



2-Channel, 1 GS/s VXI bus Digital Storage Oscilloscope

Model ZT621VXI

User's Manual: 0004-000079
Revision 1.0

April 20, 2009

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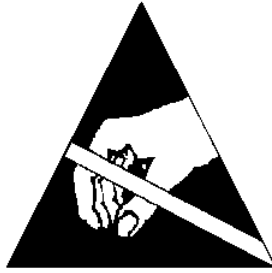
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Handling Precautions for Electronic Devices Subject to Damage by Static Electricity

This instrument is susceptible to Electronic Static Discharge (ESD) damage. When transporting, place the instrument or module in conductive (anti-static) envelopes or carriers. Open only at an ESD-approved work surface. An ESD safe work surface is defined as follows:

- The work surface must be conductive and reliably connected to an earth ground with a safety resistance of approximately 250 kilo Ohms.
- The surface must NOT be metal. A resistance of 30–300 kilo Ohms per square inch is suggested.

Ground the frame of any line-powered equipment, chassis, test instruments, lamps, soldering irons, etc., directly to the earth ground. To avoid shorting out the safety resistance, ensure that the grounded equipment has rubber feet or other means of insulation from the work surface.

Avoid placing tools or electrical parts on insulators. Do NOT use any hand tool that can generate a static charge, such as a non-conductive plunger-type solder sucker. Use a conductive strap or cable with a wrist cuff to reliably ground to the work surface. The cuff must make electrical contact directly with the skin; do NOT wear it over clothing.

Note: Resistance between the skin and the work surface is typically 250 kilo Ohms to 1 mega Ohm using a commercially-available personnel grounding device.

Avoid circumstances that are likely to produce static charges, such as wearing clothes of synthetic material, sitting on a plastic-covered stool (especially when wearing woolen material), combing the hair, or making extensive pencil erasures. These circumstances are most significant when the air is dry.

When testing static sensitive devices, ensure DC power is ON before, during, and after application of test signals. Ensure all pertinent voltages are switched OFF while circuit boards or components are removed or inserted.

Revision History

Rev	Date	Section	Description
-	03-13-2003	All	Initial Release
0.1.1	03-23-2009	All	Rewrite and addition of various items
1.0	04-20-2009	All	Updated specifications Added command list

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Installation and Configuration



Hardware Installation

The ZT621VXI may be installed into any C-size VXIbus mainframe, using any slot except slot 0 (zero), which is reserved. Before installing the ZT621VXI into the mainframe, the ZT621VXI logical address must be assigned. After setting the logical address, slide the ZT621VXI into the VXIbus mainframe until the backplane P1 and P2 connectors are mated properly. Once the module is seated in the mainframe, tighten the two captive screws above and below the ejector handles to secure the ZT621VXI into the mainframe

Mainframe Requirements

The ZT621VXI consumes approximately 54 W of power distributed among the backplane voltages as described in Appendix A. In order to dissipate this heat, **the VXIbus mainframe must provide at least 14 cubic feet per minute (CFM) of airflow to the slot in which the ZT621VXI is installed.** Failure to meet this requirement may damage the ZT621VXI.

Logical Address Switches

The ZT621VXI logical address is statically configured to any address from 1 to 254. Logical address 0 is reserved for the VXIbus resource manager and logical address 255 is reserved for VXIbus modules supporting dynamic configuration. The logical address for the ZT621VXI must be assigned by setting the two hexadecimal rotary switches accessible through cut-outs at the rear of the unit. Figure 2-1 shows the switch location on the ZT621VXI module. The most significant digit of the address is at the left when viewed from the rear of the unit with the PCB below the VXIbus connectors.

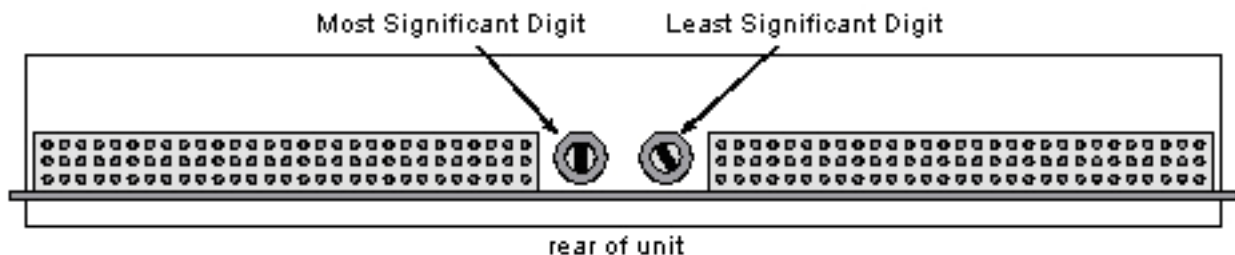


Figure 1: Logical Address Switch Location

Backplane IACK* And BGn* Jumpers

The ZT621VXI is an interrupting device and uses the IACKIN* and IACKOUT* signals. The mainframe must be configured to OPEN the connection between these two signals for the slot in which the ZT621VXI is plugged into the P1 connector. If present, ensure that the backplane IACK* jumper is in the OPEN position according to the manufacturer's guidelines. The ZT621VXI is a slave and does not use the BGnIN* or BGnOUT* signals. The ZT621VXI is internally jumpered to transparently pass the BGn* signals through to the next slot. Consequently, the backplane BGn* jumpers can be configured in either position and shall not affect the proper operation of the VXIbus system.

Register and Command Interface



Interface Description

The ZTEC Instruments model ZT621VXI is a message-based VXIbus module that supports the protocols of a VXIbus Instrument and a VXIbus 488.2 Instrument and is compliant with the instrument specifications outlined in the VXI-1 Revision 1.4 and IEEE Standard 488.2-1992 specifications. In accordance with these specifications, the ZT621VXI supports a number of levels of communication protocols including low-level VXIbus word-serial commands, IEEE 488.2 common commands, and high-level ZT621VXI-specific commands. This section describes in detail all the commands used by the ZT621VXI.

VXIbus Register-Based Interface

The ZT621VXI is an A16 message-based slave module with A32 register-based memory. As an A16 message-based slave, the ZT621VXI receives commands using the VXIbus word-serial protocol. In order to support the word-serial protocol, the ZT621VXI provides a set of A16 accessible registers as shown in Table 1. Each of the registers shown in Table 1 is defined by detailed bit descriptions given in Tables 3 to 8. The ZT621VXI also provides A32 register-based memory that is directly address-mapped in the VXIbus 32-bit address space. The A32 address space is used to transfer large data blocks to and from the ZT621VXI. Table 2 shows the ZT621VXI A32 address map. Both the A16 and A32 interfaces support 16 bit transfers only.

Offset	Function	Type
00 ₁₆	ID Register	Read-Only
02 ₁₆	Device Type Register	Read/Write
04 ₁₆	Status/Control Register	Read/Write
06 ₁₆	Offset Register	Read/Write
08 ₁₆	Protocol Register	Read-Only
0A ₁₆	Response Register	Read-Only
0C ₁₆	Unused	
0E ₁₆	Data Low Register	Read/Write
10 ₁₆ to 3E ₁₆	Unused	

Table 1: VXIbus A16 Address Space

Offset	Function	Type	Size
00000000 ₁₆ to 3FFFFFFE ₁₆	Waveform Data Memory (SDRAM)	Read/Write	1M to 64M

Table 2: VXIbus A32 or A24 address space

ID Register

The ID Register is a read-only register located at address offset 00₁₆. Reading the ID Register returns the ZT621VXI Device Class, Address Space, and Manufacturer's ID. The Device Class for the ZT621VXI is Message (10₂). The Address Space for the ZT621VXI is A16/A32 (01₂). The Manufacturer's ID for the ZT621VXI is that of ZTEC Instruments Inc.: 3712 (0E80₁₆). Writing to the ID Register has no effect. Table 3 defines the function of each bit in the read-only ID Register.

Bit #	Function	Type	Value	Meaning
14–15	Device Class	Read	10 ₂	Message-Based
12–13	Address Space	Read	00 ₂ or 01 ₂	A16/A24 Memory or A16/A32 Memory
0–11	Manufacturer's ID	Read	E80 ₁₆	ZTEC Instruments

Table 3: ID Register Bit Descriptions (Read-Only)

Device Type Register

The Device Type Register is a read-only register located at address offset 02₁₆. Reading the Device Type Register returns the ZT621VXI Required Memory and Model Code. The Required Memory for the ZT621VXI varies from 64 Mbytes (5₁₆) to 512 Mbytes (2₁₆). The Model Code for the ZT621VXI is 1569₁₀ (621₁₆). Writing to the Device Type Register has no effect. Table 4 defines the function of each bit in the read-only Device Type Register.

Bit #	Function	Type	Value	Meaning
12–15	Required Memory	Read	3 ₁₆ or 6 ₁₆	1 Mbytes or 32 Mbytes
0–11	Model Code	Read	594 ₁₆	ZT621VXI

Table 4: Device Type Register Bit Descriptions (Read-Only)

Status/Control Register

The Status/Control Register is a read/write register located at address offset 04₁₆. Writing to the Status/Control Register changes the Control Register. Table 5 defines the function of each bit in the Control Register. Reading the Status/Control Register returns the contents of the Status Register. Table 6 defines the function of each bit in the read-only Status Register.

Bit #	Name	Function	Type
15	A32 Enable	0: Disable A32 Memory 1: Enable A32 Memory	Write
2–14	Unused		
1	SFIInh	0: Enable Sysfail* Driver 1: Inhibit Sysfail* Driver	Write
0	SReset	0: Enable Unit 1: Soft Reset Unit	Write

Table 5: Control Register Bit Descriptions (Write-Only)

Bit #	Name	Function	Type
15	A32 Active	0: A32 Memory Inactive 1: A32 Memory Active	Read
14	Mod ID*	0: Mod ID Line Driven 1: Mod ID Line Not Driven	Read
3-13	Unused	0	
3	Ready	0: Unit In Configure State 1: Unit In Normal Operation State	Read
2	Passed	0: Unit Failed Self-Test 1: Unit Passed Self-Test	Read
1	SFIInh	0: Sysfail* Driver Enabled 1: Sysfail* Driver Inhibited	Read
0	SReset	0: Unit Enabled 1: Unit Software Reset	Read

Table 6: Status Register Bit Descriptions (Read-Only)

Offset Register

The Offset Register is read/write register located at address offset 06₁₆. Writing or reading the Offset Register changes or returns the contents of the Offset Register. The Offset Register defines the base address for the ZT621VXI's A32 register-based memory. Only the N most-significant bits of the Offset Register are used, where N varies from 2 to 5 depending upon the installed A32 memory options. Bit 15 is the most-significant A32 address select bit, corresponding to A31 of the address selection. Table 7 defines the function of each bit in the Offset Register.

Bit #	Name	Function	Type
(N) MSBs	Offset Address	Address Select for A32 or A24 space	Read/Write
(16-N) LSBs	Unused		

Table 7: Offset Register Bit Descriptions (Read/Write)

Protocol Register

The Protocol Register is read-only register located at address offset 08₁₆. Reading the Protocol Register indicates the additional communication protocols that are supported by the ZT621VXI. The ZT621VXI supports interrupter capability only. Writing to the Protocol Register has no effect. Table 8 defines the function of each bit in the Protocol Register.

Bit #	Name	Function	Type
15	CMDR*	1: ZT621VXI Has Servant-Only Capability	Read-Only
14	Signal Register*	1: ZT621VXI Does Not Have A Signal Register	Read-Only
13	Master*	1: ZT621VXI Does Not Have Master Capability	Read-Only
12	Interrupter	1: ZT621VXI Has Interrupter Capability	Read-Only
11	FHS*	1: ZT621VXI Does Not Support Fast Handshake	Read-Only
10	Shared Memory*	1: ZT621VXI Does Not Support Shared Memory	Read-Only
0–9	Unused	1: Unused	Read-Only

Table 8: Protocol Register Bit Descriptions (Read-Only)

Command Reference



Using This Chapter

This chapter describes Standard Commands for Programmable Instruments (SCPI) commands and summarizes IEEE 488.2 Common (*) commands applicable to the Oscilloscope module.

See the IEEE Standard 488.2-1992 and SCPI-1997 specifications for additional information on SCPI and common commands. This chapter contains the following sections:

- Command Types
- SCPI Command Reference

Command Types

Commands are separated into two types: IEEE 488.2 Common Commands and Standard Commands for Programmable Instruments (SCPI) Commands.

Common Command Format

The IEEE 488.2 standard defines the Common Commands that perform functions like reset, self-test, status byte query, etc. Common commands are four or five characters in length, always begin with the asterisk character (*), and may include one or more parameters. The command keyword is separated from the first parameter by a space character. Some examples of Common Commands are shown below:

***RST**

***CLS**

***STB?**

SCPI Command Format

The SCPI commands perform functions like setting parameters, performing measurements, querying instrument states, and retrieving data. A subsystem command structure is a hierarchical structure that usually consists of a top level (or root) command, one or more lower-level subcommands, and their parameters. The following example shows part of a typical subsystem:

```
[SENSe:]  
  INPut<number>  
    :COUPling AC | DC  
    :IMPedance?
```

[SENSe:] is the root command, :INPut is the second-level subcommand with <number> as a parameter, and :COUPling and :IMPedance? are third-level commands/queries with AC | DC as a parameter.

Command Separator

A colon (:) always separates one command from the next lower level command as shown below:

```
[SENSe:]INPut<number>:IMPedance?
```

Colons separate the root command from the second-level command ([SENSe:]INPut), and the second-level from the third-level query (INPut<number>:IMPedance?).

Abbreviated Commands

The command syntax shows most commands as a mix of upper and lower case letters. The upper case letters indicate the abbreviated spelling for the command. For shorter program lines, send only the abbreviated form. For better program readability, you may send the entire command. The instrument will only accept either the abbreviated form or the entire command.

For example, if the command syntax shows IMPedance?, then IMP? and IMPEDANCE? are both acceptable forms. Other forms of IMPedance?, such as IM?, will generate an error. You may use upper or lower case letters. Therefore, IMPEDANCE? and IMPeDaNcE? are acceptable.

Implied Commands

Implied commands are those which appear in square brackets ([]) in the command syntax. (Note that the brackets are not part of the command and are not sent to the instrument.) If a root level and second-level command are sent, but not a third-level implied command, the instrument assumes use of a implied command. Examine the portion of the [SENSE:] subsystem shown below:

```
[SENSE:]
INPut<number>
:COUPling AC | DC
:IMPedance?
```

The first-level command [SENSE:] is an implied command. To query the instrument's input 1 impedance selection, send either of the following command statements:

```
[SENS:]INP1:IMP? or INP1:IMP?
```

Parameters

The following table contains explanations and examples of parameter types.

Parameter Type	Explanations and Examples
Numeric	<p>Accepts all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation.</p> <p>123 or 1.23E2; -123 or -1.23E2; .123, 1.23E-1, or 1.23000E-01.</p> <p>Accepts all commonly used suffixes with decimal representations of numbers, including optional signs and decimal points.</p> <p>.123S or 123MS; 1234OHM or 1.234KOHM.</p> <p>Voltage = "UV" for E-6, "MV" for E-3, "V" for E0, "KV" for E3 Percent = "PCT" Ohms = "OHM", "KOHM" for E3, "MOHM" for E6. Frequency = "HZ" for E0, "KHZ" for E3, "MHZ" for E6, "GHZ" for E9. Time = "PS" for E-12, "NS" for E-9, "US" for E-6, "MS" for E-3, "S" for E0.</p> <p>Special cases include MIN and MAX. MIN (selects minimum value available), and MAX (selects maximum value available).</p>
Boolean	<p>Represents a single binary condition that is either true or false.</p> <p>1 or ON; 0 or OFF</p>
Block	<p>Definite block program data format specified in IEEE 488.2.</p>
Discrete	<p>Selects from a finite number of values. These parameters use mnemonics to represent each valid setting.</p> <p>An example is the [SENSE:]INPut<n> COUPling <mode> command, where <mode> can be AC or DC.</p>

Optional Parameters. Parameters shown within square brackets ([]) are optional parameters. (Note that the brackets are not part of the command and are not sent to the instrument.) If you do not specify a value for an optional parameter, the instrument chooses a default value. For example, consider the MEM:VME:ADDR? [<MIN | MAX>] command. If you send the command without specifying a parameter, the present external VME memory address is returned. If you send the MIN parameter, the command returns the lowest address available (2097152). If you send the MAX parameter, the command returns the maximum address available (14647294). Be sure to place a space between the command and the parameter.

Parameters Out of Range - Set to Limit. If an out of range parameter is automatically adjusted to an acceptable value, bit 10 in the STATus:QUEStionable register will be set true (1). For example, if CORRection1:AFACtor 0.1 is entered, the value is set to 0.9 (lowest available setting) and bit 10 is set to "1".

Linking Commands

- **Linking IEEE 488.2 Common Commands with SCPI Commands:** Use a semicolon between the commands. For example:

***CLS;*RST;CAL:REP? INP1**

- **Linking Multiple SCPI Commands:** Use both a semicolon and a colon between the commands. For example:

INP1:COUP AC;;SYST:ERR?

- SCPI also allows several commands within the same subsystem to be linked with a semicolon. For example:

INP1:FILT:STAT ON;;INP1:FILT:FREQ 20E6 or INP1:FILT:STAT ON;FREQ 20E6

Command List

The following list shows all commands and queries that are available with the ZT621VXI. The “?” is not shown for the query versions of the commands. Commands shown in the following table with *No Affect* listed in the comment field will be accepted by the instrument without generating an error, but will have no affect on the instrument state.

Command	Comments
ABORt	
ARM[:A]:DEFine	
ARM[:A][:LAYer1]:SOURce	
ARM:SEQuence1:DEFine	ARM:SEQ1 same as ARM:A
ARM:SEQuence1[:LAYer1]:SOURce	ARM:SEQ1 same as ARM:A
CALCulate<n>:AAMList	
CALCulate<n>:AAMList:STATe	
CALCulate<n>:DATA	
CALCulate<n>:DATA:PREamble	
CALCulate<n>:FEED<n>	
CALCulate<n>:FEED<n>:CONText	
CALCulate<n>:FORMat	
CALCulate<n>:IMMEDIATE	
CALCulate<n>:PATH	
CALCulate<n>:PATH:EXPRession	
CALCulate<n>:WMList	
CALCulate<n>:WMList:STATe	
CALCulate<n>:WMPParameter:EDGE	
CALCulate<n>:WMPParameter:HIGH	
CALCulate<n>:WMPParameter:HMETHod	
CALCulate<n>:WMPParameter:HREFerence	
CALCulate<n>:WMPParameter:HREFerence:RELative	
CALCulate<n>:WMPParameter:LOW	
CALCulate<n>:WMPParameter:LMETHod	
CALCulate<n>:WMPParameter:LREFerence	
CALCulate<n>:WMPParameter:LREFerence:RELative	
CALCulate<n>:WMPParameter:MREFerence	
CALCulate<n>:WMPParameter:MREFerence:HYSTEResis	
CALCulate<n>:WMPParameter:MREFerence:RELative	
CALCulate<n>:WMPParameter:RMETHod	
CALCulate<n>:WMPParameter:SLOPe	
CALibration[:ALL]	No Affect
CALibration:RESults[:CODE]	
CALibration:RESults:VERBose	
DATA:CATalog	DATA same as TRAC
DATA:COpy	DATA same as TRAC

Command	Comments
DATA:FEED	DATA same as TRAC
DATA:POINts	DATA same as TRAC
DATA:DATA	DATA same as TRAC
FORMat:BORDER	
FORMat[:DATA]	
FORMat[:DATA]:CALCulate	
FORMat[:DATA]:TRACe[:AATS]	
INPut<n>:COUPling	
INPut<n>:FILTer[:LPASs]:FREQuency	
INPut<n>:FILTer[:LPASs][:STATe]	
INPut<n>:IMPedance	
INPut<n>:PROTection:STATe	
INPut<n>:PROTection:TRIP	
INITiate[:IMMediate]	
INITiate:CONTInuous	
INITiate:COUNt	
INITiate:EVENT	
MEMory:NSTates	
MEMory:STATe:CATalog	
MEMory:STATe:DEFine	
OUTPut:ECLTrg<n>:POLarity	
OUTPut:ECLTrg<n>:SOURce	
OUTPut:ECLTrg<n>[:STATe]	
OUTPut:PCOMPensation:FUNcTION	
OUTPut:PCOMPensation[:STATe]	
OUTPut:REFerence:FUNcTION	
OUTPut:REFerence[:STATe]	
OUTPut:TTLTrg<n>:POLarity	
OUTPut:TTLTrg<n>:SOURce	
OUTPut:TTLTrg<n>[:STATe]	
[SENSe]:AADVance:COUNt	
[SENSe]:AADVance:MCOunt	
[SENSe]:AADVance:RECOrd:COUNt	
[SENSe]:AADVance:RECOrd:STARt	
[SENSe]:AADVance[:STATe]	
[SENSe]:AVERage:COUNt	
[SENSe]:AVERage:TYPE	
[SENSe]:AVERage[:STATe]	
[SENSe]:FUNcTION:CONCurent	
[SENSe]:FUNcTION:OFF	
[SENSe]:FUNcTION:OFF:ALL	
[SENSe]:FUNcTION:OFF:COUNt	
[SENSe]:FUNcTION[:ON]	

Command	Comments
[SENSe]:FUNctIon[:ON]:ALL	
[SENSe]:FUNctIon[:ON]:COUNt	
[SENSe]:FUNctIon:STATe	
[SENSe]:ROSCillator:SOURce	
[SENSe]:SWEep:OFFSet:POINts	
[SENSe]:SWEep:OFFSet:TIME	
[SENSe]:SWEep:OFFSet:OREFERENCE:LOCation	
[SENSe]:SWEep:POINts	
[SENSe]:SWEep:TIME	
[SENSe]:SWEep:TINTerval	
[SENSe]:VOLTage<n>[:DC]:RANGe:LOWer	
[SENSe]:VOLTage<n>[:DC]:RANGe:OFFSet	
[SENSe]:VOLTage<n>[:DC]:RANGe:PTPeak	
[SENSe]:VOLTage<n>[:DC]:RANGe:UPPer	
STATus:OPERation:CONDition	
STATus:OPERation:ENABle	
STATus:OPERation:NTRansition	
STATus:OPERation:PTRansition	
STATus:OPERation:QENable:NTRansition	
STATus:OPERation:QENable:PTRansition	
STATus:OPERation[:EVENT]	
STATus:PRESet	
STATus:QUEStionable:CONDition	
STATus:QUEStionable:ENABle	
STATus:QUEStionable:NTRansition	
STATus:QUEStionable:PTRansition	
STATus:QUEStionable:QENable:NTRansition	
STATus:QUEStionable:QENable:PTRansition	
STATus:QUEStionable[:EVENT]	
STATus:SESR:QENable	
SYSTem:CDATe	
SYSTem:ERRor:ALL	
SYSTem:ERRor:CODE:ALL	
SYSTem:ERRor:CODE[:NEXT]	
SYSTem:ERRor:COUNt	
SYSTem:ERRor[:NEXT]	
SYSTem:MODel	
SYSTem:PROTect	
SYSTem:SET	
SYSTem:VERSiOn	
TEST[:ALL]	
TEST:RESUltS[:CODE]	
TEST:RESUltS:VERBoSe	

Command	Comments
TRACe:CATalog	
TRACe:COPI	
TRACe:FEED	
TRACe:POINts	
TRACe[:DATA]	
TRIGger[:A]:ATRigger[:STATe]	
TRIGger[:A]:COUPling:AC	
TRIGger[:A]:COUPling:ACNReject	
TRIGger[:A]:COUPling:DC	
TRIGger[:A]:COUPling:DCNReject	
TRIGger[:A]:COUPling:HFReject	
TRIGger[:A]:COUPling:LFReject	
TRIGger[:A]:COUPling[:STATe]	
TRIGger[:A]:DEFine	
TRIGger[:A]:DELay	
TRIGger[:A]:ECOunt	
TRIGger[:A]:FILTer[:LPASs][:STATe]	
TRIGger[:A]:FILTer:NREJect[:STATe]	
TRIGger[:A]:FILTer:HPASs[:STATe]	
TRIGger[:A]:HOLDoff:TIME	
TRIGger[:A]:LEVel	
TRIGger[:A]:PULSe:CLASs	
TRIGger[:A]:PULSe:GLITch:POLarity	
TRIGger[:A]:PULSe:GLITch:QUALify	
TRIGger[:A]:PULSe:GLITch:WIDTh	
TRIGger[:A]:PULSe:SOURce	
TRIGger[:A]:PULSe:THReshold	
TRIGger[:A]:PULSe:WIDTh:HLIMit	
TRIGger[:A]:PULSe:WIDTh:LLIMit	
TRIGger[:A]:PULSe:WIDTh:POLarity	
TRIGger[:A]:PULSe:WIDTh:QUALify	
TRIGger[:A]:SLOPe	
TRIGger[:A]:SOURce	
TRIGger[:A]:TYPE	
TRIGger:B:ATRigger[:STATe]	
TRIGger:B:COUPling:AC	
TRIGger:B:COUPling:ACNReject	
TRIGger:B:COUPling:DC	
TRIGger:B:COUPling:DCNReject	
TRIGger:B:COUPling:HFReject	
TRIGger:B:COUPling:LFReject	
TRIGger:B:COUPling[:STATe]	
TRIGger:B:DEFine	

Command	Comments
TRIGger:B:DElAy	
TRIGger:B:ECouNt	
TRIGger:B:FiLTeR[:LPASs][:STATe]	
TRIGger:B:FiLTeR:NREJect[:STATe]	
TRIGger:B:FiLTeR:HPASs[:STATe]	
TRIGger:B:HOLDOff:TiME	
TRIGger:B:LEVeL	
TRIGger:B:PULSe:CLASs	
TRIGger:B:PULSe:GLITCh:POLARity	
TRIGger:B:PULSe:GLITCh:QUALify	
TRIGger:B:PULSe:GLITCh:WIDTh	
TRIGger:B:PULSe:SOURce	
TRIGger:B:PULSe:THReshold	
TRIGger:B:PULSe:WIDTh:HLIMit	
TRIGger:B:PULSe:WIDTh:LLIMit	
TRIGger:B:PULSe:WIDTh:POLARity	
TRIGger:B:PULSe:WIDTh:QUALify	
TRIGger:B:SLOPe	
TRIGger:B:SOURce	
TRIGger:B:TYPE	
TRIGger:SEQuence<n>:ATRigger[:STATe]	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:COUPLing:AC	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:COUPLing:ACNReject	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:COUPLing:DC	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:COUPLing:DCNReject	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:COUPLing:HFRReject	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:COUPLing:LFRReject	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:COUPLing[:STATe]	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:DEFine	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:DElAy	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:ECouNt	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:FiLTeR[:LPASs][:STATe]	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:FiLTeR:NREJect[:STATe]	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:FiLTeR:HPASs[:STATe]	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:HOLDOff:TiME	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:LEVeL	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:CLASs	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:GLITCh:POLARity	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:GLITCh:QUALify	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:GLITCh:WIDTh	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:SOURce	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:THReshold	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:WIDTh:HLIMit	SEQ1 = A, SEQ2 = B

Command	Comments
TRIGger:SEQuence<n>:PULSe:WIDTh:LLIMit	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:WIDTh:POLarity	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:PULSe:WIDTh:QUALify	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:SLOPe	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:SOURce	SEQ1 = A, SEQ2 = B
TRIGger:SEQuence<n>:TYPE	SEQ1 = A, SEQ2 = B
*CAL	No Affect
*CLS	
*ESE	
*ESR	
*IDN	
*OPC	
*OPT	
*RCL	
*RST	
*SAV	
*SRE	
*STB	
*TRG	
*TST	
*WAI	

Specifications



Input Channel Specifications

Channels	2
Connectors	BNC Female
Bandwidth	DC to 250 MHz
Bandwidth Limiting	Bypass, 20 MHz, or 250 MHz (180 MHz equivalent)
Full Scale Input Range	10 mV to 100 V Fine resolution range settings (1400 steps)

DC Gain Accuracy

Full-Scale Range	Maximum DC Gain Error
≥ 20 mV	±1.5% of full-scale range
< 20 mV	±2% of full-scale range

Impedance	1 MΩ 12 pF or 50 Ω
Input VSWR (50 Ohm)	< 1.3:1DC to 500 MHz < 1.5:1500 MHz to 1 GHz

Maximum Input	±400 VDC (1 MΩ) 5 Vrms (50 Ω)
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Input Protection	Thermal (RMS) overload protection for 50 Ω load
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Coupling	DC or AC
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AC Coupling Cutoff

Input Impedance	AC Highpass Frequency
1 MΩ	200 kHz
50 Ω	10 Hz

Offset Adjust

Full-Scale Range	Offset Adjust Range
10 mV to 1 V	±1 V
1.01 V to 10 V	±10 V
10.1 V to 100 V	±100 V

DC Offset Accuracy	± (1% offset adjust setting + 2% full scale range)
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Analog-to-Digital Converter Specifications

ADC Resolution	8 bit resolution
Sample Rate	5 S/s to 1 GS/s sample rate (1, 2.5, 5 steps)
Acquisition Time	10 ns to 50 s
RMS Digitization Noise	

Input Bandwidth	Maximum RMS Noise
250 MHz (filter bypass)	350 μ V + 0.5% range
180 MHz (250 MHz filter)	<48.6mV: 315 μ V + 0.5% range
	\geq 48.6mV: 165 μ V + 0.5% range
20 MHz (20 MHz filter)	<48.6mV: 175 μ V + 0.5% range
	\geq 48.6mV: 75 μ V + 0.5% range

Record Size	256 samples to 30k samples
Timebase	Software selectable 10 MHz timebase, internal 2.5 ppm TCXO or VXI CLK10
Channel Skew	< 200 ps delay skew between channels (channels at the same range & coupling settings)

Trigger Specifications

Trigger Sources	External Trigger Input, Channels 1 and 2, TTLTRG*(0-7), ECLTRG(1-0)
Trigger Detect Modes	Edge, Pulse Width, Glitch
Edge Trigger	Rising or Falling Edge
Pulse Width Trigger	Width Inside Window or Width Outside Window
Glitch Trigger	Less Than Limit or Greater Than Limit
Glitch / Pulse Width	Minimum: larger of 1 sample interval or 4 ns Maximum: 1 s
Trigger Position	Pre-Trigger and Post-Trigger Acquisition
Trigger Delay	16 ns to 250 s
Detection Delay	< 20 ns
Trigger Holdoff	250 ns to 12 s
Auto-Trigger Mode	Normal or Auto
Event Counter	Qualify on N th Trigger Event, N = 1 to 65535 Events

Trigger B Auto-Advance Mode	Qualify on Second Edge Source 1 to 1024 records, depending on record size re-arm time < 10 ms
Trigger Time Stamp	100 ns resolution, 1 s rollover

Trigger, Channels 1-2

Trigger Level	(offset – range/2) to (offset + range/2)
Trigger Level Accuracy	± (2% trigger level setting + 3% full scale range + 1% offset adjust setting)
Coupling	DC, AC (60 Hz), LF reject (> 80 kHz), HF reject (< 30 kHz), noise reject
Trigger Bandwidth	> 200 MHz

Trigger, External Input

Maximum Input	±5 V
Trigger Level	-1V to +1V
Trigger Level Accuracy	±(2% trigger level setting + 75 mV)
Coupling	DC
Impedance	50 Ω
Trigger Bandwidth	> 100 MHz
Connector	BNC Female

Fiducial Input

Maximum Input	2 Vrms
Level	±1 V
Gain	-6 ± 25%
Coupling	AC
Impedance	0.01 μF in series with 50 Ω
Rise Time	< 3 ns
Insertion	Fiducial added before digitizer, after input scaling

Connector BNC Female

Arm Input

Arm Sources External Arm Input, Immediate (bypass), Software, TTLTRG*(0-7), ECLTRG(1-0)

Level TTL compatible, 0 to 5 V maximum

Termination 1 k Ω pullup to +5 V

Logic Logic 1 = hold off trigger detection,
Logic 0 = enable trigger detection

Connector BNC Female

Reference Output

Modes Reference Voltage or Reference Clock

Reference Voltage +8 V \pm 1% into 10 k Ω load

Reference Clock >1 Vpp into 50 Ω load, 10 MHz timebase source:
Internal 2.5 ppm TCXO or VXI CLK10

Connector BNC Female

Signal Processing Specifications

Acquisition Modes Normal, Envelope, Average, Auto-Advance

Reference Waveforms 10 waveforms, (up to 15000 samples),
saved in non-volatile memory

Configuration Save 10 instrument configurations,
saved in non-volatile memory

Math Channels 4

Math Functions Add, Subtract, Multiply, Divide, Greater than, Less than

Measurements Min, Max, High, Low, Mid, Mean, Cycle Mean, Amplitude, Peak-to-Peak, Area, Cycle Area, Positive Area, Cycle Positive Area, Cycle RMS, Standard Deviation, Positive Width, Negative Width, Center of Pulse, Period, Frequency, Positive Duty, Negative Duty, Risetime, Falltime, Preshoot, Overshoot, Nth Positive Crossing Time, Nth Negative Crossing Time, Time at Crossing, Gain, Phase, Delay

Measurement Accuracy Delta DC Voltage \pm (DC gain accuracy)
 Absolute DC Voltage \pm [(DC gain accuracy)+(offset accuracy)]
 Time \pm (one sample interval)
 Frequency \pm [1/(one sample interval)]

LED Status Indicators

Ready Green LED indicating that unit has passed power-up self-diagnostics and is ready for use, indicator flashes when error status is pending

Accessed Yellow LED indicating that a VXI access has occurred or that the VXIbus MODID line was asserted

Arm'd Green LED indicating that the unit is armed and awaiting a trigger

Trig'd Green LED indicating that a trigger event occurred

VXI Interface

Backplane Connection Standard P1 and P2 interface

Command Interface A16 message based, SCPI compatible

Interrupt Operation Programmable interrupter, level 1 to 7

Data Interface 64 Mbytes of VXI accessible DRAM in A32 register-based address space

Power

Power Supplies

Voltage	DC Current	Dynamic Current
+24V	0.0A	0.0A
+12V	0.1A	0.1A
+5V	10.7A	0.7A
-24V	0.0A	0.0A
-12V	0.1A	0.1A
-5.2V	0.15A	0.1A
-2V	0.05A	0.1A

Power Consumption 54.5 W typical total power & cooling

Error Codes



The ZT621VXI maintains an error queue containing codes for faults conditions encountered during unit operation. These codes are listed in the table below along with a brief description of the code meaning. The error log may be read by using the SYSTEM ERROR QUERY.

Code	Error Summary	Description
-100	Command error	A generic syntax error (only used when a more specific error does not apply)
-101	Invalid character	A syntactic element contains a character which is invalid for that type
-102	Syntax error	An unrecognized command or data type was encountered
-103	Invalid separator	The parser was expecting a separator and encountered an illegal character
-104	Data type error	The parser recognized a data element different than the one allowed
-105	Get not allowed	Group execute trigger not allowed
-108	Parameter not allowed	More parameters were received than expected
-109	Missing parameter	Fewer parameters were received than expected
-110	Command header error	A generic error was detected in the command
-112	Mnemonic too long	The command contains too many characters
-113	Undefined header	The command is correct, but undefined for the specific instrument
-120	Numeric data error	A generic numeric syntax error (only used when a more specific error does not apply)
-121	Invalid char in number	An invalid character for the data type was encountered
-123	Exponent too large	The magnitude of the exponent was larger than 32000
-124	Too many digits	The mantissa of a decimal numeric data element contained more than 256 digits
-128	Numeric data not allowed	A legal numeric data element was received, but the instrument does not accept one at this position in the command
-130	Suffix error	General command suffix error (only used when a more specific error does not apply)
-131	Invalid suffix	The command suffix is invalid for this instrument
-138	Suffix not allowed	A suffix was encountered after a numeric element which does not allow suffixes
-140	Character data error	General character data element error (only used when a more specific error does not apply)

Code	Error Summary	Description
-141	Invalid character data	Either a invalid character in the parameter or the character data is not valid for this command
-144	Character data too long	The character parameter contains to many characters
-148	Character data not allowed	The character data is legal but not supported by this instrument
-150	String data error	General data string error (only used when a more specific error does not apply)
-151	Invalid string data	An invalid string command parameter
-158	String data not allowed	A sting element was in the wrong place for this instrument command
-160	Block data error	General block data error (only used when a more specific error does not apply)
-161	Invalid block data	An invalid block data element was received for this instrument command
-168	Block data not allowed	Block data element not allowed by this instrument command at this parameter
-200	Execution error	General execution error (only used when a more specific error does not apply)
-213	Already initiated	Indicates that a measurement request was ignored because another measurement was already in progress
-220	Parameter error	General program parameter error (only used when a more specific error does not apply)
-221	Settings conflict	Indicates that a legal command was received by the instrument but could not be executed because of the current state of the instrument
-222	Data out of range	Indicates that a valid parameter was received but could not be executed because the parameter is out of range for the instrument
-223	Too much data	The command contained more data then the instrument memory could support
-300	Device specific error	General instrument error (only used when a more specific error does not apply)
-302	System error	Indicates that an instrument system error has occurred
-350	Error queue overflow	This code indicates that there is no room in the error queue and an error occurred but was not recorded
-400	Query error	General query error (only used when a more specific error does not apply)
-410	Query interrupted	Indicates that a command was received before the query was fully executed
-422	Query with no response	An query occurred with nothing to respond
-500	ZT621VXI instrument error	General ZT621VXI instrument error (only used when a more specific error does not apply)
-501	TCXO test failed	Internal TCXO timebase reference self-test failed
-502	CLK10 test failed	VXIbus CLK10 timebase reference self-test failed

Code	Error Summary	Description
-503	SRAM test failed	Static RAM self-test failed
-504	DRAM test failed	Dynamic RAM self-test failed
-505	Acquisition RAM test failed	Acquisition RAM self-test failed
-506	Trigger RAM test failed	Trigger event RAM self-test failed
-507	ROM test failed	Manufacturer information ROM self-test failed
-508	Glue FPGA test failed	Glue FPGA device self-test failed
-509	Gate FPGA test failed	Gate FPGA device self-test failed
-510	DRAM FPGA test failed	DRAM controller FPGA device self-test failed
-511	VXI FPGA test failed	VXI interface FPGA device self-test failed
-512	Daughter card test failed	Daughter card interface self-test failed
-513	Digitizer1 test failed	Digitizer sub module channel1 interface self-test failed
-514	Digitizer2 test failed	Digitizer sub module channel2 interface self-test failed
-520	PLL unlocked	The instrument clock phase-locked loop is not locked to the selected timebase reference
-521	Invalid sample rate & points	Invalid combination of sample rate and waveform points
-522	Invalid reference size	Invalid reference waveform size requested
-523	Waveform sizes not equal	Waveform sizes not equal for requested two waveform function
-524	Pulse width trigger limited	Pulse width trigger range limited to allowable range for selected sample rate
-600	ZT621VXI device-specific error	General ZT621VXI device-specific error (only used when a more specific error does not apply)
-603	CPU clock error	CPU clock speed error
-604	Record tag error	Unknown record identifier tag error
-605	Memory page error	Invalid memory page error
-606	Table corrupt error	Cross reference table corrupt error
-607	Command table error	Command table corrupt error
-608	Command state error	Command parser state error
-609	Capture state error	Capture state error
-610	Flash memory error	Flash memory operation error
-611	Measurement list error	Measurement list full error
-612	Download too large	Waveform download too large error
-613	Corrupt configuration	Corrupt instrument state storage configuration error
-614	Scale error	Invalid scale modifier error
-615	Measurement error	Invalid measurement function error
-616	Boot Failed	Second boot operation failed
-617	Calibration corrupt	Default calibration table corrupt error
-618	Segment size error	Invalid segment size for installed memory error
-619	DAC out of range	DAC code out of range error
-620	SPI error	SPI invalid select error
-621	Arm state error	Invalid arm state error



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