

## 12 volt Motor Control Board Specs.

- \* 35 amps continuous, 50 amps peak
- \* current fold back when temperature gets hot
- \* reverse polarity protected
- \* PWM output, continuously variable speed from stop to full forward and stop to full reverse.
- \* Regenerative braking
- \* Output for magnetic brake assembly coil
- \* Compact circuit board approx. 3.75" X 5.5".
- \* Utilizes 7 IRLZ34 power hexfets. 3 for motor control, 3 for regenerative braking and 1 for an optional magnetic brake coil control.
- \* Controllable manually with only 1 single component- a standard 5K linear potentiometer or by applying a control voltage between the "pot wiper" (PW) terminal and ground.
- \* Acceleration and deceleration are preset at the factory. This means that if you suddenly apply a full forward or reverse control signal your robot, wheelchair, or electric scooter will not attempt to do a "wheely". The acceleration, forward or reverse will always be smooth, yet still rapid.
- \* All you need to try it is to connect + 12 volts, a ground, 2 connections to a motor, 1 connection to a start lead and 3 connections to a control potentiometer.
- \* Controllable by a BS1 or BS2 via the PWMOUT command.
- \* All controllers are brand new. They are designed, primarily, as motor controllers for electric scooters, small golf carts, wheelchairs etc.

## 12V Motor Speed Controller Operation Notes

This H-Bridge motor controller controls the speed and direction of an attached motor with a 5,000 ohm linear potentiometer. The potentiometer is connected to the PH (pot high), PW (pot wiper) and PL (pot low) terminals on the circuit board. To limit the top speed of the motor, an optional 25K speed limiting pot may be placed in series with the center lead of the control pot which normally goes to the PW terminal on the PCB (see schematic elsewhere on this disk).

The board is energized by applying +12 volts to the "SW" terminal on the PCB. The high current B+ and B- leads can be permanently left connected without an on-off switch. The PCB draws no current until the required 12 volts is applied to the SW terminal.

Across the PH and PL terminals is a regulated reference voltage of 5 volts supplied by the PCB. This voltage is applied across the potentiometer. The potentiometer applies a divided down voltage to the PW terminal that is determined by it's position. The motor controller is designed to interpret 2.50 volts as "neutral". So, with the pot at dead center position, no motor movement occurs. When the potentiometer is moved off dead center and towards the 5 volt end of the pot, the motor moves in the forward direction. It's speed is dependent on how much toward the 5 volt source the wiper is moved. The more the voltage the faster the motor goes (to a point). Conversely, and in the same manner, if the potentiometer is moved off dead center and toward the 0 volt end of the pot, the motor will go increasingly faster in the reverse direction (to a point). The current through the potentiometer is minimal (1 ma.) so the physical size or shape of the pot is not a serious consideration and is determined by the requirements of your application.

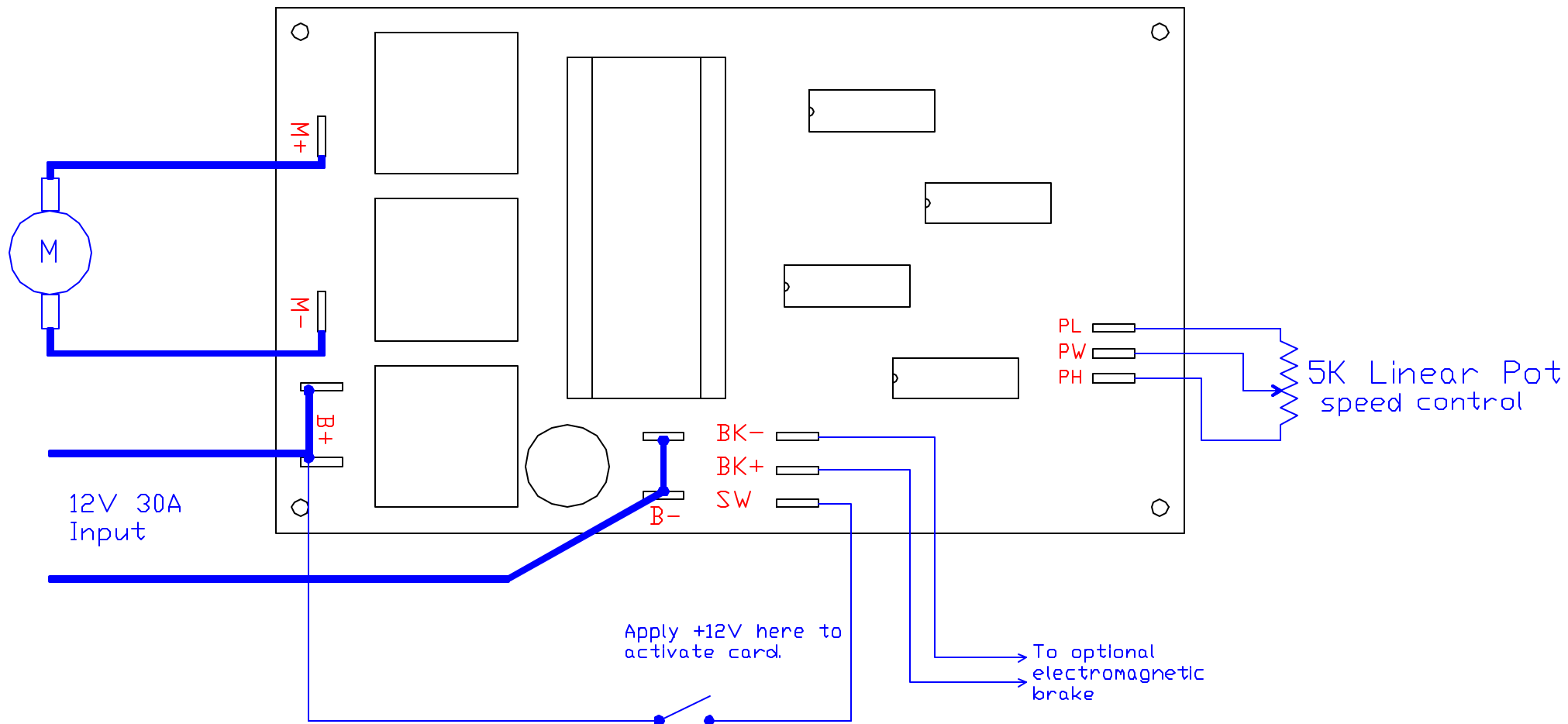
In the previous paragraph, I said "(to a point)" twice. That is because it is important to note that this motor control does not utilize the full range of the 5K potentiometer, i.e. while 2.5 volts IS neutral, 5 volts at the PW terminal is not full forward and 0V is not full reverse. This card was designed as an electric scooter motor control where the full range of operation had to be realized within a certain defined distance of center. This means that full forward is somewhat less than 5 volts and full reverse is somewhat more than 0V.

This motor control board can also be controlled by a microcontroller. To do this, you must put a 5.1k resistor across the PH and PL terminals to make the controller "think" it has a pot connected. Internal safeguards prevent the controller from working without it. A control voltage from a filtered PWM output of a microcontroller such as the Basic Stamp, PIC16F84 or D-A converter or any other device of your choice can be utilized. It must be within the voltage constraints discussed previously and is applied to the PW terminal. See other pages of Diverse Electronic Services web site for examples of how to do this as well as downloadable sample programs. It is important to be sure that the ground from the digital circuitry and the ground from the motor control circuit must be tied together.

The BK+ and BK- terminals on the PCB are for an external electromagnetic brake which is utilized by most scooters so they don't go for unanticipated joy rides. If not used, they may be left unconnected or you can connect a 12 volt light bulb which draws no more than 1/2 amp across the terminals. The light will go on & off when you operate the throttle. **DO NOT SHORT THESE TERMINALS.** Components will be damaged and this is not covered under warranty.

The motor used with this controller can be anything from a toy motor up to a motor rated at about 1/2 HP and drawing 35 amps. The controller will allow brief excursions to 50 amps or so but only for a short while. If you try to do this for a sustained time, the controller will "fold back" the current to 35 amps or less until it cools off. You can use a voltage source of up to 15 volts MAXIMUM with this card. Anything in excess of that WILL destroy components on the card. This is easily identifiable and will also void the warranty.

This card cannot be modified to work at 24 volts or higher. If your needs are for greater than 12 volts as an operating voltage, see the Diverse Electronic Services web site.



**MCIPC-12 CONNECTION DIAGRAM  
MANUAL CONTROL**