MEB3

Installation and Programming Manual

This manual covers the MEB3 Modbus Plus to Ethernet Bridge.



Effective: June 22, 2026

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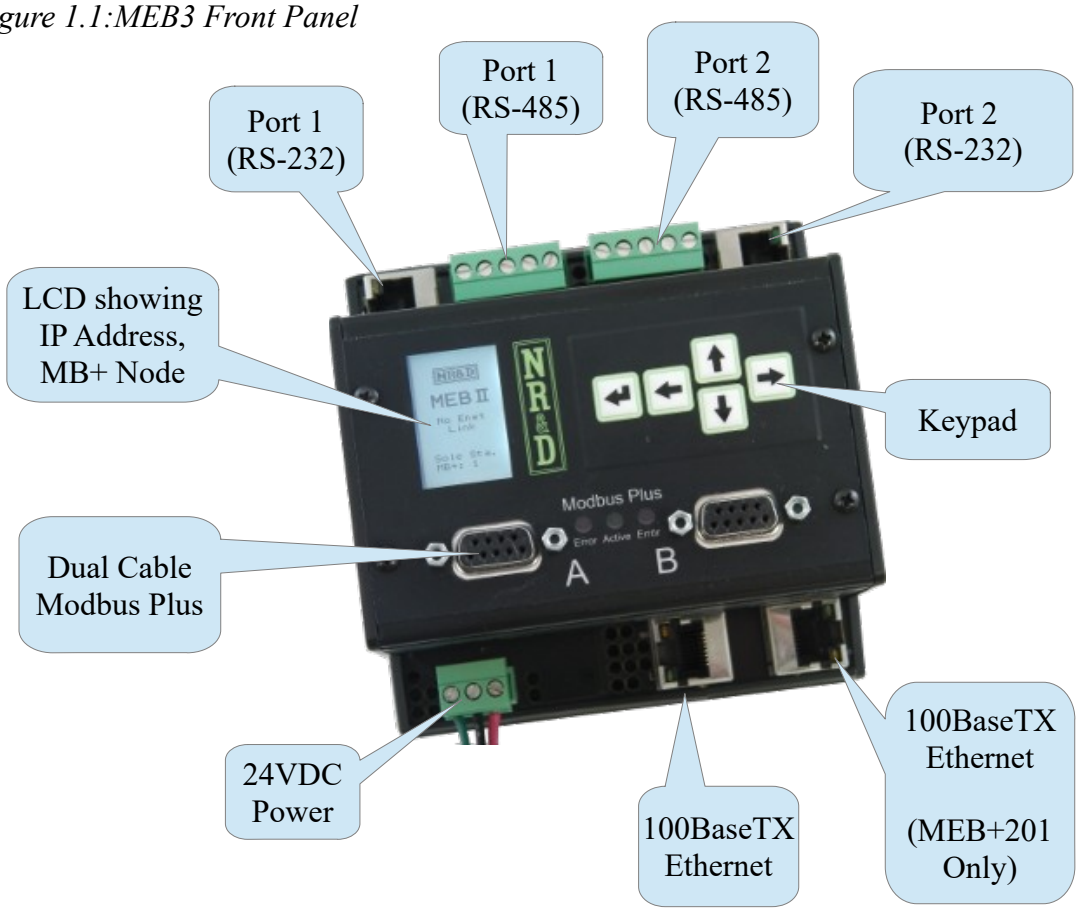
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1 Introduction

The Niobrara MEB3 is a stand-alone DIN rail mount Modbus Plus to Ethernet Bridge. It features a redundant cable Modbus Plus (MB+) port, one (or two) 10/100BaseTX Ethernet port, and two isolated serial ports. The MEB3 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 Control Expert (Unity Pro), Concept, ProWORX, and Modsoft.

Figure 1.1:MEB3 Front Panel



The MEB3 features at least one 100BaseTX Ethernet port that supports Modbus/TCP as both a client and a server at the same time. The MEB3 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 an Ethernet 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 MEB3+201 model includes two 100BaseTX Ethernet ports that support Rapid Spanning Tree Protocol (RSTP) allowing the MEB3 to be used in a copper ring network for redundant Ethernet cable connections. It also now supports independent IP addresses for each port, allowing the MEB3+201 to participate on two separate networks. It may also be used in a daisy-chain Ethernet network as well.

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. The MEB3 MB+ port may be used in a “Proxy” mode that allows Modbus Plus messages routed to the MEB3’s drop number to be sent across a Modbus/TCP socket to a target PLC such as an M580.

There are two isolated serial ports on the MEB3. 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 MEB3 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.

A built-in web server is included in the MEB3. This password-protected, AJAX Javascript-enabled server allows two user levels for configuration, backup/restore, troubleshooting, and even firmware updating – all from a standard web browser.

The MEB3 also includes a “Hot MB+” mode that allows two MEB3 units to work together to provide an automatic fully redundant primary/standby system for high availability systems.

2 Installation

WARNING: Do not connect the MEB3 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.

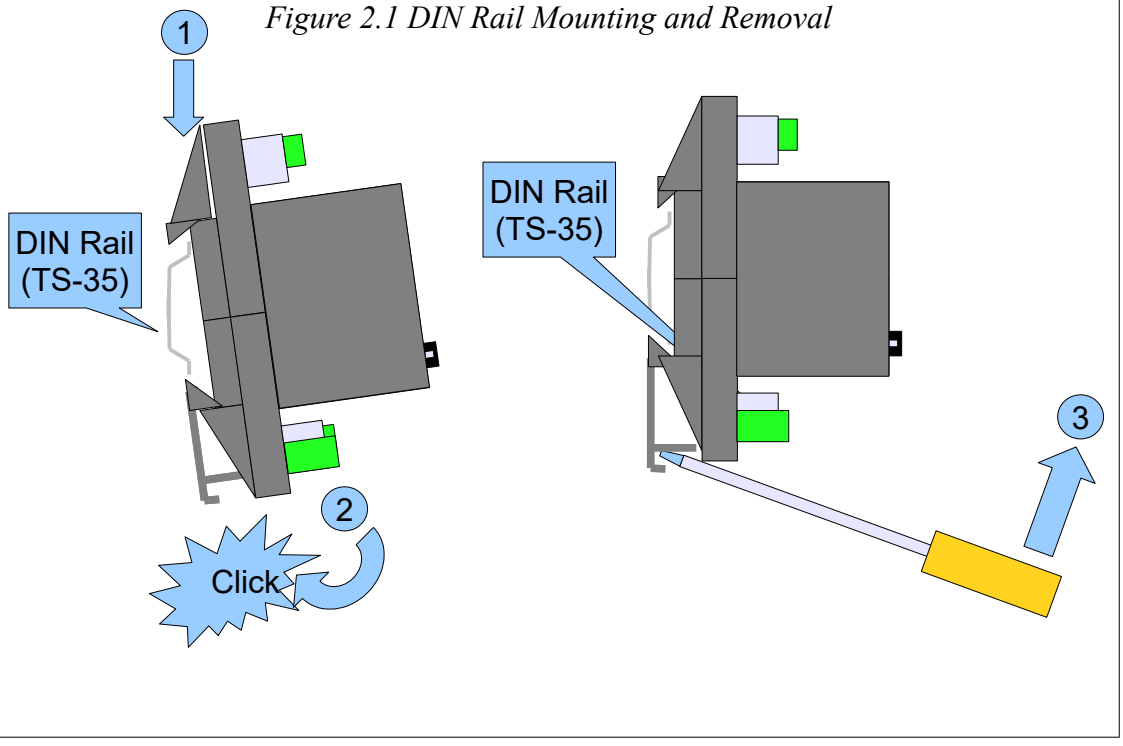
Device Mounting/Removal

(1) Hook the top notch on the upper lip of the DIN rail.

(2) Rotate the MEB3 until the lower latches click tight.

(3) Use a screw driver to unclip the lower latches to remove the MEB3 from the DIN rail.(See Figure 2.1 DIN Rail Mounting and Removal)

Figure 2.1 DIN Rail Mounting and Removal

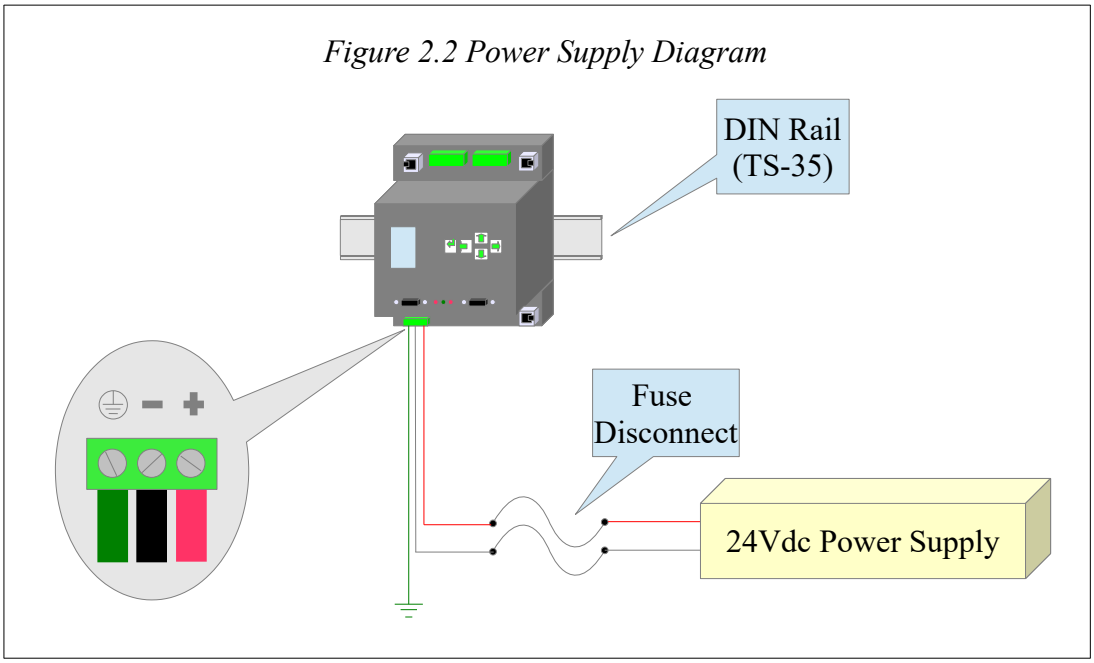


Power Supply

Connect a suitable 24VDC power to the three position removable connector. The MEB3 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

Figure 2.2 Power Supply Diagram



3 Ethernet

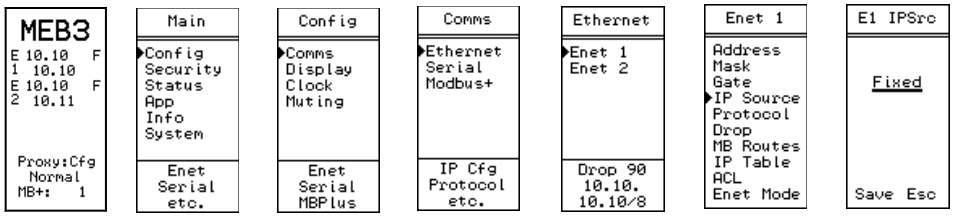
Setting the IP Address

The MEB3 defaults to a fixed IP Address of 10.10.10.10 (for Enet Port 1. 10.10.10.11 for Enet Port 2). This is easy to change through the use of the front panel keypad. The MEB3 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.

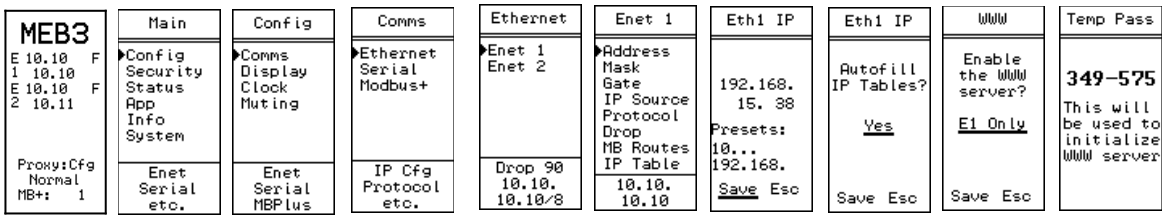
NOTE: BOOTP and DHCP operation usually requires that the server be configured for the MAC Address of the MEB3. The MEB3's MAC address is printed on the serial number label and is also shown on IP Source screen.

Figure 3.1 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 3.2 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 MEB3's IP Address

and the last octet will be set to the index number 0-199.

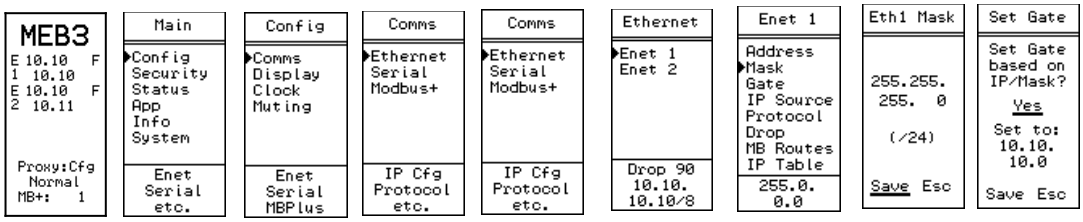
If the www server is disabled then a prompt will appear asking to enable the www server. In the MEB3+201, options will include Enet 1 only, Enet 2 only, or both.

If the www server is enabled and the web password has been resent then a temporary password is displayed. This temporary password is random and must be entered on the web page and you must include the "-" in the password.

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 3.3 Subnet Mask Screen

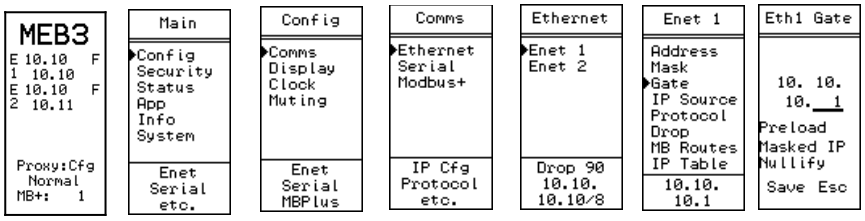


The "Auto Set Default Gate?" applies the new subnet mask to the current IP Address to preset the Default Gate.

Setting the Default Gate

The Default Gate edit page functions just like the IP Address edit page. The Default Gate should be pointed to the local IP Router IP Address. There are two presets to simplify this settting: MaskedIP and Nullify. "MaskedIP" applies the Subnet Mask to the MEB3's IP Address. "Nullify" sets the Default Gate to 0.0.0.0 which will prevent the MEB3 from communicating through routers.

Figure 3.4 Default Gate Screen



Ethernet Connection

After the IP Address is configured for the MEB3, it is safe to connect the Ethernet port to the network. The MEB3 includes a standard RJ-45 Ethernet connector with indicators for Link/Activity (green LED) and 100Mb (amber LED). (See Figure 3.5 Ethernet Port) The green Link/Activity light illuminates when the MEB3 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 MEB3's Ethernet port supports 10/100BaseTX auto-crossover operation. Standard CAT5 cables may be used to connect the MEB3 to Ethernet switches and hubs.

Figure 3.5 Ethernet Port

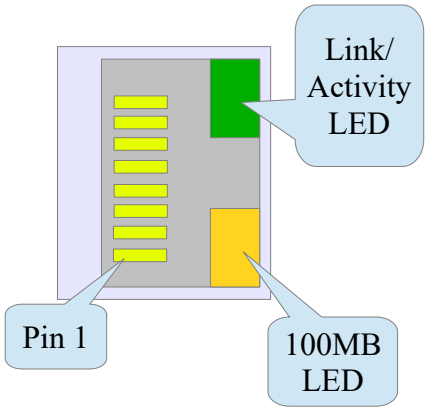
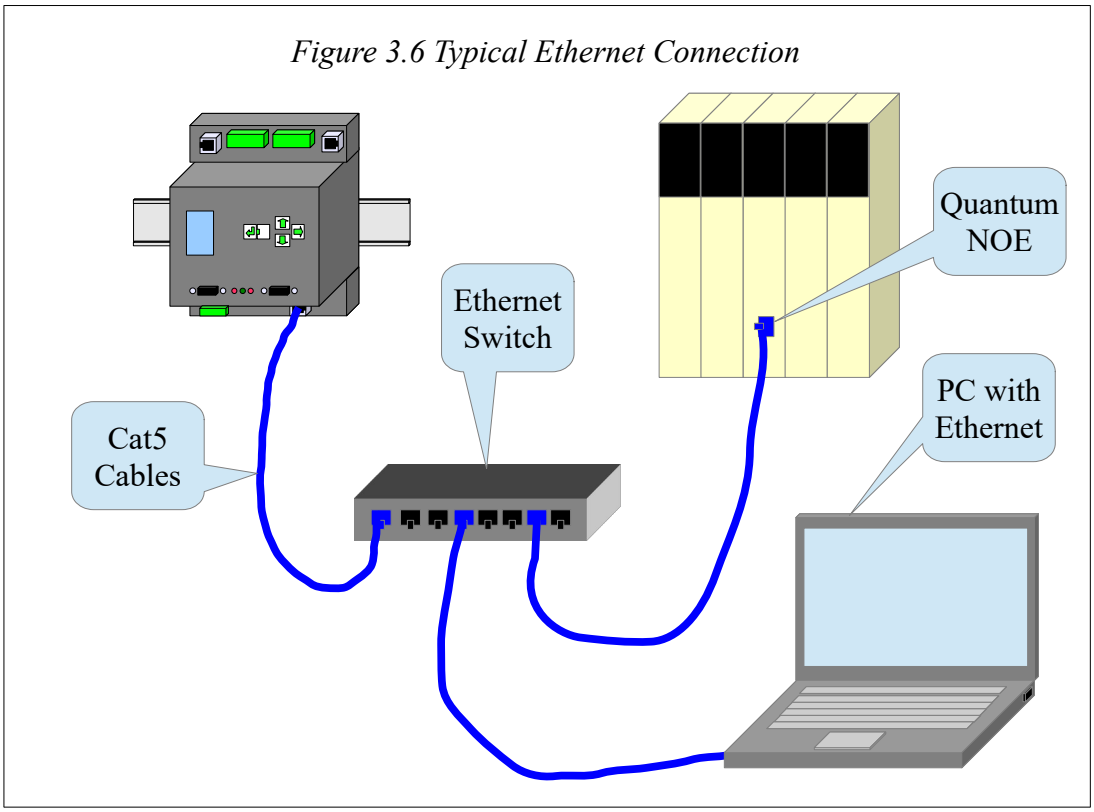


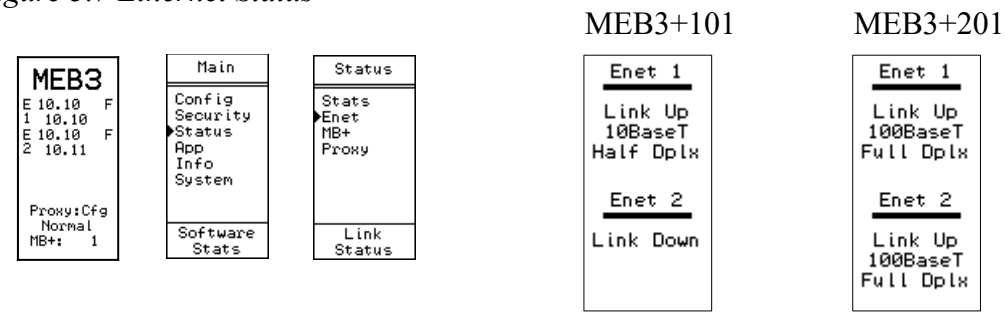
Figure 3.6 Typical Ethernet Connection



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

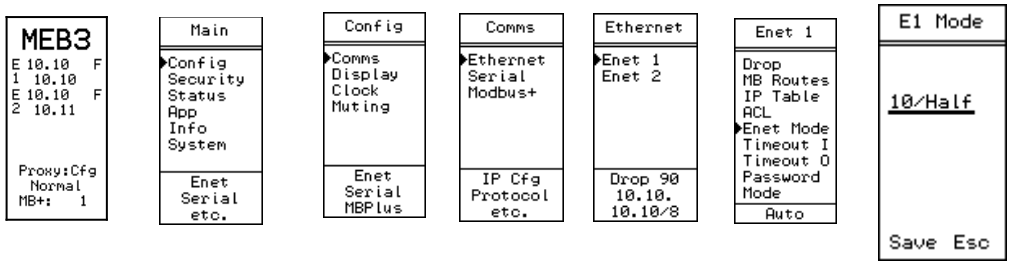
NOTE: MEB3+101 will always show "Enet2 Link Down".

Figure 3.7 Ethernet Status



Both Ethernet ports default to "Auto" mode but may be manually set to a fixed 10BaseT or 100BasetT with fixed Full or Half Duplex operation.

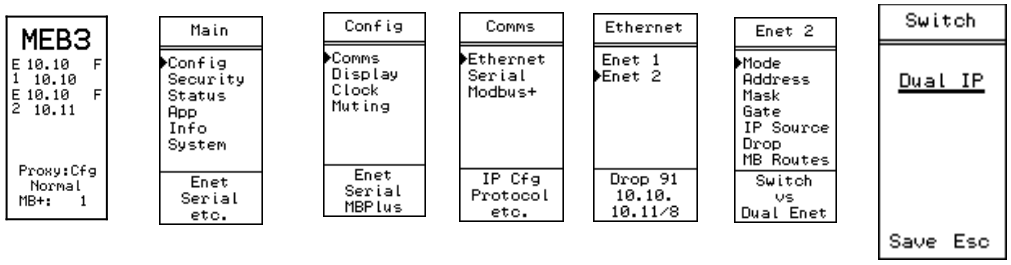
Figure 3.8 Ethernet Mode Configuration for Enet Port 1



MEB3+201 Second Ethernet Port

The MEB3+201 includes two Ethernet ports. The current firmware of the MEB3+201 supports this second port as daisy-chain or copper ring operation, or it will allow the second port to operate independently with a second IP Address.

Figure 3.9 Enet Port 2 Operation Mode Configuration

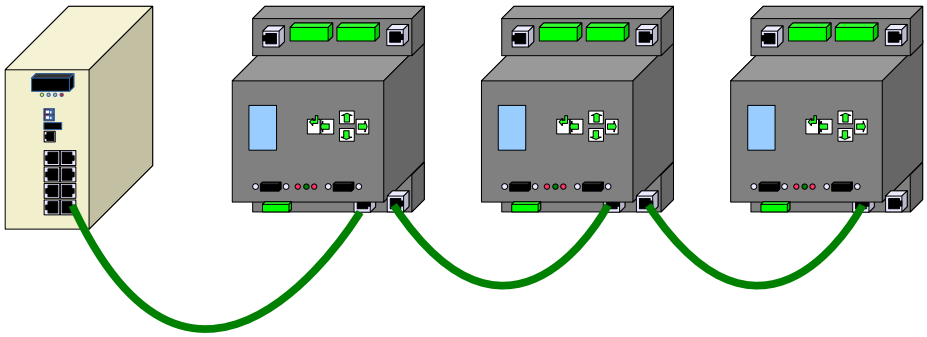


Daisy-Chain Operation

The MEB3+201 may have its Ethernet ports connected in a Daisy-Chain fashion.

NOTE: Communication to downstream Ethernet devices may be lost if one of the daisy-chain units fails or loses power.

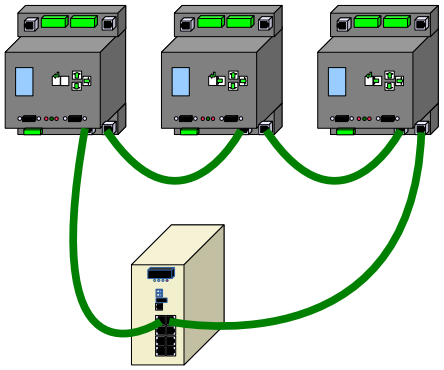
Figure 3.10 Daisy-Chain Ethernet Connection



Copper Ring Operation

The MEB3+201 may be used in a copper RSTP ring with an appropriate Ethernet switch such as the Schneider-Electric ConneXium TCSESM083F23F0. This ring operation provides redundant cable paths to each MEB3.

Figure 3.11 Copper Ring Operation



4 Modbus Plus

Modbus Plus Configuration

Setting the Node Number

The Modbus Plus (MB+) node of the MEB3 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 MEB3 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.

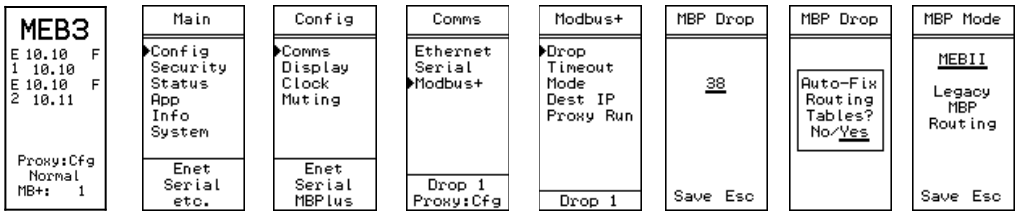


Figure 4.1: Edit Modbus Plus Drop (Proxy Disabled)

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 no longer work properly – they must then be edited manually.

Next "MBP Mode" will be prompted. "MEBII" means that the unit will be in MEBII mode. "Proxy" puts the unit into Proxy mode and then prompts for the IP Address of the target PLC.

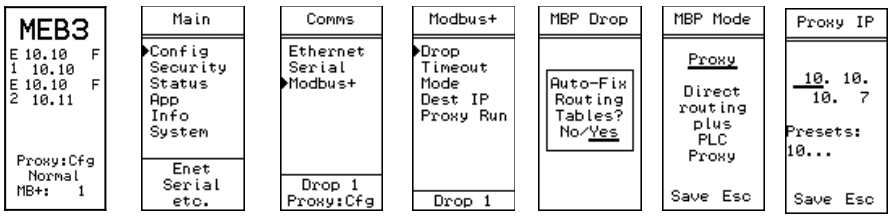
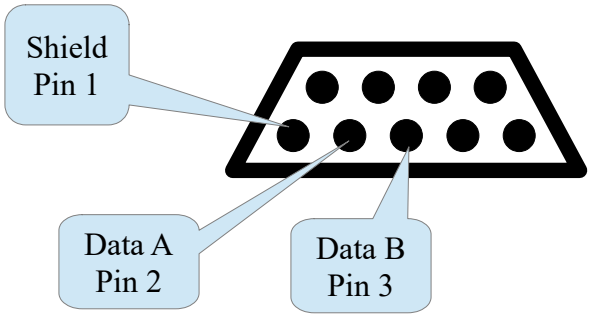


Figure 4.2: Edit Modbus Plus Drop (Proxy Enabled)

Modbus Plus Cable Connection

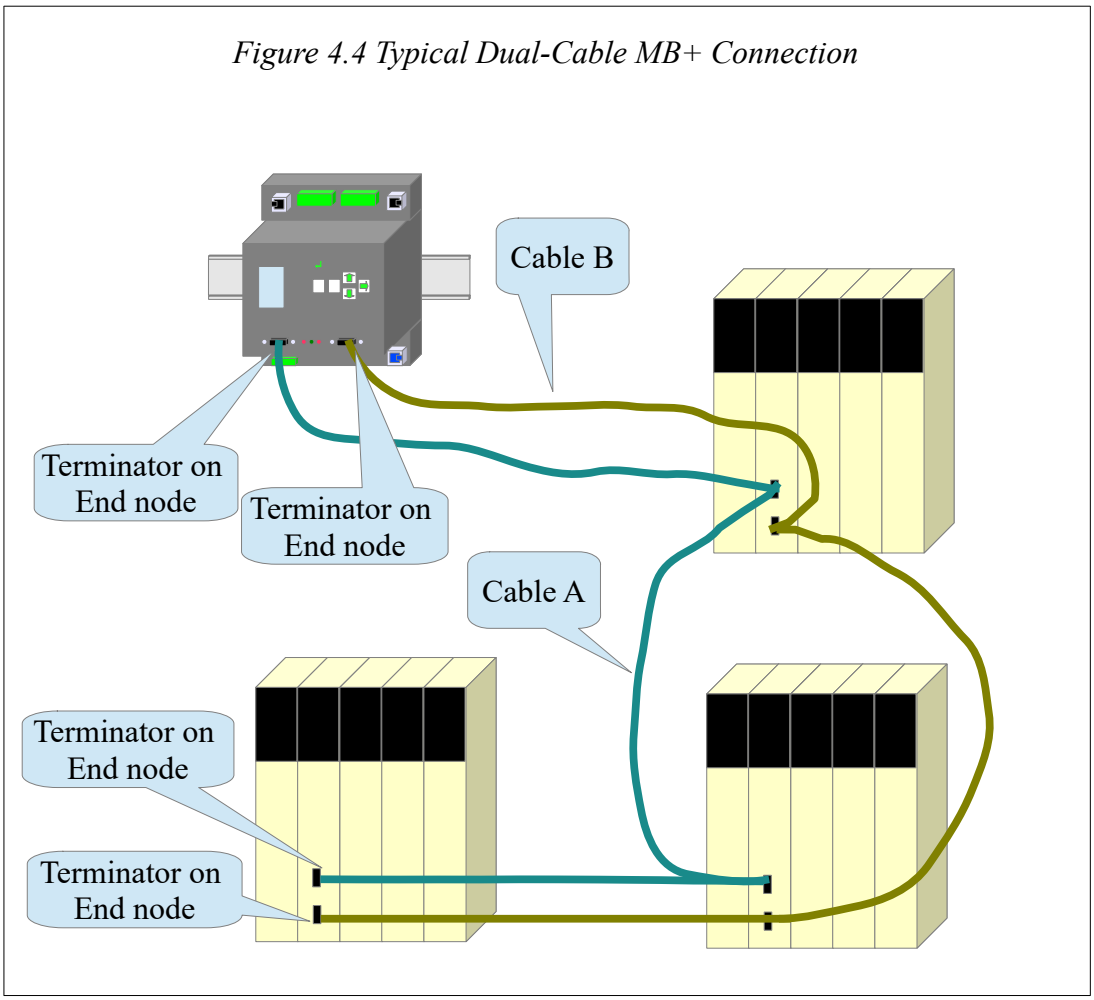
NOTE: See the Modicon Modbus Plus Network Planning and Installation Guide 890 USE 100 00 for complete instructions on proper MB+ cable installation methods and considerations.
Modbus Plus has very specific rules about minimum and maximum cable lengths, number of nodes per segment, the use of repeaters, and cable termination. It is extremely important to follow the rules spelled out in the above mentioned guide for proper network operation.

Figure 4.3 Modbus Plus Pinout



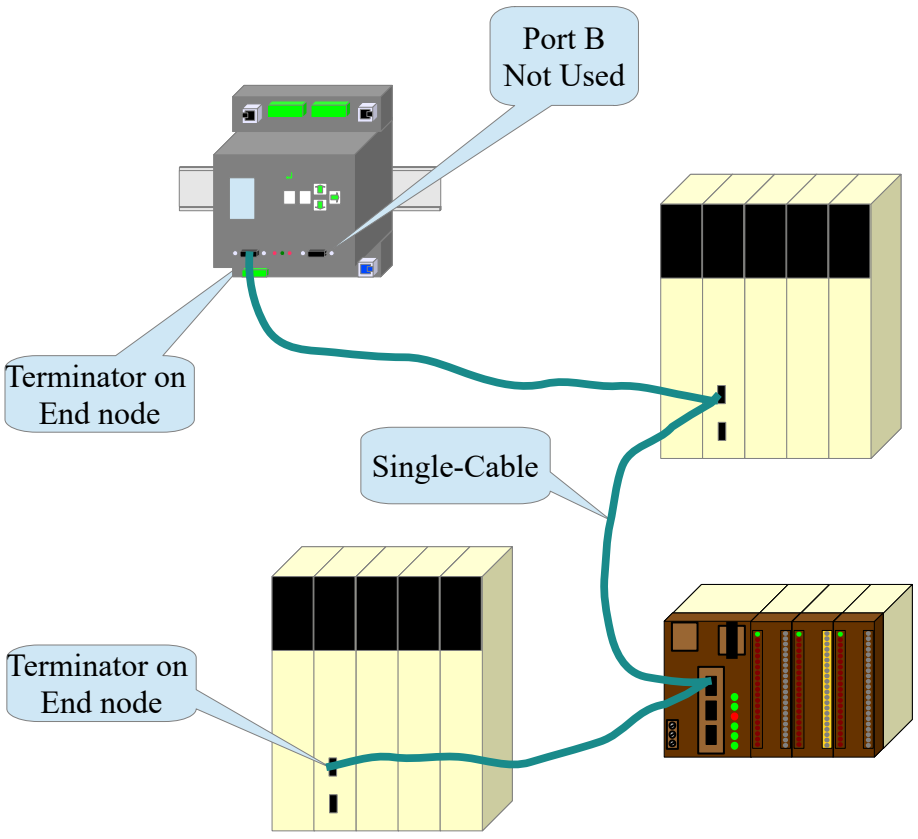
The MEB3 includes two MB+ DB9 connectors labeled “A” and “B”. (See Figure 4.3 Modbus Plus Pinout) These ports may be used in a “dual-cable” Modbus Plus network. This does not mean that the MEB3 has two MB+ nodes, it behaves as a single MB+ node with two physical network connectors. The dual-cable system uses redundant wiring between nodes for added network integrity. (See Figure 4.4 Typical Dual-Cable MB+ Connection)

Figure 4.4 Typical Dual-Cable MB+ Connection



The MEB3 may be used in a “single-cable” network by simply connecting the MB+ network to port “A”. (See Figure 4.5 Typical Single-Cable MB+ Connection)

Figure 4.5 Typical Single-Cable MB+ Connection



Modbus Plus Lights

The MEB3 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 4.1: MB+ Green Active Flashes)

Table 4.1: 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

Modbus Plus Modes

The Modbus Plus port on the MEB3 may operate in one of two different modes: MEBII and PROXY.

Key features of MEBII mode are:

- MEBII Mode routes messages from MB+ based on the "slave channel" number that follows the MEB3's drop number in the MB+ route. The slave channel number must be within the range of 1-8.
- Incoming MB+ routes must not end with the MEB3's node number as this is an illegal route and an exception response will be returned.
- MEBII Mode supports Modbus Plus Global Data to the MEB3's 2048 mailbox registers only. Peer Cop Specific Data is not supported.

Key features of Proxy Mode are:

- Proxy Mode routes messages from MB+ that have a route that terminates with the MB+ node number of the MEB3 are tunneled across Modbus/TCP Ethernet to a target PLC (usually an M580 or M340). This allows a new PLC to replace an older one without needing to change MB+ routing.
- Proxy tunnel messages to the target PLC may have register and coil offsets applied to Modbus read and write messages. This can be very useful for changing the 1-based PLC (Quantum, 984) to the 0-based PAC (M580, M340).
- Proxy tunnel messages to the target PLC may have register space conversions applied to change Analog Input Reads (FC04) to Holding Register Reads (FC03) or Discrete Input Reads (FC02) to Coil Reads (FC01). This may be useful for M340 applications that do not support 3x or 1x address spaces.
- Modbus Plus messages arriving at the MEB3 are routed based on the drop number of the MEB3 port matching the next drop in the route. Unlike the MEBII, messages are no longer limited to a single incoming message per slave channel.
- Proxy Mode allows Peer Cop operation where Specific Data Inputs and Outputs

are automatically transferred from the Proxy Target PLC to/from targets on Modbus Plus. Specific Outputs are only published on Modbus Plus when the Proxy Target PLC is in RUN.

- Proxy Mode allows Peer Cop operation where Global Data Inputs and Outputs are automatically transferred from the Proxy Target PLC to/from targets on Modbus Plus. Global Data Outputs are only published on Modbus Plus when the Proxy Target PLC is in RUN.
- Proxy Mode allows the MEB3's Modbus/TCP I/O Scanner to automatically move data between external Modbus/TCP devices to the Proxy Target PLC. I/O Scanner Outputs are only pushed to the remote Ethernet Devices when the Proxy Target PLC is in RUN.
- When Proxy RUN is enabled in the MEB3, most settings for the device are not allowed to be changed either by the front panel or by the web server. Proxy mode must be put into CONFIG before changes in configuration are allowed. This prevents accidental loss of control of the MB+ I/O by the PLC.

MEBII Mode (Proxy Disabled)

The factory default mode for the MB+ port is "MEBII". Messages routed from Modbus Plus into the MEB3 are routed based on the drop number of the incoming route using the following table:

Table 4.2: MB+ Route Presets

Drop following MB+ Node	Target
1	Serial Port 1
2	Serial Port 2
3	Internal Registers
4, 5, 6, 7, 8	Ethernet

A message to be sent over Modbus Plus to the MEB3 must have a drop number 1 through 8 following the MEB's drop number. These drop numbers are the Modbus Plus Slave Channels as used by the old Schneider Electric Modbus Plus Chipset used by the MEBII. Any other incoming route will result in an exception response.

Figure 4.6 MEBII Mode Routing Example

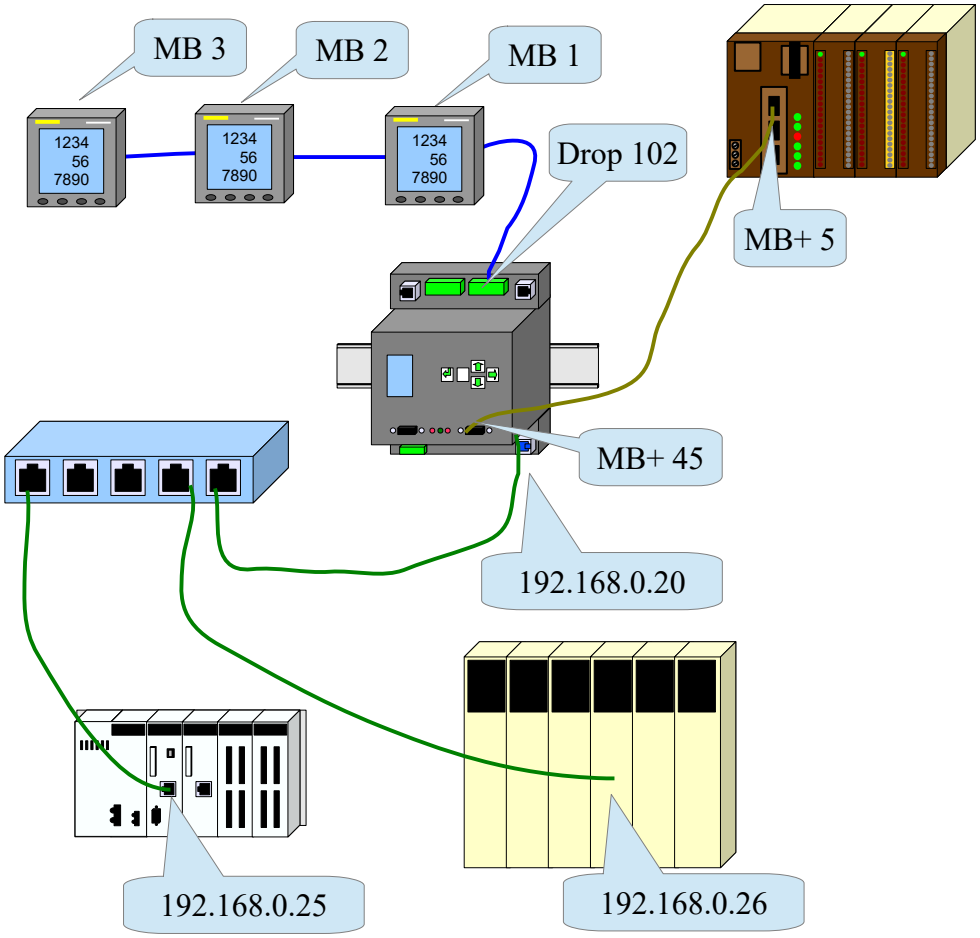


Table 4.3: MEBII Routing Example TCP Table

TCP Table Entry	Target IP
25	192.168.0.25
26	192.168.0.26

This example has the normal Auto-Fill TCP Table Entries for drops 25 and 26 that point to the IP Addresses of the M340 at 192.168.0.25 and the Quantum at 192.168.0.26.

Modbus Plus messages from the Compact 984 will use the routes shown in the following table to reach each target.

Table 4.4: MEBII Routing Example

MB+ Route from Compact PLC	Target
45.2.1	Meter 1
45.2.2	Meter 2
45.2.3	Meter 3
45.4.25	M340
45.5.26	Quantum

PROXY Mode

Proxy mode allows the full Modbus Plus route to be sent through the MEB3.

Figure 4.7 Proxy Mode Routing Example

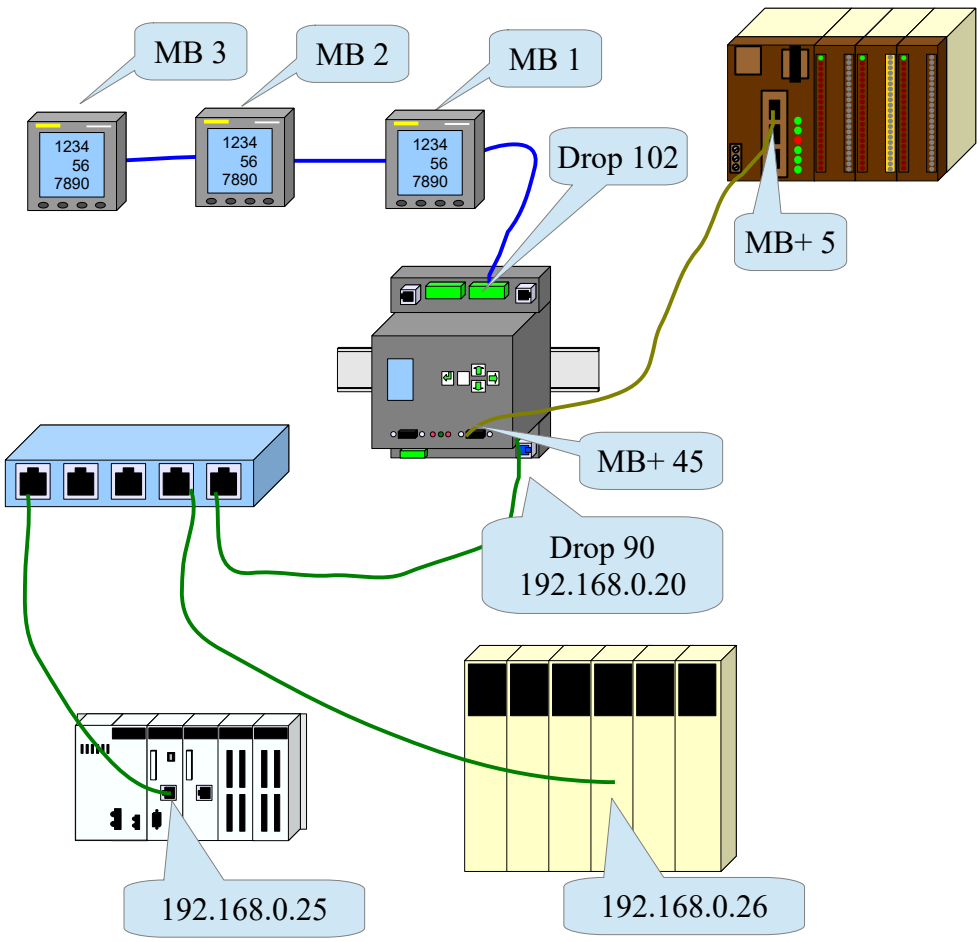


Table 4.5: Proxy Routing Example

MB+ Route from Compact PLC	Target
45.102.1	Meter 1
45.102.2	Meter 2
45.102.3	Meter 3
45.90.25	M340
45.90.26	Quantum

5 Serial Ports

The MEB3 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

Figure 5.2 RS-232 Port 1

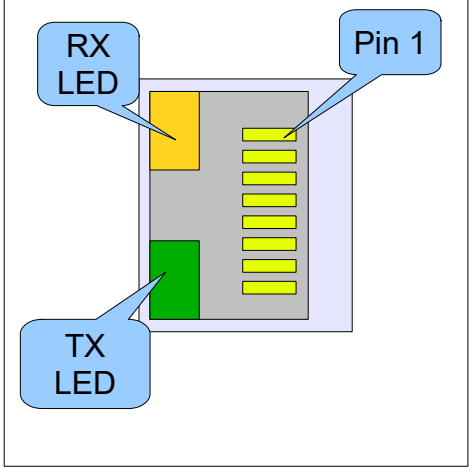
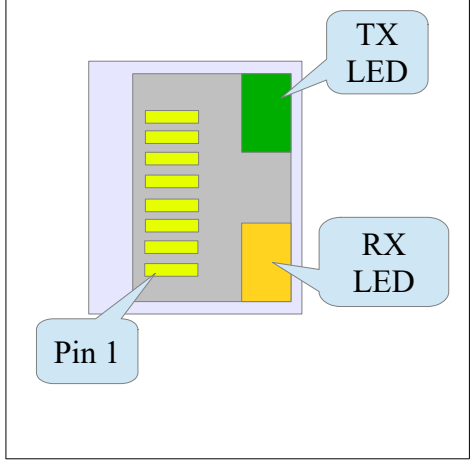


Figure 5.1 RS-232 Port 2

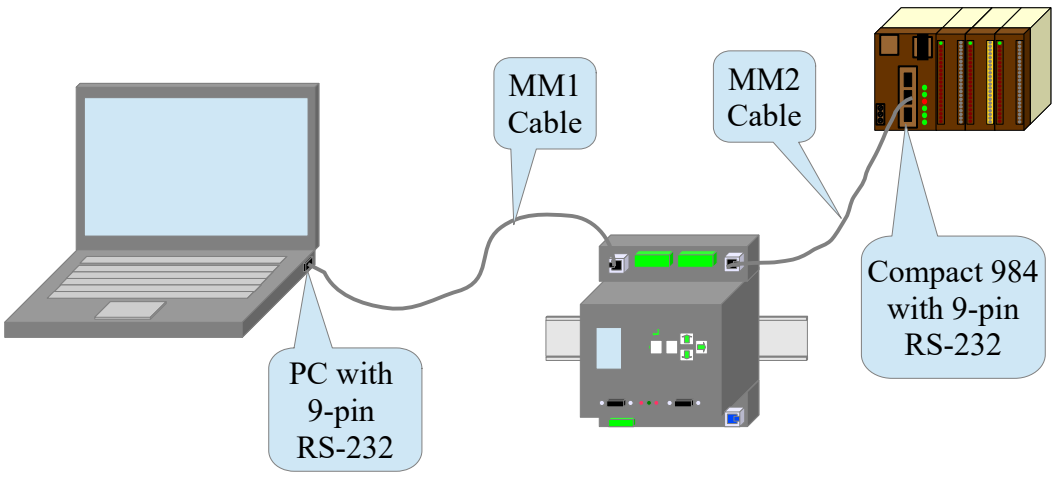


The RJ-45 connectors are used for RS-232 operation. The pin configuration is shown in Table 5.1: RJ45 RS-232 Pinout. The Niobrara MM1 cable is used to connect one of these ports to the a standard 9-pin serial port on a PC. (See Figure 12.1.: MM1 Serial Cable)

Table 5.1: 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

Figure 5.3 Typical RS-232 Connections



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 5.4 RS-485 Port.

Table 5.2: 5-position RS-485 pinout

Pin	Function
Shield	No internal connection
RX-	(-) data into MEB3
RX+	(+) data into MEB3
TX-	(-) data out from MEB3
TX+	(+) data out from MEB3

Figure 5.4 RS-485 Port

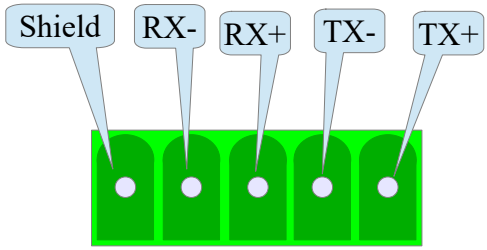
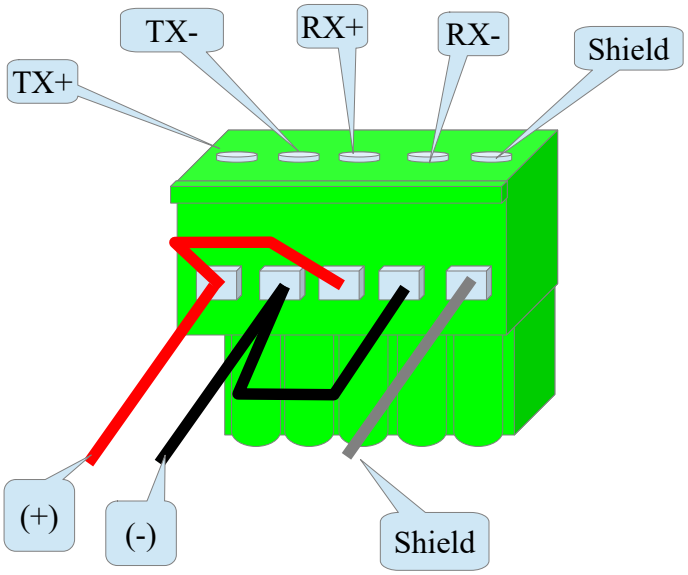
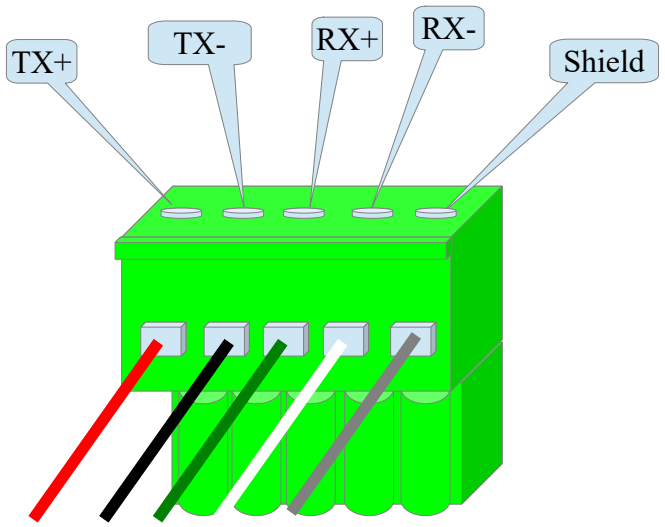


Figure 5.5 Jumper for 2-wire RS-485



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 5.6 Normal 4-wire RS-485 Wiring



6 Software Installation

The MEB3_SETUP.EXE file includes this user manual, the MEB3 firmware files, the RPCLOAD.EXE firmware loader utility, and 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 "MEB3_SETUP.EXE".

Updating the MEB3 Firmware

On occasion it may be necessary to update the operating system of the MEB3.

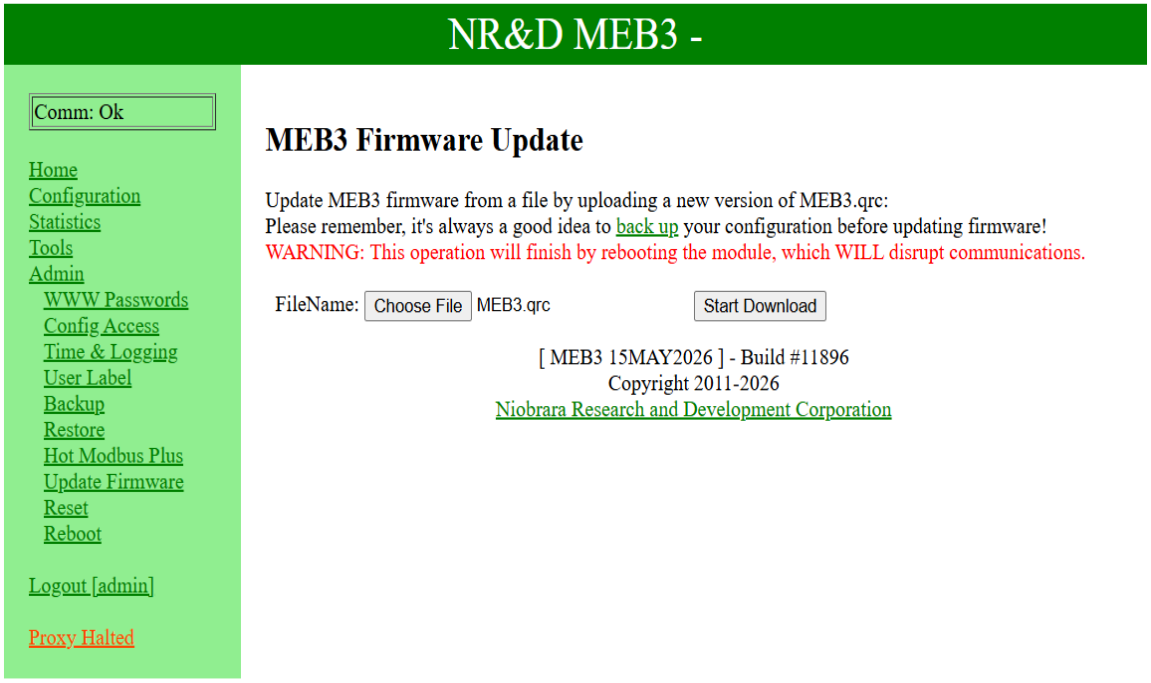
> NOTE: Updating firmware in a Hot MB+ must be done through the Web server. The Primary unit must be updated first. An automatic switchover will occur as the firmware is updated. After the completion of the update, proceed to update the new Primary.

Updating Firmware through the Web server

This action may be quickly done through the built-in web server.

NOTE: Proxy mode must be disabled or placed into "CONFIG" before the firmware may be updated.

1. Log into the MEB3's web server as user:ADMIN.
2. Click on the "Admin" link in the left green menu column.
3. Click on the "Update Firmware" link in the left green menu column.
4. Click on the "Browse" button and select the "C:\Niobrara\Firmware\MEB3.qrc" file.
5. Press the "Start Download" button to begin the update.



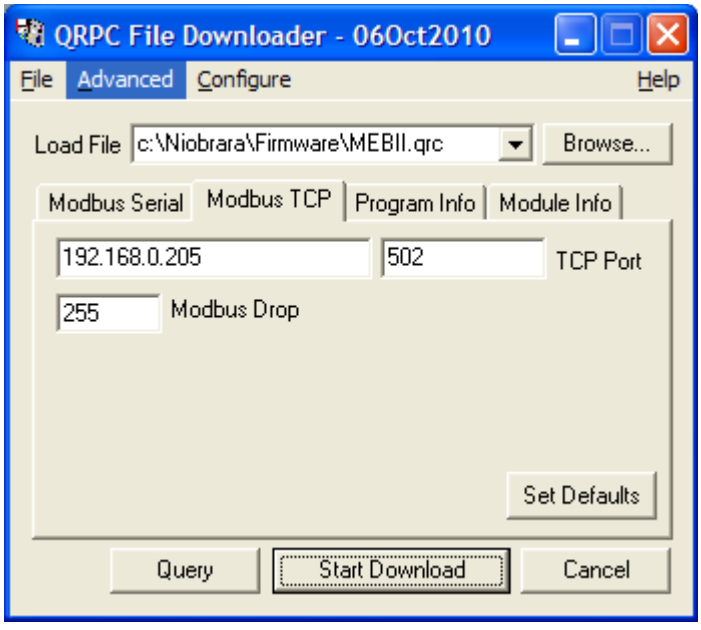
Updating Firmware using RPCLOAD

The RPCLOAD program may be used to install the MEB3 firmware through the Ethernet connection using Modbus/TCP.

Since the MEB3 supports the built-in web server, it is recommended to use the firmware update feature of the web server instead of RPCLOAD. The update process is much faster using the web server.

1. Make sure the MEB3 is powered and running.
2. Start RPCLOAD.EXE. The Windows Start Menu link is "Start, Programs, Niobrara, MEB, RPCLOAD MEB3 Firmware".
3. Click on the Browse button and select MEB3.qrc.
4. Select the Modbus TCP tab.
5. Enter the IP Address of the target MEB3 (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 6.1: RPCLOAD Screen



7 Modbus/TCP Operation

The MEB3 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 MEB3. These connections are dynamically split between client and server operation.

Server Operation

The MEB3 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 MEB3 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 MEB3 where to send the message. This table consists of a column for the Destination Index, a translation description, and a downstream route. Some of the translation descriptions allow for remapping of target address space data such as remapping 3x input queries to 4x outputs (with optional offsets).

The example in Figure 7.1 shows a PC connected via Ethernet to an MEB3.

The MEB3'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 MEB3. The three power meters are addressed as Modbus slaves 1, 2, and 3.

Table 7.1 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 MEB3 will internally process incoming Modbus/TCP messages with no route, the special index 255, or any route that doesn't leave the MEB3. This action may result in unexpected reply data since this data is from the MEB3 itself.

Figure 7.1 Ethernet Modbus Routing Example

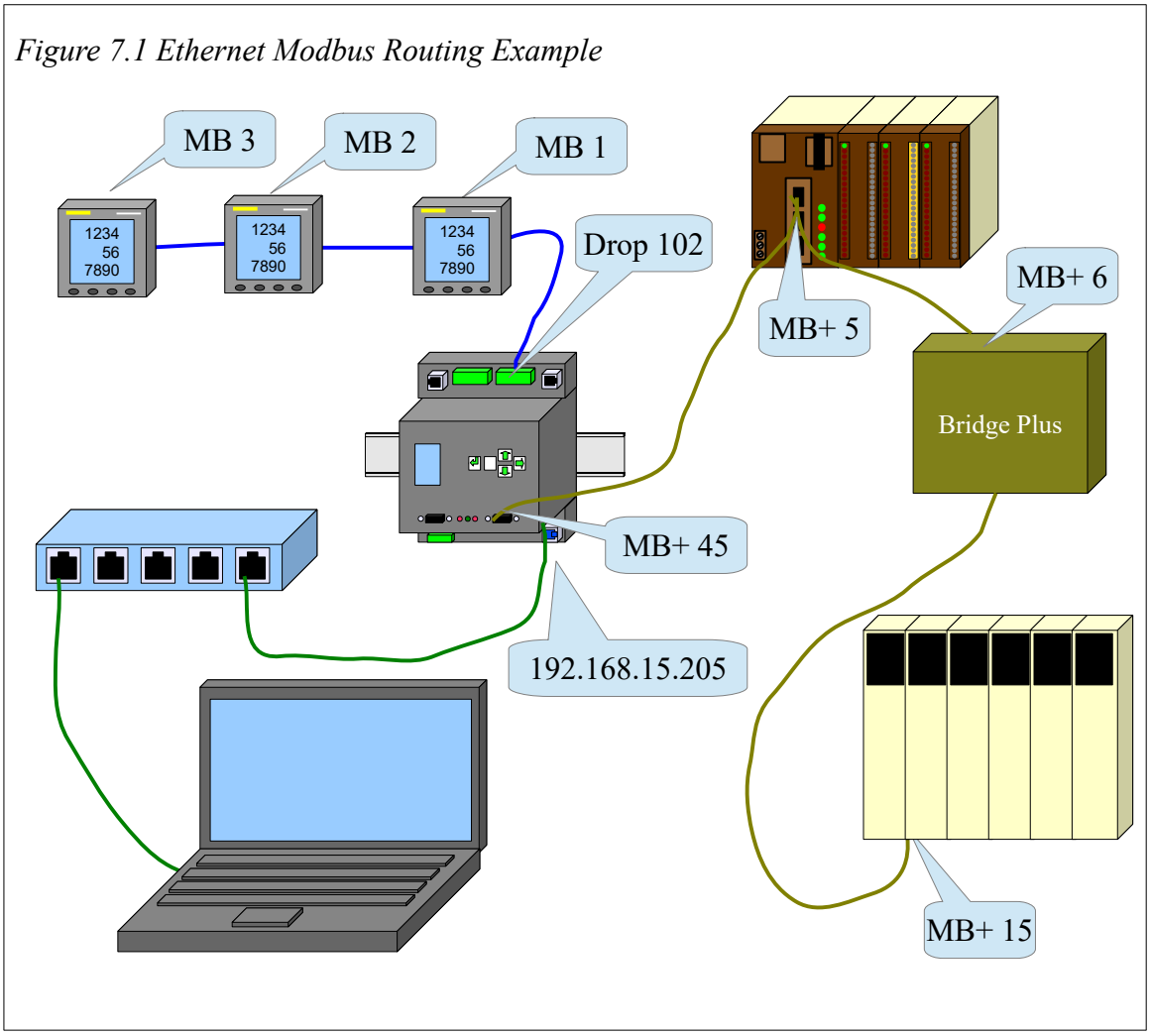


Table 7.1: Ethernet Modbus Routing Table Example

Index	Type	Route	Comments
0	OTHER	NONE	MEB3 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 MEB3'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 though 32.

Table 7.2: 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

Auto-Fix Modbus Table

The MEB3 offers to “Auto-Fix” 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.

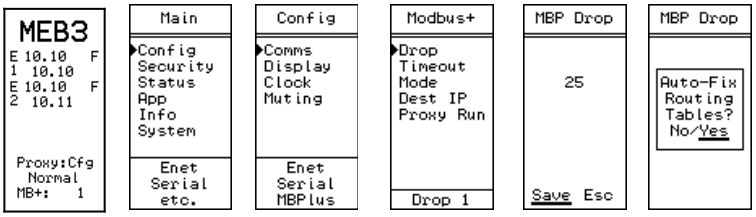


Figure 7.2: Edit Modbus Plus Drop

Table 7.3: Ethernet Modbus Routing Table for MB+ Drop 25 after Auto-Fix

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 viewed and 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.

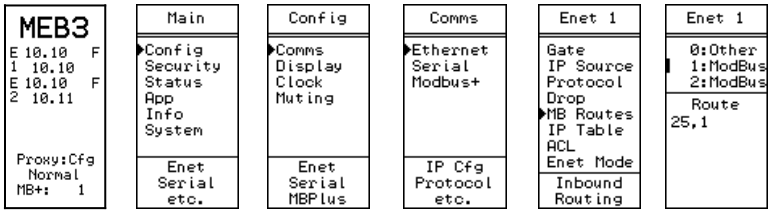


Figure 7.3: Modbus Route Edit Screen

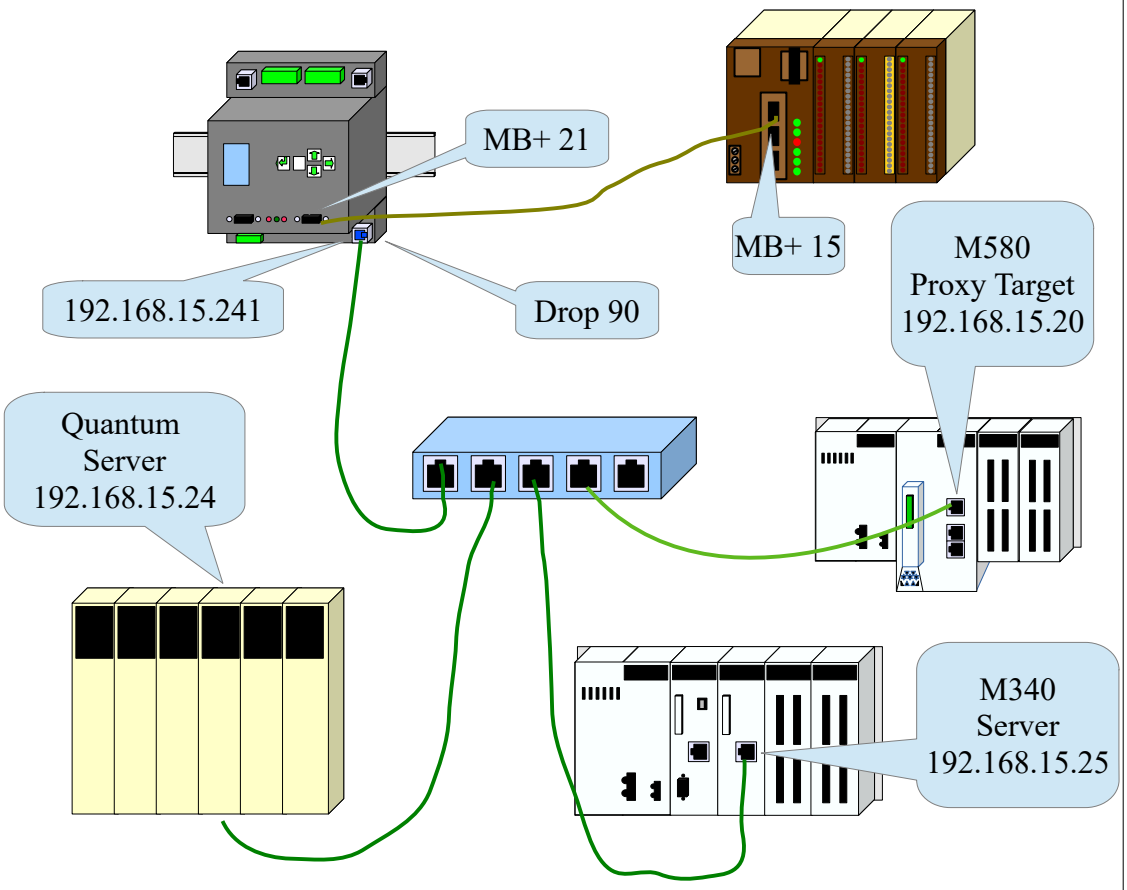
Client Operation

The MEB3 may act as a Modbus/TCP Client even while simultaneous Server operations are occurring. Modbus Plus or serial master devices may generate read or write messages that are routed out the MEB3's Ethernet port to access remote Servers.

The MEB3 uses a look-up table to map routing drop numbers to TCP/IP addresses. This table is called the TCP Routing Table. This table consists of a drop number, target IP Address, and an optional Downstream Route. Messages passing through the MEB3 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 7.4 shows an MEB3 connected to a Compact 984 PLC via Modbus Plus. The Ethernet port is set to be drop 90 and is connected to a Quantum PLC at IP Address 192.168.15.24 and an M340 PLC at 192.168.15.25 and an M580 at 192.168.15.20. The M580 is configured in the MEB3 as the Proxy Target.

Figure 7.4 Modbus/TCP Client Routing Example



- Configuration
  - Ethernet
    - IP Settings
    - Port Params
    - Security
    - MB Routing
    - TCP Routing
    - IO Scanner
    - Stats
  - Port 1
  - Port 2
  - Modbus Plus
  - PLC Proxy
- Statistics
- Tools
- Admin

Logout [admin]

Auto-Fill IP Table Pressing this button will write EVERY ι

TCP Routing Table		
Drop	IP Address	Downstream Drop
0	192.168.15.0	0
1	192.168.15.1	0
2	192.168.15.2	0
3	192.168.15.3	0
4	192.168.15.4	0
5	192.168.15.5	0
6	192.168.15.6	0
7	192.168.15.7	0
8	192.168.15.8	0
9	192.168.15.9	0
10	192.168.15.10	0
11	192.168.15.11	0
12	192.168.15.12	0
13	192.168.15.13	0
14	192.168.15.14	0
15	192.168.15.15	0
16	192.168.15.16	0
17	192.168.15.17	0
18	192.168.15.18	0
19	192.168.15.19	0
20	192.168.15.20	0
21	192.168.15.21	0
22	192.168.15.22	0
23	192.168.15.23	0
24	192.168.15.24	0
25	192.168.15.25	0
26	192.168.15.26	0

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 MEB3.
- The second drop (4, 5, 6, 7, and 8) is the drop number that tells the MEB3 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 MEB3 to determine the target for the MSTR message.

Table 7.4: MSTR Routes for Compact PLC in Figure 7.4

MSTR MB+ Route	Target
21.0.0.0.0	M580
21.90.24.0.0	Quantum at 192.168.0.24
21.90.25.0.0	M340 at 192.168.0.25
21.90.3.1.0	Compact in Figure 7.1
21.90.3.2.0	Quantum in Figure 7.1
21.90.3.3.0	Power Meter 1 in Figure 7.1
21.90.3.4.0	Power Meter 2 in Figure 7.1
21.90.3.5.0	Power Meter 3 in Figure 7.1
21.90.3.0.0	MEB3 in Figure 7.1

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 multi-threaded by the MEB3. In other words, multiple outstanding message are allowed on a client socket at the same 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 were only 8 data slave channels on the Schneider Electric MB+ chipset used in the older MEBII. This is not the case with the MEB3. The Niobrara chipset allows up to 32 slave messages to be processed through the MB+ port at the same time.
- Other PLCs on the same MB+ network could use exactly the same routes as this PLC. With the old SE chipset in the MEBII, when 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 though, it just slows down a little as they take turns. This rarely happens with the MEB3 since it is not limited to eight individual slave paths.

NOTE: When the MEB3'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 9.

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 7.5: Default 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 7.6: 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 (IP Routes)

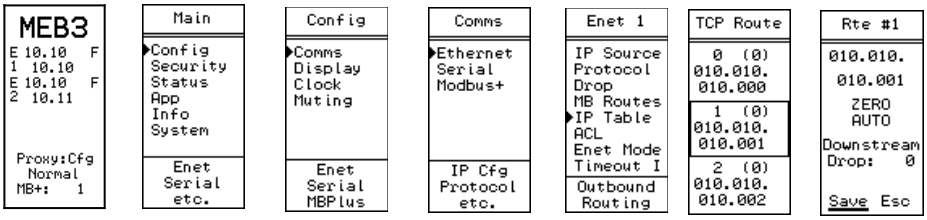


Figure 7.5: IP Route Edit Screen

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 LEFT button while on the TCP Route screen 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.

8 Modbus Serial Operation

The MEB3 serial ports can operate as either a Modbus Master or Slave using either Modbus RTU or 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 MEB3 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 MEB3 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 MEB3 where to send the message. This table consists of a column for the Destination Index, a translation description and a downstream route.

The example in Figure 8.1 shows a PC connected via RS-232 to an MEB3 Port 1.

The MEB3'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 MEB3. The three power meters are addressed as Modbus slaves 1, 2, and 3.

Table 8.1 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 MEB3 will internally process incoming Modbus RTU messages with the special index 255, or any route that doesn't leave the MEB3. This action may result in unexpected reply data since this data is from the MEB3 itself.

Figure 8.1 Serial Master Modbus Routing Example

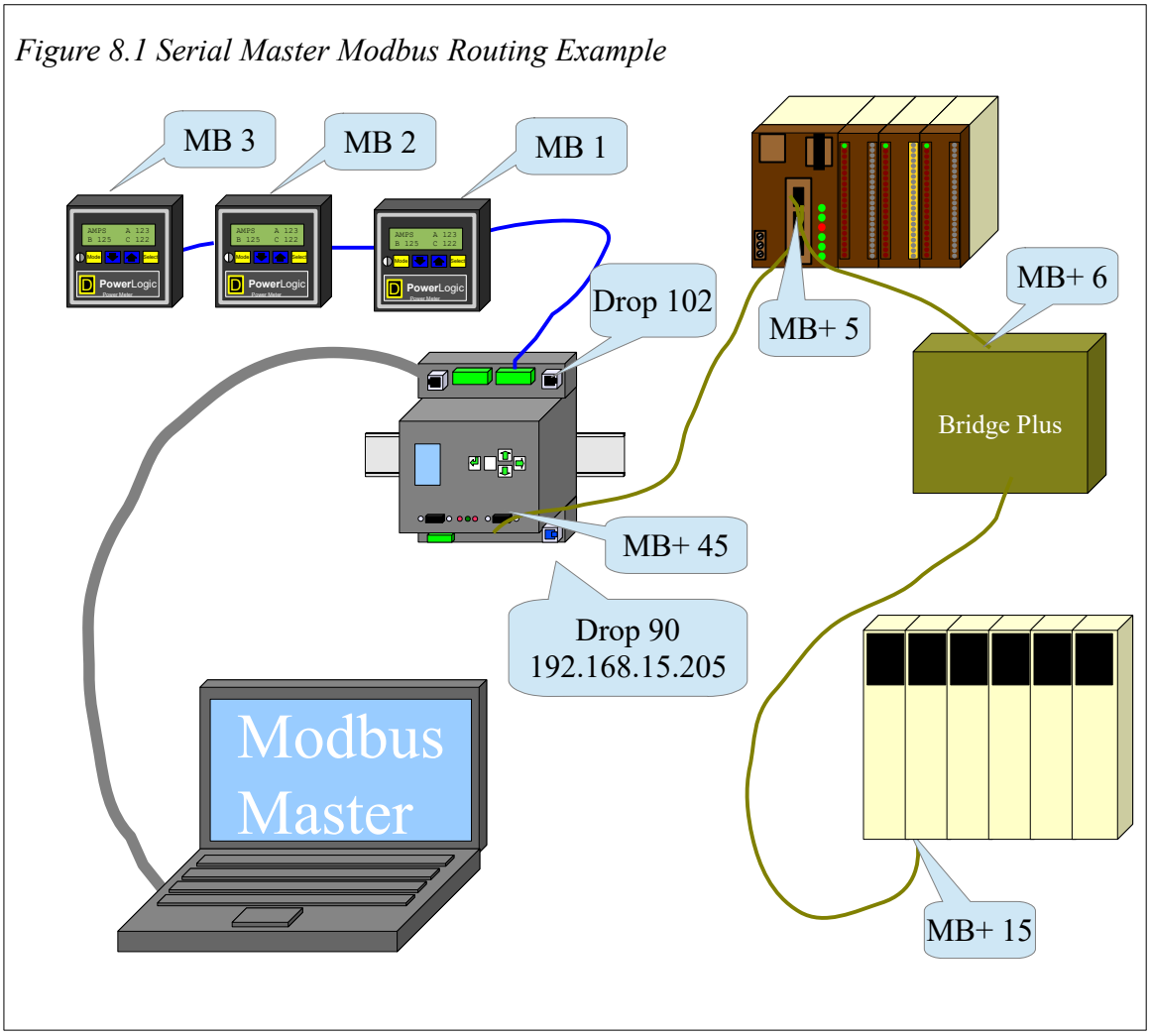


Table 8.1: Serial Modbus Routing Table Example

Index	Type	Route	Comments
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 MEB3'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 though 32 (port 1 only).

Table 8.2: 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

Auto-Fix Modbus Table

The MEB3 offers to "Auto-Fix" 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.

Front Panel Edit Modbus Route

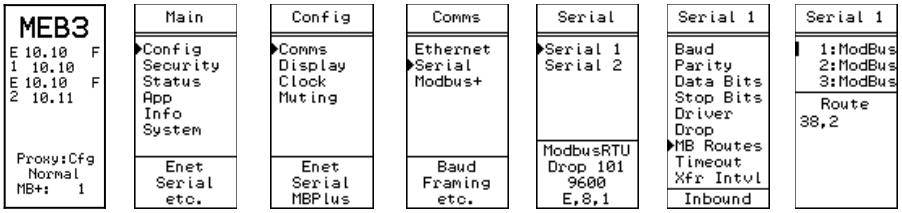


Figure 8.2: Edit Modbus Serial Route

Master Operation (External Slave)

The MEB3 serial ports may be used to connect Modbus slave devices to Ethernet and MB+ masters. A typical use is to connect a string of Modbus power meters to the MEB3.

Figure 13.9 shows a string of power meters connected to the RS-485 port 2 of the MEB3. Port 2 is configured for Modbus RTU mode and set to match the baud rate and parity of the meters. The drop number of port 2 is left at 102 (default). The normal routing to each each meter is simply the route to reach port 2, followed by the slave address of the meter.

9 Legacy SY/MAX Operation

The MEB3 serial and Ethernet ports can operate in a variety of modes to support legacy Square D SY/MAX PLCs and older PowerLOGIC meters.

Translations

The MEB3 translates Modbus messages to SY/MAX (and vice versa) as each message passes through the device. There are two possible translations that can be set by the "Mode" setting in the Modbus Routing Table.

- Other (SY/MAX Non-Priority)
- SY/MAX Priority - Some SY/MAX devices (such as a NIM) only support Priority messages.

NOTE: Some Modbus devices may refer to Holding Register 100 as 4x0100, 4:0100, 40100, or 4000100. The 4 at the beginning simply means it is a Holding Register. Analog Input registers (3x) are shown as 3x0001, 3:0001, 300001, or 300001. Output coils (0x) may be shown as 0x0025, 0:0025, 25. Input bits (1x) start with a 1 like 1x1234, 1:1234, 11234, or 101234.

NOTE: Some Modbus devices may start at register 0 instead of register 1. (This is commonly referred as JBUS.) It may be necessary to offset each register number by 1 to access the proper data.

NOTE: SY/MAX bit numbers are 1 to 16 with bit 1 as the least significant bit. This manual will note bit references as Sxxxx-yy where xxx is the SY/MAX register number and yy is the bit number. For example, register 20, bit 14 will be shown as S20-14.

Modbus to SY/MAX Translations

- Holding Registers (4x) – Holding Registers (read/write) are directly mapped 1-to-1 to SY/MAX registers. A Modbus client wanting the data from SY/MAX register 1503 would send a Holding Regsister Read (FC03) to remote register 1503. Modbus single (FC06) and multiple register writes (FC16) are supported with the target register chosen simply as the SY/MAX register number.
- Analog Input Registers (3x) – Modbus clients may access SY/MAX registers as

though they are Modbus 3x data (read only). The mapping is just like 4x registers and is simply the target SY/MAX address.

- Coils (0x) - Modbus coils (read/write) may be mapped into SY/MAX registers. The translation starts as SY/MAX register 1, bit 1 (S1-1) = Modbus coil 0x1. S1-16 = 0x16. S2-1 = 0x17. The formula to determine the Modbus coil from a SY/MAX bit is: COIL = ((REG – 1) * 16) + (BIT).
- Input Bits (1x) – Modbus discrete inputs (read only) are mapped exactly the same as 0x coils.

Incoming Modbus commands (4x, 3x, 1x, 0x) are translated into Non-Priority SY/MAX Read or Write messages. Coil write messages (FC05 and FC15) are translated as bit-masked NP writes when possible to allow single SY/MAX bits to be modified.

NOTE: FC15 multiple coil write message may not be able to be processed when the bits span multiple SY/MAX registers. The SY/MAX bit-masked NP Write message cannot handle this type of masking operation. The MEB3 will send back a Modbus Exception code 5 error when this condition occurs.

NOTE: A few SY/MAX end devices (NIMs for example) do not support Non-Priority messages. In this case, select Priority

SY/MAX to Modbus Translations

SY/MAX Priority and Non-Priority Read and Write command messages are translated into Holding Register Read (FC03) and Write (FC16) messages. SY/MAX Random Access Read messages are translated into PowerLOGIC's Modbus Random Access Read (FC100).

If the SY/MAX client needs to access other memory spaces on a Modbus serial server, the Modbus Host serial mode may be used. This mode allows the user to manually configure the translation for both the read and the write. Supported Modbus Function Codes are 03 (4x read), 04 (3x read), 02 (1x read), 01 (0x read), 05 (0x single write), 06 (4x single write), 15 (0x multiple write), and 16 (4x multiple write).

NOTE: Standard Priority and non-bit-maksed Non-Priority SY/MAX write messages will translate into 16 FC05 coil messages or one 16-bit FC15 message. All 16 bits will be forced.

NOTE: SY/MAX Read and Write messages support up to 128 registers. Modbus messages are limited to a maximum of 125 registers on a read and 120 registers on a write. Individual servers may have additional register count restrictions.

Error Translations

Modbus and SY/MAX do not share the same error messages. Table 9.1 shows the MEB3's translations.

All other errors are passed straight through with no translation.

Modbus Exception Code	SY/MAX Error Code	Meaning
2	3	Illegal Address
3	5	Illegal Value
10	29	Illegal Route
11	17	Device Not Responding

Table 9.1: Modbus and SY/MAX Error Translations

SY/MAX Serial

MEB3 ports 1 and 2 may be configured to SY/MAX mode to directly connect to a SY/MAX PLC. The RS-485 port is typically used along with the MU7 (MEB3 to SY/MAX) cable.

Default values for SY/MAX ports are 9600, EVEN, 8, 1, RS-422, and BCC.

The drop number of the SY/MAX mode port will be the last drop of an incoming route and the first drop of an output TREAD, TWRITE, or TALARM message from the SY/MAX PLC.

SY/MAX mode ports are full duplex and allow the PLC to be both a master and a slave at the same time.

Figure 9.1 SY/MAX Serial Routing Example shows a SY/MAX Model 400 PLC connected with an MU7 cable to the RS-485 port 1 of an MEB3. This port is set to SY/MAX at drop 101.

An entry in the Ethernet Modbus Routing table must be modified to access the Model 400 PLC. For this example, Entry 1 was chosen since there wasn't a MB+ node 1 and it would be easy to remember. The new route is shown in Table 9.2: Modbus Routing Table for Ethernet Port. The type set to OTHER or Priority since this is not a MODBUS target.

A Modbus/TCP client such as the M340 PLC in this example would simply use Modbus/TCP index 1 to access the SY/MAX PLC.

Table 9.2: Modbus Routing Table for Ethernet Port

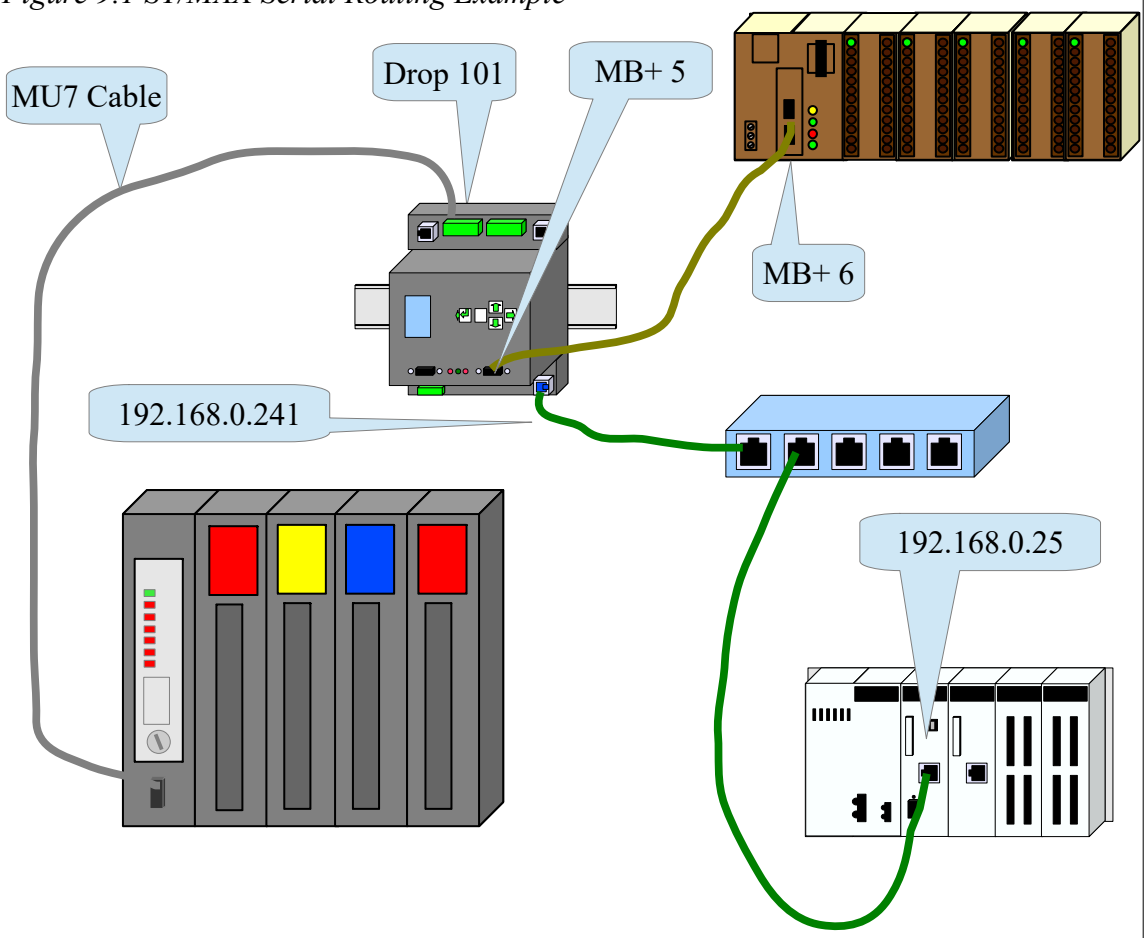
Index	Type	Route	Comments
0	OTHER	NONE	
1	OTHER	101	Model 400 PLC
2	MODBUS	5,2	
3	MODBUS	5,3	
4	MODBUS	5,4	
5	MODBUS	5,5	
6	MODBUS	5,6	Compact 984 PLC
7	MODBUS	5,7	

The Compact PLC can read and write the SY/MAX PLC using MB+ MSTR Read and Write messages. In this example, the MSTR route would be 5.101.0.0.0 since the message needs to go out MEB3 port 1. The remote register in the MSTR is simply the SY/MAX target register.

The SY/MAX PLC may also use TREAD and TWRITE messages to access both the M340 and Compact PLCs.

The route to the Compact would be 101,5,6 while the route to the M340 would be 101,90,25,1 assuming that the Ethernet port on the MEB3 is set to 90 and TCP table entry 25 has the IP Address of the M340.

Figure 9.1 SY/MAX Serial Routing Example



NET-TO-NET Mode

The MEB3 may be connected to a SY/NET network using the NET-TO-NET mode. This mode is used to connect the MEB3 to an RS-422 port on a CRM-510 NIM, RS-422 port on a SY/LINK (SFI-510) PC card, Niobrara SPE4, EPE5, or even MEB modules.

The following rules apply to NET-TO-NET ports:

- Both ports must be set to NET-TO-NET mode. This may involve setting DIP switches on the NIM.
- Both ports must be set to the same SY/NET drop number. Set the MEB3 port to match the NIM.
- Both ports must have the same baud rate, parity, data bits, stop bits, and

checksum. Most NIMs use BCC but the CRM-511 and 512 may be set to use CRC-16.

The route message includes the NET-TO-NET drop number only once for the port pair.

Figure 9.2 NET-TO-NET Serial Routing Example

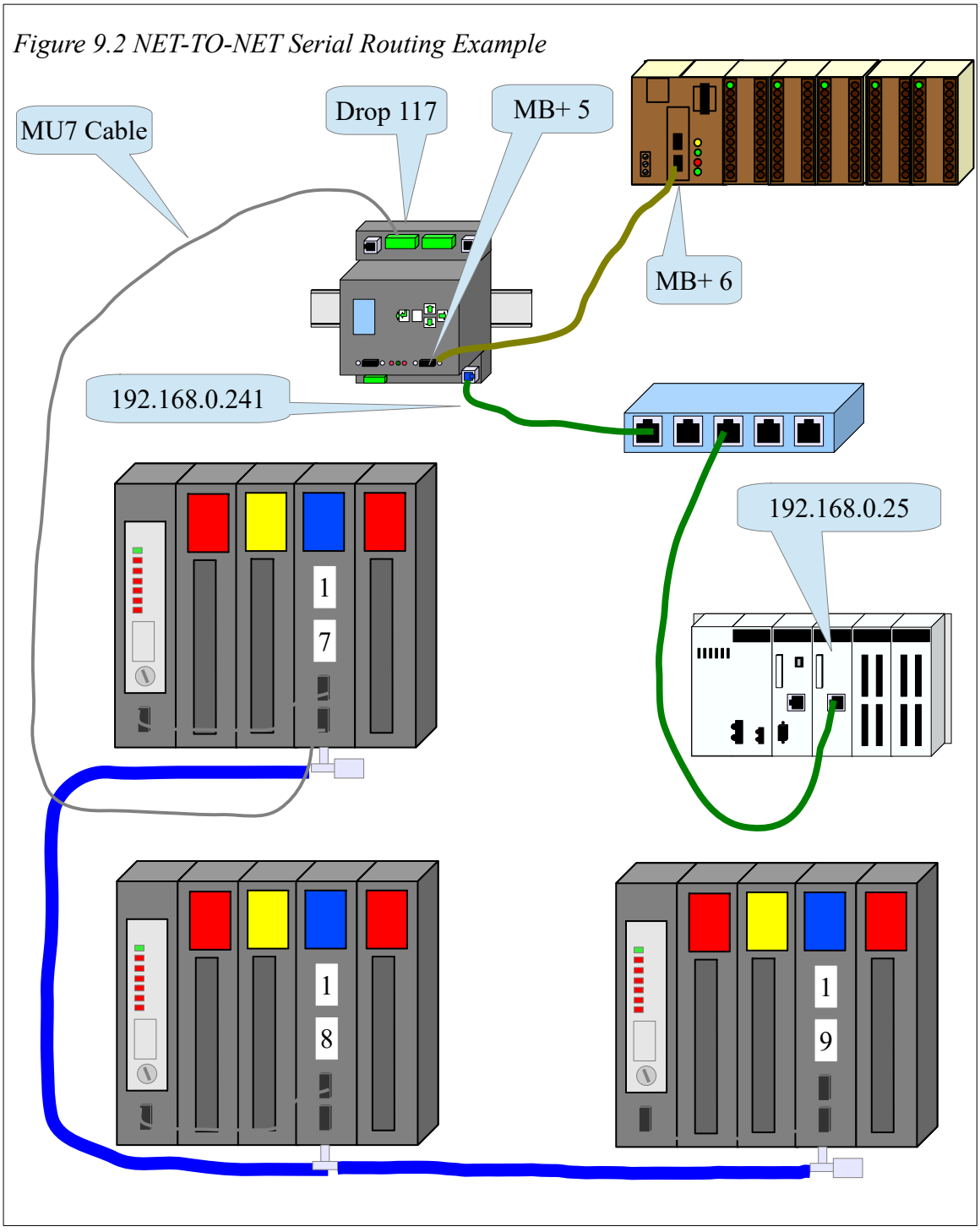


Figure 9.2 NET-TO-NET Serial Routing Example show an MEB3 port 1 connected NET-TO-NET to a CRM-510 set to node 17. This NIM is on a small “Blue Hose” SY/NET network with two other NIMs set to 18 and 19. NIMs 17 and 18 have a PLC connected to the 0xx port with a CC-100 cable. NIM 19 has the PLC connected to port 119. The MEB3 is connected to the 117 port so the drop number of the MEB3 port 1 must also be set to 117. Both the NIM port and MEB3 must be set to NET-TO-NET mode.

Table 9.3: Modbus Routing Table for Ethernet Port

Index	Type	Route	Comments
0	OTHER	NONE	
1	MODBUS	5,1	
2	MODBUS	5,2	
3	MODBUS	5,3	
4	MODBUS	5,4	
5	MODBUS	5,5	
6	MODBUS	5,6	Compact 984 PLC
7	MODBUS	5,7	
...	...	...	
16	MODBUS	5,16	
17	OTHER	117,17	PLC on NIM port 17
18	OTHER	117,18	PLC on NIM port 18
19	OTHER	117119	PLC on NIM port 119
20	MODBUS	5,20	

The Modbus/TCP Ethernet routing table shows the Modbus/TCP Index values of 17, 18, and 19 that will allow clients to access the SY/MAX PLCs.

The Compact PLC can access any of the SY/MAX processors with MSTR routes of 5.117.17 or 5.117.18 or 5.117.119. Notice that the second drop of the MSTR route is always 117 because it is MEB3 port 1 connected to the NIM.

Any of the SY/MAX PLCs may access devices through the MEB3 with TREAD or TWRITE messages.

Table 9.4: SY/MAX NET-TO-NET Routes

Source	Target	Route
PLC 17	Compact	17,117,5,6
PLC 18	Compact	18,117,5,6
PLC 119	Compact	119,117,5,6
PLC 17	M340	17,117,90,25,1
PLC 18	M340	18,117,90,25,1
PLC 119	M3340	119,117,90,25,1

SY/MAX Ethernet

The MEB3's Ethernet port may be configured to support Modbus/TCP and SY/MAX 802.3 protocols at the same time. Thus the user may bridge older SY/MAX Ethernet enabled PLCs (Model 450 and Model 650) to Modbus/TCP, Modbus Plus, and various serial networks.

NOTE: Always check that the SY/MAX 802.3 node number is unused on the LAN before setting the MEB3's address. SY/MAX Ethernet devices that detect duplicate drops remove themselves from the LAN and in many cases must be power cycled before they function again. This action may result in equipment damage, personal injury, or death.

The SY/MAX 802.3 protocol supports up to 100 physical node addresses (0-99). Logical Node numbers 100-199 are possible on Niobrara devices (MEB, EPE5, RPC) by setting a serial or MB+ port to “On Ethernet YES”. Node numbers above 100 also consume the node modulo 100. For example, if the MEB3's Ethernet port is set to 55 then node 155 is also required to be within this MEB3. Therefore serial port 1 may be set to drop 155 and have “On Ethernet YES” configured.

SY/MAX Routing

The MEB3 in the combination Modbus/TCP+SY/MAX Ethernet mode simply becomes another drop in the SY/MAX route between the source and the target. Inbound Ethernet messages include the MEB3's Ethernet port drop number as the next drop in the route.

Figure 9.3 SY/MAX Ethernet Routing Example

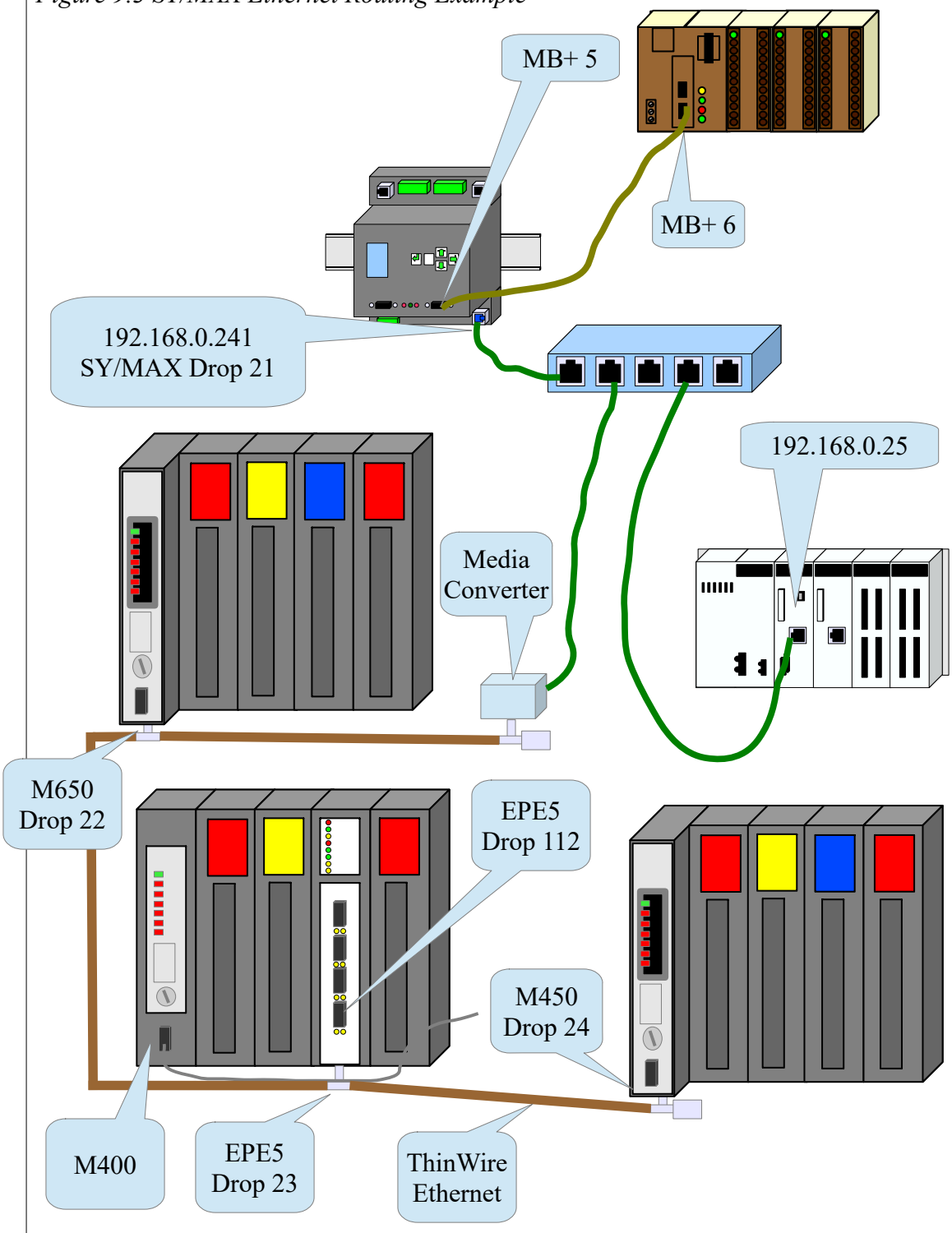


Table 9.5: SY/MAX Ethernet Routes

Source	Target	Route
Model 650	Compact	22,21,5,6
Model 400	Compact	112,23,21,5,6
Model 450	Compact	24,21,5,6
Model 650	M340	22,21,21,25,1
Model 400	M340	112,23,21,21,25,1
Model 450	M340	24,21,21,25,1
Compact	Model 650	5.21.22
Compact	Model 400	5.21.23.112
Compact	Model 450	5.21.24
M340	Model 650	192.168.0.241 index 22
M340	Model 400	192.168.0.241 index 23
M340	Model 450	192.168.0.241 index 24

The outbound messages to the M340 PLC have the MEB's Ethernet drop number in the route twice. The first entry to select the MEB, the next entry to route the message back out the Ethernet port. The drop following the second entry is the TCP Table entry of the M340 PLC.

The MEB3 uses the entry in the TCP routing table to decide to send the message out as Modbus/TCP (entry not 0.0.0.0) or SY/MAX 802.3 (entry is 0.0.0.0).

Table 9.6: Modbus Routing Table for Ethernet Port

Index	Type	Route	Comments
0	OTHER	NONE	
1	MODBUS	5,1	
2	MODBUS	5,2	
3	MODBUS	5,3	
4	MODBUS	5,4	
5	MODBUS	5,5	
6	MODBUS	5,6	Compact 984 PLC
7	MODBUS	5,7	
...	...	...	
21	MODBUS	5,21	
22	OTHER	21,22	Model 650
23	OTHER	21,23,112	Model 400
24	OTHER	21,24	Model 450
25	MODBUS	5,25	

Table 9.7: Ethernet TCP Routing Table

Drop	IP Address	Route	Description
0	0.0.0.0	NONE	SY/MAX node 0
1	192.168.0.1	NONE	Modbus/TCP
2	192.168.0.2	NONE	Modbus/TCP
3	192.168.0.3	NONE	Modbus/TCP
...	...	...	
20	192.168.0.20	NONE	Modbus/TCP
21	192.168.0.21	NONE	Modbus/TCP
22	0.0.0.0	NONE	SY/MAX node 22
23	0.0.0.0	NONE	SY/MAX node 23
24	0.0.0.0	NONE	SY/MAX node 24
25	192.168.0.25	NONE	Modbus/TCP
26	192.168.0.26	NONE	Modbus/TCP
...	...	...	
200	192.168.0.200	NONE	Modbus/TCP

PowerLogic Serial Modes

All newer Square D PowerLogic electric meters and breaker panels communicate with Modbus serial and Modbus/TCP Ethernet protocols. Older meters like the CM2000 and PowerLink AS units use the SY/MAX based PLOGIC and PNIM protocols. The MEB3 supports all of these protocols plus a mixed mode called CHEVRON which allows both PNIM and Modbus RTU devices to reside on the same daisy-chain.

Note that some PowerLogic devices only support 4-wire RS-485, some only support 2-wire RS-485, and some may be used in either mode.

Note that some PowerLogic devices only support EVEN parity, some only support NONE, and some support both settings.

Table 9.8: Common PowerLogic Devices

	Device Series	Protocols	RS-485	Parity	Notes
	CM100 CM200	PLOGIC PNIM	4-wire	EVEN	Must cycle power when changing between PNIM and PLOGIC
	CM2000	PLOGIC PNIM	4-wire	EVEN NONE	Dynamically switches between PNIM and PLOGIC
	CM3000 CM4000	Modbus RTU Modbus ASCII	4-wire 2-wire	NONE EVEN ODD	
	PM600	PLOGIC PNIM Modbus RTU	4-wire 2-wire	EVEN NONE	Dynamically switches between PNIM and PLOGIC
	PM700 PM800	Modbus RTU Modbus ASCII	2-wire	NONE EVEN ODD	
	Enercept	Modbus RTU	2-wire	NONE	
	BCM	Modbus RTU	4-wire 2-wire	NONE EVEN ODD	
	BCPM	Modbus RTU	4-wire 2-wire	NONE EVEN ODD	
	PowerLink AS	PLOGIC PNIM	4-wire only	EVEN	Must cycle power when changing between PNIM and PLOGIC
	PowerLink G3	Modbus RTU Modbus ASCII	4-wire 2-wire	NONE EVEN ODD	

10 Hot MB+ Operation

Automatic Redundant Operation

The MEB3 features a unique operating mode called “Hot MB+” that allows two MEB3 units to operate in a fully redundant, hot-backup system. One MEB3 acts as the “Primary” unit performing the typical serial, Ethernet, and Modbus Plus message routing and translations, while the “Secondary” unit monitors the Primary and waits for its chance to take over should something fail (power supply, Ethernet link, or Modbus Plus connection). When a changeover event occurs, the Secondary unit becomes the new Primary and assumes it's IP Address and MB+ node number, and all routing information.

Both units are configured exactly the same and online configuration changes are only allowed on the Primary. The Secondary unit monitors the EEPROM configuration of the Primary and if the two units are not configured exactly the same, the Secondary automatically pulls the entire configuration from the Primary.

Requirements and Restrictions

- Port 2 of both MEB3s are required to be connected together with either 4-wire RS-422 or RS-232 cables. This serial connection is required for automatic configuration transfers when the Primary and Secondary mismatch. This connection must be full-duplex 4-wire RS-422 or RS-232. 2-wire RS-485 is not permitted.
- The Primary and Secondary units require adjacent TCP/IP Addresses. For example, if the Primary is at address 192.168.5.178, the Secondary will be at address 192.168.5.179.
- The Primary and Secondary units require adjacent MB+ drop numbers. For example, if the Primary is at node 53, the Secondary will be at node 54.
- Online modifications of the configuration are only allowed in the Primary unit. The Secondary unit is effectively “read-only”. The Secondary unit only allows “USER” web access (not “ADMIN”).
- Modifications made in the Primary are only updated in the Secondary after a “Store to EEPROM” operation has occurred. Future “Store to EEPROM” operations are temporarily locked out while the Secondary is fetching the new configuration.
- The transition from Secondary to Primary is not “bumpless”. It takes about 16 seconds for the Modbus Plus chipset to restart to the Primary's address.
- Modbus Plus “Proxy” operation is allowed in Hot MB+ but must be set for “Config” at this time. This means that while in Proxy mode the Primary MEB3 is not allowed to control Peer Cop (Specific In or Out) messages.

- SY/MAX 802.3 Ethernet operation is not supported in Hot MB+ mode at this time.
- Modbus serial slave and RNIM slave operation on Port 1 are not supported at this time.
- Modbus serial master, Chevron mode, PNIM, and RNIM master operations on port 1 are supported in RS-485 driver modes allowing redundant access of serial slaves from both Modbus Plus and Ethernet.
- Any PLC programming connection active through the Primary will close during a transfer from Secondary to Primary.
- It is recommended that each MEB3 have its own power supply and Ethernet connection to an independent switch to avoid any single point of failure.

"Primary" Unit Configuration Procedure

1. Mount one of the MEB3 units on a DIN rail. This unit will be the "Primary".
2. Do not connect any serial, Ethernet, or MB+ cables at this time.
3. Apply power to this unit.
4. It is recommended to perform a Factory Reset on the unit at this time. Select "System", "Factory", "Defaults" to reset the unit to a known state.
5. Configure this unit with the Primary IP Address, Modbus Plus drop number, Modbus routing tables, IP tables, and serial port 1 parameters. This configuration may be done through the front panel LCD/keypad and/or web server. Be certain to store the configuration to EEPROM.
6. Connect the Ethernet and MB+ cables to the Primary unit.
7. Test the routing and the rest of the configuration to be sure that everything is operating correctly.
8. If configuring through the front panel:

   Select "System", "Hot MB+", "Init 1st". This changes the system operation to Hot MB+ mode and takes control of Port 2 for Hot MB+ interconnection.

   If configuring through the web server:

   Select "Admin > Hot Modbus Plus", and select "Inititialize as First" then "Store EEPROM".

   The "Primary" unit is now fully functional.

“Secondary” Unit Configuration Procedure

1. Mount the second MEB3 on a DIN rail. This unit will be the “Secondary”.
2. Do not connect any serial, Ethernet, or MB+ cables at this time.
3. Apply power to the second MEB3.
4. It is recommended that the unit be reset to Factory Defaults by selecting “System”, “Factory”, “Defaults”.
5. From the front panel select “System”, “Hot MB+”, “Init 2nd”.
6. Connect a 4-wire RS-422 cable between port 2 of each MEB3. (RS-232 cabling may also be used.). The RX and TX lights on both port 2 should be flashing quickly.
7. Return to the main splash screen. The MB+ drop number should be the Primary+1. The IP Address should be showing “Reading Config.” The Secondary unit is fetching the entire configuration from the Primary.
8. When the Secondary unit is finished fetching the configuration from the Primary, it reboots and assumes normal Hot MB+ operation.
9. Now connect the Ethernet and MB+ cables. The IP Address should be Primary+1.

Example

Figure 10.1 Hot MB+ Example

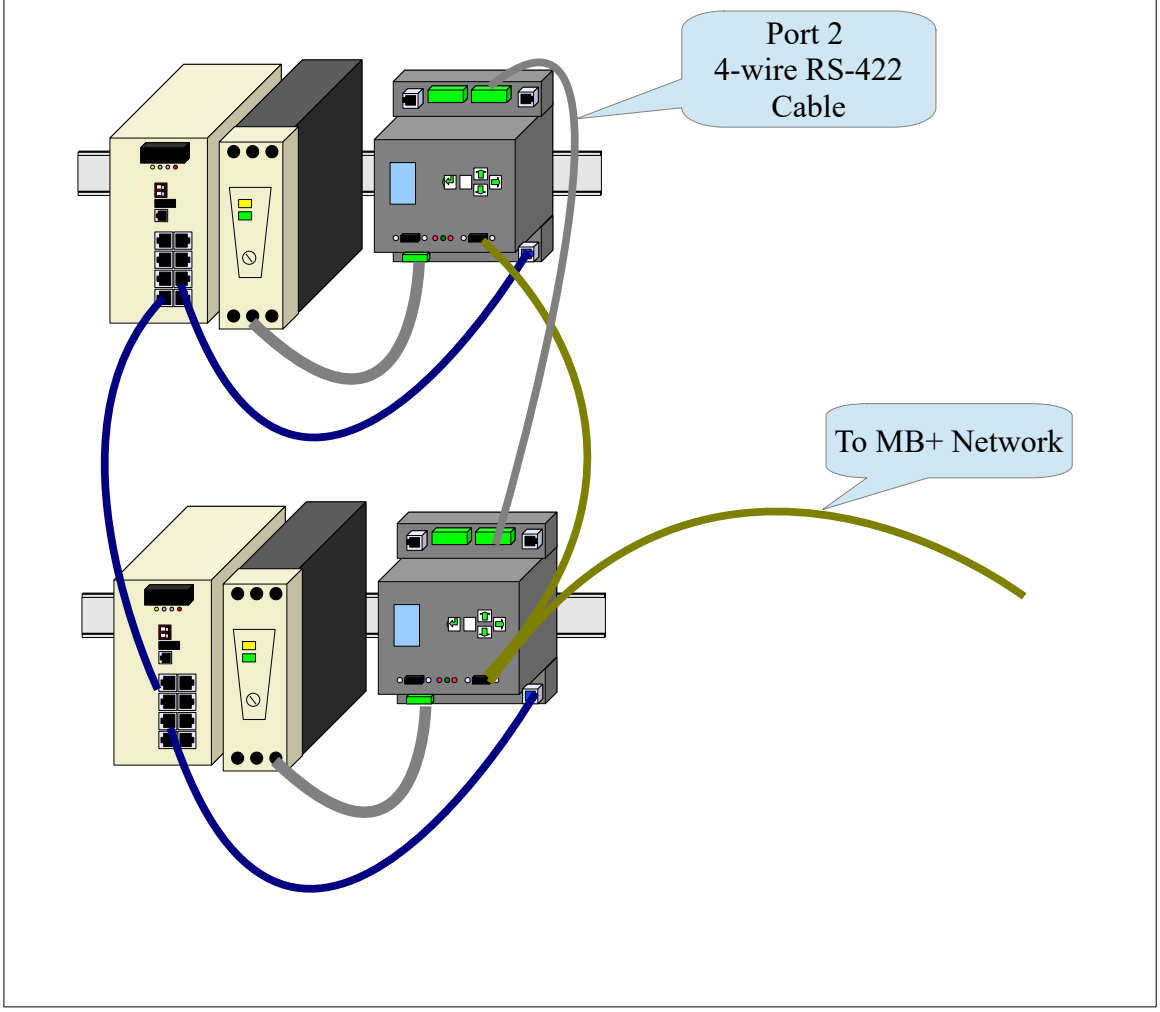
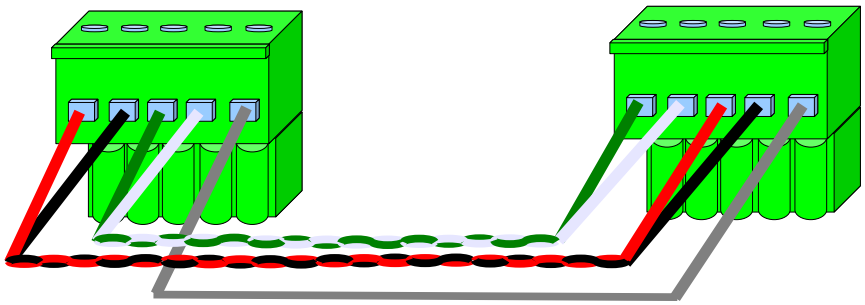


Figure 10.2 Hot MB+ Port 2 RS-422 Cable



Reasons for Automatic Switchover

- Primary becomes sole station on MB+.
- Primary loses Ethernet link. Both Ethernet ports must lose link on an MEB3+201 for a switchover to occur.
- "Revert to Secondary" command written to Primary via Modbus communication.
- Secondary unit will become Primary if port 2 communications are lost and the Primary MB+ address is missing from the network. For example, power is removed from the Primary.
- Firmware update is completed on Primary unit.
- Unequal Firmware in the two units will cause the unit with the oldest firmware to become the Primary. This will allow the oldest unit to have its firmware to be updated because only the Primary unit may have its firmware upgraded through the web page. Note: Firmware updates are only permitted through the web page while in Hot MB+. RPCLOAD updates are not allowed.

Hot MB+ Statistics and Information Registers

The Hot MB+ mode uses a number of the standard Port 2 statistical counters with new meanings. Of particular interest are the State values in registers 2133 and 2134 and the MEB's serial number in registers 2137 and 2138.

It may be desirable to have an HMI periodically poll the Primary MEB3 to read the state

of the Primary and Secondary units. The serial number of the primary unit may also be quickly determined.

4x Register	Description	Meaning
2133	State of this unit's Hot MB+	0=Startup State 1=Operating as Primary 2=Operating as Secondary 3=Becoming Secondary 4=Becoming Primary 5=OFFLINE 6=Init – waiting for command 7=Receiving config from Primary 8=Secondary, MB+ is sole station 9=Hold OFFLINE 10=Hold Sole Station
2134	State of peer unit's Hot MB+	0=Startup State 1=Operating as Primary 2=Operating as Secondary 3=Becoming Secondary 4=Becoming Primary 5=OFFLINE 6=Init – waiting for command 7=Receiving config from Primary 8=Secondary, MB+ is sole station 9=Hold OFFLINE 10=Hold Sole Station 255=Peer UNKNOWN
2137	Low word of this unit's Serial Number	S/N 800111 would have a decimal value of 13679.
2138	High word of this unit's Serial Number	S/N 80111 would have a decimal value of 12. To calculate the S/N, multiply this value by 65536 and then add the value from register 2137. (12 x 65536) + 13679 = 800111

Table 10.1: Hot MB+ Statistics

Serial Number

Reading registers 2137 and 2138 from the MEB3 will provide the serial number of the MEB3. This may very helpful for determining which physical MEB3 is the primary. Register 2137 contains the least significant word of the serial number while 2138 contains the most significant word. To calculate the actual serial number, take the value in 2138 and multiply it by 65536 and then add the value in 2137.

For example if R[2137] = 13751 and R[2138] = 12 then

S/N = (12 x 65536) + 13751 = 800183

Controlled Switchover

It may be desired to periodically trigger a controlled switchover between the two Hot MB+ units.

A single Modbus write of the special value 43776 (decimal) to register 8092 in the Primary MEB3 will trigger a “Revert to Secondary” on this unit.

When this command is sent to the Primary MEB3 in a functioning Hot MB+ system, it will trigger a Hot-Swap. That is, the Primary becomes Secondary and Secondary becomes Primary. This command will only take effect if the Primary “sees” the Secondary as being online and fully functional as a standby unit. If the Primary thinks the Secondary is not able to take over as primary, this command is ignored.

11 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 moves left to the previous field.
- 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 MEB3 includes a high resolution LCD screen to assist the user in configuring and troubleshooting the device. Ethernet, MB+, and serial port parameters 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(es) of the MEB3, how the IP address(es) is obtained, the module name (if set), MB+ node number and status, MB+ Proxy status, and SY/MAX 802.3 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 MEB3. A red LED is positioned behind the LCD and will glow red on Proxy error conditions.

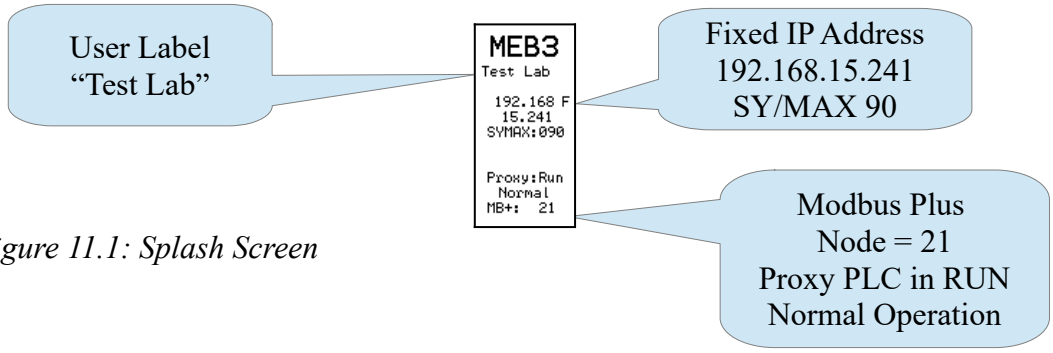


Figure 11.1: Splash Screen

Possible values for the Modbus Plus Status are:

- Monitor – The MEB3 is monitoring the MB+ network waiting to be asked to join the token rotation.
- Normal – The MEB3 is participating in normal token operation.
- No Token – Traffic is being heard on the MB+ network but the MEB3 is not claiming the token. Most likely a physical RS-485 transmitter problem.
- Sole Sta. – The MEB3 is in "Sole Station" and is unable to pass the token to any other nodes. It is attempting to restart the network.
- Duplicate – The MEB3 has heard another node set to its address active on the network. The MEB3 will be silent and not participate on the network until the duplicate node is removed or its drop number is changed.
- Reset – The Modbus Plus board within the MEB3 is being reset. This will happen any time the MB+ drop number is changed and during startup.

Possible values for the Proxy Status are:

- Missing – If the word "Proxy:" is not shown then the unit is in MEBII mode and Proxy is disabled. This is the factory default mode.
- Proxy:Cfg – Proxy mode is enabled but the service is in "CONFIG" mode. Global Data and Peer Cop are disabled. Proxy routing to the target PLC (if configured) is active.
- Proxy:Run – Proxy mode is enabled. A good Modbus/TCP connection is active to the target PLC and the target PLC is in RUN. Peer Cop and Global Data should be active for both outputs and inputs. Proxy routing to the target PLC is active.
- Proxy:Sto – Proxy mode is enabled. A good Modbus/TCP connection is active to the target PLC and the target PLC is in STOP. Peer Cop and Global Data Inputs are pushed to the target PLC but Outputs are not published onto Modbus Plus. Proxy routing to the target PLC is active.
- Proxy:??? – Proxy mode is enabled. A good Modbus/TCP connection is not active to the target PLC. Peer Cop and Global Data are both disabled. Proxy routing to the target PLC is inactive since the MEB3 cannot connect via

Modbus/TCP.

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.

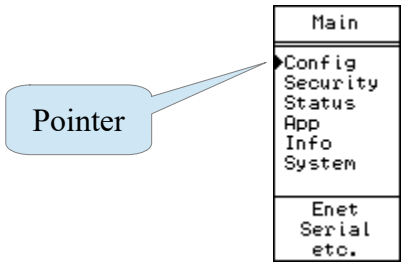


Figure 11.2: Main Menu Screen

Configuration Menu

Selecting the Config item leads to the Config menu and a choice of Comms and Display.

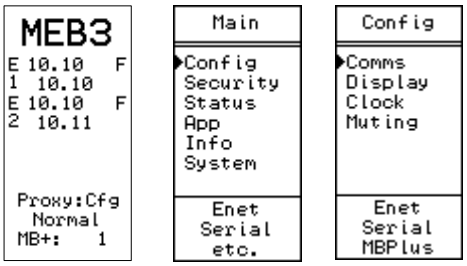


Figure 11.3: Config Menu Screen

The Comms sub-menu moves on to Ethernet, serial port, and MB+ options. The Display sub-menu allows the user to adjust the screen contrast. The Clock sub-menu allows the user to set the time and date in the MEB3. The Muting sub-menu allows the user to turn the speaker on and off.

Comms Menu Screen

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

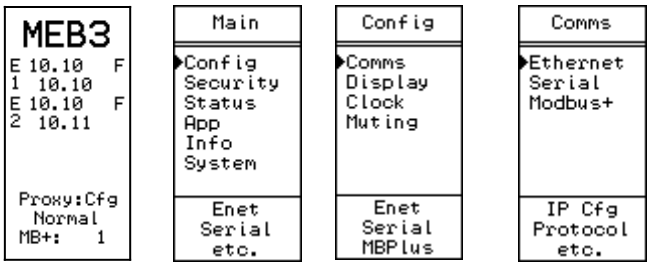


Figure 11.4: Comms Menu Screen

Ethernet Configuration Menu

The Ethernet menu allows the selection of editing the settings for the Operation mode, IP Address, Subnet Mask, Default Gateway, IP Source, Ethernet Protocol, port drop number, Modbus Routes, IP Route table, Access Control List, inbound and outbound message timeouts, WWW password reset, and the physical Ethernet port mode settings.

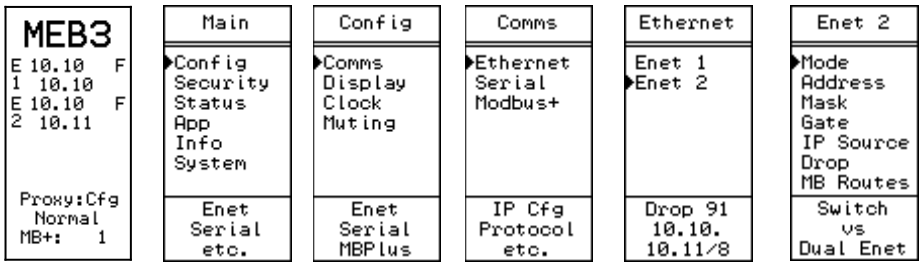


Figure 11.5: Ethernet Menu Screen

Address Screen

The IP Address of the MEB3 may be quickly changed using the Address 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 MEB3 automatically fill the TCP table with the first 3 octets of this IP Address and the fourth octet the index value.

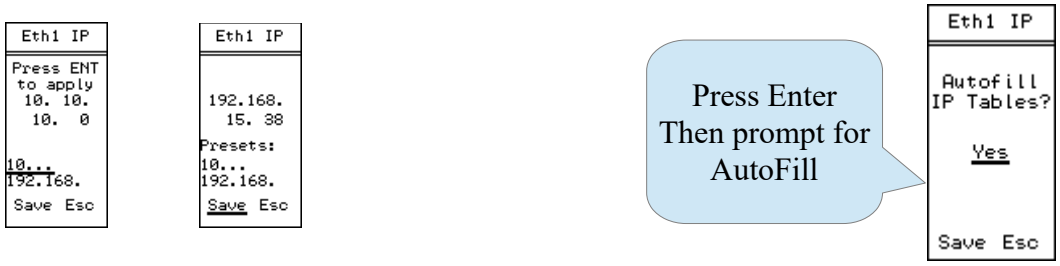


Figure 11.6:IP Address Screens

Mask Screen

The Subnet Mask of the MEB3 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 MEB3 automatically apply the subnet mask to the IP Address to generate most of the default gateway setting..

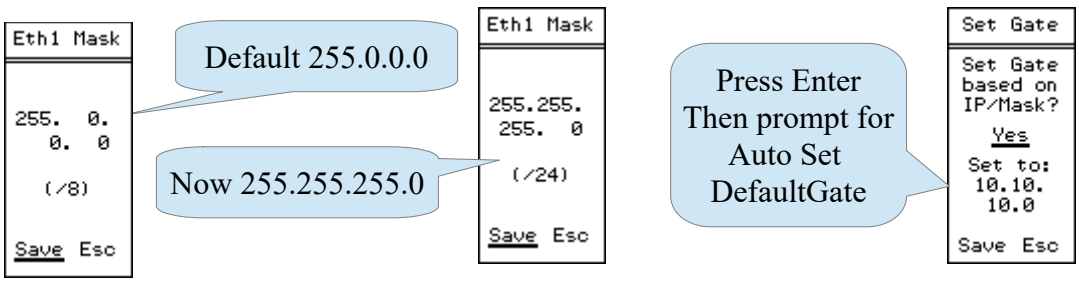


Figure 11.7:Subnet Mask Screens

Gate Screen

The Default Gateway of the MEB3 is edited just like the IP Address. The LEFT and RIGHT buttons move the cursor while the UP and DOWN buttons are sued to adjust the value. Press ENTER to accept the new value.

The user can also select one of the preloads to either apply the current IP address and subnet mask, or nullify the gate to 0.0.0.0. Set the Default Gate to 0.0.0.0 to disable routing operation outside the local subnet.

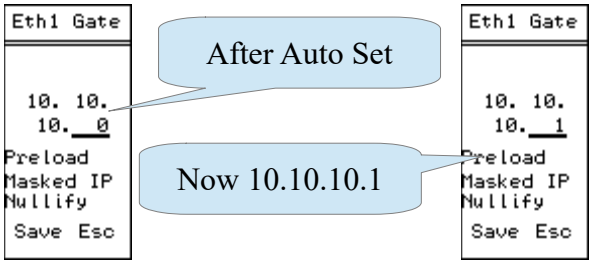


Figure 11.8:Default Gate Screen

IP Source Screen

The MEB3 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 MEB3's Ethernet port. This MAC address is shown on the side label in hexadecimal (00-20-BD-0C-35-04). The MEB3 will also support DHCP from a Schneider FDR server. The module name will be MEB3_XXX, where XXX is a three-digit number that may be modified with the UP and DOWN arrows on the keypad.

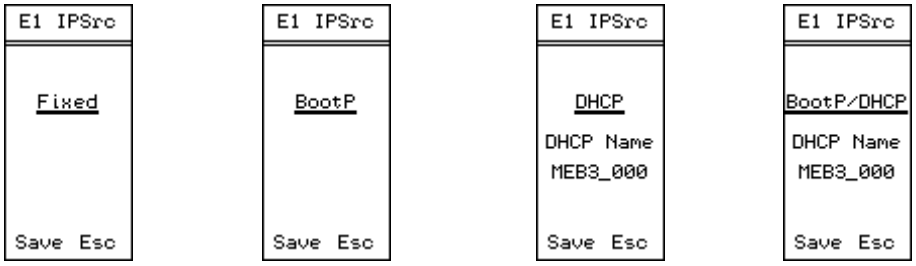


Figure 11.9:IP Source Screen

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 a 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.

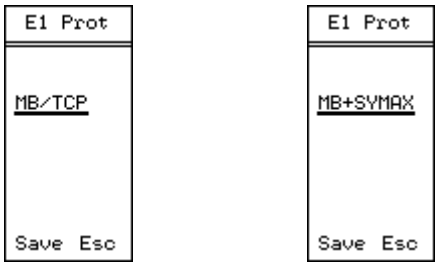


Figure 11.10:Ethernet Protocol Screens

Ethernet Drop Screen

The drop number of the Ethernet ports default to 90 (Enet 1) and 91 (Enet 2) and rarely need 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 a 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.

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.

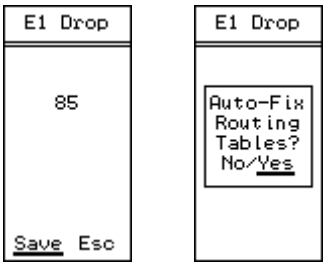


Figure 11.11:Ethernet Drop Screen

MB Routes Screen

The Modbus Routing table for the Ethernet port may be edited through the MB Routes screen. The sub-menu screen shows an overview of 3 entries from the table. Using the UP and DOWN arrows will scroll through the table, with the full information of the highlighted entry shown on the bottom half of the screen. Pressing the ENTER or RIGHT arrows will display the configuration screen for a single entry from the table with the index on the top line. The cursor is moved with the left and right arrows. Each choice may be edited by pressing the ENTER button, and modifying in the resulting screen.

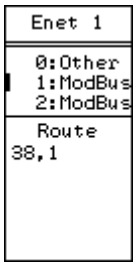


Figure 11.12:Modbus Routes Overview Screen

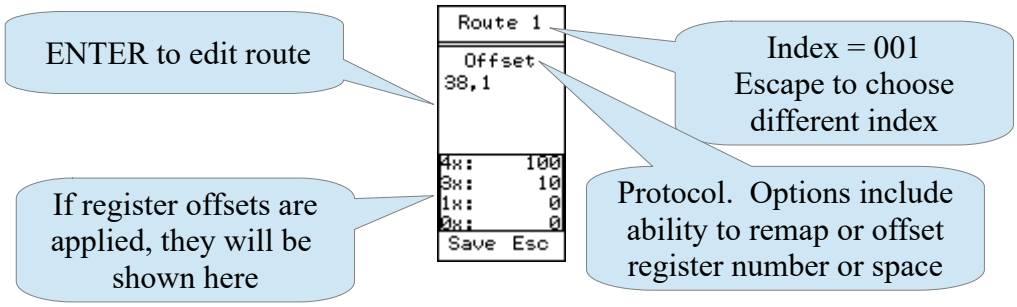


Figure 11.13:Modbus Route Edit Screen

IP Table Screen

The IP Routing table for the Ethernet port may be edited through the IP Table screen. This screen shows three entries from the table with the index at the beginning. The cursor is moved with the up and down arrows. Values are altered by pressing enter, then editing the entry in the next screen.

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.

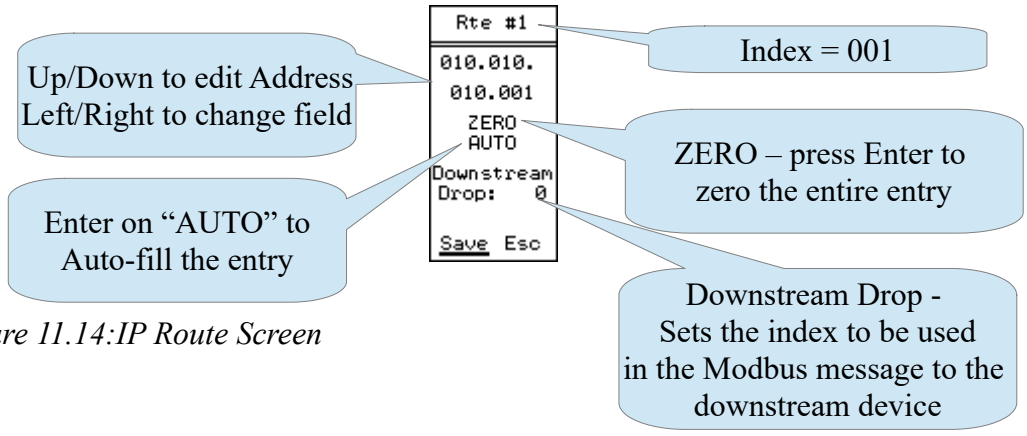


Figure 11.14:IP Route Screen

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

The Downstream Drop field allows the user to specify the Modbus index to be used in any Modbus/TCP messages sent using this entry in the table.

ACL Screen

The ACL screen allows the user to configure the Access Control List (ACL). This list is part of the MEB3's cybersecurity measures, and allows or disallows TCP connections on ports 80 (WWW) and 502 (MB/TCP) for either Ethernet port based on IP address and mask rules. The first sub-menu shows an overview of 3 rules. Pressing the enter or the right button will display a single entry.

Note – The first eight entries (0-7) and entry 255 are not able to be edited. Rules 2-7 may be enabled or disabled by the user. Rules may be added by editing rule 8, which will cause the MEB3 to also create rule 9 on the screen.

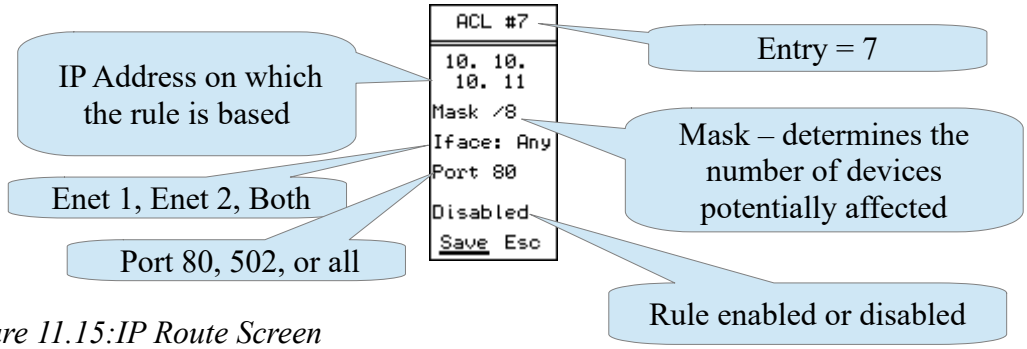


Figure 11.15:IP Route Screen

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

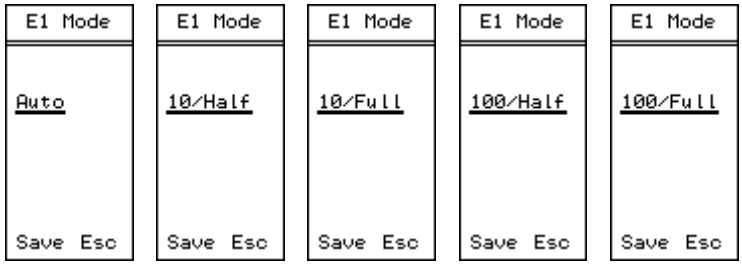


Figure 11.16:Ethernet Port Mode Screens

Timeout Screens

The MEB3 has a default timeout for any incoming Modbus/TCP message of 11 seconds, and a default timeout for any outgoing Modbus/TCP message of 10 seconds. The Timeout I and Timeout O screens allows the user to modify these times. Because of a holdover from previous MEB iterations, the time is measured in centiseconds (cS).



Figure 11.17:Ethernet Message Timeout Screens

Password Screen

The Password screen serves two functions. If the WWW password has not been set, or has been recently reset, the screen displays the temporary password generated by the MEB3. If there is an existing WWW password set by the user, this screen offers the ability to reset the password to the temporary password.

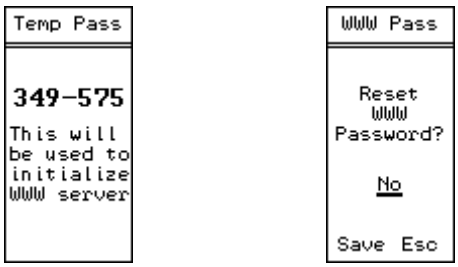


Figure 11.18:WWW Password Screens

Mode Screen

The MEB3+201 has two Ethernet ports. The Mode screen allows the user to set whether the second port is used like a switch, or another Ethernet adapter with a separate IP address.



Figure 11.19:Ethernet Mode Screen

Serial Port Menu

The Serial menu allows the selection of a particular serial port to edit. Choices are Port 1 and Port 2. The bottom third of the screen will provide a summary of the port settings.

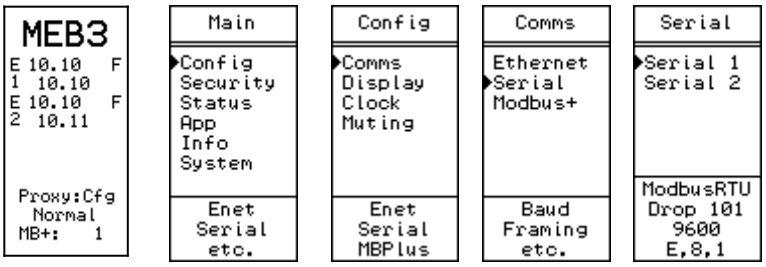


Figure 11.20: Serial Port Menu Screen

Port 1 Menu

Both serial ports share the same menu list.

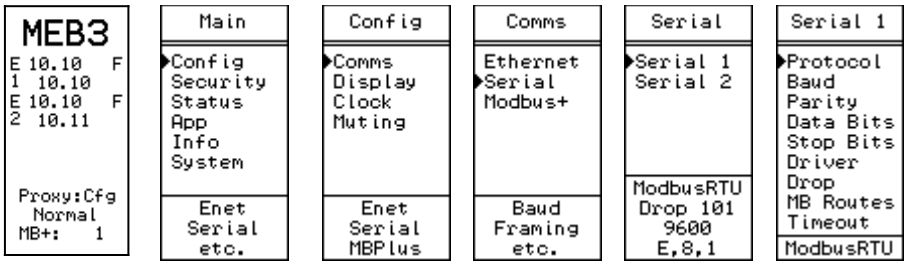


Figure 11.21: Serial Port 1 Menu Screen

Settings available for 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 MB Routes Screen on page 81
- Timeout – Outbound message timeout. Default is 100 centiseconds
- Xfr Intvl – Time between any automatic transfer. Default is 100 centiseconds

Modbus+ Menu

The Modbus+ menu allows the user to set several options related to the Modbus Plus port.

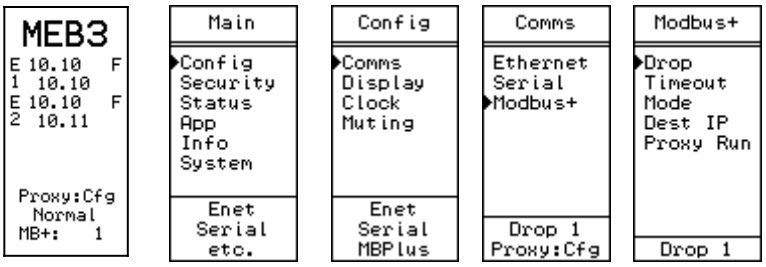


Figure 11.22: Serial Port Menu Screen

Modbus + Drop Screen

The MBP Drop edit screen shows the current MB+ drop number and allows the user to edit the new number. Valid entries are 1-64. The MEB3 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 11.23: Modbus Plus Edit Screen

Choosing the Save option will prompt “Auto-Fix Routing Tables?” Selecting “Yes” will

cause the MEB3 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.

If Proxy mode is disabled, then after the “Auto-Fix” prompt for enabling Proxy Mode.

- Disabled – MEBII mode is selected.
- Enabled – Proxy mode is selected.

If Proxy mode is Enabled then the user is prompted for the Target PLC IP Address. This address is edited just like the IP Address front panel screen.

The Proxy Stat page allows the user to place the Proxy Mode into “Config” or “Run”

Display Edit Screen

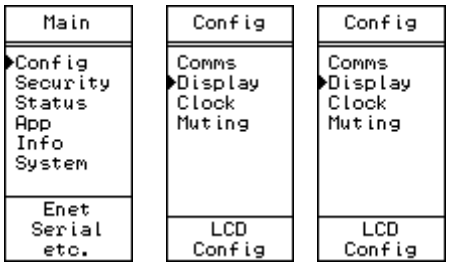


Figure 11.24: Display Contrast Edit Screen

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.

Clock Screen

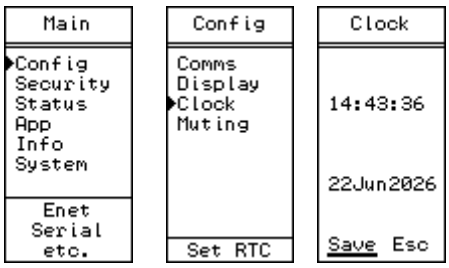


Figure 11.25: Clock Edit Screen

The Clock screen allows the user to set the MEB3’s real time clock. The UP and DOWN arrows change the setting. The RIGHT or LEFT arrows move between fields.

Muting Screen

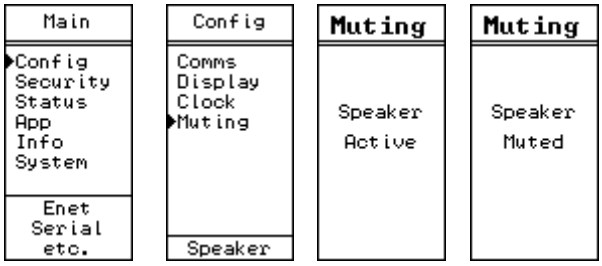


Figure 11.26: Speaker Mute Edit Screen

The Muting screen allows the user to mute the MEB3's speaker. The UP and DOWN arrows change the setting. The ENTER or LEFT arrows accept the new value.

Status Menu Screens

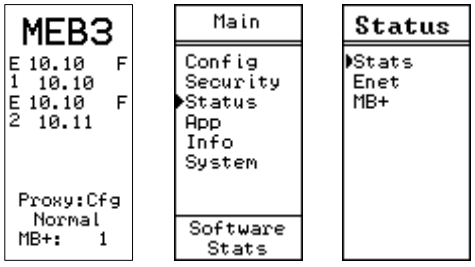


Figure 11.27: Status Menu Screen

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.

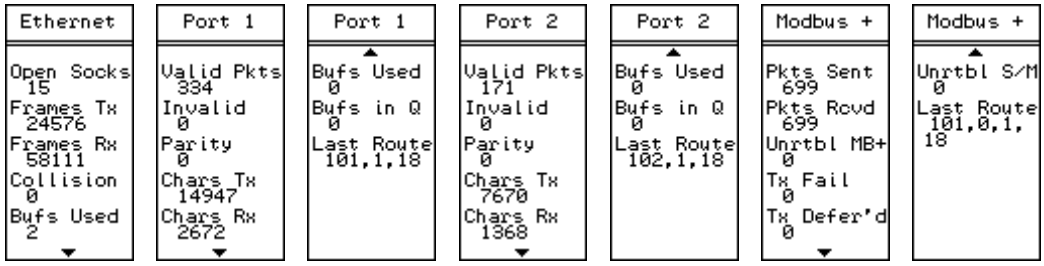


Figure 11.28: Stats Screens

Enet Status Screen

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

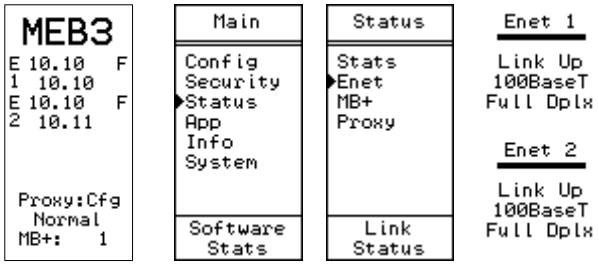


Figure 11.29: Ethernet Status Screen

MB+ Stats Screen

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

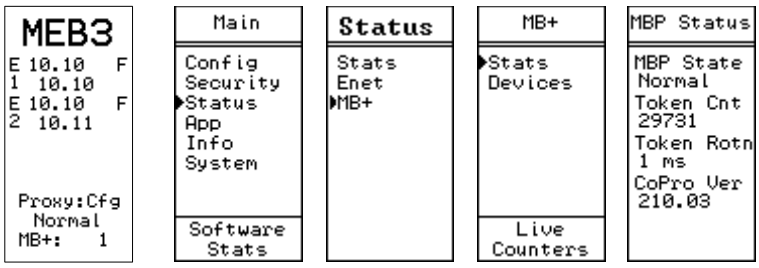


Figure 11.30: MBP Stats Screen

App Menu

The APP menu allows the user to halt the MEB3 application. This feature should only be used when directed by Niobrara Technical Support.

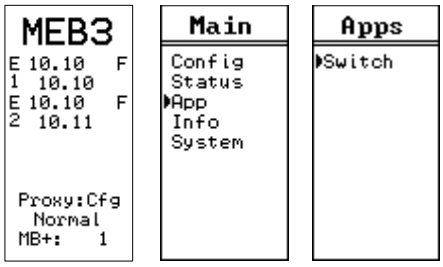


Figure 11.31: App Menu Screen

Switch Screen

The Switch screen allows the user to HALT or RUN the MEB3 application.

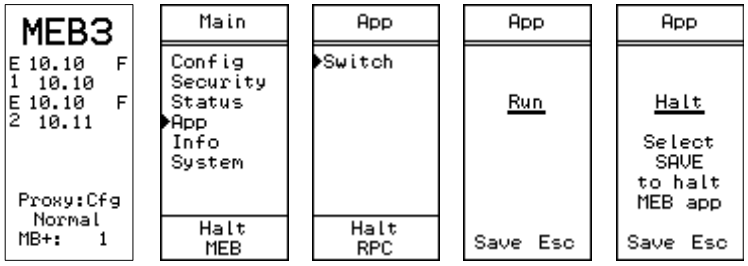


Figure 11.32: Switch Screen

Info Menu

The Info Menu provides access to various information about the MEB3 firmware and network connections.

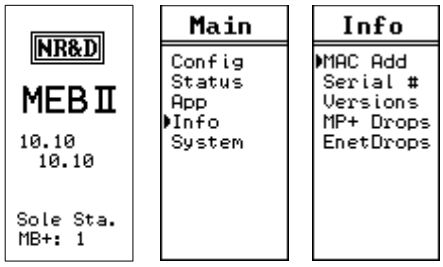


Figure 11.33: Info Menu Screen

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.

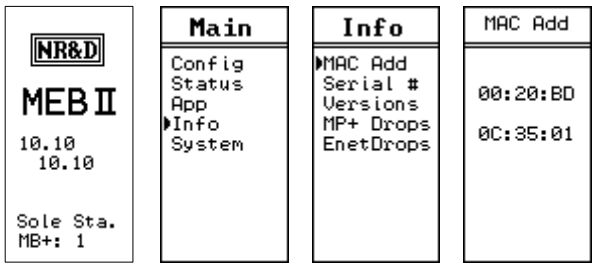


Figure 11.34: MAC Address Screen

Serial Number Screen

This screen shows the serial number of the MEB3.

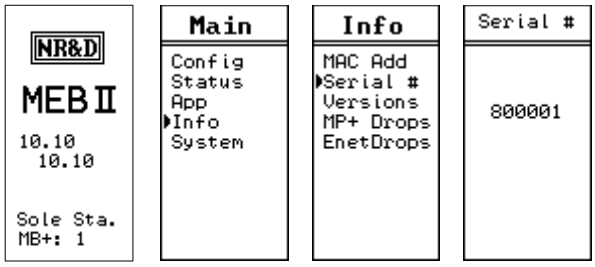


Figure 11.35: Serial Number Screen

Versions Screen

The Versions menu gives access to the MEB3 firmware, DUCM firmware, and boot version.

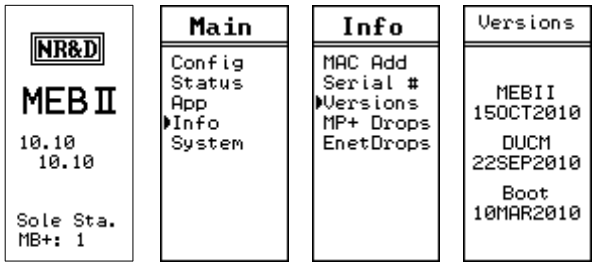


Figure 11.36: Versions Screen

MB+ Drops Screen

The MB+ drops screen shows the addresses of local MB+ nodes that are recognized by the MEB3. 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 MEB3 is highlighted.

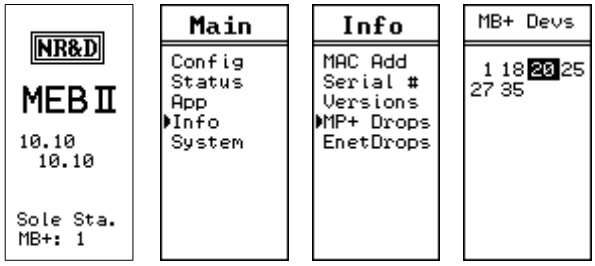


Figure 11.37: MB+ Drops Screen

Enet Drops Screen

The Enet drops screen will show the SY/MAX 802.3 drops accessible to the MEB3. 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 MEB3 are highlighted. This includes the Ethernet port and any other port with "ON ETHERNET" set to YES.

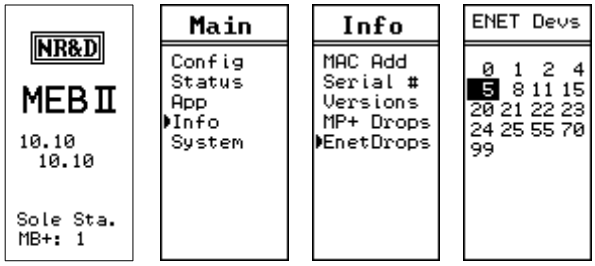


Figure 11.38: SY/MAX Ethernet Drops Screen

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 MEB3 without physically removing the power.

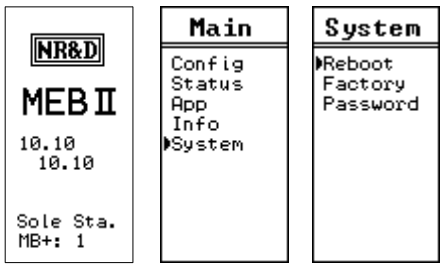


Figure 11.39: Reboot Screen

Factory Defaults Screen

The Factory screen allows the user to quickly reset the MEB3 to factory defaults. The reset process also includes a reboot. Selecting "NO" will return to the previous menu without altering the current setup.

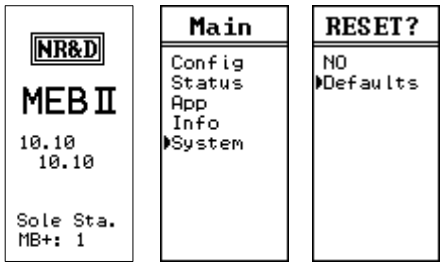


Figure 11.40: Factory Defaults Screen

Password Screen

The MEB3 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.

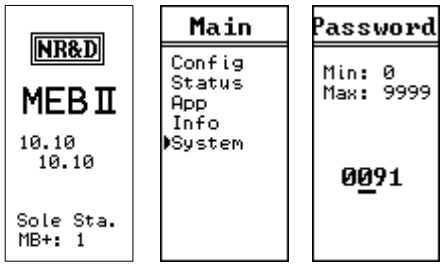


Figure 11.41: Password Screen

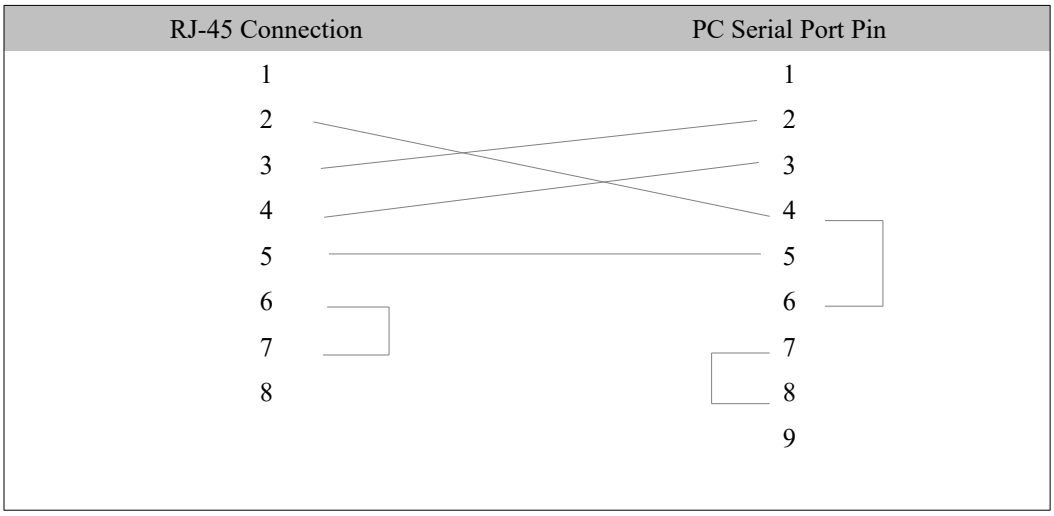
12 Recommended Cables

RS-232 Cables

MM1 (PC to MEB3)

The Niobrara MM1 cable may be used to connect the MEB3 RS-232 port to a standard PC 9-pin male port. The pinout is shown in Figure 12.1.: MM1 Serial Cable.

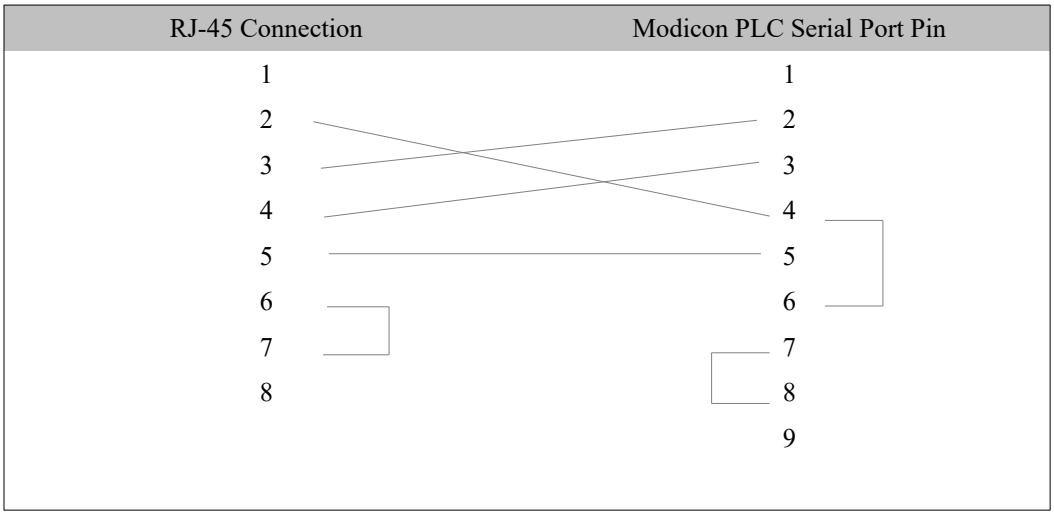
Figure 12.1.: MM1 Serial Cable



MM2 (Modicon PLC to MEB3)

The Niobrara MM2 cable may be used to connect the MEB3 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 12.2.: MM2 Serial Cable.

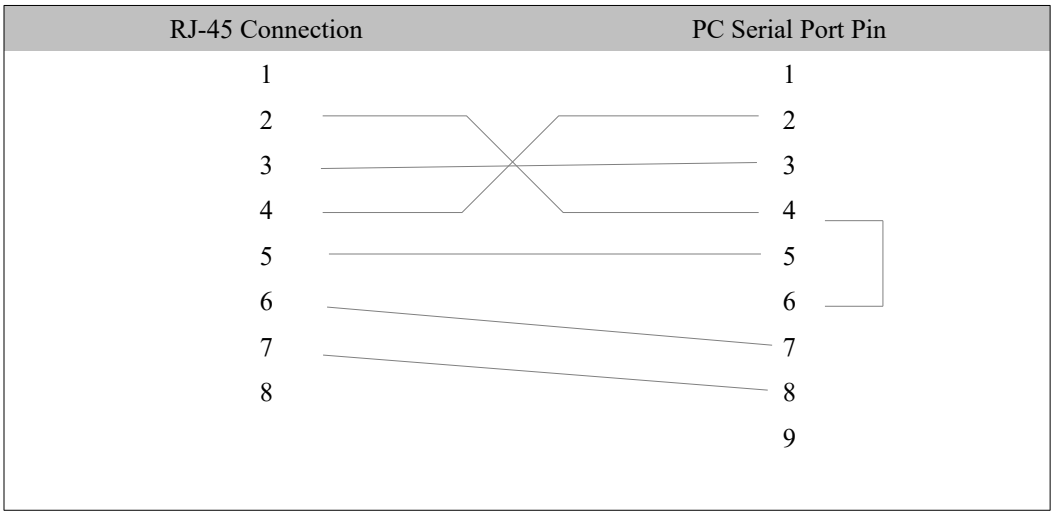
Figure 12.2.: MM2 Serial Cable



MM3 (MEB3 to emulate a 9-pin PC port)

The Niobrara MM3 cable may be used to make the MEB3 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 MEB3 to a newer Compact 984 PLC. The pinout is shown in Figure 12.3.: MM3 Serial Cable.

Figure 12.3.: MM3 Serial Cable



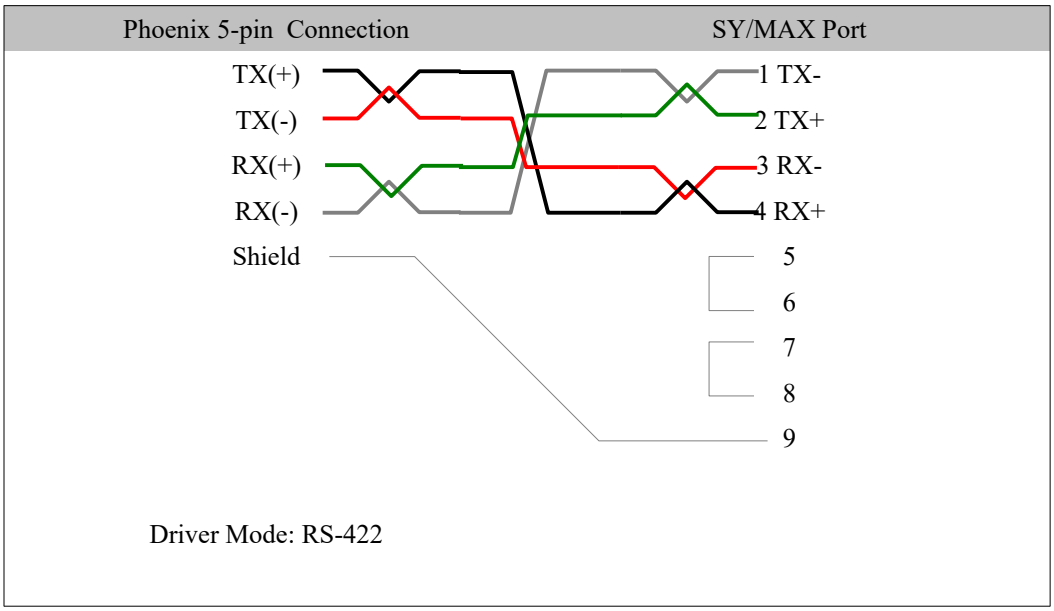
RS-485 Cables

MU7 (MEB3 to SY/MAX)

The Niobrara MU7 cable is used to connect the RS-485 port of the MEB3 to a standard SY/MAX DB9 female port. This cable is normally used to connect the MEBI directly to a SY/MAX PLC or NIM module.

NOTE: The MEB3 port driver mode is normally set to RS422 when connected to a SY/MAX serial port.

Figure 12.4.: MU7 Serial Cable



MEB3 Master to 4-wire RS-485 Slaves

The MEB3 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 MEB3.

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.

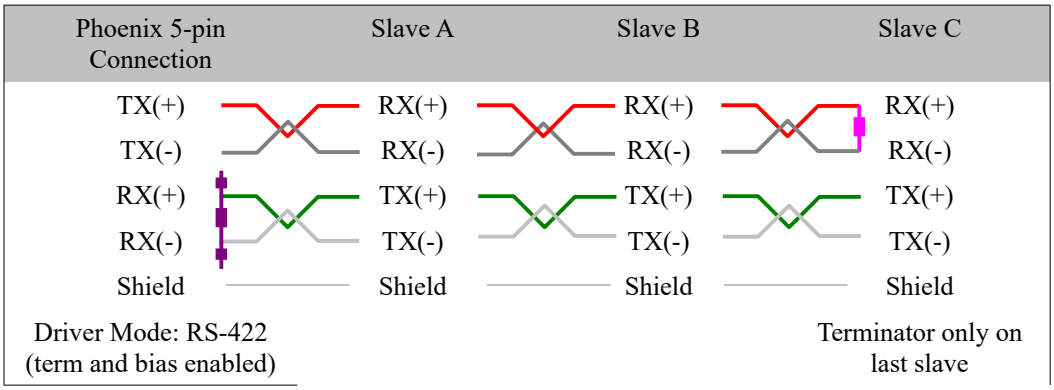
The Driver Mode for the MEB3 port should be set to RS-422. This mode enables the transmitter of the port at all times to bias the receivers of all of the slaves. This mode also enables the internal termination and bias of the MEB3's receiver.

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 MEB3's power supply connector.

Figure 12.5.: 4-wire RS-485 Master



MEB3 to 2-wire RS-485

The MEB3 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 MEB3.

The MEB3 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 MEB3 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 RS845+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 MEB3 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 MEB3's power supply connector.

Figure 12.6.: 2-wire RS-485 Network with internal Bias

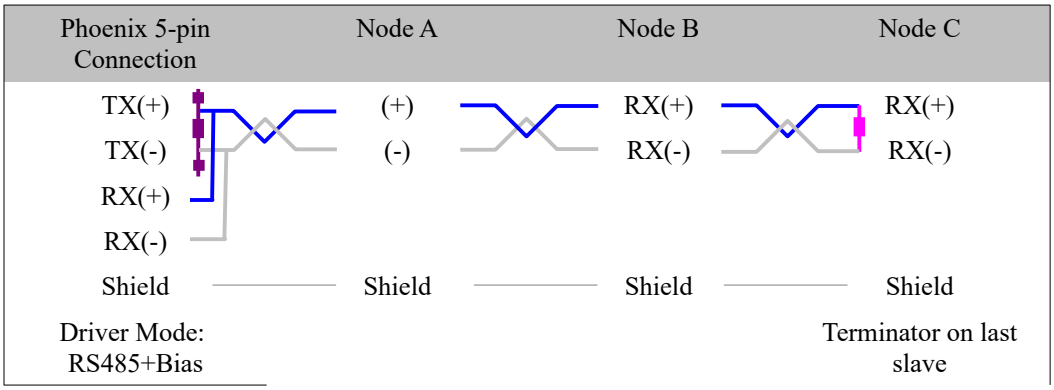
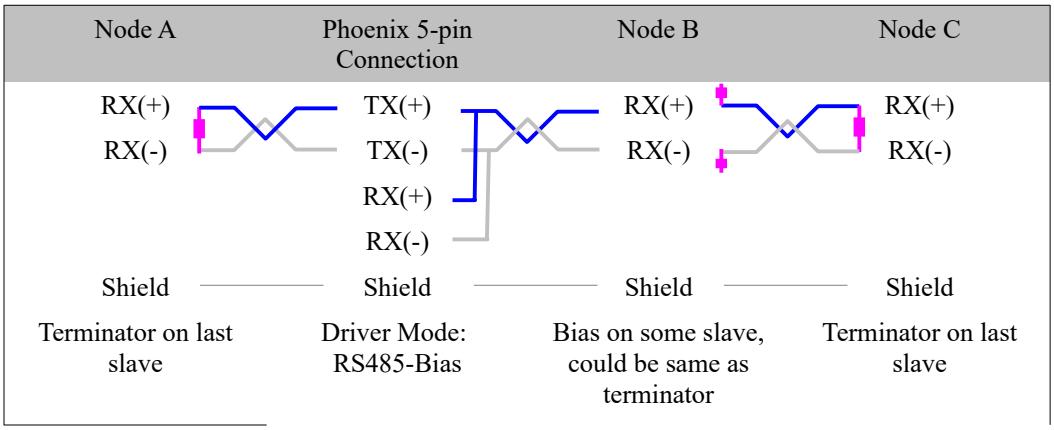


Figure 12.7.: 2-wire RS-485 Network without internal Bias



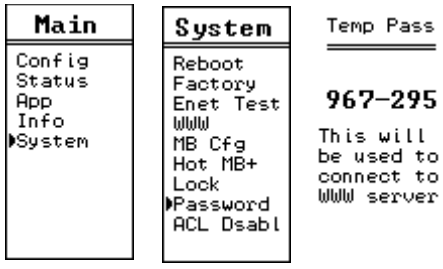
13 Web Server

The MEB3 uses a built-in Web server for remote configuration over the Ethernet network. This Web server requires the use of Javascript.

First Access

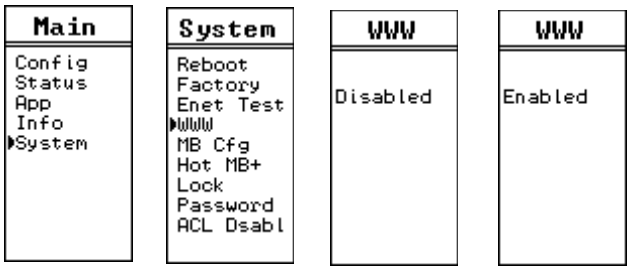
In order to comply with California SB 327, the MEB3 applies a unique password to web access each time the module is reset to factory defaults. The user may access the password via the front panel. Use the arrow keys to navigate to Main > System > Password. The screen will look similar to the screen below:

Figure 13.1: Web Interface default password



For additional security, the web interface is disabled by default. To enable, navigate to Main > System > WWW, then the UP or DOWN arrow key to change it to “Enabled.”

Figure 13.2: Enable WWW



Note: If the user sets the IP address from the front panel before connecting to a network, the MEB3 will first ask if the user wants to autofill the TCP table, and will then ask if the web interface should be enabled. This eliminates the extra steps of also having to repeat the process above.

Login

After retrieving the default password, open a browser and navigate to the IP address that has been assigned to the MEB3. The page should appear as below:



Figure 13.3: First Login Screen

Enter the password, then click Submit. Remember to include the dash in the password. The following page will result:

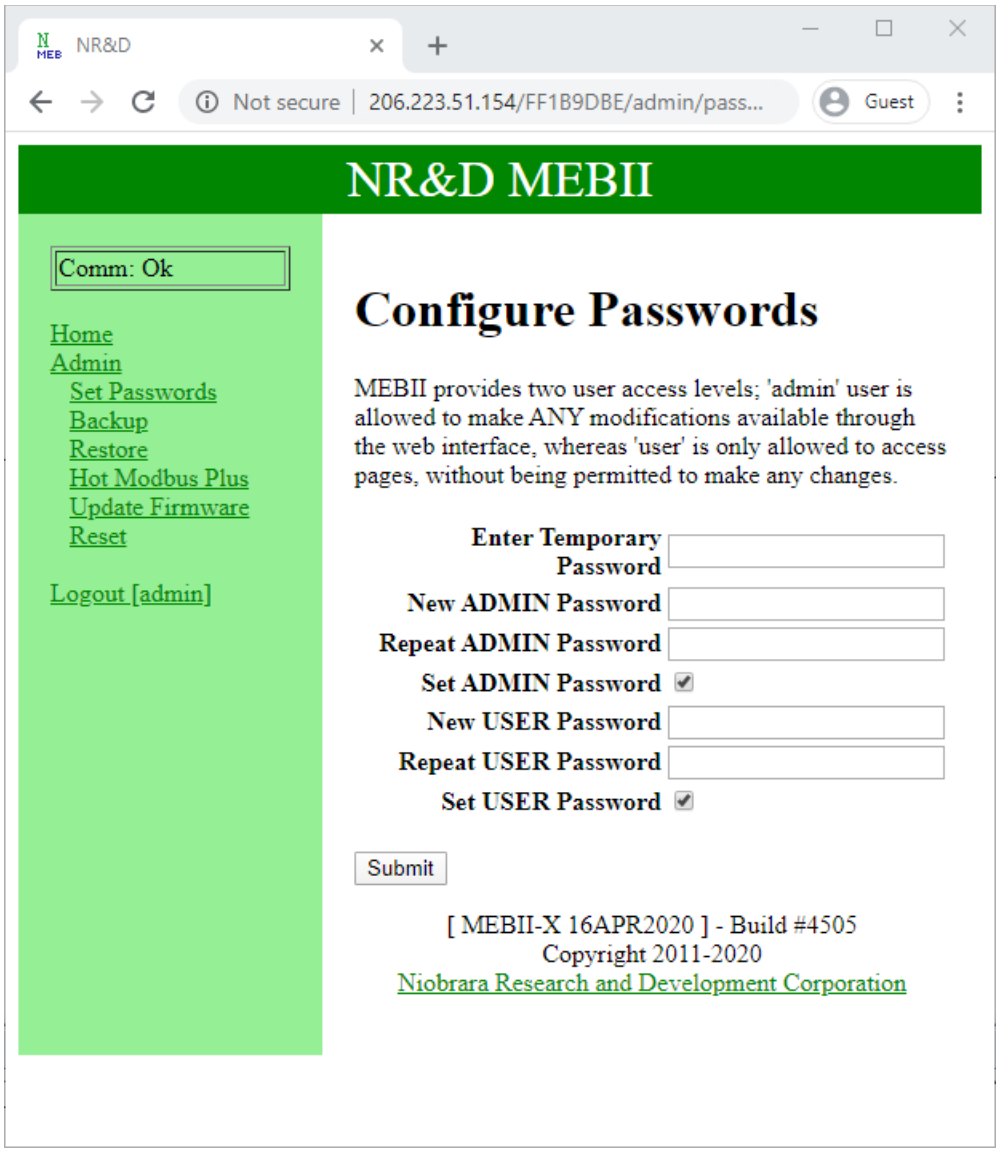


Figure 13.4: Create Passwords Screen

The MEB3 Web server supports two user access levels: “User” and “Admin”. These usernames are not changeable and are not case sensitive. “User” provides read-only access to view the configuration of the MEB3. “Admin” provides full configuration edit capabilities as well as backup/restore and firmware upgrade. Create passwords for these levels, and store them. The passwords cannot be retrieved from the MEB3 by any method. Once the passwords have been set, the screen will show as below:

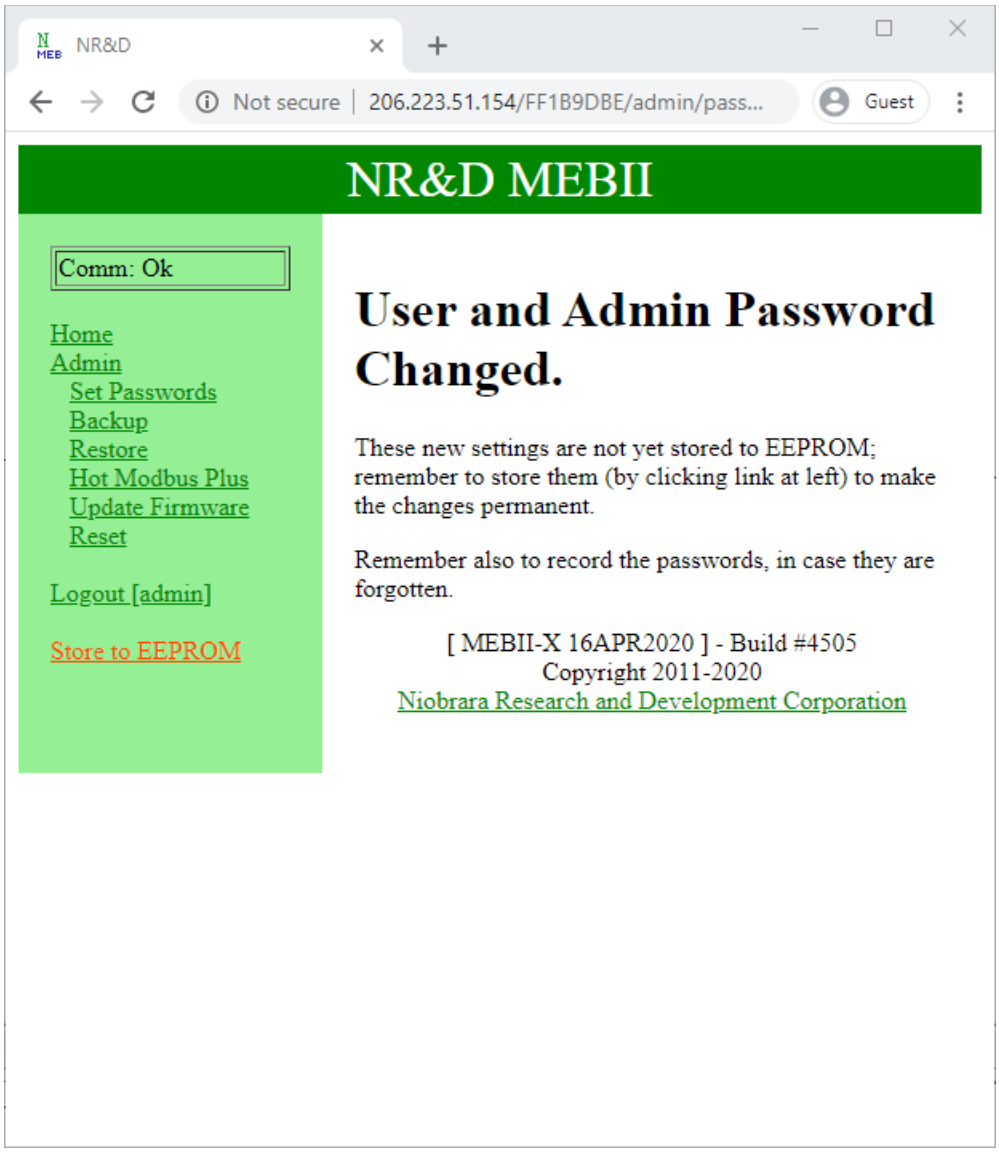


Figure 13.5: Create Passwords Screen

Once these passwords have been configured, every subsequent login to the MEB3 will be as follows.

Figure 13.6 shows the Login page. Enter the appropriate username and password to gain access to the MEB3.

If the “User” account is used and the operator attempts to modify a setting in the MEB3, a pop-up notification will appear to announce that modifications are not allowed for this user level. (See Figure 13.7)

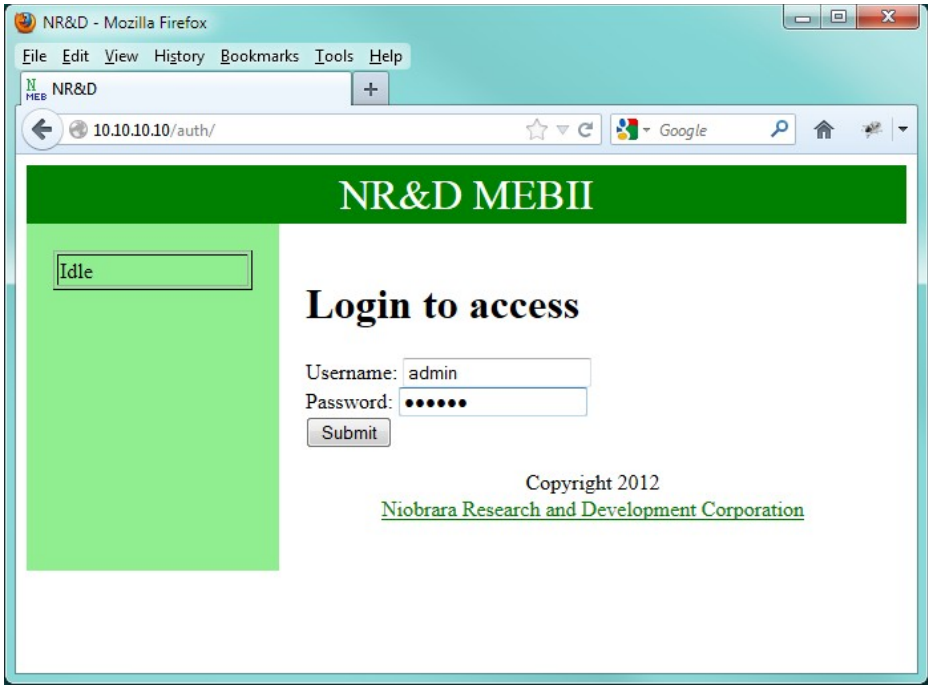


Figure 13.6: Login Screen

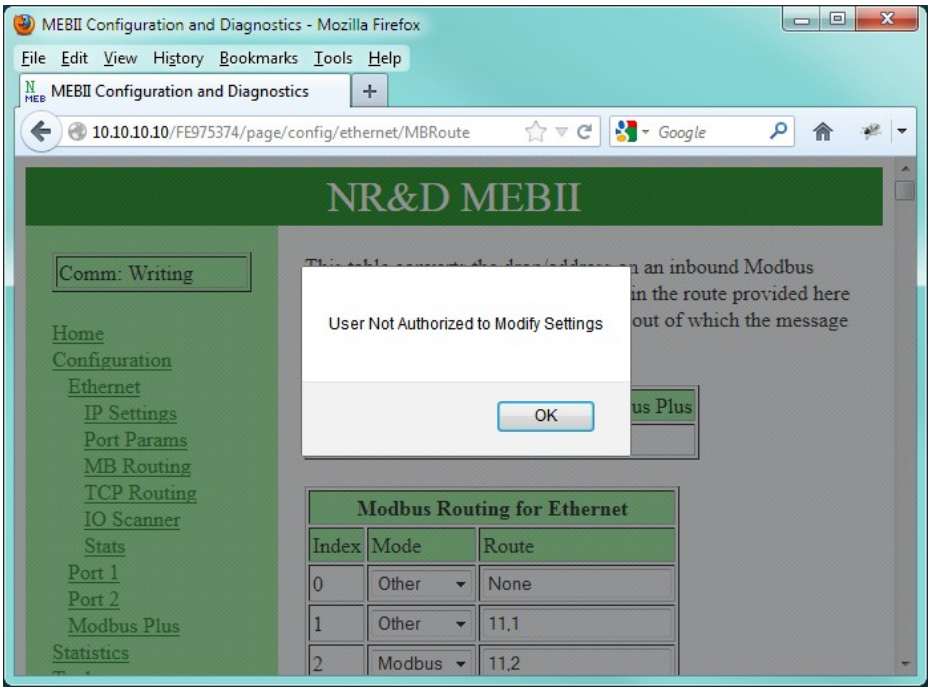
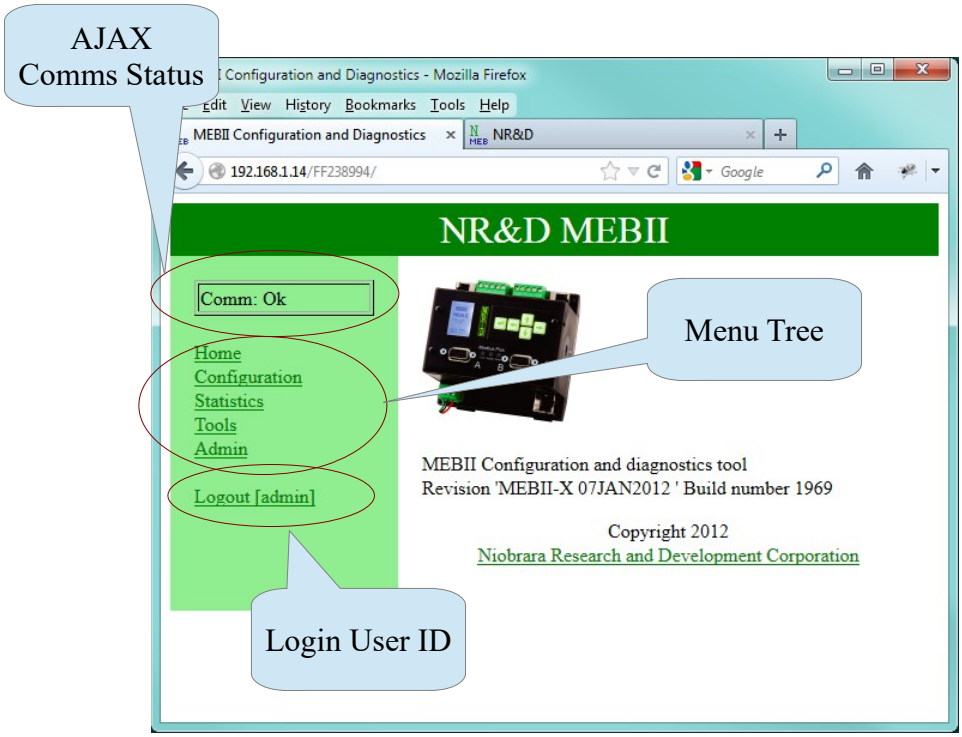


Figure 13.7 "User" attempting to modify settings

Home

Figure 13.8: Home



The typical web page includes an AJAX status box showing the state of the Javascript communication between the browser and the MEB3. The background of this box turns red when comm errors are occurring.

The menu tree may has the following branches: Home, Configuration, Tools, and Admin.

NOTE: Admin is not present when logged in as “user”.

Configuration

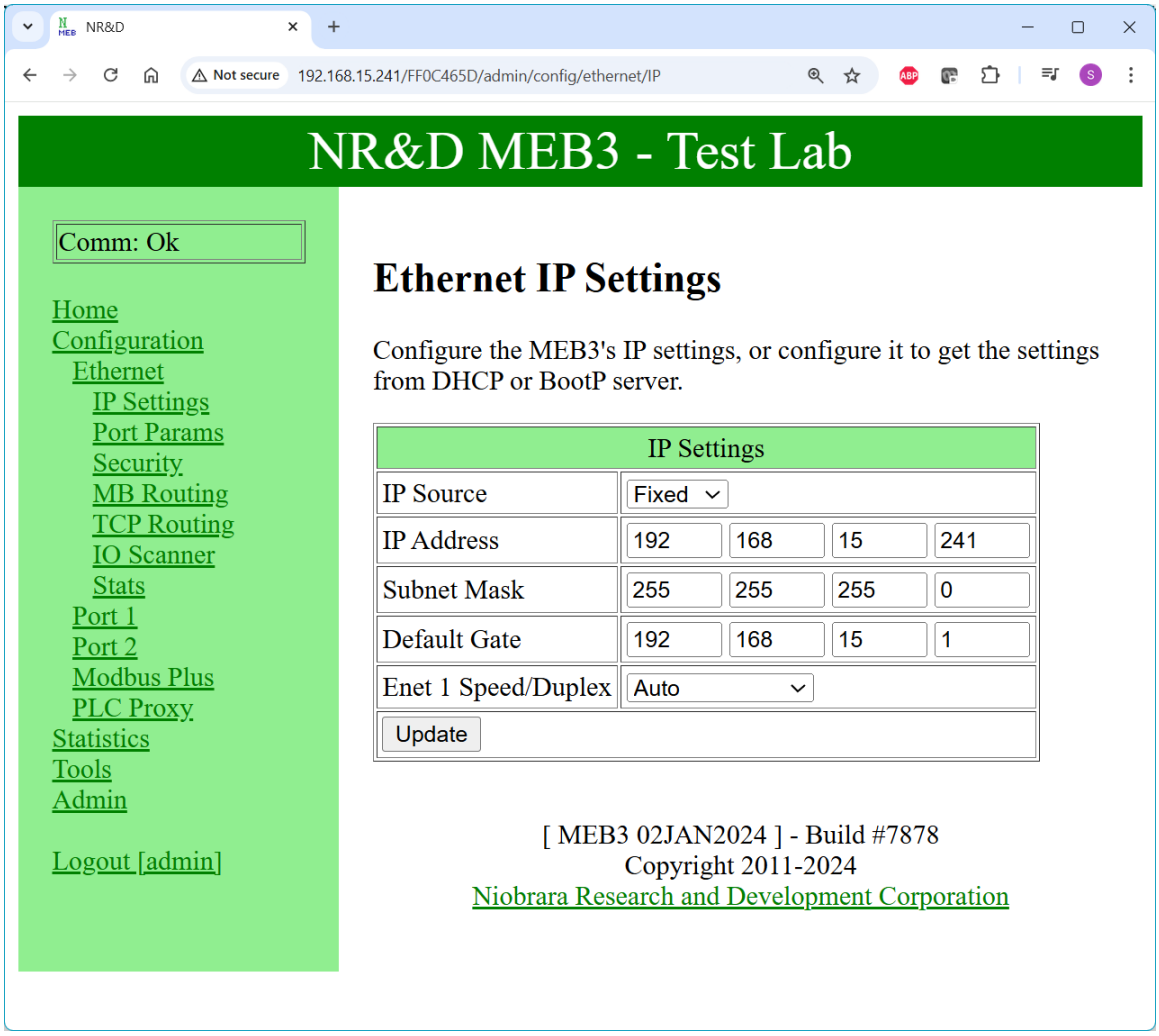
The Configuration menu provides access to the settings for Ethernet, Port 1, Port 2, and Modbus Plus.

Ethernet

There are pages for setting the IP Address, Ethernet Protocol, IP Security, Modbus Routing, TCP Client Routing, and I/O Scanner.

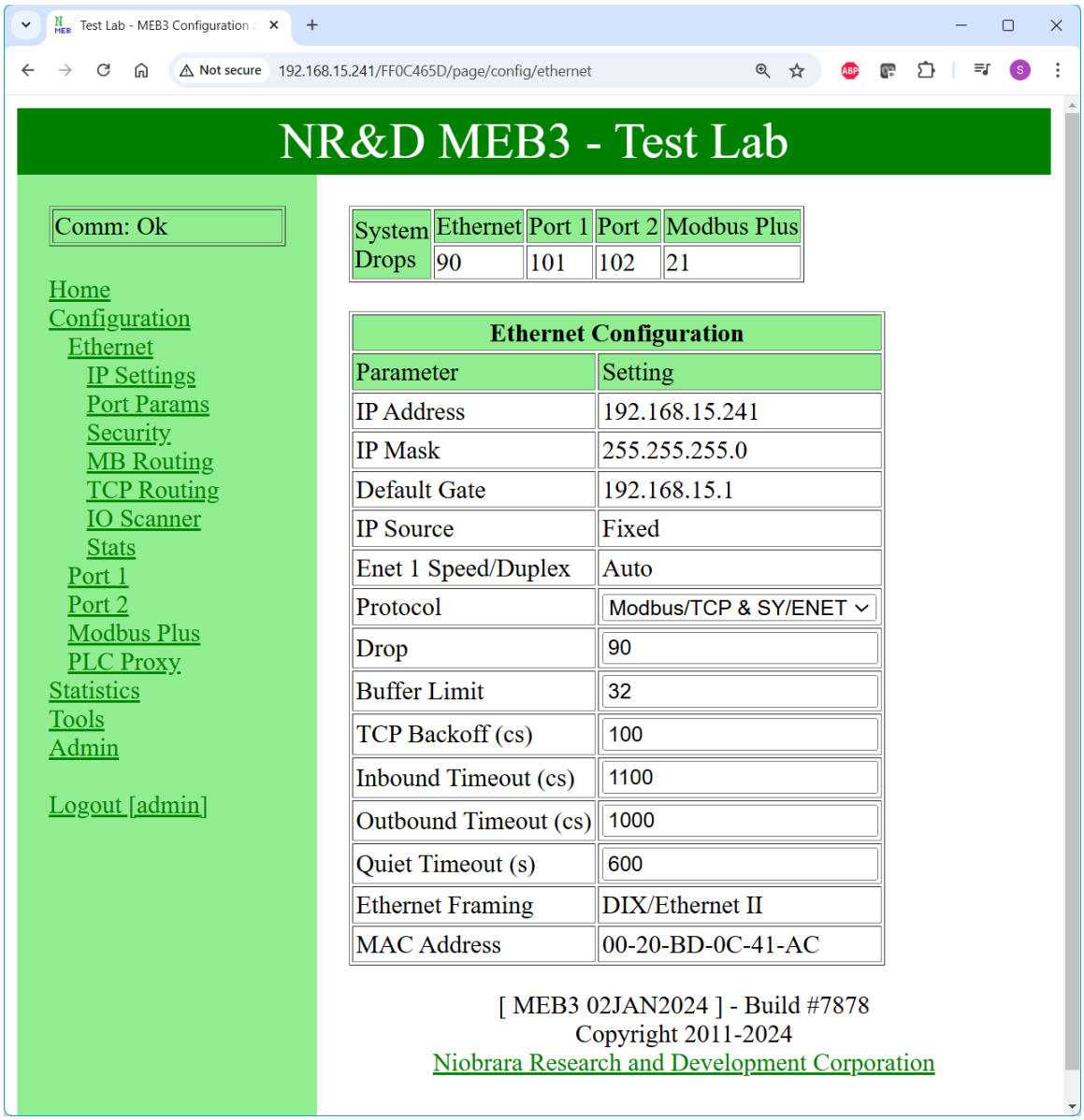
IP Settings

The IP Settings page allows the Admin to select the IP Parameters for the module.



Ethernet Port Parameters

This page allows the Admin to configure the MEB3 to operate in Modbus/TCP or SY/MAX+Modbus/TCP mode and set the SY/MAX 802.3 drop number.



Security

The Security page allows the user to configure the inbound access control list, or ACL. The ACL is a list of up to 256 rules that the MEB3 uses to determine if a new incoming TCP connection will be allowed at the time of its request. This list allows the user to allow certain IP addresses or groups of addresses. The rules use an IP address and a mask to create a list of connections that will be allowed. The user can also at any time disable a rule. This will usually result in blocking connection requests from the IP addresses in that rule.

The figure below shows all the default entries, plus one added for reference. The first

two entries (0 and 1) are controlled by the front panel. When a user chooses the “ACL Dsabl” from the front panel, these entries are set to “Accept TCP” for 15 minutes, and will temporarily allow a connection on any port from any IP address.

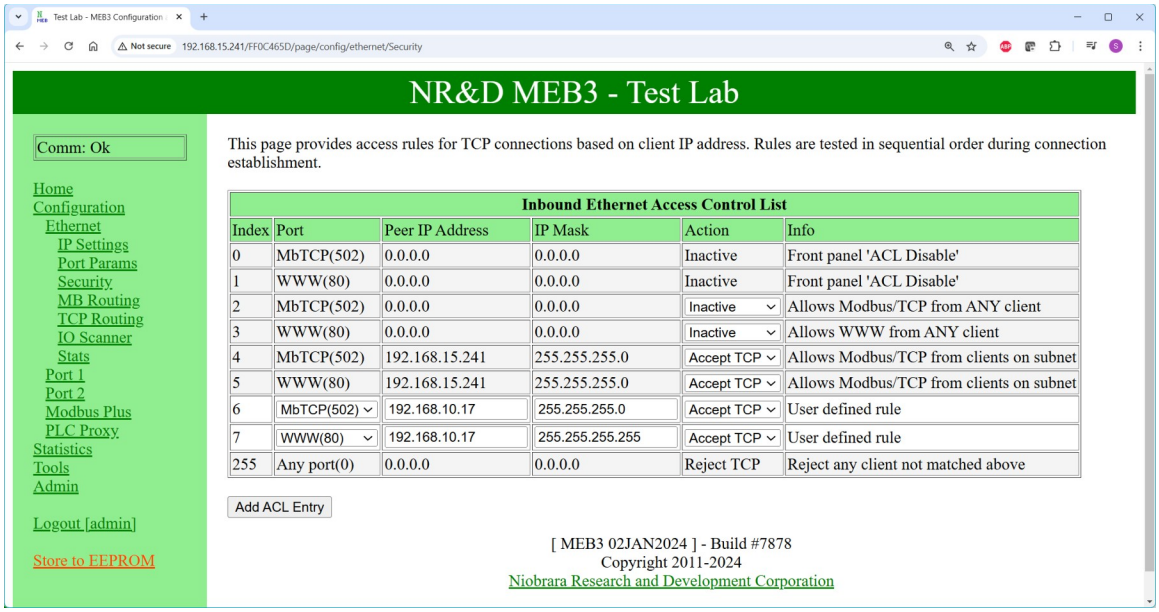
The next two entries (2 and 3) may be controlled from the front panel or the web interface. If enabled, they allow connections from any IP address at the specified port.

Entries 4 and 5 use the MEB3's IP address and subnet mask to create rules that would allow connections from any IP address within the MEB3's subnet.

Entry 6 has been created as an example. This rule as shown will allow connections on any device from subnet 192.168.10.x for Port 502 only.

Entry 7 has been created as another example. This rule will allow port 80 (web) connections from only node 192.168.10.17 and any node on subnet 192.168.15.x (entry 5).

Entry 255 is a fixed entry that blocks all connections on all TCP ports that are not specifically allowed by the active rules above it.



Modbus Routing for Ethernet Port

The Ethernet port has 253 entries in its Modbus Routing table. The Route typically consists of the drop number of the outbound MEB3 port followed by any additional drops needed to reach the target.

Each entry includes a “Mode” setting that can alter the incoming message including offsetting the target memory locations.

- Other (Non-Priority SY/MAX) – Modbus messages are translated into Non-Priorty SY/MAX messages.
- Modbus Pass-Through – Modbus messages are not altered.
- SY/MAX Priority – Modbus messages are translated into Priority SY/MAX messages.
- Modbus Remap (Input Regs to Holding Regs) – Modbus Function Code 04 (Analog Input Read) messages are translated into Function Code 03 (Holding Register Read). No register offsets are applied. All other Function Codes are passed-through.
- Modbus Remap (3x reads access 4x, 1x reads 0x) – Modbus Function Code 04 (Analog Input Read) messages are translated into Function Code 03 (Holding Register Read). Function Code 02 (Binary Input) messages are translated into Function Code 01 (Coils). No register offsets are applied. All other Function Codes are passed-through.
- Modbus Remap (3x reads access 4x, 1x reads 0x) with offset – Modbus Function Code 04 (Read) messages are translated into Function Code 03 (Holding Register Read). Function Code 02 (Binary Input) messages are translated into Function Code 01 (Coils). Each address space may have its own offset configured.
    - FC 01 (Read Coils) 0x Offset is added to the starting coil.
    - FC 02 (Read Discrete Inputs) 1x Offset is added to the starting coil and the FC is changed to 01.
    - FC 03 (Read Holding Registers) 4x Offset is added to the starting register.
    - FC 04 (Read Input Registers) 3x Offset is added to the starting register and the FC is changed to 03.
    - FC 05 (Write Single Coil) 0x Offset is added to the coil.
    - FC 06 (Write Single Register) 4x Offset is added to the register.
    - FC 15 (Write Multiple Coils) 0x Offset is added to the starting coil.
    - FC 16 (Write Multiple Register) 4x Offset is added to the starting register.
    - FC 22 (Mask Write Single Register) 4x Offset is added to the register.
    - FC 23 (Read/Write Registers) 4x Offset is added to the read and write starting registers.
- Modbus Pass-Through with offset - Each address space may have its own offset configured.
    - FC 01 (Read Coils) 0x Offset is added to the starting coil.
    - FC 02 (Read Discrete Inputs) 1x Offset is added to the starting coil.
    - FC 03 (Read Holding Registers) 4x Offset is added to the starting register.

- FC 04 (Read Input Registers) 3x Offset is added to the starting register.
- FC 05 (Write Single Coil) 0x Offset is added to the coil.
- FC 06 (Write Single Register) 4x Offset is added to the register.
- FC 15 (Write Multiple Coils) 0x Offset is added to the starting coil.
- FC 16 (Write Multiple Register) 4x Offset is added to the starting register.
- FC 22 (Mask Write Single Register) 4x Offset is added to the register.
- FC 23 (Read/Write Registers) 4x Offset is added to the read and write starting registers.

NOTE: Entries with no route will allow that index to access the MEB3's internal registers.

NOTE: Entries with the first drop in the route that does not match a drop number of any port on the MEB3 will access the MEB3's internal registers.

NOTE: Using the Ethernet port's drop number as the first drop in the route will cause the message to be routed back out the Ethernet port. This feature allows the MEB3 to translate between Modbus/TCP and SY/MAX 802.3 Ethernet.

NOTE: Index 254 is reserved for FC 101 and FC 102 which are Niobrara special route messages.

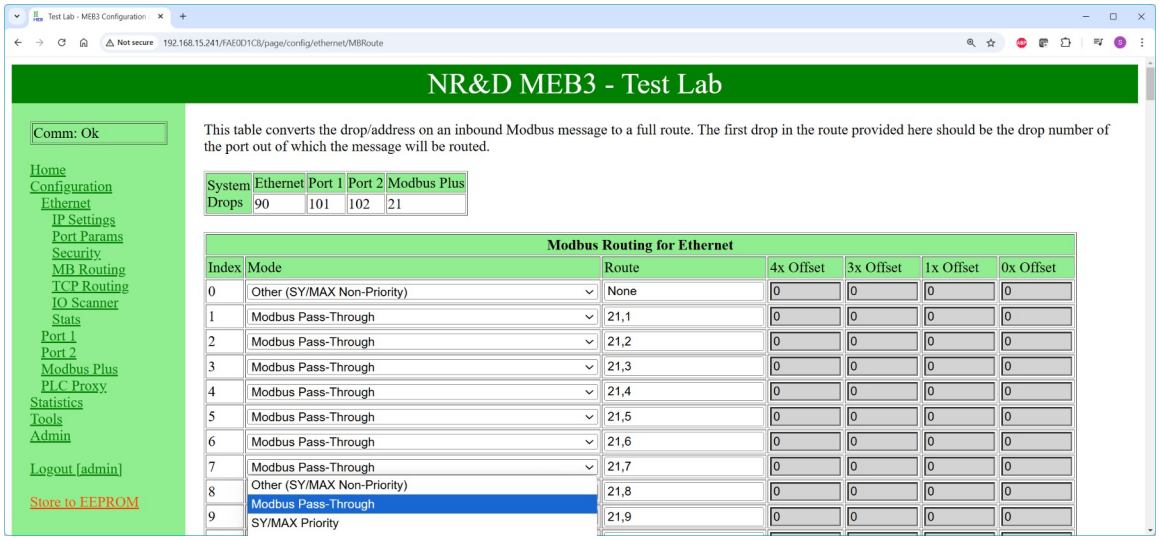


Figure 13.9: Offset Example shows routing table entries that use offsets. Entries 20 and 21 have the route of 90,20 which point the client back out the Ethernet port to an M580 CPU. Entries 22 and 23 have the route 21,22 which point to a Quantum CPU on Modbus Plus.

The M580 CPU is 0-based while the Quantum is 1-based. So if a 1-based client uses the

yellow entries (20 and 22) it would access the same registers and coils as a 0-based client using the blue entries (21 and 22).

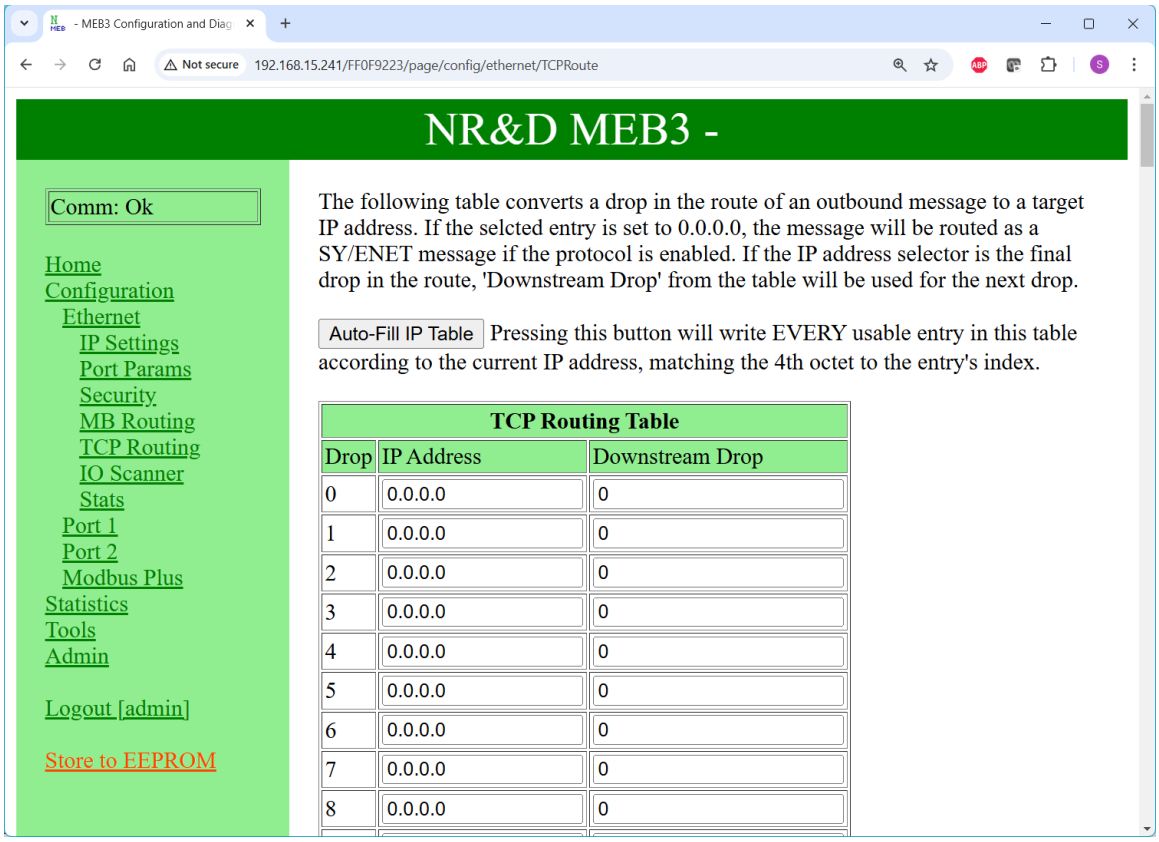
17	Modbus Pass-Through	21,17	0	0	0	0
18	Modbus Pass-Through	21,18	0	0	0	0
19	Modbus Pass-Through	21,19	0	0	0	0
20	Modbus Pass-Through with offset	90,20	1	1	1	1
21	Modbus Pass-Through	90,20	0	0	0	0
22	Modbus Pass-Through	21,22	0	0	0	0
23	Modbus Pass-Through with offset	21,22	-1	-1	-1	-1
24	Modbus Pass-Through	21,24	0	0	0	0
25	Modbus Pass-Through	21,25	0	0	0	0

Figure 13.9: Offset Example

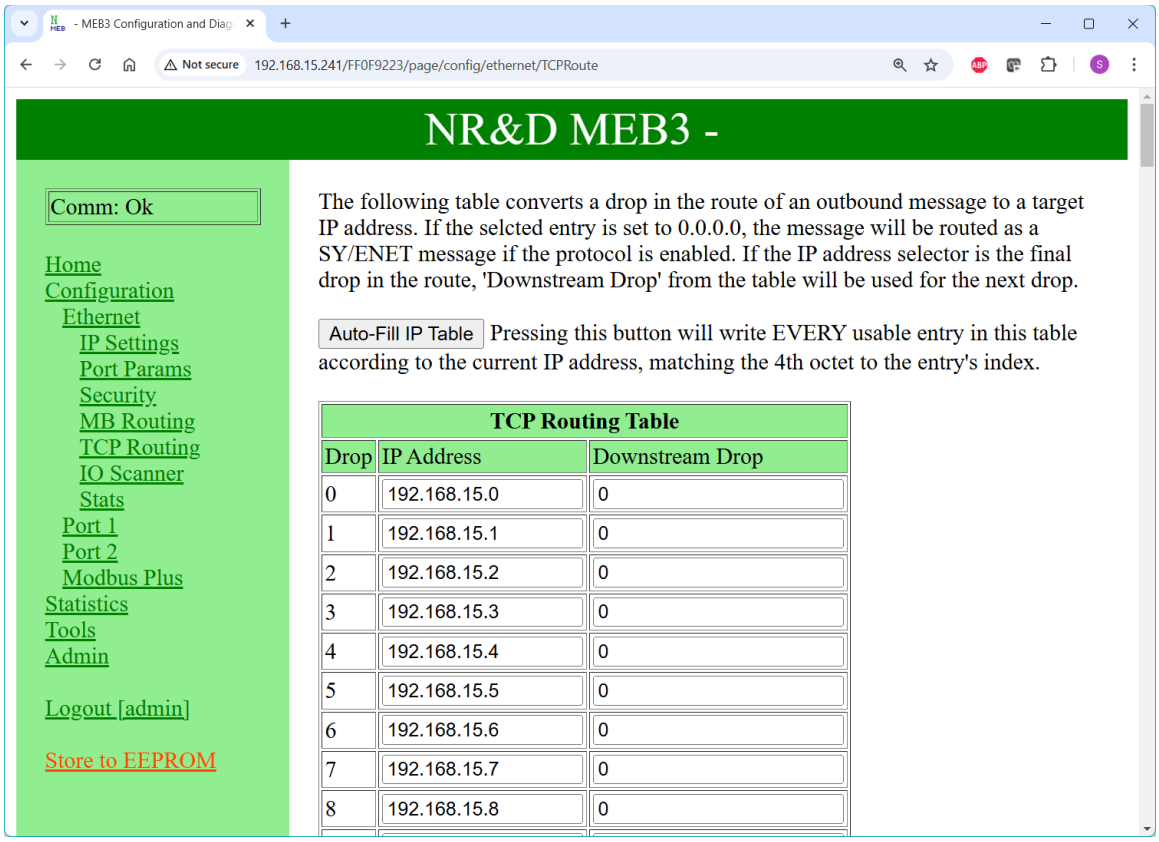
TCP Routing Table

The TCP Routing table is used for Modbus/TCP Client operation. Messages routed to the Ethernet port are inspected for the next drop number in the route. That drop number points to the entry in this table for that target IP Address. If there are additional drops in the route then the next drop will be the Destination Index for the client Modbus/TCP message otherwise the "Downstream Drop" is used for the Destination Index.

NOTE: SY/MAX 802.3 Ethernet client operation is selected by setting the drop number IP Address to 0.0.0.0.



The “Auto-Fill IP Table” button is used to apply the MEB3’s E1 IP Address matching the 4th octet to the entry’s index.



I/O Scanner

The MEB3 includes a Modbus/TCP I/O Scanner. This scanner allows automatic Read, Write, and Read+Write time based messages to be generated between the MEB3 and up to 128 Modbus TCP servers. I/O Scanner Read and Write Master Address operates on the Mailbox registers (1-2048) in the MEB3's internal registers. The Modbus Plus Proxy Mode determines the operation of the I/O Scanner.

- If the Modbus Plus Mode is set to MEBII then the I/O Scanner will send Reads and Writes as long as it is enabled.
- If the Modbus Plus Mode is set to PROXY then the I/O Scanner Reads and Writes will only operate when the Target PLC is connected and the PLC is in RUN.

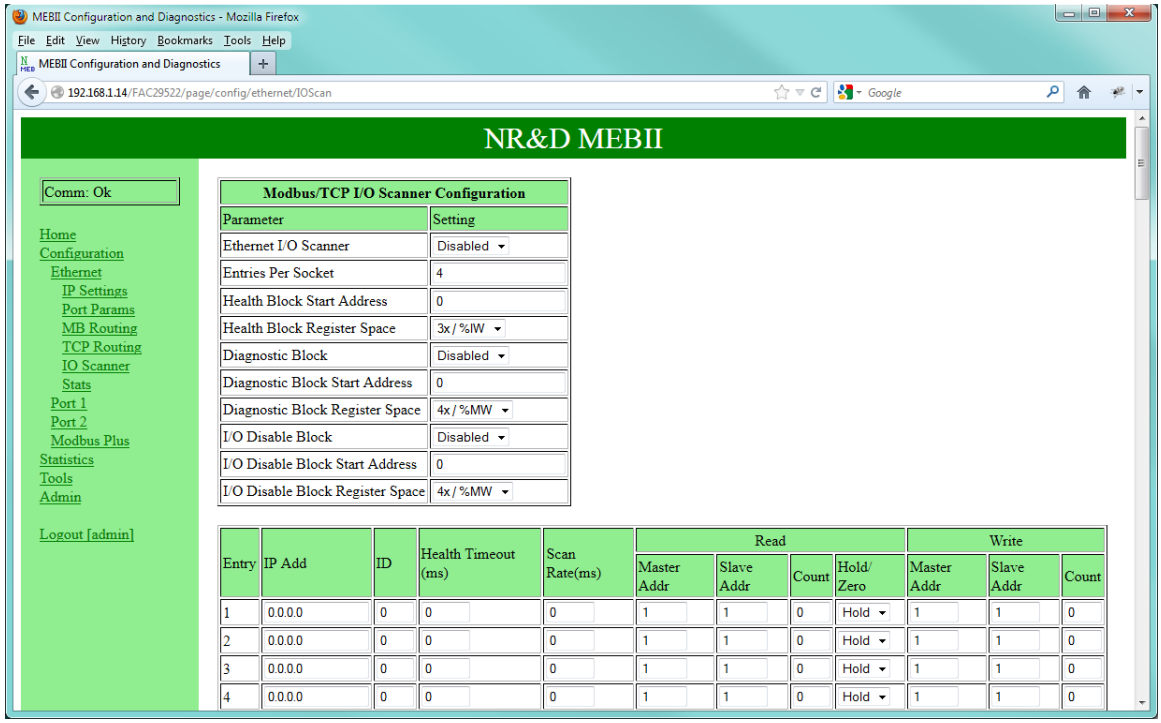
Entries Per Socket

The “Entries Per Socket” defines the number of entries targeting the same IP Address that are multi-threaded on a single socket. For example if 6 entries are targeting the same remote IP Address and the “Entries Per Socket” is set to 4 then two sockets will be opened to the remote target.

Health Block

The “Health Block Start Address” sets the MEB3 mailbox register where the 8 words of health bits for the I/O Scanner starts. A Start Address = 0 disables the health block. Each entry in the I/O Scanner has a health bit in these 8 words. Entry 1’s health bit will be the Most Significant bit of the first word of the health block. Entry 128’s health bit will be the Least Significant bit of the eighth word of the health block.

The “Health Block Register Space” is ignored. The Start Address is always in the 4x Mailbox Registers.



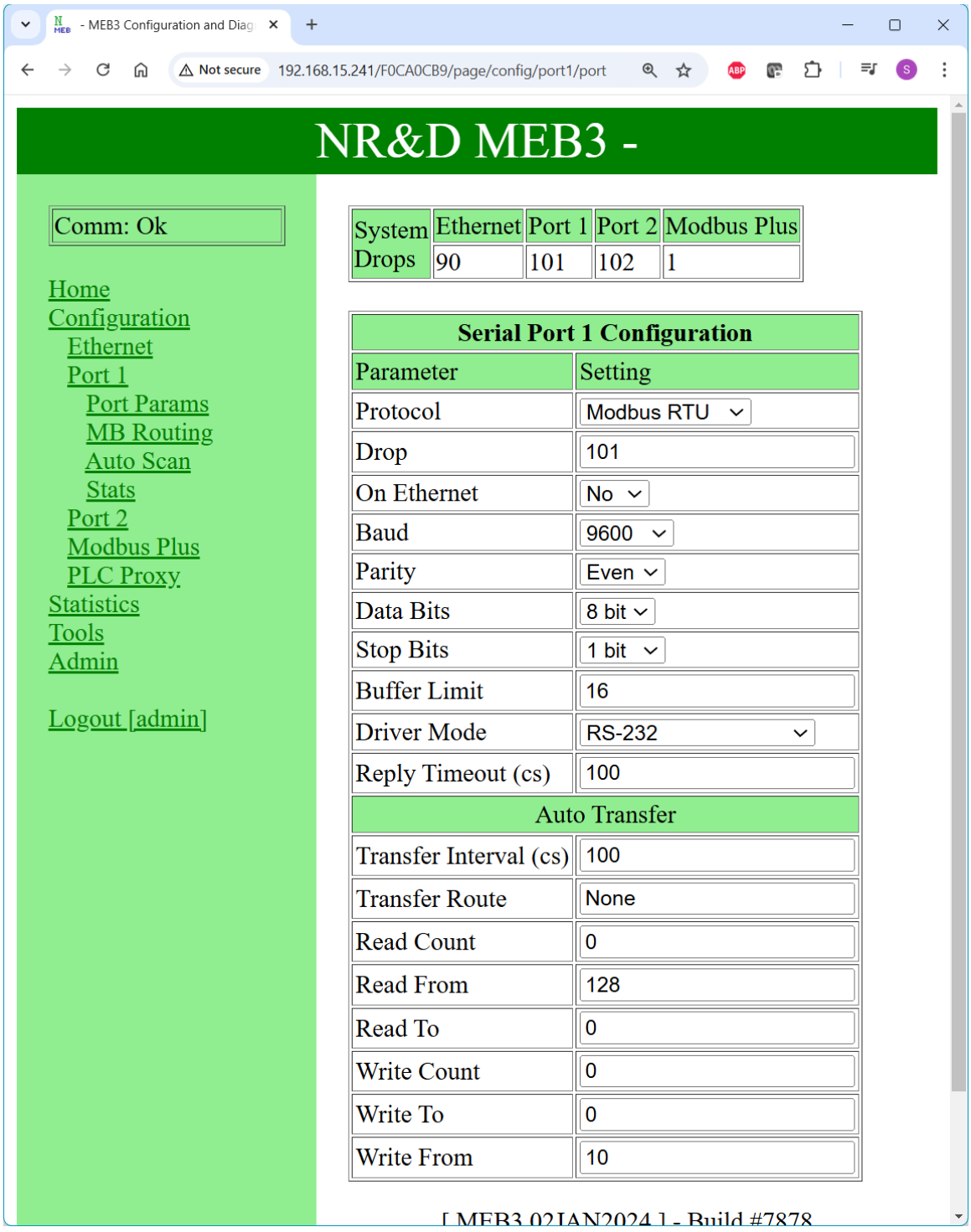
I/O Disable Block

The “I/O Disable Block” is an optional 8 word block with one bit per entry that allows an individual entry to be disabled when set. The Start Address is the Maibox 4x register in the MEB3. The Register Space setting is ignored.

Serial Ports

Port Parameters

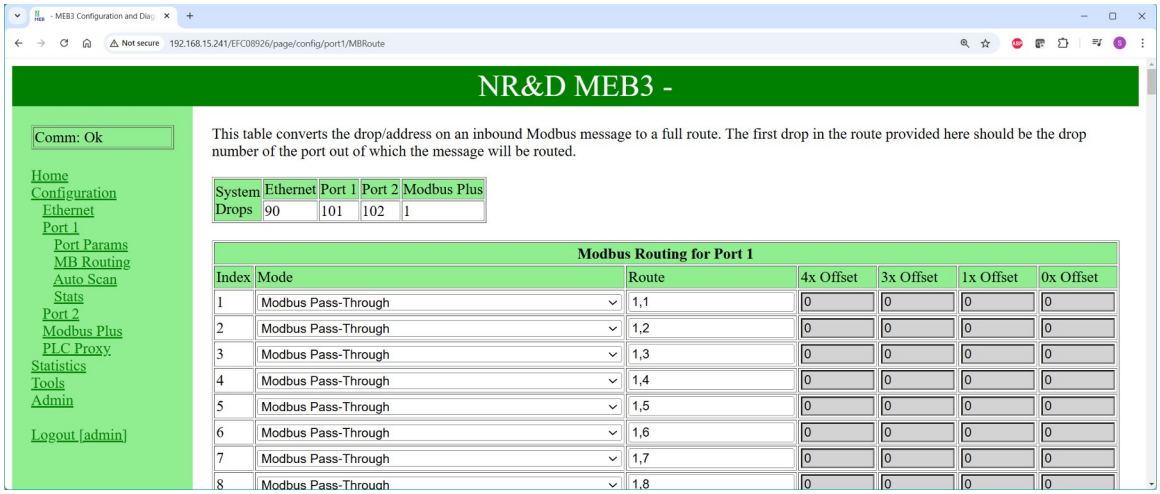
The Port Parameters page will show the settings for a given serial port. Various protocol modes have different settings that may be displayed. Changing the protocol mode will prompt the “Admin” to “Apply typical settings” for the new mode. Selecting “OK” will change many of the settings to match the normal usage of the new mode.



Serial Port Modbus Routing Table

Each serial port includes its own 253 entry look-up table for Modbus Slave operation.

The first drop in the Route field is the drop number of the outbound MEB3 port. Just like the Ethernet port, this table supports Mode will protocol changes and offsets.

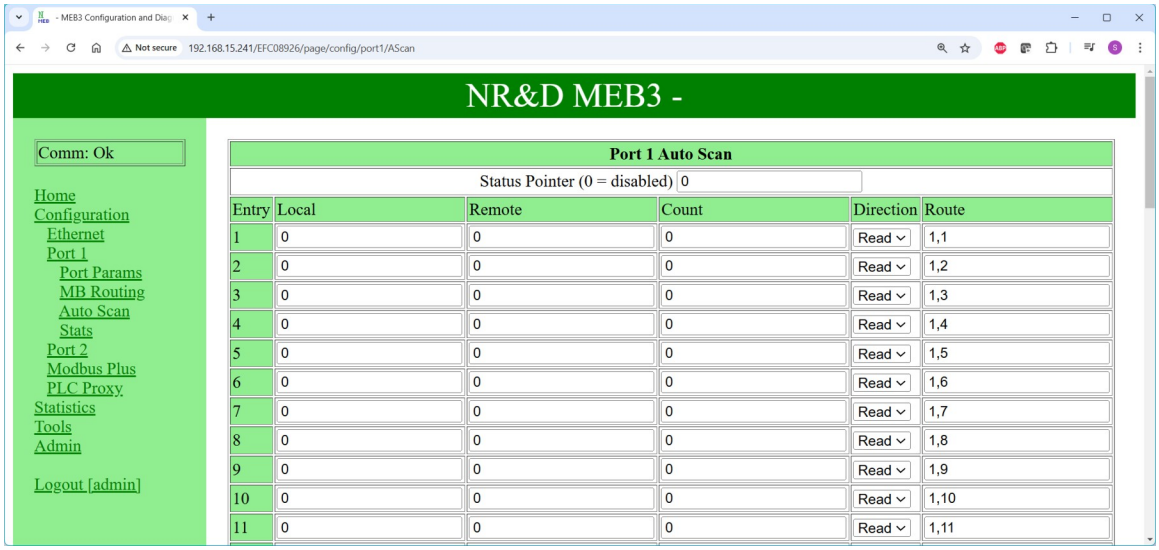


Serial Port Auto Scan

Each serial port may be configured to automatically poll attached slave(s) on a timed interval. This table provides the configuration for each of the 48 possible entries.

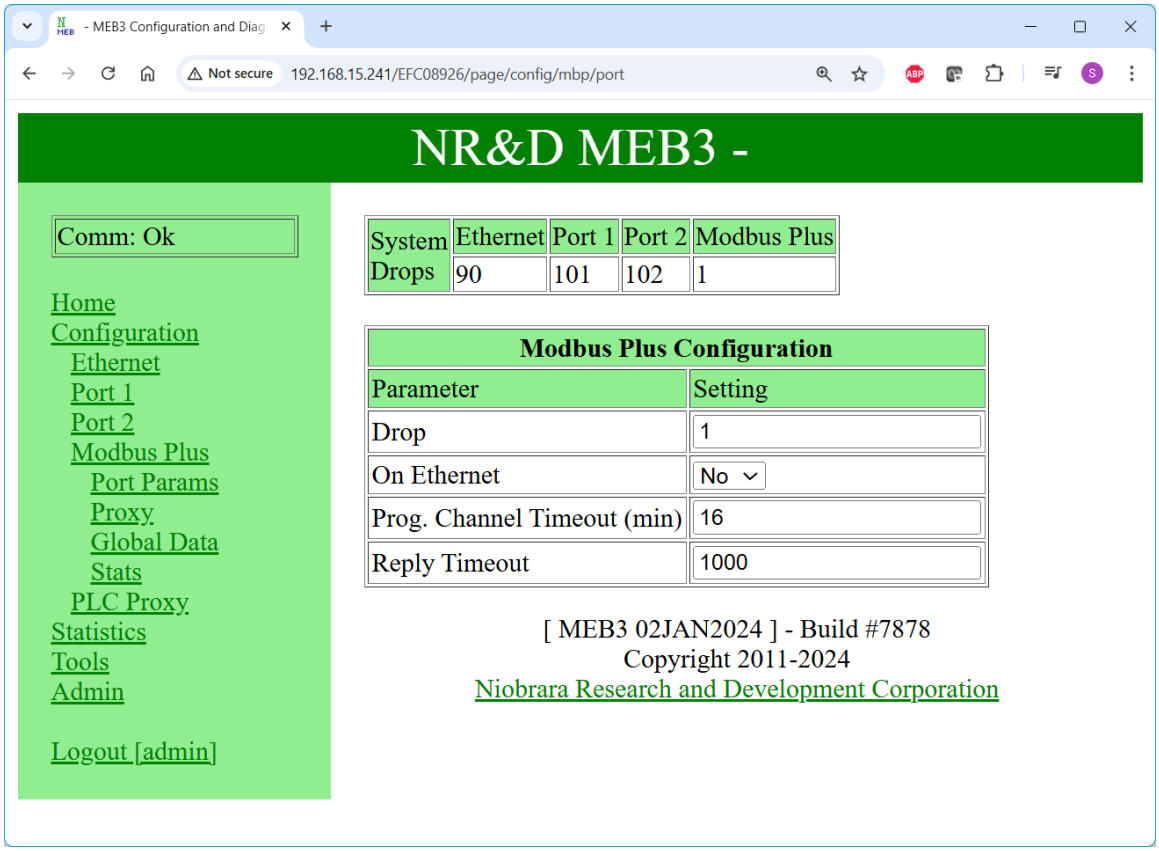
NOTE: The Auto Scan Table for port 2 is disabled when the MEB3 is in Hot Modbus Plus operation.

NOTE: Port 2 Auto Scan may be used to generate read/write messages onto MB+ by entering the MB+ port drop number as the first entry in the Route field.



Modbus Plus Port Parameters

The MB+ port settings may be altered on this page.



Drop

The "Drop" number for the Modbus Plus port is restricted to be in the range of 1 through 64 inclusive and must not match any other node number on the local Modbus Plus network. This drop number must not match the drop number of either serial port or Ethernet port within the MEB3.

On Ethernet

The "On Ethernet" setting may be used when the Ethernet port is set for "Modbus/TCP & SY/ENET". With this setting set to "YES" the MB+ port becomes a virtual SY/ENET node.

Prog. Channel Timeout

The "Prog. Channel Timeout" is the number of minutes that the MEB3 will leave an idle 984 Programming Channel open. This setting does not apply to Control Expert (Unity) programming as Unity uses Data channels and not Programming channels.

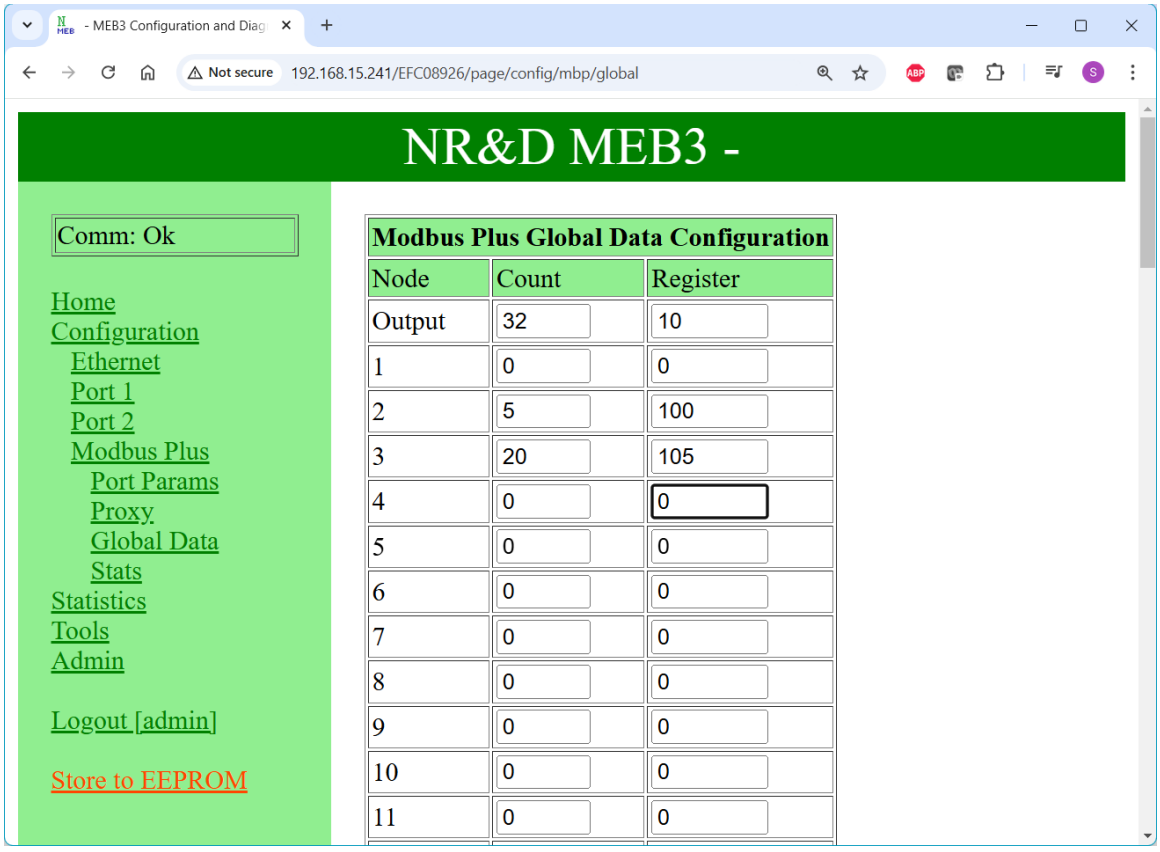
Reply Timeout

The “Reply Timeout” setting is in cS units. The default of 1000 equates to 10.00 seconds.

Modbus Plus Global Data (MEBII Mode)

The MEB3 may be configured to publish up to 32 words of data from its mailbox registers (Holding Registers 1-2048) as port of MB+ Global Data when the port is in MEBII mode. It may also be configured to subscribe to the Global Data outputs of each of the other 63 nodes on the MB+ network. The subscription data will be placed in the mailbox registers of the MEB3.

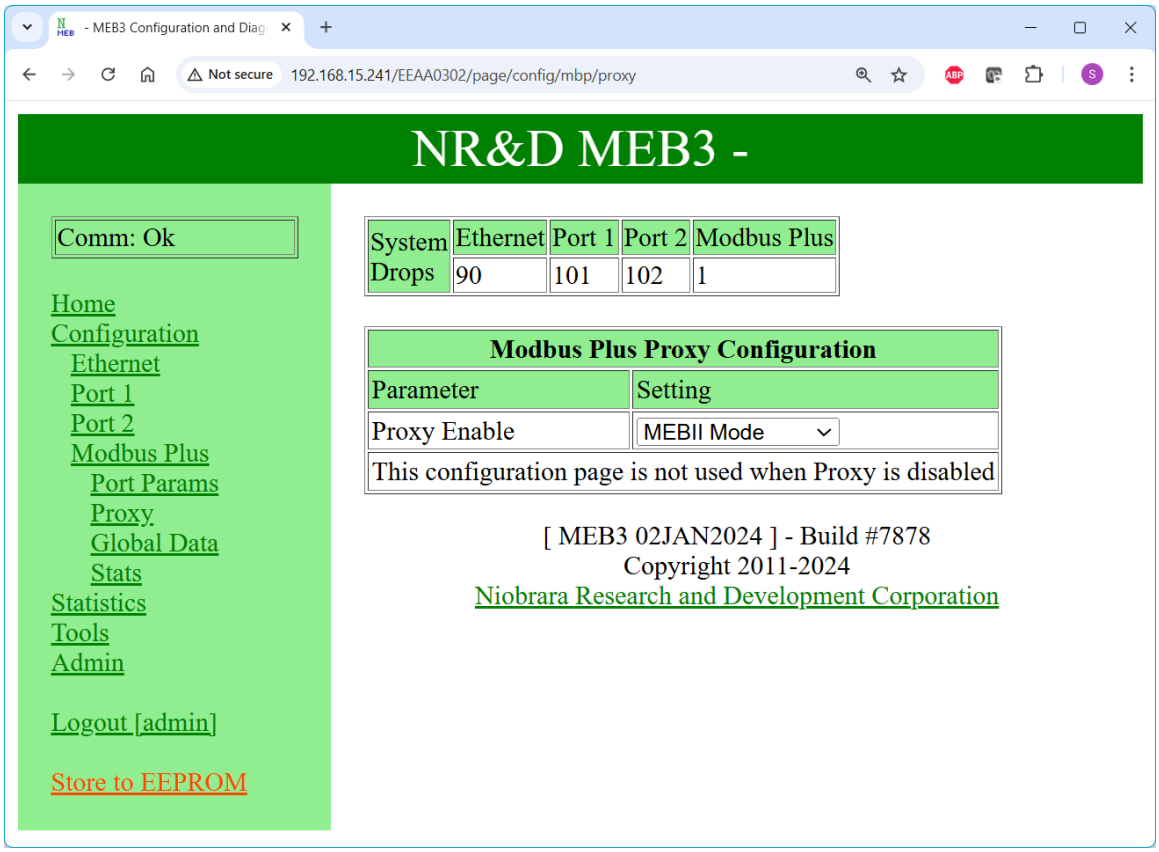
NOTE: Hot Modbus Plus operation uses the Global Data output and is thus not available for customer use while in MEBII mode.



Proxy

MEBII Mode

The factory default setting for the Modbus Plus port is MEBII Mode. In this mode, Peer Cop is disabled and routing from Modbus Plus masters is done with the MEBII requirement of the drop number following the MB+ port to be in the range of 1-8.



PLC Proxy Mode

Proxy mode enabled turns on Peer Cop (Global Data and Specific Data), provides tunneled Modbus Plus data to the Target PLC, and full drop routing from Modbus Plus.

Proxy Config

Note: The "Proxy Run" must be set to "Config" to edit any of the Proxy settings including Global Data, Specific In, and Specific Out.

Proxy Enable

Two options for Proxy Enable are "MEBII Mode" and "PLC Proxy Mode". Setting to PLC Proxy Mode enables the "PLC Proxy" menu tree.

Proxy Run

- "Config" stops all Proxy Modbus Plus outputs (Global Data and Specific Output).
- "Config" allows editing of all Proxy settings.
- Modbus Plus traffic routed to the MEB3's drop is routed to the Dest IP target in both "Config" and "Run" modes.
- "Run" enables Global Data Outputs and Specific Outputs.
- "Run" enables writing of the PLC Status Block and TICK.

Routing Mode

"Direct to Modbus/TCP" routes incoming Modbus Plus messages that terminate in the MEB3's drop number to the target PLC on Modbus/TCP Ethernet at "Dest IP" using "Index". All Peer Cop read and write messages use this connection. Writing of the PLC Status Block and TICK use this connection as well as the UMAS query to determine RUN/STOP status of the target PLC.

"Route" allows the user to define a full 8 drop route to point to the target PLC using networks other than Ethernet. For example, the target PLC could be connected to one fo the serial ports of the MEB3. This feature would rarely be used but would be selected by clicking on the "Enable Routing Mode" button at the bottom of the web page.

Dest IP

The "Dest IP" setting is the IP Address of the target PLC. This value is shown when "Direct to Modbus/TCP" Routing is selected. This must be a hard-coded IPv4 address.

Index

The "Index" setting is the Modbus/TCP destination index for the target PLC. Normally this would be set to 0 or 255 if the target is the CPU's Ethernet port or NOC. Valid values are 0-255. This value is shown when "Direct to Modbus/TCP" Routing is selected.

Route

The "Route" setting is the comma separated route to the target PLC when "Route" Routing mode is selected. The route may be up to 8 drops.

PLC Status Timeout (ms)

This value sets the time limit for a response for the UMAS PLC Status query generated by the MEB3 to the target PLC. This query determines if the target PLC is in RUN/STOP. The default value is 500mS.

Inputs Timeout (ms)

This value sets the time limit for a valid update via Modbus Plus for Global Data Inputs or Specific Data Inputs. If the particular input is not updated before this timer expires then the "Comms Loss Action" is applied and the status bit for that input is cleared. The default value is 1000mS.

Comms Loss Action

When set to "Zero", the MEB3 will zero Global Data Inputs and Specific Data Inputs that are offline. "Hold Last Value" means that the data will not be changed. The default is "Hold Last Value".

Status Block

The status block is a group of 12 16-bit integers that provide a bit-map of the online status of the Global Inputs, Specific Outputs, and Specific Inputs. Bit 0 of word 0 is the status of Global Input for Node 1. A bit value of 1 indicates that the Node data is healthy. The status block is disabled by default.

Table 13.1: Status Block

Group	Word	Bit-to-Network Node Relationship															
Global Input	0	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	1	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	2	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	3	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Specific Output	4	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	5	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	6	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	7	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Specific Input	8	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	9	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	10	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	11	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

PLC Status Block Addresses

This setting locates the %MW address for the beginning of the 12 word Health Status

Block written by the MEB3 to the target PLC.

Status Freshness TICK

The MEB3 can write to the target PLC a word of status about the MEB3 itself. This data is split into two bytes. The Most Significant Byte of the data is the state of the Modbus Plus network while the Least Significant Byte is an 8-bit counter that increments with each write of the data to the target PLC. This counter may be used as a watchdog by the PLC to ensure that the connection from the MEB3 is active.

Table 13.2: TICK Description

	MSB	LSB	Example Value (Dec)	Example Value (Hex)
Meaning	MB+ State 0=Monitor 1=Normal 2=No Token 3=Sole Station 4=Duplicate Drop 5=Reset	Counter 0-255 (0-xFF)		
Duplicate Drop, Count = 123	4	123 (x7B)	1147	x047B
Normal, Count = 124	1	124 (x7C)	380	x017C
Monitor, Count = 255	0	255 (xFF)	255	x00FF
Sole Station, Count = 0	3	0 (x00)	768	x0300
Reset, Count = 1	5	1 (x01)	1281	x0501

TICK Location

The TICK work may be “Attached to Status Struct” as the 13th word of the block or it may be “Separately Located”. It is recommended that TICK be attached to the Health Block Structure if possible to minimize the number of messages to be written to the target PLC.

PLC TICK Address

If the TICK word is “Separately Located” then this is the %MW address for the TICK word to be written in the target PLC.

Offset PLC Address

The MEB3 may be configured to alter read and write messages arriving from Modbus Plus sent to the target PLC. This may be useful when replacing a 1-based PLC (Quantum or Compact 984) with a 0-based PLC (M340 or M580).

The following example shows the Mapping for replacing a Schneider Electric Proxy with Legacy Compatibility Offset Enabled. 3x reads are remapped to 4x reads offset by 2049

and 1x reads are remapped to 0x coils offset by 2049.

Offset PLC addresses	Enabled

Proxy Register Mapping	
Parameter	Setting
Offset 4x/%MW	1
Offset 3x/%IW	2049
Offset 1x%I	2049
Offset 0x/%M	1
3x/%IW requests	Remap to 4x/%MW
1x/%I requests	Remap to 0x/%I

Enable Routing Mode or Enable IP Direct Mode

This button toggles the Routing Mode between Routing and IP Direct.

Global Data

The Global Data page of the Proxy Settings is used to configure both Global Data Output (Publish) and Global Data Input (Subscribe). These settings may only be modified while the Proxy is set for "Config".

Global Data Out

As part of the Peer Cop operation, the MEB3 may read a block of up to 32 words of data from the target PLC and publish this data as Global Data on Modbus Plus. This data may be subscribed by any other node on the local Modbus Plus network. Global Data does not pass through Bridge Plus routers.

- The target PLC source may be %MW or %M located variables.
- The length of day may be set from 0 (disabled) to 32 words.
- If the source is %MW then the data may be published as straight binary (BIN) or BCD. The MEB3 automatically converts the binary source data into BCD before publishing onto Modbus Plus.
- This data is published onto Modbus Plus as long as the MEB3 is actively communicating with the target PLC and the target PLC is in RUN.

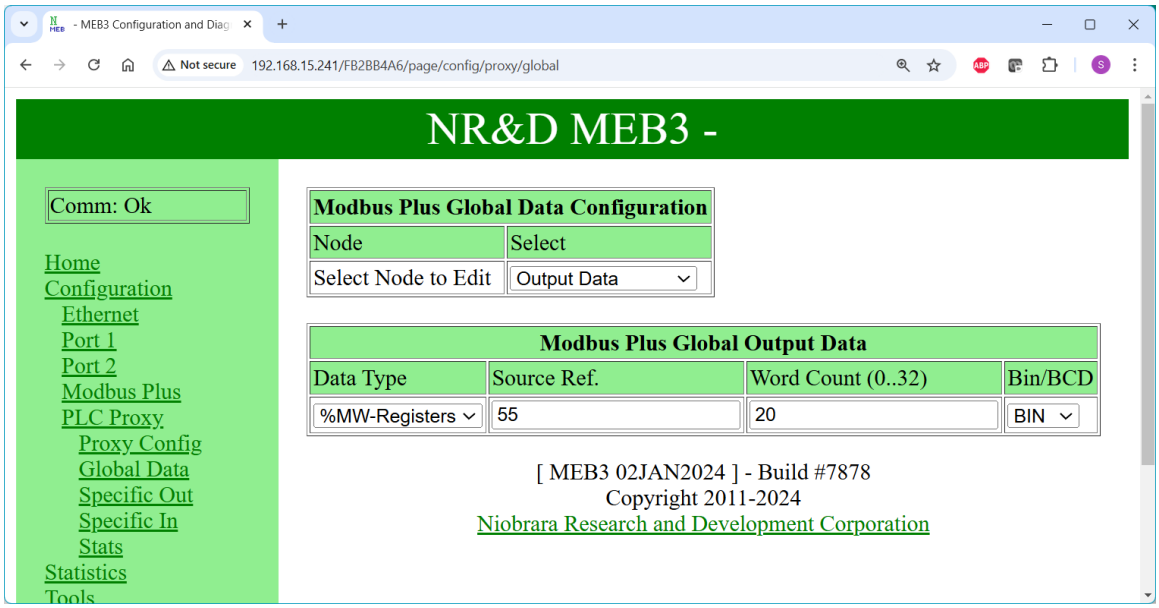


Figure 13.10: Global Data Out

Global Data In

The MEB3 may be configured to subscribe to Global Data published by any of the possible 63 other Modbus Plus nodes on the local network. Each node on the network may publish up to 32 words of Global Data Output. The MEB3 has the ability to extract all or part of the Global Data Output from specific nodes and write that data into the target PLC.

- Dest Ref is the %MW (or %M) starting address in the target PLC.
- Index is the word offset within the block of published Global Data. This setting may be from 1 to the number of words actually published by the remote node. The maximum value is 32.
- Word Count is the number of 16-bit words for the subfield. 0 = disabled.
- Bin/BCD is used only for %MW and if set to BCD, the MEB3 converts the BCD value from the Global Data input to binary before writing to the target PLC.

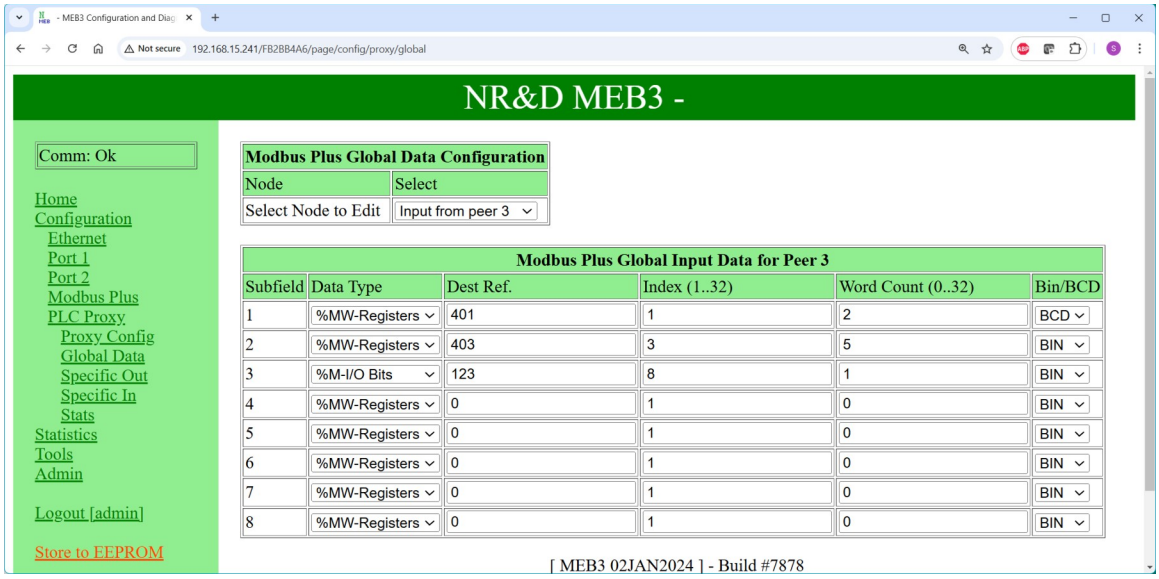


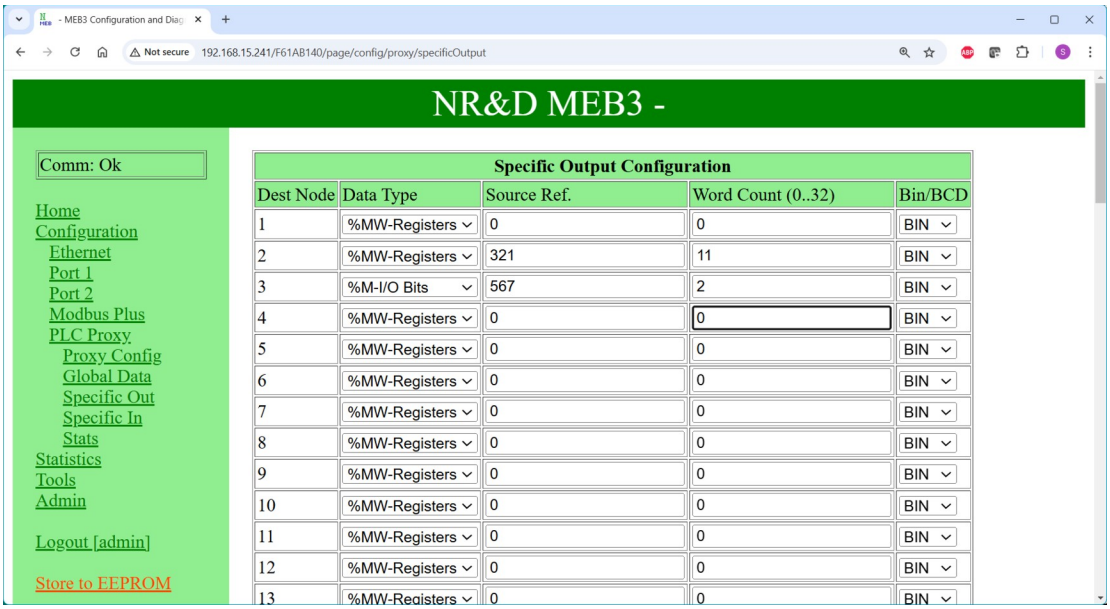
Figure 13.11: Global Data In

NOTE: Although each node supports up to 8 subfields of data extraction, keep in mind that each subfield may result in a separate Modbus/TCP write from the MEB3 to the target PLC. This multiple subfield configuration made sense on a Quantum PLC where the CPU MB+ (or NOM) could do direct memory writes at the end of the scan. This is terribly inefficient when the MEB3 must do multiple Modbus/TCP writes. A better solution is to do a single subfield of all of the Global Data for a given node and use PLC code to move subfields within its own memory.

Specific Out

The MEB3 in Proxy mode may publish up to 500 words of data as Specific Outputs onto Modbus Plus. Each node on the local Modbus Plus network may be a possible target for Specific Outputs.

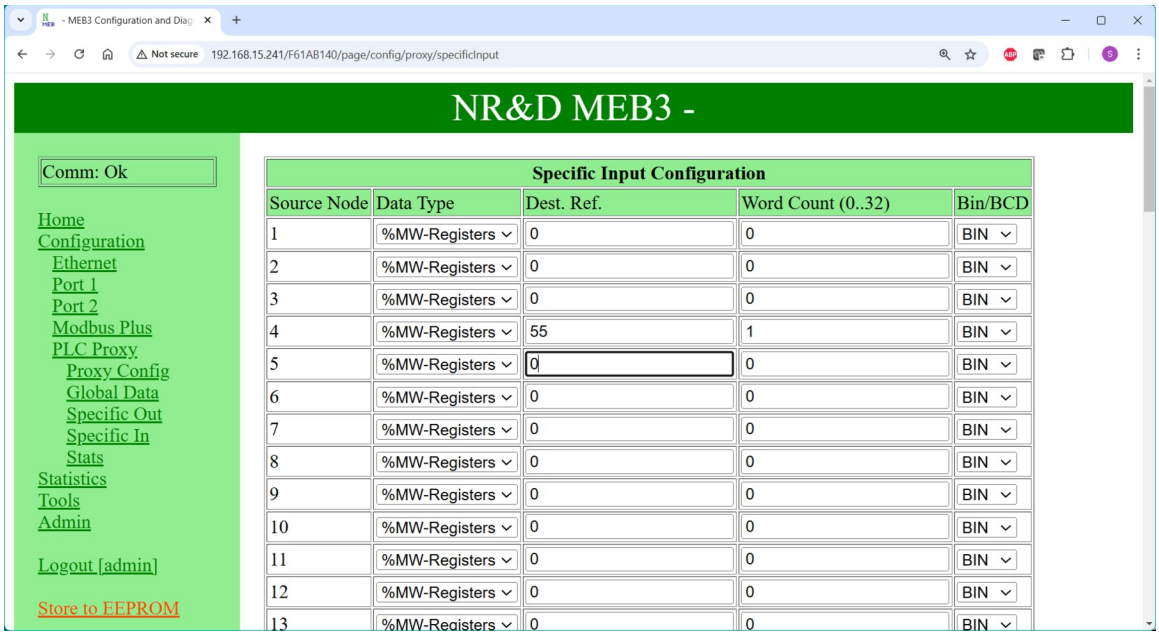
- The table includes a row for each Destination Node.
- The source Data Type may be %MW or %M in the source PLC.
- The Source Ref. Is the %MW or %M starting address in the PLC. %M starting address are not restricted to 16-bit boundaries.
- The maximum number of words for each target node32 is 32.
- If the Source Ref is %MW then the MEB3 may do a BIN/BCD conversion automatically.



Specific In

The MEB3 in Proxy mode may subscribe to up to 500 words of data as Specific Inputs from Modbus Plus. Each node on the local Modbus Plus network may be a possible source for Specific Inputs.

- The table includes a row for each Source Node.
- The Data Type may be %MW or %M in the target PLC.
- The Dest. Ref. Is the %MW or %M starting address in the PLC. %M starting address are not restricted to 16-bit boundaries.
- The maximum number of words from each source node is 32.
- If the Dest. Ref. is %MW then the MEB3 may do a BIN/BCD conversion automatically.



Statistics

Pages are provided for statistical counter pages for each port.

Many of these pages have “Reset Counter” buttons that allow either the “User” or “Admin” to zero the counters.

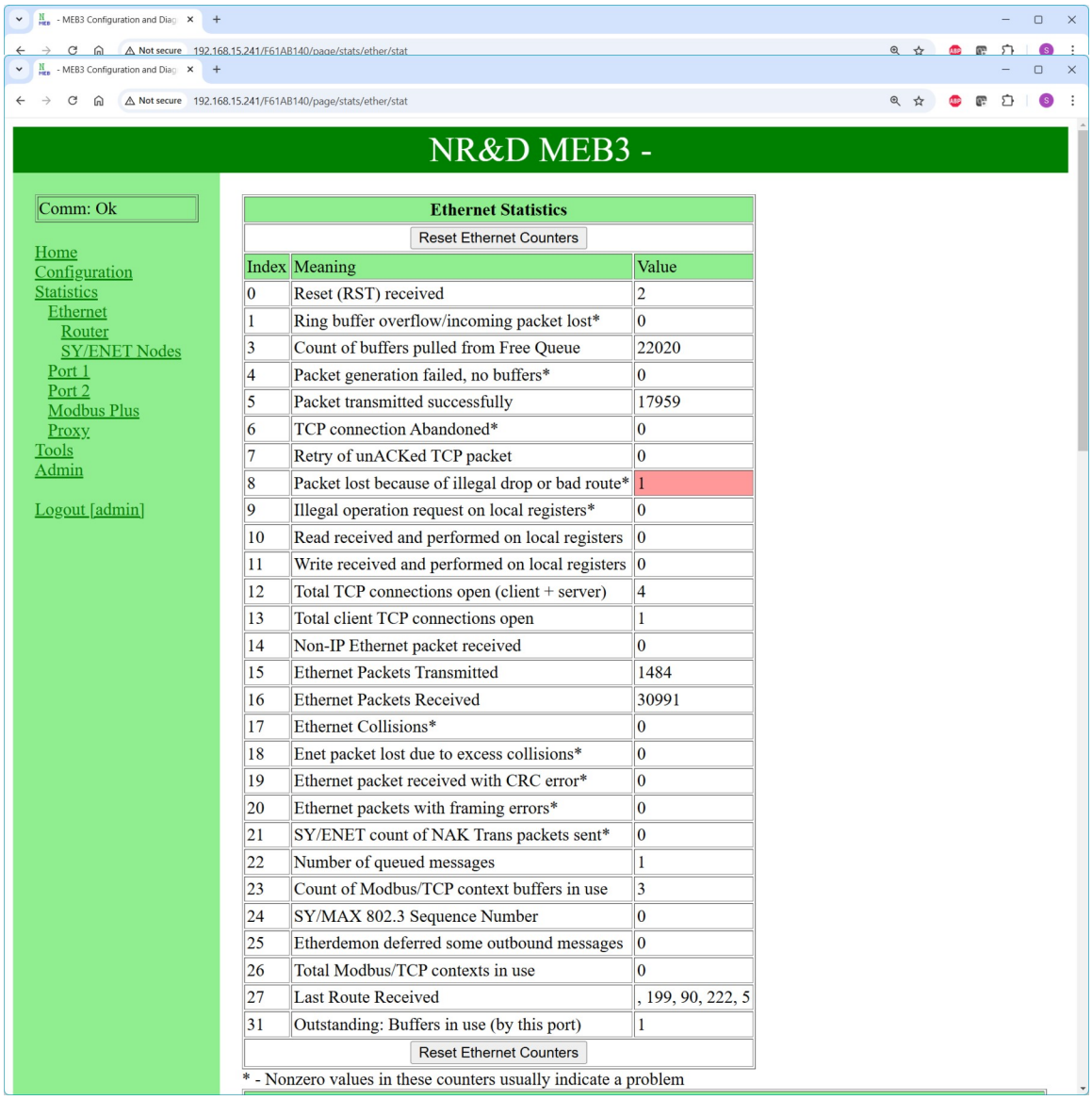
Some counters have an * which means that nonzero values in these counters usually indicate a problem. Many of these counters have their background color change from white to red when nonzero.

NOTE: These counters are typically unsigned words and will roll over from 65535 to 0 with no indication that a rollover has occurred.

NOTE: These counters do not survive a power cycle/reboot.

Ethernet Router Stats

The Ethernet Router page shows counters for the Modbus/SY/MAX router for this port. The top table shows overall counters for the port.

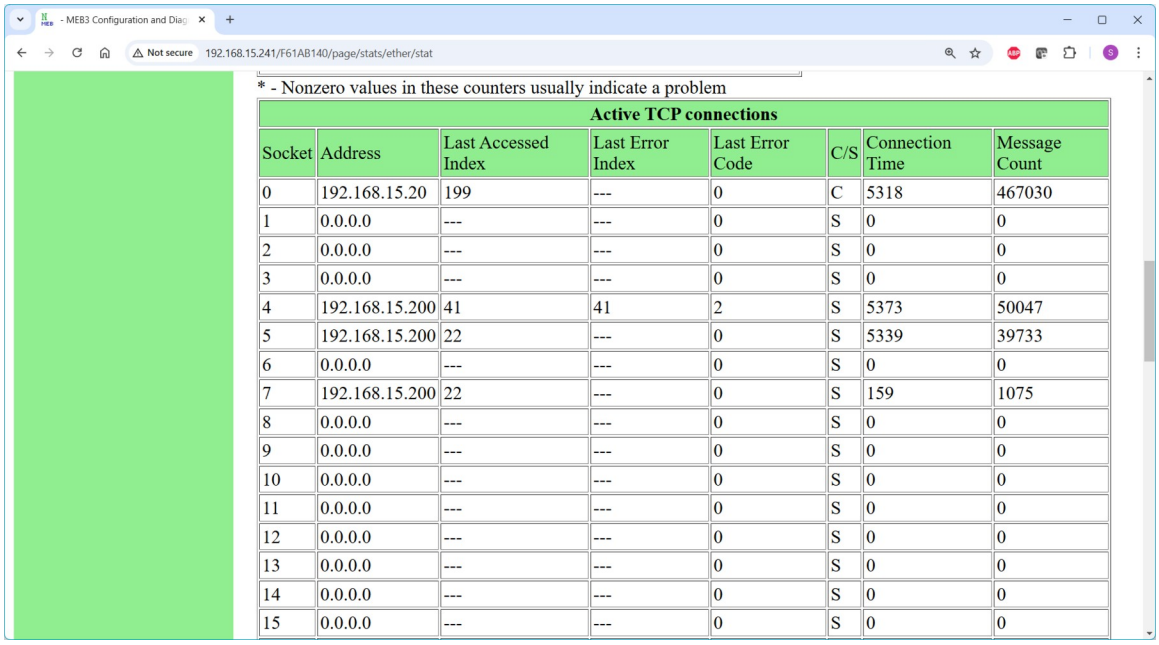


The lower table shows counters for the Modbus/TCP sockets. The MEB3 has 64 sockets for Modbus/TCP. This pool of sockets is used for both client and server connections.

- The “Address” column is the remote IP Address for the socket. A value of 0.0.0.0 indicates that the socket is not active.
- The “Last Accessed Index” shows the most recent Destination Index (Modbus

Slave) for the socket.

- The “Last Error Index” shows the Destination Index for the most recent Modbus Exception Code for the socket. “---” is displayed if no errors have yet occurred.
- The “Last Error Code” shows the most recent Modbus Exception (Error Code) for the socket. 0 is displayed if no errors have occurred.
- The C/S column shows a “C” for a client connection and “S” for server.
- “Connection Time” is the number of seconds the socket has been active.
- “Message Count” is the number of messages processed through the socket.



* - Nonzero values in these counters usually indicate a problem

Active TCP connections							
Socket	Address	Last Accessed Index	Last Error Index	Last Error Code	C/S	Connection Time	Message Count
0	192.168.15.20	199	---	0	C	5318	467030
1	0.0.0.0	---	---	0	S	0	0
2	0.0.0.0	---	---	0	S	0	0
3	0.0.0.0	---	---	0	S	0	0
4	192.168.15.200	41	41	2	S	5373	50047
5	192.168.15.200	22	---	0	S	5339	39733
6	0.0.0.0	---	---	0	S	0	0
7	192.168.15.200	22	---	0	S	159	1075
8	0.0.0.0	---	---	0	S	0	0
9	0.0.0.0	---	---	0	S	0	0
10	0.0.0.0	---	---	0	S	0	0
11	0.0.0.0	---	---	0	S	0	0
12	0.0.0.0	---	---	0	S	0	0
13	0.0.0.0	---	---	0	S	0	0
14	0.0.0.0	---	---	0	S	0	0
15	0.0.0.0	---	---	0	S	0	0

SY/MAX 802.3 Ethernet Nodes

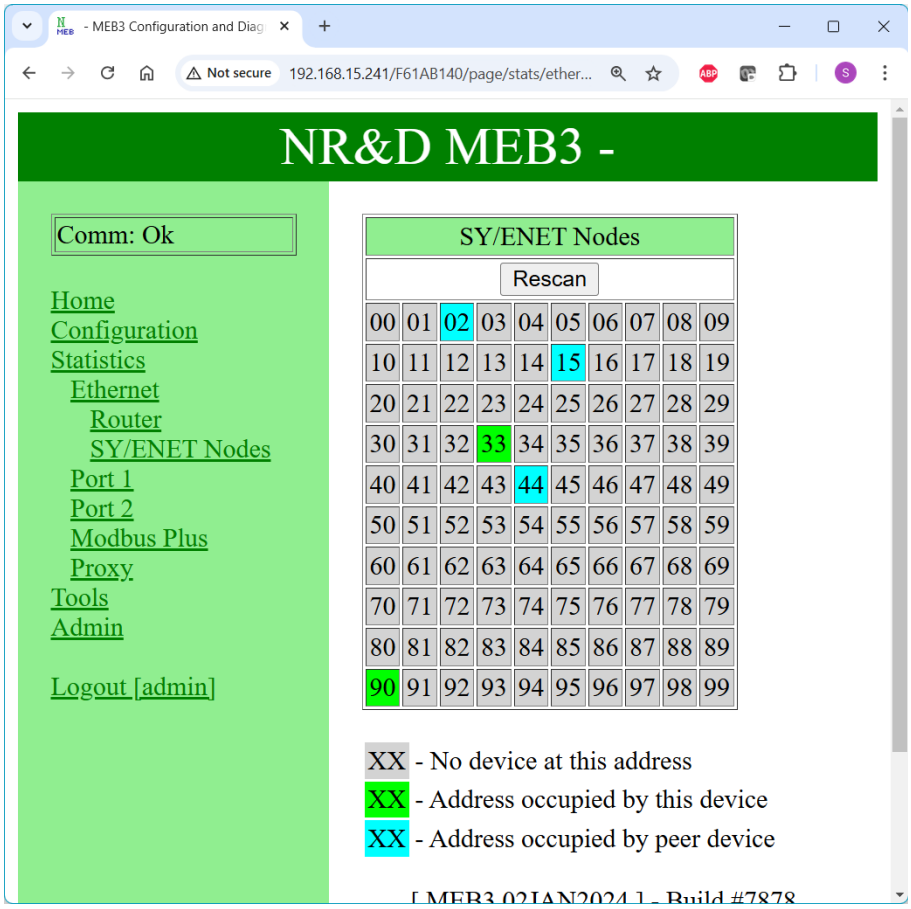
This table shows all of the visible SY/MAX Ethernet devices on the MEB3's local Ethernet network.

NOTE: The MEB3 Ethernet port must be set for SY/MAX+Modbus mode for this table to be accurate.

Any SY/MAX Ethernet drop number occupied by this MEB3 is highlighted in green. This includes any serial port or the MB+ port that is set for “ON Ethernet YES”. Serial ports that have a drop number greater than 100 and configured for “ON Ethernet YES” will also consume the SY/MAX drop number minus 100.

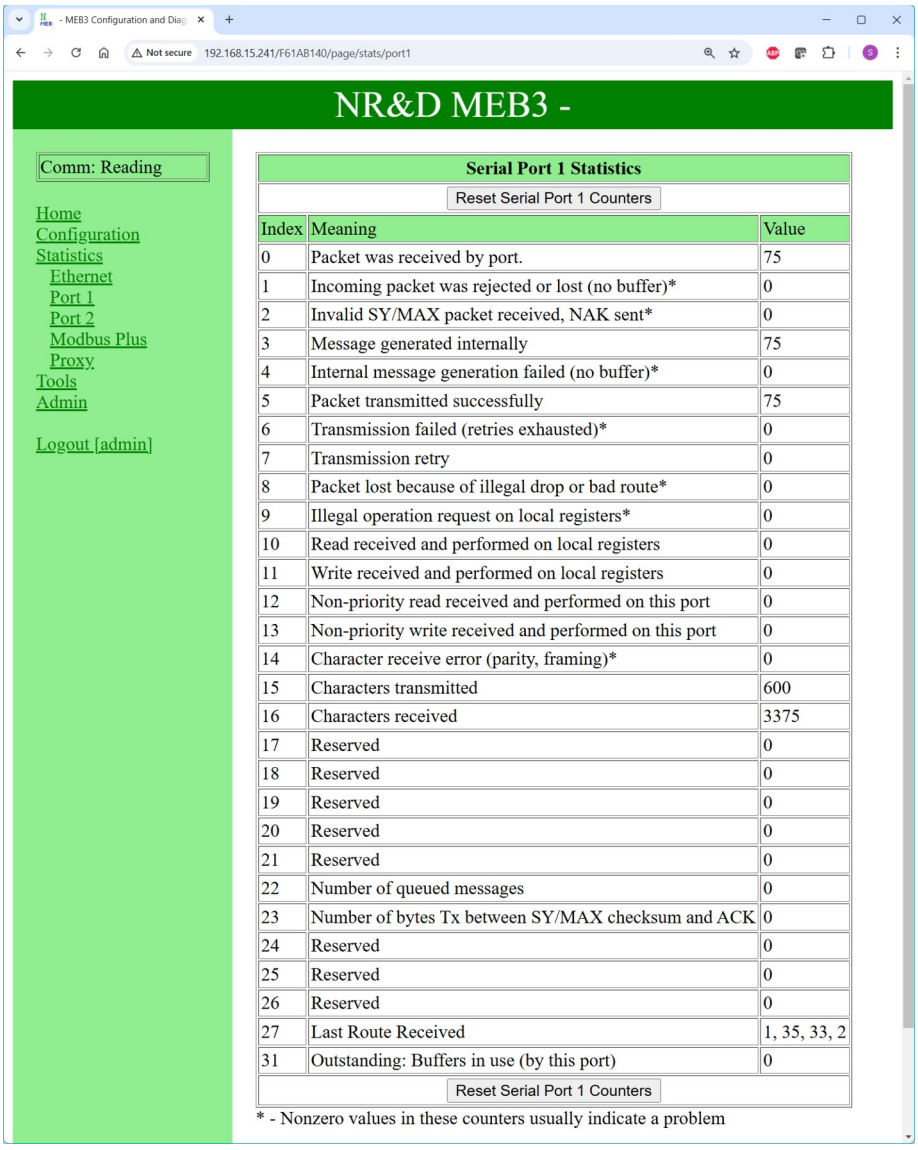
The “Rescan” button will cause the MEB3 to generate the multicast

Drop Number of peer devices are highlighted in blue.



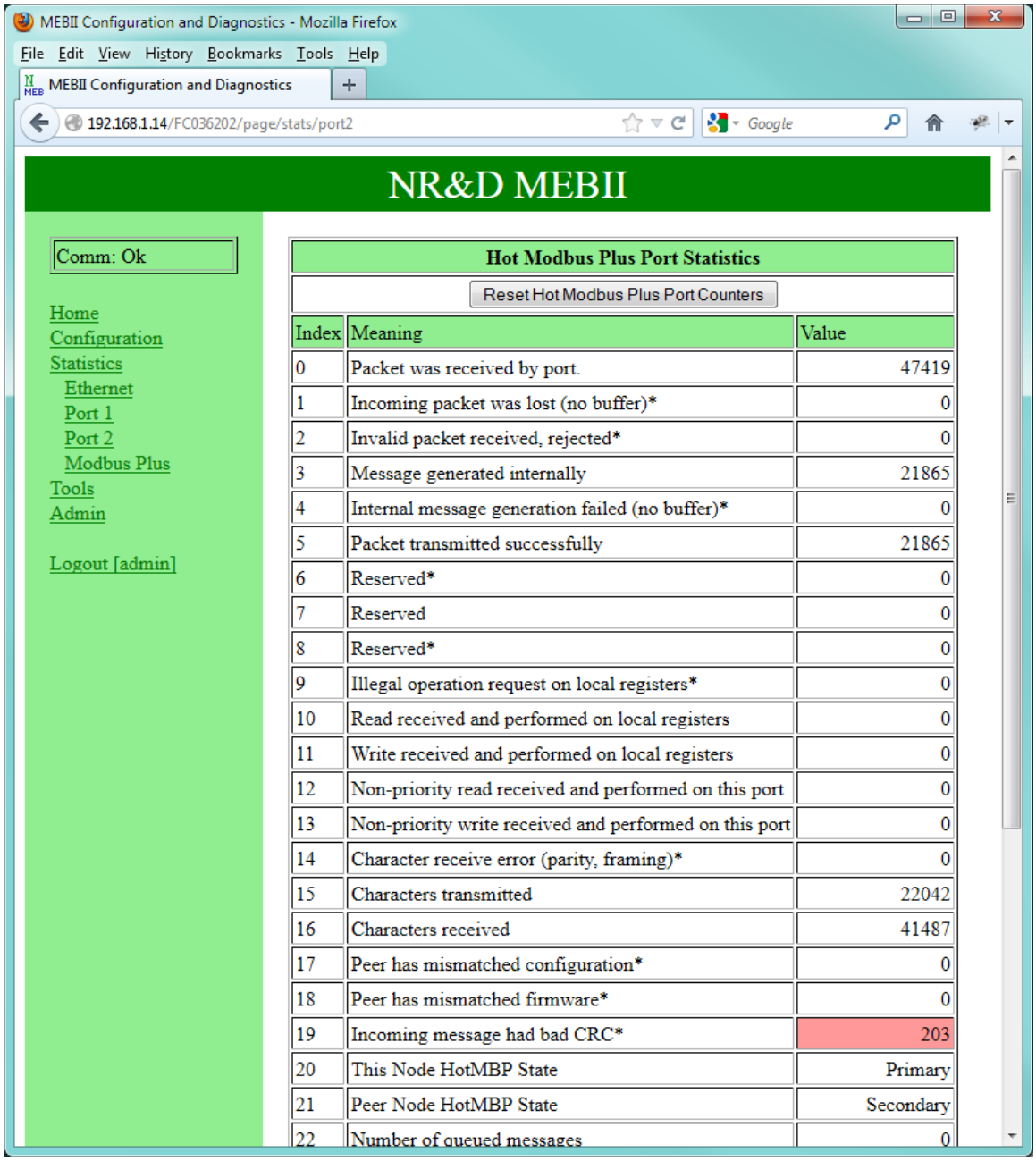
Serial Port

Serial ports 1 and 2 have counter pages to show the SY/MAX / Modbus router information associated with that port.


- MEB3 Configuration and Diag
Not secure
192.168.15.241/F61AB140/page/stats/port1
NR&D MEB3 -
Comm: Reading
Home
Configuration
Statistics
Ethernet
Port 1
Port 2
Modbus Plus
Proxy
Tools
Admin
Logout [admin]
Serial Port 1 Statistics
Reset Serial Port 1 Counters
Index | Meaning | Value
0 | Packet was received by port. | 75
1 | Incoming packet was rejected or lost (no buffer)* | 0
2 | Invalid SY/MAX packet received, NAK sent* | 0
3 | Message generated internally | 75
4 | Internal message generation failed (no buffer)* | 0
5 | Packet transmitted successfully | 75
6 | Transmission failed (retries exhausted)* | 0
7 | Transmission retry | 0
8 | Packet lost because of illegal drop or bad route* | 0
9 | Illegal operation request on local registers* | 0
10 | Read received and performed on local registers | 0
11 | Write received and performed on local registers | 0
12 | Non-priority read received and performed on this port | 0
13 | Non-priority write received and performed on this port | 0
14 | Character receive error (parity, framing)* | 0
15 | Characters transmitted | 600
16 | Characters received | 3375
17 | Reserved | 0
18 | Reserved | 0
19 | Reserved | 0
20 | Reserved | 0
21 | Reserved | 0
22 | Number of queued messages | 0
23 | Number of bytes Tx between SY/MAX checksum and ACK | 0
24 | Reserved | 0
25 | Reserved | 0
26 | Reserved | 0
27 | Last Route Received | 1, 35, 33, 2
31 | Outstanding: Buffers in use (by this port) | 0
Reset Serial Port 1 Counters
* - Nonzero values in these counters usually indicate a problem

Port 2 Hot Modbus Statistics

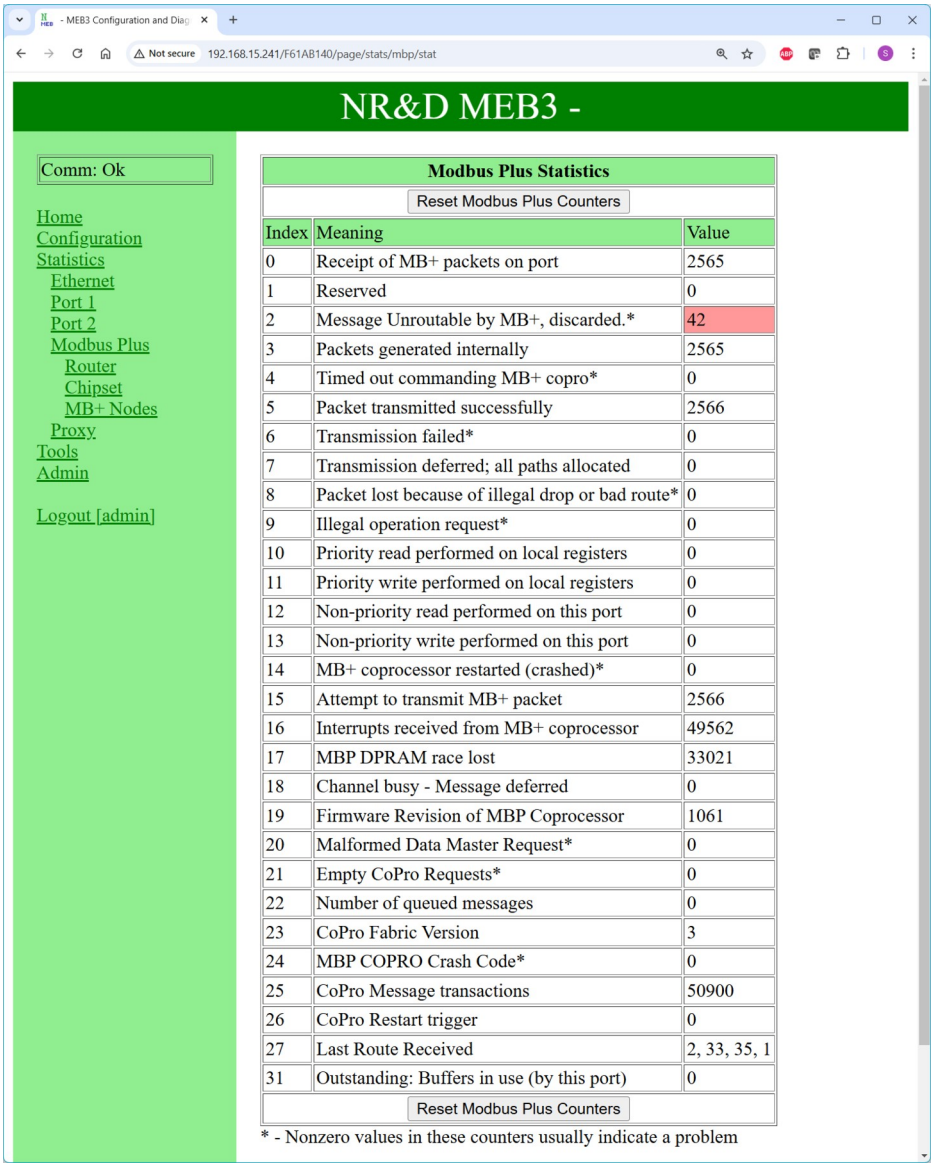
The statistics page for Port 2 is different when the MEB3 is configured for Hot Modbus Plus operation.



Index	Meaning	Value
0	Packet was received by port.	47419
1	Incoming packet was lost (no buffer)*	0
2	Invalid packet received, rejected*	0
3	Message generated internally	21865
4	Internal message generation failed (no buffer)*	0
5	Packet transmitted successfully	21865
6	Reserved*	0
7	Reserved	0
8	Reserved*	0
9	Illegal operation request on local registers*	0
10	Read received and performed on local registers	0
11	Write received and performed on local registers	0
12	Non-priority read received and performed on this port	0
13	Non-priority write received and performed on this port	0
14	Character receive error (parity, framing)*	0
15	Characters transmitted	22042
16	Characters received	41487
17	Peer has mismatched configuration*	0
18	Peer has mismatched firmware*	0
19	Incoming message had bad CRC*	203
20	This Node HotMBP State	Primary
21	Peer Node HotMBP State	Secondary
22	Number of queued messages	0

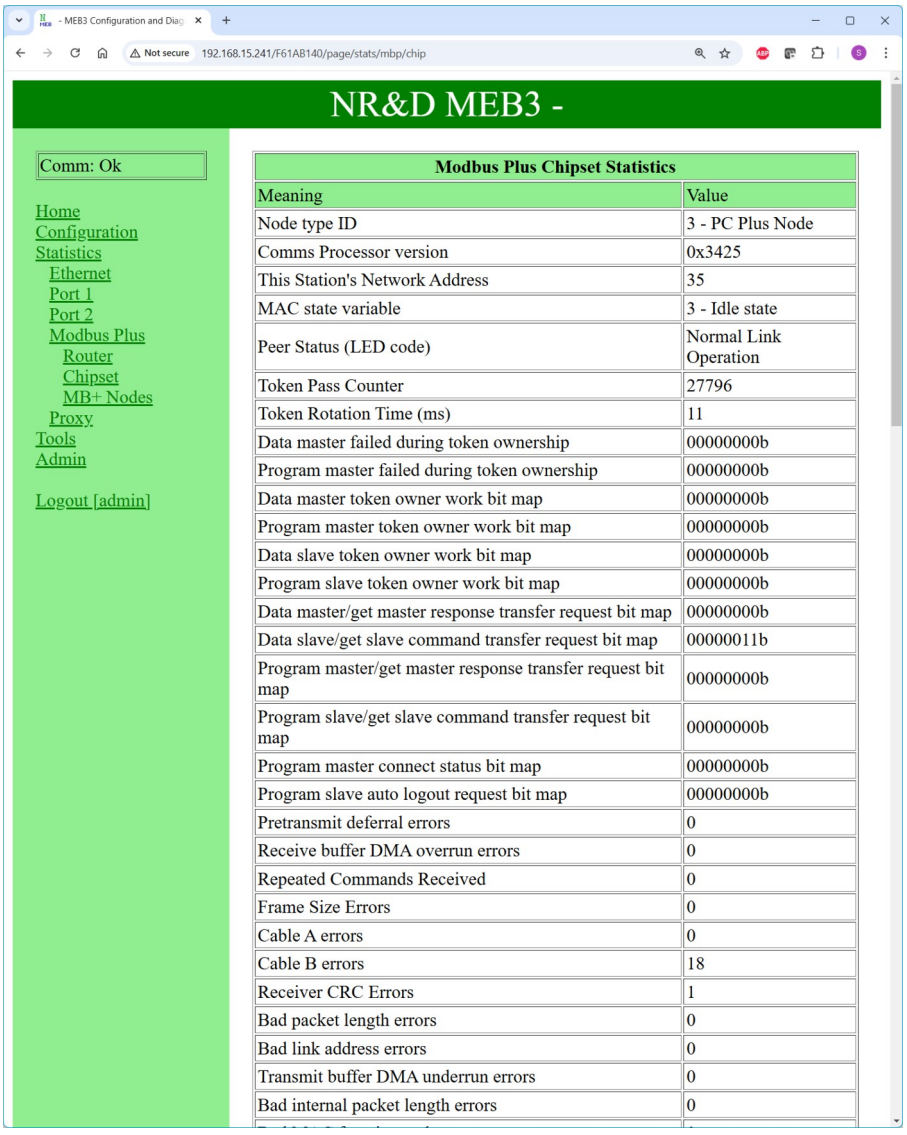
Modbus Plus Router

The Router statistics page shows the normal Modbus router counters for the MB+ port.



MB+ Chipset

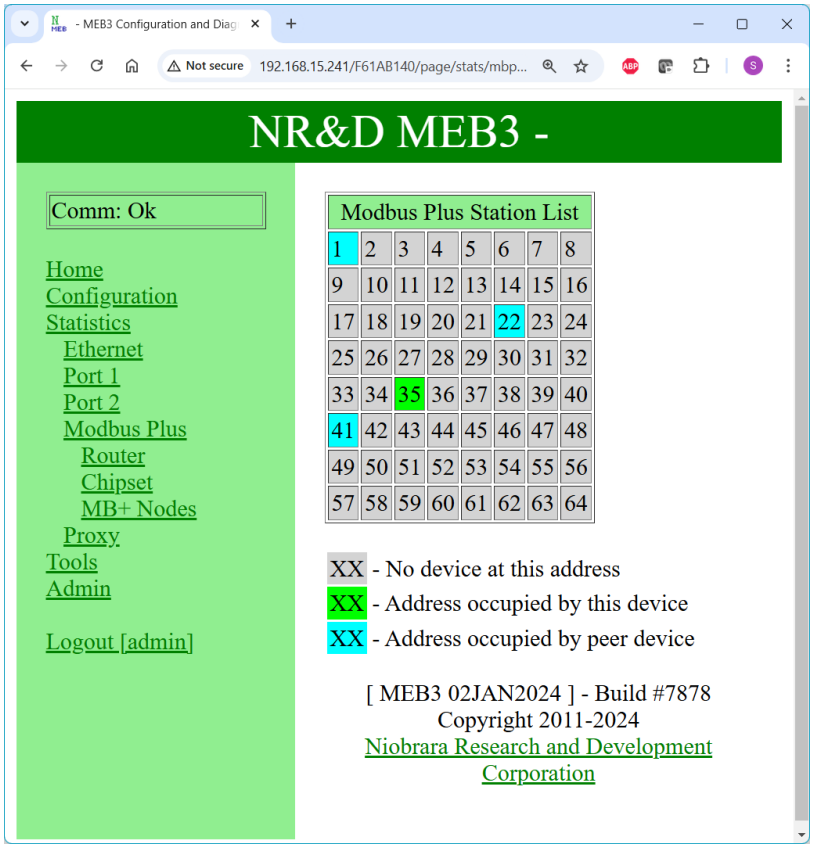
The MB+ Chipset page shows information provided by the MB+ chipset. These counters are not resettable.



Modbus Plus Chipset Statistics	
Meaning	Value
Node type ID	3 - PC Plus Node
Comms Processor version	0x3425
This Station's Network Address	35
MAC state variable	3 - Idle state
Peer Status (LED code)	Normal Link Operation
Token Pass Counter	27796
Token Rotation Time (ms)	11
Data master failed during token ownership	00000000b
Program master failed during token ownership	00000000b
Data master token owner work bit map	00000000b
Program master token owner work bit map	00000000b
Data slave token owner work bit map	00000000b
Program slave token owner work bit map	00000000b
Data master/get master response transfer request bit map	00000000b
Data slave/get slave command transfer request bit map	00000011b
Program master/get master response transfer request bit map	00000000b
Program slave/get slave command transfer request bit map	00000000b
Program master connect status bit map	00000000b
Program slave auto logout request bit map	00000000b
Pretransmit deferral errors	0
Receive buffer DMA overrun errors	0
Repeated Commands Received	0
Frame Size Errors	0
Cable A errors	0
Cable B errors	18
Receiver CRC Errors	1
Bad packet length errors	0
Bad link address errors	0
Transmit buffer DMA underrun errors	0
Bad internal packet length errors	0

Modbus Plus Nodes

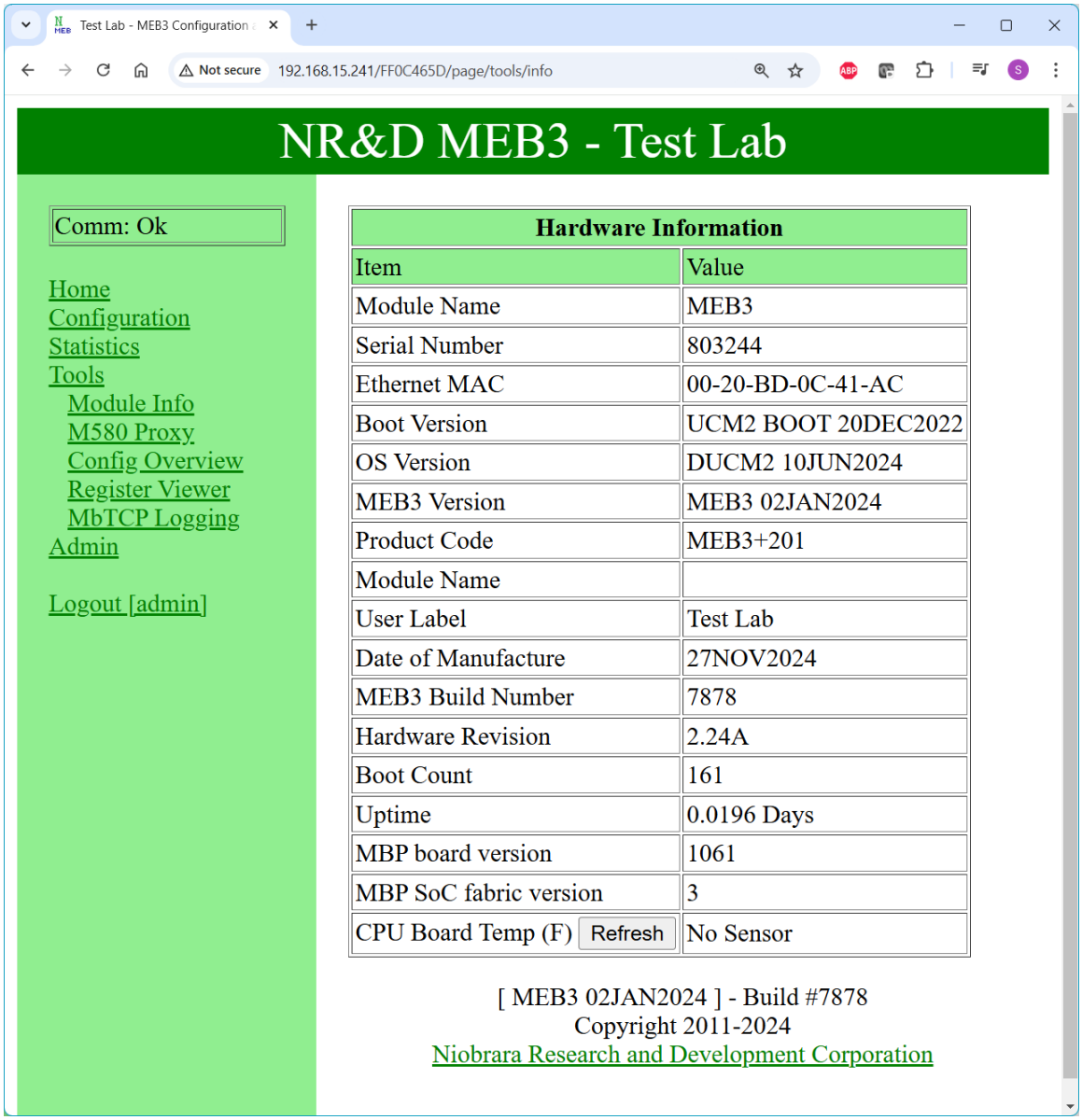
This table shows all possible 64 MB+ stations on the MEB3's local MB+ network. The MEB3's drop number is highlighted in green. All other visible nodes are highlighted in blue.



Proxy

Module Info

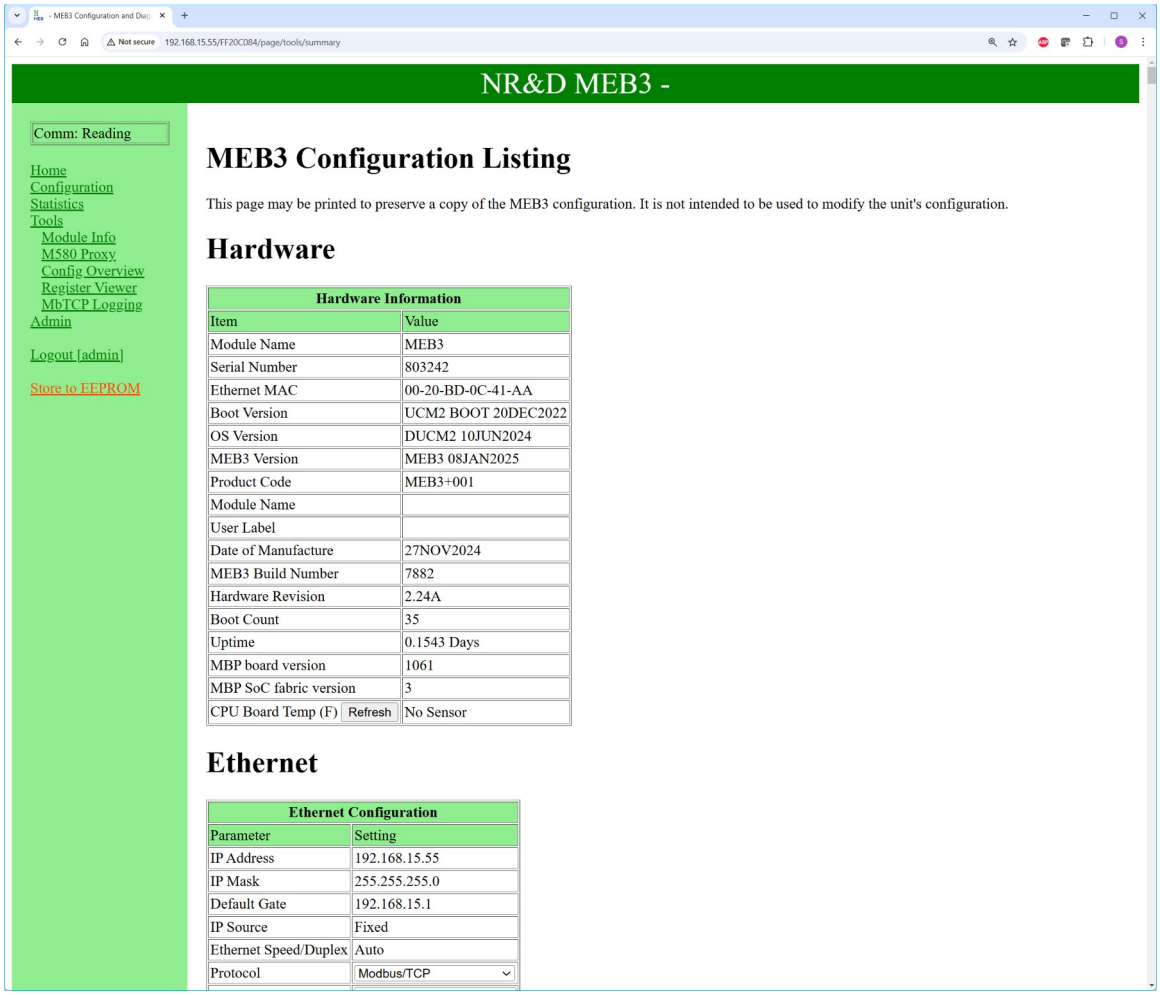
The Module Info page shows the MEB3's serial number and various firmware versions.



Config Overview

The Config Overview page provides a complete listing of all of the configuration of the MEB3. This page may be printed to provide a hard copy of the module's setup.

Note: This page takes several seconds to populate. At the end of the configuration is a text line “This is the end of the Configuration Listing.”



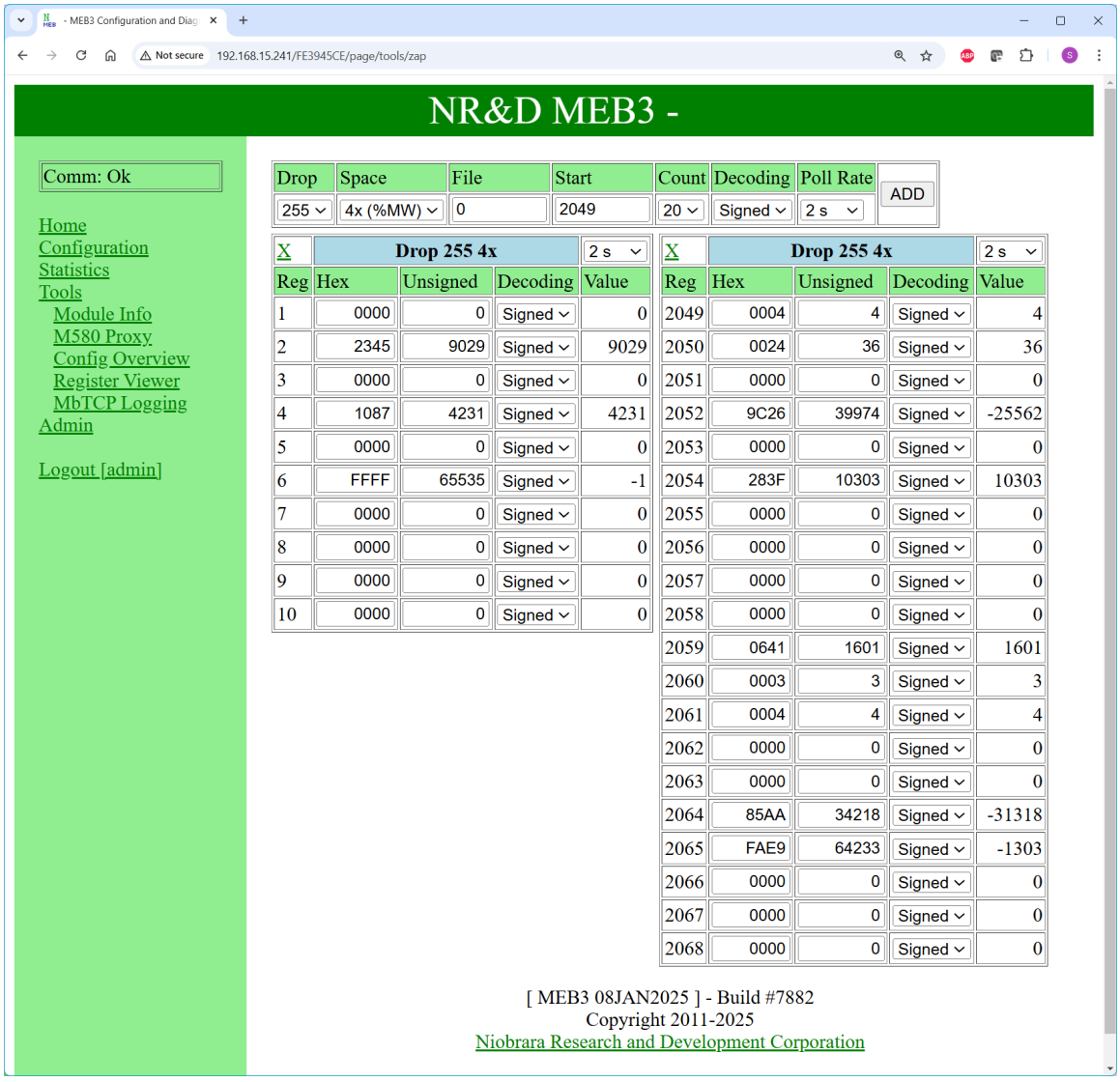
Register Viewer

The Register Viewer allows the User or Admin to view/modify register data in a target. The Target is determined using the Modbus Routing Table Index for the Ethernet Port.

NOTE: The present fimware only allows access to Modbus Index 255 (the MEB3 itself).

Access to 4x (Holding Registers) or 6x (Files) are supported.

Multiple viewing windows may be opened. Windows may be closed by clicking the “X” in the upper left corner of the window. The polling rate of each viewing window is adjustable with the pull-down in the upper corner of each window.

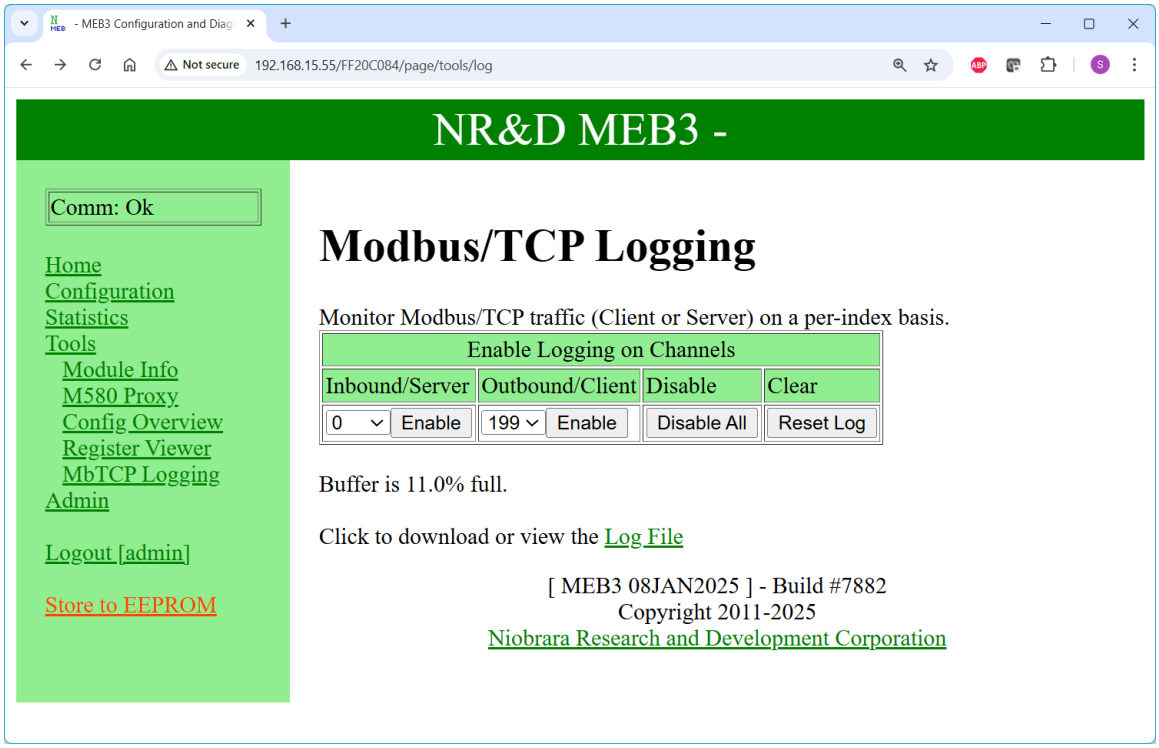


MbTCP Logger

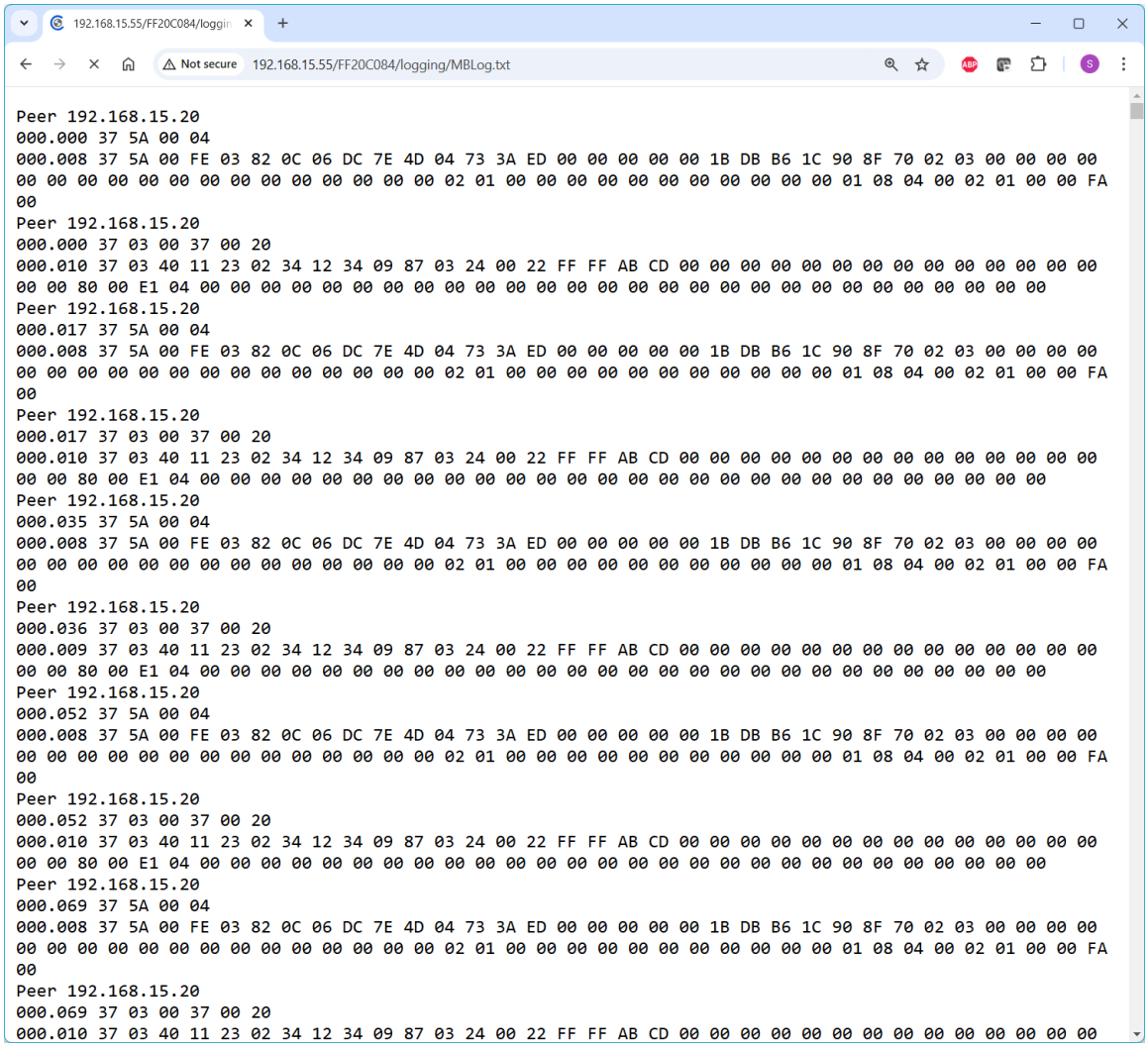
The MEB3 offers the ability to log Modbus/TCP data that is coming in or going out of the Ethernet port. On inbound connections, the user selects from a pull down menu the entry in the Modbus routing table for the Ethernet port to monitor. Once the entry is selected, the user will click the "Enable" button to start the capture. While that logging is enabled, the user may select another indexes, and enable them at the same time.

For outbound connections, the user selects and index in the TCP routing table, then clicks "Enable." This will capture all Modbus/TCP traffic between the MEB3 and the device at the IP address to which the TCP table entry points.

In both cases, clicking "Disable All" will stop all data logging for all connections. Clicking "Reset Log" will erase all logged traffic that had been stored.



Once data has been logged, the user can click on the “Log File” link to view the captured data in the browser window. Right-click the link to save the data to a text file, which could be emailed to NR&D technical support for analysis.



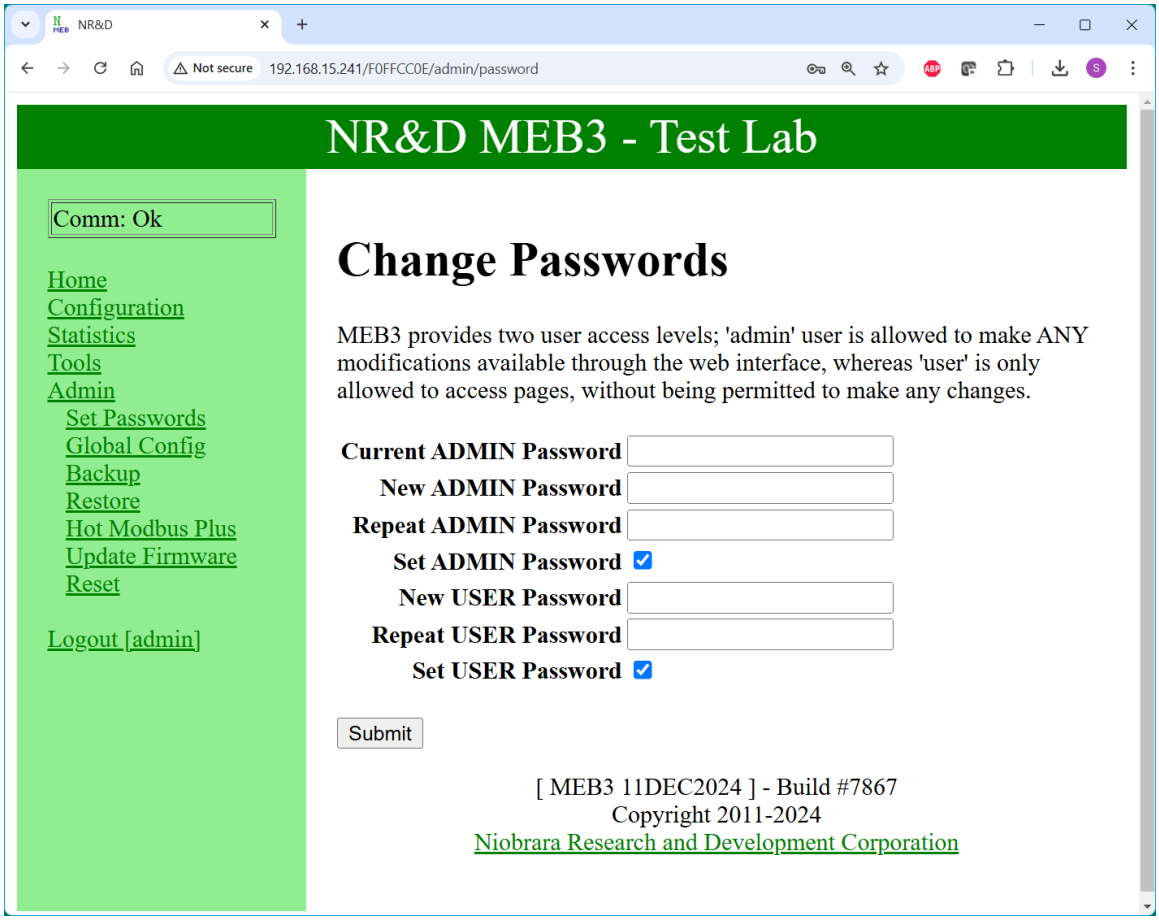

```
Peer 192.168.15.20
000.000 37 5A 00 04
000.008 37 5A 00 FE 03 82 0C 06 DC 7E 4D 04 73 3A ED 00 00 00 00 00 1B DB B6 1C 90 8F 70 02 03 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 02 01 00 00 00 00 00 00 00 00 00 00 00 01 08 04 00 02 01 00 00 FA
00
Peer 192.168.15.20
000.000 37 03 00 37 00 20
000.010 37 03 40 11 23 02 34 12 34 09 87 03 24 00 22 FF FF AB CD 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 80 00 E1 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Peer 192.168.15.20
000.017 37 5A 00 04
000.008 37 5A 00 FE 03 82 0C 06 DC 7E 4D 04 73 3A ED 00 00 00 00 00 1B DB B6 1C 90 8F 70 02 03 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 02 01 00 00 00 00 00 00 00 00 00 00 00 01 08 04 00 02 01 00 00 FA
00
Peer 192.168.15.20
000.017 37 03 00 37 00 20
000.010 37 03 40 11 23 02 34 12 34 09 87 03 24 00 22 FF FF AB CD 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 80 00 E1 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Peer 192.168.15.20
000.035 37 5A 00 04
000.008 37 5A 00 FE 03 82 0C 06 DC 7E 4D 04 73 3A ED 00 00 00 00 00 1B DB B6 1C 90 8F 70 02 03 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 02 01 00 00 00 00 00 00 00 00 00 00 00 01 08 04 00 02 01 00 00 FA
00
Peer 192.168.15.20
000.036 37 03 00 37 00 20
000.009 37 03 40 11 23 02 34 12 34 09 87 03 24 00 22 FF FF AB CD 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 80 00 E1 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Peer 192.168.15.20
000.052 37 5A 00 04
000.008 37 5A 00 FE 03 82 0C 06 DC 7E 4D 04 73 3A ED 00 00 00 00 00 1B DB B6 1C 90 8F 70 02 03 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 02 01 00 00 00 00 00 00 00 00 00 00 00 01 08 04 00 02 01 00 00 FA
00
Peer 192.168.15.20
000.052 37 03 00 37 00 20
000.010 37 03 40 11 23 02 34 12 34 09 87 03 24 00 22 FF FF AB CD 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 80 00 E1 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Peer 192.168.15.20
000.069 37 5A 00 04
000.008 37 5A 00 FE 03 82 0C 06 DC 7E 4D 04 73 3A ED 00 00 00 00 00 1B DB B6 1C 90 8F 70 02 03 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 02 01 00 00 00 00 00 00 00 00 00 00 00 01 08 04 00 02 01 00 00 FA
00
Peer 192.168.15.20
000.069 37 03 00 37 00 20
000.010 37 03 40 11 23 02 34 12 34 09 87 03 24 00 22 FF FF AB CD 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Admin Menu

The Admin menu heading is only shown when the “Admin” account is used for the web login.

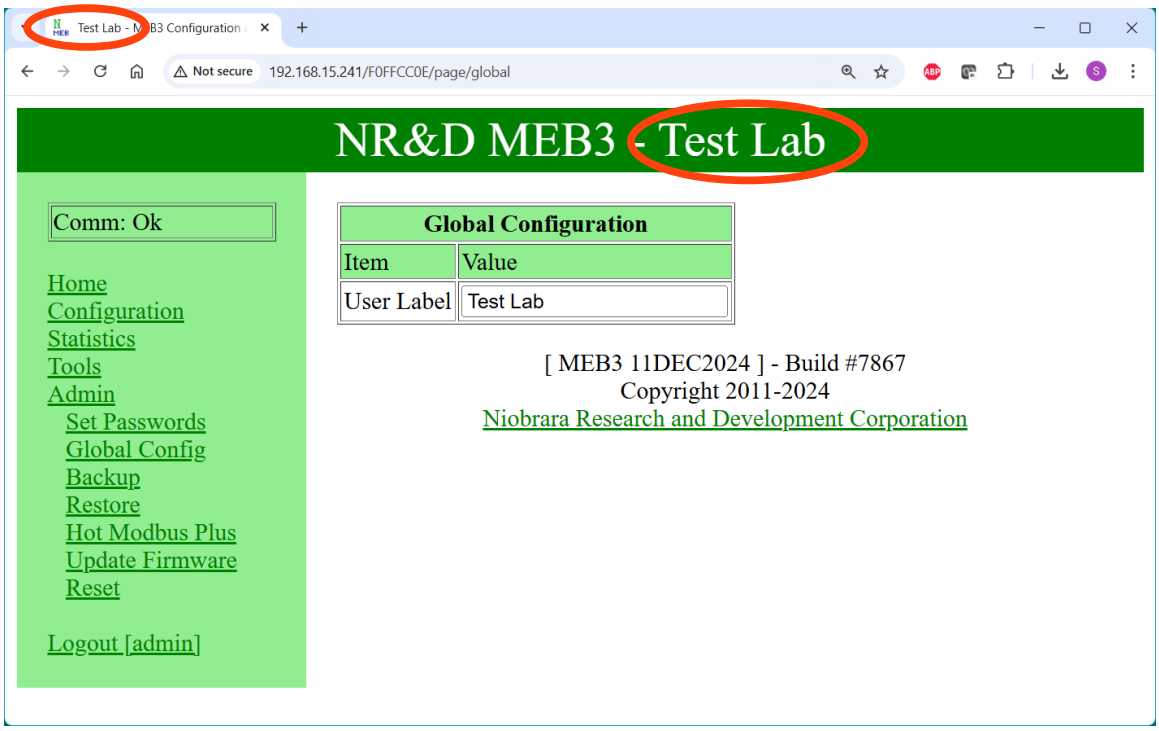
Set Passwords

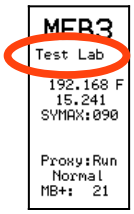
The Set Passwords page allows the Administrator to modify the “Admin” and/or “User” passwords.



Global Configuration

The “Global Configuration” page allows the Admin to adjust items that pertain to the entire module. At this point the “User Label” is the only value set on this page. The User Label is shown on the title bar of each web page and the splash screen of the LCD.

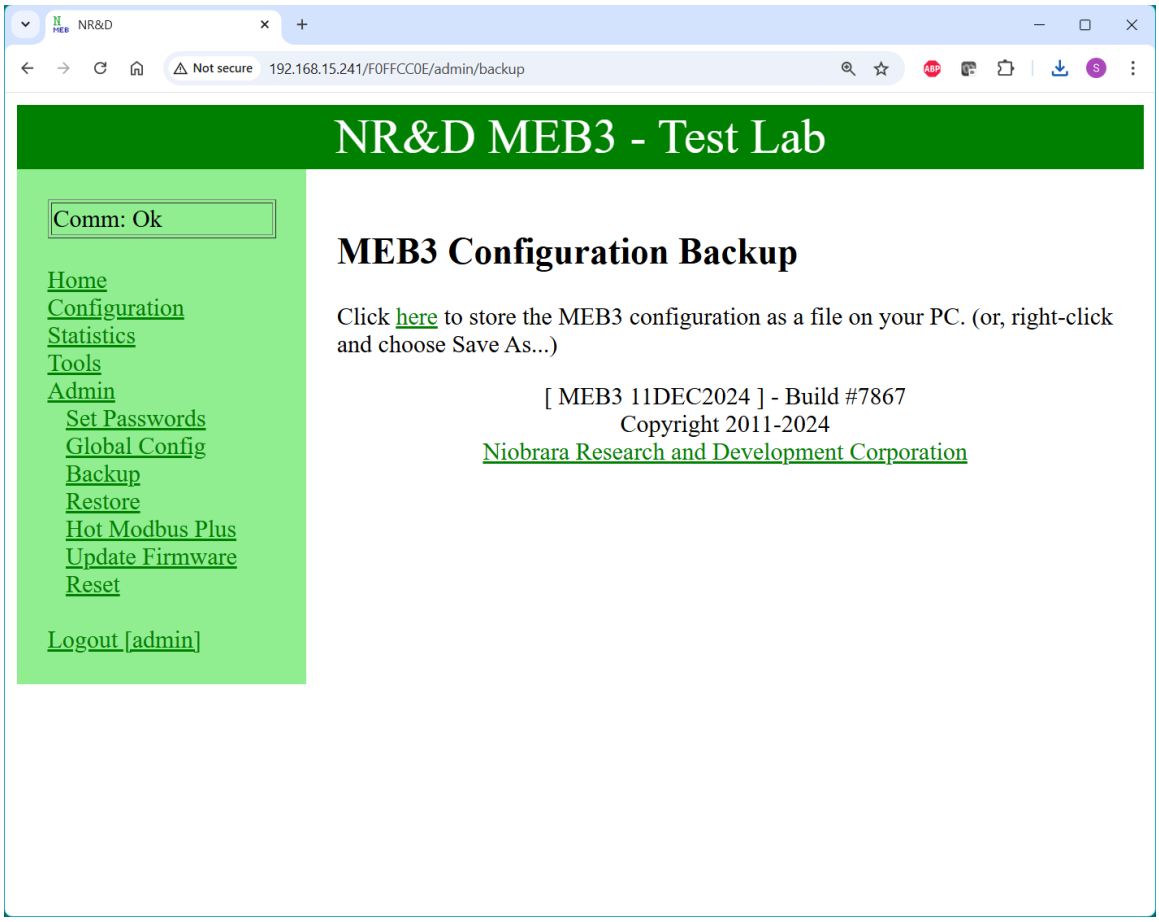




Configuration Backup

The configuration of the MEB3 may be pulled from the MEB3 and saved as an XML file on the PC. The common method is to right click the “here” link and choose “Save Link As...” or “Save Target As...” and then save the file.

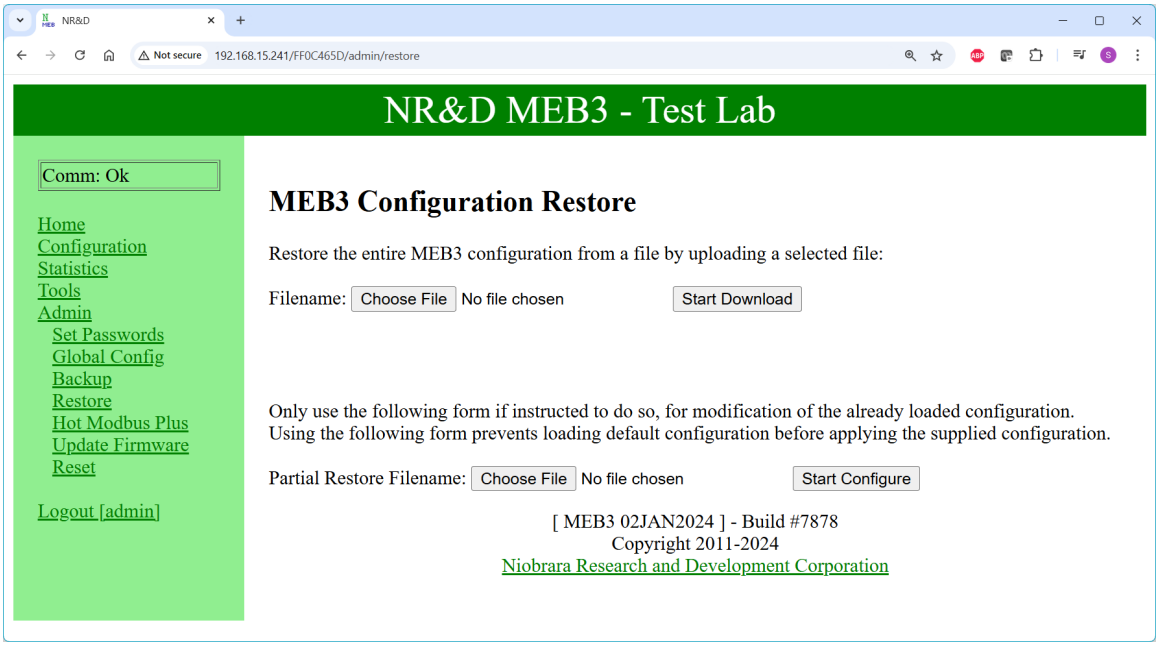
The default filename is of the form: config_192_168_15_241.MEB3 where 192.168.15.241 is the IP Address of the MEB3 in question.



Configuration Restore

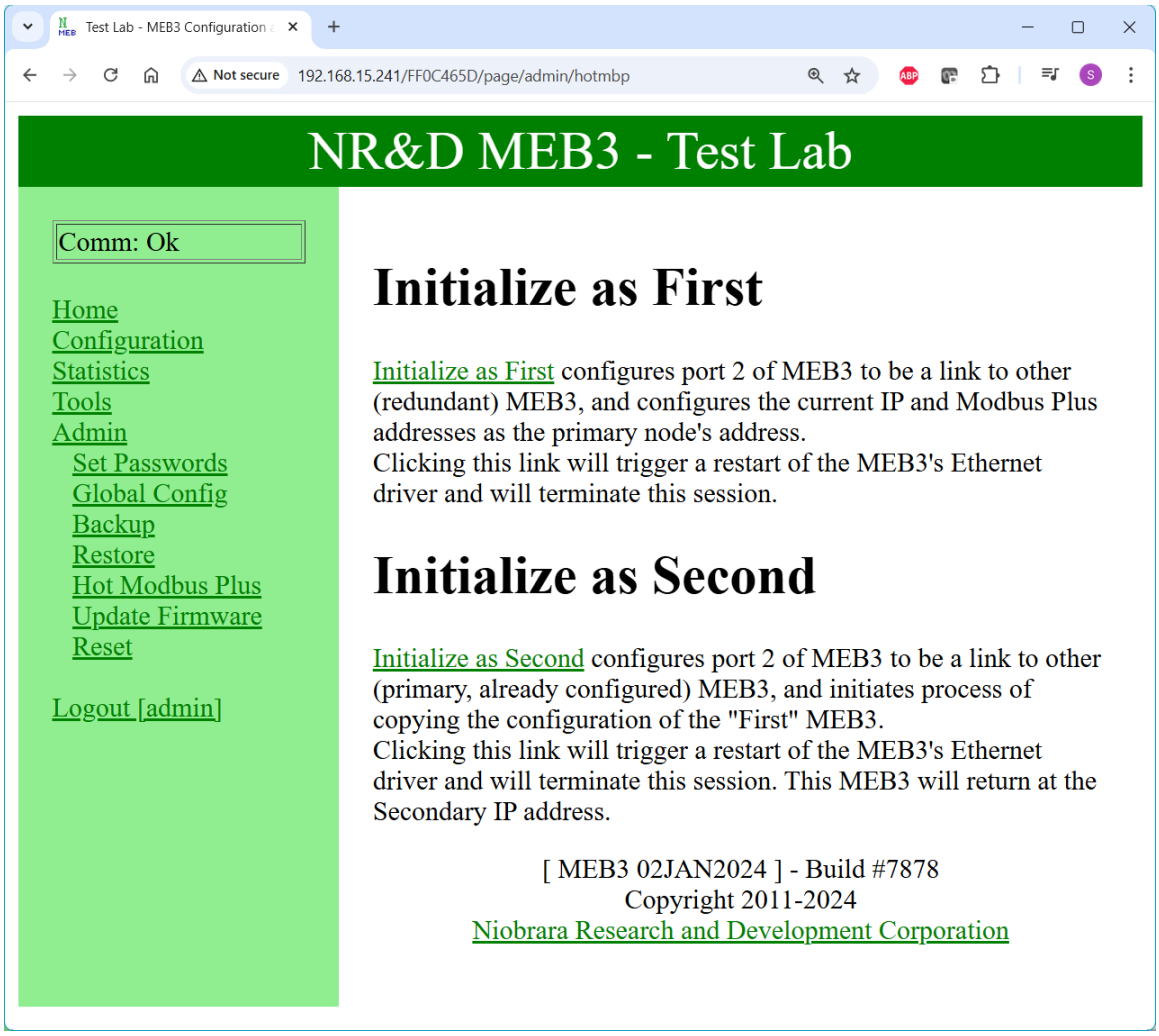
The Restore link will allow the Admin to restore a previously saved backup file to the MEB3. The upper "File Name" selector is for downloading a full .MEB3 backup file. A complete factory default is done before the restoration is started. All IP settings and passwords will be set to those in the .MEB3 file.

The lower "Partial Restore File Name" selector is for downloading a "partial restore" .MEB3 file. The "partial" restore file is built from a Niobrara Utility program such as "Extract_NOM.EXE" and these files usually just include Peer Cop configurations. This "partial" file does not reset the MEB3 to factory defaults before doing the restore function. Therefore, IP settings and passwords are not altered.



Hot Modbus Plus

The Hot Modbus Plus page may be used to initialize the MEB3 as the first Primary or Secondary unit.

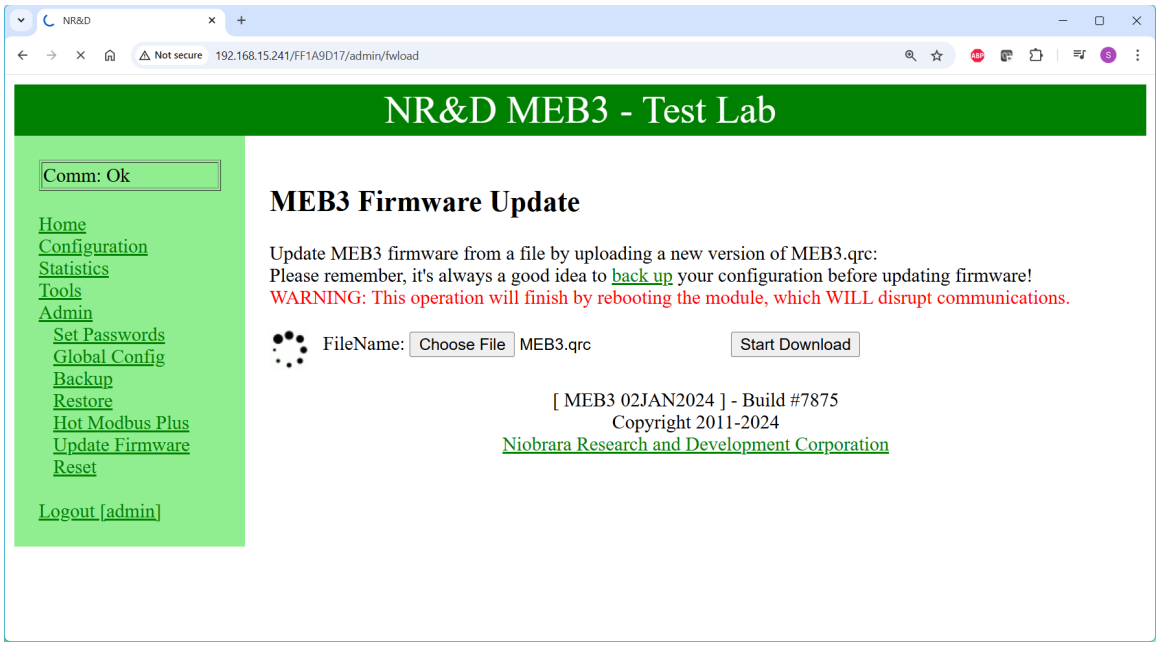


Firmware Update

The Firmware Update page allows the Admin to install a new version of the MEB3.qrc file.

NOTE: It is always recommended that a new backup of the MEB3 configuration be done before updating the firmware.

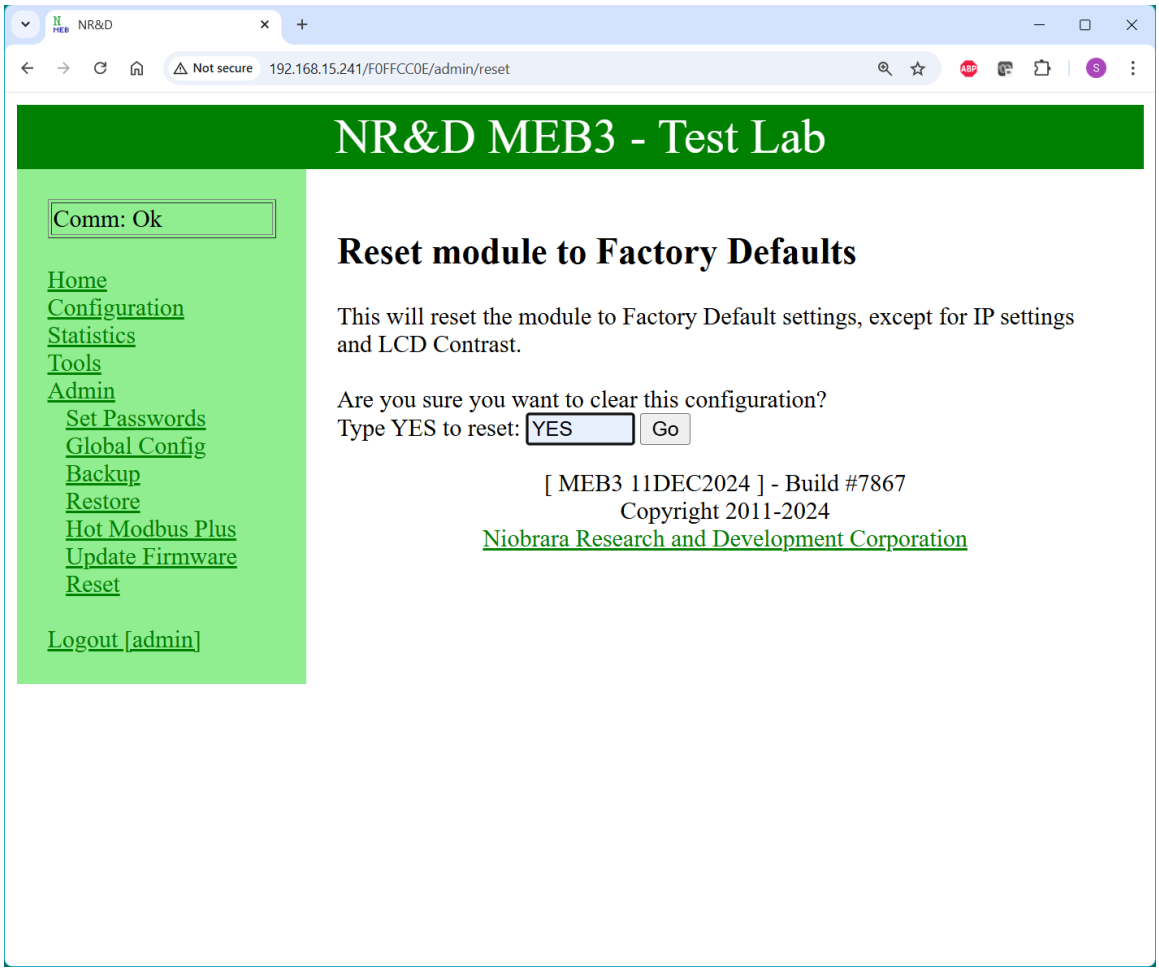
The new firmware is usually installed in the c:\Niobrara\Firmware\ folder.



Reset to Factory Defaults

The MEB3 may be reset to Factory Defaults by typing “YES” into the text field. Resetting to Factory using this web page will keep the current Ethernet settings (IP Address, Subnet Mask, Default Gateway, and ACL table) and Web Passwords but will revert all other settings to factory default.

NOTE: Resetting the MEB3 to Factory Default using the front panel LCD will also revert the IP settings to 10.10.10.10, reset the web server passwords so the temporary password must be entered.


NR&D
Not secure
192.168.15.241/F0FFCC0E/admin/reset
NR&D MEB3 - Test Lab
Comm: Ok
Home
Configuration
Statistics
Tools
Admin
Set Passwords
Global Config
Backup
Restore
Hot Modbus Plus
Update Firmware
Reset
Logout [admin]
Reset module to Factory Defaults
This will reset the module to Factory Default settings, except for IP settings and LCD Contrast.
Are you sure you want to clear this configuration?
Type YES to reset: YES
Go
[MEB3 11DEC2024] - Build #7867
Copyright 2011-2024
Niobrara Research and Development Corporation

14 Utilities

MBP_EXTRACT.EXE

This utility is used to modify a QUANTUM .ZEF project file from EcoStruxure Control Expert (ECE) or Unity Pro to remove the Modbus Plus configuration and convert it to a useful format for the M580. The utility steps through the original file to find all Peer Cop configuration for the native CPU MB+ port and any NOM 212 XX modules. Global Data Inputs and Outputs, Specific Data Inputs and Outputs, and Quantum DIO racks are found and removed from the configuration.

This program will provide configuration for an MEB3 that will replace the Quantum CPU MB+ port. Configuration for additional MEB3 units will be provided for each NOM card in the CPU rack. Up to 3 NOMs are supported and are numbered NOM1, NOM2, and NOM3 with NOM1 being the NOM with the lowest slot number. If there are more than 3 NOM modules configured in the rack then the remaining NOMs are ignored.

The source file must be a .ZEF. If you have a .XEF file then import it into ECE and do a new export as a .ZEF.

The first time mbp_extract is ran on a new source.ZEF file, a new \source\ folder will be created. Inside that folder, mbp_extract will attempt to open two files source_SETUP.TXT and source_COMMS.TXT. If these files are not present then they will be created and the program will stop and the user prompted to edit the source_setup.txt file before restarting the process.

SOURCE_SETUP.TXT

This file instructs the MBP_EXTRACT program for the IP Address settings for each of the possible MEB3 modules used to replace the Quantum CPU and possible NOMs. This file also sets the IP Address of the replacement M580 CPU as well as the Modbus Plus addresses of each MEB3.

SOURCE_COMMS.TXT

Command line Example

A Quantum CPU at MB+ node 18 with a NOM at MB+ node 60 is to be replaced by an M580 at 192.168.15.20. Two MEB3s will be used with the one replacing the CPU at 192.168.15.18 and its MB+ set to 18. The second will replace the NOM at 192.168.15.19 and its MB+ set to 60. The source file is "qtest.ZEF" and UMAC will be setting %SW141 = 1 so -offset will be used.

```
>mbp_extract qtest.ZEF -cpuip192.168.15.20 -cpumeb3ip192.168.15.18 -cpumeb3drop18 -nom1meb3ip192.168.15.19 -nom1meb3drop60 -offset
```

The resulting filename will be "qtest_MBP.ZEF" This file will be opened within UMAC to generate the M580 zef.

MBP_EXTRACT generates a folder same name as the original filename. Inside this folder are the MEB3 partial restore configuration files for each of the MEB3s and a few files for troubleshooting.

For the above example the folder \qtest\ contains the following files:

Directory of C:\Niobrara\MEB3\QTEST

```
02/21/2025  02:48 PM          24,992 convertnotes.txt
02/21/2025  02:48 PM    <DIR>          DTM
02/21/2025  02:00 PM              89 DtmAuditRecord.xml
02/21/2025  02:48 PM             942 MEB3_192_168_15_18_Partial_Restore.meb3
02/21/2025  02:48 PM           1,198 MEB3_192_168_15_19_Partial_Restore.meb3
02/21/2025  02:48 PM           4,992 MW_Register_List.txt
02/21/2025  02:00 PM         139,309 orig_unitpro.xef
02/21/2025  02:00 PM          67,604 Project_Definition.xpdf
02/21/2025  02:00 PM             410 props.xml
02/21/2025  02:48 PM           4,242 qbus.txt
02/21/2025  02:48 PM          96,538 unitpro.xef
              10 File(s)        340,316 bytes
```

The file "convertnotes.txt" gives a text description of all MB+ head units found, any QDIO networks found and the module descriptions of each rack, and any Peer Cop settings (Specific Inputs, Outputs, Global Data Inputs, or Outputs).

"MW_Register_List".txt is a summary of all %MW registers used in the project.

"MEB3_192_168_15_18_Partial_Restore.meb3" is the Partial Restore file for the MEB3 that replaces the Quantum CPU.

"MEB3_192_168_15_19_Partial_Restore.meb3" is the Partial Restore file for the MEB3 that replaces the NOM.

PLC Segments, Structures, and DFBs Added

MBP_EXTRACT removes an NOMs and MB+ related configuration from the original ZEF. It also adds several data structures to store the MB+ related Quantum configuration and several DFBs and program sections (if needed).

MBP_Extract searches through the original ZEF and builds a list of all assigned %MW registers. If there is room near the top of the %MW memory it will claim blocks of these

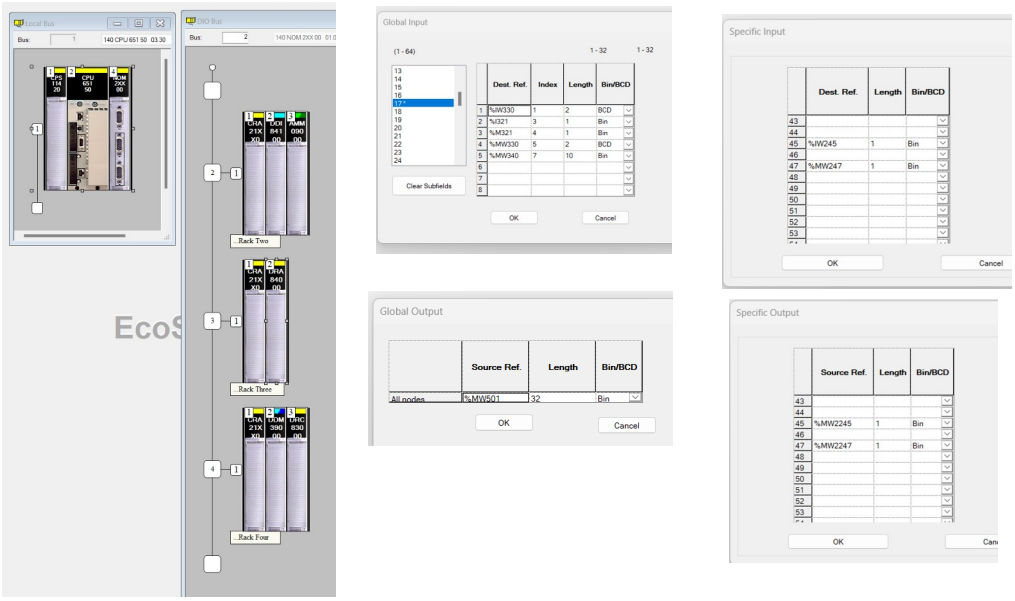
registers for a mailbox used by each MEB3 to exchange data with the M580. The size of these blocks depends upon the MB+ configuration in the original Quantum. At a minimum there will be a MEB3_Health block of 13 words for each MEB3. If other configuration was present then additional blocks are added. The PLC Inputs (data written to the M580 from the MEB3) are grouped together while the PLC Outputs (data read from the M580 by the MEB3) are in the next group. This allows a minimum of communication messages between the MEB3 and the M580. Each data block is named with a reference to the original slot number of the head (CPU or NOM) and the MB+ node of the target MEB3. Possible data blocks are shown below:

- Health (PLC Input)
- Global Data In (PLC Input)
- Specific Data In (PLC Input)
- QDIO Data In (PLC Input)
- Global Data Out (PLC Output)
- Specific Data Out (PLC Output)
- QDIO Data Out (PLC Output)

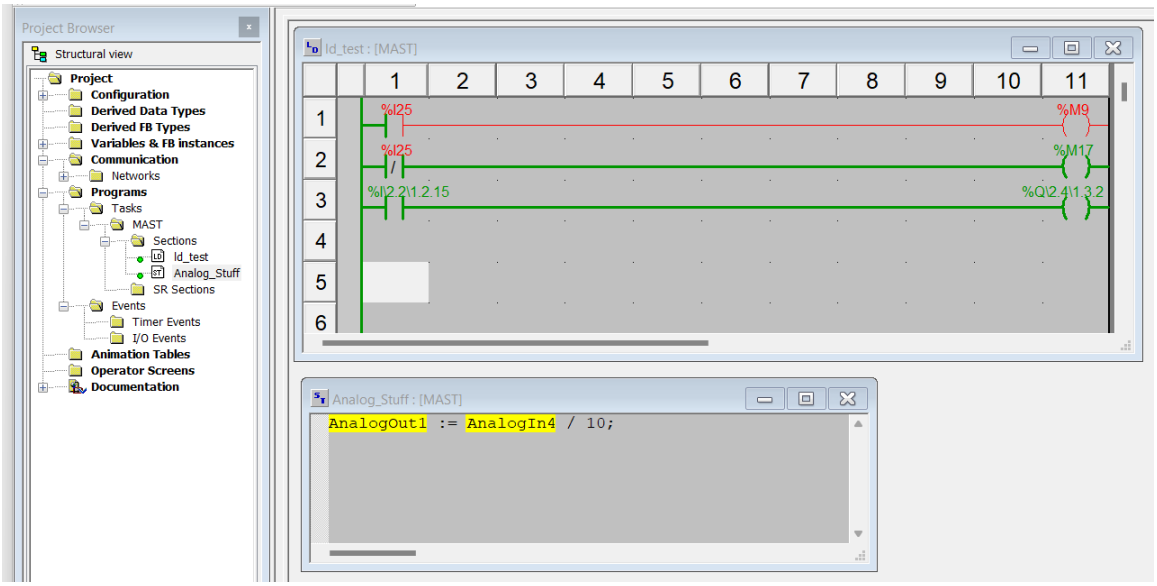
MEB3_Hs2_Hn18_Health	MEB3_Health			%MW7904
MEB3_Hs4_Hn60_Health	MEB3_Health			%MW7917
MEB3_Hs4_Hn60_SpecificInputs	ARRAY[7929..7930] OF INT			%MW7930
MEB3_Hs4_Hn60_GlobalInputs	ARRAY[7931..7946] OF INT			%MW7932
MEB3_Hs4_Hn60_DioInputs	ARRAY[7947..7959] OF INT			%MW7948
MEB3_Hs4_Hn60_SpecificOutputs	ARRAY[7960..7961] OF INT			%MW7961
MEB3_Hs4_Hn60_GlobalOutputs	ARRAY[7962..7993] OF INT			%MW7963
MEB3_Hs4_Hn60_DioOutputs	ARRAY[7994..7998] OF INT			%MW7995
sw138	INT	1	Modbus Discrete Inputs base offset	%SW138
sw139	INT	1	Modbus Discrete Outputs(coils) base o...	%SW139
sw140	INT	1	Modbus Input Registers base offset	%SW140
sw141	INT	1	Modbus Holding Registers base offset	%SW141

In the previous example Head Slot 2 was the Quantum CPU and Head Slot 4 was the NOM. The CPU MB+ port had no Peer Cop or QDIO networks attached so it only has the MEB3_Hs4_Hn18_Health block variable. The NOM had Global Data, Specific Data, and QDIO so it has block variables for each of these groups.

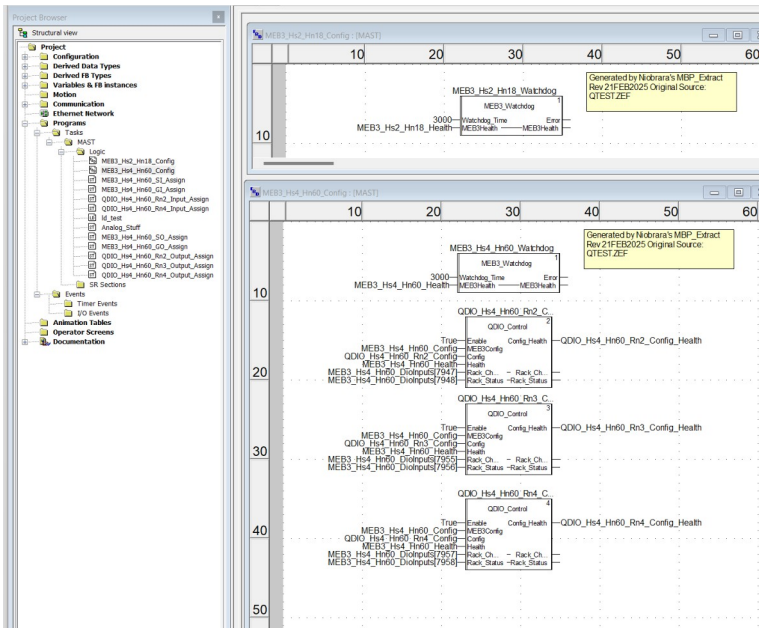
The original Quantum application had 3 QDIO racks connected to the NOM network. It also included Global Data from Node 178 and Specific Data settings for Nodes 45 and 47.



The original source had two simple sections;

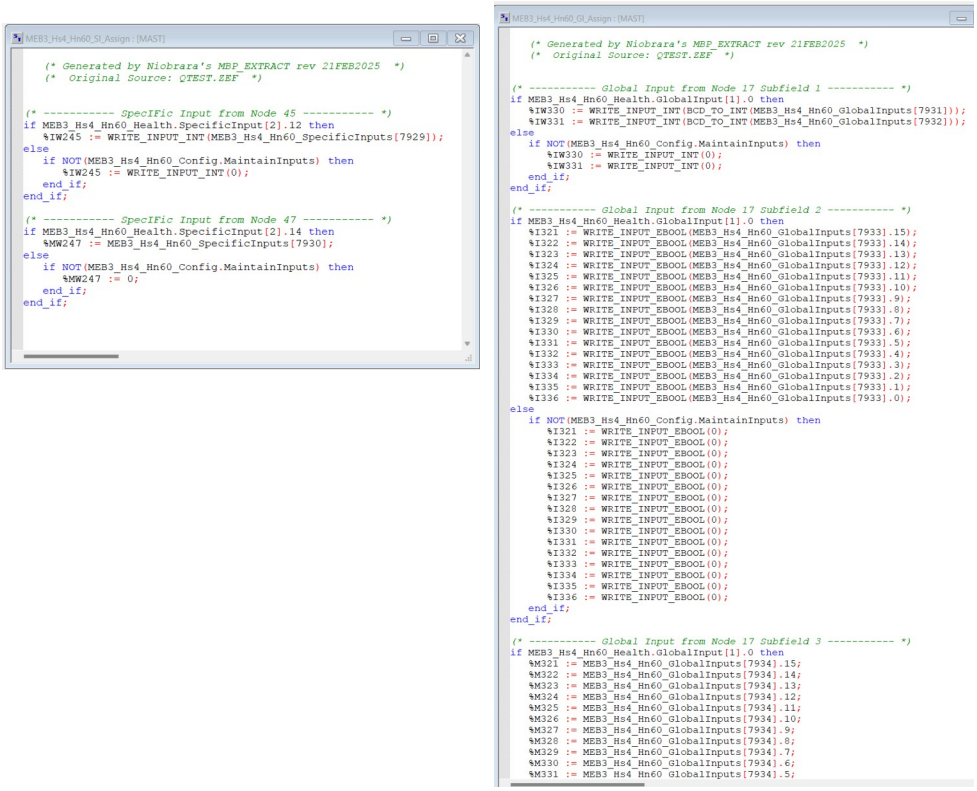


After the conversion to the M580 is complete new segments were added for both MEB3 units.



The Config sections include a DFB for Watchdog operation and if QDIO is present the section also includes a DFB for each QDIO rack. These configuration sections as well as the Input_Assign sections for the Global Data In, Specific Data In, and QDIO In are all added above the original two program sections.

The Specific Data In is for the Node 45 and 47 Input data.



```
(* Generated by Niobrara's MBP_EXTRACT rev 21FEB2025  *)
(*  Original Source: QTEST.ZEF  *)


(* ---------- SpecIFic Input from Node 45 ---------- *)
if MEB3_Hs4_Hn60_Health.SpecificInput[2].12 then
   %IW245 := WRITE_INPUT_INT(MEB3_Hs4_Hn60_SpecificInputs[7929]);
else
   if NOT(MEB3_Hs4_Hn60_Config.MaintainInputs) then
      %IW245 := WRITE_INPUT_INT(0);
   end_if;
end_if;

(* ---------- SpecIFic Input from Node 47 ---------- *)
if MEB3_Hs4_Hn60_Health.SpecificInput[2].14 then
   %MW247 := MEB3_Hs4_Hn60_SpecificInputs[7930];
else
   if NOT(MEB3_Hs4_Hn60_Config.MaintainInputs) then
      %MW247 := 0;
   end_if;
end_if;
```

```
(* Generated by Niobrara's MBP_EXTRACT rev 21FEB2025  *)
(*  Original Source: QTEST.ZEF  *)

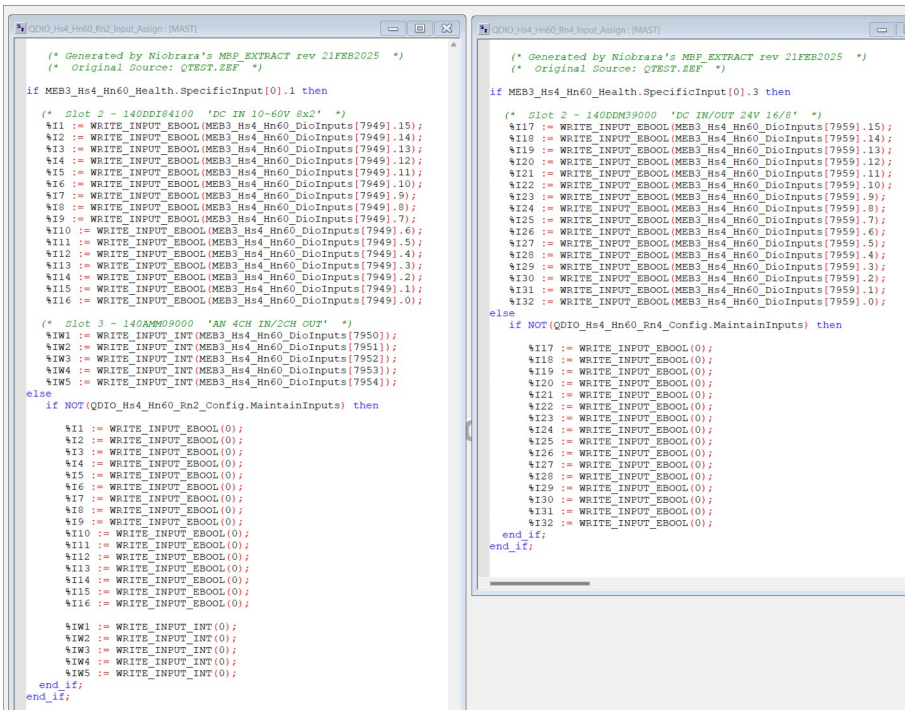

(* ---------- Global Input from Node 17 Subfield 1 ---------- *)
if MEB3_Hs4_Hn60_Health.GlobalInput[1].0 then
   %IW330 := WRITE_INPUT_INT(BCD_TO_INT(MEB3_Hs4_Hn60_GlobalInputs[7931]));
   %IW331 := WRITE_INPUT_INT(BCD_TO_INT(MEB3_Hs4_Hn60_GlobalInputs[7932]));
else
   if NOT(MEB3_Hs4_Hn60_Config.MaintainInputs) then
      %IW330 := WRITE_INPUT_INT(0);
      %IW331 := WRITE_INPUT_INT(0);
   end_if;
end_if;

(* ---------- Global Input from Node 17 Subfield 2 ---------- *)
if MEB3_Hs4_Hn60_Health.GlobalInput[1].0 then
   %I321 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].15);
   %I322 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].14);
   %I323 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].13);
   %I324 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].12);
   %I325 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].11);
   %I326 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].10);
   %I327 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].9);
   %I328 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].8);
   %I329 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].7);
   %I330 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].6);
   %I331 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].5);
   %I332 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].4);
   %I333 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].3);
   %I334 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].2);
   %I335 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].1);
   %I336 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_GlobalInputs[7933].0);
else
   if NOT(MEB3_Hs4_Hn60_Config.MaintainInputs) then
      %I321 := WRITE_INPUT_EBOOL(0);
      %I322 := WRITE_INPUT_EBOOL(0);
      %I323 := WRITE_INPUT_EBOOL(0);
      %I324 := WRITE_INPUT_EBOOL(0);
      %I325 := WRITE_INPUT_EBOOL(0);
      %I326 := WRITE_INPUT_EBOOL(0);
      %I327 := WRITE_INPUT_EBOOL(0);
      %I328 := WRITE_INPUT_EBOOL(0);
      %I329 := WRITE_INPUT_EBOOL(0);
      %I330 := WRITE_INPUT_EBOOL(0);
      %I331 := WRITE_INPUT_EBOOL(0);
      %I332 := WRITE_INPUT_EBOOL(0);
      %I333 := WRITE_INPUT_EBOOL(0);
      %I334 := WRITE_INPUT_EBOOL(0);
      %I335 := WRITE_INPUT_EBOOL(0);
      %I336 := WRITE_INPUT_EBOOL(0);
   end_if;
end_if;

(* ---------- Global Input from Node 17 Subfield 3 ---------- *)
if MEB3_Hs4_Hn60_Health.GlobalInput[1].0 then
   %M321 := MEB3_Hs4_Hn60_GlobalInputs[7934].15;
   %M322 := MEB3_Hs4_Hn60_GlobalInputs[7934].14;
   %M323 := MEB3_Hs4_Hn60_GlobalInputs[7934].13;
   %M324 := MEB3_Hs4_Hn60_GlobalInputs[7934].12;
   %M325 := MEB3_Hs4_Hn60_GlobalInputs[7934].11;
   %M326 := MEB3_Hs4_Hn60_GlobalInputs[7934].10;
   %M327 := MEB3_Hs4_Hn60_GlobalInputs[7934].9;
   %M328 := MEB3_Hs4_Hn60_GlobalInputs[7934].8;
   %M329 := MEB3_Hs4_Hn60_GlobalInputs[7934].7;
   %M330 := MEB3_Hs4_Hn60_GlobalInputs[7934].6;
   %M331 := MEB3_Hs4_Hn60_GlobalInputs[7934].5;
```

Each segment copies the mailbox data to the original %I, %IW, %M, or %MW location and does BCD conversion if needed.

Each QDIO rack with input cards will have a section added for assigning the original %I and %IW data from the rack.



```
(* Generated by Niobrara's MBP_EXTRACT rev 21FEB2025 *)
(* Original Source: QTEST.EEF *)

if MEB3_Hs4_Hn60_Health.SpecificInput[0].1 then

(* Slot 2 - 140DDI84100 'DC IN 10-60V 8x2' *)
%I1 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].15);
%I2 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].14);
%I3 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].13);
%I4 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].12);
%I5 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].11);
%I6 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].10);
%I7 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].9);
%I8 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].8);
%I9 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].7);
%I10 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].6);
%I11 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].5);
%I12 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].4);
%I13 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].3);
%I14 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].2);
%I15 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].1);
%I16 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7949].0);

(* Slot 3 - 140AMM09000 'AN 4CH IN/2CH OUT' *)
%IW1 := WRITE_INPUT_INT(MEB3_Hs4_Hn60_DioInputs[7950]);
%IW2 := WRITE_INPUT_INT(MEB3_Hs4_Hn60_DioInputs[7951]);
%IW3 := WRITE_INPUT_INT(MEB3_Hs4_Hn60_DioInputs[7952]);
%IW4 := WRITE_INPUT_INT(MEB3_Hs4_Hn60_DioInputs[7953]);
%IW5 := WRITE_INPUT_INT(MEB3_Hs4_Hn60_DioInputs[7954]);
else
  if NOT(QDIO_Hs4_Hn60_Rn2_Config.MaintainInputs) then

    %I1 := WRITE_INPUT_EBOOL(0);
    %I2 := WRITE_INPUT_EBOOL(0);
    %I3 := WRITE_INPUT_EBOOL(0);
    %I4 := WRITE_INPUT_EBOOL(0);
    %I5 := WRITE_INPUT_EBOOL(0);
    %I6 := WRITE_INPUT_EBOOL(0);
    %I7 := WRITE_INPUT_EBOOL(0);
    %I8 := WRITE_INPUT_EBOOL(0);
    %I9 := WRITE_INPUT_EBOOL(0);
    %I10 := WRITE_INPUT_EBOOL(0);
    %I11 := WRITE_INPUT_EBOOL(0);
    %I12 := WRITE_INPUT_EBOOL(0);
    %I13 := WRITE_INPUT_EBOOL(0);
    %I14 := WRITE_INPUT_EBOOL(0);
    %I15 := WRITE_INPUT_EBOOL(0);
    %I16 := WRITE_INPUT_EBOOL(0);

    %IW1 := WRITE_INPUT_INT(0);
    %IW2 := WRITE_INPUT_INT(0);
    %IW3 := WRITE_INPUT_INT(0);
    %IW4 := WRITE_INPUT_INT(0);
    %IW5 := WRITE_INPUT_INT(0);
  end_if;
end_if;
```

```
(* Generated by Niobrara's MBP_EXTRACT rev 21FEB2025 *)
(* Original Source: QTEST.EEF *)

if MEB3_Hs4_Hn60_Health.SpecificInput[0].3 then

(* Slot 2 - 140DDM39000 'DC IN/OUT 24V 16/8' *)
%I17 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].15);
%I18 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].14);
%I19 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].13);
%I20 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].12);
%I21 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].11);
%I22 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].10);
%I23 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].9);
%I24 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].8);
%I25 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].7);
%I26 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].6);
%I27 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].5);
%I28 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].4);
%I29 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].3);
%I30 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].2);
%I31 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].1);
%I32 := WRITE_INPUT_EBOOL(MEB3_Hs4_Hn60_DioInputs[7959].0);
else
  if NOT(QDIO_Hs4_Hn60_Rn4_Config.MaintainInputs) then

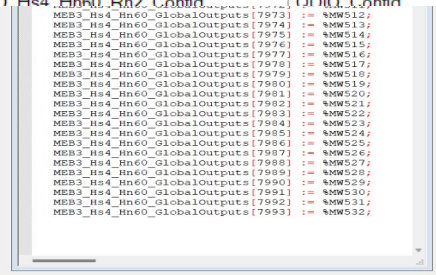
    %I17 := WRITE_INPUT_EBOOL(0);
    %I18 := WRITE_INPUT_EBOOL(0);
    %I19 := WRITE_INPUT_EBOOL(0);
    %I20 := WRITE_INPUT_EBOOL(0);
    %I21 := WRITE_INPUT_EBOOL(0);
    %I22 := WRITE_INPUT_EBOOL(0);
    %I23 := WRITE_INPUT_EBOOL(0);
    %I24 := WRITE_INPUT_EBOOL(0);
    %I25 := WRITE_INPUT_EBOOL(0);
    %I26 := WRITE_INPUT_EBOOL(0);
    %I27 := WRITE_INPUT_EBOOL(0);
    %I28 := WRITE_INPUT_EBOOL(0);
    %I29 := WRITE_INPUT_EBOOL(0);
    %I30 := WRITE_INPUT_EBOOL(0);
    %I31 := WRITE_INPUT_EBOOL(0);
    %I32 := WRITE_INPUT_EBOOL(0);
  end_if;
end_if;
```

After the original sections, there are now Output assignment sections added for Global Data Out, Specific Data Out, and QDIO data Out.

Configuration Structures

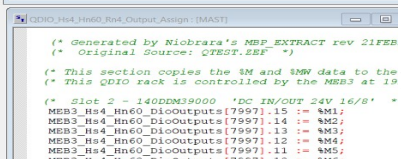
Each MEB3 has a configuration structure assigned. This structure is used by the M580 code to send QDIO configuration messages to each rack. It is also used by MBP_MSTR replacement DFBs for former MB+ read and write messages. If it is necessary to change the MEB3's IP address then simply modify the initial value in the structure.

Name	Type	Value	Comment
BMEP58_ECPU_EXT	T_BMEP58_ECPU_EX...		
MEB3_Hs2_Hn18_Config	MEB3_Config		
MEB3_IPaddress	string[16]	192.168.15.18	Form 192.168.10.xx
OutboundRoute	string[10]	0.0.3	Usually '0.0.3'
MaintainInputs	BOOL	0	1=Yes, 0=Zero on comms loss (PEER COP...
Orig_Slot	INT	2	CPU Rack Slot number of original MB+ port
Clear_Stats	BOOL		Rising Edge Resets Stats to zero
MEB3_Hs4_Hn60_Config	MEB3_Config		
MEB3_IPaddress	string[16]	192.168.15.19	Form 192.168.10.xx
OutboundRoute	string[10]	0.0.3	Usually '0.0.3'
MaintainInputs	BOOL	0	1=Yes, 0=Zero on comms loss (PEER COP...
Orig_Slot	INT	4	CPU Rack Slot number of original MB+ port
Clear_Stats	BOOL		Rising Edge Resets Stats to zero
QDIO_Hs4_Hn60_Rn2_Config	QDIO_Config		



```
MEB3_Hs4_Hn60_GlobalOutputs[7973] := %MW512;
MEB3_Hs4_Hn60_GlobalOutputs[7974] := %MW513;
MEB3_Hs4_Hn60_GlobalOutputs[7975] := %MW514;
MEB3_Hs4_Hn60_GlobalOutputs[7976] := %MW515;
MEB3_Hs4_Hn60_GlobalOutputs[7977] := %MW516;
MEB3_Hs4_Hn60_GlobalOutputs[7978] := %MW517;
MEB3_Hs4_Hn60_GlobalOutputs[7979] := %MW518;
MEB3_Hs4_Hn60_GlobalOutputs[7980] := %MW519;
MEB3_Hs4_Hn60_GlobalOutputs[7981] := %MW520;
MEB3_Hs4_Hn60_GlobalOutputs[7982] := %MW521;
MEB3_Hs4_Hn60_GlobalOutputs[7983] := %MW522;
MEB3_Hs4_Hn60_GlobalOutputs[7984] := %MW523;
MEB3_Hs4_Hn60_GlobalOutputs[7985] := %MW524;
MEB3_Hs4_Hn60_GlobalOutputs[7986] := %MW525;
MEB3_Hs4_Hn60_GlobalOutputs[7987] := %MW526;
MEB3_Hs4_Hn60_GlobalOutputs[7988] := %MW527;
MEB3_Hs4_Hn60_GlobalOutputs[7989] := %MW528;
MEB3_Hs4_Hn60_GlobalOutputs[7990] := %MW529;
MEB3_Hs4_Hn60_GlobalOutputs[7991] := %MW530;
MEB3_Hs4_Hn60_GlobalOutputs[7992] := %MW531;
MEB3_Hs4_Hn60_GlobalOutputs[7993] := %MW532;
```

```
MEB3_Hs4_Hn60_DioOutputs[7996].7 := %M25;
MEB3_Hs4_Hn60_DioOutputs[7996].6 := %M26;
MEB3_Hs4_Hn60_DioOutputs[7996].5 := %M27;
MEB3_Hs4_Hn60_DioOutputs[7996].4 := %M28;
MEB3_Hs4_Hn60_DioOutputs[7996].3 := %M29;
MEB3_Hs4_Hn60_DioOutputs[7996].2 := %M30;
MEB3_Hs4_Hn60_DioOutputs[7996].1 := %M31;
MEB3_Hs4_Hn60_DioOutputs[7996].0 := %M32;
```



```
(* Generated by Niobrara's MBP_EXTRACT rev 21FEB
(* Original Source: QTEST.EEF *)

(* This section copies the %M and %MW data to the
(* This QDIO rack is controlled by the MEB3 at 19

(* Slot 2 - 140DDM39000 'DC IN/OUT 24V 16/8' *
MEB3_Hs4_Hn60_DioOutputs[7997].15 := %M1;
MEB3_Hs4_Hn60_DioOutputs[7997].14 := %M2;
MEB3_Hs4_Hn60_DioOutputs[7997].13 := %M3;
MEB3_Hs4_Hn60_DioOutputs[7997].12 := %M4;
MEB3_Hs4_Hn60_DioOutputs[7997].11 := %M5;
MEB3_Hs4_Hn60_DioOutputs[7997].10 := %M6;
MEB3_Hs4_Hn60_DioOutputs[7997].9 := %M7;
MEB3_Hs4_Hn60_DioOutputs[7997].8 := %M8;

(* Slot 3 - 140DRC83000 'RELAY OUT 8x1 NO/NC'
MEB3_Hs4_Hn60_DioOutputs[7997].7 := %M9;
MEB3_Hs4_Hn60_DioOutputs[7997].6 := %M10;
MEB3_Hs4_Hn60_DioOutputs[7997].5 := %M11;
MEB3_Hs4_Hn60_DioOutputs[7997].4 := %M12;
MEB3_Hs4_Hn60_DioOutputs[7997].3 := %M13;
MEB3_Hs4_Hn60_DioOutputs[7997].2 := %M14;
MEB3_Hs4_Hn60_DioOutputs[7997].1 := %M15;
MEB3_Hs4_Hn60_DioOutputs[7997].0 := %M16;
```

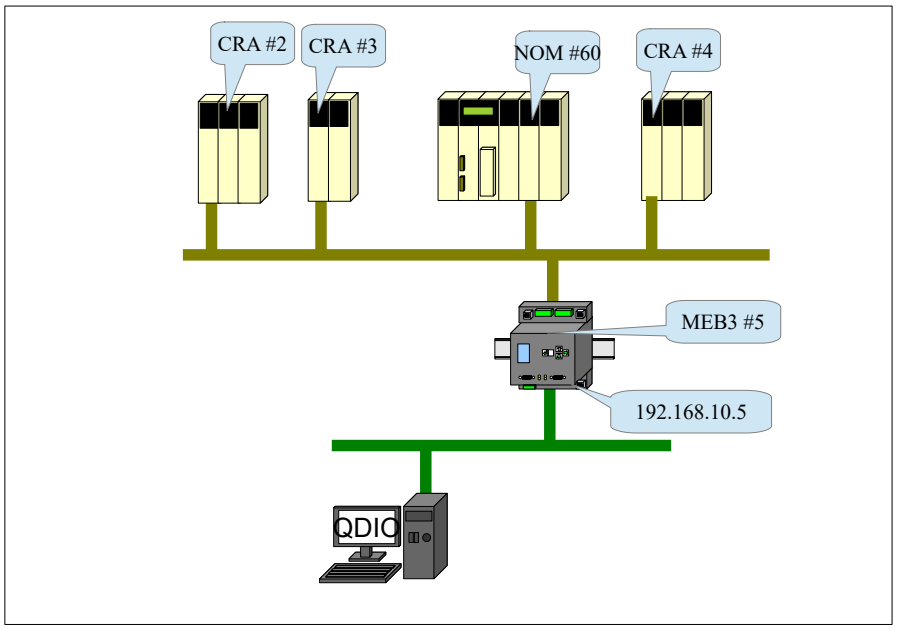
If QDIO racks are included then a configuration structure for each rack is added. Each rack has configuration data for all possible 16 slots. Use caution in modifying this setup.

QDIO_Hs4_Hn60_Rn2_Config	QDIO_Config		
TargetDrop	INT	2	QDIO Rack MB+ Node
HoldUp	INT	3	x100mS
MaintainInputs	BOOL	0	1=Maintain, 0=Zero
Slot	ARRAY[1..16] OF QDI...		
Slot[1]	QDIO_Slot		
Slot[2]	QDIO_Slot		
PartNumber	string[16]	140DDI84100	
Description	string[30]	DC IN 10-60V 8x2	
ModuleID	INT	18	
InByteCount	INT	2	
OutByteCount	INT	0	
InFlags	INT	160	
In_DPM	BOOL		
Interrupt	BOOL		
In_Simple	BOOL		
In_BCD	BOOL		
In_Coil	BOOL		
OutFlags	INT	0	
Out_DPM	BOOL		
Out_Hold	BOOL		
Out_Simple	BOOL		
Out_BCD	BOOL		
Out_Coil	BOOL		
InStart	UINT	1	Plc Input Start
OutStart	UINT	0	Plc Output Start
ConfigCount	INT	0	
ConfigINT	ARRAY[1..51] OF INT		
InBpStart	UINT	0	Input Block Offset
OutBpStart	UINT	0	Output Block Offset
Slot[3]	QDIO_Slot		
PartNumber	string[16]	140AMM09000	
Description	string[30]	AN 4CH IN/2CH OUT	
ModuleID	INT	277	
InByteCount	INT	10	
OutByteCount	INT	4	
InFlags	INT	0	

QDIO_CONFIG.EXE

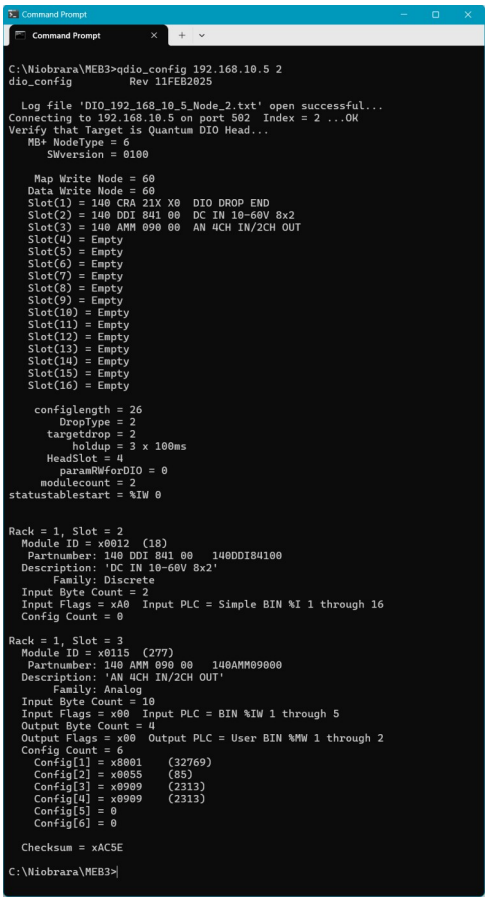
This command line utility may be used to read the running configuration from a QDIO rack through a MEB3.

In the following example, an MEB3 has been added to a MB+ network consisting of a Quantum CPU at node 1and three CRA QDIO racks at nodes 2, 3, and 4. The MEB3 is set to node 5 since that node was not used on the network. The MEB3 is set to IP Address 192.168.10.5 and is on the same subnet as the PC.



C:\Niobrara\MEB3>qdio_config 192.168.10.5 2

Starting this program will create a text file with the IP Address and Index in the filename.



```
Command Prompt

C:\Niobrara\MEB3>qdio_config 192.168.10.5 2
dio_config          Rev 11FEB2025

  Log file 'DIO_192_168_10_5_Node_2.txt' open successful...
Connecting to 192.168.10.5 on port 502  Index = 2 ...OK
Verify that Target is Quantum DIO Head...
   MB+ NodeType = 6
      SWversion = 0100

    Map Write Node = 60
   Data Write Node = 60
   Slot(1) = 140 CRA 21X X0  DIO DROP END
   Slot(2) = 140 DDI 841 00  DC IN 10-60V 8x2
   Slot(3) = 140 AMM 090 00  AN 4CH IN/2CH OUT
   Slot(4) = Empty
   Slot(5) = Empty
   Slot(6) = Empty
   Slot(7) = Empty
   Slot(8) = Empty
   Slot(9) = Empty
   Slot(10) = Empty
   Slot(11) = Empty
   Slot(12) = Empty
   Slot(13) = Empty
   Slot(14) = Empty
   Slot(15) = Empty
   Slot(16) = Empty

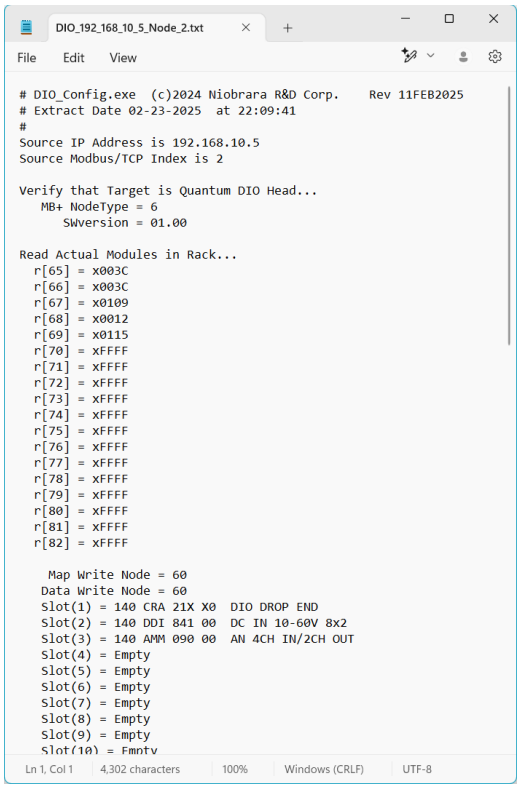
    configlength = 26
        DropType = 2
      targetdrop = 2
          holdup = 3 x 100ms
      HeadSlot = 4
        paramRWforDIO = 0
     modulecount = 2
statustablestart = %IW 0


Rack = 1, Slot = 2
  Module ID = x0012  (18)
   Partnumber: 140 DDI 841 00   140DDI84100
  Description: 'DC IN 10-60V 8x2'
       Family: Discrete
  Input Byte Count = 2
  Input Flags = xA0  Input PLC = Simple BIN %I 1 through 16
  Config Count = 0

Rack = 1, Slot = 3
  Module ID = x0115  (277)
   Partnumber: 140 AMM 090 00   140AMM09000
  Description: 'AN 4CH IN/2CH OUT'
       Family: Analog
  Input Byte Count = 10
  Input Flags = x00  Input PLC = BIN %IW 1 through 5
  Output Byte Count = 4
  Output Flags = x00  Output PLC = User BIN %MW 1 through 2
  Config Count = 6
    Config[1] = x8001    (32769)
    Config[2] = x0055    (85)
    Config[3] = x0909    (2313)
    Config[4] = x0909    (2313)
    Config[5] = 0
    Config[6] = 0

  Checksum = xAC5E

C:\Niobrara\MEB3>
```



```
DIO_192_168_10_5_Node_2.txt
File  Edit  View

# DIO_Config.exe  (c)2024 Niobrara R&D Corp.    Rev 11FEB2025
# Extract Date 02-23-2025  at 22:09:41
#
Source IP Address is 192.168.10.5
Source Modbus/TCP Index is 2

Verify that Target is Quantum DIO Head...
   MB+ NodeType = 6
      SWversion = 01.00

Read Actual Modules in Rack...
  r[65] = x003C
  r[66] = x003C
  r[67] = x0109
  r[68] = x0012
  r[69] = x0115
  r[70] = xFFFF
  r[71] = xFFFF
  r[72] = xFFFF
  r[73] = xFFFF
  r[74] = xFFFF
  r[75] = xFFFF
  r[76] = xFFFF
  r[77] = xFFFF
  r[78] = xFFFF
  r[79] = xFFFF
  r[80] = xFFFF
  r[81] = xFFFF
  r[82] = xFFFF

    Map Write Node = 60
   Data Write Node = 60
   Slot(1) = 140 CRA 21X X0  DIO DROP END
   Slot(2) = 140 DDI 841 00  DC IN 10-60V 8x2
   Slot(3) = 140 AMM 090 00  AN 4CH IN/2CH OUT
   Slot(4) = Empty
   Slot(5) = Empty
   Slot(6) = Empty
   Slot(7) = Empty
   Slot(8) = Empty
   Slot(9) = Empty
   Slot(10) = Empty

Ln 1, Col 1   4,302 characters   100%   Windows (CRLF)   UTF-8
```

It is highly recommended that each CRA setup be documented while still in control of the original Quantum PLC.

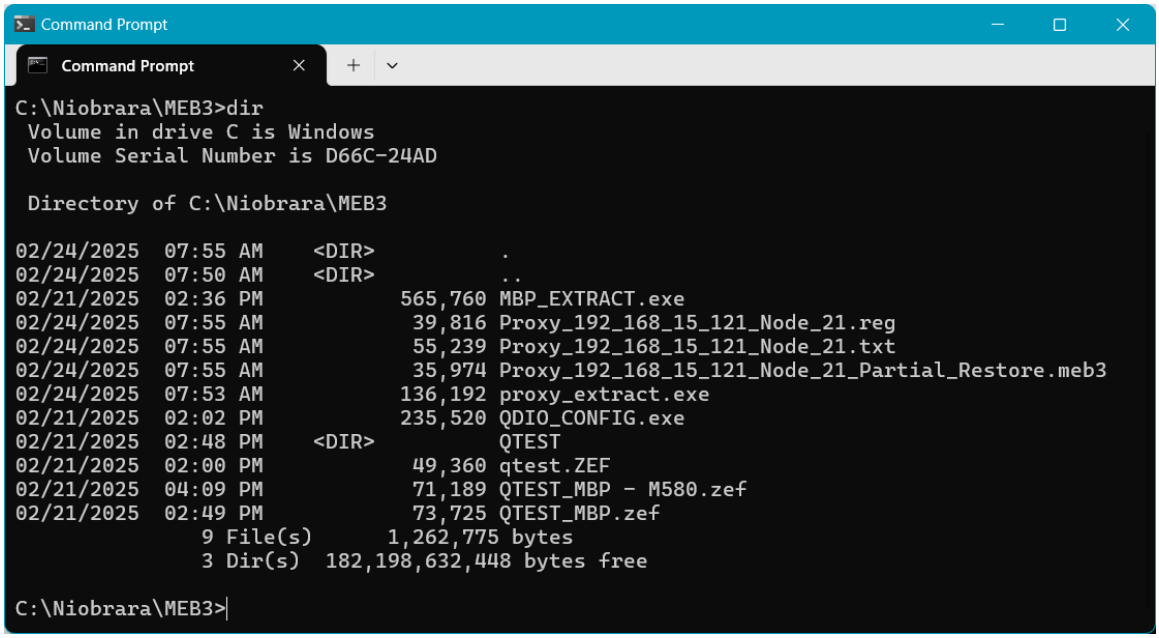
PROXY_EXTRACT.EXE

This command line utility may be used to read the running configuration from a SE Proxy and build a full MEB3 configuration file to make a drop-in replacement for the SE Proxy.

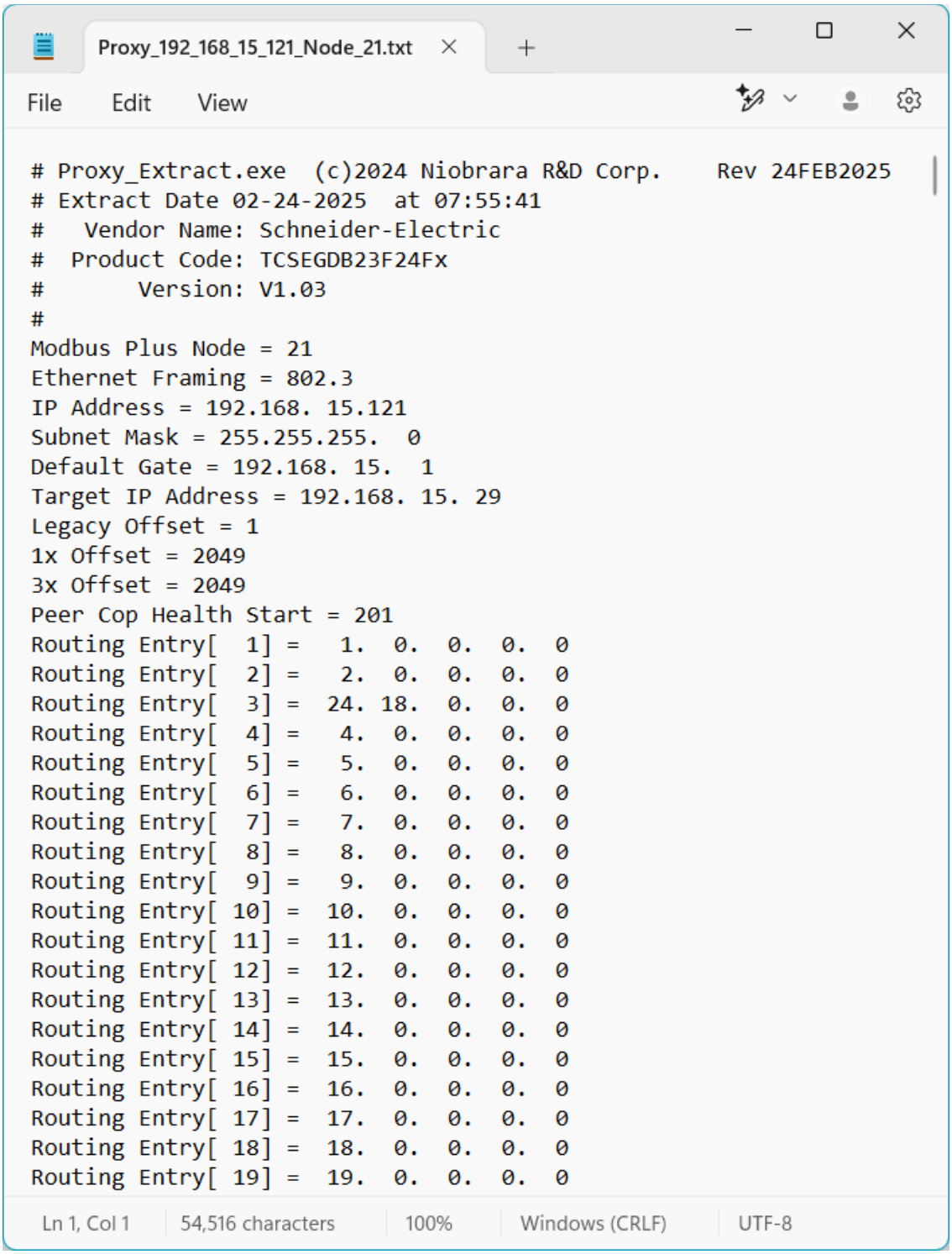
Connect the PC to the Proxy's Ethernet network. Start the program with the IP Address of the Proxy.

C:\Niobrara\MEB3>proxy_extract 192.168.15.121

A Modbus/TCP connection is established and the setup of the Proxy is extracted and a new "_Partial_Restore" setup file for the MEB3 is created. Two additional text files are created that give a register based and textual description of the Proxy setup.



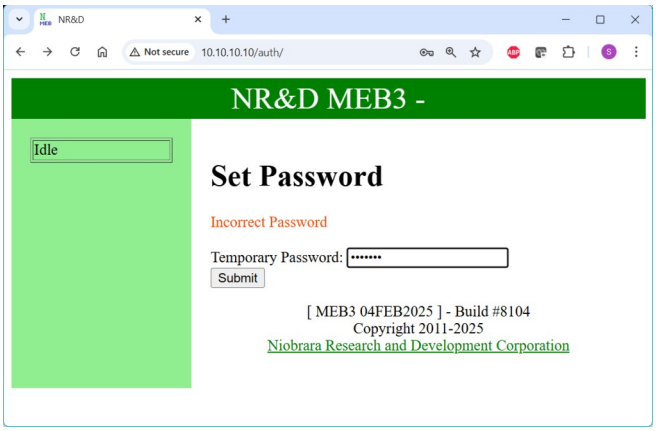
A quick view of the .txt file shows the actual configuration.



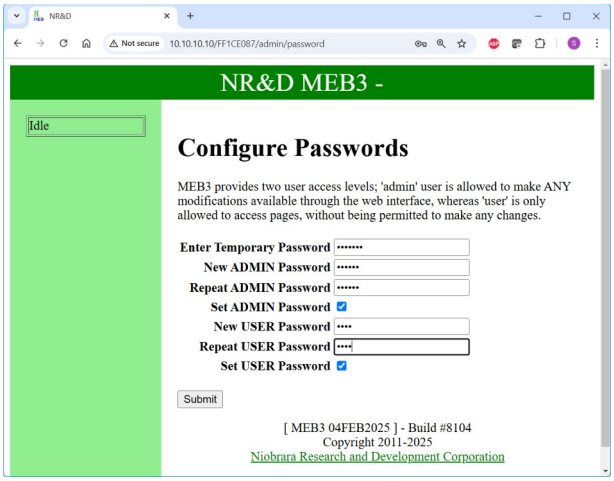
To finish the installation do these steps:

1. Reset the MEB3 to factory defaults through the front panel by selecting “System > Factory” and then “Defaults”.

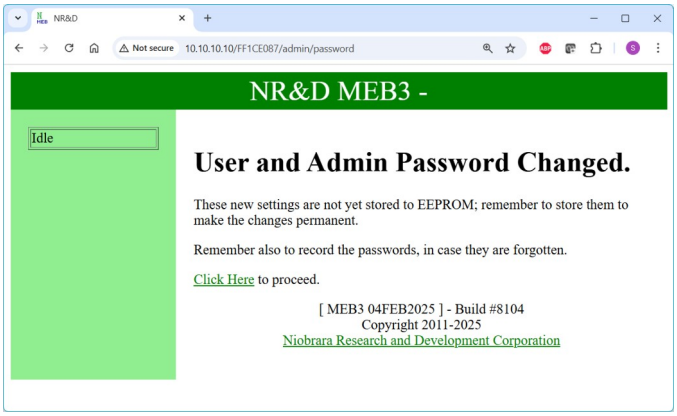
2. Select “System > WWW” to enable the web server.
3. Select “System > Password” to find the temporary password. Note this value including the “-”. It will be of the form 123-456.
4. Connect to the IP Address (10.10.10.10) web server on port 80. Enter the temporary password.



5. Enter new Admin and User passwords.



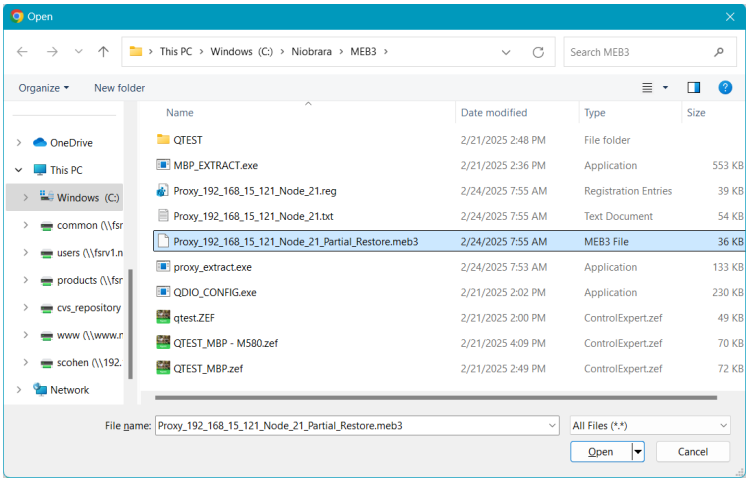
6. Click on the “Click Here” link to proceed.



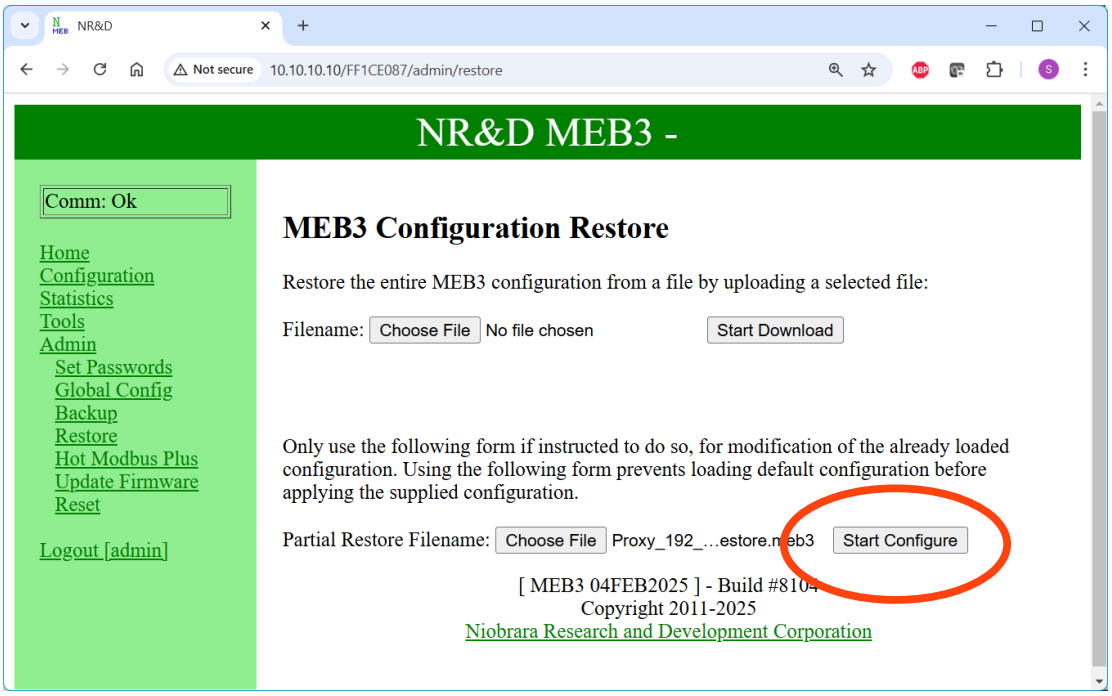
7. Click on the “Store to EEPROM” link.



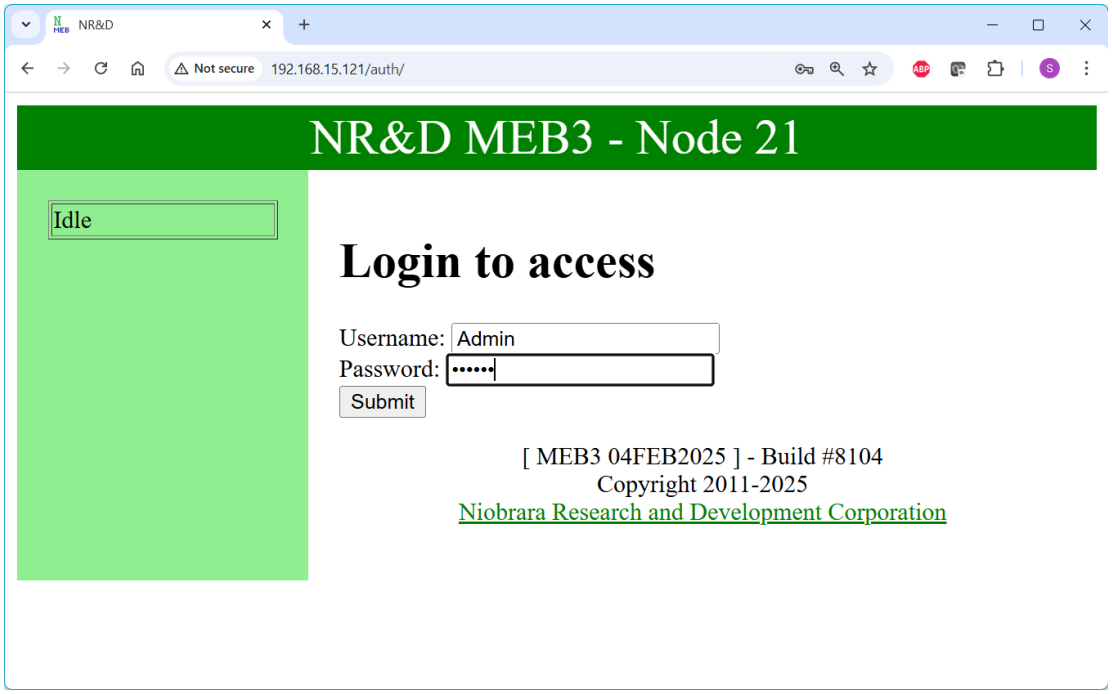
8. Click on “Admin > Restore”.
9. Click on “Partial Restore Filename Choose File” button and Select the Proxy_ip_index_Partial_Restore.meb3 file.



10. Click the “Start Configure” button.



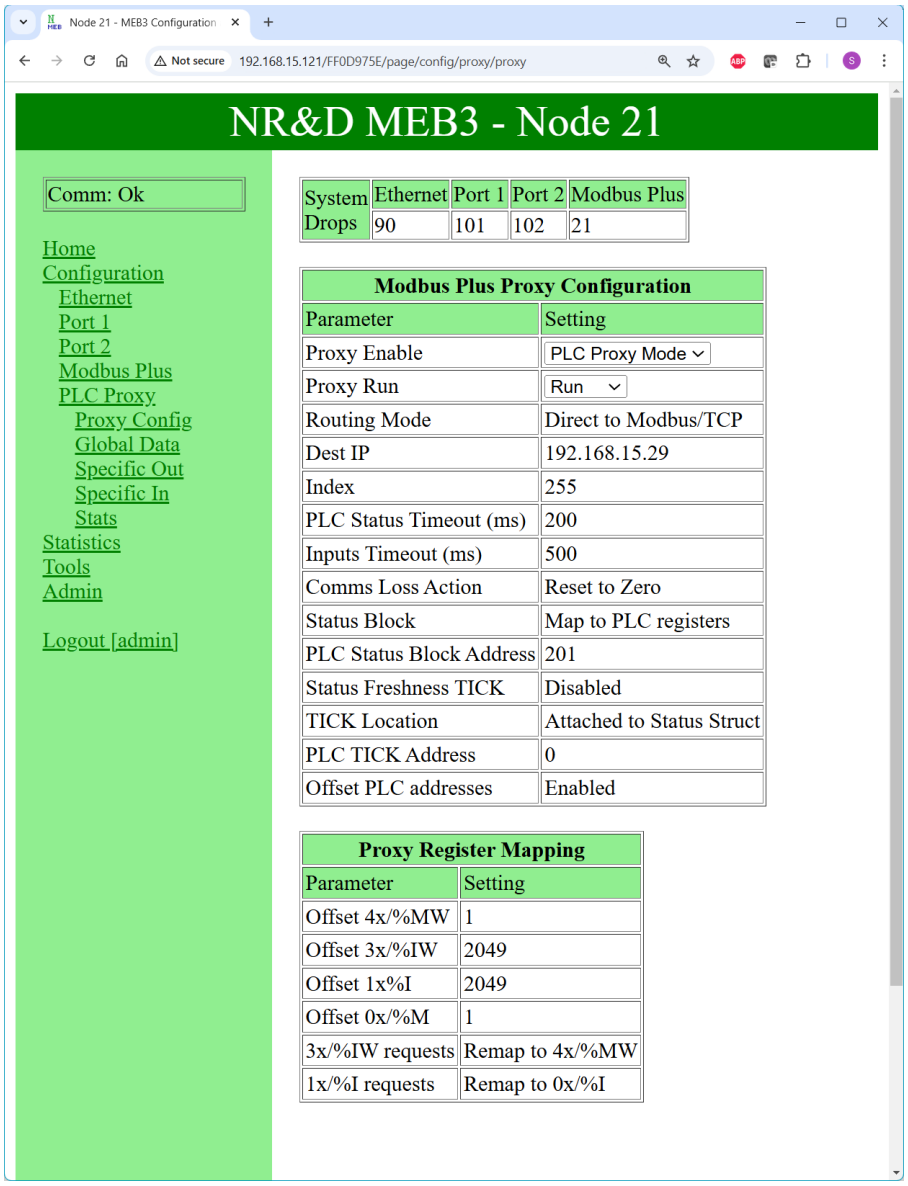
11. The MEB3 will then reboot at the new IP Address with the new Proxy configuration but still keep the Admin and User passwords.



12. Be sure to do the “Store to EEPROM” after completing the upload.



At this point you can inspect the Proxy settings to verify that they match the original SE hardware.


Node 21 - MEB3 Configuration
Not secure
192.168.15.121/FF0D975E/page/config/proxy/proxy
NR&D MEB3 - Node 21
Comm: Ok
Home
Configuration
Ethernet
Port 1
Port 2
Modbus Plus
PLC Proxy
Proxy Config
Global Data
Specific Out
Specific In
Stats
Statistics
Tools
Admin
Logout [admin]
System Drops 90
Ethernet 101
Port 1 102
Port 2 21
Modbus Plus 21
Modbus Plus Proxy Configuration
Parameter | Setting
Proxy Enable | PLC Proxy Mode
Proxy Run | Run
Routing Mode | Direct to Modbus/TCP
Dest IP | 192.168.15.29
Index | 255
PLC Status Timeout (ms) | 200
Inputs Timeout (ms) | 500
Comms Loss Action | Reset to Zero
Status Block | Map to PLC registers
PLC Status Block Address | 201
Status Freshness TICK | Disabled
TICK Location | Attached to Status Struct
PLC TICK Address | 0
Offset PLC addresses | Enabled
Proxy Register Mapping
Parameter | Setting
Offset 4x/%MW | 1
Offset 3x/%IW | 2049
Offset 1x%I | 2049
Offset 0x/%M | 1
3x/%IW requests | Remap to 4x/%MW
1x/%I requests | Remap to 0x/%I