
User's Reference

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For Safety information, Warranties, and Regulatory
information, see the pages behind the index

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HP 54721A Amplifier Plug-In

Amplifier Plug-In for the HP 54720 or HP 54710 Mainframes

The HP 54721A Amplifier is one of several plug-ins for the HP 54720 or HP 54710 mainframes. Use this plug-in when you need the highest sample rate for single-shot applications. Its main features are:

- 1-GHz single-shot capability
- 4-GSa/s sample rate when combined with a mainframe
- 32K memory depth when combined with an A model mainframe, and 128K memory depth when combined with a D model mainframe
- 1.1-GHz bandwidth
- 1-GHz external trigger and 1-GHz internal trigger
- N-type (f) channel and trigger connectors
- Two probe-power connectors for two active probes
- 10-mV/div maximum sensitivity with software expansion down to 1 mV/div.

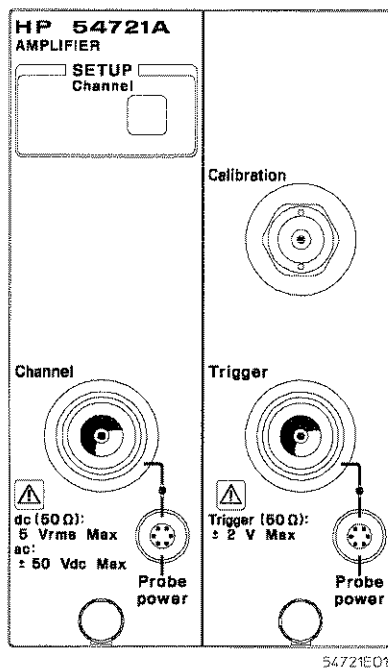
What is the purpose of a plug-in?

The purpose of a plug-in is analog signal conditioning. A plug-in scales the input signal, sets the bandwidth of the system, and allows you to choose input coupling and input impedance. The output of the plug-in is an analog signal that is applied to the ADCs that are on the acquisition boards inside of the mainframe. A plug-in also provides a trigger signal sync to the time base/trigger board inside of the mainframe.

Front panel of the plug-in

The plug-in takes up two mainframe slots. You are trading channel count for increased sample rate, increased record length, and increased single-shot bandwidth.

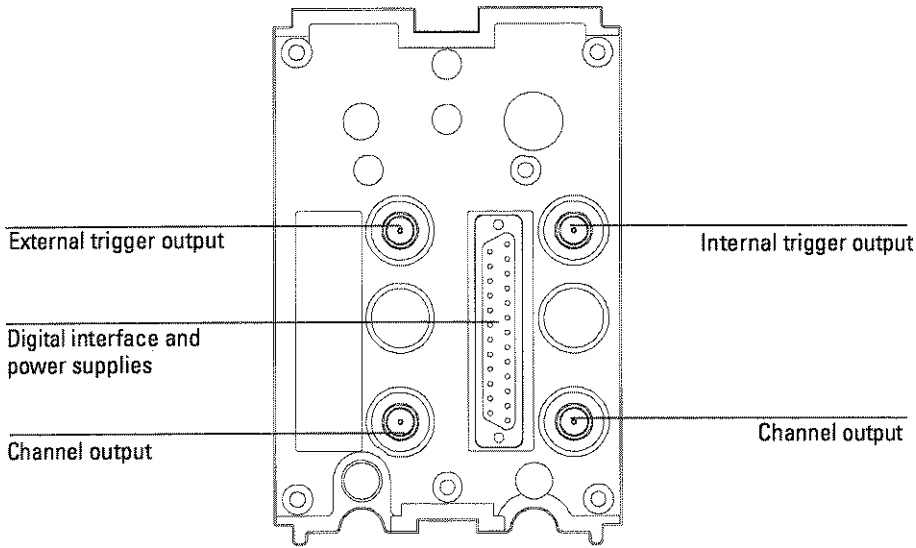
The front panel of the plug-in has a channel input, an external trigger input, and a calibration output signal. The calibration signal has a pulse width of about 500 ps, which is used for performing a best accuracy calibration on the plug-in. The front panel also has two probe power connectors for HP 54700-series probes, and one hardkey that brings up a softkey menu on the display. The softkey menu allows you to access to the channel features of the plug-in.



Rear panel of the plug-in

The rear panel has both internal and external trigger output signals. One digital interface connector that has the control signals for the attenuator ranges, channel setup hardkey, softkey selections, and power supply lines.

You may notice that there are two channel output connectors. The 4-GSa/s sample rate is achieved by interleaving two sampler hybrids inside of the mainframe. There is a channel output for each of the two hybrids, and that is why the plug-in takes up two slots on the mainframe.



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Getting the best performance from the plug-in

To obtain the 1 percent dc accuracy specifications, you must perform a best accuracy calibration. Also, when you move a plug-in from one slot to another slot, you must repeat the best accuracy calibration to retain the 1 percent accuracy specifications. See "Calibrate to Best Accuracy" on page 17.

The best accuracy calibration also performs the sampler interleave calibration, which must be performed for the plug-in to function correctly at 4 GSa/s.

Installing the plug-in

You do not need to turn off the mainframe to install or remove any plug-ins, and you can install a plug-in into any slot on the HP 54720 mainframe. However, on the HP 54710 mainframe only slots 1 and 2 have channel acquisition hardware, but you can still use slots 3 and 4 as trigger sources.

You can install this plug-in in slots 1 and 2, 2 and 3, or 3 and 4.

To make sure that the oscilloscope meets all of the published specifications, there must be a good ground connection from the plug-in to the mainframe. The RF connectors on the rear of the plug-in are spring loaded, so finger tighten the knurled screw on the front panel of the plug-in to make sure that the plug-in is securely seated in the mainframe.

Trigger menu

You may notice a couple of differences in the trigger menu on the mainframe when you are using this plug-in. The external trigger level range for this plug-in is ± 1 V. Also, the trigger source selection follows the slots that the plug-in is installed in. For example, if the plug-in is installed in slots 2 and 3, then the internal trigger source is listed as channel 2, and the external trigger source is listed as trigger 3.

In this book

This book is a User's Reference for the HP 54721A Amplifier Plug-in. The book contains three chapters:

Chapter 1, "Channel Setup Menu," takes you through the channel setup menu and gives you a description of each softkey.

Chapter 2, "Specifications and Characteristics," lists the system specifications and characteristics of this plug-in when it is combined with a mainframe.

Chapter 3, "In Case of Difficulty," gives you a few simple checks that you can make in case the plug-in does not appear to be operating properly.

For HP-IB programming information, refer to the Programmer's Reference supplied with the mainframe, and for service information refer to the Service Guide.

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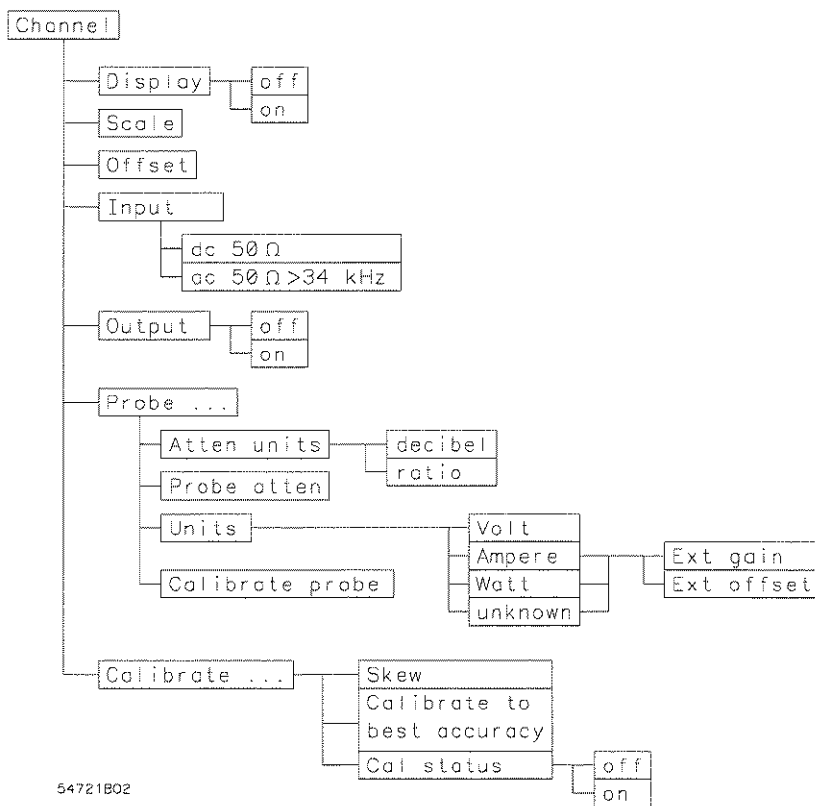
Channel Setup Menu

Channel Setup Menu

At the top of the plug-in is the Channel-Setup hardkey. This hardkey gives you access to the channel menu for the plug-in. The channel menu is a softkey menu that comes up on the right side of the display when you press the Channel-Setup hardkey. You will also notice that there are several types of softkeys available. A description of how each softkey functions is given in the User's Quick Start Guide that was supplied with the mainframe.

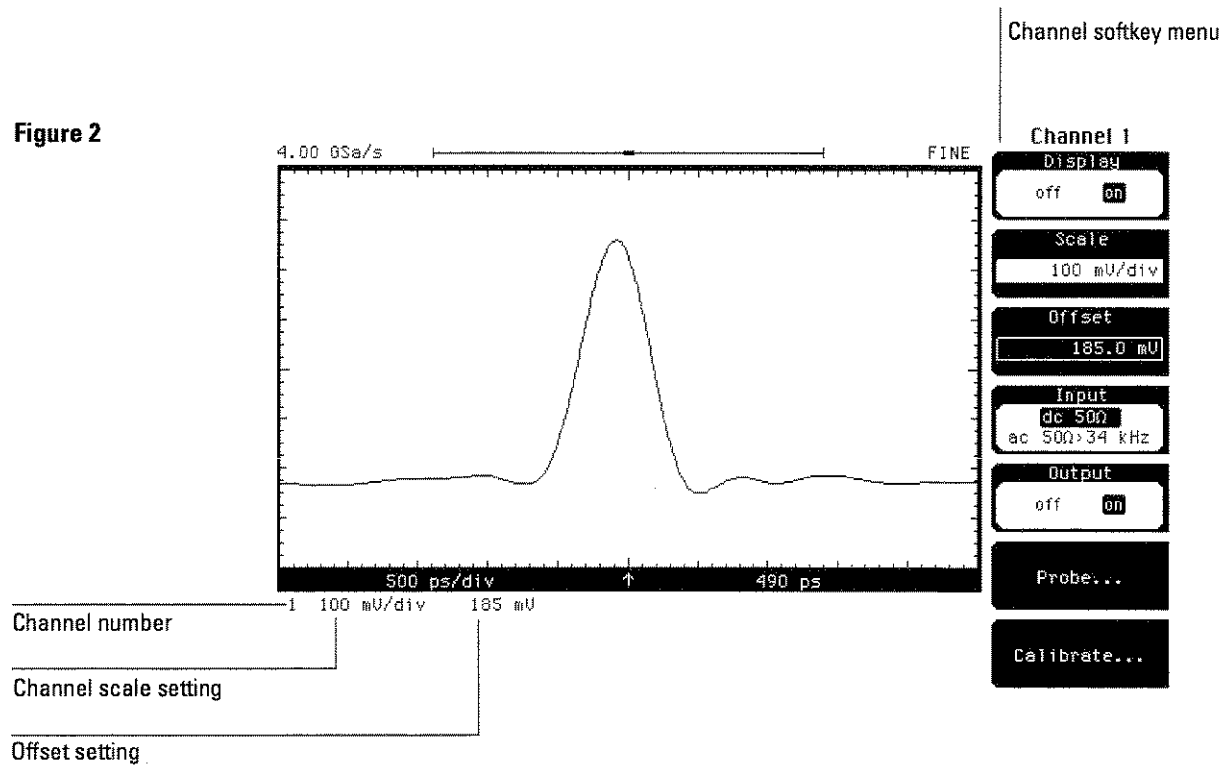
Figure 1 is the menu map of the channel-setup hardkey.

Figure 1



When you press the Channel-Setup hardkey on the plug-in, the softkey menu shown in figure 2 is displayed. This chapter gives you a description of the function of each channel softkey. Some of the softkeys bring up additional menus on the display. A picture of each additional menu is included along with a description of the menu.

Figure 2



Display

Display turns the channel display off and on. When the channel display is on, a waveform is displayed for that channel, unless the offset is adjusted so that the waveform is clipped off the display. Also, the channel number, vertical scaling, and offset are displayed at the bottom left of the waveform area. They stay displayed until the channel is turned off, or until an automatic measurement is performed. The automatic measurement results share the same area of the display as the channel setups.

When the channel display is off, the waveform display for that channel is turned off. Also, acquisition on that channel is stopped, unless it is needed as an operand for waveform math functions, and any pulse parameter measurements are stopped.

Even though the channel display is off, you can still use the plug-in as a trigger source or as a function source in the math menu. However, the oscilloscope will not trigger unless one or more of the other channel displays are turned on, or unless a math function is using one of the channels.

Scale

Scale controls the vertical scaling of the signal. If the fine mode is off, then the knob and arrow keys change the vertical scaling in a 1-2-5 sequence. When the fine mode is on (shift-down arrow), the knob and arrow keys change the vertical scaling in 1-mV increments. You can always use the keypad to enter values in 1-mV increments independent of the fine mode selection. Software expansion is used to obtain the scale values not in the 1-2-5 sequence, and from 1 mV/div to 10 mV/div.

Offset

Offset moves the waveform vertically. It is similar to the position control on analog oscilloscopes. A feature of digital offset is that it is always calibrated. The offset voltage is the voltage at the center of the display, and the range of offset is ± 12 times the full resolution channel scale. You can use the knob, arrow keys, or keypad to change the offset setting.

When an HP 54700-series active probe is used with the plug-in, the offset control adjusts the offset of the hybrid inside the active probe.

Input

You can use the Input softkey to change the input coupling of the plug-in. Use dc 50Ω for connecting to devices use a standard 50Ω transmission line. Use ac 50Ω to remove the dc component from signals, which allows you to use more sensitive scale settings to view an ac signal that is riding on a dc voltage.

Output

You use the Output softkey to turn on and off the front-panel Calibration signal on the plug-in. The calibration signal is used to interleave the samplers during the best accuracy calibration of the plug-in.

You should set the Output softkey to off when you are not using the calibration signal. This reduces the possibility of stray radiation from the calibration signal causing noise or crosstalk on the other channel inputs.

Channel Setup Menu

Probe

Probe

The Probe menu allows you to set up the oscilloscope so that the screen displays the channel scale, offset, and voltage measurements that correspond to the probe.

When you press the Probe softkey, the menu at the left is displayed.

Atten units

Attenuation units lets you pick how you want to represent the probe attenuation factor. Set the attenuation units to decibel for attenuators and to ratio for probes.

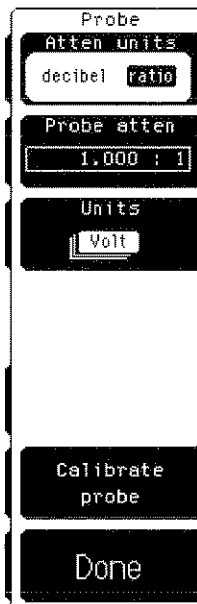
Probe atten

Probe attenuation lets you select a probe attenuation that matches the probe or device connected to the oscilloscope. When the probe attenuation is set correctly, the oscilloscope maintains the current scale factors if possible. All marker values and voltage measurements will reflect the actual voltage at the tip of the probe.

The probe attenuation range is from 0.0001:1 to 1,000,000:1.

When you connect an active probe power connector to the plug-in, the oscilloscope automatically sets the probe attenuation. For all other probes, set the probe attenuation with the knob, arrow keys, keypad, or use the Calibrate probe softkey.

Calibrate Probe in this chapter for information on how to calibrate to the tip of the probe when you are using voltage probes.



See Also



Units

Units lets you select Volt, Ampere, Watt, or unknown as the unit of measure for the channel scale, offset, and vertical measurement values. The unit you select is appended to these numeric values. You would use Volt for voltage probes, Ampere for current probes, Watt for optical-to-electrical (O/E) converters, and unknown when there is no unit of measure or when the unit of measure is not one of the available choices.

Ext gain and Ext offset

When you select Ampere, Watt, or unknown, two additional softkeys are available, external gain and external offset. These two additional softkeys allow you to compensate for a transducer's actual characteristics as compared to its ideal characteristics. For example, you might have an amplified lightwave converter whose ideal characteristics are 300 V/W with 0 V of output offset. But, its actual characteristics are 324 V/W with 1 mV of output offset. Set the external gain to 324 V/W and the external offset to 1 mV.

Example Voltage probes

Because the mainframe's CAL signal is a voltage source, you can let the oscilloscope compensate for the actual characteristics of your probe by letting the oscilloscope calibrate to the tip of the probe. The following steps illustrate how to calibrate a voltage probe to the probe tip.

- 1 Set the **Atten units** softkey to **ratio**.
- 2 Set the **Units** softkey to **Voltage**.
- 3 Connect the probe to the front-panel CAL signal
- 4 Press the **Calibrate Probe** softkey.

The oscilloscope automatically calibrates to the tip of the probe, setting the probe attenuation and compensating for any probe offset.

Channel Setup Menu

Probe

Example Other devices

Because the mainframe's CAL signal is a voltage source, you cannot use it to calibrate to the probe tip when units is set to Ampere, Watt, or unknown. Instead, you set the external gain and external offset to compensate for the actual characteristics of the probe or device. If you do not know the actual characteristics, you can refer to the typical specifications that came with the probe or device. The following steps show you how to do this.

- 1 Set the **Atten units** softkey to **ratio**.
- 2 Set the **Probe atten** softkey to **1:1**.
- 3 Set the **Units** softkey to **Ampere, Watt, or unknown**.
- 4 Set the **Ext gain** softkey to the actual gain characteristics of the probe or device.
- 5 Set the **Ext offset** softkey to the offset that is introduced by the probe or device.

Calibrate probe

Connect a voltage probe from the plug-in to the CAL signal on the mainframe, then press the Calibrate probe softkey. The oscilloscope calibrates to the tip of the probe by setting the probe attenuation to the actual attenuation ratio of the probe. The oscilloscope also automatically compensates for any offset that the probe may introduce.

Calibrate

Skew

Skew changes the horizontal position of a waveform on the display. Skew lets you compensate for differences in cable or probe lengths. It also allows you to place the triggered edge at the center of the display when you are using a power splitter connected between the channel and trigger inputs. Another use for Skew is when you are comparing two waveforms that have a timing difference between them. If you are more interested in comparing the two waveforms than the actual timing difference between them, you can overlay one waveform on top of the other waveform by using Skew.

The range of Skew is about $\pm 100 \mu\text{s}$.

Calibrate to best accuracy

Calibrate to best accuracy allows you to achieve the 1 percent accuracy specifications. A best accuracy calibration is valid for a specific plug-in, in a specific slot, in a specific mainframe. It is valid as long the temperature of the mainframe is within $\pm 5 \text{ }^\circ\text{C}$ of the temperature of when it was last calibrated, the temperature of the mainframe is within $\pm 5 \text{ }^\circ\text{C}$ of when the last best accuracy calibration was done, and the best accuracy calibration was performed within the last 24 hours.

The best accuracy calibration factors are stored in the mainframe's memory. The calibration factors are retained until another best accuracy calibration is performed in this slot.

If you perform another best accuracy calibration on that plug-in in a different slot or mainframe, when you bring the plug-in back into the original slot, and as long as another best accuracy calibration was not performed in that slot, the original best accuracy calibration factors are retained.

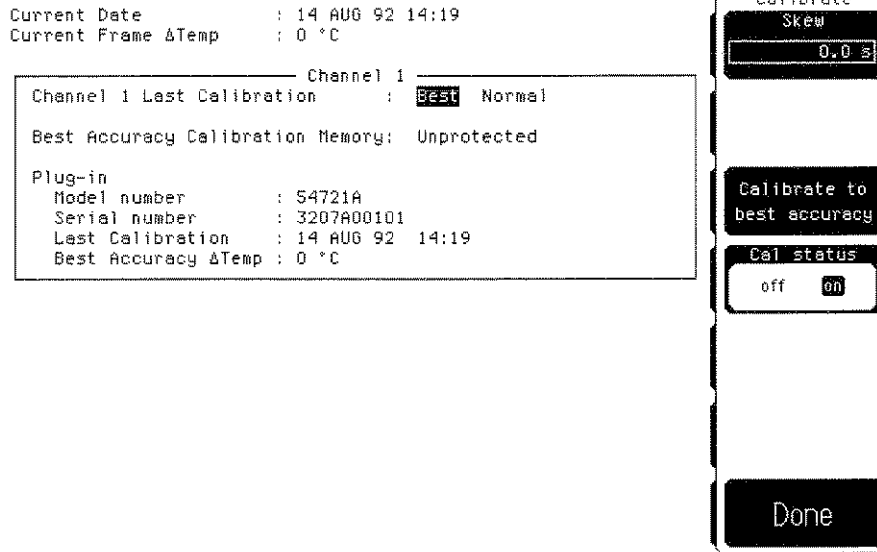


Channel Setup Menu
Calibrate

Cal status

Pressing the Cal status softkey brings up the display in figure 3.

Figure 3



Current Date This is the current date and time. You can compare this to the "Last Calibration" time. That way you will know how long it has been since the last best accuracy calibration or normal plug-in calibration was performed.

Current Frame Δ Temp This is the temperature change, of the inside of the instrument, since the last mainframe calibration was performed. A positive number indicates how many degrees warmer the mainframe is now compared to the temperature of the mainframe at the last mainframe calibration. A best accuracy calibration is valid as long as the mainframe temperature Δ is within ± 5 °C of the temperature at which it was calibrated. If the temperature Δ is more than ± 5 °C of the temperature at which it was calibrated, you must perform a mainframe calibration before performing a best accuracy calibration to ensure that the best accuracy calibration is valid.

Channel 1 Last Calibration The oscilloscope displays Best, Normal, or Uncalibrated, depending on what calibration was last performed on the plug-in.

Best indicates that a best accuracy calibration was performed on the plug-in, and that the best accuracy calibration factors are retained in the mainframe's memory. For the best accuracy to remain valid, the internal temperature of the mainframe needs to be ± 5 °C of when the last best accuracy calibration was performed, and no more than 24 hours has elapsed.

Normal indicates that the plug-in is not calibrated for best accuracy. Either the best accuracy calibration factors were cleared from the mainframe's memory, or a best accuracy calibration has not yet been performed in this slot. But normal does indicate that the normal plug-in calibration is still valid for this plug-in, and all you have to do to gain back the 1 percent dc accuracy specifications is to perform a best accuracy calibration.

Uncalibrated means that the normal plug-in calibration is invalid. You must calibrate the plug-in to normal accuracy before performing a best accuracy calibration. To calibrate the plug-in, see the Service Guide that is supplied with the plug-in.

Channel Setup Menu
Calibrate

Best accuracy Calibration Memory The oscilloscope displays either Protected or Unprotected. Protected means that the mainframe memory is write protected, so you cannot perform a best accuracy calibration. If you try to perform a best accuracy calibration when the memory is protected, the message "Best accuracy calibration memory protected" is displayed at the top of the screen. You must set the best cal switch on the rear panel of the mainframe to Unprotected before a best accuracy calibration is allowed.

Plug-in This lists the model number, serial number, date and time of the plug-in's last calibration, and the temperature Δ from the mainframe's temperature when the last best accuracy calibration was performed. If this temperature Δ is more than ± 5 °C, then you must perform a new best accuracy calibration to make sure that your measurement results are to the 1 percent dc accuracy specifications.

**Specifications and
Characteristics**

Specifications

This chapter lists the system specifications and characteristics of the HP 54721A plug-in when it is combined with either the HP 54720 or HP 54710 mainframes. The specifications and characteristics for the mainframe are in the *HP 54720 and HP 54710 Oscilloscope User's Reference*.

Specifications

The following are specifications used to test the HP 54721A plug-in. Specifications are valid after a 20 minute warm-up period. See the HP 54701A Active Probe service guide for complete probe specifications.

Channel

Analog Bandwidth (-3 dB) dc to >1.1 GHz

Bandwidth (-3 dB) with HP 54701A Active probe dc to >1 GHz

dc Voltage Measurement Accuracy (Best Accuracy calibration only)¹

Single Marker ±(gain accuracy + offset accuracy)

Dual Marker ±[gain accuracy + (2 × resolution)]

Input Resistance 50 Ω ±1.5%

Internal Trigger

Trigger Sensitivity²

High Sensitivity 0.1 div at 100 MHz; 0.3 div at 1 GHz

Normal Sensitivity 0.5 div at 100 MHz; 1.5 div at 1 GHz

Noise Reject 1 div at 100 MHz; 3.0 div at 1 GHz

Minimum Pulse Width at Normal Sensitivity² ≤500 ps at ≥1 div'

External Trigger

Trigger Sensitivity

High Sensitivity 6 mV_{p-p} at 100 MHz; 20 mV_{p-p} at 1 GHz

Normal Sensitivity 30 mV_{p-p} at 100 MHz; 90 mV_{p-p} at 1 GHz

Noise Reject 60 mV_{p-p} at 100 MHz; 150 mV_{p-p} at 1 GHz

Minimum Pulse Width at Normal Sensitivity ≤500 ps at ≥60 mV_{p-p}

**Interleave Cal
Output**

Pulse Width (FWHM) 475 ps

Amplitude 550 mV_{p-p} ±150 mV

Frequency 152.1 MHz ±0.05%

1) Best Accuracy Cal specifications apply for 24 hours to plug-ins that are calibrated with Best Accuracy Cal and remain in the same slot. Otherwise, normal accuracy characteristics apply. Best Accuracy Cal specifications are valid within 5°C of the best accuracy calibration temperature while also within 5°C of the mainframe calibration temperature.

2) Characteristics apply to full resolution channel scales. Use the next lower full-resolution sensitivity for intermediate channel scale settings.

Characteristics

The following characteristics are typical for the HP 54721A plug-in. See the *HP 54701A Active Probe Service Guide* for complete probe characteristics.

Channel

Number of Channels 1

Number of Mainframe Slots 2

Max Sample Rate to Analog Bandwidth 3.64:1

Digital Bandwidth Limit dc to (sample rate/20) in the real-time mode only

Rise Time 318 ps

Channel Scale (8 divisions full screen)¹ 1 mV/div to 1 V/div

Channel Scale with HP 54701A Active Probe² 10 mV/div to 10 V/div

Full Resolution Channel Scales 10, 20, 50, 100, 200, 500, 1000 mV/div

Vertical Resolution

Real Time 8 bits (0.4%), increasing to 8.6 bits (0.1%) with digital bandwidth limit turned on.

Equivalent Time 8 bits (0.4%). This can be improved, by averaging, to >12 bits.

Specifications and Characteristics
Characteristics

dc Gain Accuracy³

Normal Accuracy $\pm 3\%$ of full screen

Best Accuracy Cal $\pm 1\%$ of full screen

With HP 54701A Active Probe⁴ $\pm 2\%$ of full screen

Offset Accuracy³

Normal Accuracy $\pm(3\%$ of offset setting + 3% of full screen)

Best Accuracy Cal $\pm(0.5\%$ of offset setting + 1% of full screen)

With HP 54701A Active Probe⁴ $\pm(0.5\%$ of offset setting + 2% of full screen)

dc Offset Range ± 12 times the full resolution channel scale

RMS Noise (Max Sensitivity) $< 300 \mu\text{V}$

Input Connector N-type (f) (Previous HP 54721A plug-ins with serial prefix 3210A shipped with a BNC input connector.)

Input Coupling (cutoff Frequency) dc, ac (34kHz)

Maximum Safe Input Voltage

dc 5 Vrms (+27 dBm)

ac $\pm 50 \text{ Vdc}$ $\pm 5 \text{ Vac}$, rms

Probe Power Yes

Time base

Maximum Sampling Rate

Real Time 4 GSa/s

Equivalent Time⁵ 500 MSa/s

Record Length (per plug-in slot)⁶ 16 to 32,768 points in the A model mainframes, and up to 64,536 points in the D model mainframes

Max Record Duration at Max Sample Rate

A model mainframes 8.192 μ s

D model mainframes 32.768 μ s

Internal Trigger

RMS Jitter <6 ps \pm 0.005% of delay setting

Trigger Level Range \pm 1.5 full resolution screen diameters from center screen

External Trigger

Input Resistance 50 Ω

Input Connector N-type (f) (Previous HP 54721A plug-ins with serial prefix 3210A shipped with a BNC input connector.)

RMS Jitter <6 ps \pm 0.005% of delay setting

Trigger Level Range \pm 1 V

Max Safe Input Voltage \pm 1.5 V

Probe Power Yes

- 1) Adjustable in 1 mV/div steps up to 1 V/div and 10 mV/div steps above 1 V/div
- 2) The probe attenuation factor is automatically set to 10:1 when the probe's power cable is connected to the plug-in. The plug-in input coupling is automatically set to dc and 50 Ω .
- 3) Characteristics apply to full resolution channel scales. Use the next lower full-resolution sensitivity for intermediate channel scale settings.
- 4) These characteristics are valid after a Best Accuracy Cal and Probe Cal.
- 5) Multiple 500 MSa/s acquisitions are time-correlated into a single record with 1-ps resolution, yielding an effective sampling rate of 1 terasample/second.
- 6) All data points that fall within the waveform display area's time window are plotted to the screen.

Specifications and Characteristics
General Characteristics

General Characteristics

**Environmental
Conditions**

These general characteristics apply to the HP 54721A plug-in. The instrument meets Hewlett-Packard's environmental specifications (section 750) for class B-1 products with exceptions as described for temperature and condensation. Contact your local HP field engineer for complete details.

Temperature

Operating 10 °C to +40 °C (50 °F to +104 °F)

Nonoperating -40 °C to +70 °C (-40°F to +158 °F)

Humidity

Operating up to 95% relative humidity (noncondensing) at +40 °C (+104 °F)

Nonoperating up to 90% relative humidity at +65 °C (+149 °F)

Altitude

Operating up to 4,600 meters (15,000 ft.)

Nonoperating up to 15,300 meters (50,000 ft.).

Vibration

Operating Random vibration 5 to 500 Hz, 10 minutes per axis, 0.3 grms

Non-operating Random vibration 5 to 500 Hz, 10 minute per axis, 2.41 grms; Resonant search 5 to 500 Hz swept sine, 1 Octave/minute sweep rate, (0.75g), 5 minute resonant dwell at 4 resonances per axis.

**Power
Requirements**

Supplied by mainframe.

Weight

Net approximately 1.4 kg (3.0 lb.)

Shipping approximately 2.3 kg (5.0 lb.)

3

In Case of Difficulty

In Case of Difficulty

This chapter gives you a few helpful hints in case you are experiencing difficulty in getting your plug-in to operate. The simple check steps in this chapter are intended for you to perform. For complete service information, refer to the Service Guide that was supplied with the plug-in.

If the mainframe does not power up

- Make sure that the mainframe is attached to a power source.
- Make sure that the power switch on the mainframe is set to On, and that the rear-panel line switch is set to On.
- Remove the plug-in to see if the mainframe will power up without it.

If the mainframe still does not power up, refer to the Service Guide that was supplied with the mainframe, or return the mainframe to your service department.

If the plug-in does not operate correctly

- Make sure that the plug-in is seated in the slot, and that the knurled screw at the bottom of the plug-in is finger-tight.
- Press the **Run** key to make sure the oscilloscope is ready to acquire data.
- Set the trigger to auto sweep.
 - 1 Press the **Trigger** key.
 - 2 Set the **Sweep** softkey to **auto**.
- Make sure that the channel **Display** softkey is set to **On**.
 - 1 Press the **Channel** key on the plug-in.
 - 2 Set the **Display** softkey to **On**.
- Make sure the channel offset is adjusted so the waveform is not clipped off the display.
- If you are using the plug-in as a trigger source only, make sure at least one other channel is turned on.

If all the channels are turned off, the mainframe will not trigger.
- Does the mainframe identify the plug-in?
 - 1 Press the **Utility** key.
 - 2 Press the **System config...** softkey.

The calibration status of the plug-ins is listed near the bottom of the display, in the box entitled "Plug-ins." If the model number of the plug-in is listed next to the appropriate slot number, then the mainframe has identified the plug-in. If all of the above steps check out okay, and the plug-in still does not operate correctly, then the problem is beyond the scope of this book. Refer to the Service Guide or return the plug-in to your service department.

If "~known" is displayed instead of the model number of the plug-in, then remove and reinsert the plug-in in the same slot. If "~known" is still displayed, then the memory contents of the plug-in are corrupt. Refer to the Service Guide or contact your service department.

Error messages

The following five error messages are for the plug-in. Typically, the error messages indicate there is a problem with either the plug-in or the mainframe. This section explains what the messages mean and offers a few suggestions that might help resolve the error condition. If the suggestions do not eliminate the error message, then additional troubleshooting is required that is beyond the scope of this book. Refer to the Service Guide that is supplied with the plug-in and the mainframe for troubleshooting information.

Additional error messages are listed in the User's Reference for the mainframe.

Error message

Memory error occurred in plug-in __ : Try reinstalling plug-in

The mainframe could not correctly read the contents of the memory in the plug-in.

- Remove and reinstall the plug-in.

Each time a plug-in is installed, the mainframe rereads the plug-in's memory.

- To make sure that the plug-in is seated correctly, finger tighten the knurled screw at the bottom of the plug-in.
- Install the plug-in in a different slot in the mainframe.

Error message

Busy timeout occurred with plug-in __: Try reinstalling plug-in

The mainframe is having trouble communicating with the plug-in. You want to make sure that there is a good connection between the mainframe and the plug-in.

- Remove and reinstall the plug-in into the mainframe.
- To make sure that the plug-in is seated correctly, finger-tighten the knurled screw at the bottom of the plug-in.
- Install the plug-in in a different slot in the mainframe.

Error message

Communication failure exists at slot __. Service is required

An illegal hardware state is detected at the mainframe to plug-in interface of the specified slot.

- If the slot is empty, then there is a mainframe hardware problem. Refer to the Service Guide for the mainframe.
- If a plug-in is installed in the slot, then there is a plug-in hardware problem. Refer to the Service Guide for the plug-in.

Error message

ID error occurred in plug-in __: Service is required

The information read from the plug-in's memory does not match the hardware in the plug-in. This can be caused by a communication problem between the mainframe and the plug-in. You want to make sure that there is a good connection between the mainframe and the plug-in.

- Remove and reinstall the plug-in into the mainframe.
- To make sure that the plug-in is seated correctly, finger-tighten the knurled screw at the bottom of the plug-in.

In Case of Difficulty
Error messages

Error message

Plug-in is not supported __: System firmware upgrade is needed

The system firmware in your mainframe does not support this plug-in. To upgrade your system firmware, contact you nearest Hewlett-Packard Sales Office, use the software update request form that is in the system firmware, or use the copy of this form that is in the User's Reference for the mainframe.

To print out the firmware update request form, follow these steps.

- 1 Connect a printer to the oscilloscope
- 2 Press the blue shift key on the keypad, then press the Setup print key (printed in blue above the Print key).
- 3 Press the **Print format** softkey. Use the knob, arrow keys, or softkeys to select the correct printer, then press the **Enter** softkey.
- 4 Press the **Destination** softkey. Then, select the correct destination for your printer.

If the destination is HP-IB, make sure you select the correct HP-IB address that matches your printer.

If you are unsure what the HP-IB address of the printer is, refer to the manual that was supplied with the printer.

- 5 Press the Utility key.
- 6 Press the **Firmware support...** softkey.
- 7 Press the **Firmware update request** softkey.

Glossary

Atten units (attenuation units)
Lets you set the probe attenuation units to either decibel or ratio.

Calibrate probe Automatically calibrates voltage probes to their tip so the oscilloscope takes into account the actual voltage attenuation factor of the probe and any offset introduced by the probe.

Calibrate to best accuracy
When the plug-in is calibrated to best accuracy, you obtain the 1 percent dc accuracy specifications.

Calibration status Displays details on the calibration status of the plug-in.

Decibel Used for setting the probe attenuation when you are using an external attenuator instead of a voltage probe.

Display (channel) Turns the channel display off and on.

Offset Moves the waveform vertically on the display.

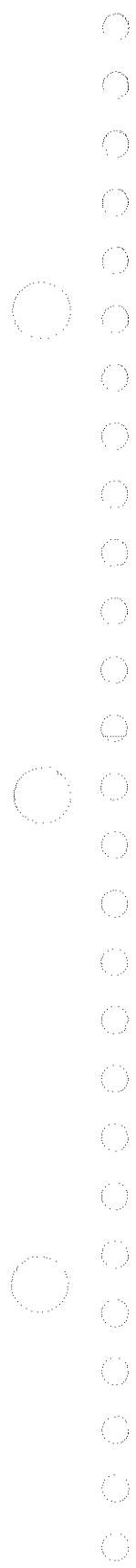
Probe Atten (probe attenuation)
Allows you to set the probe-attenuation factor from 0.0001:1 to 1,000,000:1.

Ratio Used for setting the probe attenuation on voltage probes where the division factor is listed as a ratio.

Scale (channel scale) Scales the input signal with an internal attenuator. Software expansion is used on the scale settings between the attenuator ranges.

Skew Lets you compensate for differences in cable or probe lengths. You can also use Skew to overlay waveforms.

Units Lets you select Volt, Ampere, Watt, or unknown as the unit of measure for the channel scale, offset, and vertical measurement values.



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