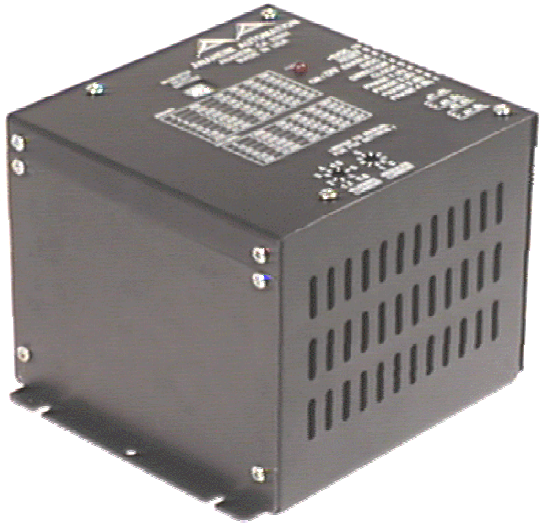
USER'S MANUAL

MODEL DPD60001
MICROSTEP DRIVER PACK



ANAHEIM AUTOMATION
910 E. Orangefair Lane
Anaheim, CA 92801
TEL (714) 992-6990
FAX (714) 992-0471
http://www.anaheimautomation.com
e-mail: aamotion@aol.com

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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 the products are subjected to physical damage or abuse.

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

TECHNICAL SUPPORT
Should you have problems using the equipment covered by this manual, please read the manual to see if it will answer the questions you have. If you need assistance beyond what this manual can provide, contact your Local Distributor,or Anaheim Automation direct..

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INTRODUCTION

The DPD60001 is a high performance, low cost MICROSTEP Driver Pack that incorporates advanced surface mount and ASIC technology. The DPD60001 is compact, easy to interface, and powerful enough to handle the most demanding applications. Recognizing that cost and size are important criteria in many low and medium power applications, Anaheim Automation designed the DPD60001 to meet those needs and offer innovative features.

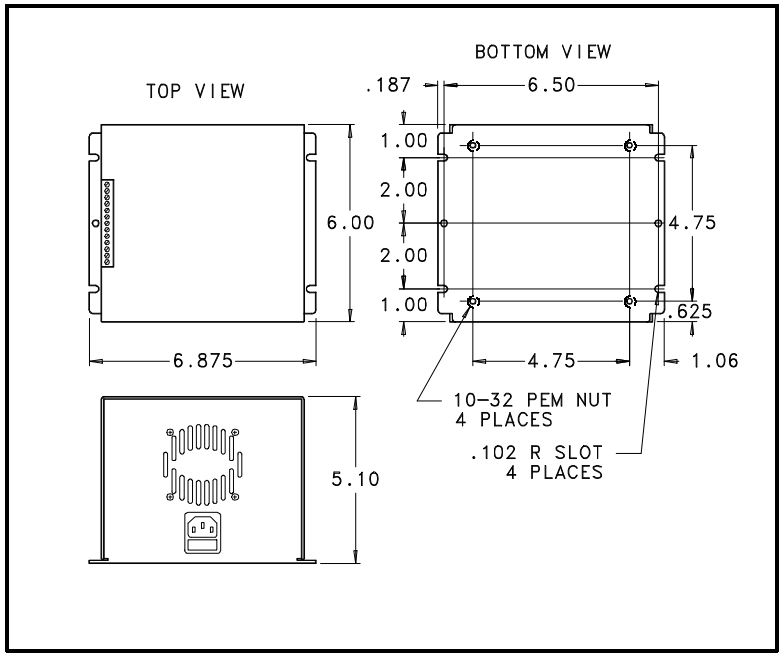
The DPD60001 will deliver a peak current of 5.5 Amperes per phase at 75 Volts, providing outstanding motor performance. This advanced technology reduces ripple current while maintaining the 20kHz chopping frequency in the motor, causing less heat in both the motor and drive.

Various step resolutions can be implemented by the on-board dip switches. These divisions range from 400 steps per revolution to 51,200 steps per revolution, and are available in both binary and decimal numbers. The bipolar drive configuration handles 4, 6 and 8 lead motors. Protection devices have been added to this driver for *All-Way-Short-Circuit, Over/Under Voltage,* and *Excessive-Temperature* conditions. If an error (short-circuit or excessive-temperature) occurs, a 'Fault Output' is available to inform the machine control of a problem. An 'At Full Step' output enables the control to know when the motor is positioned in one of the natural step angles of the motor (typically every 1.8°).

Driver Pack features include:

- Low Cost
- Small Size (6.0"x 6.875"x 5.1")
- Output Current 5.5 Amps Peak
- 400 to 51,200 steps/rev
- Short Circuit Protection
- Excessive-Temperature Protection
- No Minimum Inductance
- Optical Isolation
- Integrated 200 Watt Power Supply

DPD60001 DIMENSIONS



ORDERING INFORMATION FOR ANAHEIM AUTOMATION MICROSTEP DRIVERS AND ACCESSORIES

6 Amp Microstep Driver Packs	**DPD60001 Driver Pack**
4 Amp Microstep Driver	MDM40001 Modular Driver
6 Amp Microstep Driver	MDM60001 Modular Driver
10 Amp Microstep Driver	MDM10001 Modular Driver
40VDC Power Supply	PSA40V4A (For MDM40001)
40VDC Power Supply	PSA40V8A (For MDM40001)
40VDC Power Supply	PSA40V8A-2 (For MDM40001)
65VDC Power Supply	PSA65V5A (For MDM60001)
65VDC Power Supply	PSA65V5A-2 (For MDM60001)
80VDC Power Supply	PSA80V4A (For MDM10001)
Shielded Motor Cable	AA129010S

Driver Pack features described on page 2.

TERMINAL CONNECTION DESCRIPTIONS

Pin#	Description
1	**Phase 4:** of the Step Motor
2	**Phase 2:** of the Step Motor
3	**Phase 3:** of the Step Motor
4	**Phase 1:** of the Step Motor
5	**Clock:** A negative going edge on this isolated input advances the motor one increment. The size of the increment is dependent on the Microstep Select Inputs of Switch 1.
6	**Direction:** This isolated input is used to change the direction of the motor. Logic High is CW and Logic Low is CCW. Physical direction also depends on the connection of the motor windings.
7	**0VDC:** Supply Voltage Ground. (Return)
8	**On/Off:** This isolated input is used to enable/disable the output section of the driver. When HIGH (open) the outputs are enabled. However, this input does not inhibit the step clock. Therefore the outputs will be updated by the number of clock pulses (if any) applied to the driver while it had been disabled.
9	**Reset:** When LOW, this isolated input will reset the driver (outputs will disable). When released, the driver will be at its initial state.
10	**+5Volt:** +5Vdc is supplied to users to power other external operations.

Table1: Terminal Block CONNECTOR DESCRIPTIONS

POTENTIOMETER DESCRIPTIONS

Pot	Description
Reduced Current	**Reduce Current:** Phase Current Reduction. This POTENTIOMETER will proportionately reduce the current in both windings (1 second after the last step). The amount of current reduction will depend on the potentiometer setting used. (*Refer to Table 3*)
Running Current	**Running (Adjust) Current:** Phase Current Adjustment input. This POTENTIOMETER adjusts the maximum Phase Current in the motor.

Table 2: Running Current and Reduced Current Potentiometers

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

INPUT VOLTAGE	125 VAC
OUTPUT CURRENT	6 AMPS PEAK
DRIVER PLATE TEMPERATURE	70° C
STORAGE TEMPERATURE	-40° TO +125° C
INPUT CURRENT (PINS 5,6,8,9)	15 mA

ELECTRICAL SPECIFICATIONS (TA=25°C, V+ = 75VDC)

ITEM	TEST CONDITION	MIN	TYP	MAX	UNITS
Input Voltage		105	115	125	V
Phase Output Current	RMS	1		4	A
Phase Output Current	Peak	1.4		6	A
Quiescent Current	Outputs Floating			13	mA
Active Power Dissipation	Iout=4 Amps RMS			9	W
Input Sink Current	Input Pins 5,6,8,9	7			mA
Input Forward Voltage			1.4	1.7	V
+5Vdc Output	Output Pin 10		5		V
+5Vdc Output	Output Pin 10			50	mA
Input Reverse Breakdown Voltage		5			V
Clock Pulse Width	Off Time	215			nS
Clock Pulse Width	On Time	50			nS
Direction Change	Execution Time		100		nS
Microstep Select Change	Execution Time		100		nS
Reset	Pulse Width	500			nS

DETERMINING OUTPUT CURRENT

The output current for the motor used when microstepping is determined differently from that of a halfstep/fullstep unipolar driver. In the DPD60001 Driver Pack, a sine/cosine output current is used in rotating the motor. The output current for a given motor is determined by the motors current rating *and* the configuration for how the motor is hooked up. The current adjustment potentiometer (*Running Current*) is used to set the output current of the DPD60001. This sets the peak output current of the sine/cosine waves. The specified motor current (which is the RMS value) is multiplied by a factor of 0.7, 1.0, or 1.4 depending on the motor configuration (series, half-coil, or parallel).

SETTING OUTPUT CURRENT

The output current on the DPD60001 is set by the Running Current Potentiometer.
This resistance determines the per Phase Peak output current of the driver.

Running Current Potentiometer Setting	Current (Amps)
1	1.4
2	2
3	3
4	4
4	4.5
5	5
5.5	5.5

TABLE 3: Running Current Settings

REDUCING OUTPUT CURRENT

The amount of current per Phase in the reduction mode is related to the value of the current adjustment potentiometer (*Running Current*) and the current reduction potentiometer (*Reduced Current*). When the current reduction circuit is activated, the Reduced Current resistance is paralleled with the Running Current resistance. This lowers the total resistance value, and thus lowers the selected Phase output current by a percentage.

Pot	1.4 AMPS	2 AMPS	3 AMPS	4 AMPS	5 AMPS	5.5 AMPS
1	50%	42%	32%	26%	22%	21%
2	61%	53%	43%	36%	31%	30%
3	70%	64%	54%	46%	41%	39%
4	75%	70%	61%	54%	48%	46%
5	80%	75%	67%	59%	54%	52%
6	82%	78%	71%	64%	58%	56%
7	84%	81%	75%	68%	63%	61%
8	86%	84%	77%	71%	66%	64%
9	89%	88%	83%	78%	74%	72%

TABLE 4: Percentage of I(peak) settings on Reduced Current Potentiometer

MOTOR SELECTION

The DPD60001 Driver Pack contains a bipolar Microstep driver working equally well with 4, 6 or 8 Lead Step Motors (Series, Half Coil, or Parallel Motor Configurations respectively).

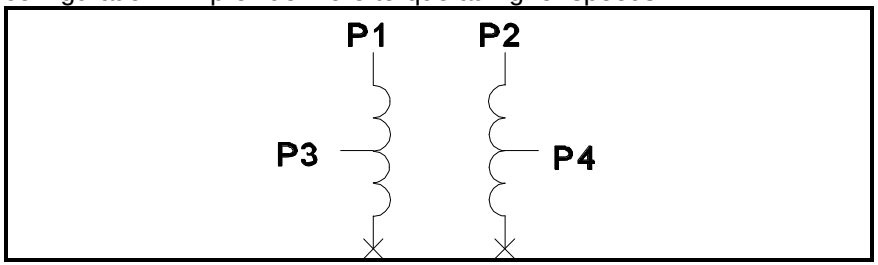
Motors with low current ratings and high inductance will perform better at low speeds, providing higher low-end torque. Motors with high current ratings and low inductance will perform better at higher speeds, providing higher high-end torque. Since the DPD60001 is a constant current source, it is not necessary to use a motor that is rated at the same voltage as the supply voltage. It is important that the DPD60001 be set to the appropriate current level based on the motor being used.

STEP MOTOR CONFIGURATIONS

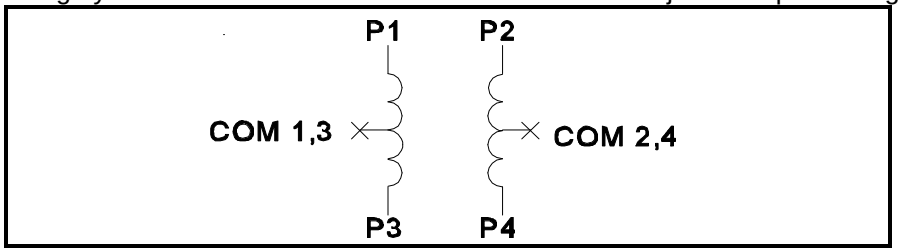
Step motors can be purchased in configurations of 4, 6 or 8 leads. Each configuration requires different current settings. Different lead configurations and the procedures to determine their output current are shown below .

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) use the specified per Phase (or unipolar) current rating to determine the current adjustment pot setting. This configuration will provide more torque at higher speeds.

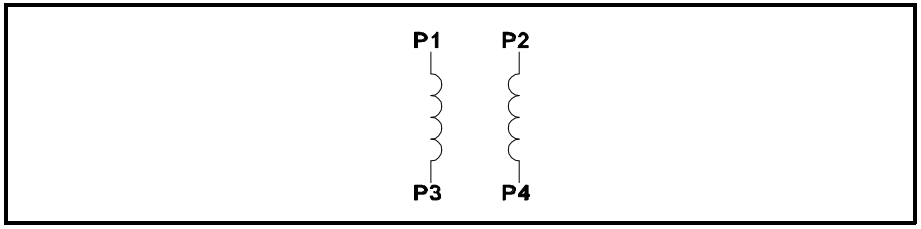


When configuring the motor in a ***series configuration*** (connected from end to end with the center tap floating) multiply the per Phase (or unipolar) current rating by 0.7. Use this result to determine the current adjustment pot setting.



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.

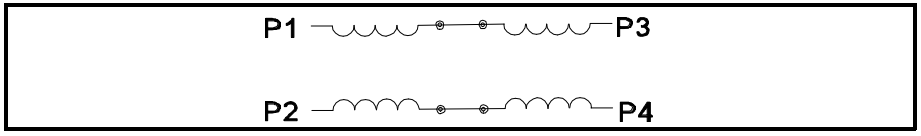
4 Lead Motors



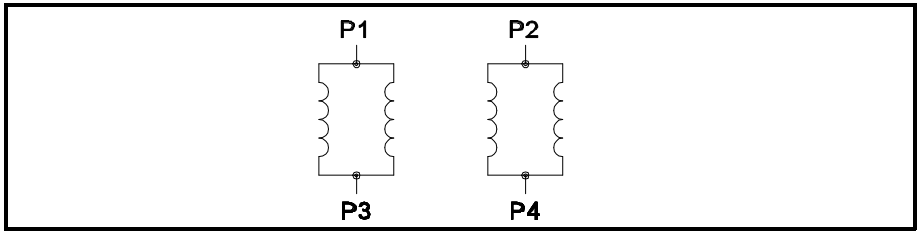
Use the specified ***series*** motor current to determine the current adjustment resistor value. Four-lead motors are usually rated with their appropriate series current, as opposed to the *Phase Current* which is the rating for 6 and 8 lead motors.

8 Lead Motors

Series Connection: When configuring the motor windings in series, multiply the per Phase (or unipolar) current rating by 0.7. Use this result to determine the current adjustment pot setting.

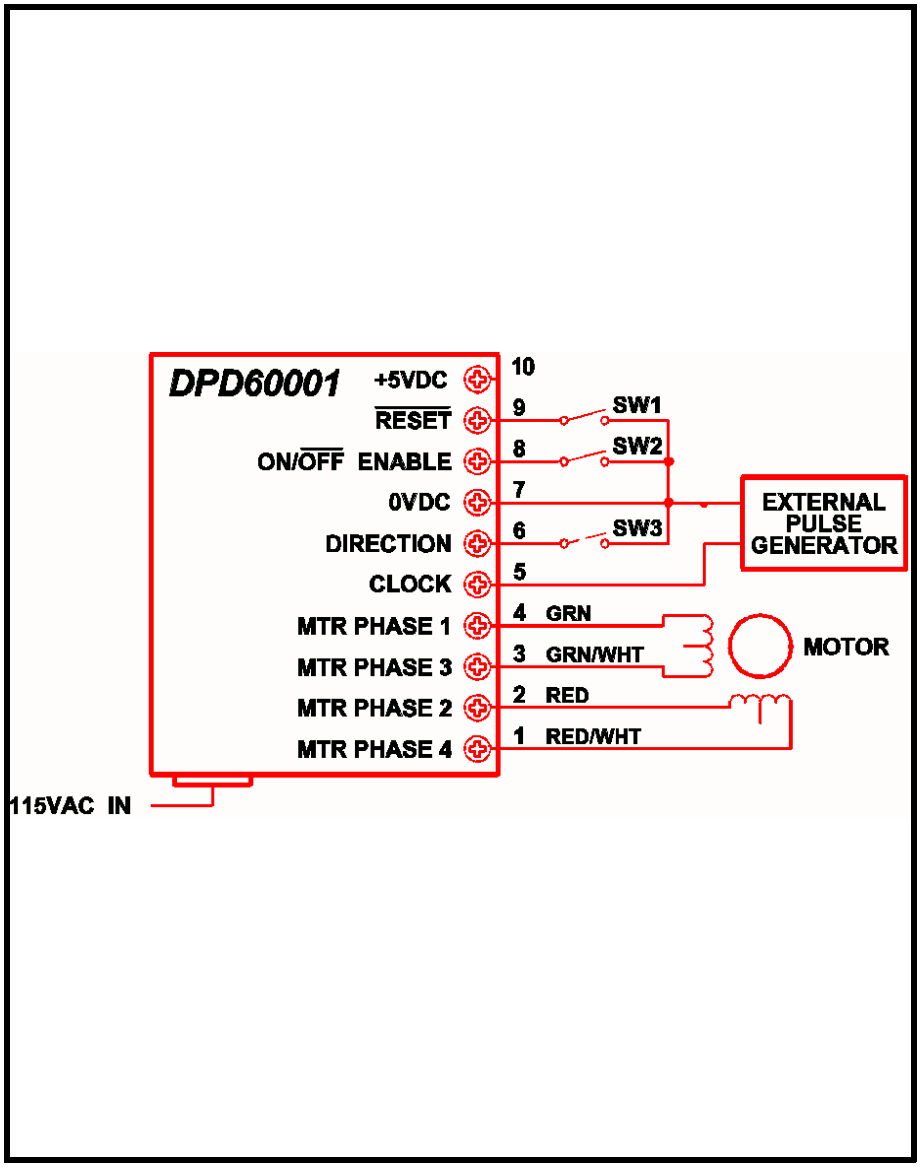


Parallel Connection: When configuring the motor windings in parallel, multiply the per Phase (or unipolar) current rating by 1.4. Use this result to determine the current adjustment pot setting.



NOTE: After the current has been determined, according to the motor connections above, follow the procedure Determining Output Current on page 7 to find the current value. Then use Table 3 to choose the proper pot setting.

TYPICAL APPLICATION HOOK-UP



WARNING: Do not connect or disconnect motor wires while power is applied!

Anaheim Automation Standard Step Motor Selection Guide

Part Number suffix: single shaft - "S" dual shaft - "D"	Motor Current (Unipolar Rating) [Amps]
23D104	2.0
23D108	3.9
23D204	1.8
23D209	4.7
23D306	2.9
23D309	4.6
34D106	3.0
34D109	4.8
34D207	3.5
34D209	4.6
34D307	3.5
34D311	5.5

TABLE 5:Standard AA Motor per Phase ratings.

Note: Anaheim Automation also carries a full line of high torque step motors. Contact your local distributor or Anaheim Automation for a specification sheet.

MICROSTEP SELECTION

The number of microsteps per step is selected by the dip switch(SW1). Table 6 shows the standard resolution values along with the associated settings for these switches. The standard waveforms are sinusoidal.

Resolution	Steps/ Rev	Switch 1	Switch 2	Switch 3	Switch 4
2	400	ON	ON	ON	ON
4	800	OFF	ON	ON	ON
8	1,600	ON	OFF	ON	ON
16	3,200	OFF	OFF	ON	ON
32	6,400	ON	ON	OFF	ON
64	12,800	OFF	ON	OFF	ON
128	25,600	ON	OFF	OFF	ON
256	51,200	OFF	OFF	OFF	ON
5	1,000	ON	ON	ON	OFF
10	2,000	OFF	ON	ON	OFF
25	5,000	ON	OFF	ON	OFF
50	10,000	OFF	OFF	ON	OFF
125	25,000	ON	ON	OFF	OFF
250	50,000	OFF	ON	OFF	Open

TABLE 5: Mode Selections

Note: *The Microstep Mode Select switches are located on the top cover of the DPD60001.*

OPTICALLY ISOLATED INPUTS

The following inputs to the DPD60001 Driver Pack are Optically Isolated.

Item	Pin #
Clock	5
Direction	6
On/Off	8
Reset	9

Note: All inputs musts be able to sink a minimum of 7mA.

TIMING

The Direction and Microstep Resolution Select inputs are synchronized with the negative going edge of the Step Clock input. When the Step Clock input goes low, the Direction and Microstep Select inputs are latched and further changes to the inputs are ignored until the next falling edge of the Step Clock input.

After the Direction and the Microstep Select inputs signals are latched, the DPD60001 looks to see if any changes have occurred. If a change has occurred, the DPD60001 will execute the change before taking the next step. Only AFTER the change has been executed will the step be taken. If no change has occurred the DPD60001 will simply take the next step. This feature works as an automatic debounce for the Direction and Microstep Select inputs.

The Reset and Enable(PWR) inputs are asynchronous to any input and can be changed at any time.The Reset requires a minimum pulse width of 500 nS.

FAULT PROTECTION

The DPD60001 Driver Pack is internally protected against over temperature, over/under voltage, and short circuits. The over temperature set point is between 60°C and 70°C.

The short circuit protection consists of PHASE to PHASE, PHASE to GROUND, and +V to PHASE.

In the condition where the DC voltage of the driver drops below +23 volts the driver's output stage will be disabled. When the driver's DC voltage rises back above 24 volts, the driver will automatically re-enable the outputs (if previously enabled).

In the condition where the DC voltage of the driver exceeds approximately 82 volts, the driver will execute a fault.

If any fault is detected by the DPD60001, the motor outputs will be disabled and can not be re-enabled without resetting or powering down the driver. At the same time the open collector FAULT output is activated, as well as the red FAULT LED .

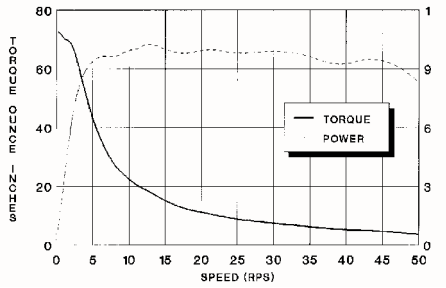
OVER TEMPERATURE PROTECTION

The DPD60001 Microstep Driver Pack is a power device and is designed to protect itself from overheating. It does this by monitoring the surface temperature of the drive plate and will automatically shutdown if the temperature reaches 65°C (152°F).

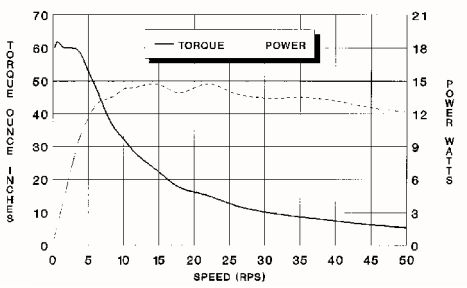
To prevent shutdowns, proper ventilation is required to maximize the air flow into the Driver Pack.

STANDARD STEP MOTOR
TORQUE/SPEED CURVES

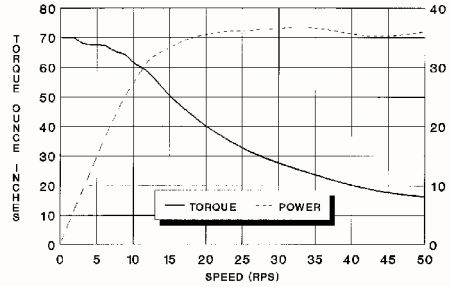
23D102
DIVIDE BY 10, CURRENT=1.0A



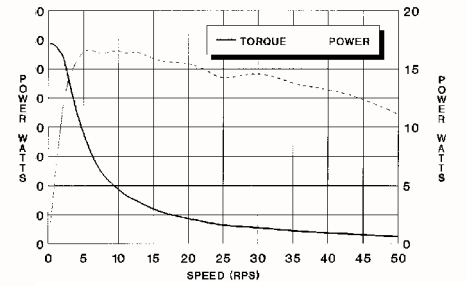
23D104
DIVIDE BY 10, CURRENT=2.0A



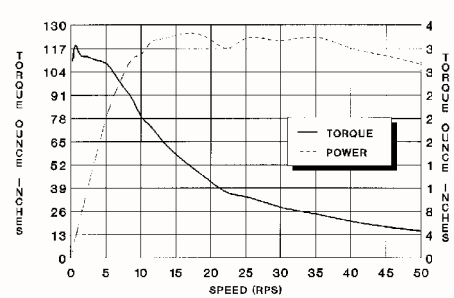
23D108
DIVIDE BY 10, CURRENT=3.9A



23D204
DIVIDE BY 10, CURRENT=1.8A



23D209
DIVIDE BY 10, CURRENT=4.7A



23D306
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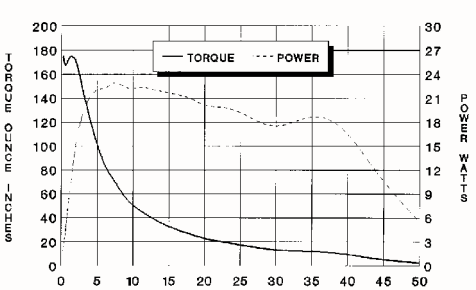

STANDARD STEP MOTOR
TORQUE/SPEED CURVES

23D309
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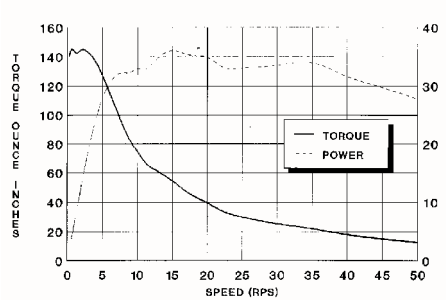

34D106
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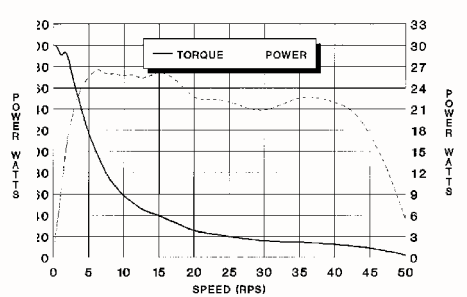

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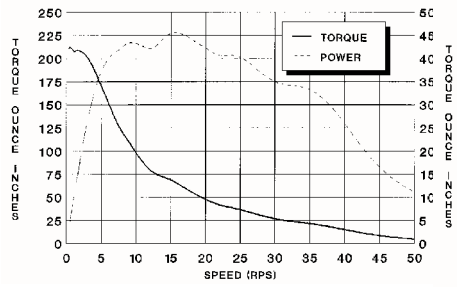

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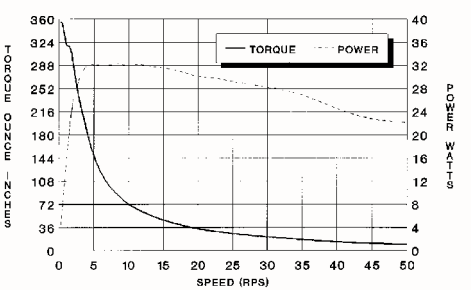

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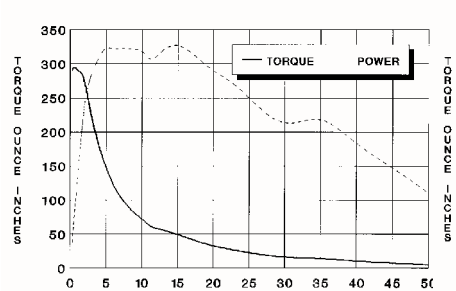
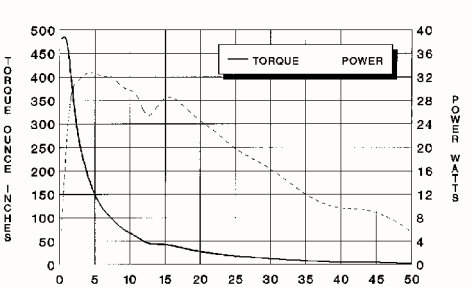


34D307S
DIVIDE BY 10, CURRENT=3.5A



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