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LAMBDA Electronics Inc.®

3055 Del Sol Blvd - San Diego, CA 92154
Phone (619) 575-4400 Fax (619) 429-1011

INSTALLATION MANUAL

POWER SUPPLY
CASE 02/03/04

LEI P/N: 200024
REVISION: 1G
ECO: 9961
DATE: AUGUST 1995

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LAMBDA ELECTRONICS INC.

Case 02/03/04 Power Supply
Installation Manual

CERTIFICATION

Lambda Electronics Inc. certifies that this product meets the published specification at the time of shipment from the factory.

WARRANTY

This Lambda Electronics Inc. power supply is warranted against defects in material and workmanship for a period of three years from date of shipment. During this period Lambda Electronics Inc. will either repair or replace this product if proven to be defective.

MODEL NUMBERS

This manual applies to power supply models 02XYZ, 03XYZ and 04XYZ for AC input units.
Manual part no. 200024 sixth printing, November 1992.

INSTALLATION MANUAL

This manual explains how to install the equipment and how to do some basic troubleshooting.

SAFETY SYMBOLS



This symbol indicates dangerous voltages present within the power supply. Isolation transformers should be used between the AC mains and the power supply if work is to be carried out with the Safety covers removed.

GENERAL SAFETY

The Case 02, 03, 04 power supply series is primarily designed to be used with other equipment or enclosures, which restricts access to authorized personnel only.

Make sure that the unit is being supplied by a power source as indicated on the label.

Slots in the case are designed for ventilation and must not be obstructed when the product is installed and/or operated.

Never insert objects of any kind into the product through the slots in the case. This could result in electric shock or fire hazard.

Do not operate this product unless it is mounted in a secure position.

When mounting product, do not use screws that violate the maximum penetration depth specified in the mechanical outline drawing in this handbook.

Unit covers are designed to protect personnel from electrical hazards and should be accessible to skilled personnel only. Do not use covers as part of the internal covers of any equipment where they may be accessible to operators. Parts of the chassis may reach temperatures in excess of those being considered safe for operator access.

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Servicing, repair and testing must be done by competent personnel fully familiar with the hazard of AC and DC line operated equipment and dangers associated with off line switch mode power supplies.

AFTER DISCONNECTING THE AC SOURCE ALLOW 5 MINUTES MINIMUM FOR CAPACITORS IN THE SUPPLY TO DISCHARGE, BEFORE TOUCHING ANY COMPONENTS WITHIN THE SUPPLY.

UNPACKING

Units should be unpacked carefully. If the shipping container is damaged keep it. If the power supply has been damaged mechanically, do not install the unit or apply power. If shipping container is damaged and power supply is nonfunctional, notify the carrier. Keep shipping materials for inspection by the carrier. Electrical tests conducted on the unit prior to installation must be done by qualified personnel familiar with AC or DC powered equipment. This person must have knowledge associated in dealing with switch mode power supplies, especially if the covers of the supplies are removed.

MOUNTING REQUIREMENTS AND COOLING

The mechanical outline drawings in this pamphlet give the necessary information for customer mounting.

WARNING: Do not exceed maximum screw penetration depths given on drawings. All units are equipped with a fan and can be mounted in any orientation provided that the fan air intake and air outlets are unobstructed. Normal air flow for Case 02 - 04 is intake through the fan and exhaust on the output terminal side. Case 02, 03 and Case 04 cannot be operated with reverse air flow. When mounting the supply in other equipment, ventilation holes must be provided near the position where the unit is mounted.

LOCATION	FASTENER SIZE	TORQUE (INCHES/LBS)
OUTPUT STUD NUTS	5/16-18	60 ± 3
CASE 10 -OUTER HEX NUT -INNER HEX NUT	 5/16-18 5/16-18	 60 ± 3 80 ± 3
GENERAL HARDWARE -STEEL/BRASS	 4-40 6-32 8-32 10-32	 5.0 ± 1 9.0 ± 1 20.0 ± 1 30.0 ± 1

INPUT CONNECTIONS

The input terminal block is located below the terminal cover. The terminal screws are 6-32" x 1/4". Connections to this block should use correctly sized input wiring per electrical code.

Line:	Black
Neutral:	White
Ground :	Green

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Connections to the unit must have no loose strands and the insulation must cover the wire up into the connector itself.

The ground connection must be made to a known, good, low impedance ground.

INPUT VOLTAGE SELECTION

On 02 and 04 models the input voltage selection is factory set to operate from 120V AC nominal unless otherwise specified. To change to 240V AC nominal operation remove the strap between terminals 4 and 5. Case 04 can be optionally equipped with an automatic range selector. Case 03 offers the auto-range feature on all models. No strapping is required on these models.

AUTOMATIC INPUT VOLTAGE SELECTION (AUTORANGE)

On units equipped with this circuit, the input voltage range selection is done automatically during power-up. To allow for proper range reconfiguration, the AC power must be removed for 15 seconds minimum (reset time) before the alternate range voltage is applied. Insufficient reset time will cause non-operation when changing from high range (180-264Vac) to low range (90-132Vac), or blown input fuses when changing from low range to high.

FUSING

Case 02, 03 and 04 require external fuses. See Table 1 for recommended fuse values.

AVERTISSEMENT

Une protection contre les surintensities d'au plus (Table 1) doit etre installee le circuit d'entree du primaire.

Table 1

Case	Output Power	Fuse Value	
		120VAC	240VAC
03	250W	8A	5A*
02	400W	10A*	10A*
04	500W	15A*	10A*

* **Normal Blow (250VAC)**

RFI

Case 02, 03, and 04 are designed to meet Curve A of VDE 0871 (150 KHz to 30MHz) and FCC 20780 Part 15 Subpart J of Level A at the input connector. The AC wiring and ground can influence the conducted and radiated EMI pattern. The customer may require additional EMI filtering to meet system requirements. If problems are encountered, the customer should contact Lambda Electronics Inc. Application Engineering.

OUTPUT VOLTAGE ADJUSTMENT (REMOTE SENSE)

Main Channel

A 3/4 inch multi turn rectangular pot is used to adjust the output voltage. A 3/8" square single turn pot is used for the OVP (Over Voltage Protection) and AC power fail threshold settings.

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The OVP threshold is factory set to 120% - 130% of the output setting. The OVP set point can be verified by increasing the channel 1 output voltage until the output falls to zero volts. The output voltage setting should be reduced and the input to the supply should be removed for 1 or 2 minutes to allow for the internal circuitry to reset.

Auxiliary Channel

The output voltage adjust potentiometers are located near the output terminal strip for channels 2-4 (top to bottom). The OVP potentiometers are located under the top cover.

OVP is available on all auxiliary outputs. OVP activation on any channel will shut down and latch the supply. To reset the supply, remove the input power and wait 1 or 2 minutes before reapplying power.

To compensate for voltage drops in the output leads (up to 250 mV per line) the sense terminals may be connected to the load with separate leads. Remote sense cables must be twisted and the polarity must be observed. Sense leads must be routed away from motors, AC input cables, etc.

Options

The following options can be factory installed on all Case 02, 03 and 04 series power supplies and is identified by letters following the model number on the label. Pin numbers apply to the J1 Molex, reference pinout label supplied on supply.

AC Power Fail "F"

Open collector output U1 Pin 5) changes from HI to LO when the input voltage is 90-95V AC, 180-190V AC. Tested with supply fully loaded. The signal changes state 2 mSec. min. before main output drops out of regulation. Sink current is 40 mA max.

Margin "M"

The output shall increase 4-6% when J1 Pin 2 is connected to -Remote Sense U1 Pin 4). The output shall decrease 4-6% when J1 Pin 2 is connected to +Remote Sense U1 Pin 1).

SAFETY STANDARDS

All models are designed to meet UL 478, UL 1950, IEC 950 and CSA electrical, Bulletin 1402 C and/or standard 234. Some models are under evaluation to BS 6301. Contact Lambda Electronics Inc. Sales for up-to-date approval information.

Units complying with EN 60950 have been evaluated based on Installation Category II at the equipment supply terminals and Pollution Degree 2.

Special attention should be given to maintain creepage and clearance distances and distances through insulation. Outputs shall be connected such that SELV voltage levels are maintained. The power supply shall be loaded such that no individual output exceeds its maximum current. The total output power for this power supply should not exceed rated output at 50°C ambient.

This power supply requires an external safety ground and a suitable disconnect device. Input power is connected as shown on pages 12, 14 and 16.

NOTE: In order for host equipment to meet the requirements of the above specifications, the installation of the power supply must not infringe on the requirements of these specifications.

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CIRCUIT OPERATION

The AC input current is limited by a triac resistor inrush circuit when the power supply is initially switched on. AC input voltage is fed into a rectifying doubler circuit for 120V AC input and into a full wave rectifier bridge for 240V AC input. On all 03 and some 04 models, voltage selection is accomplished by electronic means. Conducted RFI is reduced by an EMI input filter. A boost circuit on the primary side of the main transformer provides a regulated 24V source for the DC fan and Vcc for the control circuit.

The rectified high voltage DC is switched across a transformer configured as a forward converter. The volt-seconds of the main output of this transformer is maintained constant by varying the pulse width (on time of the power FET's) to compensate for load and line voltage changes.

Auxiliary outputs are derived from the same transformer. This output is fed into a rectifier, mag amp and LC filter, the circuit is completed with an error amplifier, feedback loop and reset circuit resulting in a regulated DC voltage. Each output has an individual OVP circuit. An OVP condition on any output will shut down the entire power supply.

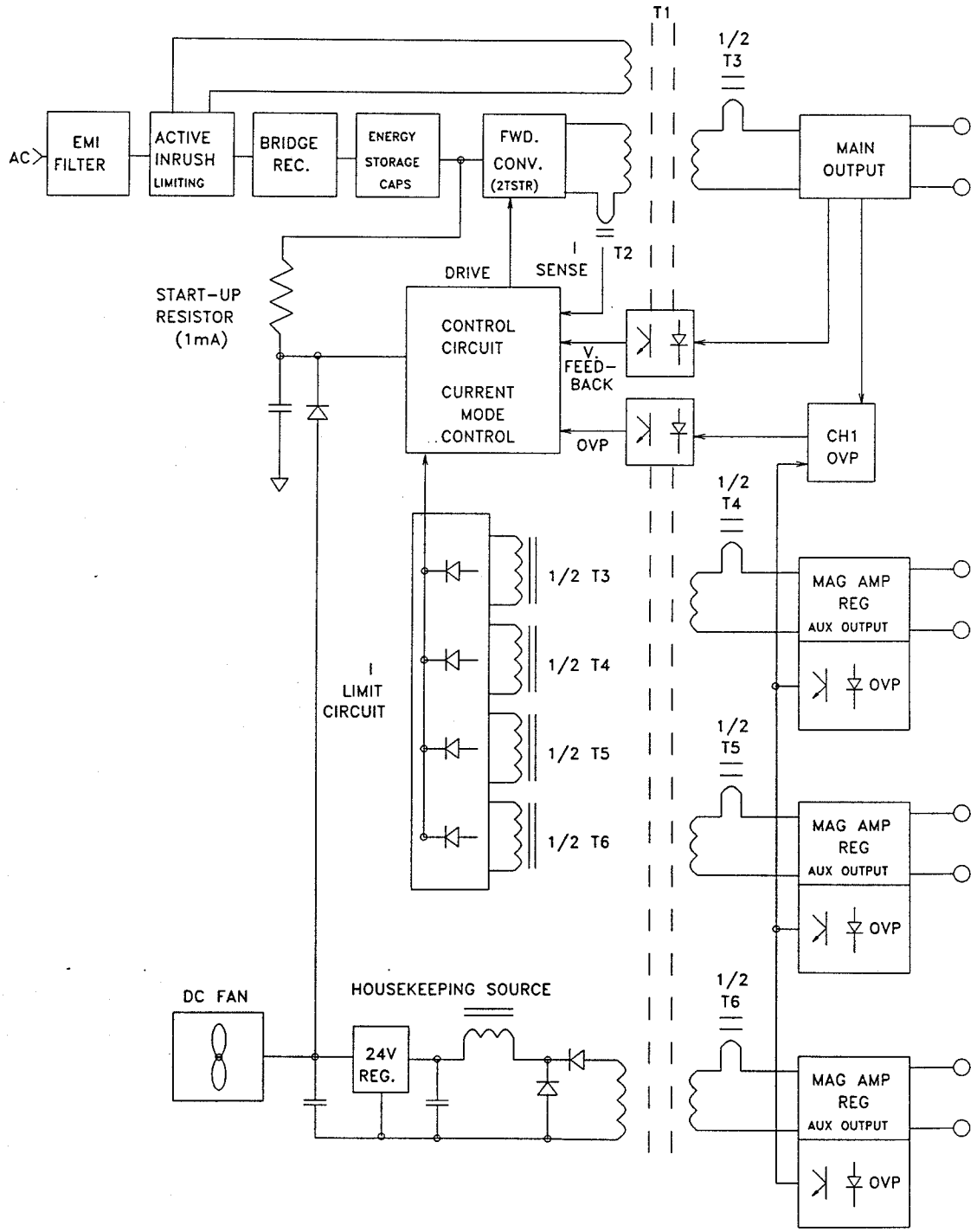
Current limit on the aux. outputs are fixed. However, a current limit condition on any output will cause a cycling "hiccup" condition, until the overload is removed.

RESTRICTIONS

See rating label for output current/power restrictions.

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CASE 02,03,04 BLOCK DIAGRAM



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SPECIFICATIONS (Case 02, 03, 04)

OUTPUT PARAMETER	CONDITIONS	MIN.	NOM.	MAX.	UNITS
Input Voltage Tolerance	Case 02, 03, 04 Case 03, 04 (Auto Range) (Note 4)	90 180	115 230	132 250	VAC
Efficiency			75		%
Inrush Current				30A	pk
Input Frequency	AC Input (Contact Factory for 440 Hz App.)	47	60	63	Hz
Holdup Time	At zero crossing 120 V AC	16	20		mSec
Dielec. Withstand	Input to Output Input to Chassis Output to Chassis (Note 1)	3000 1500 100			VAC VAC VDC
Leakage Current	Line to Chassis 264V AC (50 Hz)			3.5	mA
Safety Spacing	Primary to Sec. Primary to Chassis	6.4 4			MM MM
Conducted EMI	VDE 0871 Level A Fcc 20780 Part 15 Subpart J Level A				
Output Power	Full Load Case 03 (Note 2) Case 02 Case 04			250 400 500	Watts Watts Watts
Power Factor	115V AC 230V AC	.65 .51		Typical Typical	
Vibration	Operating 5-500 Hz - .03" displacement to .25G Non-operating 5-500 Hz - .15" displacement to 1G				
Shock	Operating 5G, half sine 15 mSec bottom only Non-operating 10G, half sine 15 mSec 3 axis				
Operating Temp.	100% load 0-50°C: derate linearly to 50% at 70°C 0-70°C: load distribution requirements 40%-60% split (60% load on the slaves)	0		50	°C
Storage Temperature		-40		85	°C
Relative Humidity	Non Condensing			95	%
Cooling	Fan cooled		37 18		CFM CFM
Mean Time Between Failure	Consult factory	50,000			Hrs.
Weight	Case 02 Case 03, 04	4.5 lbs.			

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AUXILIARY OUTPUT SPECIFICATIONS

OUTPUT PARAMETER	CONDITIONS	MIN.	NOM.	MAX.	UNITS
Output Voltage	See Rating label				
Output Current	See Rating label				
Remote Volt. Sense	Total Cable Drop Case 02/03/04 (Available on Chi. 1, Ch.2 Only)			.5	V
Temperature Coefficient	0 to 50◦C after initial 1 hour warmup		.01	.02	%/◦C
Line Regulation	Over input operating range		.05 .50	.20 .80	% %
Load Regulation	0 to 100% load with remote sense Channels without remote Sense			1	%
Minimum Load	Case 02 Case 03 Case 04			5 5 8	Amp Amp Amp
Current Limit	Constant current "Hiccup" mode, factory set (consult factory for Range).				
Overvoltage Protection	Trip point as a % of nom. output voltage. Resetable by recycling input.	120 %	125%	130%	V
Reverse Voltage Protection	Reverse current as a % of full rated current			50%	Amp
PARD	20 MHz 50MHz (Note 3)			1% 2%	mVpp mVpp
Transient Response	Output voltage excursion for 25% load step (within operating range). Recovering to 1% within 300 μS, slew rate 4A/μS.			3%	mVpk
Turn on Delay (Soft Start)	After input applied (all channels within regulation)			1	Sec
Overshoot (V out)	Turn on			5%	V
Switching Frequency	All channels synchronized with main inverter		150		KHz

NOTES:

1. Between DC outputs and chassis with all bypass components disconnected, 500V AC or 700V DC for one minute.
2. Measure across a 220μF electrolytic in parallel with a .1 μF ceramic disc capacitor at the load using about 6-24" of load cable.
3. All case 03 and some case 04 models with auto range do not require the use of external strapping for operation at 115/230VAC. However, if the input exceeds ≈140VAC the auto strap circuit will latch off, making the supply operational in the 180-250VAC range only. To resume operation at 120VAC the input power must be recycled.

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TROUBLESHOOTING GUIDE

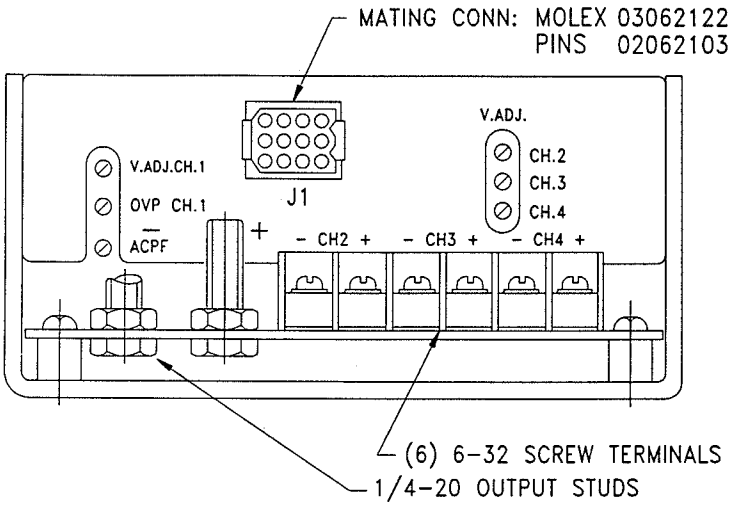
This guide is intended for locating start-up problems and causes. Operating conditions are assumed as follows:

-Input power is preset at specified frequency and voltage.
-Chassis is properly grounded.

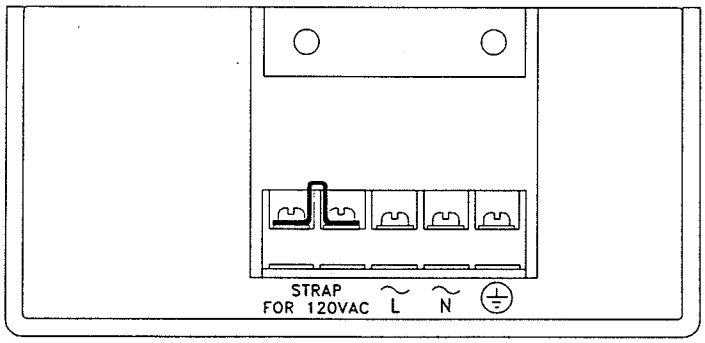
Symptom	Probable Cause	Remedy
Zero Volts	Sense wires crossed.	Check wiring and reset input
DC Output	OVP triggered. Unit at no load.	Lower output voltage and reset input and/or re-adjust OVP potentiometer. Put min. load on Ch. 1.
Incorrect Output	Output overloaded. Output set incorrectly. Output low on channels 2, 3, or 4 with full load.	Remove overload. Adjust output voltage. Adjust potentiometer. Minimum load of 10% required on channel 1.
Cycling Output	Overload on any output channel	Remove overload condition.
No AC Power Fail	No load on channel 1. (Outputs > 5V)	Increase load. Pull up resistor missing. Sense not connected.
Load regulation out of tolerance	Drop across load cables.	Hook up sense leads. Measurement not taken at sense leads.
Fan not working	Faulty fan. Loose connection missing 24 VDC supply voltage.	Repairs should be done by qualified personnel only or contact Lambda Electronics Inc.

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CASE 02 FRONT PANEL



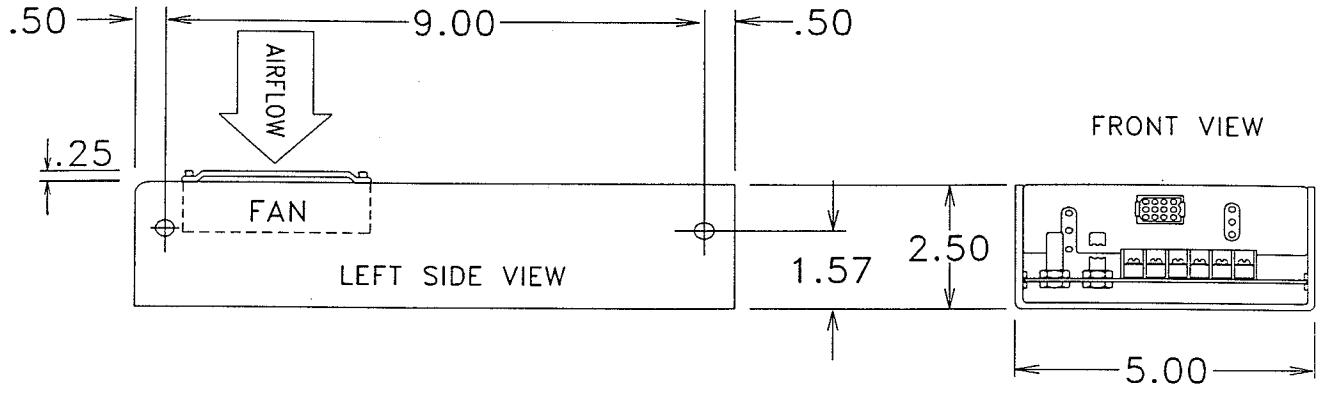
CASE 02 INPUT PANEL

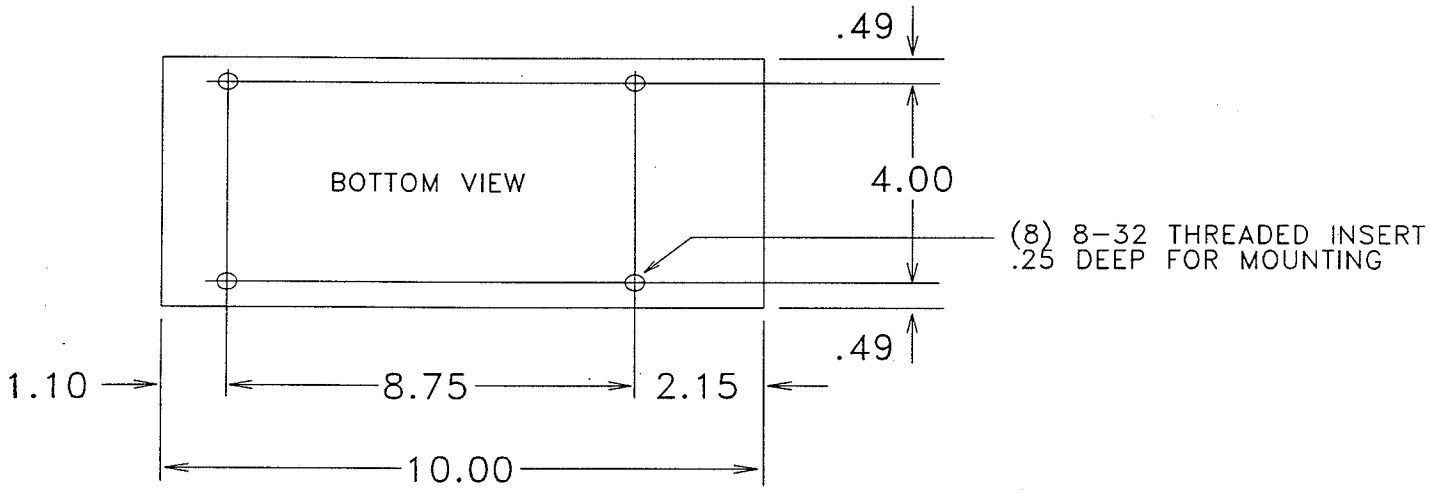


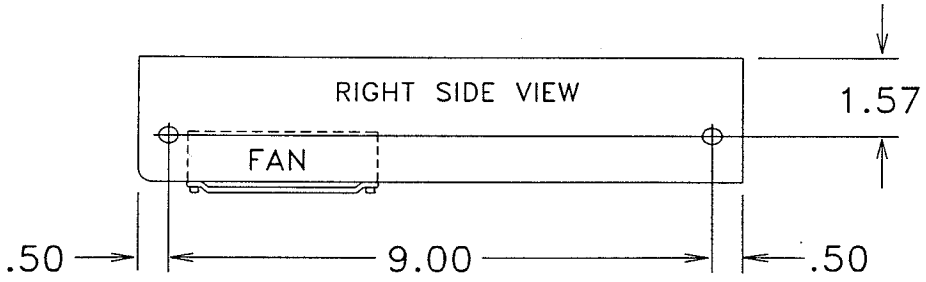
TERMINAL STRIP WITH (5) 6-32 SCREW TERMINALS. CONNECT INPUT TO L, N AND ⏚. ADD STRAP FOR 120VAC AND OMIT STRAP FOR 240VAC INPUT.

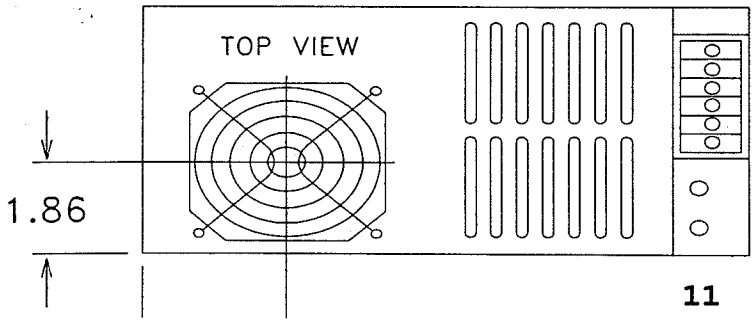
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CASE 02 CHASSIS DETAIL



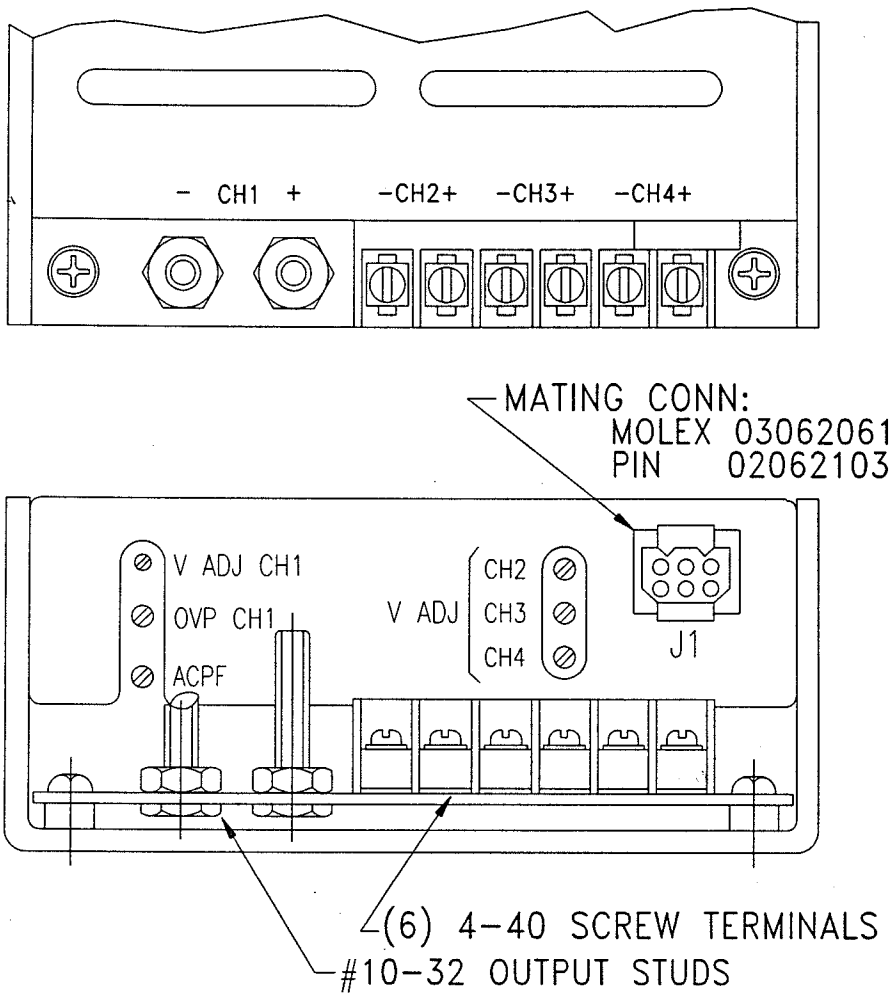




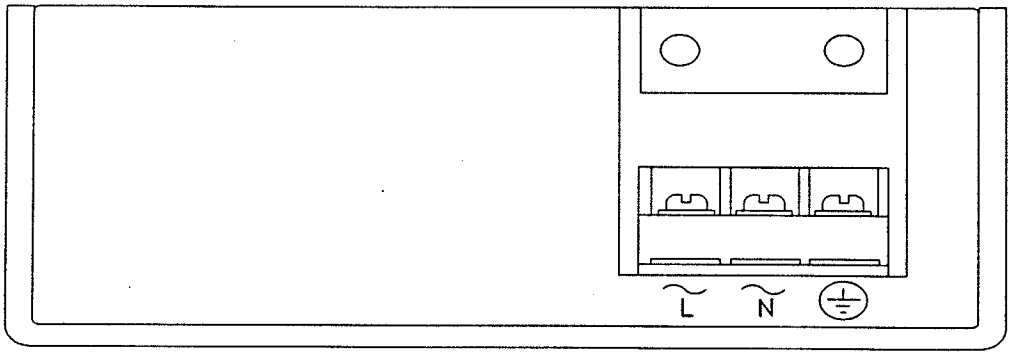


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CASE 03 FRONT PANEL



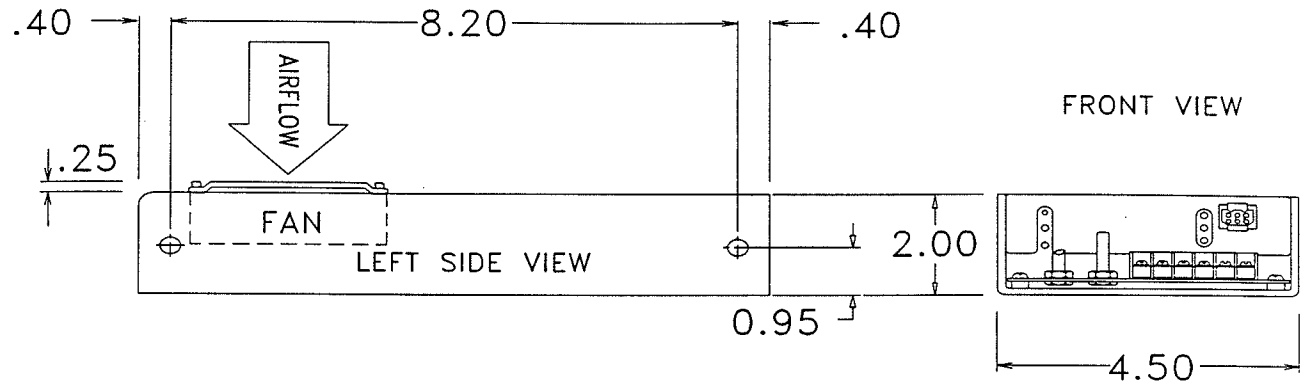
CASE 03 INPUT PANEL

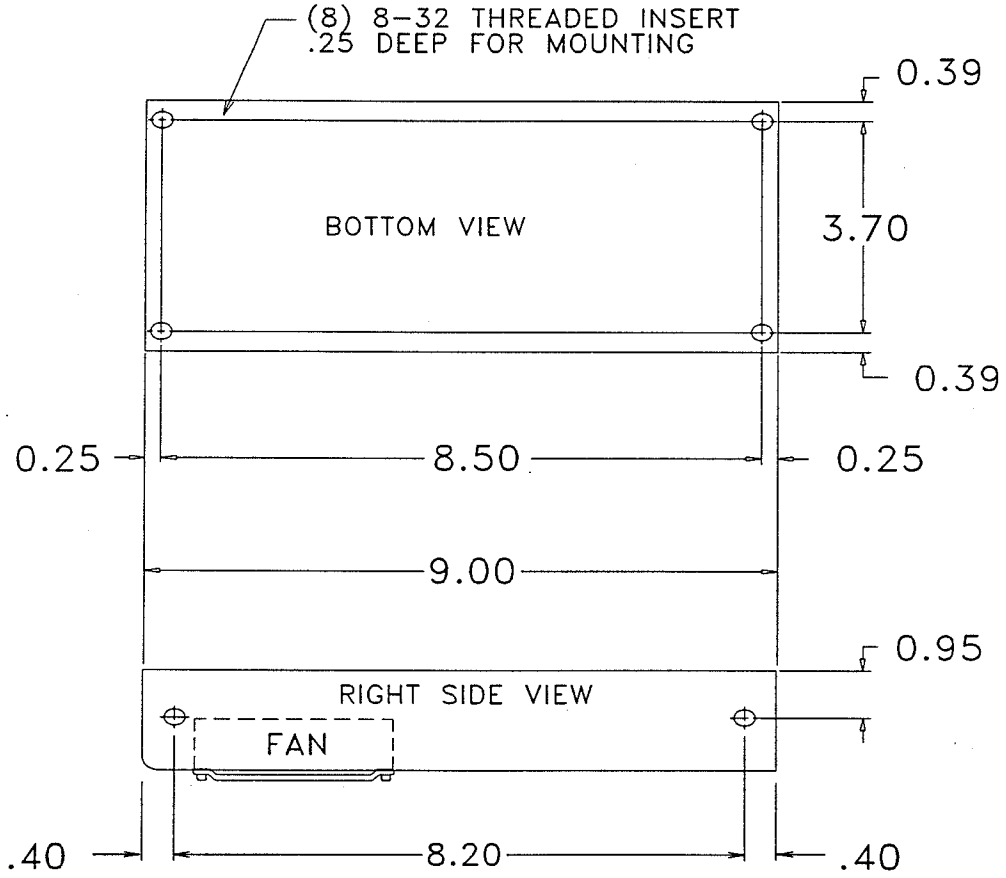


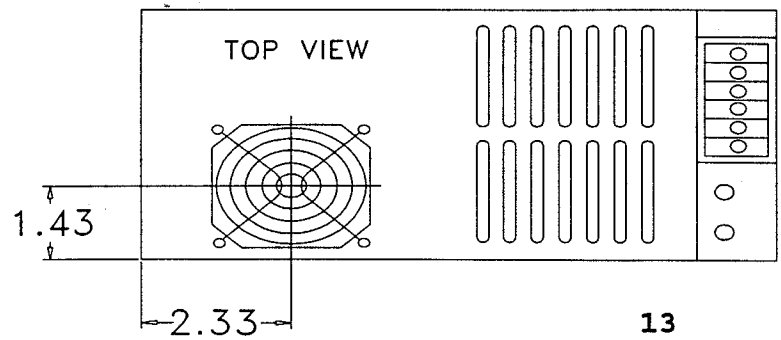
TERMINAL STRIP WITH (3) 6-32 SCREW TERMINALS.
CONNECT INPUT TO L, N AND ⏚.

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CASE 03 CHASSIS DETAIL

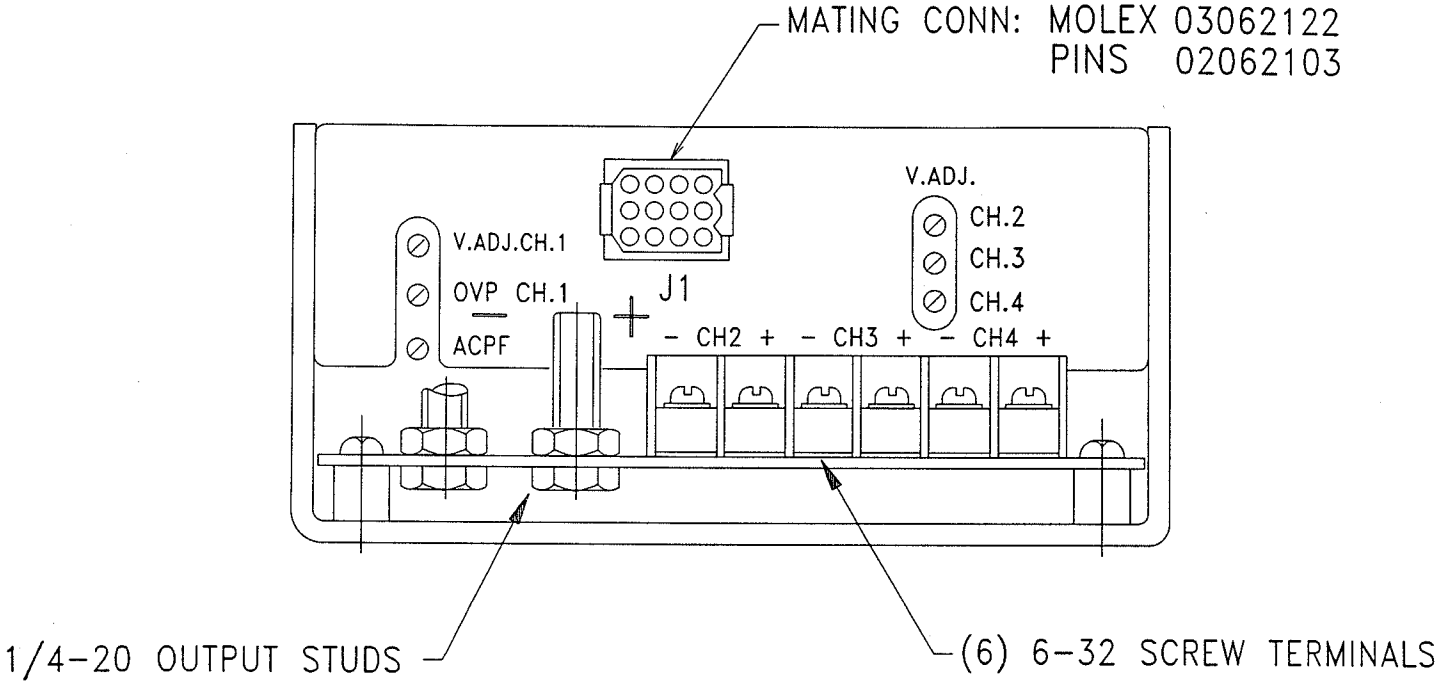




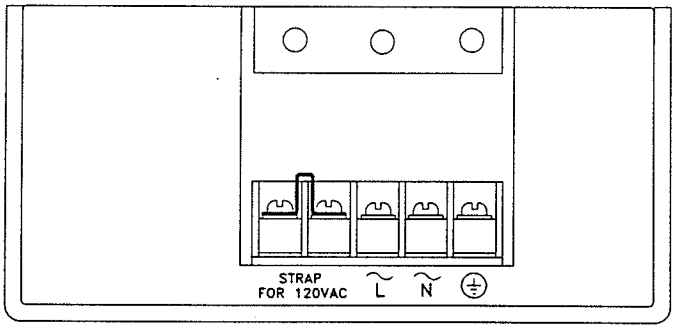


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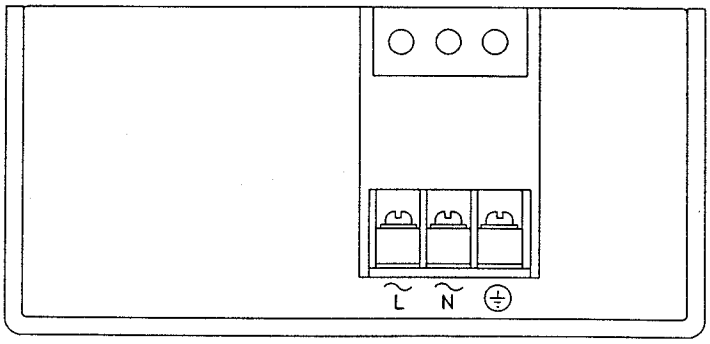
CASE 04 FRONT PANEL



CASE 04 INPUT PANELS



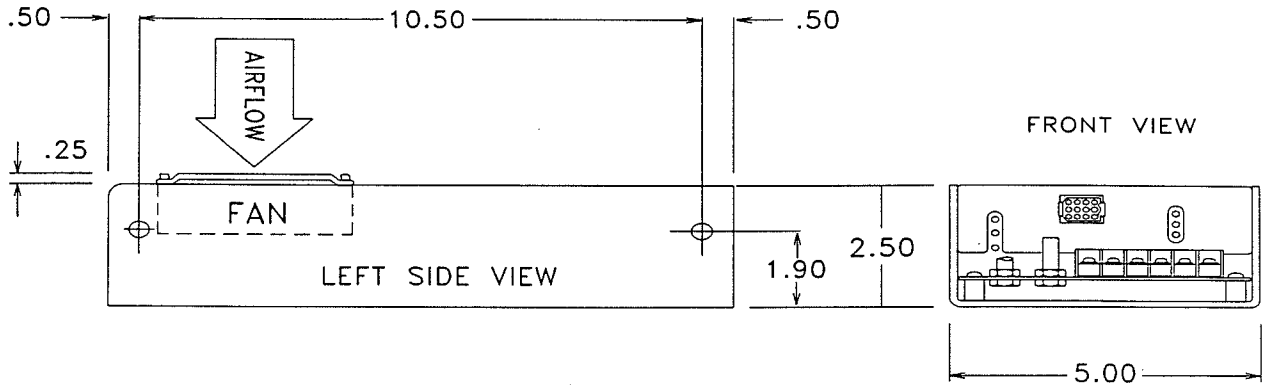
TERMINAL STRIP WITH (5) 6-32 SCREW TERMINALS. CONNECT INPUT TO L, N AND ⏚. ADD STRAP FOR 120VAC AND OMIT STRAP FOR 240VAC.

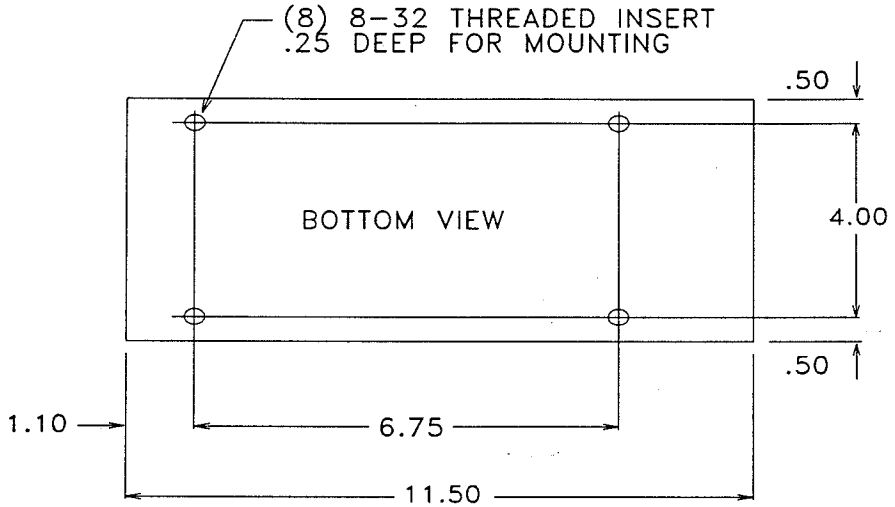


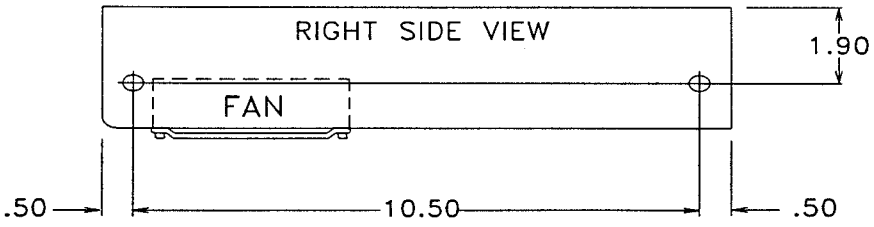
TERMINAL STRIP WITH (3) 6-32 SCREW TERMINALS. CONNECT INPUT TO L, N AND ⏚.

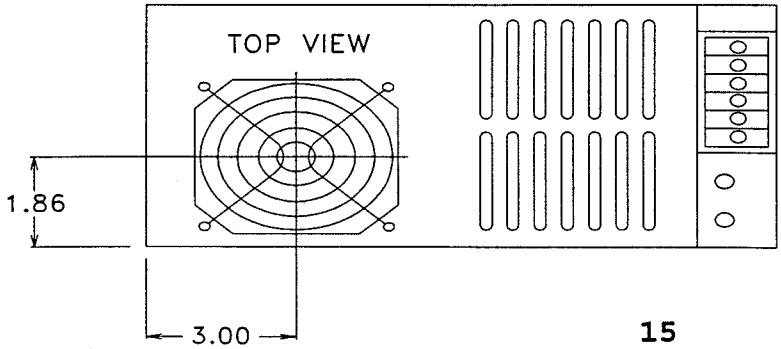
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CASE 04 CHASSIS DETAIL



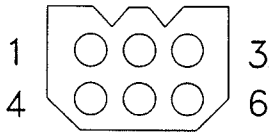






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J1 MOLEX PINOUTS

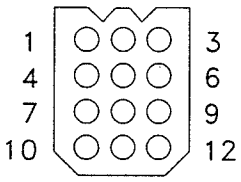


MATING CONNECTOR
MOLEX #03-06-2061
PINS #02-06-2103

6 PIN

PIN	FUNCTION
1	+ SENSE (CH.1)
2	INHIBIT, LOGIC LOW (STD)
3	+ SENSE (CH.2)
4	- SENSE (CH.1)
5	INPUT POWER FAIL (STD)
6	- SENSE (CH.2)

12 PIN



MATING CONNECTOR
MOLEX #03-06-2122
PINS #02-06-2103

PIN	FUNCTION
1	+ SENSE (CH.1)
2	MARGIN (OPTIONAL)
3	N/C
4	- SENSE (CH.1)
5	AC POWER FAIL (STANDARD)
6	INHIBIT, ACTIVE LOW (OPTIONAL)
7	+ SENSE (CH.2)
8	N/C
9	N/C
10	- SENSE (CH.2)
11	N/C
12	N/C

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