

Title		
PPM to Joystick/Serial Port Converter		
Size	Number	Revision
A4		1
Date:	14-Jul-2003	Sheet of 1
File:	C:\My Documents\16F87x Interface	Drawn By: E Brouwer

PIC 16F87x INTERFACE	
Bill of Materials	
Designator	Part Type
R1	2K2
R2	100K
R3	100K
R4	100K
R5	33K
R6	47K
R7	470R
R8	1K5
R9	100K
R10	100K
R11	100K
R12	100K
R13	100K
R14	100K
R15	100K
R16	100K
R17	100K
R18	10K
R19	10K
R20	10K
R21	10K
C1	15p
C2	15p
C3	0.1uf
C4	22uf
D1	5V6
D2	LED1
Q1	BC109
Q2	BC179
Q3	BC109
Q4	BC109
Q5	BC109
Q6	BC109
U1	PIC16F873-04
U2	AD5204B100
X1	CrYstal, 4MHz
P1	HEADER 2 PIN
P2	DB15 Male
P3	DB9 Female
S1	SWITCH PCB
S2	PCB Microswitch
S3	PCB Microswitch
S4	PCB Microswitch
S5	PCB Microswitch

PIC 16F873 Config

Configuration Bits			
Address	Value	Category	Setting
2007	3D72	Oscillator	HS
		Watchdog Timer	Off
		Power Up Timer	On
		Brown Out Detect	On
		Low Voltage Program	Disabled
		Flash Program Write	Disabled
		Background Debug	Disabled
		Data EE Read Protect	Off
		Code Protect	Off

PIC 16F873A Config

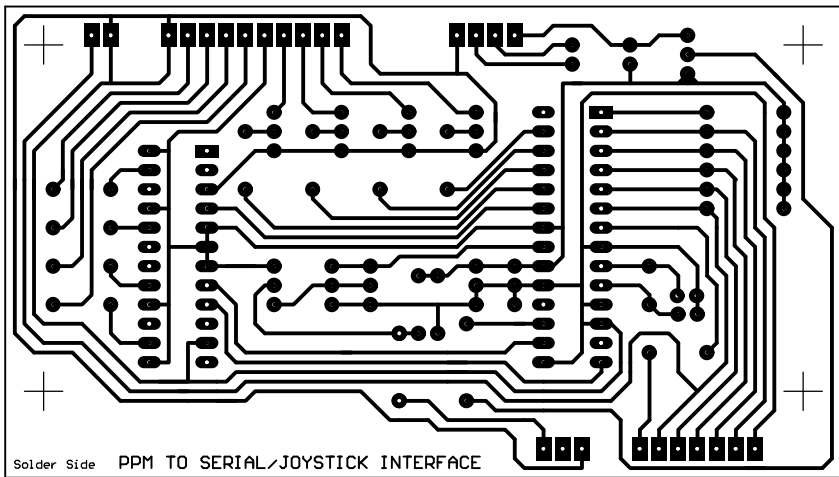
Configuration Bits			
Address	Value	Category	Setting
2007	3F72	Oscillator	HS
		Watchdog Timer	Off
		Power Up Timer	On
		Brown Out Detect	On
		Low Voltage Program	Disabled
		Flash Program Write	Write Protection Off
		Background Debug	Disabled
		Data EE Read Protect	Off
		Code Protect	Off

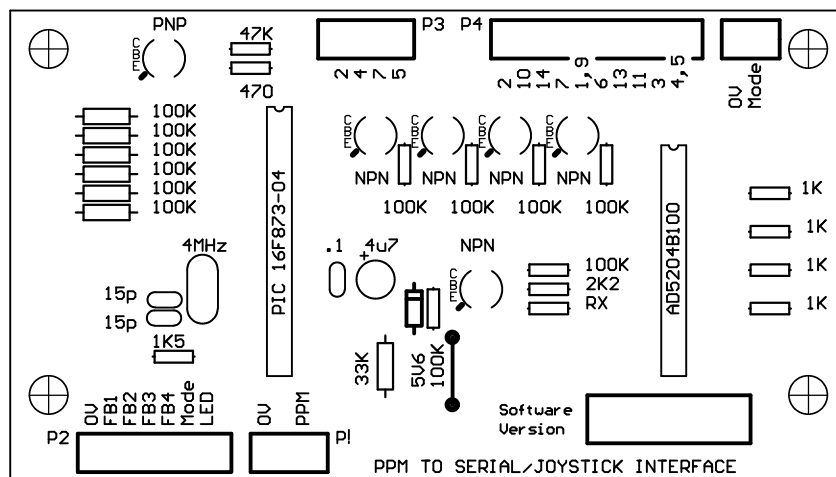
PIC 16F876 Config

Configuration Bits			
Address	Value	Category	Setting
2007	3D72	Oscillator	HS
		Watchdog Timer	Off
		Power Up Timer	On
		Brown Out Detect	On
		Low Voltage Program	Disabled
		Flash Program Write	Disabled
		Background Debug	Disabled
		Data EE Read Protect	Off
		Code Protect	Off

PIC 16F876A Config

Configuration Bits			
Address	Value	Category	Setting
2007	3F72	Oscillator	HS
		Watchdog Timer	Off
		Power Up Timer	On
		Brown Out Detect	On
		Low Voltage Program	Disabled
		Flash Program Write	Write Protection Off
		Background Debug	Disabled
		Data EE Read Protect	Off
		Code Protect	Off





PPM to PC INTERFACE

Designed by Eric Brouwer

The R/C interface was developed to allow you to connect your radio directly to your PC, using the joystick port. On almost all new PC's, the joystick port can accommodate up to four axes, and four buttons. As most planes only need a maximum of four channels to fly (throttle, ailerons, elevator and rudder), this makes for an ideal port to connect up your radio.

Joystick Interface (15 pin plug)

The interface works on the principle of converting channels 1 – 4 from your radio, to a signal that can be used to simulate two normal PC joysticks. Channels 5 – 8 on your radio (if present, but not required) are used to control the four fire buttons that will normally be present if two joysticks were connected to your PC. The interface updates the joystick port every 22 milliseconds, which is the same rate your plane's receiver will receive the signal from your radio. Thus, all stick movements are seen by your PC at the same interval your plane does.

By making use of the joystick port, you can use your R/C radio to play any simulator or game that can be controlled with a joystick. The interface has been tested on several PC's using RealFlight R/C Simulator and Flight Model Simulator (FMS). You can even use the interface on the old DOS simulators, as long as the software supports a joystick.

There is one drawback from using the joystick port, and that is the way that the port itself works. Although you have total control over your plane, you might notice that there are slight changes on the controls, without you changing the stick positions on your radio. This can be seen when checking the calibration of your controller. Even after calibrations, you might notice that there are some movement on the four axes. This does not mean that your interface is not working, or that your radio is faulty. This is caused by the joystick port, and might vary between different types and/or speeds of PC's.

FMS Serial Interface (9 pin plug)

A very nice simulator, available freely on the Internet, is Flight Model Simulator, or for short, FMS. This simulator has a further option of using different types of interfaces, varying from printer ports to serial ports. All these interfaces work, but not as smooth as one would like it to be. I have designed this interface to also accommodate the FMS PIC-interface, which make use of a serial port. This interface works excellent, as the PC no longer has to decode the R/C radio signal. Instead, the PIC interface transmits its data once every 22 milliseconds to the PC in serial data format.

Interface baud rate

The interface can be programmed to work on 9600 baud or 19200 baud. Although the latest version of FMS Version 2 Beta 7 works on both settings, older versions of FMS only supports 9600 baud. For this reason, I have decided to include both options on the interface.

- To program the baud rate, make sure the transmitter is NOT connected to the interface (The LED on the interface should be off).
- Press any button for less than 1 second. The LED will indicate the current baud rate by flashes. 1 Flash indicates 19200 baud mode, 2 flashes indicate 9600 baud mode.
- To change the mode, press and hold the mode button on the back of the interface. The LED will indicate the current mode, and after 2 seconds, will change the mode. When the LED stays on, release the button. The mode has been programmed.
- After changing the baud rate, please ensure that the interface is set up correct under FMS.

Using the interface

To use the interface, simply plug the 15-pin plug into your PC's joystick port, and set up the interface as described in details later in this document. If you are going to use Flight Model Simulator, you have the option to set up the interface using the joystick port, or the serial port. Both options are also explained in detail. If you intend using the FMS serial interface and the joystick port, no problem. You can use any one of the two interfaces, or both. As long as at least one cable is connected to the PC.

Connect your R/C radio to the interface using the trainer socket on the radio. Remember to leave your R/C radio switched off at all times when connected to the interface. With your radio switched on, the interface might not work, as the signal from the radio will not be routed to the trainer socket. Refer to your radio's manual. If you do switch on your R/C radio, do not panic, as the interface or the radio will not be damaged.

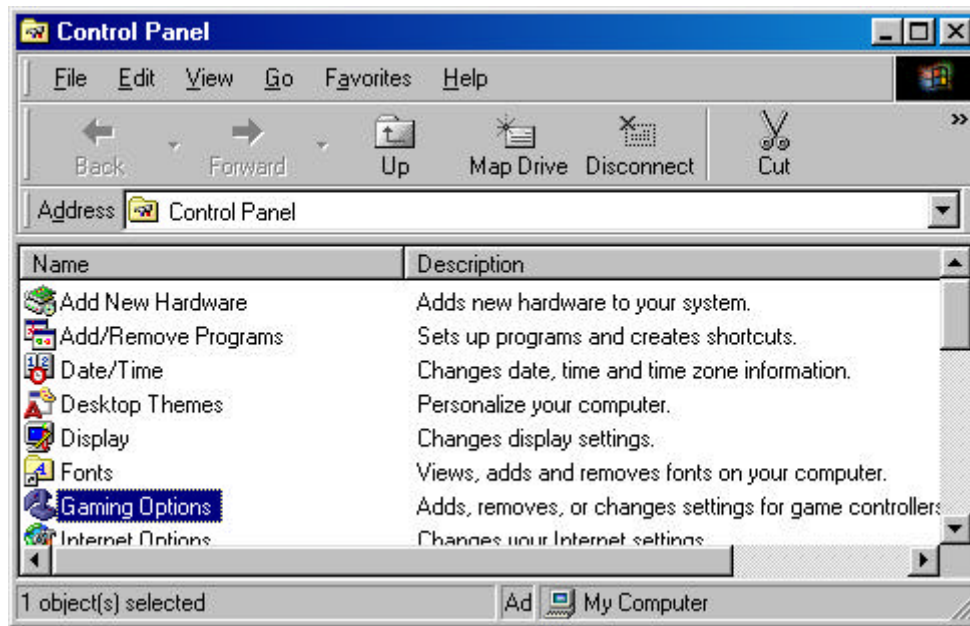
When you connect your radio to the interface, the LED in the interface will turn on, indicating that the radio signal is present. If you are only using the serial interface (9 pin plug), you might need to start FMS first, as the simulator needs to set up the serial port first for the interface to work. This setup is done automatically by FMS.

After you have calibrated the interface, leave all sticks in the centre position, with throttle fully closed. Press the button on the back of the interface to store this stick positions. This is only required once. This will ensure that if you unplug your radio from the interface, the interface will simulate all outputs (serial and joystick ports) to this radio positions. This will prevent your plane from flying off on it's own when you unplug your radio.

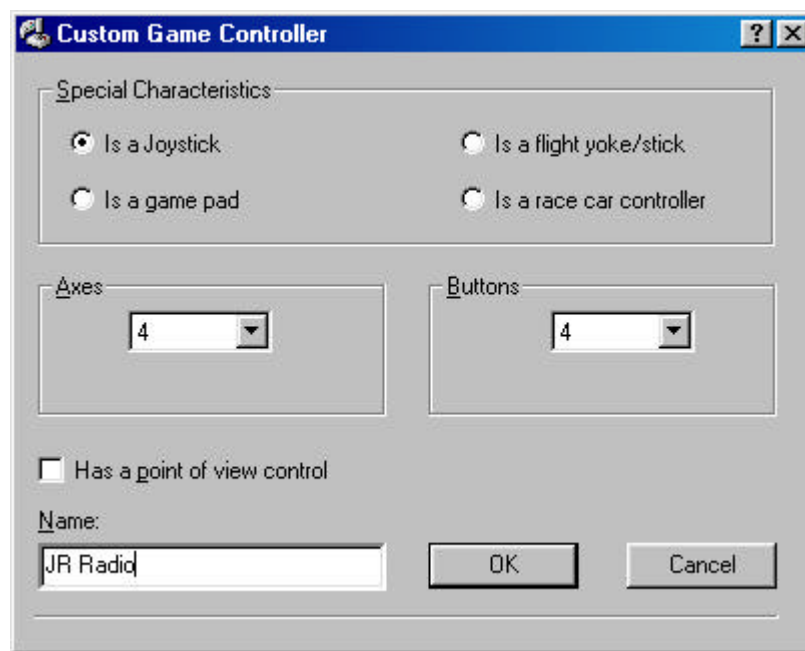
Happy flying...

TO CONFIGURE YOUR INTERFACE WITH THE JOYSTICK PORT

From the Windows Start Menu, select Settings, then Control Panel. Once in Control Panel, select Gaming Options.

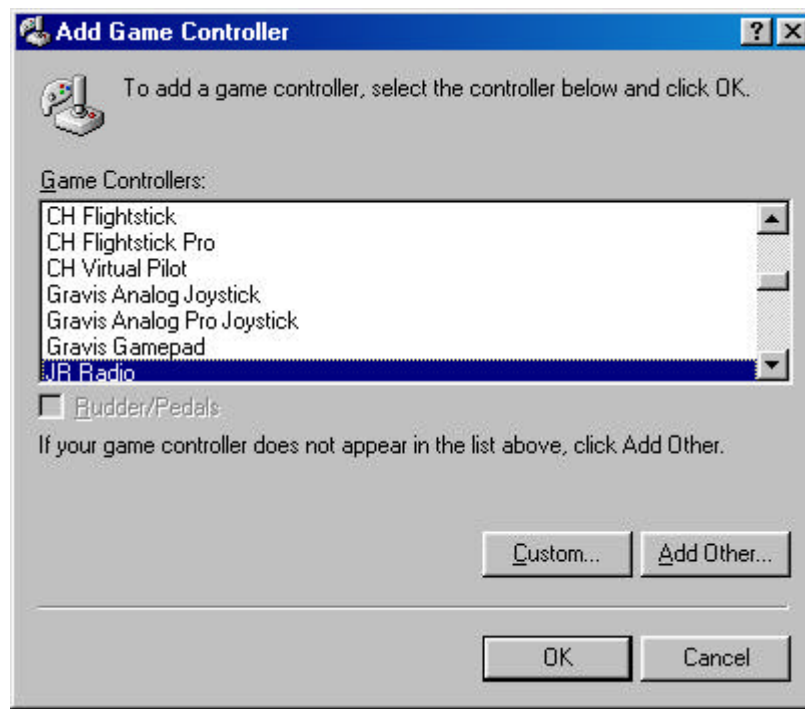


In Gaming Options, click on the Add button, then on the Custom button. The following screen will appear.

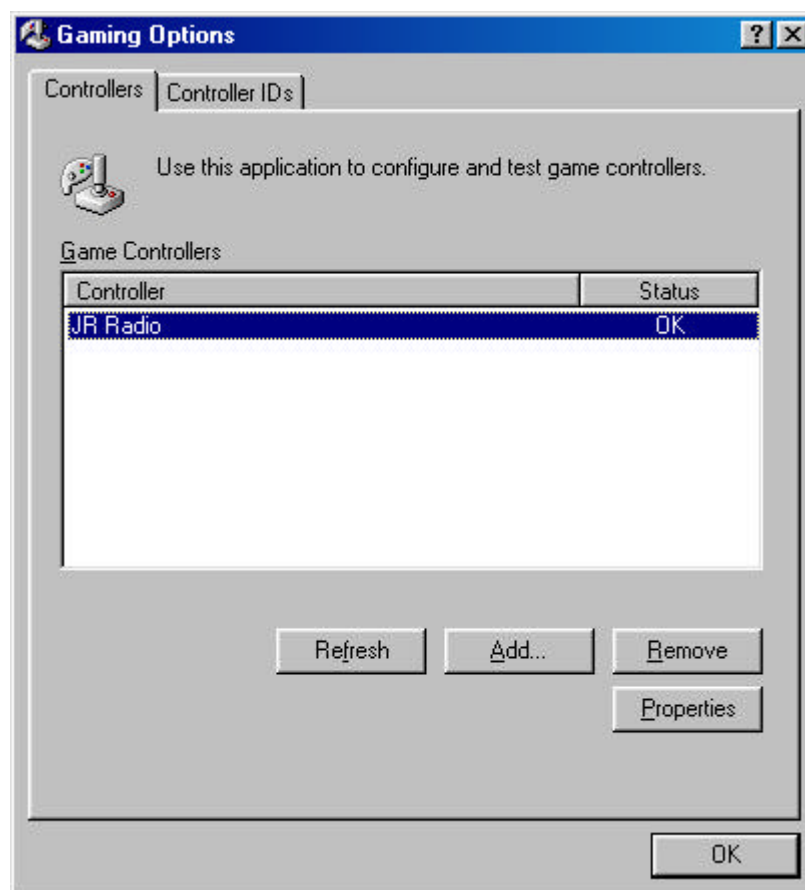


Under Special Characteristics, select 'Is a Joystick', set 'Axes' to 4, and 'Buttons' to 4. Do not select 'Has a point of view control'. Give the new controller a name you like, and click on Ok. Your new Game Controller was created.

From the list, select your newly created controller.

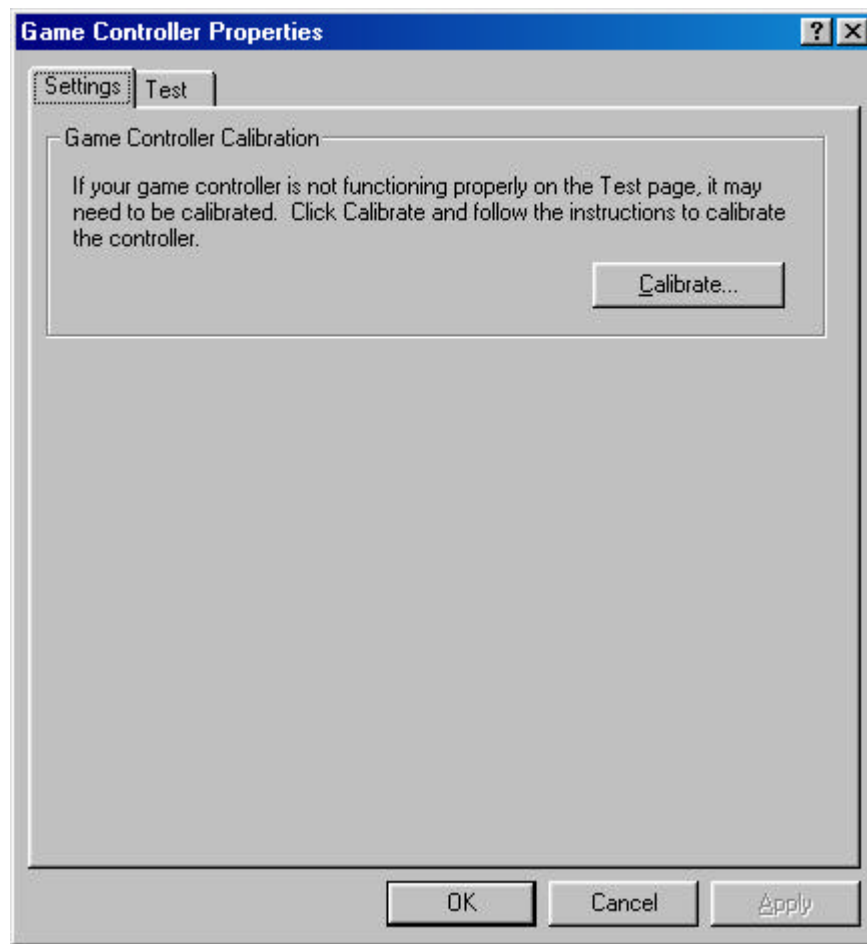


Click on Ok to activate the controller. Your radio should now be listed under the Controllers.

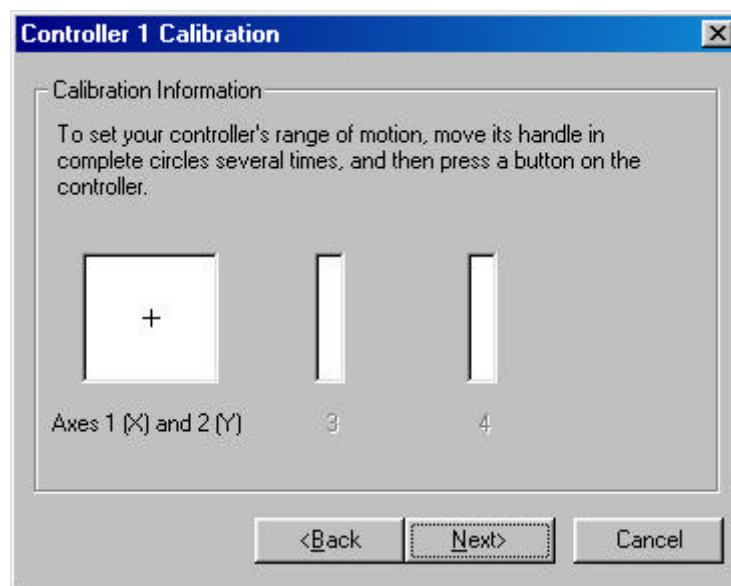


All that remain is for your radio to be calibrated like a normal joystick. Select your controller, and click on Properties. If another controller was already assigned, you might need to remove it first for you radio controller to work.

On the Properties window, select the Setting Tab.



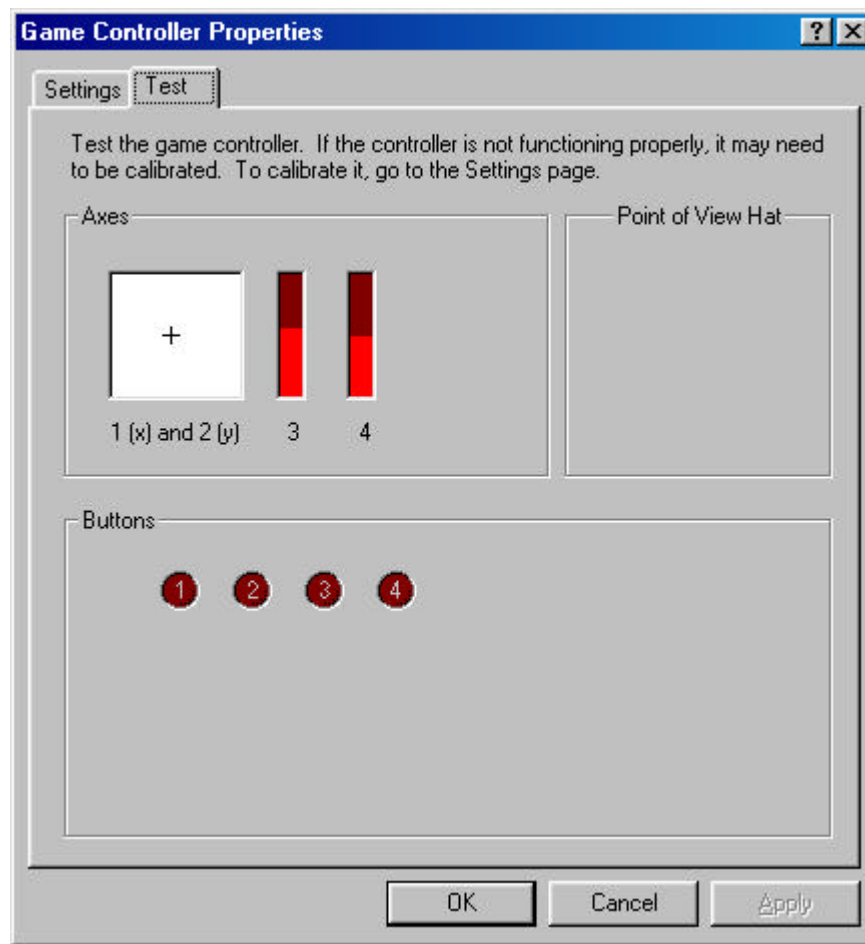
Click on Calibrate.



Follow the on-screen instructions to calibrate your controller.

NOTE: The buttons are assigned to channels 5 – 8 on your radio, and will not function with a four – channel radio. In this case, press Next instead of a button on the controller.

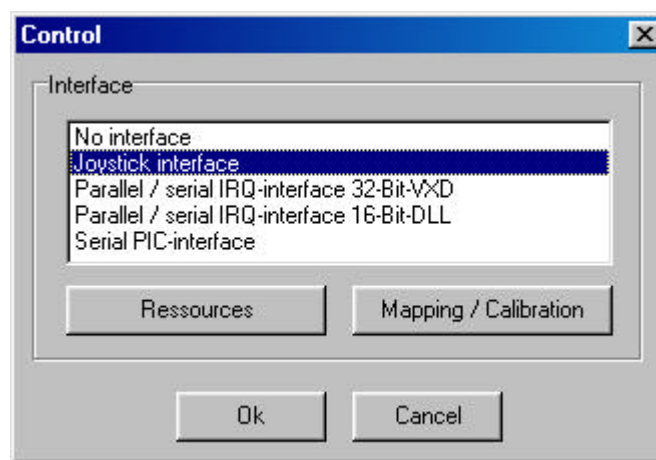
After the calibration is complete, you can verify the controller under the Test tab.



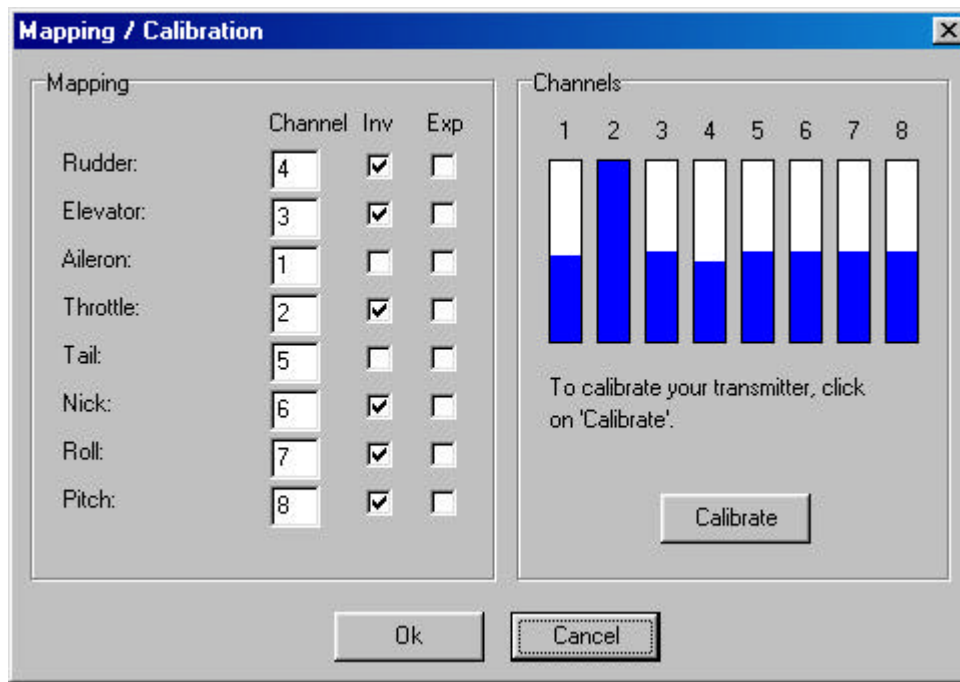
You have completed setting up you interface to be used as a joystick.

TO CONFIGURE INTERFACE WITH FMS USING THE JOYSTICK PORT

Using the menu in FMS, click on Controls, then Analog Controls. The following screen will appear.



Select Joystick interface, then click on Mapping/Calibration.

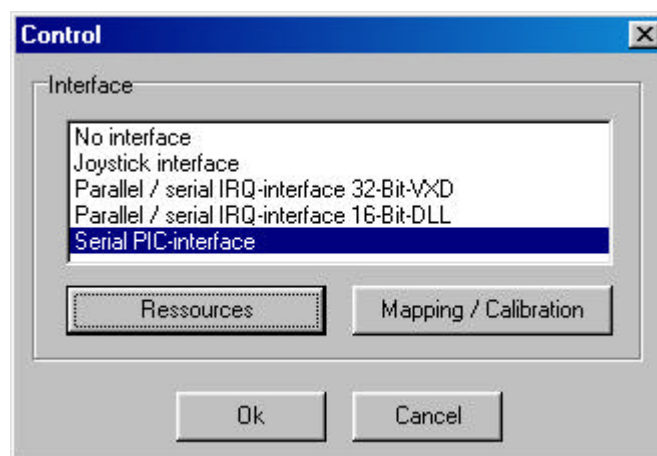


With the interface plugged into your radio's training socket, the light on the interface should be on. Now, press Calibrate, and follow calibration process. Once your radio is calibrated, you need to assign each channel on our radio with the correct mapping. You will have to test fly a plane to ensure all channels are working in the correct direction. If not, simply select Inv for the specific channel that is working in reverse.

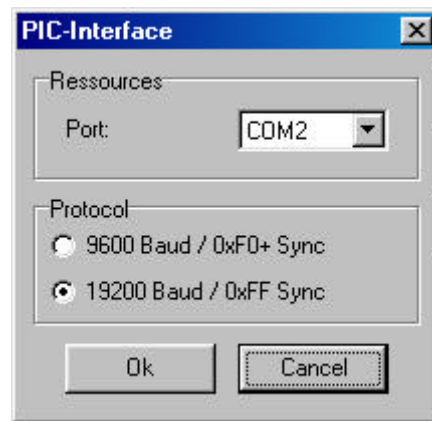
Once the above procedure is complete, the interface is ready to be used with FMS, using your joystick port.

TO CONFIGURE INTERFACE WITH FMS USING A SERIAL PORT

Using the menu in FMS, click on Controls, then Analog Controls. The following screen will appear.



Select Serial PIC-interface, then click on Resources.

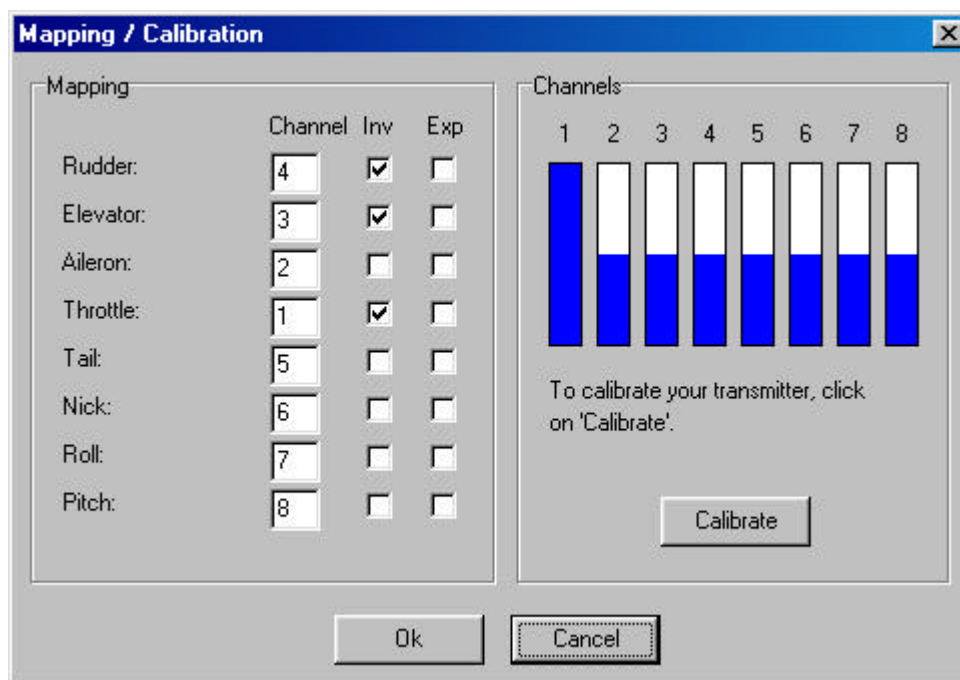


Select the correct Port (COM1 or COM2)

Select 19200 Baud or 9600 Baud depending on the interface setting.

Press Ok

Press Mapping/Calibrations. The following screen will appear.



With the interface plugged into your radio's training socket, the light on the interface should be on. Now, press Calibrate, and follow calibration process. Once your radio is calibrated, you need to assign each channel on our radio with the correct mapping. You will have to test fly a plane to ensure all channels are working in the correct direction. If not, simply select Inv for the specific channel that is working in reverse.

Once the above procedure is complete, the interface is ready to be used with FMS, using your serial port.