FLOW board DAQ

DSP Robotics

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1 Introduction

ABOUT FLOWBOARD

About This Guide

This manual provides a detailed description of the FlowBoard hardware and extension boards. Its purpose is to show you how the hardware works and what its capabilities are.

If you are looking for tutorials on how to use the FlowBoard with the FlowStone graphical programming software then see the Tutorials section of the DSP Robotics web site:
http://www.dsprobotics.com/tutorials.html

Additional information and articles about the product can be found at:
http://www.dsprobotics.com/support.html

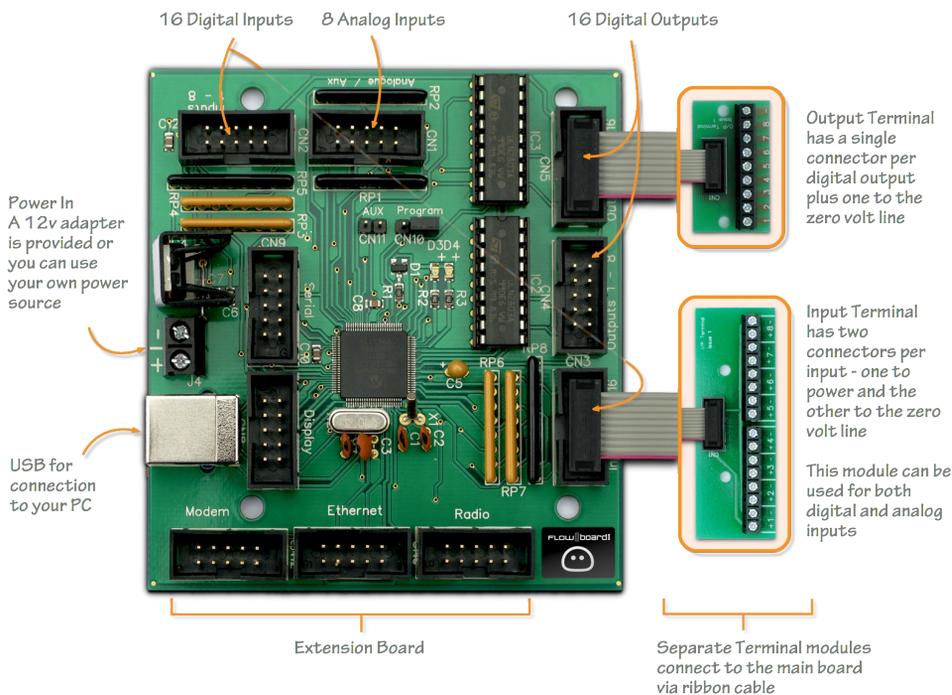If you have any comments about this guide please email them to info@dsprobotics.com.

IMPORTANT

Please read this guide carefully BEFORE using the product(s) you have purchased. The guide contains important safety information that you must be aware of before attempting to power the board or connect anything to it.

What is FlowBoard?

FlowBoard is a low cost Data Acquisition (DAQ) system developed by DSPRobotics specifically for the use with the FlowStone programming language.

FlowBoard uses a modular system of satellite boards which allows you to configure the hardware exactly to your needs. Interchangeable Input and Output terminal boards provide the base interface with added functionality being provided by optional extension boards.

Specifications

16 Digital Inputs 8 Analog Inputs 16 Digital Outputs

Output Terminal has a single connector per digital output plus one to the zero volt line

Power In
A 12v adapter is provided or you can use your own power source

Input Terminal has two connectors per input - one to power and the other to the zero volt line

This module can be used for both digital and analog inputs

USB for connection to your PC

Modem Ethernet Radio

Extension Board

Separate Terminal modules connect to the main board via ribbon cable

At the heart of the system is the FlowBoard DAQ. This connects to your PC via USB and manages communications between the satellite boards and your computer. Power is also supplied through this main board.

2 Getting Started

HOW TO GET UP AND RUNNING

Package Contents

The FlowBoard DAQ Pack contains the following components:

- 1 x FlowBoard DAQ main board
- 2 x Digital Output Terminal boards
- 2 x Digital Intput Terminal boards
- 1 x Analog Input Terminal board
- 1 x PSU adapter
- 1 x PSU connector (pre-fitted to power terminals on the main board)
- 5 x connector ribbons
- 1 x USB connector cable

NOTE: the PSU adapter and USB cable may differ slightly in appearance from the picture above. The PSU adapter should also be supplied with the correct pin arrangement for your region.

Important Safety Note

Please read this section carefully before connecting anything to the main board.

Satellite boards should not be connected with the power applied as this may cause damage to either the satellite board or the FlowBoard itself.

Always power off before connecting or disconnecting elements from the FlowBoard.

Connecting Up

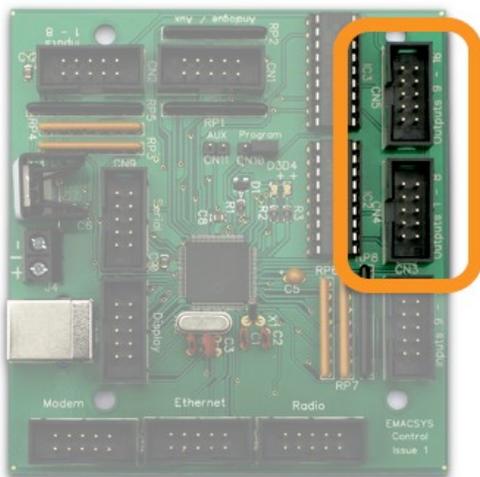Connecting your FlowBoard is easy and takes just 3 simple steps.

Step 1 - Connecting Satellite Boards

The first step is to choose your configuration of satellite boards. These must be connected before applying power to the FlowBoard.

The supplied ribbon cables should be used to connect the satellite boards to the main board. The locations of the connector sockets on the main board are outlined below.
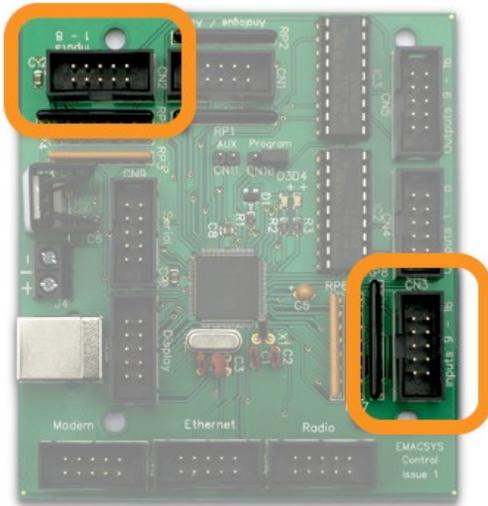
Digital Output Terminal Board

There are two sockets labeled Outputs 1-8 and Outputs 9-16. These obviously correspond to the 16 digital outputs.

Digital Input Terminal Board

There are two sockets labeled Inputs 1-8 and Inputs 9-16. These obviously correspond to the 16 digital inputs.

Analog Input Terminal Board

There is a single socket for connecting the analog input terminal board labeled Analogue/Aux.

GSM Board

There is a single socket for connecting the GSM board and it's marked Modem.

The GSM board also requires a sim card to be inserted for normal operation (not supplied). For good reception a suitable antenna should also be connected to the input lead.

Step 2 - Connecting Power

The FlowBoard needs to be powered in order to function. The power input terminals are indicated by + and - symbols and their location is shown in the picture opposite.

The FlowBoard comes with a standard 12v power adapter and a connector for attaching this to board. This allows you to get up and running quickly. However, you can connect any power source you like so long as it is within the boards operating limits. The red LED will light to indicate power is on

Power Requirements and Operating Limits

The main board will run over the range 6 to 15 Volts d.c. However, if the Relay extension board is being used the range is reduced to 10 to 15 Volts as the relays themselves have a nominal rating of 12 Volts.

Current consumption is around 40mA excluding the power consumed by the satellite boards. For the total consumption of your configuration add the current used for the main board plus the current used by all the satellite boards. Power supplies should be well regulated.

GSM Board Power Requirements

The GSM Board requires its own separate power supply. This is in addition to the power supplied to the main board.

Once again the the ribbon connection between the GSM board and the main board should be in place BEFORE power is applied to EITHER of them.

Average current consumption of the GSM board is approximately 40mA but the power supplied should be capable of providing currents up to 1A for very short periods. Voltage should be in the range 6 to 15 Volts.

The on-board red LED will flash rapidly while the modem is acquiring the network and then will flash every 2 to 3 seconds once it is on the network.

Step 3 - Connect to PC

The final step is to plug the USB cable into the board using the silver socket. The other end of the cable should then be connected to your PC. The green LED will light to show that the board is connected to the PC and the red LED should turn off.

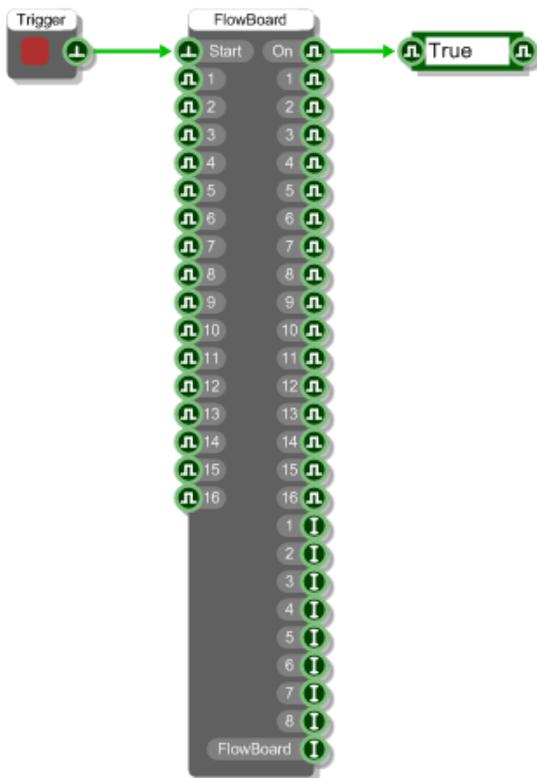Your FlowBoard is now connected and ready to use with FlowStone.

3 FlowStone

USING FLOWBOARD INSIDE FLOWSTONE

The FlowBoard Component

FlowStone communicates with the FlowBoard via the FlowBoard component. This is located in the External group of the toolbox.

Drag in a FlowBoard component, add a Trigger Button and a Boolean component and connect them as shown below, then press the trigger button.

The Boolean component should change from False to True indicating that FlowStone has connected to the FlowBoard.
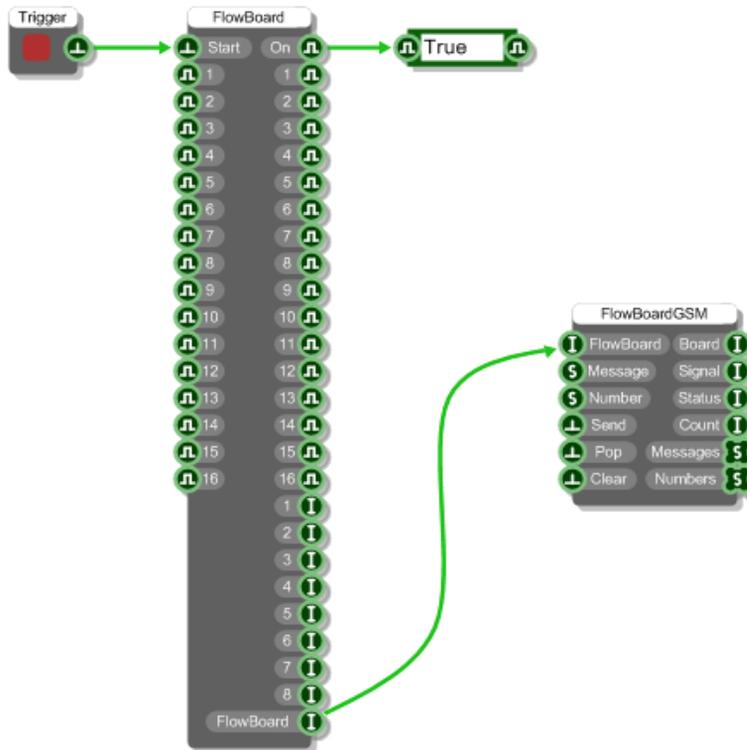

You can now connect Boolean values to the inputs and see them reflected at the digital outputs on the FlowBoard.

Changes at the Digital and Analog inputs on the FlowBoard can be monitored by attaching components to the outputs from the FlowBoard component (analog values are in the range 0-1023).

It's that simple.

The FlowBoard GSM Component

To communicate with the GSM Board you need to hook up a FlowBoardGSM component to the FlowBoard output of the FlowBoard component.

The first output of the FlowBoard GSM component shows the connection status. A value of 1 indicates connection to the FlowBoard, a value of 2 indicates connection to the FlowBoard and the GSM Board. A value of zero indicates that no connection has been established.

The second output of the component shows signal strength. This is in the range 0-30. A value of -1 is returned if the board is searching for a network or if no GSM board is detected.

The Status output refers to the send message status. A value of 0 indicates successful sending of the last message and that the board is ready to send again. A value of 1 indicates sending in progress and a value of 2 means that the last message failed to send.

The Messages and Numbers outputs show all the messages and corresponding numbers that have been received. You can Pop the oldest message off the lists or Clear everything.

To send a message supply a message string and phone number then trigger the Send input to send the message. Messages must be at most 160 characters – longer messages will be truncated.

4 Updating Firmware

HOW TO UPDATE THE FIRMWARE ON YOUR FLOWBOARD

FlowBoard Updater

We will occasionally need to add features or change the way that the FlowBoard works. When this happens you will need to update the firmware installed on the board.

This process is very easy and can be done in couple of minutes. You'll first need to download the latest version of the FlowBoard Updater program. You can get this from the Support are of the DSP Robotics web site here:

http://www.dsprobotics.com/supportfilesarea.php
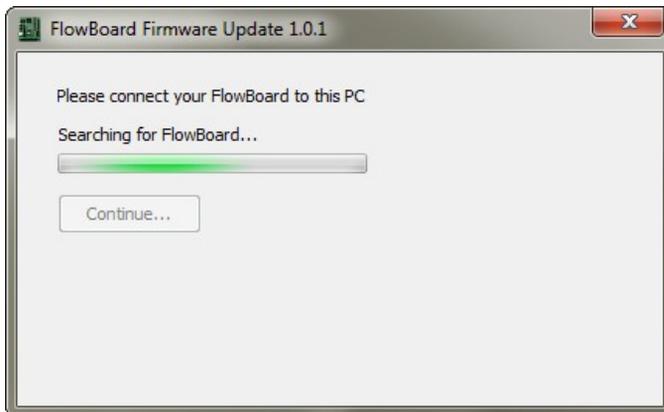
Go into the section named FlowBoard and click where it says FlowBoard Firmware. This will download the updater program. This is in a zip file so you'll need to extract the updater before you begin.

Using the Updater

You're now ready to update the firmware on your FlowBoard. This section will guide you through the process step by step.
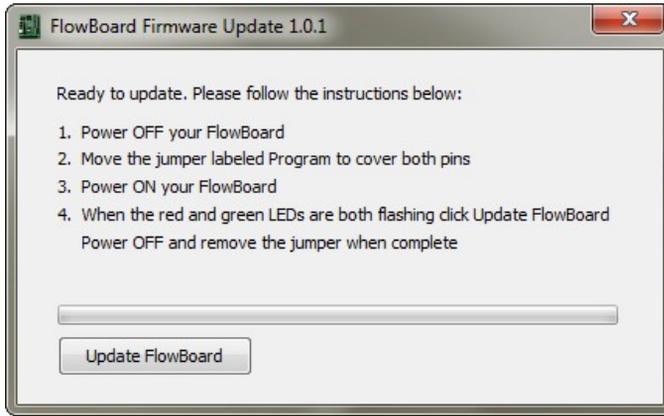
STEP 1 – Locate the Board

Run the FlowBoard Updater executable. You should see something like the dialog show below.

You'll be asked to connect your FlowBoard. You should connect it in the normal way, just as you do when using it with FlowStone. Plug in the USB and apply power (see "Connecting Up" earlier in this document). When the updater finds the board it will tell you and the Continue button will be show.
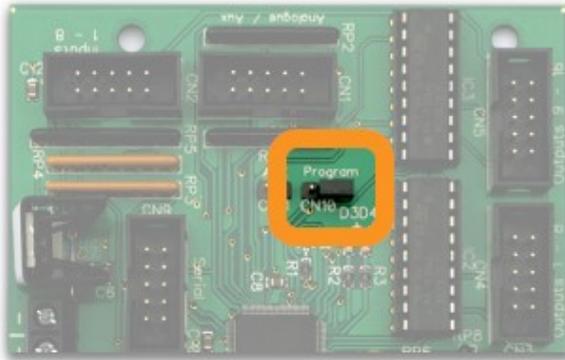
STEP 2 – Perform the Update

Click Continue and the dialog will change to something like the picture below.

Instructions are provided and you must follow them step by step.

1. First turn the power OFF on your FlowBoard (and any other connected boards)

2. Locate the Program switch on the board (see below) and move the jumper so that it covers both pins.

3. Turn the power back ON again

4. When the red and green LEDs are both flashing click Update FlowBoard

The update process will begin and the program will tell you when it is complete.

That's it, you're all up to date.

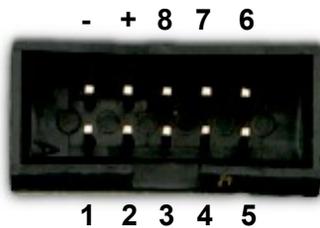REMEMBER: you need to remove the jumper from the Program pins before using your FlowBoard.

5 Technical Information

DETAILED INFORMATION ABOUT THE HARDWARE

Connector Sockets

The digital inputs and outputs are connected via 10 way headers. The headers also have power pins so that satellite boards can be powered directly from the FlowBoard. Each of the headers has the same pin assignment regardless of whether they are inputs or outputs. However, the inputs power pin is connected to the internal 3.3 Volt power rail while the outputs power pin is connected to the external supply.

The following diagram shows the pin arrangement:

Digital Inputs

Each digital input is connected to the processor inputs via a 100K resistor. It is pulled up to the internal 3.3 Volt supply rail via a 10K resistor. The input can be directly interfaced to digital outputs with a range of 0 – 3.3 Volts. The input voltage should not exceed 3.3 Volts. In addition the inputs can use clean contacts referenced to 0 Volts or open collector outputs again referenced to 0 Volts. If the driving modules do not share the same power supply as the Control Module then it will be necessary to common their 0 Volt lines.

Digital Outputs

Outputs are open collector and can be used to drive relays, solenoids, LEDs etc. The maximum current for the outputs is 50mA. Note that if these outputs are to drive inductive loads such as relays and motors then the load must have some form of back EMF suppression fitted.

IF SUPPRESSION IS NOT FITTED THEN THE OUTPUT DEVICE WILL BE DAMAGED

Analogue Inputs

The analogue inputs cover the range 0 to 3.3 Volts. If a larger range is necessary then it will be necessary to use a potential divider on the input.

Measurements are referenced to the internal 3.3 Volt supply rail which has an accuracy of 5%. The resolution of the A/D converter is 10 bits. For the highest accuracy the input impedance should be less than 2K ohms. Higher values are possible but the accuracy will be reduced and there will be increased noise levels.

The voltage on the input should not exceed 3.3 Volts. If higher voltages are possible (e.g. if you are using a potential divider) then you must ensure that voltages higher than the 3.3 Volts limit cannot be present under start up or fault conditions. If the driving modules do not share the same power supply as the Control Module then it will be necessary to common their 0 Volt lines.