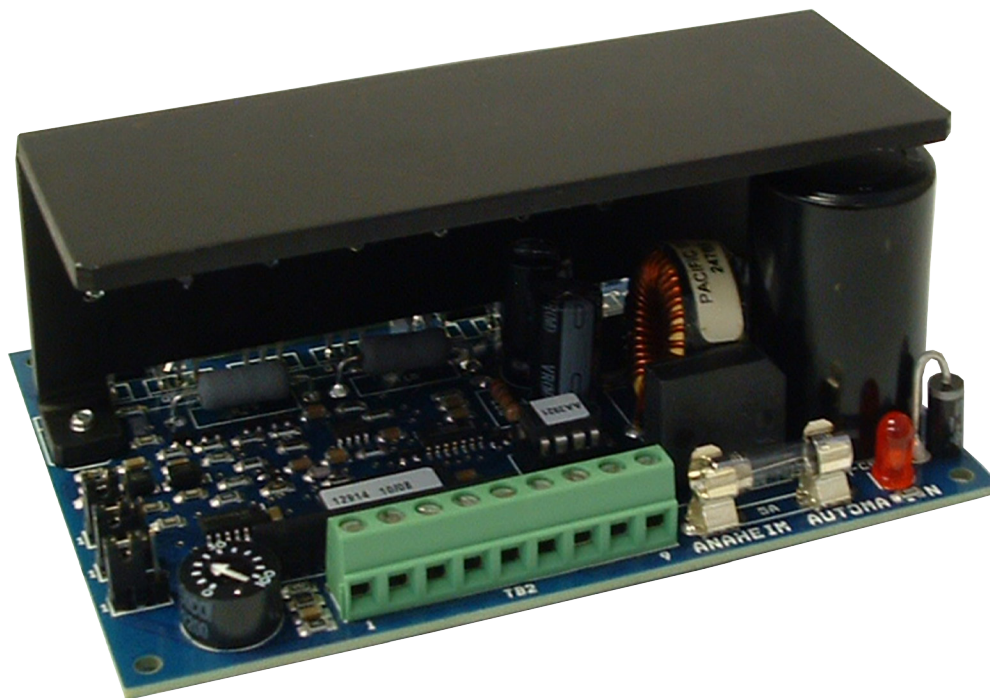


# TM4500 Track Mounted Step Motor Driver

## User's Guide



CE Certified and RoHS Compliant



**ANAHEIM AUTOMATION**

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## TM4500 Driver Features

- 1.0-4.5 Amperes/Phase Operating Current
- Higher Torque/Speed Output
- Improved Start-Stop Speeds
- Short Circuit Protection
- Open Motor Wire Detection
- No RFI or EMI Problems
- Requires 7-28 VAC or 10-40 VDC Input Power
- 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
- CE Certified and RoHS Compliant

## General Description

The TM4500 driver is a low cost, unipolar step motor driver designed for 4 phase step motors. The TM4500 is a track mount driver, meaning that it can be quickly mounted on easy to use snaptrack (sold separately). The TM4500 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 or DC 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 has over chopper drivers, is that the TM4500 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 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.

## Ordering Information

Part #	Description
PSA40V4A	DC Power Supply 40VDC at 4 Amps
PSA24V2.7A	DC Power Supply 24VDC at 2.7 Amps
PSA40V8A	DC Power Supply 40VDC at 8 Amps
AA2295B	AC Transformer 100 Watt (Recommended)
AA2784A	AC Transformer 200 Watt (Recommended)
AA2785	AC Transformer 300 Watt
AA3963	5" Mounting Track
KIT-AA2750A	Mounting Plate & Hardware

**Note:** The AA2295B or AA2784A is the recommended transformer. For additional information 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.

## Phase Inputs

The TM4500 has the ability to accept phase inputs to control each of the 4 motor phases. For example, a microcontroller can be used to control the motor phases. Terminals 1, 2, 3, and 4 of TB2, are used as the inputs for phase 1, phase 2, phase 3, and phase 4 respectively. Either positive true phase inputs or negative true phase inputs may be used.

## 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	JP4
Negative Going Clock Input	1-2	1-2	1-2	---
Positive Going Clock Input	1-2	2-3	1-2	---
Negative True Phase Inputs	1-2	1-2	2-3	---
Positive True Phase Inputs	2-3	2-3	2-3	---
Standard Product (Ready to Ship)	1-2	1-2	1-2	1-2

**Note:** JP4 is used to set the range for the low voltage power. Please see Low Voltage Adjust options on page 6 of this manual.

## Terminal Descriptions

### TB1:

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

### TB2:

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

### 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.

### Half Step/Full Step

The TM4500 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.

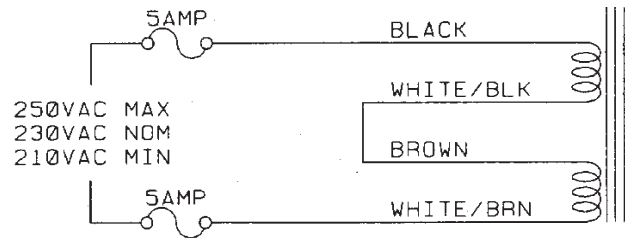
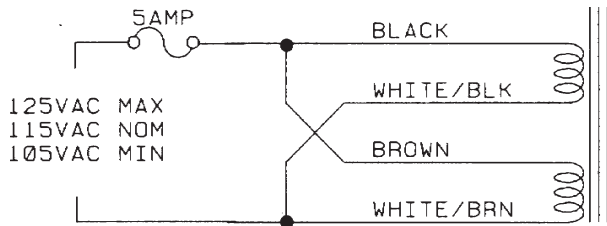
### Motor On/Off

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.

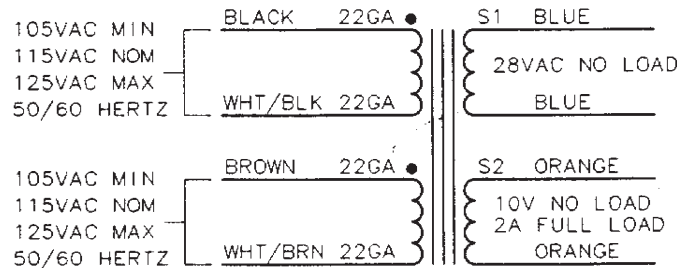
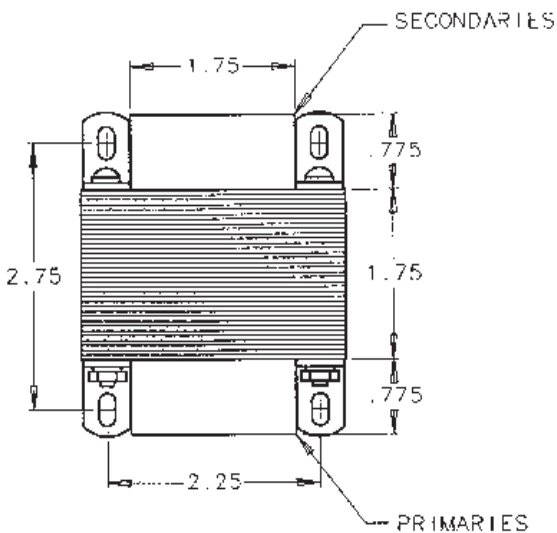
## Power Requirements

The TM4500 can be powered by an AC or DC 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.

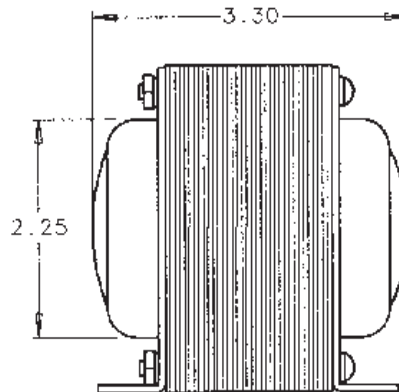
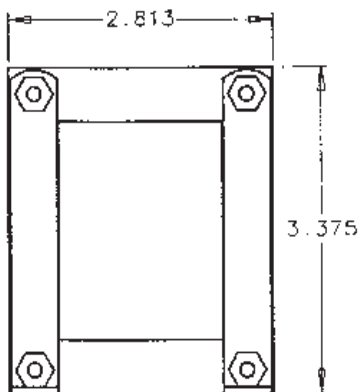
## Transformer Wiring Diagrams (Primary Input)



## Transformer Drawings (AA2784A)

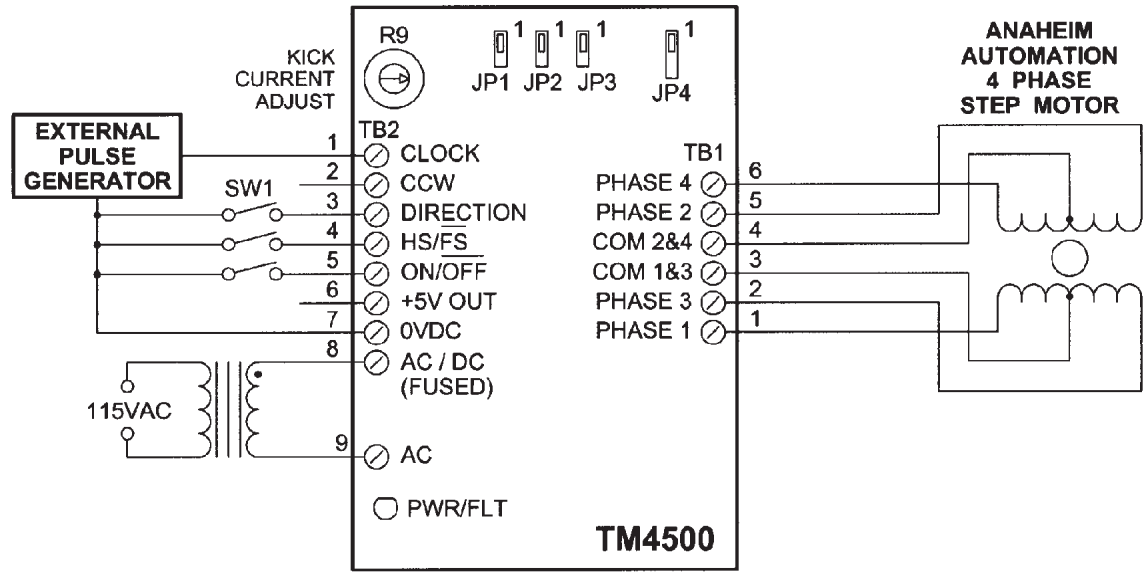


**Note:** Blue wires go to TB2, pins 8 & 9 on the driver.



## 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 heat sink to maintain suitable temperatures.



## 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 R9 and JP4 setting will produce a standstill current that is 70% of the rated current. Refer to the Anaheim Automation website for motor current ratings. The charts below are a guide when selecting a motor and the jumper JP4 setting.

Pins 1-2
17Y203
23D104
23Y104
23Y206
34D106
34K108
34Y108

Pins 2-3
17Y002
23D108
23D209
23D309
23Y106
34D109
34D209

Pins 3-4	
17Y102	23Y306
17Y202	34D207
17Y302	34D307
23D102	34K104
23D204	34K207
23D306	34K307
23Y002	34Y104
23Y102	34Y207
23Y204	34Y307

**Note:** For motors not listed, refer to the website or contact the factory for correct jumper settings.

## Current Adjust Setting (CUR. ADJ.)

The potentiometer R9 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 R9)

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%

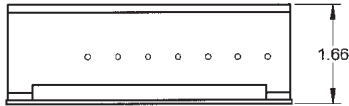
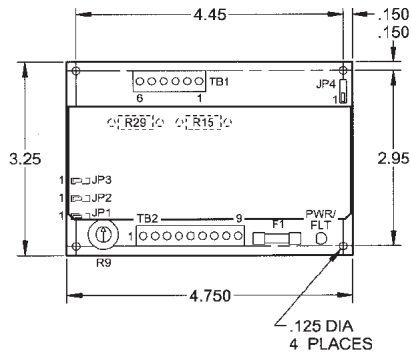
## Fault Protection

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

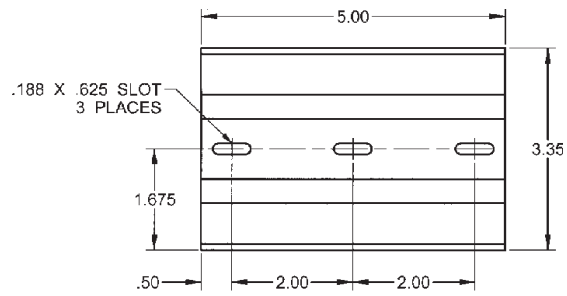
LED # of Blinks	Description
1	Open wire in the motor or cable.
2	Shorted wire in the motor or cable.

**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.

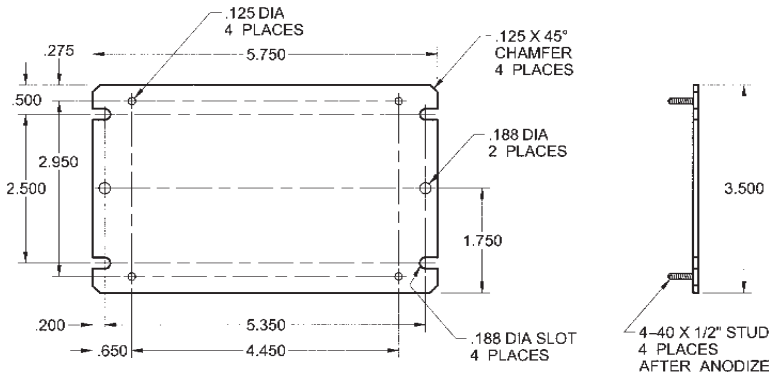
## Dimensions



TM4500 (Featured)



AA3963 (Purchased Separately)



KIT-AA2750A (Purchased Separately)

## Specifications

### Control Inputs: (TB2, Pins 1-5)

TTL-CMOS Compatible

Logic "0" = 0-0.8VDC

Logic "1" = 3.5-5.0VDC

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 7 and 8 or 8 and 9)**

7VAC (min) - 28VAC (max) or  
10VDC (min) - 40VDC (max)

**Operating Temperature:**

Heat Sink: 0°-60° C

**Fuse:**

5 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 its positioning.

**Checking Output Transistors**

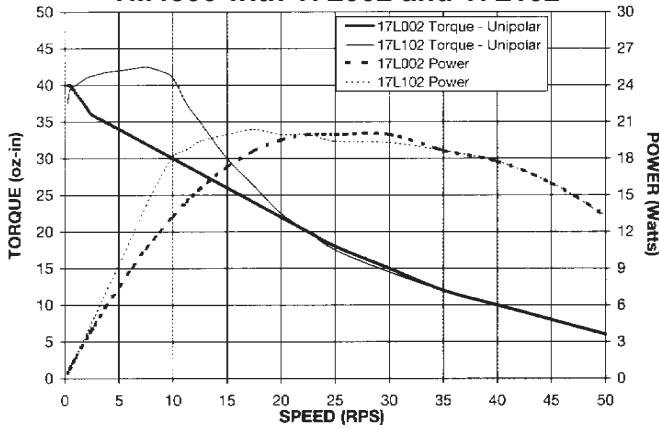
1. Set the multimeter to "diode test".
2. Place the red meter lead on ground (TB2 Pin 7).
3. Touch the black meter lead to each phase (TB1, Pins 1,2,5 and 6).
4. Readings should be between 0.450 VDC and 0.550 VDC.
5. If any readings are significantly less than 0.450 VDC, then the unit has been damaged.

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

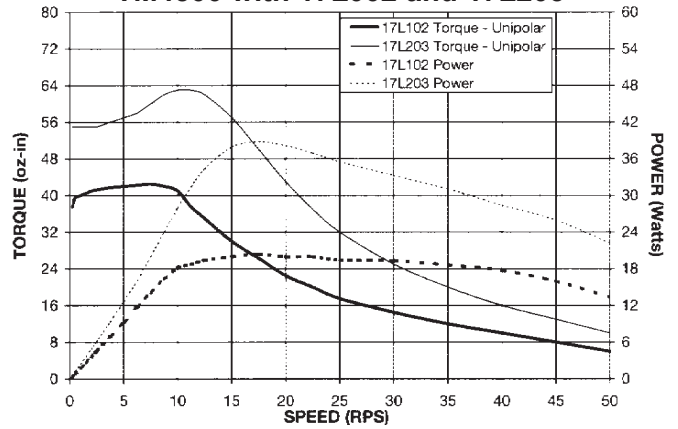
**(800) 345-9401 or (714) 922-6990**

# Torque Speed Curves

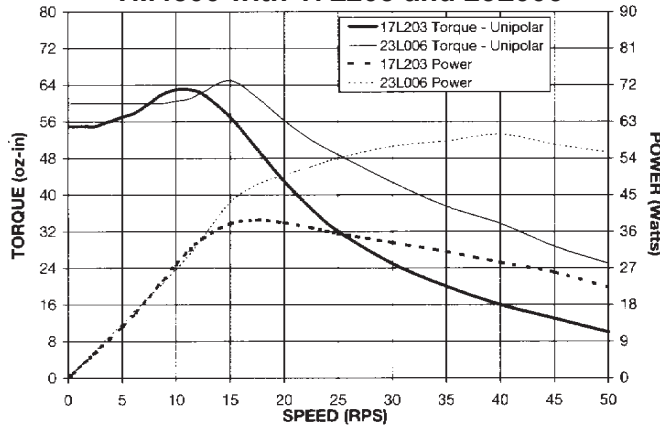
**TM4500 with 17L002 and 17L102**



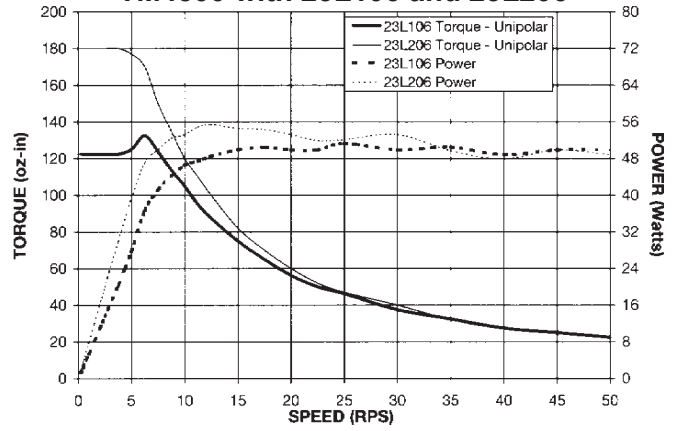
**TM4500 with 17L002 and 17L203**



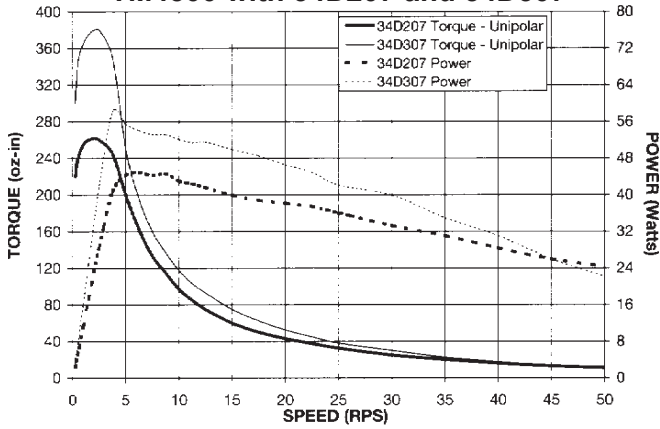
**TM4500 with 17L203 and 23L006**



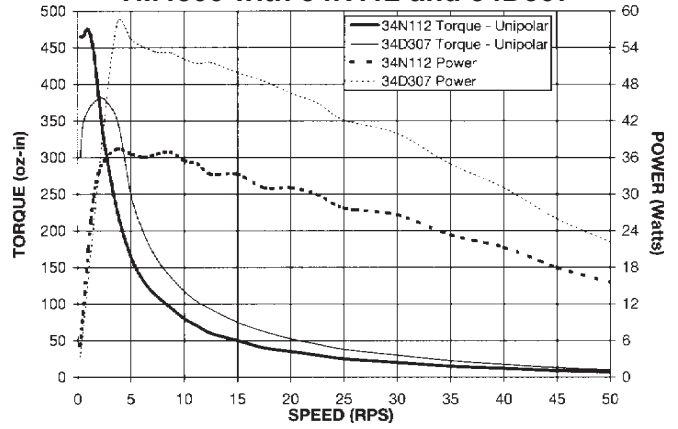
**TM4500 with 23L106 and 23L206**



**TM4500 with 34D207 and 34D307**



**TM4500 with 34N112 and 34D307**



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## **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.

## **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.

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