AN2005: Synaptron Micro Test Software

hardware made easy
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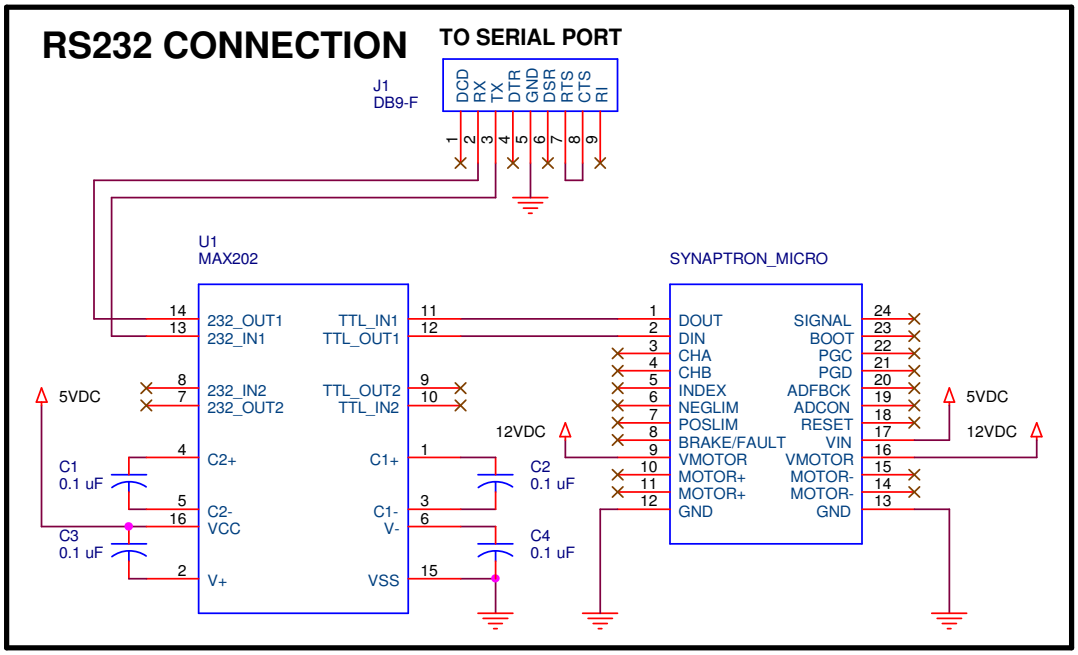
Solutions Cubed is an innovative electronic design firm. We have created successful designs for a myriad of industries including mass produced consumer products, deep-sea robotic components, and encrypted encoders for the banking industry. We love meeting new customers and are interested in hearing about your design needs.

Overview- Solutions Cubed provides test software for the Synaptron module. This software includes many functions including the ability to monitor and modify registers, display status bits, chart control and feedback source values, program new firmware through the bootloader, and employ programming scripts for pre-production.

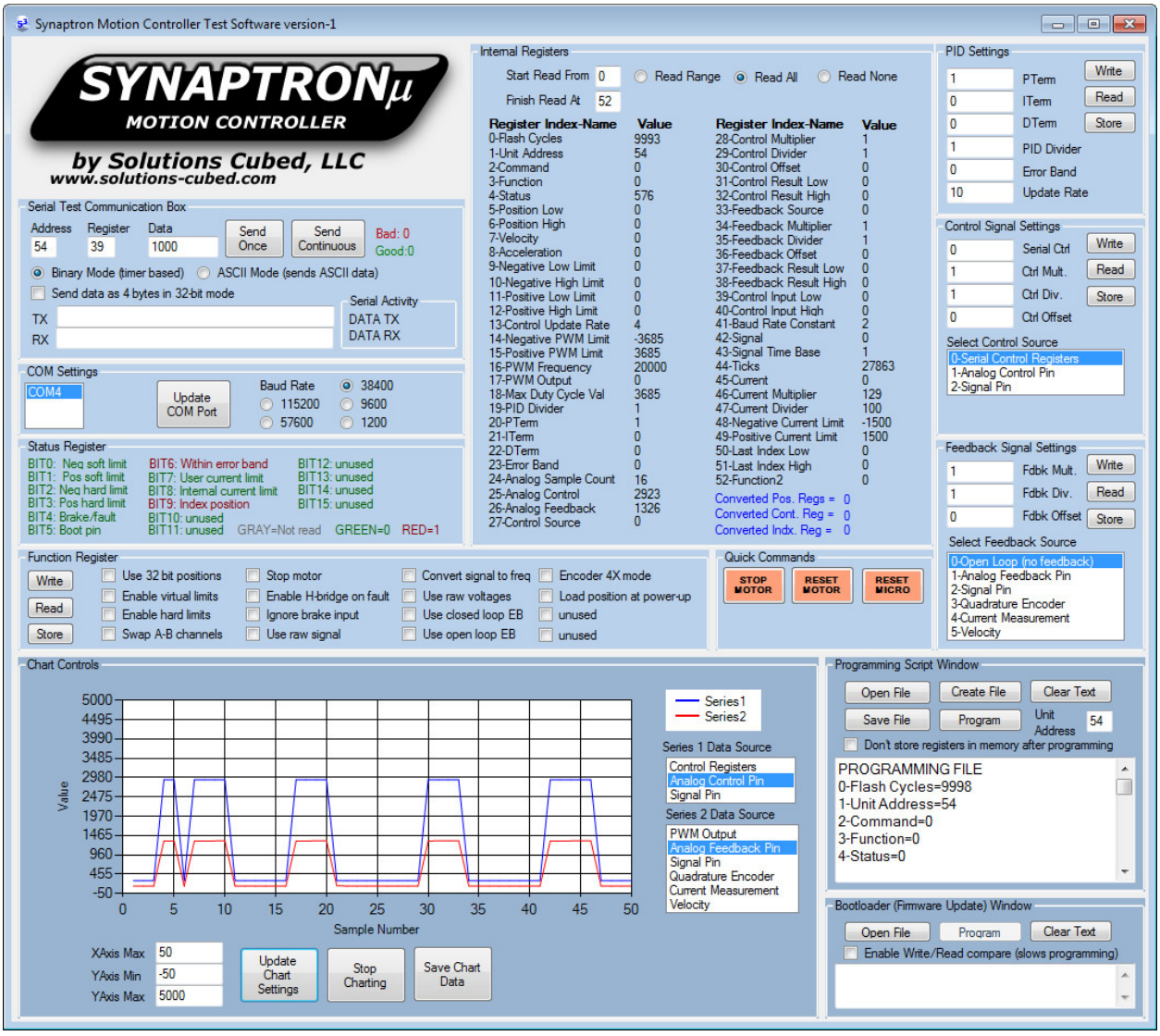
Hardware- You will need to connect the Synaptron serial pins to a computer via a RS232 serial interface. You may use a USB-RS232 converter between the RS232 IC and a PC USB port. A sample connection is shown below.



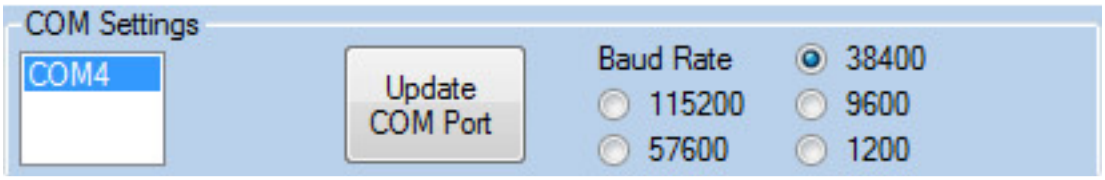
Software- You must successfully install and launch the Synaptron test software. This can be found at www.solutions-cubed.com

Note: The software interface may change over time. Screen captures are for reference and may differ from what you see.

Test Software- All functions of the test software reside on a single form.



COM Settings- You can select the baud rate and Communications port from this window. The default baud rate for the Synaptron is 38,400bps. To change the COM port select the desired port from the listbox and press the "Update COM Port" button.

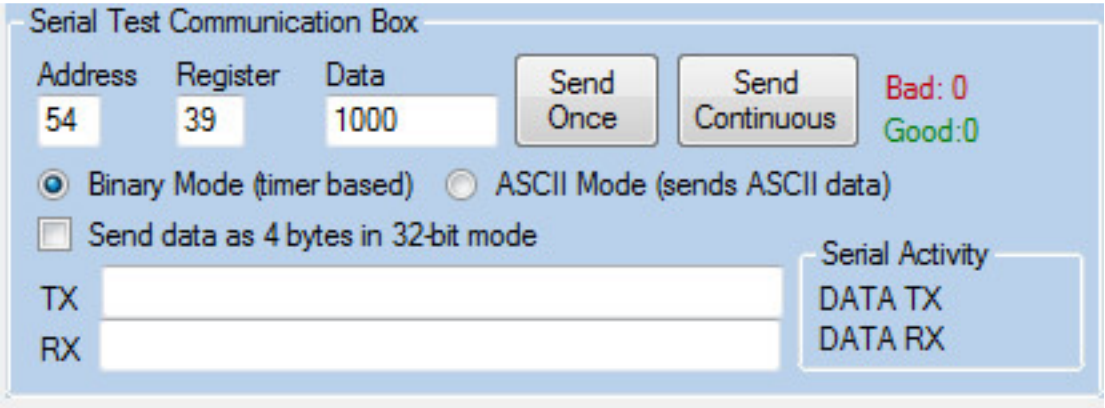


Serial Test Communication Box – The serial test box allows you to send specific serial commands. To read from a register type in the unit's address and the register number you want to read from. Leave the data box blank (or clear it if it has a value in it). To write a value fill in the address, register number, and the data you want to send.

Two radio buttons allow you to select between the binary and ASCII communication modes. If you want to read or write a 32-bit value select the check box below the radio buttons.

To send a communication string once click the "Send Once" button. To send the command continuously click the "Send Continuous" button. The number of good and bad communication attempts will be tracked if "Send Continuous" is selected.

The TX and RX text boxes will display the data sent and received. The Serial Activity box will indicate the success or failure of



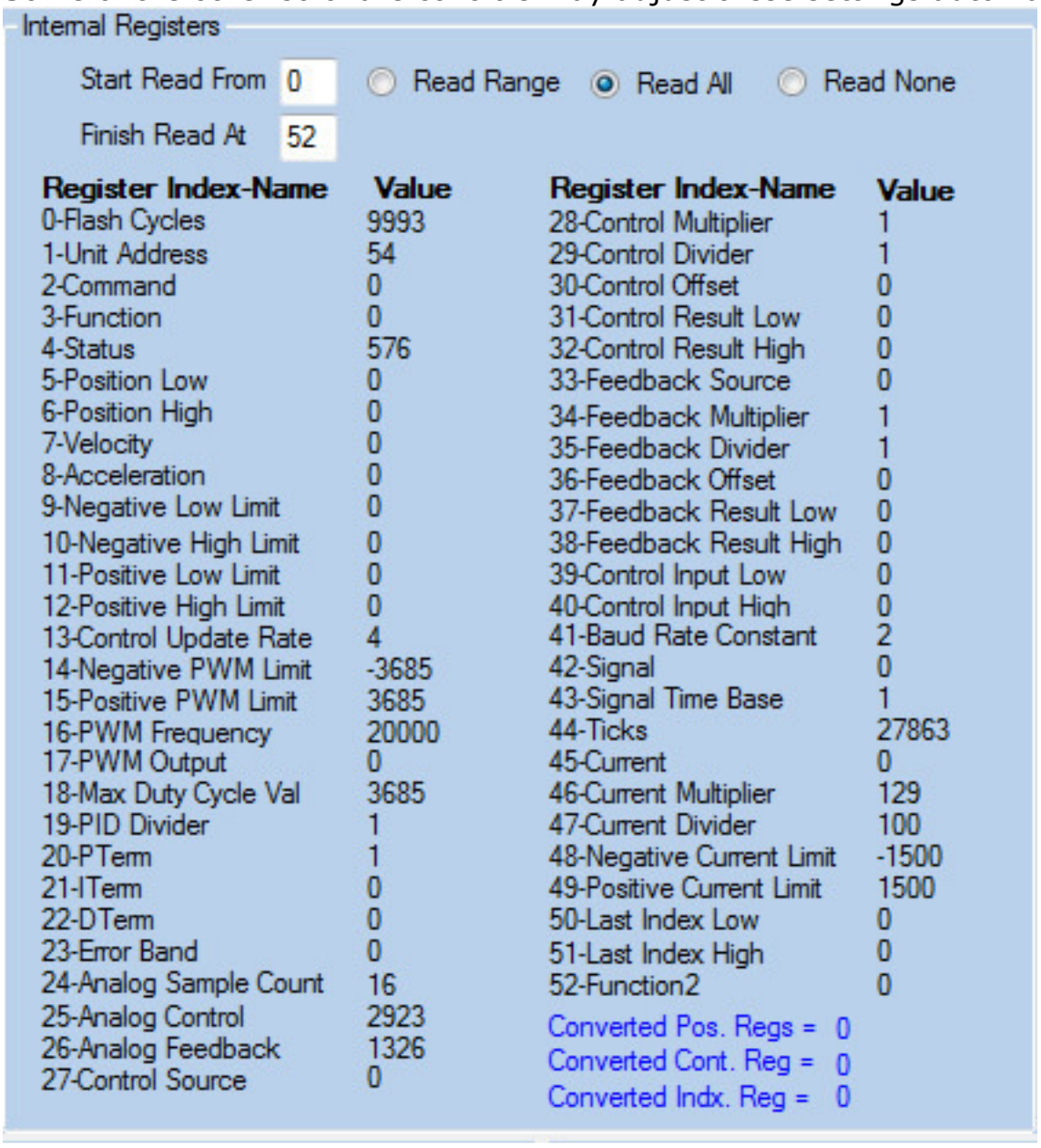
Internal Registers - One of the most useful functions of the software is the ability to read and display the internal registers of the controller. There are 3 options to choose from. The first, and default, is to read none of the registers. The second is to read all of the registers. The final option is to read a range of registers. The options are selected with three radio buttons above the register names.

Selecting a range of registers is useful if you just want to monitor one or two registers. Enter the register numbers you want start and finish reading from using the text boxes provided. For example, to read just the *AnalogControl* and *AnalogFeedback* registers the start value is 25 and the finish value is 26.

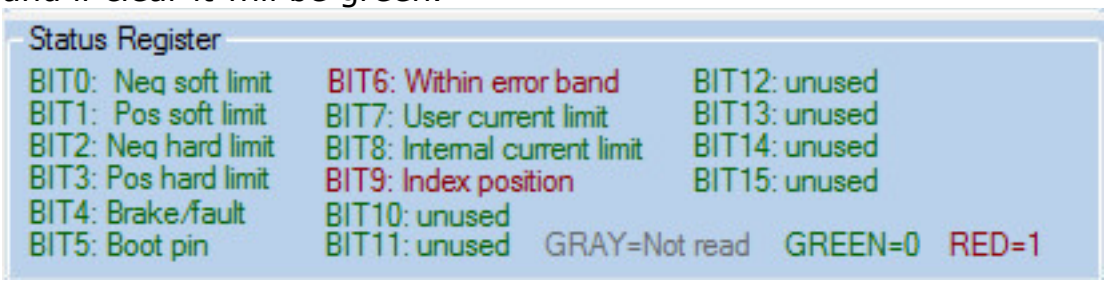
Reading all of the registers implements a Read all command which is fairly fast at baud rates of 38,400bps or higher. Reading a range of registers cycles through each register, and is considerably slower if a large number of registers are read.

At the bottom of the Internal Register the value of the *Position* (registers 5-6), *ControlInput* (39-40), and *Index* (50-51) are displayed. This display is useful if the *Function.F_32Pos* bit is set as it converts each register pairs into a single value.

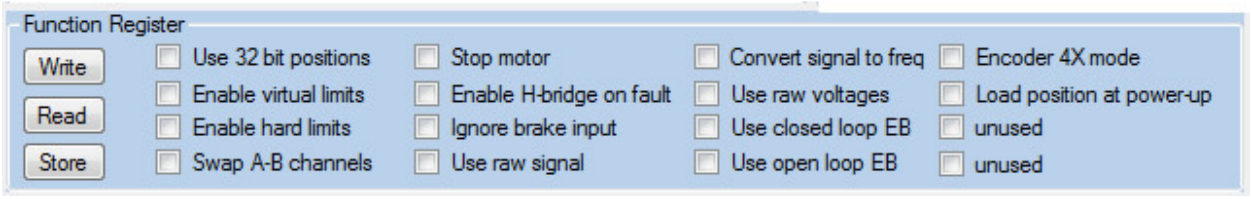
Some of the other software controls may adjust these settings automatically.



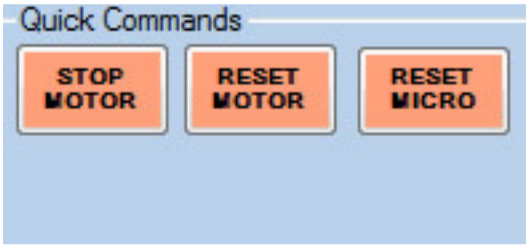
Status Register – The state of the *Status* register will be displayed if the register is read by a setting in the Internal Register window. If the register is not being read the bits will be gray. Otherwise if a bit is set it will be red and if clear it will be green.



Function Register – You can read, write, and store the various bits in the *Function* register. Pressing the "Store" button places the bit setting in non-volatile program memory, making them the power-on settngs for the module.



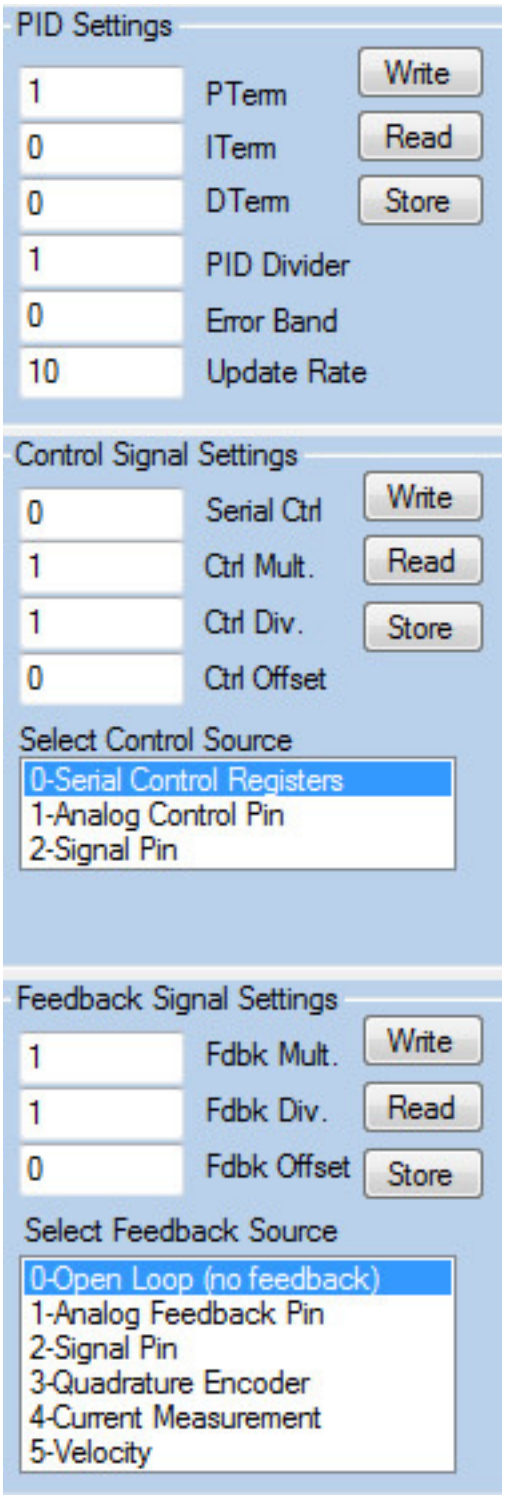
Quick Commands- These buttons allow you to access some commands quickly without having to form them via the Serial Test Communications Box settings. The "Stop Motor" button disables the motor drive signal by setting te *Function.F_StopMotor* bit. This might become useful if your PID settings create oscillations during testing and you need to quickly shut the motor down. The "Reset Motor" button is useful in to clear the Brake/fault status bit if a fault condition causes the H-bridge to latch "off". The "Reset Micro" button will force a watch-dog-timer timeout to occur in the micrcontroller on the module.



PID, Control, and Feedback Settings-
The user will likely have to make a variety of changes to the registers associated with the PID algorithm, the control source, and the feedback source during testing. These text boxes and buttons simplify doing that.

Additionally, if you are using 32-bit mode (*Function.F_32Pos* bit is set) the serial control command will convert the value for you.

Pressing the "Read" button will read all of the registers in the box associated with the button. Likewise, the "Write" button will write all of the values. The "Store" button issues a store command and programs all of the internal register values into non-volatile prgram memory (making them the power-on values).



PID Settings: You can program the *PTerm, ITerm, DTerm, PIDDivider, ErrorBand,* and the *ControlLoopRate* registers can be adjusted with this window. Press the "Read" button to load the text boxes with the existing register values.

Control Signal Settings: You can program the *ControlInputLow, ControlInputHigh, ControlMultiplier, ControlDivider, ControlOffset,* and *ControlSource* registers with this window. Press the "Read" button to load the text boxes with the existing register values. The control source is set by selecting the desired source from the list box and pressing the "Write" button.

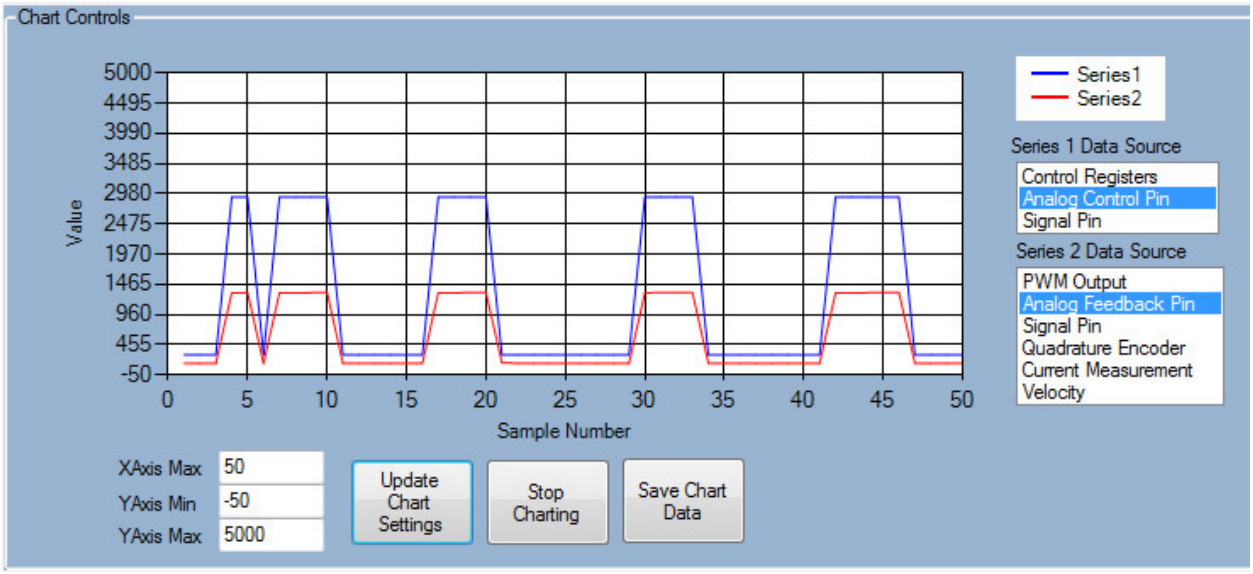
Feedback Signal Settings: You can program the *FeedbacknputLow, FeedbackInputHigh, FeedbackMultiplier, FeedbackDivider, FeedbackOffset,* and *FeedbackSource* registers with this window. Press the "Read" button to load the text boxes with the existing register values. The feedback source is set by selecting the desired source from the list box and pressing the "Write" button.

Chart Settings- The software comes with simple charting functionality to help display the control system's responsiveness and effectiveness.

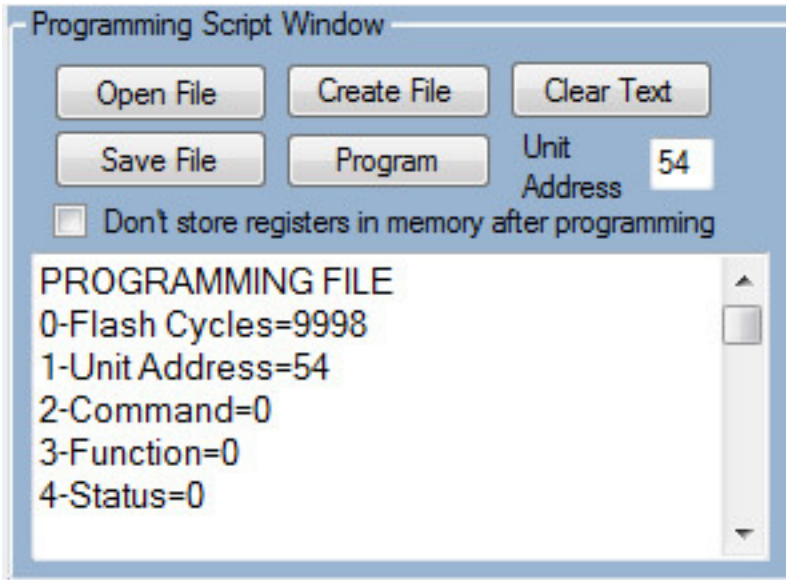
You can set the range of the verticle axis by entering values in the YAxis Min and YAxis Max text boxes. The XAxis Max text box sets the number samples displayed on the horizontal axis. The samples are kept in a circular buffer, so in the example below the 51st sample is shown at point 1 of the horizontal axis. To change these settings just adjust the text box values and press the "Update Chart Settings" button.

Data series 1 displays control source data, and the data source is selected from the Series 1 listbox. The feedback source is selected from the Series 2 listbox.

To start charting press the "Start Charting" button (press it again to stop charting). You can save the charted data as a *.csv file which can be opened with most spreadsheet programs. You should stop charting data prior to saving the chart data to make sure the buffer is not being updated while you select the file name and locations. Press the "Save Chart Data" to save the information to a file.



Programming Script Window – The programming script window allows you to create, open, and save text files associated with custom register settings. This allows you to quickly program multiple units with the same custom settings. See AN2004 at www.solutions-cubed.com for detailed information on using programming scripts.



Bootloader (Firmware Update) Window- Firmware upgrades or even custom applications may become avaiable for this product. The customer may upgrade their product by programming a new operating system into the unit. See AN2002 at www.solutions-cubed.com for detailed information on using the bootloader and upgrading firmware.