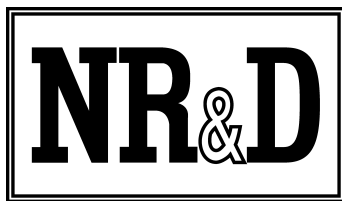


MEB II

Installation and Programming Manual

This manual covers the MEB II Modbus Plus to Ethernet Bridge.

Effective: November 22, 2010



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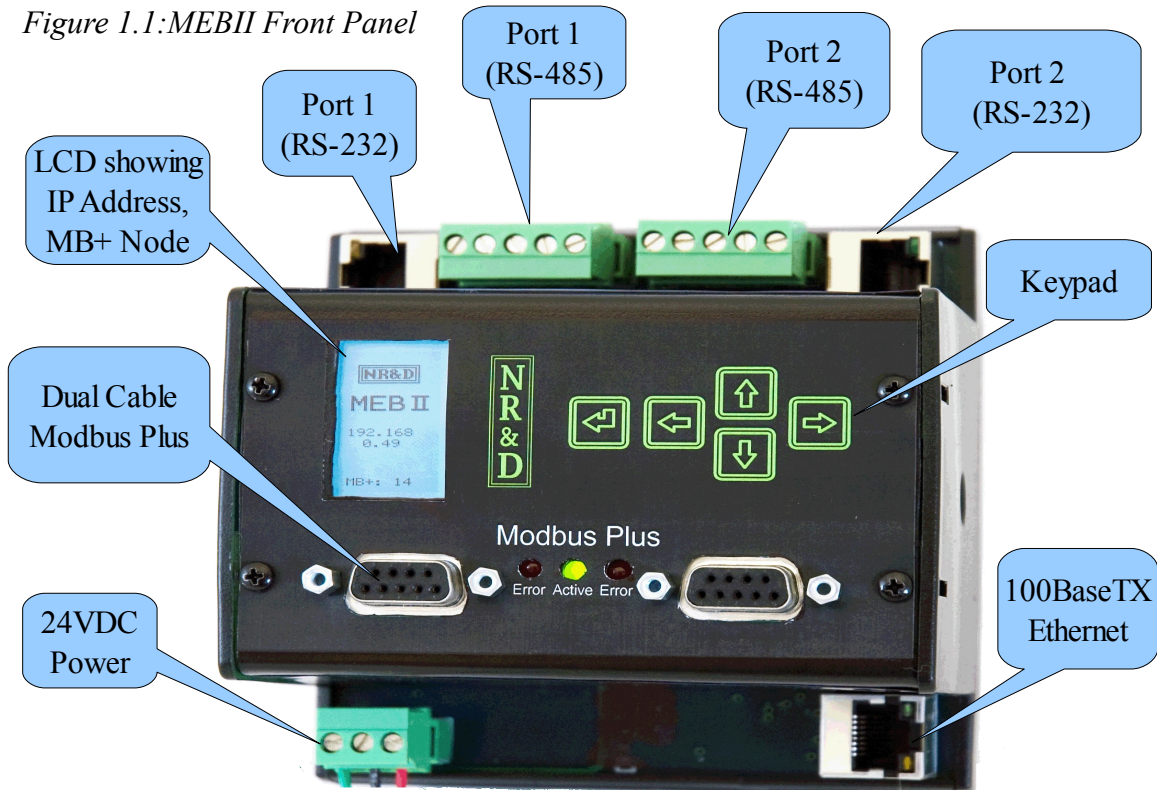
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1 Introduction

The Niobrara MEBII is a stand-alone DIN rail mount Modbus Plus to Ethernet Bridge. It features a redundant cable Modbus Plus (MB+) port, a 10/100BaseTX Ethernet port, and two isolated serial ports. The MEB II allows simultaneous pass-through routing data messages from Modbus/TCP Ethernet, MB+, and Modbus serial between all ports. Full support of PLC programming message pass-through is also provided on all communication ports including Unity Pro, Concept, ProWORX, and Modsoft.

Figure 1.1: MEBII Front Panel



The MEBII features a 10/100BaseTX Ethernet port that supports Modbus/TCP as both a client and a server at the same time. The MEBII can support up to 64 simultaneous Modbus/TCP connections. A routing table is used to map the incoming Modbus/TCP Destination Index (Slave Address) from a client to a downstream route that determines where the message is directed. This route may point to a PLC on MB+, a slave on one of the MEB's serial ports, or even back out the Ethernet port to a different device. The Ethernet port also supports the older SY/MAX 802.3 protocol for smoothly integrating legacy Square D Model 650 and 450 PLCs into a Modbus/TCP system.

The Modbus Plus port supports dual-cable redundant MB+ networking but may simply be used in a single-cable system by leaving one of the ports open. The standard 5-drop MB+ routing structure is supported allowing full access to MB+ devices on the local network or through Modicon Bridge Plus and Bridge Mux devices.

There are two isolated serial ports on the MEBII. Each port may be selected to use its RJ-45 connector for RS-232 or a removable 5-pin screw connector for RS-485. The RS-485 port may operate in 4-wire RS-422, 4-wire RS-485, or 2-wire RS-485 modes with selectable termination and bias. The two serial ports may be independently configured for one of 18 different protocols including Modbus RTU, Modbus ASCII, and SY/MAX. The default mode supports Modbus RTU and can dynamically switch between being a master or a slave.

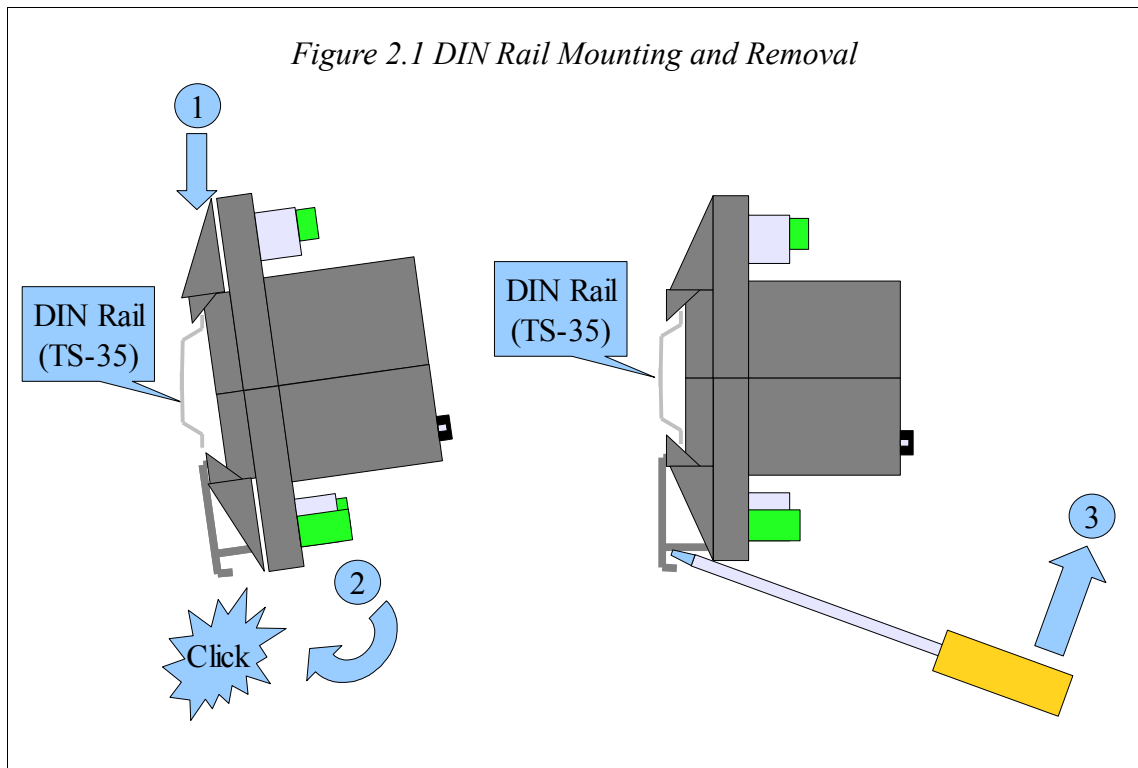
The MEBII features a front panel backlit LCD and keypad that may be used for configuration and troubleshooting. The IP Address, MB+ node address and most serial port settings may be configured through this interface which may be password protected to prevent unauthorized changes.

2 Installation

WARNING: Do not connect the MEB II to any Ethernet or MB+ network before configuring the appropriate network addresses. Duplicate network address may lead to improper network communication, equipment damage, injury, or death.

Device Mounting/Removal

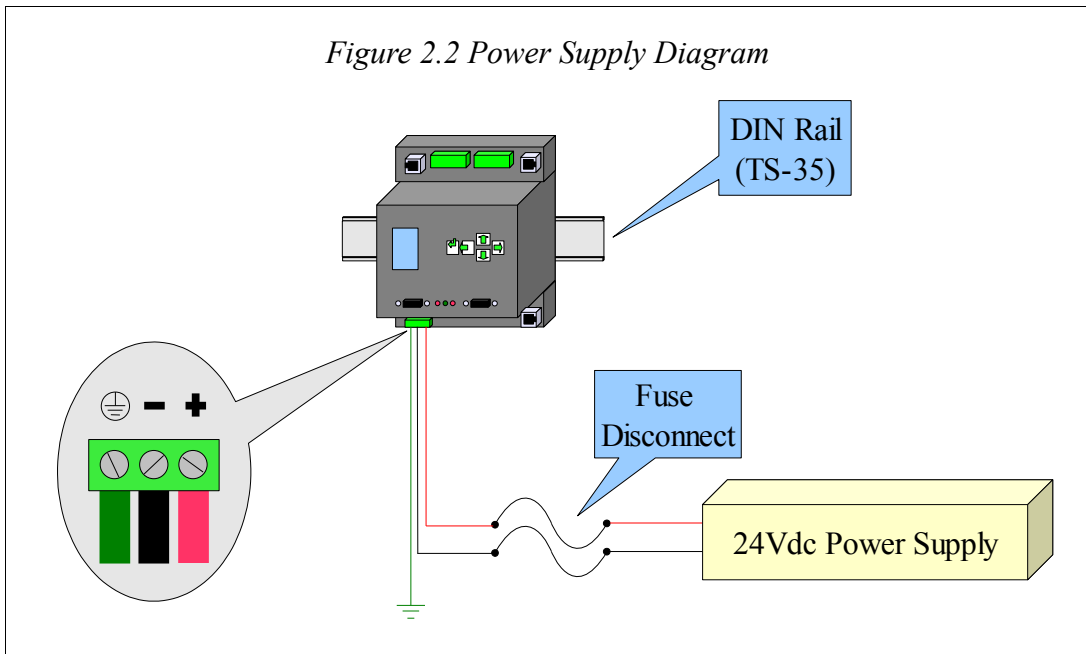
- (1) Hook the top notch on the upper lip of the DIN rail.
- (2) Rotate the MEBII until the lower latches click tight.
- (3) Use a screw driver to unclip the lower latches to remove the MEBII from the DIN rail.(See Figure 2.1 DIN Rail Mounting and Removal)



Power Supply

Connect a suitable 24VDC power to the three position removable connector. The MEB II requires a 5W minimum supply and will operate on 9-30Vdc but 24Vdc is recommended. (See Figure 2.2 Power Supply Diagram) An external fuse is recommended. Typical power supply wire colors are:

- Red = 24Vdc (+)
- Black = 24Vdc (-)
- Green = Earth Ground



Ethernet

Setting the IP Address

The MEBII defaults to a fixed IP Address of 10.10.10.10. This is easy to change through the use of the front panel keypad. The MEBII supports fixed IP Address, DHCP, or BOOTP. Press the **→** key four times to step through the “> Main > Config > Comms > Ethernet >” pages.

If BOOTP or DHCP is desired, **↓** arrow to the IP Source menu item, and then press the **→** key. The **↑** and **↓** arrows are used to select FIXED, DHCP, or BOOTP. The **←** key is used to accept the new value and return to the previous menu.

NOTE: BOOTP and DHCP operation usually requires that the server be configured for the MAC Address of the MEBII. The MEBII's MAC address is printed on the serial number label and is also shown on IP Source screen. The example below shows a MAC Address of 00:20:BD:0C:35:01.

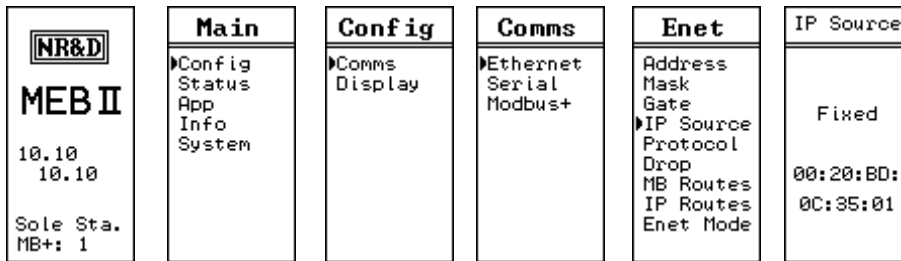


Figure 2.3: IP Address Source Screen

If a fixed address is required, make sure that the IP Source is set to Fixed, then select the Address page. The **↑** and **↓** arrows are used to adjust the values while the **→** and **←** arrows move between fields. The **←** key is used to accept the new value.

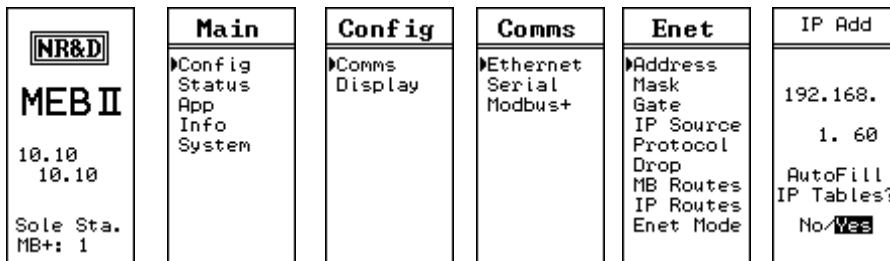





Figure 2.4: Fixed IP Address Screen

The “Autofill IP Tables?” offers the automatic filling of the TCP client table. Each of the 200 entries in the TCP table will be set to the first three octets of the MEBII's IP Address and the last octet will be set to the index number 0-199.

Setting the Subnet Mask

The Subnet Mask edit page is designed to quickly step through the valid bit-mapped options. Pressing the  and  arrows adjusts the mask value. The  key is used to accept the new value.

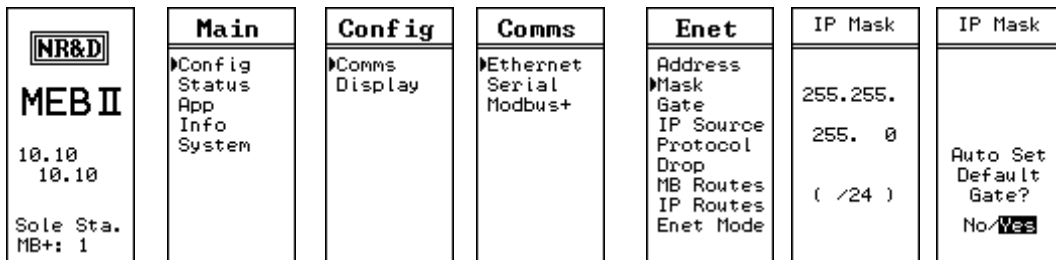


Figure 2.5: Subnet Mask Screens

The “Auto Set Default Gate?” applies the new subnet mask to the current IP Address to preset the Default Gate.

Setting the Default Gate

The Default Gate edit page functions just like the IP Address edit page.

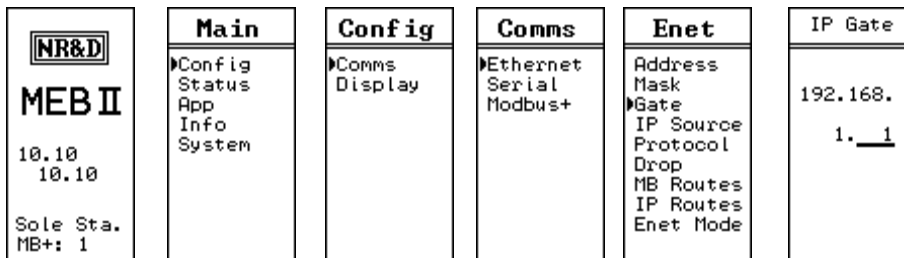


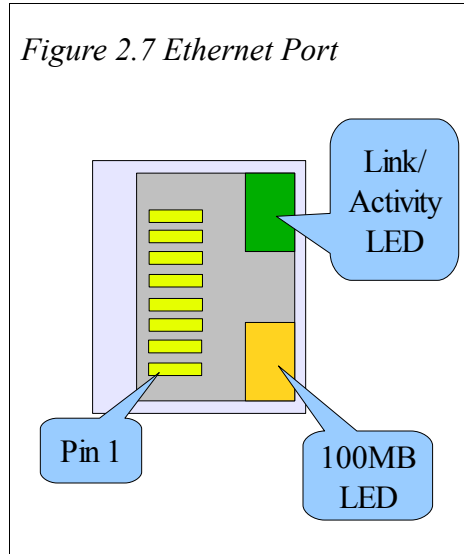
Figure 2.6: Default Gate Screen

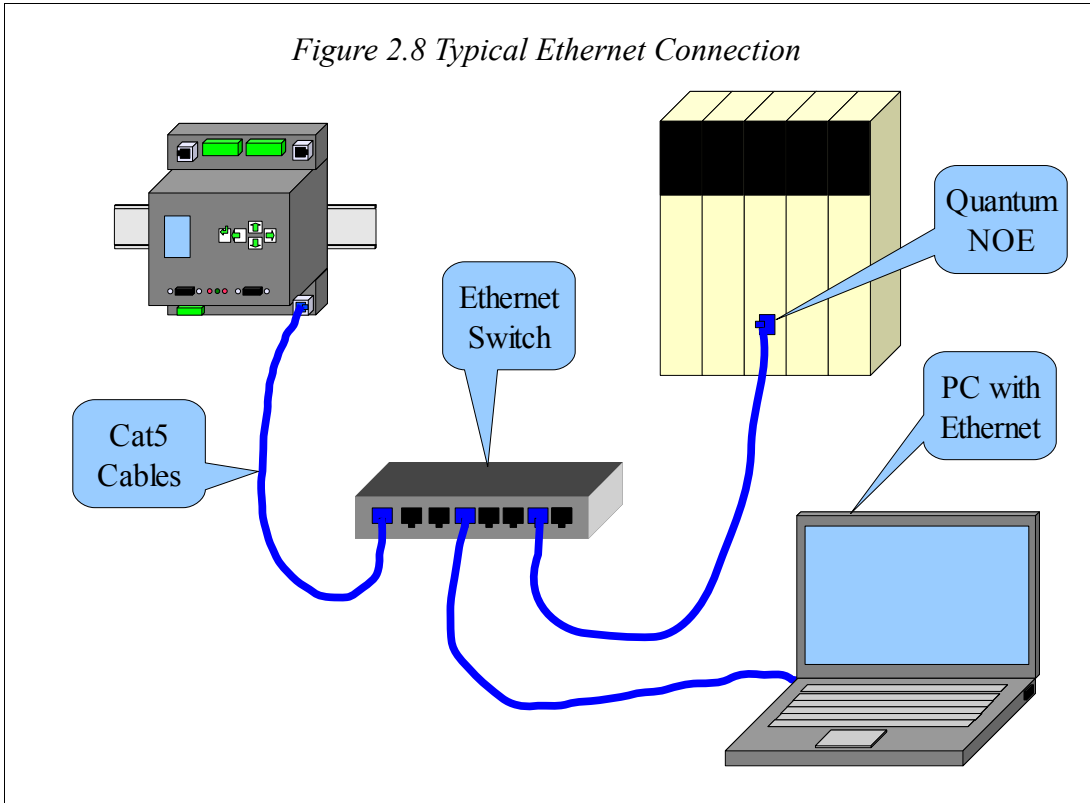
Ethernet Connection

After the IP Address is configured for the MEBII, it is safe to connect the Ethernet port to the network. The MEBII includes a standard RJ-45 Ethernet connector with indicators for Link/Activity (green LED) and 100Mb (amber LED). (See Figure 2.7 Ethernet Port) The green Link/Activity light illuminates when the MEBII has a valid link to the attached

network port and blinks off while experiencing network traffic. The 100Mb amber LED is illuminated when the Ethernet port has negotiated 100Mb operation and off while configured for 10Mb operation.

The MEBII's Ethernet port supports 10/100BaseTX auto-crossover operation. Standard CAT5 cables may be used to connect the MEBII to Ethernet switches and hubs.





The status of the Ethernet port may be inspected through the front panel LCD by choosing “> Main > Status > Enet >”

NR&D MEB II 10.10 10.10 Sole Sta. MB+: 1	Main Config Status App Info System	Status Stats Enet MB+	Enet Phy Link:Up Rate:100 Dplx:Full
---------------------------------------------------------------------------	----------------------------------------------------------	---------------------------------------	-----------------------------------------------------

Figure 2.9: Ethernet Port Status

The Ethernet port defaults to “Auto” mode but may be manually set to a fixed 10BaseT or 100BaseT with fixed Full or Half Duplex operation.

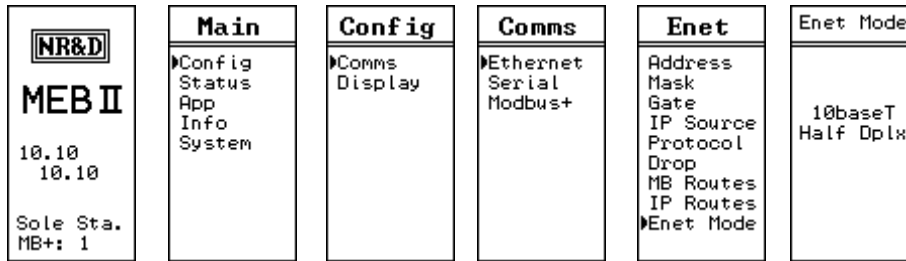





Figure 2.10: Ethernet Mode Screen

Modbus Plus

Modbus Plus Configuration

The Modbus Plus (MB+) node of the MEBII may be assigned an address between 1 and 64 with a default value of 1. This address must be unique within the local MB+ network segment. To edit the MB+ drop number choose:

“> Main > Config > Comms > Modbus+ >“

The  and  arrows are used to adjust the new MB+ drop. The  key is used to accept the new value.

NOTE: If the MEBII is physically connected to the local MB+ network, it will automatically skip MB+ drop numbers that are already in use. The drop numbers of the Ethernet and serial ports will also be skipped if they fall within the valid MB+ range.

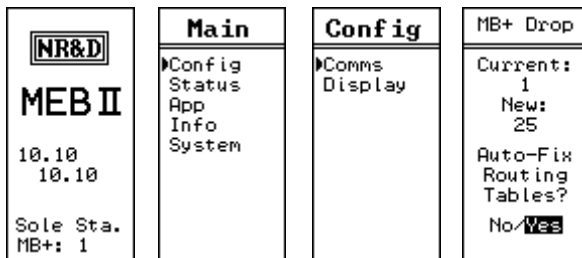


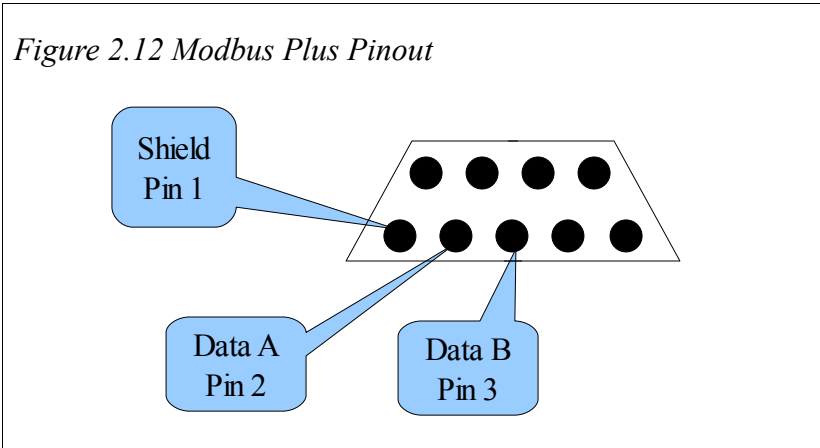
Figure 2.11: Edit Modbus Plus Drop

After selecting the new MB+ drop number, the screen will change to ask if the user would like to AutoFix the Routing Tables. Choosing Yes will result in the Modbus Routing Tables for the Ethernet and serial ports 1 and 2 being updated to include the new drop number of the MB+ port. If No is selected, these tables will not be updated and many of the routes will not longer work properly – they must then be edited manually.

Modbus Plus Connection

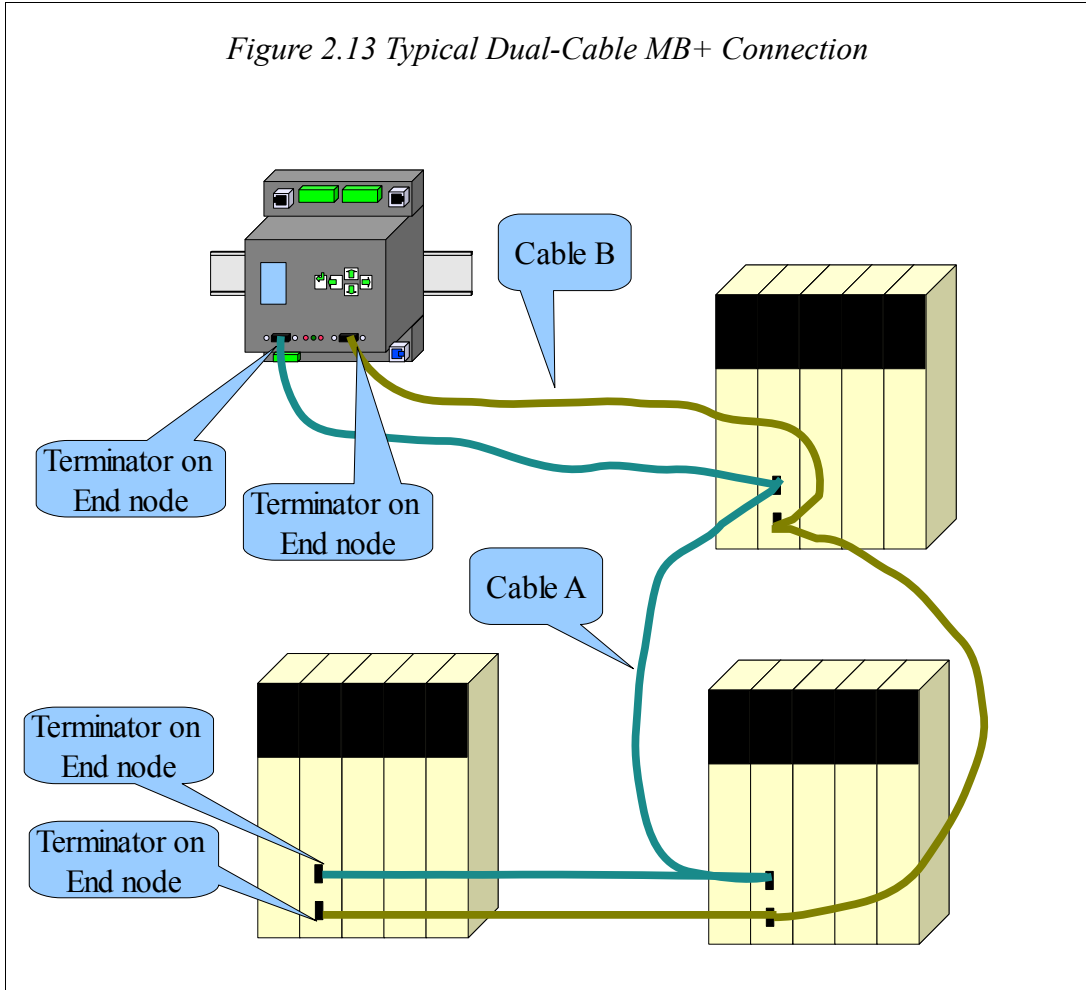
NOTE: See the Modicon Modbus Plus Network Planning and Installation Guide 890 USE 100 00 for complete instructions on proper MB+ cable installation methods and considerations.

Modbus Plus has very specific rules about minimum and maximum cable lengths, number of nodes per segment, the use of repeaters, and cable termination. It is extremely important to follow the rules spelled out in the above mentioned guide for proper network operation.

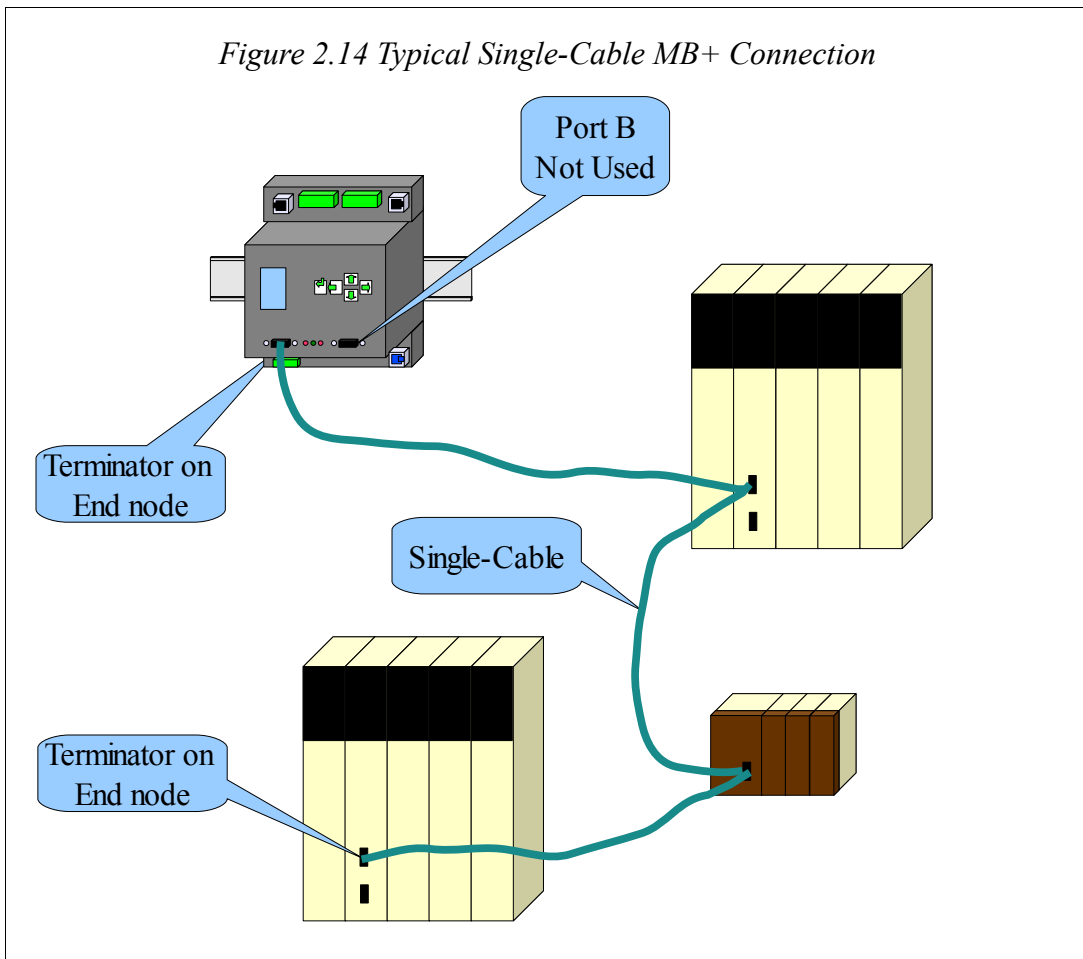


The MEBII includes two MB+ DB9 connectors labeled “A” and “B”. (See Figure 2.12 Modbus Plus Pinout) These ports may be used in a “dual-cable” Modbus Plus network. This does not mean that the MEBII has two MB+ nodes, it behaves as a single MB+ node with two physical network connectors. The dual-cable system uses redundant wiring between nodes for added network integrity. (See Figure 2.13 Typical Dual-Cable MB+ Connection)

Figure 2.13 Typical Dual-Cable MB+ Connection



The MEBII may be used in a “single-cable” network by simply connecting the MB+ network to port “A”. (See Figure 2.14 Typical Single-Cable MB+ Connection)



Modbus Plus Lights

The MEBII includes one green LED and two red error LEDs to provide visual status of the MB+ network operation.

If the red error A or error B lights blink momentarily, it indicates that a message error was detected on the corresponding network port. A steady ON error light indicates that a hard fault exists. The fault may either be in the cable or on a node connected to that cable. If communication on one cable is lost, the other should continue normally.

The green Active light flashes in patterns to indicate the operating state of the MB+ node. (See Table 2.1: MB+ Green Active Flashes)

Table 2.1: MB+ Green Active Flashes

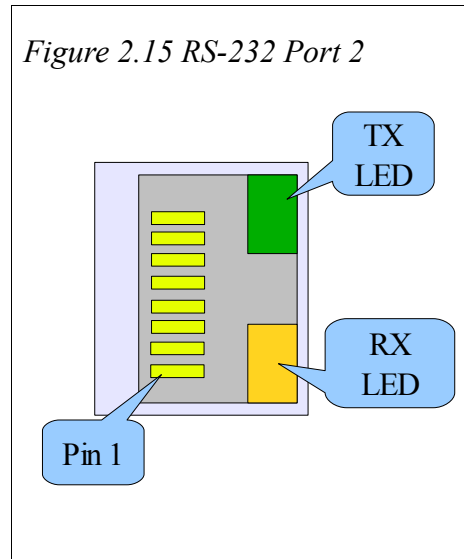
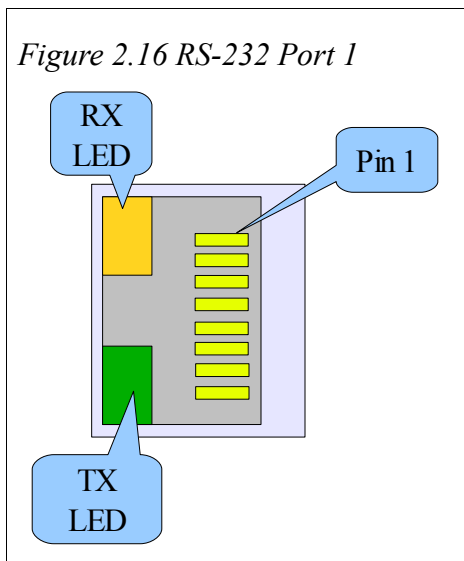
Green Active Flashes	Meaning
Six steady flashes per second	Normal Operating State
One flash per second	Offline, monitoring network traffic
Two flashes, then OFF for two seconds	Hears traffic but never receives the Token
Three flashes, then OFF for 1.7 seconds	Sole Station, no other nodes detected
Four flashes, then OFF for 1.4 seconds	Offline, Duplicate Node Address Detected

Serial Ports

The MEBII includes two isolated serial ports. Separate connectors are provided for each port with an RJ-45 connector for RS-232 and a removable 5-position screw terminal connector for RS-485/422.

NOTE: Port 1 is electrically isolated from Port 2. The RS-232 connector of a given port is not isolated from the RS-485 connector of the same port.

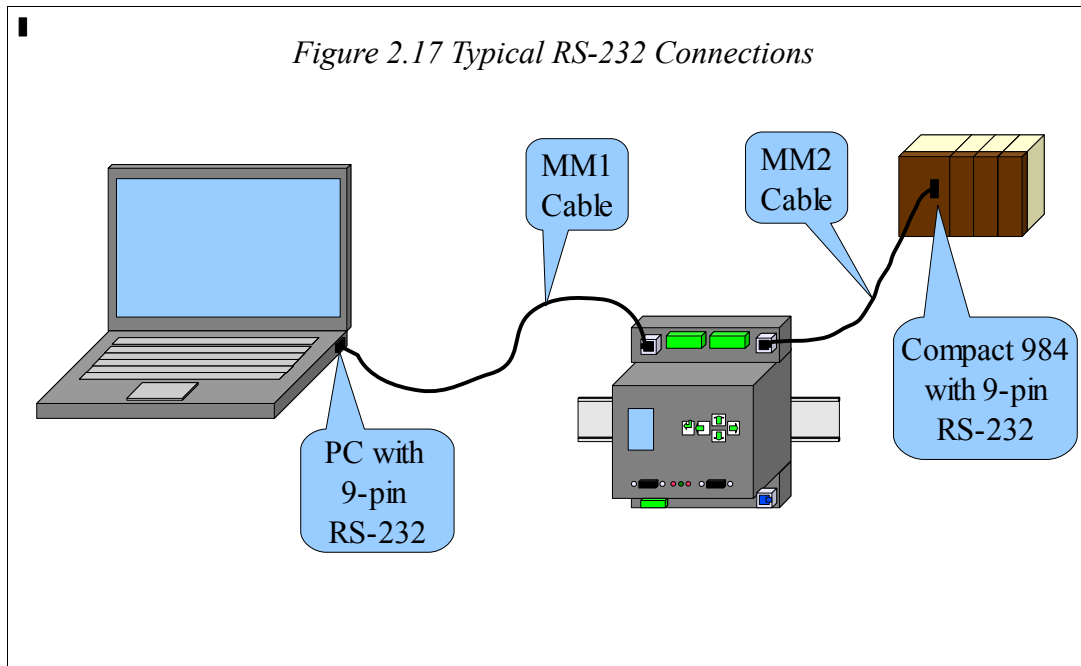
RS-232 Ports



The RJ-45 connectors are used for RS-232 operation. The pin configuration is shown in Table 2.2: RJ45 RS-232 Pinout. The Niobrara MM1 cable is used to connect an one of these ports to the a standard 9-pin serial port on a PC. (See Figure 1.1.: MM1 Serial Cable)

Table 2.2: RJ45 RS-232 Pinout

Pin	Function
1	No Connection
2	DSR (pulled high)
3	Data TX
4	Data RX
5	Signal GND
6	RTS
7	CTS
8	Chassis GND



RS-485 Ports

Port 1 and 2 may be used for RS-485 (4-wire or 2-wire) and RS-422 operation. A 5-pin removable screw terminal connector is provided. The pinout is shown in Figure 2.18 RS-485 Port.

Table 2.3: 5-position RS-485 pinout

Pin	Function
Shield	No internal connection
RX-	(-) data into MEBII
RX+	(+) data into MEBII
TX-	(-) data out from MEBII
TX+	(+) data out from MEBII

Figure 2.18 RS-485 Port

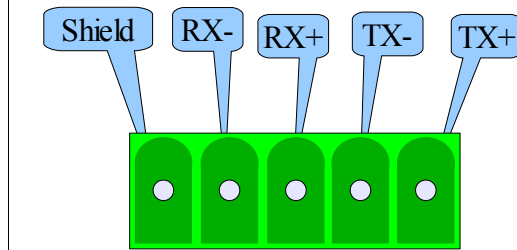
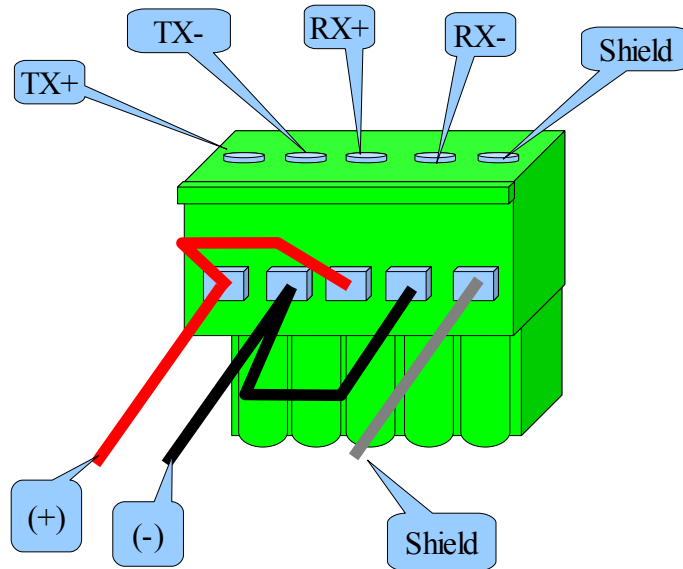
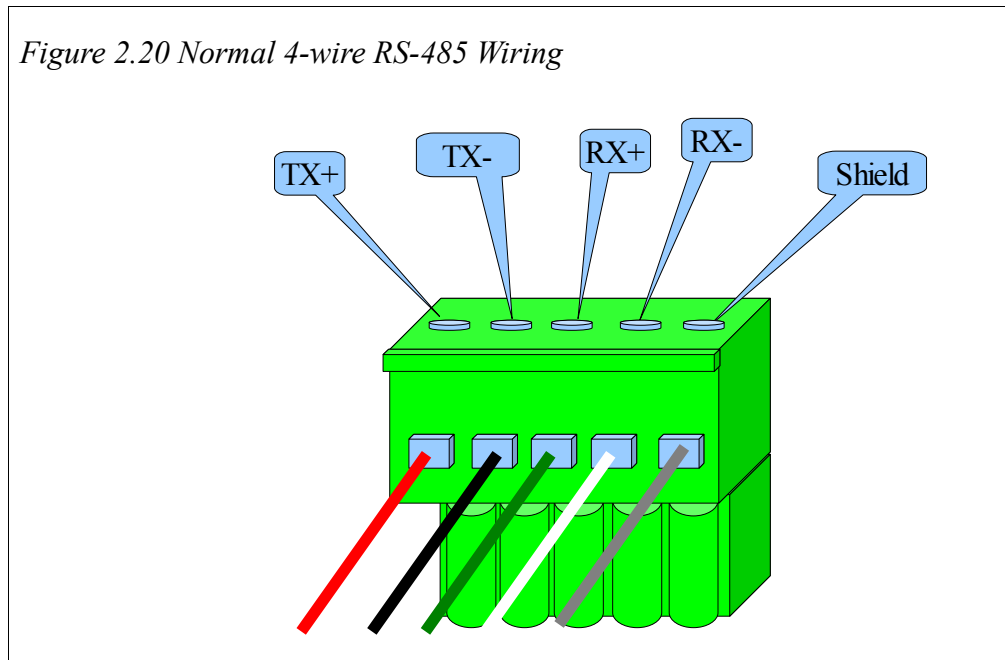


Figure 2.19 Jumper for 2-wire RS-485



For 2-wire RS-485 operation, jumper the TX+ to RX+ to make the (+) connection, then jumper the TX- to RX- to make the (-) connection.

Figure 2.20 Normal 4-wire RS-485 Wiring



Software Installation

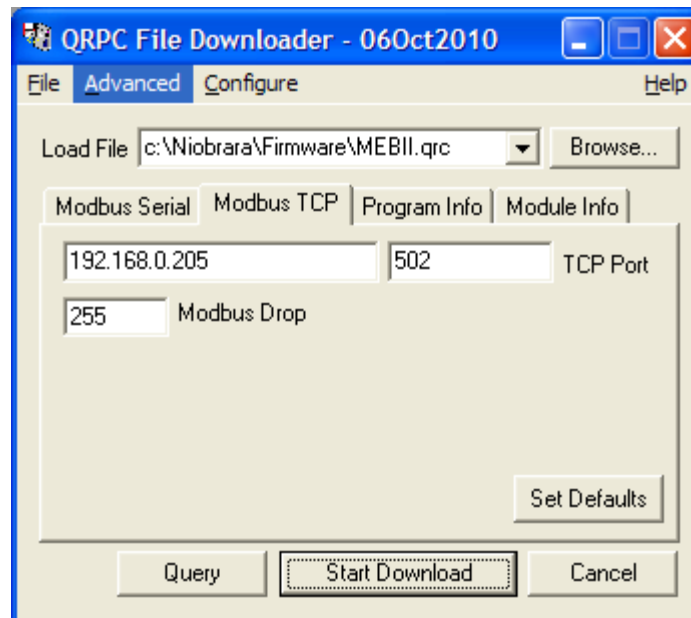
The MEB_SETUP.EXE file includes this user manual, MEBSW32.EXE configuration software, the MEBII firmware files, the RPCLOAD.EXE firmware loader utility, the NRDTOOL.EXE register viewer utility, The latest version of this file is located at www.niobrara.com. Follow the link for “Download Area”, select “Module Software” and then “MEB_SETUP.EXE”.

Updating the MEBII Firmware

On occasion it may be necessary to update the operating system of the MEBII. The RPCLOAD program is used to install the MEBII firmware through the Ethernet connection.

1. Make sure the MEBII is powered and running.
2. Start RPCLOAD.EXE. The Windows Start Menu link is “Start, Programs, Niobrara, MEB, RPCLOAD MEBII Firmware”.
3. Click on the Browse button and select MEBII.qrc.
4. Select the Modbus TCP tab.
5. Enter the IP Address of the target MEBII (i.e. 192.168.0.205)
6. Make sure that the TCP port is set to 502.
7. Make sure that the Modbus Drop is set to 255.
8. Press the “Start Download” button. RPCLOAD will open a progress bar to show the status of the download.

Figure 2.21: RPCLOAD Screen



3 Modbus/TCP Operation

The MEBII can operate as both a Modbus/TCP Server (slave to external masters) and Client (master to external slaves) at the same time. Up to 64 simultaneous TCP/IP connections may be made to the MEBII. These connections are dynamically split between client and server operation.

Server Operation

The MEBII listens for Modbus/TCP connections on the standard Modbus/TCP port number of 502. Modbus/TCP commands or queries generated by a client are processed by the MEBII by examining the Destination Index (Modbus Slave Address) of the message.

A look-up table is used to map the Destination Index to a route that tells the MEBII where to send the message. This table consists of a column for the Destination Index, a translation description (from legacy SY/MAX operation), and a downstream route.

The example in Figure 3.1 shows a PC connected via Ethernet to an MEBII.

The MEBII's MB+ port is set to drop 45. A Compact 984 PLC is connected to the MB+ network and has a drop of 5. A Bridge Plus is also on the MB+ network and is used to connect to a Quantum PLC on a second MB+ network at drop 15.

A network of power meters is connected to port 2 (drop 102) of the MEBII. The three power meters are addressed as Modbus slaves 1, 2, and 3.

Table 3.1 gives a Modbus Routing table for this example. The PC would use index 1 to communicate with the Compact PLC. Index 2 would access the Quantum PLC. Index 3 will reach power meter #1.

NOTE: Index 0 has a route of NONE. The MEBII will internally process incoming Modbus/TCP messages with no route, the special index 255, or any route that doesn't leave the MEBII. This action may result in unexpected reply data since this data is from the MEB itself.

Figure 3.1 Ethernet Modbus Routing Example

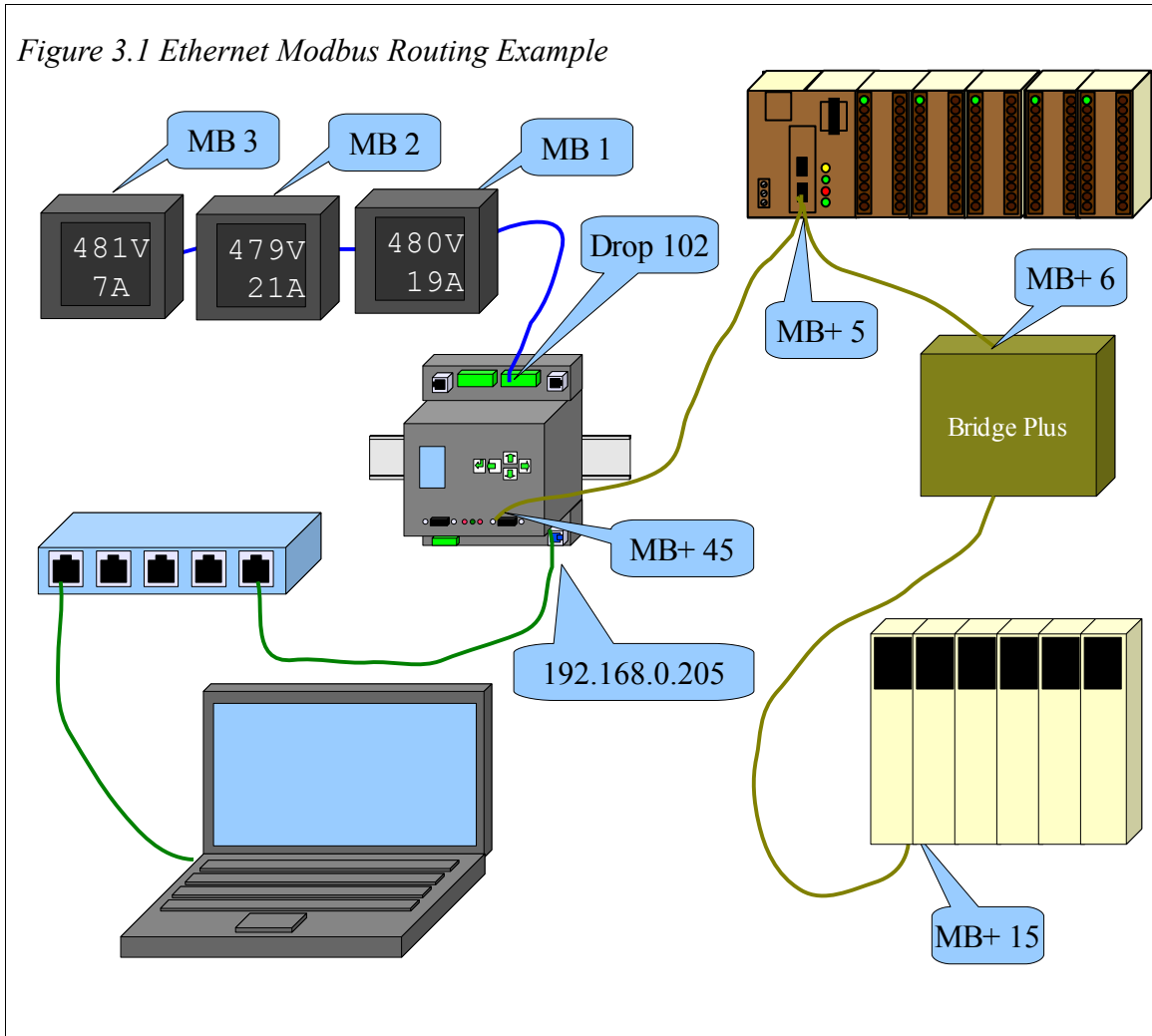


Table 3.1: Ethernet Modbus Routing Table Example

Index	Type	Route	Comments
0	OTHER	NONE	MEBII Itself
1	MODBUS	45,5	Compact 984 PLC
2	MODBUS	45,6,15	Quantum PLC on far side of Bridge Plus
3	MODBUS	102,1	Power Meter 1
4	MODBUS	102,2	Power Meter 2
5	MODBUS	102,3	Power Meter 3

Default Modbus Routing Table

The default Modbus Routing table for the Ethernet port maps Modbus/TCP destination index values 1-64 to the MB+ node on the MEBII's MB+ network. Table entries 1 through 64 are set to have the first drop be the MB+ port number and the second drop be the same as the index for drops 1 through 64. Entries 65 through 96 use Port 1's drop number, 1 through 32. Entries 97 through 128 use Port 2's drop number, 1 through 32.

Table 3.2: Default Ethernet Modbus Routing Table for MB+ Drop 1, Port 1 drop 101, and Port 2 drop 102

Index	Type	Route
0	OTHER	NONE
1	MODBUS	1,1
2	MODBUS	1,2
3	MODBUS	1,3
...	MODBUS	...
63	MODBUS	1,63
64	MODBUS	1,64
65	MODBUS	101,1
66	MODBUS	101,2
67	MODBUS	101,3
68	MODBUS	101,4
...	MODBUS	...
95	MODBUS	101,31
96	MODBUS	101,32
97	MODBUS	102,1
98	MODBUS	102,2
99	MODBUS	102,3
100	MODBUS	102,4
...	MODBUS	...
127	MODBUS	102,31
128	MODBUS	102,32
129	OTHER	NONE

AutoFix Modbus Table

The MEBII offers to “AutoFix” the Modbus Routing tables after the MB+ drop number is altered. The Ethernet and both serial port Modbus Routing tables are examined and entries where the first drop of the route matches the old MB+ drop number are changed to match the new drop number.

<p>NR&D MEB II 10.10 10.10 Sole Sta. MB+: 1</p>	<p>Main ►Config Status App Info System</p>	<p>Config ►Comms Display</p>	<p>Comms Ethernet Serial ►Modbus+</p>	<p>MB+ Drop Current: 1 New: 25 Auto-Fix Routing Tables? No/Yes</p>
---------------------------------------------------------------------------------------	-----------------------------------------------------------------------	---------------------------------------------	----------------------------------------------------------	-----------------------------------------------------------------------------------------------------------

Figure 3.2: Edit Modbus Plus Drop

Table 3.3: Ethernet Modbus Routing Table for MB+ Drop 25 after AutoFix

Index	Type	Route
0	OTHER	NONE
1	MODBUS	25,1
2	MODBUS	25,2
3	MODBUS	25,3
...	MODBUS	...
63	MODBUS	25,63
64	MODBUS	25,64

Front Panel Modbus Route Edit

The Ethernet Modbus Routing tables may be modified from the front panel. The “Index” field may be changed with the UP and DOWN arrows. Pressing the ENTER button on the Index field will exit this screen.

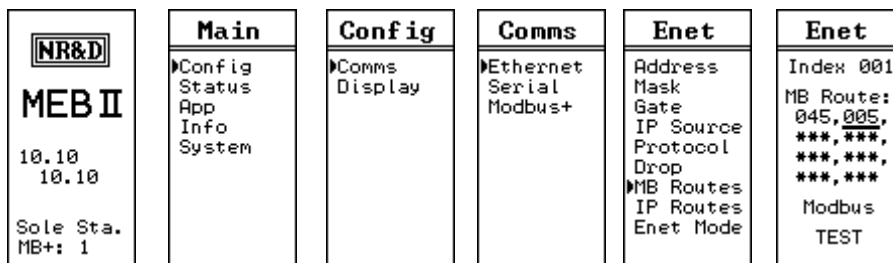


Figure 3.3: Modbus Route Edit Screen

Pressing ENTER button on the TEST field will cause the MEBII to generate a Modbus opcode 03 Holding Register read of the target device. The test will report PASS or FAIL. A “Downstream Timeout” is a failure but an Error 01 (Illegal Opcode) or Error 02 (Illegal Register) are PASS because the target device responded with the error.

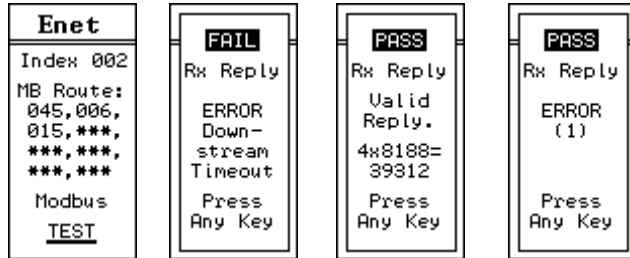


Figure 3.4: Modbus Route Edit TEST Screens

Client Operation

The MEBII uses a look-up table to map routing drop numbers to TCP/IP addresses. This table is called the TCP Routing Table within MEBSW32. This table consists of a drop number, target IP Address, and an optional Downstream Route. Messages passing through the MEBII from MB+ or the serial ports (or the Ethernet port itself) that are directed out the Ethernet port are sent to the TCP Routing Table to determine the target device.

Figure 3.5 shows an MEBII connected to a Compact 984 PLC via Modbus Plus. The Ethernet port is set to be drop 25 and is connected to a Quantum PLC at IP Address 192.168.0.24 and an M340 PLC at 192.168.0.25.

Figure 3.5 Modbus Client Routing Example

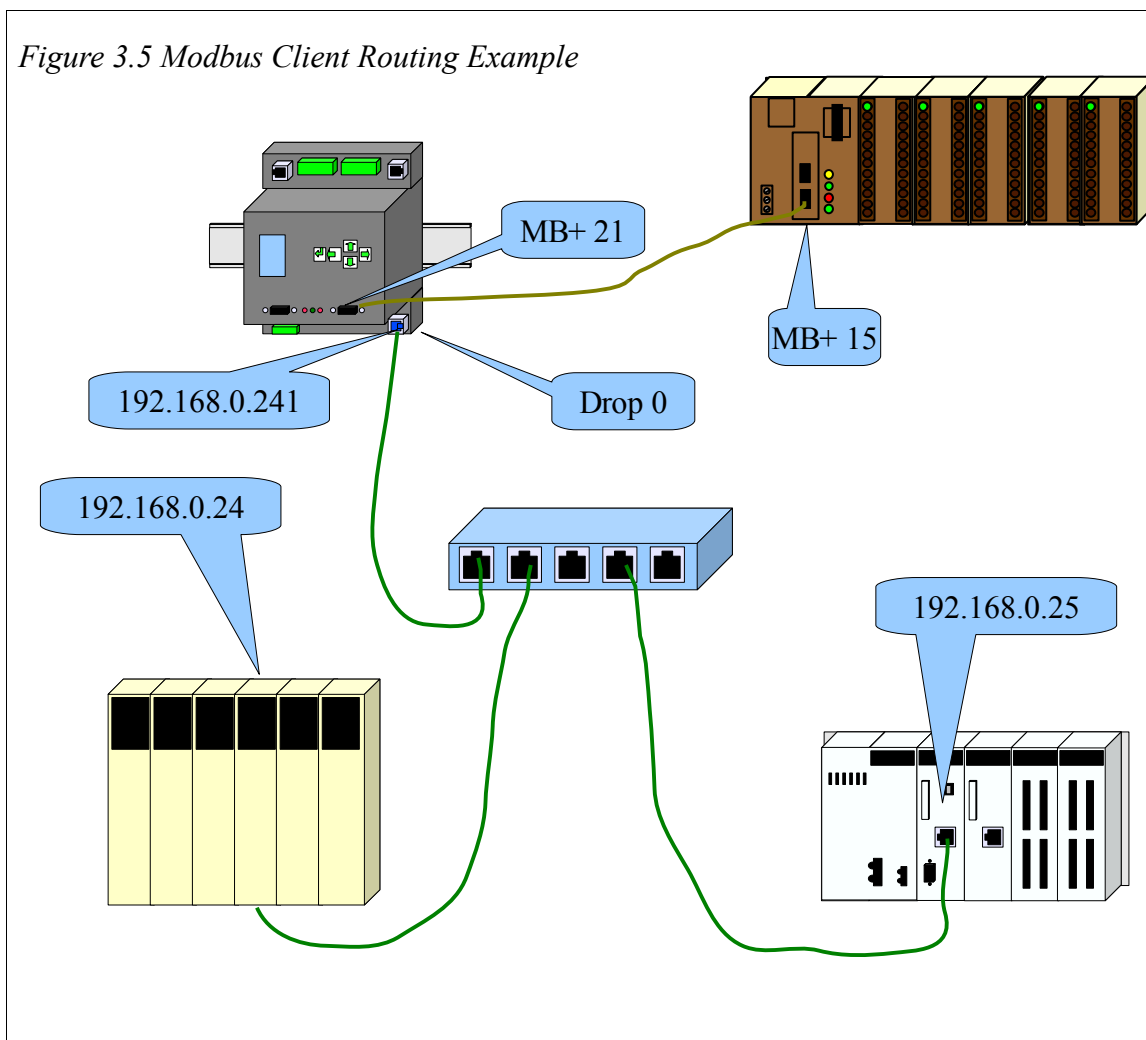


Table 3.4: MEBII TCP Table Example

Drop	IP Address	Downstream Route	Comments
0	0.0.0.0	NONE	
1	192.168.0.24	NONE	Quantum PLC
2	192.168.0.25	NONE	M340 PLC
3	192.168.0.205	NONE	MEBII from Figure 3.1
4	0.0.0.0	NONE	

The table below shows routes for MSTRs for the Compact PLC in this example.

- The first drop (21) in the route is the MB+ number of the MEBII.
- The second drop (4, 5, 6, 7, and 8) is the drop number that tells the MEBII to route the message out of the Ethernet port. See Chapter ??? for more information on MB+ inbound routing.
- The third drop (1, 2, and 3) is the TCP table look-up drop. This number defines the target IP Address.
- The fourth drop (0, 1, 2, 3, 4, 5, and 255) is the destination index for the Modbus/TCP message sent to the target IP device. The local M340 and Quantum NOEs don't care about the value of this number. This number is used in the Modbus Routing table in the remote MEBII to determine the target for the MSTR message.

Table 3.5: MSTR Routes for Compact PLC in Figure 3.5

MSTR MB+ Route	Target
21.4.1.0	Quantum at 192.168.0.24
21.5.2.0	M340 at 192.168.0.25
21.6.3.1	Compact in Figure 3.1
21.7.3.2	Quantum in Figure 3.1
21.8.3.3	Power Meter 1 in Figure 3.1
21.8.3.4	Power Meter 2 in Figure 3.1
21.8.3.5	Power Meter 3 in Figure 3.1
21.8.3.255	MEBII in Figure 3.1

There are a few subtle issues of note in this example:

- The MEB chooses to open new client sockets based on the entry in the TCP table. When a message arrives at the Ethernet port, the drop following the Ethernet port is examined to determine the target IP Address. If there is already a client socket opened to this target then the new message then this new message will be sent on this socket. Client sockets are single-threaded by the MEBII. In other words, only one outstanding message is allowed on a client socket at a time. Newly arrived messages are held in a queue and sent when one at a time.
- There are 200 entries in the TCP table. This feature may be exploited to cause the MEB to open multiple client connections to a given target by simply adding the same IP Address to multiple table entries. Use caution with this method as there are only 64 total sockets available.
- There are only 8 data slave channels on the MB+ chipset in the MEBII. The drop

number following the MEB's MB+ drop number directly selects the data slave channel. (Channels 1 and 2 are dedicated to serial ports 1 and 2, channel 3 is dedicated to the MEB's internal registers, and channels 4, 5, 6, 7, and 8 are dedicated to the Ethernet port. MB+ data channels are single-threaded which means that only one message may be outstanding at a time on a given channel. If the PLC only has one MSTR active at a time, then the routes could be changed to only use a single data channel (like 4) with no impact on system throughput.

- Other PLCs on the same MB+ network could use exactly the same routes as this PLC. If multiple MB+ messages attempt to use the same data channel at the same time, the MB+ network takes care of this situation automatically, all of the messages get through, it just slows down a little as they take turns.
- The most efficient way to handle multiple PLCs generating client messages would be to partition data channels to each PLC/MSTR. (Don't configure 10 PLCs to only use a single data channel. It is more efficient to split them between the five possible channels.)

NOTE: When the MEBII's Ethernet port is in Modbus+SYMAX mode, the TCP table is how the unit decides to connect a client message via Modbus/TCP or SY/MAX 802.3. If the IP Address for a given drop number is 0.0.0.0 then the message is sent out as SY/MAX 802.3 to that drop number. See Chapter ???.

AutoFill TCP Table

Changing the IP Address from the front panel keypad will prompt the user to automatically adjust the TCP Routing Table. This feature will automatically fill in the first three bytes of the local IP Address and have the fourth byte match the drop number.

Table 3.6: Defaykt Ethernet TCP Routing Table

Drop	IP Address	Route
0	0.0.0.0	NONE
1	0.0.0.0	NONE
2	0.0.0.0	NONE
3	0.0.0.0	NONE

Table 3.7: Ethernet TCP Routing Table for 206.223.51.155 after AutoFill

Drop	IP Address	Route
0	206.223.51.0	NONE
1	206.223.51.1	NONE
2	206.223.51.2	NONE
3	206.223.51.3	NONE

Front Panel Edit of TCP Table


 MEB II 10.10 10.10 Sole Sta. MB+: 1	Main ▶Config Status App Info System	Config ▶Comms Display	Comms ▶Ethernet Serial Modbus+	Enet Address Mask Gate IP Source Protocol Drop MB Routes ▶IP Routes Enet Mode	IP Routes Index <u>002</u> 192.168. 001.002 ZERO AUTO
---------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------	------------------------------------	------------------------------------------------	-----------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------

Figure 3.6: IP Route Edit Screen

The IP Routes may be edited from the front panel. The UP and DOWN buttons on the INDEX field scroll through the 200 entries. Pressing the ENTER button while on the INDEX field exits the screen.

Pressing the ENTER button while on the ZERO field will zero the IP Address. This is useful in SY/MAX Ethernet applications.

Pressing the ENTER button while on the AUTO field will auto load the AutoFill value for this Index.

4 Modbus Serial Operation

The MEBII serial ports can operate as both a Modbus Master and Slave using either Modbus RTU and Modbus ASCII protocols. The protocol modes are labeled “Modbus RTU” and “Modbus ASCII”. All Modbus serial modes can dynamically switch between functioning as a Master or a Slave.

NOTE: The mode “MODBUS HOST” is a version of the RTU mode with special message translation features.

Slave Operation (External Master)

A Modbus mode port on the MEBII listens for Modbus serial messages whenever it is idle. When a message arrives and has a good checksum, the Modbus Slave Address in the message is examined and compared to entries in the Modbus Routing Table for that serial port. If the entry for that drop number is not empty, then the MEBII will forward that message according to this defined route. If the entry is empty (NONE), then the message is ignored.

A look-up table is used to map the Destination Index to a route that tells the MEBII where to send the message. This table consists of a column for the Destination Index, a translation description (from legacy SY/MAX operation), and a downstream route.

The example in Figure 4.1 shows a PC connected via RS-232 to an MEBII Port 1.

The MEBII's MB+ port is set to drop 45. A Compact 984 PLC is connected to the MB+ network and has a drop of 5. A Bridge Plus is also on the MB+ network and is used to connect to a Quantum PLC on a second MB+ network at drop 15.

A network of power meters is connected to port 2 (drop 102) of the MEBII. The three power meters are addressed as Modbus slaves 1, 2, and 3.

Table 4.1 gives a Modbus Routing table for this example. The PC would use index 1 to communicate with the Compact PLC. Index 2 would access the Quantum PLC. Index 3 will reach power meter #1.

NOTE: The MEBII will internally process incoming Modbus/TCP messages with the special index 255, or any route that doesn't leave the MEBII. This action may result in unexpected reply data since this data is from the MEB itself.

Figure 4.1 Ethernet Modbus Routing Example

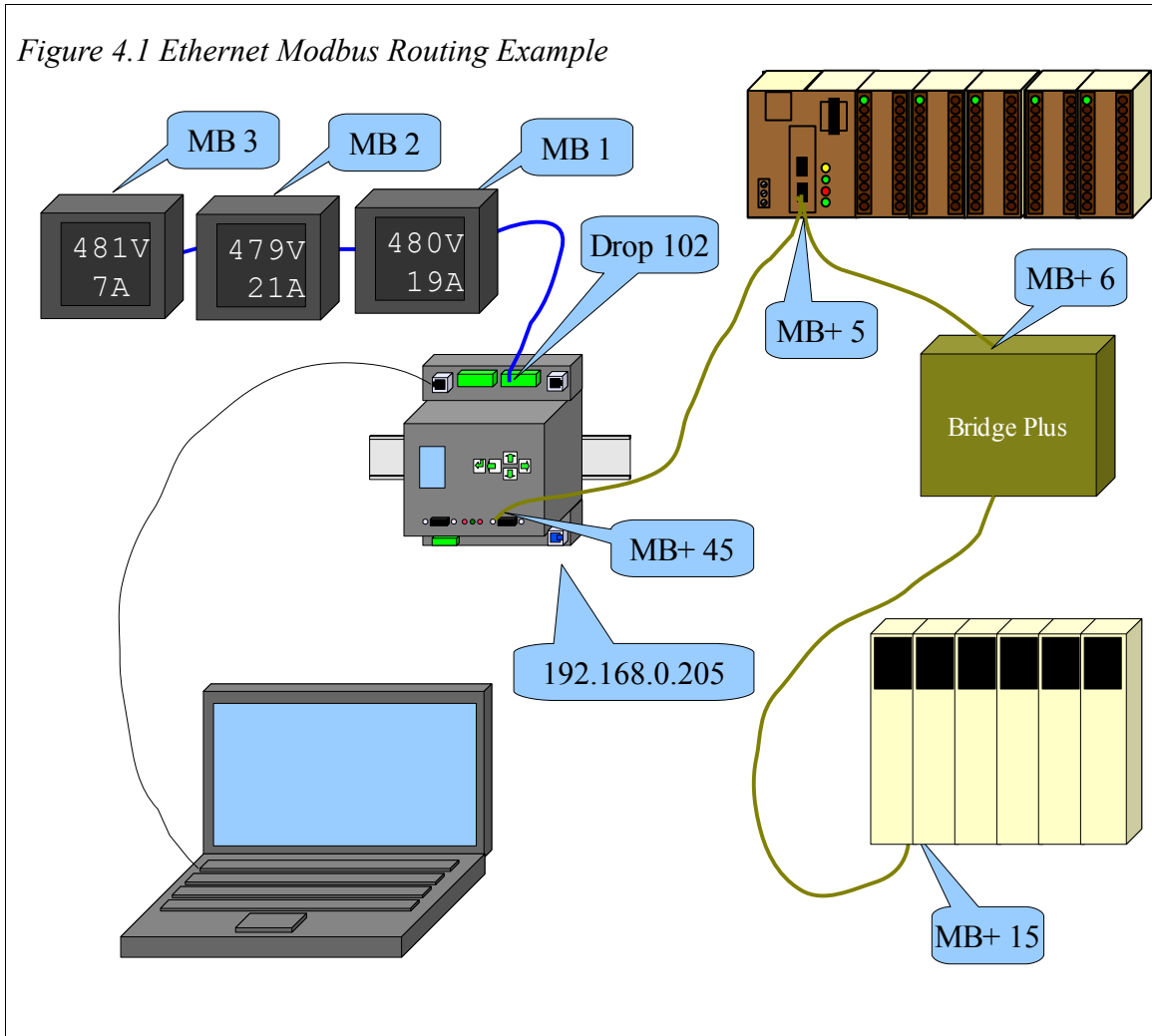


Table 4.1: Serial Modbus Routing Table Example

Index	Type	Route	Comments
0	OTHER	NONE	MEBII Itself
1	MODBUS	45,5	Compact 984 PLC
2	MODBUS	45,6,15	Quantum PLC on far side of Bridge Plus
3	MODBUS	102,1	Power Meter 1
4	MODBUS	102,2	Power Meter 2
5	MODBUS	102,3	Power Meter 3

Default Modbus Routing Tables

The default Modbus Routing table for each serial port maps Modbus Slave Address (Index) values 1-64 to the MB+ node on the MEBII's MB+ network. Table entries 1 through 64 are set to have the first drop be the MB+ port number and the second drop be the same as the index for drops 1 through 64. Entries 65 through 96 use Port 1's drop number, 1 through 32 (port 2 only) . Entries 97 through 128 use Port 2's drop number, 1 through 32 (port 1 only).

Table 4.2: Default Serial Port Modbus Routing Table for MB+ Drop 1, Port 1 drop 101, and Port 2 drop 102

Index	Type	Route for Port 1	Route for Port 2
1	MODBUS	1,1	1,1
2	MODBUS	1,2	1,2
3	MODBUS	1,3	1,3
...	MODBUS
63	MODBUS	1,63	1,63
64	MODBUS	1,64	1,64
65	MODBUS	NONE	101,1
66	MODBUS	NONE	101,2
67	MODBUS	NONE	101,3
68	MODBUS	NONE	101,4
...	MODBUS	NONE	...
95	MODBUS	NONE	101,31
96	MODBUS	NONE	101,32
97	MODBUS	102,1	NONE
98	MODBUS	102,2	NONE
99	MODBUS	102,3	NONE
100	MODBUS	102,4	NONE
...	MODBUS	...	NONE
127	MODBUS	102,31	NONE
128	MODBUS	102,32	NONE

AutoFix Modbus Table

The MEBII offers to “AutoFix” the Modbus Routing tables after the serial port drop number is altered. The Ethernet and both serial port Modbus Routing tables are examined

and entries where the first drop of the route matches the old serial drop number are changed to match the new drop number.

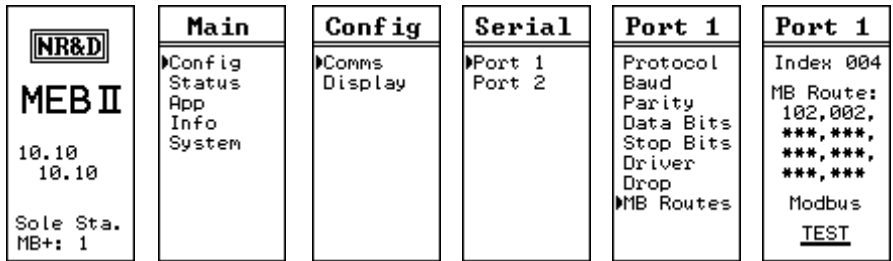


Figure 4.2: Edit Modbus Serial Route

Pressing ENTER button on the TEST field will cause the MEBII to generate a Modbus opcode 03 Holding Register read of the target device. The test will report PASS or FAIL. A “Downstream Timeout” is a failure but an Error 01 (Illegal Opcode) or Error 02 (Illegal Register) are PASS because the target device responded with the error.

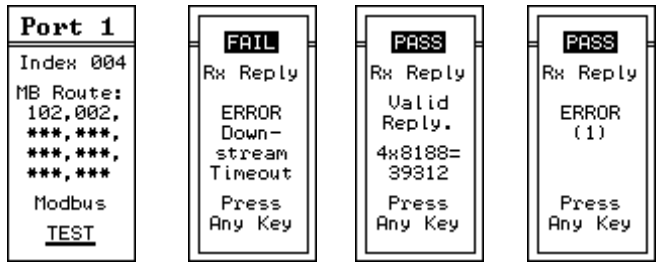


Figure 4.3: Modbus Route Edit TEST Screens

Master Operation (External Slave)

The MEBII uses a look-up table to map routing drop numbers to TCP/IP addresses. This table is called the TCP Routing Table within MEBSW32. This table consists of a drop number, target IP Address, and an optional Downstream Route. Messages passing through the MEBII from MB+ or the serial ports (or the Ethernet port itself) that are directed out the Ethernet port are sent to the TCP Routing Table to determine the target device.

Figure 4.4 shows an MEBII connected to a Compact 984 PLC via Modbus Plus. The Ethernet port is set to be drop 25 and is connected to a Quantum PLC at IP Address 192.168.0.24 and an M340 PLC at 192.168.0.25.

Figure 4.4 Modbus Routing Example

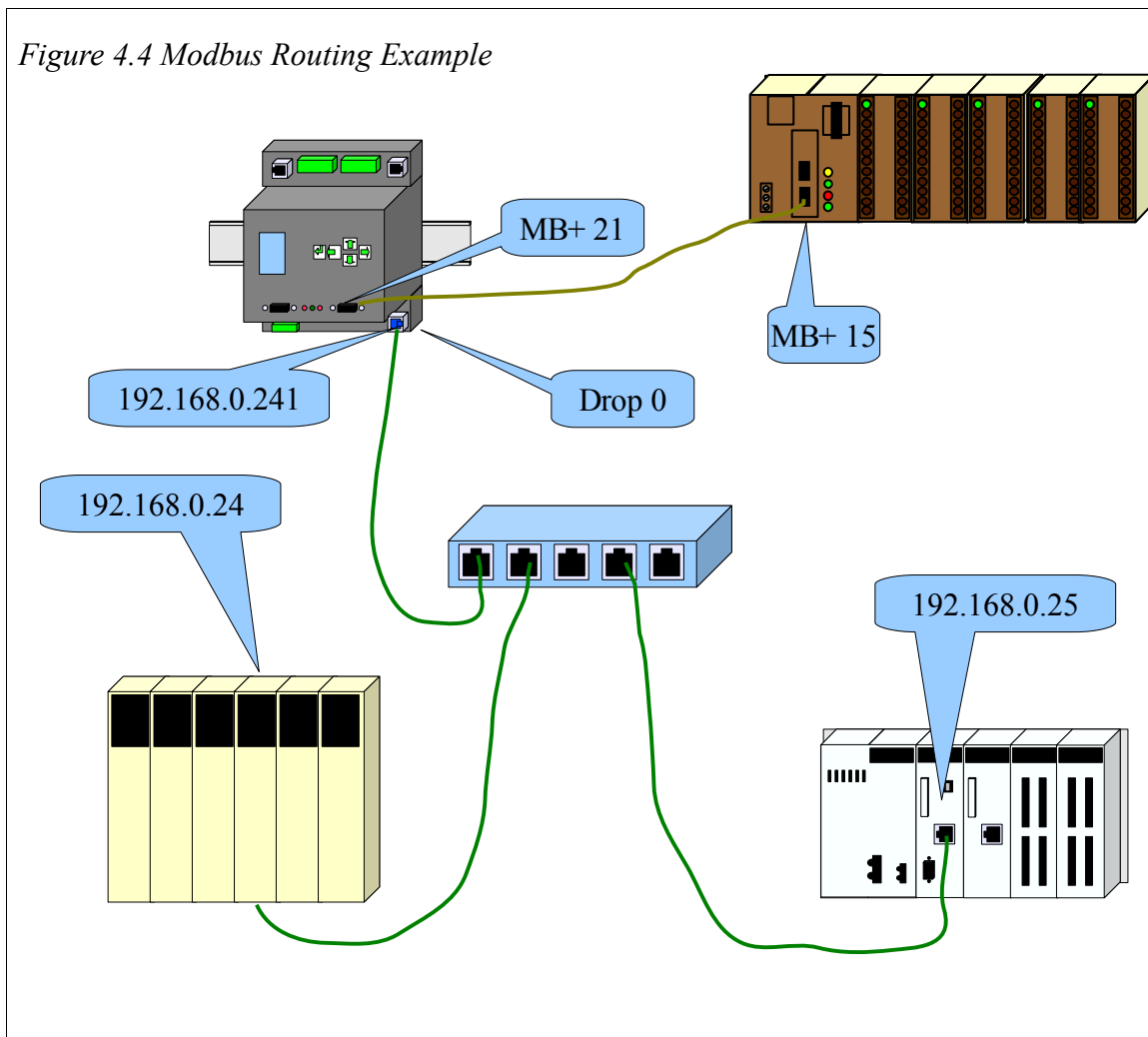


Table 4.3: MEBII TCP Routing Table

Drop	IP Address	Downstream Route	Comments
0	0.0.0.0	NONE	
1	192.168.0.24	NONE	Quantum PLC
2	192.168.0.25	NONE	M340 PLC
3	192.168.0.205	NONE	MEBII from Figure 4.1
4	0.0.0.0	NONE	

The table below shows routes for MSTRs for the Compact PLC in this example.

- The first drop (21) in the route is the MB+ number of the MEBII.
- The second drop (4, 5, 6, 7, and 8) is the drop number that tells the MEBII to route the message out of the Ethernet port. See Chapter ??? for more information on MB+ inbound routing.
- The third drop (1, 2, and 3) is the TCP table look-up drop. This number defines the target IP Address.
- The fourth drop (0, 1, 2, 3, 4, 5, and 255) is the destination index for the Modbus/TCP message sent to the target IP device. The local M340 and Quantum NOEs don't care about the value of this number. This number is used in the Modbus Routing table in the remote MEBII to determine the target for the MSTR message.

Table 4.4: MSTR Routes for Compact PLC in Figure 4.4

MSTR MB+ Route	Target
21.4.1.0	Quantum at 192.168.0.24
21.5.2.0	M340 at 192.168.0.25
21.6.3.1	Compact in Figure 4.1
21.7.3.2	Quantum in Figure 4.1
21.8.3.3	Power Meter 1 in Figure 4.1
21.8.3.4	Power Meter 2 in Figure 4.1
21.8.3.5	Power Meter 3 in Figure 4.1
21.8.3.255	MEBII in Figure 4.1

There are a few subtle issues of note in this example:

- The MEB chooses to open new client sockets based on the entry in the TCP table. When a message arrives at the Ethernet port, the drop following the Ethernet port is examined to determine the target IP Address. If there is already a client socket opened to this target then the new message then this new message will be sent on this socket. Client sockets are single-threaded by the MEBII. In other words, only one outstanding message is allowed on a client socket at a time. Newly arrived messages are held in a queue and sent when one at a time.
- There are 200 entries in the TCP table. This feature may be exploited to cause the MEB to open multiple client connections to a given target by simply adding the same IP Address to multiple table entries. Use caution with this method as there are only 64 total sockets available.
- There are only 8 data slave channels on the MB+ chipset in the MEBII. The drop

number following the MEB's MB+ drop number directly selects the data slave channel. (Channels 1 and 2 are dedicated to serial ports 1 and 2, channel 3 is dedicated to the MEB's internal registers, and channels 4, 5, 6, 7, and 8 are dedicated to the Ethernet port. MB+ data channels are single-threaded which means that only one message may be outstanding at a time on a given channel. If the PLC only has one MSTR active at a time, then the routes could be changed to only use a single data channel (like 4) with no impact on system throughput.

- Other PLCs on the same MB+ network could use exactly the same routes as this PLC. If multiple MB+ messages attempt to use the same data channel at the same time, the MB+ network takes care of this situation automatically, all of the messages get through, it just slows down a little as they take turns.
- The most efficient way to handle multiple PLCs generating client messages would be to partition data channels to each PLC/MSTR. (Don't configure 10 PLCs to only use a single data channel, split them up between the five possible channels.)

NOTE: When the MEBII's Ethernet port is in Modbus+SYMAX mode, the TCP table is how the unit decides to connect a client message via Modbus/TCP or SY/MAX 802.3. If the IP Address for a given drop number is 0.0.0.0 then the message is sent out as SY/MAX 802.3 to that drop number. See Chapter ???.

AutoFill TCP Table

IP Add
206.223.
51.155
AutoFill IP Tables?
No/Yes

Changing the IP Address from the front panel keypad will prompt the user to automatically adjust the TCP Routing Table. This feature will automatically fill in the first three bytes of the local IP Address and have the fourth byte match the drop number.

Table 4.5: Ethernet TCP Routing Table for Address 10.10.10.10

Drop	IP Address	Route
0	0.0.0.0	NONE
1	10.10.10.1	NONE
2	10.10.10.2	NONE
3	10.10.10.3	NONE







Table 4.6: Ethernet TCP Routing Table for 206.223.51.155 after AutoFill

Drop	IP Address	Route
0	0.0.0.0	NONE
1	206.223.51.1	NONE
2	206.223.51.2	NONE
3	206.223.51.3	NONE

5 Front Panel Operation

Keypad Buttons

The front panel includes five push buttons.

-  The RIGHT arrow advances to the next screen or field. In many cases, it has the same behavior as the  key.
-  The LEFT arrow escapes to the previous screen or field. Changes are saved when the left arrow is pressed.
-  The UP arrow moves up in a list or increments a selection.
-  The DOWN arrow moves down in a list or decrements a selection.
-  The ENTER key accepts the values on a screen and exits to a previous screen.

LCD Screen

The MEBII includes a high resolution LCD screen main screen to assist the user in configuring and troubleshooting the device. Ethernet, MB+, and serial port parameters and may be observed and modified. Statistical information is also provided through the front panel interface.

Backlight

The LCD backlight will illuminate on any button press. The timeout for the backlight is configured through Modbus drop 255 register 7003 and defaults to 300 seconds.

Operating Screens

Splash Screen

The main page shows the IP Address of the MEBII and the MB+ node number and status, and SY/MAX 8023 drop number (if enabled).

Error conditions may be displayed on the splash screen as they occur. Indications for duplicate IP Address, duplicate SY/MAX 802.3 node, or the various Modbus Plus status descriptions are shown. Certain errors will flash the backlight until a key is pressed to draw attention to the MEBII.

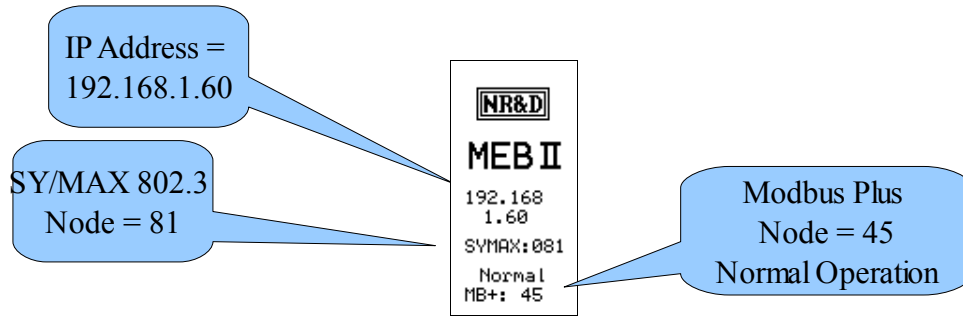


Figure 5.1: Splash Screen

Main Menu Screen

Pressing a key while the splash screen is displayed will move to the Main menu page. A pointer along the left margin indicates the sub-menu to be chosen. Pressing the UP or DOWN arrows will move the pointer. Pressing the RIGHT arrow or ENTER buttons will select the sub-menu. Pressing the LEFT arrow will return to the splash screen page.

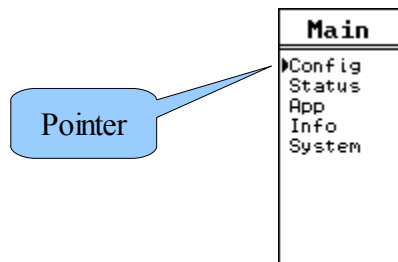


Figure 5.2: Main Menu Screen

Configuration Menu

Selecting the Config item leads to the Config menu and a choice of Comms and Display. The Comms sub-menu moves on to Ethernet, serial port, and MB+ options while the Display sub-menu allows the user to adjust the screen contrast.

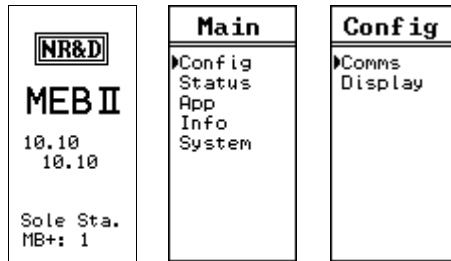


Figure 5.3: Config Menu Screen

Comms Menu Screen

The Comms menu allows the selection of editing the settings for the Ethernet, Serial ports, or Modbus Plus port.

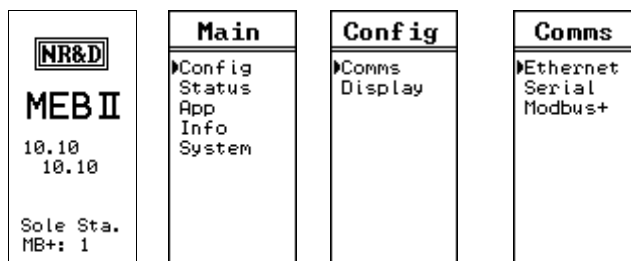


Figure 5.4: Comms Menu Screen

Ethernet Configuration Menu

The Ethernet menu allows the selection of editing the settings for the IP Address, Subnet Mask, Default Gateway, IP Source, Ethernet Protocol, port drop number, Modbus Routes, IP Route table, and the physical Ethernet port mode settings.

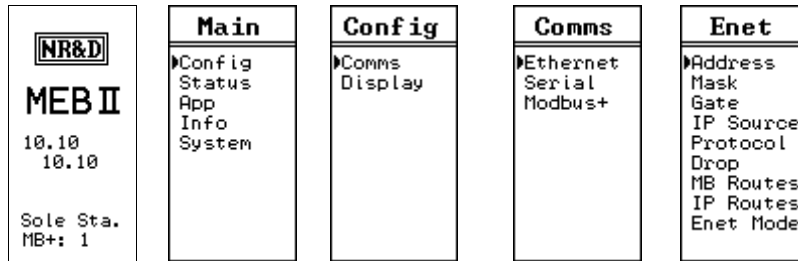


Figure 5.5: Ethernet Menu Screen

IP Addr Screen

The IP Address of the MEBII may be quickly changed using the IP Addr screen. Move the cursor with the LEFT and RIGHT arrows and adjust the octet with the UP and DOWN arrows. Holding the UP or DOWN key will scroll the value quickly. When the new address is finished, press the ENTER key and a prompt for “AutoFill IP Tables?” is presented. Select “Yes” to have the MEBII automatically fill the TCP table with the first 3 octets of this IP Address and the fourth octet the index value.

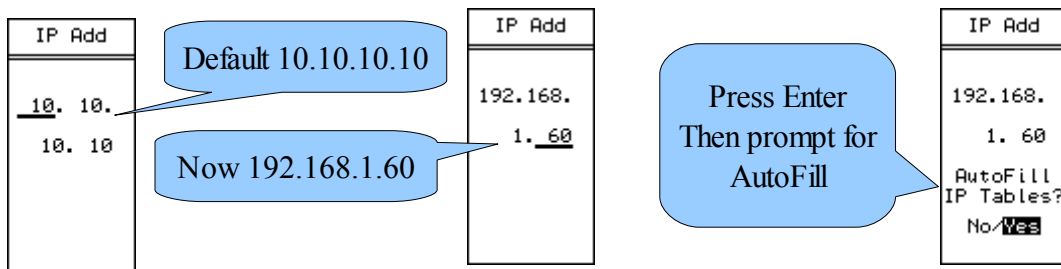


Figure 5.6: IP Address Screens

Subnet Mask Screen

The Subnet Mask of the MEBII may be quickly changed using the Mask screen. The UP and DOWN buttons are used to adjust the number of bits in the mask. When the new mask is finished, press the ENTER key and a prompt for “Auto Set Default Gate?” is presented. Select “Yes” to have the MEBII automatically apply the subnet mask to the IP Address to generate most of the default gateway setting..

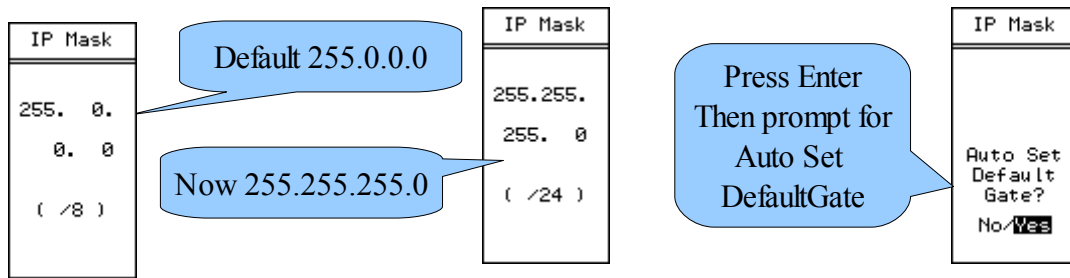


Figure 5.7:Subnet Mask Screens

Default Gate Screen

The Default Gateway of the MEBII is edited just like the IP Address. The LEFT and RIGHT buttons move the cursor while the UP and DOWN buttons are used to adjust the value. Press ENTER to accept the new value.

Set the Default Gate to 0.0.0.0 to disable routing operation outside the local subnet.

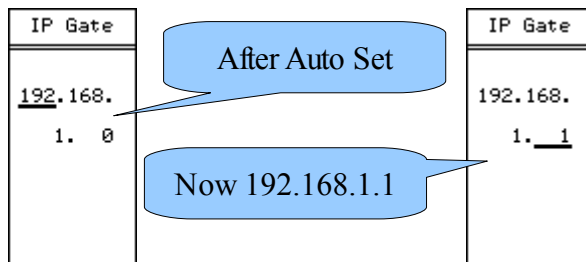


Figure 5.8:Default Gate Screen

IP Source Screen

The MEBII may have a fixed IP Address or use BOOTP or DHCP to have its IP settings configured. The IP Source screen allows the user to configure the appropriate setting. Use the UP and DOWN buttons to select the setting. DHCP and BOOTP typically require the server to be configured for the MAC address of the MEBII's Ethernet port.

This MACC address is shown on the screen in hexadecimal (00:20:BD:0C:35:04).

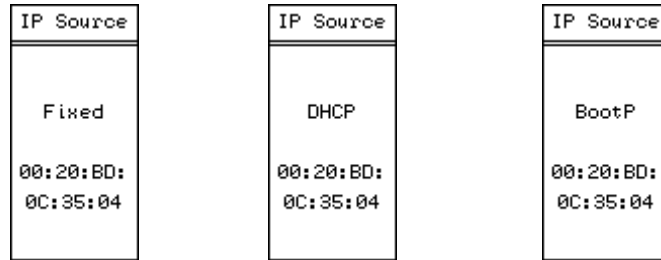


Figure 5.9: IP Source Screen

Ethernet Protocol Screen

The Ethernet port may be configured for only Modbus/TCP or a combination of Modbus/TCP plus SY/MAX 802.3 for support of legacy SY/MAX Ethernet devices. The Protocol screen allows the setting of the mode.

WARNING: Set the drop number of the Ethernet port to SY/MAX 802.3 drop that is **not** present on the connected network before setting the port to MB+SYMAX mode. Choosing a duplicate drop on the network will result in both nodes halting SY/MAX communication which may result in equipment damage, injury, or death.

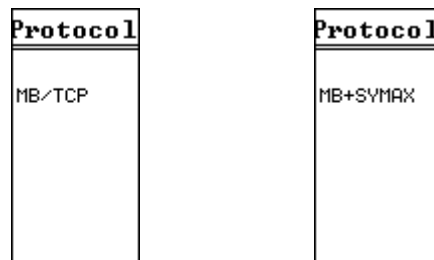


Figure 5.10: Ethernet Protocol Screens

Ethernet Drop Screen

The drop number of the Ethernet port defaults to 0 and rarely needs to be changed. This drop number is used to set the SY/MAX 802.3 Ethernet node number when the Ethernet port is set to MB+SYMAX protocol mode.

WARNING: Set the drop number of the Ethernet port to SY/MAX 802.3 drop that is **not** present on the connected network before setting the port to MB+SYM MAX mode. Choosing a duplicate drop on the network will result in both nodes halting SY/MAX communication which may result in equipment damage, injury, or death.

After selecting the new drop number by pressing the Enter button, a prompt for “Auto-Fix Routing Tables?” is presented. Selecting Yes will automatically adjust entries in the Ethernet and serial ports 1 and 2 Modbus Routing tables. Route entries with the old drop number as the first drop in the route will be changed so the new drop number replaces the old value .

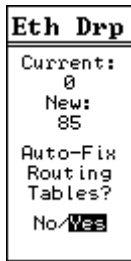


Figure 5.11: Ethernet Drop Screen

Modbus Route Screen

The Modbus Routing table for the Ethernet port may be edited through the Modbus Route screen. This screen shows a single entry from the table with the index on the top line. The cursor is moved with the left and right arrows. Values are altered with the up/down buttons.

The enter button exits the screen when on the index field.

The enter button on the TEST field causes a test message to be sent using the route to the target device.

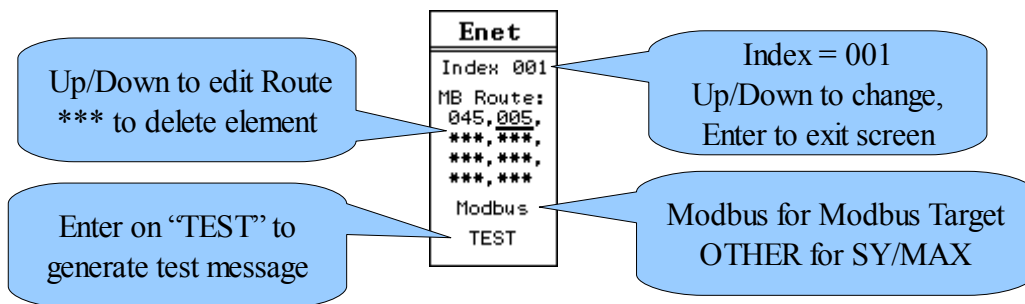


Figure 5.12: Modbus Route Edit Screen

The TEST message is an opcode 03 Modbus Holding Register read of remote registers 8188. Possible results from this read are:

- A valid reply is received from the target slave. The screen will show PASS along with the decimal value of the remote register 4x8188. On older SY/MAX PLCs, this value is the PLC model number.
- A valid error reply is received from the target slave. The screen will show PASS along with the returned error code. Possible errors are:
 - Error 01 = Illegal Opcode. This means that the slave does not support Modbus opcode 03 (Holding Register read). The slave is replying to the test message, it just does not support the test message.
 - Error 02 = Illegal register. This means that the slave does not have Holding Register 4x8182. This is also a PASS condition, it just means that the test message asked for a register that does not exist in the slave.
- The network was unable to receive a reply from the slave. This is a FAIL condition with the error message Downstream Timeout.
- The MEBII was unable to generate the query because the first drop in the route was not a valid drop number of another port in the MEBII. The FAIL message will show

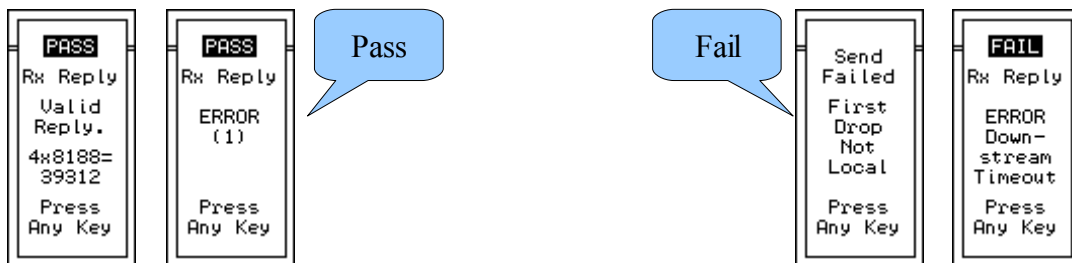


Figure 5.13: Modbus Route Test Results Screens

IP Route Screen

The IP Routing table for the Ethernet port may be edited through the IP Route screen. This screen shows a single entry from the table with the index on the top line. The cursor is moved with the left and right arrows. Values are altered with the up/down buttons.

The enter button exits the screen when on the index field.

The enter button on the ZERO field causes the IP Address to be set to 0.0.0.0. This is handy for zeroing an entry for SY/MAX 802.3 Ethernet entries.

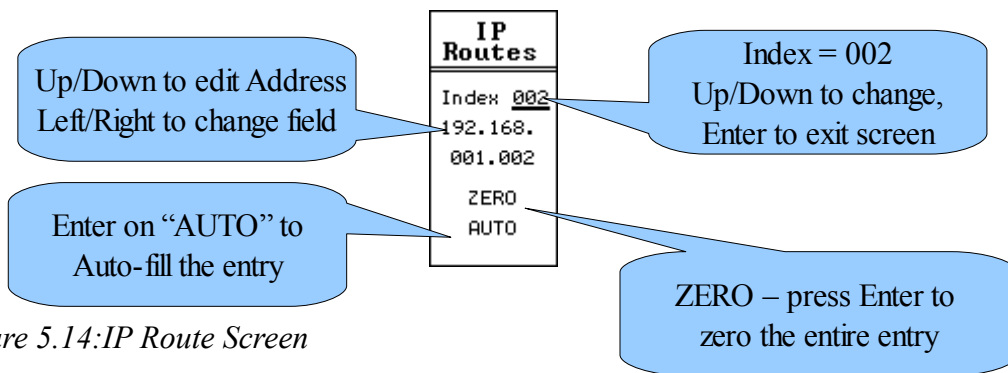


Figure 5.14: IP Route Screen

The AUTO field sets the entry to the MEB's IP Address with the last octet set to match the index.

Ethernet Mode Screen

The Ethernet Mode screen allows the physical configuration of the Ethernet port. The port defaults to "AUTO" mode which automatically sets itself to match the attached device. The possible settings are:

- AUTO
- 10BaseT – Full Duplex
- 10BaseT – Half Duplex
- 100BaseT – Full Duplex
- 100BaseT – Half Duplex

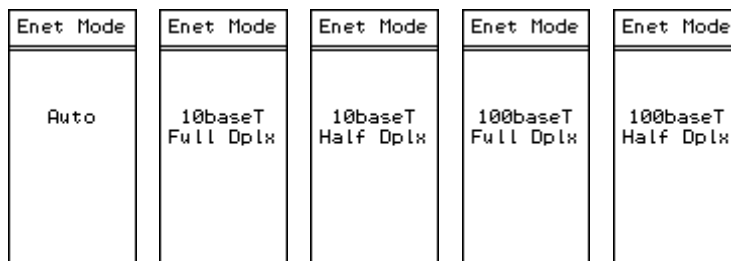


Figure 5.15: Ethernet Port Mode Screens

Serial Port Menu

The Serial menu allows the selection of a particular serial port to edit. Choices are Port 1 and Port 2.

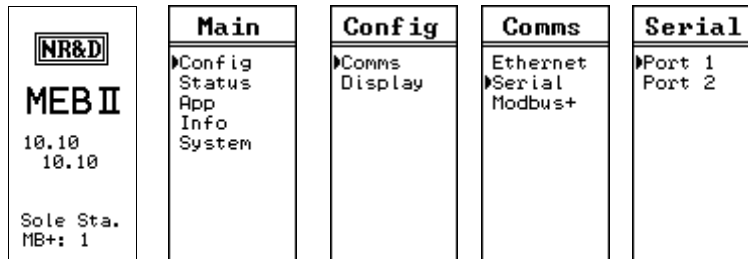


Figure 5.16: Serial Pot Menu Screen

Port 1 Menu

Both serial ports share the same menu list.

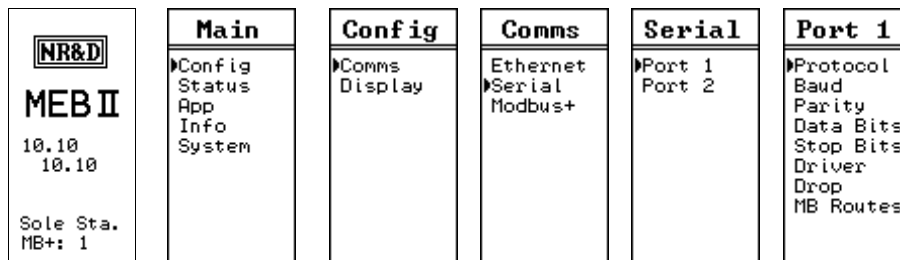


Figure 5.17: Serial Pot 1 Menu Screen

Settings available from the two serial ports are:

- Protocol
 - Modbus RTU (default)
 - Modbus ASCII
 - Modbus Host (RTU with special translations)
 - Chevron (combination Modbus RTU master with RNIM master)
 - Dual Slave (combination Modbus RTU slave and SY/MAX slave)
 - Hot Modbus Plus (Port 2 only)
 - SY/MAX, NET-TO-NET, RNIM Master, RNIM Slave (legacy Square D PLC)

- serial protocols)
 - PNIM and PLOGIC (legacy PowerLOGIC protocols)
 - IDEC (legacy Square D Model 50 and Micro-1)
 - Transfer (legacy Square D PLC Hot Backup)
 - Peripheral, Share, Transfer (legacy Square D ASCII)
 - Gateway (legacy Niobrara ASCII)
 - Multidrop (legacy Niobrara serial network)
- Baud Rate – 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 7200, 9600 (default), 19200
- Parity – EVEN (default), ODD, NONE
- Data Bits – 8 (default), 7 (ASCII modes only)
- Stop Bits – 1 (default), 2
- Driver – RS-232 (default), RS-422, RS-485 + Bias, RS-485 - Bias
- Drop – 101 (default for port 1), 102 (default for port 2)
- Modbus Routes – See Modbus Route Screen on page 52

Modbus Plus Edit Screen

The MB+ Drop edit screen shows the current MB+ drop number and allows the user to edit the new number. Valid entries are 1-64. The MEBII will not allow the user to select a drop number that it already sees on the MB+ network. It will also not allow the new drop number to be the same as either serial port drop or the Ethernet port drop.

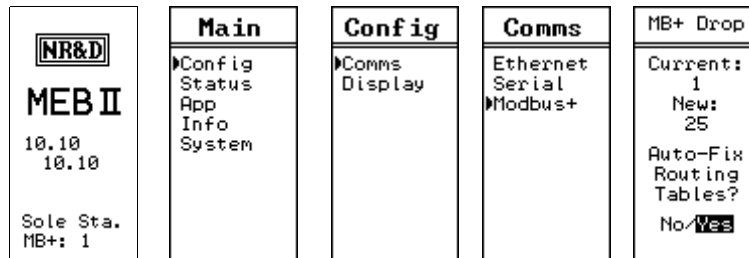


Figure 5.18: Modbus Plus Edit Screen

Pressing the Enter button will prompt “Auto-Fix Routing Tables?” Selecting “Yes” will cause the MEBII to adjust the Modbus routing tables for both serial ports and the Ethernet port to replace the first drop in a route that matches the “Current” drop with the “New” drop.

Display Edit Screen

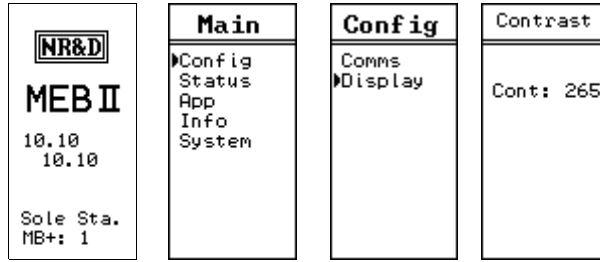


Figure 5.19: Display Contrast Edit Screen

The Display screen allows the user to adjust the contrast value for the display. The UP and DOWN arrows allow the changing of the setting. The ENTER or LEFT arrows accept the new value.

Status Menu Screens

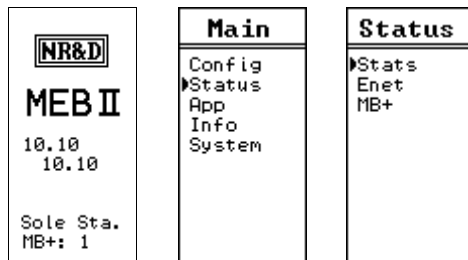


Figure 5.20: Status Menu Screen

The Status menu item gives access to physical status and communication statistics for all ports.

Stats Screen

Each port has multiple screens to give statistical counters about communication through the port. LEFT and RIGHT arrows change between ports. UP and DOWN move between pages for a given port. ENTER returns to the previous menu.

Ethernet Open Socks 15 Frames Tx 24576 Frames Rx 58111 Collision 0 Bufs Used 2	Port 1 Valid Pkts 334 Invalid 0 Parity 0 Chars Tx 14947 Chars Rx 2672	Port 1 Bufs Used 0 Bufs in Q 0 Last Route 101,1,18	Port 2 Valid Pkts 171 Invalid 0 Parity 0 Chars Tx 7670 Chars Rx 1368	Port 2 Bufs Used 0 Bufs in Q 0 Last Route 102,1,18	Modbus + Pkts Sent 699 Pkts Rcvd 699 Unrtbl MB+ 0 Tx Fail 0 Tx Defer'd 0	Modbus + Unrtbl S/M 0 Last Route 101,0,1, 18
---------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------

Figure 5.21: Stats Screens

Enet Status Screen

The Enet status screen shows the current physical connection status of the Ethernet port.

NR&D MEB II 10.10 10.10 Sole Sta. MB+: 1	Main Config ▶Status App Info System	Status Stats ▶Enet MB+	Enet Phy Link:Up Rate:100 Dplx:Full
-------------------------------------------------------------------------------	-----------------------------------------------------------	----------------------------------------	-----------------------------------------------------------------

Figure 5.22: Status Menu Screen

MB+ Status Screen

The MB+ status screen shows information about the state of the MB+ port.

NR&D MEB II 10.10 10.10 Sole Sta. MB+: 1	Main Config ▶Status App Info System	Status Stats Enet ▶MB+	MBP Status MBP State Normal Token Cnt 29731 Token Rotn 1 ms CoPro Ver 210.03
-------------------------------------------------------------------------------	-----------------------------------------------------------	----------------------------------------	-------------------------------------------------------------------------------------------------------------

Figure 5.23: Status Menu Screen

App Menu

The APP menu allows the user to halt the MEBII application. This feature should only be used when directed by Niobrara Technical Support.

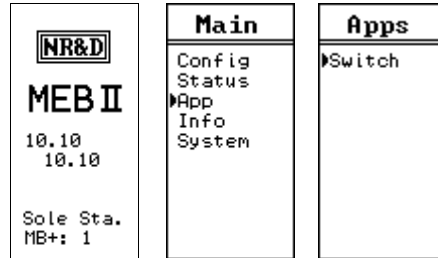


Figure 5.24: App Menu Screen

Switch Screen

The Switch screen allows the user to HALT or RUN the MEBII application. The MEM PROT setting is ignored at this time and is the same as RUN.

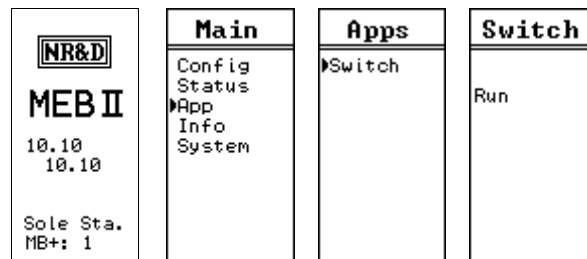


Figure 5.25: Switch Screen

Info Menu

The Info Menu provides access to various information about the MEBII firmware and network connections.

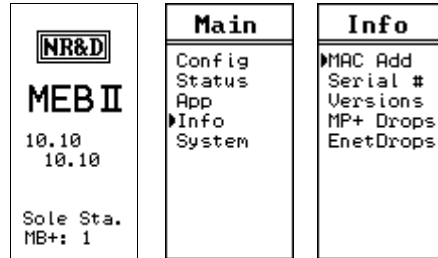


Figure 5.26: Info Menu Screen

MAC Address Screen

The MAC address screen shows the hardware address of the Ethernet port in hexadecimal. This information is useful when the IP Address is set by BOOTP or DHCP.

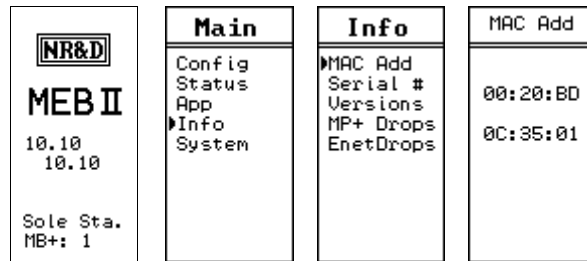


Figure 5.27: MAC Address Screen

Serial Number Screen

This screen shows the serial number of the MEBII.


 <p>MEB II 10.10 10.10 Sole Sta. MB+: 1</p>	<table border="1"><tr><th>Main</th></tr><tr><td>Config Status App Info System</td></tr></table>	Main	Config Status App Info System	<table border="1"><tr><th>Info</th></tr><tr><td>MAC Add Serial # Versions MP+ Drops EnetDrops</td></tr></table>	Info	MAC Add Serial # Versions MP+ Drops EnetDrops	<table border="1"><tr><th>Serial #</th></tr><tr><td>800001</td></tr></table>	Serial #	800001
Main									
Config Status App Info System									
Info									
MAC Add Serial # Versions MP+ Drops EnetDrops									
Serial #									
800001									

Figure 5.28: Serial Number Screen

Versions Screen

The Versions menu gives access to the MEBII firmware, DUCM firmware, and boot version.


 <p>MEB II 10.10 10.10 Sole Sta. MB+: 1</p>	<table border="1"><tr><th>Main</th></tr><tr><td>Config Status App Info System</td></tr></table>	Main	Config Status App Info System	<table border="1"><tr><th>Info</th></tr><tr><td>MAC Add Serial # Versions MP+ Drops EnetDrops</td></tr></table>	Info	MAC Add Serial # Versions MP+ Drops EnetDrops	<table border="1"><tr><th>Versions</th></tr><tr><td>MEBII 15OCT2010 DUCM 22SEP2010 Boot 10MAR2010</td></tr></table>	Versions	MEBII 15OCT2010 DUCM 22SEP2010 Boot 10MAR2010
Main									
Config Status App Info System									
Info									
MAC Add Serial # Versions MP+ Drops EnetDrops									
Versions									
MEBII 15OCT2010 DUCM 22SEP2010 Boot 10MAR2010									

Figure 5.29: Versions Screen

MB+ Drops Screen

The MB+ drops screen shows the addresses of local MB+ nodes that are recognized by the MEBII. This page is dynamically updated and may stretch to show more than one screen. The UP and DOWN keys may be used to move between screens if needed.

The MB+ node of the MEBII is highlighted.

<p style="text-align: center;">NR&D</p> <p style="text-align: center;">MEB II</p> <p style="text-align: center;">10.10 10.10</p> <p>Sole Sta. MB+: 1</p>	<p style="text-align: center;">Main</p> <p>Config Status App ▶Info System</p>	<p style="text-align: center;">Info</p> <p>MAC Add Serial # Versions ▶MP+ Drops ▶EnetDrops</p>	<p style="text-align: center;">MB+ Devs</p> <p>1 18 20 25 27 35</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------

Figure 5.30: MB+ Drops Screen

Enet Drops Screen

The Enet drops screen will show the SY/MAX 802.3 drops accessible to the MEBII. This page may extend beyond a single screen and the UP and DOWN buttons are used to move between screens.

Any drop numbers local the MEBII are highlighted. This includes the Ethernet port and any other port with “ON ETHERNET” set to YES.

<p style="text-align: center;">NR&D</p> <p style="text-align: center;">MEB II</p> <p style="text-align: center;">10.10 10.10</p> <p>Sole Sta. MB+: 1</p>	<p style="text-align: center;">Main</p> <p>Config Status App ▶Info System</p>	<p style="text-align: center;">Info</p> <p>MAC Add Serial # Versions MP+ Drops ▶EnetDrops</p>	<p style="text-align: center;">ENET Devs</p> <p>0 1 2 4 5 8 11 15 20 21 22 23 24 25 55 70 99</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------

Figure 5.31: SY/MAX Ethernet Drops Screen

System Menu

The System menu provides access to the front panel password, reboot, and reset to factory defaults.

Reboot Screen

This screen allows the user to force a hardware reboot of the MEBII without physically removing the power.

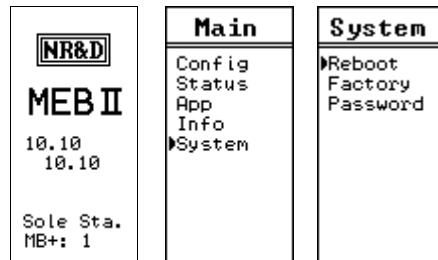


Figure 5.32: Reboot Screen

Factory Defaults Screen

The Factory screen allows the user to quickly reset the MEBII to factory defaults. The reset process also includes a reboot. Selecting “NO” will return to the previous menu without altering the current setup.

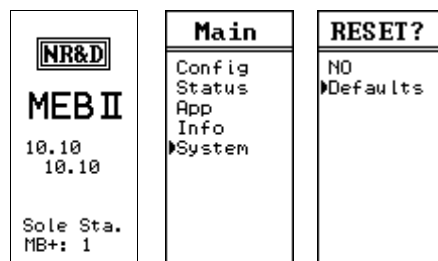


Figure 5.33: Factory Defaults Screen

Password Screen

The MEBII may have a password enabled to limit front panel operation. The password is a four digit number (0000-9999) that must be entered before settings are altered. Once the password is entered, it settings may be altered until a reboot or the backlight timeout occurs.

Setting the password to 0000 disables the feature.

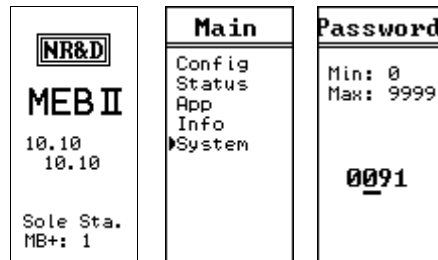


Figure 5.34: Password Screen

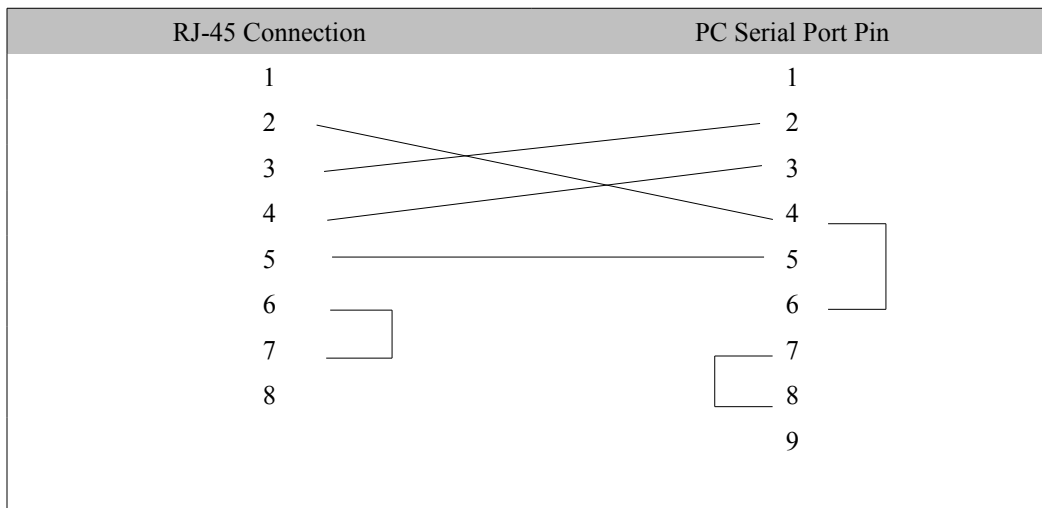
1.Recommended Cables

RS-232 Cables

MM1 (PC to MEBII)

The Niobrara MM1 cable may be used to connect the MEBII RS-232 port to a standard PC 9-pin male port. The pinout is shown in Figure 1.1.: MM1 Serial Cable.

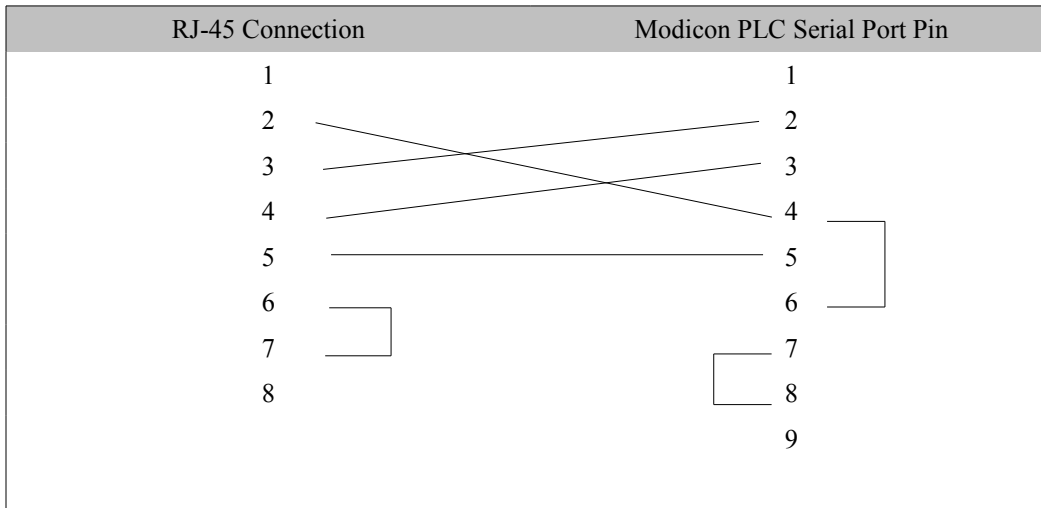
Figure 1.1.: MM1 Serial Cable



MM2 (Modicon PLC to MEBII)

The Niobrara MM2 cable may be used to connect the MEBII RS-232 port to a standard Modicon 9-pin female PLC programming port. These ports are common on the Quantum PLC, Compact 984, 984, BM85 Bridge Mux, and other older Modicon products. This is the same cable as the MM1 with a male 9-pin connector. The pinout is shown in Figure 1.2.: MM2 Serial Cable.

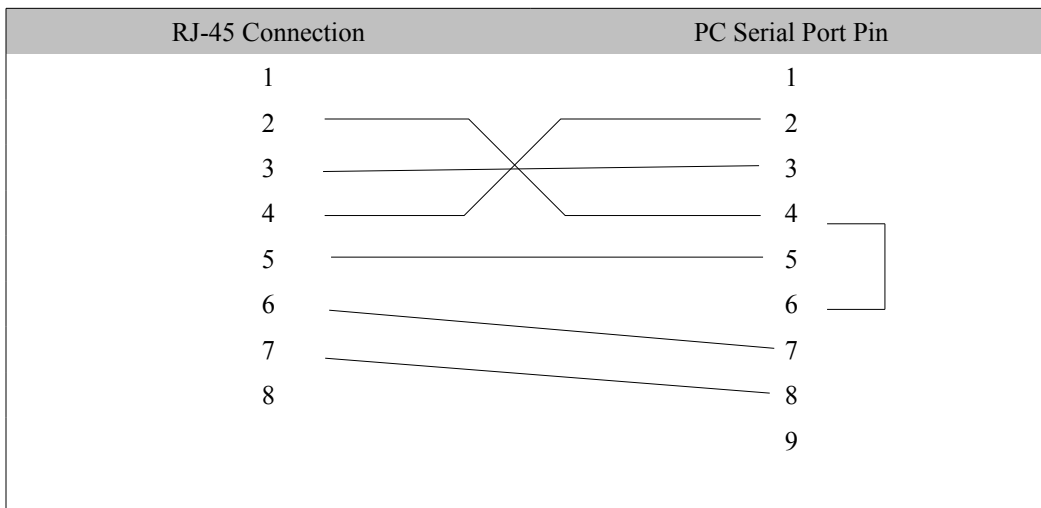
Figure 1.2.: MM2 Serial Cable



MM3 (MEBII to emulate a 9-pin PC port)

The Niobrara MM3 cable may be used to make the MEBII RS-232 port appear as a standard PC 9-pin male port. This cable is often used along with an MM1 cable to connect two RJ-485 RS-232 ports together such as an MEBII to a newer Compact 984 PLC. The pinout is shown in Figure 1.3.: MM3 Serial Cable.

Figure 1.3.: MM3 Serial Cable



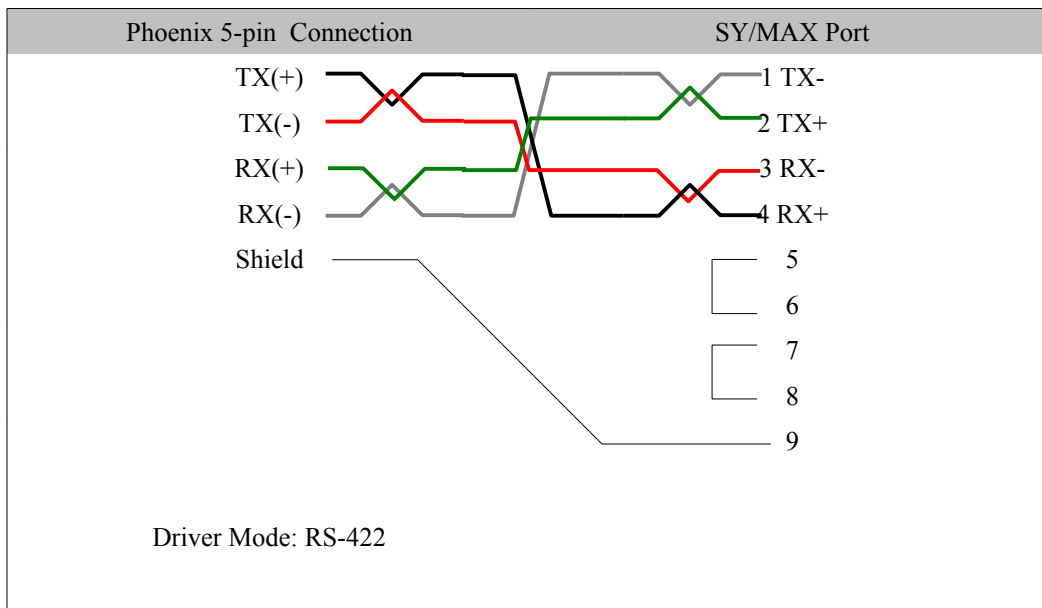
RS-485 Cables

MU7 (MEBII to SY/MAX)

The Niobrara MU7 cable is used to connect the RS-485 port of the MEBII to a standard SY/MAX DB9 female port. This cable is normally used to connect the MEBII directly to a SY/MAX PLC or NIM module.

NOTE: The MEBII port driver mode is normally set to RS422 when connected to a SY/MAX serial port.

Figure 1.4.: MU7 Serial Cable



MEBII Master to 4-wire RS-485 Slaves

The MEBII may be used to be a master on a 4-wire RS-485 network. An example of this network is a string of PowerLogic meters attached to the MEBII.

An external terminator should be used at the last slave across its RX pair. Normally, this is a 120 ohm resistor or the PowerLogic MCT-485.

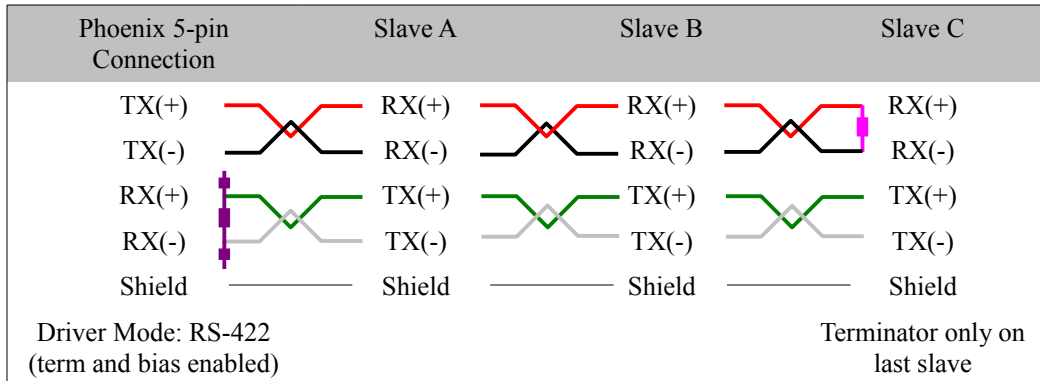
The Driver Mode for the MEBII port should be set to RS-422. This mode enables the transmitter of the port at all times to bias the receivers of all of the slaves. This mode also enables the internal termination and bias of the MEBII's receiver.

Belden 8723 or equivalent is recommended for this type of network.

The shield wire should only be grounded at one location - usually at the master. A simple

method of grounding the shield is to connect the Shield terminal of the MEB's RS-485 connector to the Earth Ground terminal of the MEBII's power supply connector.

Figure 1.5.: 4-wire RS-485 Master



MEBII to 2-wire RS-485

The MEBII may be used as a master or slave on a 2-wire RS-485 network. An example of this network is a string of 2-wire RS-485 PowerLogic meters attached to the MEBII.

The MEBII must have the TX(+) and RX(+) lines jumpered together to make the (+) connection on a 2-wire network. The TX(-) and RX(-) lines must also be jumpered together to connect to the (-) line.

Terminator should be used at the last slave on each end of the daisy-chain. Normally, this is a 120 ohm resistor.

Bias should only be enabled on one device of the 2-wire network. Typically, the bias is enabled at the Master device since it is required to be active on the network.

If the MEBII is the Master of the network, then it should be located at one end of the daisy-chain and the Driver Mode should be set to RS485+Bias. The RS485+Bias mode enables the internal bias and termination resistors.

NOTE: RS485+Bias mode always enables both the internal termination and bias resistors. If another device on the 2-wire network is providing the bias then the MEBII port must be set for RS485-Bias and an external termination resistor must be used.

Belden 9841 or equivalent is recommended for this type of network.

The shield wire should only be grounded at one location - usually at the master. A simple method of grounding the shield is to connect the Shield terminal of the MEB's RS-485 connector to the Earth Ground terminal of the MEBII's power supply connector.

Figure 1.6.: 2-wire RS-485 Network with internal Bias

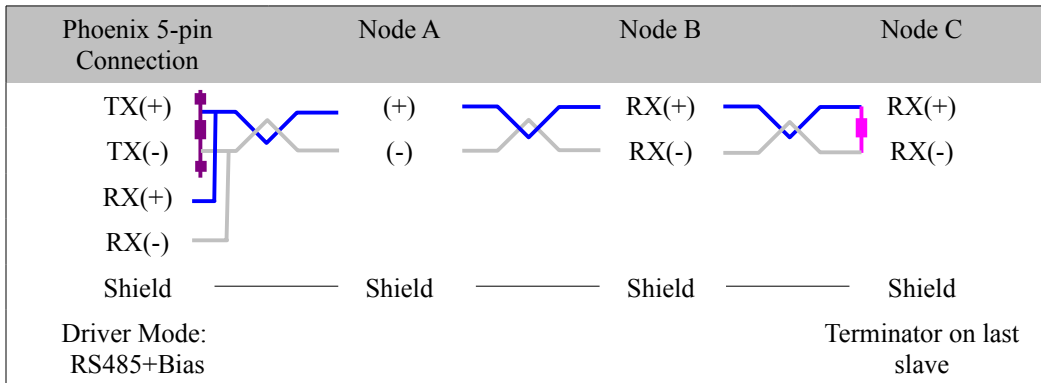
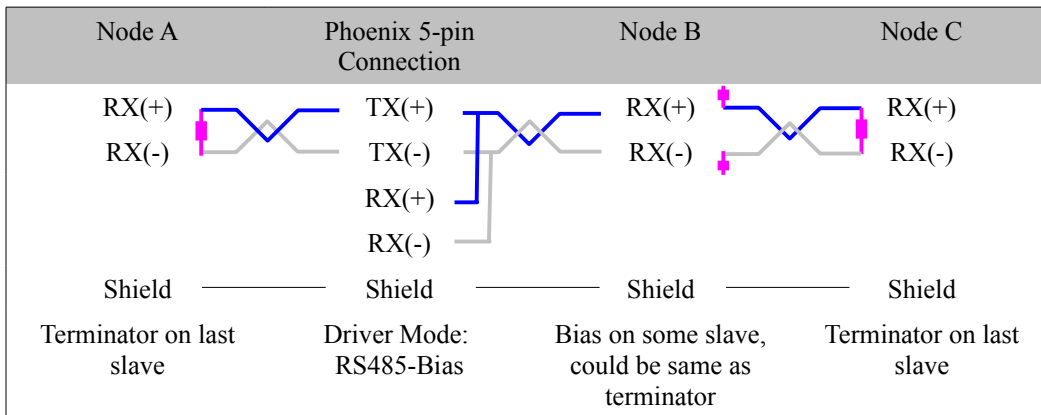


Figure 1.7.: 2-wire RS-485 Network without internal Bias



6 MEBSW32

MEBSW32 is a MS Windows32 console application to allow online/offline configuration of the MEBII and older MEB hardware.

Startup Screen



Figure 6.1: Startup Screen

The first time that MEBSW32 is started, it will show a screen like Figure 6.1. The date in the upper right corner (06Aug2010) is the revision of MEBSW32. The Error notification in the lower right corner indicates that the program is unable to locate the setup file.

Note: Press the F10 key or the Escape (ESC) to move past an error notification.

This particular error will not be displayed if the setup file is saved. Clearing this error will immediately drop into the “Setup, Serial communication” screen.

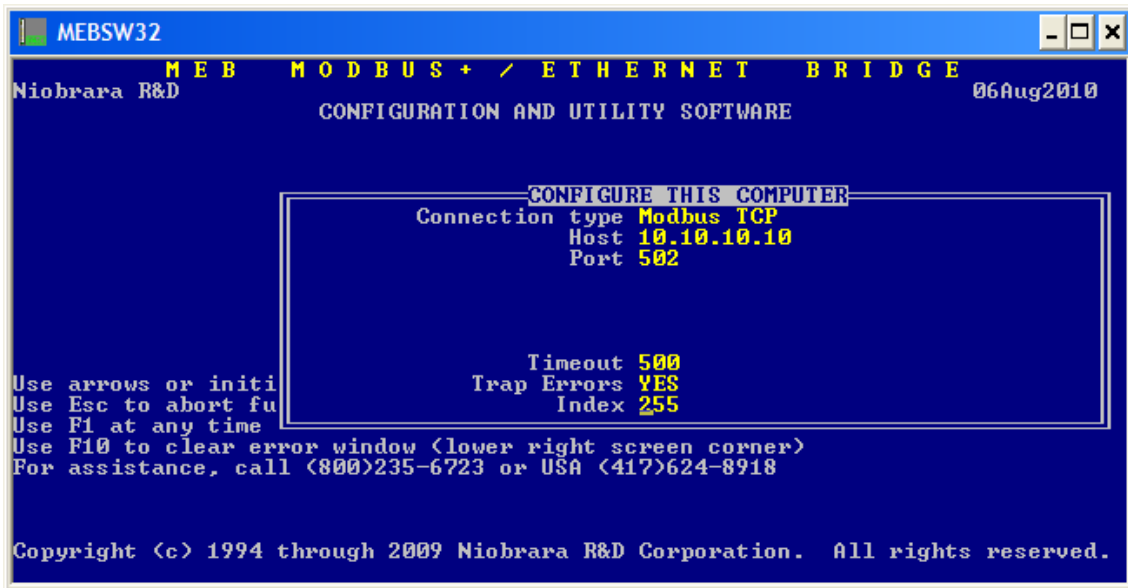


Figure 6.2: Setup Serial Screen

This screen is used to configure the connection between the PC and the target MEBII. In this case, the connection is Modbus/TCP Ethernet to the target 10.10.10.10 using index 255. See section Serial communication on page 88 for more information.

Pressing “Enter” after selecting the Index field will pop up the “Write setup to startup file?” window. Pressing “Enter” or “y” will save the file and avoid the error on the next startup.

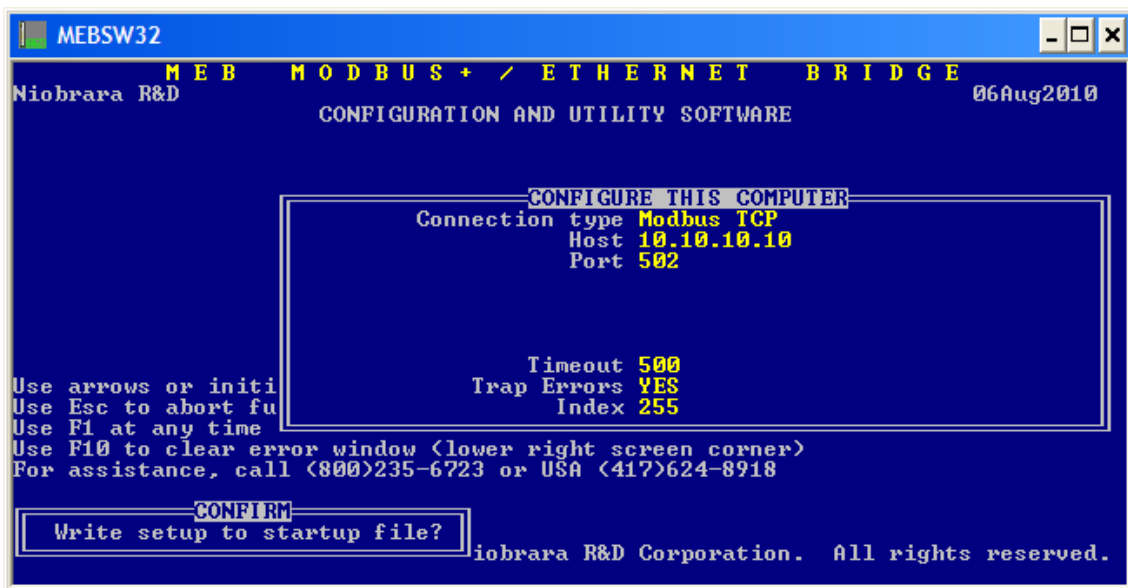


Figure 6.3: Setup Serial Screen

Main Menu

The Main Menu is shown in Figure . All menu items may be selected by using the arrow keys to move around or by using the yellow shortcut letter.

- “N” for oNline – Edit the configuration directly in the MEBII in real time.
- “F” for oFfline – Edit, Save, Print offline copies of the MEBII's configuration.
- “U” for Utility – View registers, statistics, MB+ station lists.
- “S” for Setup – Configure the PC connection.
- “Q” for Quit – Exit the MEBSW32 program.

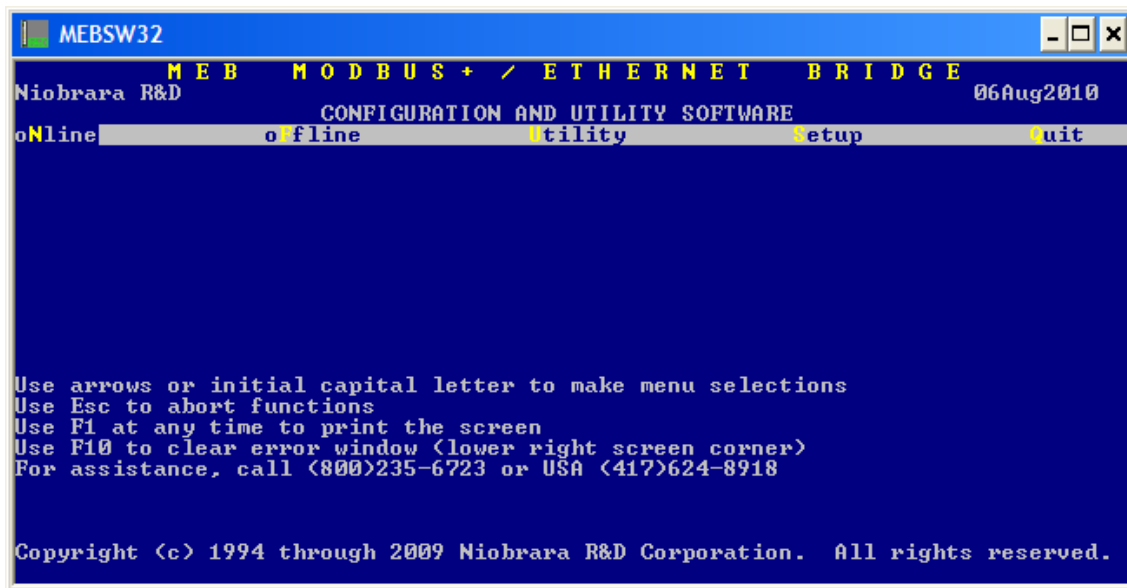


Figure 6.4: Setup Serial Screen

oNline Menu

The oNline menu is used to directly edit parameters in the MEBII.

- Edit port parameters – Adjust settings for the Ethernet, Serial, and MB+ ports.
- edit Modbus routing – Configure routing tables for the Ethernet and serial ports.
- edit Auto scan table – Configure the automatic polling tables for the serial and MB+ ports.
- edit Global data table – Modify the MB+ Global Data Table.
- edit TCP routing – Modify the Modbus/TCP client IP Address table.

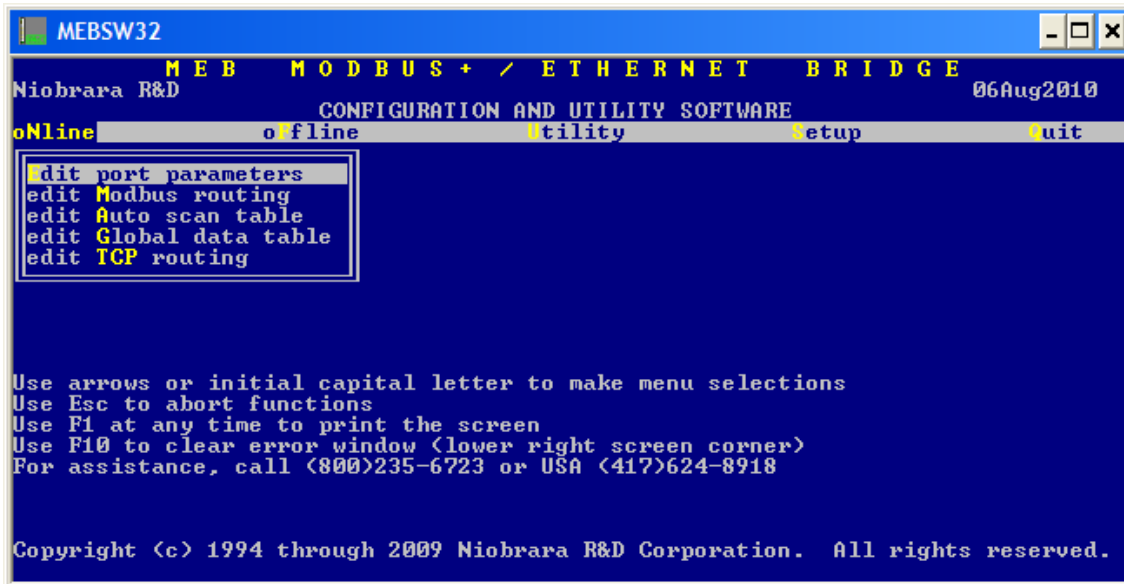


Figure 6.5: oNline Menu

Edit port parameters

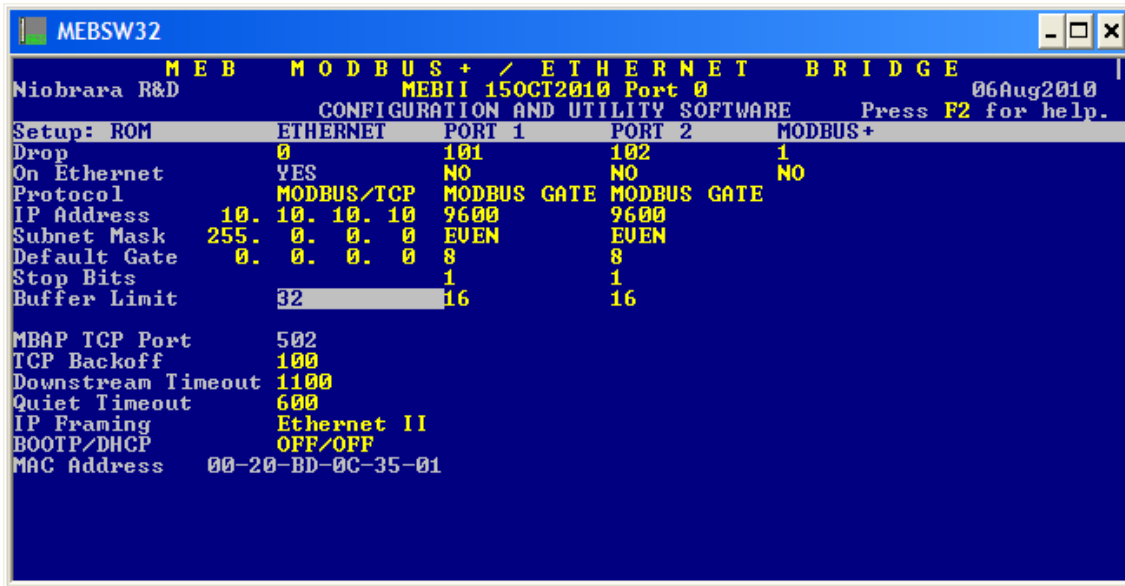


Figure 6.6: oNline edit port parameters Screen

The oNline edit port parameters screen has a column for the Ethernet port, each serial port, and the MB+ port. The arrow keys are used to move the highlighted cell around. The space bar and + and – keys are used to modify the values.

NOTE: Care must be exercised while editing online parameters. Changing settings on the port the computer is using will result in a loss of communication.

Edit Modbus routing

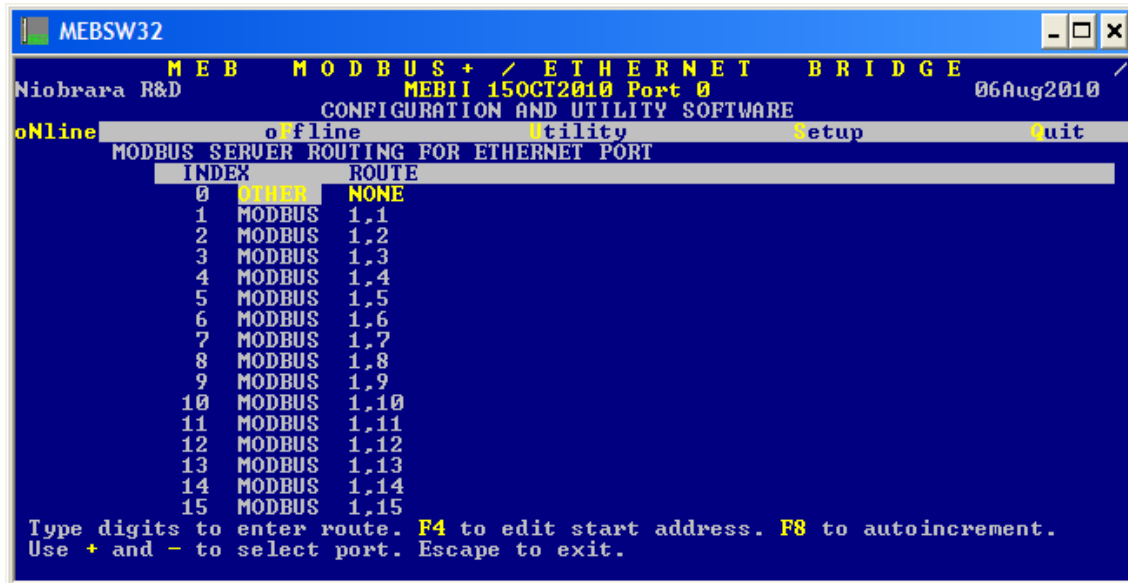


Figure 6.7: Modbus Routing Screen

The Modbus Routing screen is used to set the lookup tables for Ethernet clients and serial Modbus master.

The left column is the Modbus slave or Modbus/TCP Index. The Ethernet port has 255 possible entries. Each serial port supports 128 entries. The F4 key is used to alter the starting slave address for the serial port tables. The F4 key also allows the selection of “Micrologic Support”.. Micrologic support is a special feature that takes the route for each of the first 50 drop numbers in the table and automatically support the same route for 50+x, 100+x, and 150+x drops.

The center column is either “MODBUS” or “OTHER”. MODBUS is used when the target device is a Modbus slave. OTHER is used when the target slave is SY/MAX or some other device that is not Modbus.

The ROUTE field is used to define the path to the target. The first drop in the route should be the drop number of the MEBII port heading towards the target slave. The example above shows routes of 1,x where 1 is the drop number of the MB+ port and x is the MB|drop number of the target PLC.

Auto Scan Edit

The Auto Scan feature allows a serial port to automatically generate up to 48 sequential messages on a fixed time interval. The messages may be either a read or a write. Each message includes the starting local mailbox register, the starting remote register, the count, the direction (READ or WRITE), and the route.

F4 edits the Status bit map registers. These registers provide 48 bits to indicate the success or failure of the scan.

F8 auto increments the next entry.

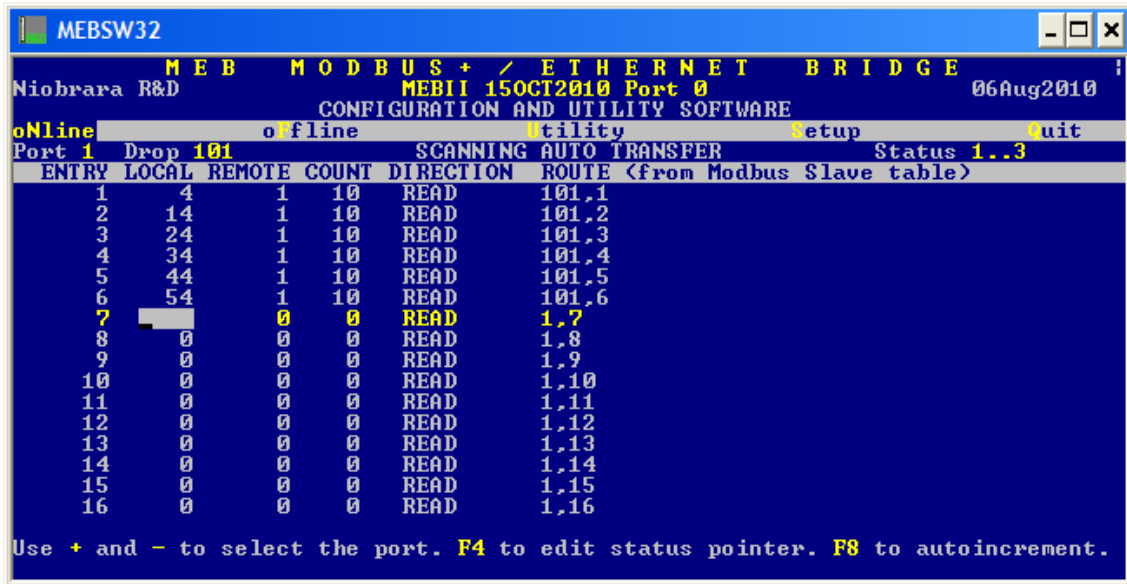


Figure 6.8: Auto Scan Screen

Global Data

The MEBII MB+ port may participate in Global Data. This feature allows each node on the MB+ network to publish up to 32 words that are visible by all other nodes on each token pass. The published mailbox data is set in the OUTPUT field in the lower right corner.

The REG field is the MEBII's mailbox register and must be within the range of 1-2048.

The COUNT field is set to 0 to disable the subscription and has a maximum value of 32.

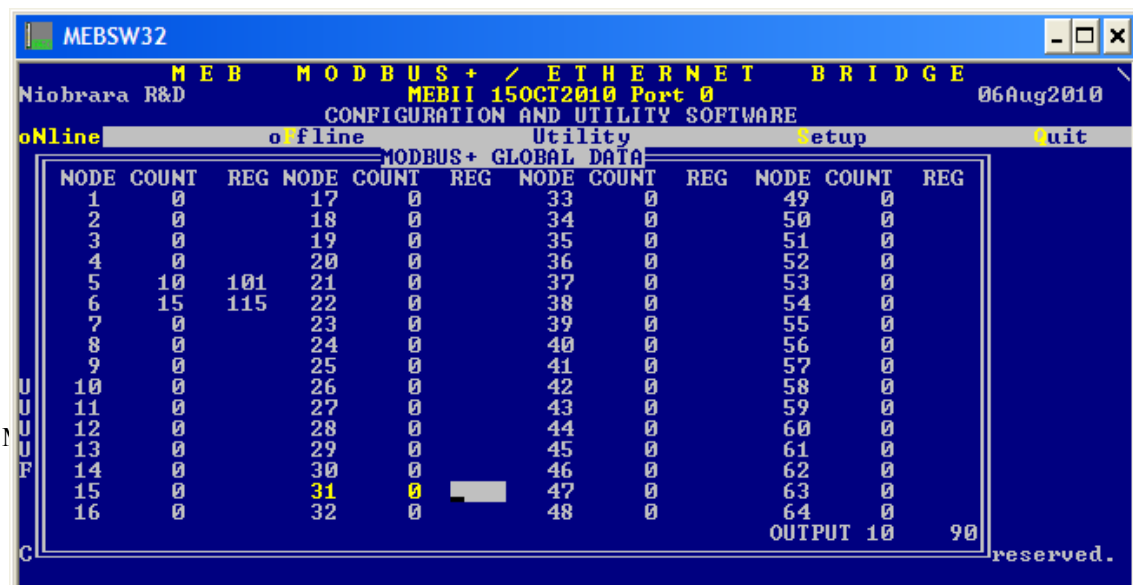


Figure 6.9: Global Data Screen

TCP Routing

The TCP Routing screen gives access to the 200 entries the table. This table is used to associate the drop number in the route following the Ethernet port drop number to an IP Address. The Downstream Route feature may be used to add the Modbus/TCP Destination Index in the rare situation where all 5 MB+ drops in the route are already used by the time the message reaches the TCP table.

The Auto-Fill feature of the IP table on the MEBII's front panel will automatically place the first three octets of the new IP Address in each of the 200 entries of this table. The fourth octet will simply be the index value for the entry.

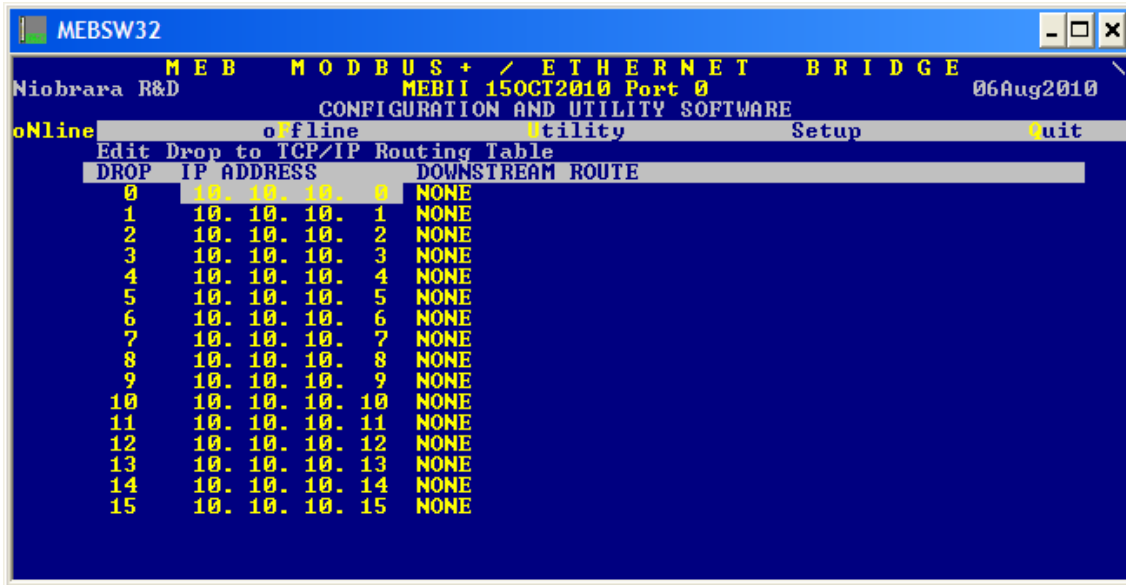


Figure 6.10: TCP Routing Screen

offline Menu

The offline menu allows MEBII configuration without a physical connection to the hardware.

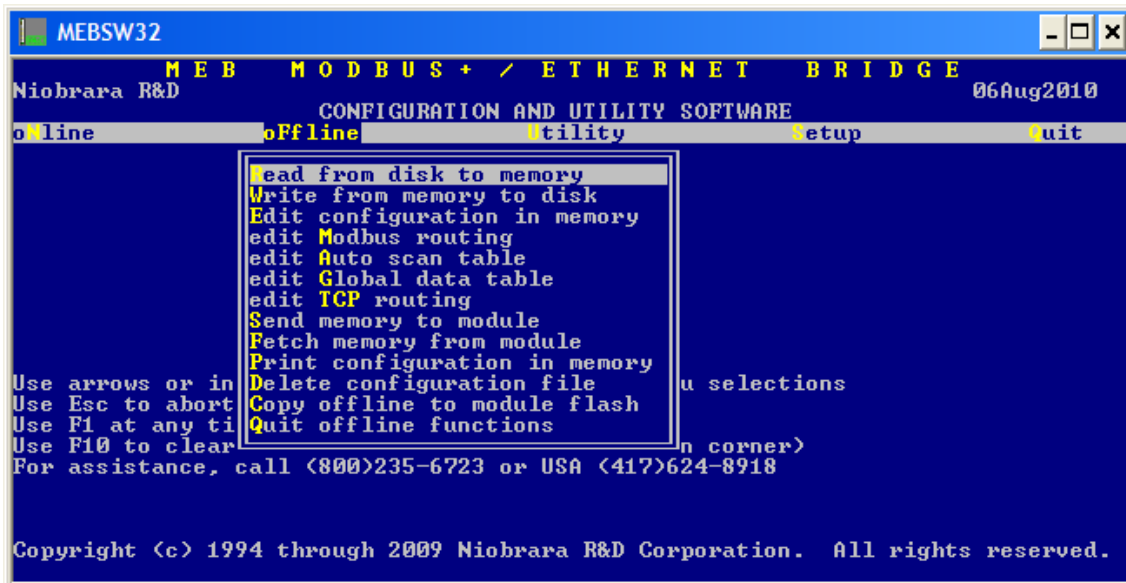


Figure 6.11: TCP Routing Screen

Read from disk to memory

The oFline, Read from disk to memory menu item allow the MEBSW32 program to read a previously saved configuration file from the computer's hard disk into the offline memory. This file may then be viewed, modified, printed, saved, or sen to an MEBII. The filename must be a maximum of 8 characters and is chosen from files with the extension .MEB.

The arrow keys may be used to move around the list of stored files or the filename may besimply typed into the File to read: box. Moving the cursor around to an item encased by [] will choose that drive letter or folder name.

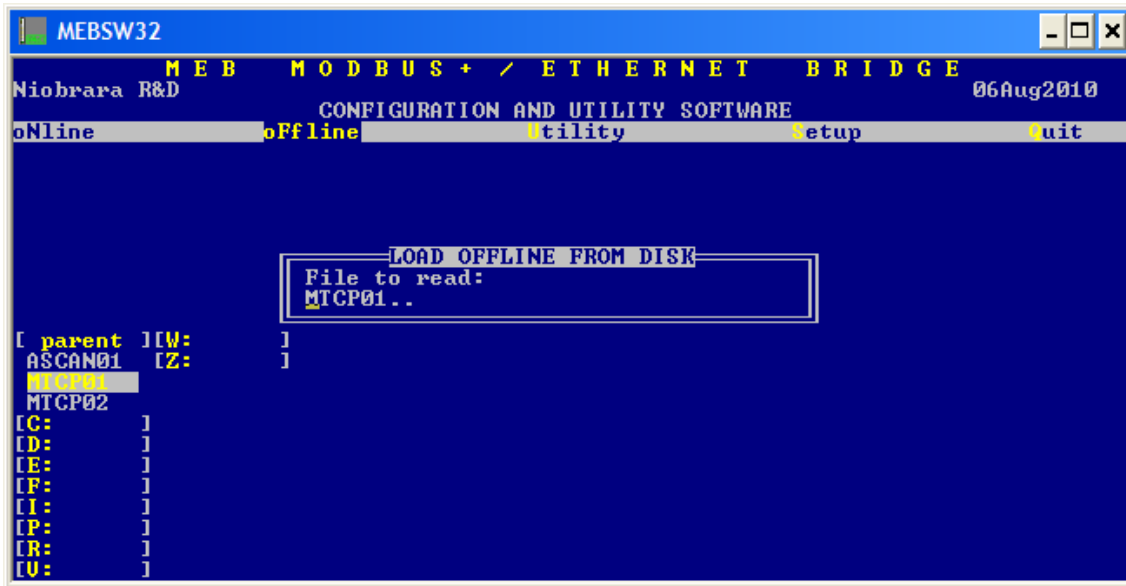


Figure 6.12: Read File from Disk Screen

Write from memory to disk

The oFfline, Write from memory to disk is used to save the current offline memory to a file on the PC. The navigation and file name operation is the same as the “Read from disk to memory”.

Edit configuration in memory

The oFfline, Edit configuration in memory screen works just like the oNline Edit port parameters version on page 75.

edit Modbus Routing

The oFfline, edit Modbus routing screen works just like the oNline Edit Modbus routing on page 76.

edit Global data table

The oFfline, edit Global data table screen works just like the oNline,Global Data on page 77

edit TCP routing table

The oFfline, edit TCP routing table screen works just like the oNline, TCP Routing on page 78

Send memory to module

The oFfline, Send memory to module screen sends all of the oFfline data to the MEBII.

NOTICE: This action will overwrite all data in the MEBII and may potentially cause the PC to loose communication with the MEBII.

Note: The data sent to the MEBII will not be saved in the module until Utility, Write setup to EEPROM is completed.

Fetch memory from module

This menu item copies all of the configuration from the MEBII to the oFfline section of MEBSW32.

Print configuration in memory

A hard copy of the oFfline configuration may be created using the Print configuration in memory. Choose LPT1: to print directly to port LPT1. A text file name may also be entered to print directly to a file.

Delete configuration file

This screen is used to remove a .MEB file from the computer. Select the file and pres enter to delete the file from the computer.

Copy offline to module flash

This menu item is to supported by the MEBII. It is only used with the older SY/MAX versions of the MEB.

Quit offline functions

This menu item returns to the main menu. Pressing the ESC key performs the same task.

Utility Menu

The Utility menu offers several handy features to troubleshoot a system.

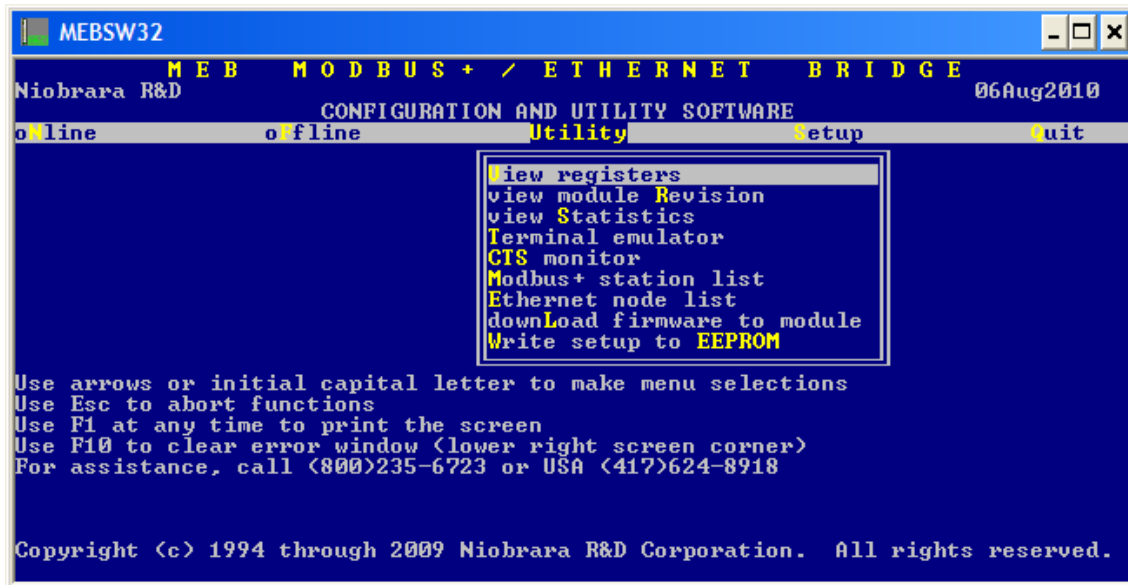


Figure 6.13: Utility Menu Screen

View registers

The View registers screen gives a Modbus register viewer/modifier screen that may access Holding (4x) or Analog Input (3x) registers in the target device. Use the Serial communication and Register viewer pages to choose the target device and viewable register type and range.

The register data is shown in Hex, unsigned, signed, and binary form. Use the arrow, page up and down, and home keys to move the cursor around. Use the number keys to modify the register's content. Pressing Enter will send the new data to the target.

NOTE: Writing data to a target device may cause unexpected behavior, equipment damage, personal injury or death.

Jump to a particular register location by typing in a new number while the cursor is in the far left column.

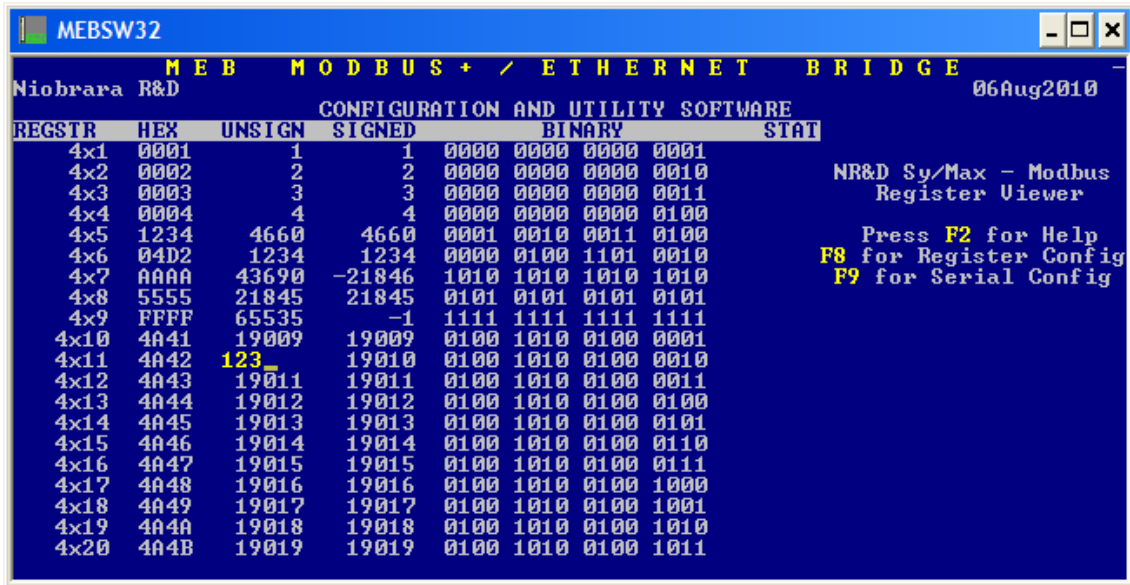


Figure 6.14: Utility Menu Screen

view module Revision

The view module Revision screen will show the MEBII's current firmware revision.

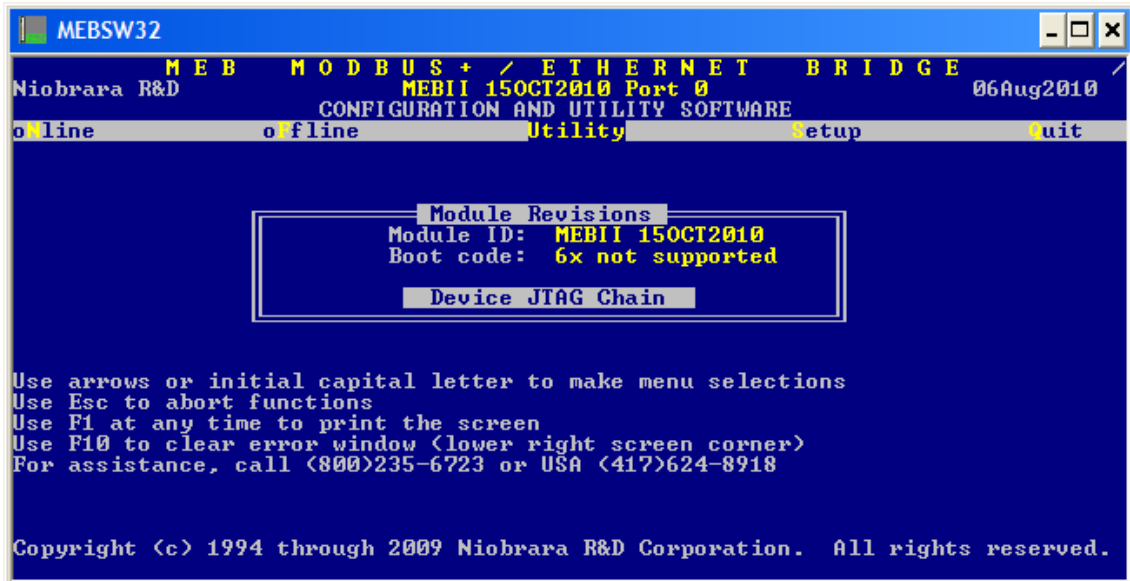


Figure 6.15: Utility View Module Revision Screen

view Statistics

The MEBII contains many pages of statistical information about the operation of its various ports. There are pages for the Ethernet port, both serial ports, and the MB+ port. Most port pages include multiple screens accessed with the Page Up and Page Down buttons. Pressing the + and - or “space bar” buttons will move between port pages. Use the “z” or “0” keys to zero the counters for a given port.

	Count	Register
Connection reset by peer	0	2049
	0	2050
	0	2051
Packets generated internally	6595	2052
Internal generations failed (No Buffer)	0	2053
Received ACK of sent segment	6603	2054
Connection aborted, too many retries	0	2055
Segments retransmitted	0	2056
Packets lost because unrouteable	0	2057
Illegal queries	0	2058
Local reads	5986	2059
Local writes	0	2060
Open connections	1	2061
Client connections	0	2062
Unknown ethernet frame type received	1664	2063
Ethernet frames transmitted	6632	2064
Ethernet frames received	35395	2065

Figure 6.16: Ethernet Statistics Screen

	Value	Register
Node type ID	3-PC+	3700
MAC state variable	8-Check pass	3703
Peer status	32-Normal lnk	3704
Communications processor version	210.3	3701
Network address for this station	1	3702
Token pass count	65404	3705
Token rotation time in ms.	1	3706
Retransmit deferral error count	0	3713
RX buffer DMA overrun error count	0	3713
Repeated command received count	0	3714
Frame size error count	0	3714
RX collision-abort error count	66	3715
RX alignment error count	0	3715
RX CRC error count	0	3716
Bad packet-length error count	0	3716

Figure 6.17: MB+ Statistics Screen

Terminal emulator

MEBSW32 includes a simple terminal emulator that works with the PC's serial ports. Characters typed on the screen are sent directly out the serial port. Characters received on the serial port are displayed on the screen. Non-printable characters are shown as their hexadecimal values enclosed in <xx> such as <0D> for a carriage return.

The terminal emulator may be exited by pressing Ctrl+End keys at the same time.

Use the F7 key to select a text file to capture all received characters.

F5 key will toggle the screen to hex only display mode.

The Insert key will prompt the user to type in two digit hex codes separated by space characters to send.

CTS monitor

This screen shows the state of the Clear To Send line of the RS-232 ports on the MEBII.

NOTE: the port needs to be in RS-232 mode for this value to make sense.

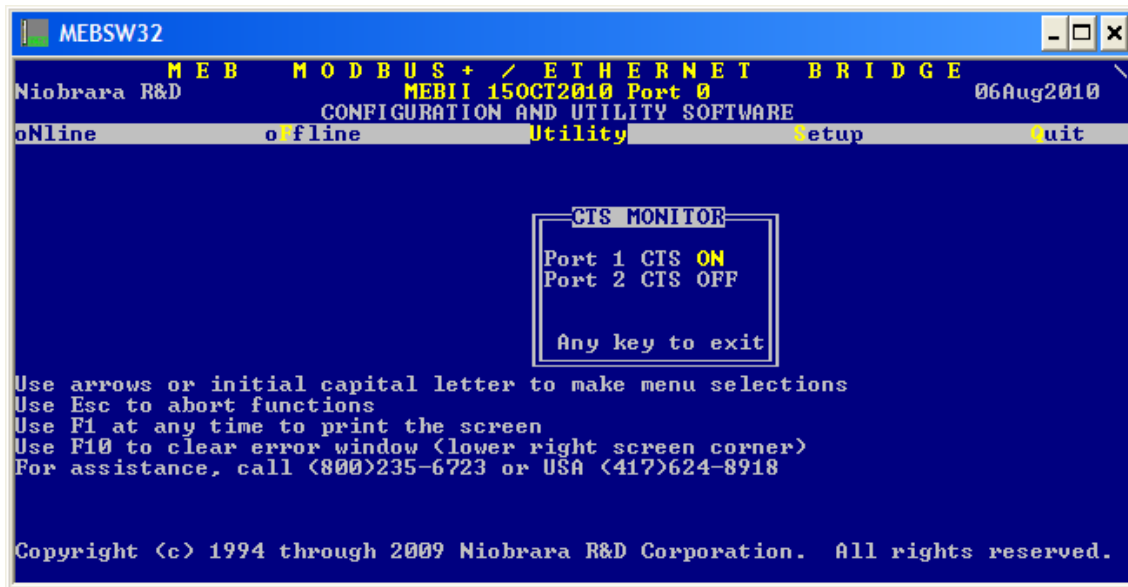


Figure 6.18: CTS Monitor Screen

Modbus+ station list

This screen shows the MB+ stations present on the local MB+ network. The node of the MEBII is shown as inverted text.

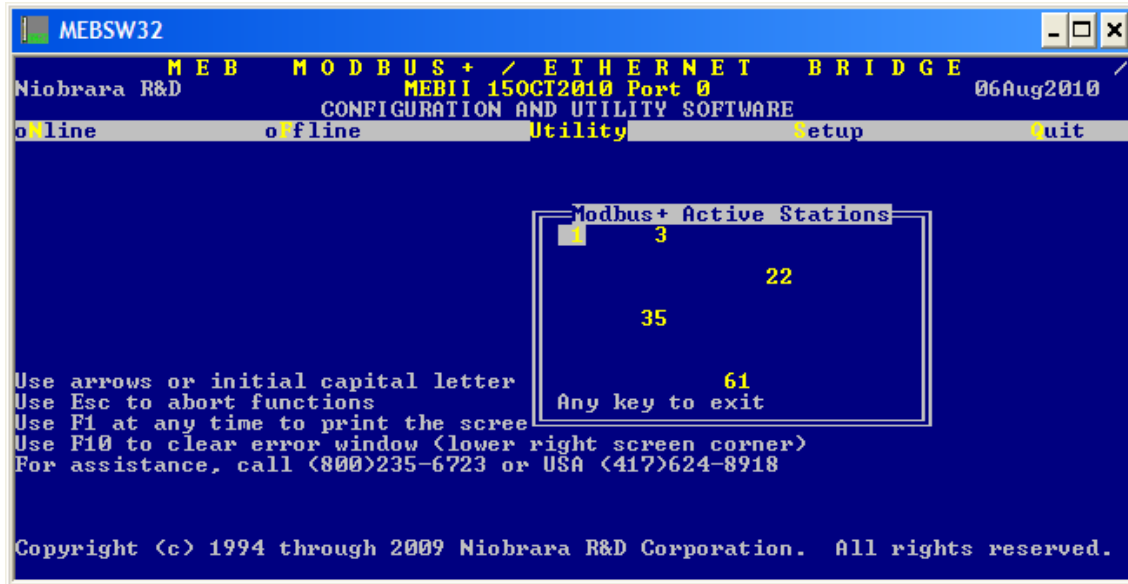


Figure 6.19: Modbus+ Station List Screen

Ethernet node list

This screen shows the connected SY/MAX 802.3 Ethernet drop numbers on the local network. The possible nodes 0-99 are viewable.

NOTE: The Ethernet port must be set to MBTCP+SYMAX mode to enable the MEBII to communicate with SY/MAX 802.3 devices.

Press the F2 key to generate a new global poll.

Nodes that are in the MEBII are inverted. Note, this may include serial and MB+ ports set to "On Ethernet = YES".



Figure 6.20: SY/MAX 802.3 Station List Screen

downLoad firmware to module

This menu item is not used with the MEBII but is kept in the software for very old SY/MAX MEB-D support. The RPCLOAD.EXE program is used to upgrade the MEBII's software (See page 26).

Write setup to EEPROM

Select this menu item to store the current settings to EEPROM.

NOTE: This operation is required when values are changed using this software. Otherwise the new settings will be lost on a power cycle.

Setup Menu

The Setup menu allows the user to configure the PC's connection to the MEBII.

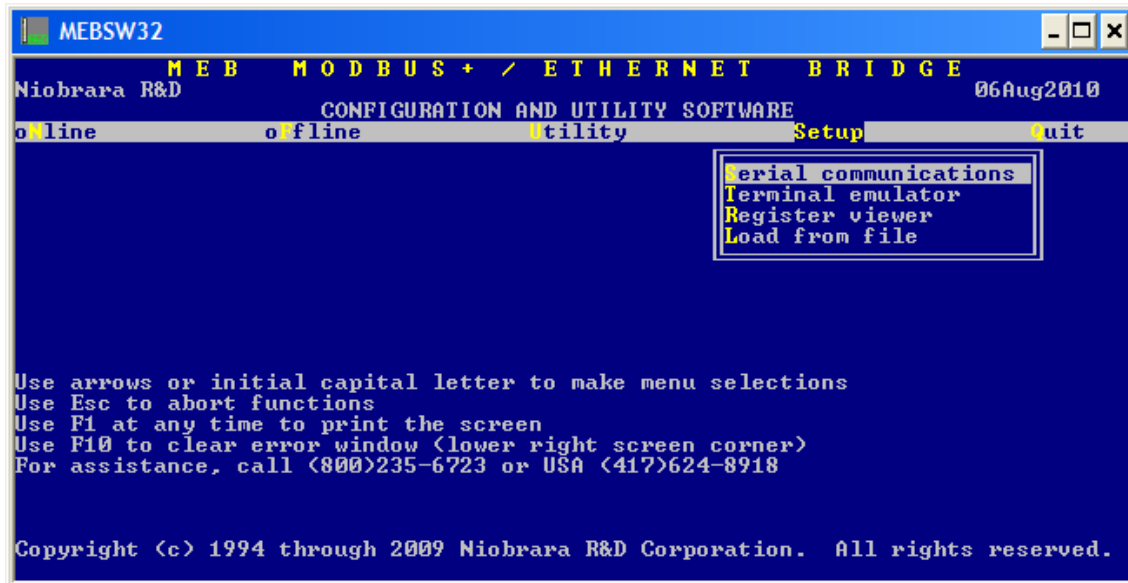


Figure 6.21: Setup Menu Screen

Serial communication

The Setup, Serial communication screen configures the Modbus or SY/MAX connection between the PC and the MEBII or other target device.

The PC must have its serial port configured to match the attached port of the MEBII or other network device.

The default serial port connection to an MEBII would be Modbus RTU at 9600,EVEN,8,1 with a drop number of 255.

Modbus/TCP connections use the IP Address of the MEBII in the “Host” field and Index 255.

A typical SY/MAX serial direct connection to an MEBII port in SY/MAX mode will be at 9600,EVEN,8,1 with a route of NONE.

A typical Net-to-Net connection will be at 9600,EVEN,8,1 with a route of the drop number of the Net-to-Net port.

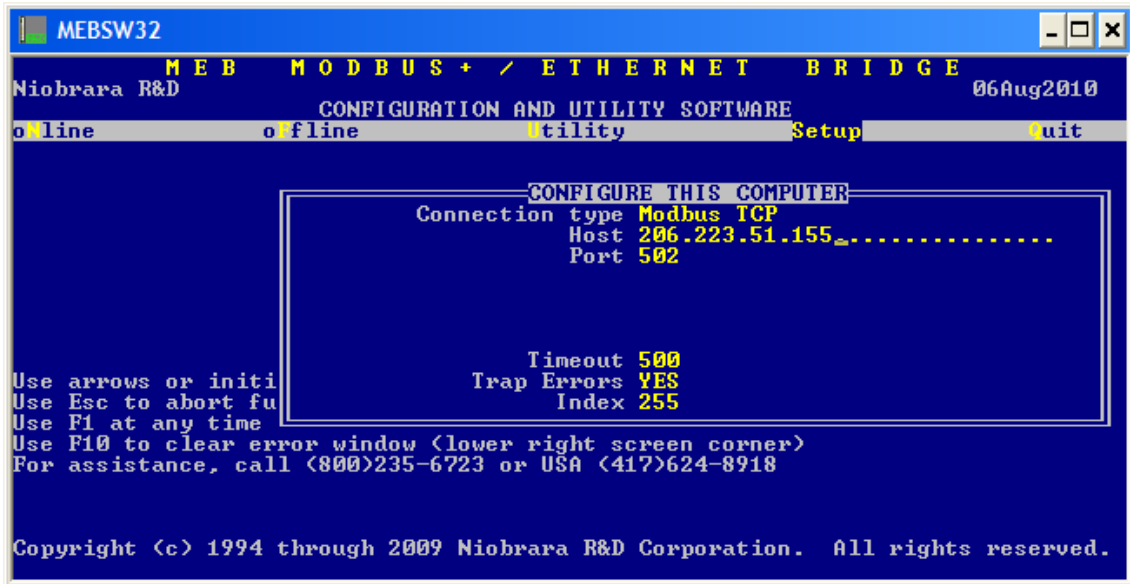


Figure 6.22: Setup Serial Screen for Modbus/TCP connection

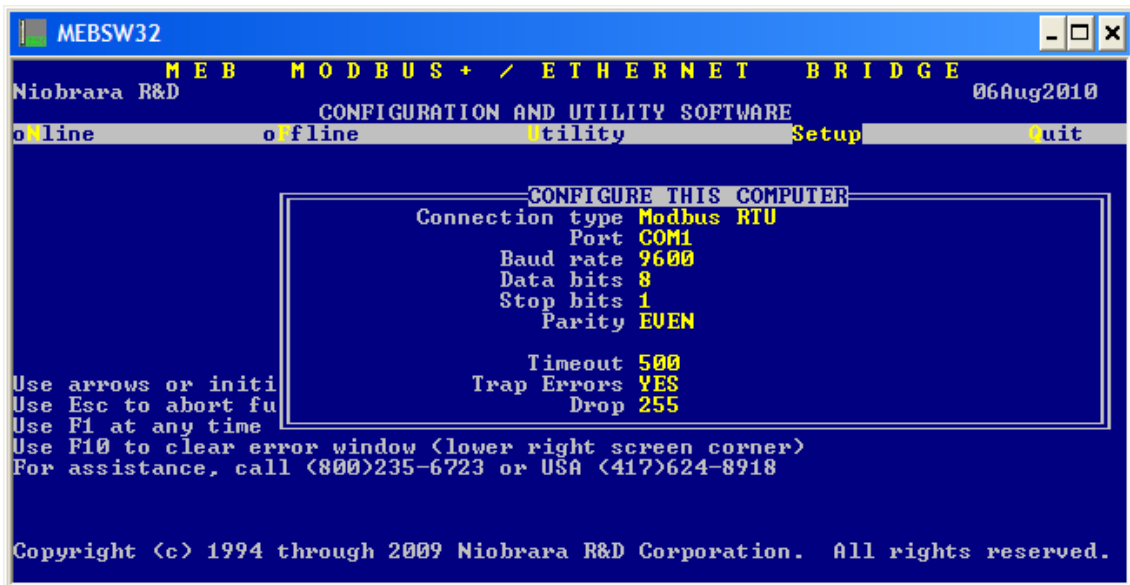


Figure 6.23: Setup Serial Screen for Modbus RTU connection

Terminal emulator

The setup screen for the terminal emulator configures the PC's serial port for use with the Utility, Terminal emulator.

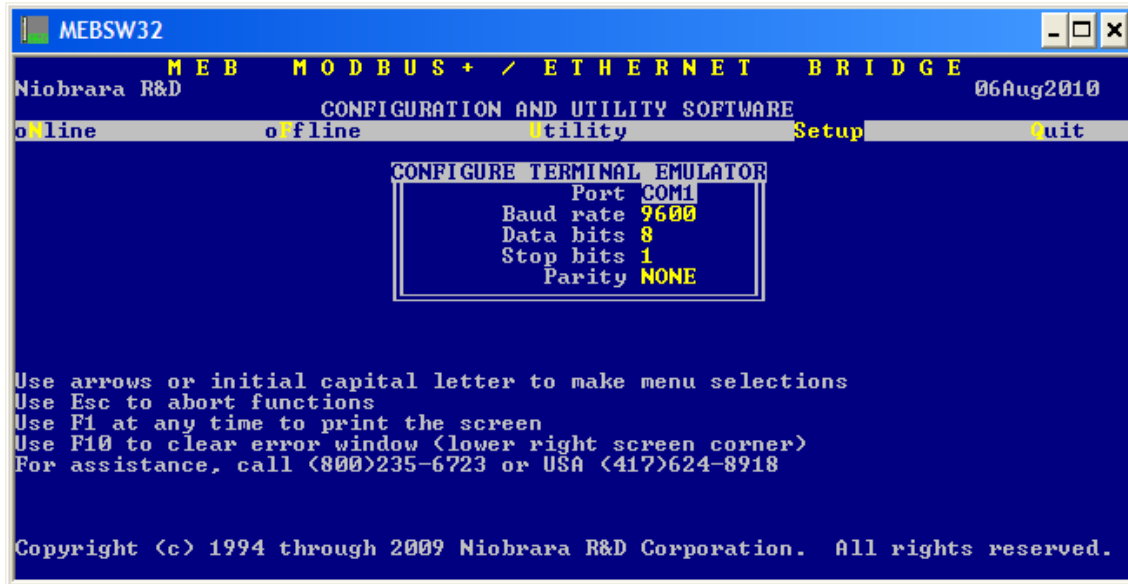


Figure 6.24: Setup Terminal emulator connection

Register viewer

The Utility Register Viewer setup screen allows the configuration of several aspects of the the viewer.

- Priority – SY/MAX mode messages may be Priority or Non-Priority
- Status Registers – Yes or No for SY/MAX PLCs
- Screen Size – Number of registers queried (default = 20)
- Starting Register – defaults to 1
- Register Set – 4x = Modbus Holding Registers, 3x = Modbus Analog Inputs
- Identify Module – Poll register 8188 and show the value at the top of the screen

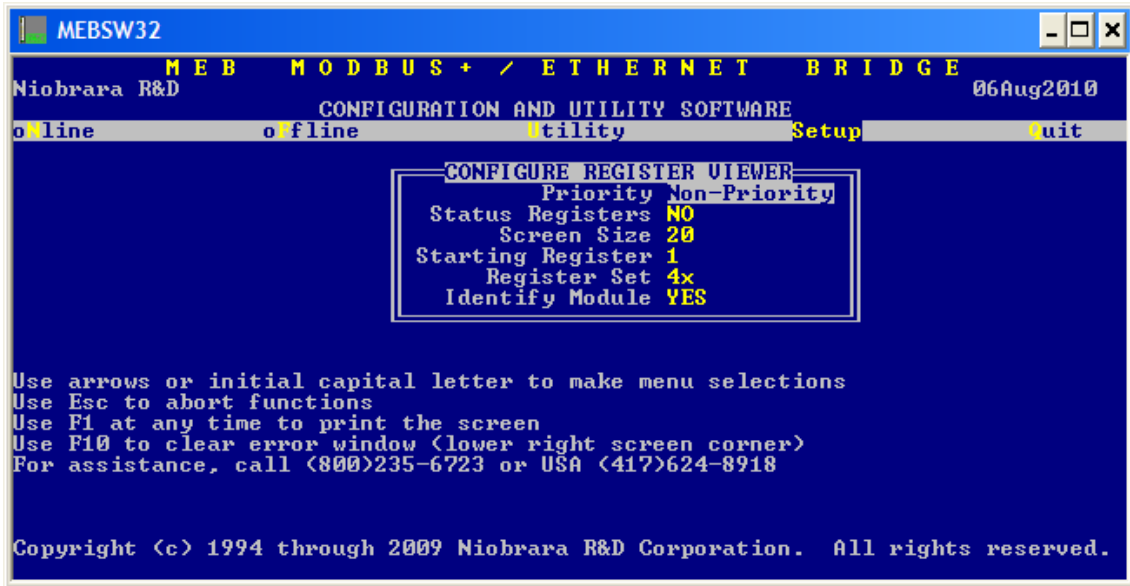


Figure 6.25: Setup Register Viewer

Quit Menu

Press Enter to exit the MEBSW32 program.