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GPIB-XKW1
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Operating Manual

Internal GPIB Interface for XKW Series Programmable DC Power Supply

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Operating Manual for

Internal GPIB Interface for XKW 1000 Watt and 3000 Watt Series

Programmable DC Power Supply

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What does this warranty cover and how long does it last?

This Limited Warranty is provided by Xantrex Technology, Inc. (“Xantrex”) and covers defects in workmanship and materials in your **Internal GPIB Interface card**. This warranty lasts for a Warranty Period of **5 years** from the date of purchase at point of sale to you, the original end user customer.

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Toll Free North America:	1 800 667 8422
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- The dated purchase receipt from the original purchase of the product at point of sale to the end user, or
- The dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status, or
- The dated invoice or purchase receipt showing the product exchanged under warranty

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d. the product if it is used as a component part of a product expressly warranted by another manufacturer;

e. the product if its original identification (trade-mark, serial number) markings have been defaced, altered, or removed.

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Please refer to your product user manual for limitations on uses of the product. Specifically, please note that this power supply is not intended for use in connection with life support systems and Xantrex makes no warranty or representation in connection with any use of the product for such purposes.

Xantrex Technology, Inc.
8999 Nelson Way
Burnaby, British Columbia
Canada V5A 4B5

Information About Your Power Supply

Please record the following information when you first open your Power Supply package:

Model Number _____

Serial Number _____

Purchased From _____

Purchase Date _____

Release

Release 1.0 (2002-07)

Warnings and Cautions

Warnings and cautions are defined and formatted in this manual as shown below.

WARNING
Describes a potential hazard which could result in injury or death, or, a procedure which, if not performed correctly, could result in injury or death.

CAUTION
Describes a procedure which, if not performed correctly, could result in damage to data, equipment, or systems.

Power Supply Safety

WARNING—High Energy and High Voltage
Exercise caution when using and calibrating a power supply. High energy levels can be stored at the output voltage terminals on a power supply in normal operation. In addition, potentially lethal voltages exist in the power circuit and on the output and sense connectors of a power supply with a rated output greater than 40 V. Filter capacitors store potentially dangerous energy for some time after power is removed.

CAUTION
Operate the power supply in an environment free of flammable gases or fumes. To ensure that the power supply's safety features are not compromised, use the power supply as specified in this manual and do not substitute parts or make any unauthorized modifications. Contact the service technician for service and repair help. Repairs must be made by experienced service technicians only.

About This Manual

This technical manual is for the internal GPIB interface, a Talker-Listener card for the XKW Series DC output power supplies. This manual provides you with descriptions and specifications, user options, and configuration instructions, in addition to a command set which enables you to manage the power supply from an external source. Error messages and calibration procedures are also included.

This manual is designed for the user who is familiar with basic electrical theory especially as it applies to the operation of power supplies. This implies a recognition of Constant Voltage and Constant Current operation modes and the control of input and output power, as well as the observance of safe techniques while effecting supply or pin connections and any changes in switch settings. The user should also have experience with a computer-based communications software package.

Refer to your power supply manual for installation, configuration, and operating procedures for your power supply.

Main Sections

Section 1 Features and Specifications Describes the power supply and lists its features and specifications.

Section 2 Installation and Configuration Goes through basic setup procedures. Describes inspection, cleaning, shipping, and storage procedures. Includes additional options for configuring the GPIB interface for operation.

Section 3 Operation Lists the complete command set, status registers, and error codes.

Section 4 Calibration Provides detailed procedures for voltage and current mode calibration as well as over voltage protection (OVP) calibration. Includes calibration for programming and readback accuracy.

Manual Revisions

The current release of this manual is listed below. Updates may be issued as an addendum.

Release 1.0 (2002-07)

Contents

Section 1. Features and Specifications

Description

The internal GPIB interface card allows you to operate your power supply from a computer controller via the IEEE-488 communications bus. See Figure 1.1, “Sample Configuration using GPIB Interface”.

The GPIB interface allows complete remote programming of your power supply, including status reporting, settings query, and interrupt generation with user-designated fault conditions. Both the voltage and current output are precisely programmed directly in volts and amps with 14-bit resolution. Additionally, the built-in DVM and current shunt measure the actual power supply output and provide you with 12-bit readback. The programming command set is easy-to-use and self-documenting. The interface card comes standard with several protection features such as programmable over voltage protection, foldback, load isolation signal, and soft limits.

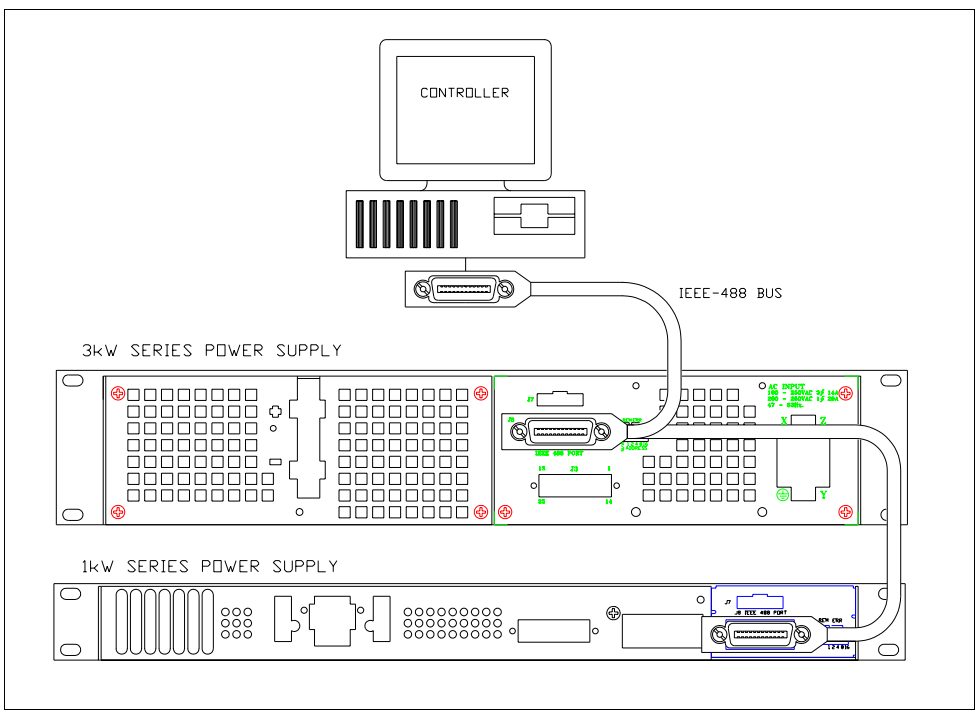


Figure 1.1 Sample Configuration using GPIB Interface

Features and Functions

Features

- 14-bit programming and 12-bit readback of voltage and current
- Programmable soft limits for voltage and current
- Programmable over voltage protection with reset
- Easy-to-use, self-documenting command set
- Isolated user-programmable signals such as isolated fault, polarity, and isolation
- LED status signals: error, system malfunction, address, service request, and over voltage protection (Plus fault, isolation, and polarity on 3kW models)
- Foldback in CV or CC mode with reset
- Local Lockout capability

Programmable Functions

- Output voltage and current
- Soft limits for voltage and current
- Overvoltage protection
- Output enable/disable
- Maskable fault interrupt
- Hold and trigger
- User-programmable output relay signals

Readback Functions

- Actual measured voltage and current
- Voltage and current settings
- Soft voltage and current limits
- Overvoltage protection setting
- Present and accumulated power supply status
- Programming error codes
- Fault codes
- Power supply model and version identification

Specifications

Table 1.1 Specifications for XKW 1000 W Series Supply with GPIB Interface Installed (8 V-60 V)

Models	8-125	20-50	33-33	40-25	60-18
Program Resolution					
Voltage	2.4mV	6mV	9.9mV	12mV	18mV
Current	37.5mA	15mA	9.9mA	7.5mA	5.4mA
OVP	4mV	10mV	16.5mV	20mV	30mV
Program Accuracy					
Voltage	30mV ±0.12%	75mV ±0.12%	75mV ±0.27%	75mV ±0.3%	150mV ±0.25%
Current	500mA ±0.1%	250mA ±0.1%	200mA ±0.1%	140mA ±0.15%	120mA ±0.1%
OVP	80mV	200mV	330mV	400mV	600mV
Readback Resolution					
Voltage	2.4mV	6mV	9.9mV	12mV	18mV
Current	37.5mA	15mA	9.9mA	7.5mA	5.4mA
Readback Accuracy					
Voltage	30mV ±0.12%	75mV ±0.12%	75mV ±0.27%	75mV ±0.3%	150mV ±0.25%
Current	500mA ±0.1%	250mA ±0.1%	200mA ±0.1%	140mA ±0.15%	120mA ±0.1%

Table 1.2 Specifications for XKW 1000 W Series Supply with GPIB Interface Installed (80 V-600 V)

Models	80-13	150-7	300-3.5	600-1.7
Program Resolution				
Voltage	24mV	45mV	90mV	180mV
Current	3.9mA	2.1mA	1.05mA	0.51mA
OVP	40mV	75mV	150mV	300mV
Program Accuracy				
Voltage	150mV ±0.3%	300mV ±0.3%	300mV ±0.4%	750mV ±0.37%
Current	80mA ±0.1%	40mA ±0.12%	20mA ±0.12%	20mA ±0.12%
OVP	800mV	1.5 V	3 V	6 V
Readback Resolution				
Voltage	24mV	45mV	90mV	180mV
Current	3.9mA	2.1mA	1.05mA	0.51mA
Readback Accuracy				
Voltage	150mV ±0.3%	300mV ±0.3%	300mV ±0.4%	750mV ±0.37%
Current	80mA ±0.1%	40mA ±0.12%	20mA ±0.12%	20mA ±0.12%

Table 1.3 Specifications for XKW 3000 W Series Supply with GPIB Interface Installed (8 V-40 V)

Models	**8-350**	**10-300**	**12-250**	**20-150**	**40-75**
Program Resolution					
Voltage	2.4mV	3.0mV	3.6mV	6mV	12mV
Current	105mA	90mA	75mA	45mA	22.5mA
OVP	4mV	5mV	6mV	10mV	20mV
Program Accuracy					
Voltage	50mV	50mV	50mV	50mV	50mV
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
Current	460mA	390mA	330mA	200mA	100mA
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
OVP	80mV	100mV	120mV	200mV	400mV
Readback Resolution					
Voltage	2.4mV	3.0mV	3.6mV	6mV	12mV
Current	105mA	90mA	75mA	45mA	22.5mA
Readback Accuracy					
Voltage	75mV	75mV	75mV	75mV	75mV
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
Current	900mA	750mA	600mA	300mA	200mA
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%

Table 1.4 Specifications for XKW 3000 W Series Supply with GPIB Interface Installed (55 V-300 V)

Models	**55-55**	**60-50**	**80-37**	**150-20**	**300-10**
Program Resolution					
Voltage	16.5mV	18mV	24mV	45mV	90mV
Current	16.5mA	15mA	11.1mA	6.5mA	3.3mA
OVP	27.5mV	30mV	40mV	75mV	150mV
Program Accuracy					
Voltage	75mV	75mV	100mV	180mV	360mV
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
Current	75mA	70mA	50mA	50mA	50mA
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
OVP	550mV	600mV	800mV	1.5 V	3 mV
Readback Resolution					
Voltage	16.5mV	18mV	24mV	45mV	90mV
Current	16.5mA	15mA	11.1mA	6.5mA	3.3mA
Readback Accuracy					
Voltage	100mV	110mV	150mV	280mV	560mV
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
Current	150mA	135mA	100mA	100mA	100mA
	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%

Section 2. Installation and Configuration

Introduction

To use this product, you must have the following equipment:

- a compatible model of DC output power supply
- IEEE-488 connector and cable
- computer with an IEEE-488 interface
- Computer-based communications software package

We usually install the GPIB interface in a power supply at the factory. Your local distributor or service center can also install the interface, especially for use in a previously-purchased supply already on site. We set the interface's PCB switches or program its EPROM to identify the power supply model to the interface during installation. You will need to configure the GPIB Interface-enhanced supply for your system using the "Basic Setup Procedure" on page 21. Refer also to Figure 2.1, pg. 16, Figure 2.2, pg. 17 and Figure 2.5, pg. 20 for drawings of the front panel, the interface subplate, and the GPIB interface printed circuit board (PCB).

Initial Inspection

CAUTION
If you remove the unit's cover, use proper static control techniques to avoid damage to static-sensitive components on the printed circuit board.

On first receiving your unit, perform a quick physical check.

- Ensure each package contains a power supply with its GPIB interface board installed, and manuals for the power supply and the GPIB interface. Any additional parts shipped with the power supply will be identified in the supply's documentation.
- Inspect the unit for any signs of physical damage such as scratches, cracks, or broken switches, connectors, or displays.
- Check the printed circuit board and components if you suspect internal damage.

If the unit is damaged, save all packing materials and notify the carrier immediately. For additional information, please see the section titled, "Returning Power Supplies to the Manufacturer" in the manual shipped with your complete unit.

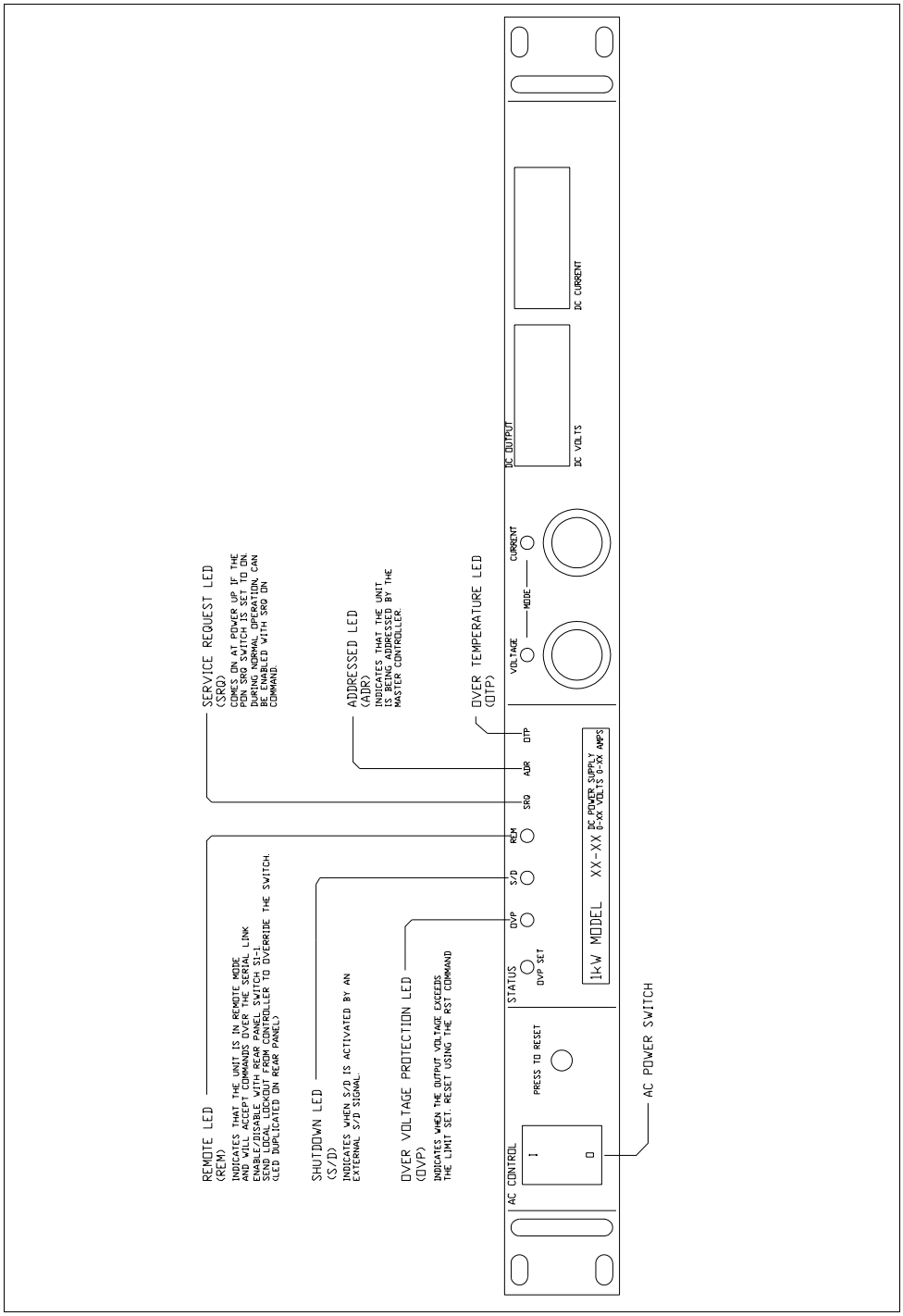


Figure 2.1 1kW Power Supply Front Panel with GPIB Interface Installed

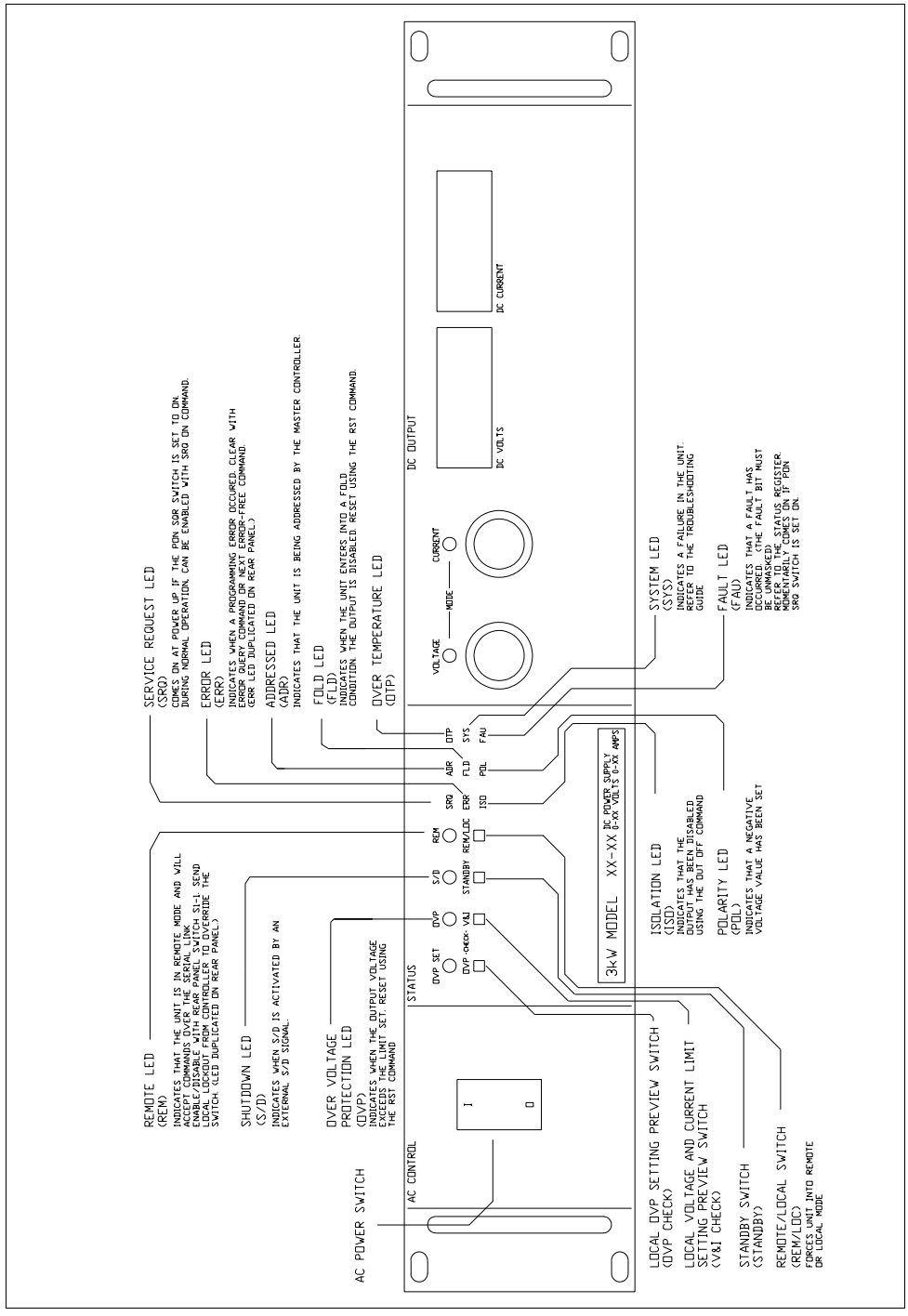


Figure 2.2 3kW Power Supply Front Panel with GPIB Interface Installed

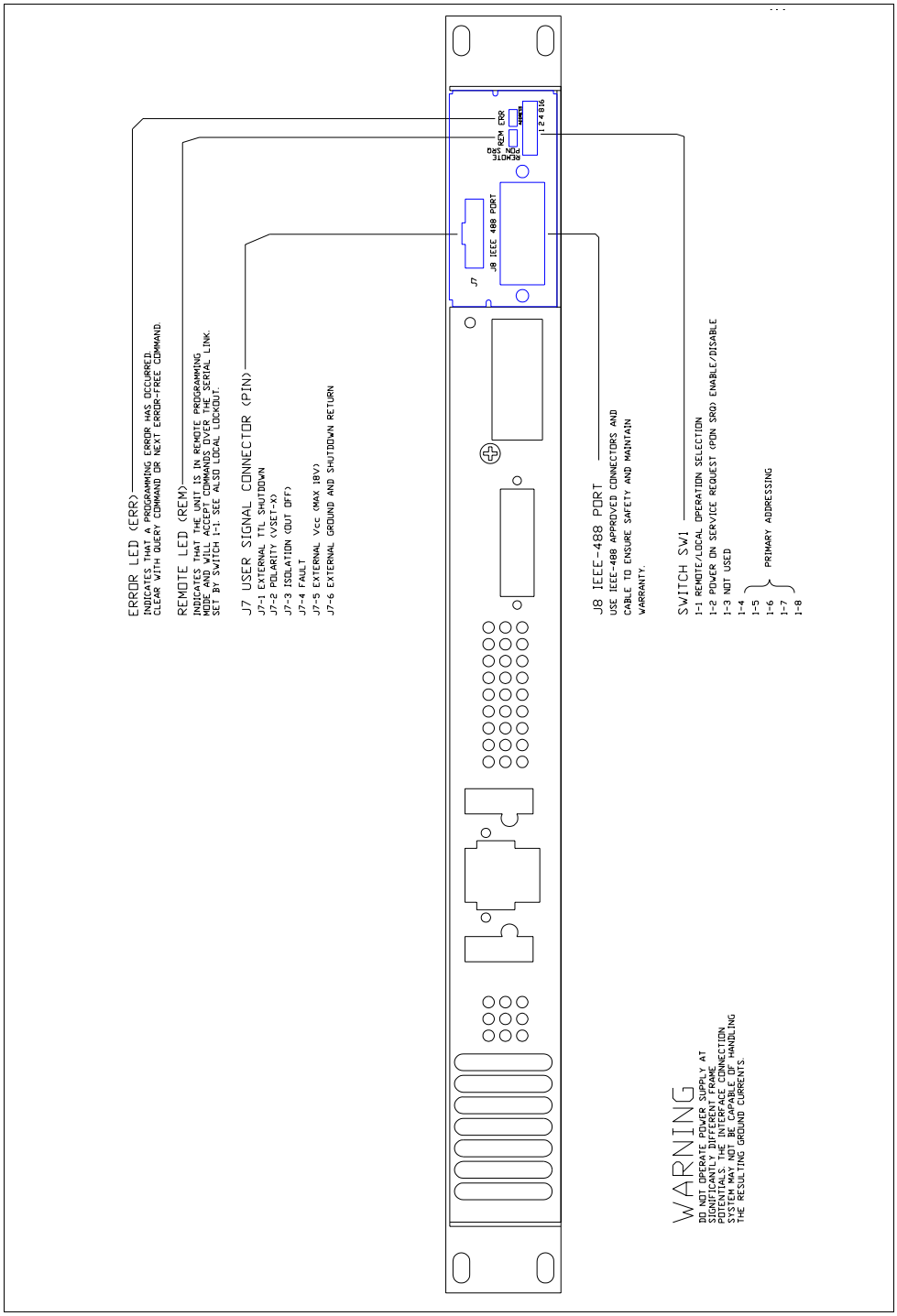


Figure 2.3 1kW Power Supply Rear Panel with GPIB Interface Installed

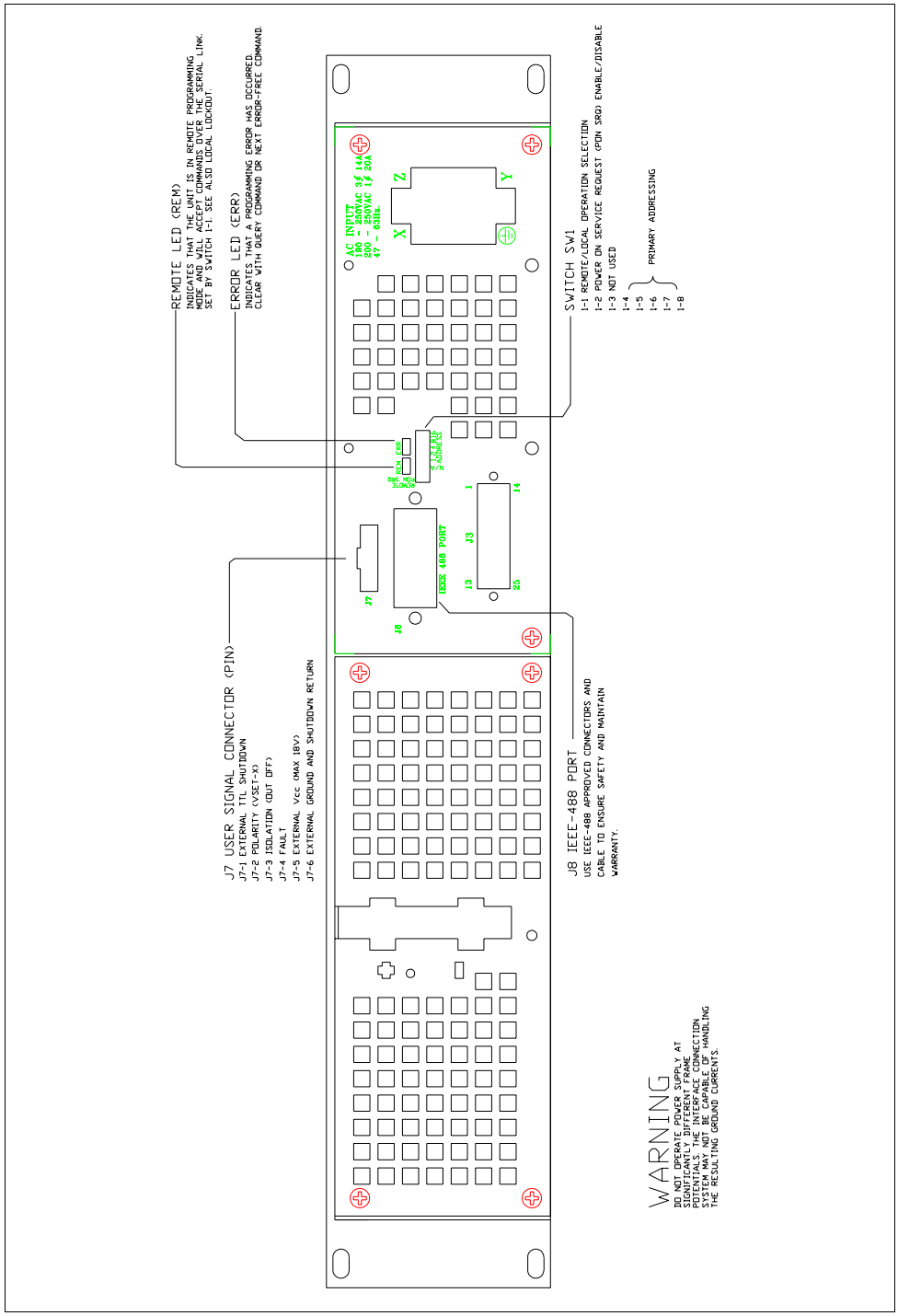


Figure 2.4 3kW Power Supply Rear Panel with GPIB Interface Installed

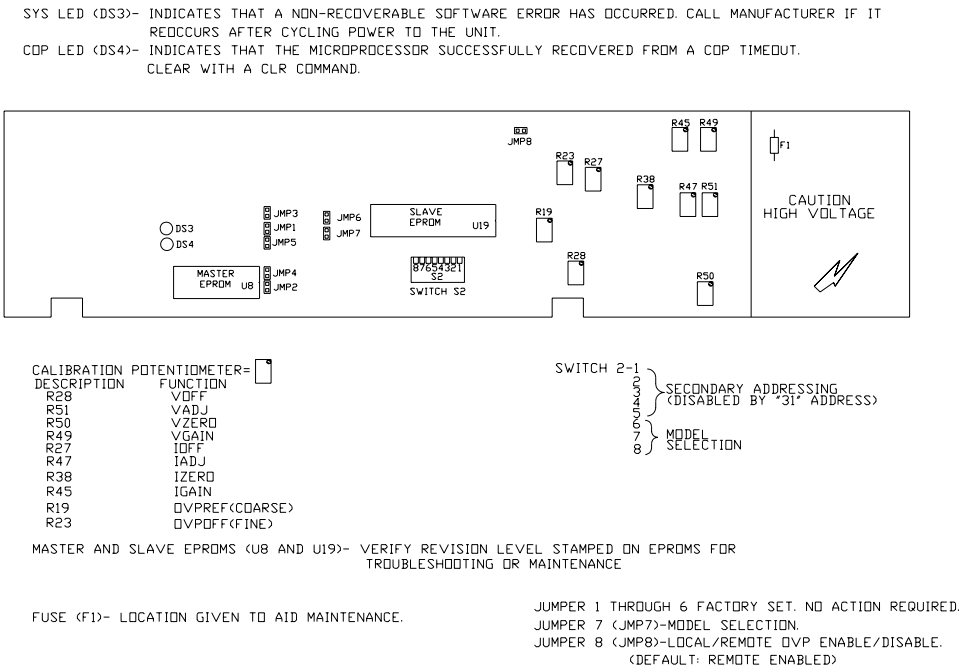


Figure 2.5 GPIB Interface PCB

Basic Setup Procedure

CAUTION
Use proper static control techniques to avoid damage to static-sensitive components on the printed circuit board.

This procedure can be used as a quick reference for those familiar with the configuration requirements for the GPIB interface as installed in the DC power supply. For those who want more information, each step refers to more detailed procedures located in subsequent sections. Execute each step of the procedure in the sequence given.Unless indicated otherwise, all procedures apply to the XKW series power supplies.

Table 2.1 Setup Procedure

Step #	Description	Action	Reference
1	Series, Model and OVP Selection	By default, you control the over voltage protection (OVP) function via remote operation.	See "Series, Model and OVP Selection" on page 22
2	Primary Address Selection	Use GPIB interface rear panel switches SW1-4 to SW1-8 to select a unique primary address. Setting the address identifies the power supply to the computer controller in a GPIB system.	See "IEEE-488 Primary Address Selection" on page 23
3	Remote/Local Operation	Set the unit to remote mode using the rear panel switch SW1-1 (open)	See "Remote/Local Operation" on page 24
4	IEEE-488 Controller Connection	Connect the IEEE-488 bus to the supply at connector J8.	See "IEEE-488 Controller Connection" on page 25
5	Power ON	Power on the unit. Before proceeding, check to ensure that the green REMOTE LED on the front panel is on.	See "User Signals" on page 26 for information about Power On Sevice Request, Local/Remote OVP and auxiliary connector J217 user signals.
6	Configure Computer Controller	Configure the controller to match the power supply identification and characteristics using one of the available programs.	One such program is IBCONF (Interface Bus Configuration) from National Instruments. This program is used here as an example only.
7	Test	Test the link by communicating with the power supply.	Example: VSET2;ISET1 This command string sets power supply voltage to 2V and its current limit to 1A. Example: ibwrt "vset2;iset1" As above, using IBIC. *

* This text uses National Instruments' IBIC (Interface Bus Interactive Control) program commands developed for their GPIB interface for computer controllers as examples only.

Series, Model and OVP Selection

If you are installing the GPIB Interface in a 1kW Series DC power supply yourself, you will need to set GPIB Interface PCB switches to identify:

- The model number for the 1kW Series supply. (3kW model numbers will have been set on EPROM 1.33 and subsequent EPROM versions at the factory)
- The choice of local or remote OVP operation for the 1kW or 3kW Series supply.

Model Selection for 1kW Supplies

To set the 1kW series supply model number, use switches SW2-6 to SW2-8 as well as jumper J7 on its GPIB Interface PCB. Table 2.2 shows the S2 switch and jumper J7 positions for model selection. Refer to the Figure 2.5, “GPIB Interface PCB” on page 20 for the location of jumper J7. "Closed" indicates that the specified switch must be closed or that the jumper 7 connection must be soldered.

Table 2.2 1kW Programmable Power Supply Model Selection

Model	S2-6	S2-7	S2-8	JMP 7
8—125	1	1	1	0
20—50	0	1	1	0
33—33	1	0	1	1
40—25	1	0	1	0
60—18	0	0	1	0
80—13	1	1	0	0
150—7	0	1	0	0
300—3.5	1	0	0	0
600—1.7	0	0	0	0

0 = Open (no connection)1= Closed connection

You may need to recalibrate the power supply each time the model number is changed. See Section 4, “Calibration” for calibration of the power supply.

OVP Selection for 1kW and 3kW Supplies

Both the 1kW and 3kW Series supplies are shipped with jumper J8 on the GPIB Interface PCB already connected for remote OVP programming (default). Disconnect the jumper to allow power supply control of OVP setting, whether from the supply's front panel or via an analog signal from the rear panel. Refer to Figure 2.5, “GPIB Interface PCB” on page 20 for the location of jumper J8.

IEEE-488 Primary Address Selection

1. Assign a primary address to each power supply: Choose a number between 0 and 30 which is unique to your IEEE-488 bus, that is, different from other device addresses on the same bus.
2. Locate switch SW1 on the GPIB interface rear panel. See Figure 2.3, pg. 18 or Figure 2.4, pg. 19 for the rear panel drawings.
3. Use switch positions SW1-4 to SW1-8 to set the primary address for the power supply. See Table 2.3, “IEEE-488 Primary Address Selection”.

Switch 0 = (OFF, OPEN) Switch 1 = (ON, CLOSED)

Table 2.3 IEEE-488 Primary Address Selection

Address	SW1-8	SW1-7	SW1-6	SW1-5	SW1-4	Address	SW1-8	SW1-7	SW1-6	SW1-5	SW1-4
0	0	0	0	0	0	16	1	0	0	0	0
1	0	0	0	0	1	17	1	0	0	0	1
2	0	0	0	1	0	18	1	0	0	1	0
3	0	0	0	1	1	19	1	0	0	1	1
4	0	0	1	0	0	20	1	0	1	0	0
5	0	0	1	0	1	21	1	0	1	0	1
6	0	0	1	1	0	22	1	0	1	1	0
7	0	0	1	1	1	23	1	0	1	1	1
8	0	1	0	0	0	24	1	1	0	0	0
9	0	1	0	0	1	25	1	1	0	0	1
10	0	1	0	1	0	26	1	1	0	1	0
11	0	1	0	1	1	27	1	1	0	1	1
12	0	1	1	0	0	28	1	1	1	0	0
13	0	1	1	0	1	29	1	1	1	0	1
14	0	1	1	1	0	30	1	1	1	1	0
15	0	1	1	1	1						

Note: Ensure you assign one address to each GPIB controller board as well.

Remote/Local Operation

You can select remote or local operation of your power supply in one of two ways:

- Rear panel Remote/Local switch SW1-1, or
- IEEE-488 Local Lockout command, or

Remote/Local Switch

Use the rear panel Remote/Local switch SW1-1 to toggle between remote and local operation without losing programmed values. To locate the switch, refer to the Figure 2.3, pg. 18 and Figure 2.4, pg. 19.

Rear Panel SW1-1 Position	Operation Selected
Open	Unit in remote mode
Closed	Unit in local mode

Powering up in remote mode will result in the default operating conditions in Table 2.4. See also “Command Reference” on page 39.

Table 2.4 Remote Mode Power On Conditions

Condition	Default Settings	7.5-140 Model Example
Voltage	0 V	VSET 0
Current	0 A	ISET 0
Soft Voltage Limit	VMAX (see models)	VMAX 7.5
Soft Current Limit	IMAX (see models)	IMAX 140
OVP Trip Voltage	Model VMAX + 10%	OVSET 8.25
Delay	0.5 s	DLY 0.5S
Foldback Protection	OFF	FOLD OFF
Output	ON	OUT ON
Hold	OFF	HOLD OFF
Unmask	NONE	UNMASK NONE
Service Request Capability	OFF	SRQ OFF

IEEE-488 Controller Connection

CAUTION
Do not operate power supplies at significantly different chassis potentials. The interface connection system is not capable of handling the resulting excessive ground currents.

Use an approved IEEE-488 connector and cable when connecting the GPIB Interface to your IEEE-488 GPIB network. The IEEE-488 connector uses mating connector J8 on the rear panel. Refer to Figure 2.3, pg. 18 and Figure 2.4, pg. 19.

User Signals

Power On Service Request (PON SRQ)

Setting the rear panel PON SRQ switch SW1-2 to open causes the power supply to send a service request to the computer controller when the power supply is turned on or when it re initializes after a momentary power interrupt. When a service request is sent, the front panel SRQ LED will also turn on. You can clear the service request and turn off the SRQ LED by performing a serial poll. See also “Command Reference” on page 39 for information about the SRQ command.

Table 2.5 Enable Switch Selection

Rear Panel Switch SW1-2	PON SRQ State
Open	PON SRQ Enabled
Closed	PON SRQ Disabled

Local/Remote Over Voltage Protection (OVP)

Over voltage protection control is remote when settings and commands are issued from the computer controller, and local when the OVP limit is set from the power supply. For additional information about OVP programming, refer to the power supply manual.

1kW and 3kW Series supplies are shipped with a factory default setting enabling remote OVP operation. To change OVP operation to local control, remove jumper 8 on the GPIB interface. See Figure 2.5, “GPIB Interface PCB” on page 20 for the location of jumper 8.

Connector J7 User Signals

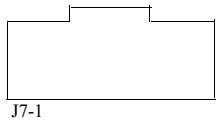
Auxiliary connector J7, located on the GPIB interface rear panel, provides several signals to increase your operating control of the supply. These signals are dependent on the operator's design and uses. The operation of the J7 signal requires that you provide external Vcc and ground. To locate the connector, refer to the GPIB interface subplate drawing in refer to the Figure 2.3, pg. 18 and Figure 2.4, pg. 19. See Figure 2.6, “User Signals J7 Connector” on page 27 for pin descriptions.

J7-1 External TTL shutdown input signal

J7-2 Polarity signal, open collector
(asserted by VSET -x)

J7-3 Isolation signal, open collector
(asserted by OUT OFF)

J7-4 Fault signal, open collector
(asserted when bit set in fault register)



J7

J7-5 External Vcc, 18V maximum
(supplied by connecting and operating an external source)

J7-6 External ground and shutdown return
(supplied by connecting and operating an external source)

Figure 2.6 User Signals J7 Connector

Section 3. Operation

Introduction

This section covers GPIB interface programming, starting with IEEE-488 functions, continuing with an extensive set of device-dependent commands, and, finally, providing error codes, and status and fault register information.

GPIB Operation

A GPIB interface controller card enables you to control an IEEE-488 bus system via computer, identifying which of its interconnected devices are to send and receive data. Interconnected devices could include programmable AC or DC power supplies, oscilloscopes, signal generators, digital voltmeters, universal counters, readouts, relays, and printers.

Use the GPIB interface to relay GPIB instructions from a computer controller to a power supply located at a selected IEEE-488 address and then to return responses from the power supply to the computer. You will also use the computer controller to issue device-dependent commands such as output voltage level and status queries.

Note: This text employs National Instruments' IBIC (Interface Bus Interactive Control) program commands developed for their GPIB interface for computer controllers as examples only.

Table 3.1 IEEE-488.1 Interface Functions Implemented

	Mnemonic	Capability	Description
Multiline Control Functions	SH1	Source Handshake	Device must properly transfer a multiline message.
	AH1	Acceptor Handshake	Device must properly receive remote multiline messages.
	T6	Talker	Device must be able to transmit.
	L4	Listener	Device must receive commands and data.
Interface Functions	DC1	Device Clear	Device can be initialized to a previously determined state.
	DT1	Device Trigger	A device function can be initiated by a talker on the bus.
	E1	Open Collector Drivers	Describes the type of electrical drivers in a device.
	PP1	Parallel Poll	Upon controller request, device must uniquely identify itself if it requires service.
	RL1	Remote/Local	Device must be able to operate from front panel and via remote information from bus.
	SR1	Service Request	Device can asynchronously request service from controller.
	SP1	Serial Poll	All talkers on the bus assume a serial poll mode. Each device when addressed will provide an 8-bit word of status information.

Multiline Control Functions

The GPIB interface and the computer controller implement the Acceptor Handshake, Source Handshake, Listener, and Talker functions. No user action is required. The unit's ADR (Addressed) LED turns on when the power supply is addressed to listen or talk.

Device Clear

The power supply will implement Device Clear regardless of whether it is in local or remote control. Device Clear is typically used to send all or selected devices to a known state with a single command. The power supply will be set to Initial (Power On) Conditions after Device Clear.

Example:

ibclr	Low level command directed to entire bus, or
ibwrt"clr"	Device-dependent command directed to a specific device.

Device Trigger

Device Trigger will implement the most recently programmed values whether the unit is in local or remote control. If the power supply is in local mode, the new values will be implemented when it is switched from local to remote control. Device Trigger is typically used to synchronize the operation of a number of addressed devices.

Example: Use HOLD Command to set values to be executed when triggered. See “Command Reference” on page 39.

Then use:.

ibtrg	Command directed to entire bus, or
ibwrt"trg"	Command directed to a specific device.

Parallel Poll

Parallel Poll allows the computer controller to determine quickly which of a number of instruments on the bus requested service. The parallel poll response corresponds to bit 7 of the serial poll status byte. Parallel Poll does not reset the service request. The power supply must be configured remotely to respond to a parallel poll with either a "1" or "0" on one of the DIO lines if the unit is requesting service.

Example:

ibrpp	Conduct a parallel poll.
PPOLL	Perform a parallel poll.

Local Lockout

Send Local Lockout from the computer controller to ensure that a power supply operated in remote mode. The IEEE-488 Local Lockout command overrides the Remote/Local switch, SW1-1 on the rear panel. If the switch is set to OFF (or Local), the Local Lockout command can force the supply into remote mode. For more information, see “Remote/Local Operation” on page 24.

Example:

ibfind GPIB0	Address the computer controller.
ibsic	Put the controller in charge by sending an Interface Clear.
ibcmd “?_@/x11”	Send commands (UNL, UNT, MTA0, LLO) in ASCII.
ibfind "devname"	Address the unit (devname or device name as configured originally with ibconf).
ibloc	Set unit to local mode.
ibwrt"id?"	Any message to the unit now puts it back to remote mode.
ibloc	Toggle back to local mode.

Service Request

Service request is a uniline message asserted by the power supply at power on and for fault conditions. Six (6) power supply conditions are defined as faults: CV, CC, OV, OT, SD, and FOLD. See “Accumulated Status, Status, and Fault Registers” on page 44 for more information. Power ON (PON) can also be flagged in the fault register if the supply's rear panel power on service request (PON SRQ) switch is set to ON. See “Power On Service Request (PON SRQ)” on page 26.

Enabling or disabling a condition from asserting service request does not affect the condition within the power supply, nor the external status indicators.

Serial Poll

In a serial poll, the controller polls each device.

Example:

ibrsp	Return serial poll byte.

The power supply responds with a 8-bit status byte defined as follows:

Table 3.2 Serial Poll Status Register

Bit Position	Decimal Weight	Description	Reset By
0 (LSB)	1	**Fault** - Set when any bit in the fault register is set by a fault condition in the supply. See also “Accumulated Status, Status, and Fault Registers” on page 44.	FAULT? query to reset
1	2	Not used	
2	4	Not used	
3	8	Not used	
4	16	**Ready** - Set when power supply is ready to accept commands.	Power supply, during command processing period
5	32	**Error (ERR)** - Set when ERR bit asserted in status register. See also “Accumulated Status, Status, and Fault Registers” on page 44.	ERR? query or a new error-free command
6	64	**Request Service (SRQ)** - Set when power supply requests service.	Serial Poll
7 (MSB)	128	**Power On (PON)** - Set when unit initializes at power on.	CLR or Device Clear

Command Syntax

Manual Conventions

The manual uses these conventions when displaying command information. These characters are not part of the command but are used to denote parameters used with the command.

< > (angle brackets)	Angle brackets enclose a parameter. Do not include the angle brackets in the command line you send to the computer.
/ (slash)	Separates two alternative parameters. When a slash separates two parameters, you can use either parameter to achieve the same result. Example: <1/ON> Entering 1 or ON will achieve the same result.
COMPUTER ENTRY	Words typed on the computer are shown in Arial text, full capitals.

Command Format and Parameters

The device-dependent language for the GPIB Interface consists of commands and parameters. A command is a one word code which either gives instructions to the interface or asks for information from the interface. A command may be followed by one or more parameters, a short code that changes the state of the power supply or the state of the bit register. Table 3.3, "Command Parameters" lists the parameters that affect the command set.

Format:

COMMAND or
COMMAND <parameter> or
COMMAND <parameter>,<parameter>

- You can enter commands in upper or lower case lettering.

  Example: MASK FOLD = mask fold

- Do not further abbreviate command names or parameters.

  Example: MASK FOLD ≠ MK FOLD

  MASK FOLD ≠ MASK FD

- Use a space between the command and the first parameter. Any number of consecutive spaces is treated as one space. Numeric data may contain leading spaces. Embedded spaces between digits or between a digit and a decimal point are not accepted.

  Example: MASK FOLD = MASK FOLD

  VOUT 3.4 = VOUT 3.4

  VOUT 3.4 ≠ VOUT 3. 4

- Use commas between parameters in those commands with more than one parameter, and between mnemonic parameters as in the MASK and UNMASK commands. Only one comma is allowed and it may be preceded or followed by any number of spaces.

Example: MASK CV, OV, FOLD

Table 3.3 Command Parameters

Parameter	Description	Form
<current>	The current in amps or milliamps. If no unit is given, the default unit is amps.	<float> <float>A <float>mA
<seconds>	The time in seconds or milliseconds. If no unit is given, the default unit is seconds.	<float> <float>s <float>ms
<voltage>	The voltage in volts or millivolts. If no unit is given, the default unit is volts.	<float> <float>V <float>mV
<fault mask>	A combination of CV, CC, CV, OV, SD and FOLD. See MASK and UNMASK commands in the command reference for use of the ALL and NONE parameters.	See registers on page 44.
<status mask>	A combination of CV, CC, OV, SD, FOLD, ERR, and REM. See MASK and UNMASK commands in the command reference for use of the ALL and NONE parameters.	See registers on page 44.
<other>	Command-specific parameters such as 1, 0, ON, OFF, ALL or NONE.	

Floating Point Number <float> Variables sent with command parameters are floating point numbers. Table 3.4 defines the structure of floating point numbers for use with the software commands.

Table 3.4 Floating Point Numbers

Floating Number Definition	Example
The floating point number has four significant figures. It can be of either sign, positive or negative.	1.234 -1.234 +1.234
A floating point number can have one decimal point.	0.123 1.2 123.4
Scientific Notation Use E or e after the number for a base ten exponent. An integer of either sign must follow an exponent.	123.0E-1 1.2E-1 10.00E+1

Command Strings

If you send more than one command line, separate the commands with a semicolon. The semicolon may be preceded or followed by spaces.

Example:

```
ISET 2.0A;VSET 5V
ISET 2.0A ; VSET 5V
```

Command Terminators

Terminators indicate the end of a command string and tell the power supply to execute the command. The termination character is LF (Line Feed).

Format:

COMMAND1 <parameter1>; COMMAND2 <parameter1>, <parameter2><LF>

Most computer controllers automatically send LF with output statements.

You may also terminate commands by asserting EOI on the GPIB concurrently with the last byte of the command.

Example:

```
VMAX 5.25
      E
      O
      I
```

All data sent by the power supply to the computer controller is terminated by a carriage return and a line feed character. EOI is asserted concurrently with a linefeed.

Example:

```
VMAX 5.250CRLF
            E
            O
            I
```

Order

You may send commands in any order, keeping in mind that only those commands received after a HOLD and before a TRG (trigger) will be released by the TRG command. In addition, only these commands received after a supply disable and before a RST (reset) or OUT ON command will be released by the RST command or the OUT command. Commands are executed in the order they are received.

Command Summary

Use these commands to control the operation of the supply. They are listed here in order of function such as PROGRAMMING, QUERY, and STATUS commands. See “Command Reference” on page 39 for more detailed information about each command and its use.

Table 3.5 Programming Commands

Command	Description
CLR	Initializes the power supply to its Power ON (PON) state.
DLY	Sets a programmable time delay which is executed by the supply before reporting fault conditions after a new output voltage or current is specified.
FOLD	Sets foldback mode for the supply.
HOLD	Enables or disables voltage/current setting hold mode for the supply.
IMAX	Sets an upper soft limit on the programmed output current for the supply.
ISET	Sets the output current of the supply in amps (default) or in milliamps.
OUT	Enables or disables voltage/current output for the supply.
OVSET	Sets the over voltage protection trip point for the supply in volts (default) or in millivolts.
RST	Resets the supply to the present voltage and current settings if the output is disabled by OVP or foldback protection.
SRQ	Enables or disables the power supply's ability to generate a service request.
TRG	Implements programmed voltage and current settings which had been in hold mode.
VMAX	Sets an upper soft limit on the supply’s programmed output voltage.
VSET	Sets the output voltage of the power supply in volts (default) or in millivolts.

Table 3.6 Query Commands

Command	Description
DLY?	Asks for the programmable time delay setting before the supply reports fault conditions.
ERR?	Asks for the most recent remote programming error which occurred in the supply since the last time the error query command (ERR?) was used.
FOLD?	Asks for the supply's present foldback setting.
HOLD?	Asks for the present hold mode setting.
ID?	Asks for the power supply's model name and master EPROM version.
IMAX?	Asks for the supply's soft current limit setting.
IOUT?	Measures the supply's actual current output.
ISET?	Asks for the supply's present output current limit setting.
OUT?	Asks for the present enabled/disabled status of the supply's output.
OVSET?	Asks for the supply's present over voltage protection limit.
SRQ?	Asks for the present enabled/disabled status of the IEEE-488 Service Requests generated by the supply.
VMAX?	Asks for the supply's soft voltage limit setting.
VOUT?	Measures the supply's actual voltage output.
VSET?	Asks for the supply's present output voltage setting.

Table 3.7 Status Commands

Command	Description
ASTS?	Asks for the supply's accumulated status register.
FAULT?	Asks for the supply's fault register for the status preset operating conditions.
MASK	Prevents the supply's previously unmasked operating conditions from setting bits in the fault register.
STS?	Asks for the supply's present status register.
UNMASK	Enables you to select those supply's operating conditions that you are most interested in monitoring for fault occurrence.
UNMASK?	Asks for the supply's fault conditions which are currently enabled (unmasked).

Command Reference

Table 3.8 Command Reference

Command	Description
ASTS?	Asks for the supply's accumulated status register. The accumulated status register stores any bit that was entered in the status register since the accumulated status query command (ASTS?) was last used, regardless of whether the condition still exists. The accumulated status register has the same bits, weights, and conditions as the status register. A bit in the accumulated status register will be set at 1 if the corresponding bit in the status register has been 1 (TRUE) at any time since the register was last read. See "Accumulated Status, Status, and Fault Registers" on page 44. The ASTS? query clears the status register. Response: ASTS <status mask> where status mask is the decimal equivalent of the total bit weights for the operating conditions as listed in the status register.
CLR	Initializes the power supply to its power ON (PON) condition. Resets the PON bit (position 7) in the serial poll register.
DLY <seconds>	Sets a programmable time delay employed by the supply before reporting fault conditions. The power supply uses the time delay after receiving a new output voltage or current setting via VSET or ISET, or after receiving RST, TRG, or OUT ON commands. During the time delay, the power supply disables CV, CC, and FOLD conditions from generating faults, preventing possible nuisance foldback if the supply momentarily switches modes while changing an output setting. Range: 0 to 32 seconds, with 32ms resolution Initial value: 0.5 second
DLY?	Asks for the setting of the programmable time delay before the supply reports fault conditions. Response: DLY <seconds>
ERR?	Asks for the most recent remote programming error. When the power supply detects a programming error, it sets the ERR bit in the status and fault registers, which can be unmasked (UNMASK) on the fault register to request service. The remaining portion of the command line is discarded. An error query or a new error-free command clears the ERR bit in both the status and serial poll register. See "Error Codes" on page 45. Response: ERR <error number> Example: ERR 0 (if no error)

Command	Description
FAULT?	Queries the fault register for the supply's fault condition status. When a bit is set in the fault register, the rear panel J7 connector Fault Line 4 is also asserted. The fault line from any supply in a system may be tied to the External Shutdown Line J7-1 of all supplies to provide shutdown of the system, independent of the GPIB, for user-defined faults. The FAULT? query clears bits in the supply's fault register and fault lines. Response: FAULT <fault mask> where fault mask is the decimal equivalent of the total bit weights for the operating conditions as listed in the fault register. See "Accumulated Status, Status, and Fault Registers" on page 44.
FOLD <2/CC>, <1/CV>, <0/OFF>	Sets foldback mode for the supply. Foldback protection disables the power supply output when the output enters the fold condition. Reset with the RST command. Example: Specify FOLD 1 or FOLD CV (Constant Voltage) when you want the supply to operate in Constant Current mode and have foldback protection disable the output if the supply switches to Constant Voltage mode. Initial value: FOLD 0/OFF
FOLD?	Asks for the supply's present foldback setting. Response: FOLD <mode> where mode is: 0 (OFF) or 1 (CV or Constant Voltage mode) or 2 (CC or Constant Current mode)
HOLD <1/ON>,<0/OFF>	Enables or disables voltage/current setting hold mode for the supply. When HOLD ON is specified, hold mode is enabled so that all voltage and current settings which would normally be implemented by the supply are held until a TRG (trigger) command is received. This feature allows you to synchronize the operation of several supplies. Initial value: HOLD OFF or HOLD 0
HOLD?	Asks for the present hold mode setting. Response: HOLD 0 (OFF or disabled) or HOLD 1 (ON or enabled)
ID?	Asks for the power supply model and the master EPROM version. Response: ID <model name><version>
IMAX <current>	Sets an upper soft limit on the supply's programmed output current. If the soft limit is exceeded, or if the soft limit value is lower than the present output current setting, the supply will ignore the command, turn on the ERR LED, and set the ERR bit in the bit registers. Range: 0 to model maximum output current (IMAX) Initial value: model IMAX

Command	Description
IMAX?	Asks for the supply's soft current limit setting. Response: IMAX <current>
IOUT?	Measures the supply's actual current output using the built-in current readback circuitry. Response: IOUT <current>
ISET <current>	Sets the power supply's output current in amps (default) or in milliamps. This programmed current is the actual output in CC mode or the current limit in CV mode. Range: 0 to model maximum output current (IMAX) Initial value: 0 amps
ISET?	Asks for the supply's present output current setting. Does not apply to current settings which are being held. See HOLD command. Response: ISET <current>
MASK <mnemonics>	Disables the supply's previously unmasked operating conditions from setting bits in the fault and status registers. See "Accumulated Status, Status, and Fault Registers" on page 44. Mnemonics are separated from each other by commas and may be sent in any order. Mnemonics: CV, CC, OV, OT, SD, FOLD Note: UNMASK NONE = MASK ALL (Initial value) MASK NONE = UNMASK ALL
OUT <1/ON>,<0/OFF>	Enables or disables the supply's voltage/current output. The supply will continue to accept new commands while the output is disabled but these will not be implemented until OUT ON or OUT 1 is received. OUT ON is the default setting. When you start the supply in remote mode, the output is enabled. OUT OFF (or OUT 0) also sets the isolation signal on the rear panel J7 connector, line 3. You can use the to trip external relays to isolate the power supply from the load. Initial value: OUT ON (or OUT 1) for output enabled
OUT?	Asks for the present enabled/disabled status of the supply's output voltage/current. Response: OUT 1 output enabled or OUT 0 output disabled
OVSET <voltage>	Sets the supply's over voltage protection trip point in volts (default) or in millivolts. If the trip point is exceeded, or if the trip point value is lower than the present output voltage setting, the supply will ignore the command, turn on the ERR LED, and set the ERR bit in the accumulated status register. Reset with the RST command. Range: 0 to 110% of model maximum output voltage (VMAX) Initial value: 110% of model VMAX
OVSET?	Asks for the supply's present over voltage protection limit. Response: OVSET <voltage>

Command	Description
RST	Resets the supply to present voltage and current settings if the output is disabled by over voltage or foldback protection. Output values may be changed via VSET, ISET, and OVSET while the unit is disabled, but those values will not take effect until RST is applied.
SRQ <1/ON>,<0/OFF>	SRQ ON enables the supply to respond to a variety of fault conditions with a request for service to the IEEE-488 bus controller. With SRQ ON, the SRQ line will be asserted true whenever the FAU bit in the supply's serial poll register changes from 0 to 1. Therefore, the mask register, in addition to specifying which conditions set the FAU bit, also determines which conditions can generate service requests. Seven power supply conditions are defined as faults: CV, CC, OV, OT, SD, FOLD and PON. Use the FAULT? query to discover which condition caused the service request. See “Accumulated Status, Status, and Fault Registers” on page 44. A request for service at Power ON (PON SRQ) is set via a rear panel switch on the supply. See “Power On Service Request (PON SRQ)” on page 26. SRQ remains disabled until the FAULT bit in the serial poll register is cleared by a FAULT? query.
SRQ?	Asks for the supply's present ability to generate service requests. Response: SRQ 0 (disabled) SRQ 1 (enabled)
STS?	Asks for the supply’s present status register. Status conditions are stored in the status register. Each bit represents a separate condition. When the condition is true, the corresponding bit is 1 (true). Bits remain set in the status register as long as the condition is true. See “Accumulated Status, Status, and Fault Registers” on page 44. Response: STS <status mask> where status mask is the decimal equivalent of the total bit weights for the operating conditions as listed in the status register.
TRG	Implements programmed voltage and current settings which had been in hold mode. The supply operates with previous values until the TRG (trigger) command is sent.
UNMASK <mnemonics>	Enables you to select the supply operating conditions that you are most interested in monitoring for fault occurrence. Mnemonics describing the conditions are separated from each other by commas, and may be sent in any order. Specifying one or more mnemonics which describe the conditions (or the decimal equivalent of their total bit weight) enables the selected conditions to set bits in the supply’s fault and status registers during operation. A bit is set in the fault register when the corresponding bit in the status register changes from 0 to 1 and the corresponding bit in the mask register is 1. See “Accumulated Status, Status, and Fault Registers” on page 44. Mnemonics: CV, CC, OV, OT, SD, FOLD Initial value: UNMASK NONE

Command	Description
UNMASK?	Asks for the supply's fault conditions which are currently enabled (unmasked). Response: UNMASK <fault mask> where fault mask is the decimal equivalent of the total bit weights for the operating conditions as listed in the status and fault registers See "Accumulated Status, Status, and Fault Registers" on page 44.
VMAX <voltage>	Sets an upper soft limit on the supply's programmed output voltage. If the soft limit is exceeded, or if the soft limit value is lower than the present output voltage setting, the supply will ignore the command, turn on the ERR LED, and set the ERR bit in the accumulated status register. Range: 0 to model maximum output voltage (VMAX) Initial value: model VMAX
VMAX?	Asks for the supply's soft voltage limit setting. Response: VMAX <voltage>
VOUT?	Measures the supply's actual voltage output using the built-in voltage readback circuitry. Response: VOUT <voltage>
VSET <voltage> or VSET <-voltage>	Sets the power supply's output voltage in volts (default) or in millivolts. This programmed voltage is the actual output in CV (constant voltage) mode or the voltage limit in CC (constant current) mode. If you enter a negative voltage value, the power supply will assert a signal on the J7-4 user signal line. You can use the user signal to trip external relays to switch the output polarity. Range: 0 to model maximum output voltage (VMAX) Initial value: 0 volts
VSET?	Asks for the power supply's present output voltage setting. Does not apply to voltage settings which are being held. See HOLD command. Response: VSET <voltage>

Accumulated Status, Status, and Fault Registers

The GPIB option card uses three separate registers which are always active. They are the accumulated status, status, and fault registers. You can use the status commands shown in Table 3.7, “Status Commands” to activate the registers. The bit register has eight conditions, each assigned a bit weight. When querying a register, the controller returns a response which is the sum of the weights of all relevant conditions.

Example:

ASTS?	Query the Accumulated Status register.
ASTS <771>	Controller response.

771 = 512 + 256 + 2 + 1 = PON + REM + CC + CV

The accumulated status register shows that PON, REM, CC and CV have all been active since the last accumulated register query.

Table 3.9 shows the mnemonics and bit weights which correspond to each register condition. You can control conditions in the fault and status register by using the MASK and UNMASK commands.

Table 3.9 Accumulated Status, Status, and Fault Registers

Condition	Mnemonic	Bit Position	Bit Weight
Constant voltage operation	CV	0	1
Constant current operation	CC	1	2
Not used	–	2	4
Overvoltage protection tripped	OV	3	8
Overtemperature protection tripped	OTP	4	16
Supply external shutdown active (J7-1)	SD	5	32
Foldback mode operation	FOLD	6	64
Remote programming error	ERR	7	128

Notes:

1. Only CV, CC, OV, SD, ERR and FOLD can be masked or unmasked.
2. The error (ERR) bit is reset in the accumulated status, status, and serial poll registers with an error query (ERR?).
3. The accumulated status register is cleared with an accumulated status query (ASTS?).
4. A fault is cleared with a fault query (FAULT?).

Error Codes

If the ERR flag in the accumulated status or fault registers has been activated, an ERR? query will return an error number which corresponds to an event described in the following table. The ERR? query will also clear the ERR bit in the register.

Table 3.10 Error Codes

ERROR #	ERROR IDENTIFICATION	EXPLANATION
0	No Errors	
1	Unrecognized Character	Received a character such as @,*,$.
2	Improper Number	Received a numeric character but the characters were not a proper number. Example: VSET,±10.3
3	Unrecognized String	Received an invalid command.
4	Syntax Error	Received an incorrectly placed word, number, separator, or terminator. Example: OFF SRQ, VOUT 6, MASK, ERR
5	Number Out of Range	Specified a value for the command which was outside of the allowed range.
6	Attempt to Exceed Soft Limits	Attempted to program a voltage or current greater than the soft limit. Example: VMAX 500; VSET 550 LF
7	Improper Soft Limit	Attempted to program a soft limit less than the output value.
8	Data Requested without a Query Being Sent	The controller requested data from the power supply without first sending a query command.
9	OVP Set Below Output	Sent an OVSET command with a trip value lower than the output voltage.

Troubleshooting

WARNING
Exercise caution when using and servicing power supplies. High energy levels can be stored at the output voltage terminals on all power supplies in normal operation. In addition, potentially lethal voltages exist in the power circuit and the output connector of power supplies which are rated at 40V and over. Filter capacitors store potentially dangerous energy for some time after power is removed.

Section 4. Calibration

Introduction

WARNING
Exercise caution when using and servicing power supplies. High energy levels can be stored at the output voltage terminals on all power supplies in normal operation. In addition, potentially lethal voltages exist in the power circuit and the output connector of power supplies which are rated at 40V and over. Filter capacitors store potentially dangerous energy for some time after power is removed.

You can calibrate the GPIB interface by adjusting the signal levels on the interface card so that they correspond to the expected signal levels on the power supply's main assembly. You may need to recalibrate the interface if you replace parts either on the interface board or on the main power supply board, or if the unit falls out of specification due to component aging drifts.

You can calibrate the GPIB Interface for:

- Voltage program
- Voltage readback
- Current program
- Current readback
- Overvoltage protection

The calibration procedures in this section are designed to be performed at an ambient temperature of 25°C ± 5°C.

Calibration Setup

1. Disconnect the supply's AC power.
2. Disconnect the load from the power supply you want to calibrate.
3. Remove the cover to access the GPIB Interface PCB calibration potentiometers.
4. Ensure the power supply is connected for local sensing (factory default).
5. Connect a digital voltmeter (DVM) for voltage or OVP calibration, or, a current shunt rated for the full output current of the supply and a DVM for current calibration. See Figure 4.1, Voltage Calibration Setup or Figure 4.2, Current Calibration Setup.
6. Ensure the correct IEEE primary address has been set (rear panel switches SW1-8 to SW 1-4). See “IEEE-488 Primary Address Selection” on page 23 for information on address selection.
7. Set the power supply to REMOTE mode (rear panel switch SW1-1 ON).
8. Connect the IEEE controller to the power supply at connector J8.
9. Reconnect the AC power. Turn unit ON and allow the unit to warm up for 30 minutes.

Voltage Mode Calibration

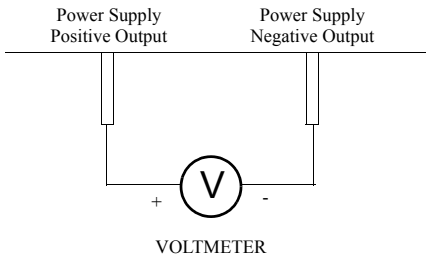


Figure 4.1 Voltage Calibration Setup

Voltage Program

1. Connect the unit to the digital voltmeter as shown in Figure 4.1. See also "Calibration Setup" on page 48, step 4.
2. Program the output to 5% of full scale voltage by sending the following command string from the computer:

VSET2;ISET25 (for 1kW Model 40-25)

3. Adjust voltage programming offset potentiometer R28 (VOFF) until the external meter reading is within the power supply's voltage program accuracy specification. Refer to specification tables in Section 1.

Example: ±75mV ±(0.3% (5% of 40V)) (for 1kW Model 40-25)

4. Program the output to full scale voltage by sending:

VSET40;ISET25 (for 1kW Model 40-25)

5. Adjust voltage programming full scale potentiometer R51 (VADJ) until the external meter reading is within the power supply's voltage program accuracy specification. Refer to specification tables in Section 1.

Example: ±75mV ±(0.3% of 40V) (for 1kW Model 40-25)

6. Repeat steps 2 to 5 (between VOFF and VADJ) for best linearity.

Voltage Readback

1. Connect the unit to the digital voltmeter (DVM) as shown in Figure 4.1. (Optional step)
2. Program the output to 5% of full scale by sending the following command string from the computer:

VSET2;ISET25 (for 1kW Model 40-25)

3. Perform a readback operation of the output voltage from the computer:

VOUT?

4. Adjust the voltage readback offset potentiometer R50 (VZERO) until the readback value is within specification. Refer to the voltage readback accuracy specification in Section 1.

Example: ±75mV ± (0.3% (5% of 40V)) (for 1kW Model 40-25)

5. Program the output to full scale voltage by sending:

VSET40;ISET25 (for 1kW Model 40-25)

6. Adjust the voltage readback full scale potentiometer R49 (VGAIN) until the readback voltage value is within specification. Refer to the voltage readback accuracy specification in Section 1.

Example: ±75mV ± (0.3% of 40V) (for 1kW Model 40-25)

7. Repeat steps 2 (VZERO) to 5 (VGAIN) for best linearity.

Current Mode Calibration

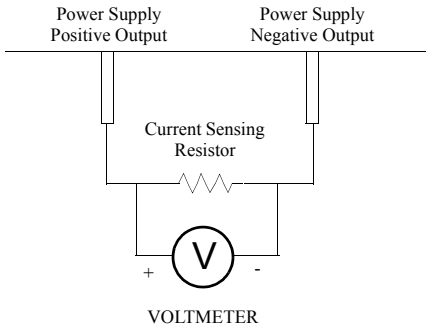


Figure 4.2 Current Calibration Setup

Current Program

1. Ensure the current shunt has been connected to the power supply as shown in Figure 4.2. See also “Calibration Setup” on page 48, step 4.
2. Program the output to 5% of full scale current by sending the following command string from the computer:

VSET40;ISET1.25 (for 1kW Model 40-25)

3. Adjust current programming offset potentiometer R27 (IOFF) until the meter reading is within the power supply's current program accuracy specification. Refer to specification tables in Section 1.

Example: ±140mA ± (0.15% (5% of 25A)) (for 1kW Model 40-25)

4. Program the output to full scale current by sending:

VSET40;ISET25 (for 1kW Model 40-25)

5. Adjust current programming full scale potentiometer R47 (IADJ) until the meter reading is within the power supply's current specification. Refer to specification tables in Section 1.

Example: ±140mA ± (0.15% of 25A) (for 1kW Model 40-25)

6. Repeat steps 2 to 5 (between IOFF and IADJ) for best linearity.

Current Readback

1. Ensure the current shunt has been connected to the power supply as shown in Figure 4.2. See also "Current Calibration Setup" on page 51, step 4. Connecting a DVM is optional.
2. Program the output to 5% of full scale current by sending the following command string from the computer:

VSET40;ISET1.25 (for 1kW Model 40-25)

3. Perform a readback operation of the output current from the computer:

IOUT?

4. Adjust the current readback offset potentiometer R38 (IZERO) until the readback value is within the current readback accuracy specification. Refer to specification tables in Section 1.

Example: ±140mA ± (0.15% (5% of 25A)) (for 1kW Model 40-25)

5. Program the output to full scale current by sending:

VSET40;ISET25 (for 1kW Model 40-25)

6. Perform a readback operation of the output current from the computer:

IOUT?

7. Adjust the current readback full scale potentiometer R45 (IGAIN) until the readback current value is within specification. Refer to specification tables in Section 1.

Example: ±140mA ± (0.15% of 25A) (for 1kW Model 40-25)

8. Repeat steps 2 (IZERO) to 7 (IGAIN) for best linearity.

Over Voltage Protection (OVP) Calibration

1. Connect the unit as for voltage mode calibration. See Figure 4.1. See “Calibration Setup” on page 48, step 4. (Optional step.)
2. Program the OVP setting to 50% of the full scale voltage by sending the following command string from the computer:

OVSET20 (for 1kW Model 40-25)

3. Program the output voltage to about 40% of the OVP set value by sending:

VSET16;ISET25 (for 1kW Model 40-25)

4. Increment the programmed output voltage from the computer until the OVP fires. The red OVP LED on the front panel will light up.
5. Clear the supply settings by sending:

CLR

6. and reset the OVP condition with:

RST

7. The OVP trip point is in specification if the meter value shown when OVP fires is within the total of the set trip point ± the OVP program accuracy specification for the power supply model. See Section 1.

Example: 20V ± 400mV (for 1kW Model 40-25)

8. If the OVP trip point was out of specification, adjust potentiometers R19 (OVPREF, coarse adjustment) and R23 (OVPOFF, fine adjustment). Repeat steps 2 to 5 until the unit operates within specified values again.
9. Check for linearity by testing the OVP trip point at 10% and 90% of full scale voltage.

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