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# I/O Function Guide

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## Interface Modules for HP 54600-Series Instruments

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# Introduction

These modules provide the means for remote communication with HP 54600-series instruments. For programming specifics, refer to the Programmer's Guide or Programmer's Reference shipped with your oscilloscope or logic analyzer. The hardcopy process does not interrupt front-panel operation of the instrument. While any of the interfaces are connected to the rear panel of the instrument, the instruments trace memories become nonvolatile and are saved when the power is removed from the instrument.

## **HP 54650A HP-IB Interface Module**

- Full programmability
- Hardcopy output

## **HP 54651A RS-232-C Interface Module**

- Full programmability
- Hardcopy output

## **HP 54652A Parallel Interface Module**

- Hardcopy output

## **HP 54652B Parallel/RS-232-C Interface Module**

- Full programmability
- Hardcopy output
- Connection to both an RS-232-C controller and a parallel printer at the same time.

## **HP 54655A Test Automation Module (HP-IB) and HP 54656A Test Automation Module (RS-232-C)**

- Full programmability.
- Hardcopy output.
- 100 nonvolatile sequence steps.
- 40 nonvolatile mask templates.

- 2 nonvolatile trace memories.
- Built-in automatic mask generation and mask editing capabilities.
- Protection of test sequence and mask template setup through software.

The HP 54656A has the following additional features:

- External input lines for Next, Previous and Reset control.
- 5 user-definable output lines.
- Recessed protection switch.

**HP 54657A Measurement/Storage Module (HP-IB),  
HP 54658A Measurement/Storage Module (RS-232-C), and  
HP 54659B Measurement/Storage Module (RS-232-C/Parallel)**

- Full programmability.
- Hardcopy output.
- Three additional automatic voltage measurements (amplitude, preshoot, and overshoot).
- Two additional automatic time measurements (delay and phase angle).
- User defined measurement thresholds of 10%/90%, 20%/80%, or selected voltage values.
- Two additional cursor measurements (voltage in percent and time in degrees).
- Two additional cursor measurement sources (math function 1 and 2).
- Waveform math functions (addition, subtraction, multiplication, differentiation, integration, and FFT).
- Time and date tagging of hardcopy and nonvolatile memories.
- Three nonvolatile trace memories.
- Additional 64K of nonvolatile trace memory (with data compression).

The HP 54659B has an additional parallel output connector which allows the module to be connected to both an RS-232-C controller and a parallel printer at the same time.

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**Interface I/O functions**


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<b>Interface module</b>	<b>Interface connection</b>	<b>I/O Function</b>
<b>HP 54650A</b>	HP-IB	HP-IB controller <u>or</u> HP-IB output to printer/plotter
<b>HP 54651A</b>	RS-232-C	RS-232-C controller <u>or</u> RS-232-C output to printer/plotter
<b>HP 54652A</b>	Parallel	Parallel output to printer
<b>HP 54652B<sup>2</sup></b>	RS-232-C and parallel	RS-232-C controller <u>and</u> parallel output to printer, or RS-232-C output to printer/plotter
<b>HP 54655A<sup>1,3</sup></b>	HP-IB	HP-IB controller <u>or</u> HP-IB output to printer/plotter
<b>HP 54656A<sup>1,3</sup></b>	RS-232-C	RS-232-C controller <u>or</u> RS-232-C output to printer/plotter
<b>HP 54657A<sup>1</sup></b>	HP-IB	HP-IB controller <u>or</u> HP-IB output to printer/plotter
<b>HP 54658A<sup>1</sup></b>	RS-232-C	RS-232-C controller <u>or</u> RS-232-C output to printer/plotter
<b>HP 54659B<sup>1,2</sup></b>	RS-232-C and parallel	RS-232-C controller <u>and</u> parallel output to printer, or RS-232-C output to printer/plotter

<sup>1</sup> The enhanced features of the HP 54655A/56A/57A/58A/59B are not available to the HP 54620A/C Logic Analyzer. These modules supply enhanced oscilloscope programming functions. The I/O functions of these modules will function when used with the HP 54620A/C Logic Analyzer.

<sup>2</sup> The 54652B and HP 54659B are not compatible with the HP 54600A, HP 54601A, HP 54602A, and HP 54610A.

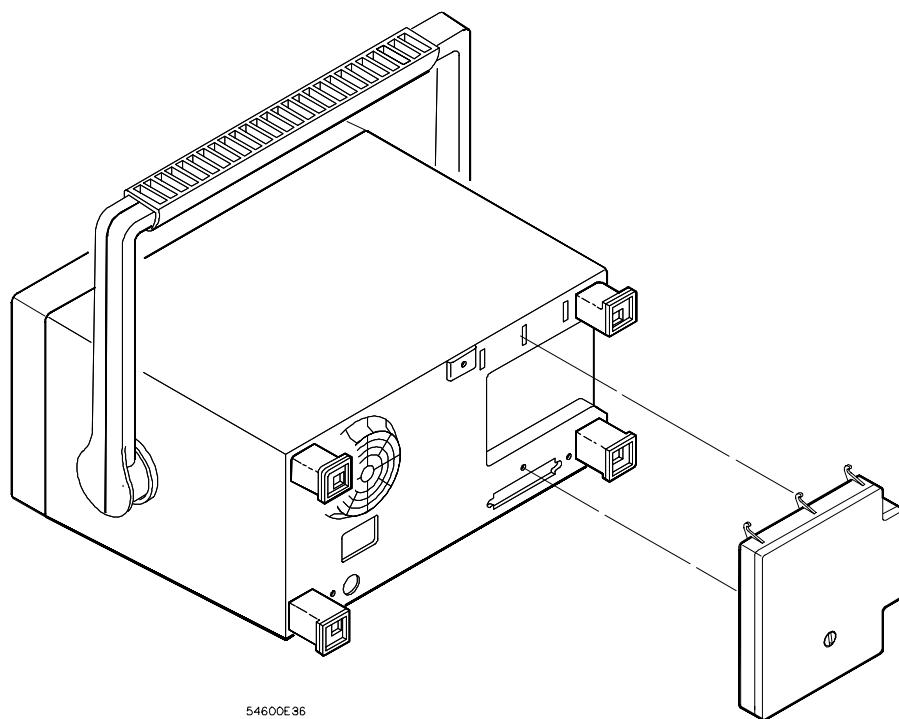
<sup>3</sup> The 54655A and HP 54656A are not compatible with the HP 54615B, HP 54615B, HP 54645A and HP 54645D.

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## To install the interface module

- 1 Turn off the instrument.
- 2 Install the module as shown below.

The instrument is reset after installation. The installed interface module is shown in the message displayed when you turn on the instrument. The I/O functions (controller and hardcopy) are available by pressing the instrument front-panel **Print/Utility** key.



Installation of interface module to HP 54600-Series instrument

## Interface Cables

Interface module	Cable function (Instrument to ..)	Module connector	Printer/plotter/ controller connector	HP part number	Cable Length
<b>HP 54650A, HP 54655A<sup>1,3</sup>, HP 54657A<sup>1</sup> (HP-IB)</b>	Printer/plotter/ controller	HP-IB	HP-IB	HP 10833A	1 m (3.3 ft)
				HP 10833B	2 m (6.6 ft)
				HP 10833C	4 m (13.2 ft)
				HP 10833D	0.5 m (1.6 ft)
<b>HP 54651A, HP 54656A<sup>1,3</sup>, HP 54658A<sup>1</sup> (RS-232-C)</b>	Printer/plotter/ controller	25-pin F	25-pin F	HP 13242G HP 17255M	5 m (16.7 ft) 1.5 m (4.9 ft)
	Controller	25-pin F	25-pin M	HP 92219J HP 17255D	5 m (16.7 ft) 1.5 m (4.9 ft)
	Controller	25-pin F	9-pin M	HP 24542G	3 m (9.9 ft)
<b>HP 54652A (parallel output only)</b>	Parallel printer	parallel	parallel	C2950A	2 m (6.6 ft)
				C2951A	3 m (9.9 ft)
<b>HP 54652B<sup>2</sup>, HP 54659B<sup>1,2</sup> (RS-232-C and parallel output)</b>	RS-232-C controller	9-pin M	25-pin M	HP 34398A	2.5 m (8.2 ft)
	RS-232-C controller	9-pin M	9-pin M	HP 34398A	2.5 m (8.2 ft)
	RS-232-C printer/ plotter/controller	9-pin M	25-pin F	HP 34398A + HP 34399A adapter kit	2.5 m (8.2 ft)
	Parallel printer	parallel	parallel	C2950A C2951A	2 m (6.6 ft) 3 m (9.9 ft)

<sup>1</sup> The enhanced features of the HP 54655A/56A/57A/58A/59B are not available to the HP 54620A/C Logic Analyzer. These modules supply enhanced oscilloscope programming functions. The I/O functions of these modules will function when used with the HP 54620A/C Logic Analyzer.

<sup>2</sup> The 54652B and HP 54659B are not compatible with the HP 54600A, HP 54601A, HP 54602A, and HP 54610A.

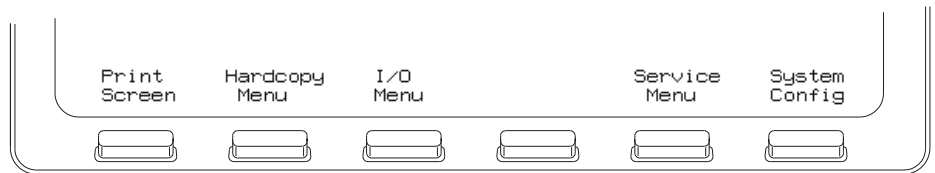
<sup>3</sup> The 54655A and HP 54656A are not compatible with the HP 54615B , HP 54615B, HP 54645A and HP 54645D.

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## Print/Utility Menu

The Print/Utility menu of your HP 54600-series instrument allows you to select I/O functions for the module you have connected to your instrument. The module can have an HP-IB, RS-232-C, parallel, or combination RS-232-C/parallel interface.

- To display this menu, press **Print/Utility** .



### Print/Utility Menu

**Print Screen** pressing this softkey sends the screen image to your printer or plotter.

#### Interface setup

In many cases, the interface will need to be configured before attempting to print. If you are setting up an HP-IB module, refer to "To set HP-IB addresses" on page 17. If you are setting up an RS-232-C module, refer to "To set RS-232 baud rate and handshake" on page 18.

**Hardcopy Menu** this softkey allows you to select your printer or plotter type and to set parameters for that printer or plotter.

**I/O Menu** this softkey allows you to set up parameters for your RS-232-C or HP-IB interface for printer or controller operation.

**Service Menu** and **System Config** these softkeys control instrument and enhanced module functions such as service self-test, service self-calibration and system configuration. Refer to your instrument *User and Service Guide* or enhanced module *User's Guide* for use of these softkeys.



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## To select your printer or plotter.

- Press the **Hardcopy Menu** softkey to view printer/plotter options.  
Your module can be configured to print in several formats.
- To select the format of your printer/plotter, press the **Format** softkey until the desired format is displayed.



### Hardcopy Menu with RS-232-C or parallel module attached

**Format** Your module can be configured to print in the following formats:

**LaserJet** HP LaserJet format

**DJ mono** monochrome HP DeskJet format

**DJ color** color HP DeskJet format (color HP 54600-series instruments only)

**Epson** Epson format

**ThinkJet** HP ThinkJet format (HP-IB and RS-232-C modules only)

**Plotter** HP plotter (HP-GL) format. This format is available on HP-IB and RS-232-C modules only and is not an option on color HP 54600 instruments.

I/O Function Guide  
To select your printer or plotter.

**Destination** If you have an RS-232-C/parallel dual interface module, press the **Destination** softkey to select the hardcopy output destination of the module to be **RS-232** or **Parallel**.



Hardcopy Menu with RS-232-C/parallel dual interface module attached

**Printer address** If you have an HP-IB interface module, press the **PrintAddr** softkey until the correct address is displayed. The address can also be incremented or decremented by turning the knob closest to the **Cursors** key. The default printer/plotter address is 1.

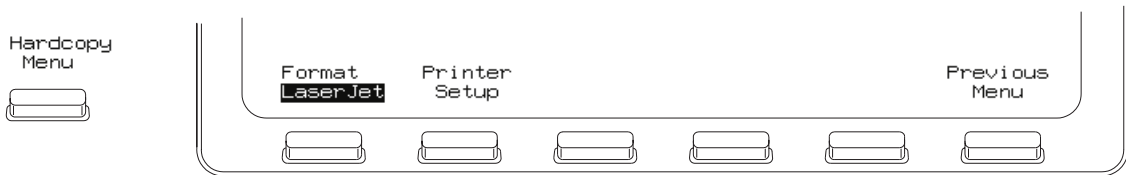


Hardcopy Menu with HP-IB module attached

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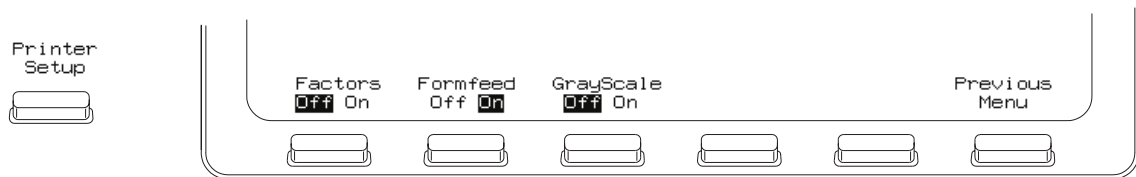
## To setup your printer or plotter

- From the **Hardcopy Menu**, press the **Printer Setup** softkey.



### Selecting Printer Setup from the Hardcopy Menu

Printer/plotter options are displayed for formfeed, scale factors, and gray scale printing.



### Printer setup options for HP LaserJet and HP DeskJet formats

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## To set formfeed

- To set formfeed, press the **Hardcopy Menu** softkey, then the **Printer Setup** softkey. **Formfeed** can be selected as **On** or **Off**

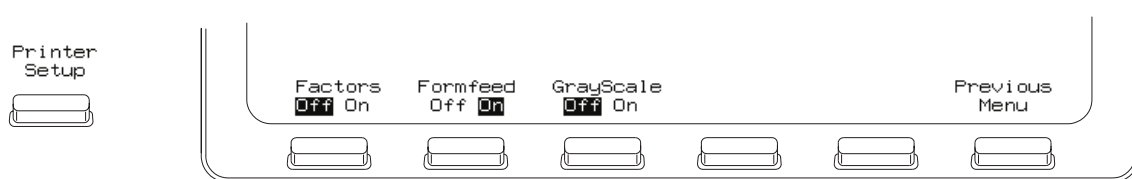
The instrument will send a formfeed command after printing when **Formfeed** is set to **On**.

Formfeed is not an option when <b>Format</b> is set to <b>Plotter</b> .
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## To print or plot gray scale

### Gray scale printing

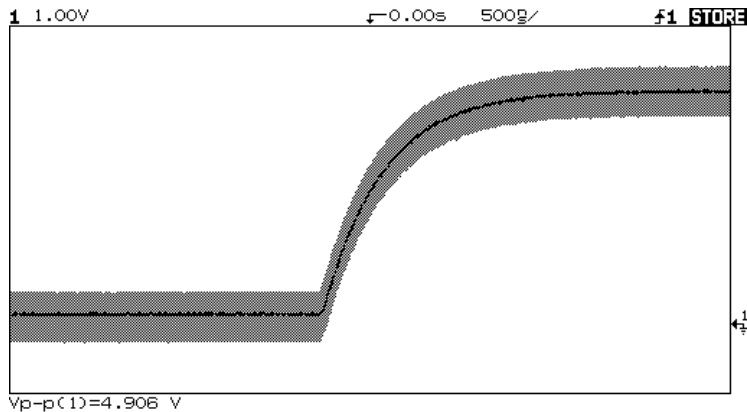
- To print in gray scale, press the **Hardcopy Menu** softkey, then the **Printer Setup** softkey. **GrayScale** can be selected as **On** or **Off**



### Selecting GrayScale from the Printer Setup menu

When gray scale printing is selected, the full-bright and half-bright traces on the instrument screen are printed on the hardcopy.

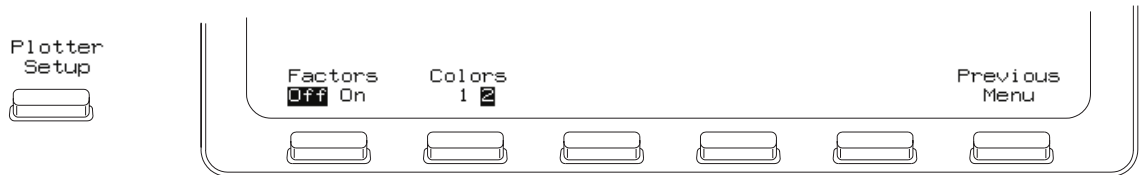
Gray scale printing requires an HP-PCL printer capable of at least 300 dpi (dots-per-inch), such as an HP LaserJet or HP DeskJet series printer. Grayscale printing is not available with **ThinkJet** and **Epson** formats. If you have a color HP 54600-series instrument, **DJ Color** format will print in 2 different colors.



Gray scale print

### Gray scale plotting

- 1 Press the **Hardcopy Menu** softkey, then press the **Format** softkey until **Plotter** is displayed.



#### Plotting GrayScale from the Plotter Setup menu

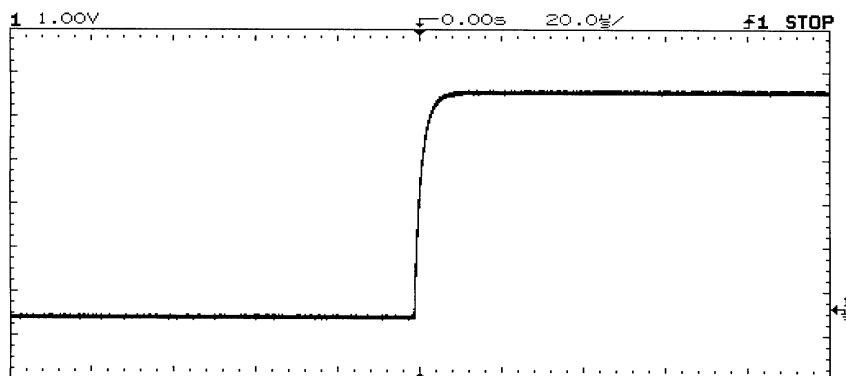
Gray scale plotting requires an HP-GL plotter capable of plotting with at least 2 pens.

- 2 Press the **Plotter Setup** softkey, then press the **Colors** softkey until **2** is displayed.  
Gray scale plot uses two pens for the hardcopy. Half-bright traces are plotted with plotter pen 1 and full-bright traces are plotted with plotter pen 2.

## To print or plot scale factors

Instrument scale factors may be turned on or off for hardcopy prints and plots. All factors are printed on the hardcopy when on is selected. When factors is selected for a hardcopy plot, the plot is in portrait mode. When factors is not selected for hardcopy plot, the plot is in landscape mode.

- 1 Press the **Hardcopy Menu** softkey, then press the **Printer Setup** softkey.
- 2 Press the **Factors** softkey until **On** is displayed.



	State	Volts/Div	Position	Couplg	BW Lim	Invert	Probe
Chan 1	On	1.000 V	-2.366 V	DC	Off	Off	1:1
Chan 2	Off	100.0mV	0.000 V	DC	Off	Off	1:1
Chan 3	Off	100.0mV	0.000 V	DC	---	---	1:1
Chan 4	Off	100.0mV	0.000 V	DC	---	---	1:1

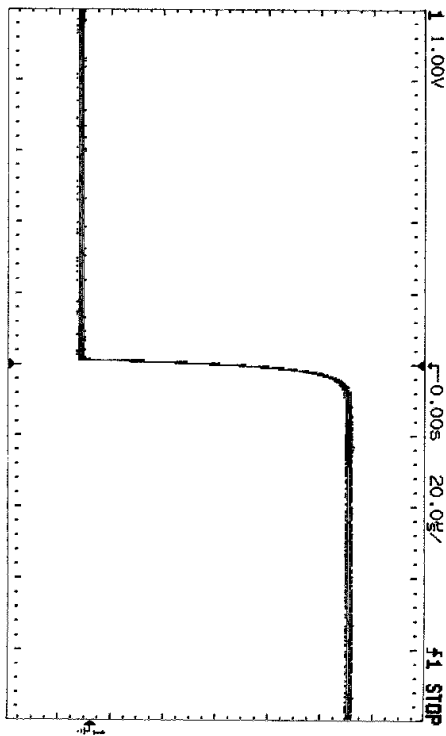
	Mode	Main Time/Div	Main Delay	Time Ref	Delayed Time/Div	Delayed Delay
Horizontal	Normal	20.00us/	0.000 s	Cntr	-----	-----

Trigger Mode	Source	Level	Holdoff	Slope	Couplg	Reject	NoiseRej
AutoLvl	Ch 1	2.366 V	200.0ns	Pos	DC	Off	Off

Display Mode: Normal

### Print or Plot with Factors On (portrait mode)

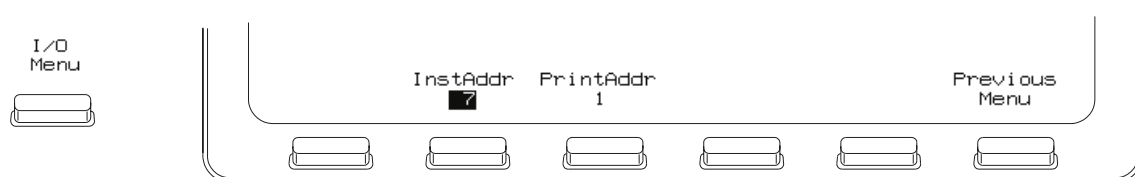


Plot with Factors Off (landscape mode)



## To set HP-IB addresses

- To set addresses on HP-IB modules, press **Print/Utility** , then press the **I/O Menu** softkey.



### Setting HP-IB addresses

This menu allows you to set the instrument and printer/plotter address. Each device on an HP-IB bus must have a unique instrument address between 0 and 30.

#### Instrument address

To set the instrument address, press the **InstAddr** softkey until the correct address is displayed. The address can also be incremented or decremented by turning the knob closest to the **Cursors** key. The default instrument address is 7.

#### Printer Address

To set the printer or plotter address on the HP-IB bus, press the **PrintAddr** softkey until the correct address is displayed. The address can also be incremented or decremented by turning the knob closest to the **Cursors** key. The default printer/plotter address is 1.

### See also

For more information on HP-IB parameters, refer to the Programmer's Guide that came with your HP 54600-Series instrument.

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## To set RS-232 baud rate and handshake

- To set the baud rate and handshake parameters on a module with an RS-232 interface, press **Print/Utility** , then press the **I/O Menu** softkey.



### Setting RS-232-C baud rate and handshake

#### Baud rate

To set the RS-232 baud rate, press the **Baud Rate** softkey until the correct value is displayed. The baud rate can also be incremented or decremented by turning the knob closest to the **Cursors** key. The baud rate can be selected as 1200, 2400, 9600, or 19200. The default baud rate is 9600.

#### Handshake

To set the RS-232 handshake protocol, press the **Handshake** softkey until the correct protocol is displayed.

**Handshake** can be set to **DTR** (data terminal ready) or **XON** (XON-transmit on /XOFF-transmit off.)

#### See also

For more information on RS-232 parameters, refer to the Programmer's Guide that came with your HP 54600-Series instrument.

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