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HP Interactive Test Generator for HP BASIC

Driver Documentation

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HP ITG Driver Documentation

Manual Part Number: E2001-90000

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Introduction

The HP E2001A provides a set of instrument drivers for use with the HP Interactive Test Generator (ITG). Each section of this manual contains information on the individual drivers.

Most of the sections of this manual include a summary of the ocmponents in the driver. These tables provide most of the necessary information for writing test programs using HP ITG with these drivers. The first column of the table is the component name. The second column describes various attributes of the component. The third column indicates the initial value of the component. In many cases, any initial value is not defined for the component. The following table summarizes how to interpret the entry in this column.

Type of component	**Entry in summary table**
Integer Array	IARRAY[size] or IARRAY[row-size,col-size]
Real Array	RARRAY[size] or RARRAY[row-size,col-size]
String	STRING[length]
Enumerated	List of values
Numeric	Range of legal values
Buttons	The word "button" (or no entry")
Read-only components	No entry

HP 438A Power Meter

Overview

The HP 438A Power Meter is a dual channel meter. It measures power in the range of -70 to +44 dBm over the frequency range of 100 kHz to 50 GHz using the HP 8480 series power sensors. A 1.00 mW 50 MHz Power Reference is available for calibrating the meter to the sensitivity of the sensors.

Files Names

The name of the driver for the HP 438A is: **IDHP438A**

Its Help file is: **IHHP438A**

Using the Panel

The HP 438A driver is controlled through six panels:

- **Main** - General Meter Operation
- **Cal** - Zeroing and Calibration
- **A Meas** - Channel A Configuration
- **B Meas** - Channel B Configuration
- **Other** - Miscellaneous Controls
- **Status** - Status and Error Controls

Most power measurements may be made by using the **Cal** panel for zeroing and calibration and the **Main** panel for configuration. Usually, the default settings on the **A Meas** and **B Meas** panels may be used.

To take a reading:

- Click on the display.

Error

The error number can be read by clicking on the display labeled **Error** in the **Status** panel. It is also the value reported when HP ITG's **Error Checking** mode detects an error.

Error Number	Error Definition
0	No error
1	Cannot zero-sensor A
2	Cannot zero-sensor B

3	Sensor A not connected to reference during cal
4	Sensor B not connected to reference during cal
5	Power Meter cannot calibrate sensor A
6	Power Meter cannot calibrate sensor B
11	Input overload on sensor A
12	Input overload on sensor B
15	Sensor A requires zeroing (reference has drifted negative)
16	Sensor A requires zeroing (reference has drifted negative)
17	Input power on sensor A too high for current range
18	Input power on sensor B too high for current range
25	Overflow error (combination of input power, offset, cal factor, and measurement mode results in a value that is too large)
26	Underflow Error
27	Log Error
28	Invalid or missing reference
31	Channel A does not have a sensor connected
32	Channel B does not have a sensor connected
33	Both front and rear sensor A inputs have sensors connected
34	Both front and rear sensor A inputs have sensors connected
50	Entered cal factor out of range
51	Entered offset out of range
52	Entered range number is out of range
53	Entered filter number is out of range
54	Entered recall register is out of range
55	Entered storage register is out of range
56	Entered reference cal factor is out of range

57	Continuous memory failure
58	Entered HP-IB address is out of range
90	HP-IB data without a valid prefix
91	Invalid HP-IB code
61-69	Service related errors

Serial Poll

Bit Definition	Bit Weight
Data Ready	1
Cal/Zero Complete	2
Entry Error	4
Measurement Error	8
Over/Under Limit	16
Always 0	32
RQS Bit (Require Service)	64
Always 0	128

HP 438A Power Meter Revision 1.0		
Component	Values	Initial Value
A_AFILTER	OFF,ON	ON
A_ARANGE	OFF,ON	ON
A_CAL	button	
A_CAL_ADJUST	50 - 120	100
A_CAL_FACTOR	1 - 150	100
A_FILTER	0 - 9	DONTCARE
A_LIMIT_HI	-299.999 - +299.999	0
A_LIMIT_LO	-299.999 - +299.999	0
A_OFFSET	-99.99 - +99.99	0
A_RANGE	1 - 5	DONTCARE
A_ZERO	button	
B_AFILTER	OFF,ON	ON
B_ARANGE	OFF,ON	ON
B_CAL	button	
B_CAL_ADJUST	50 - 120	100
B_CAL_FACTOR	1 - 150	100
B_FILTER	0 - 9	DONTCARE
B_LIMIT_HI	-299.999 - +299.999	0
B_LIMIT_LO	-299.999 - +299.999	0
B_OFFSET	-99.99 - +99.99	0
B_RANGE	1 - 5	DONTCARE
B_ZERO	button	
CLEAR_STATUS	button	
DISPLAY_ENABLE	OFF,TEST,ON	ON
ERROR	-32768 - 32767	
LEARN_STRING	STRING[128]	""
LIMIT_ENABLE	OFF,ON	OFF
MASK	0 - 255	0
MODE	A,A/B,B-A,A-B,B/A,B	A
READING		
RECALL	0 - 19	
REFERENCE	OFF,ON	OFF
RESET	button	
STATUS	0 - 255	

HP 438A Power Meter Revision 1.0 (continued)		
Component	Values	Initial Value
STATUS_MESSAGE	STRING[80]	
STORE	1 - 19	
TRIGGER	FAST,INTERNAL,SINGLE	SINGLE
UNITS	LOG,LINEAR	LOG

HP 3314A Function Generator

Overview

The HP 3314A is a multi-mode, HP-IB programmable Function Generator featuring sine, square, and triangle functions from 1 mHz to 19.99 MHz. Ramps and pulses are available from 1 mHz to 1.999 MHz using variable symmetry. Additional features include gate, counted bursts, dc offset, phase lock, lin/log sweeps, AM, FM, and VCO.

The HP 3314A multi-modes of operation include:

- Free Run
  - The HP 3314A output signal is continuous or swept. Triggers are ignored unless the HP 3314A is sweeping, when they are used as sweep start signals.
- Gate
  - The HP 3314A output signal is gated ON or OFF by the trigger level. When the trigger level satisfies the trigger slope and threshold conditions the output is ON. The output will gate OFF at the signal's first transition through the Stop Phase after the trigger signal changes level.
- N Cycle
  - The HP 3314A output signal is a counted burst of "N" whole cycles. The trigger edge that satisfies the trigger slope and threshold conditions will initiate an N cycle burst.

- 1/2 Cycle
  - The HP 3314A output signal is alternate 1/2 cycles (180 degrees). The trigger edge that satisfies the trigger slope and threshold conditions will initiate a 1/2 cycle burst.
- Fin * N
  - The HP 3314A output frequency is phase locked to and "N" times the reference frequency. The reference and 3314A frequencies are limited from 50 Hz to 19.99 MHz.
- Fin / N
  - The HP 3314A output frequency is phase locked to and "1/N" times the reference frequency. The reference and 3314A frequency range is from 50 Hz to 19.99 MHz.

The Arbitrary waveform mode is not implemented in this driver.

Using the Panel

This panel allows interactive control of these features of the HP 3314A:

- Main or entry waveform parameters
- Waveform sweep parameters
- Modulation parameters
- Trigger parameters
- Calibration parameters (Other Panel)
- Instrument state storage and recall (Other Panel)

- SRQ mask (Status Panel)
- Status
- Error (Status Panel)
- Serial poll

Recalling States

When using HP ITG's recall state feature (either as **Recall State** from the panel menu or by calling Hpt_recall), a new frequency value is programmed as follows:

(1) The symmetry value is programmed to 50%, and

(2) The frequency value is programmed to the value specified.

Status

The status byte is an 8-bit word that the HP 3314A outputs when involved in a serial poll. The state of each bit (1 or 0) indicates the status of an internal HP 3314A function. A bit is set after that bit has been unmasked and the bit condition is satisfied. After the status byte is sent, all bits are reset to 0; the bit(s) are not set again if the condition(s) does not change.

The following exceptions automatically reset a bit immediately after the HP 3314A sends its status byte:

- Overload
- Trigger (in gate mode)
- Busy flag

Bit Definition	Bit Weight
Error or Failure (1)	1
Information Flag (1)	2
Operator Alert (1)	4
Output Overload	8
Trigger Status (1)	16
PLL or Sweep Status (1)	32
Service Requested (SRQ line)	64
Busy Flag (2)	128

(1) SRQ on 0-to-1 transition

(2) SRQ on 1-to-0 transition

Error

The error number can be read by clicking on the **Error** box (Status Panel). The error numbers for the HP 3314A are:

Error #	Error Definition	Status Bit Weight
0	No errors	--
1	Frequency/Symmetry conflict	1
2	Bus address entry error	1
3	Front panel key failure	1
4	Cal measurement not performed	2
5	Allowed in sweep only	1
6	Not allowed in sweep	1
7	Store 0 not allowed	1
8	Store 0 not allowed	1
9	Non-volatile memory lost	1
10	Vector insert not allowed	1
11	Vector delete not allowed	1
18	Allowed in ARB, only	1
19	Not allowed in ARB	1
20	Unstable input frequency	2
21	Input freq. outside capture range	2
22	Output freq. would be out of range	2
23	Internal interval 20 ms	2
24	Internal synthesis unlocked	1
30	No freq. detected	1

31	Frequency error exceeds correction	1
32	Frequency unstable during calibration	1
34	Signal amplitude outside range	1
35	Signal amplitude gain too high	1
36	Signal amplitude gain too low	1
37	Signal amplitude gain out of limit	1
38	Signal amplitude offset gain limit	1
41	Mnemonic invalid	1
42	Definition number invalid	1
43	Data invalid	1
44	Units invalid	1
45	Range Hold not allowed	1
46	ARB/SWEEP parameter conflict	1
47	Not allowed in Manual Sweep	1
50	AM or FM/VCO input voltage limit	2
51	Output voltage safe limits	4

Serial Poll

The serial poll register is an 8-bit register that the HP 3314A uses to keep track of its internal operating status and to determine the operating status of each of its outputs.

Bit Definition	Bit Weight
Error or Failure (1)	1
Information Flag (1)	2
Operator Alert (1)	4
Output Overload	8
Trigger Status (1)	16
PLL or Sweep Status (1)	32
Service Requested (SRQ line)	64
Busy Flag (2)	128

(1) SRQ on 0 to 1 transition

(2) SRQ on 1 to 0 transition

HP 3314A FUNCTION GENERATOR Revision 1.0		
Component	Values	Initial Value
Am	Off,On	Off
Amplitude	0 - 10	.1
Cal_all		
Calibrate	Disable,Enable	Enable
Error		
Fm	Off,On	Off
Frequency	.001 - 19.99E6	1000
Func_invert	Off,On	Off
Function	Off,Sine,Square,Triangle	Sine
Instr_status_mask	0 - 255	0
Manual_trig		
Mkr_freq	.001 - 19.99E6	5000
Mode	Free,Gate,Ncyc,Hcyc,Fxn,Fdivn	Free
Number	1 - 1999	1
Offset	-5 - 5	0
Phase	- 199.9 - 199.9	0
Recall_state	0 - 5	0
Reset		
Start_freq	.001 - 19.99E6	1000
Status		
Stop_freq	.001 - 19.99E6	10000
Store_state	1 - 5	1
Sweep_mode	Off,Lin,Log	Off
Sweep_time	.0072 - 1999	.01
Symmetry	5 - 95	50
Trig_level	One_volt,Zero_volt	One_volt
Trig_slope	Pos,Neg	Pos
Trig_source	Int,Ext	Int
Vco	Off,On	Off

HP 3325A Synthesizer/Function Generator

Overview

The HP 3325A is an HP-IB programmable Synthesizer/ Function Generator featuring Sine (1 uHz to 60.999999999 MHz), Square (1 uHz to 10.999999999 MHz), Triangle, Positive slope ramps and Negative slope ramps (1 uHz to 10.999999999 kHz). The frequency of the output function (Sine, Square, Triangle, Positive slope ramps, and Negative slope ramps) may be selected with up to eleven digits of resolution.

Output amplitude is 1 mV p-p to 10 V p-p. The output level may also be selected or displayed in V rms or in dBm (50 ohms). Any function may be dc offset up to +/- 4.5 V, or the output may be dc only up to +/-5 V. An optional high voltage output produces up to 40 V p-p into greater than or equal to 500 ohms load.

Frequency sweep of all functions is provided in linear or log sweep, at sweep times of 10 ms to 99.99 s for linear sweep. Maximum time for log sweep is 99.99 s and minimum time is 2 s for single log sweep and 0.1 s for continuous log sweep. Single linear sweep may be up or down, while continuous sweep is up/down/up, etc., in the linear mode and up/up/, etc. in log mode.

File Names

The name of the HP 3325A driver, without the high voltage output option is: **IDHP3325A**

The name of its Help file is: **IHHP3325A**

The name of the HP 3325A driver with the high voltage output option is: **IDHP3325A2**

The name of its Help file is: **IHHP3325A2**

Using the Panel

This panel allows interactive control of these features of the function generator:

- Main or entry waveform parameters
- Waveform sweep parameters
- Modulation parameters
- Calibration parameters (Other Panel)
- Instrument state storage and recall (Other Panel)
- SRQ mask (Status Panel)
- Status
- Error (Status Panel)
- Serial poll

Recalling States

When using HP ITG's recall state feature (either as **Recall State** from the panel menu or by calling Hpt_recall in a program), a new amplitude value is programmed as follows:

1. The offset value is programmed to 0 volts, and
2. The amplitude value is programmed to the value specified.

Status

The status byte is an 8-bit word that the HP 3325A outputs when involved in a serial poll. The state of each bit (1 or 0) indicates the status of an internal HP 3325A function. A bit is set after that bit has been unmasked and the bit condition is satisfied. After the status byte is sent, all bits are reset to 0; the bit(s) are not set again if the condition(s) does not change.

Exceptions that automatically reset a bit immediately after the HP 3325A sends its status byte are: sweep (sweep in progress) and busy flag.

Bit Definition	Bit Weight
ERR (Program or keyboard entry error)	1
STOP (Sweep stopped)	2
START (Sweep started)	4
FAIL (Hardware failure)	8
BIT 4 (Always zero)	16
SWEEP (Sweep in progress)	32

RQS (Corresponds to the HP-IB SRQ signal)	64
BUSY (Set if a command is being executed)	128

Error

The error number can be read by clicking on the **Error** box (Status Panel).. The error numbers for the HP 3325A are:

Error Number	Error Definition
0	No error
1	The value entered for the selected parameter exceeds the valid limits.
2	The units key selected is improper for the selected parameter.
3	The frequency entered is too high for the waveform function selected.
4	The sweep time is too small or too large.
5	Amplitude and dc offset values are incompatible.
6	Sweep frequency too large for function; sweep bandwidth too small; start frequency too small (log sweep); start frequency greater than stop frequency (log sweep).
7	Unknown error
8	Unrecognizable data character received.
9	Option not installed

Serial Poll

The serial poll register is an 8-bit register that the HP 3325A uses to keep track of its internal operating status and to determine the operating status of each of its outputs.

Bit Definition	Bit Weight
ERR (Program or keyboard entry error)	1
STOP (Sweep stopped)	2
START (Sweep started)	4
FAIL (Hardware failure)	8
BIT 4 (Always zero)	16
SWEEP (Sweep in progress)	32
RQS (Corresponds to the HP-IB SRQ signal)	64
BUSY (Set if a command is being executed)	128

HP 3325A SYNTHESIZER/FUNCTION GENERATOR Revision 1.0		
Component	Values	Initial Value
Am	Off,On	Off
Amplitude	.001 - 10	.001
Amptd_cal		
Assign_p		
Aunits	Vpp,Rms,dBm	Vpp
Error		
Frequency	1E-6 - 60.999999999E6	1000
Function	Dc,Sine,Square,Triangle,'Pos Ramp','Neg Ramp'	Sine
Instr_status_mask	0 - 15	0
Mkr_freq	1E-6 - 20.999999999E6	5E6
Offset	-4.502 - 4.502	0
Phase	-719.9 - 719.9	0
Pm	Off,On	Off
Recall_state	0 - 9	0
Reset		
Self_test		
Start_cont		
Start_freq	1E-6 - 20.999999999E6	1E6
Start_sgl		
Status		
Stop_freq	1E-6 - 20.999999999E6	10E6
Store_state	0 - 9	0
Sweep_mode	Lin,Log	Lin
Sweep_time	.01 - 99.99	1
Terminals	Front,Rear	Front

HP 3325B Synthesizer/Function Generator

Overview

The HP 3325B is an HP-IB programmable Synthesizer/ Function Generator featuring Sine (1 uHz to 60.999999999 MHz), Square (1 uHz to 10.999999999 MHz), Triangle, Positive slope ramps and Negative slope ramps (1 uHz to 10.999999999 kHz). The frequency of the output function (Sine, Square, Triangle, Positive slope ramps, and Negative slope ramps) may be selected with up to eleven digits of resolution.

Output amplitude is 1 mV p-p to 10 V p-p. The output level may also be selected or displayed in V rms or in dBm (50 ohms). Any function may be dc offset up to +/- 4.5 V, or the output may be dc only up to +/-5 V. An optional high voltage output produces up to 40 V p-p into greater than or equal to 500 ohms load.

Frequency sweep of all functions is provided in linear or log sweep, at sweep times of 10 ms to 1000 s for linear sweep. Maximum time for log sweep is 1000 s and minimum time is 1 s for single log sweep and 0.1 s for continuous log sweep. Single linear sweep may be up or down, while continuous sweep is up/down/up, etc., in the linear mode and up/up/, etc. in log mode.

File Names

The name of the HP 3325B driver, without the high voltage output option is: **IDHP3325B**

The name of its Help file is: **IHHP3325B**

The name of the HP 3325B driver with the high voltage output option is: **IDHP3325B2**

The name of its Help file is: **IHHP3325B2**

Using the Panel

This panel allows interactive control of these features of the function generator:

- Main or entry waveform parameters
- Waveform sweep parameters
- Modulation parameters
- Calibration parameters (Other Panel)
- Instrument state storage and recall (Other Panel)
- SRQ mask (Status Panel)
- Status
- Error (Status Panel)
- Serial poll

Recalling States

When using HP ITG's recall state feature (either as **Recall State** from the panel menu or by calling Hpt_recall in a program), a new amplitude value is programmed as follows:

1. The offset value is programmed to 0 volts, and
2. The amplitude value is programmed to the value specified.

Status

The status byte is an 8-bit word that the HP 3325B outputs when involved in a serial poll. The state of each bit (1 or 0) indicates the status of an internal HP 3325B function. A bit is set after that bit has been unmasked and the bit condition is satisfied. After the status byte is sent, all bits are reset to 0; the bit(s) are not set again if the condition(s) does not change.

The following exceptions automatically reset a bit immediately after the HP 3325B sends its status byte:

- Sweep (sweep in progress)
- Busy flag

Bit Definition	Bit Weight
ERR (Program or keyboard entry error)	1
STOP (Sweep stopped)	2
START (Sweep started)	4
FAIL (Hardware failure)	8

BIT 4 (Always zero)	16
SWEEP (Sweep in progress)	32
RQS (Corresponds to the HP-IB SRQ signal)	64
BUSY (Set if a command is being executed)	128

Error

The error number can be read by clicking on the **Error** box (Status Panel). The error numbers for the HP 3325B are:

Error Number	Error Definition
0	No error
100	The value entered for the selected parameter exceeds the valid limits.
200	The units key selected is improper for the selected parameter.
201	The units key selected is improper for the selected parameter with high voltage option.
300	The frequency entered is too high for the waveform function selected.
400	The sweep time entered is too large for the frequency span (sweep span is too small).
401	The sweep time is too small for the frequency span.
500	Amplitude and dc offset values are incompatible.
501	The dc offset is too large for amplitude.
502	The amplitude is too large for the dc offset.

503	Amplitude is too small.
600	Sweep frequency too large for function.
601	Sweep frequency too large for function.
602	Sweep bandwidth too small.
603	Log sweep start frequency too small.
604	Log sweep stop frequency less than start frequency.
605	Discrete sweep segment is empty.
700	Unknown command
701	Illegal query
751	Key ignored, front-panel key pressed while the HP 3325B is in remote.
752	Key ignored, front-panel key pressed while the HP 3325B is in local lockout.
753	Feature disabled in compatibility mode.
754	Attempt to recall a memory register that has not been stored since power up.
755	Amplitude modulation not allowed on selected function.
756	Modulation source arbitrary waveform memory register is empty.
757	Too many modulation source arbitrary waveform points.
758	Firmware (program) failure
800	A remote HP-IB or RS-232 command has a syntax error.
801	Illegal digit for selection item
802	Illegal binary data block header
803	Illegal string, string overflow
810	RS-232 overrun, characters lost

811	RS-232 parity error
812	RS-232 frame error
900	Option not installed
-CAL-	Calibration in progress
PASS	A self test is successful.
FAIL	A self test is unsuccessful (refer to qualified service personnel for repair).

Serial Poll

The serial poll register is an 8-bit register that the HP 3325B uses to keep track of its internal operating status and to determine the operating status of each of its outputs.

Bit Definition	Bit Weight
ERR (Program or keyboard entry error)	1
STOP (Sweep stopped)	2
START (Sweep started)	4
FAIL (Hardware failure)	8
BIT 4 (Always zero)	16
SWEEP (Sweep in progress)	32
RQS (Corresponds to the HP-IB SRQ signal)	64
BUSY (Set if a command is being executed)	128

HP 3325B SYNTHESIZER/FUNCTION GENERATOR Revision 1.0		
Component	Values	Initial Value
Am	Off,On	Off
Amplitude	.001 - 10	.001
Amptd_cal		
Assign_p		
Aunits	Vpp,Rms,dBm	Vpp
Calibrate	Disable,Enable	Enable
D_clear		
D_recall	0 - 99	0
D_store	0 - 99	0
Error		
Frequency	1E-6 - 60.999999999E6	1000
Function	Dc,Sine,Square,Triangle,'Pos Ramp','Neg Ramp'	Sine
Hv_out	Off,On	Off
Instr_status_mask	0 - 15	0
Mkr_freq	1E-6 - 20.999999999E6	5E6
Mod_amplitude	.1 - 12	.1
Mod_amplitude_units	Vpp,Rms	Vpp
Mod_frequency	.1 - 1E4	1000
Mod_function	Off,Sine,Square	Off
Offset	-4.502 - 4.502	0
Phase	-1440.0 - 1440.0	0
Pm	Off,On	Off
Recall_state	0 - 9	0
Self_test		
Start_cont		
Start_freq	1E-6 - 20.999999999E6	1E6
Start_sgl		
Status		
Stop_freq	1E-6 - 20.999999999E6	10E6
Store_state	0 - 9	0
Sweep_mode	Lin,Log,Discrete	Lin
Sweep_time	.01 - 1000	1

HP 3437A System Voltmeter

Overview

The HP 3437A is a microprocessor-controlled 3-1/2 digit, successive approximation system voltmeter. Chassis-isolated input terminals, a wideband input amplifier, auto-zero, auto-polarity, sample and hold, and 100% overrange on each of the input ranges (.1 volt, 1 volt, and 10 volts) provide floating measurement capability (+ /-20 V) over the frequency range of dc through 1.0 MHz. The HP 3437A can delay an external trigger from 0 to 1 second in 100 ns steps, and can make single reading or burst measurements.

File Names

The name of the HP 3437A driver is: **IDHP3437A**

The name of its Help file is: **IHHP3437A**

Using the Panel

This panel allows you to control the following features of the voltmeter:

- Range
- Delay
- Trigger mode
- Number of readings
- Service request mask (Status Panel)
- Error (Status Panel)
- Serial poll (Status Panel)

Both single and multi-reading displays are provided.

Burst measurements

Bursts of readings can be obtained by setting "Num Readings" to values greater than 1. The reading display changes to the XY style indicating more than one reading. The center line of the XY display represents zero volts, and the top is twice the range setting (figure 1). This driver does not support packed format transfers, and is quite limited in its ability to perform higher speed bursts of readings. The typical symptom of this condition is a "trigger too fast (2)" error. In these cases, increase the Delay time.

SRQ Mask

The service request mask (**SRQ Mask** on the **Status Panel**) allows you to specify events that cause the HP 3437A to request service. The bits of the mask are defined as follows:

Bit Definition	Bit Weight
Invalid Program	1
Ignore Trigger	2
Data Ready	4

SRQ Status

The HP 3437A returns the status byte when serial polled (i.e., when the user clicks on **SRQ Status** on the **Status Panel**) The definition of the bits in this byte are:

Bit Definition	Bit Weight
Mask: Invalid Program	1
Mask: Ignore Trigger	2
Mask: Data Ready	4
Status: Invalid Program	8
Status: Ignore Trigger	16
Status: Data Ready	32
Identifies HP 3437A as service requester	64

Error

The error number is derived from the status byte, and has the following bit definitions:

Bit Definition	Bit Weight
Invalid program sent to HP 3437A	1
Ignore trigger (trigger too fast)	2

HP ITG displays the error number in the display labeled **Error** in the **Status Panel**.

HP 3437A System Voltmeter Revision 1.0		
Component	Values	Initial Value
DELAY	0 - .9999999	0
ERROR	0 - 3	0
MASK	0 - 7	0
NRDGS	1 - 9999	1
RANGE	.1 - 19.98	10
READING		
READINGS	RARRAY[1000]	
RESET	button	
SRQ	0 - 127	
TRIGGER	SYN,EXT,HOLD	SYN

HP 3456A Digital Voltmeter

Overview

The HP 3456A is a fully programmable HP-IB digital voltmeter that measures dc and true RMS ac volts, ac + dc volts, and 2 or 4-wire ohms.

Performance features include:

- 4 to 6 digit precision
- 100 nV dc and 1 uV ac resolution; 1000 V maximum
- True RMS ac to 250 kHz
- 100 microhm resolution to 1 Gigohms

File Names

The file name of the driver for the HP 3456A is: **IDHP3456A**

Its Help file is: **IHHP3456A**

Using the Panel

This panel allows interactive control of the following:

- Measurement function (DCV, ACV, ACV + DCV, 2-wire Ohms, 4-wire Ohms)
- Measurement input range
- Number of power-line-cycles of integration (NPLC)
- Trigger mode
- Autozero
- Ohms offset-compensation
- DC ratio measurements
- Display control (**Other Panel**)
- AC input filter (**Other Panel**)
- Settling delay time (**Other Panel**)
- SRQ mask (**Status Panel**)
- SRQ status (HP-IB SPOLL)
- Error register (**Status Panel**)
- Instrument self-test

SRQ Mask

The (SRQ) mask allows you to specify events that cause the HP 3456A to request service. The bits of the mask are:

Bit Definition	Bit Weight

Front panel SRQ	1
Program memory execution complete	2
Data ready	4
Trigger too fast	8
Illegal instrument state	16
Program memory error	32
Pass/fail limits failure	128

SRQ Status

The HP 3456A returns the following status byte when serial polled:

Bit Definition	Bit Weight
Front panel SRQ	1
Program memory execution complete	2
Data ready	4
Trigger too fast	8
Illegal instrument state	16
Program memory error	32
Identifies HP 3456A as requester	64
Pass/fail limits failure	128

Error Register

The error register contains a portion of the status byte for the following error conditions:

Bit Definition	Bit Weight
This bit is always 0	1
This bit is always 0	2
This bit is always 0	4
Trigger too fast	8
Illegal instrument state	16
Program memory error	32
This bit is always 0	64
Pass/fail limits failure	128

See SRQ mask for additional information.

HP 3456A Digital Voltmeter Revision 1.0		
Component	Values	Initial Value
ADELAY	OFF, ON	ON
ARANGE	OFF, ON	ON
AZERO	OFF, ON	ON
DCRATIO_OHMSCOMP	OFF, ON	OFF
DDIG	3 - 6	4
DELAY	0 - 999.999	DONTCARE
DISPLAY_STRING	OFF, NORMAL	NORMAL
ERROR	0 - 255	
FILTER	OFF, ON	OFF
FUNCTION	DCV, OHM4, OHM2, ACDCV, ACV	DCV
MASK	0 - 255	184
NPLC	.01 - 100	1
RANGE		DONTCARE
READING		INVALID
RESET		
SRQ	0 - 255	INVALID
TERMS	REAR, FRONT	INVALID
TEST	STOP, START	STOP
TRIGGER	INT, HOLD, SINGLE, EXT	HOLD

HP 3457A System Multimeter

Overview

The HP 3457A is a 3.5 to 6.5 digit multimeter capable of making precision measurements of DC and AC voltage and current, resistance, and frequency. It can take measurements as fast as 1350 readings per second in the 3.5 digit mode, or take 53 readings per second with 60 dB of normal mode noise rejection at 6.5 digits. The HP 3457A also offers two multiplexer options.

Using the Panel

The right hand side of the HP 3457A panel generally specifies the measurement. The lower left area specifies when the measurements are made (triggering), and the upper left displays the measurements. Further details are provided in section on each subpanel, as well as the sections on Displays and Triggering.

The HP 3457A driver has been written to simplify the selection of trigger modes and reading memory format. From the RESET state, triggering and acquiring both single and burst measurements will occur by clicking on the display. This behavior can be disabled by changing **Trigger Arming** and

Reading Memory controls, but requires more work and understanding on the part of the user.

In general, panels marked **Advanced** (or **Adv**) contain controls that require in-depth knowledge of the HP 3457A.

Highest Resolution

Highest resolution measurements can be obtained by setting the **% Resolution** control on the **Main Panel** to .00005.

Scanner

The HP 3457A driver recognizes two multiplexer options: the HP 44491 Armature Relay and the HP 44492 Reed Relay multiplexers. The **Scanner** popup provides the controls necessary to operate these options. When the **Scanner** button is clicked on, the HP 3457A is queried to dynamically determine which option is installed and the proper controls for that option are displayed. If no multiplexer option is available, all available scanner controls can be displayed to allow program generation for either option by turning **Live** mode off.

Scanner states are stored and recalled similarly to the way that the HP 3457A does its own internal state storage and recall. Only the scan list (**Slist**), input terminals (**Terms**) and scanner advance (**Sadv**) controls are saved as part of the instrument

state. This means that the state of the Actuators (HP 44491 only) and Chan closures cannot be stored/recalled.

Displays

Both single and multi-reading displays are provided. An XY display is used if more than one measurement is to be taken.

Clicking on either display executes only an HP BASIC ENTER statement from the HP 3457A. In the default trigger settings, this will also cause the multimeter to make a measurement, which will then be displayed.

The single-reading display performs a single ASCII format ENTER into a real variable.

The XY display performs an ASCII ENTER into a real array variable. Using reading memory for multiple reading measurements generally provides the highest system throughput.

See also Triggering, Reading Memory, XY Panel.

Multiple Readings

The HP 3457A will take more than one reading per trigger if:

1) The **Number of Arms** (**AdvTrg** popup) is greater than 1, or

2) The **Number of Readings** (lower left section of panel) is greater than 1.

Triggering

The HP 3457A driver contains an extra triggering control located on the **AdvTrg** popup. This control, which toggles between **Auto** and **Man**, simplifies the complex triggering hierarchy of the HP 3457A during straightforward measurements.

In **Auto** mode (default), **Trigger Arming** will remain in **Synchronous**, and Trigger Mode Single and **Hold** are not allowed. In this state, clicking on the display will trigger and display measurement(s). You should rarely need to leave **Auto** mode.

If this control is in Manual (**Man**) mode, the user has full control of the triggering sequence, but must make sure that the HP 3457A has been triggered before clicking on the display.

Reading Memory

This driver attempts to use HP 3457A reading memory whenever more than one measurement is being taken. This limits the maximum number of measurements that may be taken with one trigger.

On the **Advanced Panel**, there is an extra memory control labeled **Reading Memory**. When in **Auto**, reading memory format is computed by the driver, which uses the fastest format that retains the full measurement accuracy.

When in Manual (**Man**) mode, the user has control of reading memory. In this case, the user must choose an appropriate memory format, or make sure that the ENTER of the readings

is fast enough for the measurement. See the restrictions in Displays in this case.

The driver can enter a burst of up to 1024 measurements. Larger bursts require driver modification or doing your own ENTER.

The driver uses FIFO mode when transferring multiple measurements.

Main Panel

The **Main Panel** contains the HP 3457A **Function** selection and most controls that affect measurements made with that function.

Special Notes

The **Range** query provides the current instrument range, not necessarily the last setting.

The **NPLC** query provides the current instrument integration time, not necessarily the last setting. During the query, the HP 3457A will be programmed to the value it just sent.

The **Resolution** is sent as part of the RANGE command, and is a percent of the specified range rather than the cardinal range point.

Other Panel

The **Other Panel** contains miscellaneous controls.

Special Notes

To use the **Tone** commands, define the frequency and duration (in seconds) then click on the **Tone** button.

Keybd On and **Keybd Off** refer to the HP 3457A LOCK command, which enables or disables the multimeter's keyboard.

Status Panel

The **Status Panel** contains information about the state of the multimeter. See also the Help topics SRQ Mask, SRQ Status, Error Mask, Error, and Auxiliary Error.

The **SRQ** button causes the HP 3457A to do an HP-IB SRQ.

The **Clr** button clears the bits in the HP 3457A status byte that are not based on the state of the multimeter.

Advanced Panel

The **Advanced Panel** includes miscellaneous controls that require more knowledge of the HP 3457A.

Special Notes

Reading Memory should be left in **Auto** as much as possible. The **Clear** button clears reading memory. See also Reading Memory.

The HP 3457A Auto Calibration process takes between 3 and 35 seconds. Unless you set the HP ITG timeout to 0 for **Calibrate All** and **Calibrate Ohms**, HP ITG will time out on this command. ACAL security strings are not supported by this driver.

Math Panel

The HP 3457A math functions are available on the **Math Panel**.

Special Notes

The math functions **Stats**, **Null**, **Filter**, **RMS**, and **dBm** include state as well as event information. Recalling a state that includes these settings may not achieve the desired results. In these cases, an Hpt_recall of the desired state with **Math Off**, followed by an Hpt_set_str to initiate the correct math operation is advised.

XY Panel

The **XY Panel** only appears on the main menu if multiple readings are being taken. It contains controls to help you look at multiple-reading measurements. It does not represent HP 3457A functionality, and its controls are not intended for programmatic use.

The first display is the measurement value at the current marker.

The second control is the current marker, which can be set to an arbitrary value or incremented/decremented with the buttons on either side.

The next group of four controls set (and show) the current display scaling. They represent the top, bottom, left, and right XY values, and can be changed to display specific portions of the measurement.

The last two toggles control whether a marker is displayed, and whether individual measurements are connected with lines.

About Panel

The **About Panel** contains title, revision, and copyright information.

SRQ Mask

The service request mask allows you to specify the events that cause the HP 3457A to request service. See SRQ Status for the definition of the bits in this byte.

SRQ Status

The HP 3457A returns the status byte when serial polled. The definition of the bits in this byte are:

Bit Definition	Bit Weight
Program memory execution completed	1
High or low limit exceeded	2
Front panel SRQ	4
Power-on SRQ	8
Ready for instructions	16
Error (consult error register)	32
Service requested	64
Not used	128

Error Mask

The HP 3457A will set the Error bit in its Status Register if an error occurs and the corresponding Error Mask bit is set. See Error for the definition of the bits in this register.

Error

The error register reports instrument errors. The definition of the bits in this register are:

Bit Definition	Bit Weight
Hardware error (consult aux error)	1
Calibration error	2
Trigger too fast error	4
Syntax error	8
Unknown command received	16
Unknown parameter received	32
Parameter out of range	64
Required parameter missing	128
Parameter ignored	256
Out of calibration	512
Calibration required	1024

Auxiliary Error

The Auxiliary error register reports hardware errors in the instrument. The definition of the bits in this register are:

Bit Definition	Bit Weight
Isolation error during operation	1
Slave processor self-test failure	2
Isolation self-test failure	4
Integrator convergence failure	8
Front end zero measurement error	16
Current source, gain selection failure	32
Amps self-test failure	64
AC amplifier's DC offset test failure	128
AC flatness check	256
Ohms precharge failure during autocal	512
32k ROM checksum failure	1024
8k ROM checksum failure	2048
Non-volatile RAM failure	4096
Volatile RAM failure	8192
Cal RAM write or protection failure	16384

HP 3457A System Multimeter Revision 1.0		
Component	Values	Initial Value
ACAL	ALL,AC,OHMS	
ACBAND	1 - 1E+6	20
ACTUATOR_8	OPEN,OPEND,CLOSE	OPEN
ACTUATOR_9	OPEN,OPEND,CLOSE	OPEN
ADELAY	AUTO,MAN	AUTO
AMEM_FORMAT	AUTO,MAN	AUTO
ARANGE	OFF,ON	ON
ATARM	AUTO,MAN	AUTO
AUX_ERROR		INVALID
AZERO	OFF,ON	ON
BEEP	OFF,ON,ONCE	ON
CHAN	-1 - 13	-1
CRESET	button	
CSB	button	
DEGREE		20
DELAY	0 - 2100	DONTCARE
DISPLAYED_STRING	STRING[75]	""
DISPLAY_STRING	OFF,NORMAL,STRING_ON, STRING_OFF	OFF
ERROR		INVALID
ERROR_MASK	0 - 2047	2047
FIXEDZ	OFF,ON	OFF
FSOURCE	ACV,ACDCV,ACI,ACDCI	ACV
FUNCTION	DCV,ACV,ACDCV,OHM2,OHM4, DCI,ACI,ACDCI,FREQ,PER	DCV
HIRES		0
ID	STRING[7]	INVALID
INBUF	OFF,ON	OFF
LFREQ	50 - 400	60
LINE		INVALID
LOCK	OFF,ON	OFF
LOWER		0
MASK	0 - 255	0
MATH1	OFF,CTHRM,DB,DBM,FILTER,	OFF

HP 3457A System Multimeter Revision 1.0 (continued)		
Component	Values	Initial Value
	FTHRM,NULL,PERC,PFAIL, RMS,SCALE,STAT	
MATH2	OFF,CTHRM,DB,DBM,FILTER, FTHRM,NULL,PERC,PFAIL, RMS,SCALE,STAT	OFF
MAX		0
MEAN		0
MEM_CLEAR	button	
MEM_FORMAT	OFF,ASCII,SINT,DINT, SREAL	OFF
MIN		0
NPLC	500E-6 - 100	1
NRDGS	1 - 32767	1
NSAMP		0
OCOMP	OFF,ON	OFF
OFFSET		0
OPT		INVALID
PERC		1
PRESET	button	
RANGE	(depends on FUNCTION)	DONTCARE
READING		INVALID
READINGS	RARRAY[1024]	INVALID
REF		1
RES		50
RESET	button	
RESOLUTION	5E-5 - 100,AUTO	AUTO
SADV	HOLD,SGL,AUTO	HOLD
SAMPLE_EVT	AUTO,EXT,SYN,TIMER	AUTO
SCALE_KLUDGE		1
SDEV		0
SELF_TEST	button	
SLIST	STRING[70]	INVALID
SLIST_QUERY	0 - 20	0

HP 3457A System Multimeter Revision 1.0 (continued)		
Component	Values	Initial Value
SRQ	0 - 255	INVALID
SRQDO	button	
TARM	AUTO,EXT,SGL,HOLD,SYN	SYN
TARM_NUM	1 - 32767	1
TBUFF	OFF,ON	OFF
TERMS	OPEN,FRONT,REAR,SCANR	FRONT
TIMER	600E-6 - 2100	1
TONE	button	
TONE_DURATION	0 - 32.767	.512
TONE_FREQ	0 - 3000	2048
TRIGGER	INT,EXT,SGL,HOLD,SYN	INT
UPPER		0

HP 3458A System Multimeter

Overview

The HP 3458A is a high performance multimeter capable of making precision measurements of DC and AC voltage and current, resistance, and frequency, and also capable of digitizing voltage at rates up to 100,000 samples per second.

Using the Panel

The right hand side of the HP 3458A panel generally specifies the measurement. The lower left area specifies when the measurements are made (triggering), and the upper left displays the measurements. Further details are provided in the section on each subpanel, as well as the sections on Displays and Triggering.

The HP 3458A driver has been written to simplify the selection of trigger modes and reading memory format. From the RESET state, triggering and acquiring both single and burst measurements will occur by clicking on the display. This behavior can be disabled by changing Trigger Arming and Reading Memory controls, but requires more work and understanding on the part of the user.

In general, panels marked Advanced (or Adv) contain controls that require in-depth knowledge of the HP 3458A.

Highest Speed

In the DCV function, the driver can handle measurements made at 50,000 readings/second with default settings. Use **Preset Digitize (Other Panel)** for this configuration.

From this state, bursts up to 100,000 readings/second can be made by setting:

- **Timer** to 10 to 20 us (**AdvTrg** popup)
- **Aper** to 1.5 us or less (**Main Panel**)
- **Memory Format** to **Sgl Int** (**Advanced Panel**)

Remember to set **Reading Memory** back to **Auto** after a high-speed burst.

The DS and SS functions can be used for digitizing up to their limits without changing the default driver settings.

Highest Resolution

Highest resolution measurements can be obtained by setting the **% Resolution** control on the **Main Panel** to 0. The long

integration times of these measurements may cause an HP ITG timeout on its default setting of 30 s.

Displays

Both single and multi-reading displays are provided. An XY display is used if more than one measurement is to be taken.

Clicking on either display executes only an HP BASIC ENTER statement from the HP 3458A. In the default trigger settings, this will also cause the multimeter to make a measurement, which will then be displayed.

The single-reading display performs a single ASCII format ENTER into a real variable. **Reading Memory Format** must be off during this type of ENTER.

The XY display performs an ENTER into a real array variable. When **Reading Memory Format** is **Off**, the ENTER is performed in ASCII format. If **Reading Memory Format** is other than **Off**, the readings are entered in double real format. Using reading memory for multiple reading measurements generally provides the highest system throughput.

See also Triggering, Reading Memory, XY Panel.

Multiple Readings

The HP 3458A will take more than one reading per trigger if:

1) The **Number of Arms** (**AdvTrg** popup) is greater than 1, or

2) The **Number of Readings** (lower left section of panel) is greater than 1.

If the measurement function is **SSamp AC** or **SSamp DC**, the HP 3458A will use the number of readings specified on the **Sweep** popup, rather than the one on the lower left section of the panel.

Triggering

The HP 3458A driver contains an extra triggering control located on the **AdvTrg** popup. This control, which toggles between **Auto** and **Man**, simplifies the complex triggering hierarchy of the HP 3458A during straightforward measurements.

In **Auto** mode (default), **Trigger Arming** will remain in **Synchronous**, and **Trigger Mode Single** and **Hold** are not allowed. In this state, clicking on the display will trigger and display measurement(s). You should rarely need to leave **Auto** mode.

If this control is in Manual (**Man**) mode, the user has full control of the triggering sequence, but must make sure that the HP 3458A has been triggered before clicking on the display.

Trigger Arm Auto (not the **Auto** control mentioned above) can cause the HP 3458A to ignore HP-IB commands in certain configuration. This setting should not be used in a measurment system.

The **Level** popup contains controls for scope-like triggering. **Trigger Mode** and/or **Sample Event** need to be set to **Level** to obtain this type of triggering.

Reading Memory

This driver attempts to use HP 3458A reading memory whenever more than one measurement is being taken. This limits the maximum number of measurements that may be taken with one trigger.

On the **Advanced Panel**, there is an extra memory control labeled **Reading Memory**. When in **Auto**, reading memory format is computed by the driver, which uses the fastest format that retains the full measurement accuracy.

When in Manual (**Man**) mode, the user has control of reading memory. In this case, the user must choose an appropriate memory format, or make sure that the ENTER of the readings is fast enough for the measurement. See the restrictions in Displays in this case.

The driver can enter a burst of up to 1024 measurements. Larger bursts require driver modification or doing your own ENTER.

The driver uses FIFO mode when transferring multiple measurements.

See also Highest Speed.

Main Panel

The **Main Panel** contains the HP 3458A **Function** selection and most controls that affect measurements made with that function.

Special Notes

The **Range** query provides the current instrument range, not necessarily the last setting.

The **Aper/NPLC** query provides the current instrument integration time, not necessarily the last setting. During the query, the HP 3458A will be programmed to the value it just sent. When operating the HP 3458A from the driver panel, toggling between **Aper** and **NPLC** queries and reprograms the instrument.

The **Resolution** is sent as part of the RANGE command, and is a percent of the specified range rather than the cardinal range point.

Subsample functions (**SSamp AC** and **SSamp DC**) should not be used when **Trigger Arming** (**AdvTgr** popup) is set to **Auto**. This can cause the HP 3458A to ignore HP-IB commands.

Other Panel

The **Other Panel** contains miscellaneous controls.

Special Notes

The HP 3458A reports only **Display Off** and **Display On**. A query of the **Display** control will only report these two values.

Keybd On and **Keybd Off** refer to the HP 3458A LOCK command, which enables or disables the multimeter's keyboard.

The HP 3458A self test takes about 80 seconds to complete. Unless you set the HP ITG timeout to 0 (panel menu **Config**), HP ITG will time out on this command.

Status Panel

The **Status Panel** contains information about the state of the multimeter. See also SRQ Mask, SRQ Status, Error Mask, Error, and Auxiliary Error.

The **SRQ** button causes the HP 3458A to do an HP-IB SRQ.

The **Clr** button clears the bits in the HP 3458A status byte that are not based on the state of the multimeter.

Advanced Panel

The **Advanced Panel** includes miscellaneous controls that require more knowledge of the HP 3458A.

Special Notes

Reading Memory should be left in **Auto** as much as possible. The **Clear** button clears reading memory. See also Reading Memory.

Before using **Defeat On**, read the caution in Defeat Help.

The HP 3458A Auto Calibration process takes between 1 and 11 minutes. Unless you set the HP ITG timeout to 0, HP ITG will time out on this command. ACAL security strings are not supported by this driver.

Math Panel

The HP 3458A math functions are available on the **Math Panel.**

Special Notes

Regular math and memory math cannot be on at the same time.

The memory math functions statistics (**Stats**) and **PassFail** cannot be performed unless there are readings in memory. With default driver settings, readings are not left in instrument memory. Manual triggering of the HP 3458A is required to use the statistics and PassFail memory functions.

The math functions **Stats, Null, Filter,** and **RMS** include state as well as event information. Recalling a state that includes these settings may not achieve the desired results. In these cases, an Hpt_recall of the desired state with **Math Off,** followed by an Hpt_set_str to initiate the correct math operation is advised.

XY Panel

The **XY Panel** only appears on the main menu if multiple readings are being taken. It contains controls to help you look at multiple-reading measurements. It does not represent HP 3458A functionality, and its controls are not intended for programmatic use.

The first display is the measurement value at the current marker.

The second control is the current marker, which can be set to an arbitrary value or incremented/decremented with the buttons on either side.

The next group of four controls set (and show) the current display scaling. They represent the top, bottom, left, and right XY values, and can be changed to display specific portions of the measurement.

The last two toggles control whether a marker is displayed, and whether individual measurements are connected with lines.

About Panel

The **About Panel** contains title, revision, and copyright information.

Sweep Popup

A SWEEP command is sent whenever settings on the **Sweep** popup (under the display) are changed. Be aware that the SWEEP command affects the **Timer**, **Number of Readings**, and **Sample Event** when the multimeter is not in a subsampling function.

Defeat

Caution

Defeat On (Advanced Panel) must only be used when you are certain that overload voltages on the Input terminals will not exceed +/-100 V peak on the 10 V range or below.

On the 100 V and 1000 V ranges, the multimeter can withstand voltages up to +/-1200 V peak regardless of whether **Defeat** is **On** or **Off**. **Defeat On** disables (defeats) the input switch sequencing that protects the multimeter's input circuitry from overload voltages. If input protection is disabled and an overload is detected on the 10 V range or below, the multimeter will enable input protection and internally mark the illegal overload for instrument warranty considerations.

SRQ Mask

The service request mask allows you to specify the events that cause the HP 3458A to request service. See SRQ Status for the definition of the bits in this byte.

SRQ Status

The HP 3458A returns the status byte when serial polled. The definition of the bits in this byte are:

Bit Definition	Bit Weight
Program memory execution completed	1
High or low limit exceeded	2
SRQ command executed	4

Power-on SRQ	8
Ready for instructions	16
Error (consult error register)	32
Service requested	64
Data available	128

Error Mask

The HP 3458A will set the Error bit in its Status Register if an error occurs and the corresponding Error Mask bit is set. See Error for the definition of the bits in this register.

Error

The error register reports instrument errors. The definition of the bits in this register are:

Bit Definition	Bit Weight
Hardware error (consult aux error)	1
Calibration error	2
Trigger too fast error	4
Syntax error	8
Command not allowed from remote (ADDRESS)	16
Undefined parameter received	32
Parameter out of range	64
Memory error	128
Destructive overload detected	256
Out of calibration	512
Calibration required	1024
Settings conflict (memory/sub-sampling)	2048
Math error (divide by 0, etc.)	4096
Subprogram error	8192
System error	16384

Auxiliary Error

The Auxiliary error register reports hardware errors in the instrument. The definition of the bits in this register are:

Bit Definition	Bit Weight
Slave processor not responding	1
DTACK failure	2
Slave processor self-test failure	4
Isolator test failure	8
A/D converter convergence failure	16
Calibration value out of range	32
HP-IB chip failure	64
UART failure	128
Timer failure	256
Internal overload	512
ROM checksum failure, low-order byte	1024
ROM checksum failure, high-order byte	2048
Non-volatile RAM failure	4096
Option RAM failure	8192
Cal RAM write or protection failure	16384

HP 3458A Multimeter Revision 1.0		
Component	Values	Initial Value
ACAL	ALL,OHMS,AC,DCV	
ACBAND_HI	1 - 10E+6	2E+6
ACBAND_LO	1 - 10E+6	20
ADELAY	AUTO,MAN	AUTO
ALFREQ	AUTO,MAN	AUTO
AMEM_FORMAT	AUTO,MAN	AUTO
APER	0 - 1	DONTCARE
ARANGE	OFF,ON	ON
ATARM	AUTO,MAN	AUTO
AUX_ERROR		INVALID
AZERO	OFF,ON	ON
BEEP	OFF,ONCE,ON	ON
CSB	button	
DEFEAT	OFF,ON	OFF
DEGREE		20
DELAY	0 - 6000	DONTCARE
DISPLAYED_STRING	STRING[75]	""
DISPLAY_STRING	OFF,CLR,STRING_OFF STRING_ON,NORMAL	OFF
EFF_INTERVAL	10E-9 - 6000	100E-9
ERROR		INVALID
ERROR_MASK	0 - 32767	32767
EXTOUT	OFF,RCOMP,SRQ,BCOMP APER,ONCE,ICOMP	ICOMP
EXTOUT_POL	NEG,POS	NEG
FIXEDZ	OFF,ON	OFF
FSOURCE	ACV,ACDCI,ACI,ACDCV	ACV
FUNCTION	DCV,SSDC,SSAC,DSDC,DSAC, PER,FREQ,ACDCI,ACI,DCI, OHM4,OHM2,ACDCV,ACV	DCV
HIRES		0
ID	STRING[7]	INVALID
INBUF	OFF,ON	OFF
LEVEL_COUP	DC,AC	AC

HP 3458A Multimeter Revision 1.0 (continued)		
Component	Values	Initial Value
LFILTER	OFF,ON	OFF
LFREQ	45 - 440	DONTCARE
LINE		INVALID
LOCK	OFF,ON	OFF
LOWER		0
MASK	0 - 255	0
MATH1	OFF,FRTD92,FRTD85, CRTD92,CRTD85,FTHRM10K, FTHRM2K,CTHRM10K,CTHRM2K, STAT,SCALE,RMS,PFAIL, PERC,NULL,FTHRM,FILTER, DBM,DB,CTHRM	OFF
MATH2	OFF,FRTD92,FRTD85, CRTD92,CRTD85,FTHRM10K, FTHRM2K,CTHRM10K,CTHRM2K, STAT,SCALE,RMS,PFAIL, PERC,NULL,FTHRM,FILTER, DBM,DB,CTHRM	OFF
MAX		0
MEAN		0
MEM_CLEAR	button	
MEM_FORMAT	OFF,DREAL,SREAL,DINT, SINT,ASCII	OFF
MIN		0
MMATH1	OFF,FRTD92,FRTD85, CRTD92,CRTD85,FTHRM10K, FTHRM2K,CTHRM10K,CTHRM2K, STAT,SCALE,RMS,PFAIL, PERC,NULL,FTHRM,FILTER, DBM,DB,CTHRM	OFF
MMATH2	OFF,FRTD92,FRTD85, CRTD92,CRTD85,FTHRM10K, FTHRM2K,CTHRM10K,CTHRM2K,	OFF

HP 3458A Multimeter Revision 1.0 (continued)		
Component	Values	Initial Value
	STAT,SCALE,RMS,PFAIL, PERC,NULL,FTHRM,FILTER, DBM,DB,CTHRM	
NPLC	0 - 1000	1
NRDGS	1 - 16777215	1
NRDGS_SWEEP	1 - 16777215	1024
NSAMP		0
OCOMP	OFF,ON	OFF
OFFSET		0
OPT		INVALID
PERC		1
PFAILNUM		0
PRESET	FAST,DIG,NORM	
RANGE	(depends on FUNCTION)	DONTCARE
RATIO	OFF,ON	OFF
READING		INVALID
READINGS	RARRAY[1024]	INVALID
REF		1
RES		50
RESET	button	
RESOLUTION	0 - 100, AUTO	AUTO
REV	STRING[3]	INVALID
SAMPLE_EVT	AUTO,LINE,LEVEL,TIMER, SYN,EXT	AUTO
SCALE_KLUDGE		1
SDEV		0
SELF_TEST	button	
SETACV	ANA,SYNC,RNDM	ANA
SLOPE	NEG,POS	POS
SRQ	0 - 255	INVALID
SRQDO	button	
SSRC_MODE	AUTO,HOLD	AUTO
SSRC_SOURCE	EXT,LEVEL	LEVEL

HP 3458A Multimeter Revision 1.0 (continued)		
Component	Values	Initial Value
TARM	AUTO,SYN,HOLD,SGL,EXT	SYN
TARM_NUM	1 - 2.1E9	1
TBUFF	OFF,ON	OFF
TEMPERATURE		INVALID
THRESHHOLD	-500 - 500	0
TIMER	1E-6 - 6000	1
TRIGGER	INT,LINE,LEVEL,SYN,HOLD, SGL,EXT	INT
UPPER		0

HP 3478A Digital Multimeter

Overview

The HP 3478A is a fully programmable HP-IB digital multimeter that measures dc and true RMS ac volts, 2 and 4-wire ohms, and dc and RMS ac current.

Performance features include:

- 5-1/2 digit precision
- 100 nV dc and 1 uV ac resolution; 300 volts maximum
- True RMS ac to 300 kHz
- 100 microhm resolution to 30 Megohms

File Names

The name of the driver for the HP 3478A is: **IDHP3478A**

Its Help file is: **IHHP3478A**

Using the Panels

This panel allows interactive control of the following multimeter functions:

- Measurement function (DCV, ACV, DCI, ACI, 2-wire Ohms, 4-wire Ohms)
- Measurement input range
- Measurement resolution (number of digits - 3.5, 4.5, 5.5)
- Trigger mode
- Autozero
- Message display (**Other Panel**)
- Home state (**Other Panel**)
- SRQ mask (**Status Panel**)
- SRQ status (**Status Panel**)
- Error register (**Status Panel**)

Message Display

Type in the message you want displayed in the box labeled **String** and press Return.

Click on the box labeled **Display** to select from the following:

- **Normal**
- **String** (the string is displayed, and the annunciators are continuously updated)

- **String only** (annunciators turned off and string is not displayed).

The HP 3478A can display only 12 characters at a time. Legal characters are decimal 32 through 95 of the 128 ASCII characters. Only upper case letters and numbers can be displayed. Lower case letters generate characters that do not resemble the letters. Commas, periods, and semicolons can go between characters.

Home State

The **Home State** control (**Other Panel**) allows you to select from states that match the HP 3478A's Home commands. An * in the control box means that none of the Home states are currently active.

SRQ Mask

The Service Request (SRQ) mask allows you to specify events that cause the HP 3478A to request service from the controller. The bits of the mask are:

Bit Definition	Bit Weight
Data ready	1
Syntax error	4

Internal error	8
Front panel SRQ	16
Invalid calibration	32
Power-on SRQ	128

SRQ Status

The HP 3478A returns the following status byte when serial polled:

Bit Definition	Bit Weight
Data ready	1
This bit is always 0	2
Syntax error	4
Internal error (see Error Register).	8
Front panel SRQ	16
Invalid calibration	32
Identifies HP 3478A as requester	64
Power-on SRQ	128

Additional status information is available for the internal error condition (decimal 8) by querying the Error Register.

Error Register

The error register contains the status for internal hardware error conditions. The bit definitions are as follows:

Bit Definition	Bit Weight
Calibration RAM checksum error	1
Main CPU RAM self-test failure	2
Control ROM self-test failure	4
A/D slope error	8
A/D self-test failure	16
A/D link failure	32
This bit is always 0	64
This bit is always 0	128

To clear the error register:

- Click on the **Error Reg** button **(Status Panel)**.

HP 3478A Multimeter Revision 1.0		
Component	Values	Initial Value
ARANGE	OFF, ON	ON
AZERO	OFF, ON	ON
CALIBRATE		
DISPLAYED_STRING	STRING[12]	" "
DISPLAY_STRING	NORMAL, STRING_OFF, STRING_ON	NORMAL
ERROR	0 - 255	INVALID
FUNCTION	DCV, ACI, DCI, OHMX, OHM4, OHM2, ACV	DCV
HOMES	H0, H7, H6, H5, H4, H3, H2, H1	DONTCARE
MASK	0 - 63	0
NDIG	3.5 - 5.5	4.5
RANGE	30E-3 - 30.3099E+6	DONTCARE
READING		INVALID
RESET		
RESET_STATUS		
SRQ	0 - 255	INVALID
TERMS	REAR, FRONT	INVALID
TRIGGER	INT, FAST, HOLD, SINGLE, EXT	HOLD

HP 3488A Switch/Control Unit

The HP 3488A Switch/Control Unit is designed to hold any combination of up to 5 optional switch and control modules. There is not a main HP 3488A driver. Rather, Hewlett-Packard provides separate drivers for many of the options.

When loading an HP 3488A panel in the development environment, be sure to enter a subaddress (figure 3488-1). This subaddress should be a value between 1 and 5, corresponding to the slot number in which the module is located within the HP 3488A mainframe.

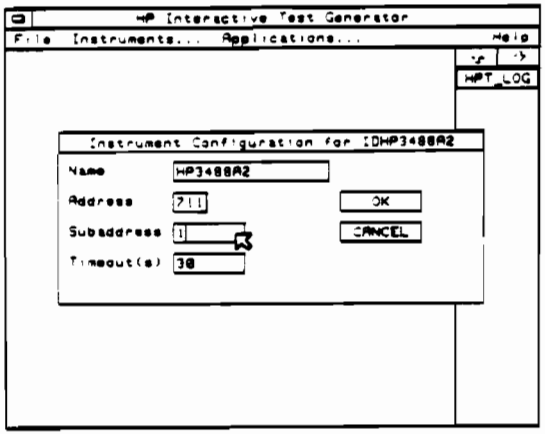


Figure 3488-1. Enter the slot number of the module as the subaddress.

The following pages contain information about each of the drivers for the HP 3488A modules that currently exist.

HP 3488A Option 012 (HP 44472A)

Overview

The HP 44472A provides dual 4-channel coaxial multiplexers for broadband signal switching to 300 MHz. The two groups of four channels are isolated from each other and chassis ground. Only one channel may be connected to the common (per group) at a time. A channel is a set of relays which connect the common BNC to one of four BNC inputs.

In the HP ITG development environment, you can specify two HP 44472As so that they operate in parallel. That is, a command sent to one card will also control the other.

File Names

The name of the HP 44472A driver is: **IDHP3488A2**

The name of its Help file is: **IHHP3488A2**

Using the Panel

This panel allows you to control these features of the HP 44472A:

- Open a channel.
  - A channel is open when the box below the channel number is blank.
    - Click on the box to toggle the channel open/closed.
- Close a channel.
  - A channel is closed when the box below the channel number contains the letters **CL**.
    - Click on the box to toggle the channel open/closed.
- Reset all channels to their initial state.
  - Click on the **Reset** button.
- Pair two HP 44472As to operate in parallel.
  - Click on the control labeled **Pair** and enter the slot number (i.e., subaddress) of the second HP 44472A.
- Detect instrument errors
  - Click on the display labeled **Error** to ask the instrument whether an error has occurred. If an error has occurred, the error number is displayed in the display. A **0** in the display means that no error has occurred.
  - This driver includes an ERROR COMPONENT statement, which instructs HP ITG to query the instrument for errors after each transaction, if you have not turned the **Error Checking** mode off. If an error has occured, HP ITG displays the error number in the **Error** display as well as in a dialog box outside of the panel.

Error Definition	Error Number
SYNTAX - Unknown command	1
EXECUTE - Command could not be executed because: a. Channel number out of range b. Card type mismatch, or c. Attempt to recall a non-existent state, list, or program.	2
TRIGGER - External increment pulse occurring too fast	4
LOGIC - A relay bit did not change state as expected.	8
POWER- out of allowable range.	16

Recalling States

During a state recall, if a recalled state specifies that all channels in a group of four should be open, then the commands to open all four channels are executed, regardless of whether any of the channels are already open.

If a recalled state specifies that one of four channels is closed, the command that closes that channel is the only one executed.

HP 3488A (HP 44472A) Dual 4 Channel VHF Switch Option Revision 1.0		
Component	Values	Initial Value
"00"	OPEN,CLOSED	OPEN
"01"	OPEN,CLOSED	OPEN
"02"	OPEN,CLOSED	OPEN
"03"	OPEN,CLOSED	OPEN
"10"	OPEN,CLOSED	OPEN
"11"	OPEN,CLOSED	OPEN
"12"	OPEN,CLOSED	OPEN
"13"	OPEN,CLOSED	OPEN
ERROR	0 - 16	0, INVALID
PAIR	None,1,2,3,4,5	None
RESET		

HP 3488A Option 013 (HP 44473A)

Overview

The HP 44473A Matrix Switch provides a 4-by-4 matrix of switches. Any combination of the 4 rows may be connected to any combination of 4 columns. Each channel consists of a 2-wire relay. Channel numbers are specified by a 2-digit number, XY, where X represents the row (0-3) and Y represents the column (0-3) where the relay resides.

In HP ITG, you can specify two HP 44473As, and the pair will operate in parallel. That is, a command sent to one card will also control the other.

File Names

The name of the HP 44473A driver is: **IDHP3488A3**

The name of its Help file is: **IHHP3488A3**

Using the Panel

This panel allows you to control these features of the HP 44473A:

- Open a relay.
  - A relay is open when the appropriate box in the matrix is blank.
    - Click on the box to toggle the relay open/closed.
- Close a relay.
  - A relay is closed when the appropriate box contains the letters **CL**.
    - Click on the box to toggle the relay open/closed.
- Reset all relays to their initial state.
  - Click on the **Reset** button.
- Pair two HP 44473As to operate in parallel.
  - Click on the control labeled **Pair** and enter the slot number (i.e., subaddress) of the second HP 44473A.
- Detect instrument errors
  - Click on the display labeled **Error** to ask the instrument whether an error has occurred. If an error has occurred, the error number is displayed in the display. A **0** in the display means that no error has occurred.
  - This driver includes an ERROR COMPONENT statement, which instructs HP ITG to query the instrument for errors after each transaction, if you have not turned the **Error Checking** mode off. If an error has occured, HP ITG displays the error number in the **Error** display.

Error Definition	Error Number
SYNTAX - Unknown command	1
EXECUTE - Command could not be executed because of: a. Relay number out of range, b. Card type mismatch, or c. Attempt to recall a non-existent state, list, or program.	2
TRIGGER - External increment pulse occurring too fast	4
LOGIC - A relay bit did not change state as expected.	8
POWER - Out of allowable range.	16

Recalling States

When recalling a state, this driver will implement a break before making contact for the channels. That is, the relays that need to be opened will break their contact before any relays make contact. Otherwise, the contacts will be made (broken) in the order 00-03, 10-13, 20-23, 30-33.

HP 3488A (HP 44473A) 4-by-4 Matrix Switch Option Revision 1.0		
Component	Values	Initial Value
ERROR	0 - 16	0,INVALID
PAIR	None,1,2,3,4,5	None
RELAY_0	OPEN,CLOSED	OPEN
RELAY_1	OPEN,CLOSED	OPEN
RELAY_10	OPEN,CLOSED	OPEN
RELAY_11	OPEN,CLOSED	OPEN
RELAY_12	OPEN,CLOSED	OPEN
RELAY_13	OPEN,CLOSED	OPEN
RELAY_2	OPEN,CLOSED	OPEN
RELAY_20	OPEN,CLOSED	OPEN
RELAY_21	OPEN,CLOSED	OPEN
RELAY_22	OPEN,CLOSED	OPEN
RELAY_23	OPEN,CLOSED	OPEN
RELAY_3	OPEN,CLOSED	OPEN
RELAY_30	OPEN,CLOSED	OPEN
RELAY_31	OPEN,CLOSED	OPEN
RELAY_32	OPEN,CLOSED	OPEN
RELAY_33	OPEN,CLOSED	OPEN
RESET		

HP 3488A Option 014 (HP 44474A)

Overview

The HP 44474A Digital I/O provides 16 bidirectional data lines (channels) plus 4 lines for control and handshaking. There are 2 8-bit ports that are completely independent, or can be used together for 16-bit operations.

Bit-wise operations operate on an entire byte. For example, reading bit 0 causes the entire low byte to be read even though only the bit is returned. When performing a read after a write, the bits that were written may not be the bits that are read unless the HP 44474A is in the Static 2 mode.

In the HP ITG development environment, you can specify two HP 44474As to operate in parallel. That is, a command sent to one card will also control the other.

File Names

The name of the HP 44473A driver is: **IDHP3488A4**

The name of its Help file is: **IHHP3488A4**

Using the Panel

This panel allows you to control of these features of the HP 44474A:

- Open a bit (set to 0).
  - In the development environment, **Data Direction** must be set to **Write** for the byte in which the bit occurs, then you can click on the bit to toggle it on/off. **Data Direction** does not need to be set in an HP ITG based program; HP ITG determines the direction based on whether a **Set** or **Get** command is executed on the component.
- Close a bit (set to 1).
  - In the development environment, **Data Direction** must be set to **Write** for the byte in which the bit occurs, then you can click on the bit to toggle it on/off. **Data Direction** does not need to be set in an HP ITG based program; HP ITG determines the direction based on whether a **Set** or **Get** command is executed on the component.
- View a bit.
  - In the development environment, **Data Direction** must be set to **Read** for the byte in which the bit occurs, then you can click on the bit to view whether it is on or off (i.e., 1 or 0).
- Write a byte (**Low** or **High**).
  - In the development environment, **Data Direction** must be set to **Write** for the byte you want to write, then you can click on the display below the byte and enter a number. **Data Direction** does not need to be set in an HP ITG based program; HP ITG determines the direction based on whether a **Set** or **Get** command is executed on the component.

- Write a word.
  - In the development environment, **Data Direction** must be set to **Write** for both bytes, then you can click on the display that spans both bytes and enter a number. **Data Direction** does not need to be set in an HP ITG based program; HP ITG determines the direction based on whether a **Set** or **Get** command is executed on the component.
- Read a byte (**Low** or **High**).
  - In the development environment, **Data Direction** must be set to **Read** for the byte you want to read, then you can click on the display below the byte to read the byte. **Data Direction** does not need to be set in an HP ITG based program; HP ITG determines the direction based on whether a **Set** or **Get** command is executed on the component.
- Write a word.
  - In the development environment, **Data Direction** must be set to **Read** for both bytes, then you can click on the display to read the word. **Data Direction** does not need to be set in an HP ITG based program; HP ITG determines the direction based on whether a **Set** or **Get** command is executed on the component.
- Select handshake mode (Click on **Mode**):
  - **Stat1** - static transfer of data.
  - **Stat2** - static transfer of data plus read of write port.
  - **R/W&S** - Use strobe to validate data during a write, or latch data during a read.
  - **R&WS** - I/O line is strobe for write; PCTL line is strobe for read.
  - **HDSHK** - Data valid for writes.

- PCTL - Ready for data during reads.
- PFLG - Ready for data during writes.
- Data valid for reads.
- Select polarity

Bit Definition	Bit Weight
Default	0
Negative Low byte	1
Negative High byte	2
PCTL Polarity	3
PFLG Polarity	4
I/O Direction Polarity	5

- Reset the panel to its initial state.
  - Click on the **Reset** button.
- Pair two HP 44474As to operate in parallel.
  - Click on the control labeled Pair and enter the slot number (i.e., subaddress) of the second HP 44474A.
- Detect instrument errors.
  - Click on the display labeled **Error** to ask the instrument whether an error has occurred. If an error has occurred, the error number is displayed in the display. A **0** in the display means that no error has occurred.
  - This driver includes an ERROR COMPONENT statement, which instructs HP ITG to query the instrument for errors after each transaction, if you have not turned the **Error Checking** mode off. If an error has occured, HP ITG displays the error number in the **Error** display as well as in a dialog box outside of the panel.

Error Definition	Error Number
SYNTAX - Unknown command	1
EXECUTE - Command could not be executed because of: a. Channel number out of range, b. Card type mismatch, or c. Attempt to recall a non-existent state, list, or program.	2
TRIGGER - External increment pulse occurring too fast.	4
LOGIC - A relay bit did not change state as expected.	8
POWER - out of allowable range.	16

Recalling States

When you recall a state, this driver sets the polarity and mode, then writes a whole word of data.

HP 3488A (HP 44474A) 16 Channel Digital I/O Option Revision 1.0		
Component	Values	Initial Value
"00"	0,1	1
"01"	0,1	1
"02"	0,1	1
"03"	0,1	1
"04"	0,1	1
"05"	0,1	1
"06"	0,1	1
"07"	0,1	1
"08"	0,1	1
"09"	0,1	1
"10"	0,1	1
"11"	0,1	1
"12"	0,1	1
"13"	0,1	1
"14"	0,1	1
"15"	0,1	1
DIRECTION	0,1	0
ERROR	0 - 16	0,INVALID
HIGH_BYTE	0 - 255	255
HI_POLARITY	0,1	0
LOW_BYTE	0 - 255	255
LO_POLARITY	0,1	0
MODE	Hdshk,R&WS,R/W&S,Stat2,Stat1	Stat1
PAIR	None,1,2,3,4,5	None
PCTL	0,1	0
PFLG	0,1	0
RESET		
WORD	-32768 - 32767	-1

HP 3488A Option 015 (HP 44475A)

Overview

The HP 44475A Breadboard Assembly provides a way for someone to design a circuit which can interface with the HP 3488A. Refer to the HP 3488A Operating manual for details on design of the interface. There are two 8-bit ports available on the breadboard: one static read port and one static write port.

Using the Panel

This panel allows you to control of these features of the HP 44475A:

- Reading from the read-only register.
- Writing to the write-only register.

Error Definition	Error Number
SYNTAX - Unknown command	1
EXECUTE - Command could not be executed because of: a. Channel number out of range, b. Card type mismatch, or c. Attempt to recall a non-existent state, list, or program.	2
TRIGGER - External increment pulse occurring too fast.	4
LOGIC - A relay bit did not change state as expected.	8
POWER - out of allowable range.	16

Recalling States

When you recall a state, this driver writes the value in the "WRITE" component to the write-only register.

HP 3488A (HP 44475A) Breadboard Option Revision 1.0		
Component	Values	Initial Value
ERROR	0 - 16	0,INVALID
READ	0 - 255	0, INVALID
WRITE	0 - 255	0, INVALID

HP 3488A Options 010/011 (HP 44470A /71A)

Overview

This driver controls either the HP 44470A or the HP 44471A.

The HP 44470A Channel Relay Multiplexer provides 10 channels to multiplex signals to a common point. Each channel consists of two sets of double pole, double throw contacts. Any combination of channels can be closed at any time.

The HP 44471A 10-Channel General Purpose Relay provides 10 independent single pole, single throw switches. Any combination of channels can be closed at any time.

In the HP ITG development environment, you can specify two HP 44470As or two HP 44471As to operate in parallel. That is, a command sent to one card will also control the other.

Channels on each card are labeled 00,01,...,09.

File Names

The name of the HP 44470A/71A driver is: **IDHP3488AX**

The name of its Help file is: **IHHP3488AX**

Using the Panel

This panel allows you to control these features of the HP 44470A and HP 44471A:

- Open a channel.
  - A channel is open when the box below the channel number is blank.
    - Click on the box to toggle the channel open/closed.
- Close a channel.
  - A channel is closed when the box below the channel number contains the letters **CL**.
    - Click on the box to toggle the channel open/closed.
- Reset all channels to their initial state.
  - Click on the **Reset** button.
- Pair two HP 44470As or HP 44471As to operate in parallel.
  - Click on the control labeled **Pair** and enter the slot number (i.e., subaddress) of the second HP 44470A/71A.
- Detect instrument errors
  - Click on the display labeled **Error** to ask the instrument whether an error has occurred. If an error has occurred, the error number is displayed in the display. A **0** in the display means that no error has occurred.
  - This driver includes an ERROR COMPONENT statement, which instructs HP ITG to query the instrument for errors after each transaction, if you have not turned the **Error Checking** mode off. If an error has occured, HP ITG displays the error number in the **Error** display as well as in a dialog box outside of the panel.

Error Definition	Error Number
SYNTAX - Unknown command	1
EXECUTE - Command could not be executed because of: a. Channel number out of range, b. Card type mismatch, or c. Attempt to recall a non-existent state, list, or program.	2
TRIGGER - External increment pulse occurring too fast.	4
LOGIC - A relay bit did not change state as expected.	8
POWER - out of allowable range.	16

Recalling States

When recalling a state, this driver will implement a break before making contact for the channels . That is, the channels that need to be opened will break their contact before any channels make contact. Otherwise, the contacts will be made (broken) in the order 00-09.

HP 3488A (HP 44470A) 10 Channel Relay Multiplexer Option HP 3488A (HP 44471A) 10 Channel General Purpose Relay Module Revision 1.0		
Component	Values	Initial Value
ERROR	0 - 16	0,INVALID
PAIR	None,1,2,3,4,5	None
RELAY_0	OPEN,CLOSED	OPEN
RELAY_1	OPEN,CLOSED	OPEN
RELAY_2	OPEN,CLOSED	OPEN
RELAY_3	OPEN,CLOSED	OPEN
RELAY_4	OPEN,CLOSED	OPEN
RELAY_5	OPEN,CLOSED	OPEN
RELAY_6	OPEN,CLOSED	OPEN
RELAY_7	OPEN,CLOSED	OPEN
RELAY_8	OPEN,CLOSED	OPEN
RELAY_9	OPEN,CLOSED	OPEN
RESET		

Contents

HP 3852A Configuration Driver IDHP3852CF

HP 3852A Configuration Driver IDHP3852CF

Overview

IDHP3852CF is the HP 3852A Data Acquisition/Control Unit configuration driver. This driver identifies the plug-in accessories installed in the 3852A mainframe and 3853A Extender, and stores the "configuration" in a configuration file.

Configuration files are required for 3852A instrument drivers such as IDHP3852IV. They enable the instrument drivers to locate the accessories and send them the appropriate commands. IDHP3852CF can be used with any number of 3852As to create multiple configuration files.

IDHP3852CF identifies accessories by automatically querying each mainframe and extender slot, or you can assign accessories to the slots. Once identified, the driver saves the configuration in a file.

Information on using the configuration driver is contained in the driver's on-line Help screens. The Help feature is located by clicking on the box in the top left corner of the IDHP3852CF panels, or by selecting Help in the right corner of the system menu.

Dedicated Configuration Files

When using more than one instrument driver with different accessories installed in the same mainframe (or extender), consider creating a configuration file dedicated to each driver. For example, if a driver uses a voltmeter and multiplexer accessories, create a configuration file containing only those accessories. If a driver uses only digital input/output accessories, create a file containing those.

The advantage in doing this is the instrument driver's reset feature. When a reset is executed, only the accessories in the configuration file used by that driver are reset to their power-on state. All other accessories remain unchanged.

Adding the Driver to Your Test System

After IDHP3852CF is installed (see the HP ITG User's Handbook), it must be added to your test development system. This enables the driver to interact with the HP ITG software as well as identify the 3852A configuration.

Note

User subprograms in the file USHP3852CF are HP BASIC subprograms called by IDHP3852CF in addition to the ITG subprograms. The user subprograms are loaded automatically when the driver is installed.

Working from the screen in Figure 1, the driver is added as follows:

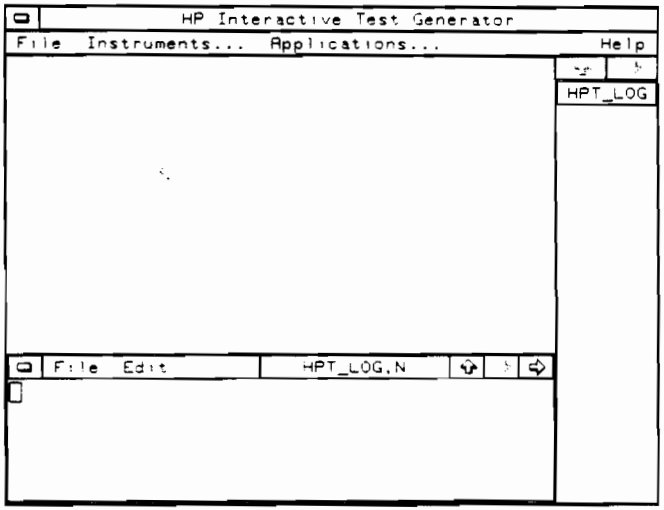


Figure 1. Adding Driver IDHP3852CF

1. Click on **Instruments** on the system menu bar.
2. Scroll through the menu until you find the driver **IDHP3852CF**.
3. Click on **IDHP3852CF**.

The configuration dialog box for the driver will appear as shown in Figure 2.

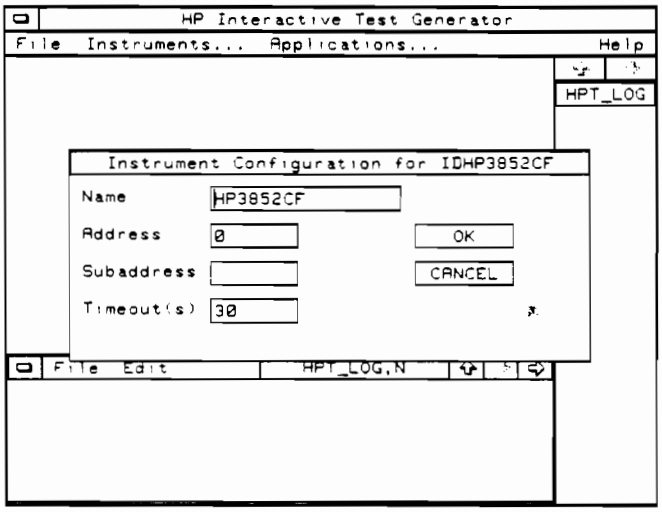


Figure 2. Configuration Dialog Box for IDHP3852CF.

Completing the Dialog Box

The information in the configuration dialog box links the driver to an instrument at a specific HP-IB address. Since IDHP3852CF can be used with multiple 3852As at different addresses, most of the information requested is not directly applicable.

To select a field, click on the box associated with that field, and then enter the parameter from the computer keyboard. Select OK when the dialog box is complete.

Name

The specified name identifies the IDHP3852CF panels when they are reduced to an icon. Thus, the default name "HP3852CF" is generally acceptable. Again, the name is an icon name and is not a file name under which the configuration is stored.

Address

The address specified in the dialog box is optional since IDHP3852CF queries the 3852A at the address specified on its Read Panel. As a guideline, if IDHP3852CF is used with a single 3852A, specify the instrument's HP-IB address (e.g. 709). If the driver is used with multiple 3852As, or if an instrument is not available when the configuration is specified, use the default address of 0.

Subaddress

The 3852A does not use sub- or secondary addressing, therefore, the box should be left blank.

Timeout(s)

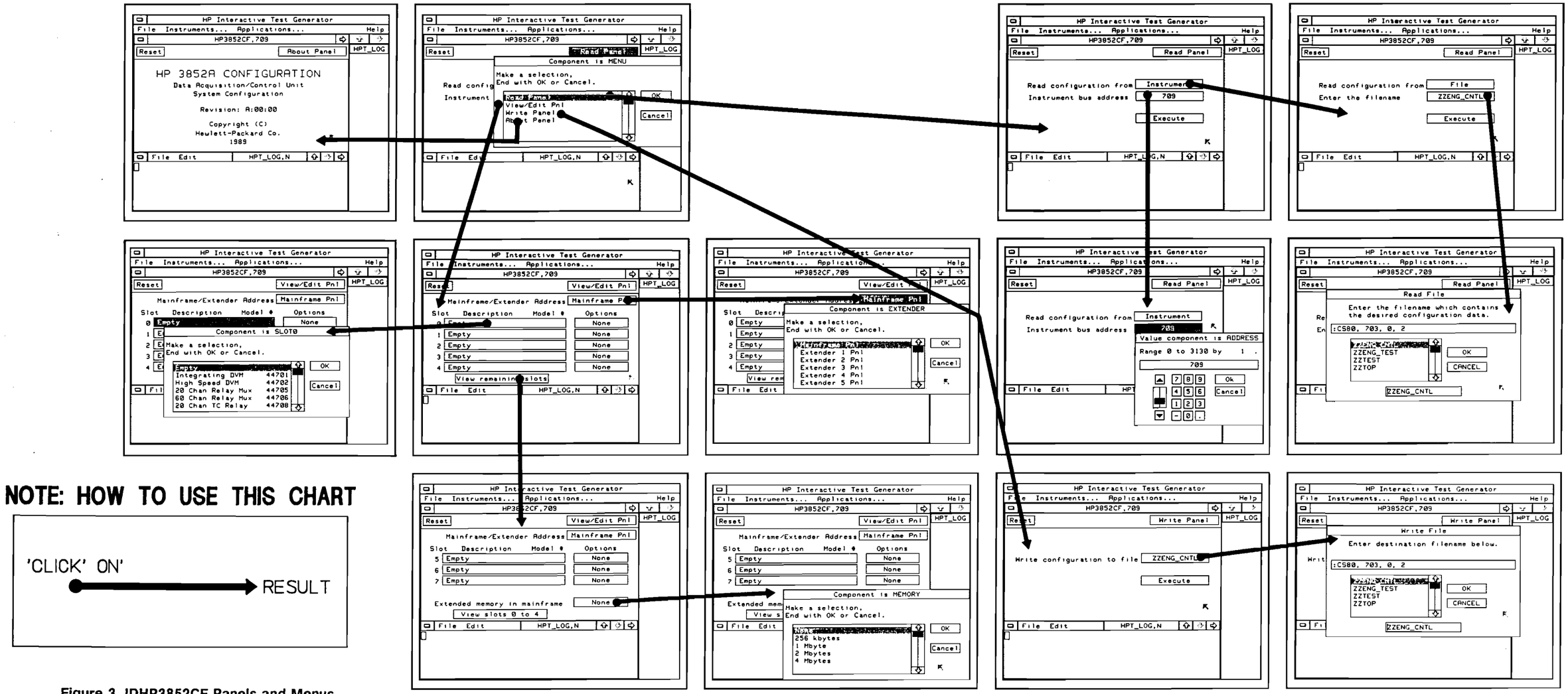
Timeout is the period HP ITG is instructed to wait for a response from the 3852A. For IDHP3852CF, this is the time required for the 3852A to respond to a query of a slot. The 30 second default timeout is sufficient.

Note

Once the dialog box is completed, it takes approximately one minute for the driver to load with an HP model 350 computer, and up to five minutes to load with an HP model 310 or Series 200 computer.

IDHP3852CF Panels and Menus

IDHP3852CF's panels and menus which help you create configuration files are shown on the following pages. Use this map to help you become familiar with the driver.



NOTE: HOW TO USE THIS CHART

'CLICK' ON' → RESULT

Figure 3. IDHP3852CF Panels and Menus.

Using the Configuration Driver

This section contains an example of how to use IDHP3852CF to create configuration files which identify the accessories in the following 3852A slots:

Slot 0: HP 44701A Integrating Voltmeter

Slot 1: HP 44705A 20-Channel Relay Multiplexer

Slot 2: HP 44708A 20-Channel Relay Multiplexer/TC

Slot 3: HP 44717A 10 Bridge 120 Ohm Static Strain Gage Relay Multiplexer

Slot 4: HP 44724A 16-Channel Digital Output

Slot 5: HP 44725A 16-Channel General Purpose Switch

Assuming two 3852A instrument drivers will use the accessories, the example creates two dedicated configuration files. One file contains the voltmeter and multiplexer accessories, and the second file contains the digital output and general purpose switch accessories.

The example also assumes HP ITG is running and that IDHP3852CF has been installed. The example begins, however, by adding the driver to the system.

Adding IDHP3852CF

To add the driver to the system:

1. Click on **Instruments** on the system menu bar.

- Select IDHP3852CF from the menu.

2. Complete the configuration dialog box as follows and then select **OK**.

Name	HP3852CF
Address	709
Sub Address	leave empty
Timeout(s)	30

Creating the First File

The first configuration file is to contain the voltmeter and multiplexer accessories. This file is created using the following steps:

1. Read (query) all 3852A slots.

2. Edit the configuration such that it contains only the voltmeter and multiplexers.

3. Write the configuration to a file.

Step 1: Read All 3852A Slots.

a. The 3852A is queried using the **Read Panel.**

- The **Read Panel** is displayed by clicking on the control box listing the current panel and then selecting **Read Panel.**

b. The box next to the statement "Read configuration from" must contain the word **Instrument.**

- To display **Instrument**, click on the box.

c. The box next to the statement "Instrument bus address" should contain the address **709.**

- To change the address, click on the box.

d. Click on **Execute.**

IDHP3852CF automatically queries each mainframe (and extender) slot.

Step 2: Edit the Configuration

a. Click on the control box displaying **Read Panel.**

Select **View/Edit Pnl** from the menu.

Figure 4 shows the View/Edit panel.

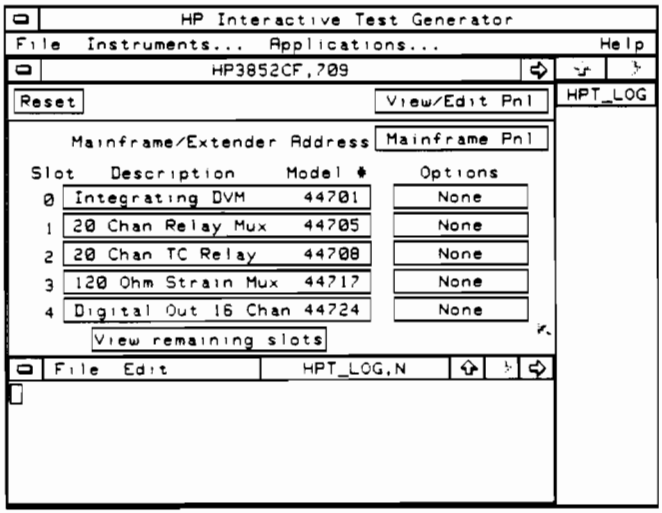


Figure 4. 3852A Configuration Identified by the Read Panel.

b. Remove the 44724A digital output and 44725A switch accessories from the configuration.

- Click on the box listing the accessory in slot 4. Locate **Empty** (the first item) in the menu. Click on **OK**.
- Click on **View remaining slots**. Click on the box listing the accessory in slot 5. Select **Empty** from the menu.

Note

The View/Edit panel can be used to specify a configuration when a 3852A and plug-in accessories are not available.

Step 3: Write the Configuration to a File.

a. Click on the control box displaying **View/Edit Pnl**.

- Select **Write Panel** from the menu.

b. Click on the box next to the statement "Write configuration to file".

- Type in the file name **ENG_TEST** and then select **OK.**

The Write Panel should appear as shown in Figure 5.

Note

When a file name is entered, the configuration driver adds the prefix ZZ to the name as the file is created. This enables the configuration driver and instrument drivers to identify configuration files on a disc or within a directory.

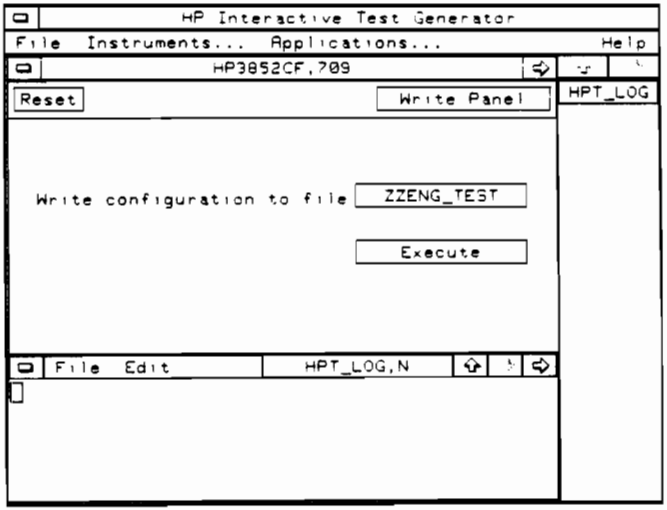


Figure 5. Setting Up the Write Panel.

c. Click on **Execute.**

The first configuration file (ZZENG_TEST) is created.

Creating the Second File

The second configuration file will contain the digital output and general purpose switch accessories. This file is created using the same method:

1. Read (query) all 3852A slots.

2. Edit the configuration so that it contains only the digital output and switch accessories.

3. Write the configuration to a file.

Step 1: Read All 3852A Slots.

a. Click on the control box displaying the current panel (Write Panel).

- Select **Read Panel** from the menu.
- Click on **Execute.**

The driver again queries each slot in the mainframe.

Step 2: Edit the Configuration.

a. Click on the control box displaying **Read Panel.**

- Select **View/Edit Pnl** from the menu.
- Click on **View Slots 0 to 4.**

b. Remove the 44701A, 44705A, 44708A, and 44717A accessories from the configuration.

- Click on the box listing the accessory in slot 0. Locate **Empty** in the menu. Select **OK.**
- Repeat the previous step for slots 1 thru 3; selecting **Empty** for each slot.

Step 3: Write the Configuration to a File.

a. Click on the control box displaying **View/Edit Pnl**.

- Select **Write Panel** from the menu.

b. Click on the box next to the statement "Write configuration to file".

- Type in the file name **ENG_CNTL** and then select **OK.**

c. Click on **Execute.**

The second configuration file (ZZENG_CNTL) is created.

Once all of the required configuration files have been created, driver IDHP3852CF is no longer needed. Either reduce the panel to an icon, or remove (**CLOSE**) the driver from the test system to save memory.

Instrument drivers requiring the configurations stored in either ZZENG_TEST or ZZENG_CNTL can now be added to the system as instructed in the instrument driver manuals.

Contents

HP 3852A Instrument Driver IDHP3852IV

HP 3852A Instrument Driver IDHP3852IV

Overview

IDHP3852IV is an HP 3852A Data Acquisition/Control Unit instrument driver that implements the following HP 44701A Integrating Voltmeter measurement capabilities:

- DC Voltage
- AC Voltage
- 2-Wire Resistance
- 4-Wire Resistance
- Temperature
  - Thermocouples
    - B, E, J, K, N14, N28, R, S, T, isothermal block
  - Thermistors (2-wire/4-wire)
    - 2252, 5k, 10k
  - RTDs (2-wire/4-wire)
    - 85, 92

- Strain
  - 120 and 350 Ohm gages
    - 1/4, 1/2, full bridge;
    - 1/2, full bridge Poisson;
    - full bridge bending Poisson;
    - Tension and Compression Shunt Diagnostics;
    - Bridge Excitation Voltage

Inputs to the 44701A are through its rear terminals or through the following multiplexer accessories:

HP 44705A	HP 44710A	HP 44717A
HP 44706A	HP 44711A	HP 44718A
HP 44708A	HP 44712A	HP 44719A
HP 44709A	HP 44713A	HP 44720A

HP 3852A Configuration Files

Before IDHP3852IV can be used, the location of the 44701A voltmeter and multiplexer accessories installed in the mainframe (and extenders) must be stored in a configuration file. Configuration files are created using the 3852A configuration driver. Refer to the "HP 3852A Configuration Driver IDHP3852CF" manual for more information.

Note

The HP 3852A Mainframe Configuration and Programming Manual covers accessory installation for the 3852A mainframe and 3853A extender.

Wiring and configuration information for the plug-in accessories is contained in the configuration and programming manual shipped with each accessory.

Adding the Driver to Your Test System

After IDHP3852IV is installed (see the HP ITG User's Handbook), it must be added to the test development system. This enables the driver to interact with the HP ITG software as well as communicate with the 3852A.

Note

User subprograms in the file USHP3852IV are HP BASIC subprograms called by IDHP3852IV in addition to the ITG subprograms. The user subprograms are loaded automatically when the driver is installed.

Working from the screen in Figure 1, add the driver as follows:

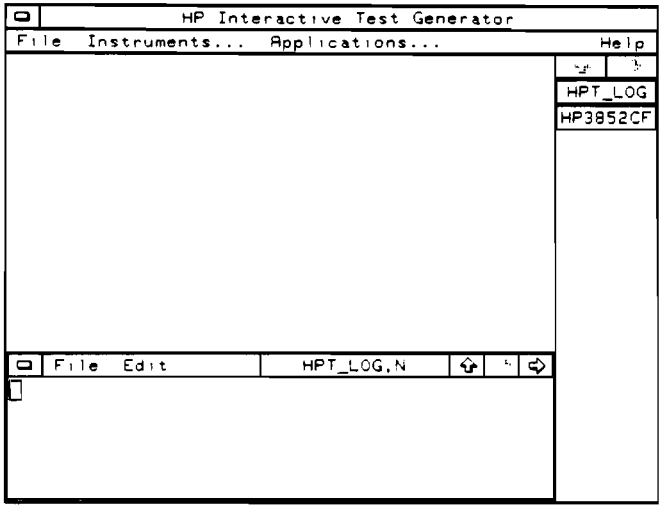


Figure 1. Adding Driver IDHP3852IV

1. Click on **Instruments** on the system menu bar.
2. Scroll through the menu until you find **IDHP3852IV.**
3. Click on **IDHP3852IV.**

Figure 2 shows the configuration dialog box for the driver.

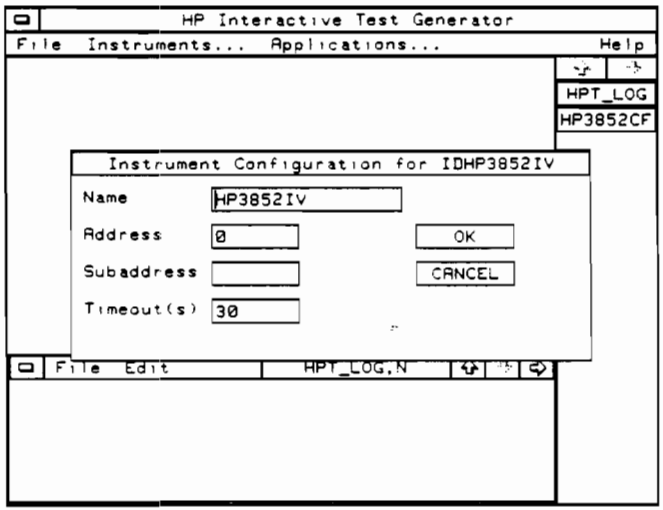


Figure 2. Configuration Dialog Box for IDHP3852IV.

Completing the Dialog Box

The information in the dialog box links IDHP3852IV to a 3852A at a specific HP-IB address.

To select a field, click on the box associated with that field, and then enter the parameter from the computer keyboard. Select OK when all applicable fields are complete.

Name

The specified name links the driver to a 3852A at the address specified. The name also identifies the driver panels when they are reduced to an icon.

Address

This field contains the 3852A's HP-IB address. If commands generated by the driver are to be sent directly to the 3852A (i.e. live mode), specify the instrument's address (709). If the driver is used to generate code without a 3852A present, specify an address of 0.

Subaddress

The 3852A does not use sub- or secondary addressing, therefore, the box should be left blank.

Timeout(s)

Timeout is the period HP ITG is instructed to wait for the 3852A to execute a command in live mode. For commands sent by IDHP3852IV, the 30 second default timeout is acceptable.

Note

Once the dialog box is completed, it takes approximately one minute for the driver to load with an HP model 350 computer, and up to five minutes to load with an HP model 310 or Series 200 computer.

Specifying a Configuration File

After it is added, the driver prompts you to specify a configuration file (Figure 3). To select a file, click on a file name and then select OK.

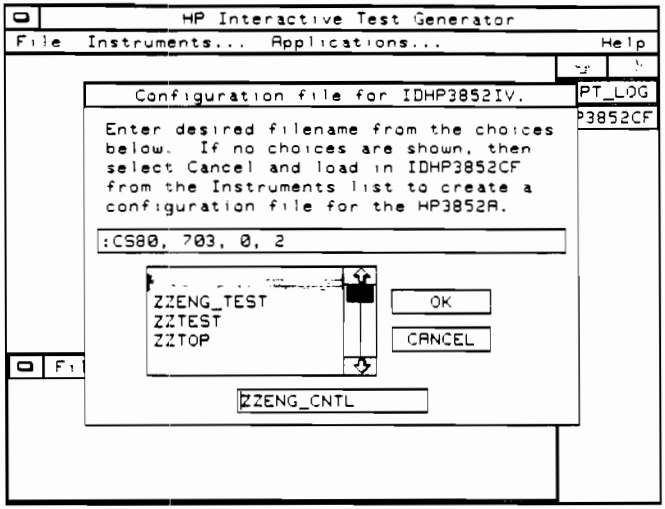
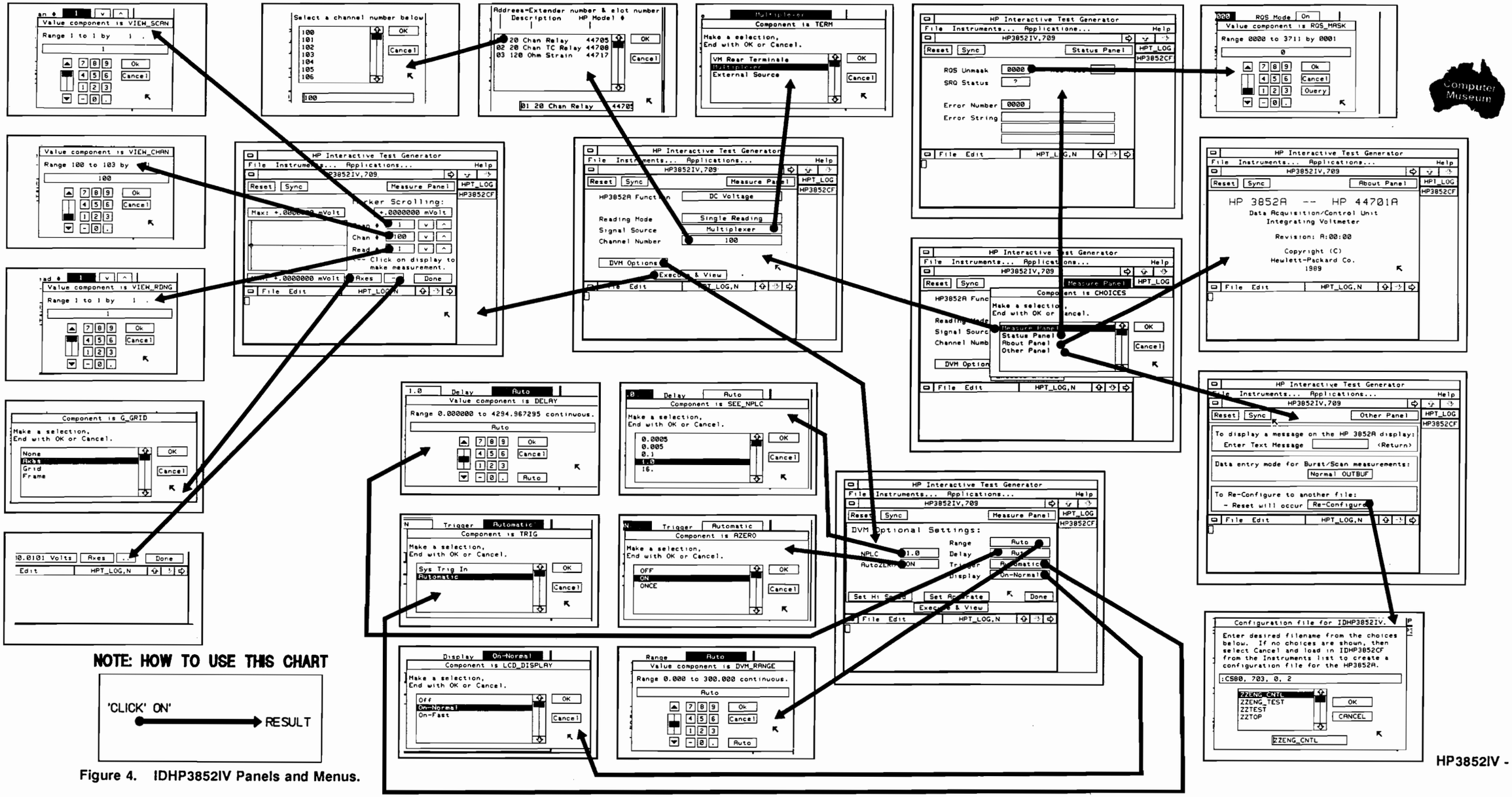


Figure 3. Specifying a Configuration File.

IDHP3852IV Panels and Menus

The driver's panels and menus which allow you program the 44701A voltmeter and 3852A mainframe are shown on the following pages. Use this map to help you become familiar with the driver.



NOTE: HOW TO USE THIS CHART

'CLICK' ON' → RESULT

Figure 4. IDHP3852IV Panels and Menus.

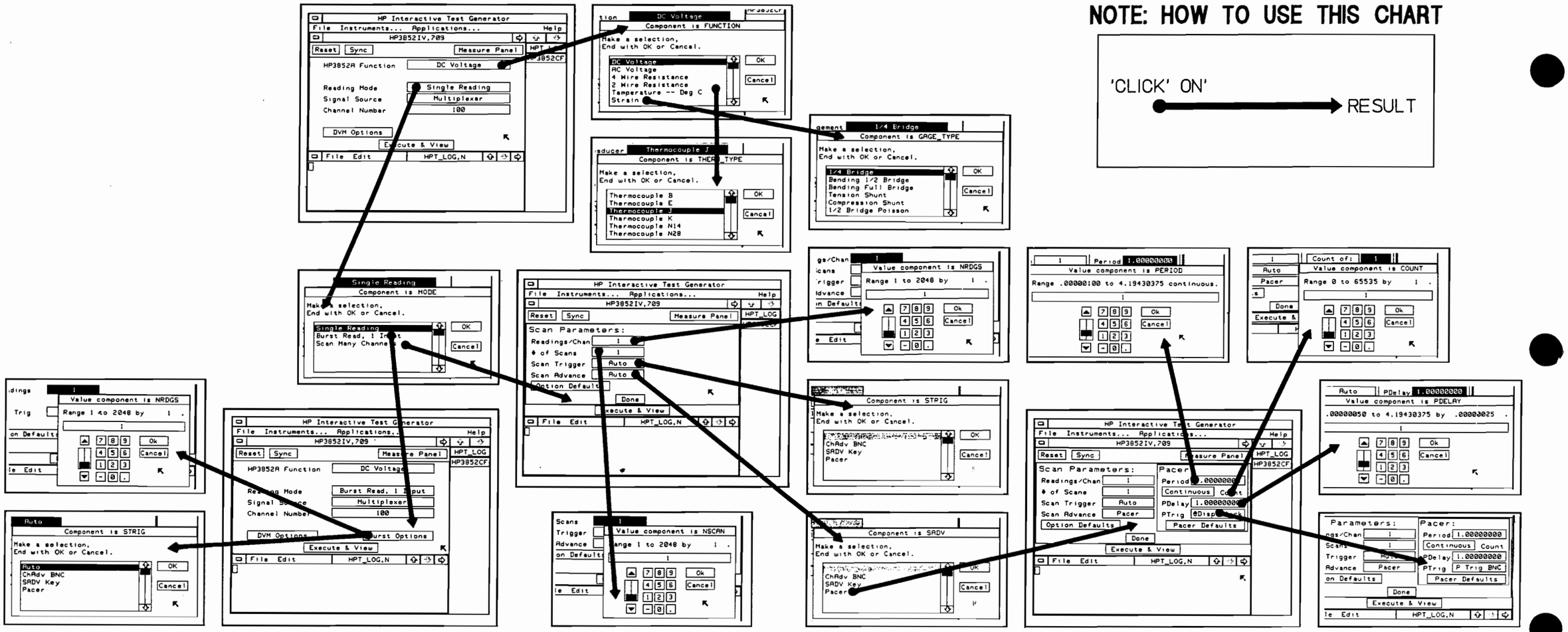


Figure 4. IDHP3852IV Panels and Menus (continued).

Using the Driver

This section contains two examples which demonstrate how to use IDHP3852IV with HP ITG's Log Calls and Log HP BASIC modes to generate test programs. These programs perform Temperature measurements using a T type thermocouple and the accessories in the following 3852A slots:

Slot 0 : HP 44701A Integrating Voltmeter

Slot 1: HP 44708A 20-Channel Relay Multiplexer/TC

Prior to the examples, driver IDHP3852CF is added to the system to create a configuration file. Driver IDHP3852IV is then added and specifies the newly created file.

Adding Driver IDHP3852CF

To add the configuration driver into the test system:

1. Click on **Instruments** on the system menu bar.
   - Select **IDHP3852CF** from the menu.
2. Complete the dialog box as shown and then select **OK**:

Name	HP3852CF
Address	709
Subaddress	leave empty
Timeout(s)	30

Creating the Configuration File

Create the configuration file by querying the mainframe slots and then saving the configuration.

1. Set the **Read Panel** as follows, if not set already:

Read configuration from	**Instrument**
Instrument bus address	**709**

2. Click on **Execute.**

3. Click on the box displaying **Read Panel.**

   - Select **Write Panel.**

4. Click on the box next to the statement "Write configuration to file".

   - Enter the file name TMP_TEST.
   - Select **OK.**
   - Click on **Execute.**

Adding Driver IDHP3852IV

Reduce the configuration panel to an icon by clicking on the "right arrow" in the upper right corner of the driver panel. Add driver IDHP3852IV to the test system. Use configuration file ZZTMP_TEST.

1. Click on **Instruments** on the system menu bar.

   - Select **IDHP3852IV** from the menu.

2. Complete the dialog box as shown and then select **OK**:

Name	HP3852IV
Address	709
Subaddress	leave blank
Timeout(s)	30

3. Select configuration file ZZTMP_TEST and then select **OK**.

Example 1: Thermocouple Temperature Measurements Using Log Calls

This example uses IDHP3852IV and HP ITG's Log Calls mode to develop a program which accomplishes the following:

- Temperature measurements using a T type thermocouple
- Five scans across four multiplexer channels
- Measurements displayed on the computer

Identified in this example are five steps involved with the development and execution of a program using the Log Calls mode:

1. Store an Instrument State
2. HP ITG Initialization
3. Program and System Storage
4. Program Customization
5. Program Execution

Step 1: Store an Instrument State

a. Initialize the HP ITG modes.

- Click on the box in the upper left corner of the HP3852IV panel.
- Select **Modes ...** from the menu.
- Set the following modes and then select **OK** (X = on).

Incremental	on
Error Checking	off
Live	on
Log Calls	off
Log HP BASIC	off
Driver Debug	off

b. Reset the plug-in accessories.

- Click on **Reset**.

Note

Any time the **Reset** feature of IDHP3852IV is used, the accessories in the configuration file specified are set to their power-on states.

---

c. Set the voltmeter measurement function.

- Click on the box next to the words **HP3852A Function**.
- Select **Temperature -- Deg** C from the menu.

d. Specify the thermal transducer.

- Click on the box next to the statement **Thermal Transducer.**
- Scroll through the menu and select **Thermocouple T.**

e. Specify the source (reading mode) of the measurements.

- Click on the box next to the statement **Reading Mode.**
- Select **Scan Many Channels** from the menu.

f. Scan channels 100 through 103.

If the 44708A multiplexer was installed in slot 1, 100 will be displayed in the box next to "First Channel #". Click on the box next to the statement **Last Channel #.**

- Select the 44708A multiplexer accessory
- Select channel **103.**

g. Turn the 3852A display off while the measurements are taken.

- Click on the box labeled **DVM Options.**
- Click on the box next to the word **Display.** Select **Off** from the menu.
- Click on **Done.**

h. Make five scans through the channel list.

- Click on the box labeled **Scan Options.**
- Click on the box next to the statement **# of Scans.** Set 5 scans.
- Click on **Done.**

i. Store the voltmeter state.

- Click on the box in the upper left corner of the HP3852IV panel.
- Select **Store State ...** from the menu.
- Store the state by entering TEMP_STATE from the keyboard.

Step 2: HP ITG Initialization

a. Enable the Log Calls mode.

- Click on the box in the upper left corner of the panel.
- Select **Modes...** from the menu.
- Turn on **Log Calls** and select **OK.**

b. Initialize HP ITG.

- Click on **Edit** on the HP ITG editor menu bar.
- Select **Generate Hpt_init** from the menu.

The follow data and subprogram calls are logged:

```
INTEGER Hp3852iv
!
Hpt_init("WFDFLT")
Hpt_assign(Hp3852iv,"HP3852IV")
!
END
```

c. Reset the accessories.

- Click on **Reset.**

The following subprogram call is logged:

```
Hpt_push(Hp3852iv,"RESET")
```

d. Recall the voltmeter state.

- Click on the box in the upper left corner of the HP3852IV panel.
- Select **Recall State...** from the menu.
- Recall "TEMP_STATE".

The following subprogram call is logged:

Hpt_recall(Hp3852iv,"TEMP_STATE")

e. Trigger the voltmeter and take the readings.

- Click on the box labeled **Execute & View**.
- Click on the panel's display to trigger the measurements.

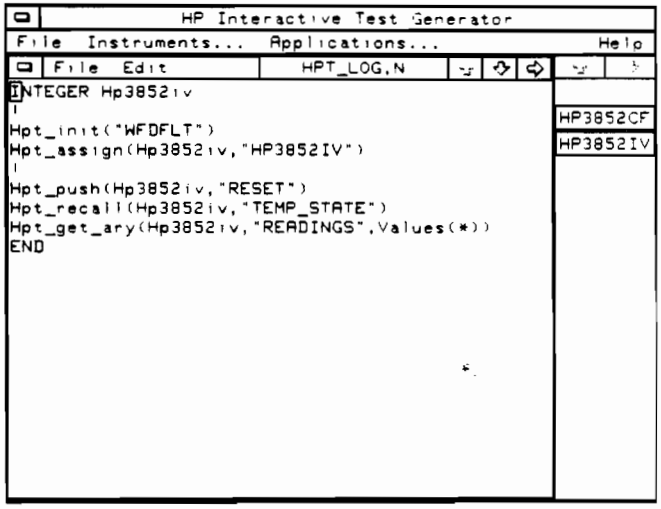
The following subprogram call is logged:

Hpt_get_ary(Hp3852iv,"READINGS",Values(*))

f. Turn off the Log Calls mode.

- Click on the box in the upper left corner of the HP3852IV panel.
- Select **Modes...** from the menu.
- Turn **Log Calls** off. Select **OK**.

By expanding the editor window (up arrow on editor menu bar) and positioning the cursor on the top line (keyboard up arrow key), all logged subprogram calls can be viewed.



Step 3: Program and System Storage

Once the subprogram calls necessary to perform the measurements have been logged, the program and system are stored and HP ITG is exited. The HP BASIC editor is used to customize the program.

a. Save the subprogram calls in an ASCII file.

- Click on **File** on the editor menu bar.
- Select **Save As ...** from the menu.
- From the keyboard, enter the file name TEMP_CALL. **Numbered** should also have an X in its box.

b. Save the system in a work file.

- Click on **File** on the system menu bar.
- Select **Save As ...** from the menu.
- From the keyboard, enter the file name WFTEMP.

c. Exit HP ITG.

- Click on **File** on the system menu bar.
- Select **Quit** from the menu.

Step 4: Program Customization

Programs can be customized using the HP ITG or HP BASIC editor. In most cases the HP BASIC editor is used.

a. Retrieve the program TEMP_CALL by typing and entering:

GET "TEMP_CALL"

b. Get into the editor mode by typing and entering:

EDIT

The program listing is shown below:

```
10  INTEGER Hp3852iv
12  !
14  Hpt_init("WFDFLT")
16  Hpt_assign(Hp3852iv,"HP3852IV")
18  !
20  Hpt_push(Hp3852iv,"RESET")
22  Hpt_recall(Hp3852iv,"TEMP_STATE")
24  Hpt_get_ary(Hp3852iv,"READINGS",Values(*))
26  END
28  !
```

b. For this example, the program is customized as indicated (in bold) below. Generally, the customization that is done will depend on the application, your knowledge of the 3852A, and your programming practices.

```
10  INTEGER Hp3852iv
12  !
14  Hpt_init("WFTEMP")
16  Hpt_assign(Hp3852iv,"HP3852IV")
18  !
20  Hpt_push(Hp3852iv,"RESET")
22  Hpt_recall(Hp3852iv,"TEMP_STATE")
23  Hpt_peek(Hp3852iv,"MAX_SIZE",Max_size)
24  ALLOCATE Values(1:1,1:Max_size)
26  Hpt_get_ary(Hp3852iv,"READINGS",Values(*))
27  FOR T=1 TO 20 STEP 4
28  PRINT Values(1,T),Values(1,T+1),
Values(1,T+2), Values(1,T+3)
38  NEXT T
48  END
```

In line 14 of the original program, the default work file (WFDFLT) is assumed. During customization, this file must be changed to the work file in which you saved the system (WFTEMP).

In line 24, a two-dimensional REAL array is allocated. This array must be declared in all programs (developed with the Log Calls mode) in which data is acquired. The array must specify as an upper bound, the size specified for the READINGS component (Table 1). Initially, the array size is 2048. In the event the size is changed from its initial value (Table 1), line 23 ensures that the correct bound is specified. Note that any valid array name can be used.

The program takes 20 temperature measurements. Lines 27, 28, and 38 are added to display those measurements on the computer.

c. Programs generated in the Log Calls mode execute in HP BASIC and use HP ITG's run-time environment. Add the HPT run-time subprograms to your program by typing:

LOADSUB ALL FROM "HPITGRT"

d. Store the customized program and the run-time subprograms in a PROG file called "Temperature" by typing and entering:

STORE "TEMPERATURE"

Step 5: Program Execution

a. After changing environments (development/run-time), or after adding or modifying COM declarations, all program variables should be cleared. To do this, type and enter:

SCRATCH C

b. To execute the program, type and enter:

RUN

Typical data generated by the program is shown below:

28.0400390625	27.9990234375	28.8046875	28.720703125
28.064453125	28.0078125	28.8203125	28.71484375
28.0400390625	28.0068359375	28.8046875	28.70703125
28.0341796875	27.990234375	28.8056640625	28.7216796875
28.0380859375	27.9853515625	28.796875	28.7314453125

Example 2. Thermocouple Temperature Measurements Using Log HP BASIC

This example uses IDHP3852IV and HP ITG's Log HP BASIC mode to develop a program which performs the same functions as described in Example 1:

- Temperature measurements using a T type thermocouple
- Five scans across four multiplexer channels
- Measurements displayed on the computer

The example identifies four steps involved with the development and execution of a program using the Log HP BASIC mode:

1. Instrument Configuration
2. Program and System Storage
3. Program Customization
4. Program Execution

After completing Example 1, it is necessary to load and run the ITG program (HPITG) before starting Example 2. To save time, the test system stored in the work file WFTEMP can be used. Thus, you do not have to specify another configuration file nor add the drivers again.

To load and run the ITG program:

- Type and enter **LOAD "HPITG"**.
- Press **RUN**.

Once ITG is running, open work file **WFTEMP**:

- Click on **File** in the system menu bar. Select **Open** from the menu.
- Select work file **WFTEMP**.
- Click on the icon labeled **TEMP_CALL**.
- If necessary, click on the down arrow on the editor menu bar to reduce the panel to its original size.
- Click on **File** on the editor menu bar. Select **New** from the menu. Do not save any changes.
- Click on the icon labeled **HP3852IV**.

Step 1: Instrument Configuration

a. Initialize the HP ITG modes.

- Click on the box in the upper left corner of the HP3852IV panel.
- Select **Modes...** from the menu.
- Set the following modes (if not set already) and then select **OK** (X = on).

Incremental	on
Error Checking	off
Live	on
Log Calls	off
Log HP BASIC	off
Driver Debug	off

b. Reset the accessories.

- Click on **Reset**.

c. Since the voltmeter set-up required for this application was stored as state "TEMP_STATE" in Example 1, the set-up can be recalled. This eliminates the need to reprogram the voltmeter.

- Click on the box in the upper left corner of the HP3852IV panel.
- Select **Recall State...** from the menu.
- Recall the state stored under "TEMP_STATE".

Note

When a state is recalled, the driver assumes the configuration (as specified by the configuration file) is the same as when the state was created. If a state is recalled after a new configuration is specified, the state may need to be modified depending on the location of the accessories.

---

d. Enable the Log HP BASIC mode.

- Click on the box in the upper left corner of the panel.
- Select **Modes...** from the menu.
- Turn on **Log HP BASIC** and select **OK**.

e. Log the commands which set the configuration.

- Click on **Sync.**

This logs the commands:

```
CLEAR Hp3852iv
OUTPUT Hp3852iv;"INBUF OFFcrlf";
OUTPUT Hp3852iv;"CLRcrlf";
OUTPUT Hp3852iv;"RST 0;crlf";
OUTPUT  Hp3852iv;"RST 100;crlf";
! wait for SPOLL bit 4
OUTPUT Hp3852iv;"REAL Hpivbufr (0);DELVAR
Hpivbufr;REAL Hpivdata(0); DELVAR Hpivdata;crlf";
OUTPUT Hp3852iv;"DISP OFF;USE 0; CONF
TEMPT;crlf";
```

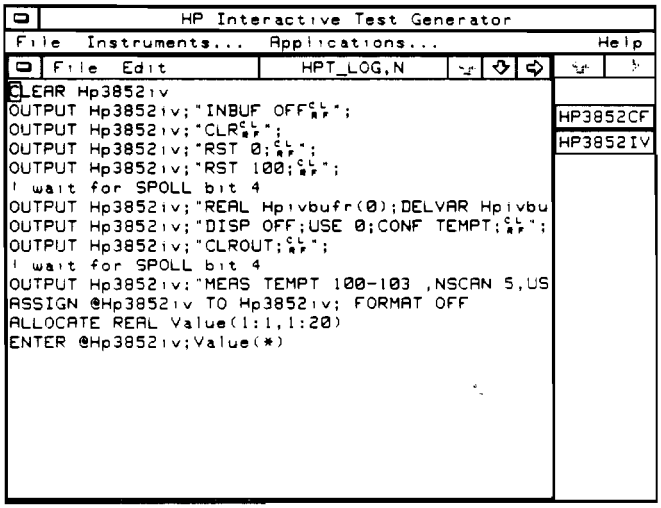
f. Trigger the voltmeter and take the readings.

- Click on the box labeled **Execute & View.**
- Click on the panel's display to trigger the measurements.

This logs the commands:

```
OUTPUT Hp3852iv;"CLROUT;crlf";
! wait for SPOLL bit 4
OUTPUT Hp3852iv;"MEAS TEMPT 100-103,
NSCAN 5,USE 0  RL64crlf";
ASSIGN @Hp3852iv to Hp3852iv;FORMAT OFF
ALLOCATE REAL Value(1:1,1:20)
ENTER @Hp3852iv;Value(*)
```

By expanding the editor window (up arrow on editor menu bar) and positioning the cursor on the top line (keyboard up arrow key), all logged commands can be viewed.



Step 2: Program and System Storage

Once the commands which perform the application have been logged, the program and system are stored and HP ITG is exited. The HP BASIC editor is then used to customize the program.

a. Save the logged commands in an ASCII file.

- Click on **File** on the editor menu bar.
- Select **Save As ...** from the menu.
- From the keyboard, enter the file name TEMP_TEST. **Numbered** should have an X in its box.

b. Save the system in a work file.

- Click on **File** on the system menu bar.
- Select **Save** from the menu.

This saves the system in the current work file (WFTEMP).

c. Exit HP ITG.

- Click on **File** on the system menu bar.
- Select **Quit** from the menu.

Step 3: Program Customization

Programs can be customized using the HP ITG or HP BASIC editor. Again, for this example, the HP BASIC editor is used.

a. Retrieve the program TEMP_TEST by typing and entering:

GET "TEMP_TEST"

b. Get into the HP BASIC editor mode by typing and entering:

EDIT

The program listing is shown below:

```
10  CLEAR Hp3852iv
12  OUTPUT Hp3852iv;"INBUF OFFcrlf";
14  OUTPUT Hp3852iv;"CLRcrlf";
16  OUTPUT Hp3852iv;"RST 0;crlf";
18   OUTPUT Hp3852iv;"RST 100;crlf";
20  !wait for SPOLL bit 4
22 OUTPUT Hp3852iv;"REAL Hpivbufr(0);DELVAR
Hpivbufr;REAL Hpivdata(0);DELVAR Hpivdata;crlf";
24  OUTPUT Hp3852iv;"DISP OFF;USE 0;CONF
TEMPT;crlf";
26  OUTPUT Hp3852iv;"CLROUT;crlf";
28  ! wait for SPOLL bit 4
30  OUTPUT Hp3852iv;"MEAS TEMPT 100-103,
NSCAN 5,USE 0 RL64crlf";
32  ASSIGN @Hp3852iv TO Hp3852iv;FORMAT OFF
34  ALLOCATE REAL Value(1:1,1:20)
36  ENTER @Hp3852iv;Value(*)
38  !
```

c. For this example, the program is customized by adding the lines shown in bold.

```
1   Hp3852Iv=709
10  CLEAR Hp3852iv
12  OUTPUT Hp3852iv;"INBUF OFF"
14  OUTPUT Hp3852iv;"CLR"
16  OUTPUT Hp3852iv;"RST 0"
18  OUTPUT Hp3852iv;"RST 100"
20  WHILE NOT BIT(SPOLL(709),4)
21  END WHILE
22  OUTPUT Hp3852iv;"REAL Hpivbufr(0);DELVAR
Hpivbufr;REAL Hpivdata(0);DELVAR Hpivdata"
24  OUTPUT Hp3852iv;"DISP OFF;USE 0;CONF
TEMPT"
26  OUTPUT Hp3852iv;"CLROUT"
28  WHILE NOT BIT(SPOLL(709),4)
29  END WHILE
30  OUTPUT Hp3852iv;"MEAS TEMPT 100-103,
NSCAN 5,USE 0 RL64"
32  ASSIGN @Hp3852iv TO Hp3852iv;FORMAT OFF
34  ALLOCATE REAL Value(1:1,1:20)
36  ENTER @Hp3852iv;Value(*)
38  FOR T=1 TO 20 STEP 4
48  PRINT Value(1,T),Value(1,T+1),Value(1,T+2),
Value(1,T+3)
58  NEXT T
68  END
```

In line 1, the 3852A's HP-IB address (709) is assigned to device selector "Hp3852iv".

The WHILE ... END WHILE loops (lines 20, 21 and 28, 29) allow the RST (reset) and CLROUT (clear 3852A output buffer) commands to complete before additional commands are executed.

The program makes 20 temperature measurements. Lines 38, 48, and 58 are added to display those measurements in four columns on the computer.

The semicolon (;) and extra carriage return/line feed (cr/lf) delimiters are removed; therefore, the program lines are terminated with a single cr/lf.

d. Re-save the customized program by typing and entering:

RE-SAVE "TEMP_TEST"

Step 4: Program Execution

a. To execute the program, type and enter:

RUN

Typical data generated by the program is shown below:

27.4072265625	27.5234375	28.19140625	28.1728515625
27.44921875	27.5166015625	28.130859375	28.30859375
27.6123046875	27.501953125	28.12890625	28.2324218[illegible]5
27.513671875	27.4443359375	28.2177734375	28.3486328125
27.5322265625	27.4970703125	28.1669921875	28.2861328125

HPT Subprograms Used by IDHP3852IV

The HPT subprograms used by IDHP3852IV are:

Hpt_set_str
Hpt_set
Hpt_push
Hpt_get
Hpt_get_ary
Hpt_get_str
Hpt_peek

Using the HP BASIC or HP ITG editor, you can modify your test programs directly by specifying the appropriate parameters in the calls to these subprograms. This allows you to add and/or change HP 44701A or 3852A mainframe functions without using the panels.

For example, typing the following within the editor:

Hpt_set_str(Hp3852iv,"FUNCTION","ACV")

sets the 44701A voltmeter measurement function to AC voltage.

Table 1 lists the pass parameters associated with the calls to these subprograms and the voltmeter and mainframe choices available.

NOTE

HP 44701A states can only be stored, modified, and recalled using the IDHP3852IV and HP ITG panels.

Table 1. HPT Subprograms Used by Driver IDHP3852IV.

Hpt_set_str(<Name>,	<Component>,	<Value$>)	Initial Value
Hp3852iv,	"FUNCTION",	"DCV" "ACV" "OHMF" "OHM" "TEMP" "STRAIN"	DCV
Hp3852iv,	"THERM_TYPE",	"TEMPB" "TEMPE" "TEMPJ" "TEMPK" "TEMPN14" "TEMPN28" "TEMPR" "TEMPS" "TEMPT" "REFT" "THM2252" "THM5K" "THM10K" "THMF2252" "THMF5K" "THMF10K" "RTD85" "RTD92" "RTDF85" "RTDF92"	TEMPJ

Table 1. HPT Subprograms Used by Driver IDHP3852IV (continued).

Hpt_set_str(<Name>,	<Component>,	<Value$>)	Initial Value
Hp3852iv,	"GAGE_TYPE",	"STRQ" "STRHB" "STRFB" "STRHP" "STRFBP" "STRFP" "STRQTEN" "STRQCOMP" "STRVEX	STRQ
Hp3852iv,	"STRAIN _FACTOR",	"NORMAL" "micro"	NORMAL
Hp3852iv,	"MODE",	"SINGLE" "BURST" "SCANNER"	SINGLE
Hp3852iv,	"TERM",	"REAR" "MUX" "ANALOG"	[1]
Hp3852iv,	"LCD_ DISPLAY",	"OFF" "ON" "FAST"	ON
Hp3852iv,	"AZERO",	"OFF" "ON" "ONCE"	ON
Hp3852iv,	"DVM_RANGE",	"AUTO"	AUTO
Hp3852iv,	"DELAY",	"AUTO"	AUTO

Table 1. HPT Subprograms Used by Driver IDHP3852IV (continued).

Hpt_set_str(<Name>,	<Component>,	<Value$>)	Initial Value
Hp3852iv,	"TRIG",	"SCAN" "SINGLE" "SYSTEM_EXT" "SYSTEM_GET"	[2]
Hp3852iv,	"OCOMP",	"OFF" "ON"	OFF
Hp3852iv,	"STRIG",	"SCAN" "CHADV" "KEY" "PACER"	SCAN
Hp3852iv,	"SADV",	"SCAN" "CHADV" "KEY" "PACER"	SCAN
Hp3852iv,	"PTRIG",	"EXT" "SINGLE"	SINGLE
Hp3852iv,	"PACER_ COUNT",	"CONTINUOUS" "COUNT"	CONTINUOUS
Hp3852iv,	"RQS_MODE",	"OFF" "ON"	ON
Hp3852iv,	"LCD_MSG",	any 12 character message	""
Hp3852iv,	"ENTRY_MODE",	"NORMAL" "VREAD"	NORMAL

Table 1. HPT Subprograms Used by Driver IDHP3852IV (continued).

Hpt_set (<Name>,	<Component>,	<Value>)	Initial Value
Hp3852iv,	"GAGE_ FACTOR",	.001 to 1E6	2.0
Hp3852iv,	"POISSON_NU",	-0.9999 to 9.9999	.3333
Hp3852iv,	"FIRST_CHAN",	Any valid channel number	0
Hp3852iv,	"LAST_CHAN",	Any valid channel number	0
Hp3852iv,	"SLOT",	0 to 7900	
Hp3852iv,	"NPLC",	.0005 .005 .1 1 16	1
Hp3852iv,	"DVM_RANGE",	Any valid voltmeter range	AUTO
Hp3852iv,	"DELAY",	0 to 4294.967295	AUTO
Hp3852iv,	"NRDGS",	1 to 2048	1
Hp3852iv,	"NSCAN",	1 to 2048	1
Hp3852iv,	"PERIOD",	0.000001 to 4.19430375	1 second
Hp3852iv,	"COUNT",	0 to 65535	CONTINUOUS
Hp3852iv,	"PDELAY",	.0000005 to 4.19430375	1 second
Hp3852iv,	"RQS_MASK",	0 to 3711	0

Table 1. HPT Subprograms Used by Driver IDHP3852IV (continued).

Hpt_push (<Name>,	<Button_name>)		Initial Value
Hp3852iv,	"RESET"		
Hp3852iv,	"SYNC"		
Hp3852iv,	"REFERENCE_BUFFER"		[3]
Hp3852iv,	"SET_FAST"		[4]
Hp3852iv,	"SET_ACCURATE"		[5]
Hp3852iv,	"DEFAULT_SEQ"		[6]
Hp3852iv,	"DEFAULT_PACER"		[7]
Hpt_get (<Name>,	**<Component>,**	**<Value>)**	**Initial Value**
Hp3852iv,	"READING",	Value	0
Hp3852iv,	"SRQ_STATUS",	Value	0
Hpt_get_ary(<Name>,	**<Component>,**	**<Value(*)>)**	**Initial Value**
Hp3852iv,	"READINGS",	Real Array [1,2048]	[8]
Hpt_get_str(<Name>,	**<Component>,**	**<Value$>)**	**Initial Value**
Hp3852iv,	"ERR_STRING",	STRING [60]	
Hpt_peek(<Name>,	**<Component>,**	**<Value>)**	**Initial Value**
Hp3852iv,	"NUMBER_ POINTS",	Value	[9]
Hp3852iv,	"MAX_SIZE",	Value	[10]

Table 1. HPT Subprograms Used by Driver IDHP3852IV (continued).

[1] Initial value is MUX if multiplexers are in the configuration file used. Initial value is REAR if no multiplexers are used.

[2] When Signal Source is "Multiplexer" (TERM MUX), the Value$ choices for component TRIG are SCAN and SYSTEM_EXT. When Signal Source is "VM Rear Terminals" (TERM REAR) or "External Source" (TERM ANALOG), the Value$ choices are SINGLE, SYSTEM_EXT, and SYSTEM_GET.

[3] Contains the unstrained reference(s) during strain measurements.

[4] SET_FAST sets the following voltmeter parameters: NPLC = 0.0005, AZERO = OFF, Delay = AUTO, OCOMP = OFF, Display = OFF.

If the Range is set to AUTO, it is changed to 300.000 if the function is DCV, 200.000 if ACV, and 3E6 if the OHM function is set. If the range was set to a value other than AUTO, it remains unchanged.

[5] SET_ACCURATE sets the following voltmeter parameters: NPLC = 16, AZERO = ON, Range = AUTO, Delay = AUTO.

[6] When pushed, DEFAULT_SEQ sets the following values: # Readings = 1, Burst Trig = Auto, Readings/Chan = 1, # of Scans = 1, Scan Trigger = Auto, Scan Advance = Auto.

[7] When the scan parameters Scan Trigger or Scan Advance are set to "Pacer", DEFAULT_PACER sets the following values: Period = 1.00, Count = Continuous, PDelay = 1.00, PTrig = @Disp Click (Single).

Table 1. HPT Subprograms Used by Driver IDHP3852IV (continued).

[8] To increase the size of the array (hence the maximum number of readings that can be taken), change the size in driver IDHP3852IV:

xxxx ! COMPONENT READINGS NOTSAVED:
xxxx ! TYPE RARRAY 1,2048;

[9] NUMBER_POINTS indicates number of readings taken during a single burst measurement; or equals # readings x # channels x # scans during scanning measurements.

[10] MAX_SIZE indicates the size of the array allocated for the READINGS component in Hpt_get_ary. Note that the maximum values for the NRDGS and NSCAN components in Hpt_set are determined by the value returned by MAX_SIZE.

Caution

Once the number of readings, number of channels, and number of scans have been determined for a particular measurement, the driver takes the product of these parameters and compares them to the value in MAX_SIZE. This determines whether or not the array for the READINGS component will be large enough. If MAX_SIZE is changed by Hpt_poke or Hpt_set, MAX_SIZEwill not contain the actual size of the array. As a result, when measurements are taken, the array may not be completely filled or it may be too small. Either condition will cause an error.

To change MAX_SIZE, change the array size associated with the READINGS component ([8]). DO NOT use Hpt_poke or Hpt_set.

HP 5334A Universal Counter

Overview

The HP 5334A is a fully programmable Universal Counter capable of measuring up to 100 MHz. With the optional C channel, it can measure up to 1.3 GHz. The instrument's basic measurement functions are:

- Frequency
- Period
- Time
- Time delay
- Ratio
- Totalize

Post-measurement data manipulation is provided, including:

- Math functions
- Pulse width
- Rise/Fall time
- Voltage peaks of the input signal

Files Names

The name of the HP 5334A driver is: **IDHP5334A**

Its Help file is: **IHHP5334A**

Using the Panel

The soft panel is divided into six over-laid subpanels, each allowing interactive control of these features of the HP 5334A:

Panel	Controls
Main	Function, Auto Trigger, Input Controls (Slope, Attenuation, Ac/dc Coupling, and Impedance)
TrigSens	Trigger Levels (manual, Dacs), And Sensitivity
GateMath	Gate Time, Average, Single-cycle, Math Disable, Offset, and Normalize
Other	Com A, Filter A, External Arming, and Wait Until Addressed
Other	SRQ Mask, Serial Poll, Error, ID, and State Store and Recall
About	Information about this driver

Reset

The **Reset** button on the panel puts the instrument in its initial (power-on) state. Note that this is not the same as the Reset button on the instrument, which effectively does a Restart.

High Speed Mode

When the HP 5334A is in High Speed Output mode, it sends its measurement data to the controller in binary, and can send it at a rate of 150 measurements per second. High-speed data must be combined with the calibration data to calculate the desired measurement, and is applicable only in frequency, period, time interval, and ratio measurements.

This driver does not support reading data from the counter in High Speed Mode or calculating the correct measurements. For this reason, the High Speed component is not included on the panel. This driver does include the necessary bus codes and couplings for High-speed mode, if you choose to turn it on (i.e., use Hpt_set_str and specify the component HighSpeedMode). When you store and recall a panel state, HP ITG includes the High Speed component.

SRQ Mask and Spoll Status

Bit Definition	Bit Weight
Data Ready	1
Always 0	2
Error Condition	4
Failure Condition	8
Instrument in Local	16
Oscillator	32

RQS (request service)	64
Always 0	128

Error

Error numbers are displayed in the box labeled **Error (Status Panel)** when you click on that box.

Error Message	Description
FRONT PANEL SETUP	0.0 No Error
	1.0 Parameter disallowed in present mode.
	1.1 Attenuators controlled by Auto Trig.
	1.2 50-ohm B, AC B settings preset by Com A
	1.3 Slope B set by Slope A in Rise/Fall mode.
	1.4 Parameter disallowed in High Speed mode.
	1.5 Calibration data unaccessible in present mode.
DATA ENTRY	2.0 Invalid key entry.
	2.1 Data outside valid range.
	2.2 Data exceeds maximum resolution.
	2.3 Mantissa digit buffer full.
	2.4 Decimal point previously entered.
KEYBOARD	3.0 Multiple key closures
HP-IB PROGRAMMING	4.0 Mnemonic not recognizable.
	4.1 Numeric syntax error.

4.2 Alpha character expected.

4.3 Data exceeds valid range.

4.4 Attention (ATN) asserted in Talk-Only mode.

SETUP MEMORY

5.0X Store instrument setup failed (X = register number: 0-9)

5.1X Recall instrument setup failed (X = register number: 0-9)

5.2 HP-IB address cannot be recalled at power-up; address defaults to 03.

For information on the Failure Messages, please refer to the instrument manual.

HP 5334A Universal Counter Revision 1.0		
Component	Values	Initial Value
AttnA	X1,X10	X1 DONTCARE
AttnB	X1,X10	X1 DONTCARE
AutoTrig	Off,On	On
CalibrationData	IARRAY[4]	
ComA	Off,On	Off
CouplingA	DC,AC	DC
CouplingB	DC,AC	DC
Dacs	Off,On	Off
ExtArmStart	Pos,Off,Neg	Off
ExtArmStop	Pos,Off,Neg	Off
FilterA	Off,On	Off
Function	FreqA,FreqB,FreqC,PeriodA,TimeAB, TimeDelAB,RatioAB,TotStopA, TotStartA, PulseWidA,RiseFallA,Dvm	FreqA
GateAverage	Off,On	Off
GateTime	0.001 - 99.999	.3
HighSpeedMode	Off,On	Off
ID	STRING[8]	
ImpedanceA	50.0 - 1.0E6	1.0E6
ImpedanceB	50.0 - 1.0E6	1.0E6
IntTrigLevelA	-5.1 - 5.1	0
IntTrigLevelB	-5.1 - 5.1	0
ManTrigLevelA		0
ManTrigLevelB		
MathDisable	Off,On	Off
Normalize	-9.9999999999E+9 - 9.9999999999E+9	+1
Offset	-9.9999999999E+9 - 9.9999999999E+9	0
PeakLowerA		
PeakLowerB		
PeakUpperA		0
PeakUpperB		0
Reading		0
Recall	0 - 9	0
Reset	button	

HP 5334A Universal Counter Revision 1.0 (continued)		
Component	Values	Initial Value
Restart	button	
SPOLL_VALUE	button	0
SRQ_MASK	0 - 255	0
SYST_ERR		
Sens	Off,On	Off
SingleCycle	Off,On	Off
SlopeA	Pos,Neg	Pos
SlopeB	Pos,Neg	Pos
Store	0 - 9	0
WaitOnAddressed	Off,On	Off

HP 5384A-5386A Frequency Counters

Overview

The HP 5384A, HP 5385A, and HP 5386A Frequency Counters provide frequency measurements on each of two inputs. Each counter measures Period and Frequency on channel A to 100 MHz. The different models provide different measurement capabilities on channel B:

Model	Min Frequency	Max Frequency
HP 5384A	50 Hz	225 MHz
HP 5385A	90 Hz	1 GHz
HP 5386A	90 MHz	3 GHz

File Names

There is one driver that supports the HP 5384A, HP 5384A, and HP 5384A. Its file name is: **IDHP538XA**

Its Help file is: **IHHP538XA**

Using the Driver

The Frequency Counter is controlled through 3 panels:

- **Meas** - General Meter Operation
- **Other** - Miscellaneous Controls
- **Status** - Status and Error Controls

Most measurements may be made by using the **Meas** panel.

To make a reading:

- Click on the display.

Error

The Error number can be read by clicking on the display labeled **Error** (**Status** panel). It is also displayed when HP ITG's **Error Checking** mode detects an error.

This is the error number reported by the instrument when an error occurs.

Serial Poll

Bit Definition	Bit Weight
Data Ready	1
Always 0	2
Error or Fail	4
Always 0	8
Local	16
Power On	32
RQS Bit (require service)	64
Always 0	128

HP 538XA Frequency Counters Revision 1.0		
Component	Values	Initial Value
Display_Decr	button	
Display_Incr	button	
Display_Norm	button	
Display_Str	STRING[24]	""
Error		
Filter_A	Off,On	Off
Function	FreqA,FreqB,PeriodA	"FreqA"
Gate_Time	0.1 - 10	0.1
Id	STRING[8]	""
Load_Error		
Local_Disp	Remote,Local	Local
Man_Lvl	Off,On	Off
Mask	0 - 255	33
Notation	Engr,Sci	Engr
Reading		
Reset	button	
Reset_Gate	button	
Status	0 - 255	0
Wait_to_Send	Off,On	Off
X20_Atten	X1,X20	X1

HP 6030A-6033A, 6038A Power Supplies

Overview

The HP 6030A-6033A and HP 6038A Power Supplies feature a combination of programming capabilities and linear power supply performance that make them ideal for systems applications. These power supplies provide up to 1000 watts of output power, with voltages up to 200 volts and currents up to 120 amps.

Model	Output Voltage	Output Current
HP 6030A	200V	17A
HP 6031A	20V	120A
HP 6032A	60V	50A
HP 6033A	20V	30A
HP 6038A	60V	10A

File Names

There is one driver that supports the HP 6030A-6033A and the HP 6038A power supplies. Its file name is: **IDHP603XA**

Its Help file is: **IHHP603XA**

Using the Panel

This panel allows interactive control of these features of the power supply:

- Output voltage and current
- Protection circuits
- SRQ mask
- Status
- Error (**Other Panel**)
- Self test (**Other Panel**)
- Serial poll (**Other Panel**)

Recalling States

When using HP ITG's **Recall State** feature (either as **Recall State** from the panel menu or by calling Hpt_recall in a program), if a new voltage and current must be sent, the voltage is always sent first. Therefore if the current and voltage are both 10, and the new current is 8 and the new voltage is 12, the supply will momentarily be requested to provide 12 volts at 10 amps. If the load would be sensitive to this, use individual Hpt_set statements instead of recalling a state with Hpt_recall.

Another alternative with HP603XA supplies is to use Hold and Trigger.

Status

The power supply maintains its present status in a 9-bit register. This status register reports the status of the supply whenever it is queried. The result is the weighted sum of each conditional bit. As long as the condition continues to be true, the bit will remain set. Click on the display to update the reading.

Bit Definition	Bit Weight
Constant Voltage Mode	1
Constant Current Mode	2
Overrange	4
Over Voltage Protection circuit tripped	8
Over Temperature Protection tripped	16
AC line dropout or out of range	32
Foldback protection circuit tripped	64
Programming Error	128
Remote Inhibit	256

Error

The Error number can be read by clicking on the display labeled **Error** (**Status Panel**). These are the error numbers for the HP603X power supplies.

Error Number	Definition
0	No error
1	Unrecognized character
2	Improper number
3	Unrecognized string
4	Syntax error
5	Number out of range
6	Attempt to exceed soft limits
7	Improper soft limit
8	Data requested without a query being sent

Serial Poll

The serial poll register is an 8-bit register that the power supply uses to keep track of its internal operating status.

Bit Definition	Bit Weight
Fault bit	1
Power on	2
Unused	4
Unused	8
Ready to process commands	16
Error	32
Request Service	64
Unused	128

HP 603XA System DC Power Supply Revision 1.0		
Component	Values	Initial Value
ASTATUS	0 - 511	0
CURR	0 - I_MAX	0
CURR_LIM	0 - I_MAX	0
FAULT	0 - 511	0
HOLD	OFF,ON	OFF
HOLD_TRIG	button	
I_MAX	17.4038 (HP 6030A) 122.85 (HP 6031A) 51.1875 (HP 6032A) 30.7125 (HP 6033A) 10.2375 (HP 6038A)	
IDN	7 chars	"HP603XA"
MASK	0 - 511	0
OUTP_PROT_DEL	0 - 31.999	.5
OUTP_PROT_STAT	OFF,CC,CV	OFF
OUTP_STAT	OFF,ON	ON
PROT_RST	button	
RELAY_OUTPUT	0,1	1
RELAY_POLARITY	0,1	1
RELAY_RELAY	0,1	1
SENS_CURR		0
SENS_VOLT		0
SPOLL_VALUE	0 - 255	
SRQ_MASK	0,1	0
STATUS	0 - 511	0
SYST_ERR		
TEST_CONF		
V_MAX	204.75 (HP 6030A) 20.475 (HP 6031A) 61.425 (HP 6032A) 20.475 (HP 6033A) 61.425 (HP 6038A)	
VOLT	0 - V_MAX	0
VOLT_LIM	0 - V_MAX	0

HP 603XA System DC Power Supply Revision 1.0 (continued)		
Component	Values	Initial Value
VOLT_PROT		0

HP 6621A-6624A, 6627A Power Supplies

Overview

The HP 6621A-6624A, 6627A Multiple Output Linear Power Supplies feature a combination of programming capabilities and linear power supply performance for systems applications. The five models in this family offer up to 200 watts of output power, with voltages to 50 volts and currents to 10 amps.

Model	Output1	Output2	Output3	Output4
HP 6621A	80W LV	80W LV		
HP 6622A	80W HV	80W HV		
HP 6623A	40W LV	80W LV	40W HV	
HP 6624A	40W LV	40W LV	40W HV	40W HV
HP 6627A	40W HV	40W HV	40W HV	40W HV

LV = Low Voltage HV = High Voltage

Output	Low Range	High Range
80W LV	7V @ 10A	20V @ 4A
80W HV	20V @ 4A	50V @ 2A
40W LV	7V @ 5A	20V @ 2A
40W HV	20V @ 2A	50V @ 0.8A

The supply automatically switches to the appropriate range.

File Names

The name of the HP 6621A driver is: **IDHP6621A.** The name of its Help file is: **IHHP6621A.**

The name of the HP 6622A driver is: **IDHP6622A.** The name of its Help file is: **IHHP6622A.**

The name of the HP 6623A driver is: **IDHP6623A.** The name of its Help file is: **IHHP6623A.**

The name of the HP 6624A driver is: **IDHP6624A.** The name of its Help file is: **IHHP6624A.**

The name of the HP 6627A driver is: **IDHP6627A.** The name of its Help file is: **IHHP6627A.**

Using the Panel

This panel allows interactive control of these features of the power supply:

- Output voltage and current
- Protection circuits
- SRQ mask
- Status
- Error (**Other Panel**)
- Self test (**Other Panel**)
- Serial poll (**Other Panel**)

Recalling States

Note that when recalling states with HP ITG (either as **Recall State** from the panel menu or by calling Hpt_recall in a program), if a new voltage and current must be sent, the voltage is always sent first. Therefore if the current and voltage are both 10, and the new current is 8 and the new voltage is 12, the supply will momentarily be requested to provide 12 volts at 10 amps. If the load would be sensitive to this, use individual Hpt_set statements instead of recalling a state with Hpt_recall.

Status

The status byte is an eight-bit word that the power supply outputs when involved in a serial poll. The state of each bit (1 or 0) indicates the status of an internal function.

Bit Definition	Bit Weight
Constant Voltage Mode	1
Positive Constant Current Mode	2
Negative Constant Current Mode	4
Over Voltage Protection circuit tripped	8
Over Temperature Protection tripped	16
Unregulated Mode	32
Over Current Protection tripped	64
Coupled Parameter	128

Coupled Parameter indicates that the range of the power supply was automatically changed to satisfy a set voltage or set current command.

Error Messages

The error number can be read by clicking on the **Error** box (**Other Panel**). These are the error numbers for the HP 662X series of power supplies.

Error Number	Error Definition
0	NO ERROR - No error.
1	INVALID CHAR - You sent the supply a character it did not recognize.
2	INVALID NUM - Format of your number is incorrect.
3	INVALID STR - Occurs when you send a command the supply does not understand.
4	SYNTAX ERROR - Either too many parameters are sent without delimiters or the number representation is incorrect.
5	NUMBER RANGE - An out of range number was sent.
6	NO QUERY - Computer addressed the supply to talk, but it did not first request data.
7	DISP LENGTH - Quoted string exceeds the display length of 12 characters.
8	BUFFER FULL - This error may occur if too many numbers are sent.

9	EEPROM ERROR - EEPROM is not responding to programming commands. Service is required.
10	HARDWARE ERR An output error has occurred in an unknown output. Service is required.
11	HDW ERR CH 1 Errors 11 through 14 refer to a specific output where there is an output error. Service is required.
12	HDW ERR CH 2 - Same as 11.
13	HDW ERR CH 3 - Same as 11.
14	HDW ERR CH 4 - Same as 11.
15	NO MODEL NUM - The interface cannot find its model number. Service is required.
16	CAL ERROR - You tried to use either a calibration command with CMODE off or the cal failed while in CMODE. Enable CMODE and check numbers sent during cal. Also, there could be a hardware error.
17	UNCALIBRATED - There is an incorrect checksum in the EEPROM possibly as a result of incorrect cal procedure. Recalibrate, and if the problem persists, your supply has a hardware failure.
18	CAL LOCKED - Calibration was attempted with the Calibration Jumper in the lockout position.
22	SKIP SLF TST - The self test jumper is in the Skip Self Test position. No self-test was done. This is for diagnostics only. See Service manual.
28	INVALID STR - Occurs when you send a command the supply does not understand.

Serial Poll

The serial poll register is an 8-bit register that the power supply uses to keep track of its internal operating status and to determine the operating status of each of its outputs.

Bit Definition	Bit Weight
Fault in output channel 1	1
Fault in output channel 2	2
Fault in output channel 3	4
Fault in output channel 4	8
Ready to process commands	16
Error	32
Request Service	64
Power On	128

HP 6621A System DC Power Supply Revision 1.0		
Component	Values	Initial Value
ASTATUS1	0 - 255	0
ASTATUS2	0 - 255	0
CURR1	0 - 10.3	0
CURR2	0 - 10.3	0
CURR_PROT_RST1	button	
CURR_PROT_RST2	button	
CURR_PROT_STAT1	OFF,ON	OFF
CURR_PROT_STAT2	OFF,ON	OFF
DISP_MODE	METER,BLANK,STRING	METER
DISP_TEXT	12 chars	"BUSY"
FAULT1	0 - 255	0
FAULT2	0 - 255	0
MASK1	0 - 255	0
MASK2	0 - 255	0
OUTP_PROT_DEL1	0 - 32	.02
OUTP_PROT_DEL2	0 - 32	.02
OUTP_STAT1	OFF,ON	ON
OUTP_STAT2	OFF,ON	ON
RESET	button	
SENS_CURR1		0
SENS_CURR2		0
SENS_VOLT1		0
SENS_VOLT2		0
SPOLL_VALUE	0 - 255	
SRQ_ERROR		
SRQ_FAULT	OFF,ON	OFF
SRQ_MASK	0 - 3	0
SRQ_PON	OFF,ON	OFF
STATUS1	0 - 255	0
STATUS2	0 - 255	0
SYST_ERR		
TEST_CONF		
VOLT1	0 - 20.2	0
VOLT2	0 - 20.2	0

HP 6621A System DC Power Supply Revision 1.0 (continued)		
Component	Values	Initial Value
VOLT_PROT1	0 - 23	23
VOLT_PROT2	0 - 23	23
VOLT_PROT_RST1	button	
VOLT_PROT_RST2	button	

HP 6622A System DC Power Supply Revision 1.0		
Component	Values	Initial Value
ASTATUS1	0 - 255	0
ASTATUS2	0 - 255	0
CURR1	0 - 4.12	0
CURR2	0 - 4.12	0
CURR_PROT_RST1	button	
CURR_PROT_RST2	button	
CURR_PROT_STAT1	OFF,ON	OFF
CURR_PROT_STAT2	OFF,ON	OFF
DISP_MODE	METER,BLANK,STRING	METER
DISP_TEXT	12 chars	"BUSY"
FAULT1	0 - 255	0
FAULT2	0 - 255	0
MASK1	0 - 255	0
MASK2	0 - 255	0
OUTP_PROT_DEL1	0 - 32	.02
OUTP_PROT_DEL2	0 - 32	.02
OUTP_STAT1	OFF,ON	ON
OUTP_STAT2	OFF,ON	ON
RESET	button	
SENS_CURR1		0
SENS_CURR2		0
SENS_VOLT1		0
SENS_VOLT2		0
SPOLL_VALUE	0 - 255	
SRQ_ERROR		
SRQ_FAULT	OFF,ON	OFF
SRQ_MASK	0 - 3	0
SRQ_PON	OFF,ON	OFF
STATUS1	0 - 255	0
STATUS2	0 - 255	0
SYST_ERR		
TEST_CONF		
VOLT1	0 - 50.5	0
VOLT2	0 - 50.5	0

HP 6622A System DC Power Supply Revision 1.0 (continued)		
Component	Values	Initial Value
VOLT_PROT1	0 - 55	55
VOLT_PROT2	0 - 55	55
VOLT_PROT_RST1	button	
VOLT_PROT_RST2	button	

HP 6623A System DC Power Supply Revision 1.0		
Component	Values	Initial Value
ASTATUS1	0 - 255	0
ASTATUS2	0 - 255	0
ASTATUS3	0 - 255	0
CURR1	0 - 5.15	0
CURR2	0 - 10.3	0
CURR3	0 - 2.06	0
CURR_PROT_RST1	button	
CURR_PROT_RST2	button	
CURR_PROT_RST3	button	
CURR_PROT_STAT1	OFF,ON	OFF
CURR_PROT_STAT2	OFF,ON	OFF
CURR_PROT_STAT3	OFF,ON	OFF
DISP_MODE	METER,BLANK,STRING	METER
DISP_TEXT	12 chars	"BUSY"
FAULT1	0 - 255	0
FAULT2	0 - 255	0
FAULT3	0 - 255	0
MASK1	0 - 255	0
MASK2	0 - 255	0
MASK3	0 - 255	0
OUTP_PROT_DEL1	0 - 32	.02
OUTP_PROT_DEL2	0 - 32	.02
OUTP_PROT_DEL3	0 - 32	.02
OUTP_STAT1	OFF,ON	ON
OUTP_STAT2	OFF,ON	ON
OUTP_STAT3	OFF,ON	ON
RESET	button	
SENS_CURR1		0
SENS_CURR2		0
SENS_CURR3		0
SENS_VOLT1		0
SENS_VOLT2		0
SENS_VOLT3		0
SPOLL_VALUE	0 - 255	

HP 6623A System DC Power Supply Revision 1.0 (continued)		
Component	Values	Initial Value
SRQ_ERROR		
SRQ_FAULT	OFF,ON	OFF
SRQ_MASK	0 - 3	0
SRQ_PON	OFF,ON	OFF
STATUS1	0 - 255	0
STATUS2	0 - 255	0
STATUS3	0 - 255	0
SYST_ERR		
TEST_CONF		
VOLT1	0 - 20.2	0
VOLT2	0 - 20.2	0
VOLT3	0 - 50.5	0
VOLT_PROT1	0 - 23	23
VOLT_PROT2	0 - 23	23
VOLT_PROT3	0 - 55	55
VOLT_PROT_RST1	button	
VOLT_PROT_RST2	button	
VOLT_PROT_RST3	button	

HP 6624A System DC Power Supply Revision 1.0		
Component	Values	Initial Value
ASTATUS1	0 - 255	0
ASTATUS2	0 - 255	0
ASTATUS3	0 - 255	0
ASTATUS4	0 - 255	0
CURR1	0 - 5.15	0
CURR2	0 - 5.15	0
CURR3	0 - 2.06	0
CURR4	0 - 2.06	0
CURR_PROT_RST1	button	
CURR_PROT_RST2	button	
CURR_PROT_RST3	button	
CURR_PROT_RST4	button	
CURR_PROT_STAT1	OFF,ON	OFF
CURR_PROT_STAT2	OFF,ON	OFF
CURR_PROT_STAT3	OFF,ON	OFF
CURR_PROT_STAT4	OFF,ON	OFF
DISP_MODE	METER,BLANK,STRING	METER
DISP_TEXT	12 chars	"BUSY"
FAULT1	0 - 255	0
FAULT2	0 - 255	0
FAULT3	0 - 255	0
FAULT4	0 - 255	0
MASK1	0 - 255	0
MASK2	0 - 255	0
MASK3	0 - 255	0
MASK4	0 - 255	0
OUTP_PROT_DEL1	0 - 32	.02
OUTP_PROT_DEL2	0 - 32	.02
OUTP_PROT_DEL3	0 - 32	.02
OUTP_PROT_DEL4	0 - 32	.02
OUTP_STAT1	OFF,ON	ON
OUTP_STAT2	OFF,ON	ON
OUTP_STAT3	OFF,ON	ON
OUTP_STAT4	OFF,ON	ON

HP 6624A System DC Power Supply Revision 1.0 (continued)		
Component	Values	Initial Value
RESET	button	
SENS_CURR1		0
SENS_CURR2		0
SENS_CURR3		0
SENS_CURR4		0
SENS_VOLT1		0
SENS_VOLT2		0
SENS_VOLT3		0
SENS_VOLT4		0
SPOLL_VALUE	0 - 255	
SRQ_ERROR		
SRQ_FAULT	OFF,ON	OFF
SRQ_MASK	0 - 3	0
SRQ_PON	OFF,ON	OFF
STATUS1	0 - 255	0
STATUS2	0 - 255	0
STATUS3	0 - 255	0
STATUS4	0 - 255	0
SYST_ERR		
TEST_CONF		
VOLT1	0 - 20.2	0
VOLT2	0 - 20.2	0
VOLT3	0 - 50.5	0
VOLT4	0 - 50.5	0
VOLT_PROT1	0 - 23	23
VOLT_PROT2	0 - 23	23
VOLT_PROT3	0 - 55	55
VOLT_PROT4	0 - 55	55
VOLT_PROT_RST1	button	
VOLT_PROT_RST2	button	
VOLT_PROT_RST3	button	
VOLT_PROT_RST4	button	

HP 6627A System DC Power Supply Revision 1.0		
Component	Values	Initial Value
ASTATUS1	0 - 255	0
ASTATUS2	0 - 255	0
ASTATUS3	0 - 255	0
ASTATUS4	0 - 255	0
CURR1	0 - 2.06	0
CURR2	0 - 2.06	0
CURR3	0 - 2.06	0
CURR4	0 - 2.06	0
CURR_PROT_RST1	button	
CURR_PROT_RST2	button	
CURR_PROT_RST3	button	
CURR_PROT_RST4	button	
CURR_PROT_STAT1	OFF,ON	OFF
CURR_PROT_STAT2	OFF,ON	OFF
CURR_PROT_STAT3	OFF,ON	OFF
CURR_PROT_STAT4	OFF,ON	OFF
DISP_MODE	METER,BLANK,STRING	METER
DISP_TEXT	12 chars	"BUSY"
FAULT1	0 - 255	0
FAULT2	0 - 255	0
FAULT3	0 - 255	0
FAULT4	0 - 255	0
MASK1	0 - 255	0
MASK2	0 - 255	0
MASK3	0 - 255	0
MASK4	0 - 255	0
OUTP_PROT_DEL1	0 - 32	.02
OUTP_PROT_DEL2	0 - 32	.02
OUTP_PROT_DEL3	0 - 32	.02
OUTP_PROT_DEL4	0 - 32	.02
OUTP_STAT1	OFF,ON	ON
OUTP_STAT2	OFF,ON	ON
OUTP_STAT3	OFF,ON	ON
OUTP_STAT4	OFF,ON	ON

HP 6627A System DC Power Supply Revision 1.0 (continued)		
Component	Values	Initial Value
RESET	button	
SENS_CURR1		0
SENS_CURR2		0
SENS_CURR3		0
SENS_CURR4		0
SENS_VOLT1		0
SENS_VOLT2		0
SENS_VOLT3		0
SENS_VOLT4		0
SPOLL_VALUE	0 - 255	
SRQ_ERROR		
SRQ_FAULT	OFF,ON	OFF
SRQ_MASK	0 - 3	0
SRQ_PON	OFF,ON	OFF
STATUS1	0 - 255	0
STATUS2	0 - 255	0
STATUS3	0 - 255	0
STATUS4	0 - 255	0
SYST_ERR		
TEST_CONF		
VOLT1	0 - 50.5	0
VOLT2	0 - 50.5	0
VOLT3	0 - 50.5	0
VOLT4	0 - 50.5	0
VOLT_PROT1	0 - 55	55
VOLT_PROT2	0 - 55	55
VOLT_PROT3	0 - 55	55
VOLT_PROT4	0 - 55	55
VOLT_PROT_RST1	button	
VOLT_PROT_RST2	button	
VOLT_PROT_RST3	button	
VOLT_PROT_RST4	button	

HP 6632A-6634A Power Supplies

Overview

The HP 6632A-6634A Power Supplies feature a combination of programming capabilities and linear power supply performance that make them ideal for systems applications. The models in this family offer 100 watts of output power, with voltages up to 100 volts and currents up to 5 amps.

Model	Output Voltage	Output Current
HP 6632A	20V	5A
HP 6633A	50V	2A
HP 6634A	100V	1A

File Names

There is one driver that supports the HP 6632A-6634A power supplies. Its file name is: **IDHP663XA**

Its Help file name is: **IHHP663XA**

Using the Panel

This panel allows interactive control of these features of the power supply:

- Output voltage and current
- Protection circuits
- SRQ mask
- Status
- Error
- Self test
- Serial poll

Recalling States

Note that when using HP ITG's recall state feature (either as **Recall State** from the panel menu or by calling Hpt_recall in a subprogram), if a new voltage and current must be sent, the voltage is always sent first. Therefore if the current and voltage are both 10, and the new current is 8 and the new voltage is 12, the supply will momentarily be requested to provide 12 volts at 10 amps. If the load would be sensitive to this, use individual Hpt_set statements instead of recalling a state with Hpt_recall.

Status

The power supply maintains its present status in a 12 bit register. This status register reports the status of the supply whenever it is queried. The result is the weighted sum of each conditional bit. As long as the condition continues to be true, the bit will remain set. Click on the display to update the reading.

Bit Definition	Bit Weight
Constant Voltage Mode	1
Positive Constant Current Mode	2
Unregulated Mode	4
Over Voltage Protection circuit tripped	8
Over Temperature Protection tripped	16
Unused	32
Over Current Protection tripped	64
Programming Error	128
Remote Inhibit	256
Negative Constant Current Mode	512
Output in Fast operating mode	1024
Output in Normal operating mode	2048

Error

The Error number can be read by clicking on the error number box. These are the error numbers for the HP663X series of Power Supplies.

Error Number	Definition
0	No error.
1	A command was executed which caused data to be written to nonvolatile memory, and the write failed.
2	More than one PON (Power-On) command was received after power on.
4	More than one DC PON command was received after power on.
5	A command requiring the relay option was sent and the option was not present.
8	The supply was addressed to talk without first receiving a query.
10	A non-alpha character was received where a header was expected.
11	A string of alpha characters was received but was not found in the table of valid commands.
20	A non-numeric character was received when a number was expected.
21	A numeric character (+ - . 0..9) was encountered but the following characters did not represent a proper number.
22	A number was received in a valid form, but it was too large or too small to be represented in internal format.
30	A comma was not received where one was expected.
31	A valid terminator was not received where one was expected.

41	A valid number was received, but it exceeded valid limits for the command.
42	A voltage programming number was received but it exceeded valid limits of voltage.
43	A current programming number was received but it exceeded valid limits of current.
44	An overvoltage programming number was received but it exceeded valid limits.
45	A delay programming number was received but it exceeded valid limits.
46	A mask programming number was received but it exceeded valid limits.
50	More than one CSAVE command was received after the unit was powered-on.
51	The EEPROM has failed, or a new uncalibrated EEPROM was installed.
52	Calibration Commands have been sent with calibration mode disabled.
53	An invalid channel number was received.
54	A CDATA command FS number was received that exceeded the limits for FS.
55	A CDATA command offset was received that exceeded the limits for offset.
59	An attempt to enable calibration was made with the CAL DISABLE jumper in.

Serial Poll

The serial poll register is an 8-bit register that the supply uses to keep track of its internal operating status.

Bit Definition	Bit Weight
Fault bit	1
Power on	2
Unused	4
Unused	8
Ready to process commands	16
Error	32
Request Service	64
Unused	128

HP 663XA System DC Power Supply Revision 1.0		
Component	Values	Initial Value
ASTATUS	0 - 4095	0
CURR	0 - I_MAX	0
CURR_PROT_STAT	OFF,ON	OFF
DISP_MODE	BLANK,METER	METER
FAULT	0 - 4095	0
IDN	7 chars	"HP663XA"
I_MAX	5.1188 (HP 6632A) 2.0475 (HP 6633A) 1.0238 (HP 6634A)	
MASK	0 - 4095	0
OUTP_PROT_DEL	0 - 32.767	.08
OUTP_STAT	OFF,ON	ON
OV_MAX	22,55,110	
PROT_RST	button	
RELAY_OUTPUT	0,1	1
RELAY_POLARITY	0,1	1
RELAY_POWER_ON	0,1	0
RELAY_RELAY	0,1	1
SENS_CURR		0
SENS_VOLT		0
SPOLL_VALUE	0 - 255	
SRQ_MASK	0,1	0
SRQ_PON	OFF,ON	OFF
STATUS	0 - 4095	0
SYST_ERR		
TEST_CONF		
VOLT	0 - V_MAX	0
VOLT_PROT	0 - OV_MAX	0
V_MAX	20.475 (HP 6632A) 51.188 (HP 6633A) 102.38 (HP 6634A)	

HP 8508A Vector Voltmeter

Overview

The HP 8508A Vector Voltmeter is a two-channel measuring receiver that measures the magnitude of the signals at its inputs and the phase difference between them. Depending on the application and measurement configuration, the results of these basic measurements can be presented in various different ways--as voltage and phase angle, power in a 50 or 75 ohm system, magnitude ratio or reflection coefficient, for example. The results displayed for reflection measurements assume that the A input is the incident signal and the B input is the reflected signal. An appropriate signal separation device such as a bridge or directional coupler is assumed. The information given here is intended as a summary.

For more complete information, consult the HP 8508A Operating and Service Manual.

File Names

The name of the HP 8508A driver is: **IDHP8508A**

Its Help file is: **IHHP8508A**

Using the Panel

This driver provides two control panels (i.e., **Measure** and **Configure**), a status panel, and a panel that provides revision information.

Reset

The Reset function returns the HP 8508A to the measurement configuration it assumes when first switched on. This function is available from all panels.

Measure Panel

The **Measure Panel** allows you to select a measurement and the setting of functions directly associated with making it.

Click on either display at the top of the panel, and you'll get the result of the current measurement for that window. In the case of two-part measurements, such as rho and transmission, both displays are updated.

If you make any changes to the measurement conditions, the last results shown in the display windows are blanked out to eliminate any ambiguity.

Measurement Choice

You may select the measurements you want from the following:

Measurement Selection	Results	
	Left Display	**Right Display**
A, B	A voltage	B voltage
A, Phase	A voltage	B-A phase
B/A, B	Ratio of B/A voltages	B voltage

B/A, Phase	Ratio of B/A voltages	B-A phase
B, Phase	B voltage	B-A phase
RHO	Reflection coefficient	
SWR	Standing Wave Ratio	
Z	Complex impedance	
1/Z	Complex admittance	
Transmission	Ratio of B/A	B-A Phase
Delay	B-A Seconds	

Measurement Functions

In the list of measurement functions below, the first state of each function listed is the one that is chosen at power-on or after a Reset.

Function	Valid States
Scale	Linear - Results displayed in mV, uW or ratio
	Log - Results displayed in dBuV, dBm or dB
Reference	Off - Measurement results displayed
	On - Results displayed relative to the stored reference
	Save - Store the current results as the reference point

Ref_select	Short - Assume the reference device for reflection measurements is a short
	Open - Assume the reference device for reflection measurements is an open
	Load - Assume the reference device for reflection measurements is a termination
Format	Polar - Results displayed as magnitude and angle
	Cart - Results displayed as real and imaginary parts
Power Function	Off - Displays the results of absolute magnitude measurements as voltages
	On - Displays the results of absolute magnitude measurements as power referred to the system impedance
Impedance	50 - System impedance is 50 ohms
	75 - System impedance is 75 ohms

Configure Panel

The **Configure Panel** allows selection of system operating features. When you select a function, you will see a display that allows you to enter a value from a given range. You can enter a new value, obtain the current value from the instrument using the **Query** option, or cancel the request.

Configuration Functions

In the list of configuration function below, the first state of each function listed is the one that is chosen at switch on or after a Reset.

Lock Range Setting

Function	Valid States
Frequency	Auto - The instrument selects its own operating range depending on its input signal.
	Manual - The operating range is selected and fixed explicitly.
Frequency selection	Enter the input signal frequency. Manual range is fixed to include this frequency.
Range	Click on either display to see the currently-selected range.

Reference A, B, Phase

These entries allow you to set explicit values for the reference states of A and B voltages and phase. These may be used in place of the reference **Save** function in the Measure Panel, which saves the current measurement as the reference point.

Normalize

Function	Valid States
Normalize	

		Off - In impedance and admittance measurements, use the current value of system impedance On - In impedance and admittance measurements, divide the results by the current value of system impedance to show normalized impedance value (for plotting on Smith Charts)
Trigger	**Function**	**Valid States**
	Trigger	Free - Allow the instrument to free run Single - Set the instrument to take a single reading on demand

Status Panel

The **Status Panel** displays the current status and error conditions of the HP 8508A.

The current serial poll response, standard event register, or operation status register value can be displayed by clicking in the appropriate box in the status column.

The error number and error string can be read by clicking on either the error number or the error string display.

Serial Poll Enable

To determine the value to set for enable, add the values for each condition to be enabled from the following table:

Condition	Enable value
Message available	16
Standard event	32
Service request	64
Operation status	128

Standard Event Enable

To determine the value to set for enable, add the values for each event to be enabled from the following table:

Condition	Enable value
Operation complete	1
Query error	4
Self test error	8
Execution error	16
Command error	32

Operation Status Enable

Set the positive and negative transition filters to set the status on a transition from false to true or from true to false, respectively. Add the values for each of the filters to be enabled from the following table:

Condition	Enable value
Calibration	1
Ranging (unlocked)	4
Measuring	16
Awaiting trigger	32

HP 8508A Vector Voltmeter Revision 1.0		
Component	Values	Initial Valuc
AVERAGE_FACTOR	0 - 10	5
A_REF	1E-6 - 1000	INVALID
B_REF	1E-6 - 1000	INVALID
CLEAR_STATUS	button	
DISPLAY1		INVALID
DISPLAY2		INVALID
ERROR_NUMBER	button	INVALID
ERROR_STRING	STRING[22]	INVALID
FREQUENCY	0.1E6 - 2000E6	DONTCARE
FREQ_BAND	1 - 15	DONTCARE
LOCK_RANGE	MANUAL, AUTO	AUTO
LOWER_LIMIT	100E3 - 1E9	DONTCARE
MEAS_FORMAT	POLAR,CART	POLAR
MEAS_SCALE	LOG,LIN	LIN
MEASUREMENT	A,B, A,PHASE, B/A,B, B/A,PHASE, RHO, SWR, Z, 1/Z, TRANSMISSION, DELAY	A,B
NORM_IMPD	OFF,ON	OFF
OPERATION_NEG_ENABLE	0 - 255	0
OPERATION_POS_ENABLE	0 - 255	0
OPERATION_REGISTER	0 - 255	0
PHASE_REF	-180 - 180	INVALID
POWER_MEAS	OFF,ON	OFF
RESET	button	
REF_SELECT	SHORT,OPEN,LOAD	SHORT
REFERENCE	OFF,ON	OFF
SPOLL_RESPONSE	0 - 255	0
STANDARD_EVENTS	0 - 255	0
STANDARD_EVENT_ENABLE	0 - 255	0
STATUS_ENABLE	0 - 255	0
SAVE_REF	button	
SYSTEM_IMPD	50 - 75	50
TRIGGER	FREE,SINGLE	SINGLE
UPPER_LIMIT	200E3 - 2E9	DONTCARE

HP 8657A Synthesized Signal Generator

Overview

The HP 8657A is a synthesized signal generator with a carrier frequency range of 100 kHz to 1040 MHz. Its output amplitude is leveled and calibrated from +13 to -127 dBm. AM and/or FM functions can be individually selected.

Using the Panel

This panel allows interactive control of these features of the signal generator:

- Carrier Frequency
- Carrier Amplitude
- Modulation source
- Modulation levels
- RF enable
- Standby mode
- Reverse power protection

Recalling States

Note that when using HP ITG's Recall State feature (either as **Recall State** from the panel menu or by calling Hpt_recall in a program), if a new frequency and and amplitude must be sent, the frequency is always sent first. Therefore if the current setting is + 10 dBm at 100 MHz, and the new setting is -100 dBm at 500 MHz, the signal generator will momentarily be requested to provide + 10 dBm at 500 MHz. If the device connected to the output would be sensitive to this, use individual Hpt_set actions instead of Hpt_recall states.

Error

The HP 8657A does not report errors or status information.

HP 8657A Signal Generator Revision 1.0		
Component	Values	Initial Value
AMPLITUDE	-143.5 - 17 (dBm)	-143.5
AMPLITUDE_OFFSET	-160.5 - 160.5	0
AMPLITUDE_UNITS	DBM, DBF, DBV, DBMV, DBUV, DB EMF V, DB EMF MV, DB EMF UV, V, EMF V	DBM
AM_DEPTH	0.0 - 100	0
AM_EXT_MODULATION	OFF,ON	OFF
AM_INT_MODULATION	OFF,ON	OFF
FM_DC_MODULATION	OFF,ON	OFF
FM_DEVIATION	0 - 99	0
FM_EXT_MODULATION	OFF,ON	OFF
FM_INT_MODULATION	OFF,ON	OFF
FREQUENCY	10E3 - 1040E6	100E6
INTERNAL_MODULATION	400, 1000	1000
PHASE_DECREMENT	button	
PHASE_INCREMENT	button	
POWER	OFF,ON	ON
RECALLSETUP	0 - 99	0
RESET	button	
REVERSE_POWER_RESET	button	
RF_ENABLE	OFF,ON	ON
SAVESETUP	0 - 99	0
SEQUENCE	button	

HP 54501A Digitizing Oscilloscope

Overview

The HP 54501A is a general-purpose digitizing oscilloscope with the following key features:

- Repetitive bandwidth: 100 MHz
- 4 channel input and display
- Maximum vertical sensitivity: 5 mV/division
- Minimum vertical sensitivity: 5 V/division
- 8-bit vertical resolution (A/D)
- 10 megasample/s sampling rate
- Autoscale for automatic setup
- Automatic measurements with user-defined measurement thresholds and statistics
- ECL/TTL presets

File Names

The name of the driver for the HP 54501A is: **IDHP54501A**

Its Help file is: **IHHP54501A**

Using the Panel

This driver for the HP 54501A provides a panel that is divided into two parts:

- An XY display is always displayed on the left side of the panel.
  - Click on the channel or channels you want HP ITG to display. When the box containing the channel number (e.g., **CH1**) is highlighted, the channel is on and HP ITG displays the waveform input to the channel.
  - Click on the XY display itself to upload all displayed channels to HP ITG.
  - This part of the panel also includes a **Digitize** button, which digitizes all displayed channels, an **Autoscale** button, and a **Run** button.
    - The driver cannot determine the status of the channel views (on or off) over the bus. Thus, the channel view buttons will be unchanged after an **Autoscale** even if the oscilloscope may have turned one or more channels on or off.
- The following subpanels incorporate the major features of the HP 54501A.
  - Main Panel
  - Timebase Panel
  - Channel Panel
  - Trigger Panel
  - Measure Panel
  - Markers Panel
  - Waveform Panel
  - Display Panel

- Status Panel
- About Panel

Notes

Bus communication between the oscilloscope and this driver is done using "HEADER OFF" and "LONGFORM OFF". Changing either of these during programmatic use could result in bus problems.

The menus on the oscilloscope's display will change as different subpanels are selected on the panel.

To guarantee a valid Reset state, the Reset actions from the panel are more than would normally result from an "*RST" command. The differences are as follows:

- SWEEP_MODE set to AUTO.
- SCREEN set to ON.
- MSMT1_SOURCE set to CHAN1, and MSMT2_SOURCE set to CHAN1.
- SRE and ESE set to 0.

Caution The oscilloscope must be on-line during state development or invalid states may result.

Main Panel

This subpanel allows you to set up the HP 54501A's

- Timebase (i.e., horizontal sensitivity in seconds/div, non-windowed mode)

- Sweep mode
- Trigger source, level (volts/div), and slope
- Channel 1-4 vertical sensitivity (volts/div) and probe attenuation factor.

Timebase Panel

This subpanel allows you to set up the HP 54501A's

- Sensitivity (i.e., horizontal sensitivity in seconds/div, non-windowed mode).
- Time delay in seconds
- Sweep mode
- Horizontal screen reference
- Window mode control
- When Window is on, you can set:
  - Time window sensitivity in seconds/div
  - Time window position in seconds

Channel Panel

This subpanel allows you to set up the following for each channel:

- Input signal coupling
- BW Limit (20 MHz low-pass filter)
- Probe attenuation factor
- Vertical sensitivity in volts/div
- Vertical offset to center scale in volts
- Presets (i.e, sets sensitivity, offset, and trigger for ECL or TTL)

- Store current channel (e.g.., **CH 1**) waveform into one of the waveform memories. Note that this control varies depending on whether you have selected **Normal**, **Average**, or **Envelope** mode (see **Waveform Panel**)

Trigger Panel

This subpanel allows you to select a trigger mode. This driver supports edge, pattern, and state triggering.

In **Edge** mode, you can set up:

- Source channel to be used as trigger source.
- Slope of the edge used for trigger.
- Trigger level voltage for active trigger.
- Holdoff, which controls delay between successive triggers

In **Pattern** mode, you can toggle between **Logic** and **Levels** to set up:

- **Logic** for each channel (H|L|X is High|Low|Dontcare), triggering condition for pattern, and holdoff, which controls delay between successive triggers.
- Trigger **Level** voltage for each channel, where each level is interpreted as the threshold between the high and low states for that channel.

In **State** mode, you can set up the following:

- Clock - you can set up a channel to be monitored for triggering transition: LH or HL , X is don't care.
- The triggering condition for the state:
  - **When Present**: when specified state is present at clock transition.

  - **When Not Present:** when specified state is not present at clock transition.
- Trigger level voltage for current clock source.
- Holdoff, which controls delay between successive triggers.

Measure Panel

You can toggle between standard (i.e., IEEE standard) definitions and user definitions for both pulse and delay measurements.

For standard pulse measurements:

- You can select from 17 separate measurements or you can select **All**. Note that **Frequency** is the default measurement.
- You can also select the channel or waveform memory on which you want to make the measurement.
- To make the measurement selected:
  - Click on the display below the box where the selected measurement is displayed.

For user-defined pulse measurements, you can set up:

- Units to be either % or volts
- Thresholds - value for lower measurement threshold (left box and value for upper measurement threshold (right box).
- Levels for measuring positive pulse width (PWid) and negative pulse width (NWid).

Note

An individual measurement is returned as a scalar. **All** measures all 17 parameters, and returns the data as a vector.

For standard delay measurements:

- Select the two sources (**From** and **To**) and then click on the display above the **Source**.

For user-defined delay measurements, set up the following:

- **Source** - specifies the channel/waveform memory/function memory sources (**From/To**).
- **Polarity** - specifies the slope that defines the start/stop point at the intersection with specified voltage level.
- **Edge Num** - specifies the occurrence (counting from left edge of screen) that defines the start/stop edges for each source.
- **Level** - specifies the voltage level that defines the intersection for start/stop edges.

Markers Panel

This subpanel allows you to set up the HP 54501A's VMarkers and TMarkers.

When you turn on the **VMarkers**, you can specify the source and the value for both VMarkers to make custom voltage measurements.

Note

VM2 source corresponds to VSTOP, which is usually the upper voltage marker. VM1 source corresponds to VSTART, which is usually the lower voltage marker.

When you turn on the **TMarkers**, you can specify the mode as either normal (**Norm**) or **Edge**.

In the normal mode, specify the start and stop time values.

Note that Start corresponds to TSTART, which is usually the left time marker. Stop corresponds to TSTOP, which is usually the right time marker.

In the edge mode, specify the edge number and time value for Start and Stop.

A positive number for Start Edge indicates the intersection of a positive edge with VM1, and a negative number indicates intersection of a negative edge with VM1.

Start Value is the value at which EM1 is currently set. It corresponds to ESTART, which is usually the left time marker.

A positive number for Stop Edge indicates the intersection of a positive edge with VM2, and a negative number indicates intersection of a negative edge with VM2.

Stop Value is the value at which EM2 is currently set. It corresponds to ESTOP, which is usually the left time marker.

Note that clicking on the Start/Stop value fields causes an edge detection measurement to be executed. If the appropriate edge is not found, an error will be reported.

Waveform Panel

This subpanel allows you to specify waveform acquisition criteria for **Normal**, **Average**, and **Envelope** display modes.

Note that under certain conditions (e.g., very fast sweep speeds), the oscilloscope will return fewer than the requested number of points during a waveform upload. You should always use the HP ITG subprogram Hpt_peek on component WF_SIZE to verify the waveform size after an upload operation.

In the **Normal** mode, you can set up the following:

- **Num Points** - specifies the number of points to be acquired when the HP 54501A digitizes a waveform.
- **Completion** - specifies the % of the number of points that must contain data in order to consider acquisition complete.
- **Display Limits** - you can select which channel limits are displayed on panel, and then HP ITG displays values of lower (left box) and upper (right box) screen limits for the specified channel. Note that these values are controlled by the **Sens/Offset/Probe** controls on the respective channel panel. HP ITG also displays values of left and right screen limits for timebase (**Time**). Note that these values are controlled by the **Sens/Delay** controls on the **Timebase Panel** or the **Sens/Position** controls on the **Window** section of the **Timebase Panel** if **Window** mode is on.

In the **Average** mode, you can set up the following:

- **Num Points** - specifies the number of points to be acquired when the HP 54501A digitizes a waveform.
- **Completion** - specifies the % of the number of points that must contain data in order to consider acquisition complete.
- **Hits/Avg** - specifies the number of samples required per point. The value must be in a binary sequence from 1 to 2048 (i.e., 1, 2, 4, 8, etc.)
- **Display Limits** - you can select which channel limits are displayed on panel, and then HP ITG displays values of lower (left box) and upper (right box) screen limits for the specified channel. Note that these values are controlled by the **Sens/Offset/Probe** controls on the respective channel panel. HP ITG also displays values of left and right screen limits for timebase (**Time**). Note that these values are controlled by the **Sens/Delay** controls on the **Timebase Panel** or the **Sens/Position** controls on the **Window** section of the **Timebase Panel** if **Window** mode is on.

In the **Envelope** mode, you can set up the following:

- **Num Points** - specifies the number of points to be acquired when the HP 54501A digitizes a waveform.
- **Completion** - specifies the % of the number of points that must contain data in order to consider acquisition complete.
- **Hits/Bin** - specifies the number of samples required per point for the max/min operation.
- **Display Limits** - you can select which channel limits are displayed on panel, and then HP ITG displays values of lower (left box) and upper (right box) screen limits for the specified channel. Note that these values are controlled by the **Sens/Offset/Probe** controls on the respective channel panel. HP ITG also displays values of left and right screen limits for timebase (**Time**). Note that these values are controlled by the **Sens/Delay** controls on the **Timebase Panel** or the **Sens/Position** controls on the **Window** section of the **Timebase Panel** if **Window** mode is on.

Display Panel

This subpanel allows you to specify display attributes for **Normal**, **Average**, and **Envelope** display modes.

Note that under certain conditions (e.g., very fast sweep speeds), the oscilloscope will return fewer than the requested number of points during a waveform upload. You should always use the HP ITG subprogram Hpt_peek on component WF_SIZE to verify the waveform size after an upload operation.

In the **Normal** mode, you can set up the following:

- **Screens** - specifies 1, 2, or 4 screens on the oscilloscope display. This does not apply to the XY display on the panel.
- **Graticule** - specifies the type of graticule used on both the oscilloscope and panel XY display.

- **Persistence** - specifies display persistence in seconds.
- **Merge** - causes the raster image on the oscilloscope display to be merged into the current image in the specified oscilloscope pixel memory (i.e., PM1 or PM2).
- **Clear** - clears the display on both the oscilloscope and the XY panel.
- **Upload** - uploads the raster image on the oscilloscope display to HP ITG. Note that the RASTER component into which the pixel image is uploaded is not the component behind the XY display on the panel. It is provided only to allow the user's program to access this raster image for special reasons.

In the **Average** mode, you can set up the following:

- **Screens** - specifies 1, 2, or 4 screens on the oscilloscope display. This does not apply to the XY display on the panel.
- **Graticule** - specifies the type of graticule used on both oscilloscope and panel display.
- **Hits/Avg** - specifies the number of samples required per point.
- **Conn Dots** - controls whether the waveform is displayed as dots or a connected trace.
- **Merge** - causes the raster image on the oscilloscope display to be merged into the current image in the specified oscilloscope pixel memory (i.e., PM1 or PM2).
- **Clear** - clears the display on both the oscilloscope and the XY display.
- **Upload** - uploads the raster image on the oscilloscope display to HP ITG. Note that the RASTER component into which the pixel image is uploaded is not the component behind the XY display on the panel. It is provided only to

allow the user's program to access this raster image for special reasons.

In the **Envelope** mode, you can set up the following:

- **Screens** - specifies 1, 2, or 4 screens on the oscilloscope display. This does not apply to the XY display on the panel.
- **Graticule** - specifies the type of graticule used on both the oscilloscope and panel XY display.
- **Hits/Bin** - specifies the number of samples required per point for the max/min operation.
- **Conn Dots** - controls whether the waveform is displayed as dots or a connected trace.
- **Merge** - causes the raster image on the oscilloscope display to be merged into the current image in the specified oscilloscope pixel memory (i.e., PM1 or PM2).
- **Clear** - clears the display on both the oscilloscope and the XY display.
- **Upload** - uploads the raster image on the oscilloscope display to HP ITG. Note that the RASTER component into which the pixel image is uploaded is not the component behind the XY display on the panel. It is provided only to allow the user's program to access this raster image for special reasons.

Status Panel

This subpanel allows you to set up the following:

- **Clear Status** - clears status structures and error queue (*CLS).
- **SPoll Status** - displays the instrument status byte (*STB).
- **SPoll Enable** - sets the Service Request Enable mask (*SRE)
- **Event Status** - displays the Event Status Register (*ESR)

- **Event Enable** - sets the Event Status Enable mask (*ESE).
- **Error** - when you click on **Error**, HP ITG displays the number of the last error detected.
- **Id** - when you click on **Id**, HP ITG displays the value of instrument ID.
- **Auto Update** - enables (disables) automatic updating of the XY display when any parameter is changed that would otherwise invalidate the displayed traces. Note that Auto Update defaults to off after the driver is loaded. Users with slower SPUs will probably want to retain this mode, while those with faster SPUs will probably want to enable the automatic update and save the driver in HP ITG's default workfile (WFDFLT) as such.
- **Scope Disp** - turns the oscilloscope's instrument display on/off. Note that this does not affect the XY display on the panel.

Serial Poll

Service Request Registers

Bit number	Bit weight	Name	SRE: enables	STB: condition
7	128	---	not used	0: not used
6	64	RQS	Request Service	0: 0: instrument not requesting service

				1: instrument requesting service
5	32	ESB	Event Status Bit	0: no event status conditions have occurred
				1: an enabled event status condition has occurred
4	16	MAV	Message Available	0: no output messages are ready
				1: an output message is ready
3	8	LTF	Limit Test Fail	0: no limit test has failed
				1: limit test has failed
2	4	MSG	Message	0: no message has been displayed
				1: message has been displayed
1	2	LCL	Local	0: no remote-to-local transition has occurred

				1: remote-to-local transition has occurred
0	1	TRG	Trigger	0: no trigger has occurred 1: trigger has occurred

Event Status Registers

Bit number	Bit weight	Name	ESE: enables	ESR: condition
7	128	PON	Power On	1: OFF-to-ON transition occurred
6	64	URQ	User Request	0: no front panel key pressed 1: front panel key pressed
5	32	CME	Command Error	0: no command error detected 1: a command error detected
4	16	EXE	Execution Error	0: no execution error detected 1: an execution error detected
3	8	DDE	Device Dependent Error	0: no device-dependent error detected

				1: a device-dependent error detected
2	4	QYE	Query Error	0: no query error detected
				1: a query error detected
1	2	RQC	Request Control	0: not used (always 0)
0	1	OPC	Operation Complete	0: operation not complete
				1: operation complete

Error Messages

Error Number	Error Message
11	Questionable horizontal scaling
12	Edges required not found
70	RAM write protected
-100	Command error (unknown command)
-101	Invalid character received
-110	Command header error

-111	Header delimiter error
-120	Numeric argument error
-121	Wrong data type (numeric expected)
-123	Numeric overflow
-129	Missing numeric argument
-130	Non-numeric argument error
-131	Wrong data type (char expected)
-132	Wrong data type (string expected)
-133	Wrong data type (block expected)
-134	Data Overflow: string or block too long
-139	Missing non-numeric argument
-142	Too many arguments
-143	Argument delimiter error
-144	Invalid message unit delimiter
-200	No Can Do (generic execute error)
-201	Not executable in local mode
-202	Settings lost due to rtl or power on
-203	Trigger ignored
-211	Legal command, but settings conflict
-212	Argument out of range
-221	Busy doing something else
-222	Insufficient capability or configuration
-232	Output buffer full or overflow
-300	Device failure
-301	Interrupt fault

-302	System error
-303	Timeout
-310	RAM error
-311	RAM failure (hard error)
-312	RAM data loss (soft error)
-313	Calibration data loss
-320	ROM error
-321	ROM checksum
-322	Hardware and firmware incompatible
-330	Power-on test failed
-340	Self-test failed
-350	Too Many Errors (error queue overflow)
-400	Query Error (generic)
-410	Query INTERRUPTED (have further data for you)
-420	Query UNTERMINATED (did not get terminating EOI)
-421	Query received, indefinite block response in progress
-422	Addressed to Talk, Nothing to Say
-430	Query DEADLOCKED

HP 54501A Digitizing Oscilloscope Revision 1.0		
Component	Values	Initial Value
AUTOSCALE		DONTCARE
BWLIMIT_CH1	OFF,ON	OFF
BWLIMIT_CH2	OFF,ON	OFF
BWLIMIT_CH3	OFF,ON	OFF
BWLIMIT_CH4	OFF,ON	OFF
CLS		DONTCARE
COMPLETION	0 .. 100	100
CONNECT_DOTS	OFF,ON	OFF
COUPLING_CH1	DC,AC	DC
COUPLING_CH2	DC,AC	DC
COUPLING_CH3	DC,AC	DC
COUPLING_CH4	DC,AC	DC
DELAY_EDGE1	1 .. 100	1
DELAY_EDGE2	1 .. 100	2
DELAY_LEVEL1	UPPER,MIDDLE,LOWER	MIDDLE
DELAY_LEVEL2	UPPER,MIDDLE,LOWER	MIDDLE
DELAY_MSMT_VALUE		INVALID
DELAY_POLARITY1	NEGATIVE,POSITIVE	POSITIVE
DELAY_POLARITY2	NEGATIVE,POSITIVE	POSITIVE
DIGITIZE		DONTCARE
DISP_CLEAR		DONTCARE
DISP_DOWNLOAD		DONTCARE
DISP_UPLOAD		DONTCARE
ECL_PRESET_CH1		DONTCARE
ECL_PRESET_CH2		DONTCARE
ECL_PRESET_CH3		DONTCARE
ECL_PRESET_CH4		DONTCARE
EDGE_TRIGGER_SOURCE	CH1 .. CH4	CH1
EMARKER1		INVALID
EMARKER2		INVALID
ENV_CH1	RARRAY[2,1024]	INVALID
ENV_CH2	RARRAY[2,1024]	INVALID
ENV_CH3	RARRAY[2,1024]	INVALID
ENV_CH4	RARRAY[2,1024]	INVALID

HP 54501A Digitizing Oscilloscope Revision 1.0 (continued)		
Component	Values	Initial Value
ERR_NUMBER		0
ESE	0 .. 255	0
ESR	0 .. 255	INVALID
ESTART	-100 .. 100	1
ESTOP	-100 .. 100	1
HIT_COUNT	1 .. 2048	1
LOWER_THRESHOLD		10
MERGE_PM1		DONTCARE
MERGE_PM2		DONTCARE
MSMT1_SOURCE	CH1..CH4,WM1..WM4,FN1..FN2	CH1
MSMT2_SOURCE	CH1..CH4,WM1..WM4,FN1..FN2	CH1
MSMT_DEFS	STD,USER	STD
MSMT_UNITS	PERCENT,VOLTS	PERCENT
NUM_POINTS	32 .. 1024	500
NUM_SCREENS	ONE,TWO,FOUR	ONE
NWIDTH_DEF	UPPER,LOWER,MIDDLE	MIDDLE
OFFSET_CH1	-300 .. 300	0
OFFSET_CH2	-300 .. 300	0
OFFSET_CH3	-300 .. 300	0
OFFSET_CH4	-300 .. 300	0
PATTERN_LOGIC_CH1	H,X,L	H
PATTERN_LOGIC_CH2	H,X,L	X
PATTERN_LOGIC_CH3	H,X,L	X
PATTERN_LOGIC_CH4	H,X,L	X
PATTERN_PRESENT_LESSTHAN	20E-9 .. 160E-3	50E-9
PATTERN_PRESENT_MORETHAN	20E-9 .. 160E-3	20E-9
PATTERN_PRESENT_START	20E-9 .. 159.999E-3	20E-9
PATTERN_PRESENT_STOP	30E-9 .. 160E-9	50E-9
PATTERN_TRIGGER_COND	ENTERED,EXITED, LESSTHAN,MORETHAN BETWEEN	ENTERED
PERSISTENCE	0 .. 11	0
PROBE_CH1	0.90 .. 1000	1

HP 54501A Digitizing Oscilloscope Revision 1.0 (continued)		
Component	Values	Initial Value
PROBE_CH2	0.90 .. 1000	1
PROBE_CH3	0.90 .. 1000	1
PROBE_CH4	0.90 .. 1000	1
PULSE_MSMT	ALL, FREQUENCY,PERIOD, RISETIME,FALLTIME, PRESHOOT,OVERSHOOT, VPP,VMAX,VMIN,VTOP,VBASE, VAMP,VRMS,VAVERAGE, PWIDTH,NWIDTH, DUTYCYCLE	FREQUENCY
PULSE_MSMT_VALUE		INVALID
PULSE_MSMT_VALUES	RARRAY[17]	INVALID
PWIDTH_DEF	UPPER,MIDDLE,LOWER	MIDDLE
RASTER	IARRAY[8288]	INVALID
REFRESH_MODE	OFF,ON	OFF
RESET		
RUN		0
SCREEN	OFF,ON	ON
SENS_CH1	<variable>	500E-3
SENS_CH2	<variable>	500E-3
SENS_CH3	<variable>	500E-3
SENS_CH4	<variable>	500E-3
SERIAL_NUM	STRING[12]	INVALID
SPOLL_RESPONSE	0 .. 255	INVALID
SRE	0 .. 255	0
STATE_LOGIC_CH1	H,X,L	X
STATE_LOGIC_CH2	H,X,L	X
STATE_LOGIC_CH3	H,X,L	X
STATE_LOGIC_CH4	H,X,L	X
STATE_TRIGGER_COND	ISNOT_PRESENT,IS_PRESENT	IS_PRESENT
STATE_TRIGGER_LEVEL	-300 .. 300	0
STATE_TRIGGER_SLOPE	NEGATIVE,POSITIVE	POSITIVE

HP 54501A Digitizing Oscilloscope Revision 1.0 (continued)		
Component	Values	Initial Value
STATE_TRIGGER_SOURCE	CH1 .. CH4	CH1
STORE_CH1_WM1		DONTCARE
STORE_CH1_WM2		DONTCARE
STORE_CH1_WM3		DONTCARE
STORE_CH1_WM4		DONTCARE
STORE_CH2_WM1		DONTCARE
STORE_CH2_WM2		DONTCARE
STORE_CH2_WM3		DONTCARE
STORE_CH2_WM4		DONTCARE
STORE_CH3_WM1		DONTCARE
STORE_CH3_WM2		DONTCARE
STORE_CH3_WM3		DONTCARE
STORE_CH3_WM4		DONTCARE
STORE_CH4_WM1		DONTCARE
STORE_CH4_WM2		DONTCARE
STORE_CH4_WM3		DONTCARE
STORE_CH4_WM4		DONTCARE
SWEEP_MODE	AUTO,TRIGGER,SINGLE	AUTO
TIME_DELAY	-175 .. 175	0
TIME_REF	LEFT,CENTER,RIGHT	CENTER
TIME_SENS	2E-9 .. 5	100E-6
TIME_WINDOW_POSITION	<variable>	0
TIME_WINDOW_SENS	100E-12 .. <variable>	100E-6
TMARKER1	<variable>	INVALID
TMARKER2	<variable>	INVALID
TRIGGER_HOLDOFF	40E-9 .. 320E-3	40E-9
TRIGGER_LEVEL_CH1	-300 .. 300	0.0
TRIGGER_LEVEL_CH2	-300 .. 300	0.0
TRIGGER_LEVEL_CH3	-300 .. 300	0.0
TRIGGER_LEVEL_CH4	-300 .. 300	0.0
TRIGGER_MODE	EDGE,STATE,PATTERN	EDGE
TTL_PRESET_CH1		DONTCARE
TTL_PRESET_CH2		DONTCARE

HP 54501A Digitizing Oscilloscope Revision 1.0 (continued)		
Component	Values	Initial Value
TTL_PRESET_CH3		DONTCARE
TTL_PRESET_CH4		DONTCARE
UPPER_THRESHOLD		90
VIEW_CH1	OFF,ON	ON
VIEW_CH2	OFF,ON	OFF
VIEW_CH3	OFF,ON	OFF
VIEW_CH4	OFF,ON	OFF
VIEW_TMARKERS	OFF,ON	OFF
VIEW_VMARKERS	OFF,ON	OFF
VM1_SOURCE	CH1..CH4,WM1..WM4,FN1..FN2	CH1
VM2_SOURCE	CH1..CH4,WM1..WM4,FN1..FN2	CH1
VMARKER1	<variable>	INVALID
VMARKER2	<variable>	INVALID
WF_CH1	RARRAY[1024]	INVALID
WF_CH2	RARRAY[1024]	INVALID
WF_CH3	RARRAY[1024]	INVALID
WF_CH4	RARRAY[1024]	INVALID
WF_SIZE	32 .. 1024	500
WF_TMAX		500E-6
WF_TMIN		-500E-6
WF_TYPE	NORMAL,AVERAGE,ENVELOPE	NORMAL
WINDOW_MODE	OFF,ON	OFF
XY_GRATICULE	OFF,AXES,GRID,FRAME	AXES

HP 71000 Modular Spectrum Analyzer System

Overview

The HP 71000 is a modular spectrum analyzer system that works within the HP 70000 Modular Measurement System. When you are manually operating the system, the functions are accessed through softkeys placed at the edges of the instrument's CRT display. The main menu items of this HP ITG panel generally follow the instrument's main menu choices, except that some of the more advanced functions have been grouped into their own menu, which is accessed through the **Advanced Panel**.

File Names

The file name of the driver for the HP 71000A is: **IDHP71000**

Its Help file is: **IHHP71000**

Timeout Errors

There is a timeout mechanism in HP ITG's development environment that returns control to the user if an instrument takes too long to respond to a command. When this happens, HP ITG is assuming that the instrument is no longer responding. The time limit can be set using **Config...** in the panel menu, but its maximum value is 32 seconds. When using functions such as averaging or long sweep times on the HP 71000 that take longer than this, the timeout function can be turned off by setting it to zero.

Using the Panel

There are 10 control panels that are accessed through the main menu control in the upper right-hand corner of the panel. The panels accessed here are:

- **Simple** - Gathers the controls for simple instrument use into one panel.
- **Freq** - Frequency span controls.
- **Amptd** - Controls for reference level, attenuator, vertical scaling, etc.
- **Marker** - Marker controls, trace peaks.
- **BW/Sweep** - Controls for resolution and video bandwidth, sweep and triggering.
- **Traces** - Controls for trace writing modes, detector, trace setup, and trace math.
- **State** - Input coupling, input select, trace lock.

Misc - Miscellaneous functions including display line, threshold, status, error, srq, and debug.

Advanced - Brings up another menu under the main one that allows access to the more advanced and less used functions of the analyzer including calibration, signal id, external mixer, tracking generator, and preselector.

Many of the main and advanced panels include from 2 to 5 subpanels that provide access to all of the controls for that item. The buttons to access these subpanels are always drawn directly below the panel selection control, and the currently selected subpanel is indicated by > and < signs, which are drawn beside the button's label (see also "Quick Access Buttons).

Buttons whose labels end in ... produce a dialog box when you click on them. Dialog boxes are used where an HP 71000 function needs some data to be specified, but the data no longer has any meaning once the function is completed. In the dialog boxes provided by this driver, the upper part of the box has one or more controls to be set to the desired value. At the bottom of the box there is a button that triggers the action, and a button labeled **Cancel** that removes the dialog box without executing the function.

Quick Access Buttons

In the area below the trace display, at the bottom edge of the panel, there are two rows of five buttons. These buttons allow quick access to the ten main menu selections, which greatly speeds the task of navigating through the panels. This area can

also be used by the marker frequency and amplitude displays, and is automatically switched to this mode when markers are active.

The user may switch this area back and forth between quick access buttons and marker display at any time by pressing a small button located just below the lower left corner of the trace display box. The button is labeled either **Mnu** for the buttons, or **Mkr** for the marker display.

Marker Readout

The area used for the marker frequency and amplitude readout is also used by the main menu quick-access buttons. See "Quick Access Buttons" for more information.

The **Mkr Freq** marker frequency readout is replaced by a **Mkr Time** marker time readout whenever the span is zero.

Instrument Status

The instrument status controls are located in the **Misc** panel.

This table shows the bits in the status byte.

Bit	Decimal	Meaning
0	1	Trigger Armed

1	2	Message Occurred
2	4	End Of Sweep
3	--	Not used
4	16	Command Complete
5	32	Error Present in Error Register
6	64	Request Service
7	--	Not used

Markers

A subset of the instrument's marker manipulation capabilities is implemented in this driver. Nothing related to markers is included in a stored state, so all non-interactive marker actions must be done in your program between state recalls, using specific HP ITG subprograms.

Generally, only marker 1 and its corresponding delta marker are used under HP ITG. The exception to this is that marker 2 is used for the **Marker Amplitude Left** function and marker 3 is used for **Marker Amplitude Right**. As soon as any marker function other than **Marker Bandwidth** is done, markers 2 and 3 are turned off. Markers can only be used on trace A.

Units

The units are not always specified for the components on this panel. In some cases, the units for particular items can change depending on other instrument settings. Frequency items are always in Hz. Amplitude items that are always in dB are labeled as such. The following items use the **Amplitude Units** (AUNITS) shown in the item directly below the lower right corner of the trace display:

Video Trigger Level	**VTL**
Mixer Level	**ML**
Calibration Power	**CALPWR**
Source Power	**SRCPWR**

The following items use the same units as those above when the analyzer is in **Absolute Amplitude** mode, but they use units of **dB** when in **Relative Amplitude** mode. See "Measurement Mode" in the HP 71000 manual.

Display Line	DL
Reference Level	RL
Threshold	TH

The **Marker Amplitude Left** (MKAL) and **Marker Amplitude Right** (MKAR) components are specified as **dB** for logarithmic values of amplitude units, and are a ratio for linear values.

For the **Marker Amplitude** (MKA) readout, several different types of units are used. See the instrument manual for a description.

Marker Normal

Marker Normal is used either to turn off the delta marker or to place a marker at a particular position. When you click on the button labeled **Marker Normal...**, a box is displayed that lets you specify a frequency (or a time, if the span is zero). The **Set Freq?** control lets you specify whether a value should be sent. If **Yes**, the marker will be placed where you specify. If **No**, any delta marker will be turned off. To actually do the function, click on the **Set** button at the bottom.

Trace Writing Mode

In each of the **Trace** subpanels (reached by buttons labeled **Trc A**, **Trc B**, and **Trc C** In the **Traces** panel) are buttons labeled **Clear Write**, **Max Hold**, **Min Hold**, **View**, **Blank**, and **Hide Trace**. These buttons duplicate the controls that the instrument provides to affect the writing status and visibility of the traces. In the case of this HP ITG panel, however, the instrument's trace writing and visibility status is modeled directly by the item labeled **Status**. The above buttons are used only to change the status component (e.g., TRB_STAT) and trigger it to set up the instrument appropriately.

Reading Trace Data

Once the trace writing status is set to the desired state, a sweep must be taken. This can be triggered interactively either by clicking the mouse on the trace display area or by clicking on the **Take Sweep** button in the **BW/Sweep** panel. If you are logging calls and you then want to generate a call that will get trace data into your program, you need to click on the **Read Trace A/B/C Data** button in the appropriate trace control panel, which is accessed by buttons labeled **Trc A**, **Trc B**, and **Trc C** in the **Traces** panel.

Here is an example of statements to read trace A data into an HP BASIC array:

```
DIM Trace_data(1:1,1:1024)
Hpt_get_ary(Hp71000,"TRA_DATA",Trace_data(*))
```

Continuous Sweep

Generally, this driver operates the HP 71000 in single sweep mode because HP ITG is oriented toward programmatic use of the instrument. Buttons are provided in the **BW/Sweep** subpanel 2 that allow switching between continuous and single sweep, but these are only provided for convenience while interactively using the instrument through HP ITG.

Trace Peaks

The controls for the Trace Peaks function are located in the Marker panel. The Trace Peaks function requires you to specify a source trace that will be searched for peaks and a destination peak where the position of the found peaks will be stored. This driver retrieves the resulting data immediately after executing the Trace Peaks function, and it puts its in a component named PEAKS_DATA, which your program can read.

Here is an example of statements to read peak trace data into an HP BASIC array:

```
INTEGER Pk_data(1:1,1:500)
Hpt_get_iary(Hp71000,"PEAKS_DATA",Pk_data(*))
```

HP 71000 Modular Spectrum Analyzer Revision 1.0		
Component	Values	Initial Value
AMB	OFF, ON	OFF
AMBPL	OFF, ON	OFF
AMC	OFF, ON	OFF
ANNOT	OFF, ON	ON
APB	button	
AT	0 - 70	DONTCARE
AT_AUTO	MAN, AUTO	AUTO
AUNITS	DBM, DBMV, DBUV, V, W	DBM, DONTCARE
AUNITS_AUTO	MAN, AUTO	AUTO
AXB	button	
BLANK_TRA	button	
BLANK_TRB	button	
BLANK_TRC	button	
BML	button	
BTC	button	
BXC	button	
CALCOR_FLAT	OFF, ON	ON
CALCOR_GAIN	OFF, ON	ON
CALCOR_LOG	OFF, ON	ON
CALCOR_RBA	OFF, ON	ON
CALCOR_RBF	OFF, ON	ON
CALFREQ	0 - 1E12	300E6
CALPWR	-300 - 20	-10
CALSRC	EXT, INT	EXT
CAL_ALL	button	
CAL_GAIN	button	
CAL_LOG	button	
CAL_RBW	button	
CF	-1E12 - 1E12	
CLRW_TRA	button	
CLRW_TRB	button	
CLRW_TRC	button	
CLS	button	
CNVLOSS	-100 - 100	0

HP 71000 Modular Spectrum Analyzer Revision 1.0 (continued)		
Component	Values	Initial Value
CONTS	button	
COUPLE	AC, DC	
DEBUG	OFF, FAST, SLOW	OFF
DET	GND, NEG, NRM, POS, SMP	NRM, DONTCARE
DET_AUTO	MAN, AUTO	AUTO
DL	-300 - 300	DONTCARE
DL_ON	OFF, ON	OFF
ERR		
FA	-1E12 - 1E12	
FB	-1E12 - 1E12	
FOFFSET	-1E12 - 1E12	
FS	button	
FULBAND	OFF, K, A, Q, U, V, E, W, F, D, G, Y, J	OFF
GRAT	OFF, ON	ON
HD	button	
HIDE_TRA	button	
HIDE_TRB	button	
HIDE_TRC	button	
HNLOCK	-100 - 100	DONTCARE
HNLOCK_ON	OFF, ON	OFF
ID	STRING[20]	
IDCF	button	
IDFREQ		
IDSTAT	-1 - 1	
INPUT	1 - 20	1
INZ	1 - 1E8	50
IP	button	
LG	.01 - 20	10
MAXH_TRA	button	
MAXH_TRB	button	
MAXH_TRC	button	
MBIAS	-100 - 100	DONTCARE
MBIASPK	button	

HP 71000 Modular Spectrum Analyzer Revision 1.0 (continued)		
Component	Values	Initial Value
MBIAS_ON	OFF, ON	OFF
MBMAX	-100 - 100	DONTCARE
MBMAX_ON	OFF, ON	OFF
MBMIN	-100 - 100	DONTCARE
MBMIN_ON	OFF, ON	OFF
MBRES	1 - 32767	10
MEASURE	SA, SR	
MINH_TRA	button	
MINH_TRB	button	
MINH_TRC	button	
MKA		
MKAL	button	
MKAL_VALUE	-300 - 300	0
MKAR	button	
MKAR_VALUE	-300 - 300	0
MKBW		
MKCF	button	
MKD	button	
MKF		
MKMIN	button	
MKN	button	
MKNOISE	OFF, ON	OFF
MKN_SENDVAL	NO, YES	NO
MKN_VALUE	-1E12 - 1E12	0
MKOFF	button	
MKPK_CP	button	
MKPK_HI	button	
MKPK_NH	button	
MKPK_NL	button	
MKPK_NR	button	
MKPX	0 - 300	6
MKRL	button	
MKSP	button	

HP 71000 Modular Spectrum Analyzer Revision 1.0 (continued)		
Component	Values	Initial Value
MKT		
ML	-300 - +300	-10
NSTART	1 - 100	1
NSTOP	1 - 100	40
PATHLOCK	OFF, ON	OFF
PEAKS	button	
PEAKS_DATA	IARRAY[500]	
PEAKS_DESTIN	TRA, TRB, TRC	TRB
PEAKS_METHOD	AMP, FRQ	AMP
PEAKS_NUMBER	0 - 1024	0
PEAKS_SOURCE	TRA, TRB, TRC	TRA
PP	button	
PRSDAC	0 - 127	
PRSENABL	OFF, ON	ON
PRSHYST	button	
RB	1 - 1E12	DONTCARE
RBR	1E-100 - 1E100	.01
RB_AUTO	MAN, AUTO	AUTO
REV	STRING[6]	
RL	-300 - +300	0
RLPOS	0 - 10	10
ROFFSET	-300 - +300	0
RQS	0 - 255	0
SER	STRING[21]	
SIGDEL	0 - 300	10
SIGID_IMAGE	button	
SIGID_SHIFT	button	
SMOOTH	button	
SMOOTH_NUMBER	3 - 1023	3
SMOOTH_SOURCE	TRA, TRB, TRC	TRA
SNGLS	button	
SP	0 - 1E12	
SRCALC	ALT, EXT, NORM	NORM

HP 71000 Modular Spectrum Analyzer Revision 1.0 (continued)		
Component	Values	Initial Value
SRCAM	0 - 100	0, DONTCARE
SRCAMF	0 - 1E12	
SRCAM_ON	OFF, ON	OFF
SRCAT	0 - 300	DONTCARE
SRCAT_AUTO	MAN, AUTO	AUTO
SRCBLNK	OFF, ON	OFF
SRCMOD	EXT, INT	INT
SRCOSC	EXT, INT	INT
SRCPOFS	-300 - 300	0
SRCPSWP	0 - 300	0, DONTCARE
SRCPSWP_ON	OFF, ON	OFF
SRCPWR	-300 - 300	DONTCARE
SRCPWR_ON	OFF, ON	OFF
SRCTK	-1000 - 1000	0
SRCTKPK	button	
SRQ	button	
SRQ_VALUE	0 - 255	0
ST	0 - 1000	DONTCARE
STB	0 - 255	
STORREF_OPEN	button	
STORREF_SHORT	button	
STORREF_THRU	button	
ST_AUTO	MAN, AUTO	AUTO
TH	-300 - +300	DONTCARE
TH_ON	OFF, ON	OFF
TIME		
TM	EXT, FREE, LINE, VID	FREE
TRA_DATA	RARRAY[1024]	
TRA_LENGTH	3 - 1024	800
TRA_STATUS	WRT_OFF, MIN_OFF, MAX_OFF, OFF_OFF, WRT_ON, MIN_ON, MAX_ON, OFF_ON	WRT_ON
TRB_DATA	RARRAY[1024]	
TRB_LENGTH	3 - 1024	800

HP 71000 Modular Spectrum Analyzer Revision 1.0 (continued)		
Component	Values	Initial Value
TRB_STATUS	WRT_OFF, MIN_OFF, MAX_OFF, OFF_OFF, WRT_ON, MIN_ON, MAX_ON, OFF_ON	OFF_OFF
TRC_DATA	RARRAY[1024]	
TRC_LENGTH	3 - 1024	800
TRC_STATUS	WRT_OFF, MIN_OFF, MAX_OFF, OFF_OFF, WRT_ON, MIN_ON, MAX_ON, OFF_ON	OFF_OFF
TRPRST	button	
TS	button	
VAVG	1 - 10000	100, DONTCARE
VAVG_ON	OFF, ON	OFF
VB	1 - 1E12	DONTCARE
VBR	1E-100 - 1E100	1
VB_AUTO	MAN, AUTO	AUTO
VERT_SCALE	LOG, LINEAR	LOG
VIEW_TRA	button	
VIEW_TRB	button	
VIEW_TRC	button	
VTH	-300 - 300	3
VTL	-300 - 300	