MODEL 4Q06125PS POWER SUPPLY

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

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Rev. 3, April 2008

Conditions of Conformance

When this product is used in applications governed by the requirements of the EEC, the following restrictions and conditions apply:

1. For European applications, requiring compliance to the Low Voltage Directive, 73/23/EEC, this power supply is considered a component product, designed for "built in“ applications. Because it is incomplete in construction, the end product enclosure must provide for compliance to any remaining electrical safety requirements and act as a fire enclosure. (EN61010-1 Cl. 6, Cl. 7, Cl.8, Cl. 9 and EN61010-1 annex F)

2. This power supply is designed for stationary installation, with mains power applied via a detachable power supply cord or via direct wiring to the source power terminal block.

3. This power supply is considered a Class 1 (earthed) product, and as such depends upon proper connection to protective earth for safety from electric shock. (EN61010-1 Cl. 6.5.4)

4. This power supply is intended for use as part of equipment meant for test, measurement and laboratory use, and is designed to operate from single phase, three wire power systems. This equipment must be installed within a suitably wired equipment rack, utilizing a three wire (grounded) mains connection. See wiring section of this manual for complete electrical wiring instructions. (EN61010-1 Cl. 6.5.4 and Cl.6.10.1)

5. This power supply has secondary output circuits that are considered hazardous, able to deliver current greater than 125A d-c.

6. The output wiring terminals of this power supply have not been evaluated for field wiring and, therefore, must be properly configured by the end product manufacturer prior to use.

7. This power supply employs a supplementary circuit protector in the form of a circuit breaker mounted on the front panel. This circuit breaker protects the power supply itself from damage in the event of a fault condition. For complete circuit protection of the end product, as well as the building wiring, it is required that a primary circuit protection device be fitted to the branch circuit wiring. (EN61010-1 Cl. 9.6.2)

8. Hazardous voltages are present within this power supply during normal operation. All operator adjustments to the product are made via externally accessible switches, controls and signal lines as specified within the product operating instructions. There are no user or operator serviceable parts within the product enclosure. Refer all servicing to qualified and trained AMI service technicians.

SAFETY INSTRUCTIONS

1. Installation, Operation and Service Precautions

This product is designed for use in accordance with EN 61010-1 and UL 3101 for Installation Category 2, Pollution Degree 2. Hazardous voltages are present within this product during normal operation. The product should never be operated with the cover removed unless equivalent protection of the operator from accidental contact with hazardous internal voltages is provided:

There are no operator serviceable parts or adjustments within the product enclosure. Refer all servicing to trained service technician.

Source power must be removed from the product prior to performing any servicing.

This product is factory-wired for the nominal a-c mains voltage indicated on the rating nameplate located adjacent to the source power connection on the product's rear panel. To reconfigure the product input for other nominal mains voltages as listed herein, the product must be modified by a trained service technician.

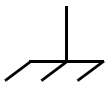
2. Grounding

This product is a Class 1 device which utilizes protective earthing to ensure operator safety.

The PROTECTIVE EARTHING CONDUCTOR TERMINAL must be properly connected prior to application of source power to the product (see instructions on installation herein) in order to ensure safety from electric shock.

PROTECTIVE EARTHING CONDUCTOR TERMINAL - This symbol indicates the point on the product to which the protective earthing conductor must be attached.

EARTH (GROUND) TERMINAL - This symbol is used to indicate a point which is connected to the PROTECTIVE EARTHING TERMINAL. The component installer/assembler must ensure that this point is connected to the PROTECTIVE EARTHING TERMINAL.



CHASSIS TERMINAL -This symbol indicates frame (chassis) connection, which is supplied as a point of convenience for performance purposes (see instructions on grounding herein). This is not to be confused with the protective earthing point, and may not be used in place of it.

3. Electric Shock Hazards

This product outputs hazardous voltage and energy levels as a function of normal operation. Operators must be trained in its use and exercise caution as well as common sense during use to prevent accidental shock.

This symbol appears adjacent to any external terminals at which hazardous voltage levels as high as 500V d-c may exist in the course of normal or single fault conditions.

This symbol appears adjacent to any external terminals at which hazardous voltage levels in excess of 500V d-c may exist in the course of normal or single fault conditions.

OPERATOR
SAFETY INSTRUCTIONS

Read these safety instructions, as well as the applicable installation and operating instructions contained in this manual before using the power supply.

WARNING

Do not touch output or load connections when active. The output is dangerous. Electric shock can cause injury or death. Heavy current can cause sparks and melt metal.

Do not remove the cover or disassemble the unit. There are no operator serviceable components inside the unit. High voltage components inside the unit can cause serious injury even with input power disconnected.

Service must be referred to authorized personnel. Using the power supply in a manner not specified by AMI. may impair the protection provided by the power supply. Observe all safety precautions noted throughout this manual. The following table lists symbols used on the power supply or in this manual where applicable.

SAFETY SYMBOLS

SYMBOL	Meaning
	WARNING: RISK OF ELECTRIC SHOCK. INDICATES THE POSSIBILITY OF BODILY INJURY OR DEATH.
	CAUTION: REFER TO REFERENCED PROCEDURE. INDICATES THE POSSIBILITY OF EQUIPMENT DAMAGE.

CAUTION

If this power supply is used in OEM equipment, the OEM equipment manufacturer is responsible for attaching appropriate warning labels on the OEM equipment.

Operating the power supply outside the specified limits for input voltage, temperature, or other environmental conditions noted in this manual can damage the power supply and void the warranty.

Safety Messages

The Model 4Q06125PS protection circuitry is designed to protect the load against unregulated high voltages and protect the Model 4Q06125PS from extensive damage in the event of a component failure. Refer to Table 1-1 for more information regarding the protection circuits.

LIST OF
WARNINGS AND CAUTIONS

PAGE	WARNING/CAUTION	
3-2	**WARNING:**	**For inductive loads, and especially superconducting magnet type loads, the inherent offset of the Model 4Q06125PS in the OFF state may generate significant current in the circuit. It is recommended that the output be turned off by applying a shutdown signal to the External Protection Port (A2A5J7), pin 1 referenced to pin 2 (see Table 2-2 for specifications), to crowbar (short) the output. Use an external voltmeter and ammeter to verify that output voltage is 0V and output current is 0A before handling connections between Model 4Q06125PS and load. To restart the unit, apply a start pulse to the START_EXT input, pin 7, of Analog I/O Port (see Table 2-7).**
3-3	**WARNING:**	**For both inductive loads and constant-current-type active electronic loads when the Model 4Q06125PS output is set to OFF, a path is provided for absorbing either the energy accumulated in the reactance of the load during the ON state, or energy delivered by an electronic load. This prevents damage to the load and power supply as well as providing safety for the user. However, In addition to the built-in safety features, constant-current-type active electronic loads must be adjusted to zero and the external voltmeter and ammeter must read 0V, minimum current, before handling the power supply-to-load connections.**
3-3	**WARNING:**	**The Model 4Q06125PS is not recommended for battery applications because the NC (normally-closed) contact of the internal contactor (heavy duty relay) keeps the output crowbarred (shorted) when input power to the Model 4Q06125PS is not present or if there is a fault within the Model 4Q06125PS. However, the Model 4Q06125PS may be used with battery and constant-voltage-type active electronic loads if a properly rated external switch is installed in series between Model 4Q06125PS and load. The switch should be automatically opened by any of three conditions to avoid battery discharge: a) an external off command, b) power loss, or c) if there is a fault within the Model 4Q06125PS. If an external off command is used, the same signal applied to either pin 1 (OFF_EXT) referenced to pin 9 of the Analog I/O Port or pins 3 and 4 (PG_EXT) of the EXT PROTECT Port must also be used to open the external series switch. For power loss or internal fault conditions, use the PG_EXT signal at pins 3 and 4 of the EXT PROTECT Port to open the external series switch.**
2-3	**CAUTION:**	**When an external shut-down signal is sent to the unit, the shut-down condition is latched and the red FAULT indicator on the front panel is ON. To resume normal operation it is necessary to cycle power off, then on or apply a "1" to "0" to "1" pulse (3 mS min.) or open-short-open sequence to START_EXT, pin 7, of Analog I/O Port.**
2-4	**CAUTION:**	**It is recommended that source power of external equipment connected to the Analog I/O Port be applied through an isolating transformer To avoid ground loops. Also, for grounded loads, if output power connection from COMMON terminal at rear panel to load is accidentally disconnected, heavy output current may flow through the Analog I/O Port signal gnd (pin 4) and damage the unit.**
2-7	**CAUTION:**	**The rack must provide support at the rear (within 6 inches of the rear panel). Optional slides can also be used (see PAR. 2.4.2).**
2-7	**CAUTION:**	**When working with active loads, the voltage or current of the active load must not exceed the maximum voltage or current rating of the Model 4Q06125PS. Otherwise the overvoltage or overcurrent protection will shut down the power supply.**

LIST OF
WARNINGS AND CAUTIONS

PAGE		WARNING/CAUTION
2-9	CAUTION:	Never connect the load to the sense terminals. Monitoring instruments (e.g., DVM, etc.) are the only external equipment that may be safely connected to the sense terminals.
2-9	CAUTION:	In case of power loss, or Model 4Q06125PS malfunction, the internal contactor short-circuits the output, protecting both the load and the power supply.
2-11	CAUTION:	For parallel configurations, Remove links between (COM S) and (COM OUT) terminals of slave unit to prevent damage to the unit and maintain system accuracy.
2-17	CAUTION:	It is recommended that source power of external equipment connected to the Analog I/O Port be applied through an isolating transformer to avoid ground loops. Also, for grounded loads, if the output power connection from the d-c COMMON terminal at rear panel to LOAD is accidentally disconnected, heavy output current may flow through the Analog I/O Port signal gnd (pin 4) and damage the unit.
2-18	CAUTION:	It is recommended that source power of external equipment connected to the Analog I/O Port be applied through an isolating transformer to avoid ground loops. Also, for grounded loads, if the output power connection from the d-c COMMON terminal at rear panel to LOAD is accidentally disconnected, heavy output current may flow through the Analog I/O Port signal gnd (pin 4) and damage the unit.

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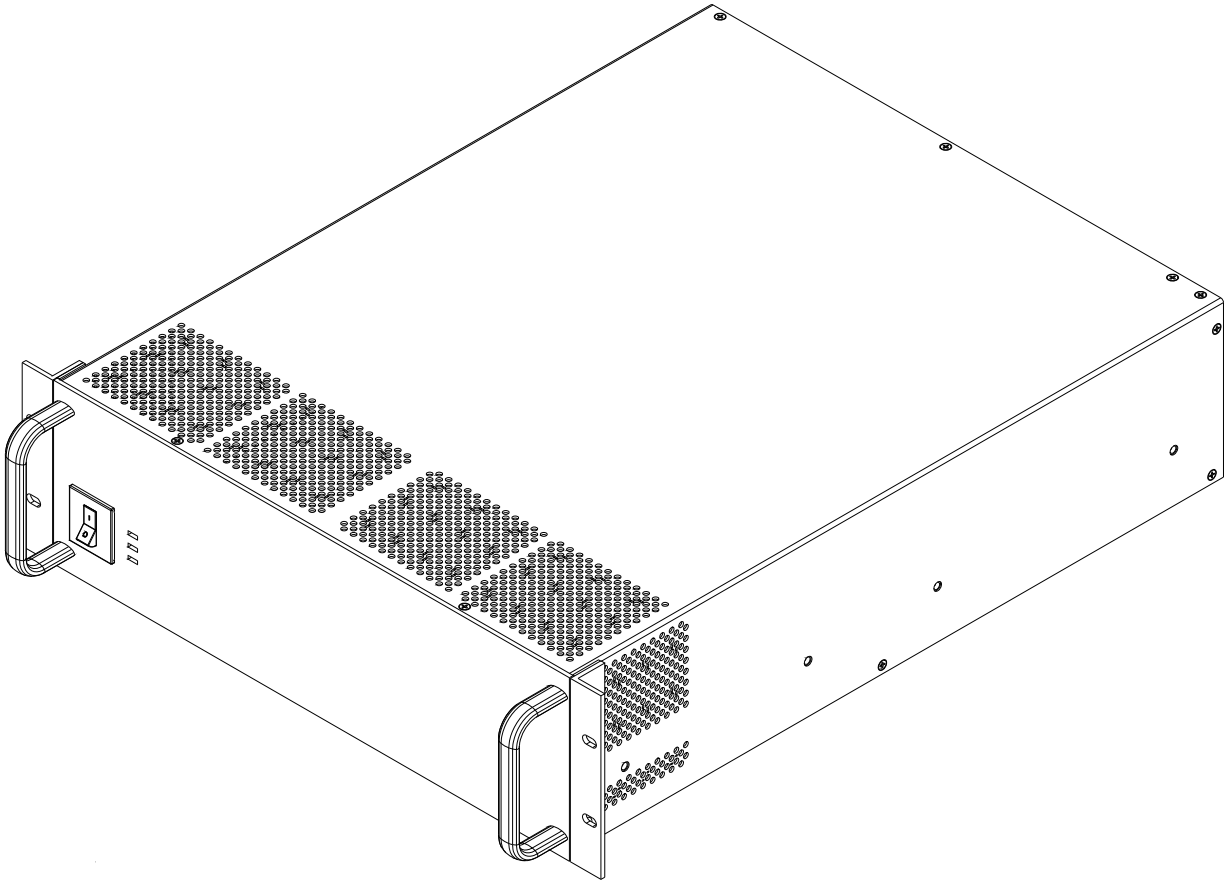


FIGURE 1-1. Model 4Q06125PS POWER SUPPLY

SECTION 1 - INTRODUCTION

1.1 SCOPE OF MANUAL

This manual contains instructions for the installation and operation of the AMI Model 4Q06125PS Power Supply. Model 4Q06125PS is a 750-watt, 4-quadrant, bipolar, programmable, voltage and current stabilized d-c power supply.

1.2 GENERAL DESCRIPTION

Model 4Q06125PS, (Figure 1-1) is a true 4-quadrant programmable voltage and current power supply, meaning it is capable of both sourcing and sinking power. The Model 4Q06125PS power supply is rated at ±6 Volts, ±125 Amperes. The power supply passes smoothly through zero to provide true ± voltage and ± current. The Model 4Q06125PS power supply uses switch mode technology for low dissipation. A bi-directional, isolating, power-factor-correcting (PFC) a-c input circuit recuperates energy from an active load and sends it back into the line to maintain low dissipation and provide energy conservation.

The Model 4Q06125PS can be remotely controlled by an analog ±10V input for the main channel (voltage or current), and a +1 to +10V input for the limit channels.

The Model 4Q06125PS is ideal for driving inductive loads such as large magnets or motors, and for exercising batteries, although the proper precautions must be observed (see PAR.3.2.3). It is also suitable for characterizing solar cell arrays, and powering many electrochemical reactions.

1.3 SPECIFICATIONS

Table 1-1 lists specifications that apply to Model 4Q06125PS.

TABLE 1-1. MODEL 4Q06125PS SPECIFICATIONS

SPECIFICATION		RATING/DESCRIPTION	CONDITION
OPERATING CHARACTERISTICS			
d-c Output Range	$E_{o\ Max}$	±6V d-c	When connecting active loads, the steady-state voltage of the active load must not exceed the maximum voltage rating of the power supply. Otherwise the overvoltage protection will shut down the power supply.
	$I_{o\ Max}$	±125 A d-c	
Closed Loop Gain	Voltage Channel	0.6	
	Current Channel	12.5	
INPUT CHARACTERISTICS			
a-c voltage	nominal	230 Va-c	Single phase
	range	176 - 264 Va-c	
Frequency	nominal	50-60 Hz	>65 Hz, leakage exceeds spec
	range	47 - 65 Hz	
Current	176 Va-c	9.5A	maximum
	264 Va-c	6.4A	maximum
Power factor		0.99 minimum	nominal output power, source
Efficiency		50%	minimum, source
Switching frequency		50 KHz	PFC Stage
EMC Compliance		EN61326-1 (1997)	Class A equipment

TABLE 1-1. MODEL 4Q06125PS SPECIFICATIONS (Continued)

SPECIFICATION		RATING/DESCRIPTION	CONDITION
INPUT CHARACTERISTICS (Continued)			
EMC immunity to:	ESD	EN61000-4-2	Electrostatic discharge
	Radiated RF	EN61000-4-3	
	EFT	EN61000-4-4	Electrical fast transient/burst
	Surges	EN61000-4-5	
	Conducted RF	EN61000-4-6	
EMC emissions	Conducted	EN61000-3-2	harmonics
		EN61000-3-3	fluctuation & flicker
	Conducted	EN55011/CISPR11	0.15 to 30 MHz
	Radiated	EN55011/CISPR11	30 to 1000 MHz
Leakage current		3.5 mA	230V a-c, 47-63 Hz
Insulation coordination	Input	Installation Category II	
		Overvoltage Category II	
	Output	Installation Category II	
		Overvoltage Category II	
	Pollution degree	2	
OUTPUT CHARACTERISTICS[1]			
Type of stabilizer		Voltage-current, 4-quadrant	Switch mode
Switching frequency		100KHz	Output Stage
Source adjustment range	voltage	-6V to +6V	0 to 50 deg C
	current	-125A to +125A	
Sink adjustment range	voltage	-6V to +6V	0 to 50°C, recuperated energy is sent back into line for reuse
	current	-125A to +125A	
Programming accuracy	Voltage	±6mV	Controlled by external calibrated analog signal
	Current	±125mA	
	Voltage Limit	±12mV	Controlled by external calibrated analog signal
	Current Limit	±250mA	
Readback accuracy	Voltage	±10mV	Main or limit channel, for the corresponding standard analog monitor signals.
	Current	±10mV	
Voltage stabilization in voltage mode	source effect	±3mV	min-max input voltage
	load effect	±6mV	0-100% load current
	time effect (drift)	±3mV	0.5 through 24 hours
	temperature	±3mV/deg C	0 to 50 deg C
	ripple and noise	±120mV p-p	Includes switching noise
Current stabilization in current mode	source effect	±62.5mA	min-max input voltage
	load effect	±250mA	0-100% load voltage
	temperature	±62.5mA/deg C	0 to 50 deg C
	ripple and noise	±2.5A p-p	Includes switching noise
Error sensing		0.1V per wire	Above rated output

NOTE 1 - Output characteristics are for a single standalone unit. Output characteristics of identical multiple unit parallel/series configurations are described in the Technical Manual associated with the applicable Cable Kit (see Table 1-4).

TABLE 1-1. MODEL 4Q06125PS SPECIFICATIONS (Continued)

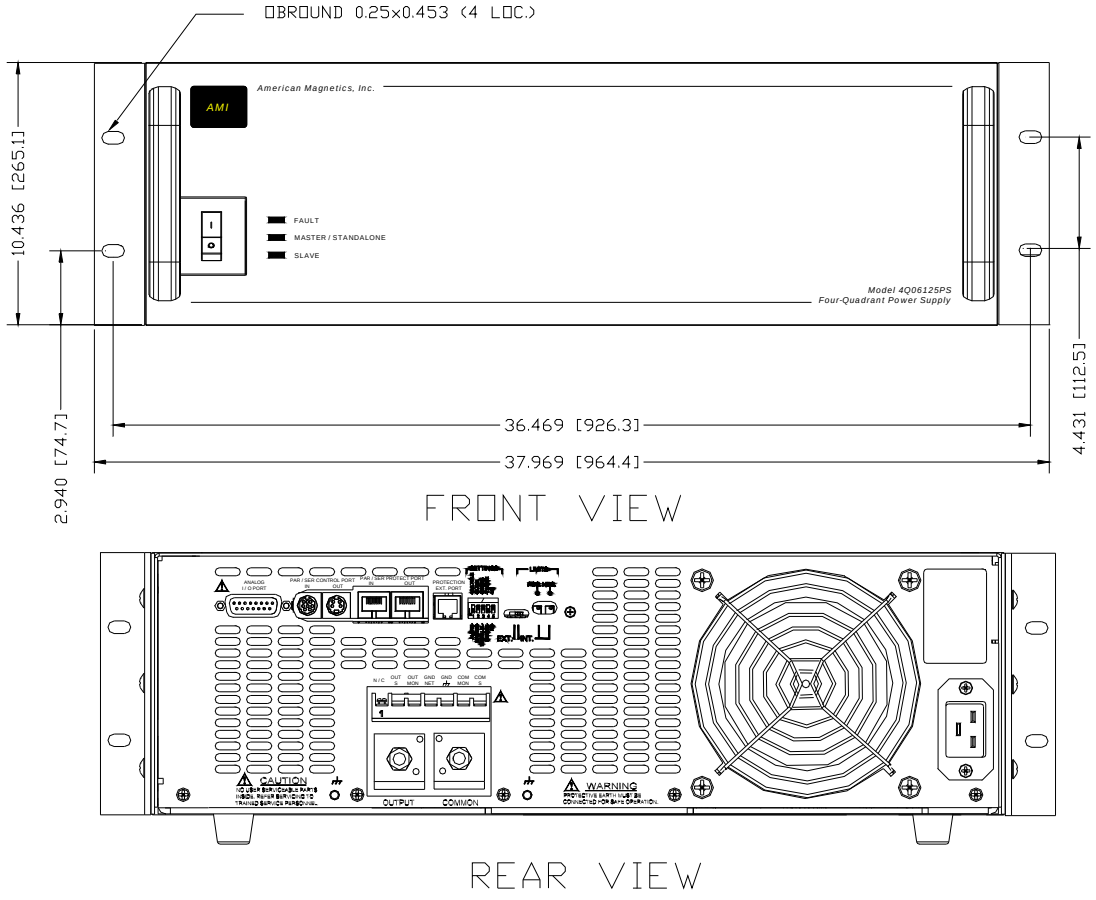
SPECIFICATION		RATING/DESCRIPTION	CONDITION
OUTPUT CHARACTERISTICS (Continued)			
Transient recovery in voltage mode	maximum excursion	±300mV	nominal voltage, 50% load step
	Recovery time	200 µsec	Return within 0.1% of set voltage
Isolation	voltage	100V	Output to ground
Series operation		Master/slave	Maximum of 2 identical units.
Parallel operation		Master/slave	Maximum of 2 identical units.
Internal Output Protection limiting (guaranteed range)		Voltage (for current mode) and current (for voltage mode), adjustable between ±Internal minimum 0.1E_{ONOM} or I_{ONOM} (box) (see Figure 1-2) and ±1.0 E_{ONOM} or I_{ONOM}.	
Output Stage Protection		Output overvoltage/overcurrent Heatsink overtemperature, power transistor overcurrent	Triggers latched shutdown protection of the output module and PFC stage. Recover by setting input power circuit breaker to off, then on or by applying a start pulse at Analog I/O Port pin 7 (see Table 2-7).
Input Stage Protection (PFC)		Internal overvoltage, undervoltage, overcurrent, heat sink overtemperature, fan inoperative	
		Input circuit breaker overcurrent	Trips circuit breaker to shut off unit
Small signal Bandwidth	voltage channel	2 KHz minimum	Into nominal resistive load 10% of rating
	current channel	800 Hz minimum	Into short circuit, 10% of rating
Rise/Fall time	voltage channel	250/250 µSec	Into nominal resistive load, measured from 10 to 90%, from 0 to ±100% of rating
	current channel	0.5/0.5 mSec	Into short circuit, measured from 10 to 90%, from 0 to ±100% of rating
PROGRAMMING/DISPLAY CHARACTERISTICS			
Analog control (See Table 2-7.)	Main channel (voltage or current)	Controls full range output if permitted by limit channels and load: –10V to +10V	100K Ohm input impedance (see PAR. 3.3)
	Protection Limit channels: +Voltage, –Voltage +Current, –Current	Controls 10% to 100% of Nominal Range if main channel is at nominal value: +1V to +10V	Input voltage clamped to 10.7V through 0.5K ohms for higher values and 0.8V for lower values. Maximum of 0.014mA input current sink at 1V input voltage.
	External mode control	Controls mode of operation, voltage or current: VM (Voltage): open circuit or TTL/CMOS logic 0 CM (Current): short circuit or TTL/CMOS logic 1	Effective for master or standalone units. For slave units the mode is automatically determined by the series or parallel setting. Current mode command (pin 2 of I/O Analog Port) is OR'ed with the rear panel SETTINGS VMODE-CMODE switch position
	External OFF control	Controls Output ON (enabled) or OFF (disabled): ON: open circuit or TTL/CMOS logic 0 OFF: short circuit or TTL/CMOS logic 1	
	External START control	Initiates the Start sequence after a power supply fault. START: open circuit - short circuit - open circuit or TTL/CMOS logic 1 - 0 - 1 (3 mS minimum pulse duration)	Effective when the unit is not operational due to detection of internal error. Unit will not start while error is present.

TABLE 1-1. MODEL 4Q06125PS SPECIFICATIONS (Continued)

SPECIFICATION		RATING/DESCRIPTION	CONDITION
PROGRAMMING/DISPLAY CHARACTERISTICS (Continued)			
Analog control (continued) (See Table 2-7.)	Voltage and Current Monitoring signals	Output voltage/current monitor (readback) standard analog signals: 0 to ±10V for 0 to $\pm E_{ONOM}$ 0 to ±10V for 0 to $\pm I_{ONOM}$	Nominal output impedance: 200 Ohms Short-circuit protected.
	Reference Voltage	+10.0V for external usage	Nominal output impedance: 1 Ohm Maximum capacitance loading: 0.01µF Maximum output current: 8mA
External Protection Port (see Table 2-2)	External Trigger Shutdown (SD_EXT, pins 1, 2)	Isolated input for setting the power supply in shutdown (latched status) 0 - 1 or 0 - 1 - 0 initiates shutdown where 1 = +3.5 to +15V (max 30mA @ 15V)	Pulse width: 100 microseconds min. Restore operation by setting input power circuit breaker to off, then on or by applying a start pulse at Analog I/O Port pin 7 (see Table 2-7).
	Shutdown Flag (PG_EXT, pins 3, 4)	Isolated output indicating shutdown status)	Action delay: 100 microseconds max
	External On-Off Command (OFF_EXT, pins 5, 6)	Isolated input controlling output on (enabled) or off (disabled) ON: open circuit or 0V OFF: +3.5 to +15V (max. 30mA @ +15V)	Action delay: 100 microseconds max
GENERAL (ENVIRONMENTAL) CHARACTERISTICS			
Temperature	operating	0 to +50 deg C	Full rated load
	storage	-20 to +85 deg C	
Cooling		Two internal fans	exhaust to the rear
Humidity		0 to 95% RH	non-condensing
Shock		20g. 11msec ±50% half sine	non-operating
Vibration	5-10HZ:	10mm double amplitude	3 axes, non-operating
	10-55HZ:	2g	3 axes, non-operating
Altitude		sea level to 10,000 feet	Consult factory for derating.
Safety Certification	a-c power	EN 61010-1	CE Mark by self-test
PHYSICAL CHARACTERISTICS			
Dimensions	English	5.25' X 19" X 21.5"	H X W X D
	metric	133.3mm X 482.6mm X 546.1mm	H X W X D
Weight	English	53 lbs	
	metric	24.1Kg	
Connections and Controls	Source power	3-pin IEC connector	
	Load connections	Nickel-plated copper bus bars	
	Sensing Output Terminal Block	7-pin terminal block	Default: 3 links installed for local sensing and ground network connected.
	Analog I/O control port	15-pin D female	See Figure 2-1, Table 2-7
	PAR/SER CTRL IN port	8-pin mini DIN connector	See Figure 2-1, Table 2-4
	PAR/SER CTRL OUT port	4-pin mini DIN connector	See Figure 2-1, Table 2-3
	PAR/SER PROT IN port	8-pin phone jack	See Figure 2-1, Table 2-5
	PAR/SER PROT OUT port	8-pin phone jack	See Figure 2-1, Table 2-6
	PROTECT EXT port	6-pin phone jack	See Figure 2-1, Table 2-2
	SETTINGS switch	5-position DIP switch	See Figure 2-1, Table 2-8

TABLE 1-1. MODEL 4Q06125PS SPECIFICATIONS (Continued)

SPECIFICATION		RATING/DESCRIPTION	CONDITION
	External-Internal switch	2-position slide switch	See Figure 2-1, Table 2-1
	Internal Limit Adjustments	POS and NEG trimpots	See Figure 2-1, Table 2-1
Crowbar Characteristics	Max. current: Max. Voltage: Contact Resistance (typ.): On/off timing (typ.):	150A 48V 0.3mOhms @100A 25mS	Short-circuits the output when there is an internal fault (front panel FAULT LED is on) or when there is a loss of input power.



NOTES:
1. MATERIAL: A) CHASSIS: #11 GA. C.R.S.
   B) FRONT PANEL: 1/8 THICK 6061-T6 ALUMINUM.
   C) COVER: #16 GA. C.R.S
   D) BACK PLATE: 0.064 THICK 5052-H32 ALUMINUM.
2. FINISH: A) CHASSIS & COVER : CADMIUM PLATE WITH CROMATE WASH.
   B) BACK PLATE: IRIDITE GOLD
   C) FRONT PANEL: SEE 1311356 PAGE 2 OF 3.
3. DIMENSION IN PARENTHESES ARE IN MILLIMETERS.
4. TOLERANCES ARE ±1/32 (0.8), EXCEPT AS NOTED.
5. PRIOR TO INSTALLATION, REMOVE FOUR FEET.
6. OPTIONAL SLIDES SHOWN INSTALLED

FIGURE 1-1. OUTLINE DRAWING (SHEET 1 OF 2)

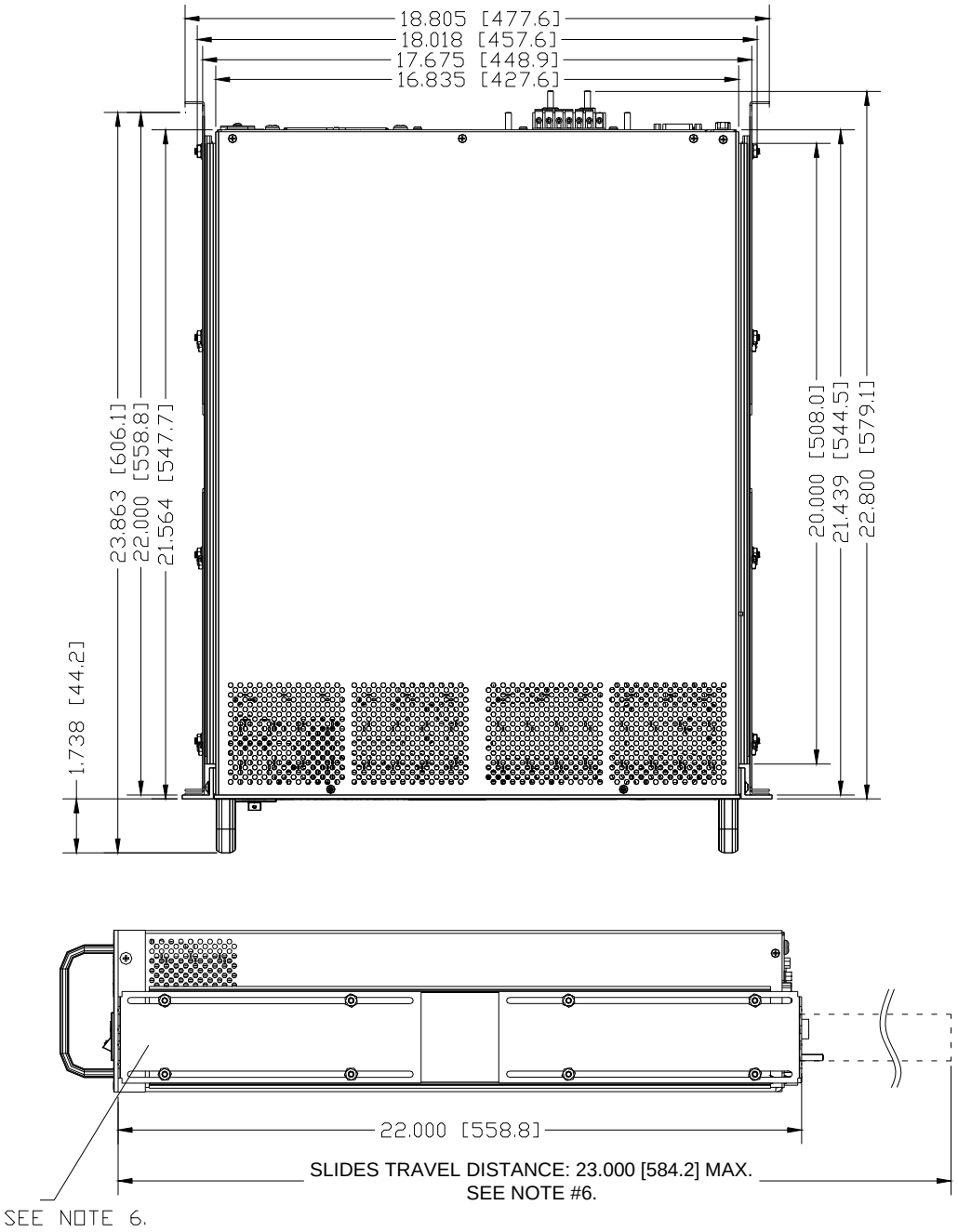


FIGURE 1-1. OUTLINE DRAWING (SHEET 2 OF 2)

1.4 MODEL 4Q06125PS CONTROL

The Model 4Q06125PS is controlled by remote analog signals applied to the Analog I/O Port. The analog signals control the main channel (voltage in voltage mode, current in current mode) and the four independent limits: ±voltage limit and ±current limit. Also, if desired, the limits (±current limit for voltage mode and ±voltage limit for current mode) can be adjusted using two local trimpots, one for positive and one for negative limit.

The main channel controls the output between zero and ±nominal output values. The limit channel controls the output between ±(0.1) nominal and ±nominal output values (guaranteed range).

1.4.1 PARALLEL AND SERIES CONFIGURATIONS

Identical Model 4Q06125PS units may be configured in series or in parallel to double either output voltage or output current. Units operating in series or in parallel function in a master-slave configuration. For series configurations, the slave causes the master's output voltage to double. For parallel configurations, the slave causes the master's output current to double. Refer to PAR. 2.8 for further details.

1.4.2 ENERGY RECUPERATION

The Model 4Q06125PS is a four-quadrant device as shown in Figure 1-2. Operating as a source, it delivers energy into a passive load, and as a sink it operates as an electronic load, absorbing and dissipating energy from an active load. To minimize energy dissipation, the Model 4Q06125PS employs energy recuperation, where energy sinked from an active load is passed backwards through the output circuit and the bidirectional input power factor correcting circuit to the a-c power lines, where it becomes available for reuse. This technology allows high power levels using switch-mode technology while maintaining high efficiency and reduced size and weight.

1.5 EQUIPMENT SUPPLIED

Equipment supplied with the Model 4Q06125PS power supply is listed in Table 1-2.

TABLE 1-2. EQUIPMENT SUPPLIED

ITEM	FUNCTION
Source Power Entry mating connector	Mates with source power entry connector
PAR/SER CONTROL - IN mating connector	Mates with PAR/SER CONTROL - IN port
Analog I/O Port mating connector	Mates with Analog Port connector to allow control of the unit.
Line cord (250V, 20A)	Provides connection to a-c mains via Nema 6-20P connector.

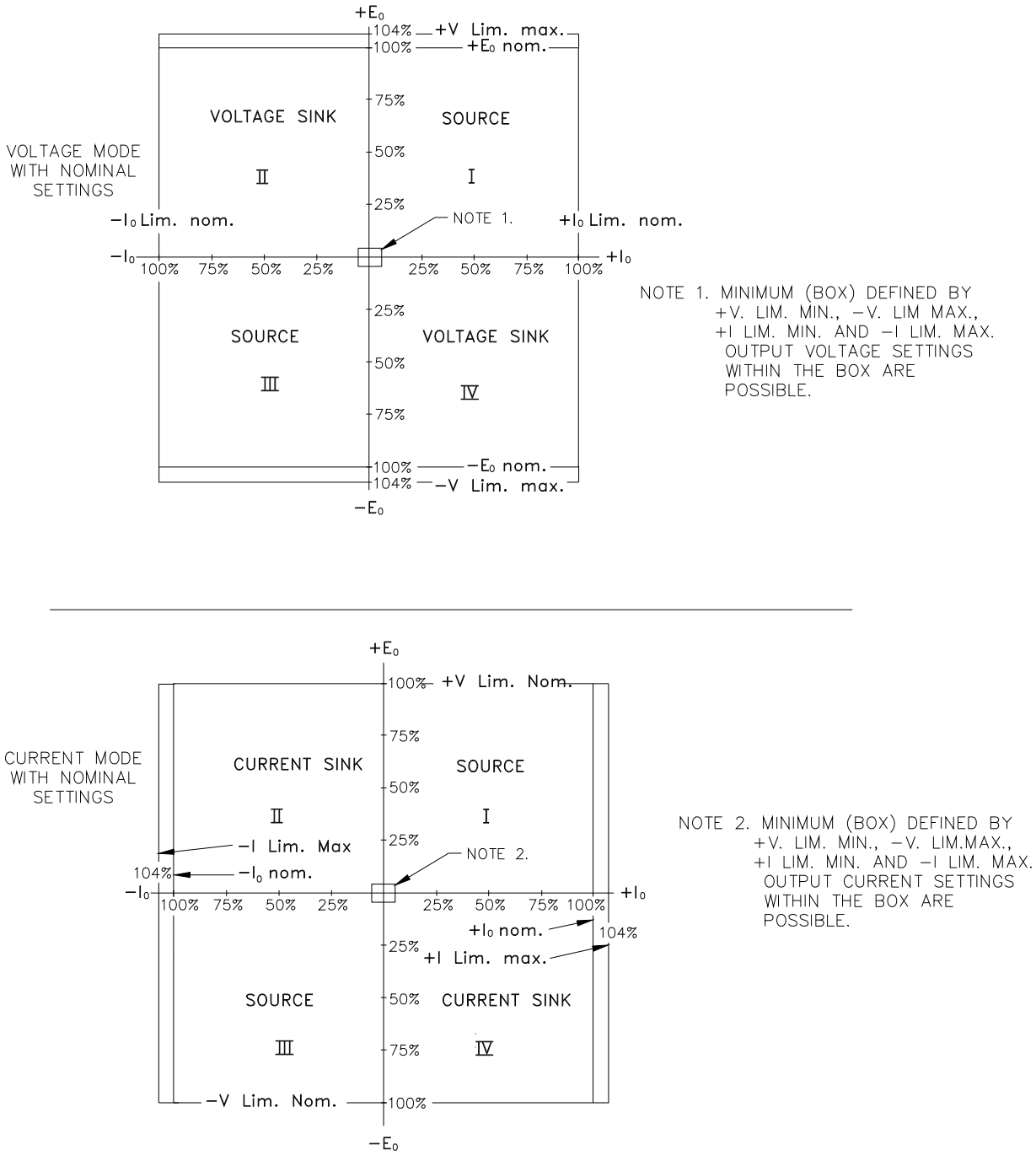


FIGURE 1-2. OUTPUT CHARACTERISTICS

1.6 ACCESSORIES

Accessories for the Model 4Q06125PS Power Supply are listed in Table 1-4.

1.7 SAFETY

Service must be referred to authorized personnel. Using the power supply in a manner not specified by AMI. may impair the protection provided by the power supply. Observe all safety precautions noted throughout this manual (see listing on page 5, preceding the Table of Contents). Table 1-3 lists symbols used on the power supply or in this manual where applicable.

TABLE 1-3. SAFETY SYMBOLS

SYMBOL	Meaning
	WARNING! RISK OF ELECTRIC SHOCK!
	CAUTION: REFER TO REFERENCED PROCEDURE.
WARNING	INDICATES THE POSSIBILITY OF BODILY INJURY OR DEATH.
CAUTION	INDICATES THE POSSIBILITY OF EQUIPMENT DAMAGE.

TABLE 1-4. ACCESSORIES

ITEM	FUNCTION	AMI PART NUMBER
Interconnection Kit for multiple identical power supplies in parallel (increase output current)	Cables required to connect multiple power supplies in parallel for increased current capability.	KIT 219-0528 (2 in parallel)
Interconnection Kit for multiple identical power supplies in series (increase output voltage)	Cables required to connect multiple power supplies in series for increased voltage capability.	KIT 219-0527 (2 in series)

SECTION 2 - INSTALLATION

2.1 UNPACKING AND INSPECTION

This instrument has been thoroughly inspected and tested prior to packing and is ready for operation. After careful unpacking, inspect for shipping damage before attempting to operate. Perform the preliminary operational check as outlined in PAR. 2.3. If any indication of damage is found, file an immediate claim with the responsible transport service.

2.2 TERMINATIONS AND CONTROLS

a) Front Panel: Refer to Figure 3-1 and Table 3-1.

b) Rear Panel: Refer to Figure 2-1 and Table 2-1.

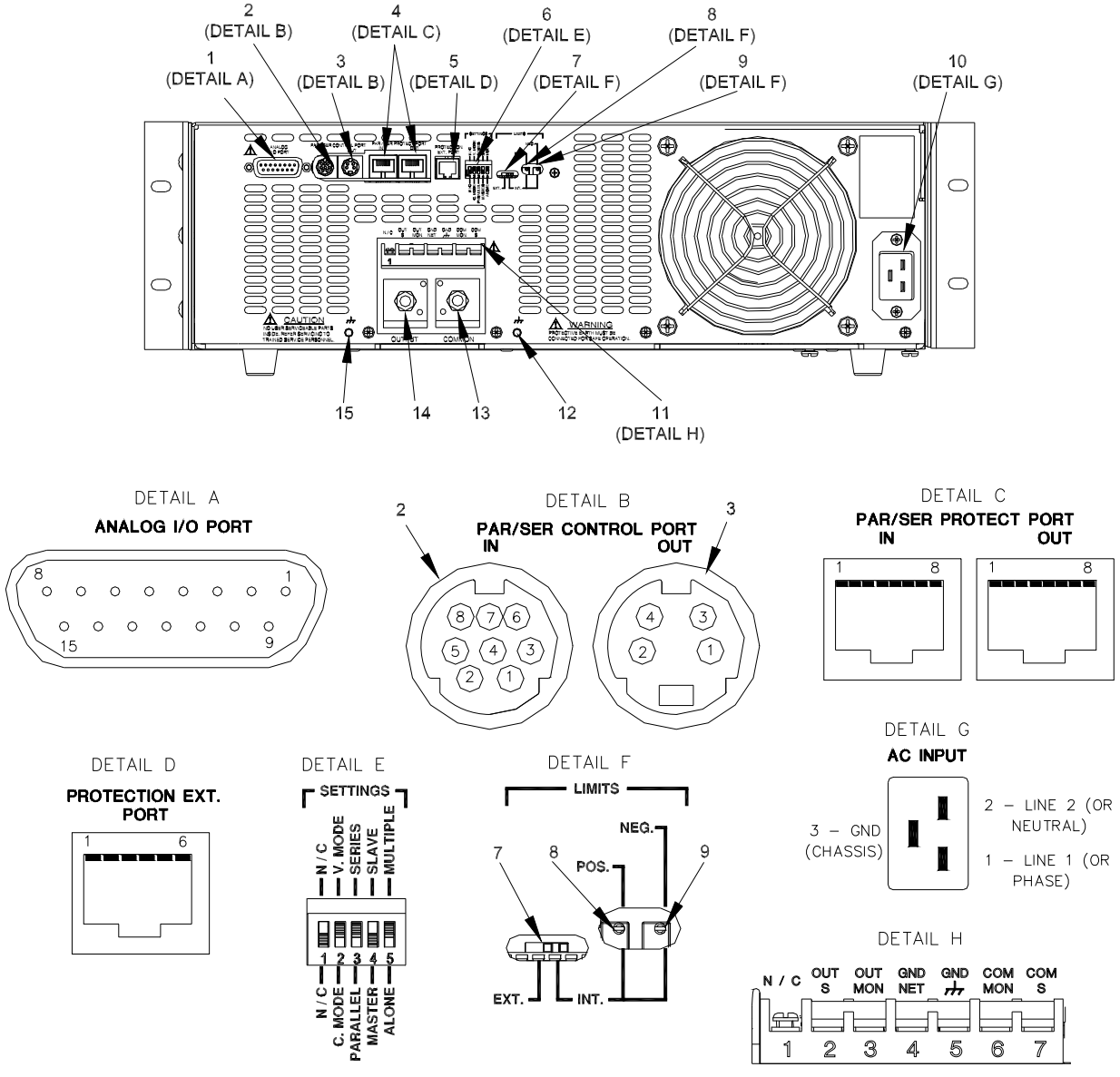


FIGURE 2-1. REAR PANEL

TABLE 2-1. REAR PANEL SWITCH AND CONNECTOR FUNCTIONS

NUMBER (FIGURE 2-1)	CONNECTOR/TERMINAL (REFERENCE DESIGNATOR)	FUNCTION
1	ANALOG I/O PORT (connector A2A5J6)	Provides interface for analog input/output signals. (See Table 2-7.)
2	PARALLEL/SERIAL CONTROL PORT - IN (connector 2A5J3)	Provides interconnections used to control parallel or serial configurations of identical power supplies as a single power supply (see Table 2-4 for A2A5J3, IN).
3	PARALLEL/SERIAL CONTROL PORT - OUT (connector A2A5J4)	Provides interconnections used to control parallel or serial configurations of identical power supplies as a single power supply (see Table 2-3 for A2A5J4, OUT).
4	PARALLEL/SERIAL PROTECT PORT (connectors A2A5J1, IN and A2A5J2 OUT)	Provides interconnections used to control protection shutdown of power supplies connected in parallel or serial configurations (see Table 2-5 for A2A5J1, IN and Table 2-6 for A2A5J2, OUT).
5	PROTECTION EXT PORT (connector A2A5J7)	Provides means for controlling protection via external circuitry and provides status flags to external circuitry. (See Table 2-2.)
6	SETTINGS (DIP switch)	Allows the unit to be set up for: Current Mode or Voltage mode operation, parallel or series connection, operate as master or slave, and single (ALONE) or multiple unit configuration (see Table 2-8 for details).
7	EXT-INT LIMITS (slide switch)	Allows limits to be set using either internal or external reference voltages. Factory default setting is EXT. EXT: Allows the ±voltage limits and ±current limits channels to be programmed by external +1V to +10V signals applied to the Analog I/O Port inputs, pins 5, 6, 13, and 14, referenced to pin 12 (see Table 2-7). If no external programming signal is present, these limits are automatically set to be 4% to 6% above the nominal (6V or 125A) setting. INT: Allows the ±current limits in voltage mode and ±voltage limits in current mode to be adjusted locally using the POS. LIMITS and NEG. LIMITS trimpots. NOTE: When set to INT, the ±voltage limits in voltage mode and ±current limits in current mode can still be programmed by external signals as described for EXT.
8	POS. LIMITS (potentiometer)	Adjusts the internal reference voltage which sets the positive limit: voltage limit in current mode and current limit in voltage mode. Factory default: adjusted to nominal value: +6V (tolerance 0V to +0.06V) or +125A (tolerance 0A to +1.25A). (See PAR. 3.3.5.)
9	NEG. LIMITS (potentiometer)	Adjusts the internal reference voltage which sets the negative limit: voltage limit in current mode and current limit in voltage mode. Factory default: adjusted to nominal value: –6V (tolerance –0.06V to 0V) or –125A (tolerance –1.25A to 0A). (See PAR. 3.3.5.)
10	INPUT connector (connector A7J1)	Connects source power to unit. Pin 1 - Line (or Line 1 without Neutral connection) Pin 2 - Neutral (or Line 2 without Neutral connection) Pin 3 - Ground (Protective conductor terminal)
11	Monitor and Sensing terminal block (terminal block A7A1TB1)	Terminal block provides external connections as follows: OUT S: Sense line connection to load (compensate for voltage drop on connections to load.) See PAR. 2.5.6 and 2.5.7 (Terminal 2). OUT MON: Monitor connection used to monitor output voltage at power terminals and to implement local sensing (Terminal 3). GND NET: Grounding network connection (Terminal 4). See PAR. 2.5.3.1. GND: Chassis ground connection (Terminal 5) See NOTE. COM MON: Monitor return connection (Terminal 6). Used to monitor output voltage at power terminals and to implement local sensing. COM S: Sense line return connection from load (Terminal 7) See PAR. 2.5.6 and 2.5.7
12	⏚ terminals	Frame or chassis terminals. See NOTE.
13	COMMON (terminal A7J3)	Power output return from load.
14	OUTPUT (terminal A7J2)	Power output connection to load.
NOTE: The mandatory connection to earth ground should be made using the frame terminals (12, Figure 2-1), NOT terminal 5 of the terminal block (11, Figure 2-1).		

TABLE 2-2. PROTECTION EXTERNAL PORT (A2A5J7) INPUT/OUTPUT PIN ASSIGNMENTS

PIN	SIGNAL NAME	FUNCTION
1	SD_EXT_K	Cathode of LED optocoupler (through a 510 ohm resistor) which is used for external isolated shutdown. Anode of LED is connected to (A2A5J7) pin 2. A positive voltage (3.5 to 15V) at pin 2 (referenced to pin 1) shuts down the unit (see CAUTION below). Maximum current is 30mA @15V.
2	SD_EXT_A	Anode of LED optocoupler which is used for external isolated shutdown. (See pin 1 above.)
3	PG_EXT_C	Collector of optocoupler-transistor which is used for external isolated “power OK” flag. Transistor emitter is connected to (A2A5J7) pin 4. When unit is operating normally, transistor is saturated. Current through transistor should not exceed 5mA and supply voltage should not exceed 15V.
4	PG_EXT_E	Emitter of optocoupler-transistor which is used for external isolated “power OK” flag. (See pin 3 above.)
5	OFF_EXT_K	Cathode of LED optocoupler through a 510-Ohm resistor which is used for external isolated “Output OFF” command. A “1” (positive voltage (+3.5V to +15V) at pin 6 referenced to pin 5) sets the output to OFF (disabled): 0.0V in voltage mode or 0.0A in current mode. A “0” (less than 0.8V or open circuit) at pin 6 referenced to pin 5 sets the output to ON. Maximum current is 30mA @15V.
6	OFF_EXT_A	Anode of optocoupler which is used for external isolated “output OFF” command. (See pin 5 above.)
CAUTION:When an external shut-down signal is sent to the unit, the shut-down condition is latched and the red FAULT indicator on the front panel is ON. To resume normal operation it is necessary to cycle power off, then on or apply a “1” to “0” to “1” pulse (3 mS min.) or open-short-open sequence to START_EXT, pin 7, of Analog I/O Port.		

TABLE 2-3. PARALLEL/SERIAL CONTROL OUT PORT (A2A5J4) PIN ASSIGNMENTS

PIN	SIGNAL NAME	FUNCTION
1	SGND	Local signal ground
2	No connection	
3	S_IN_PARALLEL	Relayed signal for daisy chain connection. (See PARALLEL/SERIAL IN PORT (A2A5J3) pin 3)
4	No connection	

TABLE 2-4. PARALLEL/SERIAL CONTROL IN PORT (A2A5J3) PIN ASSIGNMENTS

PIN	SIGNAL NAME	FUNCTION
1	SGND	Local signal ground
2	No connection	
3	S_IN_PARALLEL	Input for programming output current of a parallel-connected slave. Provided by master unit. Level: –10V to +10V controls the current between $-I_{Onom}$ to $+I_{Onom}$.
4	No connection	
5	No connection	
6	IOUT_M_UNIT	Output for programming slave current when the unit is a parallel-connected master Level: –10V to +10V programs slave current to $-I_{Onom}$ to $+I_{Onom}$.
7	No connection	
8	S_IN_SERIAL	Input for programming output voltage of a series-connected slave. Provided by master . Level: $-E_{Onom}$ to $+E_{Onom}$ of master programs output voltage from $+E_{Onom}$ to $-E_{Onom}$ of slave.

TABLE 2-5. PARALLEL/SERIAL PROTECT IN PORT (A2A5J1) PIN ASSIGNMENTS

PIN	SIGNAL NAME	FUNCTION
1	SD_A	Anode of LED optocoupler which is part of protection circuit for parallel or series combination. Cathode of LED is connected to PARALLEL/SERIAL PROTECT OUT PORT (A2A5J2) pin 1 (see Table 2-6). When activated, the optocoupler shuts down the unit. LEDs from all units of the parallel or series combination are connected in series.
2	PGOUT_C	Collector of optocoupler transistor which is part of protection circuit for parallel or series combination. Transistor emitter is connected to PARALLEL/SERIAL PROTECT OUT PORT (A2A5J2) pin 2 (see Table 2-6). When unit is operating normally, transistor is saturated. Transistors from all units of the parallel or series combination are connected in series.
3	SD_RETURN	Completes return connection for the protection circuit which receives energy from the master unit.
4	No connection	
5	No connection	
6	No connection	
7	GND	Local power ground.
8	/INH	Provides energy for the protection circuit (master unit only). Disabled at power up to prevent shutdown during power up.

TABLE 2-6. PARALLEL/SERIAL PROTECT OUT PORT (A2A5J2) PIN ASSIGNMENTS

PIN	SIGNAL NAME	FUNCTION
1	SD_K	Cathode of LED optocoupler which is part of protection circuit for parallel or series combination. (See IN port (A2A5J1) pin 1,Table 2-5.)
2	PGOUT_E	Emitter of optocoupler transistor which is part of protection circuit for parallel or series combination. (See IN port (A2A5J1) pin 2,Table 2-5.)
3	SD_RETURN	Relayed connection, provides return for the protection circuit which receives energy from the master unit.
4	No connection	
5	No connection	
6	No connection	
7	No connection	
8	No connection	

TABLE 2-7. ANALOG I/O PORT (A2A5J6) INPUT/OUTPUT PIN ASSIGNMENTS

PIN	RETURN PIN	SIGNAL NAME	FUNCTION	SPECIFICATIONS
CAUTION:IT IS RECOMMENDED THAT SOURCE POWER OF EXTERNAL EQUIPMENT CONNECTED TO THE ANALOG I/O PORT BE APPLIED THROUGH AN ISOLATING TRANSFORMER TO AVOID GROUND LOOPS. ALSO, FOR GROUNDED LOADS, IF OUTPUT POWER CONNECTION FROM COMMON TERMINAL AT REAR PANEL TO LOAD IS ACCIDENTALLY DISCONNECTED, HEAVY OUTPUT CURRENT MAY FLOW THROUGH THE ANALOG I/O PORT SIGNAL GND (PIN 4) AND DAMAGE THE UNIT.				
1	9 (GND)	OFF_EXT	Sets the output to 0 by setting the reference for main channel to zero. The external reference is disabled.	0" or open = output ON, "1" = output OFF (see Note 1), nominal impedance: 20K Ohms.
2	9 (GND)	CM_EXT	Set the operating mode of the power supply to Current Mode. Effective only for standalone unit or master unit (not effective for slave unit). This command is OR'ed with the CMODE signal from rear panel SETTINGS CMODE-VMODE switch.	"0" or open = Voltage Mode, "1" = Current Mode (see Note 1) nominal impedance: 20K Ohms.

TABLE 2-7. ANALOG I/O PORT (A2A5J6) INPUT/OUTPUT PIN ASSIGNMENTS (CONTINUED)

PIN	RETURN PIN	SIGNAL NAME	FUNCTION	SPECIFICATIONS
3	10 (GND)	IOUT_MON	Voltage proportional to output current; 0 to ±10V corresponds to 0 to ±125A output current.	Nominal impedance: 200 Ohms; Output is short circuit-protected.
4	N/A	SGND	Signal Ground used as return for EXT_REF (pin 11) .	
5	12 (GND)	– I_LIM_EXT	Analog input signal, +1V to +10V, sets the negative current limit between –12.5A and –125A.	See Notes 2 and 3.
6	12 (GND)	– V_LIM_EXT	Analog input signal referenced to pin 12, +1V to +10V sets the negative voltage limit between -0.6V and –6V.	See Notes 2 and 3.
7	9 (GND)	START_EXT	Initiates start-up sequence if unit is powered up and stopped due to an error (fault-latch condition), and the error has been cleared. Default status of the input is a “1.” A “1” to 0” to “1” pulse initiates the start-up sequence.	See Note 1. Minimum pulse duration (“0” level) is 3mS. Input current is approximately –1μA for “0” and +1μA for “1.” The same effect can be obtained with an “open, short-circuit, open” sequence, e.g., from a relay normally-open contact.
8	10 (GND)	+10V	+10V reference voltage for external use.	Output current: 8mA max., short-circuit-protected. Output impedance: 1 Ohm (nominal). Capacitive loading (max.): 0.01μF.
9	N/A	GND	Ground - Used for OFF_EXT (pin 1), CM_EXT (pin 2) and START_EXT (pin 7) return	
10	N/A	GND	Ground (used for IOUT_MON (pin 3), VOUT_MON (pin 15) and +10V (pin 8) return.	
11	4 (SGND)	EXT_REF	External analog reference signal used for voltage in voltage mode and current in current mode, 0V to ±10V corresponds to zero to ± rated nominal (full scale), voltage or current (see PAR. 3.3.4). This input is disabled for 8 seconds during power-up or when operation is halted due to error.	Nominal Input impedance: 100K Ohms
12	N/A	GND	Ground used as return for –I_LIM_EXT (pin 5), –V_LIM_EXT (pin 6), +I_LIM_EXT(pin 13) and +V_LIM_EXT (pin 14).	
13	12 (GND)	+I_LIM_EXT	Analog input signal, +1V to +10V sets the positive current limit between +12.5A and +125A.	See Notes 2 and 3.
14	12 (GND)	+V_LIM_EXT	Analog input signal, +1V to +10V sets the positive voltage limit between +0.6V and +6V.	See Notes 2 and 3.
15	10 (GND)	VOUT_MON	Voltage proportional to output voltage, 0 to ±10V corresponds to 0 to ±6V output voltage.	Nominal impedance: 200 Ohms; Output is short circuit-protected.

NOTES: 1. “0” or open circuit = less than +0.8V, “1” = +3.5V to +15V.
2. Clamped to approximately +0.8V for values less than 0.8V, and to +10.7V for values higher than +10.7V. When left open, the signal is clamped to approximately +10.7V.
3. Input current varies between approximately –14μA at +1V input voltage to -5μA at +10V input voltage.

TABLE 2-8. SETTINGS SWITCH (A2A5S2) SPECIFICATIONS

POSITION/NAME (See Figure 2-1)	FUNCTION	FACTORY DEFAULT SETTING
1 Not used	Not connected	Not significant
2 C. MODE-V. MODE	Used to set the operating mode of a standalone unit, or the master of a parallel or series configuration, to either Current mode or Voltage mode	V. MODE
3 PARALLEL-SERIES	PARALLEL: Sets the unit for parallel operation when ALONE-MULTIPLE switch position set to MULTIPLE. SERIES: Sets the unit for series operation when ALONE-MULTIPLE switch position set to MULTIPLE.	Not significant
4 MASTER-SLAVE	MASTER: Sets the unit to operate as a Master for either parallel or series configurations (see PARALLEL-SERIES switch position) and allows C. MODE-V. MODE switch position to determine power supply operating mode. SLAVE: Sets the unit to operate as a Slave for either parallel or series configurations (see PARALLEL-SERIES switch position); C. MODE-V. MODE switch is inoperative.	Not significant
5 ALONE-MULTIPLE	ALONE: Sets the unit for standalone operation and allows C. MODE-V. MODE switch position to determine power supply operating mode. MULTIPLE: Prepares the unit for either parallel or series operation. MASTER-SLAVE and PARALLEL-SERIES switch positions determine configuration. C. MODE-V. MODE switch position determines power supply operating mode of Master.	ALONE

2.3 PRELIMINARY OPERATIONAL CHECK

A simple operational check after unpacking and before equipment installation is advisable to ascertain whether the power supply has suffered damage resulting from shipping.

Refer to Figures 2-1 and 3-1 for location of operating controls and electrical connections. Tables 2-1 through 2-8 and 3-1 explain the functions of operating controls/indicators. Refer to PAR. 3.2 for a description of basic operating techniques.

1. With POWER switch set to off position, connect the power supply to source power (see PAR. 2.5.2).

2. Using the SETTINGS switch at the rear panel, set the unit to ALONE and VOLTAGE MODE. Disconnect any load from the output.

3. Connect a digital voltmeter (DVM) (resolution and accuracy of 0.01% or better) to the OUT S and COM S terminals at the rear panel terminal block.

4. Apply a +10.000V d-c signal at pin 11 (EXT_REF) referenced to pin 4 (SGND) of the Analog I/O Port. (If an external reference is not available, the +10V reference at Analog I/O Port, pin 8, can be used. If pin 8 is used, the +10V return (pin 10) is the “return” connection.)

5. Set Input Power circuit breaker to on position.

NOTE: For approximately two seconds during power-up the protection circuit errors are inhibited and the programming input of the main channel is inhibited. For approximately eight seconds during power-up the output contactor crowbars the output; during this time the front panel FAULT LED is on, and goes off when the unit is ready for operation. The unit issues a short audible beep upon power-up and each time an error is detected.

6. Verify DVM voltage across OUT S and COM S terminals reads +6V ±6mV.

7. Move DVM to monitor pin 15 (VOUT_MON) of Analog I/O Port referenced to pin 10 (GND). Verify that the DVM reads +10V ±10mV.

2.4 INSTALLATION

2.4.1 RACK MOUNTING

The unit is shipped with four feet attached to bottom of the unit which must be removed prior to installation (see Figure 1-1). The Model 4Q06125PS is designed to be rack mounted in a standard 19-inch wide rack using the mounting ears (supplied) attached to the front panel (see Figure 1-1). **CAUTION: THE RACK MUST PROVIDE SUPPORT AT THE REAR (WITHIN 6 INCHES OF THE REAR PANEL). OPTIONAL SLIDES CAN ALSO BE USED (SEE PAR. 2.4.2).**

2.4.2 SLIDE INSTALLATION

Optional slides are available for rack mounting (see Table 1-4 and Figure 1-1, sheet 2).

2.5 WIRING INSTRUCTIONS

Interconnections between an a-c power source and a power supply, and between the power supply and its load are as critical as the interface between other types of electronic equipment. If optimum performance is expected, certain rules for the interconnection of source, power supply and load must be observed by the user. These rules are described in detail in the following paragraphs.

CAUTION: WHEN WORKING WITH ACTIVE LOADS, THE VOLTAGE OR CURRENT OF THE ACTIVE LOAD MUST NOT EXCEED THE MAXIMUM VOLTAGE OR CURRENT RATING OF THE MODEL 4Q06125PS. OTHERWISE THE OVERVOLTAGE OR OVERCURRENT PROTECTION WILL SHUT DOWN THE POWER SUPPLY.

2.5.1 SAFETY GROUNDING

Local, national and international safety rules dictate the grounding of the metal cover and case of any instrument connected to the a-c power source, when such grounding is an intrinsic part of the safety aspect of the instrument. The ground terminal of the source power connector (Figure 2-1) is connected to the chassis and the instructions below suggest wiring methods which comply with these safety requirements; however, in the event that the specific installation for the power system is different from the recommended wiring, it is the customer's responsibility to ensure that all applicable electric codes for safety grounding requirements are met. As a precaution, always connect the stud marked ⏚ at the rear panel to proper earth ground.

2.5.2 SOURCE POWER CONNECTIONS

Source power is connected to the power supply via three-wire input power using the source power mating connector supplied (see Table 1-2). See Table 1-1 for source power specifications. This power supply operates from single phase a-c mains power over the specified voltage and frequency ranges (Table 1-1) without any need for range selection.

2.5.3 D-C OUTPUT GROUNDING

Connections between the power supply and the load and sensing connections may, despite all precautions such as shielding, twisting of wire pairs, etc., be influenced by radiated noise, or “noise pick-up”. To minimize the effects of this radiated noise the user should consider grounding one side of the power supply/load circuit. The success of d-c grounding requires careful analysis of each specific application, however, this recommendation can only serve as a general guideline.

One of the most important considerations in establishing a successful grounding scheme is to avoid GROUND LOOPS. Ground loops are created when two or more points are grounded at different physical locations along the output circuit. Due to the interconnection impedance between the separated grounding points, a difference voltage and resultant current flow is superimposed on the load. The effect of this ground loop can be anything from an undesirable increase in output noise to disruption of power supply and/or load operation. The only way to avoid ground loops is to ensure that the entire output/load circuit is fully isolated from ground, and only then establish a single point along the output/load circuit as the single-wire ground point.

The exact location of the “best” d-c ground point is entirely dependent upon the specific application, and its selection requires a combination of analysis, good judgement and some amount of empirical testing. If there is a choice in selecting either the OUTPUT or COMMON output terminals of the power supply for the d-c ground point, both sides should be tried, and preference given to the ground point producing the least noise. For single, isolated loads the d-c ground point is often best located directly at one of the output terminals of the power supply; when remote error sensing is employed, d-c ground may be established at the point of sense lead attachment. In the specific case of an internally-grounded load, the d-c ground point is automatically established at the load.

The output and common terminals of Model 4Q06125PS power supplies are d-c isolated (“floating”) from the chassis in order to permit the user maximum flexibility in selecting the best single point ground location. Care must be taken in measuring the ripple and noise at the power supply: measuring devices which are a-c line operated can often introduce additional ripple and noise into the circuit.

There is, unfortunately, no “best” method for interconnecting the load and power supply. Individual applications, location and nature of the load require careful analysis in each case. Grounding a single point in the output circuit can be of great importance. It is hoped that the preceding paragraphs will be of some assistance in most cases. For help in special applications or difficult problems, consult directly with AMI Technical Support.

2.5.3.1 GROUNDING NETWORK CONFIGURATION

Decoupling capacitors from each of the two output terminals to the chassis via a terminal block link form a grounding network. The grounding network is designed to reduce the common mode high frequency noise going from the power supply into the load. The power supply is shipped with the grounding network connected: a connection between terminals TB1-4 (GND NET) and TB1-5 (GND). To disconnect the grounding network from the output, remove the connection across TB1-4 and TB1-5.

2.5.4 POWER SUPPLY/LOAD INTERFACE

The general function of a voltage- or current-stabilized power supply is to deliver the rated output quantities to the connected load. The load may have any conceivable characteristic: it may be fixed or variable, it may have predominantly resistive, capacitive or inductive parameters; it may be located very close to the power supply output terminals or it may be a considerable distance away. The perfect interface between a power supply and its load would mean that the specified performance at the output terminals would be transferred without impairment to any load, regardless of electrical characteristics or proximity to each other.

The stabilized d-c power supply is definitely not an ideal voltage or current source, and practical interfaces definitely fall short of the ideal. All voltage-stabilized power supplies have a finite source impedance which increases with frequency, and all current-stabilized power supplies have a finite shunt impedance which decreases with frequency. The method of interface between the power supply output and the load must, therefore, take into account not only the size with regard to minimum voltage drop, but the configuration with regard to minimizing the impedance introduced by practical interconnection techniques (wire, bus bars, etc.). The series inductance of the load wire must be as small as possible as compared to the source inductance of the power supply: although the error sensing connection to the load compensates for the d-c voltage drop in the power leads, it cannot compensate for the undesirable output effects of the power lead inductance. These lead impedances (both power and sensing leads) are especially important if the load: is constantly modulated or step-programmed; has primarily reactive characteristics; or where the dynamic output response of the power supply is critical to load performance.

2.5.5 LOAD CONNECTION - GENERAL

Load connections to the Model 4Q06125PS power supply are achieved via the OUTPUT and COMMON bus bar-type terminals located on the rear panel. A barrier strip is provided at the rear panel for connection of the sense wires to the load (for remote sensing or multiple unit applications).

CAUTION: NEVER CONNECT THE LOAD TO THE SENSE TERMINALS. MONITORING INSTRUMENTS (E.G., DVM, ETC.) ARE THE ONLY EXTERNAL EQUIPMENT THAT MAY BE SAFELY CONNECTED TO THE SENSE TERMINALS.

NOTE REGARDLESS OF OUTPUT CONFIGURATION, EITHER LOCAL OR REMOTE OUTPUT SENSE LINES MUST BE CONNECTED FOR OPERATION.

1. OBSERVE POLARITIES: The **OUT S** sensing wire must be connected to the **OUTPUT** load wire, and the **COM S** sensing wire must be connected to the **COMMON** load wire.

2. IF LOCAL SENSING IS USED, INSTALL LINKS (see Figure 2-2).

CAUTION: IN CASE OF POWER LOSS, OR MODEL 4Q06125PS MALFUNCTION, THE INTERNAL CONTACTOR SHORT-CIRCUITS THE OUTPUT, PROTECTING BOTH THE LOAD AND THE POWER SUPPLY.

2.5.6 LOAD CONNECTION USING LOCAL SENSING

Figure 2-2 shows a typical configuration using local sensing and a grounded load; for local sensing with an isolated (“floating”) load, do not install the ground connection (see Figure. 2-2, Note 2).

2.5.7 LOAD CONNECTION USING REMOTE SENSING

Figure 2-3 shows a typical configuration using remote sensing and a grounded load; for remote sensing with an isolated (“floating”) load, do not install the ground connection (see Figure. 2-3, Note 2).

2.6 COOLING

The power devices used within the power supply are maintained within their operating temperature range by means of internal heat sink assemblies and by two cooling fans. Periodic cleaning of the power supply interior is recommended. If the power supply is located within a confined space, take care that the ambient temperature, which is the temperature of the air immediately surrounding the power supply, does not rise above the specified limits (see Table 1-1).

2.7 SETTING UP THE UNIT

The following paragraphs describe the connections and initial Model 4Q06125PS setup needed to operate in the desired mode.

2.7.1 CONSIDER THE LOAD TYPE

The Model 4Q06125PS can be configured to drive resistive, inductive or capacitive loads. Observe precautions listed in PAR. 3.2.3.

2.7.2 SETUP FOR OPERATION

With power off, connect the load to the Model 4Q06125PS using either local or remote sensing (refer to PAR. 2.5). If units are to be connected in series or parallel, refer to PAR. 2.8. Then refer to PAR. 3.2 for power supply basics and local operation. The factory default configuration is set at the rear panel for standalone operation (SETTINGS ALONE-MULTIPLE switch set to ALONE), voltage mode (SETTINGS CMODE-VMODE switch set to VMODE), external limits (LIMITS INT-EXT switch set to EXT).

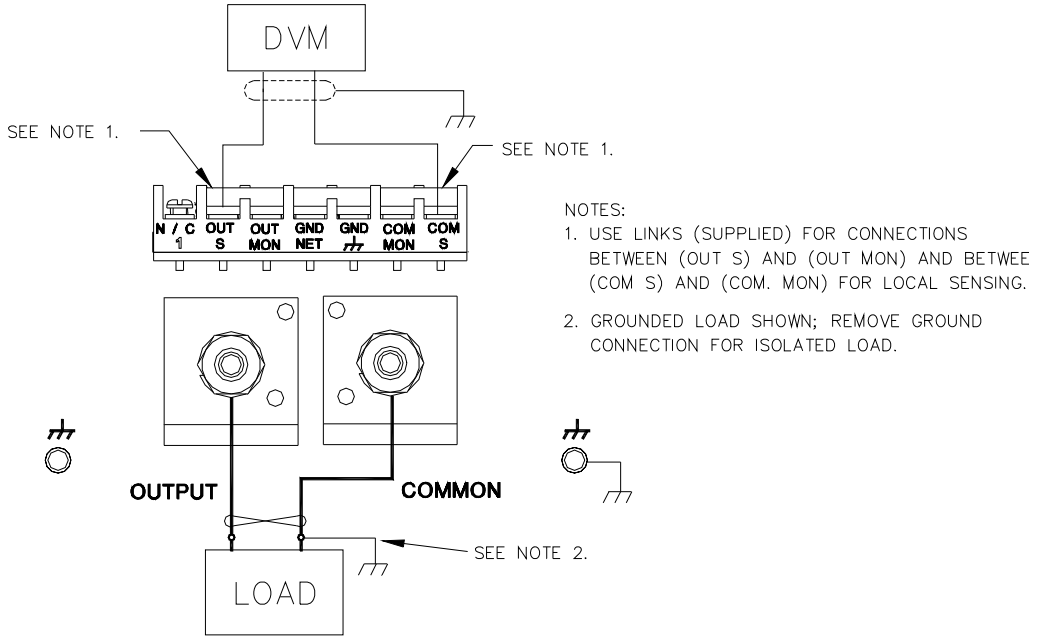


FIGURE 2-2. LOAD CONNECTIONS, LOCAL SENSING

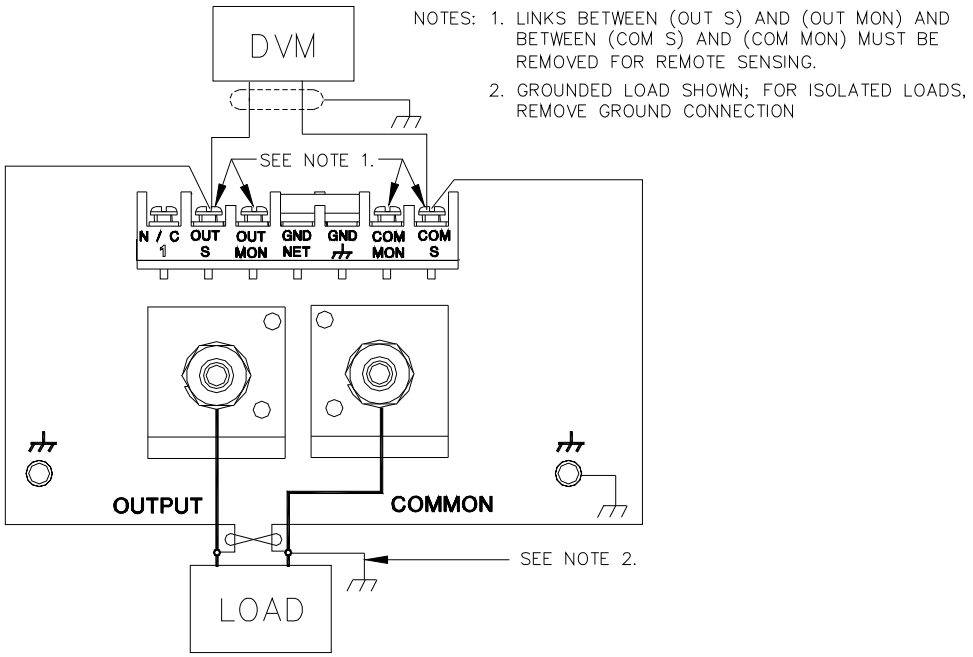


FIGURE 2-3. LOAD CONNECTIONS, REMOTE SENSING

2.8 MULTIPLE UNIT CONFIGURATIONS

Two identical Model 4Q06125PS units can be connected either in parallel to double the rated current of the power supply, or in series to double the rated voltage. Multiple unit configurations require the appropriate Interconnection Kit (see Table 1-4).

Additional hex nuts are provided in the interconnection kit for sufficient cable separation so they can be oriented as needed to fit onto the terminal.

NOTE: Multiple unit configurations require that all individual units be properly calibrated. (Units shipped from AMI have been factory-calibrated.) Using calibrated units ensures that the multiple unit configuration is calibrated; calibrating the multiple unit configuration is neither needed nor possible.

Before powering up the units to be configured, first connect the units in parallel or series. Figures 2-4 (local sensing) and 2-5 (remote sensing) show the connections for parallel-connected units; Figures 2-6 (local sensing) and 2-7 (remote sensing) show the connections for series-connected units.

CAUTION: FOR PARALLEL CONFIGURATIONS, REMOVE LINKS BETWEEN (COM S) AND (COM MON) TERMINALS OF SLAVE UNIT TO PREVENT DAMAGE TO THE UNIT AND MAINTAIN SYSTEM ACCURACY.

The following connections are required.

- Power cables
- Sense connections (either local or remote)
- All interconnection cables and terminations required for parallel or, series configurations are supplied in the applicable Interconnection Kit (see Table 1-4 for part number).

NOTE: Both master and slave must be turned on within 5 seconds of each other, otherwise the units will fault and the power-up for both units will have to be repeated. It makes no difference whether master or slave is turned on first.

2.8.1 MULTIPLE UNIT SOURCE POWER

It is recommended that multiple units all be connected to the same a-c input power source.

2.8.2 MULTIPLE UNIT PROTECTION

For multiple unit configurations it is necessary to configure the protection so that a fault will shut down all the interconnected power supplies. Figure 2-8 is a simplified diagram showing typical interconnections for master/slave configurations.

Upon startup, PAR/SER PROT IN PORT pin 8 of the master goes low and stays low for approximately eight seconds, allowing the slave time to power up. Normal power-up of a unit causes the transistor connecting PAR/SER PROT IN PORT pin 2 and PAR/SER PROT OUT PORT pin 2 to conduct. The transistors of both units are connected in series, effectively shorting out all the shutdown diodes (the shutdown diodes of both units are also connected in series). After approximately eight seconds, if a fault is not detected, the low at PAR/SER PROT IN PORT pin 8 changes to high, but the conducting transistors keep the voltage at pin 8 low and the diodes are cut off. If a fault occurs, the transistor between PAR/SER PROT IN PORT pin 2 and PAR/SER PROT OUT PORT pin 2 of the defective unit is cut off, allowing current to flow through the shutdown diodes. This develops internal shutdown signals that shut down both units.

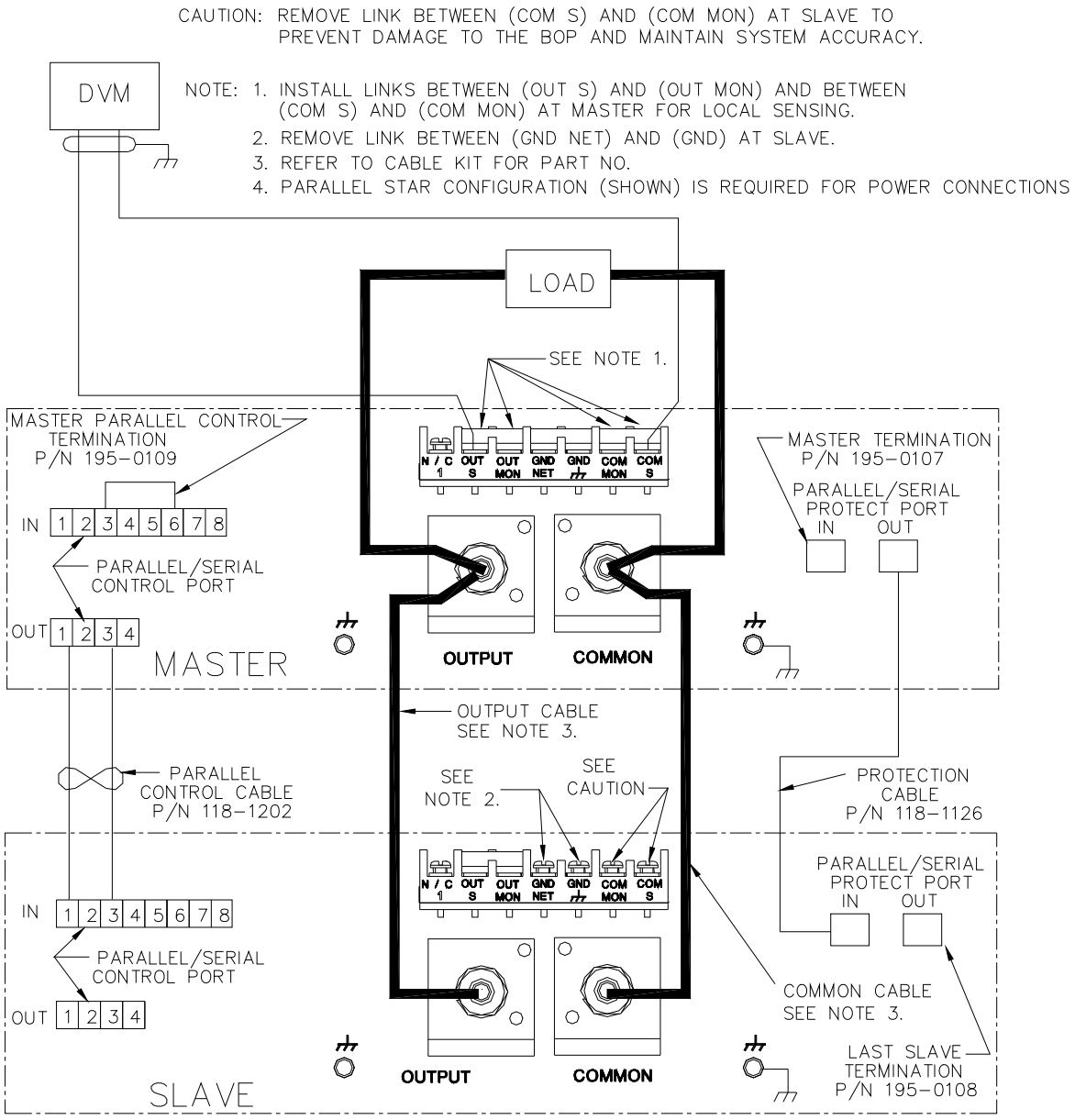


FIGURE 2-4. PARALLEL CONFIGURATION, LOCAL SENSING, TYPICAL

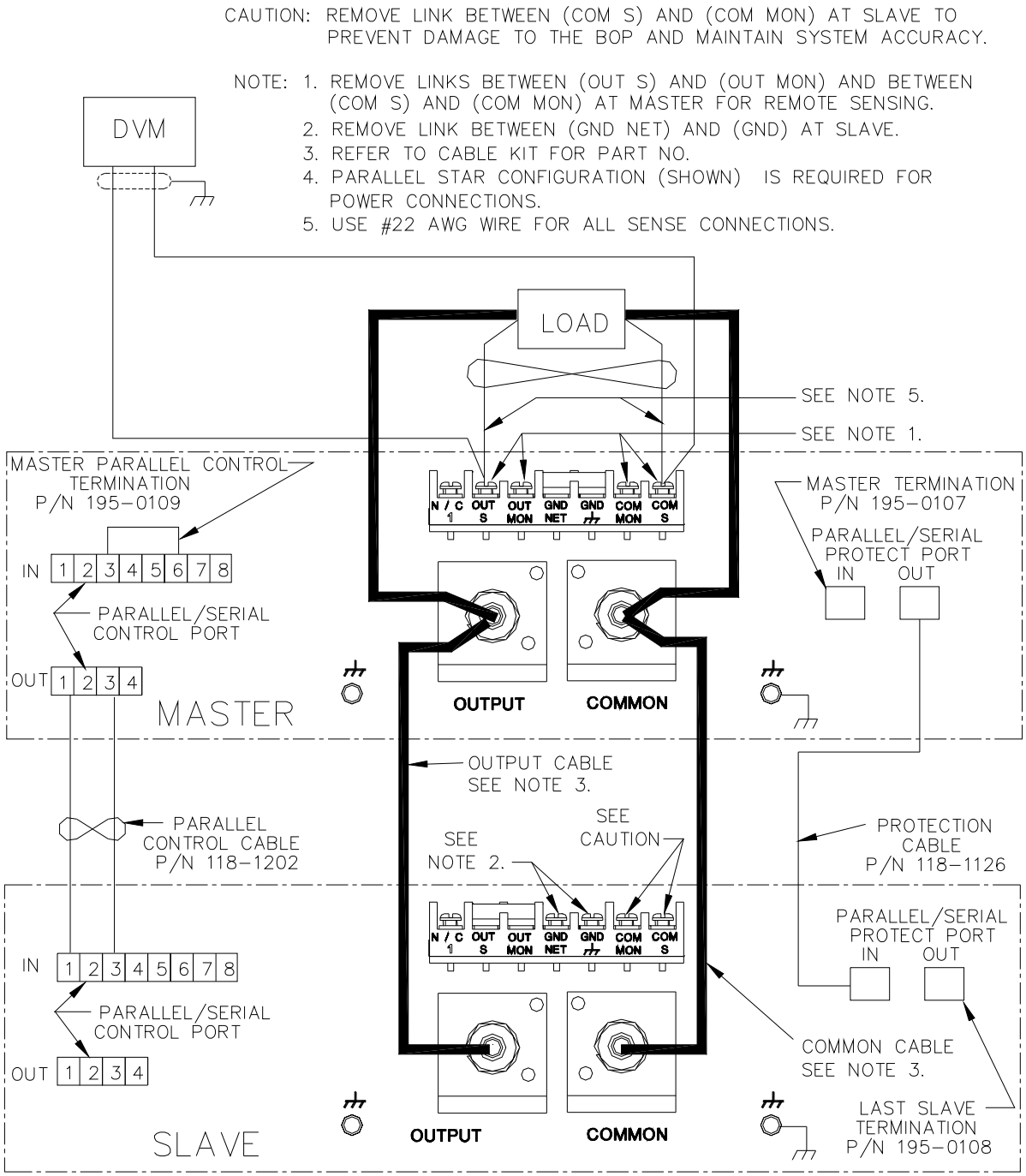


FIGURE 2-5. PARALLEL CONFIGURATION, REMOTE SENSING, TYPICAL

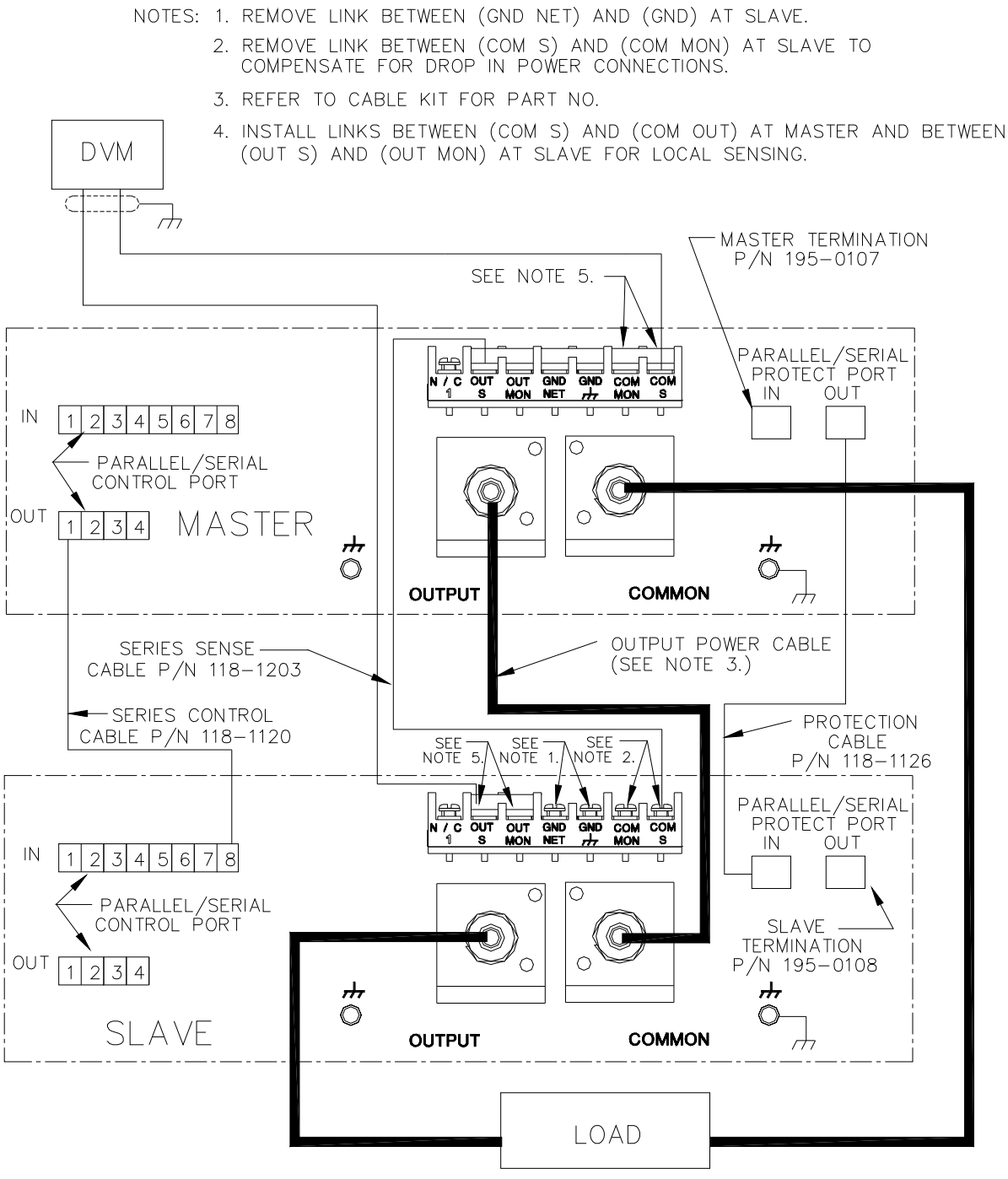


FIGURE 2-6. SERIES CONFIGURATION, LOCAL SENSING, TYPICAL

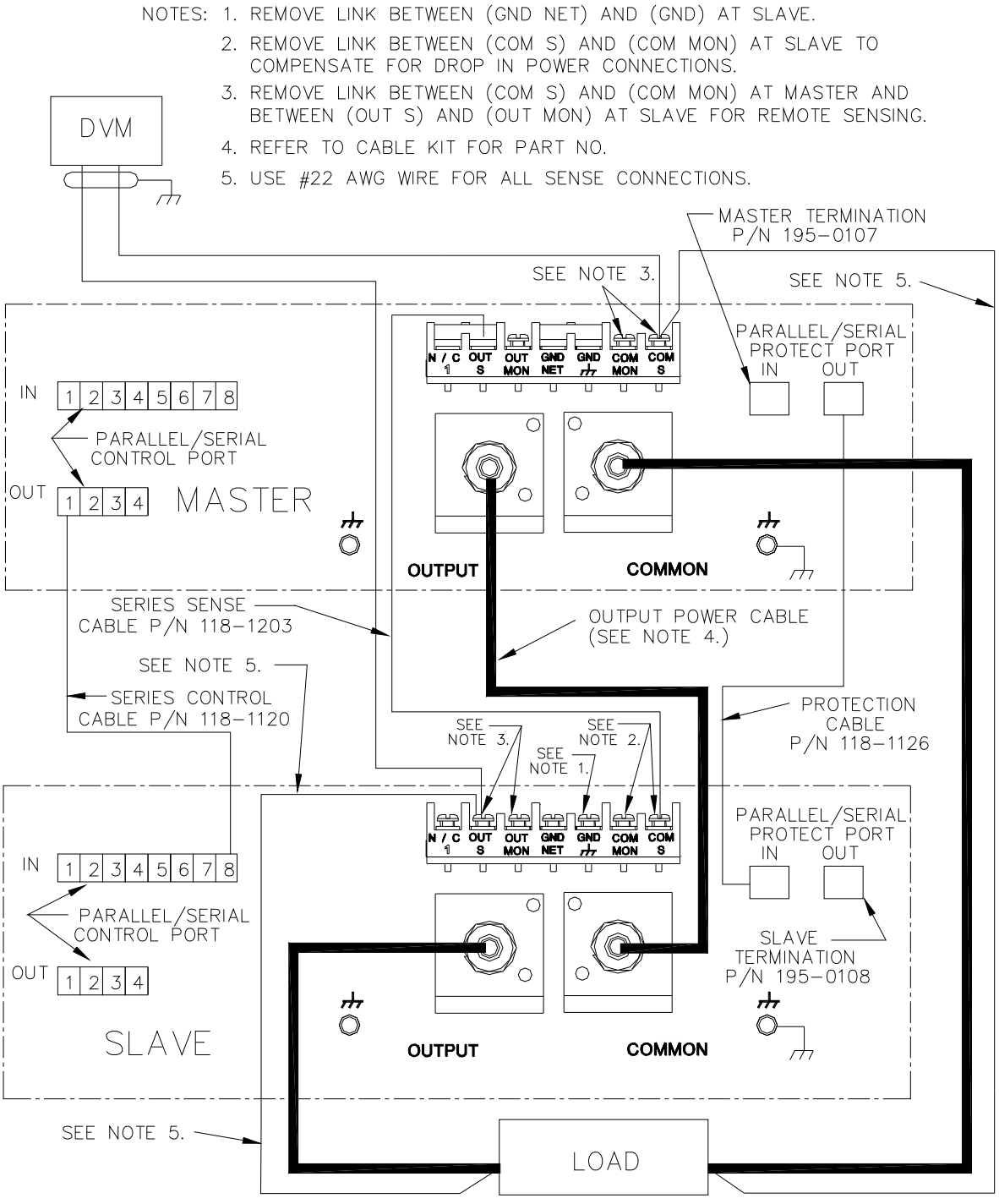


FIGURE 2-7. SERIES CONFIGURATION, REMOTE SENSING, TYPICAL

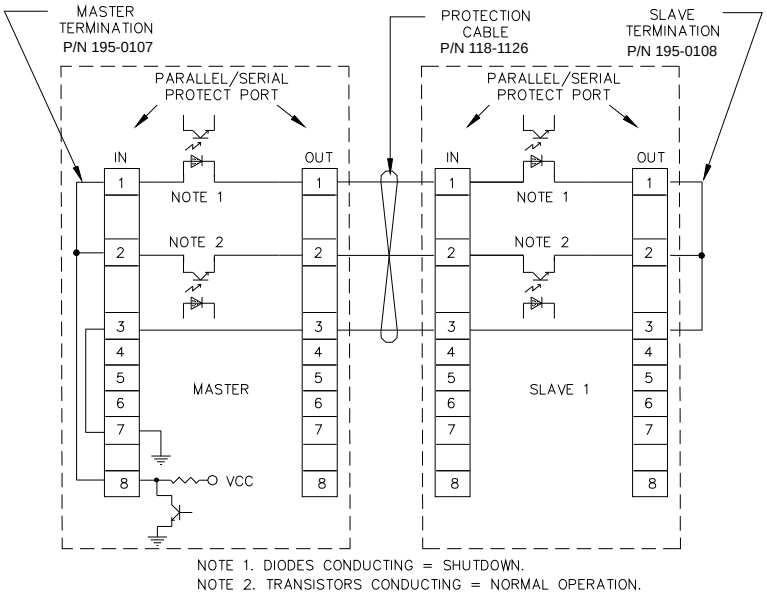


FIGURE 2-8. TYPICAL MASTER/SLAVE PROTECTION INTERCONNECTIONS

2.8.3 CONFIGURING PARALLEL COMBINATION

1. Turn off both units (master and slave).

2. Configure the master using the rear panel SETTINGS switch as follows:
   ALONE - MULTIPLE to MULTIPLE
   MASTER - SLAVE to MASTER
   SERIES - PARALLEL to PARALLEL
   V.MODE - C.MODE to V.MODE (voltage mode) or C.MODE (current mode) as desired

3. Configure the slave using the rear panel SETTINGS switch as follows:
   ALONE - MULTIPLE to MULTIPLE
   MASTER - SLAVE to SLAVE
   SERIES - PARALLEL to PARALLEL
   V.MODE - C.MODE to (not relevant)

4. Install jumpers on the rear panel terminal block of both master and slave as shown in either Figure 2-4 when using local sensing or Figure 2-5 when using remote sensing.

5. Install the Parallel Control and Protection cables and terminations as shown in either Figure 2-4 when using local sensing or Figure 2-5 when using remote sensing.

CAUTION: IT IS RECOMMENDED THAT SOURCE POWER OF EXTERNAL EQUIPMENT CONNECTED TO THE ANALOG I/O PORT BE APPLIED THROUGH AN ISOLATING TRANSFORMER TO AVOID GROUND LOOPS. ALSO, FOR GROUNDED LOADS, IF THE OUTPUT POWER CONNECTION FROM THE D-C COMMON TERMINAL AT REAR PANEL TO LOAD IS ACCIDENTALLY DISCONNECTED, HEAVY OUTPUT CURRENT MAY FLOW THROUGH THE ANALOG I/O PORT SIGNAL GND (PIN 4) AND DAMAGE THE UNIT.

2.8.4 CONFIGURING SERIES COMBINATION

1. Turn off both units (master and slave).

2. Configure the master using the rear panel SETTINGS switch as follows:
   ALONE - MULTIPLE to MULTIPLE
   MASTER - SLAVE to MASTER
   SERIES - PARALLEL to SERIES
   V.MODE - C.MODE to V.MODE (voltage mode) or C.MODE (current mode) as desired

3. Configure the slave using the rear panel SETTINGS switch as follows:
   ALONE - MULTIPLE to MULTIPLE
   MASTER - SLAVE to SLAVE
   SERIES - PARALLEL to SERIES
   V.MODE - C.MODE to (not relevant)

4. Install jumpers on the rear panel terminal block of both master and slave as shown in either Figure 2-6 when using local sensing or Figure 2-7 when using remote sensing.

5. Install the Parallel Control and Protection cables and terminations, as shown in either Figure 2-6 when using local sensing or Figure 2-7 when using remote sensing.

CAUTION: IT IS RECOMMENDED THAT SOURCE POWER OF EXTERNAL EQUIPMENT CONNECTED TO THE ANALOG I/O PORT BE APPLIED THROUGH AN ISOLATING TRANSFORMER TO AVOID GROUND LOOPS. ALSO, FOR GROUNDED LOADS, IF THE OUTPUT POWER CONNECTION FROM THE D-C COMMON TERMINAL AT REAR PANEL TO LOAD IS ACCIDENTALLY DISCONNECTED, HEAVY OUTPUT CURRENT MAY FLOW THROUGH THE ANALOG I/O PORT SIGNAL GND (PIN 4) AND DAMAGE THE UNIT.

SECTION 3 - OPERATION

3.1 GENERAL

This section explains how to operate the Model 4Q06125PS Power Supply. The power supply can be operated only in Analog Remote mode. Analog remote mode uses analog signals from the Analog I/O port to control the output (see PAR. 3.3).

3.2 POWER SUPPLY BASICS

The front panel contains the input ON/OFF Circuit breaker, and the FAULT, MASTER/STANDALONE and SLAVE indicators. Refer to Table 3-1 and Figure 3-1 for a description of front panel controls and indicators.

The power supply is controlled by signals applied to the Analog I/O Port (see Table 2-7) on the rear panel, in conjunction with the configuration established by the SETTINGS switch at the rear panel (see Table 2-1).

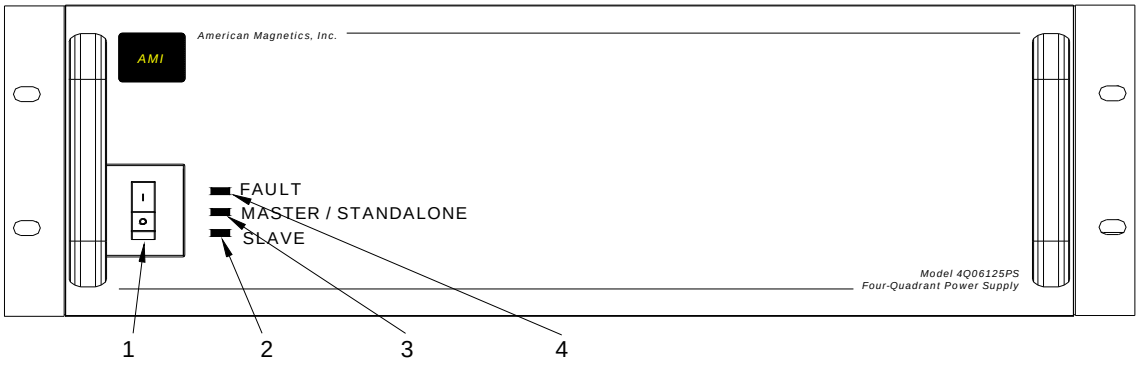


FIGURE 3-1. FRONT PANEL

TABLE 3-1. FRONT PANEL CONTROLS AND INDICATORS

NUMBER (FIGURE 2-1)	CONTROL/INDICATOR	FUNCTION
1	POWER ON/OFF circuit breaker A7CB1	Applies source power to unit
2	SLAVE indicator	Lights when the SETTINGS switch at the rear panel is configured to MULTIPLE and SLAVE.
3	MASTER indicator	Lights when the SETTINGS switch at the rear panel is configured to ALONE or MASTER.
4	FAULT indicator	Lights (red) when a fault is detected. The failure of the following assemblies cause the FAULT indicator to go on: A2 (overtemperature, instant internal overcurrent, output overvoltage/overcurrent, local +15V failure), A4 (input under/overvoltage, input overcurrent, internal output under/overvoltage, internal output overcurrent, overtemperature, fan failure, local –15V failure). When the FAULT indicator lights, an audible beep sounds a warning for approximately two seconds and the output is crowbarred by an internal contactor. The fault is latched. After the cause of the fault is removed, the unit can be restarted by cycling the POWER circuit breaker to OFF, then ON, or by applying a START_EXT pulse at Analog I/O Port pin 7 (see Table 2-7).

3.2.1 TURNING THE POWER SUPPLY ON

The power supply is turned on by setting the POWER ON/OFF Circuit Breaker (1, Figure 3-1) to ON. The unit will beep briefly upon power-up. Faults are inhibited for approximately two seconds during power-up. Also during power-up, the output is crowbarred for about eight seconds, the FAULT indicator is on, and main channel programming is disabled. After the eight second delay, the unit begins to operate, providing voltage and current at the output determined by the 1) mode (Voltage or Current) selected by the SETTINGS switch configuration, 2) the main channel and limit channel programming signals applied to the Analog I/O Port, 3) the load.

3.2.2 ENABLING/DISABLING DC OUTPUT POWER

Two different signals (listed below) allow the Model 4Q06125PS output to be turned on and off; either one can be used. With both signals at logic “0” or open, the output is on. A logic “1” on either one turns the output off. When the output is off, the programming signal of the main channel is disabled and the programming input is short-circuited to ground. The output (voltage in Voltage Mode or current in Current Mode) is programmed to zero. For multiple unit configurations the signals must be applied to the master only.

- non-isolated input: OFF_EXT signal at Analog I/O Port pin 1, referenced to GND pin 9. Logic “0” or open circuit turns the output on, logic “1” turns the output off (see Table 2-7 specifications). Control can also be accomplished using a normally open relay contact across pin 1 (OFF_EXT) and pin 8 (+10V); close the relay to turn the output off, open the relay to turn the output on.

- isolated input: OFF_EXT_A at pin 6 of EXT PROTECTION Port, referenced to pin 5, OFF_EXT_K. Logic “0” or open circuit turns the output on, logic “1” turns the output off (see Table 2-2 for specifications).

NOTE: The same approach described in Figure 3-2 for the isolated shutdown input can be applied to the OFF_EXT input as well.

3.2.3 DETERMINING HOW THE UNIT RESPONDS WHEN OUTPUT IS OFF (LOAD TYPE)

The Model 4Q06125PS can be used with both passive loads (resistive, inductive or capacitive) and active loads (either constant voltage or constant current). The following paragraphs explain how the unit behaves when set to different load types.

WARNING

For inductive loads, and especially superconducting magnet type loads, the inherent offset of the Model 4Q06125PS in the OFF state may generate significant current in the circuit. It is recommended that the output be turned off by applying a shutdown signal to the External Protection Port (A2A5J7), pin 1 referenced to pin 2 (see Table 2-2 for specifications), to crowbar (short) the output. Use an external voltmeter and ammeter to verify that output voltage is 0V and output current is 0A before handling connections between Model 4Q06125PS and load. To restart the unit, apply a start pulse to the START_EXT input, pin 7, of Analog I/O Port (see Table 2-7).

WARNING

For both inductive loads and constant-current-type active electronic loads when the Model 4Q06125PS output is set to OFF, a path is provided for absorbing either the energy accumulated in the reactance of the load during the ON state, or energy delivered by an electronic load. This prevents damage to the load and power supply as well as providing safety for the user. However, In addition to the built-in safety features, constant-current-type active electronic loads must be adjusted to zero and the external voltmeter and ammeter must read 0V, minimum current, before handling the power supply-to-load connections.

WARNING

The Model 4Q06125PS is not recommended for battery applications because the NC (normally-closed) contact of the internal contactor (heavy duty relay) keeps the output crowbarred (shorted) when input power to the power supply is not present or if there is a fault within the power supply. However, the Model 4Q06125PS may be used with battery and constant-voltage-type active electronic loads if a properly rated external switch is installed in series between power supply and load. The switch should be automatically opened by any of three conditions to avoid battery discharge: a) an external off command, b) power loss, or c) if there is a fault within the Model 4Q06125PS. If an external off command is used, the same signal applied to either pin 1 (OFF_EXT) referenced to pin 9 of the Analog I/O Port or pins 3 and 4 (PG_EXT) of the EXT PROTECT Port must also be used to open the external series switch. For power loss or internal fault conditions, use the PG_EXT signal at pins 3 and 4 of the EXT PROTECT Port to open the external series switch.

3.3 ANALOG REMOTE MODE PROGRAMMING

The Model 4Q06125PS can only be programmed remotely using analog signals applied to the remote Analog I/O port at the rear panel (see Figure 2-1 and Table 2-7). Analog remote programming allows the user to 1) turn the output off (PAR. 3.3.1), 2) restart after fault (PAR. 3.3.2), 3) establish voltage or current mode (PAR. 3.3.3), 4) control the main channel using the Model 4Q06125PS as a power amplifier or a d-c power supply (PAR. 3.3.4) and 5) establish the protection limits (PAR. 3.3.5). Output signals proportional to output voltage (PAR. 3.3.6) and output current (PAR. 3.3.7) are also provided for external use

3.3.1 REMOTE SHUTDOWN

A standalone Model 4Q06125PS can be shut down using the remote signal applied between SD_EXT_K (pin 1) and SD_EXT_A (pin 2) of the PROTECTION EXT. PORT as shown in Figure 3-2 or 3-3. See Table 2-2 for signal specifications. A multiple unit configuration (parallel or series) can be disabled by applying a remote signal to the master PAR/SER PROTECTION PORT as shown in Figure 3-2 or 3-4. When the signal is momentarily active (minimum 100 microseconds), power transfer between input and output is stopped (both input and output inter-

nal modules are shut off). This condition is latched. Normal operation can be restored by either a) setting the input power circuit breaker to off, then on, or b) applying a start pulse to START_EXT pin 7 of the Analog I/O Port (see Table 2-7). To restart a multiple unit configuration using START_EXT, refer to PAR. 3.4 for parallel or PAR. 3.5 for series.

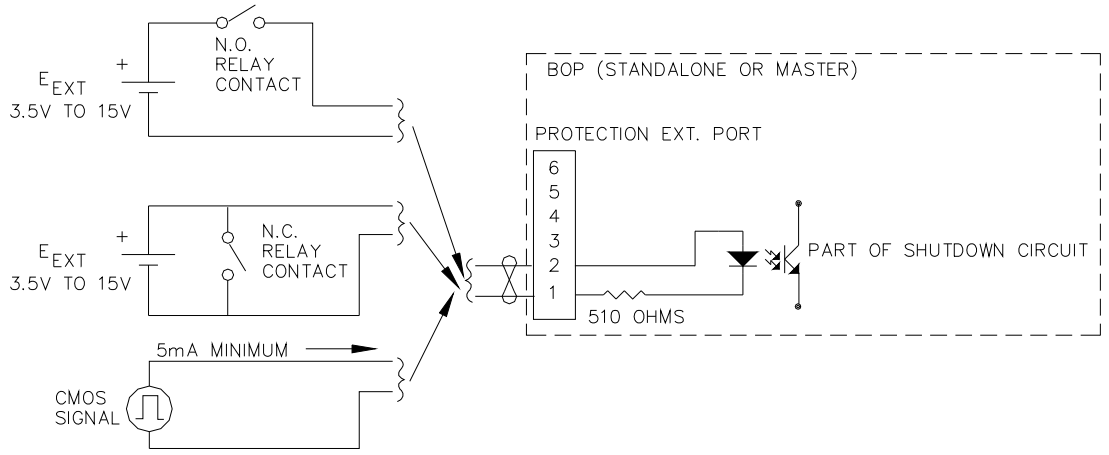


FIGURE 3-2. REMOTE SHUTDOWN USING EXTERNAL POWER, STANDALONE OR MULTIPLE UNITS

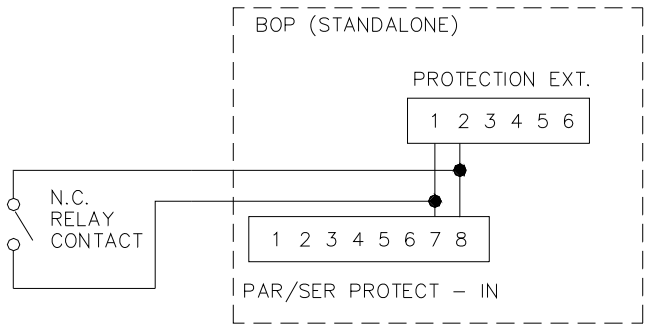


FIGURE 3-3. REMOTE SHUTDOWN USING INTERNAL POWER, STANDALONE UNITS

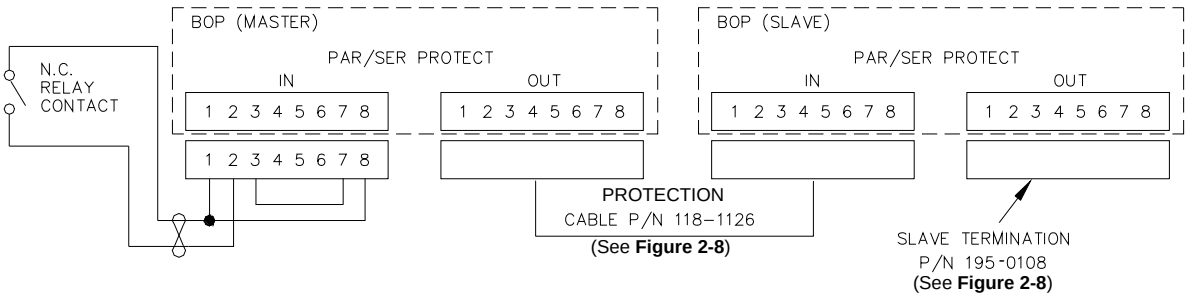


FIGURE 3-4. REMOTE SHUTDOWN USING INTERNAL POWER, MULTIPLE UNITS,

3.3.2 START-UP AFTER FAULT DETECTED

If the unit has stopped due to fault detection, once the fault has been cleared the unit can be restarted by START_EXT signal applied to pin 7 of the Analog I/O Port, referenced to pin 9 (GND). See Table 2-7 for signal specifications. To restart a multiple unit configuration using START_EXT, refer to PAR. 3.4 for parallel or PAR. 3.5 for series.

3.3.3 VOLTAGE/CURRENT MODE CONTROL

The mode of operation, voltage or current, can be programmed either locally using the C.MODE-V.MODE position of the SETTINGS switch (see Table 2-8) at the rear panel, or externally by applying a signal at pin 2 (CM_EXT), referenced to pin 9 (GND), of the Analog I/O port. See Table 2-7 for signal specifications. Applying a logic 0 (or open circuit) programs the unit to voltage mode. Applying a logic 1 programs the unit to current mode. If either the local switch or external control is set to current mode, the unit will be programmed to current mode.

The mode of operation for a series slave unit is automatically set to voltage mode; for a parallel slave unit the mode is automatically set to current mode. The SETTINGS C.MODE-V.MODE switch setting and the external CM_EXT signal at pin 2 of the Analog I/O Port are overridden and are irrelevant.

3.3.4 CONTROLLING THE OUTPUT

3.3.4.1 USING THE MODEL 4Q06125PS AS A POWER AMPLIFIER

The Model 4Q06125PS can function as a power amplifier by means of the EXT_REF (External Reference) input at pin 11, referenced to pin 4 (SGND) of the Analog I/O port. This analog signal controls the main channel of the power supply; see Table 2-7 for signal specifications. The unit functions as a voltage power amplifier in voltage mode, or as a voltage-current power converter in current mode.

3.3.4.2 USING THE MODEL 4Q06125PS AS A POSITIVE D-C POWER SUPPLY

The Model 4Q06125PS can function as a positive d-c power supply in one of three ways.

1) Deliver a nominal positive output (6V in voltage mode or 125A in current mode) by connecting +10V (pin 8) to the EXT-REF input (pin 11) on the Analog I/O Port.

2) Deliver a specific, less than nominal, positive output by connecting a resistor (R1) between the +10V (pin 8) and EXT_REF (pin 11) on Analog I/O Port and a resistor (R2) between EXT_REF (pin 11) and SGND (pin 4) . For voltage mode the output in Volts E_O = 6(R2)/(R1 +R2). For current mode the output in Amperes I_O = 125(R2)/(R1 +R2). It is recommended the R1 + R2 = 2K Ohms.

NOTE: If the power supply output and load are floating, the output polarity can be reversed by swapping the load connections.

3) Deliver an adjustable positive output by connecting a 2K potentiometer between +10V (pin 8) and SGND (pin 4) at Analog I/O Port. Connect the wiper of the potentiometer to EXT-REF (pin 11). See NOTE above to reverse polarity.

3.3.5 EXTERNAL PROTECTION LIMITS

When the LIMITS EXT-INT slide switch on the rear panel is set to EXT (External), the ± voltage limits and ± current limits can be programmed by external signals applied to the Analog I/O port.

A voltage between +1V and +10V at the following pins (referenced to Ground, pin 12) will control the corresponding protection parameter between 10% of the nominal value and the corresponding positive or negative nominal full scale value. See Table 2-7 for signal specifications.

- **–I_LIM_EXT (pin 5)** - This +1V to +10V analog signal sets the negative current protect limit from –12.5A to –125A.

- **–V_LIM_EXT (pin 6)** - This +1V to +10V analog signal sets the negative voltage protect limit from –0.6V to –6V.

- **+I_LIM_EXT (pin 13)** - This +1V to +10V analog signal sets the positive current protect limit from +12.5A to +125A.

- **+V_LIM_EXT (pin 14)** - This +1V to +10V analog signal sets the positive voltage protect limit from +0.6V to +6V.

When the LIMITS EXT-INT switch is set to INT (Internal), the external programming limit signals are disabled for the complementary limits (±current limits in voltage mode, ±voltage limits in current mode). The main channel limits (±voltage limits for voltage mode and ±current limits for current mode) are determined by the external signals listed above (if present) or set to a fixed level, approximately 4% to 6% above the nominal values. The complementary limits (±current limits for voltage mode and ±voltage limits for current mode) can be adjusted between 8% and 102% of the nominal values using the POS (positive) and NEG (negative) LIMITS trimpots on the rear panel.

The external programming circuit must be able to sink 0.014mA maximum provided by the Model 4Q06125PS. When the input is an open circuit, the corresponding input signal automatically goes to approximately 4% to 6% above the nominal protection limit.

3.3.6 MONITORING OUTPUT VOLTAGE USING ANALOG SIGNALS

The Model 4Q06125PS provides an output analog signal that is always available which can be used to monitor output voltage. VOUT_MON at Analog I/O Port pin 15 (referenced to pin 10, GND) is proportional to output voltage, 0 to ±10V corresponds to 0 to ±6V output voltage (see Table 2-7 for signal specifications). For the master of a parallel configuration this signal is proportional to the output voltage of the parallel combination. To protect the internal circuitry this signal is provided via a series 200 Ohm resistor, thus requiring a high-impedance monitoring device or instrument.

3.3.7 MONITORING OUTPUT CURRENT USING ANALOG SIGNALS

The Model 4Q06125PS provides an output analog signal that is always available which can be used to monitor output current. IOUT_MON at Analog I/O Port pin 3 (referenced to pin 10, GND) is proportional to output current, 0 to ±10V corresponds to 0 to ±125A output current (see Table 2-7 for signal specifications). For the master of a series configuration this signal is proportional to the output current of the series combination. To protect the internal circuitry this signal is provided via a series 200 Ohm resistor, thus requiring a high-impedance monitoring device or instrument.

3.4 PARALLEL CONFIGURATION START CONTROL

When using the External Start control, START_EXT at pin 7 at the Analog I/O Port (see Table 2-7) the same START_EXT command can be applied to the master and the slave, however the return for the command must be connected to pin 10 (GND) of the master. Another way to start a parallel configuration is to use a relay with two sets of NO contacts in order to generate the two separate open-short-open sequences required to start the two units.

3.5 SERIES CONFIGURATION START CONTROL

When using the External Start control, START_EXT at pin 7 at the Analog I/O Port (see Table 2-7) two separate pulses must be applied, one for the master and one for slave, The pulse applied to the master must be referenced to pin 10 (GND) of the master and the pulse applied to the slave must be referenced to pin 10 (GND) of the slave. A convenient way to produce the start commands is to use a relay with two sets of NO contacts in order to generate the two separate open-short-open sequences required to start the two units.

SECTION 4 - TECHNICAL SUPPORT

4.1 TECHNICAL SUPPORT

If the cause of a problem cannot be located, contact an AMI Technical Support Representative at (865) 482-1056 for assistance. The AMI technical support group may also be reached by Internet e-mail at **support@americanmagnetics.com**. Additional technical information, latest software releases, etc. are available at the AMI World Wide Web site at:

http://www.americanmagnetics.com

SECTION 5 - WARRANTY

5.1 WARRANTY

American Magnetics warranties its products to conform to the specifications described in its quotation for a period of fifteen months from the date of shipment. AMI makes no other warranty of any kind, expressed or implied. In the event of a failure occurring during normal use, AMI, at its option, will repair or replace all products or components that fail under warranty and such repair or replacement shall constitute a fulfillment of all AMI liabilities with respect to its products. Since, however, AMI does not have control over the installation conditions or the use to which its products are put, no warranty can be made of fitness for a particular purpose, and AMI cannot be liable for special or consequential damages. All repairs are F.O.B. Oak Ridge, Tennessee, USA. If any needed repairs are covered under this warranty, then standard shipping for return to the customer is paid for by AMI within the USA. **Repairs are warranted for 90 days from date of shipment.** Before shipping any item to AMI for repair, the customer must first obtain an RMA number from an authorized AMI representative. Do not attempt to repair or replace any items without first speaking to an authorized AMI representative. Doing so may expose the customer to hazards and will void this warranty. Customers requiring a more comprehensive warranty program may purchase additional coverage, the price of which may vary by product type.

Declaration of Conformity

Application of Council directives: **73/23/EEC (LVD)**
93/68/EEC (CE mark)

Standard to which Conformity is declared:

EN61010-1:1993 (Safety requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer's Name and Address: **KEPCO INC.**
131-38 SANFORD AVENUE
FLUSHING, N.Y. 11355 USA

Importer's Name and Address:

Type of Equipment: **Component Power Supply**

Model No.: 4Q06125PS

I, the undersigned, declare that the product specified above, when used in conjunction with the conditions of conformance set forth in the product instruction manual, complies with the requirements of the Low Voltage Directive 73/23/EEC, which forms the basis for application of the CE Mark to this product.

Place: KEPCO Inc.
131-38 Sanford Ave.
Flushing, N.Y.11355 USA

Saul Kupferberg
(Full Name)

VP OF SALES
(position)