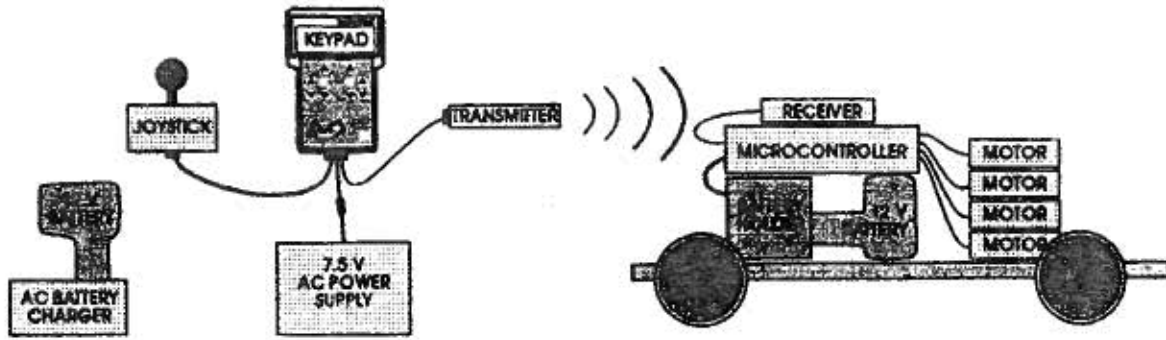


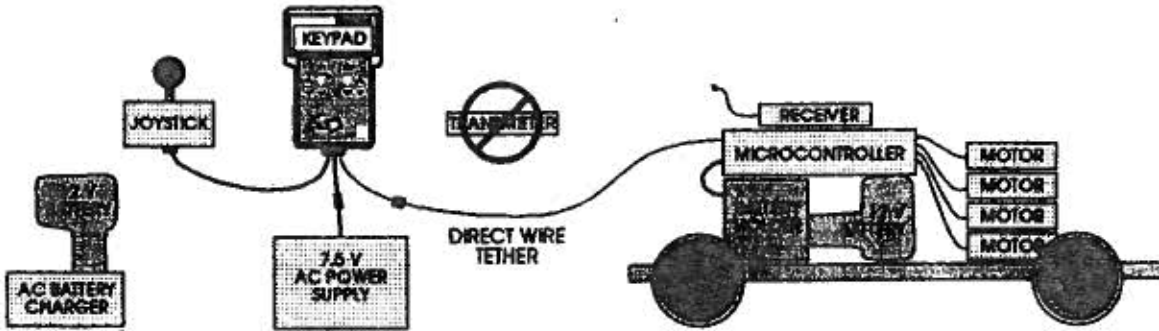
## CONTROL SYSTEM

Kits contain a Termiflex keypad controller, an 8-position joystick, a transmitter-receiver pair, a micro controller with relays, power supply, two batteries and a battery charger. There are three different modes of operating the control system as shown in a diagram on following page. While designing and building your machine at your home site, use the full wireless mode to test your machine. The controller and the transmitter is powered by an external AC power supply which plugs into the wiring harness. The control is via a RF link with the onboard receiver and a micro controller unit, powered by the battery. This mode is available to you only at your home site, because you will be the only one using the particular frequency licensed by U.S. FIRST. When your machine arrives at the competition site, the transmitter will be impounded, so as not to interfere with any other machines. While at the competition site you can test your machine using a tether. Plug one end of the tether into the wire harness (where transmitter used to be plugged in) and the other into the micro controller (disconnect the receiver first), thus establishing a direct link. While practicing or competing on the official competition fields, you will have to use the official transmitter set up at the competition. To use it, plug the cable at the team box into your wire harness (where transmitter used to be plugged in) and disconnect your power supply. The transmitter set up will supply the keyboard controller with power and it will synchronize all the transmissions to eliminate interference. The receiver on your machine needs to be plugged into the micro controller again.

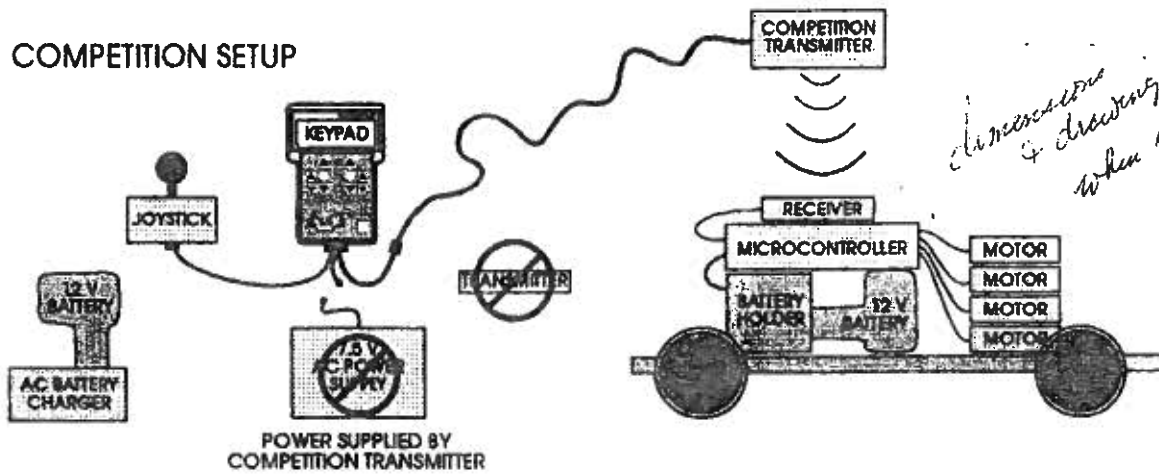
### DEVELOPMENT SETUP



### PIT AREA SETUP

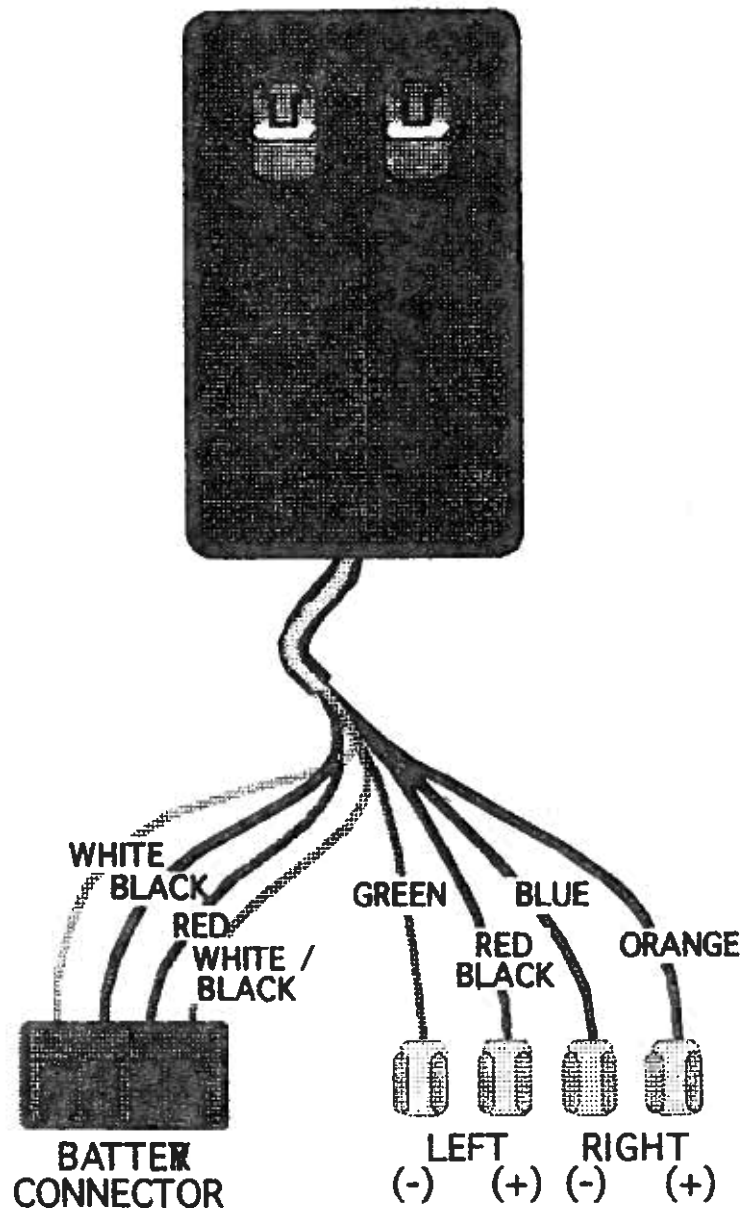


### COMPETITION SETUP

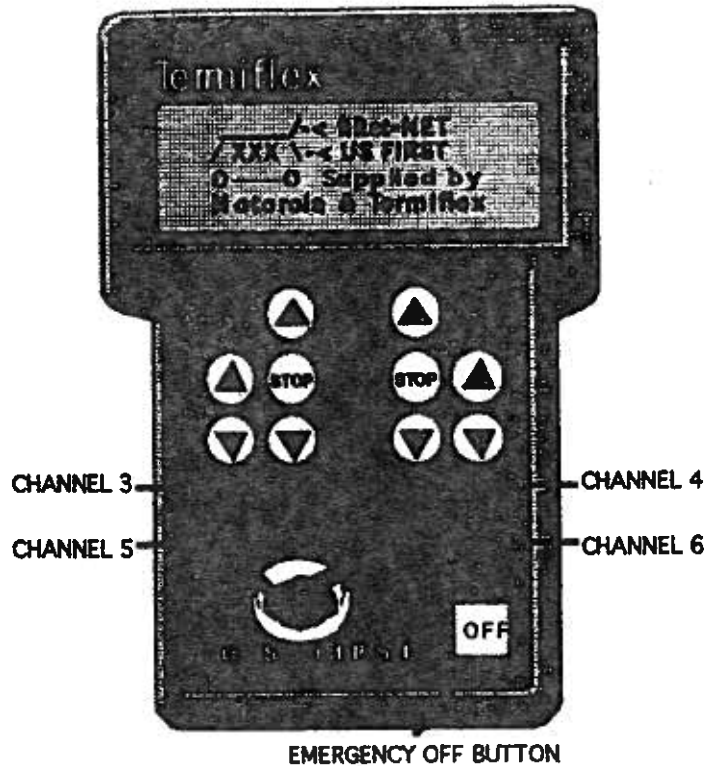


## SWITCH BOX HARNESS

Every kit is supplied with a switch box harness as shown below in the drawing. The harness may be connected to the battery holder and up to two separate motors. Using the double pole, double throw switches, the motors may be fully tested in both directions, bypassing the wireless control system. We strongly encourage the use of the wire harness during the initial components and early machine development. Using the switch harness will prevent unnecessary wear and tear of the micro controller relays and traces in case of a short circuit. If in spite of using precautions a relay is burned out, the micro controller will have to be returned to U.S. FIRST for repair.



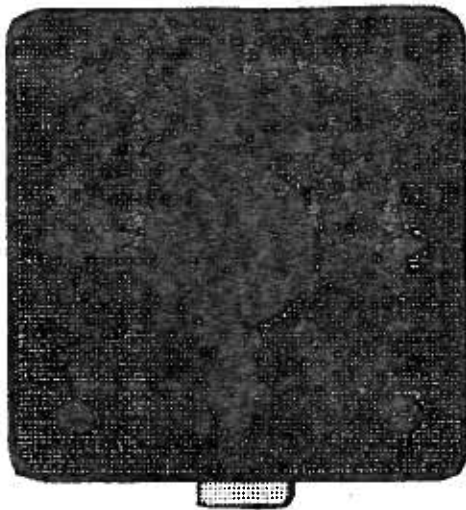
## TERMIFLEX CONTROLLER



CHANNELS 1 AND 2 ARE REVERSIBLE  
(THE ARROWS ARE MOMENTARY)

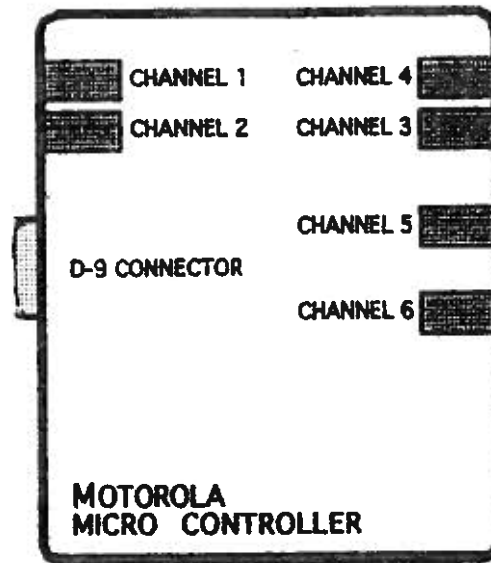
CHANNELS 5 AND 6 ARE PROPORTIONAL  
(THE ARROWS ARE MOMENTARY,  
STOP RESETS THEM TO 0)

A Termiflex keypad controller is shown above. The unit provides interface between the user and the micro controller on board of the vehicle. It is equipped with four reversible channels, each one allowing the user to turn the motor on, off or turn it in reverse. By pressing the 'up' arrow on the channel 3, the corresponding jack on the Motorola micro controller will have 12 volts across the pins, with the upper pin (red wire) being positive, and lower pin (black wire) being ground. When the 'down' arrow is pressed, the situation is reversed and now the upper pin is ground and the lower pin is power. Buttons for channels 3 and 4 are momentary switches, so when released, there is no output. Channels 5 and 6 allow the user to press the arrow keys and release, leaving the output on. The output will remain on, unless either opposite arrow key or the stop key is depressed. (You may press either arrow up to seven times, so to return back to off, you need to press the opposite arrow seven times). Pressing the 'off' button will stop transmission of any commands being sent out by the controller or the joystick, stopping all the motors on board of the machine. **NO MODIFICATION OF CONTROL KEYPAD OR ANY OTHER PART OF THE CONTROL SYSTEM IS ALLOWED.**



D-9 CONNECTOR

**JOYSTICK CHANNEL ASSIGNMENTS**



**MICRO CONTROLLER CONNECTOR LAYOUT**

To control channels 1 and 2, an 8 position joystick shown below is used. By pushing the handle forward (connector is in the back), the corresponding jack on the micro controller will have 12 volts across the pins, with the upper pin (red wire) being positive, and lower pin (black wire) being ground. Situation is reversed when the joystick is pulled back, with the upper pin becoming ground and lower pin becoming power. Same type of arrangement is on channel 2, which corresponds to the side-to-side motion of the joystick, with the red wire being power when joystick is to the right. If the joystick is moved diagonally, both channels are activated simultaneously. Hint: rotating the joystick 45° to the right and connecting channel 2 to left motor, channel 1 to right motor, a caterpillar-type control of a vehicle may be obtained. To activate different channels and directions, you need to return the joystick back to the center.