

MLP07081 / MLP07081-5 Line Powered Microstep Driver

User's Guide



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CAUTION! HIGH VOLTAGE!

READ THIS BEFORE YOU BEGIN

- This driver contains High Voltages which could cause personal injury, including death. It is important to comply to the following requirements.
- Do not insert objects into the drive: Inserting objects can damage the unit beyond repair and also cause personal injury due to the high voltages.
- Do not open the drive: Opening the drive will void all warranties associated with this product.
- Do not connect or disconnect motor wires while power is applied!

LIMITED WARRANTY

All Anaheim Automation products are warranted against defects in workmanship, materials and construction, when used under Normal Operating Conditions and when used in accordance with specifications. This warranty shall be in effect for a period of twelve months from the date of purchase or eighteen months from the date of manufacture, whichever comes first. **Warranty provisions may be voided if products are subjected to physical modifications, damage, abuse, or misuse.**

Anaheim Automation will repair or replace at its' option, any product which has been found to be defective and is within the warranty period, provided that the item is shipped freight prepaid, with previous authorization (RMA#) to Anaheim Automation's plant in Anaheim, California.

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DISCLAIMER

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TECHNICAL SUPPORT

If you should require technical support or if you have problems using any of the equipment covered by this manual, please read the manual completely to see if it will answer the questions you have. If you need assistance beyond what this manual can provide, contact your Local Distributor where you purchased the unit, or contact the factory direct at 714-992-6990.

MLP07081/MLP07081-5 Line Powered Microstep Driver Features

The MLP07081 Microstep Driver is the highest performing step motor driver available on the market today. This driver offers far more power than typically seen from a step motor. It is intended for use in applications that require high output power and high acceleration rates. It is designed to offer outstanding performance with high reliability and helpful diagnostic protection features.

- **Highest Performing Driver on the Market**
- **Selectable Resolutions from 200 to 1600 Steps/ Revolution**
- **Works from 120VAC, No Power Supply Required**
- **Over 500 Watt Output Without any External Heatsink Required**
- **Compact Size (7.75" x 2.28" x 5.925")**
- **Integrated Active Cooling**
- **Self Test and Continuous Fault Detection Features**
- **Fault Detections: Short Circuit, Miswire, Over-Temperature, Over-Voltage**
- **Built in +5VDC, 100mA Isolated Supply for External Use (Not available on MLP07081)**
- **Isolated Inputs Separate the Driver Electrically from the Controls**
- **No Minimum Inductance Limitations**
- **High Output Current Capability to 7 Amps**

The MLP07081 Microstep Driver has an output capability from 2 Amps minimum to 7 Amps maximum (peak rating). The MLP07081 is directly connected to 120VAC (60/50Hz) which in turn creates a bus voltage of 160VDC that offers superior torque over other drives.

Inputs: The inputs are optically isolated and will accept +5VDC minimum to +24VDC maximum signals, sourcing or sinking. The clock input is set to receive either positive or negative edge clocks with a maximum frequency of 100kHz. The direction input is current sourcing for CCW and no current for CW. The On/Off input is current sourcing to de-energize the step motor and no current to energize the motor.

Microstepping: Step resolutions can be implemented by the on-board dip switch. These divisions ranges are 1, 2, 4, and 8 which offer 200 steps per revolution to 3200 steps per revolution with a standard 200 step/revolution step motor.

Bipolar Drive: The bipolar drive configuration handles 4, 6, and 8 lead motors.

Reduced Current Enabled: Automatically reduces motor current 70% after last step (20msec delay).

Built In Features: Status LEDs to indicate power on (Green LED), clocks being received (Yellow LED), fault detection (Red LED) and an optically isolated fault output that conducts when a fault is detected. Both protection and detection devices have been added to this driver for phase-to-phase short-circuit, motor cable mis-wire, over temperature and over voltage conditions.

Power Supply Requirements

The MLP07081 is directly connected to 120VAC (60/50Hz) through the standard molded plug for AC Power. This AC voltage internally generates a bus voltage of 160VDC for the step motor. This 160VDC voltage provides superior torque and power over other drivers.

Pin Descriptions

The inputs on the MLP07081 are optically isolated with the anode (+) and cathode (-) both brought out to the user. With no current going through the opto-diode the input is considered high. To activate the input, a voltage needs to be applied across the opto-diode to source or sink current through the opto-diode. This is done simply by placing a voltage of +5VDC to +24VDC across the two inputs of the opto-diode. If sourcing current in to the inputs, then all three cathodes (-) should be tied together and grounded as shown on the following page. If sinking current, then all three anodes (+) should be tied together to the +voltage as shown on the following page. Provided on the MLP07081-5 is an isolated +5VDC, 100mA output which can be used to power the inputs for sinking mode **only**. The MLP07081-5 therefore has two additional pins ISO 5V OUT and ISO GND on TB1.

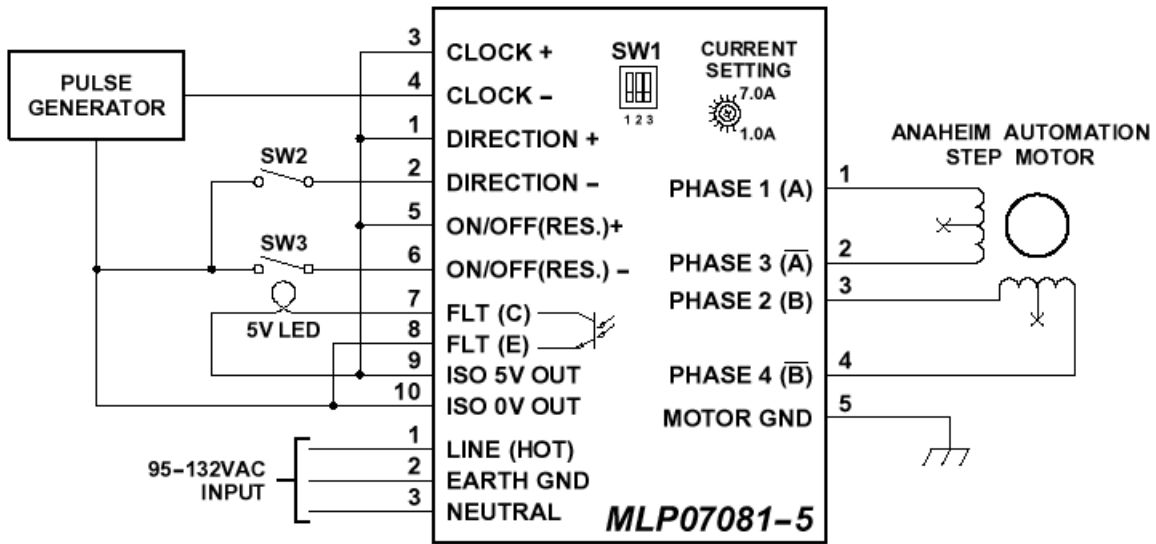
TB1: 8 Pin (MLP07081) or 10 Pin (MLP07081-5) Terminal Description

Pin #	Description	
1	DIRECTION +	This isolated input is used to change the direction of the motor. Physical direction also depends on the connection of the motor windings.
2	DIRECTION -	
3	CLOCK +	Activating this isolated input advances the motor one increment. The size of the increment is dependent on the Microstep Select Inputs of Switch 1.
4	CLOCK -	
5	ON/OFF (Reset) +	This isolated input has two functions. One is to enable and disable the output section of the driver. When not active (open) the outputs are enabled. Two is to reset the driver after a fault condition has occurred. Activating this input will reset the driver.
6	ON/OFF (Reset) -	
7	FAULT OUT (C)	This is the collector of the optically isolated fault output. When a fault occurs, this output will conduct current into the emitter. Care must be taken to not pass more than 20mA of current through this transistor.
8	FAULT OUT (E)	This is the emitter of the optically isolated fault output.
9	ISO 5V OUT	This isolated output can be used to supply up to 100mA of current to the isolated inputs and other components. (This Pin is only available on the MLP07081-5)
10	ISO GND	Isolated +5VDC return. (This Pin is only available on the MLP07081-5)

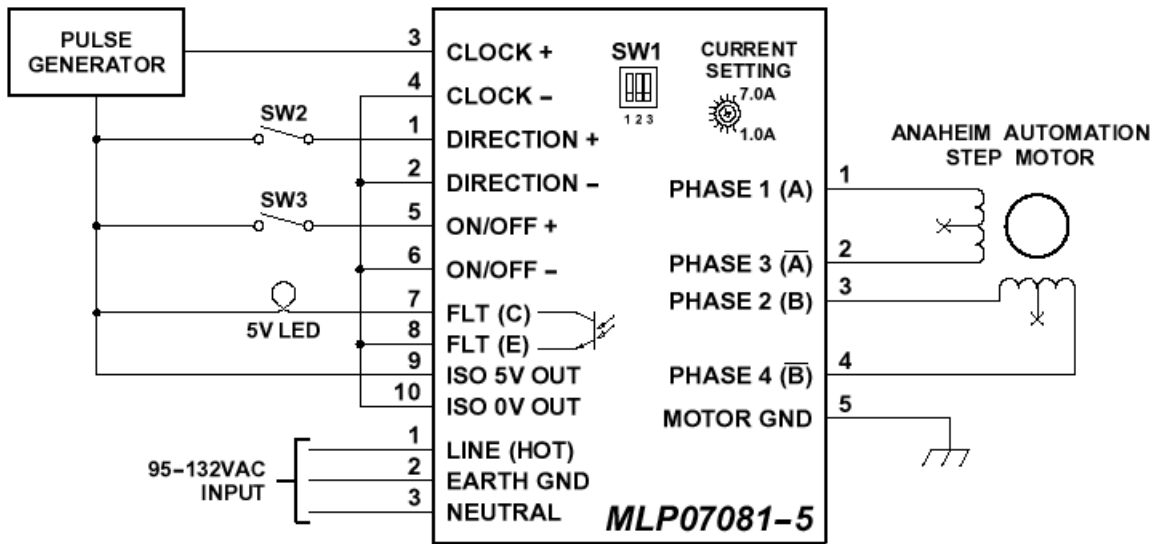
TB2: 5 Pin Terminal Description

Pin #	Description
1	Phase A: Phase 1 of the Step Motor
2	Phase \bar{A} : Phase 3 of the Step Motor
3	Phase B: Phase 2 of the Step Motor
4	Phase \bar{B} : Phase 4 of the Step Motor
5	Motor Ground

Hook Up Drawings



Typical Sinking Hook Up



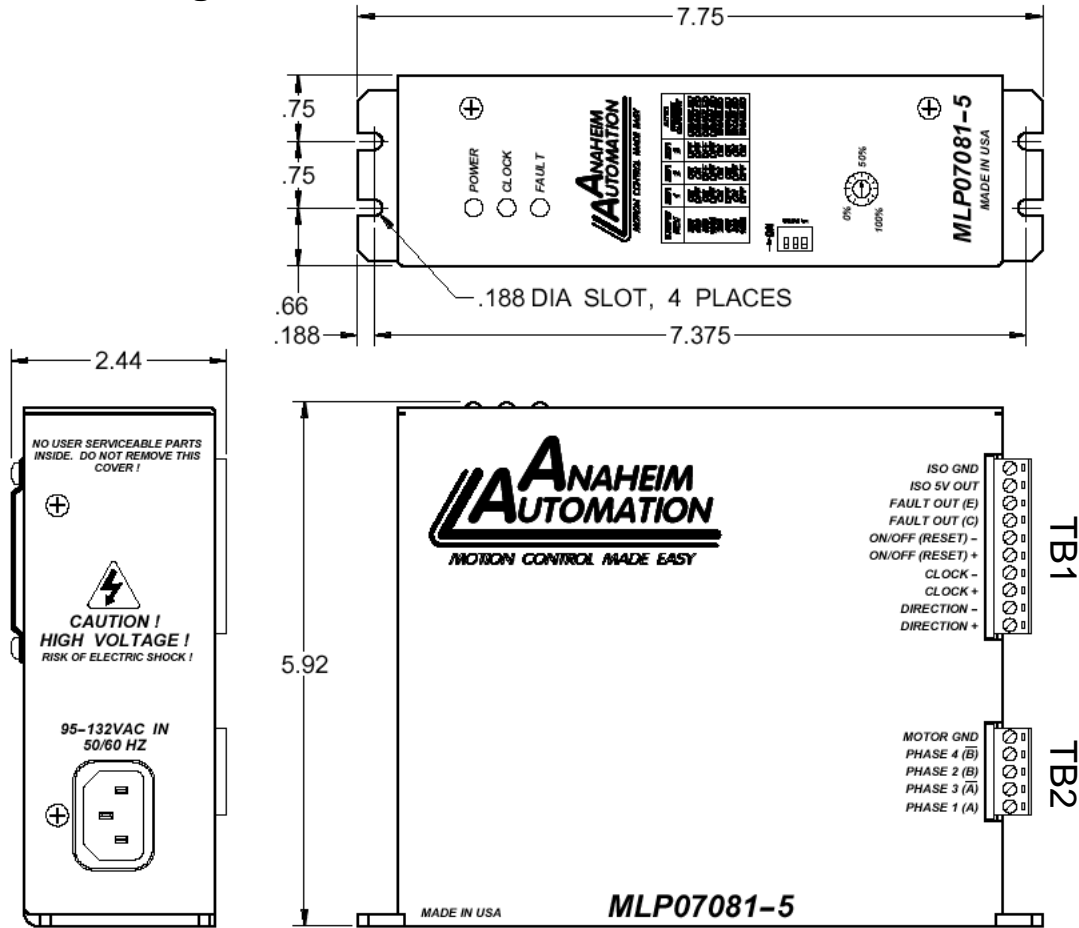
Typical Sourcing Hook Up

Connecting the Step Motor

Phase 1 and 3 of the Step Motor is connected between pins 1 and 2 on connector TB2. Phase 2 and 4 of the Step Motor is connected between pins 3 and 4 on connector TB2. The motors case can be grounded to pin 5 on connector TB2. Refer to the figures above for typical application hookup drawings. The physical direction of the motor with respect to the direction input will depend on the connection of the motor windings. To reverse the direction of the motor with respect to the direction input, switch the wires on Phase 1 and Phase 3. Refer to the dimension drawings on the following page for physical connector locations.

WARNING: DO NOT CONNECT OR DISCONNECT MOTOR WIRES WHILE POWER IS APPLIED!

Dimension Drawing



This unit is equipped with a fan on the reverse side. When mounted, there should be at least 1 inch of clearance for air flow to enter the unit. Also to help the chassis from overheating, it is recommended that the unit be mounted to a larger aluminum plate or other heat conducting surface.

Microstep Selection (SW1 Settings)

Switches 1, and 2 of the DIP switch select the resolution of the microsteps per fullstep. The following table shows the standard resolution values along with the associated positions for the dip switches. The standard waveforms are sinusoidal.

Resolution	Steps/Rev	Select 1	Select 2	Select 3	Auto Reduce Current
1	200	ON	ON	OFF	Disabled
2	400	OFF	ON	OFF	Disabled
4	800	ON	OFF	OFF	Disabled
8	1600	OFF	OFF	OFF	Disabled
1	200	ON	ON	ON	Enabled
2	400	OFF	ON	ON	Enabled
4	800	ON	OFF	ON	Enabled
8	1600	OFF	OFF	ON	Enabled

Absolute Maximum Ratings

Power Input Voltage: 132 VAC
 Output Current: 7.0 AMPS PEAK
 Maximum Plate Temperature: 70° C
 Storage Temperature: 0° to +60° C
 Isolated Input Voltage: +30VDC
 Isolated 5VDC Output Current: 100mA
 Fault Output: VCE: 35VDC
 VEC: 0.5VDC
 IC: 20mA

Electrical Specifications

Item	Min	Typ	Max	Units
Power Input Voltage	95	120	132	VAC
Phase Output Current	1.4		4.9	A (RMS)
Phase Output Current	2.0		7.0	A (PEAK)
Clock Frequency	0		100	kHz
Chopping Frequency	18	21	24	kHz
Isolated Input Voltage	3.0		30	V
Isolated Input Current @ 5.0V		1.8		mA
Isolated Input Current @ 24.0V		22.8		mA
Isolated 5V Out	4.8	5	5.6	V
Isolated 5V Out	0		100	mA
Operation Temperature	0		70	C

Ordering Information

The table below lists a variety of products available from Anaheim Automation. These products include those covered by this manual along with supporting cables and devices. We are continually adding new products to our line, so please consult your nearest authorized Anaheim Automation distributor or representative for information on the latest releases.

Part Number	Description
MLP07081	7 Amp Line Powered Microstepping Driver
MLP07081-5	7 Amp Line Powered Microstepping Driver with Isolated 5V, 100mA power supply
AA182PTS	4 Conductor Shielded Motor Cable
MBC04161	4 Amp 48VDC Microstepping Driver
MBC08161	8 Amp 80VDC or 56VAC Microstepping Driver

Motor Selection

The MLP07081 is a Bipolar Microstep Driver that is compatible with both Bipolar and Unipolar Motor Configurations, (i.e. 8 and 4 lead motors, and 6 lead center tapped motors). Since the MLP07081 is a constant current source, it is not necessary to use a motor that is rated at 160V which is the motor supply voltage. What is important is that the MLP07081 is set to the appropriate current level based on the motor being used. The higher voltage of this drive will cause the current to flow faster through the motor coils. This in turn means higher step rates and more power can be delivered to the application.

Step motors with low current ratings and high inductance will perform better at low speeds, providing higher low-end torque. Motors with high current ratings and low inductance will perform better at higher speeds, providing more high-end torque.

Step Motor Selection Guide

Part Number	Series Peak Rating	Parallel Peak Rating	Part Number	Series Peak Rating	Parallel Peak Rating
34D106	3.0	6.0	34N214	7.0	7.0
34D109	4.5	9.0	34N307	3.5	3.5
34D207	3.5	7.0	34N314	7.0	7.0
34D209	4.5	9.0	34N412	6.0	12.0
34D213	6.5	13.0	34N416	8.0	16.0
34D307	3.5	7.0	42D112	6.0	12.0
34D311	5.5	11.0	42D115	7.5	15.0
34D314	7.0	14.0	42D212	6.0	12.0
34K108	4.0	8.0	42D219	9.5	19.0
34K112	6.0	12.0	42K112	6.0	12.0
34K207	3.5	7.0	42K115	7.5	15.0
34K214	7.0	14.0	42K209	4.5	9.0
34K307	3.5	7.0	42K214	7.0	14.0
34K314	7.0	14.0	42K314	7.0	14.0
34K412	6.0	12.0	42N112	6.0	12.0
34K416	8.0	16.0	42N115	7.5	15.0
34N108	4.0	8.0	42N209	4.5	9.0
34N112	6.0	12.0	42N214	7.0	14.0
34N207	3.5	7.0	42N314	7.0	14.0

**Anaheim Automation offers motor cable, making hookups quick and easy!
Contact the factory or visit our website for more motor and cable offerings.**

Setting the Output Current

The output current on the MLP07081 is set by the on-board potentiometer. This potentiometer determines the per phase peak output current of the driver. The relationship between the output current and the potentiometer value is as follows:

Peak Current	Potentiometer Setting	Peak Current	Potentiometer Setting
2.0A	0%	5.0A	60%
2.5A	10%	5.5A	70%
3.0A	20%	6.0A	80%
3.5A	30%	6.5A	90%
4.0A	40%	7.0A	100%
4.5A	50%	--	--

Reducing Output Current

Reducing the output current is accomplished by setting switch 3 of the DIP switch to the ON position and occurs approximately 20msec. after the last positive going edge of the step clock input. The amount of current per phase in the reduction mode is approximately 70% of the set current. When the current reduction circuit is activated, the current reduction resistor is paralleled with the current adjustment potentiometer. This lowers the total resistance value, and thus lowers the per Phase output current.

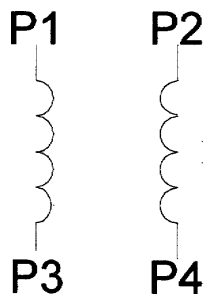
Determining Output Current

The output current for the motor used when microstepping is determined by a sine/cosine output function. The output current for a given motor is determined by the motors current rating and the wiring configuration of the motor. There is a current adjustment potentiometer used to set the output current of the MLP07081. This sets the peak output current of the sine/cosine waves. Step motors can be configured with 4, 6, or 8 leads. Each configuration requires different currents. Refer to the lead configurations and the procedures to determine their output current. The specified motor current (which is the unipolar value) is multiplied by a factor of 1.0, 1.4, or 2.0 depending on the motor configuration (series, half-coil, or parallel).

WARNING! Step motors will run hot even when configured correctly. Damage may occur to the motor if a higher than specified current is used. Most specified motor currents are maximum values. Care should be taken to not exceed these ratings.

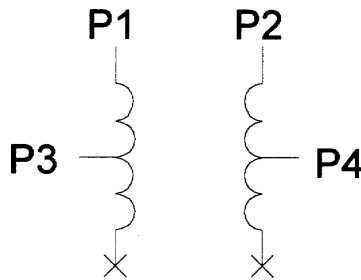
4 Lead Motors

Multiply the specified **series** motor current by 1.4 to determine the current adjustment potentiometer value. Four Lead Motors are usually rated with their appropriate series current, as opposed to the *Phase Current*, which is the rating for 6 and 8 lead motors.

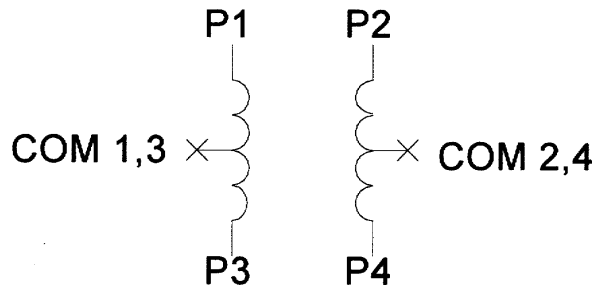


6 Lead Motors

When configuring a 6 lead motor in a **half-coil configuration** (connected from one end of the coil to the center tap), multiply the specified per Phase (or unipolar) current rating by 1.4 to determine the current setting potentiometer value. This configuration will provide more torque at higher speeds when compared to the series configuration.

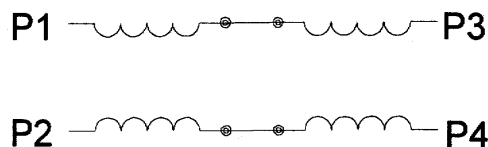


When configuring the motor in a **series configuration** (connected from end to end with the center tap floating) use the specified per Phase (or unipolar) current rating to determine the current setting potentiometer value.

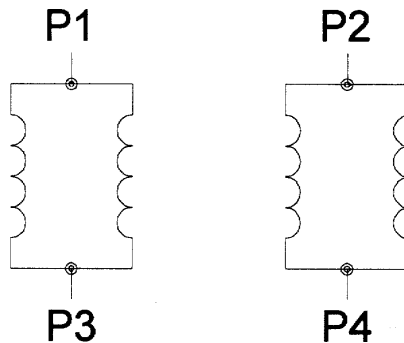


8 Lead Motors

Series Connection: When configuring the motor windings in series, use the per Phase (or unipolar) current rating to determine the current setting potentiometer value.



Parallel Connection: When configuring the motor windings in parallel, multiply the per Phase (or unipolar) current rating by 2.0 to determine the current setting potentiometer value.



NOTE: After the current has been determined, according to the motor connections above, use the table on page 8 to choose the proper setting for the current setting potentiometer.

Fault Detection and Fault LED

# of LED Blinks	Fault Condition
0 (Solid)	Short Circuit or Over Current
2	Open Motor Phase or Wrong Motor Connection
3	Input Voltage Too High (Above 132VAC)
4	Over Temperature of Heat Sink

If a fault occurs, reset the fault by activating the ON/OFF (RESET) Input for at least 100msec or by cycling power off for at least 20 seconds. After resetting, try to run the motor again. If the driver continues to fault, check the conditions listed below.

Short (Solid LED)

This indicates that the driver or motor has a phase shorted or there is a “short” in the motor cable or wiring. Check the motor and the physical wiring for shorts. If the driver continues to sense shorts after the motor and wiring are determined to be accurate, then the most likely cause is that the output transistors are bad and the unit needs to be sent back into the factory for repair. Contact the factory for a RMA# (Return Materials Authorization Number) to have it returned.

Open (Two Blinks)

This indicates that there is an “open” or intermittent connection in one of the motor wires. Check the motor and the wiring for opens. Another condition that may cause this type of fault, is when the motor is mis-wired. This is caused when Phase 1 of the motor is wired with Phase 2 or Phase 4 instead of Phase 3.

Input Voltage Too High (Three Blinks)

This indicates that the input voltage is too high (above 132VAC). Check the input line voltage to see if it is within the specified range.

Over Temperature (Four Blinks)

This is caused by the internal heat sink reaching a temperature of 80°C. Make sure proper ventilation and spacing of drivers is correct or that an additional heat sink is provided so the temperature does not reach this level.

No Power LED

If power is applied and the power LED fails to light then an internal fuse has blown and the unit needs to be sent in for repair. Contact customer service at the factory (714-992-6990) for a RMA# (Return Materials Authorization Number) to have it returned.

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