



M1 – Modbus Serial Server Manual Rev. 2

Overview

This board allows easy to setup Modbus communications. Its flexible configuration allows for implementing multiple output or expansion boards that can be developed as users request it, or for special applications.

Features

- ***FPGA Based System.***

The board has been designed using the latest FPGA technology. It incorporates a soft-core processor. This technology allows the implementation of high level programming tools. FPGAs are suited for reliable operation in industrial environments under harsh electrical conditions.

- ***Flexible design that can accommodate different combination of expansion boards.***

The core can be mounted on expansion boards. These expansion boards can also be daisy-chained together to accommodate the specific needs of the users. For example an specific application will require more analogs than another one, or different types of signals. Custom expansion boards can also be developed for pendants, control panels, or any other specific application. This design also allows expandability for future additions to a project.

- ***32 inputs and 32 outputs, Discrete or Analog.***

It can handle a total of 32 inputs and 32 outputs. Of these up to 8 can be used as analog and 12 inputs for 6 encoder inputs.

- ***6 Encoder input.***

Up to 6 quadrature encoders can be implemented; 2 discrete inputs are required per encoder. Special software implementation is required in the other end in order to be able to read the encoders.

- ***Status LEDs.***

The board comes with LEDs that indicate:

- a. That the board is under power.
- b. When communications are taking place.
- c. When a communications error has occurred.

There are on-board LEDs and on-board terminals so the user can implement external LEDs in the control box or pendant. This status LEDs comply with the Modbus hardware protocol.

- ***RS232/RS485 Communications.***

- ***Upgradeable Firmware.***

In case it is required, the firmware can be downloaded and upgraded by the user. It could be possible to do special firmware implementations with specific features. This allows for added flexibility and keeping the user's system up to date. This upgrade is done through a terminal.

- ***HyperTerminal Access.***

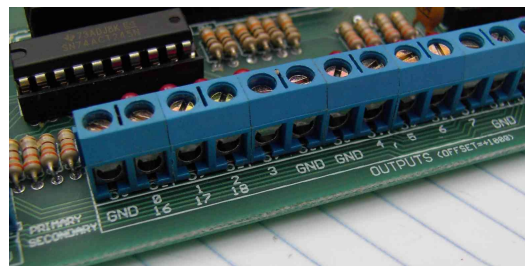
The core can be accessed through HyperTerminal (comes with MS Windows). Thus no additional hardware or software is required. On the current menu you can configure operation speeds, Modbus address (for RS485 networks), and upgrade the firmware.

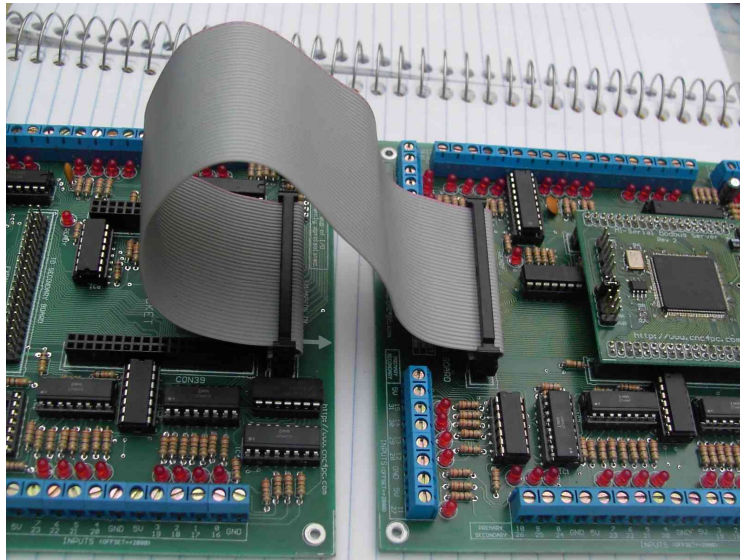
Use of Expansion Boards:

There are currently two expansion boards available. The M11-Discrete I/O Board that has 16 discrete inputs and 16 discrete outputs. The current ratings for these I/Os is +5vdc ttls. The other board is the M12 – Discrete and Analog I/O Board. It has 12 discrete inputs, 12 discrete outputs, 4 analog inputs and 4 analog outputs. The discrete I/Os take +5vdc ttl signals and the analog I/Os are 0-10vdc. Both boards are fully optoisolated.

Possible Board Combinations	Discrete		Analog	
	Inputs	Outputs	Inputs	Outputs
M11	16	16	0	0
M12	12	12	4	4
M11+M11	32	32	0	0
M11+M12	28	28	4	4
M12+M12	24	24	8	8

The expansion boards can be daisy-chained together by using a 40 ribbon cable. The board that has the core mounted on it will be referred as the primary board and the other one as the secondary board. The pins are marked with different numbers depending if the board is been used as primary or secondary.





Board Modbus addresses and address offset:

The default Modbus address for the board is 1, but the user can change this by using the configuration menu when accessing the board directly through a terminal.

Input and output pin offsets are marked on each expansion boards.

FUNCTION	OFFSET
DISCRETE OUTPUT	+1000
DISCRETE INPUT	+2000
ANALOG OUTPUT	+3000
ANALOG INPUT	+4000

To access the discrete output on pin # 1, you have to call it from the control software as 1001.

RS232 Communications:

For Modbus RTU communications the default parameters are the following:

Baud Rate = 115,200
 Data Bit = 8
 Parity = None
 Stop Bit = 2
 Flow Control = None

Baud rate, parity, and stop bit could be reconfigured by the user from the hyperterminal console.

HyperTerminal Access:

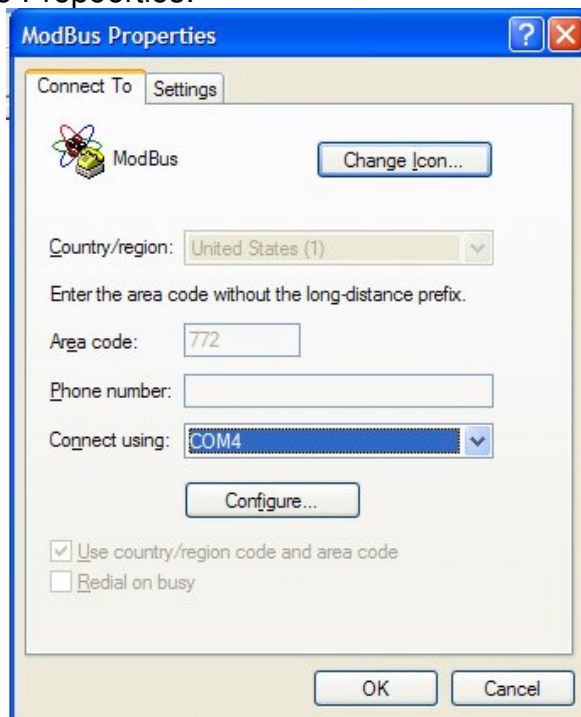
HyperTerminal access is always set to these fixed configuration values:

Baud Rate = 115,200
 Data Bit = 8
 Parity = None

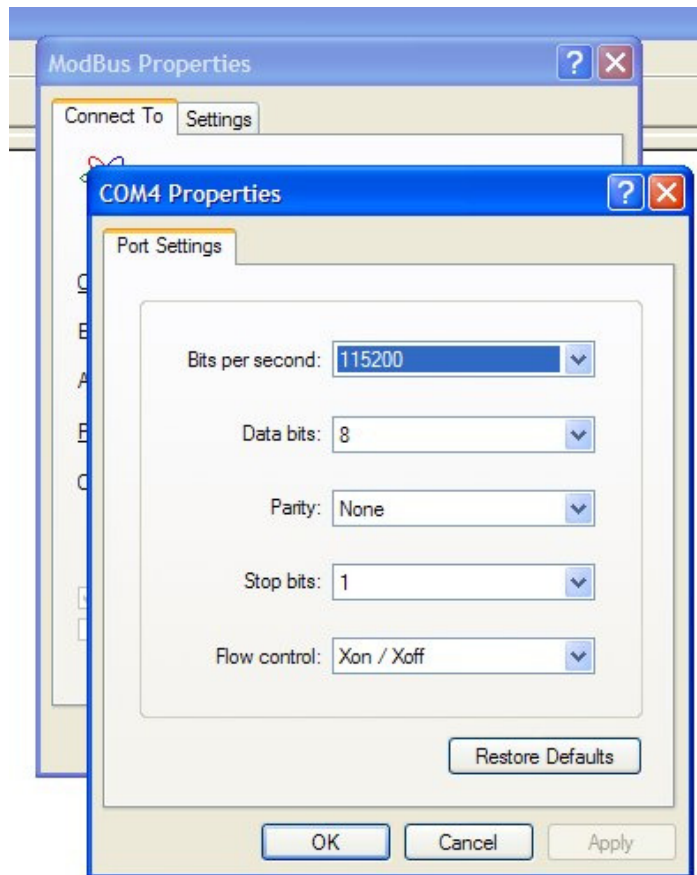
Stop Bit = 1
Flow Control = Xon/Xoff

Use the following screenshots for manual configuration:

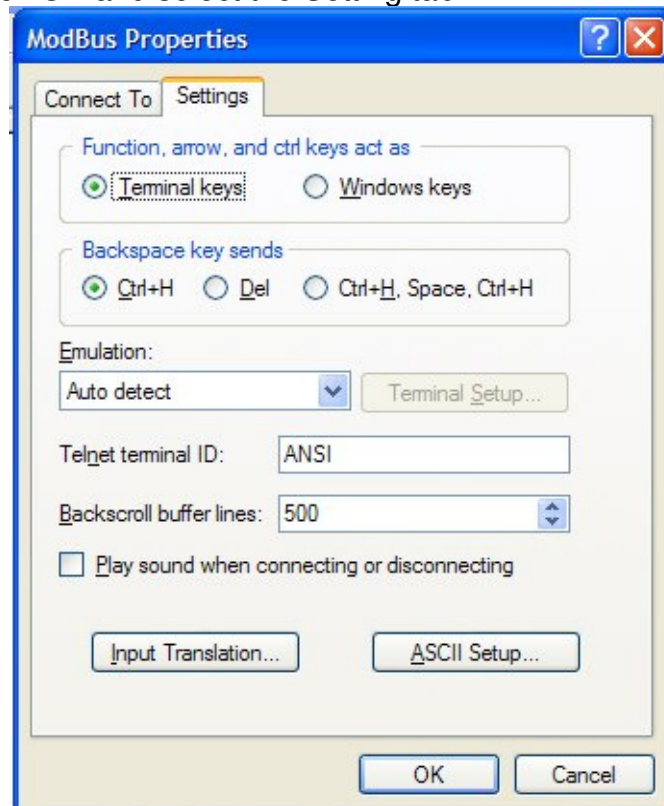
1. Go to Properties:



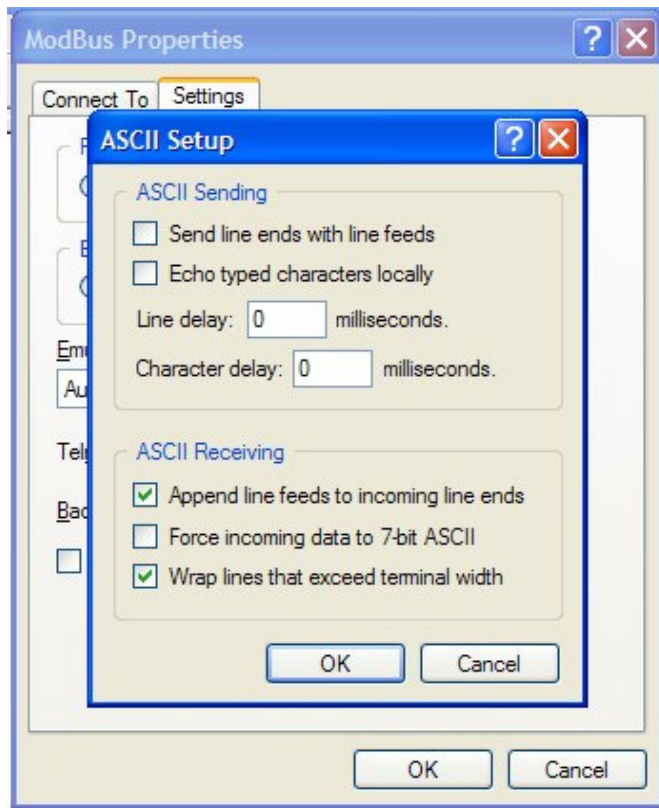
2. Select Configure:



3. Click OK and select the Setting tab:



4. Select ASCII Setup and the activate “Append line feed to incoming line ends”.



An MS Windows HyperTerminal file will be available for download from the website.

Configuring the Core:

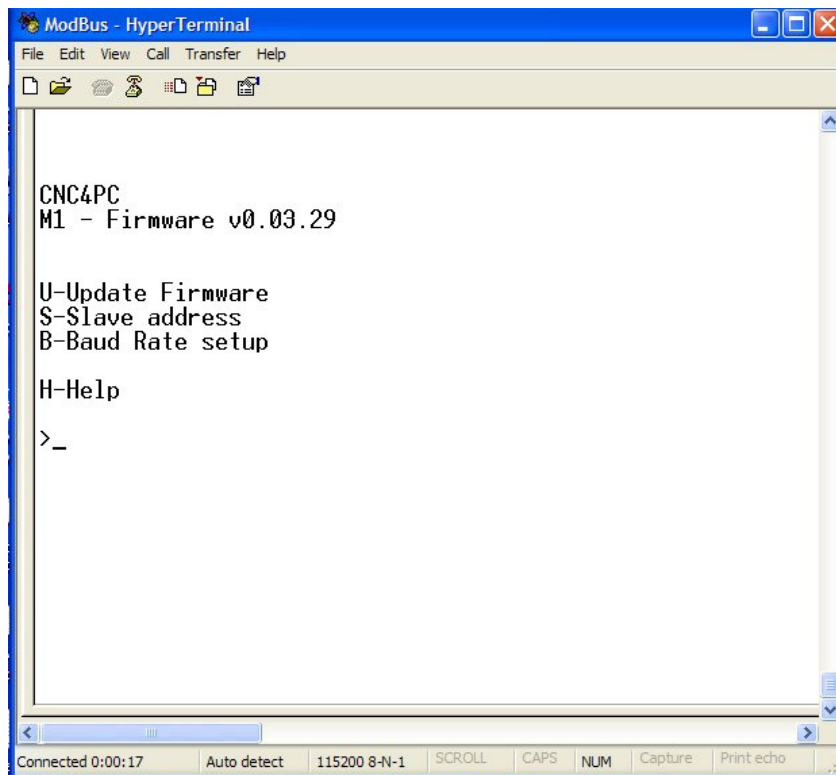
The console menu could change as new features are added to the firmware. At the time of the release of this manual the configurable features are:

1. Communication: Baud rate, parity, and stop bit could be changed.
2. Modbus Slave Address: A value from 1 to 99 can be used.

The commands are non-case sensitive.

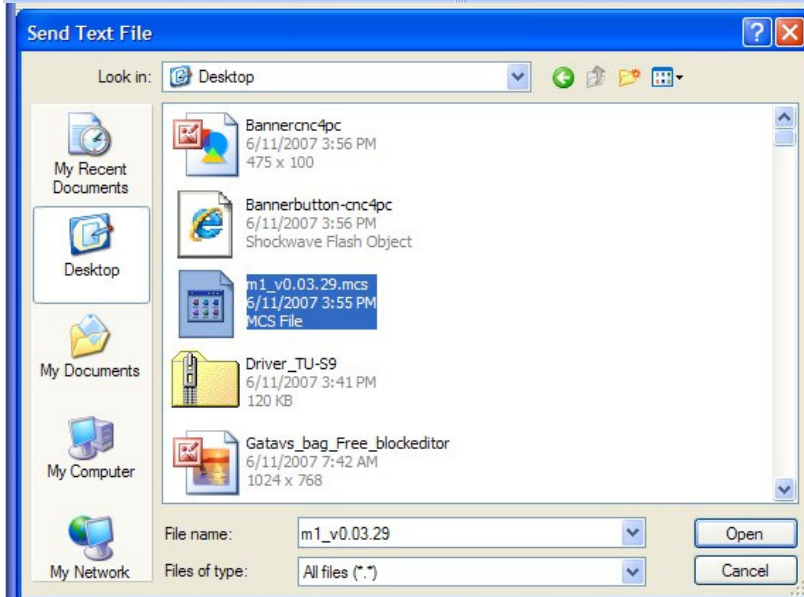
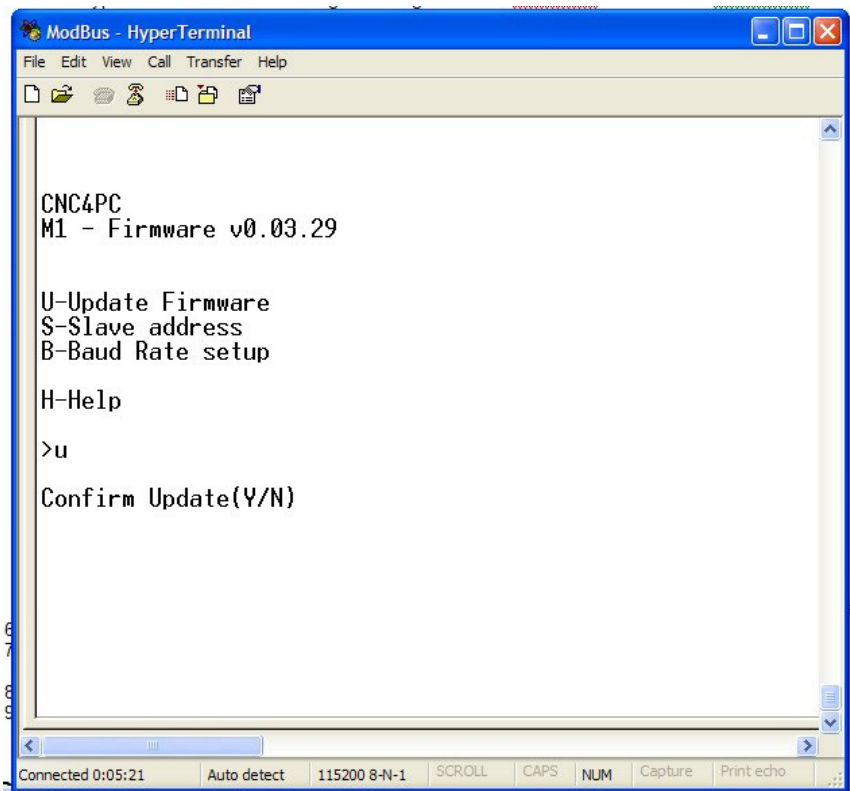
Firmware Upgrade:

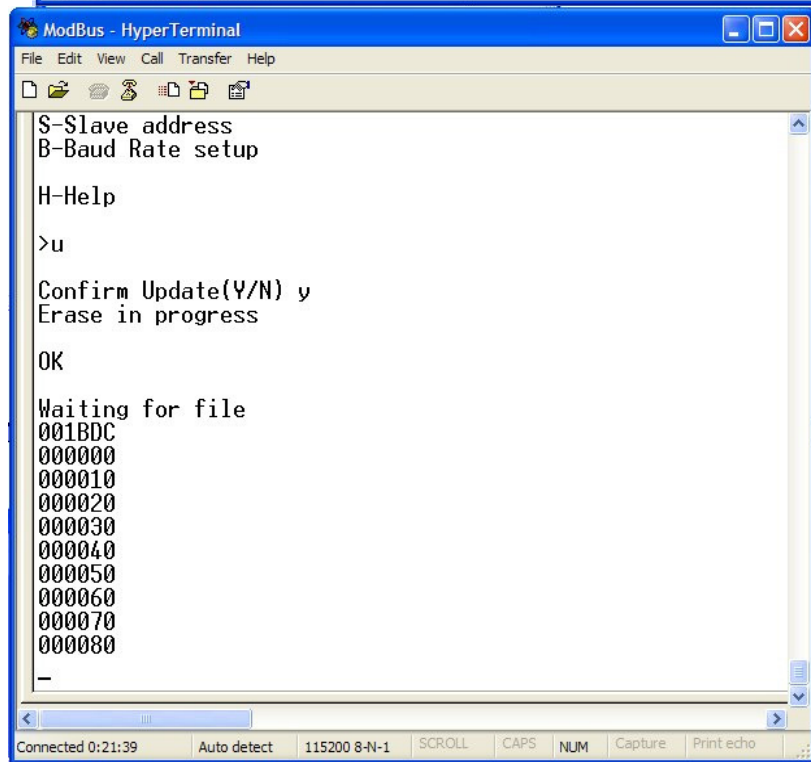
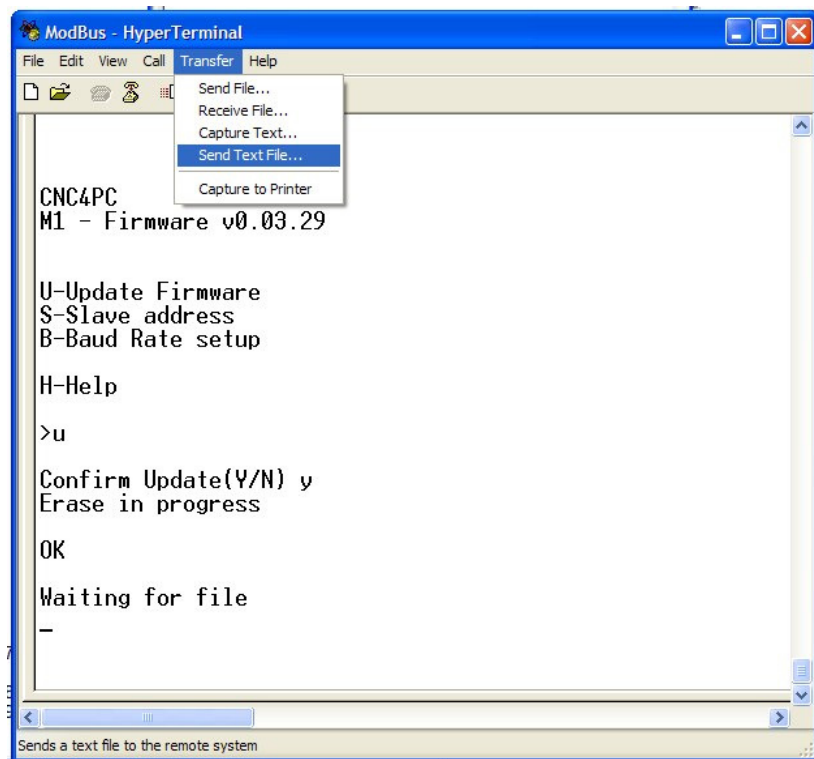
1. Place the core board (M1) in an expansion board (M11 or M12).
2. Put the programming jumper.
3. Connect the serial cable to the computer.
4. Connect the expansion board to power.
5. Start HyperTerminal in windows using the configuration file ModBus.ht. This file can downloaded from the website. You may have to change the port to the port you are actually using. You will get this screen:



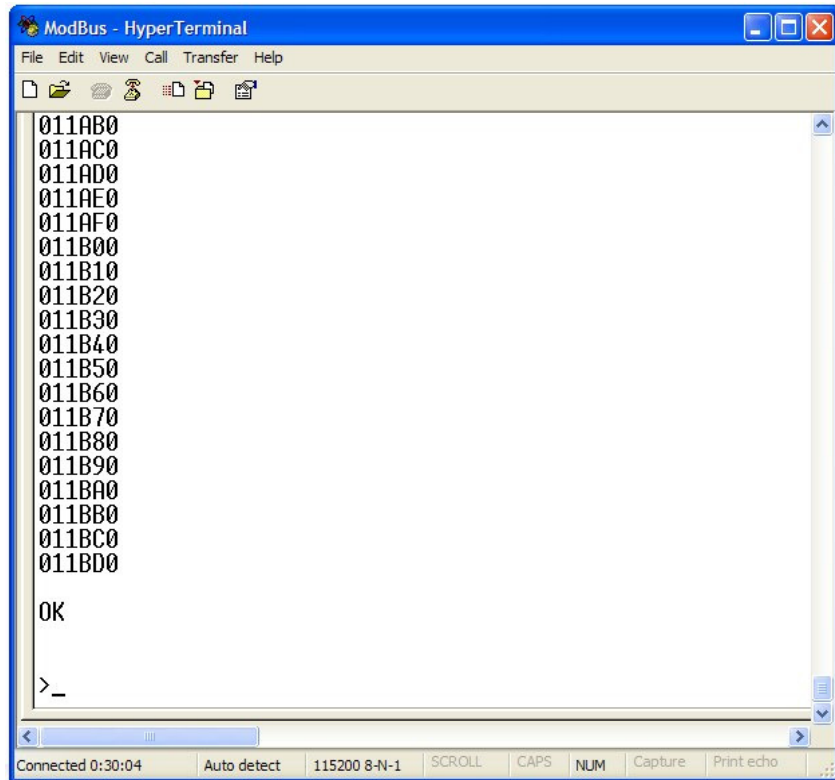
If you need to configure it manually use the settings as explained in the previous section of this manual.

6. The press "U" to update the new firmware. At this point you are asked to confirm and the core expects the new file.
7. Go to Transfer / Send Text file. Select the file you are going to update and click OK. The file will start transferring. In order to load the new firmware, the old firmware file has to be erased from the flash memory. If the communication is lost or power is shut down before the new firmware file is loaded, the firmware will be lost and the board could not be restarted again. The board will have to be sent back to have the firmware reloaded. .





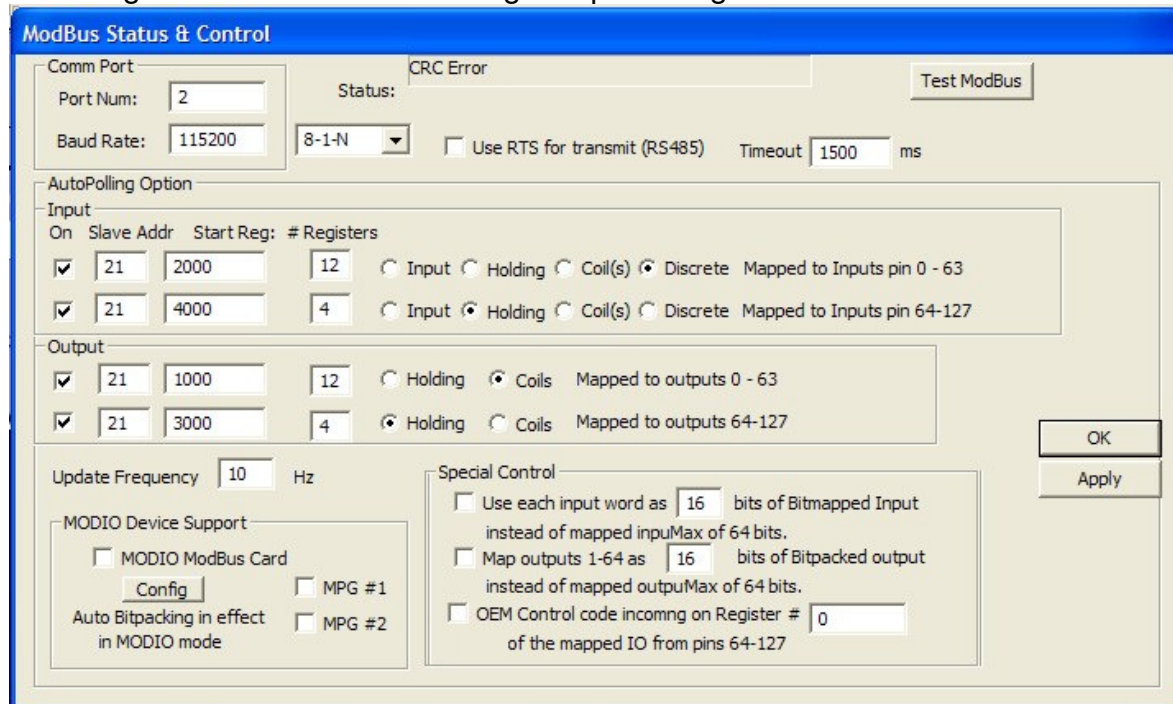
8. Once the file is transferred you will get the OK.



9. Now you can recycle the power to the boards and the new configuration will take effect on startup.

Configuring the Control Software (Mach3):

To configure Mach use the following sample configuration screen:



This configuration has been done using one M12 – expansion board. This board has 12 discrete Inputs and 12 discrete outputs, 4 analog inputs and 4 analog outputs.

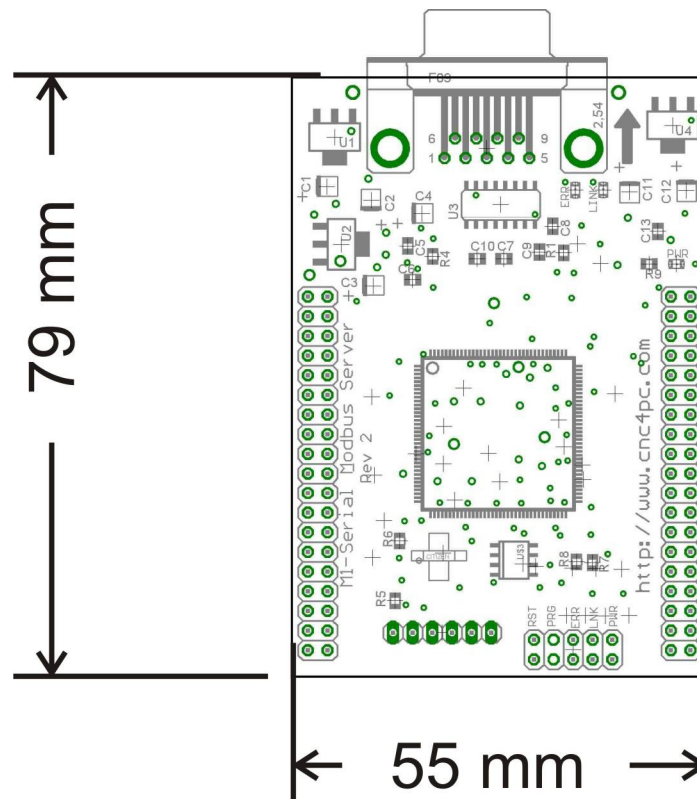
Encoder Input.

Up to 6 quadrature encoders can be hooked up to the board. This has to be connected to the primary board (to which the core is mounted on). These encoders will use the inputs assigned for discrete inputs and two inputs per encoder are assigned. Like this:

Encoder1	Encoder2	Encoder3	Encoder4	Encoder5	Encoder6
CH A - 2000	CH A - 2002	CH A - 2004	CH A - 2006	CH A - 2008	CH A - 2010
CH B - 2001	CH B - 2003	CH B - 2005	CH B - 2007	CH B - 2009	CH B - 2011

The encoder counters are 16 bits. That means they can hold 65,536 steps. The position of the encoder is held in registers 5001 to 5006. Register 5000 holds a 200us tick counter from the last encoder reading.

Dimensions:



Disclaimer:

Use caution. CNC machines are dangerous machines. DUNCAN USA, LLC or Arturo Duncan are not liable for any accidents resulting from the improper use of these devices.