

Innovation First, Inc.

Operator Interface Reference Guide

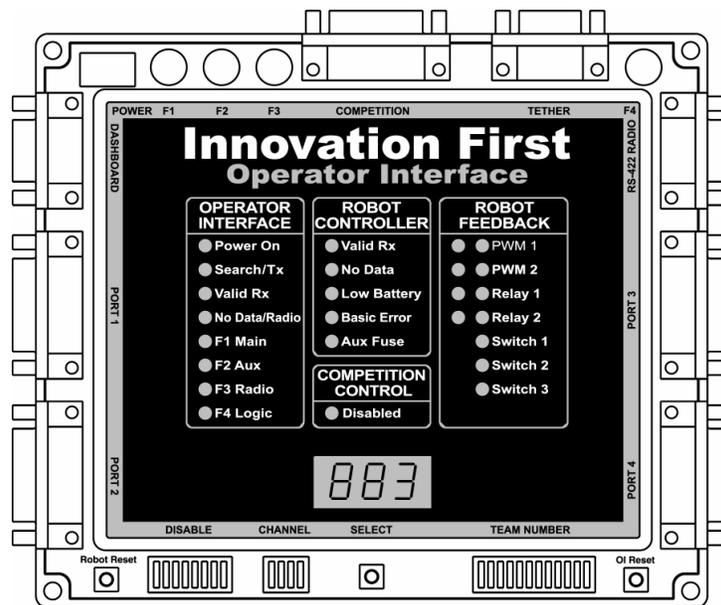
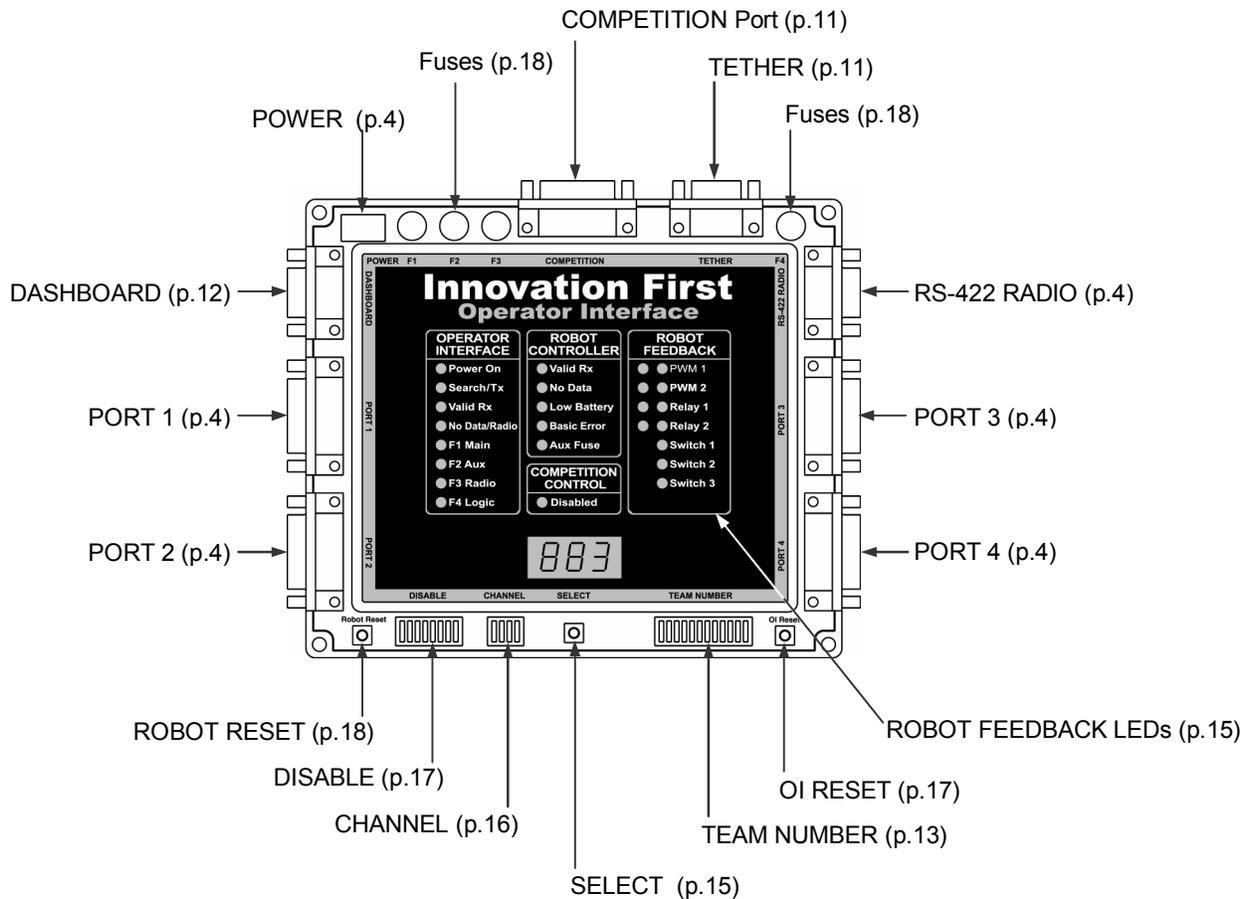


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1. Operator Interface Basics

The Operator Interface's basic function is to collect data from joysticks, buttons, and other input devices controlled by human operator(s). The data is transmitted through a Radio Modem or Tether cable to the Robot Controller. The Operator Interface also receives data transmitted from the Robot Controller, displays the data, and transmits the data out the DASHBOARD port. On new systems, the data sent out the DASHBOARD port can be switched from Received data to Transmitted data using a jumper on the Operator Interface.

The Operator Interface inputs data via PORT 1, PORT 2, PORT 3, and/or PORT 4. These ports are CH Products FlightStick compatible. The ports can also be used with custom control boxes of your own design. The four input ports have a total of 16 digital inputs for switches, 16 analog inputs for potentiometers and sensors, and 8 LED drivers for controlling external indicators.

The Operator Interface can be used with the Full-Size Robot Controller or the Isaac16 EDU Robot Controller & Motherboard.

Three ways to Power the Operator Interface

There are three ways to power the Operator Interface:

- AC Adaptor
- Tether connection to the Robot Controller
- Competition port connection on the competition field

The AC Adaptor power can be used in conjunction with Tether power. Do not use Tether power at the same time as Competition power.

The most common method to power an Operator Interface is with an AC Adaptor. This adaptor converts standard 115V 60Hz wall power to the correct voltage and provides the necessary current. Only use the AC adaptor provided with the system. When the Operator Interface and the Robot Controller are connected via TETHER ports, the Operator Interface will be powered from the robot's 12V battery. Tether power provides a means to power the Operator Interface when 115V 60Hz power is not available. Tether power is useful before or after competition rounds to check your system or collapse your robot. The Operator Interface can also be powered via the COMPETITION port. Competition power will be used at regional and championship events, eliminating the need for an AC adaptor on the competition field.

Reference Documents (available at www.InnovationFirst.com)

Size, weight, and mounting information.....	Operator Interface Installation Info.pdf
Full-Size Quick Start Guide	Full-Size Control System Quick Start Guide.pdf
EDU Quick Start Guide	EDU Control System Quick Start Guide.pdf
Dashboard port data specification	Dashboard Port Interface Guide.pdf

2. Input Power

The POWER connection on the Operator Interface is intended to accept DC power from an AC Adaptor. For information on other ways to power the Operator Interface, refer to page 3.

Warning: Only use the AC Adaptor AD48-0901500DU provided with the system. The use of any other AC Adaptor may damage the Operator Interface and will void the warranty. Additional AC Adaptors are available from Innovation First at www.InnovationFirst.com.

3. RS-422 Radio

The RS-422 RADIO port is intended to connect to the Innovation First RS-422 Radio Modem only. This port uses RS-422, instead of RS-232, to minimize noise interference in the communication link.

Caution: Do not connect any other equipment to this port.

There are two different Radio Modems provided with the system. Be sure to connect the Operator Interface to the Radio Modem that has a chrome antenna and is marked “Operator Interface.” Use a DB9 Male-Female Pin-to-Pin cable (maximum length 6 ft.) to connect the Operator Interface to a RS-422 Radio.

The chrome antenna on the “Operator Interface” Radio Modem does not extend.

4. Operator Interface Ports 1, 2, 3, and 4

The Operator Interface Port’s 1, 2, 3, and 4 are intended to provide user input. All four ports are designed to be analog joystick compatible. Each port can be split with a Y-Cable, allowing two joysticks to be connected to one port. Custom user input boxes can also be connected to one or more of these ports.

Figure 4.3.1 is an example of a four joystick configuration Page 6
 Figure 4.3.2 is an example of a two joysticks configuration and a user box Page 6
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Joysticks PORTS

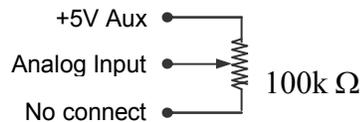
These ports are 100% CH Products FlightStick compatible. Other joysticks may be used (except during FIRST competitions), however, the joystick pinouts must be checked to ensure compatibility. The DISABLE dipswitch on the Operator Interface allows the joystick buttons to be disabled on PORT 1 and PORT 3.

Joystick Y-Cables

Y-Cables may be used to connect two joysticks to one port. This allows more functions on a custom user input box (see Figure 4.3.3). Refer to our web site (www.InnovationFirst.com) under White Papers for details on making a Joystick Y-Cable.

Analog Inputs (see pinouts on pages 7-10)

Each port provides four analog inputs. These inputs are typically connected to joysticks and potentiometers, providing an analog input ranging from 0 to 254 (in software) that is transmitted to the Robot Controller. In the event that an analog input is less than 0.05V, a value of 127 will be generated. This ensures that when a joystick is unplugged, the corresponding output on the Robot Controller will not go to a full reverse condition. Each port provides +5V Aux, used for wiring to potentiometers or other sensors. The wiring diagram for a potentiometer is shown below. Always use 100k Ω potentiometers.



Digital Inputs (see pinouts on pages 7-10)

Each port provides four unique digital inputs. PORT 2 provides access to the same digital inputs as PORT 3, allowing access to 8 digital inputs from PORT 2. PORT 4 provides access to the same digital inputs as PORT 1, allowing access to 8 digital inputs from PORT 4. To utilize these inputs, wire buttons or switches between the desired digital input signal pin and any ground pin. A digital input senses a connection to ground to become active. Do not connect switches or digital inputs to 5V. Do not use lighted switches.

LED Drivers (see pinouts on pages 7-10)

PORT 1 and PORT 3 each provide four LED output drivers. These LED drivers allow the connection of external LEDs that duplicate the function of the top eight Robot Feedback LEDs on the Operator Interface. The LED drivers provide 5V that is current limited to 10mA. Connect the LED's anode to the desired LED drive pin. Connect the LED's cathode to any ground pins.

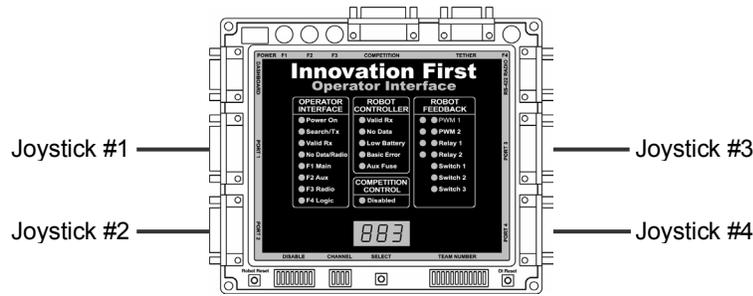


Figure 4.3.1: Operator Interface with Four Joysticks

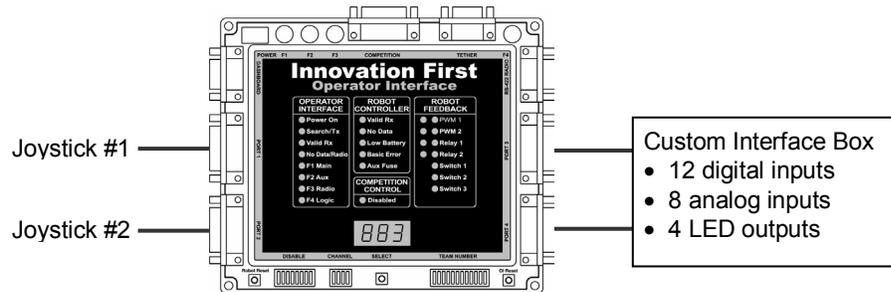


Figure 4.3.2: Operator Interface with Two Joysticks and a User Box

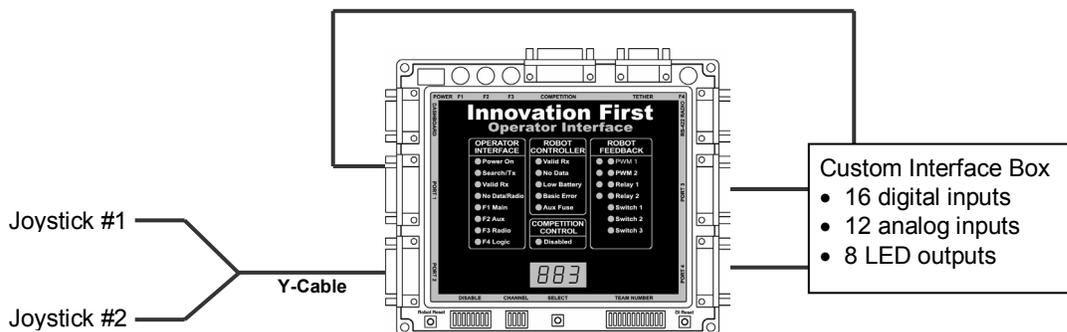


Figure 4.3.3:
Operator Interface with Two Y-Cable Joysticks and a User Box

Table 4.3.1: Port 1 Pinout and Software Function

Pin	Function	PBASIC Code Information		Disable
		Variable type	Variable Name	Dipswitch
3	X-Axis	Analog (byte)	p1_x	
6	Y-Axis	Analog (byte)	p1_y	
13	Wheel	Analog (byte)	p1_wheel	
11	Aux Analog	Analog (byte)	p1_aux	
2	Joystick Trigger Switch	Digital (bit)	p1_sw_trig	SW01 [1]
7	Joystick Thumb Switch	Digital (bit)	p1_sw_top	SW02 [1]
10	Aux Switch1	Digital (bit)	p1_sw_aux1	SW03 [1]
14	Aux Switch2	Digital (bit)	p1_sw_aux2	SW04 [1]
15	Robot Feedback LED driver [2]	Output (bit)	out8	
8	Robot Feedback LED driver [2]	Output (bit)	out9	
9	Robot Feedback LED driver [2]	Output (bit)	out10	
5	Robot Feedback LED driver [2]	Output (bit)	out11	
1	+5V Aux (Fuse F2) [3,4]			
4	Ground			
12	Ground			

Notes:

- [1] The DISABLE dipswitch on the Operator Interface
- [2] LED drivers provide 5V at 10mA
- [3] +5V Aux is to be used for potentiometers in Joysticks and custom I/O boxes.
- [4] Do not use +5V Aux for lamps or LEDs.

Table 4.3.2: Port 2 Pinout and Software Function

Pin	Function	PBASIC Code Information	
		Variable type	Variable Name
3	X-Axis	Analog (byte)	p2_x
6	Y-Axis	Analog (byte)	p2_y
13	Wheel	Analog (byte)	p2_wheel
11	Aux Analog	Analog (byte)	p2_aux
2	Joystick Trigger Switch	Digital (bit)	p2_sw_trig
7	Joystick Thumb Switch	Digital (bit)	p2_sw_top
10	Aux Switch1	Digital (bit)	p2_sw_aux1
14	Aux Switch2	Digital (bit)	p2_sw_aux2
5	same as OI Port 3 Joystick Trigger Switch	Digital (bit)	p3_sw_trig
8	same as OI Port 3 Joystick Thumb Switch	Digital (bit)	p3_sw_top
9	same as OI Port 3 Aux Switch1	Digital (bit)	p3_sw_aux1
15	same as OI Port 3 Aux Switch2	Digital (bit)	p3_sw_aux2
1	+5V Aux (Fuse F2) [1,2]		
4	Ground		
12	Ground		

Notes:

OI refers to the Operator Interface

[1] Do not use +5V Aux for lamps or LEDs.

[2] +5V Aux is to be used for potentiometers in Joysticks and custom I/O boxes.

Table 4.3.3: Port 3 Pinout and Software Function

Pin	Function	PBASIC Code Information		Disable Dipswitch
		Variable type	Variable Name	
3	X-Axis	Analog (byte)	p3_x	
6	Y-Axis	Analog (byte)	p3_y	
13	Wheel	Analog (byte)	p3_wheel	
11	Aux Analog	Analog (byte)	p3_aux	
2	Joystick Trigger Switch	Digital (bit)	p3_sw_trig	SW05 [1]
7	Joystick Thumb Switch	Digital (bit)	p3_sw_top	SW06 [1]
10	Aux Switch1	Digital (bit)	p3_sw_aux1	SW07 [1]
14	Aux Switch2	Digital (bit)	p3_sw_aux2	SW08 [1]
15	Robot Feedback LED driver [2]	Output (bit)	out13	
8	Robot Feedback LED driver [2]	Output (bit)	out12	
9	Robot Feedback LED driver [2]	Output (bit)	out15	
5	Robot Feedback LED driver [2]	Output (bit)	out14	
1	+5V Aux (Fuse F2) [3,4]			
4	Ground			
12	Ground			

Notes:

- [1] The DISABLE dipswitch on the Operator Interface
- [2] LED drivers provide 5V at 10mA
- [3] +5V Aux is to be used for potentiometers in Joysticks and custom I/O boxes.
- [4] Do not use +5V Aux for lamps or LEDs.

Table 4.3.4: Port 4 Pinout and Software Function

Pin	Function	PBASIC Code Information	
		Variable type	Variable Name
3	X-Axis	Analog (byte)	p4_x
6	Y-Axis	Analog (byte)	p4_y
13	Wheel	Analog (byte)	p4_wheel
11	Aux Analog	Analog (byte)	p4_aux
2	Joystick Trigger Switch	Digital (bit)	p4_sw_trig
7	Joystick Thumb Switch	Digital (bit)	p4_sw_top
10	Aux Switch1	Digital (bit)	p4_sw_aux1
14	Aux Switch2	Digital (bit)	p4_sw_aux2
5	same as OI Port 1 Joystick Trigger Switch	Digital (bit)	p1_sw_trig
8	same as OI Port 1 Joystick Thumb Switch	Digital (bit)	p1_sw_top
9	same as OI Port 1 Aux Switch1	Digital (bit)	p1_sw_aux1
15	same as OI Port 1 Aux Switch2	Digital (bit)	p1_sw_aux2
1	+5V Aux (Fuse F2) [1,2]		
4	Ground		
12	Ground		

Notes:

OI refers to the Operator Interface

[1] Do not use +5V Aux for lamps or LEDs.

[2] +5V Aux is to be used for potentiometers in Joysticks and custom I/O boxes.

5. Tether Port

The TETHER port is intended to connect the Operator Interface to the Robot Controller. The TETHER port passes the same data as the radios, allowing full functionality without the use of radios. A tether connection can be made with or without Radio Modems connected. The system will always use tether if it is available. When a tether connection is made, you will see the status indicators on the Radio Modems switch to Standby. Both the Operator Interface and the Robot Controller will automatically detect a tether connection and switch to tether without requiring power OFF or a reset.

A tether connection also provides power to the Operator Interface from the Robot Controllers battery. Tether power provides a means to power the Operator Interface when 115V 60Hz power is not available. Tether power is useful before or after competition rounds to check your system or collapse your robot.

Caution: This port is not intended to interface with a computer.

Use a DB9 Male-Female Pin-to-Pin cable (maximum length 6 ft.) to connect the Operator Interface to the Robot Controller.

6. Competition Port

The COMPETITION port is intended to allow control of your Operator Interface by competition organizers. Competition organizers can use the Competition port to access additional channels, provide power, and disable robot control for starting and stopping matches or for safety issues.

An adaptor cable can be connected to the Competition port allowing the 'disable robot' feature to be used anytime. This adaptor connector is not provided with the system. Details on making a disable adaptor cable are provided later in this section.

The COMPETITION port is also used to provide teams access to four additional radio channels. All Operator Interfaces default to channel 40. Access to channels 4, 13, 22, and 31 can be achieved by connecting a channel access adapter connector to the COMPETITION port. The adaptor connector is not provided with the system. Details on making a channel access adaptor connector are provided later in this section. Refer to page 16 for information on selecting additional channels once the channel access adaptor is installed.

Access to channels other than 40 will be restricted at events. Do not make the channel access jumper internal to the Operator Interface. This jumper connection is intended to be externally visible. Internal channel access jumper will be detected when you connect to the Arena Controller at FIRST Regional or Championship Events.

Competition Port Adapter

A Competition port adaptor can provide access to four additional channels and/or provide access to the Disable feature. To build this adaptor, you will need wire and the following:

- (1) DB15 Male solder pot connector
- (1) DB15 backshell
- (1) ON/OFF switch

Connect pin 12 to pin 8 to provide additional channel access. Connect pins 6 and pin 8 to the appropriate pins of an ON/OFF switch. Be sure that no other pins are shorted.

Table 4.5: COMPETITION Port Pinout

Pin	Function
12	Channel access
6	Disable
8	Ground

WARNING: The COMPETITION port has pins that connect directly to the Operator Interface microprocessor. Incorrect wiring may damage the unit and will void the warranty. This damage may not be apparent until connecting to the field at competition. Use caution and double check your wiring prior to making a connection. Always use a backshell to protect the connector's pins from ESD discharge.

7. Dashboard Port

The DASHBOARD port is intended to allow the Operator Interface to transfer data to a computer for enhanced robot feedback. The DASHBOARD port is a transmit only interface. The data transmitted out the DASHBOARD port can be selected by an OI/RC jumper located next to the DASHBOARD port. When the jumper is on the RC setting, the data transmitted out the port is the same data that is received by the Operator Interface from the Robot Controller. Likewise when the jumper is on the OI setting, the data transmitted out the port is the same data that is transmitted by the Operator Interface to the Robot Controller. Innovation First provides a Windows™ compatible Dashboard Viewer program for viewing only the RC setting data on a PC. Innovation First does not provide support for the Dashboard Viewer software or release the source code. Custom programs may be written to make use of this data.

Connect the DASHBOARD port to the RS-232 serial port of a computer using a DB9 Male-Female Pin-to-Pin cable (maximum length 6 ft.).

Refer to the Dashboard Port Data Specification available at www.InnovationFirst.com.

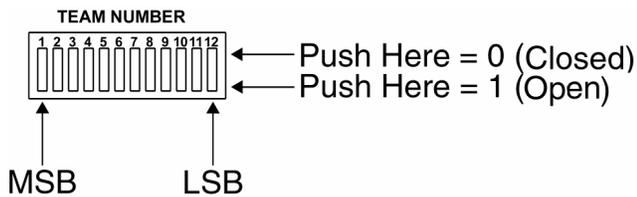
8. Setting the Team Number

A quick method of setting the Team Number without using binary is described in the Full-Size or EDU Control System Quick Start Guide.

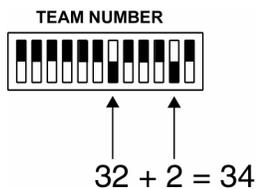
Setting the Team Number on the Operator Interface requires changing the TEAM NUMBER dipswitch settings. The Team Number is set by changing the switches to match the binary equivalent of your Team Number. The Operator Interface will update the Team Number on a 3 or 4-digit display while you change the TEAM NUMBER dipswitch. You may have to press the SELECT button several times until the Team Number is shown. The Team Number is displayed as three or four numbers only, no decimal place or letters. You can not use a team number of zero. A team number of zero is reserved for Autonomous Mode on the Robot Controller. For more information on Autonomous Mode, see the Programming Reference Guide.

Any Team Number greater than **999** will be displayed as “---“on Operator Interfaces with only a 3-digit display. The Operator Interface with a 4-digit display can show any Team Number up to **4095**.

The diagram below shows the location of the Most Significant Bit (MSB) and the Least Significant Bit (LSB) on the Team Number dip switch.



The following diagram is an example of setting the Team Number to **34**. The black areas on the Team Number Switch indicate which half of the switch is in the down position.



9. Operator Interface Indicators

Table 5.2.1: Operator Interface LEDs - Operator Interface Section

Indicator	Status	Description
Power ON	Solid	Input power is ON from AC Adaptor, Tether, or Competition port.
Search/TX	Blink	Transmitting data packets to Radio Modem.
Valid RX	Blink	Receiving data packets with correct Team Number and Channel Number.
No Data/Radio	Blink	No data packets received or bad data packets received.
No Data/Radio	Solid	Radio Modem not found. Check modem and cables.
F1 Main	Solid	Fuse F1 blown. Replace with correct value (see page 18). [1]
F2 Aux	Solid	Fuse F2 blown. Replace with correct value (see page 18). [1]
F3 Radio	Solid	Fuse F3 blown. Replace with correct value (see page 18). [1]
F4 Logic	Solid	Fuse F4 blown. Replace with correct value (see page 18). [1]

[1] Only Operator Interfaces with 3 digit displays have fuses that can be replaced.

Table 5.2.2: Operator Interface LEDs – Robot Controller Section

Indicator	Status	Description
Valid RX	Blink	The Robot Controller is receiving good data packets.
No Data	Blink/Solid	The Robot Controller is receiving bad data/no data.
Low Battery	Blink	Low battery voltage detected. Replace or recharge battery soon. Low Battery will remain blinking if the voltage ever drops below 9.0V. The Low Battery Blink threshold is user definable in the PBASIC code.
Low Battery	Solid	Low battery voltage detected. Replace or recharge battery now. Low Battery will remain solid if the voltage ever drops below 8V. [1]
Basic Error	Solid	The Robot Controller has either a PBASIC Initialization error or a PBASIC run error.
Aux Fuse	Solid	The Aux fuse on the Robot Controller is blown. Replace with correct value (see page 18).

[1] Radio communication will begin to drop out when the battery voltage drops below 8V.

10. Competition Control LED

The COMPETITION CONTROL Disabled LED on the Operator Interface has 2 functions. It can indicate that the main outputs on the Robot Controller have been disabled via the Competition port (see page 11) leaving the robot “lifeless”, or it can indicate Autonomous Mode of operation. Autonomous Mode can be turned ON by setting the team number to Zero on the Robot Controller. For more information on Autonomous Mode, see the Programming Reference Guide.

When the Disabled LED is ON solid, the Robot Controller’s PWM and RELAY outputs are disabled. The following functions are still active when the Disable LED is solid ON:

- Operator Interface inputs (joystick, buttons, etc.) are transmitted to the Robot Controller.
- PBASIC code is executing.
- PBASIC input, including Operator Interface inputs and local inputs (switches, pots, etc) are read in by the PBASIC processor.
- PBASIC output commands are still sent to, but ignored by the output processor.
- Robot Controller feedback is transmitted to the Operator Interface.

When the Disable LED is blinking, the Robot Controller is in an Autonomous Mode. The following functions are still active when the Disable LED is blinking:

- Operator Interface inputs (joystick, buttons, etc.) are transmitted to the Robot Controller in their default state(analog inputs at neutral and digital inputs disabled).
- PBASIC code is executing.
- PBASIC input, local inputs (switches, pots, etc), including Operator Interface default inputs are read in by the PBASIC processor.
- PBASIC output commands are sent to, and executed by the output processor.
- Robot Controller feedback is transmitted to the Operator Interface.
- For more information on Autonomous Mode, see the Programming Reference Guide.

Thus the Robot can move and function only from PBASIC code commands and will ignore any human input from the Operator Interface.

11. Robot Feedback LEDs

The ROBOT FEEDBACK lights on the Operator Interface represent data transmitted from the Robot Controller to the Operator Interface. The upper eight lights (PWM1, PWM2, Relay 1, and Relay 2) are user definable in the PBASIC code. The Default PBASIC Code provided with the Robot Controller utilizes these lights to display the status of PWM 1, PWM 2, Relay 1, and Relay 2 respectively.

The Switch 1, 2, and 3 indicators represent the status of the Robot Controller’s digital inputs 1, 2, and 3. These are not PBASIC software programmable.

12. Select Button and the 3/4-Digit Display

The SELECT button is used to change the 3 or 4 -digit display. Pressing SELECT will cycle the display between Robot Voltage, User Mode, Team Number, and Channel. The data displayed can be distinguished by the format used.

	3 digit	4 digit
Team Number display	000	0000
Channel display	c40	c40
Robot Voltage display	12.0	12.0
User Mode	00.0.	u000

Any Team Number greater than **999** will be displayed as “---“on Operator Interfaces with only a 3-digit display. The Operator Interface with a 4-digit display can show any Team Number up to **4095**. Refer to page 16 or the Programming Reference Guide for more info on the User Mode function.

13. User Mode

The User Mode can display any variable byte (8 bits) that is used in the PBASIC program. The default code is configured to display the Port1 Y axis. To change the variable that is display, you simply reprogram the PBASIC part with the user mode configured appropriately. Also, through software, you can change the variable that is displayed with switches, buttons, knobs...etc, to provide the human operator with a variety of feedback of critical information.

14. Channel Dipswitch

The CHANNEL dipswitch located on the Operator Interface is used to select a channel for both the Operator Interface and the Robot Controller. The Operator Interface reads the CHANNEL dipswitch on power-up or after pressing the OI RESET button. Access to channels 4, 13, 22, and 31 can be achieved by connecting a channel access adapter connector (see page 11) to the COMPETITION port and setting the CHANNEL dipswitch according to Table 5.4. The Operator Interface will default to channel 40 independent of the dipswitch setting if a competition port adapter is not detected.

The Robot Controller sets channels by scanning for the Operator Interface with the same Team Number. The Robot Controller will only scan channels on power-up or after pressing the RESET button located on the Robot Controller.

Table 5.4: CHANNEL Dipswitch Settings

1	2	3	4	Channel
X	ON	ON	ON	04
X	ON	ON	OFF	13
X	ON	OFF	ON	22
X	ON	OFF	OFF	31
X	OFF	X	X	40

ON - The switch selector is in the Down position

OFF - The switch selector is in the Up position

X - Refers to a don't care condition. The switch can be ON or OFF in a don't care condition.

Steps for changing channels:

1. Make sure a COMPETITION port adapter with channel access is installed.
2. Make sure both units (RC and OI) are set to the same Team Number.
3. Set the CHANNEL dipswitch to the desired channel.
4. Press OI RESET on the Operator Interface.
5. Press RESET on the Robot Controller.
6. Note: ROBOT RESET on the Operator Interface will not work for this.
7. After a few seconds, the "Search/TX" and "Valid RX" LEDs should be flashing on both units, indicating each is transmitting and receiving good data with the correct team number and channel number.

15. DISABLE dipswitch

The DISABLE dipswitch is used to disable buttons on joysticks connected to PORT 1 and PORT 3. Only PORT 1 and PORT 3 have joystick digital inputs that are available on another port. This disable feature is useful when a custom button box uses the same digital input as a joystick. A button on a joystick can be disabled so only the button on the box is functional. The tables below list the buttons that can be disabled.



Table 5.5.1: Disable Switches for Port 1

Port 1		DISABLE switches for Port 1	Port 4	
Pin	Button		Pin	Button
2	Joystick Trigger Switch	SW01	5	same input as OI Port 1 Joystick Trigger Switch
7	Joystick Thumb Switch	SW02	8	same input as OI Port 1 Joystick Thumb Switch
10	Aux Switch1	SW03	9	same input as OI Port 1 Aux Switch1
14	Aux Switch2	SW04	15	same input as OI Port 1 Aux Switch2

Table 5.5.2: Disable Switches for Port 3

Port 3		DISABLE switches for Port 3	Port 2	
Pin	Button		Pin	Button
2	Joystick Trigger Switch	SW05	5	same input as OI Port 3 Joystick Trigger Switch
7	Joystick Thumb Switch	SW06	8	same input as OI Port 3 Joystick Thumb Switch
10	Aux Switch1	SW07	9	same input as OI Port 3 Aux Switch1
14	Aux Switch2	SW08	15	same input as OI Port 3 Aux Switch2

16. OI Reset

The OI RESET button performs a complete hardware reset of the Operator Interface. The following are the most common uses for the OI RESET button:

- Pressing OI RESET after the CHANNEL dipswitch is changed will initiate a radio channel change. Note: If the RC was locked to the previous channel, the RC will need to be reset before a radio link can be completed.
- Pressing OI RESET is required after connecting a radio to initialize the radio. That is, if you swap a radio while the OI is operating, you must reset the OI before the radio will initialize and begin communication.

When in doubt, pressing OI RESET won't hurt.

17. Robot Reset

The ROBOT RESET button is intended to allow remote reset of the Robot Controller's BS2SX PBASIC processor. The most common use for the ROBOT RESET button is to restart the BS2SX processor in case of a programming error. The ROBOT RESET button can also be used to reset the BS2SX after a new program has been downloaded if needed.

The ROBOT RESET button on the Operator Interface only resets the BS2SX and not the entire Robot Controller. Using the RESET button on the Robot Controller or power cycling the Robot Controller are the only ways to reset the entire Robot Controller.

18. Fuses F1, F2, F3, F4

The four fuses on the Operator Interface are intended to protect the circuitry from a short circuit. In the unlikely event that a fuse blows, a LED on the front panel will indicate the fuse that failed. The most likely cause of a blown fuse is improper wiring. Prior to replacing the fuse, check your wiring for shorts or incorrect pin connections.

Be sure to only replace the fuse with the appropriate value, slow blow, TR-5 style fuse. Replacement fuses are available at the Innovation First website or from electronics vendors. If the replacement fuses continue to blow and you have thoroughly checked your wiring, contact Innovation First for further assistance.

Fuse	Protects	Value	Valid Range	Type
F1	Main	2 Amps	2.0 – 3.0 Amps	Slow Blow
F2	Aux	1.25 Amps	1.0 – 1.5 Amps	Slow Blow
F3	Radio	0.5 Amps	.50 - .75 Amps	Slow Blow
F4	Logic	0.5 Amps	.50 - .75 Amps	Slow Blow

The 4-digit Operator Interfaces do not have external fuses that can be replaced. The external fuses were removed to prevent accidental damage to the fuses, which prevented the Operator Interface from functioning properly. The 4-digit Operator Interfaces have 1 internal fuse F1, and 3 internal auto resetting circuit breakers F2 – F4. In the unlikely event that a short occurs, the corresponding LED will be illuminated. In the case of the F1 Main LED being illuminated, an internal short has occurred and the unit must be returned to Innovation First for repair. In the case of F2 – F4, the LED will illuminate showing a short condition exists. Check your wiring for shorts or incorrect pin connections. The LED will extinguish when the fault is removed and operation of the OI unit will continue as normal. If an LED continues to be illuminated and you have thoroughly checked your wiring, contact Innovation First for further assistance. Do not leave the Operator Interface powered up for any length of time while a fault condition exists.