OPERATING AND PROGRAMMING MANUAL

MODEL 54300A
PROBE MULTIPLEXER

HEWLETT PACKARD

HEWLETT PACKARD

OPERATING AND PROGRAMMING MANUAL

MODEL 54300A
PROBE MULTIPLEXER

INTRODUCTION

The scope of this manual is to provide detailed information for installing, interfacing, and programming the HP Model 54300A Probe Multiplexer. The manual is divided into three sections:

SECTION I..........GENERAL INFORMATION
SECTION II.........FRONT PANEL OPERATING AND PROGRAMMING
SECTION III........REMOTE PROGRAMMING

Included in the Appendix at the end of the manual is a Quick Reference Guide which contains a complete listing of the Multiplexer's command set. A work sheet for documenting a test setup is also included. The worksheet may be used for recording input probe connections, output connections and measurement results.

Listed on the back cover of this manual is a microfiche part number. This number may used to order 4 by 6 inch microfilm transparencies of the manual. Each microfiche contains up to 96 photoduplicates of the manual pages.
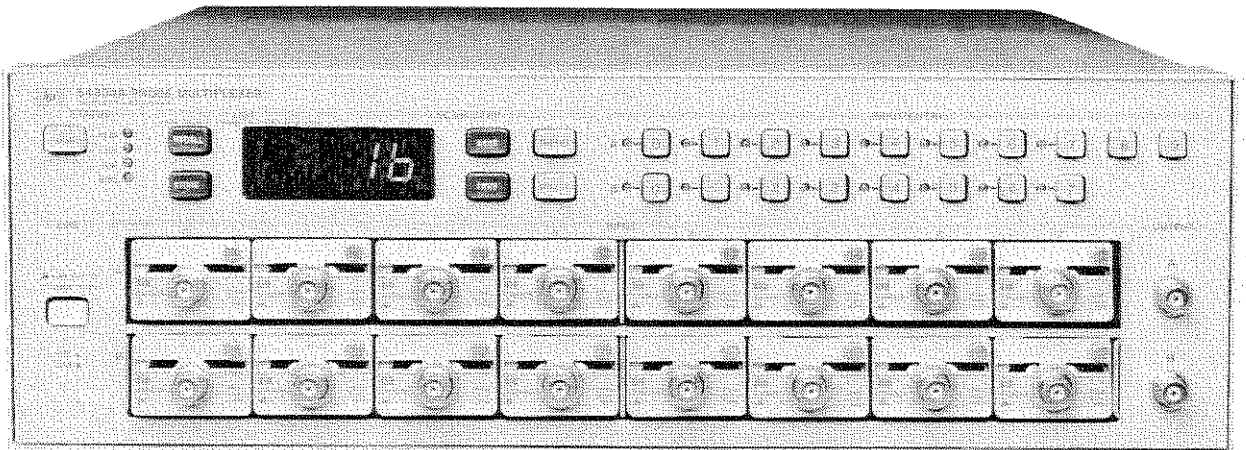
Figure 1-1. HP Model 54300A with HP 54002A Pods installed.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

This section provides general information about the HP Model 54300A Probe Multiplexer. It includes a description of the instrument, specifications, safety considerations and installation instructions.

DESCRIPTION

The HP Model 54300A is a programmable, dual eight to one probe multiplexer, designed to expand the input capability of instrumentation systems with 50 ohm input impedance. The unique strength of the multiplexer is it's configurability. The user may select from three input pods: two high frequency- high impedance probes or a 50 ohm BNC input for terminated line applications.

The Multiplexer features full IEEE-488 bus programmability as well as simple front panel manual control. The 54300A has internal nonvolatile memory for storing lists of switch closures. A switch closure is considered to be a pod selection from Channel A and/or one from Channel B. Switch closure steps may be advanced from the front panel, or over the IEEE-488 bus. For data logging applications, a rear panel input and output (TTL compatible) is provided.

The HP Model 54300A is the ideal solution in situations where delicate high frequency connections must be maintained and probes cannot be conveniently moved from one connection to another. Complex measurements can be automated by using the Multiplexer's 16 inputs. Under computer control, one or two of the inputs may be switched into an instrument at any one time. By using nine multiplexers, cascaded two deep, a total of 128 input channels is achieved.

SPECIFICATIONS

Instrument specifications are listed in table 1. These Specifications are the performance standards or limits against which the instrument is tested. Table 2 lists supplemental characteristics. Supplemental characteristics are not specifications, but are typical operating characteristics included as additional information for the user.

Table 1-1. 54300A Specifications.

INPUTS: 2 sets of 8 HP 54000 series pod receptacles on the front panel Pod receptacles accept probe pods listed below:

	Probe/Pod Model Numbers			
Probe/Pod Specs	HP 54002A 50 ohm Input	HP 54001A 1GHz Active Probe	HP 54003A 1M ohm Input w/ 10:1 Probe	HP 54003A 1M Ohm Input w/o 10:1 Probe
Max Input Voltage	5 V rms	20 V peak	20 V peak	2 V peak
Coupling	dc	dc	dc	dc
Input C (Nominal)	N/A	2 pF	8 pF	10 pF
Input Z	50 ohms	10k ohms	1M ohms	1M ohms
BW	N/A	dc to 1 GHz	dc to 300 MHz	dc to 300 MHz
TR 10% - 90%	N/A	≤ 350 ps	≤1.2 ns	≤1.2 ns
Division Ratio	1:1	10:1 ±3%	10:1 ±3%	1:1 ±1%

1 Rear panel BNC connector which accepts positive TTL level input pulses. An input pulse advances multiplexer to the next step in a current switch sequence list. Pulse must be ≥5 us in duration

OUTPUTS:
2 Front panel BNC connectors with 50 ohm output impedance. Each output BNC corresponds to a specific set of 8 input pod receptacles.

1 Rear panel BNC connector with jumper selectable polarity, TTL pulse output. Output remains true for approximately 5 us after a switch closure has settled (shipped from factory + out).

INSERTION LOSS: < 2dB at 1.0 GHz with HP 54002A 50 ohm Pod.

Table 1-1. 54300A Specifications (Continued).

```
CLOSED CHANNEL RESISTANCE: <0.5 ohm (at the end of switch life).

NONVOLATILE MEMORY: Total memory capacity of 3761 steps. Record up to
                    100 lists with up to 99 steps possible in a list.

IEEE-488 INTERFACE: Interface conforms to IEEE standard 488-1978.
                    The following capabilities as defined in IEEE standard
                    488-1978 are implemented:

                    SH1, AH1, T6, TEO, L4, LEO, SR1, RL1, PPO, DC1, CO.
```

Table 1-2. Supplemental Characteristics

```
CHANNEL TO CHANNEL DELAY: <60 ps channel to channel.

ISOLATION: >60 dB channel to channel using HP 54002A 50 ohm pods.
           >60 dB open channel to output using HP 54002A 50 ohm pods.

SWITCHING TIME: <15 ms. Switching is break before make. Off channels
                are open circuit.

POWER REQUIREMENTS: 100, 120, 220, 240 Vac, +5% to -10%
                    from 48 Hz to 66 Hz. 155 VA with highest power
                    consumption pod configuration.

ENVIRONMENTAL:
Temperature: 0° - +55°C (32° - +131°F) operating.
    -20°C to +75°C (-4°F to +167°F) non-operating.
Humidity: Up to 95% relative humidity at +40°C (+104°F).
Altitude: Operating - up to 4600 m (15,000 ft).
          Non-operating - up to 15,300 m (50,000 ft).
Vibration: Vibrated in three orthogonal axis for 15 minutes each axis,
           0.38 mm (0.015 in) peak to peak excursion, 5 to 55 Hz,
           1 minute per octave.

SWITCH LIFE: Typical from 700,000 to 1 million contact closures
             for each contact.

PHYSICAL DIMENSIONS: See outline drawing figure 1-2.

WEIGHT: net 66 kilograms (30 lbs).
```

NOTES: 1. DIMENSIONS ARE FOR GENERAL
           INFORMATION ONLY. IF DIMENSIONS
           ARE REQUIRED FOR BUILDING
           SPECIAL ENCLOSURES, CONTACT
           YOUR HP FIELD ENGINEER.
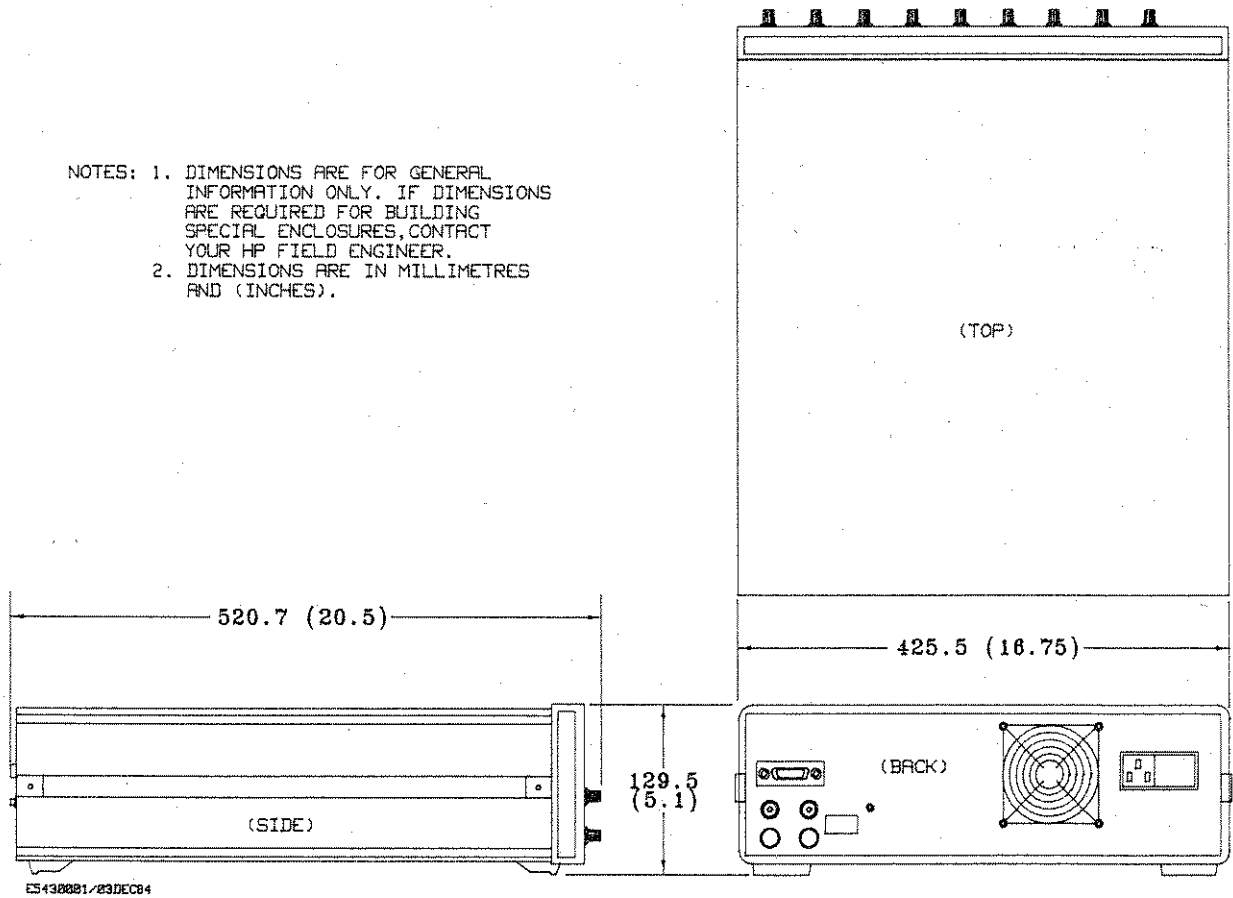   2. DIMENSIONS ARE IN MILLIMETRES
           AND (INCHES).

(TOP)

|←——— 520.7 (20.5) ———→|

|←——— 425.5 (16.75) ———→|

(SIDE)

(BACK)

129.5
(5.1)

E54300B1/03DEC84

Figure 1-2. 54300A Dimensional Detail

ACCESSORIES SUPPLIED.

The following accessories are supplied with the HP Model 54300A:

1 Line cord.
1 Operating and Programming manual.
1 Operating and Service Manual.
16 Pod receptacle covers.
16 Color coded probe identifier markers.

SAFETY CONSIDERATIONS.

This product is a Safety Class 1 instrument (provided with a protective earth terminal). Review the instrument and manual for safety markings and instructions before operation. Specific warnings, cautions and instructions are placed wherever applicable throughout this manual. These precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standard of design, manufacture, and intended use of this instrument. Hewlett-Packard assumes no liability for the customer's failure to comply with these requirements.

Operation. Before applying power, verify that the power transformer primary is matched to the available line voltage, the correct fuse is installed and safety precautions are taken (see the following warnings). In addition, note the instrument's external markings which are described under "Safety Symbols."

WARNING

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

Before switching on the 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. This protective action must not be negated by the use of an extension cord without a protective conductor. Grounding one conductor of a two conductor outlet is not sufficient protection. 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. Any interruption of the protective (grounding) conductor (inside or outside of the instrument) or disconnecting the protective earth terminal, will cause a potential shock hazard that could result in personal injury.

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

Only fuses with the required rated current , voltage and specific type

should be used. Do not use repaired fuses or short circuited fuse holders. To do so could cause a shock or fire hazard.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Do not install substitute parts or perform any unauthorized modifications to the instrument. Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and when inevitable, should be carried out only by a trained person who is aware of the hazards involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from it's power source.

Safety Symbols

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.

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the product.

Indicates hazardous voltages.

Earth terminal. Also sometimes used in the manual to indicate circuit common connected to grounded chassis.

INSTALLATION

This paragraph provides installation instructions for the Model 54300A Probe Multiplexer. It also includes information about initial inspection, damage claims, preparation for use, storage and shipment.

Initial Inspection. Inspect the shiping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shippment have been checked for completeness and the instrument has been checked mechanically and electrically. The content of the shippment should be as listed in the "Accessories Supplied" paragraph in this section.

If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the Performance Tests, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the nearest Hewlett-Packard office. Keep the shipping material for carrier's inspection. The HP office will arrange for repair or replacement at HP option without waiting for claim settlement.

PREPARATION FOR USE.

WARNING

Read the Safety Summary in the front of the Operating and Service Manual and the "Safety Considerations" paragraph in this section before installing or operating the instrument.

Power Requirements. The 54300A requires a power source of 100, 120, 220, or 240 Vac, +5% to -10%, single phase, 48 to 66 Hz. Maximum power dissipation at 60 Hz and 120 Vac is 110 watts.

AC Line Voltage Selections

CAUTION

Before placing the instrument in operation, ensure that the operating voltage visible in the power module window (figure 1-3) agrees with the line voltage being used. The power supplies may be damaged if the line voltage selection is incorrect.

The instrument is set at the factory for 120 Vac operation. To operate the instrument from any other source proceed as follows:
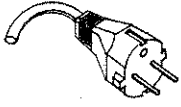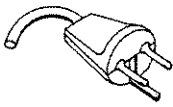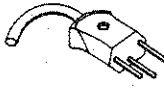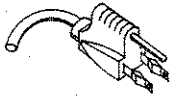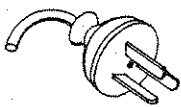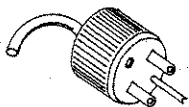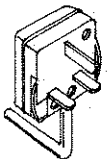
a. Disconnect the power cord from the Multiplexer.

b. Slide the fuse cover to the left and pull the fuse.

c. To select the desired operating voltage, reorient the PC board to the correct voltage position (figure 1-3). Push board firmly into module slot.

d. Reinstall the fuse. For 120 Vac operation use a 2.0A fuse, HP part number 2110-0001. For 220 Vac operation use a 1.0A fuse, HP part number 2110-0002.

OPERATING VOLTAGE IS SHOWN IN MODULE WINDOW.

NOTE

THE 54300A WILL NOT OPERATE IF THE VOLTAGE SELECTION PC BOARD IS PLACED IN EITHER THE 100-OR 220-VOLT POSITION.

SELECTION OF OPERATING VOLTAGE

1. OPEN COVER DOOR AND ROTATE FUSE-PULL TO LEFT.

2. SELECT OPERATING VOLTAGE BY ORIENTING PC BOARD TO POSITION DESIRED VOLTAGE ON TOP-LEFT SIDE. PUSH BOARD FIRMLY INTO MODULE SLOT.

3. ROTATE FUSE-PULL BACK INTO NORMAL POSITION AND RE-INSERT FUSE IN HOLDERS, USING CAUTION TO SELECT CORRECT FUSE VALUE (2.0 AMPERE FOR 115/120-VOLTS, 1.0 AMPERE FOR 230/240 VOLTS).

Figure 1-3. AC Line Voltage Selection.

AC Power Cable. This instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle the power cord grounds the instrument chassis. The type of power cable plug shipped with each instrument depends on the country of destination. The HP Part numbers and associated option numbers for the different power plug configurations available are shown in figure 1-4.

Figure 1-4. Available Power Cords and Options.

HP-IB SYSTEM INTERFACE.

The Hewlett-Packard Interface Bus (HP-IB) is Hewlett-Packard's implementation of IEEE Standard 488-1978, "Standard Digital Interface for Programmable Instrumentation." HP-IB is a carefully defined interface which simplifies the integration of various instruments and computers into systems. The interface provides for messages to be transferred between two or more HP-IB compatable devices. HP-IB is a parallel bus of 16 active signal lines grouped in three sets according to function.

Eight signal lines, termed DATA lines, are in the first function set. The DATA lines are used to transmit data in the form of coded messages. These messages are used to program the instrument function, transfer measurement data, and coordinate instrument operation. Input and Output of all messages, in bit parallel-byte serial form, are also tranferred on the DATA lines. A 7-bit ASCII code normally represents each piece of data.

Data is tranferred by means of an interlocking "handshake" technique which permits data transfer (asynchronously) at the rate of the slowest active device used in that transfer. The DATA BYTE CONTROL lines coordinate the handshaking and form the second functional group.

The remaining five GENERAL INTERFACE MANAGEMENT lines (third functional group) are used to manage the devices connected to the HP-IB. This includes activating all connected devices at once, clearing the interface and others. The connections to the HP-IB connector on the rear panel are shown in figure 1-5.

DIO1	1	13	DIO5
DIO2	2	14	DIO6
DIO3	3	15	DIO7
DIO4	4	16	DIO8
EOI	5	17	REN
DAV	6	18	P/O TWISTED PAIR WITH 6
NRFD	7	19	P/O TWISTED PAIR WITH 7
NDAC	8	20	P/O TWISTED PAIR WITH 8
IFC (BCL)	9	21	P/O TWISTED PAIR WITH 9
SRQ	10	22	P/O TWISTED PAIR WITH 10
ATN (MRE)	11	23	P/O TWISTED PAIR WITH 11
SHIELD	12	24	SIGNAL GROUND

SHOULD BE GROUNDED NEAR TERMINATION OF OTHER WIRE OF TWISTED PAIR.

TYPE 57 MICRORIBBON CONNECTOR

HS430001/03DEC84

Figure 1-5. HP-IB Interface Connector.

54300A BUS CAPABILITIES.

The 54300A interfaces to the HP-IB as defined by IEEE Standard 488-1978. The interface function subset which the 54300A implements is specified in Table 1-3.

Table 1-3. 54300A Bus Capabilities.

SH1	Source Handshake - Complete capabilities
AH1	Acceptor Handshake - Complete Capabilities
T6	Basic Talker, with Serial Poll, no Talk-only mode, unaddressed to talk when it receives its listen address.
TEO	No extended talker capabilities
L4	Basic listener, unaddressed to listen when it receives its talk adress
LEO	No extended listener
SR1	Service Request - Complete Capabilities
RL1	Full Remote/Local capabilities
PPO	No Parallel Poll Capabilities
DC1	Device Clear - Complete Capabilities
CO	No Controller Capabilities

HP-IB ADDRESS SELECTION.

The HP-IB address of the 54300A is determined by the setting of the right five switches on the rear panel. These switches are read when the Multiplexer is turned on or when reset is initiated. The 54300A address is set at the factory with the address switches set to decimal "09". The corresponding ASCII code is a listen address of ")" and a talk address of "I". Refer to table 1-4 for other HP-IB address codes. Address switch settings are shown in figure 1-6.
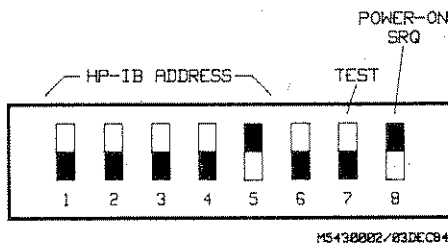
Figure 1-6. 54300A Address Switch.

Table 1-4. 54300A Address Codes

ASCII Code Character		Address Switches					5-Bit
Listen	Talk	1	2	3	4	5	Decimal Code
SP	@	0	0	0	0	0	00
!	A	0	0	0	0	1	01
"	B	0	0	0	1	0	02
#	C	0	0	0	1	1	03
$	D	0	0	1	0	0	04
%	E	0	0	1	0	1	05
&	F	0	0	1	1	0	06
'	G	0	0	1	1	1	07
(	H	0	1	0	0	0	08
)	I	0	1	0	0	1	09 ——Factory Set
*	J	0	1	0	1	0	10
+	K	0	1	0	1	1	11
,	L	0	1	1	0	0	12
-	M	0	1	1	0	1	13
.	N	0	1	1	1	0	14
/	O	0	1	1	1	1	15
0	P	1	0	0	0	0	16
1	Q	1	0	0	0	1	17
2	R	1	0	0	1	0	18
3	S	1	0	0	1	1	19
4	T	1	0	1	0	0	20
5	U	1	0	1	0	1	21
6	V	1	0	1	1	0	22
7	W	1	0	1	1	1	23
8	X	1	1	0	0	0	24
9	Y	1	1	0	0	1	25
:	Z	1	1	0	1	0	26
;	[	1	1	0	0	1	27
<		1	1	1	0	0	28
=	]	1	1	1	0	1	29
>	~	1	1	1	1	0	30

Select Codes can be any integer 1 through 12. Primary Address can be any integer 0 through 30.

SYSTEM INSTALLATION.

A typical test set-up is shown in figure 1-7. It is important that the correct pods are installed for the measurement being made. If the system under test must be terminated into 50 ohms, the HP Model 54002A pod is recommended.

For high impedance and high bandwidth requirements the HP Model 54001A is recommended. This pod with it's built in probe offers up to 1 GHz bandwidth with 10k ohms/2pF input loading. The probe utilizes a mini-tip for easy access in compact circuits. The pod is ideal for high-speed logic measurements, where low shunt capacitance are a significant factor in loading the test circuit.

The HP model 54003A with it's detachable 10:1 divider probe has 1M ohm input resistance and 8 pF shunt capacitance. When using this pod, the system bandwitdth is 300 MHz. If desired, the probe may be removed from the pod to provide a 1M ohm input resistance with 10 pF shunt capacitance, BNC compatible pod. The division ratio without the probe is 1:1.
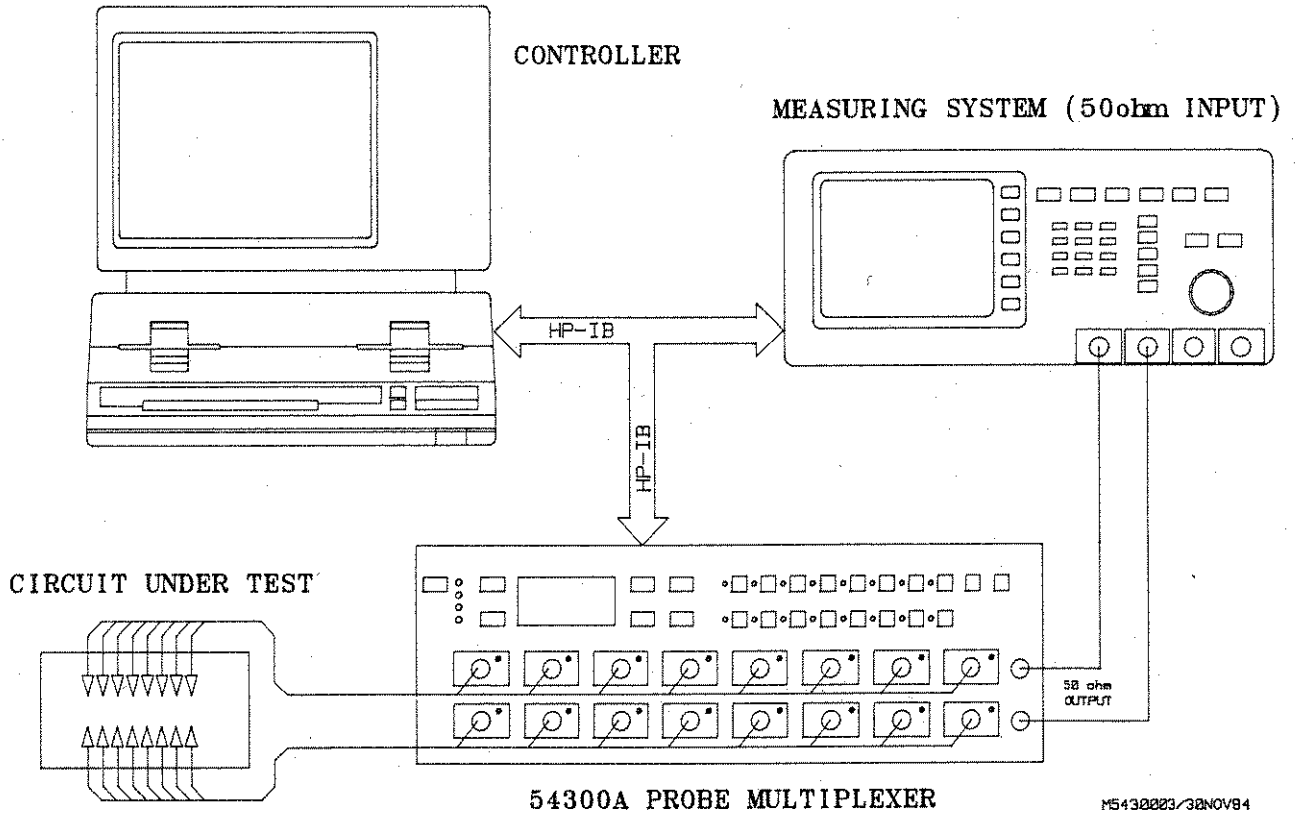
Figure 1-7. 54300A System Installation.

CAUTION

To prevent electricl damage to the active pods, never drive the multiplexer output with a signal or a dc level.
Before removing pods from multiplexer, ensure power is turned off.
To prevent heat damage to the pods, cover all unused pod slots.

INTRODUCTION

This section contains detailed front panel operating information for the HP Model 54300A Probe Multiplexer. Examples for establishing and storing lists of switch closures using the front panel controls are also included.

PANEL FEATURES

An overview of the front panel and rear panel controls is shown in figures 2-1 and 2-2. Description numbers match the numbers in the figures.
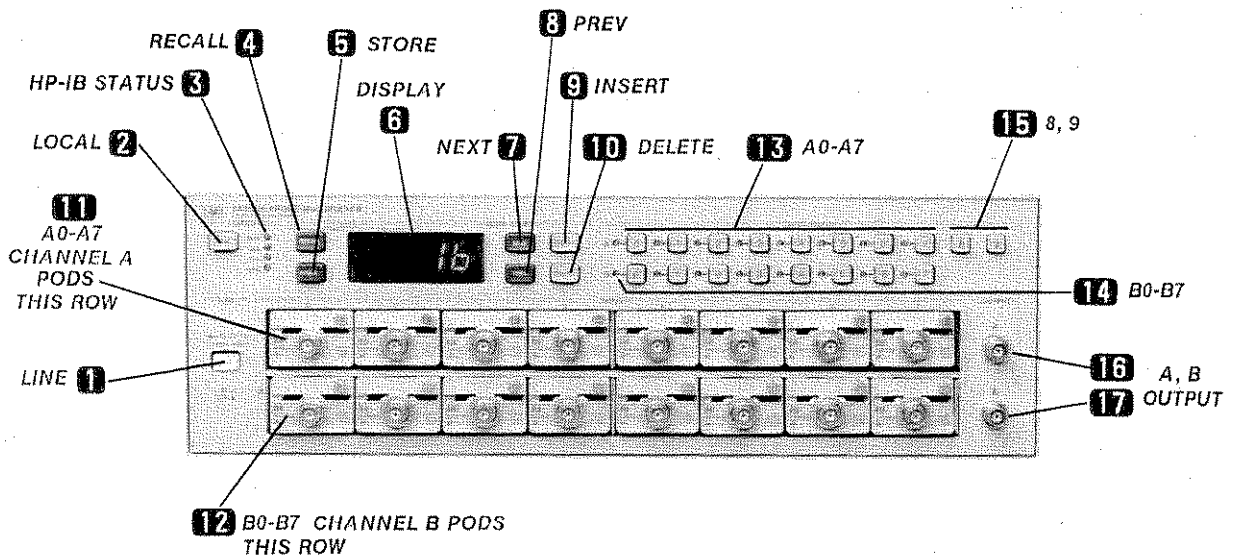
Figure 2-1. 54300A Front Panel View.

1   **LINE SWITCH.** Applies power to the instrument.

2   **LOCAL.** Returns multiplexer from HP-IB to front panel control.

3   **HP-IB HANDSHAKE STATUS.**

4   **RECALL.** To recall a switch sequence list, push RECALL once and the two digit number of a stored list (00-99). Push RECALL twice to start a new list. This erases the current list and opens all switch closures.

5　**STORE.** Push STORE and a two digit number (00-99) to place the current list of switch closures in nonvolatile memory.

6　**MULTIPLEXER DISPLAY.** Indicates error codes, HP-IB Address, current step number, and numbers of stored lists in nonvolatile memory.

7　**NEXT.** Push once to increment step by step in the current list. Keeping the NEXT key depressed will scan through the list of switch selections in the forward direction without closing the relays. At the last step of the list, scanning will stop.

8　**PREV.** Push once to decrement step by step in the current list. Keeping the key depressed will scan through the list in the reverse direction without closing the relays. At the beginning of the list, scanning will stop.

9　**INSERT.** Inserts the current switch selection into the current list. The switch selection is inserted after the displayed position. The displayed position is then incremented by one step.

10　**DELETE.** The DELETE key, when pushed once, will remove the current switch closure from the current list. The next closure in the list will take the position of the deleted closure.

11　**CHANNEL A POD POSITIONS.** Positions are the eight signal inputs for channel A (A0-A7).

12　**CHANNEL B POD POSITIONS.** Positions are the eight signal inputs for channel B (B0-B7).

13　**A0-A7.** Channel A pod selectors. These keys may also be used to assign list number assignments from 00 through 77.

14　**B0-B7.** Channel B pod selectors. These keys may also be used to assign list number assignments from 00-77.

15　**8, 9.** These two keys may be used for list assignments requiring digits 8 or 9, i.e. 89, 91.

16 **17**　**A, B OUTPUT.** Channel A and B 50 ohm outputs.
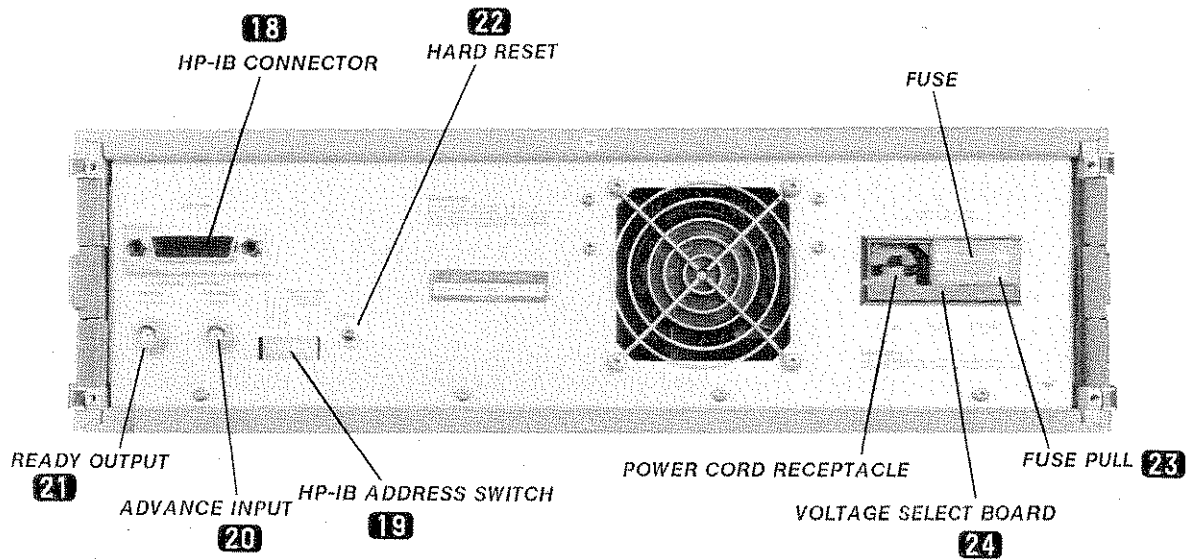
Figure 2-2. 54300A Rear Panel View.

The following control descriptions refer to figure 2-2.

18   **HP-IB Connector.** Used to connect a controller to the Probe Multiplexer. The connector conforms to the IEEE Standard 488-1978.

19   **HP-IB ADDRESS SWITCH.** The eight position switch is used to set the address of the Multiplexer, Internal Test enable and Power-on SRQ enable.

20   **ADVANCE INPUT Connector.** Input for a TTL compatible pulse. It is used to remotely scan through the current list.

21   **READY OUTPUT Connector.** The Ready Output circuit provides a TTL compatible pulse approximately 15 ms. after the advance input is received. This pulse indicates that the multiplexer is ready for another Advance Input.

With the Advance Input and Ready Output circuit, a closed loop data logging system could be implemented with a device such as a digitizing spectrum analyzer.

22   **HARD RESET.** When pushed, the 54300A will cycle through the power-up sequence.

23   **FUSE PULL.** Allows removal of line fuse.

24   PC board inside the power module for changing line operating voltages.

SELF TEST

```
CAUTION
```

Before placing the 54300A into operation, ensure that the operating voltage indicated in the power module window (figure 1-3), agrees with the line voltage being used.

The self test feature of the 54300A provides a method of verifying proper instrument operation. Self test is initiated when power is first applied, or when the Hard Reset button on the rear panel is pushed once. The Self Test sequence includes the following steps:

    a. The HP-IB switch is read.

    b. The current list of switch closures is cleared.

    c. All switches are set open.

    d. Switch closure delay is set to 15 ms.

    e. RQS mask is cleared if PON SRQ switch on rear pannel is disabled.

    f. Assert Power-on SRQ if enabled by rear panel switch.

The entire Self Test sequence requires approximately 10 seconds to complete. During the sequence the display will cycle through the following sequence:

    a. The instrument Model number is identified.

    b. The characters hP-ib = 09 are displayed.

The characters "09" mean that the address of the Multiplexer is set to 09.

    c. When the characters "00" are displayed, the self test is complete. All switches are in the open position as indicated by the display (00).

If a failure is detected during self test the display will show one of the following error messages:

ERROR NO	DESCRIPTION
ER 10	Scratch RAM Failure
ER 11	Nonvolatile Memory Failure (U36)
ER 12	Bad List Pointer in Nonvolatile Memory
ER 13	Nonvolatile RAM Failure at U7
ER 21	Checksum ROM U8
ER 55	Failure at U10
ER 56	Failure at U27
ER 79	Failure at U13

> **CAUTION**
>
> *To prevent electrical damage to the active pods, never drive the multi-plexer output with a signal or DC level.*
> *Before removing pods from multiplexer, ensure power is turned off.*
> *To prevent heat damage to the pods, cover all unused pod slots.*

FRONT PANEL OPERATING AND PROGRAMMING

The definitions outlined below must be understood before operating the Multiplexer. These definitions apply equally to operation from the front panel and remote programming.

CHANNEL: The term channel refers to each of the two signal outputs of the multiplexer. The 54300A has two channels: Channel A which consists of pod receptacles A0-A7, and Channel B which consists of B0-B7.

SIGNAL INPUT PODS. The signal input pods fit into each of the pod receptacles. Each channel has eight pods: A0-A7 and B0-B7. Refer to Section I for pod selection and pod specifications.

SWITCH SELECTION: A switch selection refers to one on or off condition for each channel. Only one switch per channel can be closed at any given time. A switch on condition selection may be referred to as a specific pod in a channel, i.e. A0, B1 etc.

LIST: A list is a sequence of switch selections stored in temporary memory, or in nonvolatile memory. There are two types of lists: the current list and a stored list. The current list is stored in temporary memory and is lost when power is interrupted or a hard reset is initiated. The stored list is recorded in nonvolatile memory and must be identified by a two digit number from 00 through 99 (100 possible stored lists). A list may contain a step with one or no switch closures.

Selecting a Switch Closure   (A0 - A7, B0 - B7)

If the current list is to be cleared before making a switch selection, push RECALL twice. Cycling power, or pushing RESET button on the rear panel will initiate the self test routine and also clear the current list.

When the current list is cleared and or self test is complete, all switches are open and the display shows 00 steps of closures in the current list.

Push switch keys A0 and B0. The lights associated with pod selection A0 and B0 will come on, indicating that channel A and channel B switches are closed. To open both switches, push A0 or B0 again. The associated lights will toggle off, indicating that the channels are open. Notice that the display of the multiplexer remained at 00. The two digits are used only to indicate the step number in the list.

If another pod is to be selected, push the desired key switch and the previous closure is opened. Remember only one pod per channel can be closed at one time.

Establishing a List of Switch Selections   (INSERT)

To establish a list of switch selections, push RECALL twice to clear the current list and to open all switches.

Select the first switch combination, i.e. A0 - B0.

Push the INSERT key to record the pod selection. Notice that the display has advanced to 01. Pod selection A0 and B0 is the first step (01) in the current list. Remember that the current list is recorded in temporary memory. If power is interrupted or if RECALL is pushed twice, the current list is lost.

Select the next switch closures and push INSERT to record the step. Notice that the display has advanced to step 02. Continue this procedure until all desired switch closures have been entered into the current list.

EXAMPLE 1. Establish a list of the following pod selections:

CHANNEL A POD	CHANNEL B POD
A0	B0
A1	--
A2	B2
A3	B3
A4	B4

-- Designates no switch closure in that step

    a. Push RECALL twice to clear the current list and to open all switches.

b. Push keys in the following sequence:

PRESS KEY	DISPLAY
A0 - B0	00
INSERT	01
A1 - B0	
INSERT	02
A2 - B2	
INSERT	03
A3 - B3	
INSERT	04
A4 - B4	
INSERT	05

The display indicates that a sequence of 05 switch closures has been recorded in temporary memory (current list). The A4 and B4 pod indicators are also on.

Stepping Through a List   (NEXT/PREV)

Through the use of the NEXT and PREV keys, the user may step through a list manually from the front panel. In Example 1, five switch selections have been stored in a current list. Step through the list backward by pressing the PREV key. Scanning will stop at step 01 of the list.

The NEXT key operates in the same manner. Step through the list forward by pressing the NEXT key for every switch closure in the list. Scanning will stop at the end of the list.

Fast Scanning a List

By keeping the NEXT or the PREV key depressed, the multiplexer will scan through the list rapidly without any switches closing. Use this feature for finding a specific signal input in a list. The scan rate may be accelerated for longer lists by pressing NEXT/INSERT simultaneously for the forward direction and pressing PREV/DELETE keys for the backward direction. The normal scan rate is approximately 5 selections per second and 15 selections per second for the accelerated scan rate.

Moving a List to and from Nonvolatile Memory   (STORE/RECALL)

When the STORE key is pushed followed by two digit keys (0 - 9), the current list is stored in nonvolatile memory. The two digit number identifies the stored list. To recall the same list from memory, push RECALL and the two digit number that indentified the list. When a list is recalled from memory, the first switch selection in the list is activated. If an attempt is made to recall a nonexistent list, the error message ER 01 is displayed.

EXAMPLE 2. Store and Recall the list that was established in Example 2.

a. Record the list of switch closures established in Example 1.
b. The display of the multiplexer will show 05 swich closures in the list.
c. Press STORE and digits 00. List 00 is stored in nonvolatile memory. The display indicates the list number and the present switch closure.
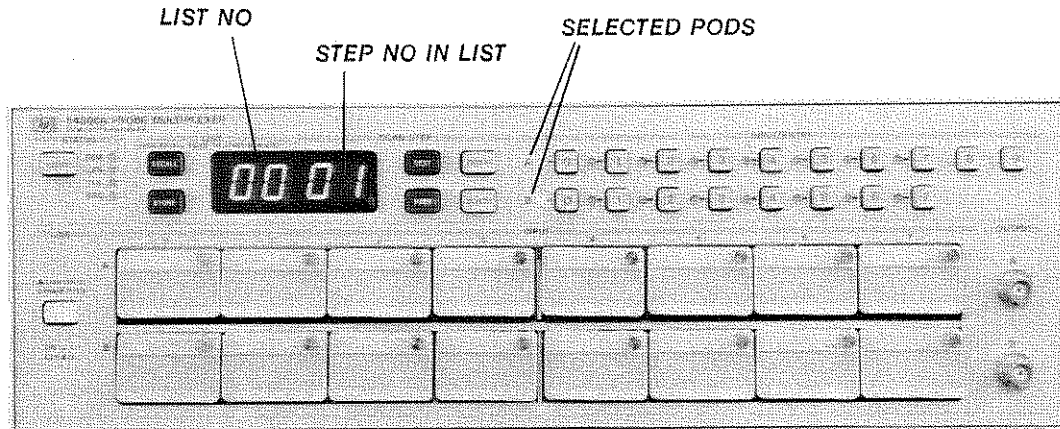
Figure 2-3, Display of a Stored List

d. To recall the list from memory, press RECALL and the two digit number that identified the list. In this example press 00. When RECALL 00 is executed, the multiplexer defaults to the first closure in the list.

Modifying A List (INSERT/DELETE)

A list may be modified by inserting or deleting steps of switch closures anywhere in the list.

EXAMPLE 3. Add switch closures A7 and B7 at step 01 in the list established in Example 2. Recollect that the list in Example 2 was identified as List 00 and contained the following switch closures:

LIST 00	SWITCH STEPS	STEP NO
	A0 - B0	01
	A1 - --	02
	A2 - B2	03
	A3 - B3	04
	A4 - B4	05

To modify the list, proceed as follows:

   a. Press RECALL 00 to bring the stored list into the current list.

   b. Push PREV key to position the step number to 00. Select pods A7 - B7 and press INSERT.

   c. Press STORE 00 to record the new list.

The modified list contains the following closures:

LIST 00	SWITCH STEPS	STEP NO
	A7 - B7	01
	A0 - B0	02
	A1 - --	03
	A2 - B2	04
	A3 - B3	05
	A4 - B4	06

Consider another modification to the same list. Test requirements dictate that pods A7 and B7 must occur last in the list (step 06).

To make this modification follow the procedure outlined below:

   a. Recall list 00, or use the NEXT/PREV keys to position the multiplexer to switch step number 01. Switch positions A7 and B7 are closed.

   b. Press DELETE and notice that the current switch closure has been deleted from the list and the next closure has moved to step number 01.
   c. Use the NEXT key to position the list to step 05. Pods A4 - B4 are closed.

   d. Select pods A7 - B7 and push INSERT, STORE 00. Pods A7 - B7 are now the last step in the list. When STORE was pressed, the new modified list as shown below was stored in nonvolatile memory:

LIST 00	POD NUMBER	STEP NUMBER
	A0 - B0	01
	A1 - --	02
	A2 - B2	03
	A3 - B3	04
	A4 - B4	05
	A7 - B7	06

Remember that any modifications made to the current list are not stored in nonvolatile memory until STORE and a two digit keys are used. If power is turned off, or a hard reset is initiated, the current list is lost.

Starting A New List   (RECALL/RECALL)

When RECALL is pushed twice, the multiplexer defaults to the "wake-up" state. It means that the current list is cleared (display shows 00) and all switches are opened, however, the self test sequence is not initiated. Initiating the self test sequence will produce the same results. Remember to save the old current list if it is to be saved.

EXAMPLE 4. In addition to the list established in Example 3, the following switch selection are to be stored in a new list identified by list number 01:

LIST 01   A0 - B1
                      A0 - B2
                      A1 - B3
                      A2 - B4

To establish the new list follow the procedure below:

a. If necessary store the current list. Push RECALL twice to clear the current list. The display shows 00 step numbers and all switches are open.

b. Enter the new list by pressing the keys in the sequence outlined below:

PRESS KEY	DISPLAY
A0 - B1	
INSERT	01
-- - B2	
INSERT	02
A1 - B3	
INSERT	03
A2 - B4	
INSERT	04

c. To store the list in nonvolatile memory, press STORE, then 01.

Deleting A List From Nonvolatile Memory   (RECALL/STORE)

A stored list may be deleted from memory by overwriting it with a current list containing zero switch closures. To erase a list, push RECALL twice to erase the current list and to open all switches. Delete the list by writing the empty current list into memory.

EXAMPLE 5: Delete the list that was stored in Example 4.

    a. Press RECALL twice to clear the current list and to open all switches.

    b. Push STORE 01. Stored list 01 is now replaced by the cleared current list. Note that the display indicates 00 switch closures for list number 00.

SECTION III
REMOTE PROGRAMMING

INTRODUCTION

The purpose of this section is to provide detailed programming instructions for the HP Model 54300A Probe Multiplexer. Programming Commands are sent to the 54300A via the Hewlett-Packard Interface Bus (HP-IB). Refer to Section I for a brief description of the HP-IB bus structure.

ADDRESS SELECTION

Each instrument connected to the HP-IB interface has a unique address assigned to it. The address provides a method for the system computer to select individual instruments for sending data to or receiving information from. The address of the 54300A Probe Multiplexer is set at the factory to decimal "09". The corresponding ASCII code is a listen address of ")" and a talk address of "I". Refer to table 1-4 for other address codes. Address switch settings are shown in figure 1-6.

COMMAND STRUCTURE

The programming examples used in this section are given in enhanced BASIC (Beginners All-purpose Symbolic Instruction Code) programming language such as used in HP Series 200 desktop computers. In these examples the statement OUTPUT 709 is used. The word OUTPUT is a statement specific to certain HP computers for moving data out of the computer. The number 709 refers to the computer interface select code, which is 7, and the 54300A address, which is 09.

The following diagram shows how commands are sent to the 54300A.

```
                        Interface                    Specific 54300A
                        Select                       Command Code
                        Code                               |
                          |                                |
       OUTPUT            7      09 ;           "CLOSE       A0 & B0"
          |                      |                           |
   Computer output        54300A HP-IB                Data for specific
   Statement will           Address                    Command Code
   depend on computer
   being used
```
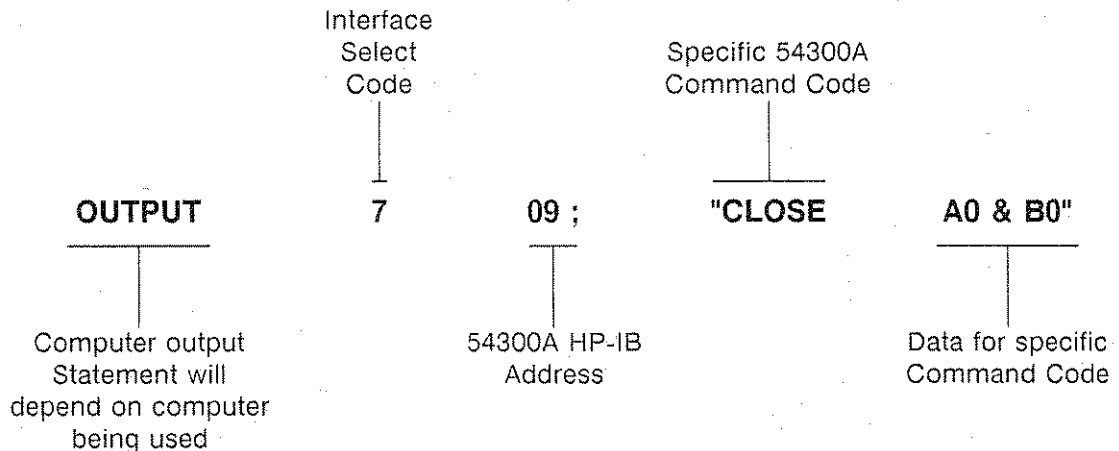
NOTATION CONVENTIONS AND DEFINITIONS

The following conventions are used in this manual in descriptions of remote (HP-IB) operation:

< >   Angular brackets enclose descriptive words that are used to symbolize a program code parameter.

[ ]   Square brackets indicate that the enclosed items are optional.

{ }   When several items are enclosed by braces, one, and only one of these elements must be selected.

| "OR" Indicates a choice of exactly one element from a list. For example: <A> | <B> indicates <A> or <B> - not both.

CAUTION

To prevent electrical damage to the active pods, never drive the multiplexer output with a signal or DC level.

Before removing pods from the multiplexer, ensure power is turned off.

REMOTE PROGRAMMING

The programming commands affecting the operation of the 54300A, are organized in the same sequence as in Section II, Front Panel Operation. Commands affecting system operations are discussed at the end of this section. A Quick Reference Guide, containing the complete command set, may be found in the Appendix at the end of this manual.

A Note About Query Commands

When multiple query commands are sent to the 54300A within a single program line, the responses are buffered such that the first query in is the first query out.

EXAMPLE:

OUTPUT 709;"ID?;REV?"
ENTER 709;A$,B$
PRINT A$,B$

The multiplexer will respond to the above program as follows:
HP54300A   2449

The response will remain in the buffer until they are read by the controller, or until another programming line containing a query is sent to the 54300A.

EXAMPLE:

> OUTPUT 709;"ID?"
> OUTPUT 709"REV?"
> ENTER 709; A$
> PRINT A$

The multiplexer will respond to only one query as shown below:

> 2449

Selecting a Switch Position (CLOSE Command/Query)

The CLOSE command is used to select a switch closure. A switch closure is one pod selection from channel A and one pod from channel B. A pod refers to a switch position of the multiplexer.

> SYNTAX: **CLOSE | CL** <POD> [, | & <POD>]

EXAMPLE: Route the input signal at switch position A0 to channel A output.

> **OUTPUT 709;"CLOSE A0"**

or:

> **OUTPUT 709;"CLA0"**

Note that the light associated with pod selection A0 is on, indicating that channel A switch is closed. The multiplexer is also in the remote mode as indicated by the REM and LSN status lights.

To select a pod from channel A and B:

> **OUTPUT 709;"CLOSE A0,B0"**

or:

> **OUTPUT 709;"CLA0,B0"**

The lights associated with pod selections A0 and B0 are on. Notice that the display of the multi-plexer remained at "00". The two digits are used only to indicate the step number of a list. If another pod combination is selected, the previous closure is opened and the new one is selected. Remember only one pod per channel can be closed at one time.

CLOSE Query

The CLOSE query command identifies the present switch selection.

SYNTAX: **CLOSE?|CL?**

The multiplexer reply is an alpha numeric string that represents the present switch selections i.e. A0B3. If the Header is enabled, the word CLOSE is added to the response.

EXAMPLE:

WITHOUT HEADER	WITH HEADER
OUTPUT 709;"CLOSE?"	**OUTPUT 709;"HDR1;CLOSE"**
ENTER 709;A$	**ENTER 709;A$**
DISP A$	**DISP A$**

If pods A0 and B3 are selected then the response of the multiplexer will be "A0B3" with Header off and "CLOSE A0B3" with Header on.

Disconnecting a Switch Position   (OPEN Command)

The OPEN command is used to disconnect a pod from channel A or channel B output.

SYNTAX: **OPEN | OP** <CHANNEL> [, | & <CHANNEL>]

EXAMPLE: Disconnect both pods used in the last example.

OUTPUT 709;"OPEN"

or disconnect one pod:

OUTPUT 709;"OPA" or: **OUTPUT 709;"OPB"**

The lights associated with both pods A0 and B0 are off indicating that channels A and B are open. The OPEN command has no effect if the swich is already open.

3-4

Decimal Encoded Setup   (SETUP Command/Query)

Switch selections may be expressed in decimal values and switches may be closed or opened using the SETUP Command. To select a combination of switches:

SYNTAX: **SETUP<00-77> | SET<00-77>**

The two digit combination in angular brackets represent the pod selection, e.g. 00 = pods A0 and B0. The first digit is the pod number for channel A and the second digit is the pod number for channel B. To disconnect both pods:

SYNTAX: **SETUP88 | SET88**

The SETUP88 Command will open all selected switches at the same time.

SETUP Query

The SETUP Query identifies the present switch closure in decimal values.

SYNTAX: **SETUP? | SET?**

The response of the multiplexer without the Header, is a two digit number, e.g. 00 or 11. The first digit represents the channel A pod selection, and the second digit is channnel B.

EXAMPLE:

```
OUTPUT 709;"SETUP?"
ENTER 709;A
DISP A
```

The response of the multiplexer is "00" without the Header, and "SETUP 00" with the header.
If both channels are open, the response of the multiplexer is "88" or "SETUP 88".

Establishing a Current List   (LIST Command/Query)

The LIST Command is used to establish a list of switch selections. Up to 99 switch selections may be made in one list provided that a total of 3761 switch selections for the multiplexer is not exceeded.

SYNTAX: **LIST <PODS> | LST <PODS> | LI <PODS>**

The pod selections are entered in decimal form the same way as the SETUP Command. The first digit is the channel A pod and the second digit is the channel B pod.

EXAMPLE: Establish the following list of switch selections:

CHANNEL A POD	CHANNEL B POD
A0	B0
A1	--
A1	B1
A2	B2

OUTPUT 709;"LIST00,18,11,22"

Notice that the second switch selection has only one closure. Use the digit "8" to leave that channel open as shown in the example.

The list established in this example is the current list and is not stored in nonvolatile memory. If power is interrupted or a Reset is initiated, the current list of switch selections is lost. Use the STORE command to move the data of the current list to nonvolatile memory.

LIST Query

The LIST query discloses all switch selections in the current list.

SYNTAX: **LIST?** | **LST?** | **LI?**

The response of the multiplexer is a string of two digit numbers, e.g. 00 11 22. The first digit in each number pair represents the channel A switch selection, the second number is the channel B switch selection. The string may be as long as 99 number pairs since 99 switch selection are possible in the list.

EXAMPLE:

OUTPUT 709;"LIST?"
ENTER 709; A
DISP A

In this example the Header is disabled. The response of the multiplexer would be "001122" without the Header. With Header enabled the word "LIST" is added to the response.

Scanning Through a List   (NEXT, PREV, STEP Commands/Queries)

The NEXT, PREV and STEP commands allow scanning through a list of switch selections. The NEXT command causes scanning through the list in the forward direction. At the last step in the list scanning will stop. The PREV command accomplishes the same thing in the reverse direction. At the beginning of the list scanning stops. The STEP command will cause the multiplexer to "wrap-around" the current list. Scanning takes place in the forward direction.

NEXT

SYNTAX: **NEXT | NXT | NX**

EXAMPLE:

OUTPUT 709;"NEXT"

Every time the NEXT command is sent, the multiplexer opens the current switch selection and advances to the next step in the current list. Any subsequent NEXT command at the last step of the list will have no effect on the operation of the multiplexer.

NEXT Query

When the NEXT Query is executed, the multiplexer response is the next switch selection in the list.

SYNTAX: **NEXT? | NXT? | NX?**

The multiplexer responds with an alpha numeric string that represents the next switch selection in the list e.g. A0B5. Any subsequent NEXT? command at the end of the list has no effect.

EXAMPLE:

OUTPUT 709;"NEXT?"
ENTER 709;A$
DISP A$

Without the header the multiplexer response is A0B5. With the Header the response will be "CLOSE A0B5".

PREV

SYNTAX: **PREV | PRV | PR**

EXAMPLE:

OUTPUT 709;"PREV"

When the PREV command is sent to the multiplexer, the current switch selection is opened and the previous step in the list is selected. At the first step of the list, scanning will stop.

PREV Query

The PREV Query discloses the previous switch selection in the current list.

SYNTAX: **PREV? | PRV? | PR?**

The multiplexer responds with an alpha numeric string, i.e. A1B4. The string represents the previous switch selection in the list.

EXAMPLE:

OUTPUT 709;"PREV?"
ENTER 709;A$
DISP A$

The multiplexer response without the header is "A1B4", with header on the response is "CLOSE A1B4".

STEP

SYNTAX: **STEP | STP | SP**

EXAMPLE:

OUTPUT 709;"STEP"

The STEP command will cause the multiplexer to open the current switch selection and advance to the next step in the list. At the last step of the list, the current list will "wrap-around" to the first step.

STEP Query

SYNTAX: **STEP?** | **STP?** | **SP?**

The STEP Query operates in the same manner as the NEXT? command, however, at the end of the list any subsequent STEP? command will cause the list to wrap-around to the first step. Programming and response of the multiplexer is identical to the NEXT? command.

Moving a Current List into Memory   (STORE Command)

The STORE command allows the current list to be stored in nonvolatile memory. A possible 100 lists may be stored in memory, provided the total number of switch selections for the multiplexer does not exceed 3671 switch selections. Each stored list must be identified by a two digit number.

SYNTAX: **STORE** | **ST**

EXAMPLE: Store the following list of switch selections:

CHANNEL A POD	CHANNEL B POD
A1	B0
A1	--
--	B1
A2	B2
A3	B3

OUTPUT 709;"LIST10,18,81,22,33"

OUTPUT 709;"STORE00"

In the first output statement the list of switch selection was established. Remember that the digit "8" in the list is a no closure. The second output statement stored that list in nonvolatile memory. The list is identified by the two digits "00".

Establishing a Stored List   (STORELIST Command/Query)

The STORELIST command allows the creation of a stored list without interfering with the current list.

SYNTAX: **STORELIST** <LIST NO> , <POD> | **STLI** <LIST NO> , <POD>

EXAMPLE: Generate a stored list with the following switch selections without disturbing the current list. Identify the list with with digits 10.

CHANNEL A POD	CHANNEL B POD
A1	B2
A2	B3
A3	B4
A4	B5

OUTPUT 709;"STORELIST10,12,23,34,45"

The first two digits in the string are the list identifier. The next decimal number combinations are the switch selections in the list. There is no indication on the display that the transfer of data has taken place.

STORELIST Query

The STORELIST Query will identify the switch selections of any stored list in nonvolatile memory without disturbing the current list.

SYNTAX: **STORELIST** <LIST NO>? | **STLI** <LIST NO>?

The response of the multiplexer, without the header, is a string of two digit numbers. The list number is identified by the first two digits. The first digit in each of the other pairs is the switch selection of channel A and the second digit is the switch selection for channel B. A possible 99 numbered pairs could be included in the response, depending on the length of the list.

EXAMPLE:

OUTPUT 709;"STORELIST00?"
ENTER 709;A$
DISP A$

The two digit number behind the command identifies the list to be queried. When the header is disabled, the response of the multiplexer will be in this format: "00 11 22 33" ect. When the header is enabled, the multiplexer will respond this way: "STORE LIST 00 00 11 22 33" etc. If the stored list is empty, the response is "STORE LIST 00".

Controlling a List   (RECALL, NEWLIST Commands)

The RECALL command allows moving a stored list of switch selections into the current list.
A current list may be erased using the NEWLIST command.

RECALL

SYNTAX: **RECALL** <LIST NO> | **REC** <LIST NO>

or:

RCO <LIST NO> | **RC** <LIST NO>

The list number in the command is the two digits that indentify the stored list. When RECALL is executed, the current list is positioned at step number 01.

EXAMPLE:

OUTPUT 709;"RECALL10"

In this example, stored list number 10 has been recalled into the current list.

NEWLIST

SYNTAX: **NEWLIST** | **NEW** | **NL**

EXAMPLE:

OUTPUT 709;"NEWLIST"

The NEWLIST command operates in the same manner as pushing RECALL twice when the multi-plexer is in the local mode.
If the current list is to be saved, use the STORE command before executing the NEWLIST command.

Modifying a Stored List   (POSITION, DELETE, INSERT Commands/Queries)

The POSITION Command moves the current list to a specific step number in the list. POSITION 0 moves the list to step 00 without affecting the relays. The DELETE and INSERT Commands are used to modify the current list by deleting or inserting switch selections anywhere in the list.

POSITION

SYNTAX: **POSITION <STEP NO> | POSN <STEP NO> | POS <STEP NO>**

EXAMPLE:

OUTPUT 709;"POSITION 01"

In the example above the current list is moved to step number 01.

POSITION Query

The POSITION Query will identify the present switch position in the list.

SYNTAX: **POSITION? | POSN? | POS?**

The reply of the multiplexer is a one or two digit number, identifying the present step in the current list (0 to 99).

EXAMPLE:

OUTPUT 709;"POSITION?"
ENTER 709;A
DISP A

If the current list is positioned at step 01 and the Header is disabled, the multiplexer will respond with "1". With the Header enabled, the word POSITION is added to the response.

DELETE

SYNTAX: **DELETE | DE**

EXAMPLE:

OUTPUT 709;"DELETE"

When the DELETE command is executed, the current switch selection is erased and the next switch closure is moved in to its place.

INSERT

SYNTAX: **INSERT** | **IN**

EXAMPLE:

OUTPUT 709;"INSERT"

To insert a new switch selection, position the list to the step of insertion. Select the new pod combination and execute the INSERT command. The new selection is inserted in front of the positioned step.

EXAMPLE: Modify the list that was used in the STORELIST command. The example has the following switch selections and is identified by digits 10:

STEP NO	CHANNEL A POD	CHANNEL B POD
01	A1	B2
02	A2	B3
03	A3	B4
04	A4	B5

The list is to be modified by deleting position B2 in step 01 and inserting pods A0 and B0 at step 01. To modify the list, program the controller as follows:

PROGRAM STEPS	COMMENTS
OUTPUT 709;"RC10	Recall stored list 10 from example.
OUTPUT 709;"DE"	Delete step 01 for modification.
OUTPUT 709;"POS00"	Position list for inserting new switch selection.
OUTPUT 709;"CLA0,B0"	Select the new pods to be inserted.
OUTPUT 709;"IN"	Insert new pods at position 01.
OUTPUT 709;"CLA1;OPB"	The modified step with pod B2 deleted.
OUTPUT 709;"IN"	Insert modified step at position 02.
OUTPUT 709;"ST10"	Store the modified list.

The modified list has the following switch selections:

STEP NO	CHANNEL A POD	CHANNEL B POD
01	A0	B0
02	A1	--
03	A2	B3
04	A3	B4
05	A4	B5

Emulating Front Panel Operation   (KEY Command/Query)

The KEY Command allows the front panel keys to be "pushed".

SYNTAX: **KEY <KEY NO> | KY <KEY NO>**

The front panel keys are represented numerically as follow:

KEY	KEY NUMBER
A0 - A7	0 - 7
B0 - B7	8 -15
LOCAL	16
STORE	17
RECALL	18
INSERT	19
DELETE	20
8	21
9	22
NEXT	24
PREV	25

Keycodes 23 and any above 25 have no effect. Key number 16 will not place the 54300A in LOCAL operation.

EXAMPLE:

    OUTPUT 709;"KEY18"
    OUTPUT 709;"KEY0"
    OUTPUT 709;"KEY0"

In the above example, the RECALL was "pressed" to move stored list 00 into the current list.

KEY Query

The response to the KEY Query is the last key that was selected in the LOCAL mode.

SYNTAX: KEY? | KY?

When the Header is disabled, the multiplexer will respond with a key number which consists of a numeric string of one or two digits, i.e. 19 for INSERT key or 7 for pod A7. If the header is enabled, the word KEY is added to the response.

EXAMPLE:

OUTPUT 709;"KEY?"
ENTER 709; A$
DISP A$

Adding the Header to a Query   (HEADER Command/Query)

The HEADER Command enables or disables the header used for the query commands.

SYNTAX: HEADER | HDR {<ON>|<OFF>|<1>|<0>}

EXAMPLE:

OUTPUT 709;"HEADER 1"

In the above example the Header is enabled. The Header will be included in any subsequent queries until disabled by the HEADER OFF Command.

HEADER Query

The response of the HEADER Query is either on or off (1 or 0).

SYNATAX: HEADER? | HDR?

With the Header off, the multiplexer response is a single digit, either 1 or 0. 1 indicates that the Header is enabled, 0 the Header is off.

EXAMPLE:

> **OUTPUT 709;"HEADER?"**
> **ENTER 709;A**
> **DISP A**

The multiplexer response is either 1 or 0.

Next Channel Output Pulse   (NCOP Command/Query)

A TTL compatible pulse will be available at the Ready Output BNC on the rear panel with the NCOP enabled whenever the NEXT, PREV, STEP, TRIGGER, or POSITION Commands are executed.

> SYNTAX: **NCOP {<ON> | <OFF> | <1> | <0>}**

In the above syntax, the digit 1 means the output pulse is enabled, digit 0 means the pulse is disabled.

EXAMPLE:

> **OUTPUT 709;"NCOP ON"**

In the above example the Next Channel output pulse is enabled.

NCOP Query

The response to the NCOP Query is either on or off (1 or 0).

> SYNTAX: **NCOP?**

EXAMPLE:

> **OUTPUT 709;"NCOP?"**
> **ENTER 709;A**
> **DISP A**

With the header disabled, the response of the multiplexer is always a single digit number. A "1" means NCOP is enabled, and a "0" means disabled.

Delay Command/Query

The DELAY command is used to insert a delay between the time a switch is opened or closed, and the time the Next Channel Output Pulse is sent. Delay time is specified from 15 ms. to 999 ms. in 1 ms. increments. If the time specified is less than 15 ms, the multiplexer defaults to 15 ms.

SYNTAX: **DELAY <TIME>** | **DLY <TIME>**

EXAMPLE:

OUTPUT 709;"DELAY 100"

The time delay in this example is set at 100 ms. The delay occurs after a NEXT, PREV, STEP, POS and TRIGGER Command.

DELAY Query

The response to the DELAY Query is the time delay last programmed into the system.

SYNTAX: **DELAY?** | **DLY?**

The multiplexer will respond with a two or three digit number representing the delay time in milliseconds. With the header enabled, the word DELAY is added to the response.

EXAMPLE:

OUTPUT 709;"DELAY"
ENTER 709;A$
DISP A$

LENLIST Query

The LENLIST query causes the multiplexer to respond with the length of a stored list. If no list number is given with the command the response will be the length of the current list.

SYNTAX: **LENLIST<LIST NO>?** | **LEN<LIST NO>?**

OR: **LENLIST?** | **LEN?**

The multiplexer response without the header is a one or two digit number representing the number of switch selections in the list. With the header on, the multiplexer will respond with the header, the list number and the number of switch selections in the list. The current list is not affected during the query.

EXAMPLE:

<table>
<tr><td>FOR CURRENT LIST</td><td>FOR A SPECIFIC LIST NO.</td></tr>
<tr><td>OUTPUT 709;"LENLIST?"
ENTER 709;A
DISP A</td><td>OUTPUT 709;"LENLIST00?"
ENTER 709;A
DISP A</td></tr>
</table>

If 10 switch selections are in list number 00, then the multiplexer will respond with "10". When the header is on the multiplexer will respond with "LENGTH 0 10".

PODTYPE Query

The PODTYPE query identifies the pod type installed in a specific switch position.

SYNTAX: **PODTYPE<POD NO>? | PT<POD NO>?**

With the header disabled, the multiplexer responds with a single digit. Each digit represents one of three pod types:

MULTIPLEXER RESPONSE	POD TYPE
7	No Pod Installed
6	HP54001A DC to 1GHZ
5	HP54003A DC to 300MHz
4	HP54002A 50 ohm INPUT

With the header enabled, the multiplexer responds with header and "PODTYPE <POD NO>".

EXAMPLE:

OUTPUT 709;"PODTYPEA0?"
ENTER 709;A$
DISP A$

CLOSURECOUNT Query

The CLOSURECOUNT query reveals the number of times a specific switch has been closed.

SYNTAX: **CLOSURECOUNT<POD NO>? | CC<POD NO>?**

The response of the multiplexer, without the header, is a number string from one to eight digits long. Unless the header is enabled, the response is always numeric.

EXAMPLE:

> OUTPUT 709;"CCA0?"
> ENTER 709;A
> DISP A

With the header enabled, the response of the multiplexer will include the header "CLOSURECOUNT", the POD NO, and the number of times the switch has been closed.

IDENTIFICATION Query

The IDENTIFICATION Query identifies the multiplexer by model number.

> SYNTAX: ID?

With the header disabled, the response of the multiplexer is "HP54300A". When the header is enabled the response is "ID HP54300A".

Serial Number Query

The SER query discloses the multiplexers serial number.

> SYNTAX: SERIAL? | SER?

The multiplexer response is in the form of: XXXX A YYYYY;

> Where: X = the serial prefix
> Y = the serial suffix
>
> The letter is the country of manufacture (A = USA).

EXAMPLE:

> OUTPUT 709;"SER?"
> ENTER 709;A$
> DISP A$

REVISION Query

The REVISION Query discloses the date code of the firmware for the multiplexer.

SYNTAX: **REVISION?** | **REV?**

The response of the multiplexer, without the header, is a four digit number in the form of XXYY;

Where: X = years since 1960
        Y = week of the year

When the header is on, the word REVISION is added to the response.

EXAMPLE:

        OUTPUT 709;"REV?"
        ENTER 709;A$
        DISP A$

The date code 2445 represents the year 1984, week 45.

TEST Command

The TEST Command initiates the multiplexers selftest sequence.

SYNTAX: **TEST** | **TST**

The test results may be obtained with an ERROR Query. If the test passes, there is no front panel indication that the test has been initiated. If the test fails, one of eight error messages will be displayed by the instrument:

ERROR CODE	DESCRIPTION
10	SCRATCH RAM FAILURE
11	NONVOLATILE RAM FAILURE AT U36
12	BAD LIST POINTERS IN NONVOLATILE RAM
13	NONVOLATILE RAM FAILURE AT U7
21	CHECKSUM ROM E U8
55	FAILURE AT U10
56	FAILURE AT U27
79	FAILURE AT U13

For further repair and troubleshooting information, refer to Section VIII in the Operating and Service Manual.

EXAMPLE:

To initiate selftest: **OUTPUT 709;"TEST"**

To initiate selftest with ERROR Query: **OUTPUT 709;"TEST;ERROR?"**
                                                           ENTER 709;A$
                                                           DISP A$

A complete list of error messages is given under the ERROR Command.

Error Command

The ERROR command allows the error register of the 54300A to be read.

SYNTAX: **ERROR?** | **ERR?**

If the computer responds with error message "-100" (and 00 on the multiplexers display), then an HP-IB syntax error has occurred. The unparsed portion of the string that was sent to the multiplexer may be retrieved by using the ERROR$ query.

SYNTAX: **ERROR$?** | **ERR$?**

Listed below are all the errors the 54300A can report. The multiplexer reports an error by flashing ERXX for a few seconds in the display. XX represents the error number in the DISPLAY colunm in the table. The HP-IB response to the ERROR query is listed in the HP-IB RESPONSE column. All of the errors, except 09, in remote, will cause the ERR bit (32) to be set in the status byte.

OPERATIONAL ERRORS

DISPLAY	HP-IB RESPONSE	DESCRIPTION
01	1	Recalling an empty list
02	2	Nonvolatile memory is full
03	3	Deleting from an empty list
04	4	Inserting to a full list
09	--	Keypress in remote (not reported to HP-IB)
00	-100	HP-IB syntax error
31	-231	Input buffer full
32	-232	Output buffer full

HARDWARE ERRORS

DISPLAY	HP-IB RESPONSE	DESCRIPTION
10	-310	Scratch RAM failure
11	-311	NV. RAM failure at U36
13	-311	NV. RAM failure at U7
12	-312	Bad list pointer in NV RAM
21	-321	Checksum ROM E U8
22	-321	Checksum ROM C U9
23	-321	Checksum ROM A U38
24	-321	Checksum ROM 8 U37
55	-330	Selftest failed at U10
56	-330	Selftest failed at U27
79	-330	Selftest failed at U13
77	377	Pod overvoltage detect

EOI Command

The EOI command is used in conjunction with all commands that are queries. When the ATN line is false, the EOI line is used to initiate the last byte of a data message.

SYNTAX: EOI{<ON> | <OFF> | <1> | <0>}

EXAMPLE

OUTPUT 709;"EOI ON"

In the above example, EOI is enabled.

EOI Query

The multiplexers response to the EOI query is either 1 or 0 (ON or OFF).

SYNTAX: **EOI?**

The multiplexer response of "1" means EOI is enabled, a response of "0" means EOI is disabled. The label EOI is added to the response when header is enabled.

EXAMPLE:

OUTPUT 709;"EOI?"
ENTER 709;A$
DISP A$

RESET Command

When the RESET command is initiated, the 54300A is returned to the "power-on state".

SYNTAX: **RESET** | **RST**

The command includes the following sequence:

    a.   Both switches are opened.

    b.   The HP-IB buffer is cleared.

    c.   The HP-IB interrupt request mask (RQS) is cleared to 0 or 8, depending on the setting of the SRQ switch on the rear panel.

    d.   The following internal variables default as shown below:

           EOI - off (will not send EOI with line feed).
           HEADER - off (will not send header with query commands).
           DELAY - set to 15 ms. (15 ms. delay before Next Channel Output Pulse).
           NCOP - on (Next Channel Output Pulse available at rear panel).

    e.   The multiplexer stays in REMOTE mode, i.e. interface functions are not affected. LOCAL and LOCKOUT are cleared.

    f.   The current list is not affected. The list is positioned at step 00.

    g.   No Power - on SRQ is generated.

HP-IB SYSTEM COMMANDS.

The following commands deal with specific HP-IB commands, which affect the HP-IB system interface. Most instruments on the bus will respond to these commands in some manner. Refer to the programming manual for each instrument connected to the interface to see how they respond to these commands.

Refer also to the I/O programming manual for the computer being used for specific information on the syntax and actions taken by the interface when sending the messages. The examples given in this section apply to the HP series 200 desktop computers.

Trigger Command

The TRIGGER command operates in the same manner as the STEP command. The TRIGGER command will cause the multiplexer to open the present switch selection and advance to the next step in the current list. At the last step, the current list will "wrap-around" to the first step (STEP 01).

SYNTAX: **TRIGGER | TRG**

EXAMPLE:

OUTPUT 709;"TRIGGER"

Trigger Query

The TRIGGER query discloses the next switch selection in the current list.

SYNTAX: **TRIGGER? | TRG?**

When the command is executed, the multiplexer will respond with an alpha numeric string such as A1B1. The response is the next switch selection in the list.

EXAMPLE:

OUTPUT 709;"TRIGGER?"
ENTER 709; A$
DISP A$

With the header enabled, the word "CLOSE" is added to the response.

Remote/Local Operation   (REMOTE,LOCAL,LOCKOUT Commands/Query)

REMOTE

SYNTAX: **REMOTE | RMT | REM**

The REMOTE command is used to disable the 54300A front panel, except the LOCAL key, and put it in remote programming control. When the REMOTE command is executed, the REM and LSN status indicators are turned on to indicate that the multiplexer is in the remote mode. To disable the LOCAL key, use the LOCKOUT ON message. Seldom will it be necessary to execute the REMOTE command. The controller will set the REM line true when the instrument is addressed. If an attempt is made to operate the multiplexer while in the remote mode, the error message "ER 09" is displayed.

LOCAL

SYNTAX: **LOCAL | LCL | LO**

The LOCAL command clears the 54300A from the remote mode and re-enables the front panel. Pressing the LOCAL key on the front panel accomplishes the same thing, provided the key has not been disabled by the LOCKOUT ON command.

LOCAL Query

> SYNTAX: **LOCAL?** | **LCL?** | **LO?**

The response to the LOCAL Query is "LOCAL" if the front panel keys are enabled and "REMOTE" if disabled.

LOCKOUT

The LOCKOUT ON command disables all the front panel controls including the front panel LOCAL key.

> SYNTAX: **LOCKOUT ON** | **LOCKOUT1**

To regain control of the front panel controls, use the LOCKOUT OFF command.

> SYNTAX: **LOCKOUT OFF** | **LOCKOUT0**

Lockout Query

The response to the LOCKOUT Query is either on or off (1 or 0).

> SYNTAX: **LOCKOUT?** | **LOCK?**

With the header disabled, the multiplexer response is either "1" or "0". Lockout is on when the response is 1, and off when the response is 0.

EXAMPLE:

> **OUTPUT 709;"LOCKOUT?"**
> **ENTER 709;A**
> **DISP A**

The label LOCKOUT is added to the response with the header enabled.

Request Service   (RQS, MASK Commads/Query)

A very important feature of the 54300A is its ability to interrupt the system computer when certain specified conditions are met. Of course the system computer must be programmed to repsond to the interrupt. The Request Service (RQS) message is used to implement this feature and is independent of all other HP-IB activity. SRQ is sent on a single Interface Bus line called SRQ line. The 54300A must be programmed to interrupt before it will actually attempt to interrupt the computer. The following list gives the possible causes of interrupt that the 54300A can be programmed for:

a. End of current list. A series of pods can be designated as a list of switch closures. The NEXT or STEP command causes the multiplexer to increment through the list. When the last pod of the list is selected, the 54300A can interrupt the computer.

b. Data available. If the computer has asked for some type of information, the 54300A can signal the computer that the information is available.

c. Power-on SRQ. The multiplexer can interrupt the system computer when the 54300A is turned on (for example, if power to the multiplexer were lost and later restored, the 54300A could inform the computer of the failure).

d. Front panel key press. The system computer can be interrupted when a front panel key has been pressed. The KEY Query may be used to find which key was pressed.

e. Error. An error has occurred either during the Selftest sequence, or during the course of programming the multiplexer. The ERROR or ERROR$ Queries may be used to find the error.

How to use SRQ

When the Request Service (SRQ) message is sent, the computer must first determine which instrument is requesting service (if more than one is capable of requesting service). This is done by conducting a SERIAL POLL (SPOLL) of each instrument connected to the interface. When an instrument is polled, it responds by sending a STATUS BYTE which indicates whether it requested service and if so, the nature of the request. If the status byte of the instrument polled indicates that the instrument was not requesting service, the computer would continue to poll the other intruments on the bus until the proper one is located.

Status Register and Status Byte

The Status Register is used to monitor the five possible interrupt conditions. It is possible for one or more interrupt conditions to be true without the 54300A causing an interrupt. The interrupt will only occur when the SRQ mask has been set for one or more of the five interrupt conditions, and the condition occurs. If the SRQ mask is set for a certain condition, and that condition occurs, bit 6 of the Status Byte will go true. When bit 6 of the Status Byte is true the multiplexer will send the SRQ meassage to the computer.

The Status Byte is an 8-bit byte that may be used to determine the current status of the multiplexer, regardless of whether an SRQ interrupt has occurred. Status Byte comes from the Status Register in the multiplexer and its output is sent to the computer in response to a SERIAL POLL. The bits of the Status Byte for the 54300A are defined as follows:

WEIGHTED VALUE

128	64	32	16	8	4	2	1
*NOT USED	*RQS	ERR	NOT USED	PON	KEY	DATA	EOQ
7	6	5	4	3	2	1	0 BITS

* BITS 6 AND 7 ARE NOT INCLUDED IN THE MASK

RQS (BIT 6) This bit is set when one of the lesser bits is set and the corresponding mask bit is enabled. The bit is cleared after SERIAL POLL is completed or after a STATUS Query.

ERROR (BIT 5) This bit is set by a syntactic or semantic error. The bit is cleared when the ERROR Query is excecuted.

PON (BIT 3) This bit is set when power is turned on or the RESET button on the rear panel is pushed. At power on, SRQ is enabled by one of the eight positions of the rear panel dip-switch. The bit is not maskable, only the rear panel switch can enable Power-on SRQ.

KEY (BIT 2) The bit is set by a front panel key being pressed. The bit is cleared after the KEY Query is initiated.

DATA (BIT 1) This bit is set when a query loads the output buffer and is cleared when the buffer is emptied.

EOQ (BIT 0) This bit is set when the last step of the current list is reached by a NEXT, STEP or POSITION command. The front panel NEXT and PREV keys can also set this bit. When the bit is set, any subsequent NEXT command won't have any effect on the operation of the multiplexer.

All bits are cleared by initiating a RESET, by meta message Device Clear, SERIAL POLL or setting the RQS Mask.

Setting the SRQ Mask   (RQS, Mask Commands/Queries)

SYNTAX: **RQS<MASK VALUE> | MASK<MASK VALUE>**

The SRQ Mask can only be set to mask bits 0 through 5 of the Status Register. To set the Mask, first determine which conditions are wanted to interrupt the computer, e.g., End of current list, or

Front panel key press etc. Sum the weighted decimal value for those conditions. Then excecute the MASK or RQS command with the decimal sum. The weighted value for the interrupt conditions can be determined using the table below.

BIT	WEIGHTED VALUE	DESCRIPTION
0	1	End of current list
1	2	Data available
2	4	Front panel key press
3	8	Power-on SRQ (set by read panel switch)
4	16	Not used
5	32	Error
*6	64	SRQ (bit is not maskable)
*7	128	Not used

* These bits are not included in the mask. The total value of the mask cannot be greater than 63.

EXAMPLE: Set RQS for the following interrupt conditions:

a. End of current list (weighted value = 1)
b. Front panel key press (weighted value = 4)
c. Error (weighted value = 32)

First, sum the weighted decimal values for the interrupt conditions. Then program the system computer as follows:

OUTPUT 709;"RQS 37"

RQS ON/OFF Command

SYNTAX: **RQS ON | RQS OFF**

The RQS OFF Command will disable the SRQ interrupt, but save the current mask.
The RQS ON command enables SRQ and restores the current mask.

STATUS COMMAND

The STATUS Command permits reading the 54300A Staus Byte. The STATUS Command returns a value which is the sum of the values of the individual bits that are set (condition is true).

SYNTAX: **STATUS | STB**

Use the following table to find the condition that the SRQ line true:

BIT	WEIGHTED VALUE	DEFINITION
0	1	EOQ - enabled
1	2	DATA - Query data available
2	4	KEY - front panel was pressed
3	8	PON - power was turned on
4	16	Not used
5	32	ERR - syntactic or sematic error
*6	64	RQS - bit is set by any of the above bits. (this bit is not maskable).
*7	128	Not used

* THESE BITS ARE NOT PART OF THE MASK.

EXAMPLE:

```
OUTPUT 709;"STATUS?"
ENTER 709;A
DISP A
```

With the header disabled, the multilpexer will respond with a two digit number representing the sum of the values of the individual bits that are set. If all the maskable bits are set, the maximum value is 63.

To find which bit or combination of bits were set, the sample program listed below may be used.

```
10   OUTPUT 709;"HDR0;STATUS?"
20   ENTER 709;A
30   DISP A
40   Eoq=BIT(A,0)
50   Dta=BIT(A,1)
60   Key=BIT(A,2)
70   Pon=BIT(A,3)
80   Err=BIT(A,5)
90   IF Eoq=1 THEN PRINT"EOQ IS SET"
100  IF Dta=1 THEN PRINT"DTA IS SET"
110  IF Key=1 THEN PRINT"KEY IS SET"
120  IF Pon=1 THEN PRINT"PON IS SET"
130  IF Err=1 THEN PRINT"ERR IS SET"
```

APPENDIX A

QUICK REFERENCE GUIDE TO PROGRAMMING

CLOSE COMMAND

DESCRIPTION: The CLOSE Command is used to select a swich closure. Only one selection per channel can be made.

SYNTAX: CLOSE | CL <POD>[, | &<POD>]

CLOSE QUERY

DESCRIPTION: The Command identifies the present switch selection.

SYNTAX: CLOSE? | CL?

CLOSURECOUNT COMMAND

DESCRIPTION: The CLOSURECOUNT Command reveals the number of times a specific pod has been selected.

SYNTAX: CLOSURECOUNT<POD NO>? | CC<POD NO>?

DELAY COMMAND

DESCRIPTION: The DELAY Command is used to insert a time delay between switch closures and the time the Next Channel Output Pulse is sent.

SYNTAX: DELAY<TIME> | DLY<TIME>

DELAY QUERY

DESCRIPTION: The response of the Query is the time delay last programmed into the system.

SYNTAX: DELAY? | DLY?

DELETE COMMAND

DESCRIPTION: The DELETE command allows the deletion of the present switch selection.

SYNTAX: DELETE | DE

EOI COMMAND

DESCRIPTION: EOI is used to initiate the last byte of a data message.

SYNTAX: *EOI {<ON> | <OFF> | <1> | <0>}*

EOI QUERY

DESCRIPTION: The response to the Query is either on or off (1 or 0).

SYNTAX: *EOI?*

ERROR COMMAND

DESCRIPTION: The ERROR Command allows the 54300A error register to be read.

SYNTAX: *ERROR? | ERR?*

HEADER COMMAND

DESCRIPTION: The HEADER Command is used to turn the Header on or off.

SYNTAX: *HEADER | HDR{<ON>|<OFF>|<1>|<0>}*

HEADER QUERY

DESCRIPTION: The response of the HEADER query is either on or off.

SYNTAX: *HEADER? | HDR?*

ID COMMAND

DESCRIPTION: The ID Command identifies the multiplexer by model number.

SYNTAX: *ID?*

INSERT COMMAND

DESCRIPTION: The INSERT Command is used to add another switch selection anywhere in the current list.

SYNTAX: *INSERT | IN*

A-2

KEY COMMAND

DESCRIPTION:　　The KEY Command allows the front panel keys to be "pushed".

SYNTAX:　　KEY <KEY NO>　|　KY <KEY NO>

KEY QUERY

DESCRIPTION:　　The response of the KEY Query is the last key that was selected in LOCAL mode.

SYNTAX:　　KEY?　|　KY?

LENLIST COMMAND

DESCRIPTION:　　The response of LENLIST is the length of either a stored list or the current list.

SYNTAX:　　LENLIST<LIST NO>?　|　LEN<LIST NO>? OR:　　LENLIST?　|　LEN?

LIST COMMAND

DESCRIPTION:　　The LIST Command is used to establish a current list of switch selections.

SYNTAX:　　LIST<PODS>　|　LST<PODS>　|　LI<PODS>

LIST QUERY

DESCRIPTION:　　The LIST Query discloses all switch selections in the current list.

SYNTAX:　　LIST?　|　LST?　|　LI?

LOCAL COMMAND

DESCRIPTION:　　The LOCAL Command enables the 54300A front panel keys.

SYNTAX:　　LOCAL　|　LCL　|　LO

LOCAL QUERY

DESCRIPTION:　　The LOCAL Query discloses whether the front panel is enabled or not.

SYNTAX:　　LOCAL?　|　LCL?　|　LO?

LOCKOUT ON/OFF COMMANDS

DESCRIPTION: The LOCKOUT ON/OFF Commands enable or disable the front panel keys, including the LOCAL Key.

SYNTAX: *LOCKOUT ON* | *LOCKOUT 1*
        or: *LOCKOUT OFF* | *LOCKOUT 0*

LOCKOUT QUERY

DESCRIPTION: The response to the LOCKOUT Query is either on or off (1 or 0).

SYNTAX: *LOCKOUT?* | *LOCK?*

MASK COMMAND

DESCRIPTION: The MASK Command is used to set the SRQ Mask. The command is identical to the RQS command.

SYNTAX: *MASK<MASK VALUE>*

MASK QUERY

DESCRIPTION: The MASK Query responds with the current RQS mask.

SYNTAX: *MASK?*

NCOP COMMAND

DESCRIPTION: The purpose of the NCOP Command is to turn on or off the Next Channel Output Pulse.

SYNTAX: *NCOP{<ON>* | *<OFF>* | *<1>* | *<0>}*

NCOP QUERY

DESCRIPTION: The response to the NCOP Query is either on or off (1 or 0).

SYNTAX: *NCOP?*

NEWLIST COMMAND

DESCRIPTION: The NEWLIST Command clears the current list so a new list can be started.

SYNTAX: *NEWLIST* | *NEW* | *NL*

NEXT COMMAND

DESCRIPTION: The NEXT Command positions the current list to the next switch selection.

SYNTAX: NEXT | NXT | NX

NEXT QUERY

DESCRIPTION: The multiplexer response to the NEXT Query is the next switch selection in the current list.

SYNTAX: NEXT? | NXT? | NX?

OPEN COMMAND

DESCRIPTION: The OPEN Command is used to disconnect a pod from Channel A or Channel B output.

SYNTAX: OPEN | OP <CHANNEL>[, | &<CHANNEL>]

PODTYPE COMMAND

DESCRIPTION: The PODTYPE Command identifies a specific pod type installed in a specific switch position.

SYNTAX: PODTYPE<POD NO>? | PT<POD NO>?

POSITION COMMAND

DESCRIPTION: The POSITION Command moves the current list to a specific step number.

SYNTAX: POSITION<STEP NO> | POSN<STEP NO> | POS<STEP NO>

POSITION QUERY

DESCRIPTION: The POSITION Query will identify the present switch position in the current list.

SYNTAX: POSITION? | POSN? | POS?

PREV COMMAND

DESCRIPTION: The PREV Command opens the present switch selection and closes the previous selection.

SYNTAX: PREV | PRV | PR

PREV QUERY

DESCRIPTION: The PREV Query discloses the previous switch selection in the current list.

SYNTAX: *PREV?* | *PRV?* | *PR?*

RECALL COMMAND

DESCRIPTION: The RECALL Command allows moving a stored list of switch selections into the current list.

SYNTAX: *RECALL<LIST NO>* | *REC<LIST NO>*

REMOTE COMMAND

DESCRIPTION: The REMOTE Command is used to disable the front panel keys, except the LOCAL Key.

SYNTAX: *REMOTE* | *RMT* | *REM*

RESET COMMAND

DESCRIPTION: When RESET is initiated, the 54300A is returned to the power-on state.

SYNTAX: *RESET* | *RST*

REVISION COMMAND

DESCRIPTION: The REVISION Command discloses the date code of the multiplexer's firmware.

SYNTAX: *REVISION?* | *REV?*

RQS ON/OFF COMMANDS

DESCRIPTION: The RQS ON/OFF Command will toggle the SRQ interrupt on or off.

SYNTAX: *RQS ON* | *RQS OFF*

RQS COMMAND *DESCRIPTION:*   The RQS Command is used to set the SRQ mask.

SYNTAX: *RQS<MASK VALUE>*

RQS QUERY

DESCRIPTION: The response of the RQS Query is the current mask value.

SYNTAX: RQS?

SER COMMAND

DESCRIPTION: The SER Command discloses the multiplexers serial number.

SYNTAX: SERIAL? | SER?

SETUP COMMAND

DESCRIPTION: The SETUP Command is used to close switches and express them in decimal values.

SYNTAX: SETUP<00-77> | SET<00-77>
SETUP88 or SET88 will open all selected switches at the same time.

SETUP QUERY

DESCRIPTION: The SETUP Query identifies the present switch closures in decimal values.

SYNTAX: SETUP? | SET?

STATUS COMMAND

DESCRIPTION: The STATUS Command permits reading the 54300A status byte.

SYNTAX: STATUS? | STB?

STEP COMMAND

DESCRIPTION: The STEP Command will open the present switch selections and advance to the next step in the current list. At the last step of the list, the current list will "wrap-around" to the first step.

SYNTAX: STEP | STP | SP

STEP QUERY

DESCRIPTION: The STEP Query operates in the same manner as the NEXT?, however, at the end of the current list, any subsequent STEP? command will cause the list to "wrap-around" to the first step.

SYNTAX: STEP? | STP? | SP?

STORE COMMAND

DESCRIPTION: The STORE Command allows the current list to be stored in nonvolatile memory.

SYNTAX: STORE<LIST NO> | ST<LIST NO>

STORELIST COMMAND

DESCRIPTION: The STORELIST Command allows the creation of a stored list without disturbing the current list.

SYNTAX: STORELIST<LIST NO>,<PODS> | STLI<LIST NO>,<PODS>

STORELIST QUERY

DESCRIPTION: The STORELIST Query will identify the switch selections of any stored list without disturbing the current list.

SYNTAX: STORELIST<LIST NO>? | STLI<LIST NO>?

TEST COMMAND

DESCRIPTION: The TEST Command initiates the multiplexer's selftest sequence.

SYNTAX: TEST | TST

TRIGGER COMMAND

DESCRIPTION: The TRIGGER Command positions the current list to the next switch selections. Operation of the command is identical as the STEP Command.

SYNTAX: TRIGGER | TRG

TRIGGER QUERY

DESCRIPTION: The TRIGGER Query discloses the next switch selections in the current list.

SYNTAX: TRIGGER? | TRG?

A-8

APPENDIX B

TEST WORKSHEET

INTRODUCTION

The Test Worksheet provides a method of recording test configurations. Provisions for 16 probe connections are made on each worksheet. The work sheet may be used to record input probe connections, output connections and measurement results.

TEST WORKSHEET INSTRUCTIONS

DATE/TIME:
Indicate date and time of original test configuration. Dates and times of minor alterations of test system should also be recorded.

TEST SYSTEM:
Record the system name under test.

LIST NO:
Record the list number where switch selections are stored in memory (00 - 99).

CHANNEL/POD NO:
Record the channel and pod number used in the test.

INPUT:
POD IS CONNECTED TO:
State where the pod is connected in the system under test.

OUTPUT:
CHA A/CHA B CONNECTED TO:
Show which 50 ohm system is used to measure the input signals.

MEASUREMENT RESULTS:
Record all parameters pertaining to signal input, i.e. voltage levels, timing data etc.

COMMENTS:
This entry should include anything not already specified.

Model 54300A - Remote Programming

DATE/TIME:		TEST SYSTEM:			LIST NO.
CHANNEL/POD NO.	INPUT: POD IS CONNECTED TO	OUTPUT: CHA A/CHA B CONNECTED TO		MEASUREMENTS RESULTS	COMMENTS

M5430022

B-2

INDEX

INDEX

INDEX

INDEX