

Team Ford First



Adding to the DEFAULT Program and Sensors

by

Bob Koehl

Team Ford FIRST

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Robot Control System Data

Download from the IFIRobotics website:

www.ifirobotics.com

Robot Control System Reference Guides

Robot Controller Documentation

Operator Interface Documentation

Team Ford First



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.

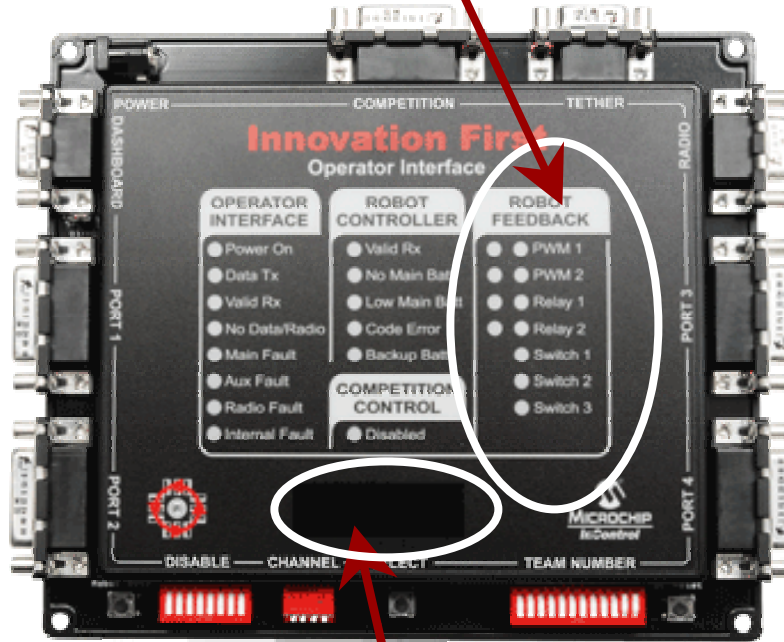


Setup to Change DEFAULT

- "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

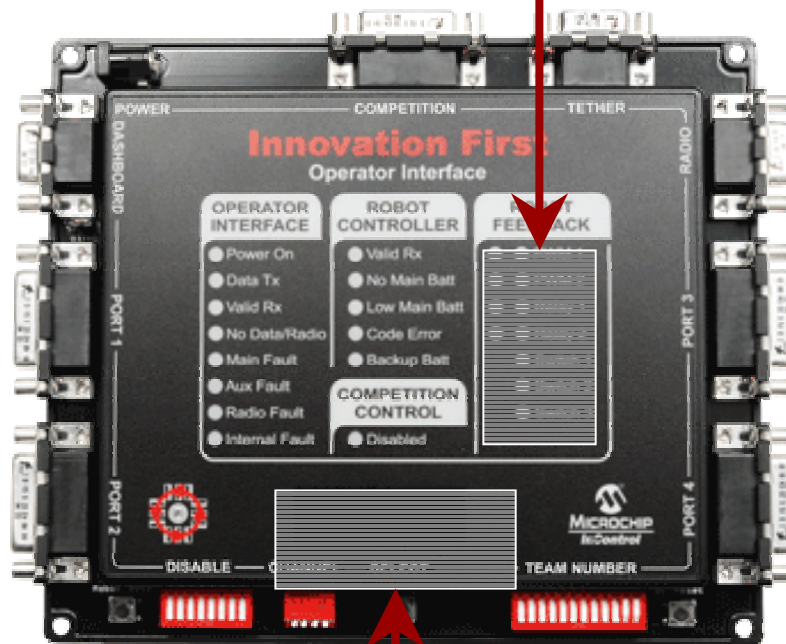
11 lights



- 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_in16. 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
- Conect 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



Dashboard
x

PortSettings Options About

Innovation First

Dashboard Viewer

OI Data

From OI to RC

PORT 1	Y	58	Redefinable	PORT 3	Y	127	Redefinable
	X	97	Redefinable		X	127	Redefinable
	WHEEL	127	Redefinable		WHEEL	127	Redefinable
	AUX	68	Redefinable		AUX	127	Redefinable
	TRIG	●	Relay 1 REV		TRIG	●	Redefinable
	TOP	●	Relay 1 FWD		TOP	●	Redefinable
	AUX 1	●	Redefinable		AUX 1	●	Redefinable
	AUX 2	●	Redefinable		AUX 2	●	Redefinable
PORT 2	Y	127	Redefinable	PORT 4	Y	127	Redefinable
	X	127	Redefinable		X	127	Redefinable
	WHEEL	127	Redefinable		WHEEL	127	Redefinable
	AUX	127	Redefinable		AUX	127	Redefinable
	TRIG	●	Redefinable		TRIG	●	Redefinable
	TOP	●	Redefinable		TOP	●	Redefinable
	AUX 1	●	Redefinable		AUX 1	●	Redefinable
	AUX 2	●	Redefinable		AUX 2	●	Redefinable

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PACKET NUMBER

40

CHANNEL

8

TEAM NUMBER

Receiving Data
COM1 19200



Dashboard
PortSettings Options About

Innovation First

Dashboard Viewer

RC Data

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

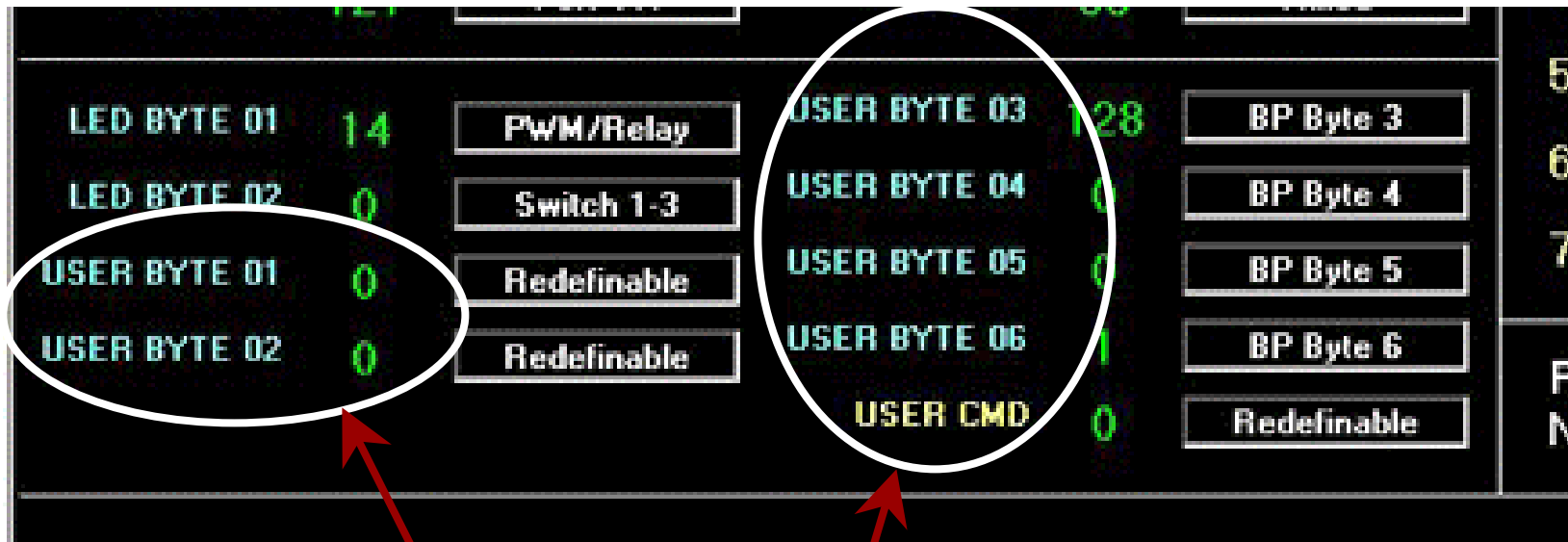
BIT LED BYTE 01	BIT LED BYTE 02
0 <input type="radio"/> PWM 1 FWD	0 <input type="radio"/> Switch 1
1 <input checked="" type="radio"/> PWM1 REV	1 <input type="radio"/> Switch 2
2 <input checked="" type="radio"/> PWM 2 FWD	2 <input type="radio"/> Switch 3
3 <input checked="" type="radio"/> PWM 2 REV	3 <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 least significant bits out is the same as divide by 2
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



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`)



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.



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.

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Questions ???