TM4500-80
Enhanced Step Motor Drive

User's Guide

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#L010189

June 2005

TM4500-80 Driver Features

- 1.0-4.5 Amperes/Phase Operating Current
- Enhanced Torque/Speed Output
- Improved Start-Stop Speeds
- Short Circuit Protection
- Open Motor Wire Detection
- No RFI or EMI Problems
- Requires 7-28 VAC
- TTL-CMOS Compatible Inputs
- Receives Positive or Negative Going Clocks
- Full Step or Half Step Operation
- Motor Turn Off Provisions
- Open Frame Circuit Board Mounts on Snaptrack

General Description

The TM4500-80 driver is a unipolar step motor driver designed for 4 phase step motors. The TM4500-80 is specifically designed to dynamically enhance driver performance while circumventing the effects of input voltage variations. The TM4500-80 allows the option of using full-step or half-step operation, giving the user the ability to step in either 1.8° or 0.9° increments. The driver can be powered by an AC voltage. For AC operation, the driver may be purchased with a recommended step down transformer. A single transformer may be used to power up several drivers based on power consumption. A major advantage that the TM4500-80 has over chopper drivers, is that the TM4500-80 is designed to use bilevel technology. This means that it has replaced the need for high frequency switching techniques, consequently it does not create the EMI, RFI, and motor heating problems that are associated with chopper drivers. This technique makes the TM4500-80 suitable for applications where low noise requirements are a must. It is especially useful for medical equipment, test instruments, positioning systems, and any other application where noise may be a problem, plus any standard application where positioning is required.

Ordering Information

Part #	Description
AA2295	AC Transformer 100 Watt
AA2784	AC Transformer 200 Watt
AA2785	AC Transformer 300 Watt
AA3963	5" Mounting Track
KIT-AA2750A	Mounting Plate & Hardware

Note: The AA2784B is the recommended transformer. For additional info on other transformers please contact the factory.

Bilevel Drive

The basic function of a step motor driver is to control the motor winding currents. Motor performance is determined by how fast the driver can increase and decrease the winding currents. A rapid rise in winding current is achieved by applying a high voltage directly to a motor winding. This rapid rise of current is also referred to as the “kick” or operating current. When a desired current level is reached, the high voltage is turned off and a low voltage is applied to maintain a suitable holding current level. When a motor winding is turned off, a rapid decrease in winding current is achieved by routing the energy in the collapsing field back to the power supply through a high voltage path. The high voltage supply furnishes the energy necessary to maintain motor output torque at high step rates thus providing high mechanical power output. The low voltage supply provides much of the current needed at low step rates and all of the holding current. Bilevel drivers do not use high frequency switching techniques as chopper drivers do. Consequently, they do not create the EMI, RFI, and motor heating problems that are associated with chopper drivers.

Motor Connection

Refer to the hookup diagram for typical driver applications. Wiring connected to inputs must be separated from motor connections and all other possible sources of interference.

Note: When connecting the driver to the step motor, consult the factory if more than 25 feet of cable will be used to extend between the motor and driver.

Jumper Functions

Function	JP1	JP2	JP3
Negative Going Clock Input	1-2	X	X
Positive Going Clock Input	2-3	X	X
TB1 Pin 2 = CCW	X	1-2	X
TB1 Pin 2 = Direction	X	2-3	X
Standard Product (Ready to Ship)	1-2	2-3	3-4

Terminal Descriptions

TB1:

Pin #	Description
1	Phase 1
2	Phase 3
3	COM Phase 1 & 3
4	COM Phase 2 & 4
5	Phase 2
6	Phase 4

TB2:

Pin #	Description
1	Clock Input
2	CCW Input
3	Direction Control
4	Halfstep/Fullstep
5	Motor On/Off
6	+5VDC/100mA Output
7	0VDC
8	AC/DC Power Input (Fused)
9	AC Power Input

Clock, CCW, and Direction

Pulses applied to the clock input cause the motor to move in the clockwise direction if the direction control input is a logic “1” (no connection), or in the counterclockwise direction if the direction control input is logic “0”. Pulses applied to the CCW input cause the motor to move in the counter clockwise direction. Either positive or negative going pulses may be used by setting jumpers in the appropriate position. To determine which setting to use, first consider the type of clock pulse output on the pulse generator or indexer (controller). If the clock output on the controller is open-collector type (sinking), then use the negative going jumper setting. If the clock output on the controller is a pnp or p-channel (sourcing) type, then use the positive going jumper setting. If the clock output on the controller is a TTL/CMOS type (totem pole), then either setting will work; but the jumper setting should be chosen based on the level of the clock output when the controller is not pulsing. If the clock is low when not pulsing, then use the positive going jumper setting. If the clock is high when not pulsing, then use the negative going jumper setting.
(Refer to Jumper Functions for details on jumpers)

Half Step/Full Step

The TM4500-80 has full-step or half-step operation. Full-step operation occurs by energizing two phases at a time, rotating a typical motor 1.8 degrees per step. Half-step operation occurs by alternately energizing one, and then two phases at a time, rotating the motor 0.9 degrees per step. Full-step operation is only for applications that specifically require that mode, such as when retrofitting existing full-step systems.

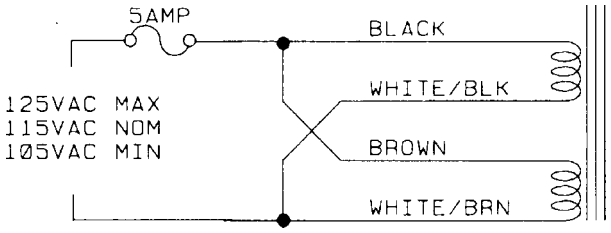
Motor On/Off

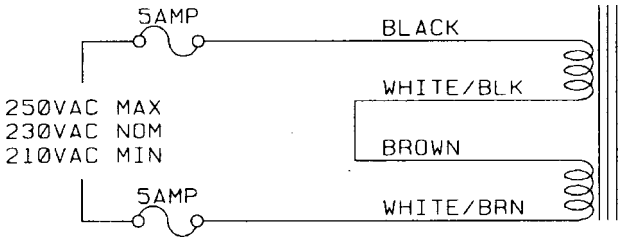
The motor On/Off feature allows the de-energizing of a motor without disturbing the positioning logic. After reenergizing the motor, a routine can continue. This reduces motor heating and conserves power, especially in applications where motors are stopped for long periods.

Power Requirements

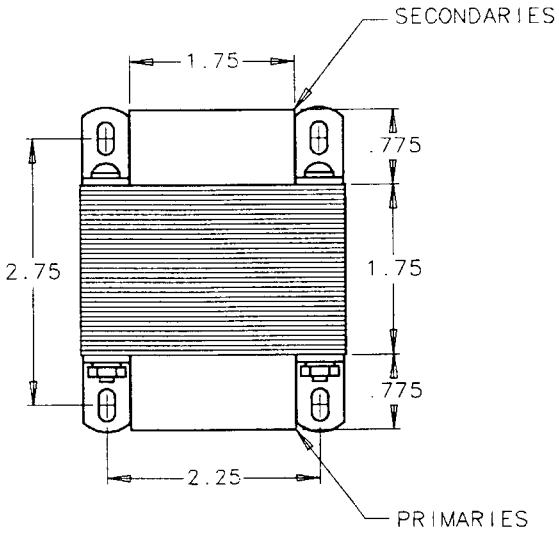
The TM4500-80 can be powered by an AC voltage (see specifications). For AC operation, the driver may be purchased with a recommended step down transformer. A single transformer may be used to power up several drivers based on power consumption.

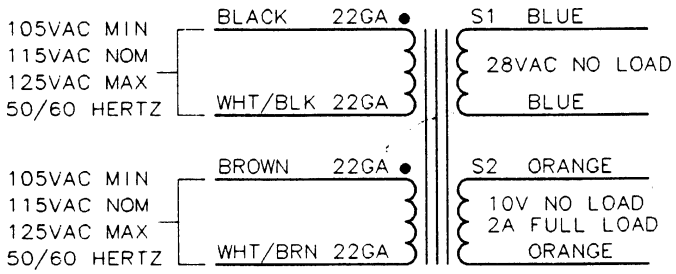
Transformer Wiring Diagrams (Primary Input, same for all transformers sold).



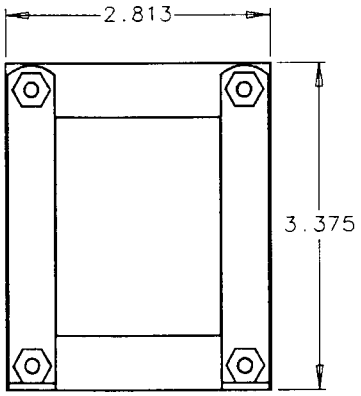


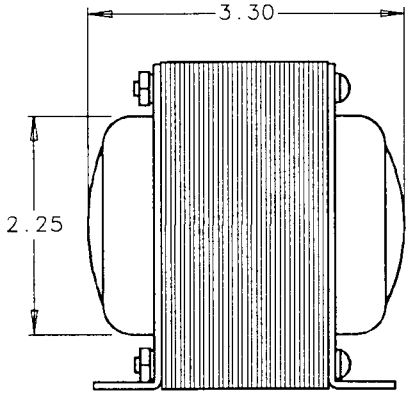
Transformer Drawings (AA2784B)



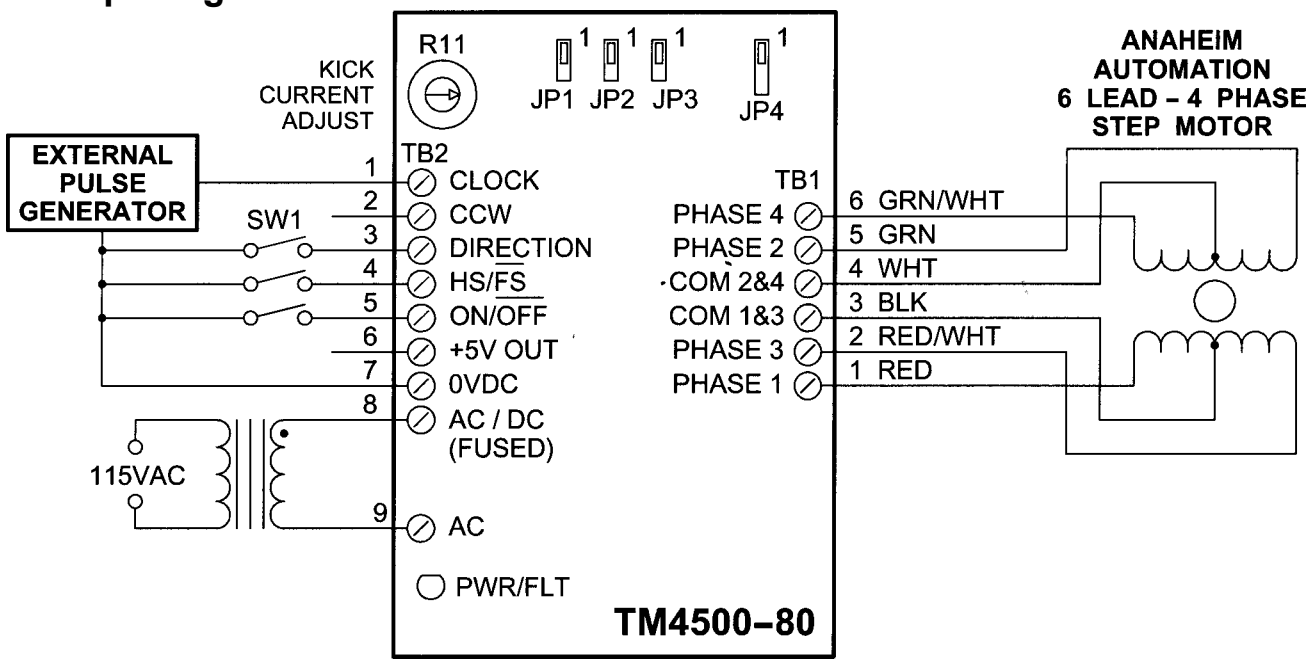


Note: Blue wires go to TB2, pins 1 & 2 on the driver.





Hookup Diagram



Low Voltage Adjust (VLV ADJ.)

The jumper JP4 is used to set the motor low voltage (VLV) supply which furnishes the current necessary for holding (standstill) torque and low speed running torque. The potentiometer R11 and JP4 setting will produce a standstill current that is 70% of the rated current. Refer to the Anaheim Automation website or catalog for motor current ratings. The charts below are a guide when selecting a motor and the jumper JP4 setting. (Refer to Jumper Functions for details on JP4)

Pins 1-2
17L203
23D104
23L104
23L206
34D106
34K108
34N108
34R106

Pins 2-3
17L002
23D108
23D209
23D309
23L106
23L106
23L108
34D109
34D209
34R109

Pins 3-4	
17L102	23L306
17L202	34D207
23D102	34D307
23D204	34K104
23D306	34K207
23L002	34K307
23L102	34N104
23L204	34N207
23L303	34N307

JP4	Description of Low Voltage Adjust Selection
2-3	Motor voltage per phase values below 2.6V should select Pins 2-3 on JP4
1-2	Motor voltage per phase values between 2.6V and 3.6V should select Pins 1-2 on JP4
3-4	Motor voltage per phase values above 3.6V should select Pins 3-4 on JP4. (Default)

Note: For motors not listed contact the factory for correct jumper settings.

Current Adjust Setting (CUR. ADJ.)

The potentiometer R11 is used to set the motor current. The pot should be set according to the motor's rated current. This will produce a kick current of 1.4 times the rated motor current. (Refer to Wiring Diagram for location of current adjust potentiometer R11)

Rated Motor Current	Kick Current	Pot Setting
1.00A	1.40A	0%
1.35A	1.89A	10%
1.70A	2.38A	20%
2.05A	2.87A	30%
2.40A	3.36A	40%
2.75A	3.85A	50%
3.10A	4.34A	60%
3.45A	4.83A	70%
3.80A	5.32A	80%
4.15A	5.81A	90%
4.50A	6.30A	100%

Heating Considerations

The temperature of the heat sink should never be allowed to rise above 60 degrees Celsius. If necessary, air should be blown across the driver to maintain suitable temperatures.

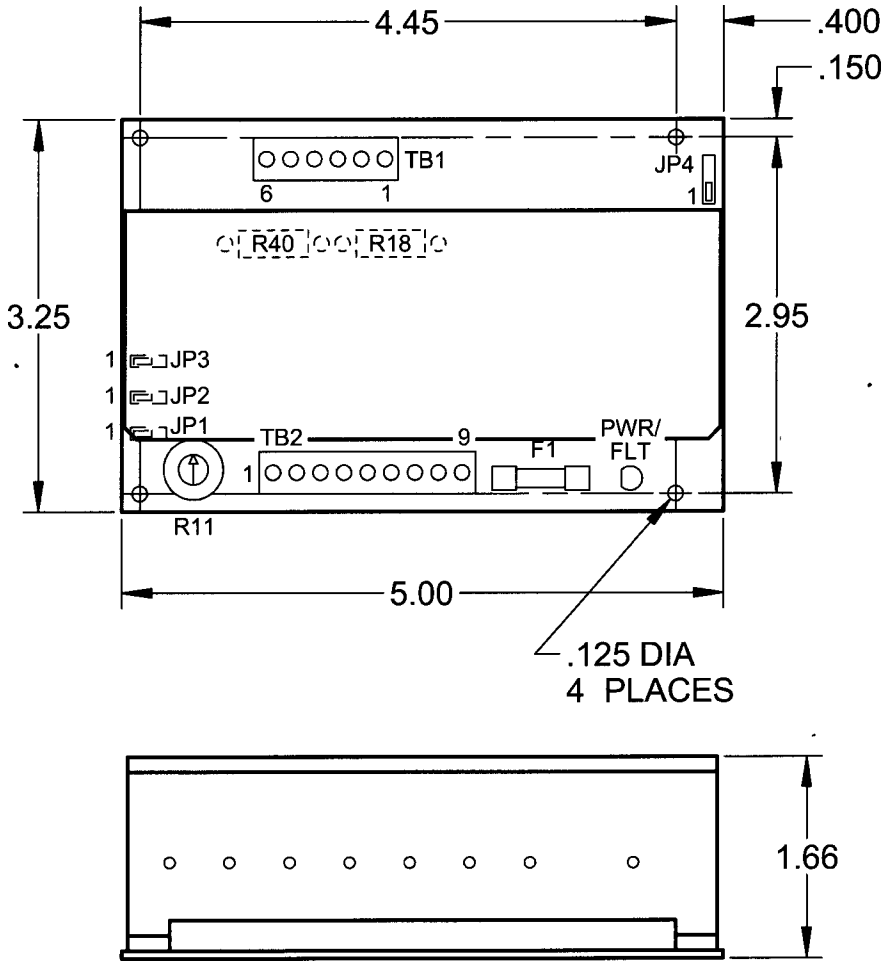
Fault Protection

There are 2 types of fault detection. When a fault is detected, the driver turns off the motor current and the corresponding LED blinking sequence indicates which type of fault has occurred. The LED is on during normal operation.

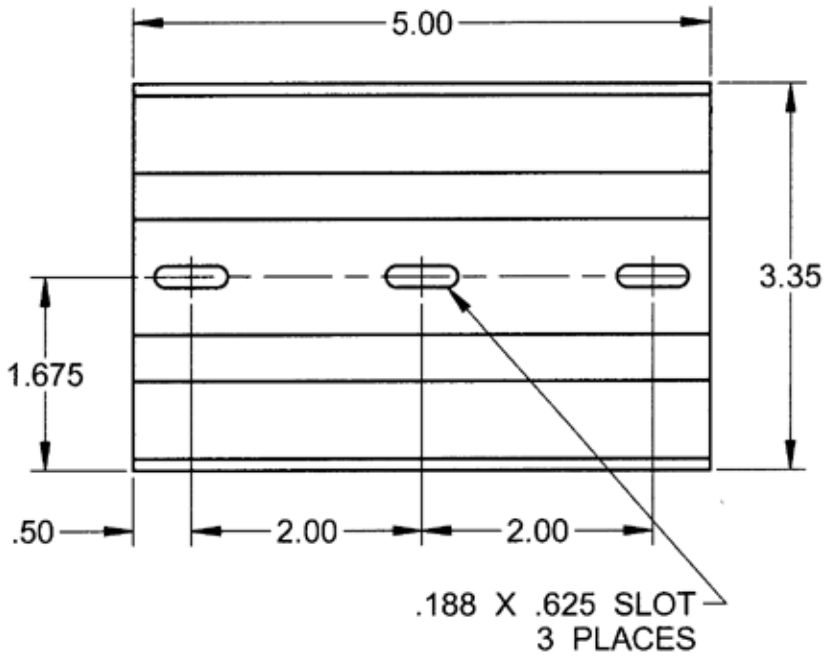
LED # of Blinks	Description
1	Open wire in the motor or cable.
2	Shorted wire in the motor or cable.

Note: If the driver goes into a fault condition, the fault may be reset by turning the power off for at least 20 seconds. Refer to the Troubleshooting section for further details.

Dimensions - TM4500



Dimensions - AA3963 Snap Track



Specifications

Control Inputs: (TB2, Pins 1-5)
TTL-CMOS Compatible
Logic “0” = 0 - 0.8VDC
Logic “1” = 3.5 - 24VDC
Pins 1-4 are pulled up or down (depending on the jumpers) through 10k ohm resistors. Pin 5 is pulled up through a 10k ohm resistor.

Clock, CCW: (TB2, Pins 1 and 2)
15 microseconds minimum pulse width, positive or negative going.

Direction Control: (TB2, Pin 3)
Logic “1” (open) - Clockwise
Logic “0” - Counterclockwise

Half Step/ Full Step: (TB2, Pin 4)
Logic “1” (open) - Half-Step
Logic “0” - Full-step

Motor On/Off: (TB2, Pin 5)
Logic “1” (open) - Motor energized
Logic “0” - Motor de-energized

Output Current Rating: (TB1)
4.5 amperes per phase maximum operating current; 3.0 amperes per phase maximum standstill current. Motor phase ratings of 1 ampere minimum are required to meet the minimum kick level.

+5VDC Output: (TB2, Pin 6)
100mA maximum

Power Requirements: (TB2, Pins 8 and 9)
7VAC (min) - 28VAC (max)

Operating Temperature:
Heat Sink: 0° - 60° C

Fuse:
7 Amp Fast Blow
5 x 20mm

Troubleshooting

If a fault occurs, reset the fault by cycling power OFF for at least 20 seconds. After resetting, try to run the motor again. If the driver faults again then check the conditions listed below.

Is the LED blinking twice?
This indicates that the motor has a phase shorted or there is a short in the motor cable or wiring. Check the motor and the wiring for shorts. If the driver continues to sense “shorts” after the motor and wiring are determined to be accurate, then the output transistor should be checked (see below).

Is the LED blinking once?
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 a large motor is ramped down too quickly so that it loses it’s positioning.

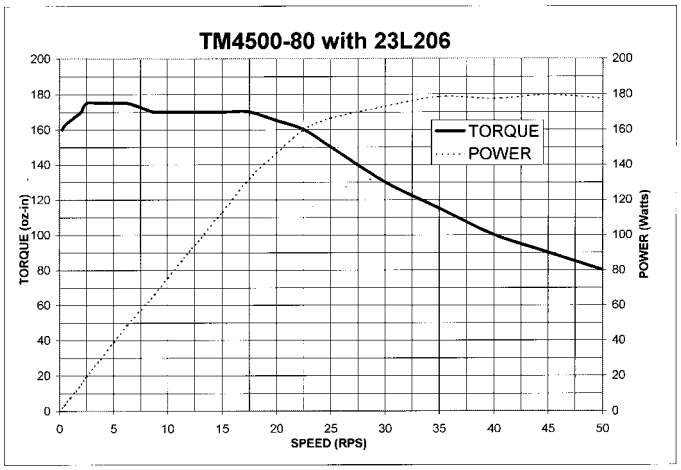
Checking Output Transistors

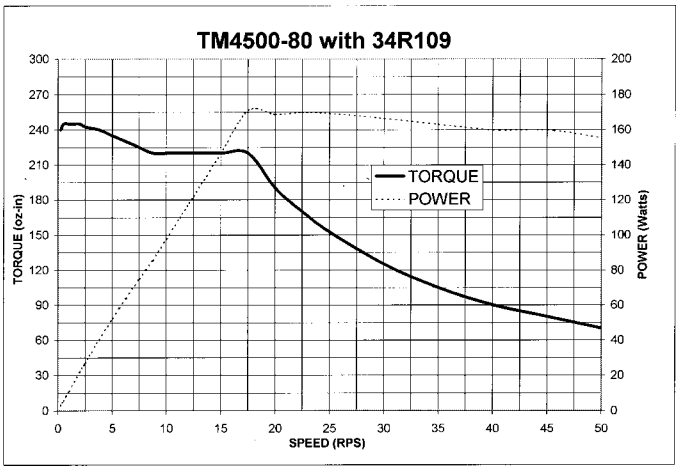
1. Set the multimeter to “diode test”.
2. Place the red meter lead on ground (TB2 Pin 7).
3. Touch the black meter lead to each phase (TB1, Pins 1,2,5 and 6).
4. Readings should be between 0.450 VDC and 0.550 VDC.
5. If any readings are significantly less than 0.450 VDC, then the unit has been damaged.

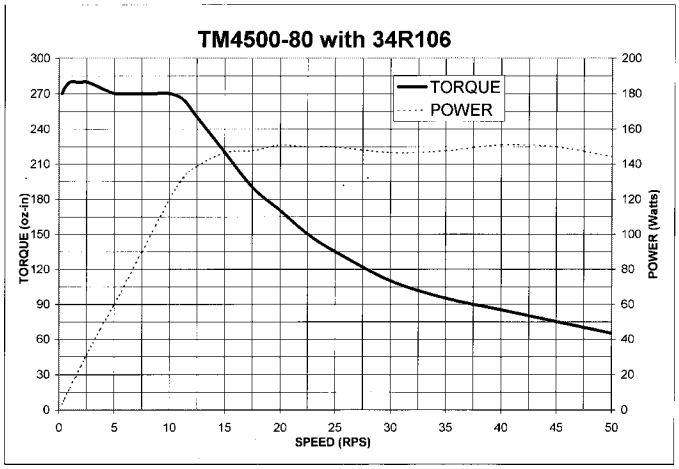
If a factory repair is required, please contact Anaheim Automation for an RMA# at:

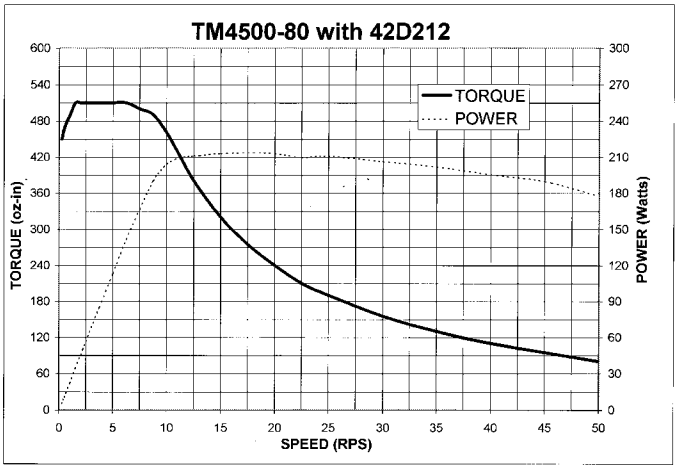
(800) 345-9401 or (714) 922-6990

Torque Speed Curves









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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.

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.