

# THE 1999 FIRST ROBOTICS COMPETITION

## TEAM UPDATE #5

Date: February 18, 1999

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### CONTROL SYSTEM TIP #1

A number of teams have asked how to use the limit switches on the robot to disable a speed controller output in the same manner that the relay outputs are controlled. This can be done through a custom control program. Below is an example of the code required to do this. The bold text indicates the required addition to an existing line in the control program.

```
Serout SSC, SSCBAUD, [SSC_CMD, PWM5, tx_pot1 MIN (127*rx_sw15) MAX (254-  
(127*rx_sw16))]
```

The above example alters the behavior of PWM output 5 by modifying the minimum and maximum values based on the state of Receiver switch inputs 15 and 16. When switch inputs are open, the corresponding variables (rx\_sw15 or rx\_sw16) are equal to 0. When switch inputs are closed, the corresponding variables are equal to 1. With a typically calibrated speed controller, a PWM output value of 0 corresponds to full reverse, 127 to off, and 254 to full forward. Thus, closing Receiver switch input 15 will prevent a speed controller connected to PWM output 5 from operating in reverse, but will still allow forward operation. Vice versa for Receiver switch input 16.

When performing the above code modification, be aware that this will not disable the ability of Receiver switch inputs 15 and 16 to affect relay output 8 as in the default control program (see Table 2.7 in The Robot). Additional control program modifications are required to selectively disable Receiver switch control over the relay outputs. Below is an example of the code required to do this. The bold text indicates the required addition to an existing line in the control program.

```
` Use 2nd 8 RX switches (rx_sw9-16) as GO switches for Relays 5-8  
relays.highbyte = relays.highbyte | (rx_sw.highbyte &~ %11000000)
```

The above example omits bits 7 and 8 of rx\_sw.highbyte (which are really bits 15 and 16 of the variable "rx\_sw" AKA rx\_sw15 and rx\_sw16) from being passed to relays.highbyte. For more information on binary numbers (%11000000), operators (&~), variables (relays), variable modifiers (.lowbyte, .highbyte) and aliases (rx\_sw15), please read the BASIC Stamp Manual.

### CONTROL SYSTEM TIP #2

A number of teams have asked how to use a switch input on the Transmitter to control a PWM output on the Receiver. This can be done with a custom control program. Below is an example of the code required to do this. The bold text indicates the required addition to an existing line in the control program.

```
Serout SSC, SSCBAUD, [SSC_CMD, PWM5, (127 + (127*sw5_fwd) -  
(127*sw5_rev))]
```

The above example alters the behavior of PWM output 5 so that it is controlled by Transmitter switch inputs 9 & 10 (sw5\_fwd & sw5\_rev). To integrate this function with the limit switch control described in Control System Tip #1, simply insert the above bold text in place of “tx\_pot1”.

When performing the above code modification, be aware that this will not disable the ability of Transmitter switch inputs 9 and 10 to affect relay output 5 as in the default control program (see Table 2.7 in The Robot). Additional control program modifications are required to selectively disable Transmitter switch control over the relay outputs. Below is an example of the code required to do this. The bold text indicates the required addition to an existing line in the control program.

```
` Set relays to match TX switch inputs  
relays = tx_sw &~ %0000001100000000
```

The above example omits bits 9 and 10 of the variable “tx\_sw” (sw5\_fwd and sw5\_rev) from being passed to the variable “relays”.

## **INSPECTION CHECKLIST**

The following checklist will be used by inspectors when performing robot inspections during Practice Day (Thursday) at each competition event. Please review this checklist now and correct any problems before shipping your robot. This will help insure that inspections take less time and help prevent the need to correct problems on-site. Please note that all items listed in the checklist are based on rules in the Competition Manual or in Team Updates and do not represent any new constraints on the design or construction of the robots.

## 1999 FIRST ROBOTICS COMPETITION INSPECTION CHECK LIST

Team # \_\_\_\_\_ Date \_\_\_\_\_  
Weight \_\_\_\_\_ (Includes battery & RNet)  
SPI Cost \_\_\_\_\_ \$425 installed on robot (verify with BOM/Price list)

- \_\_\_ Size - must fit freely in ready-to-run condition.
- \_\_\_ Team name and/or logo and number on 2 sides - 5" numerals 180deg. apart.
- \_\_\_ Changeable Alliance colors (Red & Blue) on at least 2 sides 180deg. apart. Must be at least 5" X 12" and be visible from at least 50ft.
- \_\_\_ Wheels do not damage carpet - carpet check if questionable.
- \_\_\_ Sprockets/Gears/Pulleys: total 6 or less from sources other than SPI or team built.
- \_\_\_ 12' or less of chain and/or belt from sources other than SPI or team built.
- \_\_\_ Sheets & boards (see Additional Hardware List).
- \_\_\_ No sharp objects that could harm people or damage floppies.
- \_\_\_ Springs, surgical tubing use acceptable.
- \_\_\_ Maximum of 5' latex tubing allowed to launch floppies.
- \_\_\_ Springs only from Kit or SPI.
- \_\_\_ Tekin speed controller switches set to tab side.
- \_\_\_ Tekin speed controller red PWM wire cut.
- \_\_\_ One Innovation FIRST speed controller per each Fisher-Price/van door/drill motor.
- \_\_\_ Transorbs on all Innovation FIRST speed controllers.
- \_\_\_ 60A fuse on battery (RED lead).
- \_\_\_ 30A circuit breaker in series with each drill, Fisher-Price motor, and van door motor.
- \_\_\_ Proper wire color (red/white for positive, black for negative).
- \_\_\_ #6 wire from battery to junction block.
- \_\_\_ #10 wire to Receiver relay power and Innovation FIRST speed controllers.
- \_\_\_ #16 wire to Receiver logic power, pumps, valves, window motors, Globe motors, seat motors, fan, and Tekin speed controllers.
- \_\_\_ #24 wire to switches, PWM cables, sensors, potentiometers, and LED's.
- \_\_\_ No wires in electrical contact with robot metal chassis.
- \_\_\_ 1 motor, pump, valve per relay channel. (OK: > one Speed Controller /PWM port)
- \_\_\_ Fisher-Price/van door/drill motors not on Relay channels and/or Tekin speed controllers.
- \_\_\_ Motor, pump, valve not wired directly to junction block.
- \_\_\_ Receiver, fan, optical sensor, pressure switch, and speed controller can be wired directly to junction block.
- \_\_\_ Sensors wired to Receiver sensor port only - no series connections with motors, pump, etc.
- \_\_\_ Proper use of electrical connectors and electrical tape.
- \_\_\_ No exposed electrical conductors.
- \_\_\_ No custom terminal strip.
- \_\_\_ No loose wires or material to cause entanglement.
- \_\_\_ No excess lubricants.
- \_\_\_ The BNC bulkhead connector on the robot is insulated from metal surfaces.
- \_\_\_ The Receiver LED's are visible.
- \_\_\_ The robot mounted RNet and battery are easily removable.
- \_\_\_ No tape or other adhesives used to mount receiver, joysticks, transmitters.
- \_\_\_ No illegal modification of control system components.
- \_\_\_ All pneumatics parts are from the Kit. Fittings from SPI are allowed.

Inspector initials each item when passed. A team robot passes inspection when all items are completed and signed off.