DEB SY/MAX Video

Companion Manual

This manual provides more detail on the the DEB Serial to Ethernet Bridge SY/MAX and Net-to-Net Video.

Effective: December 14, 2011
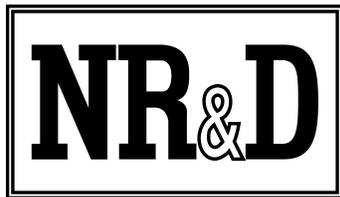
NR&D

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System Layout

The Niobrara DEB is a stand-alone DIN rail mount Serial to Ethernet Bridge. It features an optional 10/100BaseTX Ethernet port, two isolated serial ports and optionally two additional isolated serial ports. The DEB allows simultaneous pass-through routing data messages from Modbus/TCP Ethernet and Modbus serial between all ports as well as protocol translations to older Square D SY/MAX systems. Full support of PLC programming message pass-through is also provided on all communication ports including WINMATE and SYMATE serial and 802.3 Ethernet.

*Figure 1:DEB+101 Front Panel*
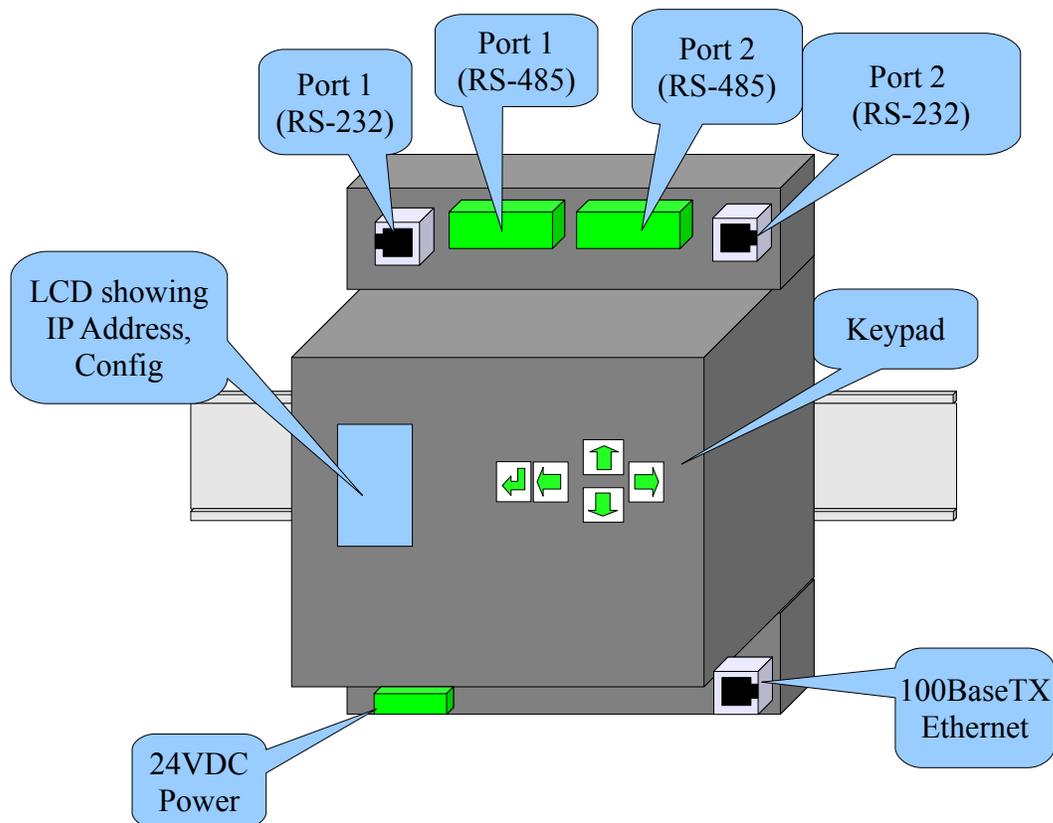
The systems in the video are two SY/MAX PLCs. One is a Model 650 while the other is a Model 300. The first half of the video shows how to use the DEB+101 to connect theses two PLCs to Modbus/TCP (and SY/MAX 802.3) Ethernet. (Figure 2 SY/MAX Network Layout) The second half of the video shows the two PLCs connected to a

SY/NET network and how to use the DEB to bridge the SY/NET network to Ethernet.

Figure 2 SY/MAX Network Layout
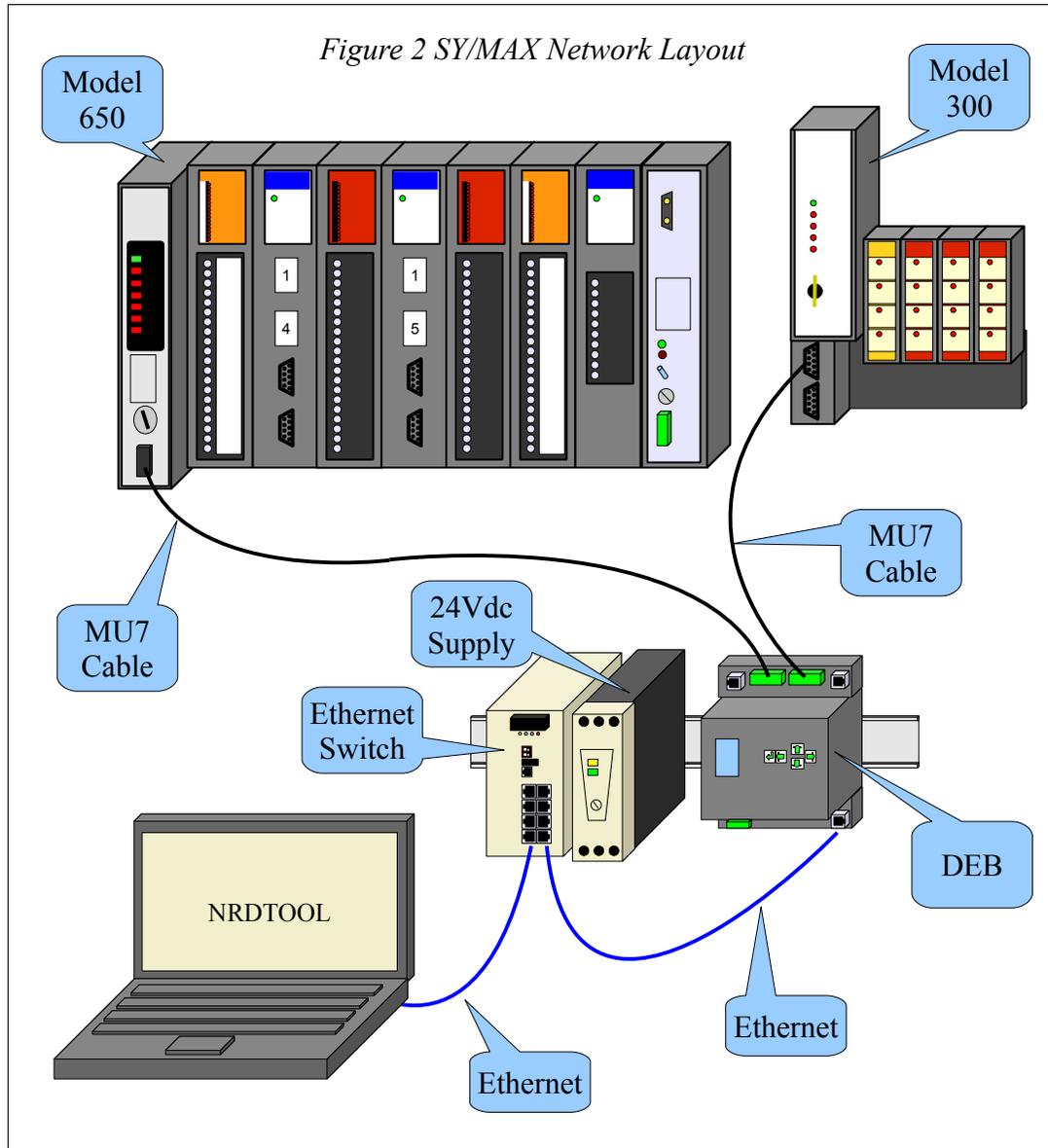
The DEB+101 is added to the system to allow a Modbus/TCP Ethernet client (PC) to access the both of the PLCs.

Figure 3 Direct Modbus Routing Setup

Modbus/TCP Index	Type	Route	Description
0	Other	NONE	Default
1	Other	101	Model 650
2	Other	102	Model 300
3	Modbus	101,3	Default
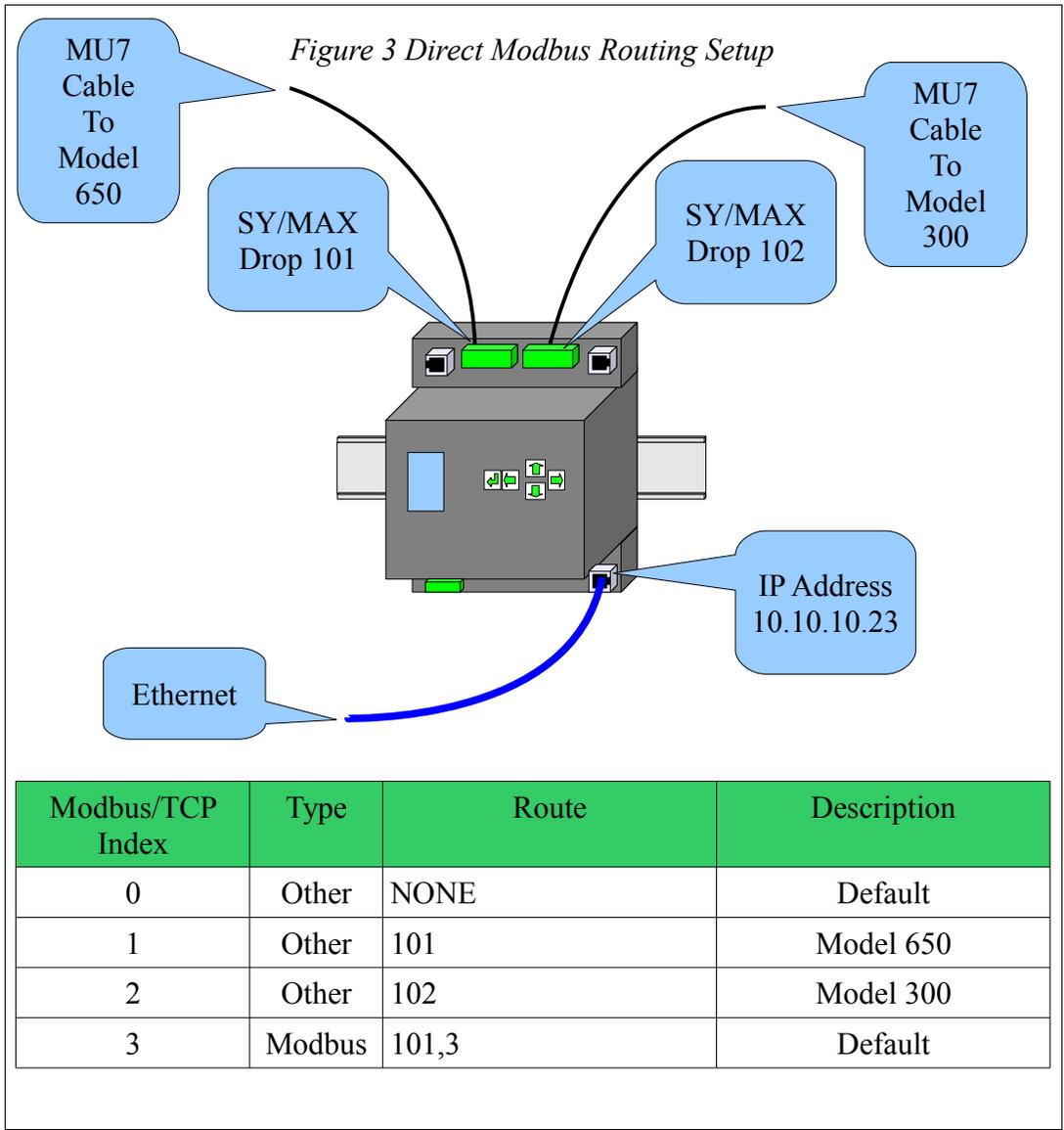
RS-422 Wiring

The DEB+101 RS-485 ports should be set for RS-422 operation when connecting to a SY/MAX port. The Niobrara MU7 cable is used to connect the DEB's serial port to a SY/MAX style port.

Figure 4 MU7 Cable

Phoenix		DB9 Male
TX(+)	————————	4 (RX+)
TX(-)	————————	3 (RX-)
RX(+)	————————	2 (TX+)
RX(-)	————————	1 (TX-)
Shield	————————	9 (Shield)
		5 (CTS-)
		6 (CTS+)
		7 (RTS-)
		8 (RTS+)

Serial Port Settings

Both serial ports will be set to SY/MAX mode to directly connect to a PLC. SY/MAX PLCs are almost always at 9600 baud. They must be at EVEN parity, 8 data bits, and 1 stop bit.

Port 1 is left at the default drop number of 101 while port 2 is at drop 102.

Figure 5: Serial Port 1 Protocol

Figure 6: Serial Port 1 Driver Mode

Figure 7: Serial Port 1 Drop 101

Figure 8: Serial Port 2 Protocol


Figure 9: Serial Port 2 Driver Mode

Figure 10: Serial Port 2 Drop

Ethernet Settings

The IP Address of the DEB+101 is set to 10.10.10.23. The video demonstrates setting this value with the following screens:

Figure 11: Fixed IP Address Screen

The Subnet Mask and Default Gate are left at their default values of 255.0.0.0 and 0.0.0.0.

Figure 12: Ethernet Protocol to Modbus/TCP + SY/MAX 802.3

The Ethernet protocol is set to MB+SYMAX so Modbus/TCP and WINMATE may be used at the same time.

Figure 13: Drop Number

Modbus/TCP index values 1 and 2 will route to slaves 1 and 2 on DEB port 1.

Figure 15: Modbus Routes for Ethernet Index 1 and 2

The "TEST" butt on the MB Routes page is used to try the downstream route. The DEB generates a read of remote register 8188 which shows the PLC model in a SY/MAX PLC.

```
┌─────────┐ ┌─────────┐ ┌─────────┐
│ ▐FAIL▌  │ │ ▐PASS▌  │ │ ▐PASS▌  │
│Rx Reply │ │Rx Reply │ │Rx Reply │
│         │ │ Valid   │ │ Valid   │
│ ERROR   │ │ Reply.  │ │ Reply.  │
│ Down-   │ │         │ │         │
│ stream  │ │4x8188=  │ │4x8188=  │
│ Timeout │ │  6551   │ │  3231   │
│         │ │         │ │         │
│ Press   │ │ Press   │ │ Press   │
│ Any Key │ │ Any Key │ │ Any Key │
└─────────┘ └─────────┘ └─────────┘
```

Figure 16: Modbus Route Test Results

NRDTOOL

The nrdtool.exe program is used to quickly view Modbus registers in both slaves. This Windows program is a Modbus register viewer that can make connections to multiple slaves and display realtime data.

Two connections are made from nrdtool to the DEB. The first connects using Modbus/TCP Index 1 to communicate with the Model 650 PLC. The second connection uses Modbus/TCP Index 2 to communicate with the Model 300.

Figure 17: NRDTOOL open connection for slave 1
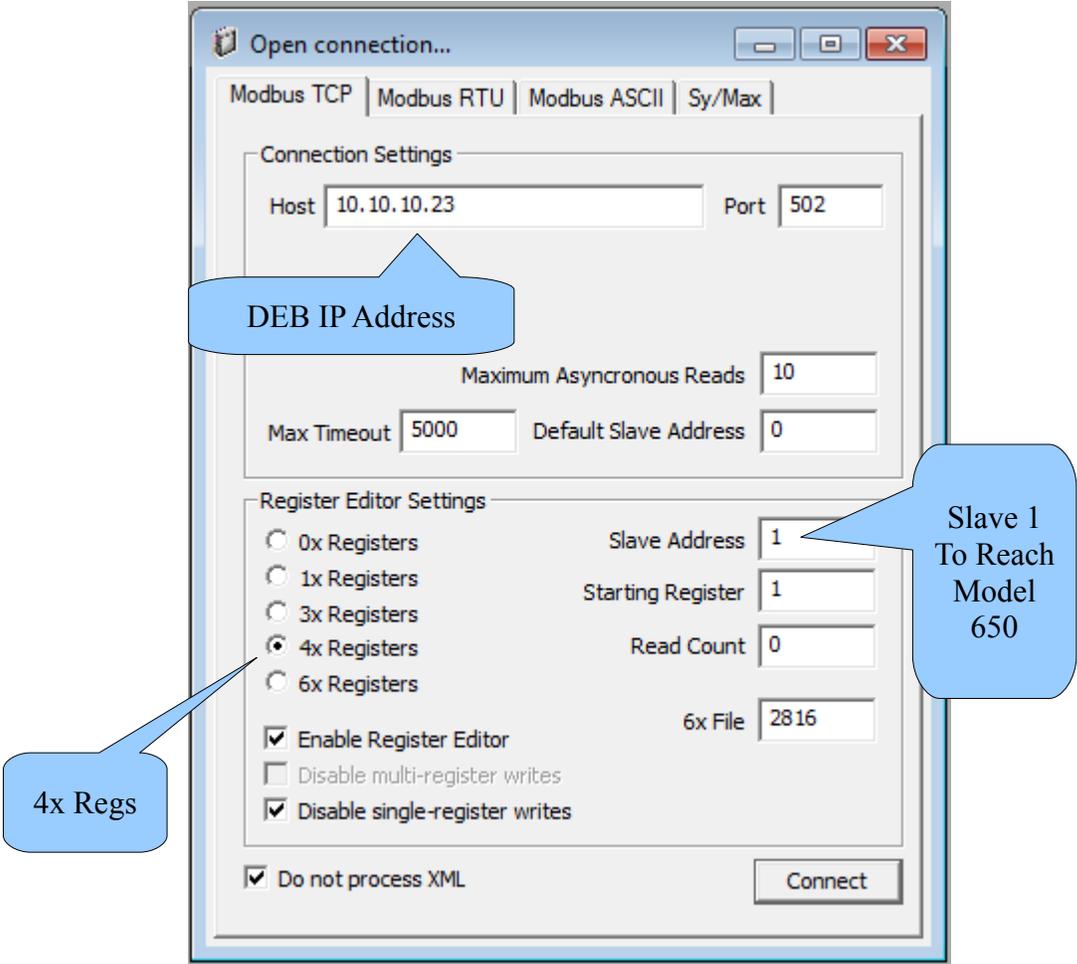
A second Modbus/TCP conection is established to the DEB targeting slave 2 (Momentum).

Figure 18: NRDTOOL open connection for slave 2
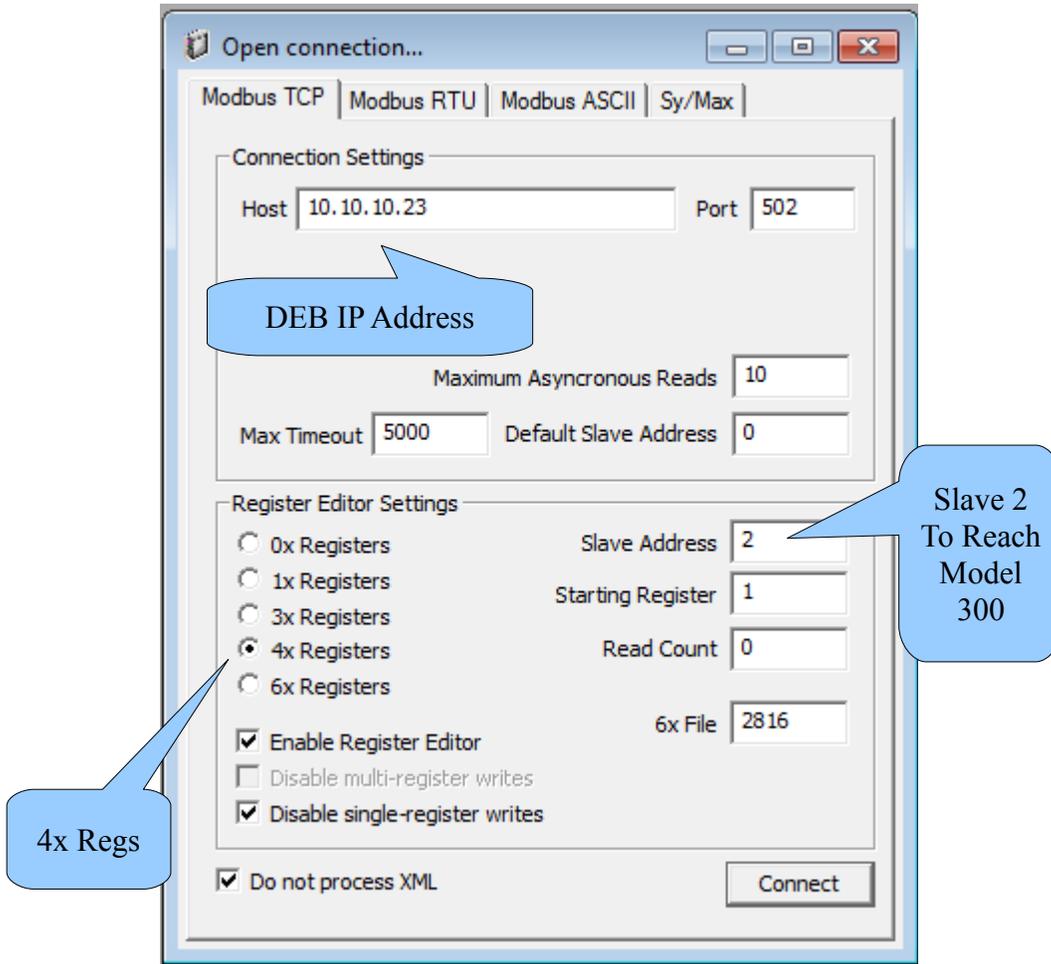
The register viewer shows the Modbus registers for the Model 650 (Slave 1) and Model 300 (Slave 2).

Figure 19: NRDTOOL Register Viewer
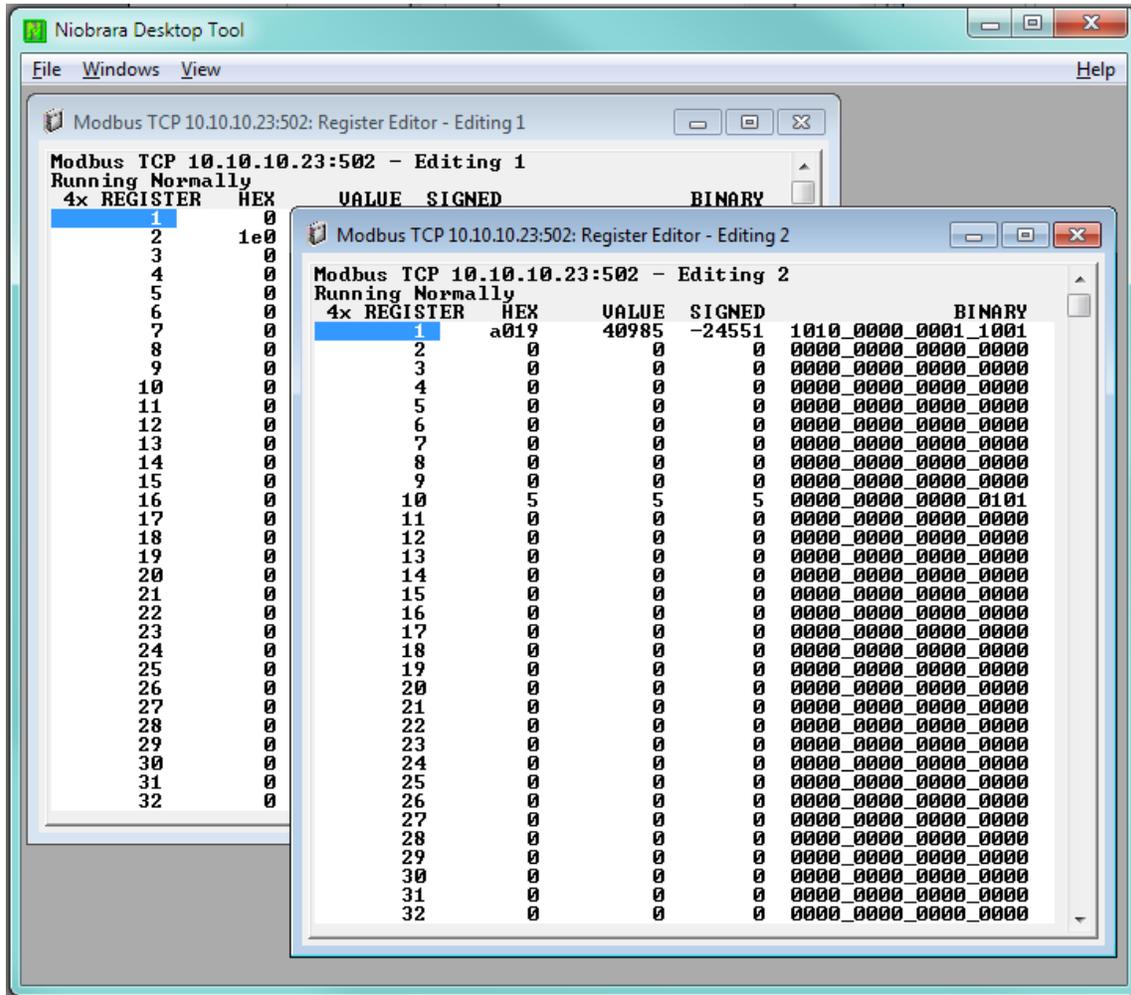
WINMATE Operation

The DEB's Ethernet port can operate in Modbus/TCP and SY/MAX 802.3 modes at the same time. In this example, the DEB's Ethernet port is set to SY/MAX address 12 and the WINMATE computer is set to SY/MAX address 97. The route to a target PLC is simply all of the drops needed to reach the PLC.

NOTE: WINMATE requires an additional drop terminator of 255 to mark the end of the

route. This is not usually required by most SY/MAX 802.3 compatible devices.

Figure 20 Direct SY/MAX 802.3 Routing Setup

Route	Description
97,12,101,255	Model 650
97,12,102,255	Model 300

NOTE: WINMATE requires the filler drop of 255 to terminate the route. Most SY/MAX compatible software systems do not use the 255 in the route.
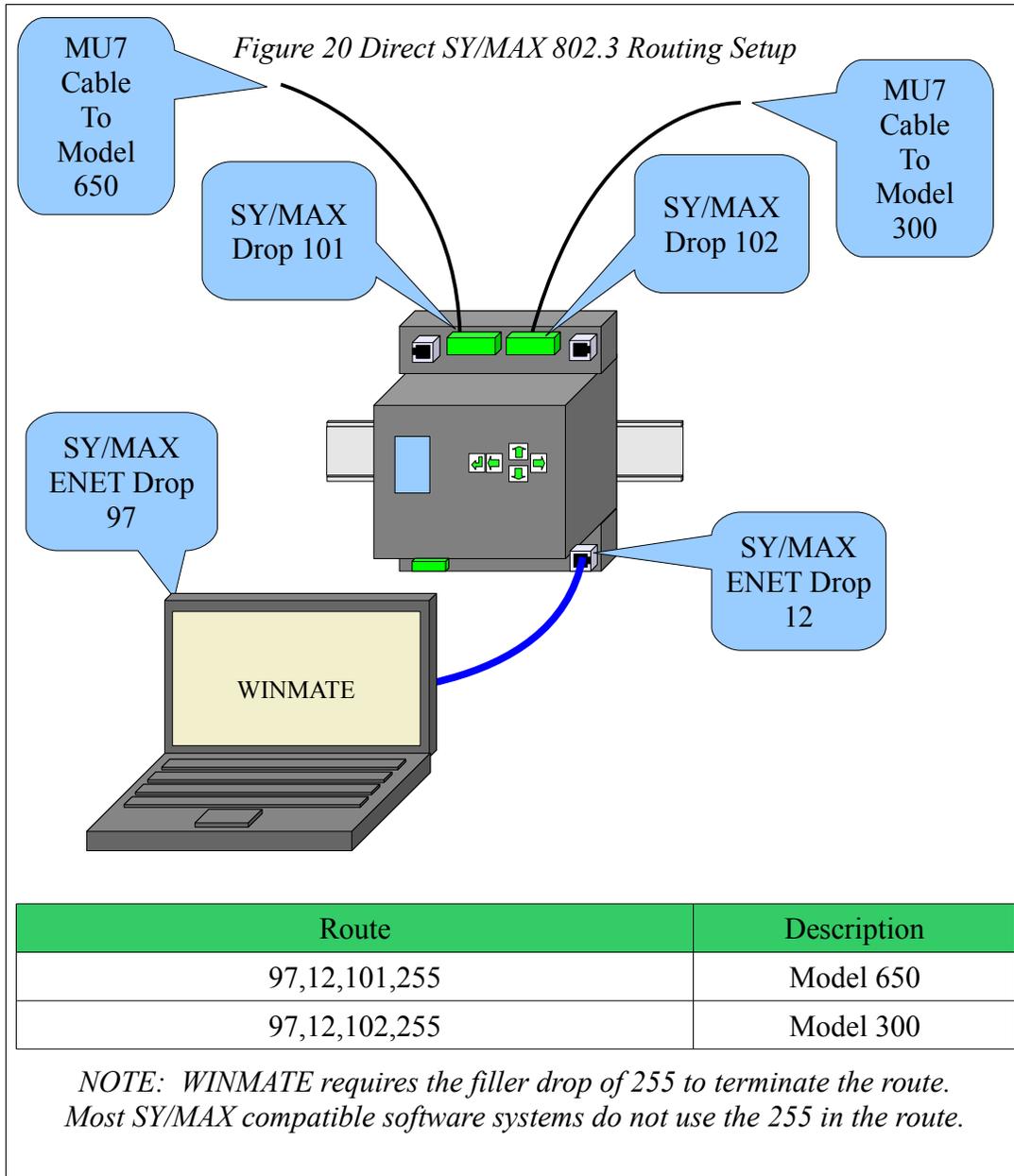
Figure 21: WINMATE Routing to Reach Model 650
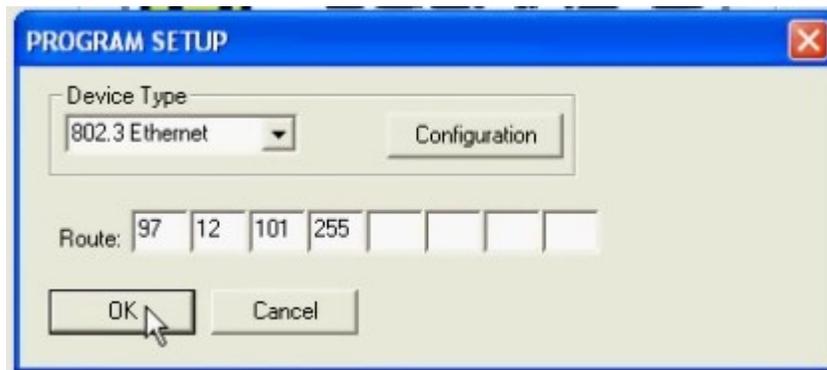
Simply change the 101 to 102 to route to the Model 300 PLC.

Figure 22: WINMATE Routing to Reach Model 300
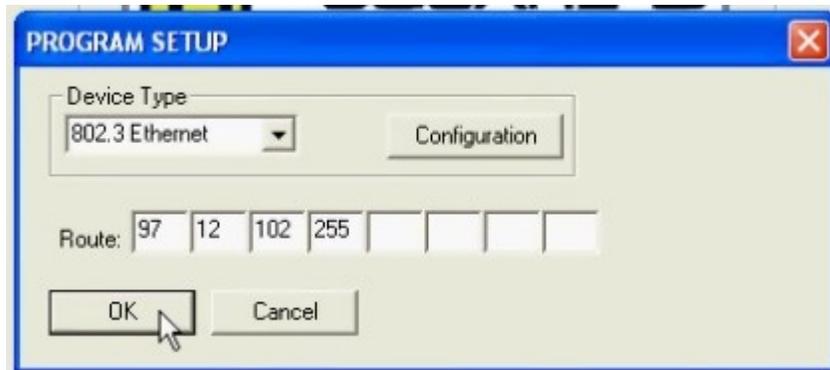
Net-to-Net Operation

The DEB may also be used to connect a SY/NET network to Ethernet. This is done by using a Net-to-Net connection between one of the serial ports on the DEB and a serial port on a standard NIM.

The following rules must be followed for a Net-to-Net connection:

- Both serial ports must be set to Net-to-Net mode.

- Both serial ports must be set to the same Drop number.

- Both serial ports must be set to the same communication parameters (typically 9600, EVEN, 8, 1.

Figure 24 shows the Net-to-Net setup from the video. The simple SY/NET network consists of two CRM510 NIMs set to nodes 14 and 15.

The bottom port of NIM 14 (drop 114) is set to SY/MAX mode and is connected to the Model 650 PLC with a Niobrara DC1 (CC-100 equivalent) cable.

The top port of NIM 15 (drop 15) is set to SY/MAX mode and is connected to the Model 300 PLC with a Niobara DC1 cable.

The bottom port of NIM 15 (drop 115) is eventually set to Net-to-Net mode and is connected to port 2 of the DEB with a Niobrara MU7 cable. The video shows an attempt to connect while the NIM port is still set for SY/MAX mode and the resulting error 29 message. The NIM port is configured by DIP switches on the back of the card.

Figure 23: NIM DIP Switches

Bottom Port SY/MAX

Bottom Port Net-to-Net

Figure 24 Net-to-Net Network Layout
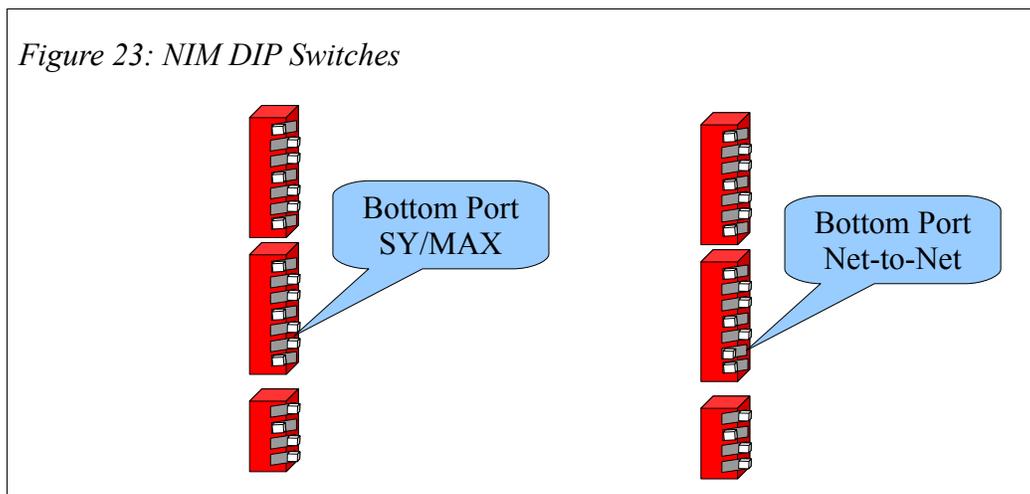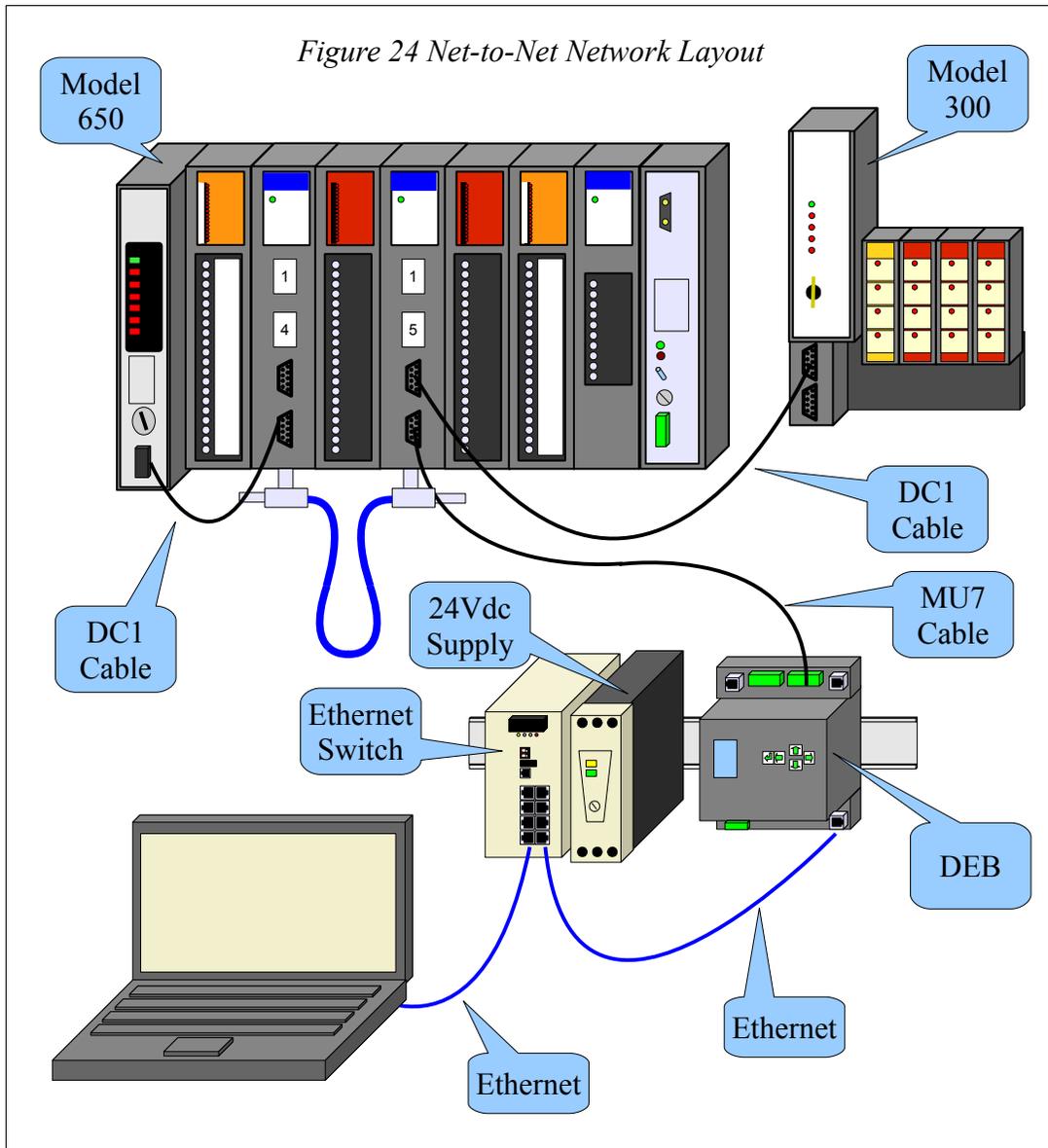
The setup for Net-to-Net involves changing the protocol for the DEB serial port, changing the Modbus Routing table entries, and moving the cables.

Port 2 of the DEB is chosen for the Net-to-Net connection. The protocol is changed to NET-TO-NET and the drop number is changed to 115 to match the NIM port.

Figure 25: Serial Port 2 Protocol

Figure 26: Serial Port 2 Drop

The Modbus Routing tables for the Ethernet port are altered to include the new routes.

Figure 27: Modbus Routes for Ethernet Index 1 and 2

Figure 28 Net-to-Net Modbus Routing Setup
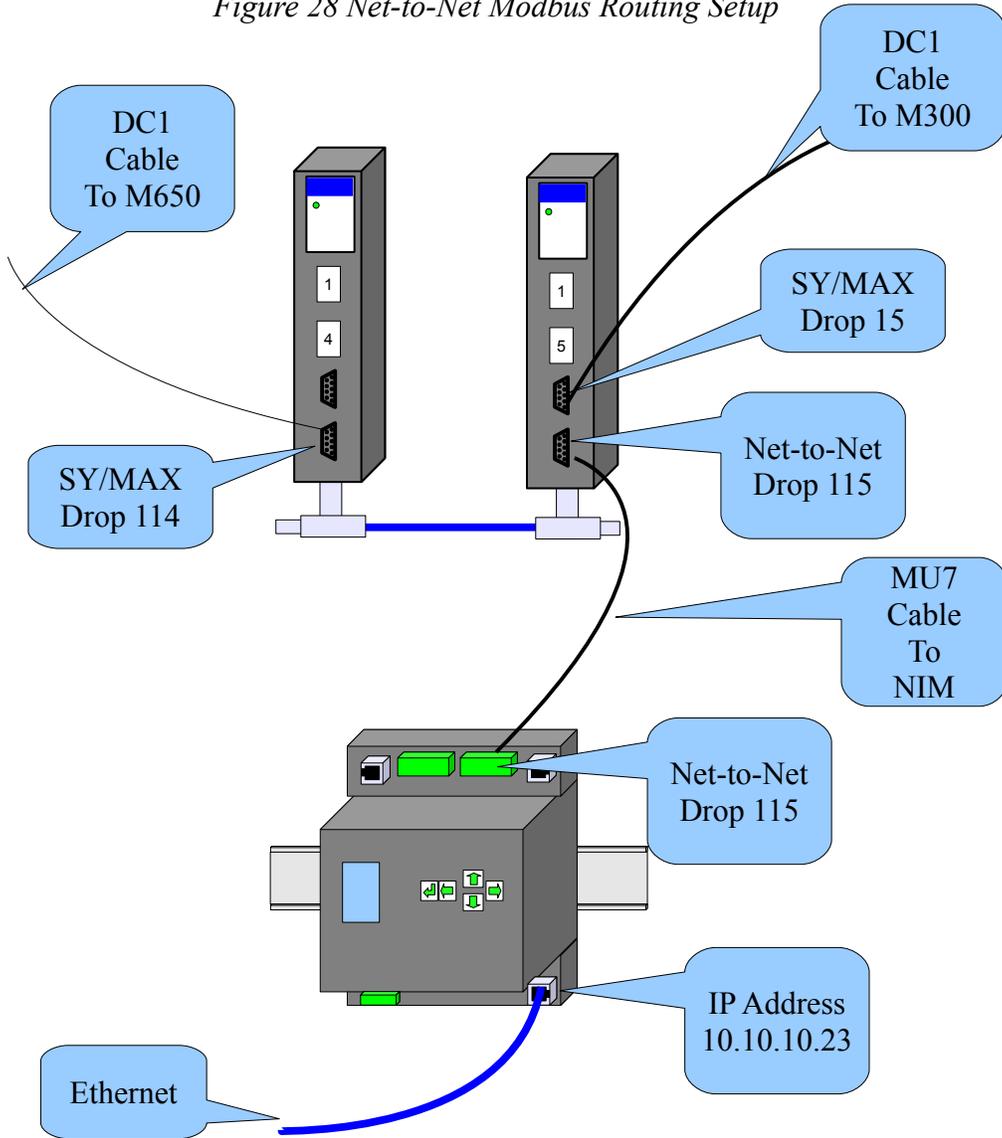
Modbus/TCP Index	Type	Route	Description
0	Other	NONE	Default
1	Other	115,114	Model 650
2	Other	115,15	Model 300
3	Modbus	101,3	Default

Figure 29 Net-to-Net SY/MAX Routing Setup
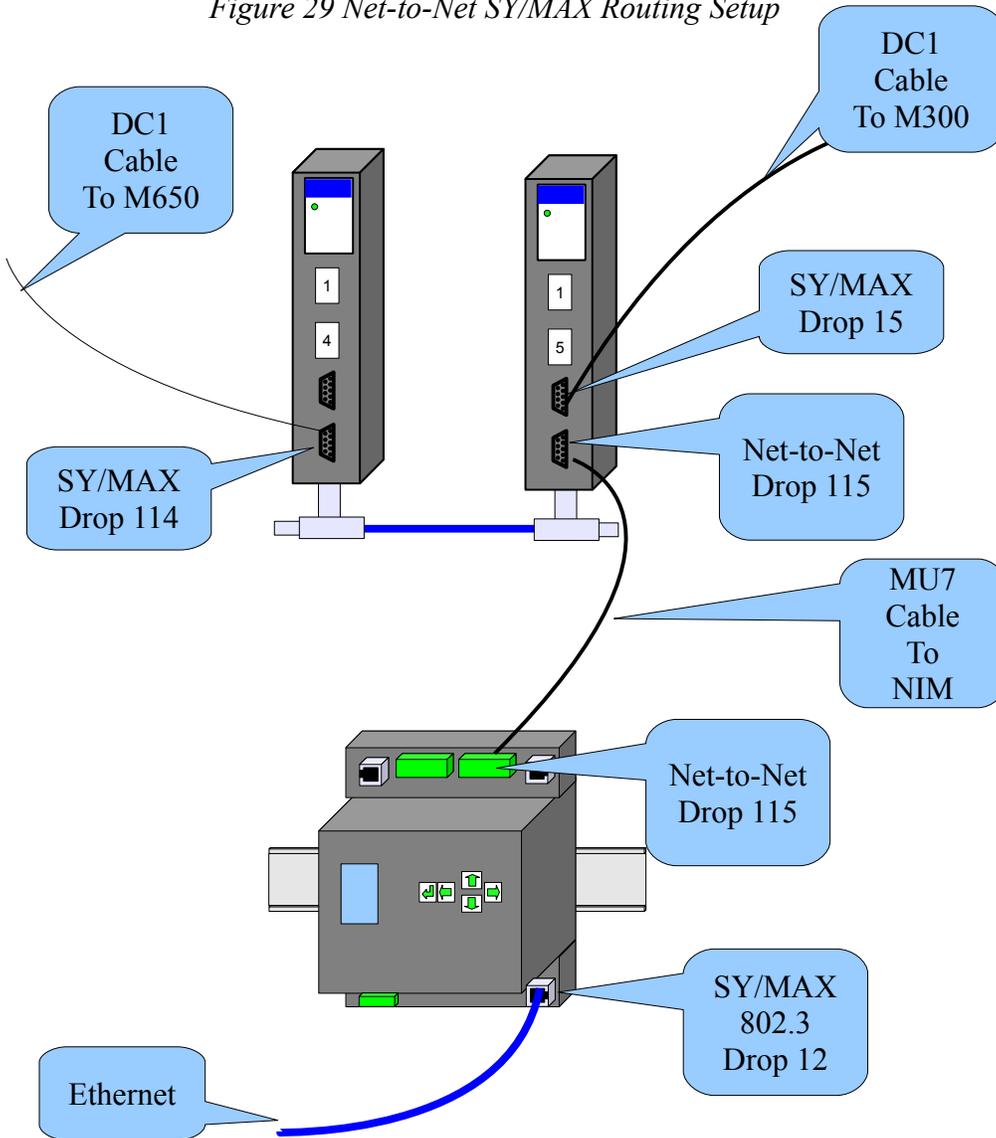
WINMATE Route	Description
97,12,115,114,255	Model 650
97,12,115,15,255	Model 300