



VT1533A

Sixteen-Bit Digital I/O

Signal Conditioning Plug-on

User's Manual

Enclosed is the User's Manual for the VT1533A Signal Conditioning Plug-on. Insert this manual in your VXI Module's User's Manual behind the "Signal Conditioning Plug-ons" divider.

APPLICABILITY

This SCP is used with the VT1415A.



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VT1533A

Digital Input/Output Signal Conditioning Plug-on

Introduction

The VT1533A Digital I/O SCP provides 16 TTL compatible bits. They are grouped as two, eight-bit “channels”. Each channel can be configured as an 8-bit input port, or an 8-bit output port. Further each channel when configured for output can be either passive (resistor) pull-up or active (transistor) pull-up.

About this Manual

This manual shows you how to configure the Signal Conditioning Plug-on (SCP) using SCPI commands and explains the capabilities of this SCP. The contents of this manual are:

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Installation

Installation for this Plug-on is common to several others and is covered in Chapter 1 of your VXI Module User’s Manual.

Identifying the Plug-on

You’ll find the VXI Technology part number on the connector side of the SCP to the left of the serial number bar code. For the VT1533A, the part number is: VT1533A

Field Wiring

Since this Digital I/O SCP is NOT ISOLATED, it is extremely important not to introduce ground current-loops in the digital ground wires. The use of isolators in your system is highly recommended. Please note a significant difference in the connection scheme for this SCP relative to other SCPs. In order to provide connection to 16 bits, the SCP position's 8 HI and 8 LO terminals are used as digital input/output connections. They are labeled D0 - D7 for each channel position. Even numbered bits connect to L terminals and odd numbered connect to H terminals. Four terminals for digital ground are provided (labeled G) for each of the two channels. The digital grounds are all connected together so are not related to specific bits.

Mapping Bits to Terminals

The relationship of bit numbers to the channel HI or channel LO terminals is dependent on the SCP's installed position. For the specific relationship between channel bits and connector terminals, see the Terminal Module labels supplied with the VT1533A SCP or the following table.

SCP's Channel.bit	SCP 0 channels	SCP 1 channels	SCP 2 channels	SCP3 channels	SCP 4 channels	SCP 5 channels	SCP 6 channels	SCP 7 channels
0.B0 & 0.B1	0 L & H	8 L & H	16 L & H	24 L & H	32 L & H	40 L & H	48 L & H	56 L & H
0.B2 & 0.B3	1 L & H	9 L & H	17 L & H	25 L & H	33 L & H	41 L & H	49 L & H	57 L & H
0.B4 & 0.B5	2 L & H	10 L & H	18 L & H	26 L & H	34 L & H	42 L & H	50 L & H	58 L & H
0.B6 & 0.B7	3 L & H	11 L & H	19 L & H	27 L & H	35 L & H	43 L & H	51 L & H	59 L & H
1.B0 & 1.B1	4 L & H	12 L & H	20 L & H	28 L & H	36 L & H	44 L & H	52 L & H	60 L & H
1.B2 & 1.B3	5 L & H	13 L & H	21 L & H	29 L & H	37 L & H	45 L & H	53 L & H	61 L & H
1.B4 & 1.B5	6 L & H	14 L & H	22 L & H	30 L & H	38 L & H	46 L & H	54 L & H	62 L & H
1.B6 & 1.B7	7 L & H	15 L & H	23 L & H	31 L & H	39 L & H	47 L & H	55 L & H	63 L & H

Programming With SCPI Commands

The SCPI commands shown here query the SCP's identification string, and configure the two digital channels. The VT1415A doesn't provide SCPI commands to read an input channel or control an output channel. See the following section for a digital input/output example.

Checking the ID of the SCP

To verify the SCP type(s) installed on your VXI module, 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 VT1533A SCP is:
HEWLETT-PACKARD,E1533A Digital I/O SCP,0,0

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

SYST:CTYPE? (@100) *query SCP type @ ch 0*
enter statement here *enter response string*

Configuring the Two Channels

The VT1533A has two eight-bit ports. Each of these groups of eight bits is accessed as a channel. The allowable channels are the first two channels in the SCP's current SCP position. For instance, if the SCP is installed in SCP position 0, the allowable channels would be 0 and 1. If in position 7, the channels would be 56 and 57. The first channel number for each of the eight SCP positions are; 0, 8, 16, 24, 32, 40, 48 and 56.

Configuring for Input

To configure VT1533A channels as 8-bit input ports use the command:
[SENSe:]FUNctIon:CONDition (@<ch_list>)

- The *ch_list* parameter specifies the first and/or second channel in the channel range covered by the SCP's position. *Ch_list* can include channels from multiple SCP positions.

To configure channels 40 and 41 as inputs

SENS:FUNC:COND (@140,141)

Configuring Input Polarity

To configure input channel polarity use the command:
INPut:POLarity INVerted | NORMal,(@<ch_list>)

To configure low channel to input inverted and high channel to input normal polarity for SCP at position 4 send:

INP:POL INV,(@132)

INP:POL NORM,(@133) *NORM is *RST default*

Configuring for Output

To configure VT1533A channels as 8-bit output ports use the command:
SOURce:FUNctIon[:SHAPe]:CONDition (@<ch_list>)

- The *ch_list* parameter specifies the first and/or second channel in the channel range covered by the SCP's position. *Ch_list* can include channels from multiple SCP positions.

To configure all channels as outputs on the two VT1533As at SCP positions 4 and 5 send:

SOUR:FUNC:COND (@ 132:133,140:141)

Configuring Output Polarity

To configure output channel polarity use the command:
OUTPut:POLarity INVerted | NORMal,(@<ch_list>)

To configure low channel to output inverted, and high channel to output normal polarity for SCP at position 5 send:

OUTP:POL INV,(@140)
OUTP:POL NORM,(@141) *NORM is *RST default*

Setting Output Type Use OUTPut:TYPE ACTIVE | PASSive to set output drive type.

To configure first channels as active pull-ups and second channels as passive pull-ups on the two VT1533As at SCP positions 4 and 5 send:

OUTP:TYPE ACTIVE,(@ 132,140)
OUTP:TYPE PASSIVE,(@ 133,141)

Programming with the VT1415A Algorithm Language

The following example shows the command sequence (platform/language independent) to transfer the digital states from the 8 channel 0 inputs to the 8 channel 1 outputs. It assumes the SCP is installed in SCP position 0 (covers channels 0 and 1).

```
alg_string = "  O101.B0 = I100.B0;      put algorithm source in string var
               O101.B1 = I100.B1;
               O101.B2 = I100.B2;
               O101.B3 = I100.B3;      each input channel bit sent to an output channel bit
               O101.B4 = I100.B4;
               O101.B5 = I100.B5;
               O101.B6 = I100.B6;
               O101.B7 = I100.B7; "
```

ALG:DEF 'ALG1,'alg_string' *send SCPI command to define algorithm "ALG1"*

SOUR:FUNC:COND (@101) *set 8 bits in channel 1 to output mode*

INIT *start algorithm (using default trig sys setup)*

When the algorithm is run, digital state on bits in channel 0 will be output on corresponding bits in channel 1.

Over-Voltage Protection

As was mentioned in the first paragraph, the VT1533A can sense an over-voltage condition on any of its digital I/O terminals. This is to protect the SCP and the module it is installed on from damaging voltage levels. If greater than approximately 6 Volts is applied to an I/O terminal, the SCP will signal the VXI module to open all of its Calibration/Protection relays. The module will then generate an error message in its error queue (read by SYST:ERR?), and set a status bit in its STAT:QUES:COND register.

Note The over-voltage protect condition is reset by issuing *RST.

***RST and *TST (important!)**

The electrical model of a VT1533A input is essentially a 1.2 k Ω resistor in series with 3 Volts DC. This circuit will look like a high logic level to another TTL compatible digital input. When *RST or *TST? is executed, VT1533A channels configured as outputs return to their default settings as inputs. The *RST condition for channel POLarity returns to NORM as well. You should keep this behavior in mind when applying the VT1415A to your system. It is best to have your system digital inputs use a high input as their quiescent or safe state.

Specifications

These specifications for the VT1533A reflect its performance while installed on your VXI module.

General Specifications

Output Characteristics	Characteristic	OUTPut:TYPE ACTive	OUTPut:TYPE PASSive
	current source (logic 1)		5 mA
current sink (logic 0)		48 mA	48 mA
Voltage (logic 1)		2.5 V Min @ 5 mA load	NA
Voltage (logic 0)		0.5 Max @ 48 mA load	0.5 Max @ 48 mA load

Input Characteristics	Characteristic	
	Equivalent circuit	
Maximum input low		0.8 Volts
Minimum input high		2 Volts

Maximum voltage applied to any input/output terminal

+5.5 V (inputs clamped at -0.8 V, must limit -current)

NOTE For detailed information on I/O characteristics, refer to a data sheet for the 75ALS160 Interface Bus Transceiver
