The logo for Team Ford First is a shield-shaped emblem. The top portion is a red banner with the word "TEAM" in white, dotted, block letters. The bottom portion is a light blue field with the word "FIRST" in white, dotted, block letters. The text "Adding to the DEFAULT Program and Sensors" is overlaid in blue, serif font across the center of the shield.

Adding to the DEFAULT
Program and Sensors

by
Mr. Bob Koehl

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www.teamfordfirst.org/Events

Robot Control System Data

Download from the IFIRobotics website:

www.ifirobotics.com

Robot Control System Reference Guides

Robot Controller Documentation

Operator Interface Documentation

Robot Software System Data

Download from the IFIRobotics website:

www.ifirobotics.com

Latest version of:

[DEFAULT Program \(zip\)](#) the robot program
([DEFAULT Program Reference guide](#))

[Program Loader \(zip\)](#) to reprogram the robot
([Programming Reference Guide pg 22](#))

[Dashboard Viewer \(zip\)](#) to troubleshoot the robot
program ([DashBoard Viewer Specifications](#))

Programming Software

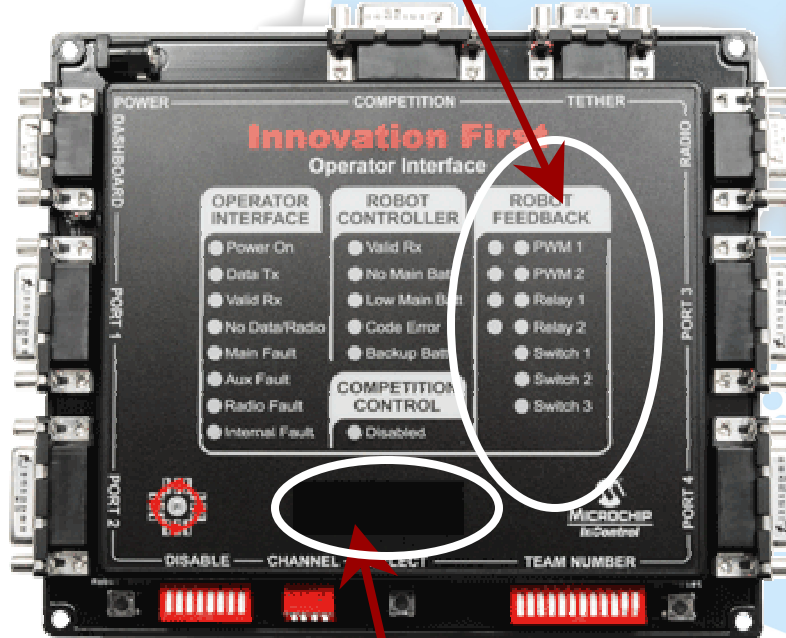
- MicroCHIP provides a "project manager" program called MPLAB_IDE which can be downloaded from the web.
- Program files are edited, saved, and compiled in the computer using MPLAB.
- The C18 Programming Language Compiler is provided to each team with the Kit of Parts.

Setup to Change DEFAULT

- "UNZIP" the DEFAULT Code
- Start MPLAB_IDE Program
- Create New Project from the DEFAULT
 - Include the date in the new Project name.
 - Copy the files from the old to the new Project.
 - Do this EVERY time a major change is made.
 - This keeps a file of the old version that worked.

Program the Operator Interface

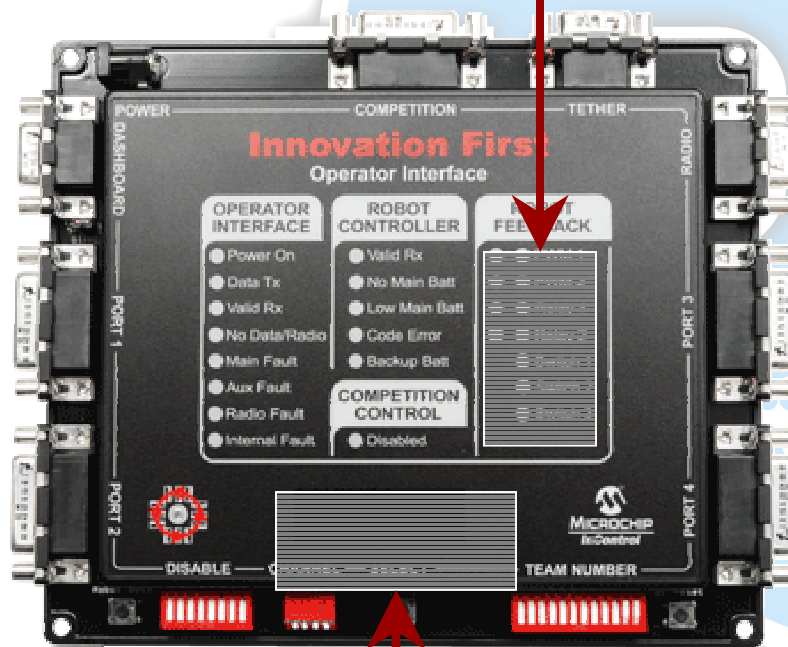
11 lights



- See [ifi_aliases.h](#) for the name of each light on the Operator Interface (OI).
- With this information we see the names of each programmable indicator on the OI on the next slide.

3 - digit display

OI Display Names



11 lights

Pwm1_red Pwm1_green
Pwm2_red Pwm2_green
Relay1_red Relay1_green
Relay2_red Relay2_green
Switch1_LED
Switch2_LED
Switch3_LED

3 - digit display
User_Mode_byte

Search the DEFAULT Program

- Find in the DEFAULT Program where the OI lights and display are programmed.
- Do a "Project Search" for " Pwm1_green"
- How would you change what it shows?
- Do a "Project Search" for " User_Mode_byte"
- How would you change what it shows?

Create new Program

- Change the 3 digit display so it shows the value being sent to pwm01.
- The program `user_routines.c` contains:
 - `User_Mode_byte = backup_voltage*10;`
 - Let's change it to the Y value of Joystick 1:
 - `User_Mode_byte = p1_y; //this makes the change`

Program Compile and Download

- Make or Build the project in MPLAB
- Fix any errors that are identified.
- Start the program IFILoader
- Select the file just created.
- Place the Robot Control in Program Mode by pressing and holding the Program Button
- Download the new program.

Confirm Program Works

- Robot Controller should automatically leave the Program Mode and begin to Run.
- Press the Mode Select Button on the Operator Interface until it displays the User_Mode_byte.
- Should be near 127
- Move Joystick 1 and observe the changes.

DEFAULT Sensors

- There are two types of sensors:
- Digital
 - Numerically either 0 or 1
 - Physically either OPEN or CLOSED, or PRESSED or RELEASED
- Includes: Limit Switches, Banner Photo Cells, Air Pressure Switch, Push Buttons on Joysticks, etc. Encoders can be 2 digital input devices.

DEFAULT Sensors

- Analogue sensors indicate the specific position of the device instead of only ON or OFF
 - Value on the Operator Interface is 0 to 255
 - Value in the Robot Controller is 0 to 1023
- Examples include: Joystick x, y, and wheel, Potentiometers (relate to degrees of rotation), Gyro (degrees/second of rotation), etc.

Operator Interface Sensors

- [ifi_aliases.h](#) defines NAMES for all of the Inputs possible from the Operator Interface
- Notice that they are named starting with either a p1, p2, p3, or p4 which indicates the desired PORT (1 through 4).
- Notice there is a **_trig**, **_top**, **_aux1**, or **_aux2** for Digital Inputs. Inputs NOT connected == 0.
- Notice that there is an **_x**, **_y**, **_wheel**, or **_aux** for Analog Inputs. Inputs NOT connected == 127.

Robot Controller Sensors

- [ifi_aliases.h](#) defines NAMES for all of the Inputs possible from the Robot Controller
- Digital Inputs are defined as **rc_dig_in01** through **rc_dig_in18**. A Digital Input with nothing connected is a 1 == OPEN
- Analogue Inputs are defined as **rc_ana_01** through **rc_ana_16**. The value when read by the controller is between 0 and 1023.



Use DashBoard Viewer

- Start the Program DashBoard_Viewer
- Connect the Program Cable to the DashBoard Port of the Operator Interface.
- Move the Jumper to show OI Data.
- Move the Jumper back to show RC Data

OI View

Dashboard
PortSettings Options About

Innovation First
Dashboard Viewer

OI Data

From OI to RC

Port	Y	X	WHEEL	AUX	TRIG	TOP	AUX 1	AUX 2	Button
PORT 1	58	97	127	68	●	●	●	●	Redefinable
PORT 2	127	127	127	127	●	●	●	●	Redefinable
PORT 3	127	127	127	127	●	●	●	●	Redefinable
PORT 4	127	127	127	127	●	●	●	●	Redefinable

PACKET NUMBER: 41

CHANNEL: 40

TEAM NUMBER: 8

Receiving Data COM1 19200

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2006

RC View

The screenshot shows the 'Innovation First Dashboard Viewer' software interface. The window title is 'Dashboard' and it has menu options for 'PortSettings', 'Options', and 'About'. The main title is 'Innovation First Dashboard Viewer' with 'RC Data' displayed in green. A red circle highlights a gear icon in the top left corner.

From RC to OI

PWM 01	54	Port 1 Y	PWM 09	127	Port 1 Wheel
PWM 02	127	Port 2 Y	PWM 10	127	Port 2 Wheel
PWM 03	127	Port 3 Y	PWM 11	127	Port 3 Wheel
PWM 04	127	Port 4 Y	PWM 12	127	Port 4 Wheel
PWM 05	86	Port 1 X	PWM 13	13	Drive
PWM 06	127	Port 2 X	PWM 14	13	Mixed
PWM 07	127	Port 3 X	PWM 15	93	Drive
PWM 08	127	Port 4 X	PWM 16	93	Mixed

LED BYTE 01	14	PWM/Relay	USER BYTE 03	128	BP Byte 3
LED BYTE 02	0	Switch 1-3	USER BYTE 04	0	BP Byte 4
USER BYTE 01	0	Redefinable	USER BYTE 05	0	BP Byte 5
USER BYTE 02	0	Redefinable	USER BYTE 06	1	BP Byte 6
			USER CMD	0	Redefinable

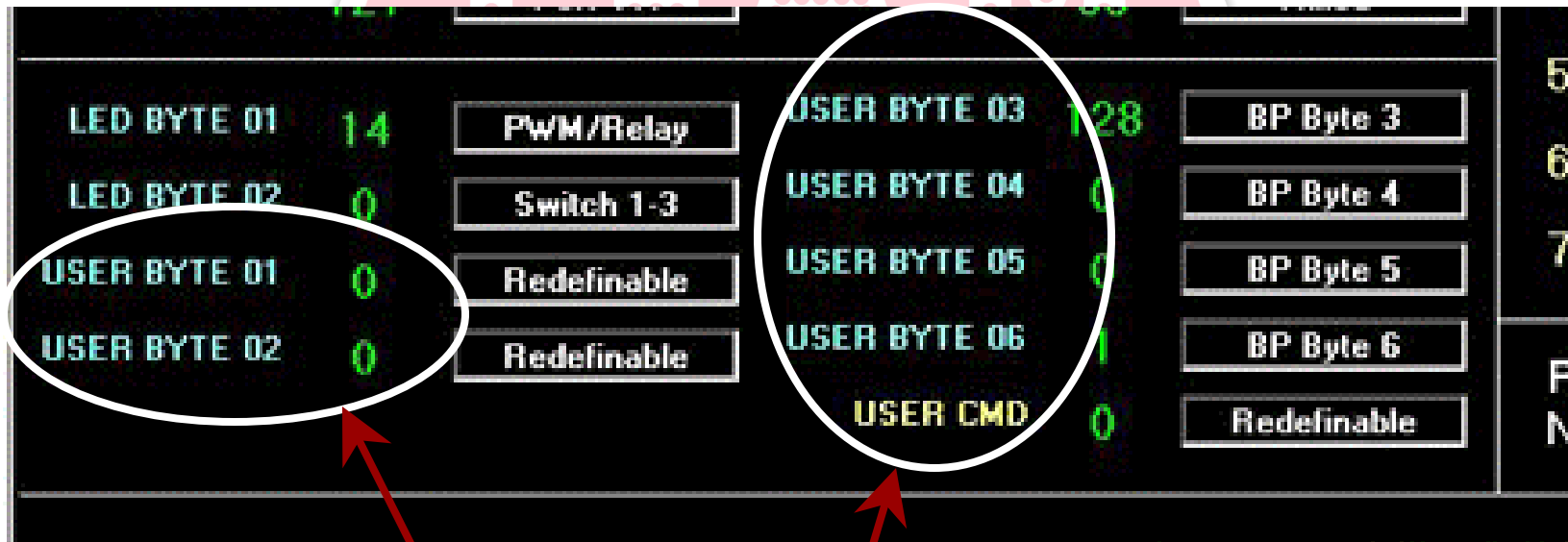
BIT	LED BYTE 01	BIT	LED BYTE 02		
0	<input type="radio"/>	PWM 1 FWD	0	<input type="radio"/>	Switch 1
1	<input checked="" type="radio"/>	PWM1 REV	1	<input type="radio"/>	Switch 2
2	<input checked="" type="radio"/>	PWM 2 FWD	2	<input type="radio"/>	Switch 3
3	<input checked="" type="radio"/>	PWM 2 REV	3	<input type="radio"/>	Redefinable
4	<input type="radio"/>	Relay 1 REV	4	<input type="radio"/>	Redefinable
5	<input type="radio"/>	Relay 1 FWD	5	<input type="radio"/>	Redefinable
6	<input type="radio"/>	Relay 2 REV	6	<input type="radio"/>	Redefinable
7	<input type="radio"/>	Relay 2 FWD	7	<input type="radio"/>	Redefinable

PACKET NUMBER	227	MASTER VERSION	9
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CHANNEL	10	TEAM NUMBER	8	BATTERY VOLTAGE MAIN	12.7	BACKUP	6.5
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Receiving Data COM1 19200

Display Additional Robot Data



Notice **User_Byte1** through **User_Byte6**.

They can be programmed to display Robot Values.

Add Robot Analogue Input

- Assume the Robot has a potentiometer wired to its Analog Input # 1.
- Use the [Programming Reference Guide](#) (page 16) we see how to read a potentiometer.
- The DashBoard Viewer can only display 8-bits so we need to program:

```
sensor1 = Get_Analog_Value( rc_ana_in01 );//read 10-bits of data
sensor1_8bits = (unsigned char)(sensor1 >> 2);
//shift the 2 lease significant bits out is the same as divide by 4
User_Byte1 = sensor1_8bits; //Display on the DashBoard
```

Make the Program Change

- Using MPLAB, add the program lines in `user_routine.c`
- "Make" or "Build" the Project.
- Fix any errors and "Make" again.
- Use IFI_Loader to Download the robot.
- Use DashBoard Viewer to verify the results.



Summary

- Today we learned where to find the DEFAULT Program, Programming and Hardware documentation, DashBoard Viewer, and the Program Loader.
- HINT: www.ifirobotics.com

The logo features a shield shape with a red top half and a blue bottom half. The word "TEAM" is written in white, dotted letters across the top. The word "FIRST" is written in white, dotted letters across the bottom. The word "Summary" is written in blue, serif font across the middle.

Summary

- Today we have learned how to find the **DEFAULT NAMES** of every connection to the Robot Controller and to the Operator Interface.
- **HINT:** `ifi_aliases.h` of the **DEFAULT** Program
- Also defined in the **OI Reference Guide** (`oi-ref-guide-2-21-05.pdf`) and the **RC Reference Guide** (`rc-ref-guide-01-31-2005.pdf`)

The logo is a shield-shaped emblem. The top half is pink and contains the word "TEAM" in white, dotted letters. The bottom half is light blue and contains the word "FIRST" in white, dotted letters. The word "Summary" is written in blue, serif font across the top half of the shield.

Summary

- Today we learned how to make different versions of our program PROJECT using the "Program Wizard" in the MPLAB program development system.
- We also learned that the C Compiler software is provided to each team with the Kit of Parts.

The logo consists of the word "TEAM" in a white, dotted, sans-serif font, set against a pink, shield-shaped background with a white border.

Summary

- Today we learned that by using the software tools we can add to the DEFAULT Program.
- We demonstrated displaying sensor values on the Operator Interface panel.
- We demonstrated displaying sensor values through the DashBoard Viewer.



November 4 and 11,
2006