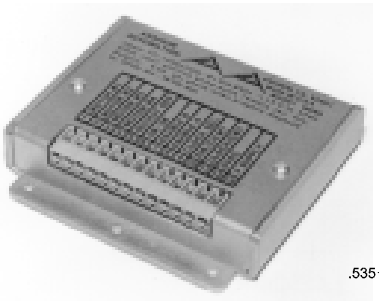
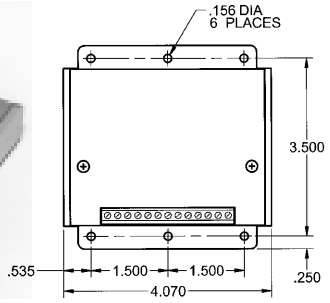
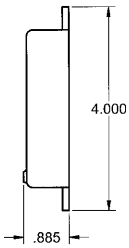
L/R STEP MOTOR DRIVER
M6R6 SERIES







- **Drives 4 Phase Motors with 5, 6 or 8 Leads**
- **Proven Reliability - Low Cost**
- **Versatile Applications**
- **Clockwise Clock with Direction Control**
- **Clockwise and Counterclockwise Control**
- **Dual and Halfstep Operation**
- **Operates Over Wide Voltage Range**
- **Motor Turn-off Provisions**
- **TTL/CMOS - Compatible Inputs**
- **Compact and Rugged Package**

L/R Drivers
This design was the basis for most older drive designs and is still used on older systems with 5 lead motors, or very high voltage (24-30Vdc) motors. It allows for full/half step operation with a dropping resistor between the supply voltage and motor to limit the current. While the L/R technique is simple and inexpensive, it is also inefficient due to the large power losses from the dropping resistor.

CLOCK PULSE REQUIREMENT
A positive or negative going pulse (or train of pulses) with a minimum pulsewidth of 15 microseconds is required to step the motor. The driver phase outputs change state and the motor steps on the leading edge of the input pulse. The maximum control pulse rate is limited by motor performance. The M6R6 driver has jumper selectable positive or negative pulse inputs.

DIRECTION CONTROL (DC)
This input is pulled up to +5 Vdc through an internal 10K ohm resistor. When the Direction Control is not connected or a Logic “1” level is applied, the motor will step in the CLOCKWISE direction when the step control pulses are applied to the Step Input. Similarly, when a Logic “0” is applied the motor steps in the COUNTERCLOCKWISE direction.

COUNTERCLOCKWISE INPUT (CCW)
This separate input for Counterclockwise clocks is jumper selectable for positive or negative pulse input. Pulses applied to this step input cause the motor to step in the counterclockwise direction.

HALFSTEP/FULLSTEP SELECT INPUT (HS/FS)
The HS/FS SELECT input is used to select either Half-Step or Full-Step operation. Half-step operation is generally preferred because this mode provides better resolution and reduces motor resonance. The motor steps in increments of half the natural step angle, e.g. in 0.9 degree steps for a 1.8 degree step motor. In full-step operation, the motor steps in 1.8 degree steps.

MOTOR ON/OFF INPUT
The Motor On/Off input can be used to turn off all four motor phases (de-energize the motor) in applications where motor detent torque is sufficient to maintain the load position. This feature can be used to reduce the load on the power supply and the heat dissipation in the driver circuitry and motor. In some multi-motor (multi-axis) applications, it is feasible to operate more than one motor and driver combination from one power supply. An example of this might be to energize only one of eight motors at one time and operate that motor. More than one motor can be operated at the same time as long as the power output rating of the power supply is not exceeded.

MOTOR DRIVER CONNECTIONS
Electrical connections to the Step (CW), direction control (DC), Counterclockwise (CCW), MODE SELECT, and MOTOR ON/OFF control inputs should be kept physically separated from the step motor connections. *Wiring from the driver to the step motor should be routed away from all other wiring.* All electrical connections are made to screw-type terminal blocks for secure and reliable connections.

POWER SUPPLY
The recommended power supply kit, part number, PSK22784N, includes a 200va transformer, diode bridge and filter capacitor. This power supply is rated at 38Vdc unloaded to 30Vdc full load, at eight amps.

ANAHEIM AUTOMATION
STEP MOTORS, DRIVES AND CONTROLS

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Specifications:

Weight	7 ounces
Inputs (All)	TTL/CMOS - Compatible Logic “0” - 0 to 0.8Vdc Logic “1” - 3.5 to 5.25 Vdc
Clock Input	Positive or negative going (jumper selectable); 15 microseconds wide minumum. Outputs change state on leading edge of clock input. Input is pulled up/down through 10K ohm resistor.
Direction Control Input	Logic “1” (OPEN) - clockwise Logic “0” - counterclockwise
Excitation Mode Input	Logic “1” (OPEN) - Half-step Logic “0” - Dual phase full-step
Power Turn-Off	Logic “1” (OPEN) - motor energized Logic “0” - motor deenergized
Power Requirement	20 - 38 Vdc. For power input voltages from 10 - 23 Vdc, special order M6R6-12 from factory. Driver requires **XX**ma or less with nominal input supply voltage of 28 Vdc, exclusive of motor.
Output Current Rating	6.5 Amps per phase, maximum, over the operating voltageand temperature range.
Operating Temperature	0 - 50 degrees C. It is recommended that the aluminum baseplate be mounted on a larger aluminum plate, or similar heat-con ducting structure, whenever possible. This will prevent the driver baseplate from heating up to a point where driver reliablity would be degraded.

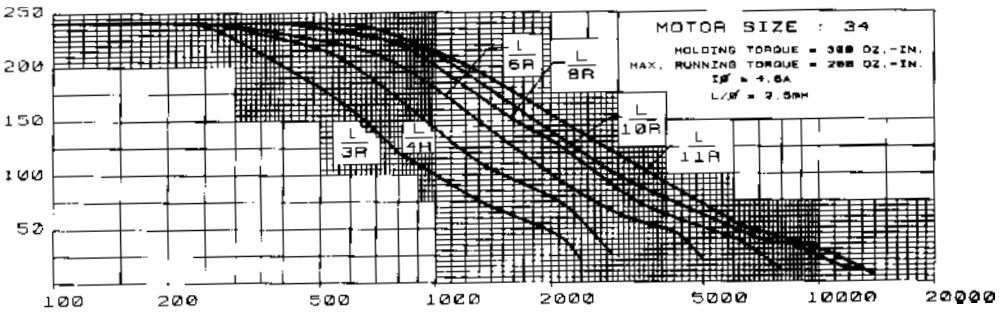
L/R DRIVE

The key factor in obtaining good overall performance (torque versus speed) in the L/R Ratio. The larger the L/R time constant, the better the performance. This fact is graghically illustrated by the curves below. If a step motor rated at 2.5Vdc is driven from a 2.5Vdc power supply (not possible with these drivers), without a series resistor, the performance would be limited. This is consideded a L/1R drive.

By increasing the drive power supply to 15VDC and adding a series resistor between the drive and motor to limit the current, the L/1R drive becomes an L/6R drive (power supply is 6 times the motor’s rated voltage).

This results in the improved L/6R speed-torque curve. Further, an even greater increase in performance can be realized by increasing the power supply voltage to 30Vdc and increasing the value of the series resistor. This would result in an L/13R drive when using the same 2.5Vdc motor and a significantly improved performance shown in the L/11R curve. L/10R is usually considered excellent. These drivers may be operated at voltages ranging from 20Vdc minimum to 38Vdc maximum.

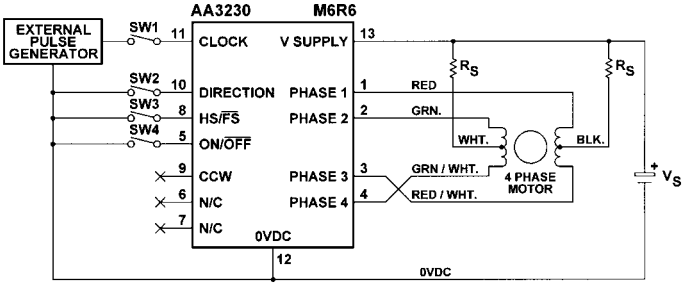
The examples given show how performance can be improved by varying the L/R time constant. The power supply voltage could be increased to higher levels; however, practical limitation of power supply size, power dissipation in the series resistors, and motor driver constraints must be considered.



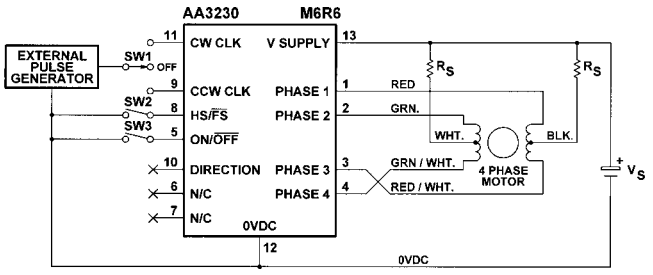
$$R_S = \frac{V_S - 1.5 - V_M}{I\phi}$$

$$P_{RS} = I\phi^2 R_S$$

Use power rating twice the calculated value



4-Phase Motor Operation using Clock and Direction Control Inputs.



4-Phase Motor Operation using Clockwise and Counterclockwise Inputs.