



Eight-Channel Current Source Signal Conditioning Plug-on VT1505A

User's Manual

The VT1505A manual also applies to Agilent/HP E1413Bs as Agilent/HP E1413 Option 15.

Enclosed is the User's Manual for the VT1505A Signal Conditioning Plug-on. Insert this manual in your VT1413C or Agilent/HP E1313 manual behind the "Signal Conditioning Plug-ons" divider.



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VT1505A Current Source Signal Conditioning Plug-on

Introduction

The VT1505A is a Signal Conditioning Plug-on that provides eight current sources programmable to one of two current levels. Each current source can be programmed to provide either 30 μA , or 488 μA . Also provided is input over-voltage detection on each channel.

About this Manual

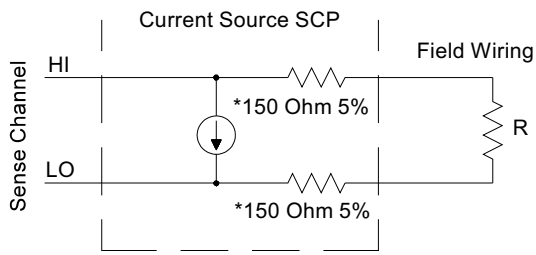
This manual shows you how to control the Signal Conditioning Plug-on (SCP) using SCPI commands as well as Register-Based commands, and explains the capabilities of this SCP. Finally, it covers specifications for this SCP. Installation for this Plug-on is common to several others and is covered in Chapter 1 your VT1413C or Agilent/HP E1313 manual. The contents of this manual are:

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Field Wiring

The VT1505A SCP is used to supply excitation current to resistance and resistance-temperature measurements. Figure 1 shows the general method of connection for both 4-wire and 2-wire connections.

Two-Wire Measurement (not recommended**)



* Because of the 150 Ohm resistor in series with each of the current source outputs, Two-Wire resistance and temperature measurements will have a 300 Ohm offset.

** The current source HI terminal is the negative voltage node.
The current source LO terminal is the positive voltage node.

Four-Wire Measurement

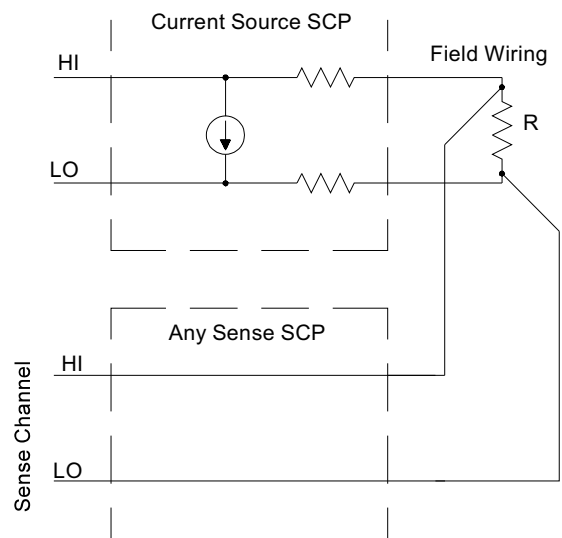


Figure 1 Wiring for Resistance and Temperature

Connecting To The Terminal Module

This section shows how to make connections 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 VT1413C and above Terminal Modules, use stickers for VT1505A SCPs. The connections are shown in Figure 2.

For Agilent/HP E1313 Terminal Modules, use stickers for VT1505A SCPs. The connections are shown in Figures 3 and 4.

For Agilent/HP E1413B and below Terminal Modules, use stickers for Agilent/HP E1413 Option 15 SCPs. The connections are shown in Figure 5.

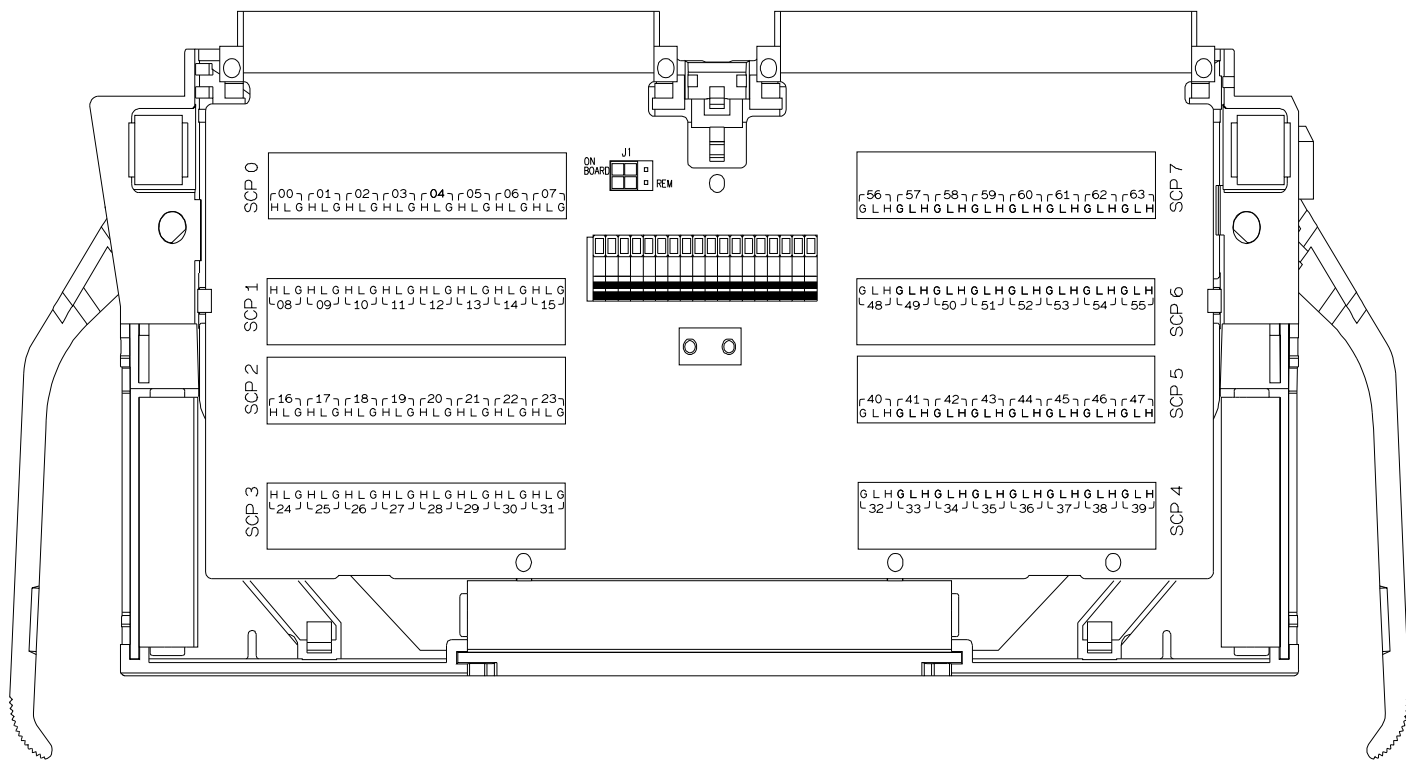


Figure 2 VT1505A C-Size Terminal Module Connections

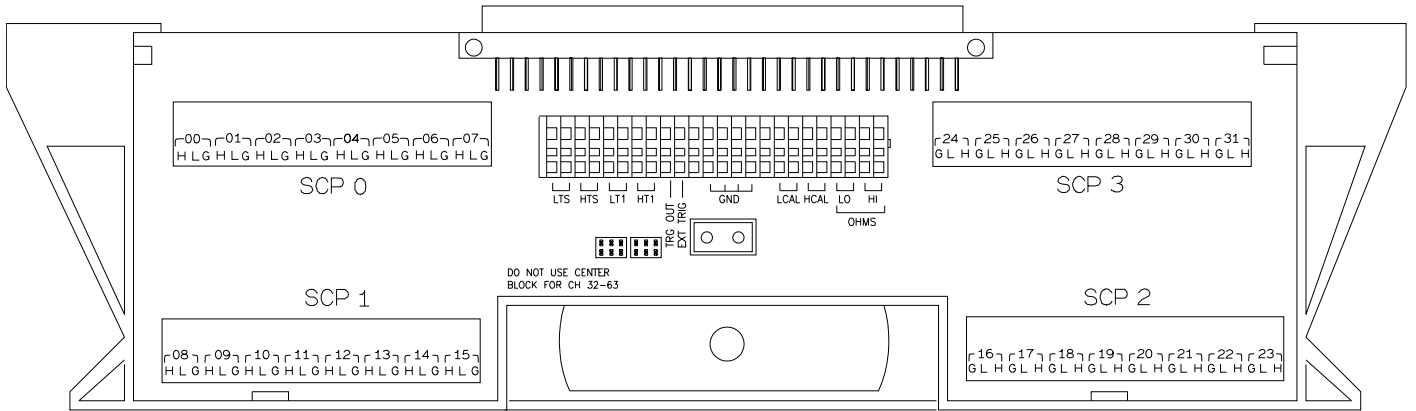


Figure 3 VT1505A B-size Terminal Module Connections (Ch00-31)

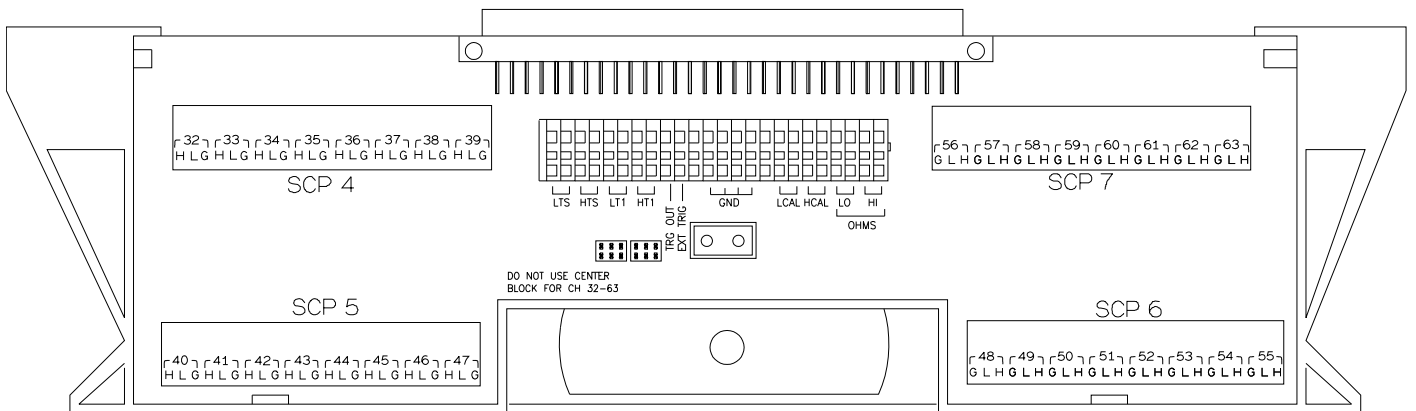


Figure 4 VT1505A B-size Terminal Module Connections (Ch 32-63)

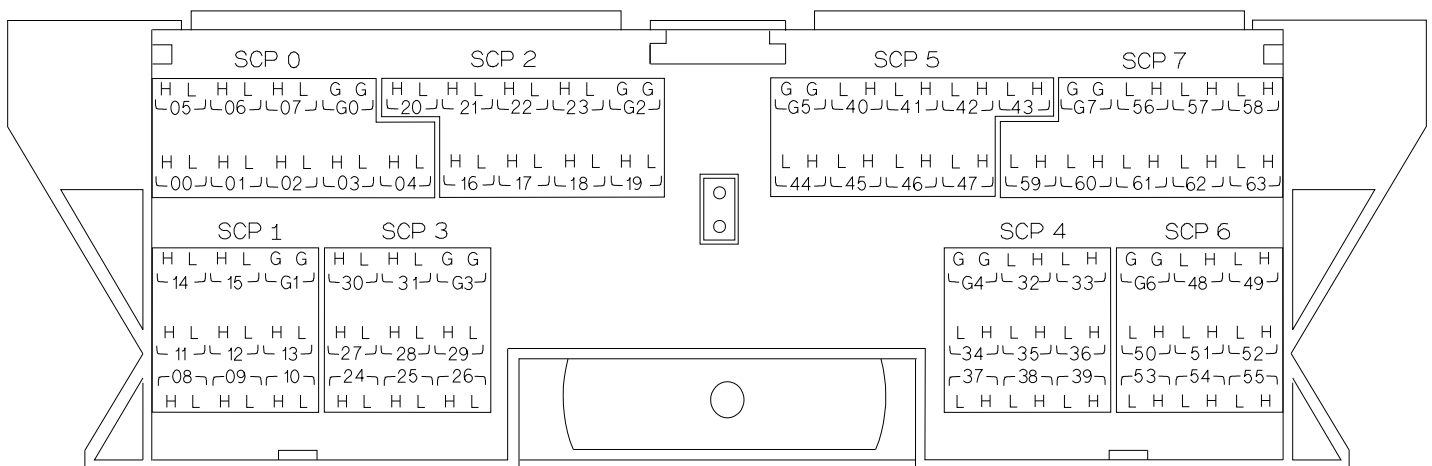


Figure 5 Agilent/HP E1413 Option 15 Terminal Module Connections (32-63)

Programming With SCPI Commands

The SCPI commands shown here are covered in Chapters 3 and 5 of your VT1413C or Agilent/HP E1313 manual. This section will relate those commands to the parameter values which are specific to this Plug-on.

Checking the ID of the SCP

To verify the SCP type(s) installed on the VT1413C or Agilent/HP 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 the SCP in an Agilent/HP E1413B is:
HEWLETT-PACKARD,E1413 Opt 15 8-Channel Current Source SCP,0,0

The value returned for the SCP in a VT1413C or Agilent/HP E1313A is:
HEWLETT-PACKARD,E1505 8-Channel Current Source 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	enter response string

Setting Current Output Level

To set the current output level use the OUTPUT:CURRent:AMPLitude <level>,(@<ch_list>) command.

The level parameter can set the current output level to either 30 μ A or 488 μ A. The default unit for *level* is Amps DC. You may also include a units suffix to specify milliamps (ma) or microamps (ua). *The level parameter will also accept MIN (30 μ A) and MAX (488 μ A). Use 488 μ A for resistance measurements under 8000 and 30 μ A for resistances of 8000 and greater.*

Notes

1. 30 μ A is the *RST and Power-On amplitude for all filter channels.
 2. Whenever you change the current amplitude, you must execute *CAL? or CAL:SETup then CAL:SETup? to calibrate the newly selected output amplitude.
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To set channels 0 through 15 and 20 to measure < 8 k , send

OUTP:CURR:AMPL 488E-6, (@100:115,120)

To set channels 16 through 31 to measure 8 k or greater, send
OUTP:CURR:AMPL 30ua,(@116:131)

Querying the Current Level

To query any channel to determine the current level use the
OUTPut:CURRent:AMPLitude? (@<channel>) command. The
OUTP:CURR? command returns either +4.88E-4 or +3.0E-5.

The channel parameter must specify a single channel.

To query the current level of channel 2 send

OUTP:CURR:AMPL? (@102)	query channel 2
enter statement here	returns 4.88e-4 or 3.0e-5

Turning Current Source Channels Off and On

To Disable and re-enable the current source channel use
OUTPut:CURRent[:STATe] <enable>,(@<ch_list>) command.

The enable parameter can take the values ON or 1, and OFF or 0.

To disable current source channels 0 through 15 and 20, send

OUTP:CURR:STAT OFF, (@100:115,120)

To enable current source channels 16 through 31, send

OUTP:CURR:STAT ON,(@116:131)

Note

The *RST and Power-On state for all Current Source SCP channels is OFF.

Querying the Current Source State

To query any channel to determine the current source output state use the
OUTPut:CURRent[:STATe]? (@<channel>) command. The OUTP:CURR?
command returns either a 1 for ON or a 0 for OFF.

The channel parameter must specify a single channel.

To query the current state of channel 2 send

OUTP:CURR:STAT? (@102)	query channel 2
enter statement here	returns 1 or 0

Register Based Programming

The register-based commands shown here are covered in Appendix D of the VT1413C or Agilent/HP 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 we'll use the Register Commands:

SCBWRITE <regaddr> <regvalue>
and
SCBREAD? <regaddr>

VT1505A Register Map

Read (returned value)	Write(<regvalue>)	SCP Register	<regaddr> Value
SCP ID (A0A0 ₁₆)		Whole SCP Reg 0	00ppp000000 ₂
SCP Gain Scale (XXX0 ₁₆)		Whole SCP Reg 1	00ppp000001 ₂
Channel Control (XXX0 ₁₆ =Off&Low, XXX1 ₁₆ =Off&High, XXX2 ₁₆ =On&Low, XXX3 ₁₆ =On&High)		Channel Reg 0	01ppppcc000 ₂
Channel Gain (XXX0 ₁₆)		Channel Reg 1	01ppppcc001 ₂
	Calibration (Xnnn ₁₆) where nnn=Cal Value	Channel Reg 7	01ppppcc111 ₂

XX=don't care

ppp=Plug-on
ccc=SCP
channel

Checking ID of SCP

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

(SCP number) 40₁₆

Then write the opcode for SCBREAD? (0800₁₆) to the Command Register. The ID value will be written to the Query Response Register.

Controlling Current Source Channels

To set current amplitude and enable or disable an SCP channel, write the following SCP channel address to Parameter Register 1:

200₁₆ (SCP number) 40₁₆ (SCP channel number) 8₁₆

Write one of the following control values to Parameter Register 2:

0000₁₆ = current low, output off

0001₁₆ = current high, output off

0002₁₆ = current low, output on

0003₁₆ = current high, output on

Then write the opcode for SCBWRITE (0810₁₆) to the Command Register.

Channel Calibration Register

The channel calibration registers control DACs that adjust the current output of each current source channel. The Register-Based command `CARDCAL?` (1000₁₆) controls these registers and the user should not write to them.

Specifications

The general specifications for the VT1505A reflect the performance of the Signal Conditioning Plug-on itself. The resistance performance specification reflects the combined performance of the VT1413C or Agilent/HP E1313 and the SCP.

General Specifications

Compliance	L terminal is at ground H terminal ± 16 V with respect to ground	
Output Accuracy	(90 days) 23°C ± 1 °C (with *CAL? done after 1 hr warm up)	
	Current Amplitude μ A	Output Accuracy
	30.518	± 9 nA
	488.28	± 60 nA
Temperature Coefficient	Current Amplitude μ A	Temperature Coefficient
	30.518	± 0.9 nA/°C
	488.28	± 6 nA/°C
Ripple and Noise	(7.5 k Ω resistor to L, 3 sigma)	
	Current Amplitude μ A	Ripple and Noise
	30.518	± 9 nA
	488.28	± 15 nA
Off Leakage Current	(7.5 k Ω resistor to L)	
	0 - 30°C	Less than ± 10 nA
	30 - 55°C	± 10 nA + 1.6 nA/°C

Resistance Specifications

(90 days) 23°C±1°C (with *CAL? done after 1 hr warm up and CAL:ZERO? within 5 min.).

Range Ohms FS	Current Amplitude μA	(A/D Range VDC)	Maximum Resolution
131.1 k	30.518	4	4
32.77 k	30.518	1	1
8.192 k	30.518	0.25	0.25
8.192 k	488.28	4	0.25
2.048 k	488.28	1	0.0625
512	488.28	0.25	0.015
128	488.28	0.0625	0.0039

Resistance Accuracy

(Four-Wire connection)

Gain:	Current Amplitude	Resistance Accuracy
	30.518 μA	0.035% of reading
	488.28 μA	0.02% of reading
Offset:	$\frac{\text{offset of input SCP (in Volts)}}{\text{current source value (in Amps)}}$	
Noise:	$\frac{\text{noise of input SCP (in Volts)}}{\text{current source value (in Amps)}}$	

Notes
