Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

Agilent Technologies

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HP 11757B Multipath Fading Simulator Operation and Programming

SERIAL NUMBERS

Attached to the rear panel of the instrument is a serial number plate. The serial number is in the form: 0000A00000. The first four digits and the letter are the serial number prefix. The last five digits are the suffix. The prefix is the same for identical instruments; it changes only when a configuration change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument.

This manual applies to instruments with serial numbers prefixed 3606U and above.

HEWLETT PACKARD

HP Part No. 11757-90059

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General Information

Description

This volume provides dictionary style reference material for the HP 11757B Multipath Fading Simulator. This includes:

- Descriptions of all front panel keys and functions, organized alphabetically.
- HP-IB Reference, including:
  - Introduction to Remote Programming
  - Common Commands
  - Root and Subsystem HP-IB Commands
- Appendix A Error Messages
- Appendix B Specifications
- Appendix C Advanced HP-IB Measurements
- Appendix D HP-IB Compliance
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DRTS

If your Fader is an integral part of a HP 11758T/U Digital Radio Test Set (DRTS) this manual also applies with a few exceptions. There is no internal printer in the DRTS, so commands relating to the internal printer must be disregarded. There are also no numeric keys [0] through [9], so parameters must be entered using arrow keys.

IF Bands

The HP 11757B has options on two IF bands. The options available are:

- Standard: 40 MHz to 100 MHz
- Option 140: 90.0 MHz to 190.0 MHz
- Option 147: 40 MHz to 100 MHz and 90.0 MHz to 190.0 MHz

Serial prefixes less than 3215A have an upper band range of 110.0 MHz to 170.0 MHz.

Option 001

If your HP 11757B is an option 001, it does not have built in signature analysis. You cannot select a measurement type such as Static M or Dynamic S. All instructions in this manual pertaining to signatures, (MEAS), (MEAS TYPE), (RADIO SETUP) and (MEAS SETUP) do not apply to option 001 instruments. To perform M-Curves or other signature measurements with option 001, you must either perform them manually, or use an external controller and program.

Connecting the HP 11757B to a BERT

The HP 11757B can work with many different types of Bit Error Rate Testers (BERT). However, not all BERTs operate the same way and it is important for you to understand how to correctly interface different types of BERTS to the HP 11757B.

Triggering

The (Radio Setup) key can be used to adjust the triggering of the ERROR PULSE INPUT and ALARM INPUT connectors to coincide with the BERT you are using. The ERROR PULSE INPUT line can be terminated in ECL/75Ω, TTL/75Ω, or TTL/ 10kΩ. In addition, an ERROR PULSE INPUT variable threshold can be selected instead of ECL or TTL thresholds. ERROR PULSE INPUT variable threshold is only available in serial prefixes 3235A and above. The HP 11757B will always trigger on the rising edge of signals applied to the "ERROR PULSE IN" connector.

The ALARM INPUT connector is always terminated in TTL/10kΩ. However, the edge (positive or negative going) that the Fader triggers on can be chosen by you. Select the one that works with your BERT.

Error Pulse Signals during Out-of-Lock Situations

It is very important to understand what kind of "ERROR PULSE" signal your BERT puts out when the radio is out-of-lock. Ideally, when the radio is out-of-lock, the BERT will put out a very fast stream of pulses indicating a very high Bit Error Rate (BER). If this is the case with your BERT, all you need do for BER Criteria measurements is connect the "ERROR PULSE" of your BERT to the ERROR PULSE INPUT connector on the front panel of the Fader.

On the other hand, some BERTs turn off their "ERROR PULSE" signal when an out-of-lock state is detected. If this is the case with your BERT, you not only need to connect the "ERROR PULSE" of the BERT to the ERROR PULSE INPUT of the Fader, you must also connect an Alarm line from either your radio or your BERT to the ALARM INPUT line of the Fader. This is because when no errors are present on the ERROR PULSE INPUT line, the Fader cannot tell the difference between an out-of-lock situation and one were the bit error rate is truly zero. The Fader needs the ALARM INPUT line to determine which of these situations is occurring.

Documentation

Four other manuals make up the documentation set for the HP 11757B. They are:

- **Installation and Calibration.** This manual contains information needed to install, verify and calibrate the HP 11757B. It is shipped inside the binder for the User's Guide
- **Making Measurements with the HP 11757B Multipath Fading Simulator.** This manual contains detailed instructions for making specific measurements with the Fader. This manual is also shipped inside the binder with the User's Guide.
- **Beginner's Guide to SCPI** This guide provides the elementary concepts you must know before you can program instruments that implement the Standard Commands for Programmable Instruments (SCPI). SCPI was formerly known as TMSL. This manual is also shipped with the User's Guide.
- **Service Manual.** This manual contains procedures needed for assembly level troubleshooting, adjustments, and servicing of the Fader.

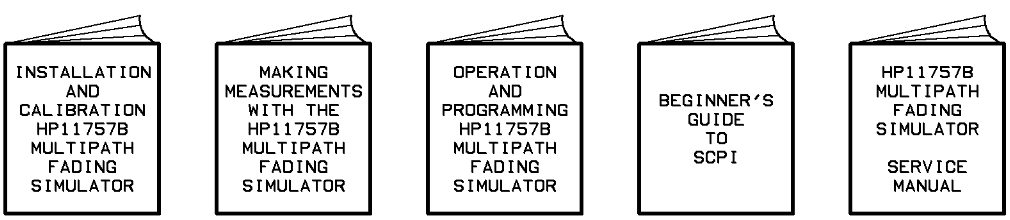

Figure 1-1. HP 11757B Documentation

Safety Considerations

This product is a Safety Class I instrument, that is, one provided with a protective earth terminal. The Fader and all related documentation should 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 for installation, operation, and performance testing is found in Installation and Calibration Manual.

Instruments Covered by this Manual

Attached to the rear panel of the instrument is a serial number plate. The serial number is in the form: 0000A00000. The first four digits and the letter are the serial number prefix. The last five digits are the suffix. The prefix is the same for identical instruments; it changes only when a configuration 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 instruments having the serial number prefix(es) listed under "Serial Numbers" on the title page.

Specifications

Instrument specifications are listed in appendix B. These specifications are the performance standards or limits against which the instrument may be tested. Supplemental characteristics are also listed in appendix B. Supplemental characteristics are not warranted specifications, but are typical characteristics included as additional information for the user.

Options

Electrical Options

Option 001, no signature capability. Equivalent to HP 11757A.
Option 140, 90 MHz to 190 MHz
Option 147, 40 MHz to 100 MHz, and 110 MHz to 170 MHz

Serial prefixes less than 3215A have an upper band range of 110.0 MHz to 170.0 MHz.

Cables and Accessories

Table 1-1. Recommended Cables

Accessory	Part Number	Use
75Ω 5.5 ft BNC	HP 8120-3616	IF and RF Input
Synchronization Cable	HP 11757-60027	One required per pair of instruments for synchronization
50Ω to 75Ω Adapter	HP 11694	Three required per instrument

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Detailed Operating Instructions

Detailed Operating Instructions

The Detailed Operating Instructions describe the keys, functions and features of the HP 11757B Multipath Fading Simulator. Appearing in alphabetical order below is a list of Detailed Operating Instructions and the page numbers where their respective descriptions are found.

Arrows

Description

The arrow keys (▲, ▼, ◀, ▶) are used to modify numeric data that is to be entered into the Fader. When one of the function keys is pressed, a numeric string is displayed with one blinking digit. The ▲ and ▼ keys are used to modify the blinking digit. The ◀ and ▶ keys are used to move to other digits.

The arrow keys have two functions when the Fader is in MORE functions mode: 1)to move from one function to the next the ▲ and ▼ keys may be used, and 2)when a function has been selected by the ENTER key, the arrow keys are used to change the values of the parameters displayed.

Local Procedure

When entering numeric data into the Fader, use ▲ and ▼ to modify the display's blinking digit. Use ◀ and ▶ to move to other digits of the parameter.

1. Press PRESET/LOCAL, then ENTER
2. Press SHIFT, then PRESET/LOCAL
3. Press ▲ ▲ ▲ ▲
4. The display should read "`4  AGC BW`"
5. Press ENTER to select.
6. The display should read "`AGC BW 30.0MZ`" The tens digit should be flashing. To set the bandwidth to 20 MHz:
7. Press ◀, then ▼
8. Press ENTER to set the parameter to 20 MHz and leave the MORE functions display mode.

Remote Procedure

There is no remote procedure for arrow keys.

ATTEN

Description

The (ATTEN) key allows you to set flat fade gain/attenuation. The attenuation can be set from 0 to 50 dB. The resolution is 0.1 dB. Attenuation may be swept.

Local Procedure

Non Swept

1. Press the (ATTEN) key.
2. Enter the appropriate attenuation using the data entry keys.
3. Press the (ENTER) key when the value is correct.

   or

4. Press the (ATTEN) key.
5. Use (▲) and (▼) to modify the blinking digit.
6. Use (◀) and (▶) to move to other digits.
7. Press the (ENTER) key when the ATTEN display reads the correct value.

Swept

To sweep attenuation we set start and stop attenuations. The sweep time will be the same as the sweep time set for (NOTCH FREQ) and (NOTCH DEPTH). It is possible to sweep only attenuation, but it is not possible to sweep it at a different rate than one set for another parameter.

1. Press the (SET START) key.
2. Press the (ATTEN) key.
3. Use the arrow keys or the data entry keys to set a value for the start attenuation.
4. Press the (ENTER) key.

5. Press the SET STOP key.
6. Press the ATTEN key.
7. Use the arrow keys or the data entry keys to set a value for the stop attenuation.
8. Press the ENTER key.
9. Activate the ATTEN SWP by pressing SHIFT, then ATTEN.

Remote Procedure

The program code for attenuation is POW:ATT. To set the attenuation to a value, use POW:ATT followed by the value and DB.

Example

To enter an attenuation of 33.3 dB:

```
OUTPUT 714;"POW:ATT 33.3DB"
```

To enter attenuation sweep parameters for start and stop:

```
OUTPUT 714;"POW:ATT:STAR 10.0DB"
OUTPUT 714;"POW:ATT:STOP 35.0DB"
```

To start the attenuation sweep:

```
OUTPUT 714;"POW:ATT:MODE SWE"
```

HP-IB Program Codes

Keystroke	Program Codes
ATTEN	POW:ATT
SET START	POW:ATT:STAR
SET STOP	POW:ATT:STOP
SWP ATTEN	POW:ATT:MODE SWE

Comments

The preset value of attenuation is 0.0 dB. The preset start and stop sweep values for attenuation are set to 0, and the sweep is off.

The (SET START) and (SET STOP) functions will prompt you for parameters for NOTCH FREQ, NOTCH DEPTH and ATTEN consecutively without pressing the keys for those functions. For instance, if you press (SET START) you will notice a blinking digit in the notch frequency field of the display. After you change the value and press (ENTER), you will notice the tens digit blinking in the notch depth field. After entering a value for notch depth, the tens digit in the attenuation field will blink. After you have entered a value for a starting attenuation, the fader will return to the settings displayed before you changed the set start parameters.

Note

By entering negative values of attenuation you can get gain of up to 12 dB. Use the minus sign to signify gain when entering values.

Automatic Gain Control (AGC)

Description

The Automatic Gain Control function provides constant power gain from the fader input to output, integrated over a user specified bandwidth. When turned on, the AGC function will set the fader to 0 dB power gain, regardless of notch position or depth. The AGC function is necessary when the fader is inserted after the AGC amplifier in a digital radio.

To set up the AGC function, it is necessary to (ENTER) the radio's intermediate frequency (i.e. 70 MHz), as well as the bandwidth of the radio. These two entries tell the fader over what frequency range to maintain a constant power gain. Once these two entries are defined, the AGC function may be turned on and off without re-entering the center frequency or bandwidth information. All AGC information is stored in battery- backed up RAM.

Local Procedure

1. Setup the AGC center frequency. This is usually the center frequency of the digital radio (i.e. 70 MHz or 140 MHz).
   a. Press (SHIFT), then (PRESET/LOCAL) to enter the MORE mode. AGC can also be accessed by pressing the (RADIO SETUP) key and using (▲) until AGC functions appear.
   b. Use the (▲) and (▼) arrows until the display shows "`3 AGC FREQ`", then press (ENTER).
   c. The display will change to "`AGC FRQ 070.0`". Use the (▲) and (▼) arrows (or numeric keypad) to select the desired center frequency. Press (ENTER).
2. Setup the AGC bandwidth. This is the bandwidth over which the fader will keep a constant power gain. This is usually the bandwidth of the digital radio's

intermediate frequency (i.e. 20 MHz bandwidth for a particular 70 MHz IF radio).

a. Press (SHIFT), then (PRESET/LOCAL) to enter the MORE mode.

b. Use the (▲) and (▼) arrows until the display shows "4 AGC BW". Press (ENTER).

c. The display will change to "AGC BW 20.0MZ". Use the (▲) and (▼) arrows (or numeric keypad) to select the desired bandwidth. Press (ENTER).

3. Turn on the AGC function. When AGC is on, the display annunciator over the "AGC" label will be on.

a. Press (SHIFT), then (PRESET/LOCAL) to enter the MORE mode.

b. Use the (▲) and (▼) arrows until the display shows "2 AGC ON/OFF". Press (ENTER).

c. The display will change to "AGC OFF". Use the (▲) and (▼) arrows to change to "AGC ON". Press ENTER.

Note

Determining the appropriate BW setting for the AGC function can be done quickly using a power meter and the IF signal to be faded.

1. Connect the IF signal of your radio to the IF Input of the Fader.

2. Connect a power meter to the IF Output of the Fader.

3. Set notch depth on the Fader to 0.0 dB. Measure the power level at the IF Output.

3. Set notch depth on the Fader to 20.0 dB. Measure the power level at the IF Output.

4. Adjust the AGC BW setting on the Fader until the power level at 20.0 dB equals the power level you measured at 0 dB.

The resultant BW setting will approximate the integrated noise-power BW of the filtered signal, and will minimize average power fluctuations that would otherwise result from changes in notch depth and frequency.

Comments

Once the AGC center frequency and AGC bandwidth have been entered, AGC ON/OFF is the only function which need be used until either the center frequency or bandwidth needs to be changed.

Remote Procedure

To enter the AGC frequency in remote mode, send the "POW:AGC:FREQ:CENT" command followed by the AGC frequency.

To enter the AGC bandwidth in remote mode, send the "POW:AGC:BAND" command followed by the AGC bandwidth.

To turn the AGC on or off in remote mode, send the "POW:AGC" command followed by "ON" or "OFF".

Example

To turn on the AGC for a 70 MHz IF radio with a 25 MHz bandwidth:

```
OUTPUT 714;"POW:AGC:FREQ:CENT 70MHZ"
OUTPUT 714;"POW:AGC:BAND 25MHZ"
OUTPUT 714;"POW:AGC ON"
```

HP-IB Program Codes

Parameter	Program Codes
AGC center frequency	POW:AGC:FREQ:CENT
AGC bandwidth	POW:AGC:BAND
AGC on	POW:AGC ON
AGC off	POW:AGC OFF

BACK SP

Description

The (BACK SP) key allows you to back space over an incorrect data entry so that you may enter another value before pressing the (ENTER) key.

Local Procedure

To use the back space simply press it until the digit you wish to correct disappears.

Example

Let's use (BACK SP) to correct an entry in attenuation.

1. Press the (ATTEN) key.
2. Press the following keys: (1) (2) (.) (3)

   Suppose you meant to enter 13.3 instead.
3. Press (BACK SP) (BACK SP) (BACK SP)
4. Press (3) (.) (3)
5. Press (ENTER).

Remote Procedure

Back space is not available in remote mode.

Comments

If you back space over all the entries in the current parameter, the setting that existed before you started data entry appears. For instance, if you had a setting of 40.0 and keystroked in 30.0 without pressing (ENTER), pressing (BACK SP) four times would produce a reading of 40.0.

DATA ENTRY

Description

The data entry keys allow numeric entry of all parameters. The keys include:

[7] [8] [9]
[4] [5] [6]
[1] [2] [3]
[0] [.] [−]

The minus sign (−) may be entered either before or after typing in numbers. For instance, [−] [4] [0] [.] [0] [ENTER] yields the same result as [4] [0] [.] [0] [−] [ENTER].

The decimal key [.] allows you to enter tenths and hundredths. You may enter tenths of a megahertz, tenths of a dB or tenths of nanosecond.

Local Procedure

To enter a notch center frequency of 75.1 MHz:

1. Press the [NOTCH FREQ] key.
2. Press [7] [5] [.] [1]
3. Press the [ENTER] key.

Remote Procedure

The program codes for the data are the same as the data themselves.

Set an attenuation of 10 dB.

```
OUTPUT 714;"POW:ATT 10.0 DB"
```

DELAY

Description

The DELAY function ((SHIFT) (PHASE)) allows simulation of various interpath delays. You simply enter a value, which is assumed to be in nanoseconds, and the instrument calculates the correct values for attenuation, notch depth, and notch frequency to simulate the delay. The range for delay is 2 ns to 25 ns in steps of 0.1 ns.

Local Procedure

To set a delay of 5 nanoseconds:

1. Press (SHIFT), then (PHASE).
2. Press (5) (.) (0) or use the arrow keys.
3. Press the (ENTER) key.

Remote Procedure

The program code for DELAY is POW:DEPT:DEL. To set a delay of 5 nanoseconds:

```
OUTPUT 714;"POW:DEPT:DEL 5NS"
```

HP-IB Program Codes

Keystroke	Program Code
DELAY	POW:DEPT:DEL

Display

Description

The selection of display functions is available only via remote programming. When the Fader display is enabled, it indicates instrument settings, entries in progress, and instrument status. In remote mode, two display functions are allowed: display enable and display disable.

Local Procedure

There is no local procedure for turning the display on and off.

Remote Procedure

Two display functions are available: display enable and display disable.

Display Enable (DISP ON)

This is the display function at turn-on. This condition is also established by PRESET.

Display Disable (DISP OFF)

This function will display "`DISPLAY OFF`" on the front panel. The front panel keys are still active. This function is cleared by sending DISP ON, by cycling power or pressing [PRESET/LOCAL].

HP-IB Program Codes

Parameter	Program Code
Display Enable	DISP ON
Display Disable	DISP OFF

ENTER

Description

The (ENTER) key is used to terminate data input, and to access various levels of data entry of the MORE FUNCTIONS key.

Local Procedure

The example below demonstrates a typical use of the (ENTER) key when it is being used to set the parameters of a function.

Example

To enter a notch frequency of 72.0 MHz.

1. Press (NOTCH FREQ). The Fader will display the previously entered frequency value with one blinking digit.
2. Modify the blinking digit (see below) until 72.0 MHz is displayed.
   a. Use (▲) and (▼) to modify the blinking digit.
   b. Use (◀) and (▶) to move to other digits.
   c. Press (ENTER).

Example

1. Press MORE FUNCTIONS ((SHIFT), then (PRESET/LOCAL)).
2. The Fader will display a blinking digit and a corresponding function category title.
3. Using (▲) or (▼), modify the blinking digit until the desired category is displayed.
4. Press (ENTER) to select the desired category.

Remote Procedure

This instrument does not require the use of (ENTER) in remote mode.

Comments

If a function is accessed and then the (ENTER) key is pressed without entering (or changing) the numeric data, the Fader uses the previously entered data.

If the (ENTER) key is not pressed after using the arrow or data entry keys to enter numeric data, (for example, if EXIT is pressed or another function is enabled), and the function is aborted or another function initiated, the instrument returns to the value that was set before you pressed the function key.

EXIT

Description

The EXIT function is used to discontinue access to selected functions. When the EXIT key (SHIFT, then ENTER) is used, the Fader returns to standard operation.

Local Procedure

To discontinue access to a selected function, press (SHIFT, then ENTER).

Remote Procedure

The Fader does not support the use of EXIT in remote mode.

Comments

If a function key is pressed, and EXIT (SHIFT, then ENTER) is pressed without entering any data, the function is aborted.

If a function key is pressed, numeric data entered, and the EXIT function is executed before the ENTER key is pressed, the value for the function remains the same as before you pressed the function key.

Fade Event

Description

The internal Fade Event feature allows a previously stored table of notch conditions to be "replayed" from the front panel. The Fade Event Table is 2000 points long Std., 4000 points long with option 001, and can be partitioned into 10 sequential or overlapping segments. The Fade Event table is stored using a remote controller, but will be preserved in the fader's internal, battery-backed-up RAM during power off conditions.

Local Procedure

1. Press (SHIFT), then (▶).
2. The display will change to "`FADE EVENT 0`". There are 10 fade events, or segments, that can be replayed. Use the (▲) and (▼) arrows or the numeric keypad to select the desired fade event, then press (ENTER).
3. The display will change to "`FADING..N`" and the selected fading segment will be run. "*N*" is the fade event (0—9) that is currently running.

Notes

Pressing any front panel key halts the procedure.

If there is no fade event stored into memory or the fade event is invalid, the display will read "`UNAVAILABLE`". Verify that the event is valid or has been stored.

4. The event will stop when finished and the front panel will display the values set by the last point in the fade event just executed.

Remote Procedure

To start a fading event in remote mode, send the command “SWE:ALL LIST” followed by the fade event number. For example, to start fade event 3:

```
OUTPUT 714;"SWE:ALL LIST3"
```

Fade Event Table Storage (Remote Only)

The fade event table is 2000 “points” long (4000 for option 001). Each “point” contains five pieces of information:

Notch frequency
Notch depth
Min/Non-Min phase
Attenuation (flat fade)
Sweep time.

Note

The Sweep time information contained in each “point” is defined as the time to reach that “point” from the previous “point”.

Storing Notch Frequency Portion of Table

To store the notch frequency portion of the table, use the LIST:FREQ command, followed by the list of frequencies that will be stored into the table.

For example, to store an array of notch frequency points:

```
OUTPUT 714;"LIST:FREQ ";Freq_array(*)
```

To store a set of notch frequency points:

```
OUTPUT 714;"LIST:FREQ 50E6,55E6, 60E6,65E6,70E6,75E6,80E6,85E6,90E6"
```

or

```
OUTPUT 714;"LIST:FREQ 50MHZ,55MHZ,
60MHZ,65MHZ,70MHZ,75MHZ,80MHZ,85MHZ,90MHZ"
```

Storing Notch Depth Portion of Table

To store the notch depth portion of the table, use the LIST:POW:DEPT command, followed by the list of notch depths that will be stored into the table.

For example, to store an array of notch depth points:

```
OUTPUT 714;"LIST:POW:DEPT ";Depth_array(*)
```

To store a set of notch depth points:

```
OUTPUT 714;"LIST:POW:DEPT 0,5,10,15,
20,25,30,35,40"
```

Storing MIN/NON-MIN Phase Portion of Table

To store the MIN/NON-MIN phase portion of the table, use the LIST:POW:DEPT:PHAS command, followed by the list of phases that will be stored into the table.

Note

MIN/NON-MIN phase can be abbreviated by "1" for min-phase or "0" for non-min-phase.

For example, to store an array of MIN/NON-MIN phase points:

```
OUTPUT 714;"LIST:POW:DEPT:PHAS ";Phase_array(*)
```

To store a set of MIN/NON-MIN phase points:

```
OUTPUT 714;"LIST:POW:DEPT:PHAS 0,
0,1,1,0,0,0,1,0"
```

or

```
OUTPUT 714;"LIST:POW:DEPT:PHAS
NONM,NONM,MIN,MIN,NONM,NONM,NONM,MIN,NONM
```

Storing ATTEN Portion of Table

To store the attenuation portion of the table, use the LIST:POW:ATT command, followed by the list of attenuations that will be stored into the table.

For example, to store an array of attenuation points:

```
OUTPUT 714;"LIST:POW:ATT ";Atten_array(*)
```

To store a set of attenuation points:

```
OUTPUT 714;"LIST:POW:ATT 0,1,2,3,4,5,6,7,8"
```

Storing Sweep Time Portion of Table

To store the sweep time portion of the table, use the LIST:TIME command, followed by the list of sweep times that will be stored into the table.

For example, to store an array of sweep time points:

```
OUTPUT 714;"LIST:TIME ";Time_array(*)
```

To store a set of sweep time points:

```
OUTPUT 714;"LIST:TIME .1,
.2,.1,.1,.1,.1,3.3,5.5,.1"
```

Storing the Fade Event Positions

To store where the the 10 Events start and stop, use the LIST:SSEQn command, where "*n*" is 0—9 and is the Event number.

For example, to set Event # 0 to points 1—9 and Event # 1 to points 5—7:

```
OUTPUT 714;"LIST:SSEQ0 1,9;SSEQ1 5,7"
```

Example

The following is an example of how to generate a fade event table and store it into the fader. The data for the table is an example of a specific signature of a radio at 10E-3 and 10E-6, for MIN phase and NON-MIN phase. The data is divided into 6 fade events that can be replayed individually. In this example, the user would monitor the 10E-3 and 10E-6 alarm indicators while the fading events were running to determine a pass/fail status for the radio's adaptive equalizer cards.

Event 0: MIN Phase Signature for 10E-3

Point #	Freq MHz	Depth dB	Phase	Atten dB	Time S
1	55.0	40	1	0	.5
2	57.5	35	1	0	.5
3	60.0	17	1	0	.5
4	62.5	16	1	0	.5
5	65.0	18	1	0	.5
6	67.5	17	1	0	.5
7	70.0	17	1	0	.5
8	72.5	17	1	0	.5
9	75.0	18	1	0	.5
10	77.5	16	1	0	.5
11	80.0	17	1	0	.5
12	82.5	35	1	0	.5
13	85.0	40	1	0	.5

Event 1: NON-MIN Phase Signature for 10E-3

Point #	Freq MHz	Depth dB	Phase	Atten dB	Time S
14	55.0	40	0	0	.5
15	57.5	35	0	0	.5
16	60.0	15	0	0	.5
17	62.5	14	0	0	.5
18	65.0	16	0	0	.5
19	67.5	15	0	0	.5
20	70.0	15	0	0	.5
21	72.5	15	0	0	.5
22	75.0	16	0	0	.5
23	77.5	14	0	0	.5
24	80.0	15	0	0	.5
25	82.5	35	0	0	.5
26	85.0	40	0	0	.5

Event 3: MIN Phase Signature for 10E-6

Point #	Freq MHz	Depth dB	Phase	Atten dB	Time S
27	55.0	40	1	0	.5
28	57.5	30	1	0	.5
29	60.0	10	1	0	.5
30	62.5	9	1	0	.5
31	65.0	11	1	0	.5
32	67.5	10	1	0	.5
33	70.0	10	1	0	.5
34	72.5	10	1	0	.5
35	75.0	11	1	0	.5
36	77.5	9	1	0	.5
37	80.0	10	1	0	.5
38	82.5	30	1	0	.5
39	85.0	40	1	0	.5

Event 4: NON-MIN Phase Signature for 10E-6

Point #	Freq MHz	Depth dB	Phase	Atten dB	Time S
40	55.0	40	0	0	.5
41	57.5	30	0	0	.5
42	60.0	10	0	0	.5
43	62.5	9	0	0	.5
44	65.0	11	0	0	.5
45	67.5	10	0	0	.5
46	70.0	10	0	0	.5
47	72.5	10	0	0	.5
48	75.0	11	0	0	.5
49	77.5	9	0	0	.5
50	80.0	10	0	0	.5
51	82.5	30	0	0	.5
52	85.0	40	0	0	.5

Remote commands to transfer table into fader memory:

```
OUTPUT 714;"LIST:FREQ
55MHZ,57.5MHZ,60MHZ,
62.5MHZ,65MHZ,67.5MHZ,70MHZ,72.5MHZ,
75MHZ,77.5MHZ,80MHZ,82.5MHZ,85MHZ,
55MHZ,57.5MHZ,60MHZ,62.5MHZ,65MHZ,
67.5MHZ,70MHZ,72.5MHZ,75MHZ,77.5MHZ,
80MHZ,82.5MHZ,85MHZ,55MHZ,57.5MHZ,60MHZ,
62.5MHZ,65MHZ,67.5MHZ,70MHZ,72.5MHZ,
75MHZ,77.5MHZ,80MHZ,82.5MHZ,85MHZ,
55MHZ,57.5MHZ,60MHZ,62.5MHZ,65MHZ,67.5MHZ,
70MHZ,72.5MHZ,75MHZ,77.5MHZ,80MHZ,
82.5MHZ,85MHZ"

OUTPUT 714;"LIST:POW:DEPT
40,35,17,16,18,17,17,17,18,16,17,35,40,
40,35,15,14,16,15,15,15,16,14,15,35,40,
40,30,10,9,11,10,10,10,11,9,10,30,40,
40,30,10,9,11,10,10,10,11,9,10,30,40"

OUTPUT 714;"LIST:POW:DEPT:PHAS
```

```
                1,1,1,1,1,1,1,1,1,1,1,1,1,
                0,0,0,0,0,0,0,0,0,0,0,0,0,
                1,1,1,1,1,1,1,1,1,1,1,1,1,
                0,0,0,0,0,0,0,0,0,0,0,0,0"
                OUTPUT 714;"LIST:POW:ATT
                0,0,0,0,0,0,0,0,0,0,0,0,0,
                0,0,0,0,0,0,0,0,0,0,0,0,0,
                0,0,0,0,0,0,0,0,0,0,0,0,0,
                0,0,0,0,0,0,0,0,0,0,0,0,0"
                OUTPUT 714;"LIST:TIME
                .5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,
                .5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,
                .5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,
                .5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5,.5"

OUTPUT 714;"LIST:SEQ0 1,13"   (10E-3 min phase signature)
OUTPUT 714;"LIST:SEQ1 14,26"  (10E-3 non-min phase)
OUTPUT 714;"LIST:SEQ2 1,26"   (complete 10E-3 signature)

OUTPUT 714;"LIST:SEQ3 27,39"  (10E-6 min phase signature)
OUTPUT 714;"LIST:SEQ4 40,52"  (10E-6 non-min phase)
OUTPUT 714;"LIST:SEQ5 27,52"  (complete 10E-6 signature)
```

Comments PRESET does not affect the Fade Event Tables.

Fast Programming of Notch Parameters (Remote Only)

For fast programming of the notch parameters (frequency,phase, depth, and attenuation), use the DIAG:PROF command followed by notch frequency, phase, depth, attenuation and slew time to that point. This is useful for replaying previously stored data that exceeds the length of the internal fade profile table (4000 points) or for shortening the HP-IB processing time.

Since fast speed is desired for this mode, use the shortest numeric representations possible. For example, use "70E6" instead of "70MHZ" or "70000000" for frequency. Also use "1" for minimum phase and "0" for non-min phase.

Remote Procedure

The program code for fast programming is DIAG:PROF followed by frequency, phase, depth, atten and time. The display will change to "`FADING` . . . " during fast programming.

Note

To achieve the fastest speed, keep each HP-IB command to less than 50 characters.

Example

For example, send the following set of information in fast mode:

Freq MHz	Phase	Depth dB	Atten dB	Time s
62.5	1	16	0	.1
65.0	1	18	0	.1
67.5	1	17	0	.1
70.0	1	17	0	.1
72.5	1	17	0	.1
75.0	1	18	0	.1
77.5	1	16	0	.1

```
OUTPUT 714;"DIAG:PROF 62.5E6,1,16,0,.1"
OUTPUT 714;"DIAG:PROF 65E6,1,18,0,.1"
OUTPUT 714;"DIAG:PROF 67.5E6,1,17,0,.1"
OUTPUT 714;"DIAG:PROF 70E6,1,17,0,.1"
OUTPUT 714;"DIAG:PROF 72.5E6,1,17,0,.1"
OUTPUT 714;"DIAG:PROF 75E6,1,18,0,.1"
OUTPUT 714;"DIAG:PROF 77.5E6,1,16,0,.1"
```

HP-IB ADDRESS

Description

HP-IB ADDRESS allows the user to modify the HP-IB address of the Fader. Values range from 0—30 with 40 as listen only, and 50 as talk only.

Local Procedure

To modify the HP-IB ADDRESS:

1. Activate MORE ((SHIFT), then (PRESET/LOCAL)). The Fader will display a MORE operation title with a blinking digit.
2. Use (▲) or (▼) to modify the blinking digit until the display reads "`5 HP-IB ADRS`".
3. Press the (ENTER) key. The Fader will display "`ADDRESS 14`" with one blinking digit.
4. Modify the blinking digit (see below) until the desired HP-IB address is displayed.
   a. Use (▲) and (▼) to modify the blinking digit.
   b. Use (◀) and (▶) to move to the adjacent digit.
   c. Press the (ENTER) key.

Remote Procedure

It is possible to set HP-IB addresses over HP-IB directly. See HP-IB chapter 5.

INIT

Description

The INITialize feature is found under the (MORE) key as item 9. This function clears everything in RAM. It does not affect items stored in EEPROM or EPROM. The items cleared include:

Fader settings stored in recall registers.
Current Fader settings.
Calibration data not stored in EEPROM. This will cause calibration data stored in EEPROM to be loaded back into RAM.
Fade Events
Test Masks
Radio Setups
Measurement Setups

Comments

After INIT has been executed, the instrument will need a few seconds to reload data into RAM.

MEAS

Description

The (MEAS) key starts and executes a measurement. The type of measurement is set by the (MEAS TYPE) key, and measurement parameters can be entered after pressing (MEAS SETUP). The (RADIO SETUP) key allows you to enter values specific to the digital radio under test.

When you press (MEAS), the display will show **ENT TO MEAS** if there is valid measurement data in the Fader that you will be writing over. Press (ENTER) unless you want to print out the old data first.

When the measurement is in progress, the display will do a countdown until the measurement is finished. After the measurement has been completed, data will be sent to a printer. The printer can be specified using the PRINTER key ((SHIFT) (MEAS)).

Notes

The measurement functions do not exist on and do not apply to option 001 Faders.

Dispersive Fade Margin

After the completion of an M-curve measurement (Static, Dynamic, or Hysteresis), the 11757B computes and displays the Dispersive Fade Margin. The type of Dispersive Fade Margin calculation is chosen by DFM TYPE under the (MEAS SETUP) key. The two DFM TYPE choices are Bellcore and CCIR. The CCIR DFM calculation is only available in serial prefixes 3215A and above.

Bellcore Dispersive Fade Margin

The Bellcore Dispersive Fade Margin is explained in Bellcore Technical Advisory TA-TSY-000752. Specifically:

$$Fd = 17.6 - 10log_{10}\frac{Sw}{158.4}$$

$$Sw = \int e^{\frac{-Bn(f)}{3.8}} + e^{\frac{-Bm(f)}{3.8}} df$$

where:

Fd = Bellcore Dispersive Fade Margin
Bn = Non-Min phase M-Curve
Bm = Min phase M-Curve
f = frequency (MHz)

CCIR Dispersive Fade Margin

The Dispersive Fade Margin labelled CCIR(Comité Consultatif International des Radiocommunications) is based on ITU Report 784-3 and is calculated as follows:

$$Kn(Min) = \frac{T_s^2}{T}\int 10^{\frac{-Bm(f)}{20}} df$$

$$Kn(Non-Min) = \frac{T_s^2}{T}\int 10^{\frac{-Bn(f)}{20}} df$$

$$Kn(Overall) = 10log_{10}\frac{Kn(Min) + Kn(Non-Min)}{2}$$

where:

Kn = CCIR Dispersive Fade Margin
Bn = Non-Min phase M-Curve
Bm = Min phase M-Curve
Ts = Radio symbol time (ns)
T = Fader delay time (6.3 ns)
f = frequency (GHz)

Note

If an HP 859X Spectrum Analyzer with the M-Curve Measurements DLP is used to display the M-Curve graphically, the result shown at the top of the display is always the Bellcore result. The CCIR result is displayed on the HP11757B Front Panel only (when CCIR is selected).

Dispersive Fade Margin with only one Phase.

If only one phase was selected for measurement, the 11757B will assume the phase that was not measured will have the same M-curve as the phase that was measured.

Dispersive Fade Margin with Hysteresis Measurements.

The Dispersive Fade Margin for a Hysteresis Measurement is the average of the Outage and Return Dispersive Fade Margins.

MEAS SETUP

Description

The (MEAS SETUP) key accesses setup options for measurements. The numbered items are:

0 DATA PTS

This option is used for all measurements except Recovery Time. It specifies the number of frequency data points (1 to 100) that will be calculated and measured. It specifies the number of sweep rate points when a Dynamic-S measurement is made. The points are evenly distributed between the start and stop frequencies. If you specify 20 points for min and non-min phase, a Static M-Curve, Dynamic M-Curve or Dynamic S-Curve measurement will create 20 points for min and 20 points for non-min, for a total of 40 points. If you specify 20 points for a hysteresis measurement, 80 points would be created.

1 STRT FRQ and 2 STOP FRQ

These options are used to set the start and stop frequencies for Static and Dynamic M-Curve, and Hysteresis measurements. For Dynamic S-Curve, the start and stop frequencies define the start and stop points for the sweep. The stop value does not have to be larger than the start value. Values are band dependent. You cannot have a start frequency in one band, and a stop frequency in another.

3 START RATE and 4 STOP RATE

These options are used for DYNM S (the S-Curve) measurements only. The upper limit is dependent on the frequency span used. The fastest the fader will slew from one point to another is 5 ms (10 ms for a complete cycle). The upper limit = $|\text{start} - \text{stop}| \div .01$

5 ERROR BITS

Error Bits controls the number of errors that are counted before a final bit error rate calculation is made. The numbers that can be entered range from 2 to 15 and represent powers of 2 (entering a 10 will cause 1024 errors to be counted). The 11757B keeps track of the amount of time, t1, it takes for the number of error pulses specified by ERROR BITS to occur. It uses this time to calculate an error rate.

Error rate $= \frac{ERRORBITS}{t1}$

This is then used along with SCALE FACTOR and the radio's BIT RATE to compute the bit error rate as follows.

Bit error rate = Error rate$\frac{scalefactor}{Bitrate}$

It is important to understand the impact of different ERROR BITS settings. Large ERROR BITS settings will provide more accurate and repeatable M-Curves than small ERROR BITS settings. This is because larger settings require the 11757B to count many errors (rather than few) before a BER is calculated.

A study in statistics arrives at the table below which shows the relationship between ERROR BITS and the maximum percent error possible in the BER calculation. Use this as a guide when selecting an ERROR BITS setting.

Error Bits	True Error Counts	Maximum % Error (90% Confidence)
2	4	120
3	8	78
4	16	54
5	32	34
6	64	22
7	128	16
8	256	11
9	512	7.0
10	1024	4.6
11	2048	3.2
12	4096	2.1
13	8192	1.4
14	16384	.96
15	32768	.64

The tradeoff that comes about with larger ERROR BITS numbers is increased measurement time. As the 11757B waits to count more errors, the measurement time will increase accordingly. This effect is particularly noticeable when the ERROR CRITERIA is a very low BER such as 1E−6.

Note

When the DYNAMIC-M or DYNAMIC-S test is selected, the 11757B will wait for at least one cycle of notch movement OR the number of errors specified in ERROR BITS, whichever occurs LAST, before it calculates a BER. This insures the radio is subjected to a uniform dynamic test even under slow dynamic conditions.

6 PHASE

This selects which phase will be measured (MIN or NON-MIN or BOTH). If type BOTH is selected, two separate measurements will be made. BOTH is used only for Static-M, Dynamic-M, and Dynamic-S. If type MIN or NON-MIN are selected, the dispersive fade margin is calculated as if both phases are identical.

7 CRITERIA

This selects the decision criteria for drawing an M-Curve. If ALARM is selected, the curve will be drawn where the radio alarm signal goes high or low. If BER is selected, the curve will be drawn where the specified BER threshold is met. Criteria choices are: 1E-3, 3E-4, 1E-4, 3E-5, 1E-5, 1E-6, and ALARM.

8 SPEED and 9 DEVIATION

These are used for the Dynamic M-Curve measurements. They specify the speed (rate) and frequency deviation to sinusoidally modulate the frequency position of the carrier. See figure 2-1.

The SPEED equals the peak frequency per second of the notch movement.

The DEVIATION can be selected from the following values: ±1 MHz, ±2 MHz, ±4 MHz, ±6 MHz, ±10 MHz, ±20 MHz. However, deviation must not cause the Fader to exceed the frequency limits of the band it is in. An additional 4 MHz of guardband should be added so that the allowable deviations for given start and stop frequencies are:

START FREQ − (|Deviation|+4 MHz) ≥40 MHz

STOP FREQ + (|Deviation|+4 MHz) ≤100 MHz

For instance, if your start sweep frequency is 45 MHz and your deviation is 2 MHz, an error will result because the frequency (45 MHz − (2 MHz + 4 MHz) = 39 MHz) is outside the range of frequencies (40 MHz to 100 MHz std.).

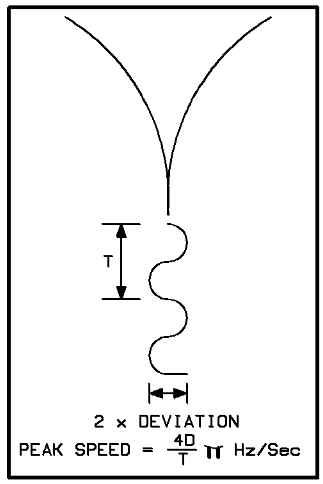

Figure 2-1. Speed and Deviation

10 EDGE ZOOM

EDGE ZOOM is used to focus on the edges of the M-Curve. If EDGE ZOOM is OFF, the number of measurement points you select will be evenly distributed across the X-axis for the measurement you have specified.

If EDGE ZOOM is ON, the measurement points you have specified will be re-distributed to provide better resolution near the edges of the M-Curve. EDGE ZOOM will only work if 15 or more measurement points are specified. EDGE ZOOM is not used for Dynamic-S or Recovery Time measurements. See figure 2-2.

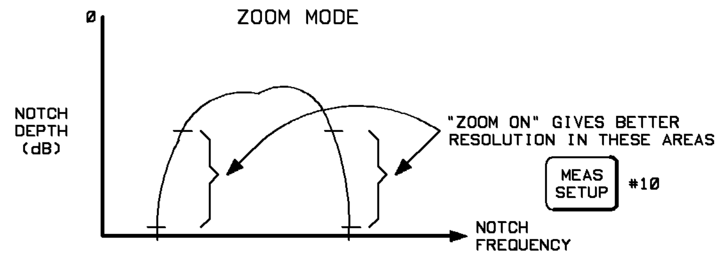

Figure 2-2. Edge Zoom

11 MK SEARCH

Digital radios use In-phase/Quadrature (I/Q) modulation techniques; there are I and Q baseband channels in both the receiver and the transmitter. When a radio receiver locks onto the transmitted signal, it can lock up in one of two ways:

- Tx I to Rx I and Tx Q to Rx Q
- Tx I to Rx Q and Tx Q to Rx I

where Tx and Rx stand or transmitter and receiver.

Because filters and other components in baseband channels are not completely identical, the performance of the radio during multipath fading could be different depending on which of the two states the radio locks up in.

If the MK SEARCH is ON, the M-Curve measurement algorithm is modified to search for the worst case (smallest notch depth) lock state. This is done by repeatedly unlocking the radio during the measurement and allowing the radio to lock up in a different state. The measurement proceeds until 2 states are found, or 20 lock/unlocks have been performed. The worst case lock state is what is displayed on the output data. Because this feature causes extra measurements to be made, it will increase the overall measurement time.

If MK SEARCH is OFF, the M-Curve algorithm will proceed as described under the MEASURE TYPE key.

MK SEARCH is not used for Dynamic-S or Recovery Time measurements.

12 DFM TYPE

Allows selection of the CCIR or Bellcore DFM type. See MEAS in this section of the manual for more information. The CCIR DFM calculation is only available in serial prefixes 3215A and above.

Note The measurement setup parameters and functions do not apply to option 001 instruments.

MEAS TYPE

This key selects the type of measurement to be made. The 11757B makes 6 different measurements that can be grouped into 4 categories.:

1. M-Curves
   a. Static M-Curve
   b. Dynamic M-Curve
   c. Hysteresis M-Curve
2. S-Curves
   a. Dynamic S-Curve
3. Recovery Time
4. Bit Error Rate

M-Curve Measurements

An M-Curve is made by creating a notch and moving it from frequency to frequency in and around the radio spectrum. At each frequency, the notch is moved in a prescribed way until a user specified criteria is met. This criteria is usually a specific Bit Error Rate, such as 1E−3. However, with the HP 11757B this criteria can also be the transition of a signal on the Alarm Input. By connecting an Alarm Line from the radio (or a BERT) this feature will allow you to set the criteria at the point where the radio goes out of lock. The result of this measurement is a number of frequency/notch depth points which cause the radio to meet the chosen criteria. When plotted as shown in figure 2-3, these points form an M-Curve. The HP 11757B provides 3 basic types of M-Curve Measurements, STATIC, HYSTERESIS, and DYNAMIC.

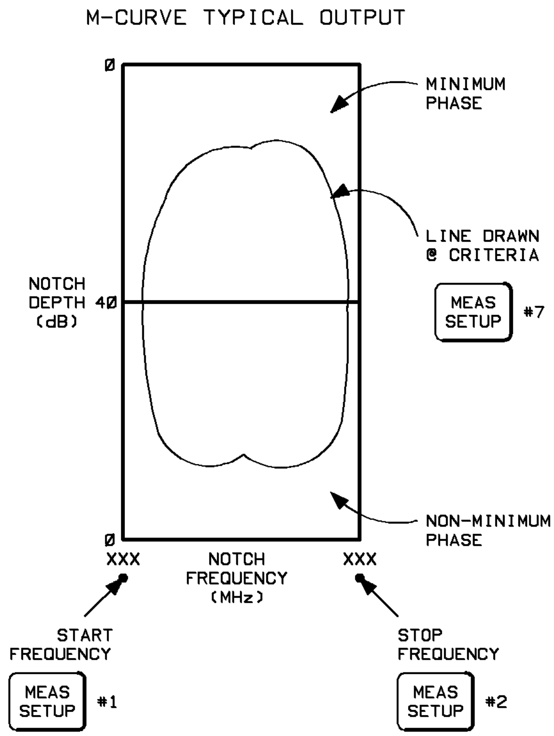

Figure 2-3. Typical M-Curve Output

Static (Static M-Curve)

The STATIC M-Curve is similar to what is shown in figure 2-3. The notch will start at the START FREQuency and at a NOTCH DEPTH of 0 db. The notch will increase in depth until the ERROR CRITERIA is met. This notch depth is then stored and the notch is set to the next frequency point at 0 db depth. This process, depicted in figure 2-4, continues until the specified number of frequency points have been measured.

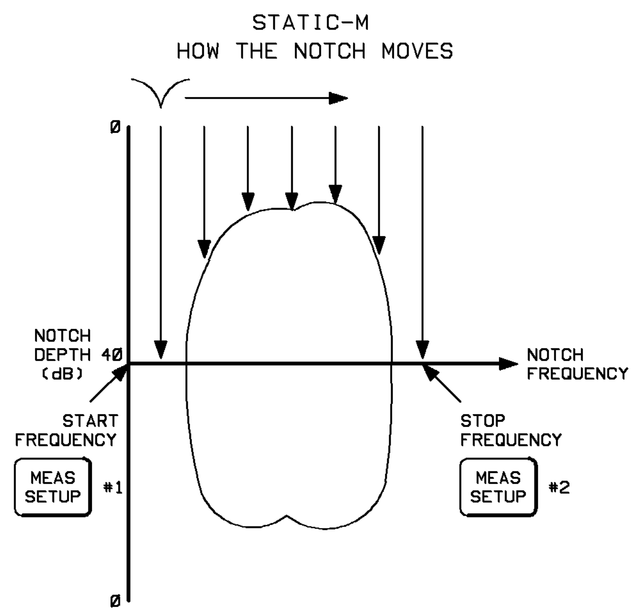

Figure 2-4. Static M-Curve Measurement

Hysteresis M-Curve

The STATIC M-Curve measurement described a method of measurement were the depth of the notch is always being increased. Because certain radios may have a significant amount of hysteresis, a different result may be arrived at if the notch is always being decreased.

The HYSTERESIS M-Curve measurement allows you to measure the amount of hysteresis in your radio by making two M-Curve measurements; one with the notch increasing (the outage) and one with the notch decreasing (the return).

Figure 2-5 describes how this is done. The 11757B is first put into minimum phase fading with the notch depth at 0 db. The notch is then increased until the ERROR CRITERIA is achieved. This is point #1 in figure 2-5 and corresponds to the Outage point for minimum phase. The notch is then increased further until a depth of 40 db is achieved. At this point the fader switches to non-minimum phase and the notch depth is decreased until the ERROR CRITERIA is again achieved. This is point #2 in figure 2-5 and corresponds to the Return point for Non-minimum phase.

This process is then repeated, with the phases reversed, for points #3 (Outage point for Non-minimum phase) and #4 (Return point for minimum phase). Both points (outage and return) are displayed for each frequency point on the printed output. Because of the way this measurement is made, HYSTERESIS M-Curve can only be made for BOTH phases.

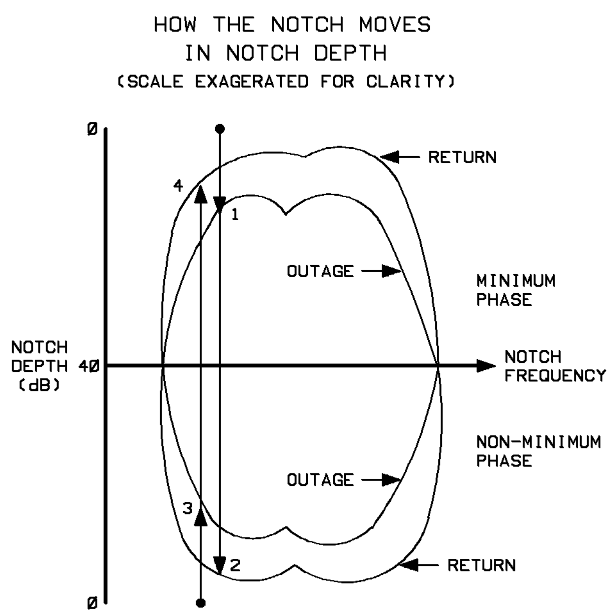

Figure 2-5. Hysteresis-M Measurement

Dynamic M-Curve

The Dynamic M-Curve is identical to the Static M-Curve with the exception that the notch frequency is sinusoidally modulated while the measurement is underway. This modulation is pictorially represented in figure 2-6. It is important to note the DEVIATION that you enter from the front panel is plus AND minus from the center frequency. Also, the SPEED at which the notch moves in frequency is expressed as the peak rate over one entire cycle. The average rate is actually $\frac{1}{\pi}$ times the peak rate.

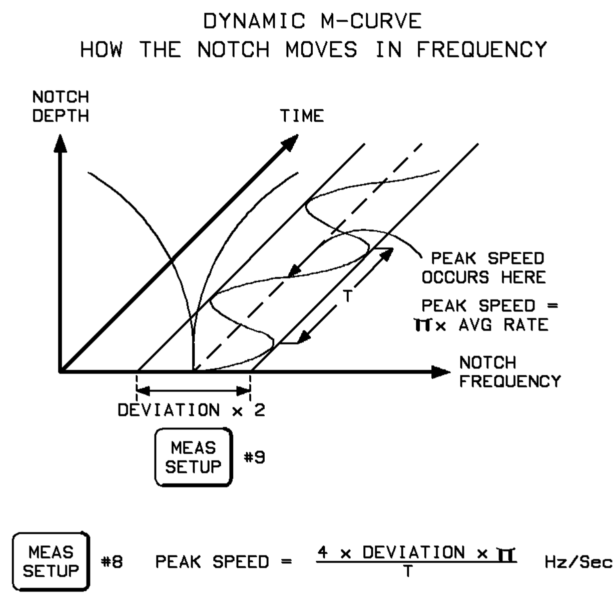

Figure 2-6. Dynamic M-Curve Measurement

Note

The DEVIATION and SPEED that you choose can significantly effect the time it takes to make a measurement. This is because the HP 11757B will wait for at least one cycle of modulation before it computes the bit error rate. If you have a wide DEVIATION and a slow SPEED, the time for one cycle can be significant when you consider many bit error rate measurements are made for each M-Curve.

The DEVIATION can be selected from the following values: $\pm$1 MHz, $\pm$2 MHz, $\pm$4 MHz, $\pm$6 MHz, $\pm$10 MHz, $\pm$20 MHz. However, deviation must not cause the Fader to exceed the frequency limits of the band it is in. An additional 4 MHz of guardband should be added so that the allowable deviations for given start and stop frequencies are:

$$\text{START FREQ} - (|\text{Deviation}|+4\ \text{MHz}) \geq 40\ \text{MHz}$$

$$\text{STOP FREQ} + (|\text{Deviation}|+4\ \text{MHz}) \leq 100\ \text{MHz}$$

For instance, if your start sweep frequency is 45 MHz and your deviation is 2 MHz, an error will result as the frequency (45 MHz − (2 MHz + 4 MHz) = 39 MHz) is outside the range of frequencies (40 MHz to 100 MHz std.).

Dynamic S-Curve Measurements

While a Dynamic M-Curve measurement checks a radios performance with a notch that varies in frequency over a narrow region, a Dynamic S-Curve measurement is a measure of how the radio responds to a notch sweeping back and forth across the entire band of the radio. The measurement is made by setting the notch to sweep across the specified band at a particular rate (see figure 2-7). While sweeping is occurring, the notch depth is increased until the ERROR CRITERIA is reached.

After achieving the desired ERROR CRITERIA, the notch depth is brought back to 0 db, and the speed at which the notch sweeps across the band is increased. The notch is again lowered until the ERROR CRITERIA is reached. This process is repeated until the highest desired sweep RATE is tested.

The data from this measurement is presented in a graph similar to the one shown in figure 2-8. This graph is different from M-Curve graphs in that the x-axis is sweep RATE instead of notch frequency.

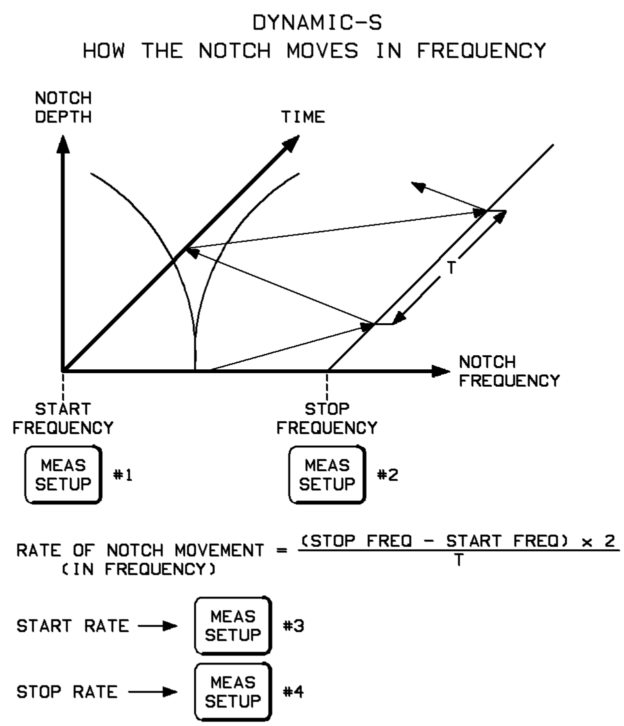

Figure 2-7. Dynamic S-Curve Measurement

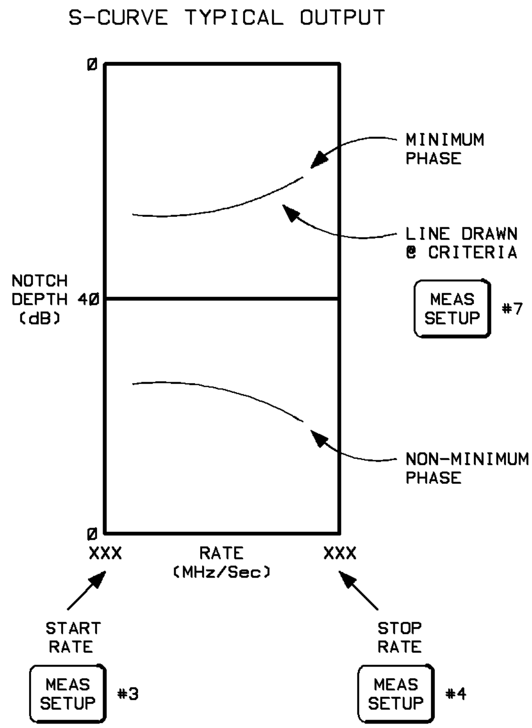

Figure 2-8. Dynamic S-Curve Measurement

Like the Dynamic M-Curve measurement, the HP 11757B will wait for at least one cycle of notch frequency movement before it calculates the bit error rate. For slow moving notches, this can significantly effect the overall measurement speed.

Recovery Time

Recovery Time is a measure of the time it takes the radio to re-lock after the IF path has been broken. After the user selects this measurement and presses the MEASURE key, the HP 11757B will break the IF path for approximately 20 milliseconds. After the path is re-established, the HP 11757B measures the time for the

ERROR CRITERIA to be reached. The resulting time is displayed on the front panel.

The HP 11757B does not reset the notch during a RECOVERY time measurement. For this reason, you should make sure the notch is set to the position you want before you start the measurement. For example, if you want to measure the radios ability to re-aquire lock while a 30 dB notch is in effect, set the notch depth to 30 dB and then start the measurement.

You can set the Fader to measure recovery time with a notch in the IF path. Simply set a notch at a frequency of interest so that when the IF path is broken and re-established, the notch is there.

Bit Error Rate Measurement

The bit error rate measurement type measures the BER by simply counting the number of events that occur on the ERROR PULSE input for approximately 1 second. It then uses the bit rate and scale factor to calculate the BER. The resulting BER is displayed on the front panel. The BER measurement runs continuously, displaying a new BER every 0.5 seconds, until the (PRESET/LOCAL) key is pressed.

You can set the Fader to measure the bit error rate with a notch in the IF path. Simply set a notch at a frequency of interest so that when the bit error rate is measured, the notch is there.

Bit error rate measurement type is only available in serial prefixes 3215A and above.

Test Parameters

The following table shows which parameters are needed for each of the Fader tests. An x indicates that the parameter should be entered and will be printed.

	Static M Hyster Threshold	Static M Hyster Alarm	Dynamic S Threshold	Dynamic S Alarm	Dynamic M Threshold	Dynamic M Alarm	Recov Threshold	Recov Alarm	BER
Meas Setup									
Data Points	x	x	x	x	x	x			
Start Freq	x	x	x	x	x	x			
Stop Freq	x	x	x	x	x	x			
Start Rate			x	x					
Stop Rate			x	x					
Error Bits	x		x		x				
Phase	x	x	x	x	x	x			
Criteria	x	x	x	x	x	x	x	x	
Speed					x	x			
Deviation					x	x			
Edge Zoom	x	x			x	x			
MK Search	x	x			x	x			
DFM Type	x	x			x	x			
Radio Setup									
Bit Rate	x		x		x		x		x
Error Term	x		x		x		x		x
Error Thresh	x		x		x		x		x
Alarm Pol		x		x		x		x	
Scale Factor	x		x		x		x		x
AGC (on/off)	x	x	x	x	x	x	x	x	x
AGC Freq	x	x	x	x	x	x	x	x	x
AGC BW	x	x	x	x	x	x	x	x	x
Wait time	x	x	x	x	x	x			x
Max slew	x	x	x	x	x	x			x
Symbol time	x	x			x	x			
Other Setup									
Delay	x	x	x	x	x	x	x	x	x
Test Mask	x	x	x	x	x	x			

Note

The AGC Frequency and Bandwidth will be printed only if AGC is on.

Phase does not need to be selected for Hysteresis measurements. It is always BOTH.

Symbol time is only used when the DFM type is CCIR.

Notes

The measurement types do not apply to option 001 instruments.

MORE

Description

The MORE key is used to access a group of operations. These operations are listed below.

0 SLEW TIME
1 SINGLE SWEEP
2 AGC ON/OFF
3 AGC FREQ
4 AGC BW
5 HP-IB ADRS
6 SYNC SOUR
7 SELF TEST
8 SERVICE
9 INIT
10 SET TIME
11 SET DATE
12 MASK CTRL

There are two levels of operation when in MORE mode:

Level 1, which allows the user to view and access the operations listed above.

Level 2, which allows the user to modify or review the settings of the parameters of the operations.

Level 1 is accessed by pressing the MORE ((SHIFT), then (PRESET/LOCAL)) key. Level 2 is accessed by pressing the (ENTER) key while a level 1 operation is selected. At the end of a level 2 operation pressing the (ENTER) key will return you to the normal display.

Local Procedure

Note

The following is a general procedure to access the MORE mode and select a level 2 operation. Detailed instructions to access specific level 2 operations are covered in other Detailed Operating Instructions.

To access the MORE mode:

1. Activate the MORE ([SHIFT], then [PRESET/LOCAL]) function. The Fader will display an operation title with a blinking digit.
2. Use [▲] or [▼] to modify the blinking digit until the desired operation title is displayed.
3. Press the [ENTER] key to access the displayed operation in level two.

Remote Procedure

It is not possible or necessary to access the MORE mode. All of the operations in MORE mode have their own individual HP-IB codes.

Comments

The EXIT ([SHIFT], then [ENTER]) key takes the Fader out of MORE mode.

NOTCH DEPTH

Description

This key allows you to set the notch depth in dB. The range of values is 0 to 40 dB (you may actually set up to 99.9) with a resolution of 0.1 dB. Notch depth may be swept, but at a maximum slew rate of 400 dB per second (40 dB/0.1 sec).

Local Procedure

1. Press the NOTCH DEPTH key.
2. Use the [▲] and [▼] keys to modify the blinking digit.
3. Use the [◀] and [▶] keys to move to other digits for modification.
4. Press the [ENTER] key when you have the value you want.

or

1. Press the [NOTCH DEPTH] key.
2. Use the data entry keys to enter the value in dB.
3. Press the [ENTER] key.

To sweep the notch depth:

1. Press the [SET START] key.
2. Press the [NOTCH DEPTH] key.
3. Use the arrow keys or the data entry keys to enter the desired starting notch depth.
4. Press the [ENTER] key.
5. Press the [SET STOP] key.
6. Press the [NOTCH DEPTH] key.
7. Use the arrow keys or the data entry keys to enter the desired notch depth to stop the sweep at.
8. Press the [ENTER] key.

9. Press SHIFT NOTCH DEPTH

Remote Procedure

The program code for NOTCH DEPTH is POW:DEPT.

Example

Set the NOTCH DEPTH to 25 dB.

```
OUTPUT 714;"POW:DEPT 25 DB"
```

Set the start and stop parameters of a NOTCH DEPTH sweep to 10 and 25 dB.

```
OUTPUT 714;"POW:DEPT:STAR 10DB"
OUTPUT 714;"POW:DEPT:STOP 25DB"
```

To start a notch depth sweep:

```
OUTPUT 714;"POW:DEPT:MODE SWE"
```

HP-IB Program Codes

Keystroke	Program Code
NOTCH DEPTH	POW:DEPT
SET START	POW:DEPT:STAR
SET STOP	POW:DEPT:STOP
SWP DEPTH	POW:DEPT:MODE SWE

Comments

The preset value for notch depth is 0 dB. The preset value for start sweep is 20 dB, stop sweep is 20 dB, and the preset mode for sweep depth is OFF.

NOTCH FREQ

Description

The NOTCH FREQ key allows entry of the center frequency of the notch. The values range from 30—100 MHz for a 70 MHz Fader, and from 100—180 MHz for a 140 MHz Fader (Option 140).

Local Procedure

1. Press the NOTCH FREQ key. The Fader will display the last frequency entered, with one digit blinking. (If the Fader has been PRESET, the display will read "70.0 0.0 0.0".)
2. Modify the blinking digit (see below) until the desired frequency is displayed.
   a. Use ▲ or ▼ to modify the blinking digit.
   b. Use ◀ or ▶ to move to other digits.
   c. Press the ENTER key.

   or
3. Press the NOTCH FREQ key.
4. Use the data entry keys to enter the desired value of frequency.
5. Press the ENTER key.

To sweep Notch Frequency:

1. Press SET START
2. Press NOTCH FREQ
3. Use the arrow keys to modify the value shown in the display to the value you wish to start the notch frequency sweep from.
4. Press ENTER
5. Press SET STOP

6. Press NOTCH FREQ
7. Use the arrow keys to modify the value shown in the display to the value you wish to sweep to.
8. Press ENTER
9. Press SHIFT
10. Press NOTCH FREQ

Note

If you do not have a start or stop notch depth > 0 set, you may not see anything sweep.

Remote Procedure

To enter a frequency value, send the command FREQ followed by the numerical frequency value, the frequency units code (MHZ, KHZ, or HZ).

Example

To enter a NOTCH frequency of 45 MHz:

```
OUTPUT 714;"FREQ 45.0MHZ"
```

HP-IB Program Codes

Parameter	Program Code
NOTCH FREQ	FREQ
SET START	FREQ:STAR
SET STOP	FREQ:STOP
SWP FREQ	FREQ:MODE SWE

Comments

PRESET sets the NOTCH FREQ value to 70.0 MHz, the sweep start value to 45 MHz, the sweep stop value to 95 MHz, and the notch frequency sweep mode to OFF.

PHASE

Description

The (PHASE) key toggles the dominant signal between the delayed path and the non-delayed path. The preset condition is minimum phase (non-delayed path dominant). The annunciator will display the current setting of the instrument. A marker will appear above MIN or NON-MIN.

MIN/NON-MIN PHASE can be set for start and stop on a sweep. After pressing (SET START) or (SET STOP), check the state of the annunciator, MIN or NON-MIN, and set the state as desired using the (PHASE) key before pressing (ENTER). When you have MIN set for start sweep and NON-MIN set for stop sweep, or NON-MIN set for start sweep and MIN set for stop sweep, the Fader changes phase in the middle of the sweep range.

Local Procedure

1. Check the annunciator panel to see what state, MIN or NON-MIN, the simulator is presently set to.
2. Press the (PHASE) key. The annunciator should show a change from one state to the other.
3. Press the (PHASE) key again. The annunciator should toggle back to the previous state.

   As an example of how to set non-minimum phase for starting notch depth of a sweep, and minimum phase for the end of the sweep:
4. Press the (SET START) key.
5. Press the (NOTCH DEPTH) key.
6. Press (1) (0) (.) (0)
7. Check the MIN and NON-MIN annunciators. If the MIN state is set, press (PHASE) to toggle the indicator to NON-MIN.

8. Press the [ENTER] key.
9. Press the [SET STOP] key.
10. Press the [NOTCH DEPTH] key.
11. Press [4] [0] [.] [0]
12. Check the MIN and NON-MIN annunciators. If the NON-MIN state is set, press [PHASE] to toggle the indicator to MIN.
13. Press [ENTER]
14. Press [SHIFT], then [NOTCH DEPTH]

Remote Procedure

The program codes for MIN and NON-MIN are POW:DEPT:PHAS MIN and POW:DEPT:PHAS NONM. To sweep phase just sweep notch depth. The following line shows how to set a starting phase of NON-MIN:

```
OUTPUT 714;"POW:DEPT:STAR:PHAS NONM"
```

The following line sets the stop phase to MIN:

```
OUTPUT 714;"POW:DEPT:STOP:PHAS MIN"
```

The following line sets notch phase to minimum:

```
POW:DEPT:PHAS MIN
```

HP-IB Program Codes

Keystroke	Program Code
MIN PHASE	POW:DEPT:PHAS MIN
NON-MIN PHASE	POW:DEPT:PHAS NONM
SET START	POW:DEPT:STAR:PHAS MIN
	POW:DEPT:STAR:PHAS NONM
SET STOP	POW:DEPT:STOP:PHAS MIN
	POW:DEPT:STOP:PHAS NONM

Comments

PRESET sets phase to MIN, start phase to MIN, and stop phase to MIN.

PRESET/LOCAL

Description

The (PRESET/LOCAL) key sets the Fader to a known state. Preset conditions are shown in the following table. When the Fader is in remote mode, pressing the (PRESET/LOCAL) key places the instrument in local mode. Local mode gives control of the Fader to the front panel keys.

Preset Values

Parameter	Condition
AGC Bandwidth	30 MHz
AGC Frequency	70 MHz (140 in Opt. 140)
AGC ON/OFF	OFF
Alarm Polarity	Positive
ATTENUATION	0.0 dB
DATA POINTS	10
DELAY	6.3 ns
DEVIATION	±1 MHz
DFM TYPE	Bellcore
DISPLAY	ON
ERROR BITS	1024 (2^10)
ERROR TERM	ECL/75Ω
FADE EVENTS	OFF
MAX SLEW(RADIO SETUP)	200 dB/sec
MEAS SETUP PHASE	MIN
MK SEARCH	OFF
NOTCH FREQ	70 MHz (140 MHz in Option 140)
NOTCH DEPTH	0 dB

Preset Values (continued)

Parameter	Condition
NOTCH PHASE	MIN
PRINT SELECT	NONE
RADIO BIT RATE	44.7 MHz
RADIO DEMO	OFF
SCALE FACTOR	1
SET START	
Attenuation	0.0 dB
Notch Depth	20.0 dB
Notch Freq	45.0 MHz (115 MHz in Option 140)
Notch Phase	MIN
SET STOP	
Attenuation	0.0 dB
Notch Depth	20.0 dB
Notch Freq	95.0 MHz (165 MHz in Option 140)
Notch Phase	MIN
SIGNATURE TYPE	STATIC
SINGLE SWEEP	OFF
SLEW TIME	100 ms
SLOPES	OFF
SPEED	300 MHz/sec
START RATE	10 MHz/sec
STOP CRITERIA	1E−4
STOP RATE	100 MHz/sec
SYMBOL TIME	50 ns
SWP ALL	OFF
SWP ATTEN	OFF
SWP DEPTH	OFF
SWP FREQ	OFF
SWP TIME	5 seconds
SYNC SOUR	Immediate
TEST MASK	OFF
WAIT TIME	500 mS
ZOOM MODE	OFF
11757A TIMER	RESET

Local Procedure

To set the Fader to the conditions shown in the preceding table:

1. Press the (PRESET/LOCAL) key. The Fader will display "ENT TO PRSET".
2. Press the (ENTER) key.

Remote Procedure

The program code for PRESET is *RST. To set the Fader to the preset conditions, send the *RST command.

HP-IB Program Codes

Parameter	Program Code
PRESET	*RST

Comments

The PRESET routine can be avoided by pressing EXIT ((SHIFT), then (ENTER)) before pressing the (ENTER) key.

PRESET has no effect on front panel storage registers 1 through 10 or the internal fading event memory. When PRESET is activated, the Fader is set to the conditions shown in the previous table.

PRESET does not affect test mask data.

PRESET erases measurement data.

PRINTER

Description

The PRINTER key (SHIFT MEAS) will access printer options. It will allow you to select between an external HP-IB ThinkJet TM or compatible printer, the internal thermal printer, or no printer (EXTERNal, INTERNal or NONE). It also allows you to set the print mode (NONE, PRVIEW, or DATA).

External Printer Setup

The Fader must be in *talk only* mode. This is done by setting the Fader's HP-IB address to 50. See the HP-IB ADRS setting under the MORE key.

The external ThinkJet printer must be placed in *listen always* mode. The procedure for setting it in this mode is as follows:

1. Turn the power to the ThinkJetTM printer off.
2. Find the HP-IB switches on the back panel of the printer.
3. Set the *listen always* switch to the up position. This switch is second from the left and is labeled.
4. Connect an HP-IB cable between the printer and the Fader.
5. Turn the power back on. The printer only scans the switch settings at power up. If you change the switches while the printer is powered up, the printer will not recognize the settings until the printer has powered off and on again.
6. Check to see that the printer is ON LINE. The light below the square blue button should be on. If not, press the blue button on the top of the printer.

Note

If you are using an external printer, there must not be any other controllers on the bus during printing. If you have a spectrum analyzer or some other controller device, disconnect the HP-IB cable to that device during printing.

Setting the Destination.

The options for destination are NONE, INTERNal, and EXTERNal. NONE specifies that no printing will take place. INTERN specifies that the internal printer will be used when a measurement is made or when a specific print mode is selected. EXTERN specifies that an external printer will be used when a measurement is made or when a specific print mode is selected.

Setting the Mode

The options for print mode are PRVIEW and DATA. PRVIEW specifies that the current measurement data and radio setup parameters will be printed. DATA will cause the M-Curve data and graph from the most recent measurement to be **re-printed** to the destination printer. The graph and data are automatically sent to the destination printer after each measurement.

Example

To set up the Fader to print the measurement setup to an external printer:

1. Press: (SHIFT) (MEAS)
2. Use the (▲) key until the display reads "**1 DEST**", press (ENTER)
3. Use the arrow keys until the display reads "**DST EXTERN**", then press (ENTER).
4. Press: (SHIFT) (MEAS)
5. Use the (▲) key until the display reads "**2 PRINT**", press (ENTER)
6. Use the arrow keys until the display reads "**PRINT PRVIEW**", then press (ENTER).

RADIO SETUP

Description

This key allows you to set the following:

0 BIT RATE This allows you to enter the bit rate of the data line you are monitoring. The preset rate is 44.70 MHz. It may be set from 0.01 to 200 MHz.

1 ERROR TERM This allows you to set the ERROR PULSE INPUT termination type. The types are ECL/75Ω, TTL/75Ω, TTL/10kΩ, variable threshold 75Ω with -2 V termination, variable threshold 75Ω with 0 V termination, and variable threshold 10kΩ with 0V termination. The preset is ECL/75Ω.

1.1 ERROR THR This allows you to set the ERROR PULSE input threshold. The preset is -1.3 V because ERROR TERM is preset to ECL/75Ω. Error pulse input variable threshold is only available in serial prefixes 3235A and above.

2 ALARM POL This allows you to set the edge trigger for the ALARM INPUT. The preset is positive edge.

3 SCALE FACT This allows you to scale the errors that are received by the Fader on the error input, and is used in conjunction with BIT RATE to compute the BER (Bit Error Rate). Specifically, the Fader computes BER as:

$$\text{BER} = \text{errors per second } \frac{scalefactor}{bitrate}$$

where the errors per second are as counted on the ERROR PULSE INPUT.

The default scale factor is 1.0

4 AGC ON/OFF Allows you to turn the Automatic Gain Control on or off. The preset state is off. This function can also be accessed from the (MORE) functions key.

5 AGC FREQ Allows you to set the AGC frequency. The range of acceptable values is 40 to 190 (MHz). This function can also be accessed from the (MORE) functions key.

6 AGC BW Allows you to set the AGC bandwidth. The range of acceptable values is 1 to 40 (MHz). The preset value is 30.0 MHz. This function can also be accessed from the (MORE) functions key.

7 WAIT TIME Allows you to set a waiting period after every notch movement during an M-Curve measurement. This wait allows your radio some settling time before a Bit Error Rate measurement is made by the Fader. The range of allowable values is 10 milliseconds to 10 seconds. The preset value is 500 milliseconds.

8 MAX SLEW Allows you to set the notch depth maximum slew rate for an M-Curve measurement. This maximum slew rate is used only during M-Curve measurements and should not be confused with the "SLEW TIME" parameter used under normal Fader operation. The range of allowable values for MAX SLEW is 10 to 500 dB/second. The preset value is 200 dB/second.

Note The preset values for WAIT TIME and MAX SLEW have been chosen to work with most radios. Modifying these two paramenters will have a significant effect on total measurement time (increasing WAIT TIME and/or decreasing MAX SLEW will slow the measurement down). If you are getting inconsistent readings (even if MK SEARCH is on), it may be the measurement is proceeding too fast. Use these two features to modify the speed of the measurement until you get consistent results.

---

9 SYMBL TIME This allows you to enter the radio's symbol time for use when calculating the CCIR DFM value. The preset is 50 ns. It may be set from 10 to

1000 ns. CCIR DFM calculation is only available in serial prefixes 3215A and above.

10 RADIO DEMO Allows you to demonstrate the signature capabilities of the Fader without a digital radio present. This feature simulates the presence of a digital radio and BERT so that that you can demonstrate a signature measurement and print results. This feature is either on or off. When it is on, all parameters and the measurement type are used in the simulation when (MEAS) is pressed. The Fader even simulates the time it takes for a measurement. MK SEARCH and other features are simulated. The preset for RADIO DEMO is off. **This feature should be kept off when you are not demonstrating the instrument. The Fader will ignore a real radio during an actual measurement if RADIO DEMO is ON.**

Notes

The Radio Setup functions and parameters do not apply to option 001 instruments.

RECALL

Description

The Fader can store instrument configurations for recall at a later time. This includes measurement and radio setups. The configurations are stored in storage registers. These registers store everything that preset alters (see PRESET). This means that phase and sweep settings are stored as well as the notch frequency, notch depth and flat attenuation.

Registers 1 through 10 are available for recall.

Local Procedure

To recall an instrument configuration:

1. Activate RECALL ((SHIFT), then (▲)). The Fader will display "RECALL 01" with one of the digits blinking.
2. Modify the blinking digit until the desired storage register is displayed.
3. Press (ENTER).

Remote Procedure

To recall an instrument configuration from a specific storage register, send the command *RCL followed by the storage register number.

Example

To recall an instrument configuration that has been stored in register 2:

```
OUTPUT 714;"*RCL 2"
```

HP-IB Program Codes

Parameter	Program Codes
RECALL	*RCL

Comments

PRESET has no effect on the storage registers 1 through 10.

SAVE

Description

The Fader can store instrument configurations for recall at a later time. This includes measurement and radio test setups.

Registers 1 through 10 are available for storing instrument configurations.

Local Procedure

To SAVE an instrument configuration:

1. Activate SAVE ((SHIFT), then (▼)). The Fader will display "SAVE" and two digits, one of which will be blinking.
2. Modify the blinking digit (see below) until the desired storage register is displayed.
   a. Use (▲) or (▼) to modify the blinking digit.
   b. Use (◀) or (▶) to move to other digits.
   c. Press (ENTER).

Remote Procedure

The program code to SAVE is *SAV. To store the current instrument configuration, send the command *SAV followed by the storage register number.

Example

To store the instrument configuration in register 2:

```
OUTPUT 714;"*SAV 2"
```

HP-IB Program Codes

Parameter	Program Codes
SAVE	*SAV

Comments

PRESET has no effect on the storage registers 1 through 10.

SELF TEST

Description

The SELF TEST function causes the Fader to initiate the internal tests that are performed when the instrument is first turned on. The tests are listed below:

ROM 0U CHECKSUM TEST
ROM 0L CHECKSUM TEST
ROM 1U CHECKSUM TEST
ROM 1L CHECKSUM TEST
BATTERY BACKED RAM 0U TEST
BATTERY BACKED RAM 0L TEST
RAM 0U TEST
RAM 0L TEST

Local Procedure

1. Activate MORE ((SHIFT), then (PRESET/LOCAL)). The Fader will display a function with a blinking digit.
2. Use (▲) or (▼) to modify the blinking digit until the display reads "`7 SELF TEST`".
3. Press the (ENTER) key. The Fader will display "`SELFTESTING *`". The test will take about 10 seconds.
4. If the self test passes, the Fader displays "`TEST: PASS`", and returns to normal mode. If the self test fails, the Fader displays "`TEST: FAIL XXX`", and returns to normal mode. The "*XXX*" will be a number corresponding to a binary weighted sum which indicates which test or tests failed. See "Comments" below for explanation.

Remote Procedure

The program code for self test is *TST?. When a self test is run over HP-IB, the instrument will return a binary weighted sum which indicates which test or tests failed. If the number is 0, then everything passed. See "Comments" below for explanation.

HP-IB Program Codes

Function	Program Code
SELF TEST	*TST?

Comments

If an error number is returned by the Fader to the front panel self test or by HP-IB's *TST?, use the following table to determine which tests failed. Each test has a bit number which is given a bit weight. The weights of failed tests are summed to form a value which is unique for each possible combination of failed tests. If no test fails, the sum is 0.

Error Condition	Bit	Weight
ROM 0U CHECKSUM BAD	0	1
ROM 0L CHECKSUM BAD	1	2
ROM 1U CHECKSUM BAD	2	4
ROM 1L CHECKSUM BAD	3	8
BATTERY BACKED RAM 0U FAILED	4	16
BATTERY BACKED RAM 0L FAILED	5	32
RAM 0U FAILED	6	64
RAM 0L FAILED	7	128

Example

If the self test failed and the number 148 appears on the display, the following tests have failed:

128—RAM 0L FAILED
16—BATTERY BACKED RAM 0U FAILED
4—ROM 1U CHECKSUM BAD

Service Mode

Description

This option enters the Fader into a service mode which allows direct control of DACs and data bits that determine the state of control lines. Each control line has been assigned an I-BUS number which can be set by accessing "**8 SERVICE**" found under **MORE** functions. Use and further explanation of the I-BUS is restricted to the Service Manual.

Warning

This feature is for use with the Service Manual. Avoid this feature when operating the Fader. If accidentally entered, use (PRESET/LOCAL) to escape any change that may have taken place.

SET YMD (date)

Description

This function allows you to set a date that can be printed with measurement results. This function is accessed as MORE function 11. The format for setting a date is YYMMDD, where YY is the year, MM is the month and DD is the day. The date you set is saved by an internal battery.

Example

To set a date:

1. Press: (SHIFT) (PRESET/LOCAL)
2. Use the (▲) arrow key until the display reads "**11 SET YMD**".
3. Press: (ENTER)
4. You will see "**YYMMDD XXXXXX**".
5. Use the arrow keys until the XXXXXX displays the year, month and day, then press (ENTER).

Comments

The hour and minute may be set using MORE function 10, **10 SET HMS**.

SET HMS (MORE function 10)

Description

This function allows you to set an hour and minute for a measurement. This time can be printed with the measurement results. The year, month and day may also be input using MORE function 11. The format for entering the hour and minute are represented on the display as "**HHMM 0000**".

Example

To set the hour and minute:

1. Press: (SHIFT) (PRESET/LOCAL) *activates MORE*
2. Use the (▲) arrow key to until the display shows "**10 SET HMS**", then press (ENTER).
3. The display will show "**HHMM 0000**". Use the arrow keys to set the hour and minute, then press (ENTER).

SET START

Description

The (SET START) key is used to set the starting parameter for sweeps of attenuation, notch depth and phase, and notch frequency. When this key is pressed the start annunciator will turn on.

Note

Using (SET START) (NOTCH FREQ) to set the starting frequency for a sweep or measurement is identical to using START FREQ found under the (MEAS SETUP) key. Changing one changes the other.

Local Procedure

After pressing (SET START), press either (NOTCH FREQ), (NOTCH DEPTH) or (ATTEN), to avoid setting the wrong parameter. Then, use the arrow keys or the data entry keys to set the starting parameter. For example, set the starting attenuation for a sweep to 5.0 dB.

1. Press the (SET START) key.
2. Press the (ATTEN) key.
3. Press (5) (.) and (0).
4. Press the (ENTER) key.

You may also set a starting phase, which may be different from the phase set for stopping.

Remote Procedure

The remote code for (SET START) is STAR. The following lines of code show how to set the start sweep parameters for notch depth, notch frequency, and attenuation. They also show the phase being set to MIN.

```
OUTPUT 714;"POW:DEPT:STAR 10DB;STAR:PHAS MIN"
OUTPUT 714;"FREQ:STAR 50MHZ"
OUTPUT 714;"POW:ATT:STAR 15DB"
```

HP-IB Program Codes

Keystroke	Program Codes
SET START	FREQ:STAR
NOTCH FREQ	FREQ
NOTCH DEPTH	POW:DEPT
ATTEN	POW:ATT

SET STOP

Description

The (SET STOP) key allows you to set a stop parameter for sweeps of attenuation, notch frequency, and notch depth and phase.

Note

Using (SET STOP) (NOTCH FREQ) to set the stop frequency for a sweep or measurement is identical to using STOP FREQ found under the (MEAS SETUP) key. Changing one changes the other.

Local Procedure

After pressing (SET STOP) the annunciator at STOP will light. You must then press a parameter to set a stop value for. The keys are (NOTCH FREQ), (NOTCH DEPTH), and (ATTEN). Then use the arrow keys or the data entry keys to set a value. When the value reads correctly in the display, press (ENTER).

For example, set a notch frequency of 45 MHz.

1. Press the (SET STOP) key.
2. Press the (NOTCH FREQ) key.
3. Press (4) (5) (.) (0)
4. Press the (ENTER) key.

You may also set a phase for stop sweep, even if it is different from the phase you set for start sweep.

Remote Procedure

The remote code for (SET STOP) is STOP. The following will set stop sweep parameters for attenuation, notch depth, and notch frequency, as well as set the stop phase to non-min.

```
OUTPUT 714;"POW:ATT:STOP 35DB;STOP:PHAS NONM"
OUTPUT 714;"POW:DEPT:STOP 30DB"
OUTPUT 714;"FREQ:STOP 90MHZ"
```

HP-IB Program Codes

Keystroke	Program Code
SET STOP	FREQ:STOP
NOTCH FREQ	FREQ
NOTCH DEPTH	POW:DEPT
ATTEN	POW:ATT

SET TIME

Description

This function sets the sweep time for all three swept parameters: notch depth, notch frequency, and attenuation. You may sweep one, two or all of these parameters. All parameters sweep at the same rate.

Local Procedure

Entries are made in seconds. The smallest value you may set is 10 milliseconds (0.01). The largest value you may set is 99.99 seconds. You may set values in increments of 10 milliseconds. The preset value for sweep time is 5 seconds. To set a sweep time of 10.5 seconds:

1. Press (SHIFT)
2. Press (SET STOP) (Sweep time is found over (SET STOP))
3. Press (1) (0) (.) (5)
4. Press the (ENTER) key.

Remote Procedure

The remote code for set time is SWE:TIME. This must be followed by digits from 0.01 to 99.99. Seconds are assumed. To set a sweep time of 10.5 seconds:

```
OUTPUT 714;"SWE:TIME 10.5S"
```

HP-IB Program Codes

Keystroke	Program Code
SET TIME	SWE:TIME

Single Sweep

Description

This option allows you to set the sweep mode for a single sweep.

To set a single sweep from the front panel call MORE function 1.

Example

To set the sweep mode to single:

1. Press: (SHIFT) (PRESET/LOCAL)
2. Use the arrow key until the display reads "**1 SINGLE SWEEP**", then press (ENTER).
3. Use the (▲) arrow key to toggle the sweep mode from **OFF** to **ON**.

HP-IB Code

The HP-IB code for a single sweep is SWE:MODE MAN. The HP- IB code for continuous sweeping is SWE:MODE AUTO.

SLEW TIME

Description

SLEW TIME allows you to set a slew time for all parameters. The input range is 10 milliseconds to 99.99 seconds. SLEW TIME is preset to 100 milliseconds. All parameters (frequency, attenuation, and depth) slew at the same rate.

Local Procedure

1. Press (SHIFT), then (PRESET/LOCAL). Use the (▲) and (▼) arrows until the display changes to "0 SLEW TIME". Press (ENTER)
2. Use the arrow keys or the data entry keys to enter the value you want.
3. Press the (ENTER) key. Press (SHIFT) then (ENTER) to exit MORE mode.

Remote Procedure

The program code for SLEW TIME is SWE:SLEW. To set a slew time of 12.34 seconds:

```
OUTPUT 714;"SWE:SLEW 12.34S"
```

HP-IB Program Codes

Keystroke	Program Code
SLEW TIME	SWE:SLEW

Comments

SLEW TIME is the amount of time the instrument takes to change linearly between the last entered value and the current value.

The Slew annunciator will be lit as the function changes between values.

SLOPES

Description

The function SLOPES uses an out-of-band notch to generate an in-band slope. The slope values must be one of the following: −0.5, −0.3, +0.3, or +0.5 dB/MHz. When you have activated the SLOPES function the display field will display the frequency band and one of the slopes values in db/MHz. If you have a fader with a 140 MHz option, that option may be displayed by pressing [▲] four times. The [▲] key will step the fader through the slope options for the 70 MHz band, then step through the options for the 140 MHz band. The [▼] key will reverse the direction in which the fader is stepping.

Local Procedure

1. Press [SHIFT] then [◄] for SLOPES
2. The fader will display the frequency band and the present slope setting.
3. Press [▲] until the setting you want is displayed.
4. Press [ENTER]

Remote Procedure

The program code for SLOPES is POW:DEPT:SLOP. You enter one of the four allowable values (−0.5, −0.3, +0.3 and +0.5) followed by the the units DB/MHZ. For example, to enter a slope of −0.5 dB/MHz:

```
OUTPUT 714;"POW:DEPT:SLOP -0.5 DB/MHZ"
```

The range (70 MHz or 140 MHz) for slopes depends on the current fixed notch frequency. When you set slopes over HP-IB, the Fader assumes you are setting your slopes for the last fixed notch frequency set, but not for a start or stop notch frequency.

HP-IB Program Codes

Keystroke	Program Code
SLOPES	POW:DEPT:SLOP

SWEEP ALL

Description

This key ((SHIFT) (SET START)) sweeps all three fader functions: notch depth, notch frequency, and flat fade attenuation. The length of time of the sweep depends on the setting of **SET TIME**, and whether the fader is set for a single sweep or continuous sweeping. The single sweep option is set using MORE function 1.

When you sweep all functions the display reads **SWP SWP SWP**. You can stop any of the functions while letting others sweep by using the shifted keys for SWP FREQ, SWP DEPTH, and SWP ATTEN.

Example

To turn on all three sweeps:

1. Press: (SHIFT) (SET START)
2. The display should show **SWP SWP SWP**
3. To turn off the frequency sweep press: (SHIFT) (NOTCH FREQ)
4. The display should show **xx.x SWP SWP**

HP-IB Codes

The code for sweep all is **SWE:ALL SWE**

To turn off all sweeps use **SWE:ALL FIX**

HP-IB

Keystroke	Program Code
SWP ALL	SWE:ALL SWE
SWP ALL OFF	SWE:ALL FIX
SWP FREQ	FREQ:MODE SWE
SWP FREQ OFF	FREQ:MODE FIX
SWP DEPTH	POW:DEPT:MODE SWE
SWP DEPTH OFF	POW:DEPT:MODE FIX
SWP ATTEN	POW:ATT:MODE SWE
SWP ATTEN OFF	POW:ATT:MODE FIX

SWEEP ATTEN

Description

This function sweeps flat fade attenuation. MORE function 1 determines whether a single sweep or continuous sweeping will take place. The start and stop attenuation levels are set using (SET START) and (SET STOP). If flat fade attenuation is already sweeping, the SWP ATTEN ((SHIFT) (ATTEN)) will stop the sweeping.

Example

To set the attenuator for a 1 second sweep from 0 to 40 dB:

1. Press: (SET START)
2. Press (ENTER) until the attenuator field on the display is active (one of the digits will have a marker).
3. Use the arrow keys until the ATTEN display reads 00.0, then press (ENTER).
4. Press: (SET STOP)
5. Press (ENTER) until the attenuator field on the display is active (one of the digits will have a marker).
6. Use the arrow keys until the ATTEN display reads 40.0, then press (ENTER).
7. Press: (SHIFT) (PRESET/LOCAL)
8. Use the (▲) key until the display reads **1 SINGLE SWP**, then press (ENTER).
9. Use the (▲), if necessary, to display **SINGLE SWP OFF**, then press (ENTER).
10. Press: (SHIFT) (ATTEN)

HP-IB Codes

The HP-IB code for attenuator sweep is **POW:ATT:MODE SWE**. To fix the attenuator use **POW:ATT:MODE FIX**.

Sweep Codes

Keystroke	Program Code
SWP ALL	SWE:ALL SWE
SWP ALL OFF	SWE:ALL FIX
SWP FREQ	FREQ:MODE SWE
SWP FREQ OFF	FREQ:MODE FIX
SWP DEPTH	POW:DEPT:MODE SWE
SWP DEPTH OFF	POW:DEPT:MODE FIX
SWP ATTEN	POW:ATT:MODE SWE
SWP ATTEN OFF	POW:ATT:MODE FIX

SWEEP DEPTH

Description

This function sweeps notch depth. MORE function 1 determines whether a single sweep or continuous sweeping will take place. The start and stop depth levels are set using (SET START) and (SET STOP). If notch depth is already sweeping, the SWP DEPTH ((SHIFT) (NOTCH DEPTH)) will stop the sweeping.

Example

To set the notch depth for a 1 second sweep from 0 to 40 dB:

1. Press: (SET START)
2. Press (ENTER) until the DEPTH field on the display is active (one of the digits will have a marker).
3. Use the arrow keys until the DEPTH display reads 00.0, then press (ENTER). If you are prompted to enter a value for flat fade attenuation, press (ENTER).
4. Press: (SET STOP)
5. Press (ENTER) until the DEPTH field on the display is active (one of the digits will have a marker).
6. Use the arrow keys until the DEPTH display reads 40.0, then press (ENTER). If you are prompted to enter a value for flat fade attenuation, press (ENTER).
7. Press: (SHIFT) (PRESET/LOCAL)
8. Use the (▲) key until the display reads **1 SINGLE SWP**, then press (ENTER).
9. Use the (▲), if necessary, to display **SINGLE SWP OFF**, then press (ENTER).
10. Press: (SHIFT) (NOTCH DEPTH)

HP-IB Codes

The HP-IB code for notch depth sweep is **POW:DEPT:MODE SWE**. To fix the notch depth use **POW:DEPT:MODE FIX**.

HP-IB

Keystroke	Program Code
SWP ALL	SWE:ALL SWE
SWP ALL OFF	SWE:ALL FIX
SWP FREQ	FREQ:MODE SWE
SWP FREQ OFF	FREQ:MODE FIX
SWP DEPTH	POW:DEPT:MODE SWE
SWP DEPTH OFF	POW:DEPT:MODE FIX
SWP ATTEN	POW:ATT:MODE SWE
SWP ATTEN OFF	POW:ATT:MODE FIX

SWEEP FREQ

Description

This function sweeps notch frequency. MORE function 1 determines whether a single sweep or continuous sweeping will take place. The start and stop frequencies are set using (SET START) and (SET STOP). If notch frequency is already sweeping, the SWP FREQ ((SHIFT) (NOTCH FREQ)) will stop the sweeping.

Example

To set the notch frequency for a 1 second sweep from 45 to 85 MHz:

1. Press: (SET START)
2. Press (ENTER) until the FREQ field on the display is active (one of the digits will flash).
3. Use the arrow keys until the FREQ display reads 45.0, then press (ENTER). If you are prompted to enter other values for notch depth and flat fade attenuation, press (ENTER) for each.
4. Press: (SET STOP)
5. Press (ENTER) until the FREQ field on the display is active (one of the digits will flash).
6. Use the arrow keys until the FREQ display reads 85.0, then press (ENTER). If you are prompted to enter a value for notch depth and attenuation, press (ENTER) for each.
7. Press: (SHIFT) (PRESET/LOCAL)
8. Use the (▲) key until the display reads **1 SINGLE SWP**, then press (ENTER).
9. Use the (▲), if necessary, to display **SINGLE SWP OFF**, then press (ENTER).
10. Press: (SHIFT) (NOTCH FREQ)

HP-IB Codes

The HP-IB code for notch frequency is **FREQ:MODE SWE**. To fix the notch frequency, use **FREQ:MODE FIX**.

HP-IB

Keystroke	Program Code
SWP ALL	SWE:ALL SWE
SWP ALL OFF	SWE:ALL FIX
SWP FREQ	FREQ:MODE SWE
SWP FREQ OFF	FREQ:MODE FIX
SWP DEPTH	POW:DEPT:MODE SWE
SWP DEPTH OFF	POW:DEPT:MODE FIX
SWP ATTEN	POW:ATT:MODE SWE
SWP ATTEN OFF	POW:ATT:MODE FIX

SWEEP ON/OFFs

Description

Four shifted functions are used to toggle on and off sweeps of the fader functions:

[SHIFT] [SET START]	Toggles on and off all sweep functions
[SHIFT] [NOTCH FREQ]	Toggles on and off notch frequency sweep
[SHIFT] [NOTCH DEPTH]	Toggles on and off notch depth sweep
[SHIFT] [ATTEN]	Toggles on and off attenuator sweep

Remote Procedure

The program code for controlling all three sweeps (frequency, depth and attenuation) is "SWE:ALL SWE". To turn all sweeps off use "SWE:ALL FIX".

```
OUTPUT 714;"SWE:ALL SWE"
```

To sweep a fade event stored in memory use LISTn, where n is the number assigned to the fade event. For example, if you have an event stored as 3, the following will start it:

```
OUTPUT 714;"SWE:ALL LIST3"
```

You may sweep continuously, which sweeps from start values to stop values and back continuously, or, you may sweep just once. The program code for continuous sweeping is SWE:MODE AUTO. The program code for a single sweep is SWE:MODE MAN. AUTO is the preset setting. For example, if you wish only a single sweep:

```
OUTPUT 714;"SWE:MODE MAN"
```

To sweep individual functions use "FREQ:MODE SWE" for frequency sweeping, "POW:DEPT:MODE SWE" for notch depth sweeping, and “POW:ATT:MODE SWE” for attenuation sweeping. Use FIX instead off SWE to stop a function from sweeping.

HP-IB Program Codes

Keystroke	Program Code
SWP ALL	SWE:ALL SWE
SWP ALL OFF	SWE:ALL FIX
SWP FREQ	FREQ:MODE SWE
SWP FREQ OFF	FREQ:MODE FIX
SWP DEPTH	POW:DEPT:MODE SWE
SWP DEPTH OFF	POW:DEPT:MODE FIX
SWP ATTEN	POW:ATT:MODE SWE
SWP ATTEN OFF	POW:ATT:MODE FIX

SYNCHRONIZATION

Two Faders can be synchronized using the Auxiliary Interface found on the back panel of the instruments. One Fader must be set up as the IMMediate unit, and the other the EXTernal unit. The immediate unit will send a signal via the Auxiliary Interface Cable to synchronize operation of the two units. To set up two faders for synchronization:

Local Procedure

1. Connect the Auxiliary Interface Cable to the back panel of both instruments.
2. On the unit you with to serve as the source of the synchronization signal, press (SHIFT) then (PRESET/LOCAL).
3. Use the (▲) key to find and display "6 SYNC SOUR"
4. Press (ENTER)
5. The display will read either "SYNC SRC IMM" or "SYNC SRC EXT".
6. If the display reads "SYNC SRC EXT", press the (▲) key to display "SYNC SRC IMM".
7. Press (ENTER)
8. On the unit you with to serve as the slave of the synchronization signal, press (SHIFT) then (PRESET/LOCAL).
9. Use the (▲) key to find and display "6 SYNC SOUR"
10. Press (ENTER)
11. The display will read either "SYNC SRC IMM" or "SYNC SRC EXT".
12. If the display reads "SYNC SRC IMM", press the (▲) key to display "SYNC SRC EXT".
13. Press (ENTER)

The two Faders are ready for synchronized operation.

After readying the master and slave for synchronization you can synchronize sweeps and fade event.

Sweeps

1. Set up sweep parameters on slave and master but don't start a sweep yet.
2. Start the sweep on the slave (the slave will slew to the start sweep value and then wait for the signal from the master to start the sweep).
3. Start the sweep on the master (the master will slew to the start sweep value and then start sweeping with the slave).

Fade Event

1. Set up parameters on slave and master but don't start a fade event yet.
2. Start the fade event on the slave (the slave will wait for the signal from the master to start the fade event).
3. Start the fade event on the master (the master will then start fading with the slave).

Remote Procedure

If you have HP-IB and don't want to use the back panel connector, the HP-IB "group execute trigger"(GET) signal will work as the master. To use this, all the Faders should be in EXTernal mode (you can have as many slaves as you can fit on the HP-IB bus). All the faders will wait for the GET signal from the HP-IB bus. To start all the Faders, send the "group execute trigger" function to the bus. All slaves will start in unison.

Sweeps

1. Set up and start sweeps on all the Faders. The Fader will slew to the start sweep value and then wait for the signal from the HP-IB bus to start the sweep.

2. Send the GET command to the Faders. In HP BASIC, the easiest way to do this is by executing TRIGGER 7.

Fade Event

1. Set up and start the fade event on all the Faders. The Faders will wait for the signal from the HP-IB bus to start the fade event.
2. Send the GET command to the Faders. In HP BASIC, the easiest way to do this is by executing TRIGGER 7.

Comments

Synchronization just synchronizes the slave's start of a sweep or fade event. It does not guarantee that both the master and slave will stop at the same time. For more information about triggering, see *TRG in the remote section.

TEST MASK

Description

The test mask allows you to enter x and y data to be plotted along with measurements. There are 11 points for min(imum) phase and 11 points for non-min(imum) phase. RESET MASK sets all locations to 70, 0 (140, 0 for option 140).

The test mask is activated by the shifted (RADIO SETUP) key. You may use the arrow keys or the numeric keys to enter data into the test mask. Use EXIT to get out of the TEST MASK.

To turn the TEST MASK on or off, or to reset the mask, use **MORE** function 12 (MASK CTRL). To get there press (SHIFT) (PRESET/LOCAL), then use the (▲) arrow key until **12 MASK CTRL** is displayed. Press (ENTER) and the display will show one of the options: MASK ON, MASK OFF, or RESET MASK. Use the arrow key to select one of these options, then press (ENTER).

If the mask is on it will be printed with the graph. Where measured x values do not coincide with test mask x points, a linear interpolation of the test mask values will occur to get a point for pass/fail comparison. See figure 2-9.

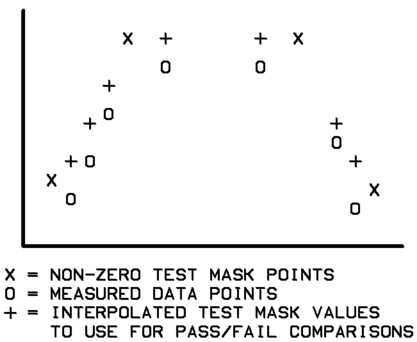

Figure 2-9. Test Mask Interpolation

The mask data is formatted as follows:

```
M00 XXX.X  YY.Y
M01 XXX.X  YY.Y
      ...
      ...
      ...
M10 XXX.X  YY.Y
N00 XXX.X  YY.Y
N01 XXX.X  YY.Y
      ...
      ...
      ...
N10 XXX.X  YY.Y
```

The M and N indicate MIN and NON-MIN phase settings.

Notes Test Mask does not apply to option 001 instruments.

3

Introduction to Remote Programming of HP 11757B

SCPI

The remote programming language used to program the HP 11757B uses the Standard Commands for Programming Instruments (SCPI) convention. Those users who are not familiar with HP-IB and the SCPI syntax convention should first refer to the "Beginner's Guide to SCPI" which has been included with this instrument.

The remainder of this manual assumes you have a working knowledge of HP-IB and SCPI syntax.

Controllers Other Than Hewlett-Packard

The programming examples in this manual are written in HP BASIC 5.0 for an HP 9000 Series 200/300 Controller. HP BASIC handles some of the redundant miscellaneous overhead associated with IEEE Standards 488.1 and 488.2 (HP-IB). For instance, when a BASIC "OUTPUT" statement is used (by the Active Controller) to send data to an HP-IB device, the following sequence of commands and data are sent over the bus:

```
OUTPUT 701;"Data"
```

1. The unlisten command is sent.
2. The talker's address command is sent (the address of the controller).
3. The listener's address command (01) is sent.
4. The data bytes "D", "a", "t", and "a" are sent.

5. Terminators CR and LF are sent with an EOI asserted on the LF character.

All bytes are sent using the HP-IB's interlocking handshake to ensure that the listener has received each byte.

This example clearly shows that the HP BASIC "OUTPUT" statement causes more to take place besides the output of data. So, for controllers other than Hewlett-Packard which are using a programming language other than HP BASIC, additional steps may have to be added to the program examples given in the manual.

For more information, refer to IEEE Standard 488.1 and IEEE 488.2 and your controller programming language reference.

Programming and Documentation Conventions

Notation Conventions and Definitions

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

< > (angular brackets) are used to enclose words or characters that symbolize a program code parameter or an HP-IB command.

::= means "is defined as". For example, <A> ::= <B> indicates that <A> can be replaced by <B> in any statement containing <A>.

... (an ellipsis) is used to indicate that the preceding element may be repeated one or more times.

[ ] (square brackets) indicate that the enclosed items are optional.

{ } (braces) indicate that one and only one of the enclosed elements must be selected.

Capital letters are necessary; small leters are optional.

"<NRf>" means that any common representation of a number is allowed, 10 or 10.0 or 1.0e1

In commands which have "ON" and "OFF" parameters, you may substitute any non-zero number for "ON", 0 for "OFF". The query of these "ON/OFF" commands always returns 1 for "ON" and 0 for "OFF".

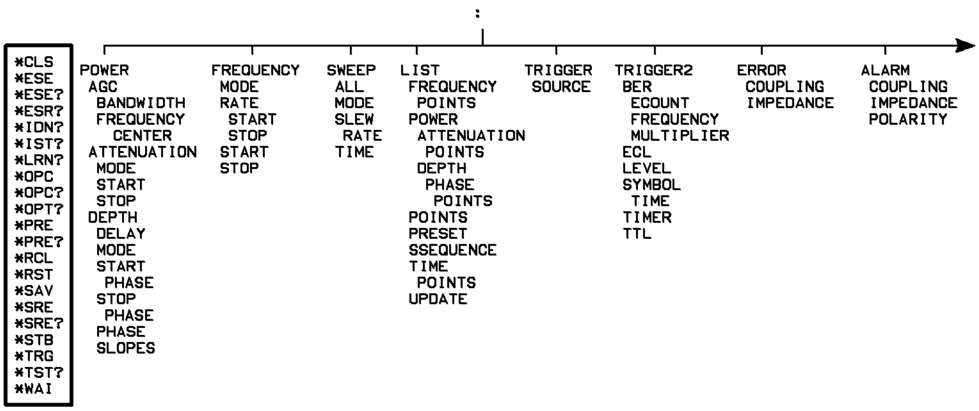

Figure 3-1a. HP-IB Commands

Command Structure

The HP 11757B programming commands are divided into two types: common commands and subsystem commands. A programming command tree is shown in figure 3-1.

Common Commands

The common commands are the commands defined by IEEE 488.2. These commands control some functions that are common to all IEEE 488.2 instruments. Sending the common commands does not take the HP 11757B parser out of a selected subsystem.

Subsystem Commands

There are several subsystems in the HP 11757B. Only one subsystem may be programmed or queried at any given time. At power on, the command parser is set to the root of the command tree; therefore, no subsystem is active.

Note

When a program message terminator or a leading colon (:) is sent in a program unit, the command parser is returned to the root of the command tree

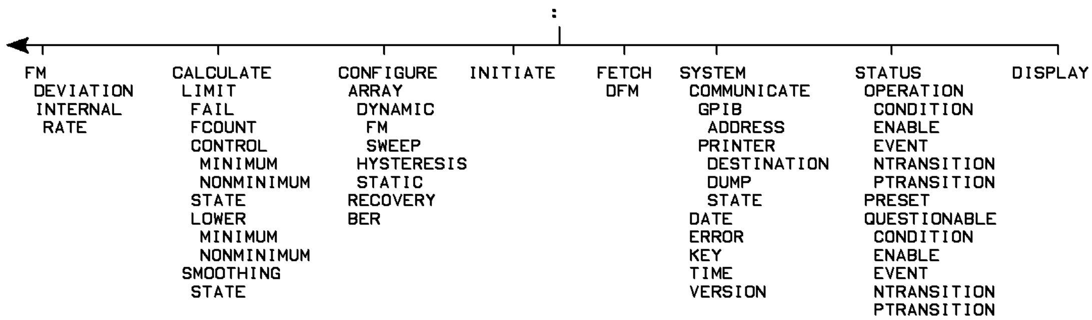

Figure 3-1b. HP-IB Commands (cont.)

The 17 subsystems in the HP 11757B are listed below:

ABORt - interrupts an existing measurment.

ALARm - sets the input triggering for the Alarm In input.

CALCulate - controls the EDGE ZOOM feature as well as the TEST MASK.

CONFigure - sets up the instrument for particular signature measurements.

DISPlay - controls the display of the HP 11757B.

ERRor - sets the input triggering for the Error In input.

FETch - downloads data from a previously made measurement.

FM - controls the sine modulation for Dynamic-M signatures.

FREQuency - controls the notch frequency.

INITiate - starts a signature measurement.

LIST - sets up a fade event.

POWer - controls notch depth as well as flat fading and AGC settings.

STATus - accesses the SCPI questionable and operation systems.

SYSTem - controls some basic functions of the HP 11757B.

SWEep - controls the sweep functions of the HP 11757B.

TRIGger - displays IF Input trigger information.

TRIGger2 - sets the Error Criterion, Input Scale Factor, and Radio Bit Rate for signature measurments

Allowed Suffixes

Allowed values for "*freq suff*", "*time suff*", and *freq per second suff* are shown in the following table:

Allowed Suffix Values

Parameter	Suffix	Multiplier
[*freq suff*]	EXHZ	1E18
	PEHZ	1E15
	THZ	1E12
	GHZ	1E9
	MHZ	1E6
	MAHZ	1E6
	KHZ	1E3
	HZ	1
	UHZ	1E−6
	NHZ	1E−9
	PHZ	1E−12
	FHZ	1E−15
	AHZ	1E−18
[*time suff*]	EXS	1E18
	PES	1E15
	TS	1E12
	GS	1E9
	MAS	1E6
	KS	1E3
	S	1
	MS	1E−3
	US	1E−6
	NS	1E−9
	PS	1E−12
	FS	1E−15
	AS	1E−18

Parameter	Suffix	Multiplier
[*freq per second suff*][1]	EXHZ/S	1E18
	PEHZ/S	1E15
	THZ/S	1E12
	GHZ/S	1E9
	MHZ/S	1E6
	MAHZ/S	1E6
	KHZ/S	1E3
	HZ/S	1
	UHZ/S	1E−6
	NHZ/S	1E−9
	PHZ/S	1E−12
	FHZ/S	1E−15
	AHZ/S	1E−18
[*db per hertz suff*]	DB/EXHZ	1E−18
	DB/PEHZ	1E−15
	DB/THZ	1E−12
	DB/GHZ	1E−9
	DB/MHZ	1E−6
	DB/MAHZ	1E−6
	DB/KHZ	1E−3
	DB/HZ	1
	DB/UHZ	1E6
	DB/NHZ	1E9
	DB/PHZ	1E12
	DB/FHZ	1E15
	DB/AHZ	1E18

1 In *freq per second suff*, S can be replaced with "[*any suffix multiplier*]S" and the input value will be scaled properly.

4

Common Commands

Introduction

The common commands are defined by the IEEE 488.2 standard. These commands will be common to all instruments that comply with this standard. They control some of the basic Fader functions:

- Instrument identification and reset
- Reading the learn (instrument setup) string
- Status reading and clearing
- Other miscellaneous functions common to programmable instruments

Common commands can be received and processed by the Fader whether they are sent over the HP-IB as separate program messages or within other program messages. If a Fader subsystem has been selected, and a common command is received by the Fader, the Fader will remain in the current subsystem for the rest of that message or until a leading colon is seen. For example, if the following program message

```
OUTPUT 714;":FREQ:START 70MHZ;*CLS;STOP 90MHZ"
```

is received by the Fader, the Fader will set the start frequency, clear the status information, and set the stop frequency. This would not be the case if some other type of command were received within the program message. For example, the program message

```
OUTPUT 714;":FREQ:START 70MHHZ;
:POW:DEPTH 10dB;:FREQ:STOP 90MHZ"
```

would set the start frequency, set the notch depth, and then set the stop frequency. In this example :FREQ is sent again in order to reenter the frequency subsystem and set the stop frequency.

Table 4-1 lists all the IEEE 488.2 Common Commands implemented by the Fader.

Table 4-1.
Fader IEEE 488.2 Common Commands

Common Command	IEEE Name
*CLS	Clear Status Command
*ESE	Standard Event Status Enable Command
*ESE?	Standard Event Status Enable Query
*ESR?	Standard Event Status Register Query
*IDN?	Identification Query
*IST?	Individual Status Query
*LRN?	Learn Device Setup Query
*OPC	Operation Complete Command
*OPC?	Operation Complete Query
*OPT?	Option Identification Query
*PRE	Parallel Poll Enable Register Command
*PRE?	Parallel Poll Enable Register Query
*RCL	Recall Command
*RST	Reset Command
*SAV	Save Command
*SRE	Service Request Enable Command
*SRE?	Service Request Enable Query
*STB?	Read Status Byte Query
*TRG	Trigger Command
*TST?	Self-Test Query
*WAI	Wait-to-Continue Command

*CLS (Clear Status Command)

Syntax: *CLS

Description

The *CLS (clear status) common command clears all of the following:

- Standard Event Status Register
- Operation Event Register
- Questionable Event Register
- HP-IB Error Queue
- Request-for-OPC flag

If the *CLS command immediately follows a PROGRAM MESSAGE TERMINATOR, the output queue and the MAV (message available) bit will be cleared.

Example Command

To clear all the status data structures and the HP-IB error queue, run the following program:

```
OUTPUT 714;"*CLS"
```

Example Query

There is no query for this command.

Related Commands

SYSTem:ERRor?
STATus:OPERation[:EVENt]?
STATus:QUEStionable[:EVENt]?
*ESR?
*OPC
*OPC?
*STB?

See Also

STATus subsystem
Error Messages Appendix
“Related Documents” in Appedix D

*ESE (Standard Event Status Enable)

Syntax:

*ESE <mask>

Where:

<mask> ::= 0 to 255

*ESE?

Returned Format: <mask><NL>

Where:

<mask> ::= 0 to 255

Description

The *ESE command sets the Standard Event Status Enable Register bits. The Standard Event Status Enable Register contains a mask value for the bits to be enabled in the Standard Event Status Register (see HP-IB command *ESR?). A "one" in the Standard Event Status Enable Register will enable the corresponding bit in the Standard Event Status Register, a "zero" will disable the bit. Refer to Table 4-2 for the information about the Standard Event Status Enable Register bits, bit weights, and what each bit masks.

The *ESE? query returns the current contents of the Standard Event Status Enable Register.

Table 4-2.
Standard Event Status Enable Register

Event Status Enable Register (High–Enables the ESR bit)		
Bit	**Weight**	**Enables**
7	128	PON–Power On
6	64	URQ–User Request
5	32	CME–Command Error
4	16	EXE–Execution Error
3	8	DDE–Device Dependent Error
2	4	QYE–Query Error
1	2	RQC–Request Control
0	1	OPC–Operation Complete

Example Command

In the following example program, the *ESE 64 command will enable the URQ (user request) bit 6 of the Standard Event Status Enable Register. Therefore, when a front panel key is pressed, the ESB (event summary bit) in the Status Byte will also be set.

```
10 OUTPUT 714;"*ESE  64"
20 END
```

Example Query

To read the Fader's Standard Event Status Enable Register, run the following program:

```
10 OUTPUT 714;"*ESE?"
20 ENTER 714;Event_enab
30 PRINT Event_enab
40 END
```

Related Commands

SYSTem:ERRor?
*ESR?
*OPC
*STB?

See Also

Error Messages Appendix
"Related Documents" in Appedix D

*ESR?
(Standard Event Status Register Query)

Syntax:

```
*ESR?
```

Returned Format: <status><NL>

Where:

<status> ::= 0 to 255

Description

The *ESR? query returns the contents of the Standard Event Status Register.

Note

Reading the register clears the Standard Event Status Register.

Table 4-3 shows the Standard Event Status Register. The table shows each bit in the Standard Event Status Register and the bit weight. When the Standard Event Status Register is read, the value returned is the total bit weights of all bits that are high at the time the register is read.

Table 4-3. Standard Event Status Register

Bit	Bit Weight	Bit Name	Condition
7	128	PON	0 = an OFF to ON power transition has not occurred
			1 = an OFF to ON power transition has occurred
6	64	URQ	0 = no front-panel key has been pressed
			1 = front-panel key has been pressed
5	32	CME	0 = no command errors
			1 = a command error has been detected
4	16	EXE	0 = no execution error
			1 = an execution error has been detected
3	8	DDE	0 = no device dependent errors
			1 = a device dependent error has been detected
2	4	QYE	0 = no query errors
			1 = a query error has been detected
1	2	RQC	0 = request control - NOT used - always 0
0	1	OPC	0 = operation is not complete
			1 = operation is complete
0 = False = Low 1 = True = High			

Example Command

There is no command for this query.

Example Query

To read the Fader's Standard Event Status Enable Register, run the following program:

```
10 OUTPUT 714;"*ESR?"
20 ENTER 714;Events
30 PRINT Events
40 END
```

Related Commands

SYSTem:ERRor?
*OPC
*ESE
*STB?

See Also

Error Messages Appendix
"Related Documents" in Appedix D

*IDN? (Identification Query)

Syntax:

```
*IDN?
```

Returned Format:

HEWLETT-PACKARD,<*id*>,<*snum*>,REV<*rr.v*><NL>

Where:

<*id*> ::= 11757A or 11757B.

<*snum*> ::= the serial number. In the Fader, the snum field is not set at the factory; therefore, it is always 0.

<*rr.v*> ::= the software revision of this Fader.

Description

The *IDN? query allows the Fader to identify itself.

In serial prefixes 3215A and above, option information is returned by *OPT?. In serial prefixes less than 3215A, the options were appended to the <*id*> returned by *IDN?. In serial prefixes less than 3215A, an 11757B/option 001 was always an 11757A.

It returns the following:

HEWLETT-PACKARD,<*id*>,<*snum*>,REV<*rr.v*><NL>

Example Command

There is no command for this query.

Example Query

To read the Fader's identification information, run the following program:

```
10 DIM Id$[72]
20 OUTPUT 714;"*IDN?"
30 ENTER 714;Id$
40 PRINT Id$
50 END
```

If the Fader were a Hewlett-Packard Model 11757B, the above program should output something like the following to the controller's display:

```
HEWLETT-PACKARD,11757B,0,REV12.6
```

In the output above, the software revision number is 12.6.

Related Commands *OPT?

See Also "Related Documents" in Appedix D

*IST? (Individual Status Query)

Syntax:

```
*IST?
```

Returned Format: <id><NL>

Where:

<id> ::= 0 or 1

Where:

0 indicates that the "ist" local message is false.
1 indicates that the "ist" local message is true.

Description

The *IST? query returns the current state of the IEEE 488.1 defined "ist" local message in the Fader. This is the same information returned during a parallel poll of the Fader. The response to this query is dependent upon the state of the Status Byte and the value of the Parallel Poll Enable Register.

The *PRE command controls the enable register which allows Status Byte conditions to set the "ist" local message.

Example Command

There is no command for this query.

Example Query

To read the "ist" local message, run the following program:

```
10 OUTPUT 714;"*IST?"
20 ENTER 714;Ist
30 PRINT Ist
40 END
```

Related Commands

*PRE
*STB?

See Also

"Related Documents" in Appedix D

*LRN?
(Learn Device Setup Query)

Syntax:

```
*LRN?
```

Returned Format: <learn string><NL>

Where:

<learn string> is less than 1000 bytes in length.

Description

The *LRN? query returns an HP-IB command that contains the current state of the Fader.

This query allows you to store a Fader setup in the controller. The stored setup can then be returned to the Fader when you want that setup at a later time.

Note

The format of the learn string contents may change if the software revision of the Fader is changed. This means that the format of the stored learn string may not be compatible if the Fader's software is changed. Use *IDN? to read the software revision of the Fader.

Example Command

There is no command for this query.

Example Query

To read the state of the Fader, run the following program:

```
10 DIM Lrn$[1000]
20 OUTPUT 714;"*LRN?"
30 ENTER 714 USING "-K";Lrn$
40 END
```

Lrn$ now contains the state of the Fader. To set the Fader to the state contained in Lrn$, run the following program:

```
10 OUTPUT 714;Lrn$
20 END
```

Related Commands

*RCL
*RST
*SAV
PRESET/LOCAL

See Also

"Related Documents" in Appendix D

*OPC (Operation Complete)

Syntax:

```
*OPC
```

```
*OPC?
```

Returned Format: 1<NL>

Description

The *OPC (operation complete) command will cause the Fader to set the operation complete bit in the Standard Event Status Register when all pending Fader operations have finished. These pending Fader operations are:

1. Slewing
2. Single sweep if single sweep mode is on;
3. Fade events;
4. Measurements;
5. Printing.

The *OPC? query places an ASCII "1" in the output queue when all pending Fader operations have finished.

Example Command

To set the operation complete bit in the Standard Event Status Register after fade event 0 has finished, run the following program:

```
10 OUTPUT 714;"SWE:ALL LIST0;*OPC"
20 END
```

Example Query

To wait until the frequency slews to 70 MHz, run the following program:

```
10 OUTPUT 714;":FREQ 70MHZ;*OPC?"
20 ENTER 714;Op_complete
30 PRINT Op_complete
40 END
```

Related Commands

*ESE
*ESR?
*STB?
*WAI

See Also

Advanced HP-IB Measurements
"Related Documents" in Appedix D

*OPT? (Option Identification Query)

Syntax:

```
*OPT?
```

Returned Format:

```
<option#1>,<option#2>,.... .,<option#n><NL>
```

Where:

<option#n> ::= is an option installed in the instrument.

Description

The *OPT? query returns the options installed in the fader. The following table lists all the possible option numbers.

Table 4-4. *OPT? Fader Option Numbers

Option Number	Description
0	No options installed
001	No signature capability
140	140 MHz band only
143	140 MHz three-tone source
147	70 and 140 MHz bands

The *OPT? query is only available in serial prefixes 3215A and above. In serial prefixes less than 3215A, the options were part of the *IDN? response. In serial prefixes less than 3215A, an 11757B/option 001 was always an 11757A.

Example Command

There is no command for this query.

Example Query

To read the options, run the following program:

```
10 DIM Options$[255]
10 OUTPUT 714;"*OPT?"
20 ENTER 714;Options$
30 PRINT Options$
40 END
```

Related Commands

*IDN?

See Also

"Related Documents" in Appedix D

*PRE (Parallel Poll Enable Register)

Syntax:

```
*PRE <mask>
```

Where:

<mask> ::= 0 to 255

```
*PRE?
```

Returned Format: <mask_value><NL>

Where:

<mask_value> ::= sum of all bits that are set–0 through 255.

Description

The *PRE command sets the parallel poll register enable bits.

The Parallel Poll Enable Register contains an enable mask for the bits in the Status Byte to produce an "ist" during a parallel poll. For additional information, refer to the *IST? command in this section.

The *PRE? query returns the current value of the Parallel Poll Enable Register.

Refer to Table 4-5 for the bits in the Parallel Poll Enable Register and what they mask.

Table 4-5. Parallel Poll Enable Register

Parallel Poll Enable Register (High –Enables the "ist" bit)		
Bit	**Weight**	**Enables**
7	128	OPERation status bit
6	64	SRQ–Service Request
5	32	ESB–Event Status Bit
4	16	MAV–Message Available
3	8	QUEStionable status bit
2	4	Not used (don't care)
1	2	Not used (don't care)
0	1	Not used (don't care)

Example Command

The following example program will allow the Fader to generate an "ist" when any error occurs:

```
10 OUTPUT 714;"*ESE 60"
20 OUTPUT 714;"*PRE 32"
30 END
```

Example Query

To read the Fader's Parallel Poll Enable Register, run the following program:

```
10 OUTPUT 714;"*PRE?"
20 ENTER 714;Pre_enable
30 PRINT Pre_enable
40 END
```

Related Commands

*IST?
*STB?

See Also

"Related Documents" in Appendix D

*RCL (Recall Command)

Syntax

*RCL <rcl_register>

Where:

<rcl_register> ::= 1 through 10

Description

The *RCL command restores the state of the Fader from the specified internal save/recall register. Registers 1 through 10 can be loaded with the *SAV command. The state saved and recalled is the same as the state affected by PRESET.

If no setup has been stored previously in the specified register, the PRESET state is recalled.

Example Command

To recall the Fader state stored in save/recall register number 3, run the following program:

```
10 OUTPUT 714;"*RCL 3"
20 END
```

Example Query

There is no query for this command.

Related Commands

*LRN?
*RST
*SAV
(PRESET/LOCAL)

See Also

"Related Documents" in Appedix D

*RST (Reset Command)

Syntax: `*RST`

Description The *RST command places the Fader in the PRESET state. Refer to Table 4-6 for the preset conditions.

In the Fader, the front panel (PRESET/LOCAL) key and the *RST HP-IB command are identical features.

Table 4-6. Preset Values

Parameter	Condition
AGC Bandwidth	30 MHz
AGC Frequency	70 MHz (140 MHz with Option 140)
AGC ON/OFF	OFF
Alarm Polarity	Positive
ATTENUATION	0.0 dB
DATA POINTS	10
DELAY	6.3 ns
DEVIATION	±1 MHz
DFM TYPE	Bellcore
DISPLAY	ON
ERROR BITS	1024 (2^10)
ERROR TERM	ECL/75Ω
FADE EVENTS	OFF
LIST:UPDate	NEW
MAX SLEW(RADIO SETUP)	200 dB/sec
MEAS SETUP PHASE	MIN
MK SEARCH	OFF

Table 4-6. Preset Values (continued)

Parameter	Condition
NOTCH FREQ	70 MHz (140 MHz in Option 140)
NOTCH DEPTH	0 dB
NOTCH PHASE	MIN
PRINT SELECT	NONE
RADIO BIT RATE	44.7 MHz
RADIO DEMO	OFF
SCALE FACTOR	1
SET START	
Attenuation	0.0 dB
Notch Depth	20.0 dB
Notch Freq	45.0 MHz (115 MHz in Option 140)
Notch Phase	MIN
SET STOP	
Attenuation	0.0 dB
Notch Depth	20.0 dB
Notch Freq	95.0 MHz (165 MHz in Option 140)
Notch Phase	MIN
SIGNATURE TYPE	STATIC
SINGLE SWEEP	OFF
SLEW TIME	100 ms
SLOPES	OFF
SPEED	300 MHz/sec
START RATE	10 MHz/sec
STOP CRITERIA	1E−4
STOP RATE	100 MHz/sec
SYMBOL TIME	50 ns
SWP ALL	OFF
SWP ATTEN	OFF
SWP DEPTH	OFF
SWP FREQ	OFF
SWP TIME	5 seconds
SYNC SOUR	Immediate
TEST MASK	OFF
WAIT TIME	500 mS
ZOOM MODE	OFF
11757A TIMER	RESET

Example Command

To preset the Fader, run the following program:

```
10 OUTPUT 714;"*RST"
20 END
```

Example Query

There is no query for this command.

Related Commands

*LRN?
*RCL
*SAV
(PRESET/LOCAL)

See Also

"Related Documents" in Appedix D

*SAV (Save Command)

Syntax:

*SAV <save_register>

Where:

<save_register> ::= 1 through 10

Description

The *SAV command stores the current state of the Fader into an internal save register. The data parameter is the number of the save register where the data will be saved. Internal registers 1 through 10 are valid for this command.

The state saved and recalled is the same as the state affected by PRESET.

Example Command

To save the Fader's state into save/recall register number 3, run the following program:

```
10 OUTPUT 714;"*SAV 3"
20 END
```

Example Query

There is no query for this command.

Related Commands

*LRN?
*RCL
*RST
(PRESET/LOCAL)

See Also

"Related Documents" in Appedix D

*SRE (Service Request Enable)

Syntax:

```
*SRE <mask>
```

Where:

<mask> ::= 0 to 255

```
*SRE?
```

Returned Format: <mask><NL>

Where:

<mask> ::= sum of all bits that are set—0 through 191

Description

The *SRE command sets the Service Request Enable Register bits. The Service Request Enable Register contains a mask value for the bits to be enabled in the Status Byte. A one in the Service Request Enable Register will enable the corresponding bit in the Status Byte, a zero will disable the bit. Refer to Table 4-7 for the bits in the Service Request Enable Register and what they mask.

The *SRE query returns the current value.

Table 4-7. Service Request Enable Register

Service Request Enable Register (High –Enables the SRQ bit)		
Bit	**Weight**	**Enables**
7	128	OPERation status bit
6	64	cannot be set–always 0
5	32	ESB–Event Status Bit
4	16	MAV–Message Available
3	8	QUEStionable status bit
2	4	Not used (don't care)
1	2	Not used (don't care)
0	1	Not used (don't care)

Example Command

The following example program, enables a service request to be generated when any error occurs:

```
10 OUTPUT 714;"*ESE 60"
20 OUTPUT 714;"*SRE 32"
30 END
```

Example Query

To read the Fader's Service Request Enable Register, run the following program:

```
10 OUTPUT 714;"*SRE?"
20 ENTER 714;Srq_enab
30 PRINT Srq_enab
40 END
```

Related Commands

*PRE
*STB?

See Also

"Related Documents" in Appendix D

*STB?
(Read Status Byte Query)

Syntax:

`*STB?`

Returned Format: <value><NL>

Where:

<value> ::= 0 through 255

Description

The *STB? query returns the current value of the Fader's status byte. The MSS (Master Summary Status) bit is reported on bit 6 instead of the RQS (request service) bit. The MSS indicates whether or not the device has at least one reason for requesting service. Refer to Table 4-8 for the meaning of the bits in the status byte.

Note

To read the Fader's status byte with RQS reported on bit 6, use the HP-IB Serial Poll.

Table 4-8. The Status Byte

Bit	Bit Weight	Bit Name	Condition
7	128	OPER	0 = no OPERation status conditions have occurred; 1 = an enabled OPERation status condition has occured.
6	64	RQS/MSS	0 = Fader has no reason for service. 1 = Fader is requesting service.
5	32	ESB	0 = no event status conditions have occurred. 1 = an enabled event status condition has occurred.
4	16	MAV	0 = no output messages are ready. 1 = an output message is ready
3	8	QUES	0 = no QUEStionable status conditions have occurred; 1 = an enabled QUEStionable status condition has occurred.
2	4		Not used—always 0.
1	2		Not used—always 0.
0	1		Not used—always 0.

0 = False = Low; 1 = True = High.

Example Command

There is no command for this query.

Example Query

To read the Fader's Status Byte, run the following program:

```
10 OUTPUT 714;"*STB?"
20 ENTER 714;Status_byte
30 PRINT Status_byte
40 END
```

Related Commands

STATus:OPERation:ENABle
STATus:OPERation[:EVENt]?
STATus:QUEStionable:ENABle
STATus:QUEStionable[:EVENt]?
*ESE
*ESR?
*PRE
*SRE
*IST?

See Also

STATus subsystem
"Related Documents" in Appedix D

*TRG (Trigger Command)

Syntax:

```
*TRG
```

Description

If TRIG:SOUR is set to EXT, *TRG will create a trigger. If the Fader is not in external trigger mode, error message 211, “Trigger ignored”, will be in the HP-IB queue (see “SYSTem:ERRor?” for information on how to read the HP-IB error queue).

The *TRG command has the same effect on the Fader as the Group Execute Trigger (GET).

Example Command

To trigger the Fader using the “*TRG” command, run the following program:

```
10 OUTPUT 714;"*TRG"
20 END
```

To trigger the Fader using the GET (Group Execute Trigger) command, run the following program:

```
10 TRIGGER 714
20 END
```

Example Query

There is no query for this command.

Related Commands

TRIGger:SOURce

See Also

“Related Documents” in Appedix D

*TST? (Self-Test Query)

Syntax:

```
*TST?
```

Returned Format: <result><NL>

Where:

<result> ::= 0 or non-zero value

Where:

0 indicates the test passed.
Non-zero indicates the test failed.

Description

The *TST? query causes the Fader to perform a self-test. The result of the test will be placed in the output queue.

A 0 indicates the test passed and a non-zero value indicates the test failed.

If a test fails, refer to the troubleshooting section of the Fader Service Manual.

Example Command

There is no command for this query.

Example Query

To run a Fader self-test and return the results, run the following program:

```
10 OUTPUT 714;"*TST?"
20 ENTER 714;Result
30 PRINT Result
40 END
```

See Also

"Related Documents" in Appedix D

*WAI (Wait-to-Continue Command)

Syntax: *WAI

Description

The *WAI command waits for all previous commands to complete before continuing. This is useful because previous commands do not necessarily complete before more commands are executed. Specifically, the *WAI command waits until:

1. Slewing finishes;
2. Single sweep finishes if single sweep mode is on;
3. A fade event finishes;
4. A measurement finishes;
5. Printing finishes.

For example,

```
OUTPUT 714;FREQ 70MHZ;*WAI;FREQ 71MHZ"
```

causes a slew to 70 MHz, then a slew to 71 MHz. Without *WAI, the slewing to 70MHz might not complete before the slewing to 71 MHz occurs.

Example Command

To wait until a single sweep completes, and then read the notch frequency, run the following program:

```
10 OUTPUT 714;"SWE:MODE MAN"
20 OUTPUT 714;"SWE:ALL SWE;*WAI"
30 OUTPUT 714;"FREQ?"
40 ENTER 714;Notch_freq
50 PRINT Notch_freq
60 END
```

Related Commands

*OPC
*OPC?

See Also

Advanced HP-IB Measurements
“Related Documents” in Appedix D

5

Subsystem Commands

This chapter provides complete descriptions of all subsystem commands for remote operation of the Fader, i.e., for operation of the Fader over the Hewlett-Packard Interface Bus (HP-IB).

POWer:AGC (Enable Disable AGC)

Syntax

$$\texttt{POWer:AGC}\left\{\begin{array}{l}\texttt{ON}\\\texttt{OFF}\end{array}\right\}$$

```
POWer:AGC?
```

Description

Enables or disables the AGC feature (automatic gain control). The Preset value is OFF.

The query returns whether the AGC feature is enabled or disabled: 0 = disabled, 1 = enabled.

Example Command

Turns on automatic gain control:

```
OUTPUT 714;"POW:AGC ON"
```

Example Query

```
OUTPUT 714;"POWER:AGC?"
ENTER 714;Agc_flag
```

POWer:AGC:BANDwidth (Set Bandwidth of Input Signal)

Syntax

```
                    ⎧ <NRf>[freq suff] ⎫
POWer:AGC:BANDwidth ⎨ MAXimum          ⎬
                    ⎩ MINimum          ⎭

                     ⎡MAXimum⎤
POWer:AGC:BANDwidth? ⎣MINimum⎦
```

Description

Sets the AGC bandwidth. This is used in conjunction with `POW:AGC:FREQ:CENT` to set the spectrum of the input signal. If no suffix is included with the input value, the value is assumed to be in Hz. Input range is 20.0MHz to 40.0MHz. The Preset value is 30.0MHz.

The query returns the current entered AGC bandwidth.

Example Command

Sets the AGC bandwidth to 15.3 MHz:

```
OUTPUT 714;"POW:AGC:BAND 15.3MHz"
```

Example Query

```
OUTPUT 714;"POW:AGC:BAND?"
ENTER 714;Agc_bandwidth
```

POWer:AGC:FREQuency:CENTer (Set AGC Center Frequency of Input Signal)

Syntax

```
                                  { <NRf>freq suff }
POWer:AGC:FREQuency:CENTer        { MAXimum        }
                                  { MINimum        }

                                   [MAXimum]
POWer:AGC:FREQuency:CENTer?        [MINimum]
```

Description

Sets the AGC center frequency. This is used in conjunction with `POW:AGC:BAND` to set the spectrum of the input signal. If no suffix is included with the input value, the value is assumed to be in Hz. Input range is 30.0MHz to 180.0MHz. The Preset value is 70.0MHz.

The query returns the current entered AGC center frequency.

Example Command

Sets the AGC center frequency to 65.3 MHz:

```
OUTPUT 714;"POW:AGC:FREQ:CENT 65.3MHz"
```

Example Query

```
OUTPUT 714;"POW:AGC:FREQ:CENT?"
ENTER 714;Agc_center_freq
```

POWer:ATTenuation (Set Attenuation)

Syntax

```
                     ⎧ <NRf>   ⎫
POWer:ATTenuation    ⎨ MAXimum ⎬
                     ⎩ MINimum ⎭

                     ⎡MAXimum⎤
POWer:ATTenuation?   ⎣MINimum⎦
```

Description

Sets the fixed attenuation value. If the attenuation sweep is active, this has no affect on the signal. Negative attenuation is gain. Input range is -30.0dB to 99.9dB. The Preset value is 0dB.

The query returns the fixed attenuation value. If the attenuation sweep is active, this returns the true current attenuation value during the sweep.

Example Command

Sets the fixed attenuation value to 12.3 dB of loss:

```
OUTPUT 714;"POW:ATT 12.3"
```

Example Query

```
OUTPUT 714;"POW:ATT?"
ENTER 714;Attenuation_level
```

POWer:ATTenuation:MODE (Set Sweep Mode for Attenuation)

Syntax

```
                           ⎧ FIXed ⎫
POWer:ATTenuation:MODE     ⎨ SWEep ⎬
                           ⎩ LISTn ⎭
```

```
POWer:ATTenuation:MODE?
```

Description

Controls the sweep mode for the attenuation. FIXed means sweep off, and SWEep means sweep on. LIST*n* means to use the LIST subsystem to get attenuation values where *n* ranges from 0 to 9. If LIST is selected frequency and depth will be set to LIST mode also. See SWE:ALL for more LIST information. The Preset value is FIXed.

The query returns the attenuation sweep mode. This query returns FIX, SWE or LIST*n* so you must read it in as a string.

Example Command

Sets the power attenuation sweep mode to fade profile 9:

```
OUTPUT 714;"POW:ATT:MODE LIST9"
```

Example Query

```
OUTPUT 714;"POW:ATT:MODE?"
ENTER 714;Mode$
```

POWer:ATTenuation:STARt (Set Start Attenuation)

Syntax

```
                            { <NRf>   }
POWer:ATTenuation:STARt     { MAXimum }
                            { MINimum }

                            [ MAXimum ]
POWer:ATTenuation:STARt?    [ MINimum ]
```

Description

Sets the start attenuation for sweeps. If attenuation sweep is active, this restarts the sweep. Negative attenuation is gain. Input range is -30.0dB to 99.9dB. The Preset value is 0dB.

The query returns the start attenuation setting.

Example Command

Sets the start attenuation value to 5 dB of gain:

```
OUTPUT 714;"POW:ATT:STAR -5"
```

Example Query

```
OUTPUT 714;"POW:ATT:STAR?"
ENTER 714;Start_power
```

POWer:ATTenuation:STOP (Set Stop Attenuation)

Syntax

$$\texttt{POWer:ATTenuation:STOP} \begin{Bmatrix} \texttt{<NRf>} \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{Bmatrix}$$

$$\texttt{POWer:ATTenuation:STOP?} \begin{bmatrix} \texttt{MAXimum} \\ \texttt{MINimum} \end{bmatrix}$$

Description

Sets the stop attenuation for sweeps. If attenuation sweep is active, this restarts the sweep. Negative attenuation is gain. Input range is -30.0dB to 99.9dB. The Preset value is 0dB.

The query returns the stop attenuation setting.

Example Command

Sets the stop attenuation value to 0.1 dB of loss:

```
OUTPUT 714;"POW:ATT:STOP 0.1"
```

Example Query

```
OUTPUT 714;"POW:ATT:STOP?"
ENTER 714;Stop_power
```

POWer:DEPTh (Set Fixed Notch Depth)

Syntax

```
POWer:DEPTh {<NRf> | MAXimum | MINimum}

POWer:DEPTh? [MAXimum | MINimum]
```

Description

Sets the fixed notch depth value. If the depth sweep is active, this has no affect on the signal. Input range is 0dB to 99.9dB. The Preset value is 0dB.

The query returns the fixed notch depth value. If the depth sweep is active, this returns the true current power depth during the sweep.

Example Command

Sets the fixed notch depth value to 34.0 dB:

```
OUTPUT 714;"POW:DEPT 34"
```

Example Query

```
OUTPUT 714;"POW:DEPT?"
ENTER 714;Notch_depth
```

POWer:DEPTh:DELay (Set Delay Time)

Syntax

$$\texttt{POWer:DEPTh:DELay} \begin{Bmatrix} \texttt{<NRf>}\left[\textit{time suff}\right] \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{Bmatrix}$$

$$\texttt{POWer:DEPTh:DELay?} \begin{bmatrix} \texttt{MAXimum} \\ \texttt{MINimum} \end{bmatrix}$$

Description

Sets the delay time for the reflected signal. Input range is 1.0ns to 25.0ns. The Preset value is 6.3ns.

The query returns the delay time for the reflected signal.

Example Command

Sets the fixed delay time for the reflected signal to\22.9 ns:

```
OUTPUT 714;"POW:DEPT:DEL 22.9ns"
```

Example Query

```
OUTPUT 714;"POW:DEPT:DEL?"
ENTER 714;Path_delay
```

POWer:DEPTh:MODE (Set Sweep Mode)

Syntax

$$\texttt{POWer:DEPTh:MODE} \begin{Bmatrix} \texttt{FIXed} \\ \texttt{SWEep} \\ \texttt{LIST}n \end{Bmatrix}$$

```
POWer:DEPTh:MODE?
```

Description

Controls the sweep mode for the notch depth. FIXed means sweep off, and SWEep means sweep on. LISTn means to use the LIST subsystem to get depth values where n ranges from 0 to 9. If LIST is selected frequency and attenuation will be set to LIST mode also. See SWE:ALL for more LIST information. The Preset value is FIXed.

The query returns the notch depth sweep mode. This query returns FIX, SWE or LISTn so you must read it in as a string.

Example Command

Sets the power notch depth sweep mode to OFF.

```
OUTPUT 714;"POW:DEPT:MODE FIX"
```

Example Query

```
OUTPUT 714;"POW:DEPT:MODE?"
ENTER 714;Mode$
```

POWer:DEPTh:PHASe (Set Notch Phase)

Syntax

```
POWer:DEPTh:PHASe {MINimum   }
                  {NONMinimum}
```

```
POWer:DEPTh:PHASe?
```

Description

Sets the fixed notch phase. If the depth sweep is active, this has no affect on the signal. The Preset value is MIN. The fastest way to set the fixed depth value and phase at the same time is like this:

```
OUTPUT 714;"POW:DEPT 12.1;DEPT:PHAS NONM"
```

The query returns the fixed notch phase. This query returns MIN or NONM so you must read it in as a string. If the depth sweep is active, this returns the true current notch phase during the sweep.

Example Command

Sets the fixed notch depth phase to minimum phase:

```
OUTPUT 714;"POW:DEPT:PHAS MIN"
```

Example Query

```
OUTPUT 714;"POW:DEPT:PHAS?"
ENTER 714;Phase$
```

POWer:DEPTh:SLOPes (Set In-Band Gain Slope)

Syntax

```
                     ⎧ <NRf>[db per hertz suff] ⎫
POWer:DEPTh:SLOPes   ⎨ MAXimum                  ⎬
                     ⎩ MINimum                  ⎭

                      ⎡MAXimum⎤
POWer:DEPTh:SLOPes?   ⎣MINimum⎦
```

Description

Set the slopes value and enables the slopes function. Input values can be -5 dB/MHz, -3 dB/MHz, +3 dB/MHz, or +5 dB/MHz. Input values between legal values will be rounded to the nearest legal value. If no suffix is used, dB/Hz will be assumed. The Preset value is -5 dB/MHZ.

Example Command

```
OUTPUT 714;"POW:DEPT:SLOP -5dB/MHZ"
```

Example Query

```
OUTPUT 714;"POW:DEPT:SLOP?"
ENTER 714;Slope_amount
```

POWer:DEPTh:STARt (Set Start Notch Depth)

Syntax

```
                       ⎧ <NRf>   ⎫
POWer:DEPTh:STARt      ⎨ MAXimum ⎬
                       ⎩ MINimum ⎭

                       ⎡ MAXimum ⎤
POWer:DEPTh:STARt?     ⎣ MINimum ⎦
```

Description

Sets the start notch depth for sweeps. If depth sweep is active, this restarts the sweep. Input range is 0dB to 99.9dB. The Preset value is 20dB.

The query returns the start notch depth setting.

Example Command

Sets the start notch depth value to 5.4 dB:

```
OUTPUT 714;"POW:DEPT:STAR 5.4"
```

Example Query

```
OUTPUT 714;"POW:DEPT:STAR?"
ENTER 714;Start_depth
```

POWer:DEPTh:STARt:PHASe (Set Start Notch Phase)

Syntax

$$\texttt{POWer:DEPTh:STARt:PHASe} \begin{Bmatrix} \texttt{MINimum} \\ \texttt{NONMinimum} \end{Bmatrix}$$

```
POWer:DEPTh:STARt:PHASe?
```

Description

Sets the start notch phase. If depth sweep is active, this restarts the sweep. The Preset value is MIN. The fastest way to set the start depth value and phase at the same time is like this:

```
OUTPUT 714;"POW:DEPT:STAR 70MHZ;STAR:PHAS:MIN"
```

The query returns the start notch phase. This query returns MIN or NONM so you must read it in as a string.

Example Command

Sets the start notch depth phase to non-minimum phase:

```
OUTPUT 714;"POW:DEPT:STAR:PHAS NONM"
```

Example Query

```
OUTPUT 714;"POW:DEPT:STAR:PHAS?"
ENTER 714;Start_phase$
```

POWer:DEPTh:STOP (Set Stop Notch Depth)

Syntax

```
                   ⎧ <NRf>   ⎫
POWer:DEPTh:STOP   ⎨ MAXimum ⎬
                   ⎩ MINimum ⎭

                   ⎡ MAXimum ⎤
POWer:DEPTh:STOP?  ⎣ MINimum ⎦
```

Description

Sets the stop notch depth for sweeps. If depth sweep is active, this restarts the sweep. Input range is 0dB to 99.9dB. The Preset value is 20dB.

The query returns the stop notch depth setting.

Example Command

Sets the stop notch depth value to its maximum depth (99.9 dB):

```
OUTPUT 714;"POW:DEPT:STOP MAX"
```

Example Query

```
OUTPUT 714;"POW:DEPT:STOP?"
ENTER 714;Stop_depth
```

POWer:DEPTh:STOP:PHASe (Set Stop Notch Phase)

Syntax

```
POWer:DEPTh:STOP:PHASe { MINimum    }
                       { NONMinimum }
```

```
POWer:DEPTh:STOP:PHASe?
```

Description

Sets the stop notch phase. If depth sweep is active, this restarts the sweep. The Preset value is MIN. The fastest way to set the stop depth value and phase at the same time is like this:

```
OUTPUT 714;"POW:DEPT:STOP 12.1;STOP:PHAS NONM"
```

The query returns the stop notch phase. This query returns MIN or NONM so you must read it in as a string.

Example Command

Sets the stop notch depth value to minimum phase:

```
OUTPUT 714;"POW:DEPT:PHAS:STOP MINIMUM"
```

Example Query

```
OUTPUT 714;"POW:DEPT:PHAS:STOP?"
ENTER 714;Stop_phase$
```

FREQuency (Set Notch Frequency)

Syntax

$$\texttt{FREQuency}\left\{\begin{array}{l}\texttt{<NRf>}[\mathit{freq\ suff}]\\ \texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}$$

Description

Sets the frequency of a fixed notch. If no suffix is included with the input value, it is assumed to be in hertz. If the frequency sweep is active, this has no affect on the signal. Input range is 30MHz to 190MHz. Preset: 70MHz

The query returns the fixed notch frequency setting. If the frequency sweep is active, this returns the true current hardware setting.

Serial prefixes less than 3215A have an upper range of 180.0 MHz.

Example Command

```
OUTPUT 714;"FREQ 40.1MHz"
```

Example Query

```
OUTPUT 714;"FREQ?"
ENTER 714;Notch_frequency
```

FREQuency:MODE (Set Sweep Mode for Notch Frequency)

Syntax

$$\texttt{FREQuency:MODE}\begin{Bmatrix}\texttt{FIXed}\\ \texttt{SWEep}\\ \texttt{LIST}n\end{Bmatrix}$$

Description

This controls the sweep mode for the notch frequency. FIXed means sweep off, and SWEep means sweep on. LIST*n* means to use the LIST subsystem to get frequency values. *n* can range from 0 to 9. If LIST is selected, attenuation and depth will be set to LIST mode also. See SWE:ALL and the LIST subsystem for more LIST information. Preset: FIXed

The query returns the notch frequency sweep mode. This query returns FIX, SWE, or LIST*n* so you must read it in as a string.

Example Command

```
OUTPUT 714;"FREQ:MODE SWE"    ! Set to Sweep Mode
```

Example Query

```
OUTPUT 714;"FREQ:MODE?"
ENTER 714;Freq_mode$
```

FREQuency:RATE:STARt (Set Freq Start Rate for Dynamic-S Meas)

Syntax

FREQuency:RATE:STARt
$$\left\{ \begin{array}{l} \texttt{<NRf>}\left[\textit{freq per sec suff}\right] \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\}$$

Description

Sets the frequency start rate for the Dynamic-S measurement. If no suffix is included with the input value, it is assumed to be in hertz per second. Input range is 1MHz/S to 6GHz/S. Preset: 10MHz/S

Example Command

```
OUTPUT 714;"FREQ:RATE:STAR 40.1MHZ/S"
```

Example Query

```
OUTPUT 714;"FREQ:RATE:STAR?"
ENTER 714;Start_rate
```

FREQuency:RATE:STOP (Set Freq Stop Rate for Dynamic-S Meas)

Syntax

```
                    { <NRf>[freq per sec suff] }
FREQuency:RATE:STOP { MAXimum                  }
                    { MINimum                  }
```

Description

Sets the frequency stop rate for the Dynamic-S measurement. If no suffix is included with the input value, it is assumed to be in hertz per second. Input range is 1MHz/S to 6GHz/S. Preset: 100MHz/S

Example Command

```
OUTPUT 714;"FREQ:RATE:STOP 85.9MHZ/S"
```

Example Query

```
OUTPUT 714;"FREQ:RATE:STOP?"
ENTER 714;Stop_rate
```

FREQuency:STARt (Set Start Frequency)

Syntax

```
                    ⎧ <NRf>[freq suff] ⎫
FREQuency:STARt     ⎨ MAXimum          ⎬
                    ⎩ MINimum          ⎭
```

Description

When the HP 11757B is not making a signature measurement, this command sets the start frequency for sweeping of the notch.

For Static-M, Hysteresis M-Curve, and Dynamic-M tests, this command sets the start frequency of the signature measurement.

For Dynamic-S tests, this command sets the start frequency of the linear sweep that occurs during the measurement.

For more information on the function of the start frequency during signature measurements, see the description of the (MEAS TYPE) key in the local part of this manual.

Example Command

```
OUTPUT 714;"FREQ:STAR 45.1MHz"
```

Example Query

```
OUTPUT 714;"FREQ:STAR?"
ENTER 714;Start_frequency
```

FREQuency:STOP (Set Stop Frequency)

Syntax

$$\texttt{FREQuency:STOP} \left\{ \begin{array}{l} \texttt{<NRf>}\left[\mathit{freq\ suff}\right] \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\}$$

Description

When the HP 11757B is not making a signature measurement, this command sets the stop frequency for sweeping of the notch.

For Static-M, Hysteresis M-Curve, and Dynamic-M tests, this command sets the stop frequency of the signature measurement.

For Dynamic-S tests, this command sets the stop frequency of the linear sweep that occurs during the measurement.

For more information on the function of the start frequency during signature measurements, see the description of the (MEAS TYPE) key in the local part of this manual.

Example Command

```
OUTPUT 714;"FREQ:STOP 70.0MHz"
```

Example Query

```
OUTPUT 714;"FREQ:STOP?"
ENTER 714;Stop_frequency
```

SWEep:ALL (Control Sweep Mode for All Sweeps)

Syntax

$$\texttt{SWEep:ALL} \left\{ \begin{array}{l} \texttt{FIXed} \\ \texttt{SWEep} \\ \texttt{LIST}n \end{array} \right\}$$

Description

Controls the sweep mode for all three sweeps (notch frequency, notch depth and attenuation). FIXed means all sweeps off, and SWEep means all sweeps on. LIST*n* means to use fade event *n* from the Fade Profile Table (see the LIST subsystem for defining fade events). If *n* is omitted then n is by default 0.

Example: "SWE:ALL LIST3" means to use fade event 3 from the Fade Profile Table. If a fade event is undefined the message "UNAVAILABLE" will appear on the front panel and no action will be taken by the instrument. Preset: FIX.

No query is associated with this command.

Example Command

Sets the sweep mode for notch frequency, notch depth and attenuation to sweep:

```
OUTPUT 714;"SWE:ALL SWE"
```

SWEep:TIME (Set Sweep Time)

Syntax

```
             ⎧ <NRf>[time suff] ⎫
SWEep:TIME   ⎨ MAXimum          ⎬
             ⎩ MINimum          ⎭

SWEep:TIME?  [MAXimum
              MINimum]
```

Description

Sets the sweep time for all sweeps. Input range is 10ms to 99.99sec. Preset: 5sec.

The query returns the sweep time setting.

Example Command

Sets the sweep time to 150 ms:

```
OUTPUT 714;"SWE:TIME 150ms"
```

Example Query

Reads the current sweep time:

```
OUTPUT 714;"SWE:TIME?"
ENTER 714;Sweep_time
```

SWEep:SLEW (Set Slew Time)

Syntax

```
          ⎧ <NRf>[time suff] ⎫
SWEep:SLEW⎨ MAXimum          ⎬
          ⎩ MINimum          ⎭

            ⎡MAXimum⎤
SWEep:SLEW? ⎣MINimum⎦
```

Description

Sets the slew time for all parameters. Input range is 10ms to 99.99s. Preset: 100ms.

The query returns the slew time setting.

Example Command

Sets the slew time to its minimum (10 ms):

```
OUTPUT 714;"SWE:SLEW MIN"
```

Example Query

Reads the current slew time:

```
OUTPUT 714;"SWE:SLEW?"
ENTER 714; Slew_time
```

SWEep:SLEW:RATE (Set Maximum Slew Rate)

Syntax

```
                 ⎧ <NRf> [dB per second suff] ⎫
SWEep:SLEW:RATE  ⎨ MAXimum                    ⎬
                 ⎩ MINimum                    ⎭
```

```
SWEep:SLEW:RATE?
```

Description

Sets the notch depth maximum slew rate for an M-Curve measurement. The range of allowable values is 10 to 500 dB/second. The Preset value is 200 dB/second. The unit suffix **DB/S** and other IEEE suffixes such as DB/MS and DB/KS are permitted.

The query returns the slew rate that is set.

Example Command

To set the notch depth slew rate of 300 dB/second:

```
OUTPUT 714;"SWE:SLEW:RATE 300DB/S"
```

Example Query

```
OUTPUT 714;"SWE:SLEW:RATE?"
```

SWEep:MODE (Set Single Sweep Mode)

Syntax

$$\texttt{SWEep:MODE} \begin{Bmatrix} \texttt{AUTO} \\ \texttt{MANual} \end{Bmatrix}$$

```
SWEep:MODE?
```

Description

Controls the single sweep mode. AUTO means that sweeping is repeated continuously. MAN means single sweep mode is enabled. In this mode, the Fader behaves as follows:

Fader at START: The Fader sweeps from START to STOP at the sweep rate.

Fader at STOP: The Fader sweeps from STOP to START at the sweep rate.

Fader somewhere else: The Fader slews to the START at the slew rate and then sweeps from START to STOP at the sweep rate.

Preset: AUTO.

The query returns the single sweep mode. This query returns AUTO or MAN so you must read it in as a string.

Example Command

Turns single sweep mode on:

```
OUTPUT 714;"SWE:MODE MAN"
```

Example Query

Reads current single sweep mode:

```
OUTPUT 714;"SWE:MODE?"
ENTER 714;Single_sweep$
```

Description of LIST Subsystem

The LIST subsystem controls the Fade Profile Table. This Table, which is illustrated in Fig. 5-1, stores data which defines between 1 and 10 (inclusive) *fade events*.

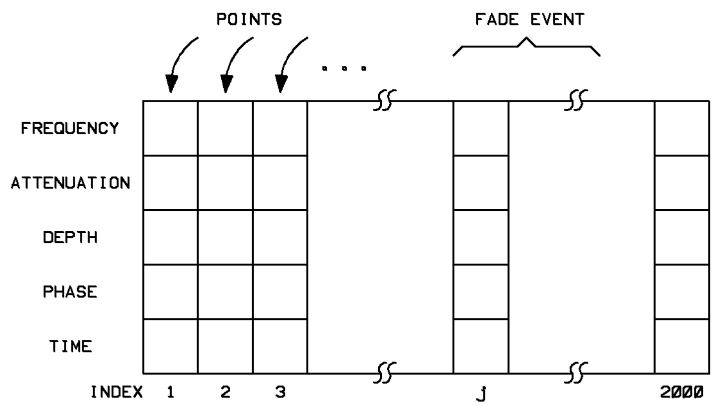

Figure 5-1. Fade Profile Table

A fade event consists of between 1 and 2000 (inclusive) *points*, but the total number of points in all fade events must be $\leq$ 2000. (In Fader Option 001, the maximum number of points is 4000.)

A point, in turn, consists of five *fields*, one each for frequency, attenuation, depth, phase, and time data. Each point has a unique index between 1 and 2000 (inclusive) (4500 in the case of Fader Option 001).

Each point is identified by an *index*, as shown in Fig. 5-2. Thus, when we speak of point 1, point 2, etc., we mean, the point whose index is 1, the point whose index is 2, etc.

You can allow fade events to overlap, e.g., you can define fade event 3 to consist of points 14 through 27, and fade event 4 to consist of points 24 through 35.

Typically, to define one or more fade events from scratch you proceed as follows:

1. Initialize the Fade Profile Table using the LIST:PRESet command.
2. Do the following in any order you wish:

   Define the frequency values for *all* fade events using the LIST:FREQuency command.

   Define the attenuation values for *all* fade events using the LIST:POWer:ATTenuation command.

   Define the depth values for *all* fade events using the LIST:POWer:DEPTh command.

   Define the phase values for *all* fade events using the LIST:POWer:DEPTh:PHASe command.

   Define the time values for *all* fade events using the LIST:TIME command.

3. Now group the above points into the desired fade events using the LIST:SSEQuence*n* command.

To modify the points in one or more fade events, or to create a new fade event:

1. Tell the Fader how you intend to modify the existing values of the Fade Profile Table, using the LIST:UPDate command.
2. Use the appropriate command(s) in step 2 above to modify the field(s) you wish.

Note

The Fader automatically makes the number of points containing data always be that of the maximum number of points for which data was input by the user. It does this in the following way. Suppose that, say, points 1 through 67 contain frequency data, points 1 through 13 contain attenuation data, points 1 through 40 contain depth data, points 1 through 23 contain phase data, and points 1 through 2 contain time data. Then points 14 through 67 will contain the same attentuation value as point 13; points 41 through 67 will contain the same depth value as point 40; points 24 through 67 will contain the same phase value as point 23; and points 3 through 67 will contain the same time value as point 2.

The number-of-points value returned by a query, however, is always the number you entered; it does not include any of the points automatically added by the Fader.

LIST:FREQuency (Enter Frequency Values into Fade Profile Table)

Syntax

```
                 ⎧ <NRf>[freq suff] ⎫
LIST:FREQuency   ⎨ MAXimum          ⎬
                 ⎩ MINimum          ⎭
  ⎧ <NRf>[freq suff] ⎫
, ⎨ MAXimum          ⎬,....
  ⎩ MINimum          ⎭

LIST:FREQuency? [MAXimum]
                [MINimum]

LIST:FREQuency:POINts? [MAXimum]
                       [MINimum]
```

Description

Sets the frequency field values for the Fade Profile Table. You may set frequency values in a maximum of 2000 points in the Table. *RST does not affect the Table. Same input range as notch frequency.

The LIST:FREQuency? query returns the values of the frequency field in all points you previously entered frequency data into in the Fade Profile Table.

The LIST:FREQuency:POINts? query returns the number of points which the LIST:FREQuency? query will return. Immediately after the LIST:PRESet command has been executed this query will return 1.

Example Command

Loads a sequence of frequencies (40 MHz, 50 MHz, 60 MHz, and 70 MHz} into points 1, 2, 3, and 4, respectively, in the Fade Profile Table:

```
OUTPUT 714;"LIST:FREQ 40MHz,50MHz,60MHz,70MHz"
```

Example Query

Returns the frequency values in all points you previously entered frequency data into in the Fade Profile Table:

```
OUTPUT 714;"LIST:FREQ?"
ENTER 714;Array(*)
```

Example Query

Returns the number of points you have previously entered frequency field data into in the Fade Profile Table.

```
OUTPUT 714;"LIST:FREQ:POIN?"
ENTER 714;Points
```

The value of `Points` will be in the range from 1 through 2000.

LIST:POWer:ATTenuation (Enter Attenuation Values into Fade Profile Table)

Syntax

```
                       ⎧ <NRf>[DB] ⎫
LIST:POWer:ATTenuation ⎨ MAXimum   ⎬
                       ⎩ MINimum   ⎭
 ⎧ <NRf>   ⎫
,⎨ MAXimum ⎬,....
 ⎩ MINimum ⎭

                        ⎡MAXimum⎤
LIST:POWer:ATTenuation? ⎣MINimum⎦

                               ⎡MAXimum⎤
LIST:POWer:ATTenuation:POINts? ⎣MINimum⎦
```

Description

Sets the attenuation field values for the Fade Profile Table. You may set attenuation values in a maximum of 2000 points in the Table. *RST does not affect the Table. Same input range as POW:ATT.

The LIST:POWer:ATTenuation? query returns the values of the attenuation field in all points you previously entered attentuation data into in the Fade Profile Table.

The LIST:POWer:ATTenuation:POINts? query returns the number of points which the LIST:POWer:ATTenuation? query will return. Immediately after the LIST:PRESet command has been executed, this query will return 1.

Example Command

Loads a sequence of attenuations (2.3 dB, 10.1 dB, -3.5 dB, and 99.0 dB) into points 1, 2, 3, 4, respectively, in the Fade Profile Table.

```
OUTPUT 714;"LIST:POW:ATT 2.3,10.1,-3.5,99"
```

Example Query

Returns the attenuation values in all points you previously entered attenuation data into in the Fade Profile Table:

```
OUTPUT 714;"LIST:POW:ATT?"
ENTER 714;Array(*)
```

Example Query

Returns the number of points you have previously entered attenuation data into in the Fade Profile Table.

```
OUTPUT 714;"LIST:POW:ATT:POIN?"
ENTER 714;Points
```

The value of `Points` will be in the range from 1 through 2000.

LIST:POWer:DEPTh (Enter Depth Values into Fade Profile Table)

Syntax

```
                  ⎧ <NRf>[DB] ⎫   ⎧ <NRf>   ⎫
LIST:POWer:DEPTh  ⎨ MAXimum   ⎬ , ⎨ MAXimum ⎬
                  ⎩ MINimum   ⎭   ⎩ MINimum ⎭
, ...
```

```
LIST:POWer:DEPTh? [MAXimum|MINimum]
```

```
LIST:POWer:DEPTh:POINts? [MAXimum|MINimum]
```

Description

Sets the field depth values for the Fade Profile Table. You may enter depth values into a maximum of 2000 points in the Table. *RST does not affect the Table. Same input range as POW:DEPT.

The LIST:POWer:DEPTh? query returns the values of the depth field in all points you previously entered depth data into in the Fade Profile Table.

The LIST:POWer:DEPTh:POINts? query returns the number of points which the LIST:POWer:DEPTh? query will return. Immediately after the execution of the LIST:PRESet command, this query will return 1.

Example Command

Loads a sequence of notch depths (10.2 dB, maximum, 0.9 dB, and 69.2 dB) into points 1, 2, 3, 4, respectively, in the Fade Profile Table.

```
OUTPUT 714;"LIST:POW:DEPT 10.2,MAX,0.9,69.2"
```

Example Query

Returns the depth values in all points you previously entered depth data into in the Fade Profile Table:

```
OUTPUT 714;"LIST:POW:DEPT?"
ENTER 714;Array(*)
```

Example Query

Returns the number of points into which you previously entered depth data in the Fade Profile Table:

```
OUTPUT 714;"LIST:POW:DEPT:POIN?"
ENTER 714;Points
```

The value of `Points` will be in the range from 1 through 2000.

LIST:POWer:DEPTh:PHASe (Enter Phase Values into Fade Profile Table)

Syntax

```
                             ⎧ <NRf>      ⎫
LIST:POWer:DEPTh:PHASe       ⎨ MINimum    ⎬
                             ⎩ NONMinimum ⎭

  ⎧ <NRf>      ⎫
 ,⎨ MINimum    ⎬, ...
  ⎩ NONMinimum ⎭

LIST:POWer:DEPTh:PHASe?

                              ⎡MAXimum⎤
LIST:POWer:DEPTh:PHASe:POINts?⎣MINimum⎦
```

Description

Sets the phase field values for the phase part of the Fade Profile Table. You may set phase values in a maximum of 2000 phases in the Table. You may also use 1 for MINimum and 0 for NONMinimum. *RST does not affect the table.

The LIST:POWer:DEPTh:PHASe? query returns the value of the phase field in all points you previously entered phase data into in the Fade Profile Table. This query returns 1 for MINimum phase and 0 for NONMinimum phase.

The LIST:POWer:DEPTh:PHASe:POINts? query returns the number of values which the LIST:POWer:DEPTh:PHASe? query will return. Immediately after the execution of the LIST:PRESet command, this query will return 1.

Example Command

Loads a sequence of notch depth phases (non-minimum phase, non-minimum phase, minimum phase, and non-minimum phase) into points 1, 2, 3, 4, respectively, in the Fade Profile Table. Both of the following commands are equivalent:

```
OUTPUT 714;"LIST:POW:DEPT:PHAS NONM,NONM,MIN,NONM"
OUTPUT 714;"LIST:POW:DEPT:PHAS 0,0,1,0"
```

Example Query

Returns the depth phase value in all points you previously entered depth phase data into:

```
OUTPUT 714;"LIST:POW:DEPT:PHAS?"
ENTER 714;Array(*)
```

Example Query

Returns the number of points which you previously entered notch depth phase data into in the Fade Profile Table:

```
OUTPUT 714;"LIST:POW:DEPT:PHAS:POIN?"
ENTER 714;Points
```

The value of `Points` will be in the range from 1 through 2000.

LIST:PRESet (Preset Fade Profile Table)

Syntax

```
LIST:PRESet
```

Description

Presets the frequency, attenuation, depth, phase, and time fields in point 1 of the Fade Profile Table to predefined values. These values are as follows:

frequency=70MHz;

attenuation=0dB;

depth=0dB;

phase=MIN;

time=5sec.

The execution of the LIST:PRESet command includes the equivalent of one execution of the command "LIST:SSEQuence*n* 1,0" for each fade event *n*.

Note

All the old Fade Profile Table data will be lost after issuing this command.

Example Command

Sets all the fade profile SSEQ indexes to 1,0, and presets point 1 of the Fade Profile Table to the above values:

```
OUTPUT 714;"LIST:PRES"
```

LIST:SSEQuence$n$ (Set Start/Stop Indexes for Fade Events)

Syntax

$$\texttt{LIST:SSEQuence}n \left\{\begin{array}{l}\texttt{<NRf>}\\ \texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}, \left\{\begin{array}{l}\texttt{<NRf>}\\ \texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}$$

$$\texttt{LIST:SSEQuence}n\texttt{?} \left[\left\{\begin{array}{l}\texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}, \left\{\begin{array}{l}\texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\} \right]$$

Description

Sets the start and stop indexes for fade event number n. n can be a value from 0 through 9. The indexes are indexes into the Fade Profile Table. (For a definition of "index", see the introduction to these LIST commands, and Fig. 5-2.) For example, the following command:

```
OUTPUT 714; "LIST:SSEQ1 1,50"
```

defines that fade event 1 is composed of the points whose indexes are from 1 through 50. Fade events can overlap. *RST does not affect the fade event definitions. Immediately after the execution of the LIST:PRESet command, all fade events (0-9) have start index 1, stop index 0. If the stop index is less than the start index, the fade event is considered undefined.

The query returns the start and stop indexes for fade event n. n can have a value from 0 through 9.

Example Command

Sets fade event 3 to use fade table indexes 2 through 4:

```
OUTPUT 714;"LIST:SSEQ3 2,4"
```

Example Query

Returns the start and stop indexes for fade event 2.

```
OUTPUT 714; "LIST:SSEQ2?"
ENTER 714;Start_index,Stop_index
```

LIST:TIME (Enter Time Values into Fade Profile Table)

Syntax

```
LIST:TIME { <NRf>[time suff] | MAXimum | MINimum }
    ,{ <NRf>[time suff] | MAXimum | MINimum }, ...

LIST:TIME? [MAXimum | MINimum]

LIST:TIME:POINts? [MAXimum | MINimum]
```

Description

Sets the time field values for the Fade Profile Table. You may set time values in a maximum of 2000 points in the Table. *RST does not affect the Table. Input range is 100ms thru 10sec.

The LIST:TIME? query returns the value of the time field in all points in the Fade Profile Table.

The LIST:TIME:POINts? query returns the number of points you have previously entered time field data into. Immediately after the LIST:PRESet command has been executed, this query will return 1.

Example Command

Loads a sequence of time values (150 ms, 120 ms, minimum, and 1 s) into points 1, 2, 3, 4, respectively, in the Fade Profile Table.

```
OUTPUT 714;"LIST:TIME 150ms,120ms,MIN,1"
```

Example Query

Returns the time field values in all points you previously entered time data into in the Fade Profile Table:

```
OUTPUT 714;LIST:TIME?
```

Example Query

Returns the number of points you have previously entered time field data into:

```
OUTPUT 714;"LIST:TIME:POIN?"
ENTER 714;Points
```

The value of `Points` will be in the range from 1 through 2000.

LIST:UPDate (Set Editing Mode for Fade Profile Table)

Syntax

$$\texttt{LIST:UPDate}\begin{Bmatrix}\texttt{NEW}\\ \texttt{APPend}\end{Bmatrix}$$

```
LIST:UPDate?
```

Description

Establishes the editing mode for the Fade Profile Table, i.e., establishes where the next one or more LIST commands will place their data, e.g., where the next LIST:FREQuency command will place its frequency data. NEW means that the fields in the current Table will be overwritten starting at index 1. APP means that the data will be appended to the existing data for that field. Preset: NEW.

The LIST:UPDate? query returns the current editing mode value. This value will be "NEW" or "APP", so you must read the response to the query as a string.

Example Command

Sets Fade Profile Table editing mode to APPend:

```
OUTPUT 714;"LIST:UPD APP"
```

5

Subsystem Commands

TRIGger:SOURce (Set Trigger Source for Fader)

Syntax

```
TRIGger:SOURce {IMMediate
                EXTernal}
```

```
TRIGger:SOURce?
```

Description

Sets the trigger source for the fader and is used only when the Fader is running an Internal Fade Event or is Sweeping.

IMMediate means that the trigger signal used to start the Sweep or Fade Event is considered to be always true. Hence this is equivalent to auto trigger.

EXTernal means trigger from an external source. This external source could be either the HP-IB "group execute trigger" command or another Fader instrument that is connected with the synchronization cable. The Preset value is IMMediate.

This trigger source has no effect on measurements.

The query returns the trigger source for the fader. This query returns IMM or EXT so you must read it in as a string.

Example Command

```
OUTPUT 714;"TRIG:SOUR EXT"
```

Example Query

```
OUTPUT 714;"TRIG:SOUR?"
ENTER 714;Trigger_source$
```

TRIGger2:BER (Set BER Threshhold)

Syntax

```
                 ⎧ <NRf>   ⎫
TRIGger2:BER     ⎨ MAXimum ⎬
                 ⎩ MINimum ⎭
```

Description

This command sets the BER threshold that is used to compute data points in signature measurements. The value entered here is only used when BER (not ALARM) criteria is selected.

Input values can be 1e-3, 3e-4, 1e-4, 3e-5, 1e-5, or 1e-6. Values between legal values will be rounded to the nearest legal value. Preset: 1e-4

For more detail on how the HP 11757B computes bit error rate, see the description of the (RADIO SETUP) key in the local operation part of this manual.

The query returns the current BER threshold setting in the Fader.

Example Command

```
OUTPUT 714;"TRIG2:BER 1e-3"
```

Example Query

```
OUTPUT 714;"TRIG2:BER?"
ENTER 714;Error_threshold
```

TRIGger2:BER:ECOunt (Set BER Accuracy)

Syntax

```
                      ⎧ <NRf>   ⎫
TRIGger2:BER:ECOunt   ⎨ MAXimum ⎬
                      ⎩ MINimum ⎭
```

Description

Sets the number of ERROR PULSE INPUT events to wait for before calculating BER. Input can be 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 9182, 16384, or 32768. Values between legal values will be rounded to the nearest legal value. Preset: 1024.

Smaller numbers make the measurement faster and less accurate while larger numbers make the measurement slower and more accurate. A more detailed explanation of these tradeoffs is presented under the (MEAS SETUP) key in the local operation part of the manual.

This feature is not used for Recovery Time measurements where BER criteria is selected. In those cases, errors are counted in periodic intervals (gate times). The user has no control over the accuracy of the measurement.

Example Command

```
OUTPUT 714;"TRIG2:BER:ECO 4096"
```

Example Query

```
OUTPUT 714;"TRIG2:BER:ECO?"
ENTER 714;Error_count_criteria
```

TRIGger2:BER:FREQuency (Set Radio Bit Rate)

Syntax

$$\texttt{TRIGger2:BER:FREQuency} \begin{Bmatrix} \texttt{<NRf>[freq suff]} \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{Bmatrix}$$

Description

Tells the HP 11757B the bit rate of the radio that is sending the ERROR PULSE's. Input range is 10kHz to 200MHz. Preset: 44.7MHz

For more detail on how the HP 11757B computes bit error rate, see the description of the (RADIO SETUP) key in the local operation part of this manual.

Example Command

```
OUTPUT 714;"TRIG2:BER:FREQ 32MHZ"
```

Example Query

```
OUTPUT 714;"TRIG:BER:FREQ?"
ENTER 714;Radio_bit_rate
```

TRIGger2:BER:MULTiplier (Scale Incoming Errors)

Syntax

```
                             { <NRf>   }
TRIGger2:BER:MULTiplier      { MAXimum }
                             { MINimum }
```

Description

Tells Fader how many errors are actually in one ERROR PULSE. Input range is 0.01 to 100. Preset: 1.

For more detail on how the HP 11757B computes bit error rate, see the description of the (RADIO SETUP) key in the local operation part of this manual.

The query returns the current MULTiplier setting in the Fader.

Example Command

```
OUTPUT 714;"TRIG2:BER:MULT 1.0"
```

Example Query

```
OUTPUT 714;"TRIG2:BER:MULT?"
ENTER 714;Scale_factor
```

TRIGger2:BER:SYMBol:TIME (Set Radio Symbol Time)

Syntax

TRIGger2:BER:SYMBol:TIME { <NRf> [*time suff*] | MAXimum | MINimum }

```
TRIGger2:BER:SYMBol:TIME?
```

Description

Sets the radio symbol time that will be used when calculating the CCIR dispersive fade margin. The range of allowable values is 10 ns to 1000 ns. The Preset value is 50 ns.

The query returns the radio symbol time that is set.

CCIR dispersive fade margin is only available in serial prefixes 3215A and above.

Example Command

To set the symbol time to 220 ns:

```
OUTPUT 714;"TRIG2:BER:SYMB:TIME 220NS"
```

Example Query

```
OUTPUT 714;"TRIG2:BER:SYMB:TIME?"
```

TRIGger2:ECL (ERROR PULSE INPUT to ECL)

Syntax

```
TRIGger2:ECL
```

Description

Sets up the ERROR PULSE INPUT to the ECL state. The ECL state is threshold −1.3 V and termination −2 V. This SCPI command is only available in serial prefixes 3235A and above.

Example Command

```
OUTPUT 714;"TRIG2:ECL"
```

Example Query

There is no query for this command.

TRIGger2:LEVel (Set ERROR PULSE Threshold)

Syntax

```
                  ⎧ <NRf> [volt suff] ⎫
TRIGger2:LEVel    ⎨ MAXimum           ⎬
                  ⎩ MINimum           ⎭
```

```
TRIGger2:LEVel?
```

Description

Sets the ERROR PULSE INPUT's trigger threshold level. The range of allowable values is −5 V to +5 V. The Preset value is −1.3 V.

The query returns the threshold level that is set.

Error pulse input variable threshold is only available in serial prefixes 3235A and above.

Example Command

To set the threshold level to 3.1 V:

```
OUTPUT 714;"TRIG2:LEV 3.1V"
```

Example Query

```
OUTPUT 714;"TRIG2:LEV?"
```

TRIGger2:TTL (ERROR PULSE INPUT to TTL)

Syntax

```
TRIGger2:TTL
```

Description

Sets up the ERROR PULSE INPUT to the TTL state. The TTL state is threshold 1.6 V and termination to 0 V. This SCPI command is only available in serial prefixes 3235A and above.

Example Command

```
OUTPUT 714;"TRIG2:TTL"
```

Example Query

There is no query for this command.

TRIGger2:TIMer (Set Radio Wait Time)

Syntax

```
                  ⎧ <NRf> [time suff] ⎫
TRIGger2:TIMer    ⎨ MAXimum           ⎬
                  ⎩ MINimum           ⎭
```

```
TRIGger2:TIMer?
```

Description

Sets a wait time that will execute after every notch movement. This allows the radio some settling time before a BER measurement is taken. The range of allowable values is 10 ms to 10 s. The Preset value is 500 ms.

The query returns the wait time that is set.

Example Command

To set the wait time to 150 ms:

```
OUTPUT 714;"TRIG2:TIM 150MS"
```

Example Query

```
OUTPUT 714;"TRIG2:TIM?"
```

ERRor:COUPling (Set Coupling for ERROR PULSE INPUT)

Syntax

ERRor:COUPling { ECL | TTL }

ERRor:COUPling?

Description

Sets the coupling for the ERROR PULSE INPUT. The Preset value is ECL. It is recommended that new programs use the SCPI commands TRIGger2:ECL and TRIGger2:TTL instead of "ERR:COUP ECL" and "ERR:COUP TTL". These new SCPI commands are only available in serial prefixes 3235A and above.

The query returns the coupling for the ERROR PULSE INPUT.

Example Command

```
OUTPUT 714;"ERR:COUP ECL"
```

Example Query

```
OUTPUT 714;"ERR:COUP?"
ENTER 714;Couple$
```

ERRor:IMPedance
(Set Input Impedance for ERROR PULSE INPUT)

Syntax

```
                 ⎧ <NRf>   ⎫
ERRor:IMPedance  ⎨ MAXimum ⎬
                 ⎩ MINimum ⎭

                 ⎡ MAXimum ⎤
ERRor:IMPedance? ⎣ MINimum ⎦
```

Description

Sets the input impedance of the ERROR PULSE INPUT. Only the values 75 ohms or 10k ohms are allowed. Values between 75 ohms and 10k ohms are rounded to the nearest of these two values. The Preset value is 75 Ohm.

The query returns the input impedance of the ERROR PULSE INPUT.

Example Command

```
OUTPUT 714;"ERR:IMP 10E3"
```

Example Query

```
OUTPUT 714;"ERR:IMP?"
ENTER 714;Input_impedance
```

ALARm:COUPling? (Query the Coupling of ALARM INPUT)

Syntax

`ALARm:COUPling?`

Description

Returns the coupling for the ALARM INPUT. The HP 11757B always returns “TTL”.

Example Query

```
OUTPUT 714;"ALAR:COUP?"
ENTER 714;Couple$
```

ALARm:IMPedance? (Query the Input Impedance of ALARM INPUT)

Syntax

```
ALARm:IMPedance?
```

Description

Returns the input impedance of the ALARM INPUT. The HP 11757B always returns 10e3 ohms.

Example Query

```
OUTPUT 714;"ALAR:IMP?"
ENTER 714;Alarm_impedance
```

ALARm:POLarity (Set Polarity of the ALARM Input)

Syntax

```
ALARm:POLarity {NORMal | INVerted}

ALARm:POLarity?
```

Description

Sets the polarity of the ALARM input. NORMal is the same as positive; INVerted is the same as negative. Preset: NORM.

The query returns the polarity of the ALARM input.

Example Command

```
OUTPUT 714;"ALAR:POL NORM"
```

Example Query

```
OUTPUT 714;"ALAR:POL?"
ENTER 714;Polarity$
```

FM:DEViation (Set Frequency Deviation for Dynamic-M)

Syntax

```
                { <NRf>[freq suff] }
FM:DEViation    { MAXimum          }
                { MINimum          }

                 [MAXimum]
FM:DEViation?    [MINimum]
```

Description

Sets frequency deviation for the Dynamic-M measurement. Input can be ±1MHz, ±2MHz, ±4MHz, ±6MHz, ±10MHz, or ±20MHz. Values between legal values will be rounded to the nearest legal value. Negative values are accepted without error but they will be changed to their "absolute value". See the description of the (MEAS SETUP) key in the local operation section of this manual for a more detailed description of the deviation. The Preset value is ±1MHz

The query returns the frequency deviation for Dynamic M measurement.

Example Command

```
OUTPUT 714;"FM:DEV 4MHZ"
```

Example Query

```
OUTPUT 714;"FM:DEV?"
ENTER 714;Peak_deviation
```

FM:INTernal:RATE (Set Frequency Rate for Dynamic-M)

Syntax

```
FM:INTernal:RATE
 { <NRf>[freq per second suff] }
 { MAXimum                     }
 { MINimum                     }

FM:INTernal:RATE? [MAXimum]
                  [MINimum]
```

Description

Sets frequency rate for the Dynamic-M measurement. Front panel is in MHz/S but HP-IB defaults to HZ/S. Input can be 10MHz/S, 30MHz/S, 100MHz/S, 300MHz/S, 600MHz/S or 1200MHz/S. Values between legal values will be rounded to the nearest legal value. See the description of the (MEAS SETUP) key in the local operation section of this manual for a more detailed description of the Dynamic-M Rate. The Preset value is 300MHz/S.

The query returns the frequency speed for Dynamic M measurement.

Example Command

```
OUTPUT 714;"FM:INT:RATE 100MHZ/S"
```

Example Query

```
OUTPUT 714;"FM:INT:RATE?"
ENTER 714;Frequency_rate
```

5

Subsystem Commands

CALCulate:SMOothing:STATe (Enable/Disable EDGE ZOOM)

Syntax

```
CALCulate:SMOothing:STATe {ON|OFF}
```

```
CALCulate:SMOothing:STATe?
```

Description

Turns the "EDGE ZOOM" feature on and off. Preset: OFF. For a more complete explanation of the EDGE ZOOM feature, refer to the description of the (MEAS SETUP) key in the local operation part of this manual.

The query returns the on/off state of EDGE ZOOM feature.

Example Command

```
OUTPUT 714;"CALC:SMO:STAT ON"
```

Example Query

```
OUTPUT 714;"CALC:SMO:STAT?"
ENTER 714;Edge_zoom
```

Test Mask Overview

How the Test Mask is Organized within HP-IB

The test mask is used to run a "pass/fail" test on the data that is generated during a Static-M, Dynamic-M, Dynamic-S, or Hysteresis M-Curve measurement.

The test mask is broken into two main sets of "x,y" data; one set for minimum phase, and one set for nonminimum phase. The number of "x,y" pairs for each phase is set at a fixed value of 11. All eleven values must be entered for the test mask to work properly. This means a total of 44 (4 x 11) data values must be entered.

The 11 "x" and 11 "y" values for each phase are entered with a separate command. These commands are summarized below.

- "x" values for Minimum phase are entered with the `CALC:LIM:CONT:MIN` command.
- "y" values for Minimum phase are entered with the `CALC:LIM:LOW:MIN` command.
- "x" values for Nonminimum phase are entered with the `CALC:LIM:CONT:NONM` command.
- "y" values for Nonminimum phase are entered with the `CALC:LIM:LOW:NONM` command.

The values that are entered with these commands must be separated by commas. Entered "x,y" pairs correspond with each other respectively. For example, the first x value entered for Minimum phase corresponds to the first y value entered for Minimum phase.

Example Command

To enter a minimum phase test mask with the following "x,y" values:

40e6,40 46e6,35 52e6,30 58e6,22 64e6,15 70e6,15 76e6,15 82e6,22 88e6,30 94e6,35 100e6,40

... you would use the following commands:

```
OUTPUT 714;"CALC:LIM:CONT:MIN 40e6,46e6,52e6,
  58e6,64e6,70e6,76e6,82e6,88e6,94e6,100e6"
OUTPUT 714;"CALC:LIM:LOW:MIN 40,35,30,22,15,
  15,15,22,30,35,40"
```

Example Query

A query of any of the four commands will return the 11 data values that are currently stored. For example, to download the Y values for minimum phase that were entered in the above example, you would use the following.

```
OUTPUT 714;"CALC:LIM:UPP:MIN?"
ENTER 714;Y0,Y1,Y2,Y3,Y4,Y5,Y6,Y7,Y8,Y9,Y10
```

CALCulate:LIMit:STATe (Turn Test Mask On/Off)

Syntax

$$\texttt{CALCulate:LIMit:STATe} \left\{ \begin{array}{l} \texttt{ON} \\ \texttt{OFF} \end{array} \right\}$$

```
CALCulate:LIMit:STATe?
```

Description

Turns the test mask on and off. Preset: OFF.

The query returns the on/off state of test mask.

Example Command

```
OUTPUT 714;"CALC:LIM:STAT ON"
```

Example Query

```
OUTPUT 714;"CALC:LIM:STAT?"
ENTER 714;Test_mask_flag
```

CALCulate:LIMit:CONTrol:MINimum (Load Test Mask “x” Min Data)

Syntax

`CALCulate:LIMit:CONTrol:MINimum` *value*, *value*, ...

`CALCulate:LIMit:CONTrol:MINimum?`

Description

Loads the Minimum phase, “x” axis data values for the test mask. The maximum number of data values that can be entered is 11. Loading this data always presets the existing data to “Notch Frequency” preset value first.

Preset has no effect on the values of the test mask.

The query returns the data as a list of numbers separated by commas.

Example Command

See the beginning of this subsystem (Test Mask Overview) for an example command.

Example Query

See the beginning of this subsystem (Test Mask Overview) for an example query.

CALCulate:LIMit:CONTrol:NONMinimum (Load Test Mask Nonmin “x” Data)

Syntax

`CALCulate:LIMit:CONTrol:NONMinimum` *value*, *value*,....

`CALCulate:LIMit:CONTrol:NONMinimum?`

Description

Loads the Nonminimum phase, “x” axis data values for the test mask. The maximum number of data values that can be entered is 11. Loading this data always presets the existing data to “Notch Frequency” preset value first.

Preset has no effect on the values of the test mask.

The query returns the data as a list of numbers separated by commas.

Example Command

See the beginning of this subsystem (Test Mask Overview) for an example command.

Example Query

See the beginning of this subsystem (Test Mask Overview) for an example query.

CALCulate:LIMit:LOWer:MINimum (Load Test Mask Min "y" Data)

Syntax

`CALCulate:LIMit:LOWer:MINimum` *value*,*value*,....

`CALCulate:LIMit:LOWer:MINimum?`

Description

Loads the Minimum phase, "y" axis data values for the test mask. The maximum number of data values that can be entered is 11. Loading this data always presets the existing data to "Notch Frequency" preset value first.

Preset has no effect on the values of the test mask.

The query returns the data as a list of numbers separated by commas.

Example Command

See the beginning of this subsystem (Test Mask Overview) for an example command.

Example Query

See the beginning of this subsystem (Test Mask Overview) for an example command.

CALCulate:LIMit:LOWer:NONMinimum (Load Test Mask Nonmin "y" Data)

Syntax

`CALCulate:LIMit:LOWer:NONMinimum` *value*, *value*, ...

`CALCulate:LIMit:LOWer:NONMinimum?`

Description

Loads the Nonminimum phase, "y" axis data values for the test mask. The maximum number of data values that can be entered is 11. Loading this data always presets the existing data to "Notch Frequency" preset value first.

Preset has no effect on the values of the test mask.

The query returns the data as a list of numbers separated by commas.

Example Command

See the beginning of this subsystem (Test Mask Overview) for an example command.

Example Query

See the beginning of this subsystem (Test Mask Overview) for an example command.

CALCulate:LIMit:FAIL? (Reports Test Mask Pass/Fail)

Syntax

```
CALCulate:LIMit:FAIL?
```

Description

Returns a 1 if any of the measurement depths were less than the corresponding `LOWer:MINimum` or `LOWer:NONMinimum` limits. Returns a 0 if none of the measurement depths were less than the corresponding `LOWer:MINimum` or `LOWer:NONMinimum` limits.

If the measured values x-coordinate does not agree with the test mask's x-coordinate, the HP 11757B will linearly interpolate between test mask x-coordinates to get a y-coordinate to compare with the measured y value. For a more complete explanation of this interpolation see the description of the (TEST MASK) key in the local operation section of this manual.

This feature does not work for Recovery Time measurements.

Example Command

There is no command for this query

Example Query

```
OUTPUT 714;"CALC:LIM:FAIL?"
ENTER 714;Pass_fail_flag
```

CALCulate:LIMit:FCOunt? (Report Number of Test Mask Fails)

Syntax

`CALCulate:LIMit:FCOunt?`

Description

Returns the number of time the measurement depths were less than the corresponding `LOWer:MINimum` or `LOWer:NONMinimum` limits.

This feature does not work for Recovery Time measurements.

Example Command

There is no command for this query

Example Query

```
OUTPUT 714;"CALC:LIM:FCO?"
ENTER 714;Fail_number
```

CONFigure:ARRay:DYNamic:FM (Configure Dynamic-M Measurement)

Syntax

```
                              ⎧ (<NRf>)    ⎫
CONFigure:ARRay:DYNamic:FM    ⎨ (MAXimum)  ⎬
                              ⎩ (MINimum)  ⎭

 ⎡MINimum   ⎤  ⎡BER  ⎤  ⎡ON ⎤
,⎢NONMinimum⎥ ,⎣ALARm⎦ ,⎣OFF⎦
 ⎣BOTH      ⎦
```

Description

Configures for a Dynamic-M measurement. The first parameter is the number of points in the measurement. This is required and must be in parenthesis.

The second parameter sets the phase (if omitted, MINimum is assumed).

The third parameter is BER for "bit error rate criteria" or ALARm for ALARM criteria (if omitted, BER is assumed). The specific BER criteria is set up with the `TRIGger2:BER:THReshold` command.

The fourth parameter turns the MK SEARCH on or off (if omitted, OFF is assumed). For a detailed explaination of how MK SEARCH works, see the description of the MEAS SETUP key in the local part of this manual.

If you don't use CONFigure before an INITIATE, the current measurement setup will be used.

Example Command

The following example sets up and executes a Dynamic-M measurement.

```
OPTION BASE 1
DIM Array(40)
OUTPUT 714;"*RST"                ! PRESETS the HP 11757B
OUTPUT 714;"TRIGGER2:BER:FREQ 44.7MHZ" ! Sets radio bit rate
OUTPUT 714;"FREQ:START 50MHZ"  ! Set Start Freq to 50 MHz
OUTPUT 714;"FREQ:STOP 90MHZ"   ! Set Stop Freq to 90 MHz
OUTPUT 714;"TRIGGER2:BER:THR 1E-3" ! Sets 1E-3 threshold
OUTPUT 714;"FM:DEV 6MHZ"       ! Set Deviation
OUTPUT 714;"FM:INT:RATE 300MHZ/S ! Set Rate
!
! The following CONFIGURE command sets up a Dynamic-M
! measurement, 10 points, Both phases, BER Criteria, and
! MK Search OFF.
!
OUTPUT 714;"CONFIGURE:ARRAY:DYN:FM (10),BOTH,BER,OFF"
OUTPUT 714;"INITIATE"         ! Starts the measurement
OUTPUT 714;"FETCH?"           ! Gets the measured data
ENTER 714;Array(*)
OUTPUT 714;"FETCH:DFM?    ! Gets the Dispersive Fade Margin
ENTER 714;Fade_margin
```

Example Query

This query returns a string which looks like the full CONFigure command needed to represent the current measurement setup (with all optional subsystems and parameters included).

```
OUTPUT 714;"CONFIGURE?"
ENTER 714;Configure$
```

CONFigure:ARRay:DYNamic:SWEep (Configure Dynamic-S Measurement)

Syntax

$$\texttt{CONFigure:ARRay:DYNamic:SWEep}\begin{Bmatrix}\texttt{(<NRf>)}\\ \texttt{(MAXimum)}\\ \texttt{(MINimum)}\end{Bmatrix}$$

$$,\begin{bmatrix}\texttt{MINimum}\\ \texttt{NONMinimum}\\ \texttt{BOTH}\end{bmatrix},\begin{bmatrix}\texttt{BER}\\ \texttt{ALARm}\end{bmatrix}$$

Description

Configures for a Static-S measurement. The first parameter is the number of points in the measurement. This is required and must be in parenthesis.

The second parameter sets the phase (if omitted, MINimum is assumed).

The third parameter is BER for "bit error rate criteria" or ALARm for ALARM criteria (if omitted, BER is assumed). The specific BER criteria is set up with the `TRIGger2:BER:THReshold` command.

If you don't use CONFigure before an INITIATE, the current measurement setup will be used.

Example Command

The following example sets up and executes a Dynamic-S measurement.

```
OPTION BASE 1
DIM Array(40)
OUTPUT 714;"*RST"                ! PRESETS the HP 11757B
OUTPUT 714;"TRIGGER2:BER:FREQ 44.7MHZ" ! Sets radio bit rate
OUTPUT 714;"FREQ:START 40MHZ"  ! Set Start Freq to 40 MHz
OUTPUT 714;"FREQ:STOP 90MHZ"   ! Set Stop Freq to 90 MHz
OUTPUT 714;"TRIGGER2:BER:THR 1E-3" ! Sets 1E-3 threshold
OUTPUT 714;"FREQ:RATE:START 10MHZ" ! Sets Start Rate
```

```
OUTPUT 714;"FReQ:RATE:STOP 100MHZ" ! Sets Stop Rate
!
! The following CONFIGURE command sets up a Dynamic-S
! measurement, 10 points, Both phases, and BER Criteria.
!
OUTPUT 714;"CONFIGURE:ARRAY:DYN:SWE (10),BOTH,BER"
OUTPUT 714;"INITIATE"          ! Starts the measurement
OUTPUT 714;"FETCH?"            ! Gets the measured data
ENTER 714;Array(*)
```

Example Query

This query returns a string which looks like the full CONFigure command needed to represent the current measurement setup (with all optional subsystems and parameters included).

```
OUTPUT 714;"CONFIGURE?"
ENTER 714;Configure$
```

CONFigure:ARRay:HYSTeresis (Configure Hysteresis M-Curve Meas)

Syntax

```
                                  ⎧ (<NRf>)   ⎫
CONFigure:ARRay:HYSTeresis        ⎨ (MAXimum) ⎬
                                  ⎩ (MINimum) ⎭
,[BER  ],[ON ]
 [ALARm] [OFF]
```

Description

Configures for a Hysteresis M-Curve measurement. The first parameter is the number of points in the measurement. This is required and must be in parenthesis.

The second parameter is BER for "bit error rate criteria" or ALARm for ALARM criteria (if omitted, BER is assumed). The specific BER criteria is set up with the `TRIGger2:BER:THReshold` command.

The third parameter turns the MK SEARCH on or off (if omitted, OFF is assumed). For a detailed explaination of how MK SEARCH works, see the description of the (MEAS SETUP) key in the local part of this manual.

The phase for Hysteresis measurements is always BOTH.

If you don't use CONFigure before an INITIATE, the current measurement setup will be used.

Example Command

The following example sets up and executes a Hysteresis M-Curve measurement.

```
OPTION BASE 1
DIM Array(80)
OUTPUT 714;"*RST"              ! PRESETS the HP 11757B
```

```
OUTPUT 714;"TRIGGER2:BER:FREQ 44.7MHZ" ! Sets radio bit rate
OUTPUT 714;"FREQ:START 50MHZ"  ! Set Start Freq to 50 MHz
OUTPUT 714;"FREQ:STOP 90MHZ"   ! Set Stop Freq to 90 MHz
OUTPUT 714;"TRIGGER2:BER:THR 1E-3" ! Sets 1E-3 threshold
!
! The following CONFIGURE command sets up a Hysteresis M-Curve
! measurement, 10 points, BER Criteria, and
! MK Search OFF.
!
OUTPUT 714;"CONFIGURE:ARRAY:HYST (10),BER,OFF"
OUTPUT 714;"INITIATE"          ! Starts the measurement
OUTPUT 714;"FETCH?"            ! Gets the measured data
ENTER 714;Array(*)
OUTPUT 714;"FETCH:DFM?     ! Gets the Dispersive Fade Margin
ENTER 714;Fade_margin
```

Example Query

This query returns a string which looks like the full CONFigure command needed to represent the current measurement setup (with all optional subsystems and parameters included).

```
OUTPUT 714;"CONFIGURE?"
ENTER 714;Configure$
```

CONFigure:ARRay:STATic (Configure Static-M Measurement)

Syntax

```
CONFigure:ARRay:STATic { (<NRf>) | (MAXimum) | (MINimum) }
   ,[MINimum | NONMinimum | BOTH],[BER | ALARm],[ON | OFF]
```

Description

Configures for a Static-M measurement. The first parameter is the number of points in the measurement. This is required and must be in parenthesis.

The second parameter sets the phase (if omitted, MINimum is assumed).

The third parameter is BER for "bit error rate criteria" or ALARm for ALARM criteria (if omitted, BER is assumed). The specific BER criteria is set up with the `TRIGger2:BER:THReshold` command.

The fourth parameter turns the MK SEARCH on or off (if omitted, OFF is assumed). For a detailed explaination of how MK SEARCH works, see the description of the (MEAS SETUP) key in the local part of this manual.

If you don't use CONFigure before an INITiate, the current measurement setup will be used.

Example Command

The following example sets up and executes a Static-M measurement.

```
OPTION BASE 1
DIM Array(40)
OUTPUT 714;"*RST"              ! PRESETS the HP 11757B
OUTPUT 714;"TRIGGER2:BER:FREQ 44.7MHZ" ! Sets radio bit rate
OUTPUT 714;"FREQ:START 50MHZ"  ! Set Start Freq to 50 MHz
OUTPUT 714;"FREQ:STOP 90MHZ"   ! Set Stop Freq to 90 MHz
OUTPUT 714;"TRIGGER2:BER:THR 1E-3" ! Sets 1E-3 threshold
!
! The following CONFIGURE command sets up a Static-M
! measurement, 10 points, Both phases, BER Criteria, and
! MK Search OFF.
!
OUTPUT 714;"CONFIGURE:ARRAY:STATIC (10),BOTH,BER,OFF"
OUTPUT 714;"INITIATE"         ! Starts the measurement
OUTPUT 714;"FETCH?"           ! Gets the measured data
ENTER 714;Array(*)
OUTPUT 714;"FETCH:DFM?    ! Gets the Dispersive Fade Margin
ENTER 714;Fade_margin
```

Example Query

This query returns a string which looks like the full CONFigure command needed to represent the current measurement setup (with all optional subsystems and parameters included).

```
OUTPUT 714;"CONFIGURE?"
ENTER 714;Configure$
```

CONFigure:RECovery (Configure Recovery Time Measurement)

Syntax

$$\texttt{CONFigure:RECovery} \begin{bmatrix} \texttt{BER} \\ \texttt{ALARm} \end{bmatrix}$$

Description

Configures for a Recovery Time measurement. If the parameter is omitted, BER is assumed.

If you don't use CONFigure before an INITIATE, the current measurement setup will be assumed.

Example Command

The following example sets up and executes a Recovery Time measurement.

```
OUTPUT 714;"*RST"                ! PRESETS the HP 11757B
OUTPUT 714;"CONFIGURE:REC BER"
OUTPUT 714;"INITIATE"            ! Starts the measurement
OUTPUT 714;"FETCH?"              ! Gets the measured data
ENTER 714;Recovery_time          ! Gets a single value equal
                                 ! to the recovery time.
```

Example Query

This query returns a string which looks like the full CONFigure command needed to represent the current measurement setup (with all optional subsystems and parameters included).

```
OUTPUT 714;"CONFIGURE?"
ENTER 714;Configure$
```

CONFigure:BER (Configure BER Measurement)

Syntax `CONFigure:BER`

Description Configures for a Bit Error Rate measurement. The Bit Error Rate measurement type is only available in serial prefixes 3215A and above.

If you don't use CONFigure before an INITIATE, the current measurement setup will be assumed.

Example Command The following example sets up and executes a Bit Error Rate measurement.

```
OUTPUT 714;"*RST"                  ! PRESETS the HP 11757B
OUTPUT 714;"CONFIGURE:BER"
OUTPUT 714;"INITIATE"             ! Starts the measurement
OUTPUT 714;"FETCH?"               ! Gets the measured data
ENTER 714;Bit_error_rate          ! Gets a single value equal
                                  ! to the bit error rate.
```

Example Query This query returns a string which looks like the full CONFigure command needed to represent the current measurement setup (with all optional subsystems and parameters included).

```
OUTPUT 714;"CONFIGURE?"
ENTER 714;Configure$
```

INITiate

Syntax

```
INITiate
```

Description

Starts the currently configured measurement based on the current measurement setup.

Example Command

```
OUTPUT 714;"INITiate"
```

Example Query

There is no query for this command.

FETCh? (Download Last Measured Data)

Syntax `FETCh?`

Description This query causes the last measured data to be put into the output buffer so it can be read with a subsequent `ENTER` command.

For Static-M, Dynamic-M, and Dynamic-S measurements, the data is returned in "frequency, depth" pairs. For MINimum or NONMinimum phases the number of pairs of data will be equal to the number of points specified when the data was taken.

For BOTH phase selections, the number of pairs of data will be equal to twice the number of points specified when the data was taken. The MINimum data will be returned first in this case.

For Hysteresis M-Curve measurements, the data is also returned in the same "frequency, depth" pairs. In this case, the total number of pairs of data is four times the number of points specified when the data was taken. The data is returned in the following order:

1. Minimum phase, Outage Data (shallow to deep notch)
2. Minimum phase, Return Data (deep to shallow notch)
3. Non-Minimum phase, Outage Data (shallow to deep notch)
4. Non-Minimum phase, Return Data (deep to shallow notch)

If the last measurement was a Recovery Time measurement, the data returned with the FETCH query will be a single number representing the recovery time.

If the last measurement was a Bit Error Rate measurement, the data returned with the FETCH query will be a single number representing the bit error rate.

Example Command

There is no command for this query.

Example Query

```
OUTPUT 714; "FETCH?"
ENTER 714;Measured_data(*)
```

FETCh:DFM? (Download Dispersive Fade Margin)

Syntax

```
FETCh:DFM? [BELLcore]
           [CCIR    ]
```

Description

Queries the Dispersive Fade Margin calculated in the last measurement. Both types are always calculated; therefore you can query either. If the parameter is omitted, BELLcore is assumed. You can query the Dispersive Fade Margin calculations only if the last measurement was a Static-M, Dynamic-M, or Hysteresis M-Curve measurement. CCIR is only available in serial prefixes 3215A and above; therefore, no parameter is allowed with serial prefixes before 3215A.

Example Command

There is not command for this query.

Example Query

```
OUTPUT 714;"FETCH:DFM? BELLCORE"
ENTER 714;Bellcore_DFM
```

5

HP-IB Commands

SYSTem:COMMunicate:GPIB:ADDRess (Set HP-IB Address)

Syntax

$$\texttt{SYSTem:COMMunicate:GPIB:ADDRess}\left\{\begin{array}{l}\texttt{<NRf>}\\ \texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}$$

$$\texttt{SYSTem:COMMunicate:GPIB:ADDRess?}\left[\begin{array}{l}\texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right]$$

Description

Sets the HP-IB address of the Fader. The Fader's HP-IB address can be from 0 to 30 (inclusive). Address 40 puts the Fader into listen only mode. Address 50 puts the Fader into talk only mode. Values between legal values will be rounded to the nearest legal value. Preset has no effect on the Fader's HP-IB address. At the factory, the Fader's HP-IB address is set to 14.

The query returns the current HP-IB address.

Example Command

To change the Fader's HP-IB address to 12, run the following program:

```
10 OUTPUT 714; "SYST:COMM:GPIB:ADDR 12"
20 END
```

Example Query

To read the Fader's current HP-IB address, run the following program:

```
10 OUTPUT 714; "SYST:COMM:GPIB:ADDR?"
20 ENTER 714;Fader_address
30 PRINT Fader_address
40 END
```

SYSTem:COMMunicate:PRINter:DESTination (Select Printout Destination)

Syntax

```
SYSTem:COMMunicate:PRINter:DESTination
  { INTernal }
  { EXTernal }

SYSTem:COMMunicate:PRINter:DESTination?
```

Description

Selects where printout requests will go. INTernal selects the Fader's internal printer. EXTernal selects a printer external to the Fader. Preset: INTernal. To achieve the front panel "NONE" printout mode, use "SYST:COMM:PRIN:STAT OFF".

The query returns the current printout destination.

Example Command

To change the Fader's printout destination to external, run the following program:

```
10 OUTPUT 714; "SYST:COMM:PRIN:DEST EXT"
20 END
```

Example Query

To read the Fader's current printout destination, run the following program:

```
10 OUTPUT 714; "SYST:COMM:PRIN:DEST?"
20 ENTER 714;Print_dest$
30 PRINT Print_dest$
40 END
```

SYSTem:COMMunicate:PRINter:DUMP (Print Measurement Information)

Syntax

```
SYSTem:COMMunicate:PRINter:DUMP {PREView | DATA}
```

Description

Outputs measurement information to a printer. PREView corresponds to printing the measurement set up information only. DATA corresponds to printing the measurement graph and the "raw" measurement data.

The printout destination should be chosen using the "SYSTem:COMMunicate:PRINter:DESTination" command.

This is an "execution" command and therefore has no preset condition.

Example Commands

To print the Fader's measurement setup to the Fader's internal printer, run the following program:

```
10 OUTPUT 714; "SYST:COMM:PRIN:DEST INT"
20 OUTPUT 714; "SYST:COMM:PRIN:STAT ON"
30 OUTPUT 714; "SYST:COMM:PRIN:DUMP PREV"
40 END
```

To print the Fader's measurement setup to an external printer, run the following program. Because the controller and an external printer share the same HP-IB bus with the Fader, performing an external print requires line 40 below. Line 40 tells the printer at address 1 to read the Fader's (at address 14) output. The UNL and DATA parts of the SEND 7 command make sure that all other instruments (including the controller) are not interfering with the printout:

```
10 OUTPUT 714; "SYST:COMM:PRIN:DEST EXT"
```

```
20 OUTPUT 714; "SYST:COMM:PRIN:STAT ON"
30 OUTPUT 714; "SYST:COMM:PRIN:DUMP PREV"
40 SEND 7; UNL LISTEN 1 TALK 14 DATA
50 END
```

Example Query There is no query for this command.

SYSTem:COMMunicate:PRINter:STATe (Enable/Disable Printer Output)

Syntax

```
SYSTem:COMMunicate:PRINter:STATe { ON | OFF }
```

```
SYSTem:COMMunicate:PRINter:STATe?
```

Description

Enables or disables printer output. Preset: OFF

The query returns the current printout enable/disable state.

Example Command

To change the Fader's printout enable/disable state to enabled, run the following program:

```
10 OUTPUT 714; "SYST:COMM:PRIN:STAT ON"
20 END
```

Example Query

To read the Fader's current printout enable/disable state, run the following program:

```
10 OUTPUT 714; "SYST:COMM:PRIN:STAT?"
20 ENTER 714;Print_state
30 PRINT Print_state
40 END
```

SYSTem:DATE (Set the Date)

Syntax

$$\texttt{SYSTem:DATE} \left\{\begin{array}{l}\texttt{<NRf>}\\ \texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}, \left\{\begin{array}{l}\texttt{<NRf>}\\ \texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}, \left\{\begin{array}{l}\texttt{<NRf>}\\ \texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}$$

$$\texttt{SYSTem:DATE?} \left[\begin{array}{l}\left\{\begin{array}{l}\texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\},\\ \left\{\begin{array}{l}\texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\},\\ \left\{\begin{array}{l}\texttt{MAXimum}\\ \texttt{MINimum}\end{array}\right\}\end{array}\right]$$

Description

Sets the date. The first parameter is year with millenium, the second parameter is month, and the third parameter is day. The year can be from 1970 (70 on front panel) to 2069 (69 on front panel). The month range is 1 to 12. The day range will depend on the the month - leap years are taken into account. Preset has no affect on the Fader's date.

The query returns the Fader's current date.

Example Command

To set the Fader's date to February 29th, 1992, run the following program:

```
10 OUTPUT 714; "SYST:DATE 1992,2,29"
20 END
```

Example Query

To read the current date from the Fader, run the following program:

```
10 OUTPUT 714; "SYST:DATE?"
20 ENTER 714;Year,Month,Day
30 PRINT Year,Month,Day
40 END
```

SYSTem:ERRor? (Read Error Queue)

Syntax

`SYSTem:ERRor?`

Description

The “SYSTem:ERRor?” query returns the oldest uncleared error number and error description from the Fader’s HP-IB error queue.

When an error is read, it is cleared as long as the error condition no longer exists.

When the “SYSTem:ERRor?” query is sent, only the oldest unread error in the HP-IB error queue will be returned. Errors are returned in the following format:

generrnum,"*generrmsg*;*deterrmsg*(*deterrnum*)"

Where,

- *generrnum* ::= The general error number.
- *generrmsg* ::= The general error message.
- *deterrmsg* ::= The detailed error message. This tells exactly what caused the error condition in the Fader.
- *deterrnum* ::= The detailed error message number that goes along with the *deterrmsg*.

Note

If no detailed error information exists, only the general error number and general error message will be returned.

The HP-IB error queue can contain a maximum of 16 error messages. If the HP-IB error queue overflows, the 16th error will be replaced in the queue with `-350,"Queue overflow"`. If the queue is empty, the message `0,"No error"` will be returned.

Preset has no effect on the HP-IB error queue. The HP-IB error queue is only cleared at power up, by sending the "*CLS" command, or by reading its entire contents.

See Also

Error Messages Appendix

Example Command

There is no command for this query.

Example Query

To cause an error condition and then query the Fader's HP-IB error queue, run the following program:

```
10  OUTPUT 714; "FREQ 100GHZ" !Creates frequency out of range error
20  DIM B$[160]
30  OUTPUT 714; "SYST:ERR?"   !Reads contents of HP-IB error queue.
40  ENTER 714; A, B$
50  PRINT A, B$
60  IF A <> 0 THEN 30         !Program loops until all errors are read.
70  END
```

The following should be printed to the controller display:

```
-222     "Data out of range;NO SWEEP FREQ(2005)"
  0      "No error"
```

SYSTem:KEY (Press Front Panel Key)

Syntax

```
               ⎧ <NRf>   ⎫
SYSTem:KEY     ⎨ MAXimum ⎬
               ⎩ MINimum ⎭

               ⎡ MAXimum ⎤
SYSTem:KEY?    ⎣ MINimum ⎦
```

Description

The “SYSTem:KEY” command presses a front panel key. The input parameter is a key code which has a range from 0 to 51.

The key code represents the hardware key to be pressed. There is no unique key code for shifted functions and “menu” features.

Key codes can not simply be strung together in a command. If more than one key code is to appear on the same command line, the subsequent key codes must be preceded by “;KEY”. In other words, only one key code per “SYSTem:KEY” command is allowed.

The query returns the last key pressed. If -1 is returned, no key has been pressed since *RST, (PRESET/LOCAL) or since the Fader was turned from off to on.

The valid key codes are shown in the following table:

Fader Key Codes

Key	Key Code	Restrictions
[75 MHz]	0 or 1	11758A or 11758B only
[67 MHz]	2	11758A or 11758B only
[70 MHz]	3	11758A or 11758B only
[NOTCH DEPTH]	4	
[ATTEN]	5	
[SET STOP]	7	
[NOTCH FREQ]	8	
[MIN PHASE]	9	
[SHIFT]	10	
[9]	12	11757A or 11757B only
[4]	3	11757A or 11757B only
[7]	14	11757A or 11757B only
[⇐]	24	
[⇒]	25	
[ENTER]	26 or 44	
[SET START]	28	
[⇓]	29	
[⇑]	30	
[PRESET/LOCAL]	31	

Fader Key Codes (continued)

Key	Key Code	Restrictions
8	33	11757A or 11757B only
5	34	11757A or 11757B only
6	35	11757A or 11757B only
1	36	11757A or 11757B only
BACK SPACE	38	11757A or 11757B only
0	39	11757A or 11757B only
2	40	11757A or 11757B only
3	41	11757A or 11757B only
.	42	11757A or 11757B only
−	43	11757A or 11757B only
ENTER	44	
MEAS	46	11757B or 11758B only
MEAS TYPE	47	11757B or 11758B only
PAPER FEED	48	11757B only
RADIO SETUP	50	11757B or 11758B only
MEAS SETUP	51	11757B or 11758B only

If a key code is sent that is between 0 and 51 inclusive, but it does not appear in the table, it will be ignored. If a key code is sent that is between 0 and 51 inclusive, but it is not allowed in the Fader model receiving the key code, it will be ignored.

Example Command

To simulate pressing the (NOTCH FREQ) and (⇧) keys, run the following program:

```
10 OUTPUT 714; "SYST:KEY 8;KEY 30"
20 END
```

Example Query

To read the last key pressed, run the following program:

```
10  OUTPUT 714; "SYST:KEY?"
20  ENTER 714; Last_key
30  PRINT Last_key
40  END
```

SYSTem:TIME (Set the Clock Time)

Syntax

$$\texttt{SYSTem:TIME} \left\{ \begin{array}{l} \texttt{<NRf>} \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\}, \left\{ \begin{array}{l} \texttt{<NRf>} \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\}, \left\{ \begin{array}{l} \texttt{<NRf>} \\ \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\}$$

$$\texttt{SYSTem:TIME?} \left[\begin{array}{l} \left\{ \begin{array}{l} \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\}, \\ \left\{ \begin{array}{l} \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\}, \\ \left\{ \begin{array}{l} \texttt{MAXimum} \\ \texttt{MINimum} \end{array} \right\} \end{array} \right]$$

Description

Sets the Fader's clock time. The first parameter is hour, the second parameter is minutes, and the third parameter is seconds. The hour range is 0 to 23. The minutes range is 0 to 59. Seconds can only be 0 or 60. Values between 0 and 60 are rounded to the closest value of the two. If seconds is equal to 60 after rounding, seconds is rounded up to 0 and one is added to the minutes. If necessary, this "carry" will propagate up to the hour and to the date too. Preset has no affect on the Fader's clock time.

The query returns the Fader's current clock time. Seconds is always 0.

Example Command

To set the Fader's clock time to 3:59 PM, run the following program:

```
10 OUTPUT 714; "SYST:TIME 15,59,0"
20 END
```

Example Query

To read the current time from the Fader, run the following program:

```
10 OUTPUT 714; "SYST:TIME?"
20 ENTER 714;Hour,Minutes,Seconds
30 PRINT Hour,Minutes,Seconds
40 END
```

SYSTem:VERSion? (Read SCPI Version)

Syntax

```
SYSTem:VERSion?
```

Description

The "SYSTem:VERSion?" query returns the SCPI (Standard Commands for Programmable Instruments) version number that the Fader supports.

When the "SYSTem:VERSion?" query is sent, the following is returned:

xxxx.y<NL>

Where:

xxxx ::= the year of the SCPI standard, and

y ::= the version number within that year.

The SCPI version number that the Fader supports at the writing of this manual is 1991.0.

Example Command

There is no command for this query.

Example Query

To read the SCPI version number supported by the Fader, run the following program:

```
10  OUTPUT 714; "SYST:VERS?"
20  ENTER 714; Scpi_vers$
30  PRINT Scpi_vers$
40  END
```

STATus:OPERation:CONDition? (Read Operation Condition Register)

Syntax

```
STATus:OPERation:CONDition?
```

Description

The "STATus:OPERation:CONDition?" query returns the contents of the Operation Condition register.

The Operation Condition register is constantly updated as operational conditions occur. No conditions are saved in this register.

When you read the contents of the Operation Condition register, the value returned is the total bit weights of all the bits that are high at the time you read it. When you read the contents of the Operation Condition register using this command, the register's contents are not altered.

Operation Condition Register Bit Definitions

Bit	Weight	Condition
15	32768	Not used - always 0.
14	16384	Not used - always 0.
13	8192	Not used - always 0.
12	4096	Not used - always 0.
11	2048	Not used - always 0.
10	1024	Not used - always 0.
9	512	Not used - always 0.
8	256	0 = not printing; 1 = printing.
7	128	Not used - always 0.
6	64	Not used - always 0.
5	32	0 = not waiting for trigger; 1 = waiting for trigger.
4	16	0 = not measuring; 1 = measuring.
3	8	0 = not sweeping; 1 = sweeping.
2	4	Not used - always 0.
1	2	0 = instrument is not settling; 1 = instrument is settling.
0	1	No used - always 0.

Example Command

There is no command for this query.

Example Query

To read the contents of the Fader's Operation Condition register, run the following program:

```
10 OUTPUT 714; "STAT:OPER:COND?"
20 ENTER 714; Oper_cond
30 PRINT Oper_cond
40 END
```

Related Commands

STATus:OPERation?
STATus:OPERation:ENABle
STATus:OPERation:PTRansition
STATus:OPERation:NTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:OPERation:ENABle (Operation Event Enable Register)

Syntax

`STATus:OPERation:ENABle` *number*

Where:

number is the number representing the value of bits in the Operation Event Enable register to be set. The number can be from 0 to 65535.

`STATus:OPERation:ENABle?`

Returned format:

number<NL>

Where:

number ::= The current value of the Operation Event Enable register.

Description

The "STATus:OPERation:ENABle" command sets the contents of the Operation Event Enable register.

The Operation Event Enable register contains a mask value for the bits to be enabled to set bit 7 in the status byte. A one (1) in the Operation Event Enable register will enable the corresponding bit in the Operation Event register to set bit 7 in the status byte. A zero (0) will disable the bit.

Operation Event Enable Register Bit Definitions

Bit	Weight	Condition
15	32768	X - don't care.
14	16384	X - don't care.
13	8192	X - don't care.
12	4096	X - don't care.
11	2048	X - don't care.
10	1024	X - don't care.
9	512	X - don't care.
8	256	0 = inhibit a "printing" event from setting bit 7 in the status byte. 1 = enable a "printing" event to set bit 7 in the status byte.
7	128	X - don't care.
6	64	X - don't care.
5	32	0 = inhibit a "trigger wait" event from setting bit 7 in the status byte. 1 = enable a "trigger" wait event to set bit 7 in the status byte.
4	16	0 = inhibit a "measuring event" from setting bit 7 in the status byte. 1 = enable a "measuring event" to set bit 7 in the status byte.
3	8	0 = inhibit a "sweeping" event from setting bit 7 in the status byte. 1 = enable a "sweeping" event to set bit 7 in the status byte.
2	4	X - don't care.
1	2	0 = inhibit a "settling" event from setting bit 7 in the status byte. 1 = enable a "settling" event to set bit 7 in the status byte.
0	1	X - don't care.

Example Command

To enable a “settling” or a “sweeping” event in the Operation Event register to set bit 7 in the status byte, run the following program:

```
10 OUTPUT 714; "STAT:OPER:ENAB 10"
20 END
```

Example Query

To read the contents of the Fader’s Operation Event Enable register, run the following program:

```
10 OUTPUT 714;"STAT:OPER:ENAB?"
20 ENTER 714; Oper_enab
30 PRINT Oper_enab
40 END
```

Related Commands

STATus:OPERation?
STATus:OPERation:CONDition?
STATus:OPERation:PTRansition
STATus:OPERation:NTRansition
*STB?

See Also

Common Commands
“Related Documents” in Appendix D

STATus:OPERation? (Read Operation Event Register)

Syntax

```
STATus:OPERation[:EVENt]?
```

Description

The "STATus:OPERation[:EVENt]?" query returns the contents of the Operation Event register.

The Operation Event register holds a record of the state changes in the Operation Condition register that were enabled by the Operation Edge Registers. The Operation Edge Registers are the Operation Positive Transition Register and the Operation Negative Transition Register.

When you read the contents of the Operation Event register, the value returned is the total bit weights of all the bits that are high at the time you read it. When you read the contents of the Operation Event register using this command, the register is cleared (set to zero).

Operation Event Register Bit Definitions

Bit	Weight	Condition
15	32768	Not used - always 0.
14	16384	Not used - always 0.
13	8192	Not used - always 0.
12	4096	Not used - always 0.
11	2048	Not used - always 0.
10	1024	Not used - always 0.
9	512	Not used - always 0.
8	256	0 = a "printing" event has not occurred in the Operation Condition register that is defined by the Operation Edge registers. 1 = a "printing" event has occurred in the Operation Condition register that is defined by the Operation Edge registers.
7	128	Not used - always 0.
6	64	Not used - always 0.
5	32	0 = a "trigger wait" event has not occurred in the Operation Condition register that is defined by the Operation Edge registers. 1 = a "trigger wait" event has occurred in the Operation Condition register that is defined by the Operation Edge registers.
4	16	0 = a "measuring" event has not occurred in the Operation Condition register that is defined by the Operation Edge registers. 1 = a "measuring" event has occurred in the Operation Condition register that is defined by the Operation Edge registers.
3	8	0 = a "sweeping" event has not occurred in the Operation Condition register that is defined by the Operation Edge registers. 1 = a "sweeping" event has occurred in the Operation Condition register that is defined by the Operation Edge registers.

Operation Event Register Bit Definitions (continued)

Bit	Weight	Condition
2	4	Not used - always 0.
1	2	0 = a "settling" event has not occurred in the Operation Condition register that is defined by the Operation Edge registers. 1 = a "settling" event has occurred in the Operation Condition register that is defined by the Operation Edge registers.
0	1	Not used - always 0.

The Operation Event register is also set to zero (0) after the "*CLS" command is sent.

Example Command

There is no command for this query.

Example Query

To read the contents of the Fader's Operation Event register, run the following program:

```
10 OUTPUT 714; "STAT:OPER:EVEN?"
20 ENTER 714; Oper_event
30 PRINT Oper_event
40 END
```

Related Commands

STATus:OPERation:CONDition?
STATus:OPERation:ENABle
STATus:OPERation:PTRansition
STATus:OPERation:NTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:OPERation:NTRansition (Operation Negative Transition Reg)

Syntax

`STATus:OPERation:NTRansition` *number*

Where:

number is the number representing the value of bits in the Operation Negative Transition register to be set. The number must be from 0 to 65535.

`STATus:OPERation:NTRansition?`

Returned format:

number<NL>

Where:

number ::= The current value of the Operation Negative Transition register.

Description

The "STATus:OPERation:NTRansition" command is used to define which bits in the Operation Condition register will set the corresponding bit in the Operation Event register on a one to zero state change.

Operation Negative Transition Register Bit Definitions

Bit	Weight	Condition
15	32768	X - don't care.
14	16384	X - don't care.
13	8192	X - don't care.
12	4096	X - don't care.
11	2048	X - don't care.
10	1024	X - don't care.
9	512	X - don't care.
8	256	0 = inhibit a one to zero state change of the printing bit from setting bit 8 in the Operation Event register. 1 = enable a one to zero state change of the printing bit to set bit 8 in the Operation Event register.
7	128	X - don't care.
6	64	X - don't care.
5	32	0 = inhibit a one to zero state change of the trigger wait bit from setting bit 5 in the Operation Event register. 1 = enable a one to zero state change of the trigger wait bit to set bit 5 in the Operation Event register.
4	16	0 = inhibit a one to zero state change of the measuring bit from setting bit 4 in the Operation Event register. 1 = enable a one to zero state change of the measuring bit to set bit 4 in the Operation Event register.
3	8	0 = inhibit a one to zero state change of the sweeping bit from setting bit 3 in the Operation Event register. 1 = enable a one to zero state change of the sweeping bit to set bit 3 in the Operation Event register.
2	4	X - don't care.
1	2	0 = inhibit a one to zero state change of the "settling" bit from setting bit 1 in the Operation Event register. 1 = enable a one to zero state change of the "settling" bit to set bit 1 in the Operation Event register.
0	1	X - don't care.

Example Command

To enable the "measuring bit" in the Operation Condition register to set the "measuring bit" in the Operation Event register on a one to zero state change, run the following program:

```
10 OUTPUT 714; "STAT:OPER:NTR 16"
20 END
```

Example Query

To read the contents of the Fader's Operation Negative Transition register, run the following program:

```
10 OUTPUT 714;"STAT:OPER:NTR?"
20 ENTER 714; Oper_ntr
30 PRINT Oper_ntr
40 END
```

Related Commands

STATus:OPERation[:EVENt]?
STATus:OPERation:CONDition?
STATus:OPERation:ENABle
STATus:OPERation:PTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:OPERation:PTRansition (Operation Positive Transition Reg)

Syntax

```
STATus:OPERation:PTRansition number
```

Where:

number is the number representing the value of bits in the Operation Positive Transition register to be set. The number must be from 0 to 65535.

```
STATus:OPERation:PTRansition?
```

Returned format:

number<NL>

Where:

number ::= The current value of the Operation Positive Transition register.

Description

The "STATus:OPERation:PTRansition" command is used to define which bits in the Operation Condition register will set the corresponding bit in the Operation Event register on a zero to one state change.

Operation Positive Transition Register Bit Definitions

Bit	Weight	Condition
15	32768	X - don't care.
14	16384	X - don't care.
13	8192	X - don't care.
12	4096	X - don't care.
11	2048	X - don't care.
10	1024	X - don't care.
9	512	X - don't care.
8	256	0 = inhibit a zero to one state change of the "printing" bit from setting bit 8 in the Operation Event register. 1 = enable a zero to one state change of the "printing" bit to set bit 8 in the Operation Event register.
7	128	X - don't care.
6	64	X - don't care.
5	32	0 = inhibit a zero to one state change of the "trigger wait" bit from setting bit 5 in the Operation Event register. 1 = enable a zero to one state change of the "trigger wait" bit to set bit 5 in the Operation Event register.
4	16	0 = inhibit a zero to one state change of the "measuring" bit from setting bit 4 in the Operation Event register. 1 = enable a zero to one state change of the "measuring" bit to set bit 4 in the Operation Event register.
3	8	0 = inhibit a zero to one state change of the "sweeping" bit from setting bit 3 in the Operation Event register. 1 = enable a zero to one state change of the "sweeping" bit to set bit 3 in the Operation Event register.
2	4	X - don't care.
1	2	0 = inhibit a zero to one state change of the "settling" bit from setting bit 1 in the Operation Event register. 1 = enable a zero to one state change of the "settling" bit to set bit 1 in the Operation Event register.
0	1	X - don't care.

Example Command

To enable the "settling bit" in the Operation Condition register to set the "settling bit" in the Operation Event register on a zero to one state change, run the following program:

```
10 OUTPUT 714; "STAT:OPER:PTR 2"
20 END
```

Example Query

To read the contents of the Fader's Operation Positive Transition register, run the following program:

```
10 OUTPUT 714;"STAT:OPER:PTR?"
20 ENTER 714; Oper_ptr
30 PRINT Oper_ptr
40 END
```

Related Commands

STATus:OPERation[:EVENt]?
STATus:OPERation:CONDition?
STATus:OPERation:ENABle
STATus:OPERation:NTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:PRESet (Preset STATus Registers)

Syntax

```
STATus:PRESet
```

Description

The "STATus:PRESet" command sets the following STATus registers to a preset state:

Operation Event Enable register (STAT:OPER:ENAB)

Operation Negative Transition register (STAT:OPER:NTR)

Operation Positive Transition register (STAT:OPER:PTR)

Questionable Event Enable register (STAT:QUES:ENAB)

Questionable Negative Transition register (STAT:QUES:NTR)

Questionable Positive Transition register (STAT:QUES:PTR)

When the "STATus:PRESet" command is sent, the status registers are preset as shown in the following table.

Status Register Preset State

Register	STATus:PRESet Value
Operation Event Enable register	0
Operation Negative Transition register	0
Operation Positive Transition register	65535
Questionable Event Enable register	0
Questionable Negative Transition register	0
Questionable Positive Transition register	65535

Example Command

To set the status registers listed above to a preset state, run the following program:

```
10 OUTPUT 714; "STAT:PRES"
20 END
```

Example Query

There is no query for this command.

Related Commands

STATus:OPERation[:EVENt]?
STATus:OPERation:CONDition?
STATus:OPERation:ENABle
STATus:OPERation:NTRansition
STATus:OPERation:PTRansition
Status:Questionable?
STATus:QUEStionable:CONDition?
STATus:QUEStionable:ENABle
STATus:QUEStionable:NTRansition
STATus:QUEStionable:PTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:QUEStionable:CONDition? (Read Questionable Condition Register)

Syntax

```
STATus:QUEStionable:CONDition?
```

Description

The "STATus:QUEStionable:CONDition?" query returns the contents of the Questionable Condition register.

The Questionable Condition register is constantly updated as questionable conditions change. No conditions are saved in this register.

When you read the contents of the Questionable Condition register, the value returned is the total bit weights of all the bits that are high at the time you read it. When you read the contents of the Questionable Condition register using this command, the register's contents are not altered.

Questionable Condition Register Bit Definitions

Bit	Weight	Condition
15	32768	Not used - always 0.
14	16384	Not used - always 0.
13	8192	Not used - always 0.
12	4096	Not used - always 0.
11	2048	Not used - always 0.
10	1024	Not used - always 0.
9	512	Not used - always 0.
8	256	0 = instrument is calibrated. 1 = instrument is uncalibrated.
7	128	Not used - always 0.
6	64	Not used - always 0.
5	32	0 = frequency is calibrated; 1= frequency is uncalibrated.
4	16	Not used - always 0.
3	8	0 = depth or attenuation is calibrated; 1 = depth or attenuation is uncalibrated.
2	4	Not used - always 0.
1	2	Not used - always 0.
0	1	Not used - always 0.

Example Command

There is no command for this query.

Example Query

To read the contents of the Fader's Questionable Condition register, run the following program:

```
10 OUTPUT 714; "STAT:QUES:COND?"
20 ENTER 714; Ques_cond
30 PRINT Ques_cond
40 END
```

Related Commands

Status:Questionable?
STATus:QUEStionable:ENABle
STATus:QUEStionable:PTRansition
STATus:QUEStionable:NTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:QUEStionable:ENABle (Questionable Event Enable Register)

Syntax

```
STATus:QUEStionable:ENABle number
```

Where:

number is the number representing the value of bits in the Questionable Event Enable register to be set. The number must be from 0 to 65535.

```
STATus:QUEStionable:ENABle?
```

Returned format:

number<NL>

Where:

number ::= The current value of the Questionable Event Enable register.

Description

The "STATus:QUEStionable:ENABle" command sets the contents of the Questionable Event Enable register.

The Questionable Event Enable register contains a mask value for the bits to be enabled to set bit 3 in the status byte. A one (1) in the Questionable Event Enable register will enable the corresponding bit in the Questionable Event register to set bit 3 in the status byte. A zero (0) will disable the bit.

Questionable Event Enable Register Bit Definitions

Bit	Weight	Condition
15	32768	X - don't care.
14	16384	X - don't care.
13	8192	X - don't care.
12	4096	X - don't care.
11	2048	X - don't care.
10	1024	X - don't care.
9	512	X - don't care.
8	256	0 = inhibit an "instrument uncalibrated" event from setting bit 3 in the status byte. 1 = enable an "instrument uncalibrated" event to set bit 3 in the status byte.
7	128	X - don't care.
6	64	X - don't care.
5	32	0 = inhibit a "frequency uncalibrated" event from setting bit 3 in the status byte. 1 = enable a "frequency uncalibrated" event to set bit 3 in the status byte.
4	16	X - don't care.
3	8	0 = inhibit a "depth or attenuation uncalibrated" event from setting bit 3 in the status byte. 1 = enable a "depth or attenuation uncalibrated" event to set bit 3 in the status byte.
2	4	X - don't care.
1	2	X - don't care.
0	1	X - don't care.

Example Command

To enable a "frequency uncalibrated" event in the Questionable Event register to set bit 3 in the status byte, run the following program:

```
10 OUTPUT 714 "STAT:QUES:ENAB 32"
20 END
```

Example Query

To read the contents of the Fader's Questionable Event Enable register, run the following program:

```
10 OUTPUT 714;"STAT:QUES:ENAB?"
20 ENTER 714; Ques_enab
30 PRINT Ques_enab
40 END
```

Related Commands

Status:Questionable?
STATus:QUEStionable:CONDition?
STATus:QUEStionable:PTRansition
STATus:QUEStionable:NTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:QUEStionable? (Read Questionable Event Register)

Syntax

```
STATus:QUEStionable?
```

Description

The "STATus:QUEStionable?" query returns the contents of the Questionable Event register.

The Questionable Event register holds a record of the state changes in the Questionable Condition register that were enabled by the Questionable Edge Registers. The Questionable Edge Registers are the Questionable Positive Transition Register and the Questionable Negative Transition Register.

When you read the contents of the Questionable Event register, the value returned is the total bit weights of all the bits that are high at the time you read it. When you read the contents of the Questionable Event register using this command, the register is cleared (set to zero).

Questionable Event Register Bit Definitions

Bit	Weight	Condition
15	32768	Not used - always 0.
14	16384	Not used - always 0.
13	8192	Not used - always 0.
12	4096	Not used - always 0.
11	2048	Not used - always 0.
10	1024	Not used - always 0.
9	512	Not used - always 0.
8	256	0 = an “instrument uncalibrated” event has not occurred in the Questionable Condition register that is defined by the Questionable Edge registers. 1 = an “instrument uncalibrated” event has occurred in the Questionable Condition register that is defined by the Questionable Edge registers.
7	128	Not used - always 0.
6	64	Not used - always 0.
5	32	0 = a “frequency uncalibrated” event has not occurred in the Questionable Condition register that is defined by the Questionable Edge registers. 1 = a “frequency uncalibrated” event has occurred in the Questionable Condition register that is defined by the Questionable Edge registers.
4	16	Not used - always 0.
3	8	0 = a “depth or attenuation uncalibrated” event has not occurred in the Questionable Condition register that is defined by the Questionable Edge registers. 1 = a “depth or attenuation uncalibrated” event has occurred in the Questionable Condition register that is defined by the Questionable Edge registers.
2	4	Not used - always 0.
1	2	Not used - always 0.
0	1	Not used - always 0.

The Questionable Event register is also set to zero (0) after the “*CLS” command is sent.

Example Command

There is no command for this query.

Example Query

To read the contents of the Fader's Questionable Event register, run the following program:

```
10 OUTPUT 714; "STAT:QUES:EVEN?"
20 ENTER 714; Ques_event
30 PRINT Ques_event
40 END
```

Related Commands

STATus:QUEStionable:CONDition?
STATus:QUEStionable:ENABle
STATus:QUEStionable:PTRansition
STATus:QUEStionable:NTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:QUEStionable:NTRansition (Questionable Negative Transition Reg)

Syntax

`STATus:QUEStionable:NTRansition` *number*

Where:

number is the number representing the value of bits in the Questionable Negative Transition register to be set. The number must be from 0 to 65535.

`STATus:QUEStionable:NTRansition?`

Returned format:

number<NL>

Where:

number ::= The current value of the Questionable Negative Transition register.

Description

The "STATus:QUEStionable:NTRansition" command is used to define which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register on a one to zero state change.

Questionable Negative Transition Register Bit Definitions

Bit	Weight	Condition
15	32768	X - don't care.
14	16384	X - don't care.
13	8192	X - don't care.
12	4096	X - don't care.
11	2048	X - don't care.
10	1024	X - don't care.
9	512	X - don't care.
8	256	0 = inhibit a one to zero state change of the "instrument uncalibrated" bit from setting bit 8 in the Questionable Event register. 1 = enable a one to zero state change of the "instrument uncalibrated" bit to set bit 8 in the Questionable Event register.
7	128	X - don't care.
6	64	X - don't care.
5	32	0 = inhibit a one to zero state change of the "frequency uncalibrated" bit from setting bit 5 in the Questionable Event register. 1 = enable a one to zero state change of the "frequency uncalibrated" bit to set bit 5 in the Questionable Event register.
4	16	X - don't care.
3	8	0 = inhibit a one to zero state change of the "depth or attenuation uncalibrated" bit from setting bit 3 in the Questionable Event register. 1 = enable a one to zero state change of the "depth or attenuation uncalibrated" bit to set bit 3 in the Questionable Event register.
2	4	X - don't care.
1	2	X - don't care.
0	1	X - don't care.

Example Command

To enable the "instrument uncalibrated" bit in the Questionable Condition register to set the "instrument uncalibrated" bit in the Operation Event register on a one to zero state change, run the following program:

```
10 OUTPUT 714; "STAT:QUES:NTR 256"
20 END
```

Example Query

To read the contents of the Fader's Questionable Negative Transition register, run the following program:

```
10 OUTPUT 714;"STAT:QUES:NTR?"
20 ENTER 714; Ques_ntr
30 PRINT Ques_ntr
40 END
```

Related Commands

Status:Questionable?
STATus:QUEStionable:CONDition?
STATus:QUEStionable:ENABle
STATus:QUEStionable:PTRansition
*STB?

See Also

Common Commands
"Related Documents" in Appendix D

STATus:QUEStionable:PTRansition (Questionable Positive Transition Register)

Syntax

`STATus:QUEStionable:PTRansition` *number*

Where:

number is the number representing the value of bits in the Questionable Positive Transition register to be set. The number must be from 0 to 65535.

`STATus:QUEStionable:PTRansition?`

Returned format:

number<NL>

Where:

number ::= The current value of the Questionable Positive Transition register.

Description

The "STATus:QUEStionable:PTRansition" command is used to define which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register on a zero to one state change.

Questionable Positive Transition Register Bit Definitions

Bit	Weight	Condition
15	32768	X - don't care.
14	16384	X - don't care.
13	8192	X - don't care.
12	4096	X - don't care.
11	2048	X - don't care.
10	1024	X - don't care.
9	512	X - don't care.
8	256	0 = inhibit a zero to one state change of the "instrument uncalibrated" bit from setting bit 8 in the Questionable Event register. 1 = enable a zero to one state change of the "instrument uncalibrated" bit to set bit 8 in the Questionable Event register.
7	128	X - don't care.
6	64	X - don't care.
5	32	0 = inhibit a zero to one state change of the "frequency uncalibrated" bit from setting bit 5 in the Questionable Event register. 1 = enable a zero to one state change of the "frequency uncalibrated" bit to set bit 5 in the Questionable Event register.
4	16	X - don't care.
3	8	0 = inhibit a zero to one state change of the "depth or attenuation uncalibrated" bit from setting bit 3 in the Questionable Event register. 1 = enable a zero to one state change of the "depth or attenuation uncalibrated" bit to set bit 3 in the Questionable Event register.
2	4	X - don't care.
1	2	X - don't care.
0	1	X - don't care.

Example Command

To enable the “frequency uncalibrated” bit in the Questionable Condition register to set the “instrument uncalibrated” bit in the Operation Event register on a zero to one state change, run the following program:

```
10 OUTPUT 714; "STAT:QUES:PTR 32"
20 END
```

Example Query

To read the contents of the Fader’s Questionable Positive Transition register, run the following program:

```
10 OUTPUT 714;"STAT:QUES:PTR?"
20 ENTER 714; Ques_ptr
30 PRINT Ques_ptr
40 END
```

Related Commands

Status:Questionable?
STATus:QUEStionable:CONDition?
STATus:QUEStionable:ENABle
STATus:QUEStionable:NTRansition
*STB?

See Also

Common Commands
“Related Documents” in Appendix D

DISPlay (Enable/Disable Display)

Syntax

$$\texttt{DISPlay}\begin{Bmatrix}\texttt{ON}\\\texttt{OFF}\end{Bmatrix}$$

```
DISPlay?
```

Description

Enables/Disables the display. Preset: ON. Presetting the instrument will turn the display ON. Cycling the power will turn the display on. When the display is off, only the message “DISPLAY OFF” will be displayed on the Fader. The display state is saved in the save/recall registers.

The query returns whether the display is enabled or disabled.

Example Command

Disables the display:

```
OUTPUT 714;"DISP OFF"
```

Example Query

Returns 1 (if display is enabled) or 0 (if display is disabled):

```
OUTPUT 714;"DISP?"
ENTER 714;Disp_state
```

A

Error Messages

Description

The HP 11757B generates error messages to indicate operating problems, and incorrect HP-IB entries. These error messages are only available for viewing over HP-IB. The Front Panel will only display operational messages.

HP-IB Output Format

When an error occurs, an error number will be stored in the Fader HP-IB error queue. The HP-IB error queue is an internal Fader buffer that can hold sixteen error numbers. Every time a SYST:ERR? query is executed, one error is returned with an error message string. At the end of the string there may be another number which corresponds to the Detail Number given in the table below. SYST:ERR? is described in the "HP-IB Commands" chapter.

If more than sixteen errors occur before you query the error buffer, the error −350,"Queue overflow" will be stored in a 16th location. If you read through the error messages and find the error −350,"Queue overflow", this means that the error queue overflowed at that point.

Example

To read the first error in the error queue, run the following program:

```
10 DIM B$[160]
20 OUTPUT 714; "SYST:ERR?"
30 ENTER 714; A,B$
40 PRINT "ERROR =";A,B$
50 END
```

To read the entire contents of the error queue, run the following program:

```
10 DIM B$[160]
20    OUTPUT 714; "SYST:ERR?"
30    ENTER 714; A, B$
40    PRINT A, B$
50 IF A < > 0 THEN 20
60 END
```

Status Reporting

When an error is reported to the HP-IB error queue, one of the Standard Event Status Register's error bits will also be set. Which bit is set depends on the value in the "Error Number" column in table A-1, "Error Messages". If the Error Number is from -199 to -100, the Command Error bit is set. If the Error Number is from -299 to -200, the Execution Error bit is set. If the Error Number is from -399 to -300 or from 1 to 32767, the Device Dependent Error bit is set. If the Error Number is from -499 to -400, the Query Error bit is set.

See the *ESR? query in the "Common Commands" chapter for more information about the Standard Event Status Register bit definitions.

Error Messages

Table A-1, "Error Messages", describes all measurement and entry errors. The error number, error message, detail number (if any), and action typically required to remove the error-causing condition are given.

Table A-1. Error Messages

Error Number	Message	Detail Number	Action Required
−440	Query UNTERMINATED after indefinite response		Correct the HP-IB controller program so that the query that returns indefinite length block data is the last item on the program line.
−430	Query DEADLOCKED		Correct the HP-IB controller program so that no more than eight queries are executed within the same line of the program.
−420	Query UNTERMINATED		Correct the HP-IB controller program so that the controller terminates commands with the newline character (NL) before the controller attempts to read query response data.
−410	Query INTERRUPTED		Check the HP-IB controller program to see if the controller is programmed to read the entire query response data before issuing a subsequent command.
−350	Queue overflow		The error queue overflowed at this point and this message replaced the 16th error. No action is required. Note: to clear the error queue use *CLS.
−311	Memory error;EEPROM is write protected	2525	An attempt to write to the EEPROM failed because the EEPROM was write protected. See Service Manual for how to unprotect the EEPROM.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−311	Memory error;Write to EEPROM was unsuccessful	2527	An attempt to write to the EEPROM failed. See Service Manual for troubleshooting information.
−311	Memory error;EEPROM past 1000 write limit - cal data was not copied	2528	An attempt to write to the EEPROM failed because the EEPROM has already been written to 1000 times. The calibration data was not copied to EEPROM. See Service Manual for troubleshooting information.
−311	Memory error;EEPROM is disabled; try again - cal data was not copied	2529	An attempt to write to the EEPROM failed because the EEPROM was disabled. See Service Manual for how to enable the EEPROM.
−311	Memory error;EEPROM sumcheck fail	1301	The EEPROM sumcheck failed which indicates that the calibration data stored there is bad. See Service Manual for troubleshooting information.
−311	Memory error;No data found in EEPROM	1302	The EEPROM has no data in it. See Service Manual for troubleshooting information.
−311	Memory error;Cannont read EEPROM	1303	There is a hardware problem with the EEPROM or the EEPROM does not exist. See Service Manual for troubleshooting information.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−260	Expression error		A syntax error occurred within an expression. Check that the expression contains correct numeric data or the words MAX, MAXIMUM, MIN, MINIMUM, DEF or DEFAULT.
−230	Data corrupt or stale;Data is invalid	500	Measurement data cannot be accessed because it does not exist or it is invalid. A measurement must be successfully completed before it can be accessed. Preset marks the measurement data as invalid.
−230	Data corrupt or stale;Measurement in progress	501	Measurement data cannot be accessed because the measurement is still running. Wait until the measurement is finished before accessing the measurement data.
−230	Data corrupt or stale;No measurement data to print	751	Measurement data cannot be accessed because it does not exist or it is invalid. A measurement must be successfully completed before the data can be printed. Preset marks the measurement data as invalid.
−223	Too much data		Correct the HP-IB controller program so that there is less data on a single command line. The Fader does not have enough memory to buffer it all.
−222	Data out of range		Correct the HP-IB numeric data so that it is within the range of 1e9999 to 1e−9999.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;BAD NUMBER OF AVERAGES SENT TO ADC	1492	Select a number of A/D averages from 1 to 100.
−222	Data out of range;NON-DECIMAL DATA OVERFLOW	1535	Correct the non-decimal numeric data so that it contains eight bytes or less.
−222	Data out of range;NO SWEEP FREQ	2005	Select a non-swept notch frequency within the following ranges: Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz
−222	Data out of range;HPIB ADDRESS	2015	Select a HP-IB address from 0 to 30. 40 is for listen only. 50 is for talk only.
−222	Data out of range;NO SWEEP DEPTH	2025	Select a non-swept notch depth from 0 dB to 99.9 dB.
−222	Data out of range;NO SWEEP ATTEN	2030	Select a non-swept attenuation from −30 dB to 99.9 dB.
−222	Data out of range;STATE STORE	2035	Select a save register number from 1 to 10.
−222	Data out of range;START FREQ	2040	Select a start notch frequency within the following ranges: Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz
−222	Data out of range;STOP FREQ	2045	Select a stop notch frequency within the following ranges: Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;START ATTEN	2050	Select a start attenuation from −30 dB to 99.9 dB.
−222	Data out of range;STOP ATTEN	2055	Select a stop attenuation from −30 dB to 99.9 dB.
−222	Data out of range;START DEPTH	2060	Select a start notch depth from 0 dB to 99.9 dB.
−222	Data out of range;STOP DEPTH	2065	Select a stop notch depth from 0 dB to 99.9 dB.
−222	Data out of range;DIAG:IBUS:DIR	2070	Correct the HP-IB command DIAG:IBUS:DIR or DIAG:IBUS:DIR? so that its parameters are within the following ranges: Shift chain (1st parameter): 0, 1, 3, or 4. Start bit (2nd parameter): 0 to 71. Bit field length (3rd parameter): 1 to 32. Data (4th parameter [Command only]): 0 to 2147483647
−222	Data out of range;INSTRUMENT CONTROL	2075	Select Fader control values within the following ranges: Destination number: 0 to 32 New value: 0 to 16383
−222	Data out of range;STATE RECALL	2080	Select a recall register number from 1 to 10.
−222	Data out of range;SLEW	2085	Select a slew time from 10ms to 99.99s

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;SWEEP TIME	2090	Select a sweep time from 10ms to 99.99s
−222	Data out of range;NO SWEEP MIN NON-MIN	2130	Select a non-swept phase of 0(NONM) or 1(MIN).
−222	Data out of range;START MIN NON-MIN	2135	Select a start phase of 0(NONM) or 1(MIN).
−222	Data out of range;STOP MIN NON-MIN	2140	Select a stop phase of 0(NONM) or 1(MIN).
−222	Data out of range;3-TONE FREQ OFFSET	2175	Select a three tone source frequency offset from -5 MHz to 5 MHz.
−222	Data out of range;3-TONE LEVEL	2180	Select a three tone source frequency offset from -60 dBm to 10 dBm.
−222	Data out of range;SLOPES	2190	Select a fixed slope setting of −0.5 dB/MHz, −0.3 dB/MHz, 0.3 dB/MHz, or 0.5 dB/MHz.
−222	Data out of range;DIAG:AVER	2195	Correct the DIAG:AVER HP-IB command so that the number of averages is from 1 to 100.
−222	Data out of range;SYST:KEY	2245	Correct the SYST:KEY HP-IB command so that the key chosen is from 0 to 51.
−222	Data out of range;DIAG:ABUS?	2270	Correct the DIAG:ABUS? HP-IB command so that the A/D channel chosen is from 0 to 7.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;DIAG:PROF	2295	Correct the HP-IB command DIAG:PROF so that its parameters are within the following ranges: Notch Frequency (1st parameter): Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz Phase (2nd parameter): 0(NONM) or 1(MIN) Notch depth (3rd parameter): 0 dB to 99.9 dB Attenuation (4th parameter): −30 dB to 99.9 dB Time (5th parameter): 100 ms to 99.99s
−222	Data out of range;INCORRECT BAND SELECTION WITH CAL:MINDEPTH:DATA	2317	Correct the band number sent with the Min Notch Depth calibration table.
−222	Data out of range;B VALUE OUT OF RANGE WITH CAL:MINDEPTH:DATA	2318	Correct the B values sent with the Min Notch Depth calibration table to be within the range of 0 to 29997.
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:MINDEPTH:DATA	2319	Correct the dac values sent with the Min Notch Depth calibration table to be within the range of 0 to 4095.
−222	Data out of range;INCORRECT BAND SELECTION WITH CAL:NMINDEPTH:DATA	2322	Correct the band number sent with the Non-Min Notch Depth calibration table.
−222	Data out of range;B VALUE OUT OF RANGE WITH CAL:NMINDEPTH:DATA	2323	Correct the B values sent with the Non-Min Notch Depth calibration table to be within the range of 0 to 29997.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:NMINDEPTH:DATA	2324	Correct the dac values sent with the Non-Min Notch Depth calibration table to be within the range of 0 to 4095.
−222	Data out of range;INCORRECT BAND SELECTION WITH CAL:FREQ:DATA	2327	Correct the band number sent with the Minimum Notch Frequency calibration table.
−222	Data out of range;FREQUENCY OUT OF RANGE WITH CAL:FREQ:DATA	2328	Correct the frequencies sent with the Minimum Notch Frequency calibration table to be within the range of 0 to 25000.
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:FREQ:DATA	2329	Correct the dac values sent with the Minimum Notch Frequency calibration table to be within the range of 0 to 4095.
−222	Data out of range;INCORRECT BAND SELECTION WITH CAL:MINFLAT:DATA	2332	Correct the band number sent with the Min Flatness calibration table.
−222	Data out of range;FREQUENCY OUT OF RANGE WITH CAL:MINFLAT:DATA	2333	Correct the frequencies sent with the Min Flatness calibration table to be within the range of 0 to 25000.
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:MINFLAT:DATA	2334	Correct the DAC values sent with the Min Flatness calibration table to be within the range of 0 to 4095.
−222	Data out of range;INCORRECT BAND SELECTION WITH CAL:NMINFLAT:DATA	2337	Correct the band number sent with the Non-Min Flatness calibration table.
−222	Data out of range;FREQUENCY OUT OF RANGE WITH CAL:NMINFLAT:DATA	2338	Correct the frequencies sent with the Non-Min Flatness calibration table to be within the range of 0 to 25000.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:NMINFLAT:DATA	2339	Correct the dac values sent with the Non-Min Flatness calibration table to be within the range of 0 to 4095.
−222	Data out of range;INCORRECT BAND SELECTION WITH CAL:ATT:DATA	2342	Correct the band number sent with the Attenuation calibration table.
−222	Data out of range;ATTENUATION OUT OF RANGE WITH CAL:ATT:DATA	2343	Correct the attenuations sent with the Attenuation calibration table to be within the range of −15000 to 30000.
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:ATT:DATA	2344	Correct the DAC values sent with the Attenuation calibration table to be within the range of 0 to 4095.
−222	Data out of range;LIST:FREQ	2345	Correct the HP-IB command LIST:FREQ so that its notch frequency parameters are all within the following ranges: Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz
−222	Data out of range;CAL:PROF	2350	Correct the HP-IB command CAL:PROF so that its parameters are within the following ranges: Notch Frequency (1st parameter): Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz Phase (2nd parameter): 0(NONM) or 1(MIN) Notch depth (3rd parameter): 0dB to 99.9 dB Attenuation (4th parameter): −30 dB to 99.9 dB

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;LIST:POW:ATT	2360	Correct the HP-IB command LIST:POW:ATT so that its attenuation parameters are all from −30 dB to 99.9 dB.
−222	Data out of range;LIST:POW:DEPTH	2370	Correct the HP-IB command LIST:POW:DEPT so that its notch depth parameters are all from 0 dB to 99.9 dB.
−222	Data out of range;LEVEL OUT OF RANGE WITH CAL:TTSLEVEL:DATA	2383	Correct the levels sent with the three tone source level calibration table to be within the range of -30000 to 30000.
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:TTSLEVEL:DATA	2384	Correct the dac values sent with the three tone source level calibration table to be within the range of 0 to 4095.
−222	Data out of range;FREQUENCY OUT OF RANGE WITH CAL:TTSFREQ:DATA	2388	Correct the frequencies sent with the three tone source frequency calibration table to be within the range of -10000 to 10000.
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:TTSFREQ:DATA	2389	Correct the dac values sent with the three tone source frequency calibration table to be within the range of 0 to 1023.
−222	Data out of range;LIST:TIME	2395	Correct the HP-IB command LIST:TIME so that its time parameters are all from 100 ms to 10s.
−222	Data out of range;LIST:POW:DEPT:PHAS	2405	Correct the HP-IB command LIST:POW:DEPT:PHAS so that its notch phase parameters are all 0(NONM) or 1(MIN).

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;LIST:SSEQ	2415	Correct the HP-IB command LIST:SSEQ so that its start and stop indices are from 1 to 2000 (4000 with Option 001).
−222	Data out of range;DELAY	2425	Select a delay from 1 ns to 25 ns.
−222	Data out of range;AGC CENTER FREQ	2450	Select an AGC center frequency within the following ranges: Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz
−222	Data out of range;AGC BANDWIDTH	2455	Select an AGC bandwidth from 20 MHz to 40 MHz.
−222	Data out of range;3-TONE FREQ LIST	2500	Select a three tone source frequency within the following ranges: Without Option 143: 67 MHz, 70 MHz, or 75 MHz. With Option 143: 137 MHz, 140 MHz, or 145 MHz.
−222	Data out of range;INCORRECT BAND SELECTION WITH CAL:FREQNM:DATA	2532	Correct the band number sent with the Non-minimum Notch Frequency calibration table.
−222	Data out of range;FREQUENCY OUT OF RANGE WITH CAL:FREQNM:DATA	2533	Correct the frequencies sent with the Non-minimum Notch Frequency calibration table to be within the range of 0 to 25000.
−222	Data out of range;DAC VALUE OUT OF RANGE WITH CAL:FREQNM:DATA	2534	Correct the dac values sent with the Non-minimum Notch Frequency calibration table to be within the range of 0 to 4095.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;DIAG:OPT	2535	Correct the HP-IB command DIAG:OPT so that it is a valid instrument option number. See Service Manual for DIAG:OPT option numbers.
−222	Data out of range;TEST MASK FREQUENCY	2575	Select a test mask “x-value” from 1E6 to 6E9.
−222	Data out of range;TEST MASK DEPTH	2577	Select a test mask depth from 0 dB to 99.9 dB.
−222	Data out of range;SET TIME	2590	Select a front panel TIME from 0000 to 2359.
−222	Data out of range;SET DATE	2595	Select a front panel DATE from 000101 to 991231.
−222	Data out of range;RADIO BIT RATE	2600	Select a radio bit rate from 10 kHz to 200 MHz.
−222	Data out of range;RADIO SCALE FACTOR	2605	Select a radio error scale factor from 0.01 to 100.
−222	Data out of range;MEAS SETUP DATA POINTS	2620	Select a front panel number of measurement points from 1 to 100.
−222	Data out of range;MEAS SETUP START FREQ	2625	Select a front panel measurement start notch frequency within the following ranges: Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;MEAS SETUP STOP FREQ	2630	Select a front panel measurement stop notch frequency within the following ranges: Option 000, 30 MHz to 100 MHz Option 140, 90 MHz to 190 MHz Option 147, 30 MHz to 190 MHz
−222	Data out of range;MEAS SETUP START RATE	2635	Select a measurement start rate from 1 MHz/S to 6 GHz/S.
−222	Data out of range;MEAS SETUP STOP RATE	2640	Select a measurement stop rate from 1 MHz/S to 6 GHz/S.
−222	Data out of range;MEAS SETUP ERROR BITS	2645	Select a front panel error bit value from 2 to 15.
−222	Data out of range;MEAS SETUP SPEED	2660	Select a measurement speed from the following values: 10 MHz/S, 30 MHz/S, 100 MHz/S, 300 MHz/S, 600 MHz/S and 1200 MHz/S.
−222	Data out of range;MEAS SETUP DEVIATION	2665	Select a measurement deviation from the following values: ±1 MHz, ±2 MHz, ±4 MHz, ±6 MHz, ±10 MHz, and ±20 MHz.
−222	Data out of range;ERROR:IMP	2690	Correct the HP-IB command ERROR:IMP so that it has a parameter value of 75 Ohm or 10 kOhm.
−222	Data out of range;CALC:LIM:CONT:DATA	2720	Select a test mask “x-value” from 1E6 to 6E9.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;CALC:LIM:LOW:DATA	2735	Select a test mask depth from 0 dB to 99.9 dB.
−222	Data out of range;DIAG:PIT	2755	Correct the HP-IB command DIAG:PIT or DIAG:PIT? so that its 1st parameter has a value from 0 to 11 and its 2nd parameter (command only) has a value from 0 to 255.
−222	Data out of range;SYST:DATE	2770	Correct the HP-IB command SYST:DATE so that its 1st parameter value is from 1970 to 2069, its 2nd parameter value from 1 to 12. The 3rd parameter value must be correct for the month and year selected by the first two parameters (leap years are observed). This error could also occur if the data were 2069,12,31 and SYST:TIME tries to add one day to the date.
−222	Data out of range;SYST:TIME	2775	Correct the HP-IB command SYST:TIME so that its 1st parameter value is from 0 to 23, its 2nd parameter value from 0 to 59 and its 3rd parameter value equal to 0 or 60. This error could also occur if the data were 2069,12,31 and SYST:TIME tries to add one day to the date.
−222	Data out of range;TRIG2:BER:THR	2820	Correct the HP-IB command TRIG2:BER:THR so that its parameter value is one of the following values: 1E−3, 3E−4, 1E−4, 3E−5, 1E−5, and 1E−6,

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;INP1:IMP	2830	Correct the HP-IB command INP1:IMP so that it is has a parameter value of 75 Ohm.
−222	Data out of range;ALARM:IMP	2840	Correct the HP-IB command ALARM:IMP so that it is has a parameter value of 10 kOhm.
−222	Data out of range;TRIG2:BER:ECOUNT	2850	Correct the HP-IB command TRIG2:BER:ECOUNT so that its parameter value is one of the following values: 1, 2, 4, 8 ,16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 9182, 16384, and 32768.
−222	Data out of range;RADIO ERROR THRESHOLD	2855	Select an error input threshold from −5 V to +5 V.
−222	Data out of range;CONFIGURE	2860	Correct the HP-IB command CONF:ARR[:STAT] or CONF:ARR:DYN:FM so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), its 3rd parameter is BER or ALARm, and its 4th parameter is ON or OFF.
−222	Data out of range;CONF:ARR:HYST	2865	Correct the HP-IB command CONF:ARR:HYST so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is BER or ALARm, and its 3rd parameter is ON or OFF.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;MEASURE?	2875	Correct the HP-IB query MEAS:ARR[:STAT]? or MEAS:ARR:DYN:FM? so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), its 3rd parameter is BER or ALARm, and its 4th parameter is ON or OFF.
−222	Data out of range;MEAS:ARR:HYST?	2880	Correct the HP-IB query MEAS:ARR:HYST? so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is BER or ALARm, and its 3rd parameter is ON or OFF.
−222	Data out of range;READ? or FETCH?	2890	Correct the HP-IB query FETC:ARR[:STAT]? or FETC:ARR:DYN:FM? or READ:ARR[:STAT]? or READ:ARR:DYN:FM? so that its 1st parameter is the number of points from 1 to 100, and its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH).
−222	Data out of range;READ:ARR:HYST? or FETCH:ARR:HYST?	2895	Correct the HP-IB query READ:ARR:HYST? or FETC:ARR:HYST? so that its parameter is the number of points from 1 to 100.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;FETCH?	2910	Correct the HP-IB query FETCH? so that its 1st parameter is the number of points from 1 to 100, and its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH) (if last measurement was HYSTeresis). If last measurement was RECOVERY, FETCH? shouldn't have any parameters.
−222	Data out of range;CONF:ARR:DYN	2925	Correct the HP-IB command CONF:ARR:DYN so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), and its 3rd parameter is BER or ALARm.
−222	Data out of range;MEAS:ARR:DYN?	2930	Correct the HP-IB query MEAS:ARR:DYN so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), and its 3rd parameter is BER or ALARm.
−222	Data out of range;RADIO RECOVERY TIME	2940	Select a radio recovery time from 10ms to 10s.
−222	Data out of range;RADIO SLEW RATE	2945	Select a radio slew rate from 10dB/S to 500dB/S.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−222	Data out of range;RADIO SYMBOL TIME	2950	Select a radio symbol time from 10 ns to 1000 ns.
−222	Data out of range;ERROR:BIAS:VOLT	2990	Correct the HP-IB command ERROR:BIAS:VOLT so that it has a parameter value of −2 V or 0 V.
−221	Settings conflict;Requested data differs from existing data	502	The measurement data requested by a READ:*function*? or a FETCh:*function*? does not match with the measurement data available.
−221	Settings conflict;Start and stop frequencies are in different bands	503	The start and stop frequencies for a measurement are in different frequency bands. Change the measurement setup so that both the start and stop frequency are in the same band.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−221	Settings conflict;Start or stop rate is out of range	504	The start or stop rate for a Dynamic S-curve measurement are out of range. The maximum allowable rate in the Fader is (start frequency - stop frequency)/.01.
−221	Settings conflict;Deviation is out of range	505	The deviation for a Dynamic M-curve measurement is out of range. The start frequency - (deviation + 4MHz) must be a legal frequency. The stop frequency + (deviation + 4MHz) must be a legal frequency.
−221	Settings conflict;Printer destination is NONE	750	The printer is disabled. Select a destination using the front panel key PRINTER or enable the printer using the HP-IB command "SYST:COMM:PRIN:STAT ON".
−221	Settings conflict;Address must be 50 for front panel initated print	753	If a printout is requested by pressing a front panel key, the HP-IB address of the Fader must be 50 (TALK ONLY).
−221	Settings conflict;Selected fade event is not defined	2167	The fade event number requested was never defined by the LIST:SSEQ command.
−221	Settings conflict;READ? settings conflict with measurement setup	2892	The READ:*function*? parameters conflict with the current measurement setup.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−221	Settings conflict;READ:REC? or READ:DFM? conflicts with measurement setup	2902	If attempting a READ:REC?, the measurement setup must be for a recovery measurement. If attempting a READ:DFM?, the measurement setup must be for a Static M-curve, a Hysteresis M-curve or a Dynamic M-curve.
−220	Parameter error;BAD ADC CHANNEL SELECTED	1494	
−220	Parameter error;BAD ADC CHANNEL SELECTED	1494	Select an A/D channel from 0 to 7.
−220	Parameter error;INCORRECT BLOCK WITH SYST:SET	2250	The "learn string" sent to the Fader is corrupt (too long). Check that the HP-IB controller is sending the string correctly. In addition, insure that the controller loaded the learn string correctly in the first place. Note: The *LRN? function always returns the same length string regardless of the state of the Fader; but, the *LRN? can change if the firmware version changes.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:MINDEPTH:DATA	2315	Correct the number of bytes sent in the Min Notch Depth calibration table.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:NMINDEPTH:DATA	2320	Correct the number of bytes sent in the Non-Min Notch Depth calibration table.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:FREQ:DATA	2325	Correct the number of bytes sent in the Minimum Notch Frequency calibration table.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:MINFLAT:DATA	2330	Correct the number of bytes sent in the Min Flatness calibration table.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:NMINFLAT:DATA	2335	Correct the number of bytes sent in the Non-Min Flatness calibration table.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:ATT:DATA	2340	Correct the number of bytes sent in the Attenuation calibration table.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:TTSLEVEL:DATA	2380	Correct the number of bytes sent in the three tone source level calibration table.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:TTSFREQ:DATA	2385	Correct the number of bytes sent in the three tone source frequency calibration table.
−220	Parameter error;INCORRECT BLOCK SIZE WITH CAL:FREQNM:DATA	2530	Correct the number of bytes sent in the Non-minimum Notch Frequency calibration table.
−211	Trigger ignored		No action required. A group execute trigger (GET) or a *TRG command was ignored.
−178	Expression data not allowed		Correct the HP-IB controller program so that the data included with the HP-IB command does not contain parentheses.
−171	Invalid expression;Improper expression termination	1548	Correct the HP-IB controller program so that the expression data included with the HP-IB command is terminated with a right parenthesis [ )].

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−168	Block data not allowed		Correct the HP-IB controller program so that the data included with the HP-IB command is not block data (no "#").
−161	Invalid block data		Correct the HP-IB controller program so that it contains a correct block data type. A block data type should begin with "#" followed by a number.
−161	Invalid block data;Improper block termination	1532	Correct the HP-IB controller program so that it terminates the indefinite length block data with the new line character (NL).
−161	Invalid block data;Invalid character in block length field	1551	Correct the HP-IB controller program so that the definite block's length field only contains the characters 0 through 9.
−158	String data not allowed		Correct the HP-IB controller program so that the data included with the HP-IB command does not contain single or double quotes (' or ").
−151	Invalid string data;Improper string termination	1528	Correct the HP-IB controller program so that the string data included with the HP-IB command is terminated with a single or double quote (' or "). The terminating quote must be the same as the leading quote of the string.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−148	Character data not allowed		Correct the HP-IB controller program so that the data included with the HP-IB command is not character data.
−144	Character data too long		Correct the HP-IB controller program so that the character data included with the HP-IB command contains less than 13 characters.
−141	Invalid character data;Invalid character in character data	1526	Correct the HP-IB controller program so that the character data included with the HP-IB command contains only the characters A—Z, a—z, 0—9 and underscore.
−141	Invalid character data;Unrecognized character data	1527	Correct the HP-IB controller program so that the character data included with the HP-IB command is an acceptable parameter for the command.
−141	Invalid character data;CONFIGURE	2862	Correct the HP-IB command CONF:ARR[:STAT] or CONF:ARR:DYN:FM so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), its 3rd parameter is BER or ALARm, and its 4th parameter is ON or OFF.
−141	Invalid character data;CONF:ARR:HYST	2867	Correct the HP-IB command CONF:ARR:HYST so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is BER or ALARm, and its 3rd parameter is ON or OFF.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−141	Invalid character data;MEASURE?	2877	Correct the HP-IB query MEAS:ARR[:STAT]? or MEAS:ARR:DYN:FM? so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), its 3rd parameter is BER or ALARm, and its 4th parameter is ON or OFF.
−141	Invalid character data;MEAS:ARR:HYST?	2882	Correct the HP-IB query MEAS:ARR:HYST? so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is BER or ALARm, and its 3rd parameter is ON or OFF.
−141	Invalid character data;CONF:ARR:DYN	2927	Correct the HP-IB command CONF:ARR:DYN so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), and its 3rd parameter is BER or ALARm.
−141	Invalid character data;MEAS:ARR:DYN?	2932	Correct the HP-IB query MEAS:ARR:DYN so that its 1st parameter is the number of points from 1 to 100, its 2nd parameter is the phase (MINimum, NONMinimum, or BOTH), and its 3rd parameter is BER or ALARm.
−138	Suffix not allowed		Correct the HP-IB controller program so that the decimal data included with the HP-IB command does not use a suffix. Use exponential notation instead.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−131	Invalid suffix		Correct the HP-IB controller program so that the decimal data included with the HP-IB command contains a valid suffix for the data.
−128	Numeric data not allowed		Correct the HP-IB controller program so that the data included with the HP-IB command is not numeric data.
−123	Exponent too large		Correct the HP-IB numeric data so that it has an exponent from −32768 to 32767.
−121	Invalid character in number;Invalid character in non-decimal data	1534	Correct the HP-IB controller program so that the non-decimal data included with the HP-IB command contains only the following characters: Binary data (#B): 0 or 1 Octal data (#Q): 0 through 7 Hexadecimal data (#H): 0—9, A—F, a—f.
−121	Invalid character in number;Invalid character in decimal data	1539	Correct the HP-IB controller program so that the decimal data included with the HP-IB command only contains acceptable characters: 0 through 9, ., −, +, E and e.
−121	Invalid character in number;Improper non-decimal data format	1547	Correct the HP-IB controller program so that it contains a correct non-decimal type. A non-decimal data type should begin with "#" followed by a b, B, Q, q, h and H.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−120	Numeric data error		Correct the HP-IB controller program so that the decimal data included with the HP-IB command follows the correct syntax for a number.
−120	Numeric data error;Non-decimal data not allowed	1533	Correct the HP-IB controller program so that the data included with the HP-IB command is not non-decimal data.
−120	Numeric data error;Improper non-decimal termination	1536	Correct the HP-IB controller program so that the non-decimal data included with the HP-IB command contains 8 bytes or less of numeric data.
−113	Undefined header;Query not allowed for this mnemonic	1545	Correct the HP-IB controller program so that the HP-IB mnemonic does not have a question mark (?) following it. Only the command is defined for the mnemonic .
−110	Command header error		An invalid mnemonic has been received. Correct the HP-IB controller program so that the HP-IB mnemonic is a mnemonic available in the Fader.
−109	Missing parameter;EMPTY DATA FIELD	1523	Correct the HP-IB controller program so that the HP-IB command does not have an empty data field. Empty data fields occur when commas are present without data.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters		Correct the HP-IB controller program so that the HP-IB command contains the correct number of parameters. Unlike the following −107 errors which have detail error numbers, it is not known which command caused this error.
−107	Incorrect number of parameters;NO SWEEP FREQ	2006	Correct the HP-IB controller program so that the HP-IB non-swept notch frequency command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;HPIB ADDRESS	2016	Correct the HP-IB controller program so that the HP-IB address command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;NO SWEEP DEPTH	2026	Correct the HP-IB controller program so that the HP-IB non-swept notch depth command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;NO SWEEP ATTEN	2031	Correct the HP-IB controller program so that the HP-IB non-swept attenuation command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;STATE STORE	2036	Correct the HP-IB Correct the HP-IB controller program so that the HP-IB save command (*SAV) has exactly 1 parameter.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;START FREQ	2041	Correct the HP-IB controller program so that the HP-IB start notch frequency command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;STOP FREQ	2046	Correct the HP-IB controller program so that the HP-IB stop notch frequency command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;START ATTEN	2051	Correct the HP-IB controller program so that the HP-IB start attenuation command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;STOP ATTEN	2056	Correct the HP-IB controller program so that the HP-IB stop attenuation command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;START DEPTH	2061	Correct the HP-IB controller program so that the HP-IB start notch depth command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;STOP DEPTH	2066	Correct the HP-IB controller program so that the HP-IB stop notch depth command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;DIAG:IBUS:DIR	2071	Correct the HP-IB controller program so that the HP-IB DIAG:IBUS:DIR command has exactly 4 parameters; the HP-IB query may have 3 or 4 parameters.
−107	Incorrect number of parameters;INSTRUMENT CONTROL	2076	Correct the HP-IB controller program so that the HP-IB instrument control command has exactly 2 parameters; the HP-IB query may have 1 or 2 parameters.
−107	Incorrect number of parameters;STATE RECALL	2081	Correct the HP-IB controller program so that the HP-IB recall command (*RCL) has exactly 1 parameter.
−107	Incorrect number of parameters;SLEW	2086	Correct the HP-IB controller program so that the HP-IB slew command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;FREQ SWEEP	2096	Correct the HP-IB controller program so that the HP-IB notch frequency sweep mode command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;DEPTH SWEEP	2101	Correct the HP-IB controller program so that the HP-IB notch depth sweep mode command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;ATTEN SWEEP	2106	Correct the HP-IB controller program so that the HP-IB attenuation sweep mode command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;SWEEP MODE	2111	Correct the HP-IB controller program so that the HP-IB all sweep mode command has exactly 1 parameter.
−107	Incorrect number of parameters;67MHZ TONE ON-OFF	2116	Correct the HP-IB controller program so that the HP-IB TONE67:STAT or TONE137:STAT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;70MHZ TONE ON-OFF	2121	Correct the HP-IB controller program so that the HP-IB TONE70:STAT or TONE140:STAT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;75MHZ TONE ON-OFF	2126	Correct the HP-IB controller program so that the HP-IB TONE75:STAT or TONE145:STAT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;NO SWEEP MIN NON-MIN	2131	Correct the HP-IB controller program so that the HP-IB non-swept phase command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;START MIN NON-MIN	2136	Correct the HP-IB controller program so that the HP-IB start phase command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;STOP MIN NON-MIN	2141	Correct the HP-IB controller program so that the HP-IB stop phase command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;SINGLE SWEEP ON-OFF	2161	Correct the HP-IB controller program so that the HP-IB single sweep command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;3-TONE FREQ OFFSET	2176	Correct the HP-IB controller program so that the HP-IB three tone frequency offset command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;3-TONE LEVEL	2181	Correct the HP-IB controller program so that the HP-IB three tone level command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;DISPLAY ON-OFF	2186	Correct the HP-IB controller program so that the HP-IB display enable command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;SLOPES	2191	Correct the HP-IB controller program so that the HP-IB fixed slopes command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;DIAG:AVER	2196	Correct the HP-IB controller program so that the HP-IB DIAG:AVER command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;DIAG:ABUS:CAL	2201	Correct the HP-IB controller program so that the HP-IB DIAG:ABUS:CAL command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;SYST:KEY	2246	Correct the HP-IB controller program so that the HP-IB SYST:KEY command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;SYST:SET	2251	The "learn string" sent to the Fader is corrupt. Check that the HP-IB controller is sending the string correctly. In addition, insure that the controller loaded the learn string correctly in the first place. Note: The *LRN? function always returns the same length string regardless of the state of the Fader; but, the *LRN? can change if the firmware version changes.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;DIAG:ABUS?	2271	Correct the HP-IB controller program so that the HP-IB DIAG:ABUS? query has exactly 1 parameter.
−107	Incorrect number of parameters;DIAG:PROF	2296	Correct the HP-IB controller program so that the HP-IB DIAG:PROF command has exactly 5 parameters; the HP-IB query may have 0 or 5 parameters.
−107	Incorrect number of parameters;DIAG:DUMP:STAT	2306	Correct the HP-IB controller program so that the HP-IB DUMP:STAT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;CAL:MINDEPTH:DATA	2316	Correct the HP-IB controller program so that the HP-IB CAL:MINDEPTH command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.
−107	Incorrect number of parameters;CAL:NMINDEPTH:DATA	2321	Correct the HP-IB controller program so that the HP-IB CAL:NMINDEPTH command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.
−107	Incorrect number of parameters;CAL:FREQ:DATA	2326	Correct the HP-IB controller program so that the HP-IB CAL:FREQ command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;CAL:MINFLAT:DATA	2331	Correct the HP-IB controller program so that the HP-IB CAL:MINFLAT command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.
−107	Incorrect number of parameters;CAL:NMINFLAT:DATA	2336	Correct the HP-IB controller program so that the HP-IB CAL:NMINFLAT command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.
−107	Incorrect number of parameters;CAL:ATT:DATA	2341	Correct the HP-IB controller program so that the HP-IB CAL:ATT command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.
−107	Incorrect number of parameters;LIST:FREQ	2346	Correct the HP-IB controller program so that the HP-IB LIST:FREQ command has from 1 to 2000 parameters (4000 with Option 001); the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;CAL:PROF	2351	Correct the HP-IB controller program so that the HP-IB CAL:PROF command has exactly 4 parameters; the HP-IB query may have 0 or 4 parameters.
−107	Incorrect number of parameters;LIST:FREQ:POIN?	2356	Correct the HP-IB controller program so that the HP-IB LIST:FREQ:POIN? query has 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;LIST:POW:ATT	2361	Correct the HP-IB controller program so that the HP-IB LIST:POW:ATT command has from 1 to 2000 parameters (4000 with Option 001); the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;LIST:POW:ATT:POIN?	2366	Correct the HP-IB controller program so that the HP-IB LIST:POW:ATT:POIN? query has 0 or 1 parameters.
−107	Incorrect number of parameters;LIST:POW:DEPTH	2371	Correct the HP-IB controller program so that the HP-IB LIST:POW:DEPT command has from 1 to 2000 parameters (4000 with Option 001); the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;LIST:POW:DEPTH:POIN?	2376	Correct the HP-IB controller program so that the HP-IB LIST:POW:DEPT:POIN? query has 0 or 1 parameters.
−107	Incorrect number of parameters;CAL:TTSLEVEL:DATA	2381	Correct the HP-IB controller program so that the HP-IB CAL:TTSLEVEL command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.
−107	Incorrect number of parameters;CAL:TTSFREQ:DATA	2386	Correct the HP-IB controller program so that the HP-IB CAL:TTSFREQ command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;LIST:TIME	2396	Correct the HP-IB controller program so that the HP-IB LIST:POW:DEPT command has from 1 to 2000 parameters (4000 with Option 001); the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;LIST:TIME:POIN?	2401	Correct the HP-IB controller program so that the HP-IB LIST:TIME:POIN? query has 0 or 1 parameters.
−107	Incorrect number of parameters;LIST:POW:DEPT:PHAS	2406	Correct the HP-IB controller program so that the HP-IB LIST:POW:DEPT:PHAS command has from 1 to 2000 parameters (4000 with Option 001); the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;LIST:POW:DEPT:PHAS:POIN?	2411	Correct the HP-IB controller program so that the HP-IB LIST:POW:DEPT:PHAS:POIN? query has 0 or 1 parameters.
−107	Incorrect number of parameters;LIST:SSEQ	2416	Correct the HP-IB controller program so that the HP-IB LIST:SSEQ command has exactly 2 parameters; the HP-IB query may have 0 or 2 parameters.
−107	Incorrect number of parameters;DELAY	2426	Correct the HP-IB controller program so that the HP-IB delay command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;RESET TIMER	2436	Correct the HP-IB controller program so that the HP-IB INIT:TPW command has exactly 0 parameters.
−107	Incorrect number of parameters;READ TIMER	2441	Correct the HP-IB controller program so that the HP-IB FETCH:TPW? query has exactly 0 parameters.
−107	Incorrect number of parameters;AGC ON/OFF	2446	Correct the HP-IB controller program so that the HP-IB AGC enable command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;AGC CENTER FREQ	2451	Correct the HP-IB controller program so that the HP-IB AGC center frequency command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;AGC BANDWIDTH	2456	Correct the HP-IB controller program so that the HP-IB AGC bandwidth command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;TRIGGER SOURCE	2466	Correct the HP-IB controller program so that the HP-IB trigger synchronization command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;INST:CAT?	2481	Correct the HP-IB controller program so that the HP-IB INST:CAT? query has exactly 0 parameter.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;INST:DEF?	2486	Correct the HP-IB controller program so that the HP-IB INST:DEF? query has exactly 1 parameter.
−107	Incorrect number of parameters;SWEEP DIRECTION	2491	Correct the HP-IB controller program so that the HP-IB SWE:DIR command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;TSOURCE:LIST:GEN	2496	Correct the HP-IB controller program so that the HP-IB TSOURCE:LIST:GEN command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;3-TONE FREQ LIST	2501	Correct the HP-IB controller program so that the HP-IB three tone source frequency list command has from 0 to 3 parameters; the HP-IB query may have 0 or 3 parameters.
−107	Incorrect number of parameters;TSOURCE:FREQ:MODE	2506	Correct the HP-IB controller program so that the HP-IB TSOURCE:FREQ:MODE command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;TSOURCE:LIST:FREQ:POIN?	2511	Correct the HP-IB controller program so that the HP-IB TSOURCE:LIST:FREQ:POIN? query has 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;LIST:UPDATE	2516	Correct the HP-IB controller program so that the HP-IB LIST:UPD command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;LIST:GEN	2521	Correct the HP-IB controller program so that the HP-IB LIST:GEN command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;CAL:FREQNM:DATA	2531	Correct the HP-IB controller program so that the HP-IB CAL:FREQNM command has exactly 1 parameter; the HP-IB query may have exactly 1 parameter.
−107	Incorrect number of parameters;DIAG:OPT	2536	Correct the HP-IB controller program so that the HP-IB DIAG:OPT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;PRINTER OUTPUT	2586	Correct the HP-IB controller program so that the HP-IB print request command has exactly 1 parameter.
−107	Incorrect number of parameters;RADIO BIT RATE	2601	Correct the HP-IB controller program so that the HP-IB radio bit rate command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;RADIO SCALE FACTOR	2606	Correct the HP-IB controller program so that the HP-IB radio error scale factor command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;RADIO ALARM POLARITY	2616	Correct the HP-IB controller program so that the HP-IB radio alarm polarity command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;MEAS SETUP START RATE	2636	Correct the HP-IB controller program so that the HP-IB measurement start rate command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;MEAS SETUP STOP RATE	2641	Correct the HP-IB controller program so that the HP-IB measurement stop rate command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;MEAS SETUP SPEED	2661	Correct the HP-IB controller program so that the HP-IB measurement speed command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;MEAS SETUP DEVIATION	2666	Correct the HP-IB controller program so that the HP-IB measurement deviation command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;ERROR:IMP	2691	Correct the HP-IB controller program so that the HP-IB ERROR:IMP command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;TEST MASK POINTS QUERY	2706	Correct the HP-IB controller program so that the HP-IB test mask number of points query has 0 or 1 parameters.
−107	Incorrect number of parameters;ERROR:COUP	2711	Correct the HP-IB controller program so that the HP-IB ERROR:COUP command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;CALC:LIM:CONT:DATA	2721	Correct the HP-IB controller program so that the HP-IB "x-value" test mask command has from 1 to 12 parameters; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;CALC:LIM:LOW:DATA	2736	Correct the HP-IB controller program so that the HP-IB test mask depth command has from 1 to 12 parameters; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;DIAG:PIT	2756	Correct the HP-IB controller program so that the HP-IB DIAG:PIT command has exactly 2 parameters; the HP-IB query may have 1 or 2 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;MEAS SETUP ZOOM	2761	Correct the HP-IB controller program so that the HP-IB zoom state command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;SYST:DATE	2771	Correct the HP-IB controller program so that the HP-IB SYST:DATE command has exactly 3 parameters; the HP-IB query may have 0 or 3 parameters.
−107	Incorrect number of parameters;SYST:TIME	2776	Correct the HP-IB controller program so that the HP-IB SYST:TIME command has exactly 3 parameters; the HP-IB query may have 0 or 3 parameters.
−107	Incorrect number of parameters;SYST:COMM:PRIN:DEST	2781	Correct the HP-IB controller program so that the HP-IB SYST:COMM:PRIN:DEST command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;SYST:COMM:PRIN:STAT	2786	Correct the HP-IB controller program so that the HP-IB SYST:COMM:PRIN:STAT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;CALC:LIM:STAT	2791	Correct the HP-IB controller program so that the HP-IB CALC:LIM:STAT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;DIAG:EXPR	2796	Correct the HP-IB controller program so that the HP-IB DIAG:EXPR command has exactly 1 parameter.
−107	Incorrect number of parameters;CALC:LIM:INT	2801	Correct the HP-IB controller program so that the HP-IB CALC:LIM:INT command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;TRIG2:BER:THR	2821	Correct the HP-IB controller program so that the HP-IB TRIG2:BER:THR command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;INP1:IMP	2831	Correct the HP-IB controller program so that the HP-IB INP1:IMP command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;INP1:COUP	2836	Correct the HP-IB controller program so that the HP-IB INP1:COUP command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;ALARM:IMP	2841	Correct the HP-IB controller program so that the HP-IB ALARM:IMP command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;ALARM:COUP	2846	Correct the HP-IB controller program so that the HP-IB ALARM:COUP command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;TRIG2:BER:ECOUNT	2851	Correct the HP-IB controller program so that the HP-IB TRIG2:BER:ECOUNT command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;RADIO ERROR THRESHOLD	2856	Correct the HP-IB controller program so that the HP-IB TRIG2:LEV command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;CONFIGURE	2861	Correct the HP-IB controller program so that the HP-IB CONF:ARR[:STAT] or CONF:ARR:DYN:FM command has 1 to 4 parameters.
−107	Incorrect number of parameters;CONF:ARR:HYST	2866	Correct the HP-IB controller program so that the HP-IB CONF:ARR:HYST command has 1 to 3 parameters.
−107	Incorrect number of parameters;CONF:REC	2871	Correct the HP-IB controller program so that the HP-IB CONF:REC command has 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;MEASURE?	2876	Correct the HP-IB controller program so that the HP-IB MEAS:ARR[:STAT]? or MEAS:ARR:DYN:FM? query has 1 to 4 parameters.
−107	Incorrect number of parameters;MEAS:ARR:HYST?	2881	Correct the HP-IB controller program so that the HP-IB MEAS:ARR:HYST? query has 1 to 3 parameters.
−107	Incorrect number of parameters;MEAS:REC?	2886	Correct the HP-IB controller program so that the HP-IB MEAS:REC? query has 0 or 1 parameters.
−107	Incorrect number of parameters;READ? or FETCH?	2891	Correct the HP-IB controller program so that the HP-IB FETC:ARR[:STAT]?, FETC:ARR:DYN:FM?, READ:ARR[:STAT]?, or READ:ARR:DYN:FM? query has 1 or 2 parameters.
−107	Incorrect number of parameters;READ:ARR:HYST? or FETCH:ARR:HYST?	2896	Correct the HP-IB controller program so that the HP-IB FETC:ARR:HYST? or READ:ARR:HYST? query has exactly 1 parameter.
−107	Incorrect number of parameters;READ:REC? or FETCH:REC?	2901	Correct the HP-IB controller program so that the HP-IB FETC:REC? or READ:REC? query has exactly 0 parameters.
−107	Incorrect number of parameters;READ:DFM? or FETCH:DFM?	2906	Correct the HP-IB controller program so that the HP-IB READ:DFM? or FETCH:DFM? query has 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;FETCH?	2911	Correct the HP-IB controller program so that the HP-IB FETC? query has 0 to 2 parameters.
−107	Incorrect number of parameters;RADIO DEMO	2921	Correct the HP-IB controller program so that the HP-IB radio demonstration state command has exactly 1 parameter; the HP-IB query may have exactly 0 parameters.
−107	Incorrect number of parameters;CONF:ARR:DYN	2926	Correct the HP-IB controller program so that the HP-IB CONF:ARR:DYN command has 1 to 3 parameters.
−107	Incorrect number of parameters;MEAS:ARR:DYN?	2931	Correct the HP-IB controller program so that the HP-IB MEAS:ARR:DYN? query has 1 to 3 parameters.
−107	Incorrect number of parameters;RADIO RECOVERY TIME	2941	Correct the HP-IB controller program so that the HP-IB TRIG2:TIMer command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;RADIO SLEW RATE	2946	Correct the HP-IB controller program so that the HP-IB SWE:SLEW:RATE command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−107	Incorrect number of parameters;RADIO SYMBOL TIME	2951	Correct the HP-IB controller program so that the HP-IB TRIG2:BER:SYMB:TIME command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−107	Incorrect number of parameters;ERROR:BIAS:VOLT	2991	Correct the HP-IB controller program so that the HP-IB ERROR:BIAS:VOLT command has exactly 1 parameter; the HP-IB query may have 0 or 1 parameters.
−105	GET not allowed		Correct the HP-IB controller program so that the group execute trigger does not occur within a line of HP-IB program code.
−104	Data type error		Correct the HP-IB controller program so that the data included with the HP-IB command is a type of data understood by the Fader.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
−103	Invalid separator		Correct the HP-IB controller program so that data included with the HP-IB command is separated only by commas and spaces.
0	No Error		No action needed. The error queue contains no errors.
752	Print did not complete successfully		A printout did not successfully complete. This error is due to aborting a print, or it will be accompanied by another error message describing the error condition.
1101	Shift chain number invalid		Correct the HP-IB command DIAG:IBUS:DIR or DIAG:IBUS:DIR? so that its chain number is 0, 1, 3, or 4. If this error occurs even though the controller is not using these HP-IB commands try the actions suggested for error numbers 1700 and 1902.
1102	Shift chain start bit invalid		Correct the HP-IB command DIAG:IBUS:DIR or DIAG:IBUS:DIR? so that its start bit is in range for the given chain number. If this error occurs even though the controller is not using these HP-IB commands try the actions suggested for error numbers 1700 and 1902.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
1103	Shift chain bit-field length invalid		Correct the HP-IB command DIAG:IBUS:DIR or DIAG:IBUS:DIR? so that its bit-field length is in range for the given chain number. If this error occurs even though the controller is not using these HP-IB commands try the actions suggested for error numbers 1700 and 1902.
1106	Shift chain data too large for bit-field length		Select an instrument control data value which fits in the requested bit-field number. If this error occurs even though the instrument control function is not being used, try the actions suggested for error numbers 1700 and 1902.
1107	Shift chain bit-field out of range		Select an instrument control bit-field number from 0 to 32. If this error occurs even though the instrument control function is not being used, try the actions suggested for error numbers 1700 and 1902.
1490	A/D cal failed		Try cycling the power on the Fader. If the error message doesn't go away, refer to the Service Manual for troubleshooting information. Only the 11758 product line uses the A/D.
1491	A/D failed—time-out error		Try cycling the power on the Fader. If the error message doesn't go away, refer to the Service Manual for troubleshooting information. Only the 11758 product line uses the A/D.

Table A-1. Error Messages (continued)

Error Number	Message	Detail Number	Action Required
1496	GND equal −5V in A/D cal		Try cycling the power on the Fader. If the error message doesn't go away, refer to the Service Manual for troubleshooting information. Only the 11758 product line uses the A/D.
1505	HP-IB was addressed to talk with nothing to say		Check the HP-IB controller program to make sure that the controller always issues a query command before attempting to read the query response data.
1700	Function not completed, try again		Try actions suggested for error number 1902.
1902	Function not completed, try again		The operation (function selection, data entry, etc.) that was attempted at the time was not executed. Try the operation again. If these errors keep recurring some troubleshooting is necessary. Begin by presetting the Fader. If this is unsuccessful in eliminating these errors from recurring, cycle the power. If this doesn't help, use the INIT function which is part of the MORE menu.

B

Specifications

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

Table B-1. Specifications

Electrical Characteristics	Performance Limits	Conditions
Note: Warranted specifications are for 15°C to 35°C after a 15 minute warm-up period and notch frequencies 70 MHz ±20 MHz or 140 MHz ±20 MHz except where noted.		
Notch Frequency		
Standard	40 MHz to 100 MHz	Serial prefixes less than
Opt. 140	90.0 MHz to 190.0 MHz	3215A have an upper band
Opt. 147	40 MHz to 100 MHz and	range of 110.0 MHz to
	90.0 MHz to 190.0 MHz	170.0 MHz.
Resolution	0.1 MHz	
Accuracy		at 20 dB notch depth
70 MHz Band	±0.3 MHz	
140 MHz Band	±0.4 MHz	
Notch Depth		Note: Specifications hold for input levels up to −5 dBm.
Range	0 to 40 dB	
Resolution	0.1 dB	
Accuracy		
20 dB Notch	±0.75 dB	70 MHz Band and 140 MHz Band
30 dB Notch	±1.5 dB	70 MHz Band and 140 MHz Band
40 dB Notch	±3.0 dB	70 MHz Band and 140 MHz Band
Flat Fade Gain/Attenuation		
Gain Range	0 to 12 dB	at 70 MHz or 140 MHz
Attenuation Range	0 to 50 dB	
Resolution	0.1 dB	
Accuracy	±2.0 dB	from 0 dB to 30 dB flat fade

Table B-1. Specifications (continued)

Electrical Characteristics	Performance Limits	Conditions
Safety	Meets requirements of EN61010-1(1993) IEC 1010-1(1990) + A1(1992) + A2(1994) CSA C22.2 No. 1010.1(1993)	
Operating and non-operating environment	Temperature, humidity, shock, and vibration type tested to MIL-T-28800B Class V requirements	
Temperature		
Operating	0° to 55°C	Accuracy specifications apply for 15°C to 35°C only.
EMI	EN55011:1991 (Group 1, Class A) EN50082-1:1992 -IEC10004-2 (1995) ESD -IEC1000-4-3 (1995) Radiated Suseptibility -IEC1000-4-4 (1995) EFT	
Acoustic Noise Emission	LpA <70 dB(A)	per ISO 3744
GERAEUSCHEMISSION	LpA <70 dB(A)	nach DIN 45635 pt. 1
Power Consumption		
Line Voltage	115, 230 ±10%	
Line Frequency	50 to 60 Hz.	
Power Dissipation	<200 VA max	

Table B-2. Supplemental Characteristics

Characteristics	Performance Limits	Conditions
Note: Typical non-warranted characteristics measured at 25°C with notch frequencies 70 MHz ±20 MHz or 140 MHz ±20 MHz except where noted.		
Automatic Gain Control	Maintains constant output power for notch depths up to 40 dB over 1.0 MHz to 40 MHz bandwidths	
Typical Notch Frequency Accuracy		
Absolute Accuracy	±0.15 MHz	
Relative Accuracy	±0.8% per change in frequency or 30 kHz, whichever is greater	
Typical Notch Depth Accuracy		
25°C Error		
20 dB	±0.2 dB	
30 dB	±0.3 dB	
40 dB	±1.0 dB	
Typical Temperature Performance		15°C to 35°C
20 dB	±0.50 dB	
30 dB	±0.75 dB	
40 dB	±2.0 dB	
Repeatability and 24-Hour Drift		
20 dB	±0.03 dB	
30 dB	±0.10 dB	
40 dB	±0.30 dB	
Interpath Delay	6.3 ns	
Variable Delay Range Resolution	 1 ns to 25 ns 0.1 ns	Simulated variable delay, valid over a restricted bandwidth.

Table B-2. Supplemental Characteristics (continued)

Characteristics	Performance Limits	Conditions
Sweep		
Speed	10 ms to 99.9s	
Resolution	in 10 ms steps	
Max. Slew Rate		
Gain/Attenuation	6500 dB/sec	
Notch Frequency	6 GHz/sec	
Notch Depth	4500 dB/sec	
Noise Figure	$\leq$15 dB	Measured with gain = 12 dB
Frequency Response		
Amplitude variation	< ±0.2 dB	0 dB notch, ±20 MHz bandwidth
Group delay variation	< ±1 ns	0 dB notch, ±20 MHz bandwidth
Internal Fading Event Memory	2000 points standard, 4000 points opt. 001	Each data set contains notch frequency, notch depth, minimum/non-minimum phase, flat attenuation and sweep time (0.10 to 10 seconds).
Number of fade event sequences	10	
Three Tone Intermodulation Response:		Measured at −4 dBm input power with gain $\leq$0 dB
70 MHz Band	$\leq$ 50 dBc	
140 MHz Band	$\leq$ 47 dBc	
Typical Flat Fade Gain/Attenuation		
Accuracy	±0.4 dB	from 0 dB to 30 dB flat fade
Net weight	10 kg (22 lbs)	
Dimensions	Height × Width × Depth 163 mm x 476 mm x 574 mm (incl. handle)	

Table B-2. Supplemental Characteristics (continued)

Characteristics	Performance Limits	Conditions
Signature Types	Static M-Curve, Dynamic M, Dynamic S-Curve, Hysteresis M, Recovery Time, BER	BER type is only available in serial prefixes 3215A and above.
Error Pulse In		
Termination	ECL/75Ω, TTL/10kΩ, TTL/75Ω, threshold −5V to +5V	variable theshold is only available in serial prefixes 3235A and above.
Minimum Pulse Width	2.5 ns ECL; 10 ns TTL	
Minimum Time Between Counted Error Bits	25 ns	
Alarm In		
Termination	TTL/10kΩ, Positive or Negative Edge Triggered	
Minimum Pulse Width	10 ns	
Setting Ranges		
Bit Rate	10 kHz to 200.00 MHz	
BER Threshold	1E−3, 3E−4, 1E−4, 3E−5, 1E−5, 1E−6	
Dynamic S Rates	1 MHz/sec to 6 GHz/sec	
Dynamic M Rates	10, 20, 100, 300, 600, 1200 MHz/sec	
Dynamic M Deviations (±)	1, 2, 4, 6, 10, 20 MHz	
Scale Factor (pulse to error ratio)	0.01 to 100.0	
Error Gate	2^n where n=2 to 15	
Maximum Number of Data Points per Measurement	100 Static M, Dynamic M, Dynamic S; 200 Hysteresis M	
Recovery Time		
Range	1 ms to 6 sec.	
Accuracy and Resolution	1 ms	
GERAEUSCHEMISSION		Typpruefungsergebnis
LpA:		
am Arbeitsplatz	47 dB (typ.)	nach DIN 45635 pt. 19
fiktiver Arbeitsplatz	38 dB (typ.)	

C

Advanced HP-IB Measurements

Introduction

To make HP-IB measurements less confusing for beginning users, FETCh:*function*?, READ:*function*?, and MEASure:*function*? were not included in the "HP-IB Commands" chapter. Only the FETCh?, INITiate[:IMMediate], CONFigure:*function* and CONFigure? commands were included in the "HP-IB Commands" chapter.

In the "HP-IB Commands" chapter, the measurement examples always used a sequence of CONFigure:*function*, INITiate[:IMMediate], and FETCh? to perform measurements. This is probably the most straightforward way of performing a measurement from HP-IB because it mirrors the steps taken when using the front panel. However, this example sequence is only a subset of the many ways to use SCPI commands and queries to do a measurement in the Fader. This appendix gives the whole picture of how to use all the SCPI measurement commands and queries.

The following sections give an overview and details regarding the Fader's SCPI measurement system. The last three sections of this appendix give a step-by-step description of how to use MEASure:*function*?, READ:*function*?, and FETCh:*function*?, respectively.

FETCh?, INITiate[:IMMediate] and CONFigure:*function* are not given a step-by-step approach here because the "HP-IB Commands" chapter gives good example HP-IB programs already for each of these commands.

This appendix assumes that the CONFigure:*function*, INITiate[:IMMediate], and FETCh? descriptions in the "HP-IB Commands" chapter have been read. Reading the measurement section in the "Beginner's Guide to SCPI" pamphlet is also recommended before diving into the details given here.

SCPI Measurement System Overview

The SCPI measurement system has a "MEASure:*function*? <measurement parameters>" query which performs the measurement described in *function*. <measurement parameters> are the parameters needed by *function* to do a measurement. Following is a list of all the available *function*'s and all the <measurement parameters> that go with them:

Table C-1. CONFigure:*function* and MEASure:*function*? Parameters

function	**<measurement parameters>**
ARRay[:POWer][:MCURve][:STATic]	(points),phase,criteria,mksearch
ARRay[:POWer][:MCURve]:DYNamic:FM	(points),phase,criteria,mksearch
ARRay[:POWer][:MCURve]:DYNamic[:SWEep]	(points),phase,criteria
ARRay[:POWer][:MCURve]:HYSTERESIS	(points),criteria,mksearch
[SCALar][:POWer]:RECovery	criteria
[SCALar]:BER	no parameters allowed

"MEASure:*function*? <measurement parameters>" is always equivalent to:

```
CONFigure:function <measurement parameters>
READ:function? <read measurement parameters>
```

Following is a list of all the available *function*'s and all the <read measurement parameters> that go with them:

Table C-2. FETCh:*function*? and READ:*function*? Parameters

function	**<read measurement parameters>**
ARRay[:POWer][:MCURve][:STATic]	(points),phase
ARRay[:POWer][:MCURve]:DYNamic:FM	(points),phase
ARRay[:POWer][:MCURve]:DYNamic[:SWEep]	(points),phase
ARRay[:POWer][:MCURve]:HYSTERESIS	(points)
[SCALar][:POWer]:RECovery	no parameters allowed
[SCALar][:POWer]:DFM	dfmtype
[SCALar]:BER	no parameters allowed

In turn, "READ:*function*? <read measurement parameters>" is always equivalent to:

```
INITiate[:IMMediate]
FETCh:function? <read measurement parameters>
```

Therefore "MEASure:*function*? <measurement parameters>" does all of the following:

```
CONFigure:function <measurement parameters>
INITiate[:IMMediate]
FETCh:function? <read measurement parameters>
```

CONFigure:*function* sets up the instrument state, INITiate[:IMMediate] starts the measurment and stores the data, and FETCh:*function*? returns the measurement data.

<read measurement parameters> describe what part of the measurement data to fetch - NOT how to do the measurement. CONFigure:*function* handles setting up the actual measurement. The only difference between READ:*function*? and FETCh:*function*? is that READ:*function*? re-measures based on the current measurement setup.

If FETCh:*function*? uses a *function* or <read measurement parameters> that do not match the measurement data, a -221, "Settings conflict" error is reported and the FETCh:*function*? request is ignored. READ:*function*? error checking works the same as FETCh:*function*?.

Invalid Measurement Data

You cannot FETCh?, FETCh:*function*? or print invalid measurement data. Old measurement data will become invalid under the following conditions:

- After a *RST
- A new measurement is aborted
- When a new measurement is completed successfully

Optional Parameters

<measurement parameters> and <read measurement parameters> are always optional (except for the number of points). These parameters can only be omitted starting with the right-most parameter. Parameters missing on the right take their "default" value. Substituting the word DEFault for a parameter will default them also.

Defaults for MEASure:*function*? and CONFigure:*function* are: points = 10, phase = MIN, criteria = BER, and mksearch = OFF. Defaults for FETCh:*function*? are equal to the points and phase of the current measurement data. If there is no valid measurement data, the FETCh:*function*? parameters default to the current measurement setup's points and phase. READ:*function*? parameters default the same as the FETCh:*function*? parameters.

For example, all of these MEAS:ARR:STAT? queries are equivalent:

"MEAS:ARR:STAT? (10),MIN,BER,OFF"
"MEAS:ARR:STAT? (10),MIN,BER"
"MEAS:ARR:STAT? (10),MIN"

"MEAS:ARR:STAT? (10)"
"MEAS:ARR:STAT? (10),DEF,BER,DEF"
"MEAS:ARR:STAT? (DEF),DEF,DEF,DEF"

READ:*function*? Details

Because READ:*function*? <read measurement parameters> is identical to

```
INITiate[:IMMediate]
FETCh:function? <read measurement parameters>
```

the <read measurement parameters> do NOT alter the CONFiguration before INITitate[:IMMediate] is executed. <read measurement parameters> are only used to determine what data is returned, NOT how to do the measurement.

If READ:*function*?'s <read measurement parameters> would cause an error in "FETCh? <read measurement parameters>" after INITiate[:IMMediate] is run, the READ:*function*? query is rejected. Therefore there would be no re-measurement and there would be no change to the state of the Fader.

FETCh:*function*? Details

If FETCh:*function*? is used, *function* must match the measurement type of the measurement data. In addition, with all measurement types (except RECovery, BER, and DFM), the number of points to fetch must be specified. The number of points can be less than or equal to the number of points in the measurement data. If the phase is not specified, the phase of the measurement data is assumed. If the phase of the measurement data is BOTH, any phase can be fetched. However, MIN phase cannot be fetched if the measurement data phase is only NONM, and vice versa.

FETCh? Details

FETCh? without a *function* is a special case. It does not require any parameters. It simply returns all of the last measurement data.

If parameters are used with this special FETCh?, they must be consistent with the current measurement data. See the "HP-IB Commands" chapter and "FETCh:*function*? Details" above for more information about using parameters with FETCh:*function*?.

This FETCh? is described in the "HP-IB Commands" chapter with CONFigure:*function* and INITiate.

CONFigure? Details

CONFigure? is a query that returns the CONFigure command string that will implement the measurement setup type, number of points, phase, criteria and mk search. CONFigure? does not require any parameters.

This query returns a string which looks like:

"*function* `<measurement parameters>`"

Simply add this string to "CONFigure:" and you have a CONFigure:*function* command to implement the current measurement setup.

The string will contain the full CONFigure command needed to represent the current measurement setup (with all optional subsystems and parameters included). For example, if the previous CONFigure command was:

```
CONF:ARRAY:DYNAMIC (10),MIN,DEF,DEF
```

and no one has used the front panel to alter the measurement setup, the query CONFigure? would return the following:

```
"ARR:POW:MCUR:DYN:SWE (10),MIN,BER,OFF"
```

All the mnemonics and parameters that are optional in the CONFigure command are included in the string for your information and future use. The string always uses the short form of everything. After *RST, the CONFigure? state returned will be = “ARR:POW:MCUR:STAT (10),MIN,BER,OFF”.

Using MEASure:*function*?

The following is a quick description of how to perform each Fader measurement type with the MEASure:*function*? query.

STATIC-M (3 steps)

1. Set up FREQ:STAR, FREQ:STOP, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE.
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "MEAS:ARR:STAT? (points),phase,criteria,mksearch"

   This performs a Static-M measurement and returns "frequency, depth" pairs. The number of pairs of data will be equal to "points". "phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.

DYNAMIC-S (3 steps)

1. Set up FREQ:STAR, FREQ:STOP, FREQ:RATE:STAR, FREQ:RATE:STOP, TRIG2:TIM, and SWE:SLEW:RATE (this measurement does not use CALC:SMO:STAT).
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used

instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.

3. "MEAS:ARR:DYN:SWE? (points),phase,criteria"

   This performs a Dynamic-S measurement and returns "sweep rate, depth" pairs. The number of pairs of data will be equal to "points". "phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "criteria" can be BER or ALARm.

DYNAMIC-M (3 steps)

1. Set up FREQ:STAR, FREQ:STOP, FM:DEV, FM:INT:RATE, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "MEAS:ARR:DYN:FM? (points),phase,criteria,mksearch"

   This performs a Dynamic-M measurement and returns "frequency, depth" pairs. The number of pairs of data will be equal to "points". "phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.

HYSTERESIS-M (3 steps)

1. Set up FREQ:STAR, FREQ:STOP, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "MEAS:ARR:HYST? (points),criteria,mksearch"

   This performs a HYSTERESIS-M measurement and returns "frequency, depth" pairs. The total number of pairs of data will be equal to 4*"points". The data is returned in the following order: all minimum "shallow-to-deep" pairs, all minimum "deep-to-shallow" pairs, all non-minimum "shallow-to-deep" pairs, and lastly all non-minimum "deep-to-shallow" pairs. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.

RECOVERY TIME (2 steps)

1. If using BER criteria, set up TRIG2:BER, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV (this measurement does not use TRIG2:BER:ECO). It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
2. "MEAS:REC? criteria"

   This performs a recovery time measurement and returns a single value equal to the recovery time in seconds. "criteria" can be BER or ALARm.

BIT ERROR RATE (2 steps)

1. Set up TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV (this measurement does not use TRIG2:BER nor TRIG2:BER:ECO). It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP.
2. "MEAS:BER?"

   This performs one bit error rate measurement and returns a single value equal to the bit error rate. The bit error rate is calculated by looking at the error input for approximately 1 second. No parameters are allowed with MEAS:BER?.

BELLCORE DISPERSIVE FADE MARGIN (2 steps)

1. Successfully MEASure:*function*? any measurement type except RECOVERY TIME, BER, and DYNAMIC-S.
2. "FETC:DFM? BELLCORE"

   This query will return the Bellcore dispersive fade margin measured by the measurement performed in step 1. For more information about Bellcore dispersive fade margin, see MEAS in the Local Reference section. You can use FETC:DFM? and READ:DFM?, but not MEAS:DFM?.

CCIR DISPERSIVE FADE MARGIN (3 steps)

1. Set up TRIG2:BER:SYMBOL:TIM.
2. Successfully MEASure:*function*? any measurement type except RECOVERY TIME, BER, and DYNAMIC-S.
3. "FETC:DFM? CCIR"

   This query will return the CCIR dispersive fade margin measured by the measurement performed in step 1. For more information about CCIR dispersive fade margin, see MEAS in the Local Reference section. You can use FETC:DFM? and READ:DFM?, but not MEAS:DFM?.

Using READ:*function*?

The following is a quick description of how to perform each Fader measurement type with the READ:*function*? query.

STATIC-M (4 steps)

1. Set up FREQ:STAR, FREQ:STOP, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE.
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "CONF:ARR:STAT (points),phase,criteria,mksearch"

   This configures for a Static-M measurement. "points" describes how many measurement points to use. "phase" can be MINimum, NONMinimum or BOTH. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.
4. "READ:ARR:STAT? (read_points),read_phase"

   Makes a measurement based on the above CONFigure and returns "frequency, depth" pairs. The number of pairs of data will be equal to "read_points". "read_phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "read_points" cannot be bigger than the CONFigure command's "points". "read_phase" cannot conflict with the CONFigure command's "phase".

DYNAMIC-S (4 steps)

1. Set up FREQ:STAR, FREQ:STOP, FREQ:RATE:STAR, FREQ:RATE:STOP, TRIG2:TIM, and SWE:SLEW:RATE (this measurement does not use CALC:SMO:STAT).
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "CONF:ARR:DYN:SWE (points),phase,criteria"

   This configures for a Dynamic-S measurement. "points" describes how many measurement points to use. "phase" can be MINimum, NONMinimum or BOTH. "criteria" can be BER or ALARm.
4. "READ:ARR:DYN:SWE? (read_points),read_phase"

   Makes a measurement based on the above CONFigure and returns "sweep rate, depth" pairs. The number of pairs of data will be equal to "read_points". "read_phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "read_points" cannot be bigger than the CONFigure command's "points". "read_phase" cannot conflict with the CONFigure command's "phase".

DYNAMIC-M (4 steps)

1. Set up FREQ:STAR, FREQ:STOP, FM:DEV, FM:INT:RATE, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE.
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP,

and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.

3. "CONF:ARR:DYN:FM (points),phase,criteria,mksearch"

   This configures for a Dynamic-M measurement. "points" describes how many measurement points to use. "phase" can be MINimum, NONMinimum or BOTH. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.

4. "READ:ARR:DYN:FM? (read_points),read_phase"

   Makes a measurement based on the above CONFigure and returns "frequency, depth" pairs. The number of pairs of data will be equal to "read_points". "read_phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "read_points" cannot be bigger than the CONFigure command's "points". "read_phase" cannot conflict with the CONFigure command's "phase".

HYSTERESIS-M (4 steps)

1. Set up FREQ:STAR, FREQ:STOP, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE.
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "CONF:ARR:HYST (points),criteria,mksearch"

This configures for a HYSTERESIS-M measurement. "points" describes how many measurement points to use. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.

4. "READ:ARR:HYST? (read_points)"

   Makes a measurement based on the above CONFigure and returns "frequency, depth" pairs. The number of pairs of data will be equal to 4*"read_points". The data is returned in the following order: all minimum "shallow-to-deep" pairs, all minimum "deep-to-shallow" pairs, all non-minimum "shallow-to-deep" pairs, and lastly all non-minimum "deep-to-shallow" pairs. "read_points" cannot be bigger than the CONFigure command's "points".

RECOVERY TIME (3 steps)

1. If using BER criteria, set up TRIG2:BER, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV (this measurement does not use TRIG2:BER:ECO). It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
2. "CONF:REC criteria"

   This configures for a recovery measurement. "criteria" can be BER or ALARm.
3. "READ:REC?"

   Makes a measurement based on the above CONFigure and returns one value which is equal to the recovery time. No parameters are allowed with READ:REC?.

BIT ERROR RATE (3 steps)

1. Set up TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV (this measurement does not use TRIG2:BER nor

TRIG2:BER:ECO). It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP.

2. "CONF:BER"

   This configures for a bit error rate measurement. No parameters are allowed with CONF:BER.

3. "READ:REC?"

   Makes a measurement based on the above CONFigure and returns one value which is equal to the bit error rate. The BER is calculated by looking at the error input for approximately 1 second. No parameters are allowed with READ:REC?.

BELLCORE DISPERSIVE FADE MARGIN (2 steps)

1. CONFigure:*function* for any measurement type except RECOVERY TIME, BER and DYNAMIC-S.
2. "READ:DFM? BELLCORE"

   This query will take a measurement based on the measurement type selected in step 1 and then return the Bellcore dispersive fade margin measured.

CCIR DISPERSIVE FADE MARGIN (3 steps)

1. CONFigure:*function* for any measurement type except RECOVERY TIME, BER and DYNAMIC-S.
2. Set up TRIG2:BER:SYMBOL:TIM.
3. "READ:DFM? CCIR"

   This query will take a measurement based on the measurement type selected in step 1 and then return the CCIR dispersive fade margin measured.

Using FETCh:*function*?

The following is a quick description of how to perform each Fader measurement type with the FETCh:*function*? query.

STATIC-M (5 steps)

1. Set up FREQ:STAR, FREQ:STOP, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE.
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "CONF:ARR:STAT (points),phase,criteria,mksearch"

   This configures for a Static-M measurement. "points" describes how many measurement points to use. "phase" can be MINimum, NONMinimum or BOTH. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.
4. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.
5. "FETC:ARR:STAT? (read_points),read_phase"

   Returns the "frequency, depth" pairs collected by the previous INITIATE command. The number of pairs of data will be equal to "read_points". "read_phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "read_points" cannot be bigger than the measurement data's "points". "read_phase" cannot conflict with the measurement data's "phase".

DYNAMIC-S (5 steps)

1. Set up FREQ:STAR, FREQ:STOP, FREQ:RATE:STAR, FREQ:RATE:STOP, TRIG2:TIM, and SWE:SLEW:RATE (this measurement does not use CALC:SMO:STAT).
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "CONF:ARR:DYN:SWE (points),phase,criteria"

   This configures for a Dynamic-S measurement. "points" describes how many measurement points to use. "phase" can be MINimum, NONMinimum or BOTH. "criteria" can be BER or ALARm.
4. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.
5. "FETC:ARR:DYN:SWE? (read_points),read_phase"

   Returns "sweep rate, depth" pairs collected by the previous INITIATE command. The number of pairs of data will be equal to "read_points". "read_phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "read_points" cannot be bigger than the measurement data's "points". "read_phase" cannot conflict with the measurement data's "phase".

DYNAMIC-M (5 steps)

1. Set up FREQ:STAR, FREQ:STOP, FM:DEV, FM:INT:RATE, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE.
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "CONF:ARR:DYN:FM (points),phase,criteria,mksearch"

   This configures for a Dynamic-M measurement. "points" describes how many measurement points to use. "phase" can be MINimum, NONMinimum or BOTH. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.
4. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.
5. "FETC:ARR:DYN:FM? (read_points),read_phase"

   Returns the "frequency, depth" pairs collected by the previous INITIATE command. The number of pairs of data will be equal to "read_points". "read_phase" can be MINimum, NONMinimum, or BOTH. If BOTH is chosen, the number of pairs of data will be equal to 2*"points" with MINimum data returned first. "read_points" cannot be bigger than the measurement data's "points". "read_phase" cannot conflict with the measurement data's "phase".

HYSTERESIS-M (5 steps)

1. Set up FREQ:STAR, FREQ:STOP, CALC:SMO:STAT, TRIG2:TIM, and SWE:SLEW:RATE.
2. If using BER criteria, set up TRIG2:BER, TRIG2:BER:ECO, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV. It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up ALARM:POL.
3. "CONF:ARR:HYST (points),criteria,mksearch"

   This configures for a HYSTERESIS-M measurement. "points" describes how many measurement points to use. "criteria" can be BER or ALARm. "mksearch" can be ON or OFF.
4. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.
5. "FETC:ARR:HYST? (read_points)"

   Returns the "frequency, depth" pairs collected by the previous INITIATE command. The number of pairs of data will be equal to 4*"read_points". The data is returned in the following order: all minimum "shallow-to-deep" pairs, all minimum "deep-to-shallow" pairs, all non-minimum "shallow-to-deep" pairs, and lastly all non-minimum "deep-to-shallow" pairs. "read_points" cannot be bigger than the measurement data's "points".

RECOVERY TIME (4 steps)

1. If using BER criteria, set up TRIG2:BER, TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV (this

measurement does not use TRIG2:BER:ECO). It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP. If using ALARm criteria, set up INP3:POL.

2. "CONF:REC criteria"

   This configures for a recovery measurement. "criteria" can be BER or ALARm.

3. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.

4. "FETC:REC?"

   Returns one value which is equal to the recovery time measured by the previous INITIATE command. No parameters are allowed with FETC:REC?.

BIT ERROR RATE (4 steps)

1. Set up TRIG2:BER:FREQ, TRIG2:BER:MULT, ERROR:IMP, ERROR:COUP, and TRIG2:LEV (this measurement does not use TRIG2:BER nor TRIG2:BER:ECO). It is recommended, that the SCPI commands TRIG2:ECL and TRIG2:TTL be used instead of ERROR:COUP.

2. "CONF:BER"

   This configures for a bit error rate measurement. No parameters are allowed with CONF:BER.

3. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.

4. "FETC:BER?"

Returns one value which is equal to the bit error rate measured by the previous INITIATE command. No parameters are allowed with FETC:BER?.

BELLCORE DISPERSIVE FADE MARGIN (3 steps)

1. CONFigure:*function* for any measurement type except RECOVERY TIME, BER and DYNAMIC-S.
2. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.
3. "FETC:DFM? BELLCORE"

   This query will return the Bellcore dispersive fade margin measured by the previous INITIATE command.

CCIR DISPERSIVE FADE MARGIN (4 steps)

1. CONFigure:*function* for any measurement type except RECOVERY TIME, BER and DYNAMIC-S.
2. Set up TRIG2:BER:SYMBOL:TIM.
3. "INITIATE"

   This tells the Fader to make a measurement based on the above CONFigure. No measurement data is returned on the HP-IB bus, it is simply stored in the Fader for FETCh:*function*? to query.
4. "FETC:DFM? BELLCORE"

   This query will return the CCIR dispersive fade margin measured by the previous INITIATE command.

D

HP-IB Compliance

Introduction

This appendix contains miscellaneous information regarding remote programming using HP-IB (the Hewlett-Packard Interface Bus).

This appendix also contains some information about compliance with IEEE 488.1-1987, IEEE 488.2-1987 and SCPI (Standard Commands for Programmable Instruments).

SCPI Conformance Information

The Fader uses the SCPI (Standard Commands for Programmable Instruments) language for HP-IB communication. The SCPI commands and queries that the Fader understands are listed and described individually in the “Remote Reference” chapter.

The SCPI version number that the Fader supports at the writing of this manual is 1991.0.

The following table lists all of the commands and queries that the Fader understands and whether they are SCPI approved, SCPI confirmed, or non-SCPI. In addition, the IEEE Standard 488.2-1987 commands and queries are labeled “IEEE 488.2 Required” and “IEEE 488.2 Optional.”

In the table, if a command is terminated with a question mark enclosed in parentheses [(?)], that particular syntax is both a command and a query.

The INPut1 subsystem is used for the IF INPUT. The INPut2 subsystem is used for the ERROR PULSE INPUT; ERRor can be used instead of INPut2 if desired. The INPut3 subsystem is used for the ALARM INPUT; ALARm can be used instead of INPut3 if desired. The [SOURce[1]] subsystem is used for the multipath fading simulator. The SOURce2 subsystem is used for the three tone source.

If you need more information about SCPI, refer to the “Beginner’s Guide to SCPI” which has been included with this Fader.

Table D-1. SCPI Conformance

Programming Command	Status
*CAL?	IEEE 488.2 Optional
*CLS	IEEE 488.2 Required
CALCulate:LIMit:STATe(?)	SCPI Confirmed
CALCulate:LIMit:CONTrol[:MINimum][:DATA](?)	Non-SCPI
CALCulate:LIMit:CONTrol[:MINimum]:POINts?	Non-SCPI
CALCulate:LIMit:CONTrol[:NONMinimum][:DATA](?)	Non-SCPI
CALCulate:LIMit:CONTrol[:NONMinimum]:POINts?	Non-SCPI
CALCulate:LIMit:FAIL?	SCPI Confirmed
CALCulate:LIMit:FCOunt?	SCPI Confirmed
CALCulate:LIMit:INTerpolate(?)	SCPI Confirmed
CALCulate:LIMit:LOWer[:MINimum][:DATA](?)	Non-SCPI
CALCulate:LIMit:LOWer[:MINimum]:POINts?	Non-SCPI
CALCulate:LIMit:LOWer[:NONMinimum][:DATA](?)	Non-SCPI
CALCulate:LIMit:CONTrol[:NONMinimum]:POINts?	Non-SCPI
CALCulate:PATH?	SCPI Confirmed
CALCulate:SMOothing[:STATe](?)	SCPI Confirmed
CONFigure?	SCPI Confirmed
CONFigure:ARRay[:STATic]	Non-SCPI
CONFigure:ARRay:DYNamic:FM	Non-SCPI
CONFigure:ARRay:DYNamic[:SWEep]	Non-SCPI
CONFigure:ARRay:HYSTeresis	Non-SCPI
CONFigure[:SCALar]:RECovery	Non-SCPI

Table D-1. SCPI Conformance (continued)

Programming Command	Status
CONFigure[:SCALar]:BER	Non-SCPI
DIAGnostic[s]:PROFile[:DATA](?)	Non-SCPI
DISPlay[:WINDow][:STATe](?)	SCPI Confirmed
*ESE(?)	IEEE 488.2 Required
*ESR?	IEEE 488.2 Required
FETCh?	SCPI Confirmed
FETCh:ARRay[:STATic]?	Non-SCPI
FETCh:ARRay:DYNamic:FM?	Non-SCPI
FETCh:ARRay:DYNamic[:SWEep]?	Non-SCPI
FETCh:ARRay:HYSTeresis?	Non-SCPI
FETCh[:SCALar]:RECovery?	Non-SCPI
FETCh[:SCALar]:DFM?	Non-SCPI
FETCh[:SCALar]:BER?	Non-SCPI
FETCh:TPWidth?	Non-SCPI
*IDN?	IEEE 488.2 Required
INITiate[:IMMediate]	SCPI Confirmed
INITiate:TPWidth	Non-SCPI
INPut[1]:COUPling(?)	SCPI Confirmed
INPut[1]:IMPedance(?)	SCPI Confirmed
INPut2:BIAS:VOLTage[:DC](?)	SCPI Confirmed
INPut2:COUPling(?)	SCPI Confirmed
INPut2:IMPedance(?)	SCPI Confirmed

Table D-1. SCPI Conformance (continued)

Programming Command	Status
INPut3:COUPling(?)	SCPI Confirmed
INPut3:IMPedance(?)	SCPI Confirmed
INPut3:POLarity(?)	SCPI Confirmed
*IST?	IEEE 488.2 Required
*LRN?	IEEE 488.2 Optional
MEASure:ARRay[:STATic]?	Non-SCPI
MEASure:ARRay:DYNamic:FM?	Non-SCPI
MEASure:ARRay:DYNamic[:SWEep]?	Non-SCPI
MEASure:ARRay:HYSTeresis?	Non-SCPI
MEASure[:SCALar]:RECovery?	Non-SCPI
MEASure[:SCALar]:BER?	Non-SCPI
MEASure:SOURce2:POWer?	SCPI Confirmed
MEASure:SOURce2:FREQuency?	SCPI Confirmed
*OPC(?)	IEEE 488.2 Required
*PRE(?)	IEEE 488.2 Required
*OPT?	IEEE 488.2 Optional
*RCL	IEEE 488.2 Optional

Table D-1. SCPI Conformance (continued)

Programming Command	Status
READ:ARRay[:STATic]?	Non-SCPI
READ:ARRay:DYNamic:FM?	Non-SCPI
READ:ARRay:DYNamic[:SWEep]?	Non-SCPI
READ:ARRay:HYSTeresis?	Non-SCPI
READ[:SCALar]:RECovery?	Non-SCPI
READ[:SCALar]:DFM?	Non-SCPI
READ[:SCALar]:BER?	Non-SCPI
*RST	IEEE 488.2 Required
*SAV	IEEE 488.2 Optional
[SOURce[1]:]FM[:DEViation](?)	SCPI Confirmed
[SOURce[1]:]FM:INTernal:RATE(?)	Non-SCPI
[SOURce[1]:]FREQuency[:CW|:FIXed](?)	SCPI Confirmed
[SOURce[1]:]FREQuency:MODE(?)	SCPI Confirmed
[SOURce[1]:]FREQuency:RATE:STARt(?)	Non-SCPI

Table D-1. SCPI Conformance (continued)

Programming Command	Status
[SOURce[1]:]FREQuency:RATE:STOP(?)	Non-SCPI
[SOURce[1]:]FREQuency:STARt(?)	SCPI Confirmed
[SOURce[1]:]FREQuency:STOP(?)	SCPI Confirmed
[SOURce[1]:]LIST:FREQuency(?)	SCPI Confirmed
[SOURce[1]:]LIST:FREQuency:POINts?	SCPI Confirmed
[SOURce[1]:]LIST:GENeration(?)	SCPI Confirmed
[SOURce[1]:]LIST:POWer:ATTenuation(?)	Non-SCPI
[SOURce[1]:]LIST:POWer:ATTenuation:POINts?	Non-SCPI
[SOURce[1]:]LIST:POWer:DEPTh(?)	Non-SCPI
[SOURce[1]:]LIST:POWer:DEPTh:POINts?	Non-SCPI
[SOURce[1]:]LIST:POWer:DEPTh:PHASe(?)	Non-SCPI
[SOURce[1]:]LIST:POWer:DEPTh:PHASe:POINts?	Non-SCPI
[SOURce[1]:]LIST:PRESet	Non-SCPI
[SOURce[1]:]LIST:SSEQuence(?)	Non-SCPI
[SOURce[1]:]LIST:TIME(?)	Non-SCPI
[SOURce[1]:]LIST:TIME:POINts?	Non-SCPI
[SOURce[1]:]LIST:UPDate(?)	Non-SCPI

Table D-1. SCPI Conformance (continued)

Programming Command	Status
[SOURce[1]:]POWer:ALC[:STATe](?)	SCPI Confirmed
[SOURce[1]:]POWer:ALC:BANDwidth(?)	SCPI Confirmed
[SOURce[1]:]POWer:ALC:FREQuency:CENTer(?)	Non-SCPI
[SOURce[1]:]POWer:ATTenuation(?)	SCPI Confirmed
[SOURce[1]:]POWer:ATTenuation:MODE(?)	Non-SCPI
[SOURce[1]:]POWer:ATTenuation:STARt(?)	Non-SCPI
[SOURce[1]:]POWer:ATTenuation:STOP(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:DELay(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:MODE(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:PHASe(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:SLOPes(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:STARt(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:STARt:PHASe(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:STOP(?)	Non-SCPI
[SOURce[1]:]POWer:DEPTh:STOP:PHASe(?)	Non-SCPI
[SOURce[1]:]SWEep:ALL	Non-SCPI
[SOURce[1]:]SWEep:DIRection(?)	SCPI Confirmed
[SOURce[1]:]SWEep:MODE(?)	SCPI Confirmed
[SOURce[1]:]SWEep:SLEW(?)	SCPI Confirmed
[SOURce[1]:]SWEep:SLEW:RATE(?)	Non-SCPI
[SOURce[1]:]SWEep:TIME(?)	SCPI Confirmed

Table D-1. SCPI Conformance (continued)

Programming Command	Status
SOURce2:FREQuency:MODE(?)	SCPI Confirmed
SOURce2:FREQuency:OFFSet(?)	SCPI Confirmed
SOURce2:LIST:FREQuency(?)	SCPI Confirmed
SOURce2:LIST:GENeration(?)	SCPI Confirmed
SOURce2:LIST:POINts?	SCPI Confirmed
SOURce2:POWer[:LEVel](?)	SCPI Confirmed
*SRE(?)	IEEE 488.2 Required
STATus:OPERation:CONDition?	SCPI Confirmed
STATus:OPERation:ENABLe(?)	SCPI Confirmed
STATus:OPERation[:EVENt]?	SCPI Confirmed
STATus:OPERation:NTRansition(?)	SCPI Confirmed
STATus:OPERation:PTRansition(?)	SCPI Confirmed
STATus:PRESet	SCPI Confirmed
STATus:QUEStionable:CONDition?	SCPI Confirmed
STATus:QUEStionable:ENABle(?)	SCPI Confirmed
STATus:QUEStionable[:EVENt]?	SCPI Confirmed
STATus:QUEStionable:NTRansition(?)	SCPI Confirmed
STATus:QUEStionable:PTRansition(?)	SCPI Confirmed

Table D-1. SCPI Conformance (continued)

Programming Command	Status
*STB?	IEEE 488.2 Required
SYSTem:COMMunicate:GPIB:ADDRess(?)	SCPI Confirmed
SYSTem:DATE(?)	SCPI Confirmed
SYSTem:ERRor?	SCPI Confirmed
SYSTem:KEY(?)	SCPI Confirmed
SYSTem:PRESet	SCPI Confirmed
SYSTem:PRINter:DESTination(?)	Non-SCPI
SYSTem:PRINter:STATe(?)	Non-SCPI
SYSTem:PRINter:DUMP	Non-SCPI
SYSTem:SNUMber(?)	Non-SCPI
SYSTem:TIME(?)	SCPI Confirmed
SYSTem:VERSion?	SCPI Confirmed
*TRG	IEEE 488.2 Optional

Table D-1. SCPI Conformance (continued)

Programming Command	Status
TRIGger[1][:SEQuence[1]|:STARt]:SOURce(?)	SCPI Confirmed
TRIGger2[:SEQuence[1]|:STARt]:BER:ECOunt(?)	Non-SCPI
TRIGger2[:SEQuence[1]|:STARt]:BER:FREQuency(?)	Non-SCPI
TRIGger2[:SEQuence[1]|:STARt]:BER:MULTiplier(?)	Non-SCPI
TRIGger2[:SEQuence[1]|:STARt]:BER:SYMBol:TIME(?)	Non-SCPI
TRIGger2[:SEQuence[1]|:STARt]:BER[:THReshold](?)	Non-SCPI
TRIGger2[:SEQuence[1]|:STARt]:ECL	SCPI Confirmed
TRIGger2[:SEQuence[1]|:STARt]:LEVel(?)	SCPI Confirmed
TRIGger2[:SEQuence[1]|:STARt]:TIMer(?)	SCPI Confirmed
TRIGger2[:SEQuence[1]|:STARt]:TTL	SCPI Confirmed
*TST?	IEEE 488.2 Required
*WAI	IEEE 488.2 Required

Avoiding Fader Interruptions

Why Avoid Interruptions?

The Fader only has one microprocessor and therefore it can only do one "function" at a time. Everything that the Fader "does" requires the microprocessor (except the time/date clock).

When the Fader is sweeping, slewing, fading or measuring, there is a potential for the Fader to become too busy to process HP-IB commands or key presses without interrupting the sweeping, slewing, fading or measuring.

The Fader becomes busier under the following conditions:

- the sweep time decreases
- the slew time decreases
- the fade event slew time decreases
- the measurement sweep rate increases

If the Fader is busy and the HP-IB bus requires action, the Fader will momentarily stop what it is doing and process the HP-IB bus' needs. If the Fader is busy and a key is pressed, the Fader will momentarily stop what it is doing and process the new key.

Therefore, to maintain a fast smooth sweep, slew, fade event, or measurement, don't issue HP-IB requests to the Fader and don't press keys. The HP-IB synchronization commands *OPC, *OPC? and *WAI should be used to wait until the previous HP-IB command is finished. As an alternative, SRQ and parallel poll can be used for polling the "finished state" of the Fader.

Note

Performing a serial poll can cause the Fader to momentarily interrupt what it is doing. Performing a parallel poll will never interrupt the Fader.

Examples

The following two example programs show two different techniques of waiting until fade event 0 is done before starting fade event 2:

```
10 OUTPUT 714;"SWE:ALL LIST0;*WAI"
20 OUTPUT 714;"SWE:ALL LIST2"
30 END
```

```
10 OUTPUT 714;"SWE:ALL LIST0;*OPC?"
20 ENTER 714;Op_complete
30 OUTPUT 714;"SWE:ALL LIST2"
40 END
```

The following example program executes fade event 0 and then does some BASIC crunching that has nothing to do with talking to the Fader. When fade event 0 is done, fade event 2 is run:

```
10 PPOLL CONFIGURE 714;4
20 OUTPUT 714;"*ESE 1"
30 OUTPUT 714;"*PRE 32"
40 OUTPUT 714;"SWE:ALL LIST0;*OPC"
50 ! Do some BASIC crunching
60 Ppoll_response=PPOLL(7)
70 IF BIT(Ppoll_response,4)=1 THEN 50
80 OUTPUT 714;"SWE:ALL LIST2"
90 END
```

The following example program shows how to use an SRQ interrupt routine. The WHILE loop waits until the measurement is done before an ENTER is performed.

```
10 OPTION BASE 1
20 DIM Array(40)
30 ON INTR 7,15 GOSUB Read_data
```

```
40 OUTPUT 714;"*CLS"
50 OUTPUT 714;"STAT:OPER:NTR 16"
60 OUTPUT 714;"STAT:OPER:ENAB 16"
70 OUTPUT 714;"*SRE 128"
80 Measure_loop: !
90 Intr_occurred=0
100 ENABLE INTR 7;2
110 OUTPUT 714;"CONF:ARR:STAT (20),MIN,BER,OFF"
120 OUTPUT 714;"INITIATE"
130 OUTPUT 714;"FETCH?"
140 WHILE (Intr_occurred=0)
150 ! Do some BASIC crunching
160 END WHILE
170 ENTER 714;Array(*)
180 OUTPUT 714;"*CLS"
190 PRINT Array(*)
200 GOTO Measure_loop
210 Read_data: !
220 Intr_occurred=1
230 DISABLE INTR 7
240 RETURN
250 END
```

Overlapped HP-IB Commands

In the Fader, all HP-IB commands can potentially be "overlapped". "Overlapped" means that previous commands are not guaranteed to be finished when a new command or query is executed.

In addition, if constant HP-IB traffic occurs, the Fader is always kept busy executing HP-IB commands. In this case, the Fader will never have a chance to sweep, slew, or fade.

For example, the following program would never allow slewing because it is contantly sending HP-IB commands to the Fader. *RST would never finish getting the hardware to the PRESET state, and the notch frequency commands in lines 20 and 30 would never get anywhere either. The Fader would remain at the current notch frequency, constantly being "re-commanded" to slew to a new notch frequency:

```
10 OUTPUT 714;"*RST"
20 OUTPUT 714;"FREQ 75MHZ"
30 OUTPUT 714;"FREQ 65MHZ"
40 GOTO 20
50 END
```

The synchronization commands (*OPC, *OPC?, and *WAI) must be used to achieve "sequential" HP-IB operation when using the Fader. The following example program shows the correct way to implement the previous example program:

```
10 OUTPUT 714;"*RST;*WAI"
20 OUTPUT 714;"FREQ 75MHZ;*WAI"
30 OUTPUT 714;"FREQ 65MHZ;*WAI"
40 GOTO 20
50 END
```

As a guideline, it is a good idea to use the synchronization commands after any Fader HP-IB command that alters any Fader hardware.

Interface Functions

This section gives a quick overview of some of the HP-IB specific capabilities of the Fader. In addition, device clear, interface clear and group execute trigger are described here.

IEEE 488.1 Interface Function Subsets

The IEEE 488.1 Interface Function Subsets of the Fader are:

SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP1, DC1, DT1, C0, E2

Device Clear

The device clear (DCL) or selected device clear (SDC) commands clear the input and output buffers. They reset the Fader's parser and clear any pending commands.

In addition, these commands ready the Fader to receive an HP-IB command or query. To achieve this, the following Fader functions must be halted (aborted):

- Fade events
- Measurements
- Printing

Group Execute Trigger (GET)

The group execute trigger command has exactly the same functionality as the *TRG command. Please see the "Common Commands" chapter for a description of the *TRG command.

Interface Clear (IFC)

This command halts all bus activity. This includes unaddressing all listeners and the talker, disabling serial poll on all devices, and returning control to the system controller. This does not perform a device clear.

Status Annunciators

The Fader will display the HP-IB bus status on the display using annunciators. There are 4 of these HP-IB annunciators: RMT, LSN, TLK, and SRQ.

RMT When this annunciator is on, the Fader is in remote mode. When this annunciator is off, the Fader is in local mode. This annunciator is always updated immediately upon a remote/local mode change.

LSN When this annunciator is on, the Fader is addressed to listen. When this annunciator is off, the Fader is not addressed to listen. This annunciator is only updated when the Fader has time; therefore, it can be incorrect if the Fader is busy. For example, the Fader gets busy if there is constant HP-IB traffic or if it is sweeping, slewing, fading, etc. For more information about when the Fader is busy, see "Avoiding Fader Interruptions".

TLK When this annunciator is on, the Fader is addressed to talk. When this annunciator is off, the Fader is not addressed to talk. This annunciator is only updated when the Fader has time; therefore, it can be incorrect if the Fader is busy. For example, the Fader gets busy if there is constant HP-IB traffic or if it is sweeping, slewing, fading, etc. For more information about when the Fader is busy, see "Avoiding Fader Interruptions".

SRQ When this annunciator is on, the Fader is issuing a service request. When this annunciator is off, the Fader is not issuing a service request. This annunciator is only updated when the Fader has time; therefore, it can be incorrect if the Fader is busy. For example, the Fader gets busy if there is constant HP-IB traffic or if it is sweeping, slewing, fading, etc. For more information about when the Fader is busy, see "Avoiding Fader Interruptions".

IEEE 488.2 Compliance Information

In section 4.9 of the document, *IEEE Standard 488.2-1987, IEEE Standard Codes, Formats, Protocols, and Common Commands For Use with ANSI/IEEE Std 488.1-1987*, the following information is required of all IEEE 488.2-1987 devices. How the Fader conforms to this Standard is described in the following 23 items:

1. A list of IEEE 488.1 Interface Functions Subsets is described in this appendix.
2. The Fader HP-IB address can be set to 0 through 30 for "normal" talker/listener operation. Special addresses 40 and 50 are allowed also; all other addresses are rejected by the Fader. If the HP-IB address is set to 40, the Fader is placed into listen only mode. If the HP-IB address is set to 50, the Fader is placed into talk only mode.
3. An HP-IB address change takes effect immediately in the Fader.
4. At power-on, the Fader will be in the same state as when it was last powered off. However, if the Fader battery fails, the Fader will not retain its old state. In this case, the Fader be in the PRESET state upon power on and non-presettable values will be set to their factory PRESET value.
5. Message exchange information
   a. The input buffer is 256 characters in size. GET is buffered as if it were an input byte. Characters are buffered until the buffer is full or until the Fader has time to parse the characters and execute them.
   b. None of the Fader queries return more than one RESPONSE MESSAGE UNIT. Multiple RESPONSE MESSAGE UNITS would look like "2.1;3.3;4.5". The Fader does have some queries

that return multiple RESPONSE DATA UNITS which look like “1,0,1,0”.

c. All Fader queries generate a response immediately after being parsed.

d. None of the Fader queries generate a response when read.

e. There are no coupled commands in the Fader.

6. Compound program headers are used for the Fader device-specific commands. The functional elements used to construct these device-specific commands are described in the “HP-IB Commands” chapter.

7. There are no buffer size limitations on block input data in the Fader.

8. The expression data allowed for measurement points can only be an <NRf>, or one of the following SCPI enumerated types: MAXimum, MINimum or DEFault. The expression parser ignores IEEE 488.2 white space. There is no mathematical evaluation of expressions in the Fader. There is no expression nesting allowed in the Fader.

9. The response syntax for every query is described in the “Common Commands” and “HP-IB Commands” chapters with each individual query.

10. When performing a print which is initiated from the front panel, the Fader must be in talk only mode. Without being a controller, the Fader will dump its print data to the bus. When performing a print initiated from HP-IB, the Fader pretends it is responding to a query. In this case it is up to the controller to route the print data to the printer.

11. The size of the *LRN? block is given on its description page in the “Common Commands” chapter.

12. The IEEE 488.2 Common Commands implemented by the Fader are listed and described in the "Common Commands" chapter.
13. The Fader state after a *CAL? is unchanged.
14. *DDT is not implemented in the Fader.
15. Macros are not implemented in the Fader.
16. The response to *IDN? is described on its description page in the "Common Commands" chapter.
17. *PUD and *PUD? are not implemented in the Fader.
18. *RDT and *RDT? are not implemented in the Fader.
19. The states affected by *RST, *LRN?, *RCL and *SAV are all identical. This state is listed with the *RST command in the "Common Commands" chapter.
20. The *TST? is described on its description page in the "Common Commands" chapter and in more detail in the Service Manual.
21. The additional status structures implemented in the Fader are described under the SYSTem:ERRor? query, the OPERation subsystem and the QUEStionable subsystem. The IEEE 488.2 Standard Event Status structure and Output Queue MAV bit are implemented by the Fader.
22. All commands that alter the output signal are overlapped in the Fader. All commands that can be executed immediately without changing the output, are sequential. Commands and queries that perform a measurement are sequential because they do not allow the Fader to process HP-IB commands until the measurement is complete. See "Overlapped

HP-IB Commands" in this appendix for more information.

23. Operation complete criteria is described with the *OPC and *OPC? on their description page in the "Common Commands" chapter.

Related Documents

The International Institute of Electrical and Electronics Engineers

IEEE Standard 488.1-1987, IEEE Standard Digital Interface for Programmable Instrumentation, New York, NY, 1987.

This document defines the technical details required to design and build an HP-IB interface conforming to the IEEE 488.1 standard. This standard contains electrical specifications and information on protocol that is beyond the needs of most programmers. However, it can be useful to clarify formal definitions of certain terms used in related remote programming documents.

IEEE Standard 488.2-1987, IEEE Standard Codes, Formats, Protocols, and Common Commands For Use with ANSI/IEEE Std 488.1-1987, New York, NY, 1987.

This document describes the underlying message formats and data types used in SCPI. It is intended more for instrument software engineers than for instrument users and programmers. However, this document can be useful if there is a need to know the precise definition of certain message formats, data types, or Common Commands.

To obtain a copy of either of these documents, write to:

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street
New York, NY 10017
USA

Hewlett Packard Company

BASIC 5.0/5.1 Interfacing Techniques, Vol. 2, Specific Interfaces, 1987, HP Part No. 98613-90022.

This HP BASIC manual contains a good non-technical description of the HP-IB interface in its chapter 12, titled "The HP-IB Interface". Subsequent revisions of HP BASIC may use a slightly different title for this manual or chapter. This manual is the best reference on instrument input/output for HP BASIC programmers.

Beginner's Guide to SCPI, 1990, HP Part No. H2325-90001.

This guide is included with the Fader. It gives a good introduction to the SCPI Language and SCPI programming. It also gives a quick overview of the SCPI STATus structure. This guide will help a reader of the Fader manual to better understand the HP-IB command descriptions in the "HP-IB Commands" chapter.

Standard Commands For Programmable Instruments Manual, April, 1991.

This document describes the complete SCPI programming standards and language. There is no need to have this document to use the Fader; it is only intended for users with an interest in SCPI. The Fader contains an applicable subset of the SCPI language. To obtain a copy of the SCPI Manual, contact your Hewlett-Packard Sales Representative; there is no HP Part number for the SCPI Manual yet.

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Special characters

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