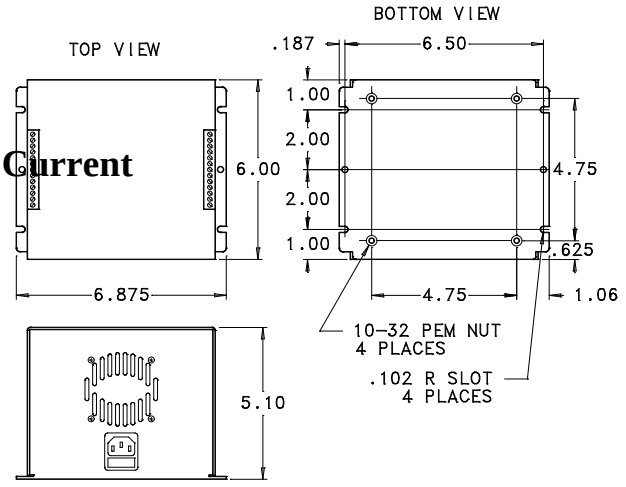
DPD72PG1
BILEVEL STEP MOTOR DRIVER PACK
With RAMPING PULSE GENERATOR



Integrated 300 Watt Power Supply
10 Amperes/phase Maximum Operating Current

7 Amperes/phase Standstill motor current
Adjustable Base and Max Speeds
Linear Ramping Pulse Generator
Half-step and Full-step Operation
Bi-level Drive Operation
No RFI or EMI problems
TTL/CMOS Compatible Inputs
Motor Turn-off Input

GENERAL DESCRIPTION

The ANAHEIM AUTOMATION DPD72PG1 Step Motor Driver Pack is designed to operate 6-lead, 4-phase step motors rated at 1 - 7 amps/phase. This Driver Pack contains a BLD72 Step Motor Driver, an AA2876 Ramping Pulse Generator, a 300 Watt transformer, and a cooling fan. Outstanding motor performance is provided by means of a Bi-level Drive technique.

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. This rapid rise of current is also referred to as the "kick" or operating current. When a desired current level is reached, 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.

Bi-level 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.

EXCITATION MODE SELECT

Users have a choice of dual-phase, full-step operation or half-step operation. Dual-phase, 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 O.9 degrees per step. Full-step operation is only suggested for applications that specifically require that mode, such as when retrofitting existing full-step systems.

STEP AND DIRECTION CONTROL

The Clock output of the AA2876 Pulse Generator is internally wired to the Clock input of the Driver board. Terminal 5 on the driver side is the Direction Input. A logic "1" on this input selects Clockwise motor direction. A logic "0" on this input selects Counterclockwise direction.

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MOTOR ON/OFF INPUT

The motor on/off input allows for de-energizing a motor without disturbing the positioning logic. After re-energizing the motor, a routine can continue. This reduces motor heating and conserves power, especially in applications where motors are stopped for long periods and no holding torque is required.

ADJUSTING KICK CURRENT

By following the silkscreen markings on the cover, use a small screwdriver to adjust the potentiometer. Line up the arrow to the number corresponding to the motor's rated current (amps/phase). The kick current is preset for 40 percent over the motor's rated amps/phase.

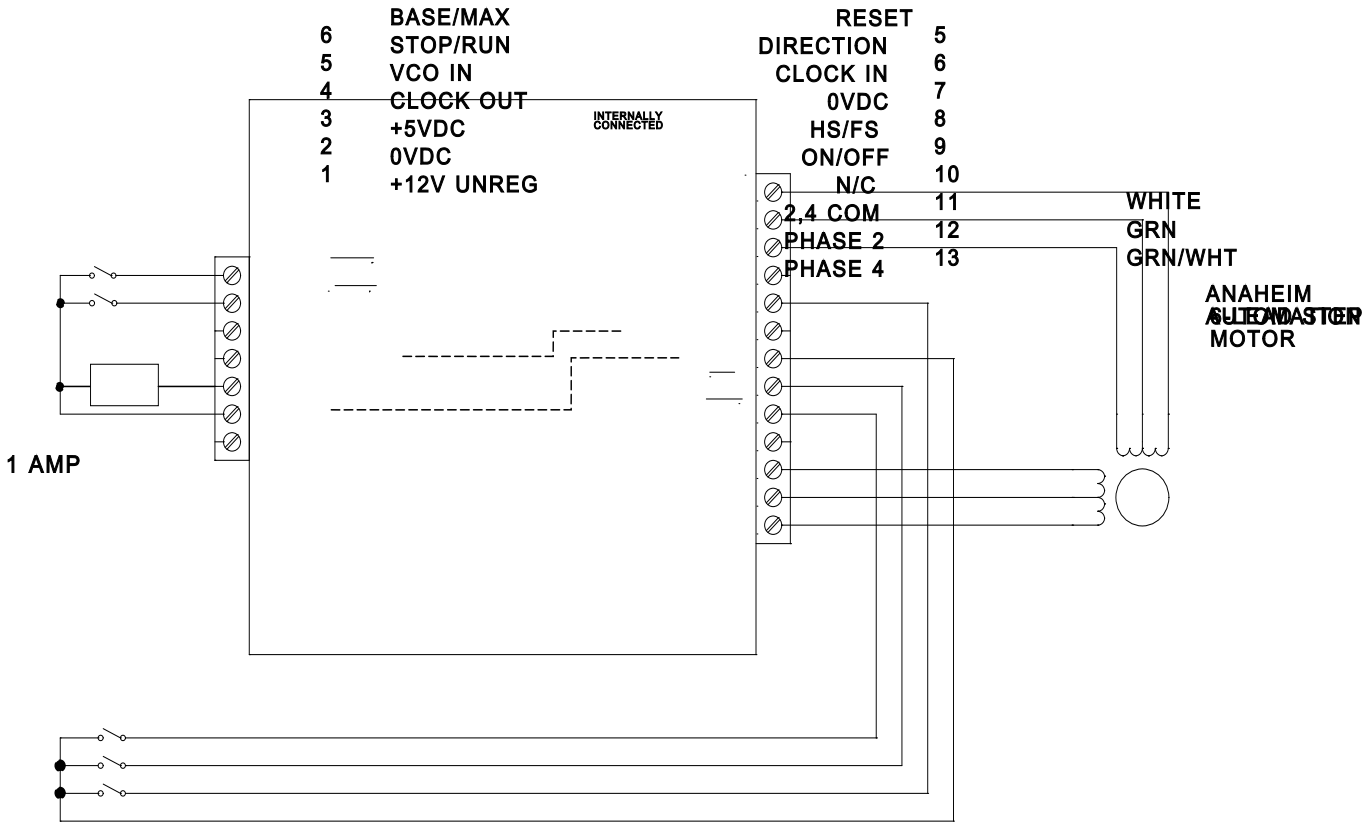
MOTOR CONNECTIONS

Figure 2 is a hookup diagram for typical DPD72PG1 driver applications. *Wiring connected to inputs must be separated from motor connections and all other possible sources of interference.*

IMPORTANT NOTE: When the wiring from the driver to the step motor extends beyond 25 feet, consult the factory.

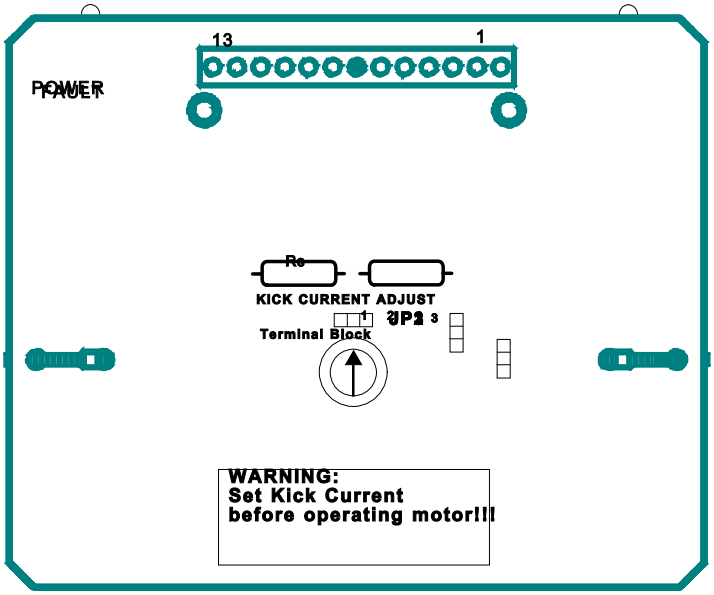
TRANSIENT VOLTAGE SUPRESSION (TVS)

The TVS diodes allow longer motor cables to be used. Normally when using long motor cables, voltage transients and spikes are created. These transients often exceed the voltage ratings of the output phase transistors, resulting in blown transistors. The addition of the TVS Diodes suppresses these transients and protects the transistors against damage.



BILEVEL DRIVER

The DPD72PG1 uses a BLD72 driver. The BLD72 has two clock options: Clock and Direction, or Dual Clock operation. Internal Terminal 5 on the BLD can be configured as the Direction Input or CCW Input by placing jumpers in the appropriate position. Pulses applied to the Clock input cause the motor to step in the clockwise direction if the Direction Input is a logic "1" or the counterclockwise direction if the Direction Input is a logic "0". Pulses applied to the CCW Input cause the motor to step in the counterclockwise direction. Either positive or negative going pulses may be used by setting jumpers in the appropriate position (See Table 1).



FUNCTION	JP1	JP2	JP3
NEGATIVE GOING CLOCKS	1-2	X	X
POSITIVE GOING CLOCKS	2-3	X	X
TERMINAL 5 = CCW	X	1-2	X
TERMINAL 5 = DIRECTION	X	2-3	X
GROUND FAULT DETECTION ENABLED	X	X	2-3
GROUND FAULT DETECTION DISABLED	X	X	1-2
STANDARD PRODUCT	1 - 2	2 - 3	2 - 3

PULSE GENERATOR

The DPD72PG1 contains the AA2876 linear ramping pulse generator (PG). The AA2876 PG has adjustable BASE and MAX speeds and independent adjustments for acceleration (ramping up) and deceleration (ramping down). It also features a VCO Input where the clock frequency produced is proportional to the voltage fed into the VCO Input. The clock pulse output of the AA2876 is an open collector type output.

SPEED RANGES

The AA2876 has an adjustable BASE speed (starting speed) and an adjustable MAX speed (running speed). There are two speed ranges that are jumper selectable. For the low speed range, the BASE speed can be adjusted from 50 pulses/sec to 500 pulses/sec and the MAX speed can be adjusted from 50 pulses/sec to 5,000 pulses/sec. For the high speed range, the BASE speed can be adjusted from 200 pulses/sec to 2,000 pulses/sec and the MAX speed can be adjusted from 200 pulses/sec to 20,000 pulses/sec. Note: it is possible to have a MAX speed that is lower than the BASE speed. The BASE speed potentiometer is on-board; the MAX speed potentiometer is external (mounted on side of chassis).

RAMPING

There are separate adjustments for acceleration and deceleration. The ramp times are adjustable from 50 milliseconds to 1.0 seconds. This is the time it takes to ramp from the lowest BASE speed to the highest MAX speed. In terms of acceleration units, the accel/decel rates are adjustable from 5,000 to 100,000 steps/s^2 on the low speed range and 20,000 to 400,000 steps/s^2 on the high speed range.

INPUTS

(See operating modes)

STOP/RUN - When this input is open or logic "1", the PG is stopped and will not output any pulses. When this input is pulled low to a logic "0", the PG will output pulses at the BASE speed rate if the BASE/MAX input is left open, or logic "1". If both the STOP/RUN and the BASE/MAX inputs are at a logic "0", the PG will ramp up and output pulses at the MAX speed rate. This input is only used in the "Two-input" operation.

BASE/MAX - This input has two functions. In the Two-input operation, this input selects either BASE speed (logic "1") or MAX speed (logic "0"). When this input changes, the PG will ramp from one speed to the other.

In the Single-input operation, this input is used to start and stop the PG (logic "1"=stop, logic "0"=run). Upon starting, the PG will start running at BASE speed but immediately ramp up to the MAX speed and keep running at the Max speed while this input is logic "0". When this input goes back to logic "1", the p.g. will either stop immediately, or it will ramp down and stop when it reaches BASE speed (depending on JP2 setting). With Single-input operation, the PG only uses BASE speed as a starting speed; it cannot run at BASE speed "for a while". The STOP/RUN input is NOT used with Single-input operation.

VCO IN - A voltage (0 to 5Vdc) can be fed into this input instead of using the MAX speeds remote POT. The AA2876 will produce a frequency that is proportional to the voltage on this input. To use this input, the BASE/MAX input must be pulled to logic "0" and the MAX Speed POT disconnected. Please note that the PG will start at BASE speed (set by the BASE speed POT) and ramp to the frequency determined by the voltage fed into the VCO Input. In most cases, it is best to set the BASE speed POT to the lowest setting when using the VCO Input. See Figure 5.

LIMITING THE MAX SPEED

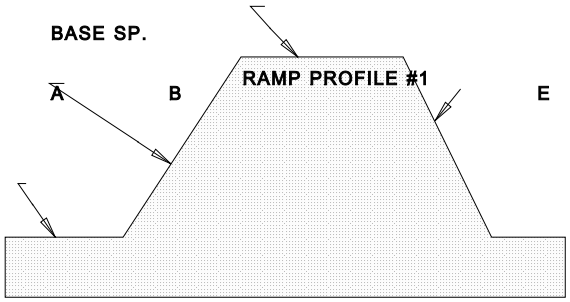
In some applications, it may be necessary to limit the MAX speed so that the operator does not run the "machine" or system too fast. The
"MAX Speed Limit" potentiometer can be adjusted to limit the top speed. Please note that this only affects the MAX speed; the BASE speed is unaffected.

+5V POWER SUPPLY

This power supply is capable of supplying up to 1.0A to other devices or circuitry. The +12V unregulated voltage may also be used for supplying current to external loads up to 1.5A. These outputs can only source a combined total of 1.5 Amps max.

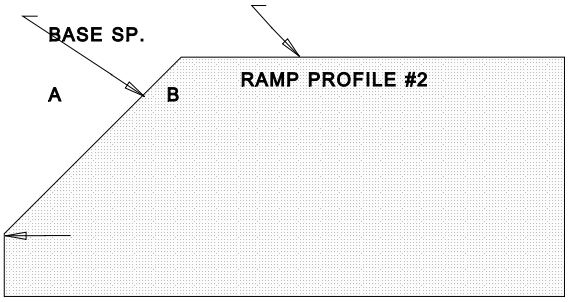
OPERATING MODES

1. TWO INPUT OPERATION - see Ramp Profile 1.
   - A. STOP/RUN is pulled low; Start at BASE speed and run for a while at BASE speed
   - B. BASE/MAX is pulled low; Ramp up to MAX speed
   - C. Both inputs are still low; MAX speed is reached (keep running at MAX speed)
   - D. BASE/MAX input is let go, or pulled high and STOP/RUN is still low; Ramp down to BASE speed
   - E. STOP/RUN is still low; BASE speed is reached
   - F. STOP/RUN input is let go, or pulled high; STOP

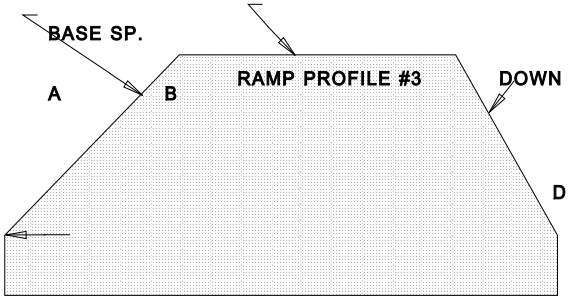


2. SINGLE INPUT OPERATION W/ NO RAMPING DOWN*
   see Ramp Profile 2.
   - A. BASE/MAX input is pulled low; Start at BASE speed and immediately ramp up to MAX speed
   - B. BASE/MAX input is still low; MAX speed is reached
   - C. BASE/MAX input is let go, or pulled high; STOP immediately

   Note: In this mode, the PG still ramps down internally even though pulses stop; so, before starting again, the operator must allow sufficient time for the PG to ramp back down to BASE speed. Also, the decel adjustment should be set for the fastest ramp down.

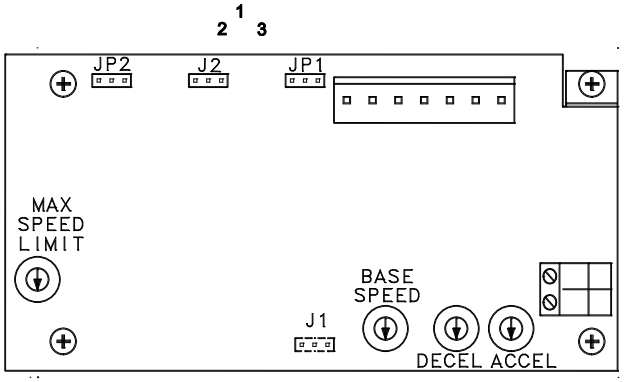


3. SINGLE INPUT OPERATION W/ RAMPING DOWN*
   see Ramp Profile 3.
   - A. BASE/MAX input is pulled low; Start at BASE speed and immediately ramp up to MAX speed
   - B. MAX speed is reached
   - C. BASE/MAX input is let go or pulled high; Ramp down
   - D. Automatically stop when BASE speed is reached.



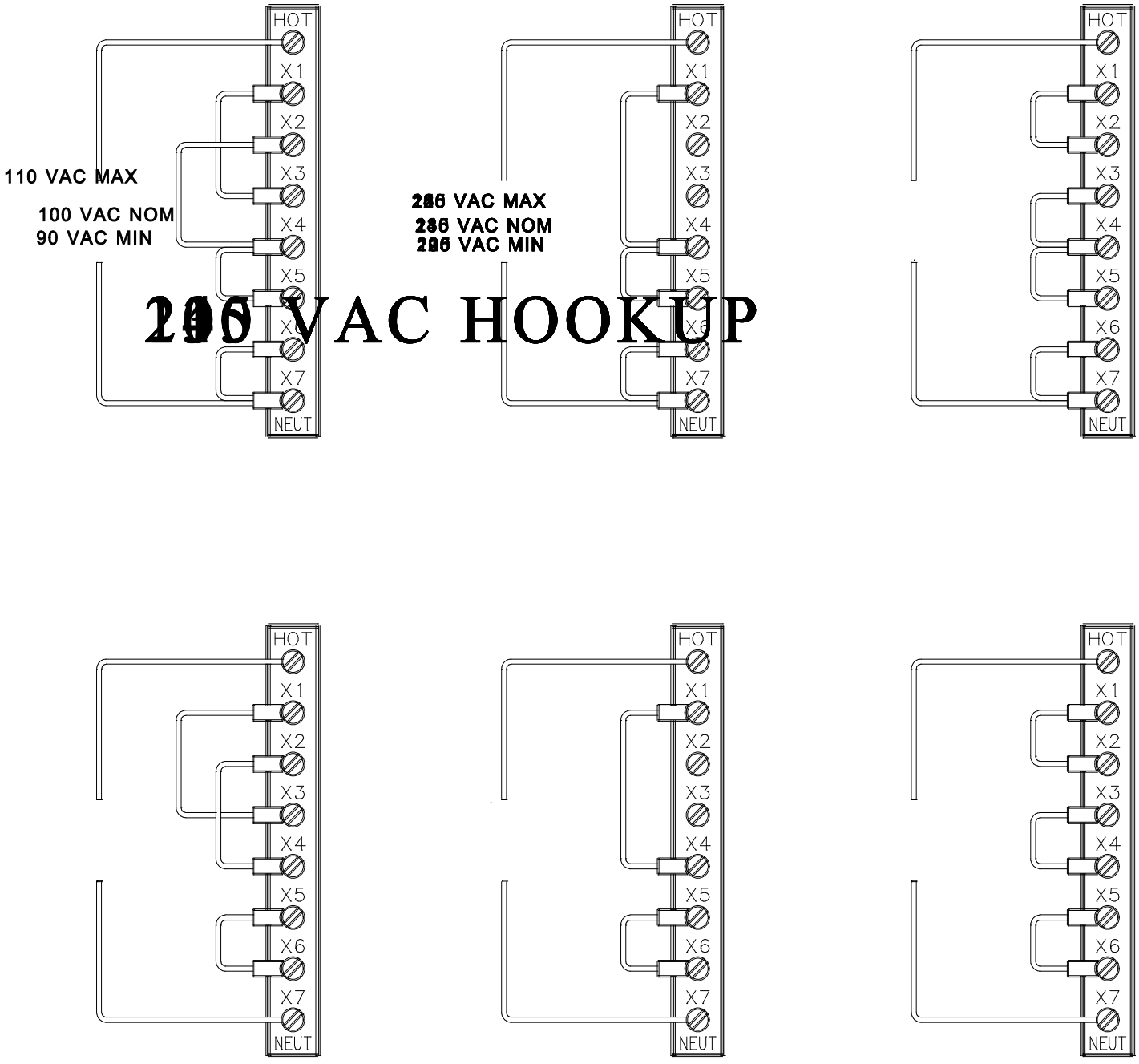
* NOTE: With single input operation, jumper JP2 is used to select RAMPING DOWN, or NO RAMPING DOWN.

Low Speed Range	1-2	-----
High Speed Range	2-3	-----
Ramp Up Only	-----	2-3
Ramp Up and Down	-----	1-2



X250A VERSIONS

The DPD72PG1 Driver Pack is available in an X250 version to accommodate power inputs other than the standard 115VAC. The X250 version can be configured to accept nominal power inputs of 100VAC, 115VAC, 130VAC, 215VAC, 230VAC, and 245VAC. Figure 4 below shows connections to the power terminals for each configuration.



DRIVER SPECIFICATIONS

Control Inputs (All): (Terminals 5, 6, 8, 9)
TTL/CMOS-compatible
Logic "O" - O to O.8 V
Logic "1" - 3.5 to 5.O V

Clock Inputs: (Terminals 5 & 6)
15 microseconds minimum pulse width required. The Clock input is internally pulled up to +5Vdc through a 1OKΩ resistor.

Direction Control: (Terminal 5)
Pulled up to +5Vdc through 10k ohm resistor
Logic "1" (open) - CW motor direction
Logic "O" - CCW motor direction

Excitation Mode Select: (Terminal 8)
pulled up to +5Vdc through 10k ohm resistor
Logic "1" - Half-step
Logic "O" -Full-step

Motor On/Off: (Terminal 9)
pulled up to +5Vdc through 10k ohm resistor
Logic "1" (open) - motor current on
Logic "0" - motor current off

Output Current Rating:
(Terminals 1, 2, 3, 11, 12, & 13)
10 Amps per phase maximum operating or running current, and 7 Amps per phase maximum standstill current. Motor phase ratings of 1.0 Amp minimum are required to meet the minimum kick level.

Power Requirement: Standard 115VAC version can accept power inputs ranging from 105VAC to 125VAC, 50-60Hz. See figure 4 for power requirements for the X250 versions.

Operating Temperature: 0 to 60 degrees C
The DPD Driver Packs contains an internal fan to create airflow through the unit. Heating considerations should include where the unit is mounted, the duty cycle of operation, ambient temperature, etc. Care should be taken so that no point on the chassis exceeds 60 degrees Celsius.

Fuse Rating:
5 Amp Fast Blow, 5x20mm
5Amp Fast Blow, 3AG for X250 Versions.

PULSE GENERATOR SPECIFICATIONS

BASE/MAX Input: pin 7, TB2
(10k ohm pull-up)
Base speed - Logic "1" or open
Max speed (single input running) - Logic "0"

STOP/RUN Input: pin 6, TB2
(10k ohm pull-up)
Stop - Logic "1" or open
Run - Logic "0"

VCO Input: pin 5, TB2
0 to 5Vdc
Input Impedance: 1Meg Ohm

PULSE OUTPUT: pin 4, TB2
Open collector, sink 100 mA

SPEED RANGES approximate:
Low: BASE SPEED 50 - 500 pulses/sec
MAX SPEED 50 - 5,000 pulses/sec

High: BASE SPEED 200 - 2,000 pulses/sec
MAX SPEED 200 - 20,000 pulses/sec

RAMP TIMES: time to ramp from lowest BASE to highest MAX
50 milliseconds to 1.0 seconds

ACCELERATION/DECELERATION RATES:
5,000 - 100,000 pulses/s^2 for the Low speed range
20,000 - 400,000 pulses/s^2 for the High speed range

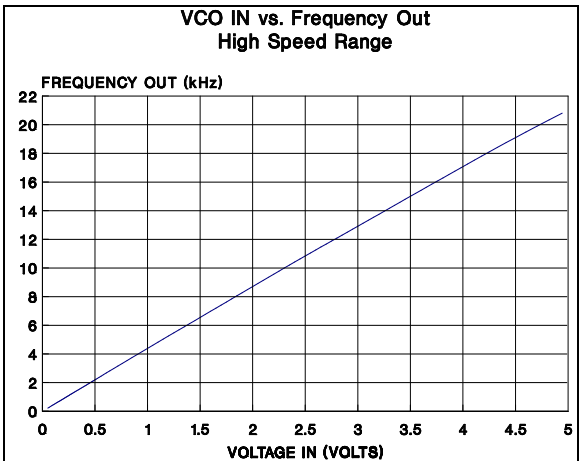
POWER SUPPLY OUTPUTS
+5VDC output: 1.0 Amps absolute maximum *
(see paragraph on +5VDC OUTPUT)

+12VDC unregulated output: 1.5 Amps maximum *

* No more than 1.5A total can be drawn from both of these outputs simultaneously.

1	AC INPUT
2	AC INPUT

1	+12V UNREG INPUT
2	0VDC
3	+5VDC
4	CLOCK OUT
5	VCO INPUT
6	STOP/RUN
7	BASE/MAX



TORQUE/SPEED CURVES

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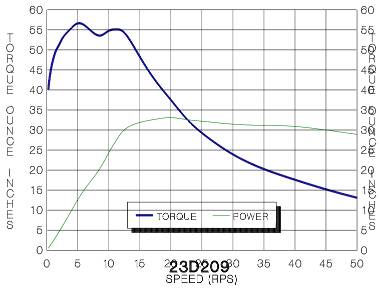

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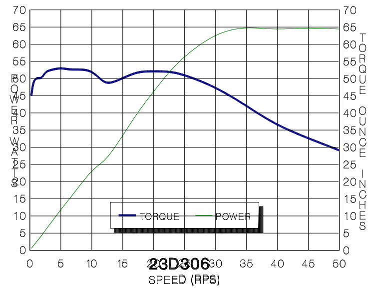

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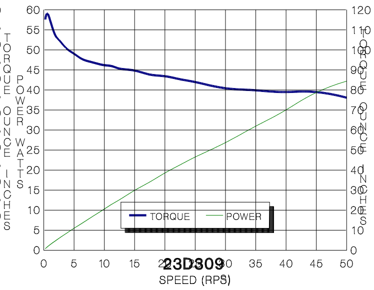

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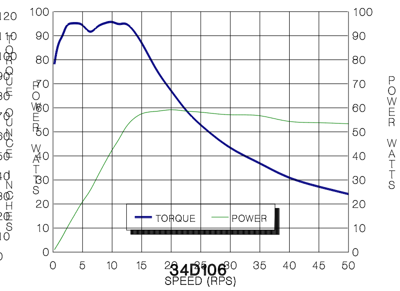

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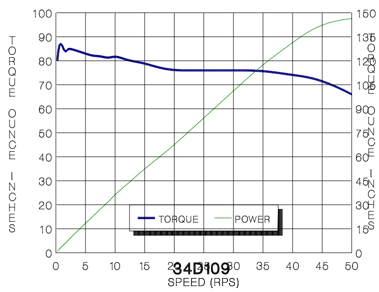

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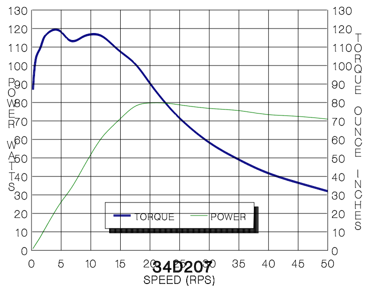

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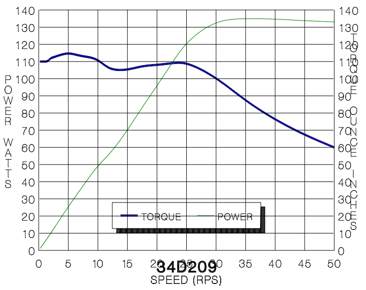

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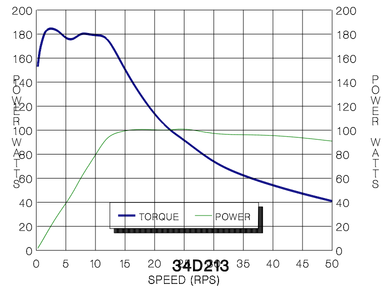

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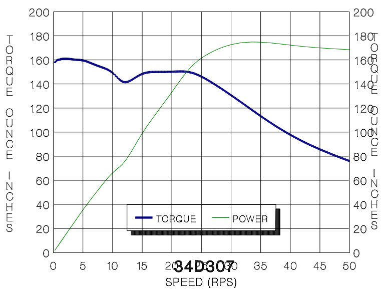

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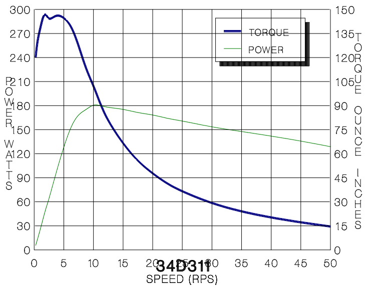

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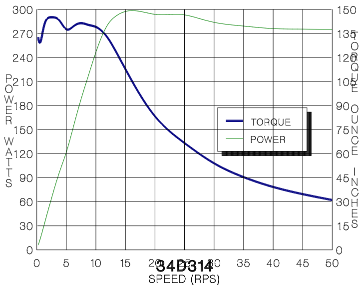

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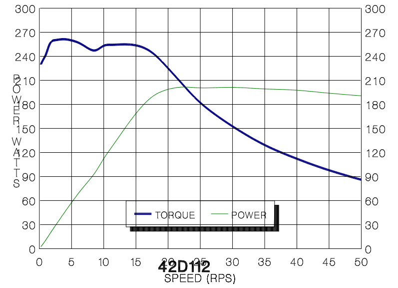

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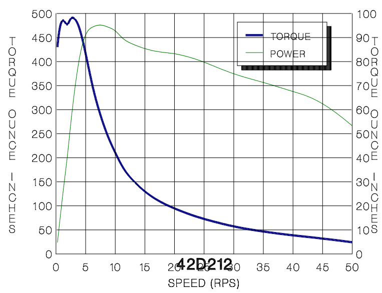

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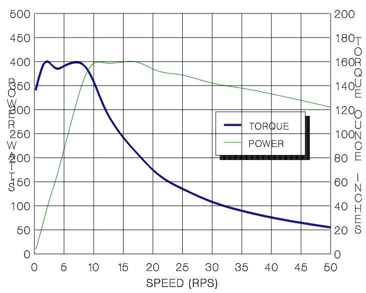

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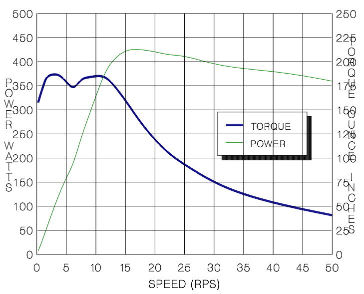

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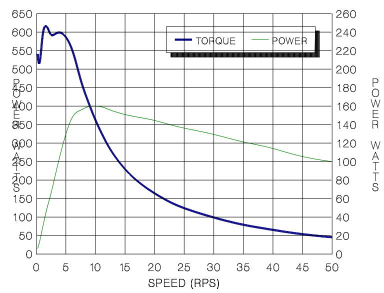

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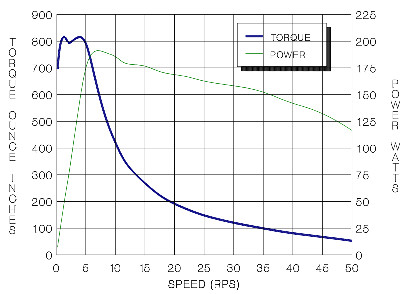

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