MDD45021-80
Enhanced Step Motor Drive

User's Guide

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MDB45021-80 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
- Enclosed Modular Package

General Description

The MDD45021-80 driver is a unipolar step motor driver designed for 4 phase step motors. The MDD45021-80 is specifically designed to dynamically enhance driver performance while circumventing the effects of input voltage variations. The MDD45021-80 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 MDD45021-80 has over chopper drivers, is that the MDD45021-80 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 MDD45021-80 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.

Ordering Information

Part #	Description
AA2295B	AC Transformer, 100 Watts
AA2784B	AC Transformer, 200 Watts
AA2785B	AC Transformer, 300 Watts

Note: The AA2784 is the recommended transformer. For additional info on other transformers please contact the factory.

Bilevel Drive

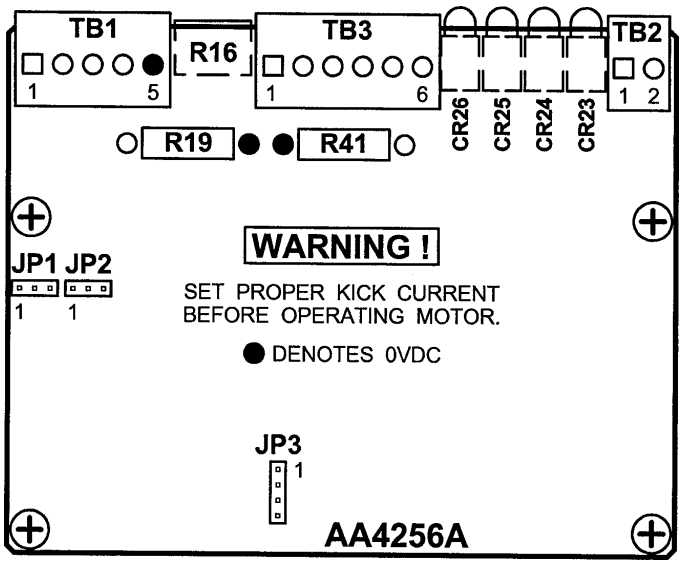
The basic function of a step motor driver is to control the motor winding currents. Motor performance is determined by how fast the driver can increase and decrease the winding currents. A rapid rise in winding current is achieved by applying a high voltage directly to a motor winding. This rapid rise 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 / Location



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	Clock Input
2	Direction Control
3	Half or Full step
4	Halfstep/Fullstep
5	+5VDC Output

TB2

Pin #	Description
1	17-28VAC Power Input
2	17-28VAC Power Input

TB3

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.
(Refer to Jumper Functions / Location for details on jumpers)

Half Step/Full Step

The MDD45021-80 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.

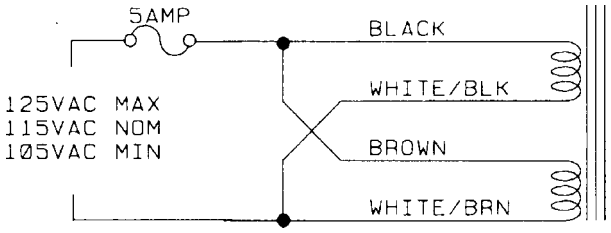
Motor On/Off

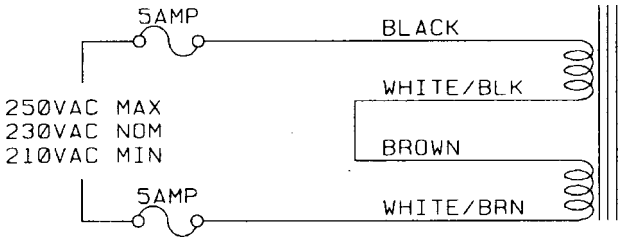
The motor On/Off feature allows the de-energizing of a motor without disturbing the positioning logic. After reenergizing the motor, a routine can continue. This reduces motor heating and conserves power, especially in applications where motors are stopped for long periods.

Power Requirements

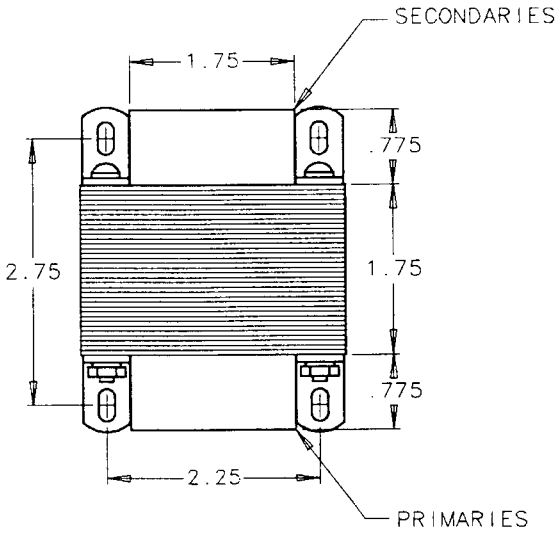
The MDD45021-80 can be powered by an AC voltage (see specifications). For AC operation, the driver may be purchased with a recommended step down transformer. A single transformer may be used to power up several drivers based on power consumption.

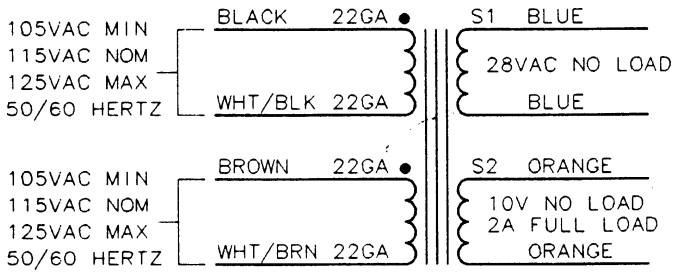
Transformer Wiring Diagrams (Primary Input)



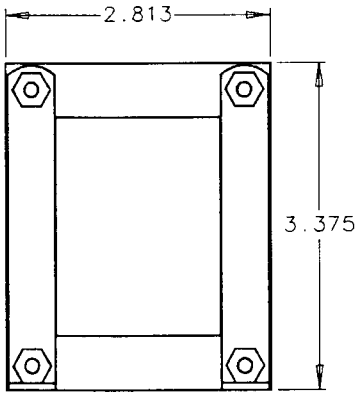


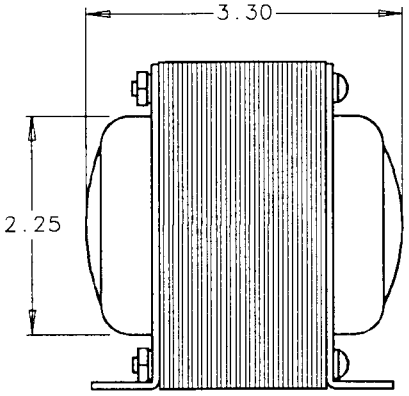
Transformer Drawings (AA2784)



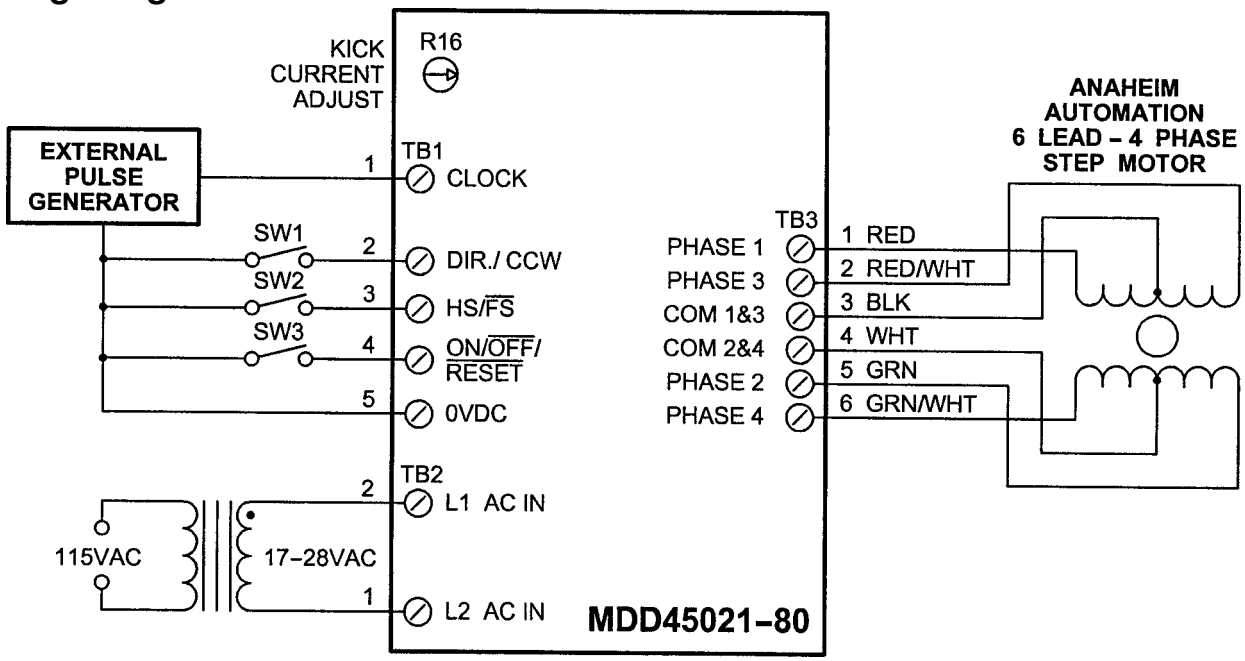


Note: Blue wires go to TB2, pins 1 & 2 on the driver.





Wiring Diagram



Low Voltage Adjust (VLV ADJ.)

The jumper JP3 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 R16 and JP3 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 JP3 setting. (Refer to Jumper Functions / Location for details on JP3)

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

JP3	Description of Low Voltage Adjust Selection
2-3	Motor voltage per phase values below 2.6V should select Pins 2-3 on JP3.
1-2	Motor voltage per phase values between 2.6V and 3.6V should select Pins 1-2 on JP3.
3-4	Motor voltage per phase values above 3.6V should select Pins 3-4 on JP3. (Default)

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

Current Adjust Setting (CUR. ADJ.)

The potentiometer R16 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 R16)

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.

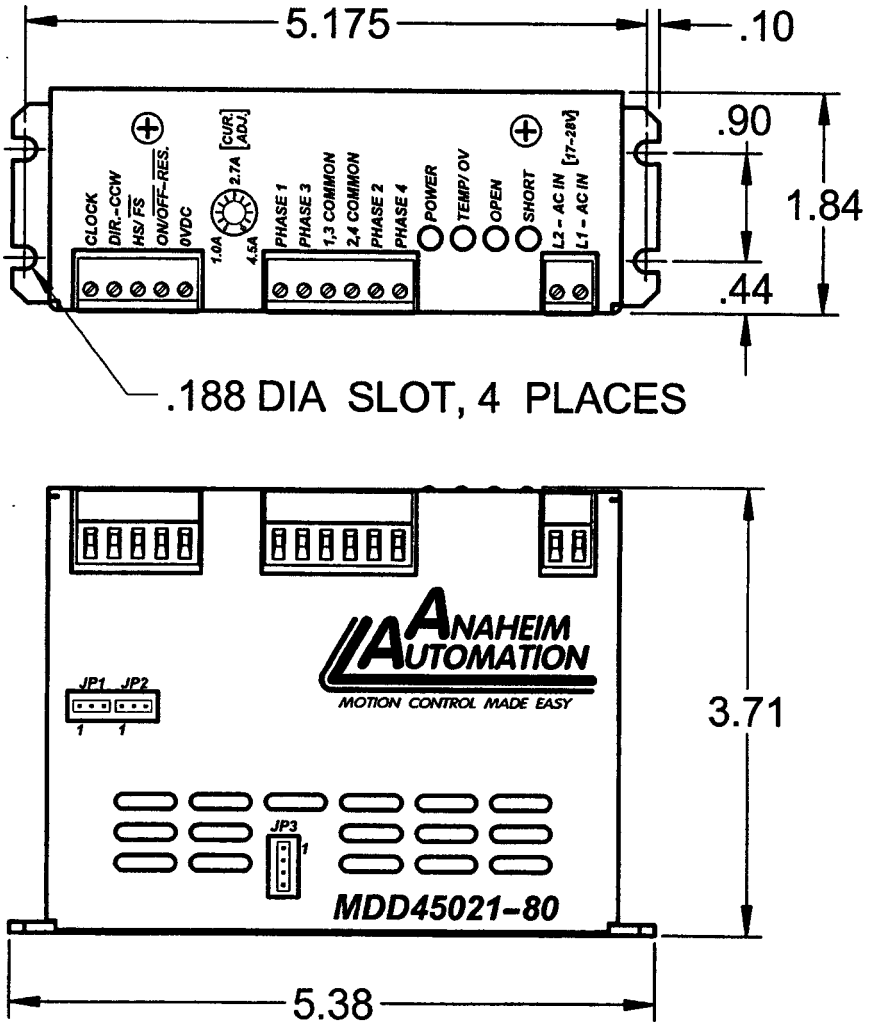
Fault Protection

There are 3 types of fault detection. When a fault is detected, the driver turns off the motor current and the corresponding LED indicates which type of fault has occurred. The Short LED, Open LED, and Temp/OV LED is off during normal operation.

LED	Description
Short	Shorted wire in the motor or cable.
Open	Open wire in the motor or cable.
Over Temp/Over Voltage	Excessive temperature on internal heatsink or an overvoltage on the motor bus voltage.

Note: If the driver goes into a fault condition, the fault may be reset by turning the power off for at least 20 seconds or by pulling the reset input (TB1 pin 4) to a logic "0" for ast least 10msec. Refer to the Trouble-shooting section for further details.

Dimensions


5.175
.10
.90
1.84
.44
CLOCK
DIR.-CCW
HS/ FS
ON/OFF-RES.
0VDC
CUR. ADJ.
1.0A
2.7A
4.5A
PHASE 1
PHASE 3
1,3 COMMON
2,4 COMMON
PHASE 2
PHASE 4
POWER
TEMP/ OV
OPEN
SHORT
L2 - AC IN
L1 - AC IN
[17-28V]
.188 DIA SLOT, 4 PLACES

ANAHEIM AUTOMATION
MOTION CONTROL MADE EASY
JP1 JP2
JP3
MDD45021-80
3.71
5.38

Specifications

Control Inputs: (TB1, Pins 1-4)
TTL-CMOS Compatible
Logic “0” = 0-0.8VDC
Logic “1” = 3.5-5.0VDC
Pins 1 and 2 are pulled up or down (depending on the jumpers) through 10k ohm resistors. Pin 3 and 4 are pulled up through a 10k ohm resistor.

Clock, CCW: (TB1, Pins 1 and 2)
15 microseconds minimum pulse width, positive or negative going.

Direction Control: (TB1, Pin 2)
Logic “1” (open) - Clockwise
Logic “0” - Counterclockwise

Half Step/ Full Step: (TB1, Pin 3)
Logic “1” (open) - Half-Step
Logic “0” - Full-step

Motor On/Off: (TB1, Pin 4)
Logic “1” (open) - Motor energized
Logic “0” - Motor de-energized

Output Current Rating: (TB3)
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.

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

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

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 Short LED on?
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 Open LED on?
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.

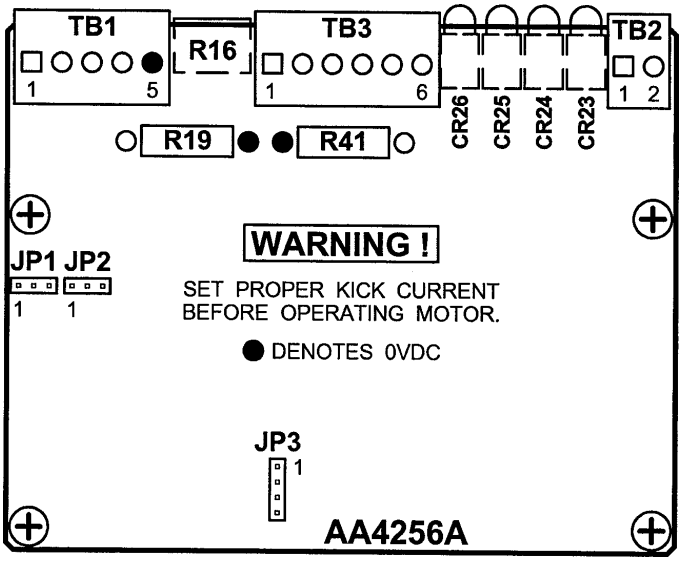
Is the Temp/OV LED on?
This indicates that there is an excessive amount of heat on the internal heat sink or an over voltage on the motor bus voltage. Check for a high input voltage into the driver.

Checking Output Transistors

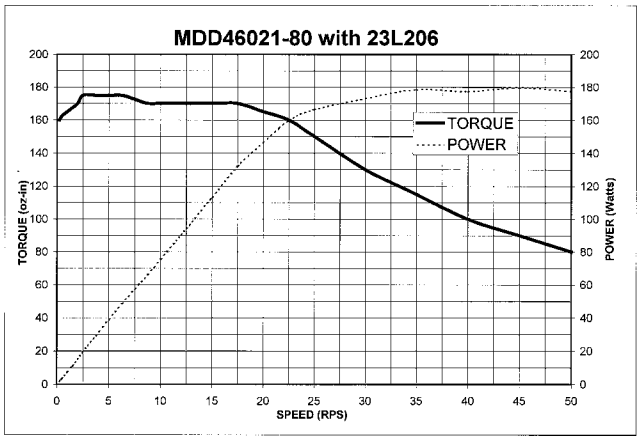
1. Set the multimeter to “diode test”.
2. Place the red meter lead on ground (TB1 Pin 5).
3. Touch the black meter lead to each phase (TB3, Pins 1,2,5 and 6).
4. Readings should be between 0.450 VDC and 0.550 VDC.
5. If any readings are significantly less than 0.450 VDC, then the unit has been damaged.

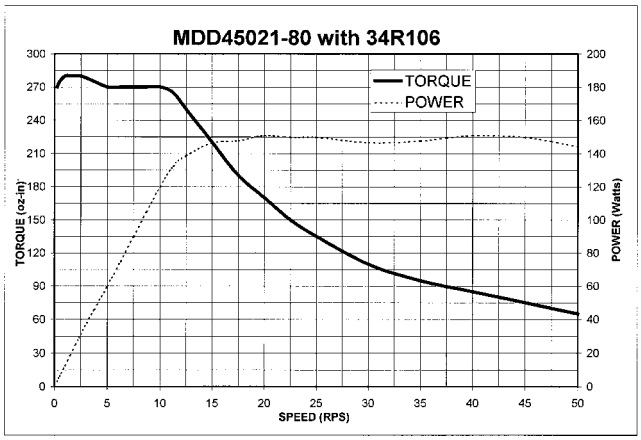
If a factory repair is required, please contact Anaheim Automation for an RMA# at:

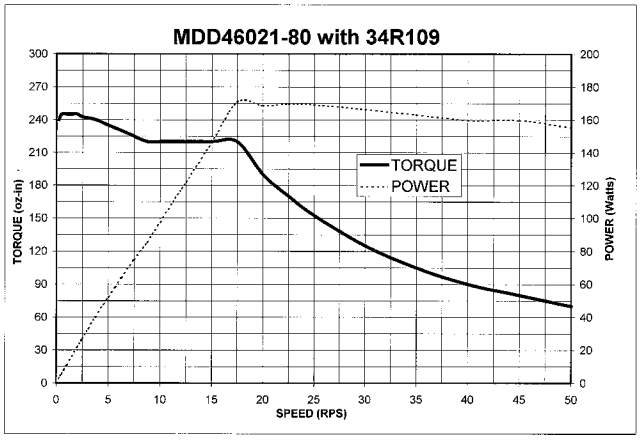
(800) 345-9401 or (714) 922-6990

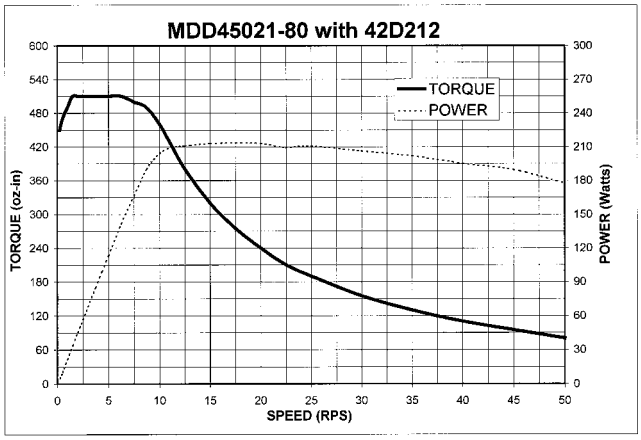


Torque Speed Curves









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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.