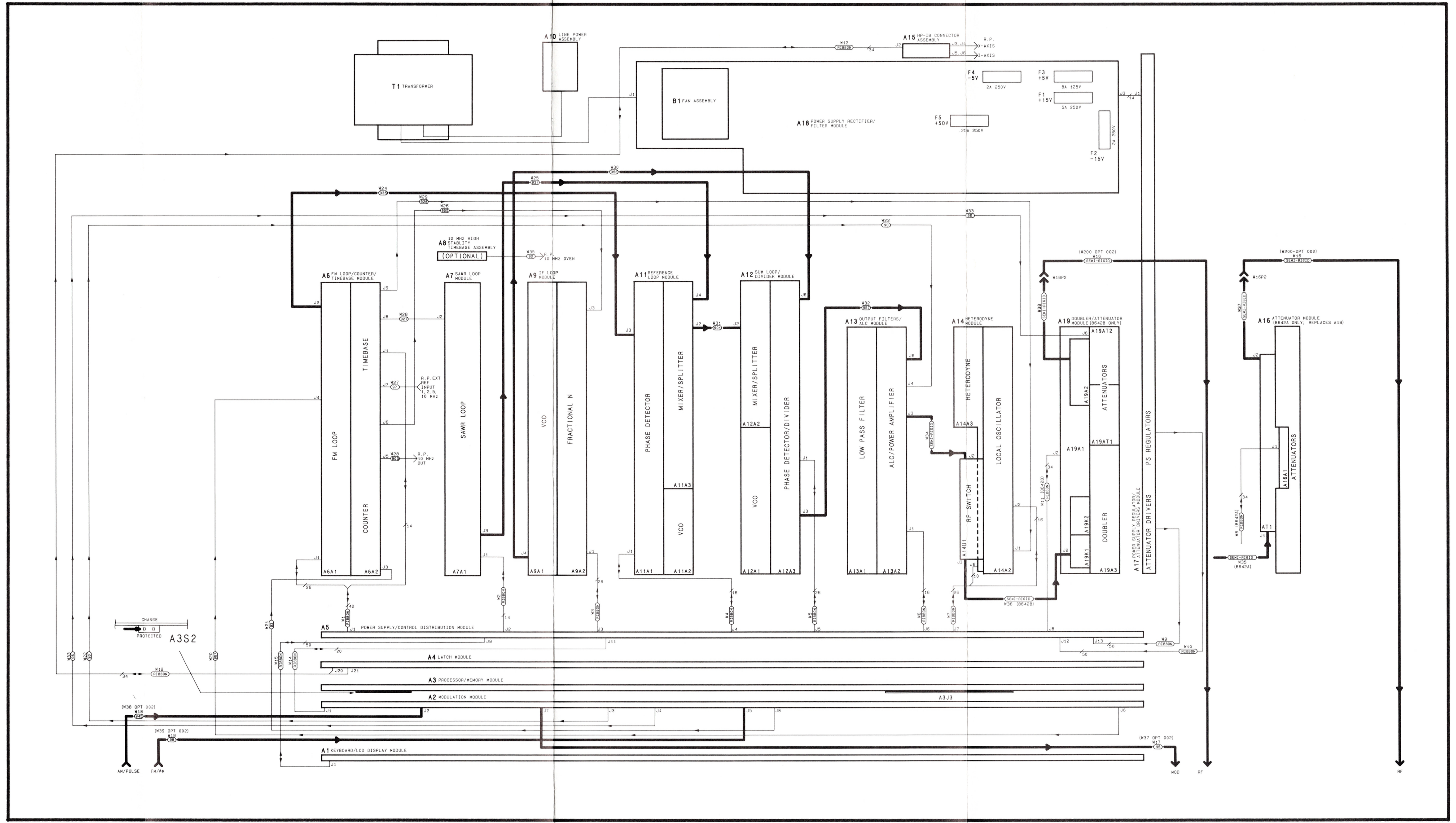


Figure 4-100. Replacing a Module.

Mechanical Procedures

5-1. INTRODUCTION

This section contains mechanical procedures required for on-site service of the HP 8642A/B Synthesized Signal Generator. Refer to **SECTION IV REPLACING A MODULE** for information regarding module calibration. Refer to instrument top cover for specific cable connection locations. The instrument should be serviced in an electrostatic discharge protected environment.

Table 5-1, located on the foldout at the end of this section, is a quick reference table for locating the paragraph in which the removal and replacement procedures for each module/assembly are found.

NOTE

Unless otherwise noted, the directions "left" and "right" given in the instructions are referenced as though you are looking at the instrument from the Front Panel.

WARNING

Servicing instructions are for use by service trained personnel only. To avoid dangerous electric shock, do not attempt to service this instrument unless you are qualified to do so.

Any interruption of the protective (grounding) conductor (inside the instrument) or disconnecting of the protective earth ground terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection.) In addition, verify that a common ground exists between the unit under test and this instrument prior to energizing either unit. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

WARNING

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

Certain procedures described in this manual are performed with power supplied to the instrument while protective covers are removed. Energy levels at certain points may, if contacted, cause personal injury. The +50 Vdc power supply level is distributed to many points throughout the instrument.

For continued protection against fire hazard, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.) Do not use repaired fuses or short circuited fuseholders.

The left rear portion of the chassis becomes hot during operation. A cooling period may be desired before servicing modules in this area.

To avoid personal injury, avoid contact with the A17 heatsink when the A17 Module is extended.

The HP 8642 is extremely heavy. Do not lift or carry the instrument without assistance. If the instrument is rack-mounted, do not pull the instrument from the rack without assistance.

COMMENT

When looking at the instrument, some of the mechanical procedures may seem intuitively obvious; however, we strongly recommend that you read through an entire procedure before performing any of the steps.

5-2. TOOLS

Torxhead Screws

Most screws used in instrument are Torxhead screws. They require a torque driver and Torxhead bits (provided in On-Site Service Kit) for proper removal and installation.

CAUTION

To avoid damage, do not exceed the following torque limits:

Torque limit for 4 mm screws: 2.2 Nm. (Use bit T15)

Torque limit for 3 mm screws: 1.5 Nm. (Use bit T10)

To set torque limit of driver, remove cover from end of handle. Lift the key to the vertical position and turn clockwise to increase torque setting, or turn counter-clockwise to decrease torque setting. Align hairline on clear bulb of driver shaft with the desired setting. Push the key back to the flat position (a very slight turn in either direction may be necessary to allow key to lock into place).

RF Wrench

An RF connector wrench is located above fan on right inner wall of center rear bracket. A fuse extraction/insertion tool is located on top of rear frame of instrument near fan.

Tools Required

The On-Site Service Kit contains most tools needed to perform an on-site service of the HP 8642. (See Table 7-1 for a listing of the contents of kit.) The tools required to perform each mechanical procedure are listed at the beginning of the procedure. Those tools required for the procedure which are not included in the On-Site Service Kit have been printed in italics.

The following is a list of tools not contained in the kit but sometimes required for on-site serivce:

2 pt. Pozidrive screwdriver.
1 pt. Pozidrive screwdriver
6.0 mm open end wrench.
Small flathead screwdriver.
Small needlenose pliers
Small diagonal cutters
Soldering/Desoldering tools

5-3. TOP COVER

Removal Time:	2 min
Replacement Time:	2 min
Tools Required:	*Pozidrive screwdriver.*

WARNING

Certain procedures described in this manual are performed with power supplied to the instrument while protective covers are removed. Energy levels at certain points may, if contacted, cause personal injury. The +50 Vdc power supply level is distributed to many points throughout the instrument.

CAUTION

The instrument should not be turned on for extended periods of time with the top cover removed. The instrument's ability to cool itself is severely reduced when the top cover is removed.

To Remove: Top Cover

1. Remove four rear feet from rear frame of instrument by removing screw in each foot.
2. Loosen screw in middle of rear edge of top cover. This is a captive screw (attached to top cover). Loosening it will cause cover to push away from front frame.
3. Slide top cover toward rear of instrument to disengage and lift up and away. (Cover has a tight fit and may need to be worked loose.)

To Replace: Top Cover

1. Place cover onto top of instrument. Slide cover toward front of instrument while applying a slight downward pressure at front edge of cover. Guide into slot in top of front frame. (Cover has a tight fit and may need to be worked forward.)
2. When screw on rear edge of cover is in contact with rear frame, tighten screw. (Cover should move forward as screw is tightened.)
3. Replace four feet on rear frame, one screw in each.

5-4. RF MODULES: A6, A7, A9, A11-14, A16, A19

Removal Time:	4 min
Replacement Time:	8 min
Tools Required:	RF connector wrench

To locate module, refer to Top View Diagram on inside of instrument top cover.

__To Remove__: **A6, A7, A9, A11-14, A16, A19**

1. Remove top cover (refer to paragraph **5-3**).

2. Reroute obstructing coax cables around ends of module (any cables lying across top of module that would hinder lifting of module from instrument).

NOTE

DO NOT disconnect intramodular cables. (These are cables which connect from one point on the module to another point on the same module.) Intramodular cables must remain in place for proper module calibration.

3. Disconnect intermodular cables from module being removed. Disconnect only those cables which connect module to other parts of instrument, including ribbon cables. Use the RF connector wrench to loosen coax cable connectors.
   - To avoid damaging semi-rigid coax cables, loosen both ends of cable before disconnecting cable from module.

4. Slide L-shaped retaining clip at each end of module toward center of module to release from guide post. See diagram **1. RF MODULE MECHANICAL PARTS** on foldout at end of this section.

5. Using finger loops on retaining clips, lift module from instrument.

6. Slide ribbon cable from behind cable retaining screw on module slide.

__To Replace__: **A6, A7, A9, A11-14, A16, A19**

1. Clear cables from empty module slot.

2. Slide ribbon cable behind ribbon cable retaining screw on module slide. Pull cable up until screw rests in cable fold. (With a new cable fold may not be evident. Allow enough slack in cable to accomodate lowering module into instrument.)

3. Align module slide with guide post mounted in instrument. (Modules are designed so slide will not align properly if an attempt is made to install module backwards.)

4. Using finger loops on module slides, lower module into place.

5. Align retaining clips with notch in guide posts and slide clips into notch to lock module in position.

6. Reconnect all cables. Tighten connectors finger tight, then use RF connector wrench to slightly tighten (1 N.m). RF connectors on modules are fragile and over-torquing can cause damage. (Refer to inside of instrument top cover for cable connection locations.)

<u>To Extend</u>: **(A6, A7, A9, A11-14, A16, A19)**

1. Remove top cover (refer to paragraph **5-3**).
2. Reroute any obstructing cables around ends of module.
3. Screw extender posts into top of module guide posts.
4. Slide L-shaped retaining clip, at each end of module, toward center of module to release from guide post.
5. Slide module up to top of extender.
6. Align retaining clip with notch in extender post. Slide clip into locked position.

5-5. CONTROL MODULE: A3

Removal Time:	1 min
Replacement Time:	1 min
Tools Required:	None

<u>To Remove</u>: **A3**

1. Remove top cover (refer to paragraph **5-3**).

2. Raise black extractor and white extractor to upright position. (Extractors may be difficult to raise. You may feel resistance from connectors on bottom of A3 module as you raise extractors.)

3. With extractors in upright position, pull module up, out of instrument.

To Replace: A3

1. Raise black extractor and white extractor to their upright position.

2. Position module so extractors are aligned with matching colored plastic guides in instrument (component side of A3 toward front of instrument).

3. Align board edges with left and right slots in plastic guides.

4. Push board into instrument holding extractors in upright position.

5. Push extractors down to lock module into notch near top of guides.

5-6. CONTROL MODULE: A4

Removal Time:	1 min
Replacement Time:	4 min
Tools Required:	None

To Remove: A4

1. Remove top cover (refer to paragraph **5-3**).

2. Disconnect yellow, Power Meter, cable fastener from mounting hole on A11 Module.

3. Raise black extractor and white extractor to their upright position. (Extractors may be slightly difficult to raise. You may feel some resistance from connectors on bottom of the A4 module as you raise them.)

4. With extractors in upright position pull module up, out of instrument.

To Replace: A4

1. Check that ribbon cable shields are in place between ribbon cables on A5 module and A4 slot. Check that ribbon cables and shields are not obstructing connectors into which A4 plugs.

2. Raise black extractor and white extractor to their upright position.

3. Position module so extractor colors are aligned with matching colored plastic guides in instrument (component side of A4 toward rear of instrument).

4. Align board edges with left and right slots in plastic guides.

5. Push board into instrument holding extractors in upright position. As you lower A4 Module into instrument, ensure that ribbon cables on A5 Module do not become disconnected.

6. Push extractors down to lock module into notch near top of guide.

7. Replace Yellow Power Meter cable fastener in its mounting hole on the A11 Module.

5-7. FRONT PANEL (Except Option 002)

Opening Time:	5 min
Closing Time:	4 min
Tools Required:	Torque driver, Torxhead bits, *small flathead screwdriver*

Front panel assembly is mounted into front frame on a retracting hinge. The hinge mechanism, located on inside left side of Front Panel, allows right side to swing open like a door for accessing A1 and A2 Modules. (If your instrument is an Option 002, refer to paragraph **5-8**.)

COMMENT

This procedure requires that careful attention is paid to each step. Read through entire procedure before performing any of the steps.

__To__ __Open__: **Front Panel**

1. Remove any adapters from **RF OUTPUT** connector on Front Panel.

2. Gently pry plastic trim strip from top of front frame by inserting a screwdriver into slots in rear edge of plastic strip.

3. On top of front frame, remove two countersunk screws (first and thirteenth holes counting from right).

4. On bottom of frame, remove three screws (third, eighth, and twelfth holes counting from right).

CAUTION

DO NOT swing right side of panel open until entire panel is pulled out from front frame. Left (hinged) side of Front Panel may be damaged if not pulled out from frame before right side is swung open.

5. Grasping **AM/PULSE INPUT** Connector (J1) and **MOD OUTPUT** Connector (J3), pull panel outward until entire Front Panel clears front frame by about 1/2 inch.

COMMENT

If it is difficult to pull Front Panel out, it may be helpful to slightly loosen the two screws on bottom of front frame directly under RF OUTPUT connector (CP1).

6. Slowly swing right side of panel outward while carefully guiding left side of Front Panel away from left edge of frame.

__To__ __Close__: **Front Panel**

1. While using J1 (**AM/PULSE INPUT** connector) to hold left side of Front Panel away from frame, slowly swing right side of panel inward until "door" is almost closed.

2. Push left side of panel straight back into front frame, then push right side into frame.

3. Replace screws in first and thirteenth countersunk holes counting from right, in top of front frame, and screws in third, eighth, and twelfth holes in bottom of frame. (Count from right.)
   - Tighten two screws under RF OUTPUT connector if they were loosened when Front Panel was opened (refer to paragraph **5-8**, step **4**).

4. Press top plastic trim strip into place on top of front frame, position slot toward rear of instrument.

5-8. FRONT PANEL (Option 002 Only)

Opening Time:	5 min
Closing Time:	4 min
Tools Required:	Torque driver, Torxhead bits, *small flathead screwdriver*

Front panel assembly is mounted into front frame on a retracting hinge. The hinge mechanism, located on inside left side of Front Panel, allows right side to swing open like a door for accessing A1 and A2 Modules. (If your instrument is not an Option 002, refer to paragraph **5-7**.)

<u>To Open</u>: **Front Panel (Option 002 Only)**

1. Gently pry plastic trim strip from top of front frame by inserting a screwdriver into slots in rear edge of trim strip.
2. On top of front frame, remove two countersunk screws (first and thirteenth holes).
3. On bottom of frame, three countersunk screws (third, eighth, and twelfth holes counting from right).

CAUTION

DO NOT swing right side of panel open until entire panel is pulled out from front frame. Left (hinged) side of Front Panel may be damaged if not pulled out from frame before right side is swung open.

4. Grasping round knob on Front Panel, pull panel outward about 1/2 inch. (If left side of panel is stuck in frame, use a screwdriver to *gently* pry it out of frame.)
5. Slowly swing right side of panel outward while carefully guiding left side of Front Panel away from left edge of frame.

<u>To Close</u>: **Front Panel**

1. Hold left side of panel out away from front frame while swinging right side inward until "door" is almost closed.

2. Push left side of panel straight back into front frame, then right side into frame.

3. Replace screws in first and thirteenth countersunk holes counting from right, in top of front frame and third, eighth and twelfth holes in bottom of frame. (Count from right.)

4. Press top plastic trim strip into place on top of front frame, position slot toward rear of instrument.

5-9. RF MODULE: A2

Removal Time:	10 min
Replacement Time:	15 min
Tools Required:	Torque driver, Torxhead bits, RF connector wrench, *diagonal cutters*, cable ties.

A2 is mounted in the front frame of the instrument behind the Front Panel.

<u>To Remove</u>: **A2**

1. Open Front Panel (refer to paragraph **5-7**: For Standard instruments; paragraph **5-8**: For Option 002 instruments).

2. Disconnect coax cables from A2 Module using RF connector wrench.
   - Clip cable ties which hold cable bundle to module ties. (See diagram **4. A2 CABLE TIES AND CONNECTORS** on foldout at end of this section.)

3. Remove seven screws securing module to instrument.

4. Disconnect ribbon cable from A2J1, then pull A2 Module out of instrument.

<u>To Replace</u>: **A2**

1. Slide four new cable ties under ties already attached to A2 Module.

2. Position module with component side forward toward front of instrument. Connect ribbon cable to A2 at A2J1.

3. Secure module to metal shield. (7 screws, finger tight).
   - When all screws are in place tighten each one.

4. Connect coax cables. See instrument top cover for cable connection locations. Secure cables to module using cable ties installed in step 1.

5. Close Front Panel (refer to paragraph **5-7**: For Standard instrument; paragraph **5-8**: For Option 002 instruments.)

5-10. CONTROL MODULE: A1

Removal Time:	8 min
Replacement Time:	8 min
Tools Required:	Torque driver, Torxhead bits, *6 mm open end wrench.*

A1 module consists of A1A1 Keyboard Assembly and A1A2 LCD Display Assembly. References to A1 refer to the module as a single unit. A1 is mounted onto back of hinged front panel.

CAUTION

When removing A1 Module, the A1A2 LCD Display can be inadvertently detached from the keyboard. Remove A1 slowly and be sure that the display is firmly in place. It is advisable to wear gloves when handling the LCD display; it is easily soiled but not easily cleaned.

The A1A2 LCD Display Assembly is extremely static sensitive. Use adequate Eletrostatic Discharge Techniques when handling the A1A2 Assembly.

<u>To Remove</u>: A1

1. Open Front Panel (refer to paragraph **5-7**: For Standard instruments; paragraph **5-8**: For Option 002 instruments).

2. Remove four screws securing metal shield to back of A1 Module and pull shield off.

3. Remove ten hex nuts 6 mm securing module to Front Panel standoffs.

CAUTION

To avoid damage to key caps, and to avoid pulling switches loose, pull A1 away from front panel slowly, keeping key caps aligned with holes in Front Panel.

4. Pull module away from Front Panel far enough to disconnect RPG (knob) wiring harness from A1 Module at A1A1J3. RPG, Rotary Pulse Generator, is round black assembly attached to Front Panel, visible through cutout in A1A1 assembly.

5. Disconnect ribbon cable from A1 Module at A1A1J1.

6. Pull A1 Module from instrument.

To Replace: **A1**

1. Position board with component side (key caps) forward toward Front Panel.

2. Connect ribbon cable from A1 Module at A1A1J1.

3. Route RPG (knob) wiring harness through circular hole in A1 Module then back under A1 to front of A1 Module and connect harness to A1 Module at A1A1J3.

4. Align key caps with holes in Front Panel, and align mounting holes with standoffs. Gently push A1 into place on standoffs.

5. Place a hex nut on each standoff (qty 10) and tighten finger tight. When each nut is in place tighten each one.

6. Position metal shield with U-shaped cutout over RPG (knob) assembly and secure shield to Front Panel with four screws.

7. Close Front Panel (refer to paragraph **5-7**: For Standard instruments; paragraph **5-8**: For Option 002 instruments).

5-11. LCD DISPLAY ASSEMBLY A1A2

Removal Time:	2 min
Replacement Time:	2 min
Tools Required:	None

CAUTION

When removing A1 Module, the A1A2 LCD Display can be inadvertently detached from the keyboard. Remove A1 slowly and be sure that the display is firmly in place. It is advisable to wear gloves when handling the LCD display; it is easily soiled but not easily cleaned.

The A1A2 LCD Display Assembly is extremely static sensitive. Use adequate Electrostatic Discharge Techniques when handling the A1A2 Assembly.

To Remove: A1A2

1. Open Front Panel (refer to paragraph **5-7**: For Standard instruments; paragraph **5-8**: For Option 002 instruments).

2. Remove A1 Module (refer to paragraph **5-10**).

3. Lay A1 Module down flat, component side up.
   - A1A2 assembly plugs into A1 Module at A1A1J4 and A1A1J5. Grasp connectors on A1A2 Assembly and pull both upward at same time. There may be resistance as you pull but, DO NOT use a rotating or twisting action as you pull upward. Torque produced by twisting can cause damage to components or solder connections.

To Replace: A1A2

1. Carefully align plugs A1A2P1 and A1A2P2 on the A1A2 with connector pins of A1A1J4 and A1A1J5 on the A1 Module.
   - With even pressure at both ends, carefully press display into place.

2. Replace A1 module in instrument (refer to paragraph **5-10**).

5-12. LCD DISPLAY INCANDESCENT LAMPS

Replacement Time:	10 min
Tools Required:	Torque driver, Torxhead bits, *Soldering iron, desoldering tool, needlenose pliers.*

CAUTION

When removing A1 Module, the A1A2 LCD Display can be inadvertently detached from the keyboard. Remove A1 slowly and be sure that the display is firmly in place. It is advisable to wear gloves when handling The LCD display; it is easily soiled but not easily cleaned.

The A1A2 LCD Display Assembly is extremely static sensitive. Use adequate Electrostatic Discharge Techniques when handling the A1A2 Assembly.

<u>To</u> <u>Replace</u>: **Incandescent Lamp**

1. Remove A1A2 (refer to paragraph **5-11**).
2. Remove two screws securing black end cap of LCD display from end of display at which defective lamp is located. The screw on upper edge of end cap requires two washers, take care not to lose them. Remove end cap.
3. Unsolder leads of incandescent lamp, and remove lamp from mounting holes. To prevent damage to printed circuit traces and plated mounting holes, be sure leads are completely unsoldered before pulling lamp free.
4. Form leads of new lamp to fit spacing of mounting holes. Place leads in mounting holes and solder leads into place.
5. Replace black end cap over lamp, and secure from circuit side with two screws. (Screw on upper edge of end cap requires two washers.)
6. Replace A1A2 Assembly (refer to paragraph **5-11**).

5-13. RIGHT SIDE COVER

Removal Time:	2 min
Replacement Time:	2 min
Tools Required:	*Pozidrive screwdriver.*

To Remove: Right Side Cover

1. Remove the four feet on rear frame by removing a screw in each foot.
2. Remove top cover (refer to paragraph **5-3**).
3. Loosen screw on rear edge of right cover. This is a captive screw (attached to cover), loosening it will cause cover to push back away from front frame.
4. After screw is disengaged from frame, pull side cover from chassis being careful not to dislodge foam pieces on cover.

To Replace: Right Side Cover

1. Inspect side cover for loose or damaged foam, replacing it if necessary. (Foam is critical to proper air flow in instrument.)
2. Place groove on bottom edge of side cover onto edge of bottom cover.
3. Slide cover froward until captive screw on rear edge of side cover is in contact with rear frame. Tightenen screw into frame. Cover should move forward into place as the screw is tightened.
4. Replace top cover (refer to paragraph **5-3**).
5. Replace four feet on rear frame.

5-14. POWER SUPPLY MODULE: A17

Removal Time:	10 min
Replacement Time:	12 min
Tools Required:	Torque driver and Torxhead bits, *Pozidrive screwdriver.*

WARNING

Left rear portion of the instrument becomes hot during operation; a cooling period may be desired before servicing.

To avoid personal injury, avoid contact with the A17 heatsink when the A17 Module is extended.

<u>To Remove</u>: **A17**

1. Remove power to instrument by disconnecting line power cord.
2. Remove top cover (refer to paragraph **5-3**).
3. Remove right side cover (refer to paragraph **5-13**).
4. Remove power supply top cover from right-rear corner of instrument (one screw).
5. Remove 13 screws on side frame shown in diagram **2. A17 MODULE MECHANICAL PARTS** on the foldout at end of this section.
6. Lift module partially out of instrument to expose ribbon cable connectors through gap in side frame. Push levers on ribbon cable connectors apart to release ribbon cables from A17 Module.
7. Disconnect power supply wiring harness (W13) from A17 Modlue at A17J1 (located toward rear of instrument, below heatsink).
8. Lift module out of instrument.

COMMENT

You may feel resistance as you pull the board upward. This may be caused by one of the foam strips adhered to the circuit side of the board. Apply slow, firm upward pressure.

<u>To</u> <u>Replace</u>: **A17**

1. Position component side of board toward outside of instrument.

2. Connect power supply wiring harness (W13) to A17 connector below heatsink.

3. Lower board into place.

COMMENT

You may feel resistance as you lower board into place. This may be caused by one of the foam strips adhered to the circuit side of the board. Use slow, firm downward pressure to install board.

4. Connect ribbon cable W9 08642-60013 to A17J3, and W10 08642-60012 to A17J2. (Part numbers of these cables are stamped on cable.)

5. Foam strip adhered to circuit side of board should overlap metal bracket in such a way as to seal gap between bracket and A17.

6. Align module with screw holes. Replace 13 screws finger tight. When all screws are in place, tighten each one. (Refer to diagram **2. A17 MODULE MECHANICAL PARTS** on foldout at end of this section.)

7. Replace side cover (refer to paragraph **5-13**).

<u>To</u> <u>Extend</u>: **A17**

1. Remove power to instrument by disconnecting line power cord.

2. Remove top cover (refer to paragraph **5-3**).

3. Remove power supply top cover, one screw.

4. Remove screws shown in diagram **2. A17 MODULE MECHANICAL PARTS** on foldout at the end of this section.

5. Lift module partially out of instrument to expose ribbon cable connectors (A17J2 and A17J3) through gap in side frame. Push levers on ribbon cable connectors apart to release ribbon cables W9 and W10.
   - Be sure the power supply wiring harness W13 remains connected to A17 and A18.

6. Pull module up until lower mounting holes on A17 Module are aligned with mounting holes in top rail of frame.

7. Insert screws into bottom mounting holes on A17 through holes in top rail and tighten finger tight. When all screws are in place, tighten each one.

8. Connect ribbon cable W9 08642-60013 to A17J3, and W10 08642-60012 to A17J2. (Part numbers of these cables are stamped on the cable.)

9. Reconnect power to instrument.

5-15. REAR BOTTOM COVER

Removal Time:	5 min
Replacement Time:	3 min
Tools Required:	*Pozidrive screwdriver, small flat head screwdriver, insulated screwdriver*

To access A18 Module or Option 001 A8 Assembly, only REAR bottom cover need be removed. All other modules are accessible through top of instrument.

CAUTION

Do not remove the center bottom cover, Its placement is important to the structural stability of instrument. All on-site serviceable parts in the center section of instrument are accessible through top of the instrument.

Remove line power cord before removing rear bottom cover.

<u>To Remove</u>: **Rear Bottom Cover**

1. Remove power to instrument by disconnecting line power cord.

2. Remove four feet on rear frame by removing a screw in each foot.

3. Turn instrument on its side and remove two rear feet from bottom cover.

4. Unscrew four screws on front edge of rear bottom cover.

5. Slide cover toward rear of instrument and lift cover from instrument. (Cover fits snugly and may need to be worked loose.)

WARNING

Capacitors on the A18 Module may still be charged even if the instrument has been disconnected from its source of power. Use a conductor with an insulated handle, such as a screw driver, to discharge capacitors by carefully grounding capacitor terminal screws, on bottom of A18 Module, to instrument's chassis.

<u>To Replace</u>: **Rear Bottom Cover**

CAUTION

Remove line power cord before replacing rear bottom cover.

1. Slide rear bottom cover forward from rear of insturment and align holes in front edge of rear cover with holes rear edge of center bottom cover.

2. Insert and tighten four screws.

3. Replace two rear feet on bottom of instrument.

4. Replace four feet on rear frame.

5-16. POWER SUPPLY MODULE: A18

Removal Time:	10 min
Replacement Time:	10 min
Tools Required:	Torque driver and Torxhead bits, *insulated screwdriver.*

WARNING

Do not operate the instrument with the A18 Module detached from chassis. The screws securing the A18 Power Supply Rectifier and Filter Module to the chassis are an integral part of the protective grounding of the instrument.

WARNING

The left rear portion of the instrument becomes heated during operation and a cooling period may be desired before servicing.

Capacitors on the A18 Module may still be charged even if the instrument has been disconnected from its source of power. Use a conductor with an insulated handle, such as a screw driver, to discharge capacitors by carefully grounding capacitor terminal screws, on bottom of A18 Module, to instrument's chassis.

<u>To Remove</u>: **A18**

1. Remove power to instrument by disconnecting line power cord.
2. Remove top cover (refer to paragraph **5-3**).
3. Remove power supply top cover, one screw.
4. Remove bottom rear cover (refer to paragraph **5-15**.)
5. Using insulated screwdriver, discharge capacitors by carefully grounding mounting terminal screws on, bottom of A18 Module, to instrument's chassis.
6. Remove screws on bottom of A18 Module shown in diagram **4. A18 MODULE MOUNTING SCREWS** on foldout at end of this section.
7. Guide module out through bottom of instrument until connecting wires become accessible by gently pushing from top side instrument.
8. Disconnect transformer output cable from A18 Module at A18J1. Disconnect cable to fan from A18 Module at A18J2. Disconnect wiring harness to A17 at A18J3.
   - If instrument is **Option 001**, disconnect wiring harness at A18J4.

<u>To Replace</u>: **A18**

1. Re-connect all cables removed in paragraph **5-16**, step **8**.

2. Guide module into position through bottom of instrument, and hold in place. Be sure air seal foam and rubber strips are inside instrument (should not overlap on outside). Foam and rubber strips are easily torn and can cause difficulty when positioning module. If necessary, re-position the module in instrument to ensure a proper seal has been attained.

3. Align A18 board with screw holes in chassis and secure screws finger tight. Use star washers on all screws. When all screws are in place tighten each one. (See diagram **4. A18 MODULE MOUNTING SCREWS** on foldout at end of this section.)

4. Replace bottom cover (refer to paragraph **5-15**).

5. Replace power supply top cover, one screw.

5-17. CALIBRATION MODULE A20

Removal Time:	3 min
Replacement Time:	3 min
Tools Required:	*Small flathead screwdriver.*

To Remove: A20

1. Find A20 Calibration Module cover on rear panel of instrument and pull outward (plungers do not detach from fasteners). Pull away A20 Calibration Module cover. (See diagram **3. A20 and B1 MECHANICAL PARTS** on foldout at end of this section.

2. Four plastic fasteners hold Calibration Module to fan access cover on rear panel. Turn screw heads 1/4 turn to close fastener shoulders.

3. Pull Calibration Module off of fastners. Fastners will stay in place on fan access cover.

To Replace: A20

1. Check that 1/4-turn fastners on fan access cover are in unlocked (shoulders closed) position. Push Calibration Module onto fastners. (See diagram **3. A20 and B1 MECHANICAL PARTS** on foldout at end of this section.)

2. Turn fastners 1/4 turn (shoulders open) to secure Calibration Module to access cover.

3. Align plastic fasteners on Calibration Module cover with mounting holes in rear panel.
   - Push fastener sockets into mounting holes and push the fastener plungers in.

5-18. A8 OSCILLATOR MODULE (OPTION 001)

Removal Time:	12 min
Replacement Time:	10 min
Tools Required:	Torque driver and Torxhead bits.

To Remove: A8

1. Remove top cover (refer to paragraph **5-3**).

2. Remove rear bottom cover (refer to paragraph **5-15**).

3. From bottom of instrument, disconnect wiring harness from A18J4.
   - Disconnect coax cable from A8J1.

4. From top of instrument, remove modules A7 and A9 (refer to paragraph **5-4**.)

5. Remove four screws on top of A8 securing it to metal bracket.

6. Pull A8 forward toward Front Panel, then pull out of instrument. A8 has a tight fit between bottom cover and metal bracket. A slight downward pressure on A8 may help its forward motion.

To Replace: A8

1. Position A8 Module with screw holes up and wiring harness side toward rear of instrument.

2. Push A8 under metal bracket with slight downward pressure, while guiding wiring harness through rectangular hole in rear of bracket.

3. Align screw holes with holes in chassis frame.

4. Secure with four screws.

5. From bottom of instrument, reconnect wiring harness to A18J4. Be sure all connector pins on A18J4 are properly plugged into wiring harness connector.
   - Reconnect coax cable to A8.

6. Replace rear bottom cover (refer to paragraph **5-15**).

7. From top of instrument, replace A7 and A9 modules (refer to paragraph **5-4**).

8. Replace top cover (refer to paragraph **5-3**).

5-19. FAN (B1)

Removal Time:	6 min
Replacement Time:	8 min
Tools Required:	Torque driver, torxhead bits

<u>To Remove</u>: **B1**

1. Find A20 Calibration Board cover on rear panel of instrument. Remove Calibration Board cover by pulling outward on plastic fastner plungers. (See diagram **3. A20 and B1 MECHANICAL PARTS** on foldout at end of this section.)

2. Disconnect line power from instrument. Fan access cover attaches to rear panel behind Calibration Board cover. Remove four screws in fan cover securing it to rear panel.

3. Fan is mounted to access cover. Pull access cover and attached fan out of instrument.

4. Disconnect fan wire from A18 Module at A18J3.

5. Remove 2 screws that attach fan to rear fan mounting bracket on access cover (one in upper right corner, one in lower left corner).

To Replace: **B1**

1. Mount fan to rear fan mounting bracket on fan access cover with two screws as shown in diagram **3. A20 and B1 MECHANICAL PARTS** on foldout at end of this section. (Air directional arrows point down and to right.)

2. Route wire through rear panel to connector A18J3. (Align with black wire toward large filter capacitors on A18 module).

3. Guide fan through access hole in the rear panel. The wire to A18J3 wraps around corner of fan and may become disconnected when fan is pushed into instrument if wire is not routed under fan.

4. Replace screws securing access cover to rear panel.

5. Replace Cal Board Cover. (Refer to paragraph **5-17**, To Replace: **A20**, step **3**.)

5-20. A5 RIBBON CABLES (W1-W8, W11, W14, W15)

Removal Time:	3 min per cable
Replacement Time:	5 min per cable
Tools Required:	Torque driver, torxhead bits, *small flathead screwdriver.*

To Disconnect: **W1-8, W11**

1. Remove A4 (refer to paragraph **5-6**).
   - Ribbon cables, W1, W8, W11, W14, and W15 are protected by the ribbon cable shields. Flip plastic, ribbon cable shields up to expose ribbon cable connectors.
   - Shields are pliable, and can be bowed slightly to raise them.

2. Cable connectors A5J1-8 (upper row of connectors) are positioned with their pins pointing downward.
   - To free cables from connectors on A5, push the cable plug downward.

To Reconnect: **W1-W8, W11**

1. Remove A4 (refer to paragraph **5-6**).

2. Route cable over top of A5 and curl cable so plug is under its A5 connector and align plug with connector pins.

3. Push plug upward onto connector.

4. Reposition ribbon cable shields (if moved).

5. Replace A4 (refer to paragraph **5-6**).

<u>To Remove</u>: **W1-W8, W11**

1. Repeat <u>To Disconnect</u>: **W1-8, 11** steps **1-2**.

2. Clip cable ties securing retaining bar to A5 Module.

3. Extend RF module to which cable being removed is attached (refer to paragraph **5-4**).

4. Slide cable from behind ribbon cable retaining screw on module slide bracket. (See diagram **1. RF MODULE MECHANICAL PARTS** on foldout at end of this section.)

5. Disconnect cable from connector on RF Module.

<u>To Replace</u>: **W1-8, W11**

1. Extend RF Module to which cable attaches. (Refer to paragraph **5-4**.)

2. Plug cable into connector on RF Module. (Match arrow on cable connector with arrow on module connector.)

3. Slide cable behind ribbon cable retaining screw on module slide bracket. (See diagram **1. RF MODULE MECHANICAL PARTS** on foldout at end of this section.)

4. Repeat <u>To Reconnect</u>: **W1-8, W11**, steps **1-4**.

5. Lower RF Module into instrument.

6. Tie wrap the retaining bar to the A5 Module to hold all ribbon cables in place.

7. Replace A4 (refer to paragraph **5-6**).

To Disconnect: **W14, W15**

Cable W15 is split and routed to two connectors on A5, A5J9 and A5J10. W14 connects to A5J11.

1. Remove Modules A3 and A4 (refer to paragraphs **5-5** and **5-6**).

2. Flip plastic ribbon cable shield up to expose ribbon cable connectors under it.
   - Shield is pliable, and can be bowed slightly to raise it.

3. Insert a flat head screwdriver between plastic retaining clip and connector body. Gently pry retaining clip away from A5 connector and cable plug.

4. Disconnect cable from connector.

To Reconnect: **W14, W15**

1. Align cable plug with A5 connector and push plug onto connector pins.

2. Insert notched edge of the retaining clip into slot on A5 connector. Push the smooth edge of clip over end of cable plug to lock plug into position.

3. Replace ribbon cable shield.

To Remove: **W14, W15**

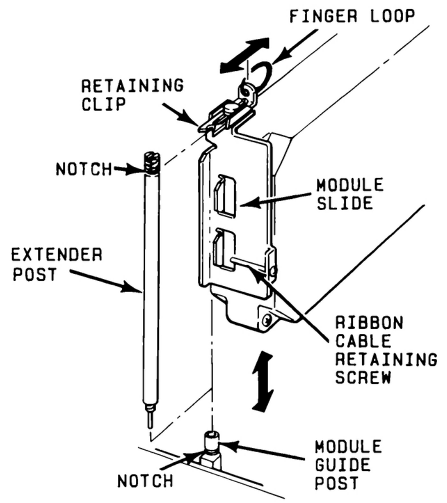
Due to extensive instrument disassembly required to access these cables, these cables are not considered to be On-Site replaceable.

TABLE OF MECHANICAL PROCEDURES

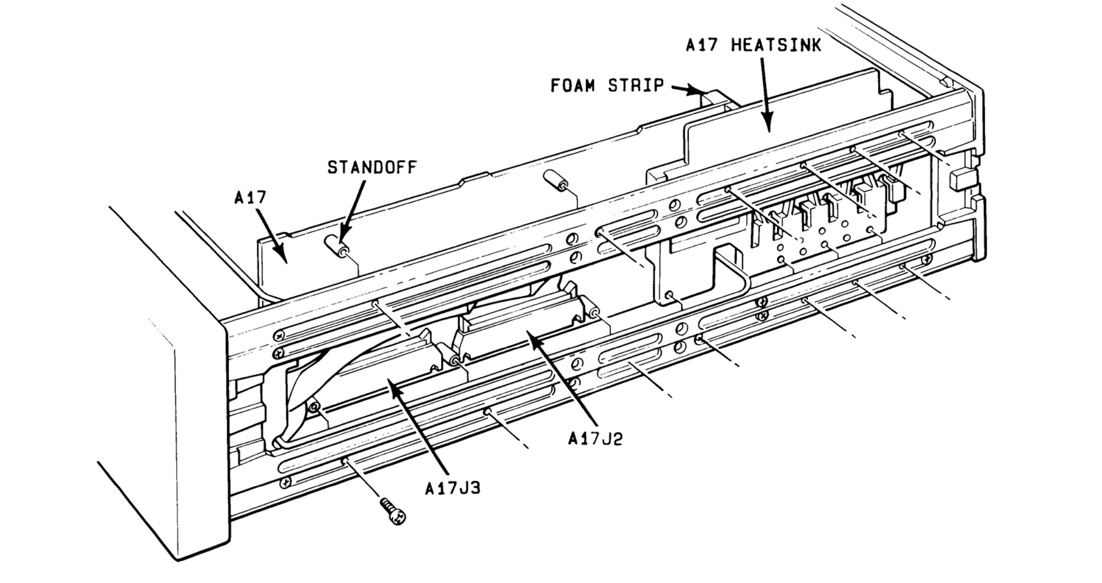
Read all introductory information in paragraph "5-1. Introduction" before performing any of the procedures called out below.

Removal/Replacement Procedure	Instrument Section	Paragraph Number
A1 Keyboard/LCD Display Module	Control	5-10
A1A2 LCD Display Module Incandescent Lamps	Control	5-11 5-12
A2 Modulation Module	RF	5-9
A3 Processor/Memory Module	Control	5-5
A4 Latch Module	Control	5-6
A6 FM Loop/Counter/ Timebase Module	RF	5-4
A7 SAWR Loop Module	RF	5-4
A8 10 MHz High Stability Timebase Assembly (Opt. 001)	RF	5-18
A9 IF Loop Module	RF	5-4
A11 Reference Loop Module	RF	5-4
A12 Sum Loop/Divider Module	RF	5-4
A13 Output Filters/ALC Module	RF	5-4
A14 Heterodyne Module	RF	5-4
A16 Attenuator Module (8642A Only)	RF	5-4
A17 Power Supply Regulators/ Attenuator Drivers Module	Power Supply	5-14
A18 Power Supply Rectifier/ Filters Module	Power Supply	5-16
A19 Doubler/Attenuator Module (8642B Only)	RF	5-4
A20 Calibration Module	Control	5-17
Module Extension		
A6, A7, A9, A11-A14, A16, A19		5-4
A17		5-14
Fan (B1)		5-19
Top Cover		5-3
Rear Bottom Cover		5-15
Right Side Cover		5-13
Front Panel (Except Opt. 002)		5-7
Front Panel (Opt. 002 Only)		5-8
A5 Ribbon Cables		5-20

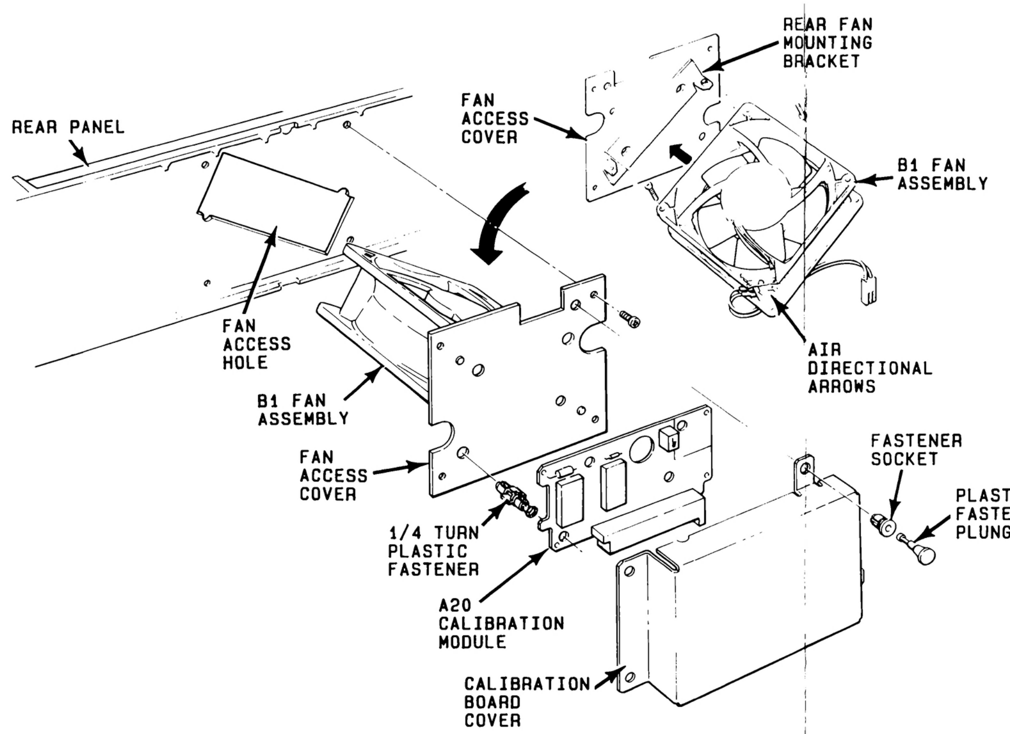
1. RF MODULE MECHANICAL PARTS



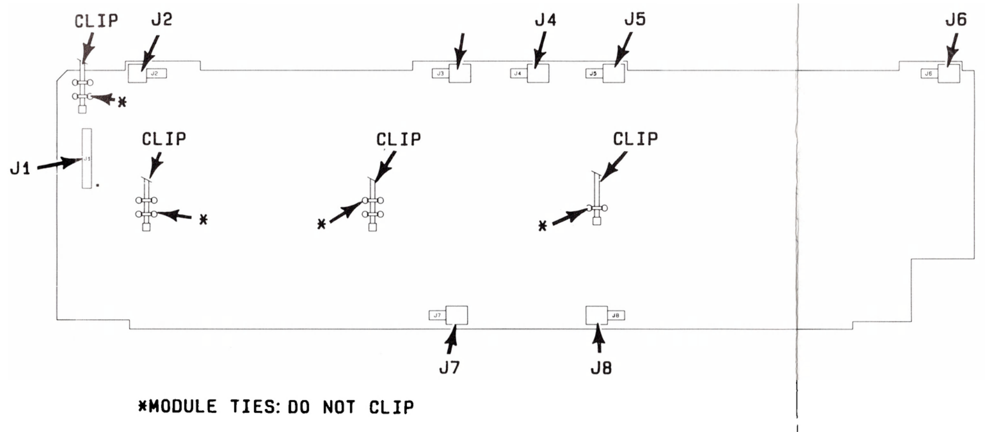
2. A17 MODULE MECHANICAL PARTS



3. A20 AND B1 MECHANICAL PARTS



4. A2 CABLE TIES AND CONNECTORS



5. A18 MOUNTING SCREWS

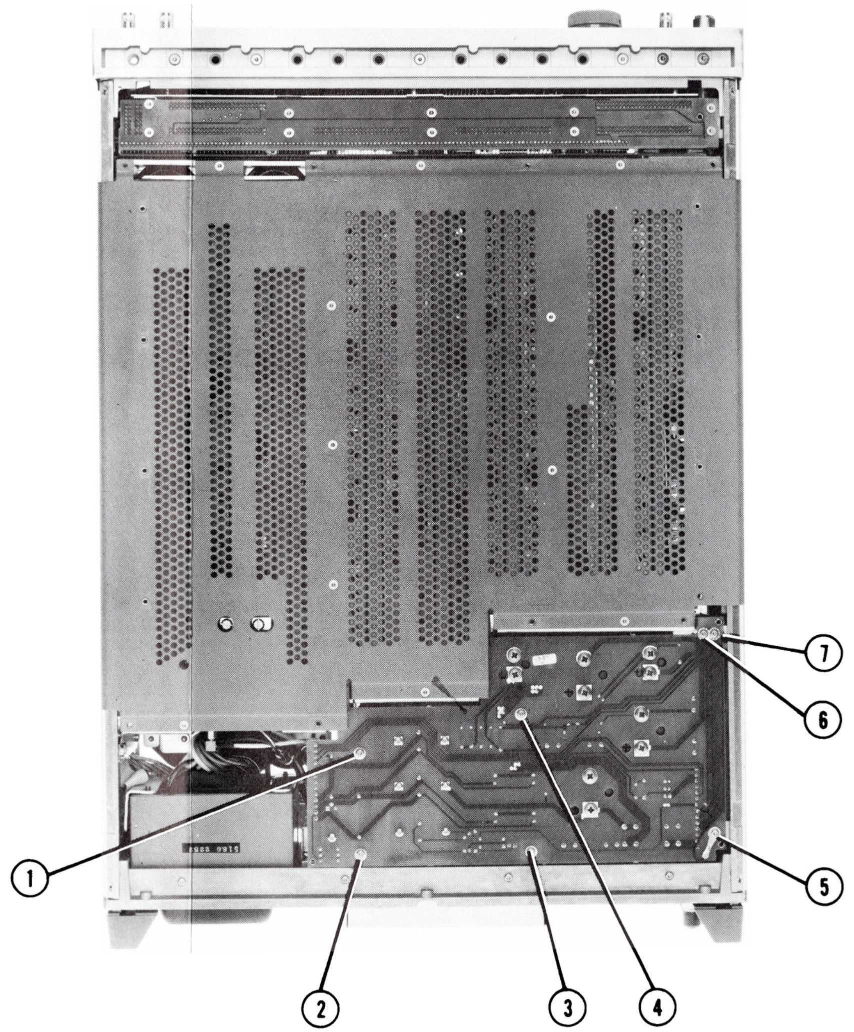


Figure 5-100. Mechanical Procedure Diagrams.

HP-IB/Remote Diagnostics

6-1. INTRODUCTION

This section contains information on the use of the HP 8642's Hewlett-Packard Interface Bus (HP-IB) for performing an on-site repair. (For general programming information, refer to the HP 8642's Operating Manual.)

6-2. SYSTEM CONTROLLER

The HP 8642 can be configured to perform as a system controller when it is in its service mode of operation. As a system controller, the instrument is able to control peripheral devices via its HP-IB. With a printer connected to its HP-IB, the instrument will output the results of a selected diagnostic routine to the printer. (Refer to the **Exceptional Cases** section for further information on operating the HP 8642 in its controller mode.)

To Output Test Results to a Printer

Initiate Service Mode:

LOCAL (keys)	**ENTRY**
	[SHFT] [SPCL] [3]

Enable System Controller:

LOCAL (keys)	**ENTRY**
	[8] [8] [HZ]

Select Diagnostic:

LOCAL (keys)	**ENTRY**
	[3] [3] [0] [HZ]

Instrument will remain in system controller mode until one of the following events occurs:

- System Controller Disabled:

LOCAL (keys)	ENTRY
	[8] [9] [HZ]

- Service Mode is Re-initiated.
- Instrument Exits Service Mode.

To Specify Printer Address

The following key sequence specifies the HP-IB address of a printer to be controlled by the HP 8642: Range **0-30**. (If not specified, **01** is default address.)

LOCAL (keys)	ENTRY
	[8] [1] (address) [HZ]

Replaceable Parts

7-1. INTRODUCTION

This section contains information for ordering parts for on-site service. Table 7-1 lists the part numbers for on-site replaceable parts. Table 7-2 contains the manufacturer names and addresses that correspond to the manufacturer's codes used in Table 7-1.

Replaceable Modules are available only in Module Replacement Kits. The Module Replacement Kit includes:

- The module (in an Electrostatic Discharge protective package)
- An **A20 Calibration Module** (with modules that require calibration data - **A2, A6, A11, A12, A13, A14, A16,** and **A19**).
- The shipping package (designed for shipping HP 8642 modules)

7-2. REPLACEABLE PARTS LIST

Table 7-1 is organized as follows:

a. Module Replacement Kits in Module reference designator order
b. Miscellaneous electrical parts
b. Cables, Adapters and Mechanical Parts
c. Tools
d. Miscellaneous Parts

The following information is given for each part:

a. The **reference designator** (for the module in the kit)
b. The Hewlett-Packard **part number.**
c. The part number **check digit** (CD)
d. The **quantity used** in the On-Site Service Kit
e. The **description** of the part
f. A **typical manufacturer** of the part in a five-digit code.
g. The **manufacturer's number** for the part.

7-3. RESTORED MODULE EXCHANGE

Some of the modules within the instrument may be replaced on an exchange basis, thus affording a considerable cost savings. Restored, factory-repaired and tested (calibrated) modules are available on a trade-in basis; therefore, the defective modules must be returned for credit. This is Hewlett-Packard's Blue Stripe Program. Modules required for spare parts stock must be ordered by the new Module Kit part number.

For modules in the Blue Stripe Program, both the new and the blue stripe (restored) part numbers are included in Table 7-1.

To order blue stripe Module Kits refer to paragraph **7-4. ORDERING INFORMATION.** An exchange module kit will be sent. Tag the defective module with the special tag provided, and return the defective module within thirty days. Refer to paragraph **7-5. PACKAGING INFORMATION** for special packaging instructions.

7-4. ORDERING INFORMATION

Serial Numbers. Attached to the rear of the instrument is a serial number plate. The first four digits and the letter are the **serial prefix**. The last five digits (suffix) are unique to each instrument. The contents of this manual apply directly to instruments having the same serial prefix(es) as those listed on the title page.

Module Configuration Codes. In addition to the instrument serial prefix, each module in the instrument has a Module Configuration Code.

There will be two labels on each module:

One is the five digit module number: 60009.

The other is the nine digit module identification code: 2448/00000. The first four digits of the nine digit code comprise the **Module Configuration Code**. The last five digits are the calibration data code.

To order a part listed in the **Replaceable Parts List**, call or write the nearest Hewlett-Packard Sales Office. Have the following information compiled to speed the ordering process:

1. The Hewlett-Packard part number and the check digit. (The check digit will ensure accurate and timely processing of your order.)
2. The quantity required.
3. An approved purchase order number may also be required.

7-5. PACKAGING INFORMATION

When the replacement Module Kit arrives, save the special packaging material in which it was shipped and use it to package and return the defective module.

7-6. PARTS LIST UPDATING

A "**MANUAL UPDATES**" packet is shipped with the manual, when necessary, to provide the most current information available at the time of shipment. These packets consist of replacement and addition pages which should be incorporated into the manual to bring it up to date.

Hewlett-Packard offers a **Documentation Update Service** that will provide you with further updates as they become available.

If you operate or service instruments of different serial prefixes, we strongly recommend that you join this service immediately to ensure that your manual is kept current. For more information, refer to the **Documentation Update Service** reply card included in this manual, or write:

Hewlett-Packard Company
Technical Writing Department
24001 E. Mission -- TAF C-34
Spokane, WA 99220

or call:

Technical Writing Department
(509) 922-4001

TABLE 7-1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1						
	08642-60889	7	1	KEYBOARD/LCD DISPLAY MODULE	28480	08642-60889
	08642-69889	5	1	KEYBOARD/LCD DISPLAY MODULE (RESTORED)	28480	08642-69889
A1A1DS2	2140-0536	7	5	LAMP-INCAND 5VDC 115MA T-1-BULB	28480	2140-0536
A1A1DS3	2140-0536	7	5	LAMP-INCAND 5VDC 115MA T-1-BULB	28480	2140-0536
A2						
	08642-60890	0	1	MODULATION MODULE	28480	08642-60890
	08642-69890	8	1	MODULATION MODULE RESTORED	28480	08642-69890
A3						
	08642-60891	1	1	PROCESSOR/MEMORY MODULE	28480	08642-60891
	08642-69891	9	1	PROCESSOR/MEMORY MODULE (RESTORED)	28480	08642-69891
A4						
	08642-60892	2	1	LATCH MODULE	28480	08642-60892
	08642-69892	0	1	LATCH MODULE (RESTORED)	28480	08642-69892
A6						
	08642-60893	3	1	FM LOOP/COUNTER/TIMEBASE MODULE	28480	08642-60893
	08642-69893	1	1	FM LOOP/COUNTER/TIMEBASE MODULE(RESTORED	28480	08642-69893
A7						
	08642-60894	4	1	SAWR LOOP MODULE	28480	08642-60894
	08642-69894	2	1	SAWR LOOP MODULE (RESTORED)	28480	08642-69894
A9						
	08642-60895	5	1	IF LOOP MODULE	28480	08642-60895
	08642-69895	3	1	IF LOOP MODULE (RESTORED)	28480	08642-69895
A11						
	08642-60896	6	1	REFERENCE LOOP MODULE	28480	08642-60896
	08642-69896	4	1	REFERENCE LOOP MODULE (RESTORED)	28480	08642-69896
A12						
	08642-60897	7	1	SUM LOOP/DIVIDER MODULE	28480	08642-60897
	08642-69897	5	1	SUM LOOP/DIVIDER MODULE (RESTORED)	28480	08642-69897
A13						
	08642-60898	8	1	OUTPUT FILTERS/ALC MODULE	28480	08642-60898
	08642-69898	6	1	OUTPUT FILTERS/ALC MODULE (RESTORED)	28480	08642-69898
A14						
	08642-60899	9	1	HETERODYNE MODULE	28480	08642-60899
	08642-69899	7	1	HETERODYNE MODULE (RESTORED)	28480	08642-69899
A16						
	08642-60842	2	1	ATTENUATOR MODULE - 8642A ONLY	28480	08642-60842
	08642-69842	0	1	ATTENUATOR MODULE (RESTORED) 8642A ONLY	28480	08642-69842
A16						
	08642-60848	8	1	ATTENUATOR MODULE - 8642A OPTION 003	28480	08642-60848
	08642-69848	6	1	ATTENUATOR MODULE - 8642A OPTION 003 (RESTORED)	28480	08642-69848
A17						
	08642-60843	3	1	POWER SUPPLY REGULATORS/ATTENUATOR DRIVERS MODULE	28480	08642-60843
	08642-69843	1	1	POWER SUPPLY REGULATORS/ATTENUATOR DRIVERS MODULE (RESTORED)	28480	08642-69843
A18						
	08642-60844	4	1	POWER SUPPLY RECTIFIER/FILTER MODULE	28480	08642-60844
	08642-69844	2	1	POWER SUPPLY RECTIFIER/FILTER MODULE (RESTORED)	28480	08642-69844
A18F1	2110-0010	9	5	FUSE 5A 250V NTD 1.25X.25 UL	75915	312005
A18F2	2110-0002	9	10	FUSE 2A 250V NTD 1.25X.25 UL	75915	312002
A18F3	2110-0036	9	5	FUSE 8A 125V NTD 1.25X.25 UL	75915	312008
A18F4	2110-0002	9		FUSE 2A 250V NTD 1.25X.25 UL	75915	312002
A18F5	2110-0004	1	5	FUSE .25A 250V NTD 1.25X.25 UL	28480	2110-0004
A19						
	08642-60845	5	1	DOUBLER/ATTENUATOR MODULE - 8642B ONLY	28480	08642-60845
	08642-69845	3	1	DOUBLER/ATTENUATOR MODULE (RESTORED) 8642B ONLY	28480	08642-69845

See introduction to this section for ordering information. * Indicates factory selected value

TABLE 7-1. REPLACEABLE PARTS

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS		
B1	08642-80019	7	1	FAN ASSEMBLY	28480	08642-80019
F1	2110-0003	0	5	FUSE 3A 250V NTD 1.25X.25 UL	75915	312003
	08662-60075	7	1	SERVICE KIT CABLE ASSEMBLY, LONG	28480	08662-60075
	08662-60080	4	4	SERVICE KIT CABLE ASSEMBLY, SHORT	28480	08662-60080
	08642-60959	2	1	50-PIN RIBBON CABLE	28480	08642-60959
	34118A	0	1	TEST LEAD KIT	28480	34118A
	1250-1697	5	1	ADAPTER-COAX STR M-SMA F-SMC	28480	1250-1697
	1250-0827	1	4	ADAPTER-COAX STR M-SMC M-SMC	28480	1250-0827
	1250-0832	8	2	ADAPTER-COAX STR F-BNC F-SMC	28480	1250-0832
	5021-0844	1	2	ADAPTER, BNC TO BANANA PLUG	28480	5021-0844
	1250-0781	6	1	BNC TEE (F-M-M)	28480	1250-0781
	1250-0837	3	1	SMC TEE (M-M-M)	28480	1250-0837
	08642-80053	9	1	POWER SUPPLY TEST CONNECTOR	28480	08642-80053
	1251-5653	3	1	CONNECTOR, RIBBON CABLE, 50-PIN	28480	1251-5653
	1251-8601	7	1	CONNECTOR, RIBBON CABLE, 34-PIN	28480	1251-8601
	1251-8248	8	1	CONNECTOR, RIBBON CABLE, 26-PIN	28480	1251-8248
	1251-8812	2	1	CONNECTOR, RIBBON CABLE, 20-PIN	28480	1251-8812
	1251-8105	6	1	CONNECTOR, RIBBON CABLE, 16-PIN	28480	1251-8105
	1251-8823	5	1	CONNECTOR, RIBBON CABLE, 14-PIN	28480	1251-8823
	1252-0153	0	1	CONNECTOR, RIBBON CABLE, 10-PIN	28480	1252-0153
	8730-0012	1	1	WRENCH-TRQ	28480	8730-0012
	8710-1465	8	1	BIT-TORX	28480	8710-1465
	8710-1493	2	1	BIT-TORX	28480	8710-1493
	8710-1541	1	1	BIT-TORX	28480	8710-1541
	08642-40073	9	1	FUSE PULLER	28480	08642-40073
	8710-0033	4	1	TUNING TOOL/SWITCH ROD	28480	8710-0033
	08642-00070	2	1	RF CONNECTOR WRENCH	28480	08642-00070
	08642-20041	9	2	EXTENDER POST	28480	08642-20041
	9300-0985	7	1	WRISTBAND, ANTISTATIC	28480	9300-0985
	9300-0980	2	1	GROUNDING CORD, ANTISTATIC	28480	9300-0980
	1400-0249	0	10	CABLE TIE .062-.625-DIA .091-WD NYL	06383	PLT1M-8
	08642-90020	1	1	ON-SITE SERVICE MANUAL	28480	08642-90020
	9320-3944	6	5	BLUE STRIPE FAILURE REPORT FORM	28480	9320-3944
	11801-90001	8	10	DEFECTIVE TAG	28480	11801-90001
	1540-0954	0	1	PLASTIC STORAGE BOX, 10 COMPARTMENTS	28480	1540-0954
	1540-0953	9	1	PLASTIC STORAGE BOX, 1 COMPARTMENT	28480	1540-0953
	11801-90201	0	1	CASE, LARGE	28480	11801-90201
	11801-90202	1	1	PAD, LARGE CASE 2 PCS	28480	11801-90202
	11801-90203	2	1	CASE, SMALL	28480	11801-90203
	11801-90204	3	1	PAD, SMALL CASE 2 PCS	28480	11801-90204
	9222-0779	1	15	BAG-ASTAT-PD POLYETH FM ENV 16X0-IN-OPNG	28480	9222-0779
	9222-0698	3	8	BAG-STAT SHLDED POLYETH/POLYE-MET-CTD	28480	9222-0698

See introduction to this section for ordering information. * Indicates factory selected value

TABLE 7-2. CODE LIST OF MANUFACTURERS

MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
06383	PANDUIT CORP	TINLEY PARK IL	60477
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
75915	LITTELFUSE INC	DES PLAINES IL	60016

GENERAL INFORMATION

8-1. INTRODUCTION

This section contains general information concerning the following:

- Safety Considerations
- Instruments Covered by this Manual
- Instrument Options
- On-Site Service Kit
- Module Exchange Program
- Rack Mounting Considerations
- Line and Voltage Fuse Selection
- Power Cables
- HP-IB Compatibility
- Recommended Test Equipment
- Packaging
- Periodic Maintenance

The HP part number for the On-Site Repair Manual is shown on the title page of this manual.

8-2. WHERE TO FIND SAFETY CONSIDERATIONS

This product is a Safety Class I instrument; that is, one provided with a protective earth terminal. Before operating or servicing the Signal Generator, service personnel should familiarize themselves with the safety markings on the Signal Generator and the safety instructions. Safety information pertinent to the task at hand (that is, information regarding installing, operating, or servicing the HP 8642) is found throughout this manual. Refer to the Safety Considerations pages found at the beginning of this manual for a summary of general safety information.

8-3. INSTRUMENTS COVERED BY THIS MANUAL

Serial Numbers. Attached to the instrument is a serial-number plate. The serial number is in this form: 0000A00000. The first four digits and the letter are the serial prefix. The last five digits form the suffix that is unique to each instrument. The contents of this manual apply directly to instruments having the same serial prefix(es) as those listed at the beginning of this manual.

Manual Updates. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed at the beginning of this manual. An unlisted serial prefix number indicates that the instrument differs in some way from those being documented when this manual was released.

A "MANUAL UPDATES" packet is shipped with the manual when necessary to provide you with the most current information available at the time of shipment. These packets consist of replacement and addition pages which should be incorporated into the manual to bring it up to date.

Hewlett-Packard offers a **Documentation Update Service** that will provide you with further updates as they become available.

If you service instruments of different serial prefixes, we strongly recommend that you join this service immediately to ensure that your manual is kept current. For more information, refer to the **Documentation Update Service** reply card included with this manual or contact:

Hewlett-Packard Company
Technical Writing Department
24001 E. Mission -- TAF C-34
Spokane, WA 99220

(509) 922-4001

8-4. DESCRIPTION

The HP 8642 is a precision synthesized signal generator. A brief theory of operation and a simplified block diagram for each module are included in the **DIAGNOSTICS** section of this manual.

8-5. OPTIONS AVAILABLE WITH THE INSTRUMENT

Electrical Options

Option 001 (High Stability Time Base). The optional **A8 High Stability Time Base Module** improves the frequency accuracy and stability of the internal reference oscillator.

Option 002 (Rear-Panel Output for All Connectors). This option places all front-panel connections on the rear panel of the instrument.

8642A Option 003 (Increased Output Power Option). This option enables the HP 8642A Synthesized Signal Generator to deliver higher maximum output power between 264.375001 and 1057.500000 MHz. (Refer to the **A16 (Option 003) Module Theory of Operation** in the **DIAGNOSTICS** Section for further information.

Documentation Options

Option 710 (On-Site Repair Manual). This option adds the On-Site Repair Manual to the standard documentation package provided with the instrument.

8-6. EQUIPMENT THAT CAN BE ORDERED FOR THE SIGNAL GENERATOR

On-Site Service Kit
A complete On-Site Service Kit contains modules, parts and tools for servicing the HP 8642 on-site. Refer to the **REPLACEABLE PARTS** section for a complete parts listing for the On-Site Service Kit.

The following table shows which On-Site Service Kit to order for your needs:

Instrument to be Serviced	On-Site Service Kit Needed
HP 8642A	11801A
HP 8642B	11801B
HP 8642A & 8642B	11801C

Bench Service Kit
This kit, in conjunction with the HP 8642 Synthesized Signal Generator Service Manual, is directed at component-level repair and module calibration of the HP 8642. The kit contains special tools and troubleshooting aids such as: a Torx torque driver and Torx bits, special cables and cable adapters, test adapters, etc. Order the Bench Service Kit with HP part number **11802A**.

Signal Generator Test System, HP 8952S
This test system provides the necessary equipment for automated performance testing of the HP 8642. The following software options have been designed specifically for automated testing of the HP 8642:

HP 11795 Opt. 205 - Software Pac

50 Ohm to 75 Ohm Adapter
This adapter is an impedance-matching network required for testing with 75 ohm cabling and/or loads. Order the adapter with HP part number **11687A**.

Fiberglass Transit Case
This is a protective case for shipping and transporting the HP 8642 Signal Generator. Order the case with HP part number **9211-2661**.

8-7. MODULE EXCHANGE PROGRAM

All modules contained in the On-Site Service Kit may be replaced. In addition, all replacement modules are available as restored (factory repaired and calibrated) parts on an exchange basis, thus providing a considerable cost savings. (Refer to the **REPLACEABLE PARTS** section for ordering information.)

8-8. ENVIRONMENTAL INFORMATION

The **operating environment** should be within the following limitations:

Temperature	**0°C** to **+55°C**
Humidity	**5** to **95%** (maximum wet bulb temperature = **40°C**)
Altitude	**<4570** meters (**15 000** feet)
Air flow	**5.8** mm (**0.23** in) minimum clearance underneath the instrument and sufficient clearance at the instrument's right side for *unobstructed* air flow.

CAUTION

The HP 8642 should not be operated for extended periods of time with its top cover off. The top cover is needed to properly direct air flow within the instrument.

For **storing or shipping** the instrument the following environmental limitations apply:

Temperature	**-55°C** to **+75°C**
Humidity	**5** to **95%** (maximum wet bulb temperature = **40°C**)
Altitude	**15 300** meters (**50 000** feet)

8-9. RACK MOUNTING CONSIDERATIONS

WARNING

The Signal Generator is heavy for its size (32.7 kg, 71.5 lb). Care must be exercised when lifting to avoid personal injury.

CAUTION

When rack mounting, it is important that the proper support rails are used to support the Signal Generator.

When rack mounting, it is important that the air flow limitations described in **8-8. ENVIRONMENTAL INFORMATION** *are not exceeded.*

Rack mounting information is provided with the rack mounting kit. If the kit was not ordered with the instrument as an option, it may be ordered through the nearest Hewlett-Packard office.

The Rack-Slide Kit enables service personnel to slide the Signal Generator away from the cabinet and service it at the operating site. Therefore, if you plan to take advantage of the On-Site Service Stategy for the HP 8642, we recommend that you use the Rack-Slide Kit to rack mount the instrument.

8-10. POWER REQUIREMENTS

The Signal Generator requires a power source of 100 Vac (90 to 105 Vac), 120 Vac (108 to 126 Vac), 220 Vac (198 to 231 Vac), or 240 Vac (216 to 252 Vac), 47.5 to 440 Hz single phase. Power consumption is 260 VA maximum (270 VA during atftenuator switching).

WARNING

This is a Safety Class I product (that is, provided with a protective earth terminal). An uninterruptible safety earth ground must be provided from the Mains power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If the instrument is to be energized via an external autotransformer for voltage reduction, make sure that the common terminal is connected to the earthed pole of the power source.

CAUTION

BEFORE PLUGGING THIS INSTRUMENT into the mains (line) voltage, be sure the correct voltage and fuse have been selected.

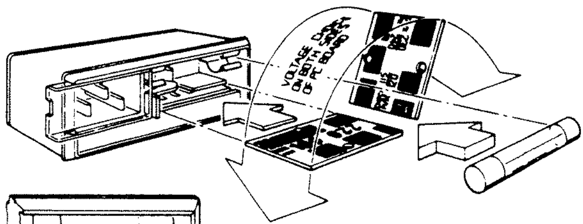
A rear-panel, line power module permits operation from 100, 120, 220, or 240 Vac. The number visible in the window (located on the module) indicates the nominal line voltage to which the instrument must be connected. Verify that the line voltage selection card and the fuse are matched to the power source. Refer to **Figure 8-1. Line Voltage and Fuse Selection**.

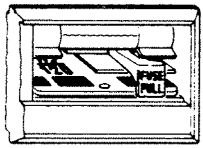
Two fuses are supplied with each instrument. One fuse has the proper rating for 110/120 Vac line operation (HP part number **2110-0003**; 3A, 250V, non-time-delay). The other fuse is rated for 200/220 Vac operation (HP part number **2110-0002**; 2A, 250v, non-time-delay).

One fuse is installed in the instrument at the time of shipment. The rating of the installed fuse is selected according to the line voltage specified by the customer. If the voltage is not specified, the rating of the installed fuse will be selected according to the country of destination.

WARNING

For protection against fire hazard, the line fuse should only be a 250V normal blow fuse with the correct current rating.





Operating voltage is shown in module window.

SELECTION OF OPERATING VOLTAGE

1. Open cover door, pull the FUSE PULL lever and rotate to left. Remove the fuse.
2. Remove the Line Voltage Selection Card. Position the card so the line voltage appears at top-left cover. Push the card firmly into the slot.
3. Rotate the Fuse Pull lever to its normal position. Insert a fuse of the correct value in the holder. Close the cover door.

Figure 8-1. Line Voltage and Fuse Selection

8-11. POWER CABLES

WARNING

BEFORE CONNECTING THIS INSTRUMENT, the protective earth terminal of the instrument must be connected to the protective conductor of the (Mains) power cord. The Mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated be the use of an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two conductor outlet is not sufficient protection.

This instrument is equipped with a three-wire power cable. When connected to an appropriate AC power receptacle, this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination.

8-12. HP-IB ADDRESS SELECTION

The Signal Generator's address is set to **19** at the factory both in RAM memory and on a switch located inside the instrument. The address stored in RAM remains valid through switching the power from **Standby** to **On** and unplugging of the AC power cord (unless the internal battery power is lost which would cause RAM memory to be lost). If RAM memory is ever lost, the address on the internal switch is read and becomes the address at turn on. To set the address from the front panel, select: [SHIFT] [LOCAL],enter address (from **00** to **30**), and [HZ].

8-13. RECOMMENDED EXTERNAL TEST EQUIPMENT

Table 8-1. Recommended Test Equipment

Instrument	Critical Specifications	Recommended Model	Use*
Digital Multimeter (DMM)	Accuracy: 4½ digit, ±0.05% reading ±1 digit Range: 10 mV to 600V Sensitivity: 10 μV	HP 3466A or HP 3455A	D
Power Measuring Device	Power Range: −127 dBm to +20 dBm Frequency Range: 100 kHz to 2115 MHz Accuracy: ±0.02 dB	HP 8902A	D, P
Oscilloscope	Vertical Sensitivity: 10 mV/division Bandwidth: 50 MHz	HP 1740A	D
Personal Computer		HP 85B	P

* D = Diagnostics
P = Performance testing

8-14. MODULE PACKAGING

The modules should be packaged in the cartons supplied for shipment. Refer to the **REPLACEABLE PARTS** section for more information on packaging and shipping.

Service Notes

MANUAL UPDATES

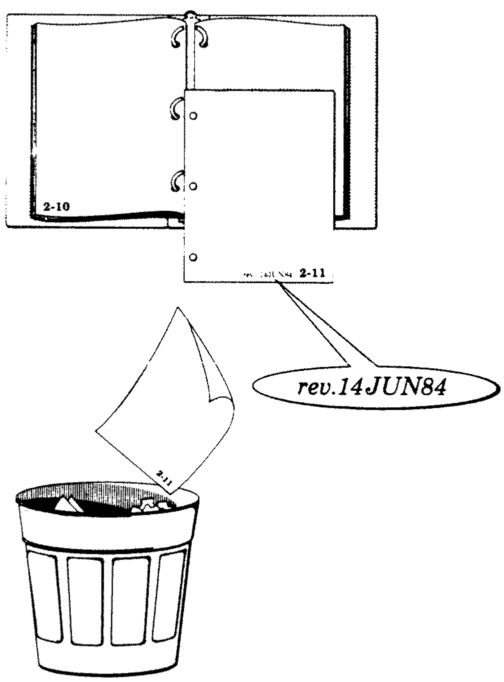
The enclosed new title page lists the instrument serial prefix numbers that will be documented by your manual as a result of the updates. The enclosed updates are in the form of *Replacement* and *Addition* pages.

HOW TO UPDATE YOUR MANUAL

Integrate all enclosed pages into your manual paying close attention to the page numbers. The page numbers will tell you whether a page from this packet is a Replacement page or an Addition page.

1. Replacing a Page

A Replacement page has a page number preceded by a revision date. The Replacement page number will always be the same as the number on the page it is meant to replace.



For example, if this packet contained a page "*rev.14JUN84* 2-11" you would remove and discard the existing page 2-11 from your manual and replace it with a new page from this packet.

NOTE: There may be a revision date on the existing page in the manual, replace it only after making sure that the Replacement page has a later revision date.

Always use the page with the latest revision date.

2. Adding a Page

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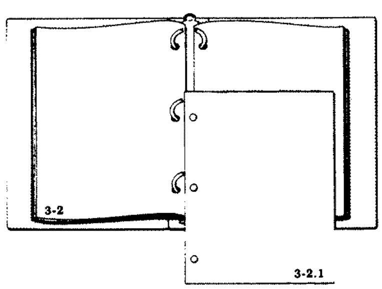

For example, page 3-2.1 in this packet would be added immediately following page 3-2 in your manual.

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RECEIVING FURTHER UPDATES

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All Serial Prefixes

A11 INPUTS VERIFICATION:

- Under "1. A11 RF INPUT CHECK" change the first result block label from "ALL ERRORS R30-33" to "EVERY ERROR R30-33."

All Serial Prefixes

A12 INPUTS VERIFICATION:

- Under "1. A12 RF INPUT CHECK." change the first result block label from "ALL ERRORS S78-97" to "EVERY ERROR S78-97."

All Serial Prefixes

A14 MODULE SIMPLIFIED BLOCK DIAGRAM:

- At the output connector A14A3 J1, change "TO A14 MODULE" to "TO A19 MODULE (HP 8642B)" and add "TO A16 MODULE (HP 8642A)."
  Also note that the output frequency range for the A14 Module is shown above the A14A3 J1 connector.

All Serial Prefixes

A16 INPUTS VERIFICATION:

- Change "3. A19 RF POWER LEVEL CHECK" to "3. A16 RF POWER LEVEL CHECK."

All Serial Prefixes

A19 MODULE SIMPLIFIED BLOCK DIAGRAM:

- At the input connector A19K1 J2, reverse the direction arrow on the input signal path and reverse the direction arrow on the signal path leading to the X2 multiplier block.

All Serial Prefixes

EXCEPTIONAL CASES TROUBLESHOOTING DIAGRAM

- Under the **A12 SUM LOOP/DIVIDER MODULE**, change setup 1 connection from A14U1 J2 to A13A2 J6.

All Serial Prefixes

INSTRUMENT WIRING DIAGRAM

- Change the cable connecting the **AM/ PULSE** input to A2J2 from W38 to W202.
- Change the cable connecting the **FM/ΦM** input to A2J5 from W39 to W201.
- Change the cable connecting the **MOD** output to A2J7 from W37 to W203.
- Change the cable connected to A6A2 J5 from W28 to W23.
- Add J2 where W10 connects to the **PS REGULATORS.**
- Add J3 where W9 connects to the **AT-TENUATOR DRIVERS.**

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The information contained in this manual is as accurate and up-to-date as possible at the time of shipment. If, however, you operate or repair instruments with serial prefixes later than what is indicated on the title page of this manual, you may require documentation updates.

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