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ELGAR

OPERATING MANUAL

for the

VXI/ABLE INTERFACE

MODEL VXP-1000 to

MODEL AT8000 DC System Module

ELGAR CORPORATION
9250 Brown Deer Road
San Diego, CA 92121

VXI/ABLE Interface
VXP-1000 - Operation

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April 11, 1995

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SAFETY NOTICE

BEFORE APPLYING POWER to the System, verify that the VXP–1000 VXI Interface is properly configured for the user's particular application.

WARNING

HAZARDOUS VOLTAGES IN EXCESS OF 230 VRMS, 400V PEAK MAY BE PRESENT WHEN COVERS ARE REMOVED. QUALIFIED PERSONNEL MUST USE EXTREME CAUTION WHEN SERVICING THIS EQUIPMENT. CIRCUIT BOARDS, TEST POINTS AND OUTPUT VOLTAGES MAY ALSO BE FLOATING ABOVE (BELOW) CHASSIS GROUND.

Installation and servicing must be performed by QUALIFIED PERSONNEL who are aware of properly dealing with attendant hazards. This includes such simple tasks as fuse verification and channel reconfiguration.

Ensure that the AC power line ground is properly connected to the VXP–1000 input connector. Similarly, other power ground lines including those to application and maintenance equipment MUST be properly grounded for both personnel and equipment safety.

Always ensure that facility AC input power is de–energized prior to connecting or disconnecting the power cable. Similarly, the VXP–1000 circuit breaker must be switched OFF prior to connecting or disconnecting output power.

In normal operation, the operator does not have access to hazardous voltages within the chassis. However, depending on the user's application configuration, **HIGH VOLTAGES HAZARDOUS TO HUMAN SAFETY** may be normally generated on the output terminals. The Customer/User must ensure that the output power (and sense) lines be properly labeled as to the SAFETY hazards and that any inadvertent contact with hazardous voltages is eliminated.

Guard against risks of electrical shock during open cover checks by NOT TOUCHING any portion of the electrical circuits. Even when power is OFF, capacitors are well known to retain an electrical charge. Use SAFETY GLASSES during open cover checks to avoid personal injury by any sudden component failure.

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SECTION I

GENERAL DESCRIPTION

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1.1 INTRODUCTION

This manual has been prepared for use with the Elgar Model VXP-1000 VXI Interface module controlling an Elgar Model AT8000A chassis with DC modules installed. The VXP-1000 is a power supply controller contained within the slots of a C-size or D-size VXI mainframe and is operated from a computer using the ABLE Command Syntax.

The VXP-1000 allows Elgar Model AT8000A DC instruments to be controlled from the VXI chassis without requiring a General Purpose Interface Bus (GPIB). The VXP-1000 places the control portion of the power system in the VXI chassis, separate from the power elements of the system, giving system integrators the ability to take advantage of VXI communications and timing capabilities without suffering from its power and cooling restrictions.

In addition to its standard DC programmable features, the VXP-1000 also provides users with increased capabilities such as automatic calibration, time-based event programming, continuous power source monitoring/ reporting, and fault isolation.

1.2 APPLICATIONS

The VXIbus is an open system architecture and specification for emerging "instrument-on-a-card" technology. VXIbus enables computers, interfaces, and instruments produced by various manufacturers to coexist as fully compatible modules within the same VXI chassis.

Unfortunately, VXI does not allow any appreciable amount of AC or DC power in the VXI chassis due to lack of power on the backplane and minimum cooling capabilities. Elgar developed the VXP series (expanded for power) to address this problem. The VXP allows the control portion of the power system to reside in the VXI chassis while the power elements of the system reside external to the VXI chassis. System integrators that use VXI can now expand the system to include power while taking advantage of the VXI communications and timing capabilities.

1.3 SPECIFICATIONS

Dimensions: VXIbus standard C-size module (refer to Figure 2-1).

Interface Capability: Up to three separate Elgar power systems.

Physical Interface: There is one front panel connector:

- One Serial Port. This port drives a specially configured Model AT8000A. This configuration supports the AT8000A system **with DC modules only.**

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NOTES

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SECTION II

INSTALLATION

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2.1 INTRODUCTION

The Model VXP-1000 has been configured, calibrated and tested prior to shipment. Therefore, the instrument is ready for immediate use upon receipt.

WARNING

Hazardous voltages are present when operating this equipment. Read the "SAFETY" notices on page ii before performing installation, operation, or maintenance.

2.2 UNPACKING

The VXP-1000 has been packed in accordance with industrial standards for safe shipment. Upon receipt of the unit, unpack and inspect the unit as described in the following steps:

1. Inspect the shipping container prior to accepting the container from the carrier. If damage to the container is evident, a description of the damage shall be noted on the carrier's receipt, then signed by the driver of the carrier agent.

2. If damage is not apparent until the contents are unpacked, a claim for concealed damage shall be placed with the carrier. The shipping container(s) and filler material shall be saved for subsequent inspection.

3. Forward a report of any damage to the Elgar Service Department. Elgar will provide instructions for repair/replacement of the instrument.

4. If possible, save the container and packing material for subsequent return of the instrument to the factory. If the instrument needs to be shipped and proper packing material is not available, contact Elgar to provide containers and shipping instructions.

2.3 PRE-INSTALLATION INSPECTION

Inspect the VXP-1000 for shipping damage such as dents, scratches, distortion, and damaged connectors. There are no mercury relays or other internal components sensitive to instrument tilting for inspection purposes.

2.4 INSTALLATION

The VXP-1000 (refer to Figure 2-1) is designed to be installed in a user-provided VXI chassis.

2.4.1 Logical Address Configuration

The VXP-1000 plug-in module has a row of switches which set the module's Logical Address. The Logical Address selector switch is accessible through the slot in the top cover of the VXP-1000.

The DIP switch configuration is as follows (refer to Figure 2-2):

- The switch is closed when placed in the "0" position.

- The switch is open when placed in the "1" position.

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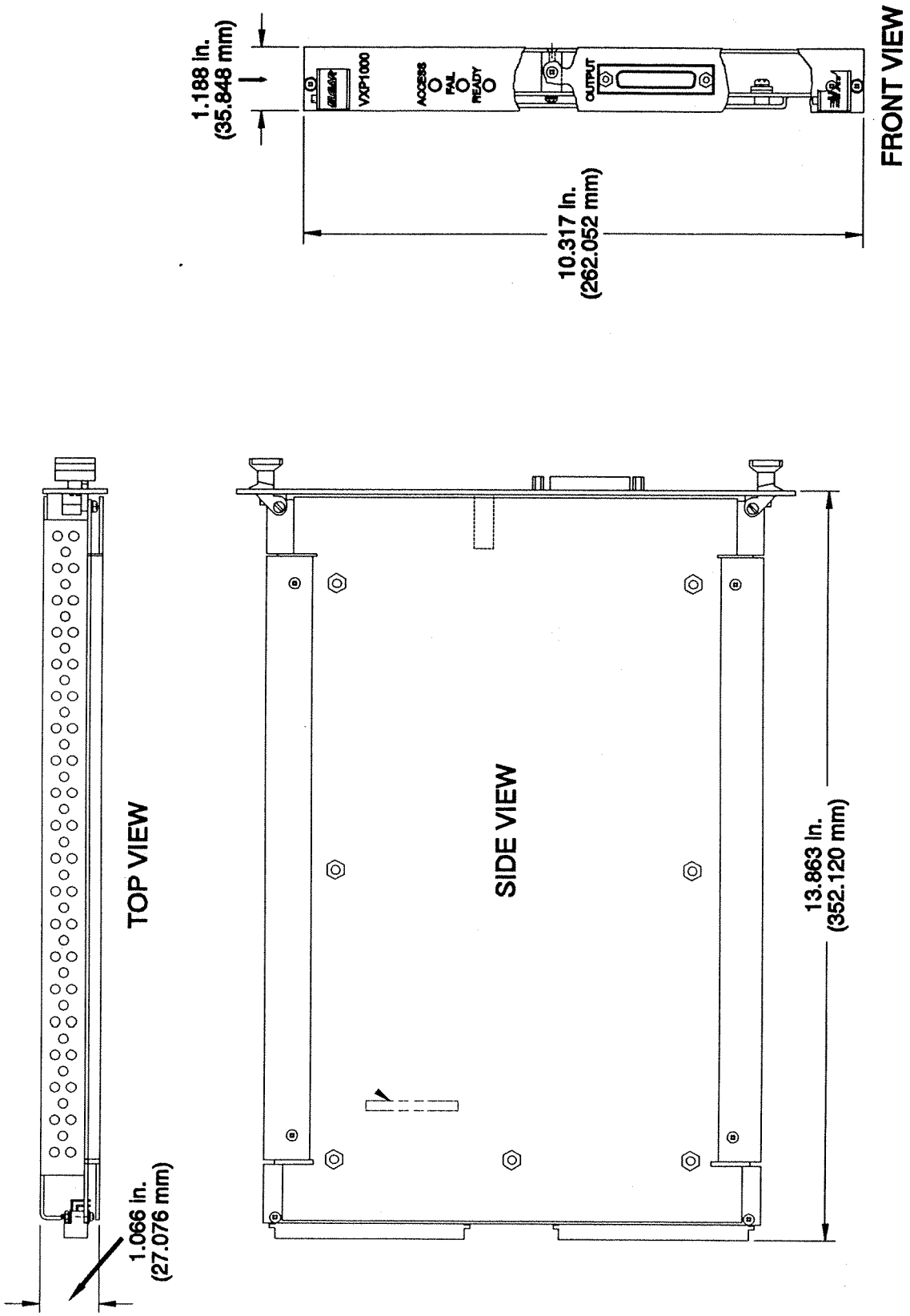


Figure 2-1. VXP-1000 Installation Dimensions

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For example, for Logical Address 3, the DIP switch would be configured as follows:

0–Off; 1–Off; 2–On; 3–On; 4–On; 5–On; 6–On; 7–On

2.4.2 Module Insertion

Perform the following:

1. Place the VXP–1000 module into any slot of the VXI chassis **except** for Slot 0.

2. Insert the VXP–1000 such that the VXP–1000 rear connectors are properly aligned with the VXI chassis back panel connectors. Use the card guides to aid in properly inserting the VXP–1000.

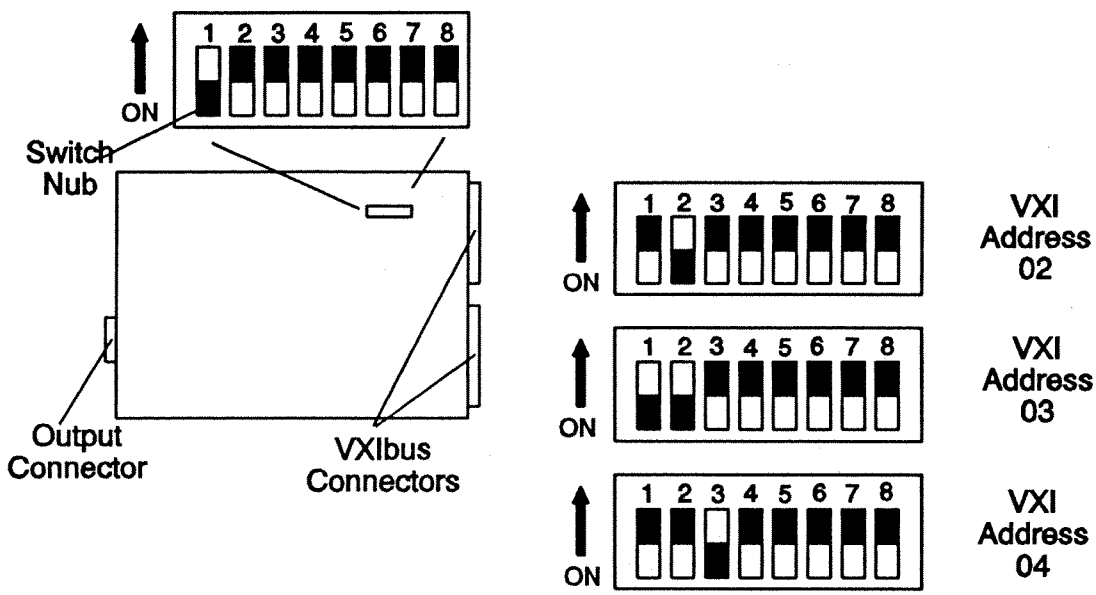


Figure 2–2. VXP–1000 Logical Address Switch Setting

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2.4.3 Installation of Interconnecting Cables

Install and verify the interconnecting cables between the VXP-1000 and the AT8000A as shown in Figure 2-3.

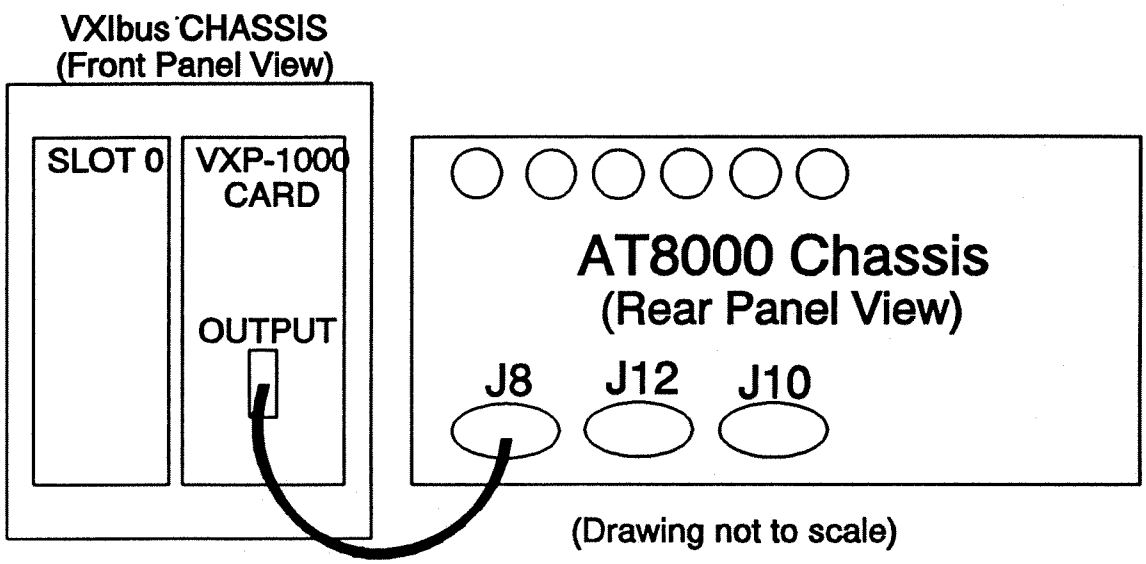


Figure 2-3. VXP-1000 and AT8000A System Interconnect Cabling

2.5 CONFIGURATION

Once the system is properly interconnected, and all of the chassis addresses are selected, the system is ready for configuration.

2.5.1 VXI Configuration

The interrupt level of the VXP-1000 is initially configured to 1. This level can be read by sending the VXP-1000 controller the following command:

"INTLVL? <cr><lf>"

When the VXP-1000 output buffer is read it will return the following string:

"INTERRUPT LEVEL = 1 <cr><lf>"

The interrupt level can be set using the following command:

"INTLVL 4 <cr><lf>"

The above command will set the VXI interrupt level to interrupt 4. All further interrupts will be generated on the new interrupt level.

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The logical address of the VXP-1000 can be queried with the following command:

"ADDRESS? <cr><lf>"

This command will return:

"LOGICAL ADDRESS = 2 <cr><lf>"

The address cannot be set in software. The address only affects the actual switch positions on the Logical Address switch.

The software revision level can be queried by:

"REV <cr><lf>"

This command returns the revision of the software installed in the VXP-1000. The format of the return is:

"ELGAR CORPORATION VXP1000 ABLE REVISION 1.00 DATE 6/19/91 <cr><lf>"

2.5.2 System Configuration

Once the VXI configuration is complete the configuration of the system can be checked. A map of the system is available for checking from the VXP-1000. The map is simply a reflection of what is in each slot in each chassis. Each chassis is referred to as a block, and each block has eight slots. The number of slots is independent of chassis size, the VXP chassis have eight slots and the AT8000A chassis have six slots.

The information in the module map can be queried by using the following command:

"CNFG BLK 1 SLT 1 <cr><lf>"

Since the VXP-1000 considers itself as block 0, the block variable runs from 1 to 15. The slot variable runs from 1 to 8. In the AT8000A chassis, anything above slot 8 will return a message indicating no module. The configuration query command will return the following two strings:

"CNFG BLOCK 1 SLOT 1: CH1=DC MAXV: 32.00 MAXI: 6.25 <cr><lf>"

with a 32-volt 6.25 amp module, or

"NO MODULE <cr><lf>"

if no module is installed in that slot.

If a module is added to the system its type and parameters can be read from identification ROM/RAM with the command:

"ITST 0 1 1 <cr><lf>"

This command actually reads the ID of the module from the module, and not from the VXP-1000's non-volatile RAM. It is useful for verifying that the configuration of the modules is correct. This command has a return buffer formatter as follows:

"TAG DATA TYPE DC SERNO AT8MOD MAXV 32.00 MAXI 6.25 <cr><lf>"

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If the system has been changed (i.e., modules moved to different slots, new modules added), the VXP-1000 needs to check all of the IDs and build its internal map. This is accomplished by using:

"CNFG SYS <cr><lf>"

The execution length of this command varies from configuration to configuration, but generally it completes in less than thirty seconds. When complete, the map of the modules in the blocks is complete and can be queried using the "CNFG BLK x SLT y <cr><lf>" command if a verification is desired.

The last stage of system configuration is building the channel map. This map tells the VXP-1000 what channel number is associated with which block and slot in the system. If the system has been changed from the configuration as shipped, the channel map must be cleared and re-entered.

Clearing the channel map is accomplished by using:

"CLEAR <cr><lf>"

After the map is cleared the channels will then be configured with:

"CNFG CH1 1 1 <cr><lf>"

This command defines channel 1 as being block 1 slot 1. Every programming reference to channel 1 will now be directed to block 1 slot 1. Once all of the channels are set up, the system is now fully configured for use. Note the space between the block # and the slot #.

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SECTION III

OPERATION

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3.1 INTRODUCTION

The VXP-1000 accepts commands in the ABLE language. This language allows programming all aspects of the installed channels. The language is intended to be easy to use; therefore, a minimum amount of effort is required to set up the operation of the power supplies.

NOTE

Only DC-related commands will be discussed since this system supports an AT8000A system with DC modules only.

3.2 PROGRAMMING SYNTAX

3.2.1 ADDRESS?

Syntax:

ADDRESS?

Example:

"ADDRESS? <cr><lf>"

This command initiates the VXP-1000 to read the Logical Address switch and return it in its output buffer.

The return ADDRESS? string format is:

"LOGICAL ADDRESS = X <cr><lf>"

Where:

X = the Logical Address ranging from 1 to 254.

3.2.2 CAL

Syntax:

CHx CAL <param>

Examples:

"CH2 CAL VOLT <cr><lf>"
"CH5 CAL CURR <cr><lf>"

The calibration command allows the user to soft calibrate the modules. The calibration command works with an external measurement device to software adjust the digital-to-analog programming.

For voltage calibration, the external voltmeter needs to be connected across the module terminals and the CAL VOLT command issued. The module will close its output relay and be programmed to 20% of its full scale output voltage. The voltage from the external DVM is then entered into the VXP-1000 input buffer. After reception of the voltage the module will program itself to 80% of full scale and the process is repeated. At the end of the calibration the module will reset itself.

For DC current calibration, the external meter (or shunt and meter) is once again connected across the output terminals and the CAL CURR command is issued. The module will program to 20% of full scale in the constant current mode, then the value is entered into the VXP-1000. The module then goes to 80% of full scale current and the process is repeated.

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3.2.3 CAL?

Syntax:

CHx CAL?

Examples:

"CH1 CAL? <cr><lf>"
"CH4 CAL? <cr><lf>"

This command is used to read the calibration factors stored for that channel. The factors are stored as current gain, current offset, voltage gain, and voltage offset. The return string format is:

"CH=x VGAIN = x.xxxxxx VOFFS = X.xxxxxx IGAIN = x.xxxxxx IOFFS = x.xxxxxx <cr><lf>"

3.2.4 CLEAR

Syntax:

CLEAR

Example:

"CLEAR <cr><lf>"

This command clears the channel configuration and only needs to be used during system configuration.

3.2.5 CLS

Syntax:

CHx CLS

Examples:

"CH1 CLS <cr><lf>"
"CH2 CLS, CH5 CLS <cr><lf>"

This command causes the specified channel to close its main output isolation relay. If a negative voltage is programmed, the reverse polarity relay will close instead of the isolation relay. To ensure that the relay is not "hot switched," the module is first programmed to zero volts by the local processor, then the relay state is changed.

3.2.6 CNF

Syntax:

CNF

Example:

"CNF <cr><lf>"

This command executes a confidence test on the system. All modules are checked for functionality, and failed modules are returned in a formatted string.

On DC modules, the voltage programming, current limit programming, and current limit shutdown are checked.

This command is functionally equivalent to IST (refer to paragraph 3.2.14 below).

If all modules, the following is returned:

"<cr><lf>"

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If modules fail:

"TEST FAILURE : VOLTAGE BLK x SLT x CURRENT BLK x SLT x FREQUENCY BLK x SLT x PHASE BLK x SLT x <cr><lf>"

If multiple failures occur, multiple blocks and slots are added to the failed parameter. If no modules fail a parameter, that parameter is not printed.

3.2.7 CNFG SYS

Syntax:

CNFG SYS

Example:

"CNFG SYS <cr><lf>"

This command causes the system to build its configuration table. The CNFG SYS command has two stages. In the first stage, the VXP-1000 tries to address all of the slaves in the system, building a map of blocks that are present. In the second stage, the VXP-1000 reads all of the module IDs from the blocks that were found active in the first stage.

3.2.8 CNFG BLK SLT

Syntax:

CNFG BLK x SLT y

Examples:

"CNFG BLK 1 SLT 3 <cr><lf>"
"CNFG BLK 2 SLT 1 <cr><lf>"

This command is used to query what modules are installed in the system. After a CNFG SYS is executed and the module map is build, this command becomes available to inspect the map. The string returned has the following formats:

If a DC module is present in the block and slot:

"CNFG BLK x SLOT x: CHx=dc; MAXV xx.xx MAXI xx.xx <cr><lf>"

If no module is present in the block and slot:

"NO MODULE <cr><lf>"

3.2.9 CNFG CH

Syntax:

CNFG CHx x x (x x)...

Example:

"CNFG CH1 1 1 <cr><lf>"
"CNFG CH2 1 2 <cr><lf>"

The CNFG CH command is used to translate a channel number to a physical block and slot, or blocks and slots. When mapping one channel number to one block and slot only, the block and slot number needs to follow the channel number. When mapping multiple blocks and slots to a channel number, a start block and slot and an end block and slot needs to be specified. **The AT8000A modules do not support software paralleling.** Below are several comprehensive configuration command examples:

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Example 1:

"CNFG CH1 1 1 <cr><lf>"

This configures channel 1 as the module in block 1 slot 1.

Example 2:

"CNFG CH0 1 1 1 1 2 2 2 2 <cr><lf>"

This configures channel 0 to act on block 1 slot 1 and block 2 slot 2 simultaneously. For example, if channel 0 is programmed to 10 volts, both modules will be programmed to 10 volts. If a "CH0 CLS <cr><lf>" command is issued, both channel's output relays will be closed. When multiple modules are ganged together, the maximum voltage of the lowest voltage module will be used for limit checking.

Example 3:

"CNFG CH2 1 1 1 2 <cr><lf>"

This configures channel 2 to parallel the modules in block 1 slot 1 and block 1 slot 2. When modules are paralleled by assigning a single channel number to them, it is allowed to assign the other channel number to the individual modules. If a paralleled channel is invoked, all modules will be used, and any channels that use the modules will be reset. If, at a later time, one of the modules is used in another channel, the paralleled channel will be reset and un-paralleled.

3.2.10 CURL

Syntax:

CHx CURL X.XX

Examples:

"CH3 CURL 1.45 <cr><lf>"
"CH5 CURL .0000375E5 <cr><lf>"

This command sets the current trip point of the module. Once the current trip point is set, the module will be reset if the current exceeds the set value. This places the module in the current limit mode. For current source mode operation, see paragraph 3.2.11 below.

3.2.11 CURR

Syntax:

CHx CURR X.XX

Examples:

"CH1 CURR 2.00 <cr><lf>"
"CH4 CURL .200E+01 <cr><lf>"

This command sets the module to operate in the constant current mode at the specified current. Once the operating current is reached the voltage will fold back to maintain the set current. Refer to the VOLT command (paragraph 3.2.26 below) for setting the compliance voltage. This command is available only on DC channels.

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3.2.12 INTLVL

Syntax:

INTLVL x

Examples:

"INTLVL 1 <cr><lf>"
"INTLVL 5 <cr><lf>"

This command sets the interrupt line on which the VXP-1000 interrupts the slot 0 resource manager. Setting the interrupt level to zero causes the VXP-1000 not to generate interrupts.

3.2.13 INTLVL?

Syntax:

INTLVL?

Example:

"INTLVL? <cr><lf>"

This command returns the current interrupt level selected. The return string is formatted as follows:

"INTERRUPT LEVEL = x <cr><lf>"

Where:

x = the current interrupt level selected.

3.2.14 IST

Syntax:

IST

Example:

"IST <cr><lf>"

This command executes a confidence test on the system. All modules are checked for functionality, and failed modules are returned in a formatted string.

On DC modules, the voltage programming, current limit programming, and current limit shutdown are checked.

This command is functionally equivalent to CNF (refer to paragraph 3.2.6 above).

If all modules, the following is returned:

"<cr><lf>"

If modules fail:

"TEST FAILURE : VOLTAGE BLK x SLT x DURRENT BLK x SLT x FREQUENCY BLK x SLT x PHASE BLK x SLT x <cr><lf>"

If multiple failures occur, multiple blocks and slots are added to the failed parameter. If no modules fail a parameter, that parameter is not printed.

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3.2.15 ITST

Syntax:

ITST x x x

Examples:

"ITST 0 1 1 <cr><lf>"
"ITST 0 2 1 <cr><lf>"

This command reads the ID (RAM or ROM) of the module in the block and slot selected. The three required parameters are: 1) a required zero, 2_ block, and 3) slot. The return string has two forms:

When a module is found:

"TAG DATA TYPE DC SERNO ssssssss MAXV xx.xx MAXI xx.xx <cr><lf>"

When no module is installed, or the RAM is un-initialized:

"TAG NOT INITIALIZED OR NO MODULE <cr><lf>"

3.2.16 MAXSLOT

Syntax:

MAXSLOT x

Example:

"MAXSLOT 8 <cr><lf>"

The maximum slot command sets the number of slots per block. **IT SHOULD ALWAYS BE SET TO 8,** unless used with the VXP-3000 chassis that has 11 slots. After a CNFG SYS command, MAXSLOT should be sent to the VXP-1000 and another CNFG SYS should be performed.

3.2.17 OPN

Syntax:

OPN

Examples:

"CH1 OPN <cr><lf>"
"CH4 OPN, CH8 OPN <cr><lf>"

This command initiates the opening of the isolation relay (or the polarity relay if negative voltage programmed). To ensure that the relay is not "hot switched" the module is first programmed to zero volts by the local processor, then the relay state is changed.

3.2.18 PWRL

Syntax:

PWRL

Examples:

"CH1 PWRL <cr><lf>"
"CH8 PWRL <cr><lf>"

This command returns the maximum voltage, current, and relays installed in the selected channel. The format of the return string is:

"PWRL: CH=x xx.xxxV x.xxA S R <cr><lf>"

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3.2.19 REV

Syntax:

REV

Example:

"REV <cr><lf>"

This command returns the current VXP-1000 software revision number and date. The return string is:

ELGAR CORPORATION VXP1000 ABLE REVISION X.XX DATE XX/XX/XX <cr><lf>"

3.2.20 RST

Syntax:

CHx RST

Examples:

"CH1 RST <cr><lf>"
"CH2 RST, CH4 RST <cr><lf>"

This command resets the specified channel(s) to default settings of: open disconnect relay, zero volts, and maximum current (AT8000A modules are set to maximum zero volt current).

3.2.21 RTN

Syntax:

CHx RTN

Examples:

"CH1 RTN <cr><lf>"
"CH7 RTN <cr><lf>"

This command returns the current programmed settings of the selected channel. The data returned by the RTN command is always current. If a module experiences a shutdown condition (current limit, over voltage, over temperature, etc.), the values are updated to the reset default conditions. The return string has the following format for DC:

"RTN: CH=x xx.xxxV xx.xxxA s o <cr><lf>"

Where:

s = sense relay state: I = internal; X = external.

o - output relay state: O = open; c = closed.

3.2.22 SENS I

Syntax:

SENS I

Examples:

"CH1 SENS I <cr><lf>"
"CH1 SENS I, CH2 SENS I <cr><lf>"

This command forces the selected channel to use its internal sense path and ignore the voltage on the connector pins.

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3.2.23 SENS X

Syntax:

SENS X

Examples:

"CH3 SENS X <cr><lf>"
"CH1 SENS X, CH2 SENS X <cr><lf>"

This command forces the selected channel to use its external sense lines. If the output relay is open, the sense relay will not close until a CLS command is issued to the channel. This output relay dependency guarantees that the module will be isolated when the output relay is open.

3.2.24 STA

Syntax:

STA

Example:

"STA <cr><lf>"

This command causes the VXP-1000 to fill its output buffer with the current status. More information in Section 3.3 below on the format of the returned strings.

3.2.25 TST

Syntax:

CHx TST >param>

Examples:

"CH1 TST VOLT <cr><lf>"
"CH2 TST CURR <cr><lf>"
"CH3 TST WATT <cr><lf>"

This command causes the instrument to initiate a measurement of the selected parameter. On DC channels, voltage, current and power can be measured. The syntax for each measurement is as follows:

"CHx TST VOLT <cr><lf>"
"CHx TST CURR <cr><lf>"
"CHx TST WATT <cr><lf>"

The strings that the TST command returns are formatted as follows:

"CHx = xx.xxV <cr><lf>" for voltage;
"CHx = xx.xxA <cr><lf>" for current; and
"CHx = xx.xxW <cr><lf>" for power (watts).

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3.2.26 VOLT

Syntax:

CHx VOLT xx.xx

Examples:

"CH1 VOLT 32.000 <cr><lf>"
"CH2 VOLT 24, CH3 VOLT 5 <cr><lf>"

The voltage command programs the voltage of the module. In constant current mode the command programs the compliance voltage; in the current limit mode it programs the output voltage.

3.3 PROGRAMMING HINTS AND EXAMPLES

The VXP-1000 is capable of changing several parameters of several channels at the same time. All of the basic set up commands can be "stacked" in the input buffer. It is not allowed to stack the configuration commands or the query commands. Below are some common examples that illustrate the allowed and illegal syntax structures.

3.3.1 Allowed Programming String Examples

"CH1 CURL4 VOLT 5, CH2 CURL 1 VOLT 15, CH3 CURL 1 VOLT -15 <cr><lf>"

"CH1 VOLT 32 CURR 1, CH2 VOLT -32, CH3 VOLT 10 <cr><lf>"

"CH1 RTN <cr><lf>"

"CH1 RST, CH2 RST, CH3 RST, CH4 RST <cr><lf>"

"CH1 RST VOLT 15 CURL 1 CLS, CH2 RST VOLT 5 CURL 5 CLS <cr><lf>"

"CH1 CLS SENS X VOLT 15, CH2 CLS VOLT -15 SENS X <cr><lf>"

3.3.2 Illegal Programming String Examples

"CH1 RTN, CH2 RTN, CH3 RTN <cr><lf>"

"CNFG CH1 1 1, CNFG CH2 1 2 <cr><lf>"

"CH1 CLS, CNF <cr><lf>"

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3.4 ERROR AND SUPERVISORY PROCESSING

There are times when the VXP-1000 signals its need for service. The need for service is handled by using the selected interrupt line on the VXIbus. The status byte of the VXP-1000 can be read and decoded using Table 3-1, After an exception is encountered, a STA command can be used to get a verbal reading of the indicated trouble.

Table 3-1. Error and Supervisory Messages

Error # (decimal)	Message Returned On STA Command
64	"CURRENT LIMIT CHx <cr><lf>"
64	"SERVO ERROR CHx <cr><lf>"
64	"OVER TEMPERATURE CHx <cr><lf>"
64	"OVER CURRENT CHx <cr><lf>"
64	"SENSE FAULT CHx <cr><lf>"
64	"FUSE FAULT CHx <cr><lf>"
64	"OVER VOLTAGE CHx <cr><lf>"
64	"NO CLOCK FROM MASTER CHx <cr><lf"
64	"UNRECOGNIZED FAILURE CHx <cr><lf>"
72	"SLAVE TIMEOUT <cr><lf>"
74	"SYNTAX ERROR <cr><lf>"
75	"COMMAND ERROR <cr><lf"

Reading the status byte clears the status byte.

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APPENDIX A

SPECIALLY MODIFIED SYSTEMS

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A.1 SCALED VOLTAGE AND CURRENT OUTPUTS

A scaled voltage and current output is brought out to the J10 (External I/O) connector. These signals run from 0 to 4.85 volts for full scale output. The signals should be reffered back to the ground reference provided on J10. This ground should not be tied to any other ground in the system, as this will result in a false reading. The table below provides the J-10 signal locations.

J-10	Signal	J-10	Signal
1	Scaled Voltage Slot 1	14	Scaled Voltage Slot 4
2	Ground Reference Slot 1	15	Ground Reference Slot 4
3	Scaled Current Slot 1	16	Scaled Current Slot 4
4	Not Connected	17	Not Connected
5	Scaled Voltage Slot 2	18	Scaled Voltage Slot 5
6	Ground Reference Slot 2	19	Ground Reference Slot 5
7	Scaled Current Slot 2	20	Scaled Current Slot 5
8	Not Connected	21	Not Connected
9	Scaled Voltage Slot 3	22	Scaled Voltage Slot 6
10	Ground Reference Slot 3	23	Ground Reference Slot 6
11	Scaled Current Slot 3	24	Scaled Current Slot 6
12	Not Connected	25	Not Connected
13	Chassis Ground		

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NOTES

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