HP 75000 SERIES B and C

Four-Channel Isolated Fixed Filter and Amplifier Signal Conditioning Plug-on HP E1514A and HP E1515A

User's Manual

Enclosed is the User's Manual for the HP E1514A and HP E1515A Signal Conditioning Plug-ons. Insert this manual in your HP E1413/E1313 or HP E1415 manual behind the "Signal Conditioning Plug-ons" divider.

HEWLETT® PACKARD

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HP E1514A and HP E1515A Four-Channel Isolated Fixed Filter and Amplifier Signal Conditioning Plug-on

Introduction

The HP E1514 and HP E1515 are Signal Conditioning Plug-ons that each provide four channels of galvanically isolated, fixed-gain amplifiers with fixed bandwidth filtering. The difference between the two SCPs is their filter frequency.

Features Set

- True galvanic isolation. DC isolation impedance is at least 10^8 Ohms at 0-55°C and 65% relative humidity
- Operates with the 16 volt full-scale A/D range only. The gain of 1 amplification provides 16-bit resolution of differential input voltages from 0 to ±16V
- Differential input impedance is 1 Megohm to channel common
- Common mode input up to ±60 volts DC or 42 volts peak AC
- HP E1514A bandwidth is 10 Hz, HP E1515A bandwidth is 100Hz.
- Open transducer detection is provided.

About this Manual

This manual shows you how your program can read the SCP's parameters using SCPI commands, and explains the capabilities of this SCP. Finally, it covers specifications for this SCP. The contents of this manual are:

Installation

Installation for this Plug-on is common to several others and is covered in Chapters 1 and 2 of your HP E1413/E1313 or HP E1415 manual.

Connecting To The Terminal Module

The SCP connections for the Terminal Modules are shown on the stick-on labels that came with the SCP. Use the appropriate label for the type of Terminal Module you have. The connections and appropriate stickers are as follows:

- For HP E1413C and above as well as the HP E1415A Terminal Modules, use the E1514-84304 labels. The connections are shown in Figure 1.
- For HP E1313 Terminal Modules, use the E1514-84303 labels. The connections are shown in Figures 2 and 3.
- For HP E1413B and below Terminal Modules, see the connections shown in Figure 4.

The HP E1514/15's Connection Formula

Even numbered H and L terminals on the Terminal Module connect to the HP E1514/15's High and Low inputs . The next higher odd numbered L terminal becomes the HP E1514/15's C input. The C input is the isolated Common terminal and needs to be driven by the test article's common-mode noise voltage (see Figure 6). G terminals on the Terminal module are not used for the HP E1514/15 Isolated Input SCPs.

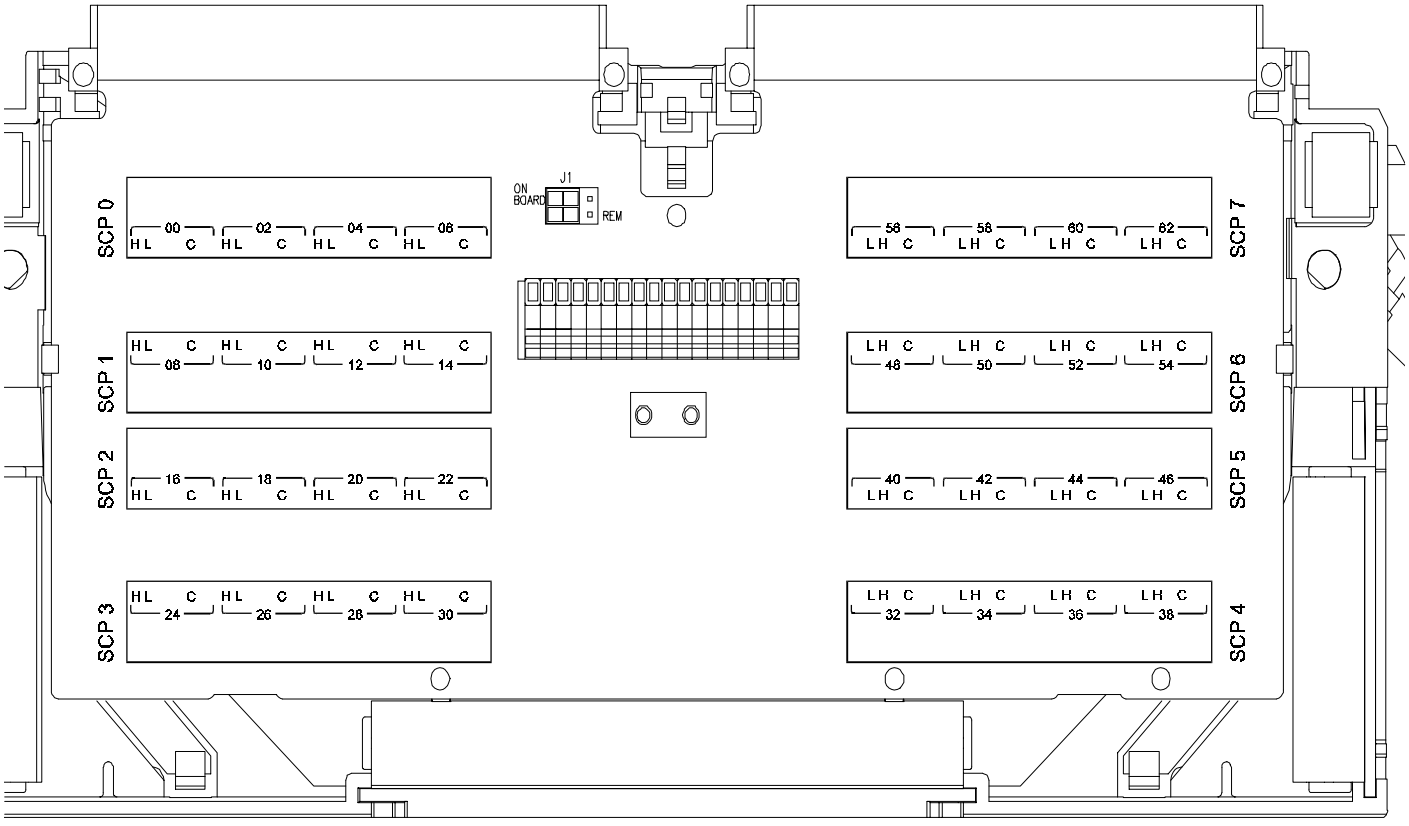

Figure 1 HP E1514/15 C-Size Terminal Module Connections

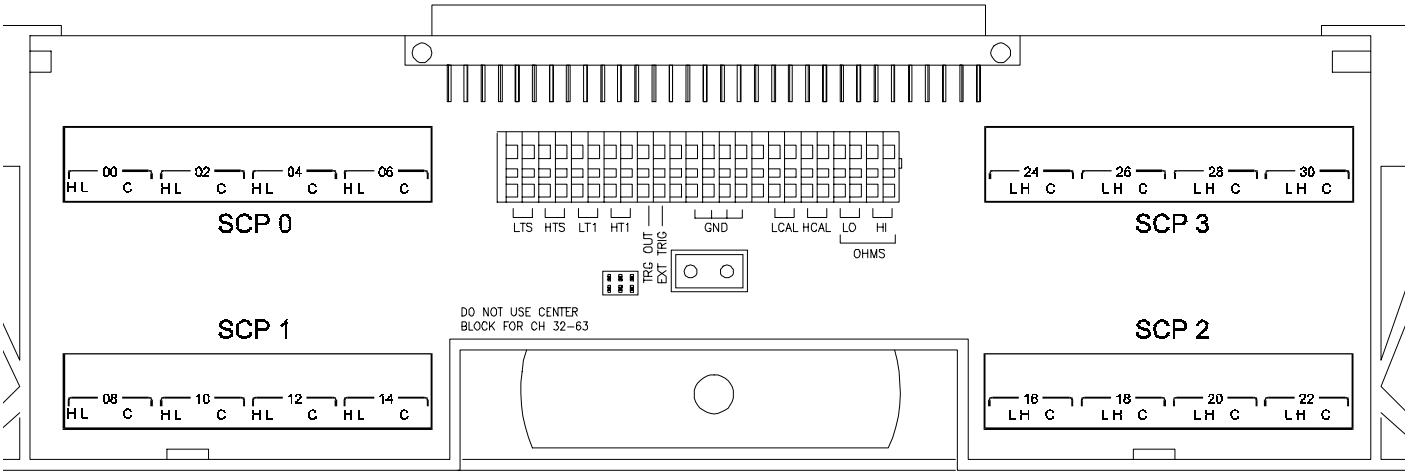

Figure 2 HP E1514/15 B-size Terminal Module (Ch 00-31)

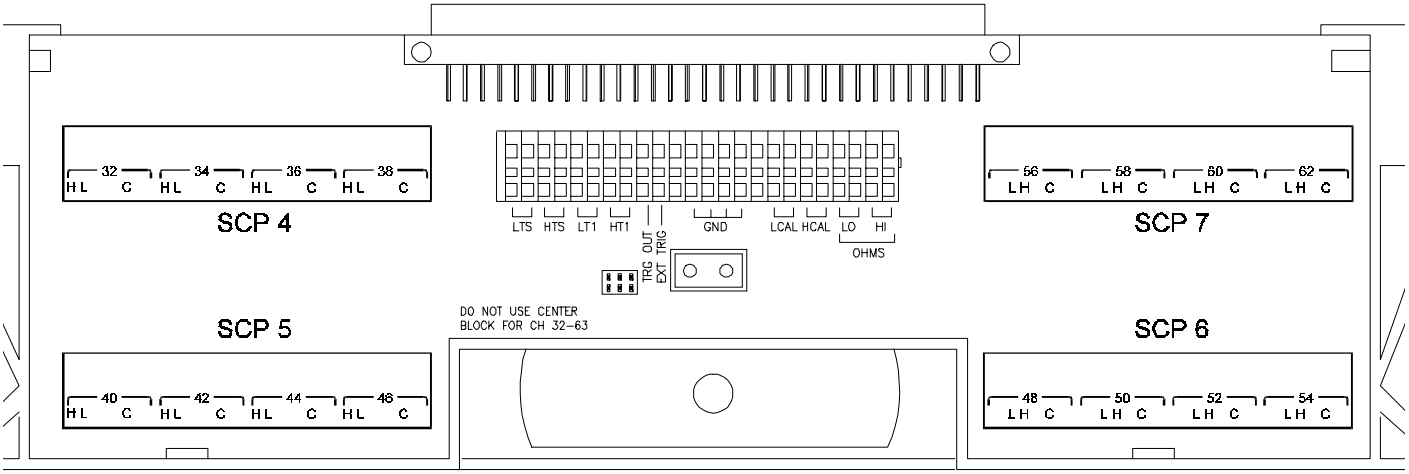

Figure 3 HP E1514/15 B-size Terminal Module (Ch 32-63)

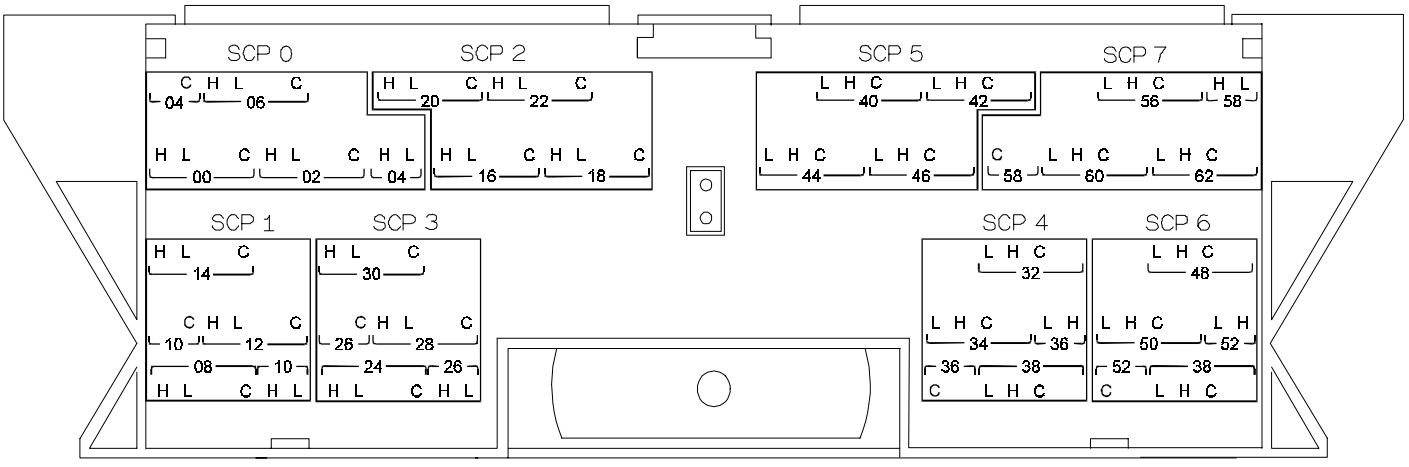

Figure 4 HP E1514/15 Connections with HP E1413B

Recommended Measurement Connections

The following illustration shows the recommended method of wiring to the HP E1514/15.

Note To provide the specified common mode noise rejection (CMR), the isolated Common terminal (Cnn) must be driven by the common mode voltage source. This is shown in Figure 5.

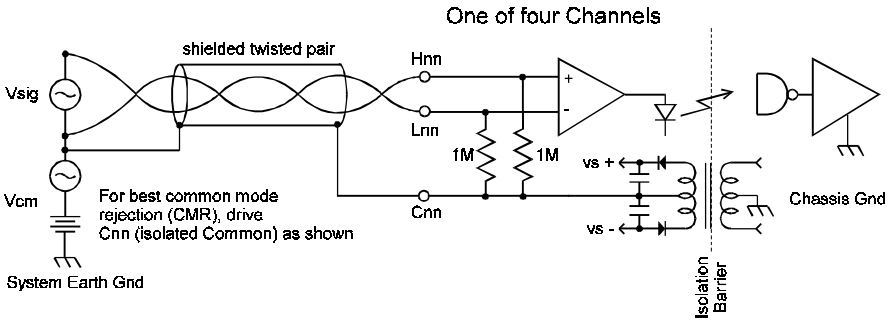

Figure 5 Wiring to the HP E1514/15 Isolated SCP

Input Voltage Limits

Figure 6 shows the normal mode and common mode voltage limitations.

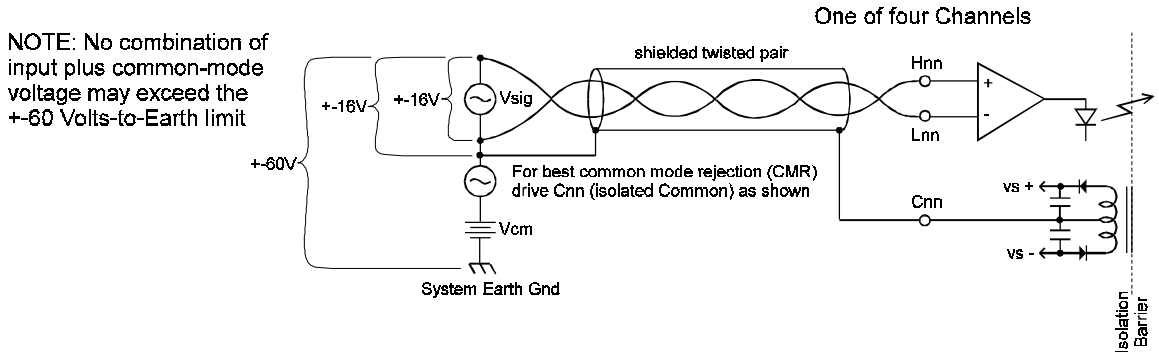

Figure 6 Maximum Operating Voltages

Programming With SCPI Commands

The SCPI commands shown here are covered in Chapters 3 and 5 of your HP E1413/E1313 manual. This section will relate those commands to the parameter values which are specific to this Plug-on.

Fixed Range Only!

This isolation SCP must be used on the 16 volt A/D range only. Any readings made through this SCP while not on the 16 volt A/D range will return an overload value ±9.9E37. This means that AUTO range must not be used. When you set the channel's measurement function using one of the [SENSe:]FUNCtion:… commands, always specify the 16 volt range.

An example:

```
SENS:FUNC:VOLT 16,(@108,110,112,114)   volt through all 4 HP E1514
                                       channels at SCP position 1
```

Since the HP E1514/15 has a gain of 1, and must be used on the 16 volt A/D range, it follows that the usable input range is zero to ±16 volts with 16-bit resolution.

Checking the ID of the SCP

To verify the SCP type(s) installed on the HP E1413/E1313 use the SYSTem:CTYPe? (@<*channel*>) command.

- The *channel* parameter specifies a single channel in the channel range covered by the SCP of interest. The first channel number for each of the eight SCP positions are; 0,8,16,24,32,40,48, and 56.

The value returned for this SCP is:

```
HEWLETT-PACKARD,E1514 4-Channel Isolated Fixed Filter SCP,0,0
```

or

```
HEWLETT-PACKARD,E1515 4-Channel Isolated Fixed Filter SCP,0,0
```

To determine the type of SCP installed on channels 0 through 7 send

```
SYST:CTYP?  (@100)                 query SCP type @ ch 0
enter statement here
```

Querying the Filter Cutoff Frequency

While the the HP E1514/15 does not provide programmable cutoff frequency the filter frequency can be queried. The response to this query will always be 10 for the HP E1514, and 100 for the HP E1515. To query any channel for its cutoff frequency use the INPut:FILTer[:LPASs]:FREQuency? (@<*channel*>) command. The INP:FILT:FREQ? command returns the numeric cutoff value currently set for the channel specified.

- The *channel* parameter must specify a single channel.

To query the cutoff frequency of channel 6 send

```
INP:FILT:FREQ?  (@106)                    query channel 6
enter statement here
```

Querying the Filter State

While the HP E1514/15 does not allow controlling whether the filters are enabled or disabled, this state can be queried. The response to this query will always be 1. To query any channel to determine if it is enabled or disabled use the INPut:FILTer[:LPASs][:STATe]? (@<*channel*>) command. The INP:FILT? command returns a 0 if the channel is OFF or a 1 if the channel is ON.

- The *channel* parameter must specify a single channel.

To query the filter state of channel 2 send

```
INP:FILT?  (@102)                         query channel 2
enter statement here
```

Querying the Channel Gain

While the HP E1514/15's amplifiers have fixed gain, the channel gain can be queried. The response to this query will always be 1. To query any channel to determine its gain setting use the INPut:GAIN? (@<*channel*>) command. The INP:GAIN? command returns the current gain value for the specified channel.

- The channel parameter must specify a single channel.

To query the gain setting of channel 8 send

```
INP:GAIN?  (@106)                         query channel 6
enter statement here
```

HP E1413/E1313 Register Based Programming

The register-based commands shown here are covered in Appendix D of the HP E1413/E1313 manual. You should read that section first to become familiar with accessing registers and executing Register-Based Commands. This section will relate those commands to the parameter values which are specific to this Plug-on.

When Register Programming an SCP most communication is through the Signal Conditioning Bus. For that you will use the Register Commands:

SCBWRITE <*regaddr*> <*regvalue*>

and

SCBREAD? <*regaddr*>

HP E1514/15 Register Map

SCP Model	Read (returned value)	SCP Register	<*regaddr*> Value
HP E1514 only	SCP ID (8282_{16})	Whole SCP Reg 0	$00ppp000000_2$
HP E1515 only	SCP ID (8383_{16})	Whole SCP Reg 0	$00ppp000000_2$
Both	SCP Gain Scale ($XXX2_{16}$)	Whole SCP Reg 1	$00ppp000001_2$
Both	Channel Gain ($XXX0_{16}$=64)	Channel Reg 1	$01pppccc001_2$

XX=don't care

ppp=Plug-on #
ccc=SCP chan. #

Checking ID of SCP

To query an SCP for its ID value, write the following value to Parameter Register 1:

($SCP\ number$) $\times\ 40_{16}$

Then write the opcode for SCBREAD? (0800_{16}) to the Command Register. The ID value will be returned to the Query Response Register.

Checking the SCP's Gain Scale

To read the SCP scale, write the following SCP channel address to Parameter Register 1:

($SCP\ number$) $\times\ 40_{16} + 1_{16}$

Then write the opcode for SCBREAD? (0800_{16}) to the Command Register. The channel gain value will be returned to the Query Response Register.

Checking a Channel's Gain

To read the gain for an SCP channel, write the following SCP channel address to Parameter Register 1:

200_{16} + ($SCP\ number$) $\times\ 40_{16}$ + ($SCP\ channel\ number$) $\times\ 8_{16} + 1_{16}$

Then write the opcode for SCBREAD? (0800_{16}) to the Command Register. The channel gain value will be returned to the Query Response Register.

Specifications

These specifications for the HP E1514/15 reflect the combined performance of the HP E1413/E1313 or HP E1415 and the HP E1514/15 Signal Conditioning Plug-on. These specifications are not to be added to those presented in the HP E1413/E1313 or HP E1415 User's Manual.

General Specifications

Measurement ranges		
DC Volts	0 - ±16V FS	
Maximum input voltage (Normal mode plus common mode)		Operating: < ±60 VDC, 42V peak AC
Maximum common mode voltage		Operating: < ±60 VDC 42V peak AC
Normal mode rejection	HP E1514A	@ 10Hz -6dB, @ 60Hz >-25dB
	HP E1515A	@ 100Hz -6dB, @ 200Hz >-15dB
Common mode rejection	HP E1514A	DC @ 60V -105dB DC - 1KHz @ 42V peak -100dB DC - 10KHz @ 10V peak -80dB DC - 100KHz @ 2V peak -65dB
	HP E1515A	DC @ 60V -105dB DC - 1KHz @ 42V peak -100dB DC - 10KHz @ 10V peak -80dB DC - 100KHz @ 2V peak -65dB
Input impedance		1 Mohm ±2% (each differential input to isolated Common)
Maximum tare cal offset		3.2213 Volts

Measurement accuracy
DC Volts

(90 days) 23°C ±1°C (with *CAL? done after 1 hr warm up and CAL:ZERO? within 5 min.). If autoranging is ON, add ±.02% FS to accuracy specifications. **For E1313, multiply Noise Spec. by 1.4.**

	Range ±V FS	Linearity % of reading	Offset Error µV	Noise mV 3 sigma	Noise mV* 3 sigma
HP E1514A	16	0.015	976	2.1	1.7
HP E1515A	16	0.015	976	2.1	1.7

* HP E1413/1313 [SENS:]FILT:LPAS:STATE ON (max scan rate - 100 rdgs/sec/channel)

Temperature Coefficients: Gain; 10ppm/°C. Offset; (0 - 40°C) .14µV/°C, (40 - 55°C) .8µV/°C