8954A
TRANSCEIVER
INTERFACE

SERIAL NUMBERS

This manual applies directly to test sets with serial numbers prefixed 2146A

For additional important information about serial numbers, see SERIAL NUMBERS in Section I.

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1620 SIGNAL DR., SPOKANE, WASHINGTON, TAF-C-34, 99220, U.S.A.

Operating and Service Manual Part Number 08954-90005

Microfiche Operating and Service Manual Part No. 08954-90006

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HEWLETT PACKARD

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 earth 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.

CAUTIONS

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.

WARNINGS

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.

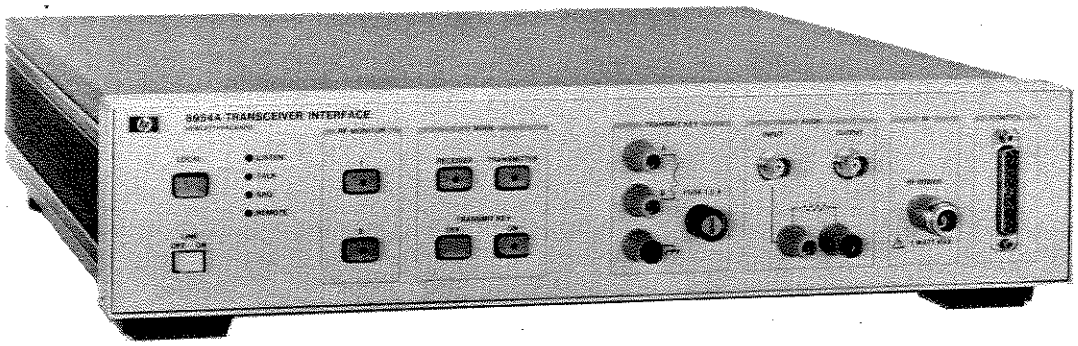
If this instrument is to be energized via an autotransformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the power source.

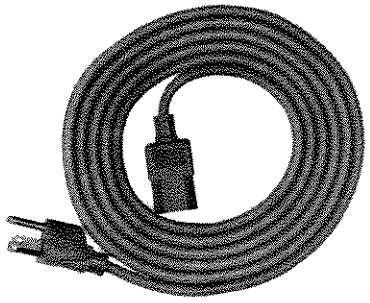
Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

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.


HP
98544 TRANSCEIVER INTERFACE



SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

This Operating and Service Manual contains information required to install, operate, test, and service the Hewlett-Packard Model 8954A Transceiver Interface. Figure 1-1 shows the instrument and accessories supplied.

The information structure of this manual is as described below:

Section I, General Information: provides instrument description and specifications, explains accessories and options, and lists recommended test equipment.

Section II, Installation: provides information concerning initial inspection, preparation for use (including HP-IB address selection for remote operation), and storage and shipment.

Section III, Operation: provides information about panel features, including operators checks and operators maintenance information.

Section IV, Performance Tests: provides tests to check that the electrical performance of the instrument agrees with the published specifications.

Section V, Adjustments: normally provides the information required to properly adjust the instrument. This instrument, however, has no adjustments.

Section VI, Replaceable Parts: provides ordering information for all replaceable parts and assemblies.

Section VII, Manual Changes: provides manual change information necessary to document all serial prefixes listed on the Operating and Service Manual title page. In addition, this section also contains recommended modifications for earlier instrument configurations.

Section VIII, Service: provides the information required to repair the instrument.

Additional copies of the Operating and Service Manual can be ordered separately through your nearest Hewlett-Packard office. The part number is listed on the title page of this manual.

Also on the title page of this manual, below the manual part number, is a microfiche part number. This number may be used to order 100 X 150mm (4 x 6) microfilm transparencies of the Operating and Service Manual. Each microfiche contains up to 96 photo-duplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement.

1-2. SPECIFICATIONS

Instrument specifications are listed in Table 1-1. These are the performance standards, or limits, against which the instrument may be tested. Information listed under Supplemental Characteristics, Table 1-2, are not warranted specifications but are typical characteristics included as additional information for the user.

1-3. SAFETY CONSIDERATIONS

This product is a Safety Class I instrument; that is, one provided with a protective earth terminal. The Transceiver Interface and all related documentation must be reviewed for familiarization with safety markings and instructions before operation. Refer to the Safety Considerations page found at the beginning of this manual for a summary of the safety information. Safety information pertinent to the task at hand; that is, installation, operation, performance testing, or service, is found throughout this manual.

1-4. INSTRUMENTS COVERED BY THIS MANUAL

This instrument has a two-part serial number in the form 0000A00000 which is stamped on the serial number plate attached to the rear of the instrument. The first four digits and the letter constitute the serial number prefix and the last five digits form the suffix. The prefix is the same for all identical instruments. It changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply directly to any instrument that has the same serial number prefix as listed under SERIAL NUMBERS on the title page.

An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates that the instrument is different from those documented in this manual. The manual for this newer instrument is accompanied by a yellow MANUAL CHANGES supplement. This supplement contains "change information" that explains how to adapt the manual to the newer instrument.

In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and as accurate as possible, Hewlett-Packard recommends that you periodically request the latest MANUAL CHANGES supplement. The supplement for this manual is identified with the manual print date and part number, both of which appear on the manual title page. Complimentary copies of the supplement are available from Hewlett-Packard.

For information concerning a serial number prefix that is not listed on the title page or in the MANUAL CHANGES supplement, contact your nearest Hewlett-Packard office.

1-5 GENERAL DESCRIPTION.

The HP Model 8954A Transceiver Interface is a switching interface specifically designed for transceiver testing. The utility of the Transceiver Interface is optimized when incorporated in a test-set environment. A test set provides the Transceiver Interface with the capability of directing signals between the transceiver under test and the appropriate test equipment; thus allowing for comprehensive, transceiver characterization.

1-6 TRANSCEIVER TESTING.

The Transceiver Interface has two, independent, signal-path configurations for transceiver testing; one is the RECEIVER MODE (RCVR) and the other is the TRANSMITTER MODE (XMTR). Figure 1-2 shows the signal paths for these modes; selected by either the front-panel keyboard or the Hewlett-Packard Interface Bus (HP-IB).

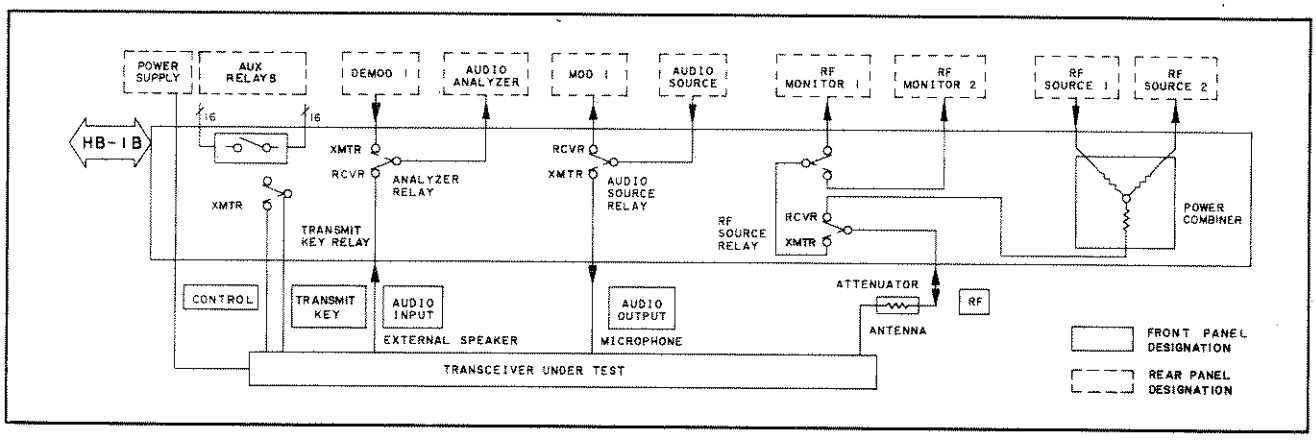


Figure 1-2. HP 8954A Transceiver Interface Test Configuration

1-7. OPTIONS AND ACCESSORIES

The following options and accessories are available and may have been ordered and received with the Transceiver Interface. If they were not received with the original shipment and are now desired, they may be ordered from your nearest Hewlett-Packard office using the part number included in the following paragraphs.

1-8. Mechanical Options

Front-Handle Kit Option 907. Ease of handling is increased with front-panel handles. Order HP part number 5061-0088.

1-8. Mechanical Options (Cont'd.)

Rack-Flange Kit Option 908. This kit contains all necessary hardware and installation instructions for mounting the Transceiver Interface in a rack with 482.5mm (standard 19") spacing. Order HP part number 5061-0074 which has standard 1.75" (4.45 cm) hole spacing.

Rack-Flange and Front-Handle Combination Kit Option 909. This kit is not simply a front-handle kit and rack flange kit packaged together. The combination is made up of unique parts which include both functions. Order HP part number 5061-0075 which has 1.75" (4.45 cm) hole spacing and is a standard flange.

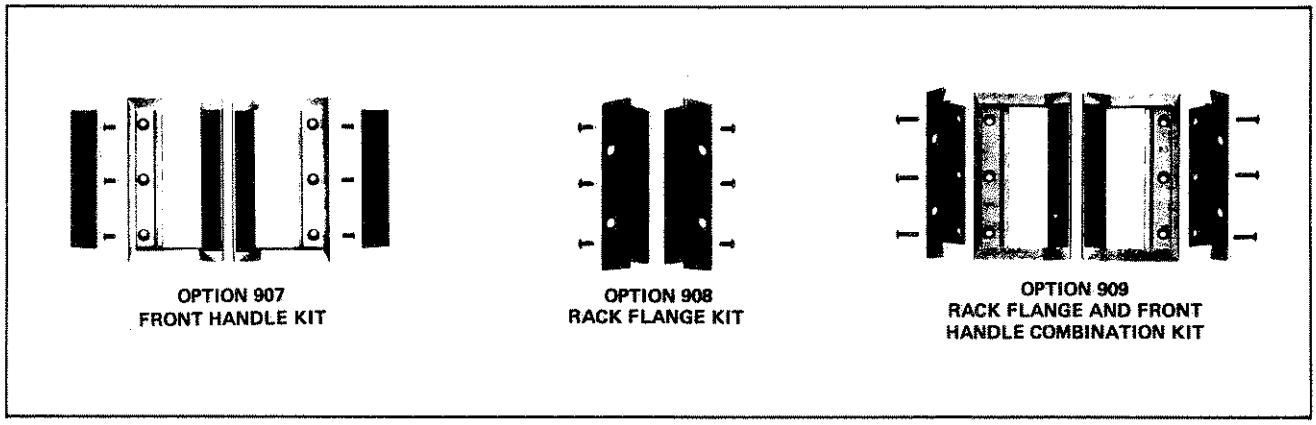


Figure 1-3. Rack Mounting Options

1-9. Accessories Available

50-Ohm Termination. Type-N, 50-ohm, coaxial termination; DC-4 GHz. Order HP part number 908A.

Control Connector and Cable. Control connector with 10 feet (3.05 m) of cable (sheathed, 9-conductor cable: 2, coaxial conductors; 2, DC power supply conductors; and 5, single-conductor wires). Order HP part number 08956-60108. Connector mates with the instrument's front panel connector J9.

Auxiliary Relay Connector. Auxiliary Relay connector hardware (unassembled; cable not included). Order HP part number 08956-60111. Connector mates with rear panel Aux. Relay connector J19.

DC Power Supply Connector. DC Power Supply connector hardware (unassembled; cable not included). Order HP part number 08956-60112. Connector mates with rear panel DC Power Supply connector J18.

NOTE: The limit to the length of cable attached to the DC Power Supply connector is determined by the amount of insertion loss developed in that cable. Refer to the dc power supply's operating manual for information which discusses power-cable parameters as a function of insertion loss. The Transceiver Interface has has 2 feet (61 cm) of #12 AWG wire between the rear panel DC Power Supply connector and the front panel Control Connector.

1-10. Service Accessories

HP-IB Test Jumpers. These service accessories are designed for use in the HP-IB signature analysis test. Test Jumper 1 is a dual-in-line test fixture which adapts the HP-IB GPIA socket for the HP-IB test (Test B), HP part number; 85650-60052. Test Jumper 2 is a dual-in-line test fixture which adapts the HP-IB socket for the HP-IB test (Test C), HP part number; 08954-60005. Both test jumpers may be ordered as a kit under HP part number (8954-60115).

1-11. HEWLETT-PACKARD INTERFACE BUS

HP-IB *

1-12. Compatibility

The Transceiver Interface has an HP-IB interface and can be used with any HP-IB controller or computer for automatic-system applications. The Transceiver Interface is fully programmable via the HP-Interface Bus. The Transceiver Interface's complete compatibility with HP-IB is defined by the following list of interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, and E1. The Transceiver Interface interfaces with the bus via open-collector TTL circuitry. An explanation of the compatibility codes can be found in the IEEE Standard 488 and the identical ANSI Standard MC1.1.

For more detailed information relating to programmable control of the Transceiver Interface, refer to Remote Operation in Section III of this manual.

1-13. Selecting the HP-IB Address

Five miniature HP-IB address switches are located on the rear panel of the Transceiver Interface. These switches represent a five-bit binary number (00 through 31 in decimal). HP-IB addresses greater than 30 (decimal) are invalid. When the instrument is shipped from the factory, the HP-IB address is preset to 03 (decimal). To determine the Transceiver Intefaces HP-IB address, refer to paragraph 2-7, HP-IB Address Selection.

1-14. RECOMMENDED TEST EQUIPMENT

Table 1-4 lists the test equipment required for testing and servicing the Transceiver Interface. The Critical Specifications column describes the essential requirements for each piece of test equipment. Other equipment can be substituted if it meets or exceeds these critical specifications.

* Not just IEEE-488, but the hardware, documentation, and support that delivers the shortest path to a measurement system.

Table 1-1. Specifications

ELECTRICAL SPECIFICATIONS	PERFORMANCE LIMIT	CONDITIONS
RF INPUT		
Range	20 Hz to 1300 MHz	
Maximum Power	1 Watt	
RF INSERTION LOSS		
Loss	≤0.5 dB	RF port to RF MONITOR port 1 or 2.
Loss	-6.15 dB ±0.35 dB	RF SOURCE port 1 or 2 to RF port. (Unused RF SOURCE port terminated with 50 ohms.)
VSWR		
Ratio	≤1.15	Between RF port and RF MONITOR port 1 or 2.
Ratio	≤1.15	Between RF SOURCE 1 or 2 and RF port. (RF port and unused RF SOURCE port terminated with 50 ohms.)
AUDIO FREQUENCY		
Range	20 Hz to 100 kHz	DC-Coupled.
AUDIO INSERTION LOSS		
Loss	<0.03 dB	20 to 20 kHz.
	<0.3 dB	20 kHz to 100kHz.

Table 1-2. Supplemental Characteristics

ELECTRICAL CHARACTERISTICS	PERFORMANCE LIMIT	CONDITIONS
EXTERNAL DC POWER SUPPLY		
Current	30A	Voltage < 28 Vdc
Voltage	50 Vdc	Current < 15A
KEY RELAY		
Current	1.5A	Voltage < 28 Vdc
Voltage	50 Vdc	Current < 0.5A
AUXILIARY RELAYS		
Current	0.5A	Voltage < 20 Vdc
Voltage	50 Vdc	Current < 0.2A

Table 1-3. General Specifications

OPERATING CHARACTERISTIC	GENERAL	PERFORMANCE LIMIT
POWER REQUIREMENTS		
Line Voltage		
100, 120 Vac	+5%, -10%	48 - 440 Hz
220, 240 Vac	+5%, -10%	48 - 66 Hz
POWER DISSIPATION	22 V×A max.	
NET WEIGHT	6.12 kg (13.5 lb)	
DIMENSIONS [Full Envelope]		
Height	89 mm (3.5 in.)	
Width	411 mm (16.2 in.)	
Depth	406 mm (16.0 in.)	

Table 1-4. Recommended Test Equipment

INSTRUMENT TYPE	CRITICAL SPECIFICATIONS	MODEL	USE*
Signal Generator	Frequency Range: 5-1000 MHz. Output Level: +13 dBm. Output Level Flatness: +1.5 dB.	HP 8640B Opt. 002	P, T
Audio Source Audio Analyzer	Frequency Range: 20-100 kHz. Output Level: 1-6 V. AC Level Accuracy: ±4% (20 kHz-100 kHz, 1 mV-6 V.)	HP 8903A	P, T
Digital Multimeter	Accuracy: 4-1/2 digits, + 0.02% of reading plus one digit. Range: 20 mV to 6 V, 2 Vac. Sensitivity: 100 uV.	HP 3455A	P, T
Signature Multimeter	Provides preferred method for troubleshooting digital circuitry.	HP 5005A	T
Power Meter	Frequency Range: 5-1000 MHz. Input Level: +13 dBm max. Dynamic Range: 40 dB.	HP 436A with HP 8482A	P, T
SWR Bridge	Frequency Range: 5-1300 MHz. Impedance: 50 Ohms. Directivity: >40 dB. Connectors: Type-N.	Wiltron 60N50 Opt. 01	P
Controller HP-IB	HP-IB compatibility as defined by IEEE Standard 488 and the identical ANSI standard MC1.1: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, and E1.	HP 9825A/ 98034B/ 98213A or HP 9826A OPT. 001 or HP 85F/ 00085-15003/ 82937A	T
50 Ohm Load		HP 908A	P
600 Ohm Load		HP 11095A	P

*P = Performance Tests; T = Troubleshooting.

SECTION II

INSTALLATION

2-1. INTRODUCTION

This section provides the information needed to install the Transceiver Interface. Included is information pertinent to initial inspection, power requirements, line voltage and fuse selection, power cables, HP-IB address selection, interconnection, mating connectors, operating environment, instrument mounting, storage, and shipment.

2-2. INITIAL INSPECTION

WARNING

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers and panels).

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, the shipping materials should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking electrical performance are given in Section IV of this manual. Notify the nearest Hewlett-Packard office if the Transceiver Interface is received in any of the following conditions: incomplete contents, mechanical damage or defect, or failure of any of the instrument's electrical performance tests. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for the carrier's inspection.

2-3. PREPARATION FOR USE

2-4. Power Requirements

The Transceiver Interface requires a power source of 100 to 120 (+5%, -10%) Vac 48-440 Hz, 220 to 440 (+5%, -10%) Vac 48-66 Hz, single phase. Power consumption is 22 V*A maximum.

2-4. Power Requirements (Cont'd.)

WARNING

This is a Safety Class I product (i.e., provided with a protective earth terminal). An uninterruptible safety earth ground must be provided from the Mains power 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 this instrument is to be energized via an external autotransformer for voltage reduction, make sure that the common terminal is connected to the earth pole of the power source.

2-5. Line Voltage and Fuse Selection

CAUTION

BEFORE PLUGGING THIS INSTRUMENT into the Mains (line) voltage, be sure the correct voltage and fuse have been selected.

The rear-panel, Line-Filter 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. See Figure 2-1, "Line Voltage and Fuse Selection". Table 2-1, lists the voltage and current ratings, and the HP part numbers for the replaceable fuses.

WARNING

For protection against fire hazard, the line fuse should only be a 250V fuse with the correct current rating.

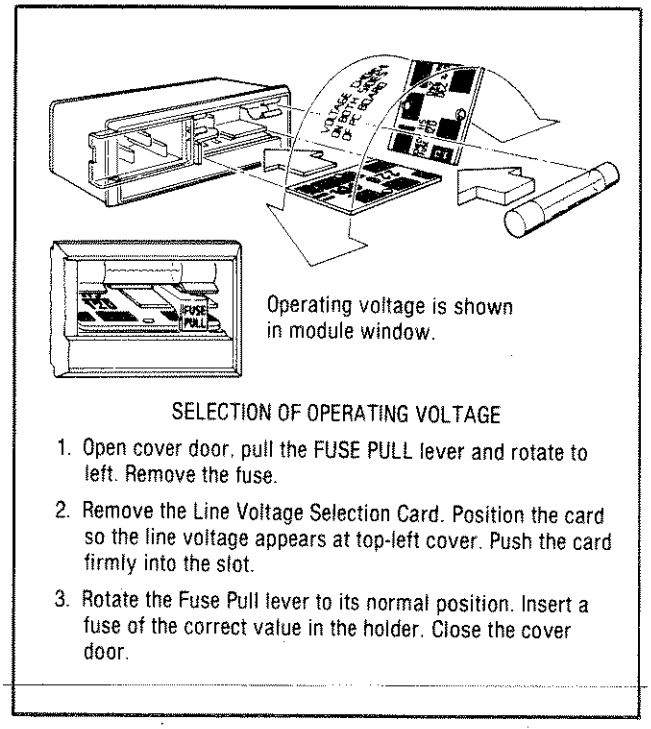


Figure 2-1. Line Voltage and Fuse Selection

Table 2-1. Line Fuse Ratings and Part Numbers

Line Voltage	Rating	Part Numbers
100/120V	250 mA, 250V	HP 2110-0004
220/240V	125 mA, 250V	HP 2110-0027

2-6. 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 by 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 the instrument depends on the country of destination. See Figure 2-2 for part numbers of the power cables and Mains plugs available.

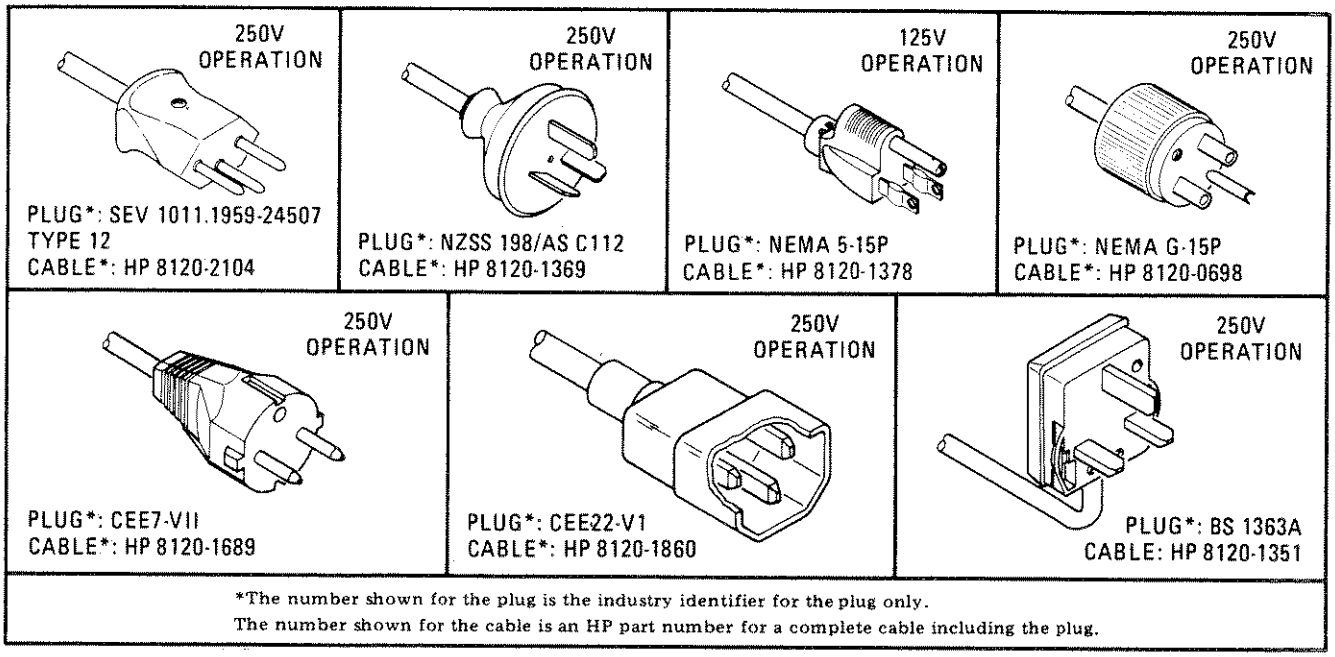


Figure 2-2. Power Cable HP Part Numbers

2-7. HP-IB Address Selection

The HP-IB address for the HP 8954A is preset at the factory for address 03. (This decimal value corresponds to a talk address of "C" and a listen address of "#".) Figure 2-3 shows the HP-IB address switch in its preset position. The addresses listed in Table 2-2 can be selected by setting the five segments of the HP-IB address switch (located on the rear panel) to correspond with the five-bit binary equivalent of the desired device address.

Table 2-2. Allowable HP-IB Address Codes

Address Switch					Equivalent Decimal Value	Equivalent ASCII Character (LISTEN)	Equivalent ASCII Character (TALK)
A1 LSB	A2	A3	A4	A5 MSB			
0	0	0	0	0	00	SP	@
1	0	0	0	0	01	!	A
0	1	0	0	0	02	"	B
1	1	0	0	0	03	#	C
0	0	1	0	0	04	$	D
1	0	1	0	0	05	%	E
0	1	1	0	0	06	&	F
1	1	1	0	0	07	'	G
0	0	0	1	0	08	(	H
1	0	0	1	0	09	)	I
0	1	0	1	0	10	*	J
1	1	0	1	0	11	+	K
0	0	1	1	0	12	,	L
1	0	1	1	0	13	-	M
0	1	1	1	0	14	.	N
1	1	1	1	0	15	/	O
0	0	0	0	1	16	0	P
1	0	0	0	1	17	1	Q
0	1	0	0	1	18	2	R
1	1	0	0	1	19	3	S
0	0	1	0	1	20	4	T
1	0	1	0	1	21	5	U
0	1	1	0	1	22	6	V
1	1	1	0	1	23	7	W
0	0	0	1	1	24	8	X
1	0	0	1	1	25	9	Y
0	1	0	1	1	26	:	Z
1	1	0	1	1	27	;	[
0	0	1	1	1	28	<	\
1	0	1	1	1	29	=	]
0	1	1	1	1	30	>	^
1	1	1	1	1	31	INVALID	INVALID

---- Factory Selected Address.

2-7. HP-IB Address Selection (Cont'd.)

If the HP-IB settings are changed while the instrument is on, the LINE ON/OFF switch must be cycled off and then on, which activates the instrument at the new address setting.

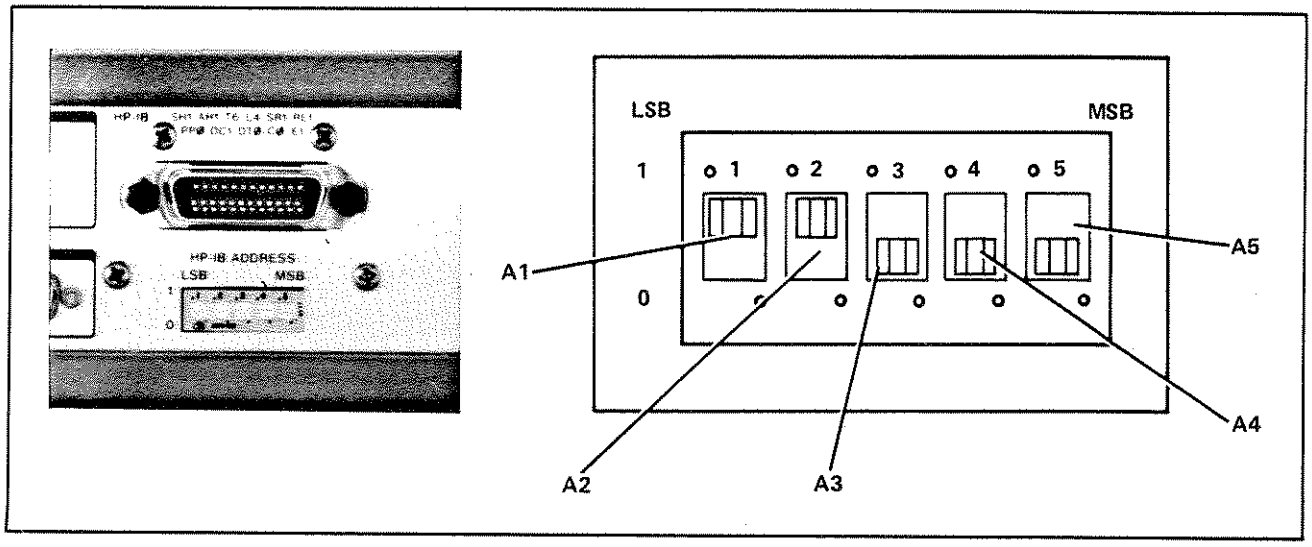


Figure 2-3. HP-IB Address Switch Location and Settings

2-8. Interconnection

Interconnection data for the Hewlett-Packard Interface Bus is provided in Figure 2-4.

2-9. Mating Connectors

Coaxial Connectors. Coaxial mating connectors used with the Transceiver Interface should be either BNC male connectors or 50-ohm, Type-N male connectors that are compatible with those specified in US MIL-C-39012.

Interface Connectors. HP-IB mating connector is shown in Figure 2-4. Note that the two securing screws are metric.

For more information regarding Transceiver Interface connectors refer to paragraph 1-9, entitled "Accessories Available".

2-10. Operating Environment

The operating environment should be within the following limitations:

Temperature.....0 degrees C to +55 degrees C
Humidity.....<95% relative at 40 degrees C
Altitude.....<4570 metres (15,000 feet)

2-11. Bench Operation

The instrument cabinet has plastic feet and foldaway tilt stands for convenience in bench operation. (The plastic feet are shaped to ensure self-alignment of instruments when they are stacked.) The tilt stands raise the front of the Transceiver Interface for easier viewing of the front panel.

2-12. Rack Mounting

Rack mounting information is provided with the rack mounting kits. If the kits were not ordered with the instrument as options, they may be ordered through the nearest Hewlett-Packard office. Refer to paragraph 1-8, "Mechanical Options", in Section I.

2-13. STORAGE AND SHIPMENT

2-14. Environment

The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment.

Temperature .....-55 degrees C to +75 degrees C
Humidity.....<95% relative
Altitude.....15,300 metres (50,000 feet)

2-14. Packaging

Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing; attach a tag indicating the type of service required, return address, model number, and full serial number. Also, mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

Other Packaging. The following general instructions should be used for repackaging the instrument with commercially available materials.

1. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial number).

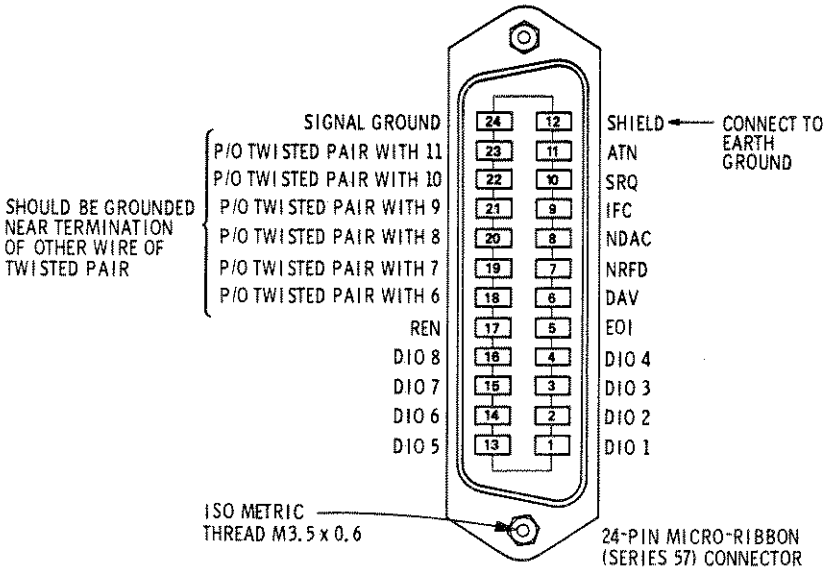
2. Use a strong shipping container. A double-wall carton made of 2.4 MPa (350 psi) test material is adequate.

2-14. Packaging (Cont'd.)

3. Use enough shock-absorbing material (75 to 100 millimeter layer; 3 to 4 inches) around all sides of the instrument to provide a firm cushion and to prevent movement in the container. Protect the front panel with cardboard.

4. Seal the shipping container securely.

5. Mark the shipping container FRAGILE to ensure careful handling.



Logic Levels

The Hewlett-Packard Interface Bus Logic Levels are TTL compatible, i.e., the true (1) state is 0.0 Vdc to +0.4 Vdc and the false (0) state is +2.5 Vdc to +5.0 Vdc.

Programming and Output Data Format

Refer to Section III, Operation.

Mating Connector

HP 1251-0293; Amphenol 57-30240.

Mating Cables Available

HP 10631A, 1 metre (3.3 ft), HP 10631B, 2 metres (6.6 ft)
HP 10631C 4 metres (13.2 ft), HP 10631D, 0.5 metres (1.6 ft)

Cabling Restrictions

1. A Hewlett-Packard Interface Bus system may contain no more than 2 metres (6 ft) of connecting cable per instrument.

2. The maximum accumulative length of connecting cable for any Hewlett-Packard Interface Bus system is 20.0 metres (65.6 ft).

Figure 2-4. Hewlett-Packard Interface Bus Connections HP-IB

SECTION III

OPERATION

3-1. INTRODUCTION

This section provides operating information for the Transceiver Interface. Included are operating instructions, operator's maintenance procedures, operational descriptions of all front- and rear-panel features, operator's checks, and information on Remote (HP-IB) operation.

3-2. Operating Characteristics

For detailed information on the Transceiver Interface's characteristics, refer to Table 1-1, "Specifications", and Table 1-2, "Supplemental Characteristics". For information on the instrument's HP-IB capabilities, refer to the summary contained in Table 3-1, "HP-IB Message Reference List".

3-3. Local Operation

The front-panel operation of the Transceiver Interface is presented in this section under "Front-Panel Features", "General Operating Instructions", and "Detailed Panel Features".

Front-Panel Features. Figure 3-1 illustrates the front panel of the Transceiver Interface and provides descriptions of each key, connector, and switch.

3-4. Remote Operation

The Transceiver Interface is capable of remote operation via the Hewlett-Packard Interface Bus (HP-IB). Knowledge of the instrument's LOCAL mode of operation is beneficial in understanding HP-IB programming. HP-IB information is presented in the following areas of this section:

1. Beginning with paragraph 3-12 - General HP-IB information.

2. Table 3-1 - A summary of HP-IB capabilities.

3. Table 3-2 - A summary of HP-IB program codes.

3-5. Operator's Checks

Operator's checks are simple procedures designed to verify that the Transceiver Interface is operating properly. Two procedures are

3-5. Operators Checks (Cont'd.)
provided: one for basic (front-panel) functional checks, and the other for HP-IB functional checks.

Basic Functional Checks. This procedure assures that the front-panel-controlled functions are being properly executed by the Transceiver Interface. The only equipment needed to perform this test is a signal generator and a spectrum analyzer. (Interconnecting cables and adapters must also be provided.)

HP-IB Functional Checks. HP-IB

These procedures assume that the instrument's front-panel operation has been previously verified; that is, that the Basic Functional Checks have been performed. These procedures check all of the applicable bus messages summarized in Table 3-1. This series of procedures requires a computing controller (HP-IB compatible) and an HP-IB interconnecting cable.

3-6. GENERAL OPERATING INSTRUCTIONS

WARNINGS

Before the Transceiver Interface is switched on, all protective earth terminals, extension cords, autotransformers, and devices attached to the instrument should be connected to a protective earth grounding socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

For continued protection against fire hazard, replace the line fuse with only a 250V fuse of the same rating. Do not use repaired fuses or short-circuited fuseholders.

CAUTION

Before the Transceiver Interface is switched on, it must be set to the same line voltage as the power source or damage to the instrument may result.

3-7. Power-On Procedure

The Transceiver Interface has an "off" state and an "on" state. If the Transceiver Interface is already plugged in, set the LINE OFF/ON switch to ON. If the power cable is not plugged in, follow these instructions:

1. Ensure that the LINE OFF/ON switch is OFF.

2. Check that the instrument's line voltage setting corresponds to the voltage of the power source. Refer to paragraph 2-4.

3. Check that the line fuse rating is appropriate for the line voltage being used. Refer to paragraph 2-5.

4. Plug in the power cable.

5. Set the LINE OFF/ON switch to ON.

3-8. OPERATOR'S MAINTENANCE

WARNING

For continued protection against fire hazards, replace the line fuse with only a 250V fuse of the same rating. Do not use repaired fuses or short-circuited fuseholders.

The only maintenance the operator should need to perform is the replacement of the primary power fuse (in A4 Line Filter Module), the TRANSMIT KEY FUSE (accessible from the front panel) or the Power Supply fuses A2F1, and A2F2 (located inside the instrument). Instructions on how to change the primary power fuse are found in Figure 2-1, steps 1 and 3, and paragraph 2-5.

* Primary power fuses may be ordered under HP Part Numbers 2110-0004 (0.250A, 250V) for 100/120 Vac operation and 2110-0027 (0.125A, 250V) for 220/240 Vac operation.

CAUTION

Before replacing the TRANSMIT KEY fuse, ensure that the Transceiver Interface LINE OFF/ON switch is in the OFF position.

* The TRANSMIT KEY FUSE is contained in the front-panel fuse holder. It may be easily removed with a flat-blade screwdriver. The TRANSMIT KEY FUSE may be ordered under HP part number 2100-0043 (1.5A, 250V).

3-8. OPERATORS'S MAINTENANCE (Cont'd.)

CAUTION

Before replacing the Power Supply fuses, ensure that the Transceiver Interface LINE OFF/ON switch is in the OFF position.

* The Power Supply fuses A2F1 and A2F2 are located on the A2 assembly (see Service Sheet 4). The fuses may be ordered under HP part numbers HP 2110-0269 (A2F1; 0.75A, 250V) and HP 2110-0027 (A2F2; 0.125A, 250V).

3-9. DETAILED PANEL FEATURES

The Transceiver Interface may be controlled by either the front panel or the Hewlett-Packard Interface Bus. The front- and rear-panel features are described in detail in Figures 3-1 and 3-2.

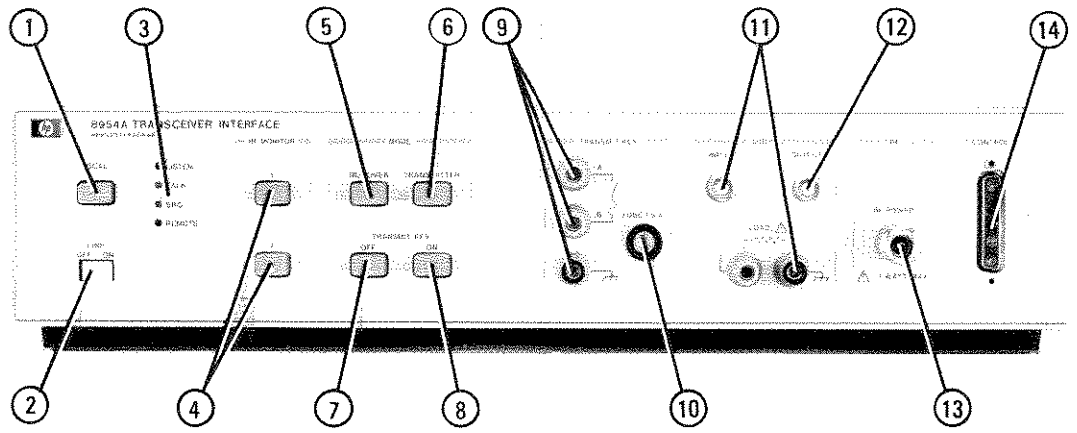


Figure 3-1 Front Panel Features

(1) LOCAL Key

The LOCAL key returns the instrument to the local operating mode (full, front-panel control) from the remote mode of operation. The LOCAL key is disabled if a Local Lockout command has been given by the HP-IB controller.

(2) LINE OFF/ON

The LINE OFF/ON switch applies line power to the Transceiver Interface when the switch is set to the ON position.

(3) REMOTE Annunciators

Four LED annunciators are used to display the instrument's operational status in the remote mode. The LISTEN and TALK annunciators indicate that the instrument is addressed to LISTEN or TALK. The SRQ annunciator indicates that the Transceiver Interface has initiated a service request. The REMOTE annunciator indicates that the instrument has entered the remote operating mode.

(4) RF MONITOR Keys (1 and 2)

The RF MONITOR keys (1 and 2) allow the input signal to the RF, Type-N connector (front panel), to be output at either RF MONITOR 1 or RF MONITOR 2, Type-N connectors (rear panel). The utilization of either monitor may be done only when the instrument is in its TRANSMITTER MODE. (Refer to TRANSMITTER MODE Key explanation).

(5) RECEIVER MODE Key

The RECEIVER MODE key causes the instrument to make the following internal relay connections to accomodate receiver testing:

- Input signals to the RF SOURCE 1 and/or 2, Type-N connectors (rear panel), are switched to the RF, Type-N connector (front panel). (Simultaneous input signals to the RF SOURCE connectors 1 and 2 are combined through a 6-dB power combiner before being output at the RF connector.)
- Input signals to the AUDIO SOURCE, BNC connector (rear panel) are switched to the RF SOURCE MOD 1, BNC connector (rear panel).
- Input signals to the AUDIO INPUT, BNC connector (front panel) are switched to the AUDIO ANALYZER, BNC connector (rear panel).
- Opens the Transmit Key relay if the instrument is in the Transmit mode with the Transmit Key on.

(6) TRANSMITTER MODE Key

The TRANSMITTER MODE key causes the instrument to make the following internal relay connections to accomodate transmitter testing:

- Input signals to the RF, Type-N connector (front panel) are switched to either RF MONITOR 1 or 2, Type-N connector (rear panel).
- Input signals to the AUDIO SOURCE, BNC connector (rear panel) are switched to the AUDIO OUTPUT, BNC connector (front panel).
- Input signals to the RF MONITOR DEMOD 1, BNC connector (rear panel) are switched to the AUDIO ANALYZER, BNC connector (rear panel).

See Figure 1-2 for an illustration of relay activity for both the receiver and transmitter modes.

(7) TRANSMIT KEY OFF MODE

The TRANSMIT KEY OFF key opens the relay (TRANSMIT KEY Relay) that keys the transmitter.

(8) TRANSMIT KEY ON MODE

The TRANSMIT KEY ON key closes the relay contacts (TRANSMIT KEY Relay) which keys the transmitter when the instrument is in the TRANSMITTER MODE. In the RECEIVER MODE, when the TRANSMIT KEY ON key is selected, the Transceiver Interface switches to the TRANSMITTER MODE.

(9) TRANSMIT KEY

The TRANSMIT KEY consists of connectors A, B, and ground ⏚, which are provided for keying the transmitter. A and B are connected via relay contacts that are controlled by the TRANSMIT KEY ON and TRANSMIT KEY OFF. The TRANSMIT KEY connectors A and B may be allowed to float or be referenced to ground ⏚.

CAUTION

Damage to the test set-up may occur if the transmitter is keyed during testing without a 30 dB pad between the device under test and the Transceiver Interface. Therefore, control of the transmitter key, other than by the Transceiver Interface, should not be allowed.

(10) TRANSMIT KEY FUSE

The TRANSMIT KEY FUSE will open if current in excess of 1.5A is drawn through the instrument's transmitter-key circuit.

(11) AUDIO INPUT

When the Transceiver Interface is in the RECEIVER MODE, an audio input signal to the AUDIO INPUT, BNC connector is output at the AUDIO ANALYZER connector (rear panel). The AUDIO INPUT is in parallel with two terminal posts (LOAD) for attaching a simulated speaker impedance.

(12) AUDIO OUTPUT

In the TRANSMITTER MODE, the AUDIO OUTPUT, BNC connector outputs a signal received from the AUDIO SOURCE input (rear panel). The AUDIO OUTPUT signal is used as the microphone input to the transceiver under test.

(13) RF

The RF, Type-N connector, is used for both RF input and output signals. When the instrument is in the RECEIVER MODE, the RF connector is switched to RF SOURCE 1 and 2. In the TRANSMITTER MODE, the RF connector is switched to either RF MONITOR 1 or 2. The maximum allowable RF input power is +30 dBm (1 Watt). The input impedance is 50 ohms nominal.

(14) CONTROL

The CONTROL connector consists of the following Transceiver Interface inputs and outputs (see following illustration):

- Pin 1 is in parallel with the AUDIO INPUT (front panel); both BNC connector and terminal posts.
- Pins 2 and 3 are in parallel with the TRANSMIT KEY terminals B and A, (front panel) respectively.
- Pin 4 is wired to the negative (-) dc voltage-input pin and the negative (-) dc voltage-sense pin (pin 4 and 5 respectively) of the rear panel POWER SUPPLY connector. Pin 5 is wired to the positive (+) dc voltage-input and the positive (+) dc voltage sense pin (pin 4 and 7 respectively) of the rear panel POWER SUPPLY connector.
- Pin 6 is in parallel with front-panel AUDIO OUTPUT, BNC connector.

Refer to paragraph 1-9 and Service Sheet 2 for more information regarding this connector.

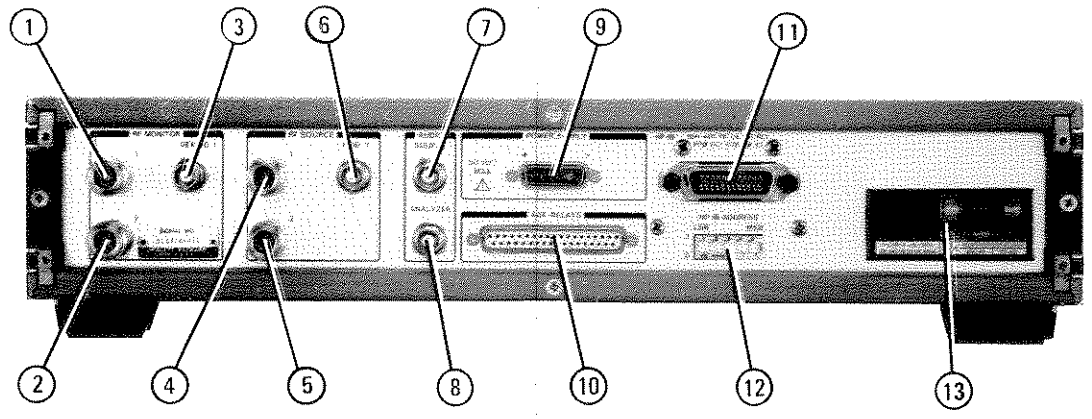


Figure 3-2. Rear-Panel Features

(1) RF MONITOR 1

In the TRANSMITTER MODE, RF MONITOR 1, Type-N connector outputs an RF signal that is received from the RF connector (front panel). See Figure 3-1, Front Panel Features for RF MONITOR 1 selection procedure (via front panel keys).

(2) RF MONITOR 2

In the TRANSMITTER MODE, RF MONITOR 2, Type-N connector outputs an RF signal that is received from the RF connector (front panel). See Figure 3-1, Front Panel Features for RF MONITOR 2 selection procedure (via front panel keys).

(3) RF MONITOR DEMOD 1

In the TRANSMITTER MODE, the transmitter's demodulated RF signal is switched from the RF MONITOR DEMOD 1, BNC connector to the AUDIO ANALYZER connector (rear panel).

(4) RF SOURCE 1

In the RECEIVER MODE, an RF signal path is connected from the RF SOURCE 1, Type-N connector to the RF connector (front panel). Refer to following NOTE

(5) RF SOURCE 2

In the RECEIVER MODE, an RF signal path is connected from the RF SOURCE 2, Type-N connector to the RF connector (front panel). Refer to following NOTE.

NOTE

Independent input signals to RF SOURCE 1 and RF SOURCE 2 are combined through a 6-dB power combiner before they are output at the RF POWER connector (front panel). If only one RF SOURCE is used, the other RF SOURCE connector must be terminated with 50 ohms.

(6) RF SOURCE MOD 1

In the RECEIVER MODE, an audio signal path is connected from the RF SOURCE MOD 1, BNC connector to the AUDIO SOURCE input connector (rear panel). The RF SOURCE MOD 1 output signal is used as an external-modulation input to the RF signal source.

(7) AUDIO SOURCE

In the TRANSMITTER MODE, an input signal from an audio source to the AUDIO SOURCE BNC connector is output at the AUDIO OUTPUT connector (front panel).

In the RECEIVER MODE, an input signal from an audio source to the AUDIO SOURCE connector is output at the RF SOURCE MOD 1 connector (rear panel).

(8) AUDIO ANALYZER

In the TRANSMITTER MODE, the AUDIO ANALYZER, BNC connector outputs an audio signal that is received from the RF MONITOR DEMOD, BNC connector (rear panel).

In the RECEIVER MODE, the AUDIO ANALYZER, BNC connector outputs an audio signal that is received from the AUDIO INPUT connector (front panel)

(9) POWER SUPPLY

The POWER SUPPLY, seven-pin connector is wired to the CONTROL connector (front panel). This connector is used as the input for an external dc power supply. The external supply provides a programmable voltage source for the transceiver under test.

Pin 1 is the positive (+) input pin and Pin 4 is a negative (-) input pin. Additional POWER SUPPLY connections are the remote sensing input pins, which includes: Pin 5; which is the positive (+) voltage sense input pin, and Pin 7; which is the negative (-) voltage sense input pin.

(10) AUX. RELAYS

The AUX. RELAYS, 36-pin connector is the external connection to 16 sets of relay contacts (single-pole, single-throw); relays are internal to the Transceiver Interface. Service Sheet 2 contains more detailed information regarding these relays.

(11) HP-IB Connector

The HP-IB, 24-pin connector is used to connect the Transceiver Interface to the Hewlett Packard-Interface Bus. This will allow the instrument to be controlled with any HP-IB controller. Connection information is presented in Section II, Installation.

(12) HP-IB Address Switch

The HP-IB address switch is a five-segment switch used to select the Transceiver Interface's HP-IB address. Address selection information is presented in Section II, Installation.

(13) Line Filter Module

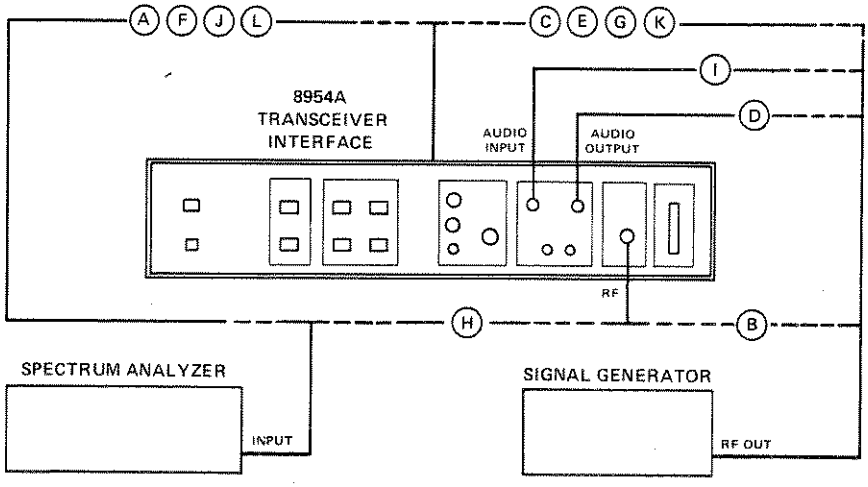
The Line Filter Module permits operation from 100, 120, 220, or 240 Vac. The number visible in the module window indicates the nominal line voltage to which the instrument must be connected. The center conductor is connected to safety earth ground. Line-voltage selection information is presented in Section II, Installation.

3-10. OPERATOR'S CHECKS

Operator's checks are simple procedures designed to verify that the main functions of the Transceiver Interface operate properly. Two procedures are provided: one for front-panel functional checks, and the other for HP-IB functional checks.

3-11. Basic Functional Checks

DESCRIPTION: This procedure assures that the front-panel-controlled functions are being properly executed by the Transceiver Interface. The only equipment needed to perform this test is a signal generator and a spectrum analyzer. (Interconnecting cables and adapters must also be provided).



BASIC FUNCTIONAL CHECKS (PROCEDURE STEPS)	CONNECTIONS
3–8	(A) RF MON 1 or 2 to Spectrum Analyzer Input. (B) Signal Generator output to RF POWER input.
9–12	(C) AUDIO SOURCE to Spectrum Analyzer Input. (D) Signal Generator output to AUDIO OUTPUT.
13–15	(E) Signal Generator output to RF MONITOR DEMOD. 1 (F) AUDIO ANALYZER to Spectrum Analyzer.
18–22	(G) Signal Generator output to RF SOURCE 1. (H) RF POWER to Spectrum Analyzer input.
24–25	(I) Signal Generator output to AUDIO INPUT. (J) AUDIO ANALYZER to Spectrum Analyzer.
26–27	(K) Signal Generator output to AUDIO SOURCE. (L) RF SOURCE MOD 1 to Spectrum Analyzer.

Figure 3-3. Test Setup for Basic Functional Checks

OPERATORS CHECKS

3-11. Basic Functional Checks (Cont'd.)

EQUIPMENT:
Signal Generator ----------HP 8640B
Spectrum Analyzer ----------HP 8558B/182T

PROCEDURE:

1. Ensure that the power cable is plugged into a suitable source of Mains Power. (Refer to paragraph 2-4, 2-5, and 2-6.)

2. Set the LINE OFF/ON switch to ON. The Transceiver Interface powers up in the RECEIVER MODE (key-cap LED, on) with RF MONITOR 1 selected (key-cap LED, on).

3. Connect the Transceiver Interface RF connector to the signal generator's RF output and the Transceiver Interface RF MONITOR 1 connector (on the rear panel) to the spectrum analyzer input.

Transmitter Mode Checks

4. Set the output amplitude of the signal generator to 0 dBm, and set the carrier frequency to 10 MHz.

5. Set the center frequency of the spectrum analyzer to 10 MHz, and set the reference level to 0 dBm.

6. Select the TRANSMITTER MODE. Verify that the level displayed on the spectrum analyzer is 0 dBm ±5 dB.

7. Connect the spectrum analyzer to the RF MONITOR 2 connector (on the rear panel). The signal level on the spectrum analyzer should be less than -60 dBm.

8. Select RF MONITOR 2. Verify that the level displayed on the spectrum analyzer is 0 dBm ±5 dB.

9. Set the signal generator's carrier frequency to 100 kHz and the spectrum analyzer's center frequency to 100 kHz.

10. Connect the signal generator to the AUDIO SOURCE connector (rear panel).

11. Connect the spectrum analyzer to the AUDIO OUTPUT connector (front panel). Verify that the level displayed on the spectrum analyzer is 0 dBm ±5 dB.

OPERATORS CHECKS

3-11. Basic Functional Checks (Cont'd.)

12. Select the RECEIVER MODE. The signal level on the spectrum analyzer should be less than -60 dBm.

13. Connect the signal generator to the RF MONITOR DEMOD 1 connector (on the rear panel).

14. Connect the spectrum analyzer to the AUDIO ANALYZER connector (on the rear panel).

15. Select the TRANSMITTER MODE. Verify that the level displayed on the spectrum analyzer is 0 dBm ±5 dB.

16. Select the TRANSMIT KEY ON MODE. Verify that there is continuity between TRANSMIT KEY terminals A and B.

Receiver Mode Checks

17. Set the signal generator's frequency to 10 MHz and the spectrum analyzer's center frequency to 10 MHz.

18. Connect the signal generator to the RF SOURCE 1 connector (on the rear panel).

19. Connect the spectrum analyzer to the RF connector (on the front panel).

20. Terminate RF SOURCE 2 connector with a 50-ohm load (RF SOURCE 1 and RF SOURCE 2 are connected through a 6-dB power combiner).

21. Select the RECEIVER MODE. Verify that the signal level displayed on the spectrum analyzer is -6 dBm ±5 dB.

22. Connect the signal generator to the RF SOURCE 2 connector. Connect the 50-ohm load to the RF SOURCE 1 connector. Verify that the level displayed on the spectrum analyzer is -6 dBm ±5 dB.

23. Set the signal generator's carrier frequency to 100 kHz and the spectrum analyzer's center frequency to 100 kHz.

OPERATORS CHECKS

3-11. Basic Functional Checks (Cont'd.)

PROCEDURE:

24. Connect the signal generator to the AUDIO INPUT connector (on the front panel).

25. Connect the spectrum analyzer to the AUDIO ANALYZER connector (on the rear panel). Verify that the level displayed on the spectrum analyzer is 0 dBm ±5 dB.

26. Connect the signal generator to the AUDIO SOURCE connector on the rear panel.

27. Connect the spectrum analyzer to the RF SOURCE MOD 1 connector on the rear panel. Verify that the level displayed on the spectrum analyzer is 0 dBm +-5 dB.

3-12. HP-IB Functional Checks HP-IB

DESCRIPTION: The following procedures check the Transceiver Interface's ability to: recognize its own HP-IB talk and listen address, properly make remote-to-local transitions, and process all of the applicable HP-IB messages described in Table 3-2. During these tests, all data input/output bus lines, control lines, and handshake lines of the Tranceiver Interface's HP-IB are checked. A Transceiver Interface, a bus controller, and an HP-IB interface with appropriate cabling are required to perform these procedures. Since these checks are intended to be independent from one another, each begins with the instrument reset to its initialized condition.

The validity of these checks is based on the following assumptions:

* The Transceiver Interface performs properly when operated via the front-panel keys (that is, in the Local operating mode). This can be verified by performing the Basic Functional Checks outlined in paragraph 3-11.

* The bus controller properly executes HP-IB operations.

* The bus controller properly interfaces with the HP-IB (able to transfer control instructions).

HP-IB

OPERATORS CHECKS

3-12. HP-IB Functional Checks (Cont'd.)

DESCRIPTION: (Cont'd.)

* The select code of the bus controller's interface is set to 7.

* The HP-IB address of the Transceiver Interface is set to 03 (the factory-set address).

The select-code address, combination 703, is used. (This select-code address is not necessary for these checks to be valid; however, the program lines presented in the following procedures would need modification for any other combination.)

If the Transceiver Interface appears to fail any of the Remote functional checks, the validity of the preceding assumptions should be reconfirmed before attempting to service the instrument.

NOTE: The Transceiver Interface's proper operation is verified by successfully performing the HP-IB functional checks. These procedures do not check all Transceiver Interface program-code responses. However, if the front-panel operation and HP-IB functional checks are confirmed to be correct, the instrument will most likely respond properly to all of its program codes.

INITIAL SET UP: The test setup is the same for all of the checks; that is, the Transceiver Interface is connected to the bus controller's HP-IB interface via the appropriate cabling.

EQUIPMENT: HP-IB Controller.....HP 85F / 00085-15003 (I/O ROM)

--or-- HP 9825/98213A (General and Extended I/O ROMs)

--or-- HP 9826A OPT 001

--or-- HP 9845A (I/O ROM)

HP-IB Interface..... HP 82937A (HP 85)

--or-- HP 98034B (HP 9825)

--or-- HP 98034B (HP 9845)

OPERATORS CHECKS

HP-IB

3-12. HP-IB Functional Checks (Cont'd.)

Address Recognition

This check determines whether the Transceiver Interface is capable of recognizing an HP-IB address.

NOTE: It is assumed that the Instrument is in the Local operating mode and that it properly handshakes on the bus.

Before beginning this check, set the LINE OFF/ON switch to OFF, then ON, for instrument initialization.

Description	HP 9825A (HPL)	HP 85F, HP 9845A & HP 9826A (BASIC)
Set the Remote Enable, bus-control line (REN) false.	lcl 7	LOCAL 7
Send the listen address to the Transceiver Interface.	wrt 703	OUTPUT 703

OPERATOR'S RESPONSE: Verify that the Transceiver Interface REMOTE annunciator remains off and that its LISTEN annunciator lights.

Description	HP 9825A (HPL)	HP 85F, HP 9845 & HP 9826A (BASIC)
Unaddress the Transceiver Interface by sending a different address.	wrt 719	OUTPUT 719

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE and LISTEN annunciators are both off.

HP-IB

OPERATORS CHECKS

3-12. HP-IB Functional Checks (Cont'd.)

Remote and Local Messages and LOCAL Key

This check determines whether the Transceiver Interface properly switches from Local to Remote operation, and from Remote to Local operation.

NOTE: It is assumed that the Transceiver Interface is able to properly handshake on the bus and recognize its own HP-IB address.

Before beginning this check, set the LINE OFF/ON switch to OFF, then ON for instrument initialization.

Description	HP 9825A (HPL)	HP 85F, HP 9845A & HP 9826A (BASIC)
Send the Remote message which sets the Remote Enable, bus-control line (REN) true and addresses the Transceiver Interface to listen.	rem 703	REMOTE 703

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE and LISTEN annunciators both light.

Send the Local message to the Transceiver Interface.	lcl 703	LOCAL 703

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE annunciator turns off and that its LISTEN annunciator remains on.

Send the Remote message to the Transceiver Interface.	rem 703	REMOTE 703

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE and LISTEN annunciators are both on. Press the LOCAL key on the front panel of the Transceiver Interface. Verify that the REMOTE annunciator turns off and that the LISTEN annunciator remains on.

OPERATORS CHECKS

HP-IB

3-12. HP-IB Functional Checks (Cont'd.)

Data Message

This check determines that the Transceiver Interface properly receives data messages.

NOTE: It is assumed that the Transceiver Interface is able to handshake, recognize its own address, and properly make Remote/Local transitions. The data message sent will cause the HP-IB data lines to be placed in both the true and false states.

Before beginning this check, set the LINE OFF/ON switch to OFF, then to ON, for instrument initialization.

Description	HP 9825A (HPL)	HP 85F, HP 9845A & HP 9826A (BASIC)
Send the first part of the Remote message (which enables the Tranceiver Interface to Remote).	rem 703	REMOTE 703
Address the Transceiver Interface to listen (which completes the Remote message), and send the data message (which selects the TRANSMITTER MODE).	wrt 703, "XM"	OUTPUT 703; "XM"

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE and LISTEN annunciators both light and that the TRANSMITTER MODE annunciator (key-cap LED) lights.

HP-IB

OPERATORS CHECKS

3-12. HP-IB Functional Checks (Cont'd.)

Local Lockout and Clear Lockout/Set Local Message

This check determines whether the Transceiver Interface properly receives the Local Lockout message that disables all front-panel keys. In addition, this check determines whether the Clear Lockout/Set Local message is properly received and executed by the instrument.

NOTE: It is assumed that the Transceiver Interface is able to handshake, recognize its own address, and properly make Remote/Local transitions.

Before beginning this check, set the LINE OFF/ON switch to OFF, then to ON, for instrument initialization.

Description	HP 9825A (HPL)	HP 85F, HP 9845A & HP 9826A (BASIC)
Send the first part of the Remote message (which enables the Transceiver Interface to remote).	rem 7	REMOTE 7
Send the Local Lockout message.	llo 7	LOCAL LOCKOUT 7
Address the Transceiver Interface to listen (which completes the Remote message).	wrt 703	OUTPUT 703

OPERATOR'S RESPONSE: Verify that the Transceiver interface's REMOTE and LISTEN annunciators both light. Press the LOCAL key on the front panel of the Transceiver Interface and Verify that the REMOTE and LISTEN annunciators both remain on.

Send the Clear Lockout/ Set Local message.	lcl 7	LOCAL 7

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE annunciator is turned off and that its LISTEN annunciator remains on.

OPERATORS CHECKS

HP-IB

3-12. HP-IB Functional Checks (Cont'd.)

Clear Message

This check determines whether the Transceiver Interface properly responds to the Clear message.

NOTE: It is assumed that the Transceiver Interface is able to handshake, recognize its own address, and properly make Remote/Local transitions.

Before beginning this check, set the LINE OFF/ON switch to OFF, then to ON, for instrument initialization.

Description	HP 9825A (HPL)	HP 85F, HP 9845A & HP 9826A (BASIC)
Send the first part of the Remote message (which enables the Transceiver Interface to Remote).	rem 7	REMOTE 7
Address the Transceiver Interface to listen (which completes the Remote message), and send the Data message.	wrt 703, "XYZ"	OUTPUT 703; "XYZ"

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE and LISTEN annunciators remain on and that the SRQ annunciator lights.

Send the Clear message.	clr 703	RESET 703 CLEAR 703 (HP 85 & 9826A)

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE and LISTEN annunciators remain on and that the SRQ annunciator is not on.

HP-IB

OPERATORS CHECKS

3-12. HP-IB Functional Checks (Cont'd.)

Abort Message

This check determines whether the Transceiver Interface becomes unaddressed when it receives the Abort message.

NOTE: It is assumed that the Transceiver Interface is able to handshake, recognize its own address, and properly make Remote/Local transitions.

Before beginning this check, set the LINE OFF/ON switch to OFF, then to ON, for instrument initialization.

Description	HP 9825A (HPL)	HP 85F, HP 9845A & HP 9826A (BASIC)
Send the complete Remote message.	rem 703	REMOTE 703

OPERATOR'S RESPONSE: Verify that the Transceiver Interface's REMOTE and LISTEN annunicators both light.

Send the Abort message (which unaddresses the Transceiver Interface to listen).	cli 7	ABORTIO 7 ABORT 7 (HP 9826A)

OPERATOR'S RESPONSE: Verify that the LISTEN annunciator turns off.

3-13. REMOTE OPERATION, HEWLETT PACKARD-INTERFACE BUS

The Transceiver Interface can be operated through the Hewlett-Packard Interface Bus (HP-IB). Bus compatability, programming, and data formats are described in the following paragraphs.

All front-panel functions and auxiliary relays are programmable via the HP-IB. A quick check of the Transceiver Interface's HP-IB input/output capability is described in paragraph 3-12, "HP-IB Functional Checks". These checks are used to verify that the Transceiver Interface responds to each of the applicable HP-IB messages described in Table 3-1.

3-14. HP-IB Compatibility

The Transceiver Interface has an open collector, TTL, HP-IB interface capability. This capability enables the instrument to be controlled by any computer or computing controller that is HP-IB programmable. The Transceiver Interface is fully programmable via the Hewlett-Packard Interface Bus. The instrument's programming capability is described by the twelve HP-IB messages listed in Table 3-1. Foremost among these messages is the Data message. Data messages contain the program codes that control the Transceiver Interface's signal paths. The Transceiver Interface's complete compatability with HP-IB is further defined by the following list of interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, and C0. A more detailed explanation of these compatibility codes can be found in the IEEE Standard 488 (and the identical ANSI Standard MC1.1).

3-15. Remote Operation

Remote Capability. In Remote operation, the front-panel keys are disabled (except for the LINE OFF/ON switch and the LOCAL key). The Transceiver Interface can be addressed to listen and to talk. When addressed to listen, the Transceiver Interface will respond to the following messages: Data, Clear, Remote, Local, Local Lockout, Clear Lockout/Set Local, and Abort. Each message is discussed in detail in the following paragraphs of this section. When addresed to talk, the Transceiver Interface outputs the following messages: Service Request and Instrument Identification (after receiving the ID Output Command).

Local-to-Remote Change. The Transceiver Interface transfers to the Remote operating mode upon receipt of the Remote message. The Remote message is comprised of two parts. They are:

* Remote Enable bus-control line (REN) set true.

* Device listen address received once (while REN is true).

The Transceiver Interface's REMOTE and LISTEN annunciators will both light and the instrument's relay switch positions will remain unchanged when the local to remote transition occurs.

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3-16. Local Operation

Local Capability. In Local operation, the Transceiver Interface's front panel is fully operational and the instrument will respond to the Remote message. Whether addressed or not, the Transceiver Interface will also respond to the Clear, Local Lockout, Clear Lockout/Set Local, and Abort messages. It will not, however, respond to the Data messages (unless it has been previously addressed).

Remote-to-Local Change. The Transceiver Interface returns to Local operation upon receipt of the Local message (GTL) or Clear Lockout/Set Local message. The Clear Lockout/Set Local message sets the Remote Enable bus-control line (REN) false. The instrument can always be set to Local operation by pressing the front-panel LOCAL key provided that a Local Lockout is not in effect. The signal paths will remain unchanged when the remote-to-local transition occurs.

Local Lockout. When a data transmission is interrupted (which can happen by returning the Transceiver Interface to Local operation with the LOCAL key) the data can be lost. This would leave the Transceiver Interface in an unknown state. To prevent this, a Local Lockout is recommended. Local Lockout disables the LOCAL key and allows a return-to-local only under program control.

NOTE

A return-to-local can also be accomplished by setting the LINE OFF/ON switch first to off, then back to ON. This technique, however, has some potential disadvantages:

* It defeats the purpose of Local Lockout; that is, the system controller will lose its control over the Transceiver Interface.

* Some HP-IB conditions are reset to their default state during turn on.

3-17. Addressing

When the Transceiver Interface is in the command-entry mode, it interprets the byte of information on its eight-data, input/output lines as either an address or a bus command. The command-entry mode is entered when the Attention bus-control line (ATN) is true and the Interface Clear bus control line (IFC) is false. Whenever the Transceiver Interface is being addressed (whether in Local or Remote operation), the front-panel LISTEN annunciator lights if addressed to listen and the TALK annunicator lights if addressed to talk.

The Transceiver Interface's address is established by five switches located on the rear panel of the instrument. The address selection procedure is described in section II (Installation). Refer to Table 2-2 for a list of the valid decimal addresses and their equivalent ASCII characters.

3-18. Data Messages

The Transceiver Interface communicates on the interface bus with Data messages. Each Data message consists of one or more bytes of information sent over the Transceiver Interface's eight, input/output bus lines (DIO1 through DIO8) during the data-entry mode. The data-entry mode is established when Attention bus-control line (ATN) is false. Data messages include the program codes listed in Table 3-2. These program codes contain the necessary information to: program all of the instrument functions available in LOCAL operation, program the 16 auxiliary relays, and program the Output Commands.

3-19. Receiving the Data Message

The Transceiver Interface must be in Remote operation and addressed to listen before it can respond to Data messages. The instrument will remain addressed to listen until it receives an Abort message, a universal unlisten command from the controller, or an address to talk.

Data Message Input Format. Data messages contain the controller's talk address, the Transceiver Interface's listen address, a string of program codes, and an End Of String message (EOS). The auxiliary relay code can be entered at any place in the string. The EOS message can be a Line Feed (LF), a bus END message (EOI and ATN bus-control lines both set true), or an internally produced EOS. Figure 3-4 provides some examples of Data messages.

3-19. Receiving the Data Message (Cont'd.)

EXAMPLE 1

CONTROLLER'S TALK ADDRESS	F2	XM	K1	END-OF-STRING MESSAGE
TRANSCEIVER INTERFACE'S LISTEN ADDRESS	Select RF MONITOR 2 relay path	Select TRANSMITTER MODE	Select TRANSMIT KEY ON	

EXAMPLE 2

CONTROLLER'S TALK ADDRESS	F1	RC	V0	END-OF-STRING MESSAGE
TRANCEIVER INTERFACE'S LISTEN ADDRESS	Select RF MONITOR 1 relay path	Select RECEIVER MODE	Set all auxiliary relays to open	

Figure 3-4. Data Message Examples

A complete list of ASCII characters with conversion to binary, octal, decimal, and hexadecimal is provided in Table 2-2.

3-20. Receiving the Trigger Message

The Transceiver Interface does not have the capability to respond to the trigger message.

3-21. Receiving the Clear Message

The Transceiver Interface will respond to a Clear message by setting the listen or talk function off. The Transceiver Interface will respond equally to the Selected Device Clear (SDC) bus command when addressed to listen, and to the Device Clear (DCL) bus command whether addressed or not.

3-22. Receiving the Remote Message

The Remote message is comprised of two parts. First, the Remote Enable, bus-control line (REN) is held true, then the device listen address is sent by the controller. These two actions occur synchronously to configure the Transceiver Interface in the Remote operating mode. Therefore, the instrument is enabled to go in Remote operation when the controller begins the Remote message. The Transceiver Interface does not actually make the transition to Remote operation until it is addressed to listen for the first time. All instrument settings remain unchanged when the transition from local-to-remote operation occurs. The front-panel REMOTE and LISTEN annunciators will both light and remain on when the Transceiver Interface has received the Remote message and is addressed to listen.

3-23. Receiving the Local Message

The controller will configure the Transceiver Interface in the Local mode by sending the Go-to-Local (GTL) bus command. If addressed to listen, the Transceiver Interface will return to Local operation (full, front-panel control) when it receives the Local message. If the instrument is in Local Lockout when the Local message is received, full, front-panel control will be returned, but Local Lockout will remain in effect. Unless the Tranceiver Interface receives the Clear Lockout/Set Local message, it will return to Local Lockout the next time it receives a Remote message. All instrument settings remain unchanged when the transition from Remote to Local is made.

The front-panel REMOTE annunciator will be turned off when the Transceiver Interface switches to Local operation. However, the front-panel LISTEN annunciator will remain lit if the Transceiver Interface is still being addressed to listen (whether in Remote or Local operation), and the front-panel TALK annunicator will remain lit if the instrument is addressed to talk.

The front-panel LOCAL key can also be used to return the Transceiver Interface to Local operation. However, pressing the LOCAL key (when the instrument is not in Local Lockout) might interrupt a Data message being sent to the Transceiver Interface. This would leave the Transceiver Interface in a state unknown to the controller. This situation is undesirable and can be avoided by sending the Local Lockout message to disable the LOCAL key.

3-24. Receiving the Local Lockout Message

The controller sends the Local Lockout command preventing access to the Local mode via the Transceiver Interface's front panel. If the Transceiver Interface is in Remote operation, it will respond to the Local Lockout message by disabling the front-panel LOCAL key. Local lockout prevents the loss of data or system control due to someone accidentally pressing the front-panel LOCAL key. If the Transceiver Interface is in Local operation when it is enabled to Remote operation (that is, REN is set true) and it receives the Local Lockout message, it will switch to Remote with Local Lockout operation the first time it is addressed to listen. Once in Local Lockout, the Transceiver Interface can only be returned to Local operation by the controller, by unplugging or resetting the instrument, or by placing the LINE OFF/ON to OFF and then back to ON.

3-25. Receiving the Clear Lockout/Set Local Message

The Clear Lockout/Set Local message is the way the controller sets the Remote Enable, bus-control line (REN) false. The Transceiver Interface will return to Local operation (front-panel control) when it receives the Clear Lockout/Set Local message. All instrument settings remain unchanged after the transition from Remote operation (with lockout) to Local operation occurs. The front-panel REMOTE annunciator will be turned off when the Transceiver Interface switches to Local operation.

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3-26. Receiving the Pass Control Message

The Transceiver Interface does not respond to the Pass Control message because it does not have a control capability.

3-27. Sending the Request Service Message

The Require Service Message is the way the Transceiver Interface sets the Service Request, bus-control line (SRQ) true. When the Service Request message is received, the controller can be instructed to serial poll the instruments on the bus.

3-28. Sending the Status Byte Message

The Status Byte message is the way the Transceiver Interface responds to a Serial Poll Enable (SPE) bus command and sends the Status Byte message to the controller. The Transceiver Interface sends the eight-bit, data word which has the following meaning to the controller:

bit	
0	Not used.
1	Not used.
2	Illegal Transceiver Interface bus command.
3	Not used, "always a one except when controller is reset".
4	HP-IB error, "hardware broken".
5	Not used.
6	Universal HP-IB Request Service Bit.
7	Bus command complete (HP-IB or front panel not busy).

3-29. Sending the Status Bit Message

The Transceiver Interface does not have the capability to respond to a Parallel Poll Enable (PPE) bus command; therefore, it cannot send the Status Bit message.

3-30. Receiving the Abort Message

The Abort message is the way the controller sets the Interface Clear, bus-control line (IFC) true. When the Abort message is received, the Transceiver Interface becomes unaddressed and stops listening.

3-31. OUTPUT COMMANDS

The Output Commands in the following paragraphs are available for use with a remote controller.

3-32. Identification (ID)

The Identification command is used to identify the Transceiver Interface. When the command is sent by the controller and the Transceiver Interface is addressed to talk, it answers "8954A TRANSCEIVER INTERFACE (Month, Day Year).

3-33. Output Memory (OM)

The Output Memory command is used to provide information for a service routine. (Refer to Section VIII, Service Sheet 1, for details.)

3-34. Request Service (RS)

The Request Service command allows the Transceiver Interface to Request Service when an incorrect command is received from the insrument controller. (Refer to paragraph 3-27.)

EXAMPLE
OUTPUT COMMAND

CONTROLLER'S TALK ADDRESS	ID	END-OF-STRING
TRANSCEIVER INTERFACE'S LISTEN ADDRESS	Sets the Transceiver Interface to output its instrument number, name, and software date when addressed to talk.	MESSAGE
CONTROLLER'S LISTEN ADDRESS	Read output data from Transceiver Interface (output must be read into string variable).	END-OF-STRING MESSAGE
TRANSCEIVER Interface'S TALK ADDRESS		

Figure 3-5. Output Command Example

Table 3-1. HP-IB Message Reference List (1 of 2)

HP-IB Message	Applicable	Response	Related Command	Interface Functions
Data	Yes	All front-panel functions are programmable. Front-panel LISTEN annunciator lights when instrument is addressed to listen. TALK annunciator lights when addressed to talk.		T6, L4 AH1, SH1
Trigger	No	Transceiver Interface does not have Device Trigger (DTO) capability.	GET	DTO
Clear	Yes	Clears the status byte. Responds equally to Device Clear (DCL) and Selected Device Clear (SDC) bus commands.	DCL, SDC	DC1
Remote	Yes	Remote operation is entered when Remote Enable (REN), bus-control line is true and instrument is first addressed to listen. Front-panel REMOTE and LISTEN annunciators light when remote operation is entered; all front-panel keys are disabled (except for the (LOCAL key).	REN	RL1
Local	Yes	Transceiver Interface returns to local operation (front-panel control) when either Go to Local bus command is received or front-panel LOCAL key is pressed.	GTL	RL1
Local	Yes	Disables front-panel LOCAL key so only controller can return instrument to local operation.	LL0	
	No	Electrical interface designation. Open collector bus drivers.		E1

Table 3-1. HP-IB Message Reference List (2 of 2)

HP-IB Message	Applicable	Response	Related Command	Interface Functions
Clear	Yes	Transceiver Interface returns to local operation and clears local lockout when REN bus-control line goes false.	REN	RL1
Pass Control Take Control	No	Transceiver Interface has no control capability.		C00
Require Service	No	Transceiver Interface sets Service Request, bus-control line (SRQ) true if an invalid program code is received.	SRQ	SR1
Status Byte	Yes	Transceiver Interface responds to a Serial Poll Enable bus command (SPE) by sending one byte of information, when addressed to talk. If instrument is holding SRQ control line true (issuing the Require Service message), RQS bit 7 in Status Byte, and bit representing condition that caused Require Service message to be issued, will both be true. Bits in the Status byte are latched but can be cleared by: 1. Removing causing condition. 2. Reading Status Byte.	SPE, SPD	T6
Status Bit	No	Transceiver Interface does not have capability to respond to parallel poll.		PP0
Abort	Yes	Instrument stops listening or talking.	IFC	T6,L4

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Table 3-2. HP-IB Programming Codes

Program Codes *	Parameter	Comments
F1	RF MONITOR 1	Activates relay K2.
F2	RF MONITOR 2	Activates relay K2.
RC	RECEIVER MODE	Activates relay K1.
XM	TRANSMITTER MODE	Activates relay K1.
K0	TRANSMIT KEY OFF	Opens relay A2K17.
K1	TRANSMIT KEY ON	Closes relay A2K17.
V1-V9	Auxiliary Relays	Opens relays A2K1-A2K9. (V1 Opens A2K1.)
VA-VG	Auxiliary Relays	Opens relays A2K10-A2K16. (VA opens A2K10.)
U1-U9	Auxiliary Relays	Closes relays A2K1-A2K9. (U1 closes A2K1.)
UA-UG	Auxiliary Relays	Closes relays K10-K16. (UA closes A2K10.)
V0	Auxiliary Relays	Opens relays A2K1-A2K16 all with one command.
U0	Auxiliary Relays	Closes relays A2K1-A2K16 all with one command.
ID	Output Command	Instrument identification; when addressed to talk, outputs instrument name, number, and Software Date.
OM	Output Command	Output Memory; information for service routine, refer to Section VIII, Service Sheet 1.
RS	Output Command	Request Service; allows Transceiver Interface to request service, refer to Paragraph 3-27.

* Program codes must be in upper case.