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.

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Niobrara Research & Development Corporation P.O. Box 3418 Joplin, MO 64803 USA

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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.

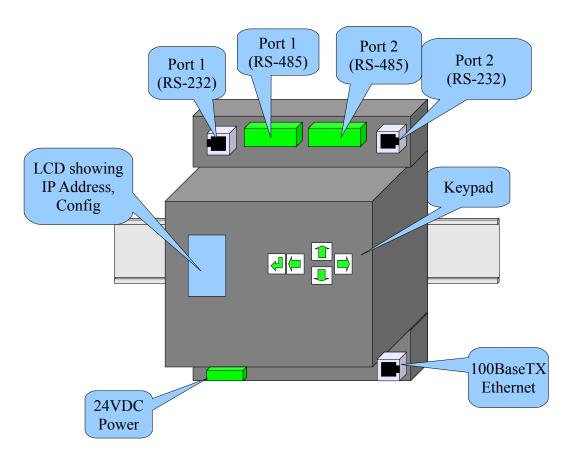
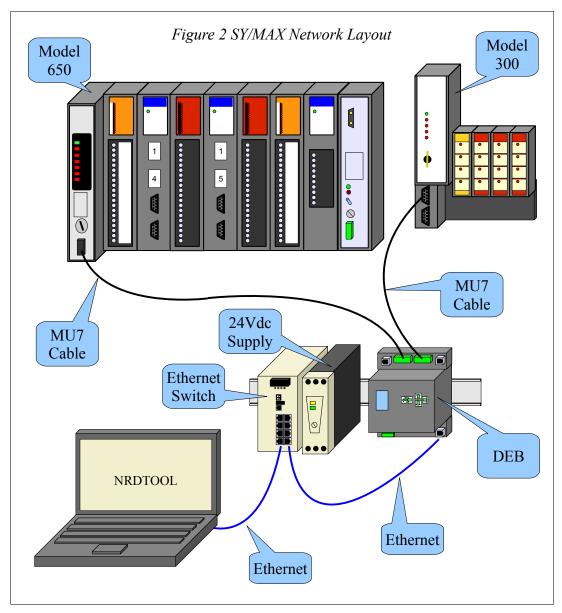


Figure 1:DEB+101 Front Panel

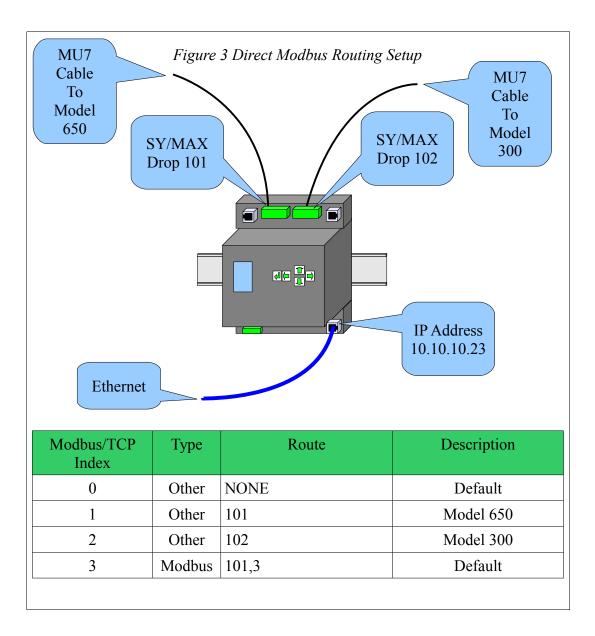
The systems in the video are two SY/MAX PLCs. One is a Model 650 while the other is a Model 300. The first half of the video shows how to use the DEB+101 to connect theses two PLCs to Modbus/TCP (and SY/MAX 802.3) Ethernet. (Figure 2 SY/MAX Network Layout) The second half of the video shows the two PLCs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

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



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



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.

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.

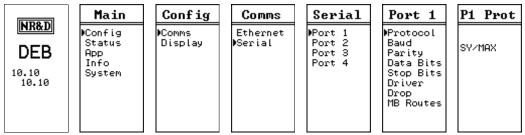


Figure 5: Serial Port 1 Protocol

LIDO D	Main	Config	Comms	Serial	Port 1	P1 Mode
NR&D DEB ^{10.10} 10.10	▶Config Status App Info System	▶Comms Display	Ethernet ∳Serial	Port 1 Port 2 Port 3 Port 4	Protocol Baud Parity Data Bits Stop Bits Driver Drop MB Routes	RS-422

Figure 6: Serial Port 1 Driver Mode

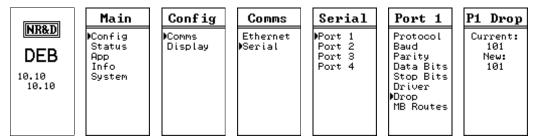


Figure 7: Serial Port 1 Drop 101

NR&D	Main Config Status	Config €Comms Display	Comms Ethernet ∳Serial	Serial Port 1 Port 2	Port 2 Protocol Baud	P2 Prot
DEB 10.10 10.10	App Info System			Port 3 Port 4	Data Bits Parity Stop Bits Driver Drop MB Routes	

Figure 8: Serial Port 2 Protocol

	Main	Config	Comms	Serial	Port 2	P2 Mode
NR&D DEB 10.10 10.10	▶Config Status App Info System	▶Comms Display	Ethernet ØSerial	Port 1 Port 2 Port 3 Port 4	Protocol Baud Data Bits Parity Stop Bits Driver Drop MB Routes	RS-422

Figure 9: Serial Port 2 Driver Mode

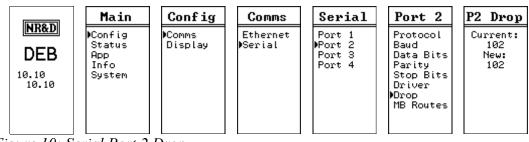


Figure 10: Serial Port 2 Drop

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.

NR&D	Main	Config	Comms	Enet	Protocol
DEB 192.168 1.19	▶Config Status App Info System	▶Comms Display	▶Ethernet Serial	Address Mask Gate IP Source Protocol Drop MB Routes IP Routes Enet Mode	MB+SYMAX

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.

NR&D	Main	Config	Comms	Enet	Eth Drp
	Config	Comms	DEthernet	Address	Current:
DEB 192.168 1.19	Status App Info System	Display	Serial	Mask Gate IP Source Protocol ⊅Drop MB Routes IP Routes Enet Mode	0 New: 12 Auto-Fix Routing Tables? No/ Wee

Figure 13: Drop Number

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

NR&D DEB 192.168 1.19	Main PConfig Status App Info System	Config Comms Display	Comms DEthernet Serial	Enet Address Mask Gate IP Source Protocol Drop MMB Routes IP Routes Enet Mode	Enet Index 001 MB Route: 101,***, ***,***, ***,*** 0ther <u>TEST</u>	Enet Index 002 MB Route: 102,***, ***,***, ***,***, ***,*** Other <u>TEST</u>
--------------------------------------------------	----------------------------------------------------	----------------------------	------------------------------	----------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------

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.

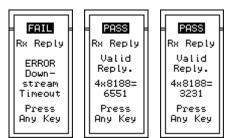


Figure 16: Modbus Route Test Results

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

	🗊 Open connection	
	Modbus TCP Modbus RTU Modbus ASCII Sy/Max	
	Connection Settings	
	Host 10.10.10.23 Port 502	
	DEB IP Address	
	Maximum Asyncronous Reads 10	
	Max Timeout 5000 Default Slave Address 0	
	Register Editor Settings	Slave 1
	C 0x Registers Slave Address 1	o Reach
	C 3x Registers	Model 650
	✓ Enable Register Editor 6x File 2816	
4x Regs	Disable multi-register writes Disable single-register writes	
	Do not process XML Connect	

A second Modbus/TCP conection is established to the DEB targeting slave 2 (Momentum).

	🗊 Open connection	
	Modbus TCP Modbus RTU Modbus ASCII Sy/Max	
	Connection Settings	
	Host 10.10.10.23 Port 502	
	DEB IP Address	
	Maximum Asyncronous Reads 10	
	Max Timeout 5000 Default Slave Address 0	
	Register Editor Settings	Slave 2
	C 0x Registers Slave Address 2	To Reach
	C 1x Registers Starting Register 1	Model 300
	4x Registers Read Count	
	C 6x Registers ✓ Enable Register Editor 6x File 2816	
	Disable multi-register writes	
4 D	✓ Disable single-register writes	
4x Regs	Do not process XML Connect	
	I	

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

Niobrara Desktop								
<u>File W</u> indows <u>V</u> iev	N							<u>H</u> el
Ø Modbus TCP 10.3	10.10.23:502:	Register Editor - Ed	liting 1			x		
Modbus TCP 10 Running Norma	11y		-					
4× REĞISTER	ĤEX Ø	VALUE SIG	IED		BINARY			
23		Modbus TCP 10	.10.10.23:502:	Register Edit	or - Editing 2	2		×
45	0	Modbus TCP 10 Running Norma	0.10.10.2 11v	3:502 - E	Editing 2	2		
6	0	4× REGISTER	HEX	VALUE	SIGNED		BINARY	
7	0	1	a019 0	40985 0	-24551 Ø)_0001_1001)_0000_0000	
9	0	3	Ø	Ø	Ø	0000_0000	0000_0000	
10 11	0	4 5 6 7	0 0	0 0	0 0		0000_0000	
11	Ø	6	Ø	Ø	Ŭ Ŭ		0000 0000	
13	0	?	Ø	Ø	Ø		0000_0000	
14 15	0	8 9	0 0	0 0	0 0		0000_0000 0000_0000	
16	Ø	10	5	5	5		0000_0101	
17	0	11	Ø	50	Ø	0000_0000	0000_0000	
18 19	0	12 13	0 0	0 0	0 0		0000_0000 0000_0000	
20	Ø	13	Ø	0	0		0000_0000	
21	0	15	Ø	0	Ø	0000_0000	0000_0000	
22 23	0	16 17	0 0	0 0	0 0		0000_0000 0000_0000	
23	Ø	18	Ø	Ø	Ŭ Ŭ		0000 0000	
25	0	19	Ø	Ø	Ø	0000_0000	0000_0000	
26 27	0	20 21	0 0	0 0	0 0		0000_0000 0000_0000	
28	Ø	22	Ø	Ø	0 0		0000_0000	
29	Ø	23	Ø	Ø	Ø	0000_0000	0000_0000	
30 31	0	24 25	0 0	0 0	0 0		0000_0000 0000_0000	
32	0	26	Ø	Ø	0		0000_0000	
		27	Ø	Ø	Ø	0000_0000	0000_0000	
		28 29	0 0	0 0	0 0		0000_0000 0000_0000	
		30	Ø	Ø	0 0		_0000_0000	
		31	Ø	Ø	Ø	0000_0000	0000_0000	
		32	Ø	0	Ø	0000-0006	0000_0000	-

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.

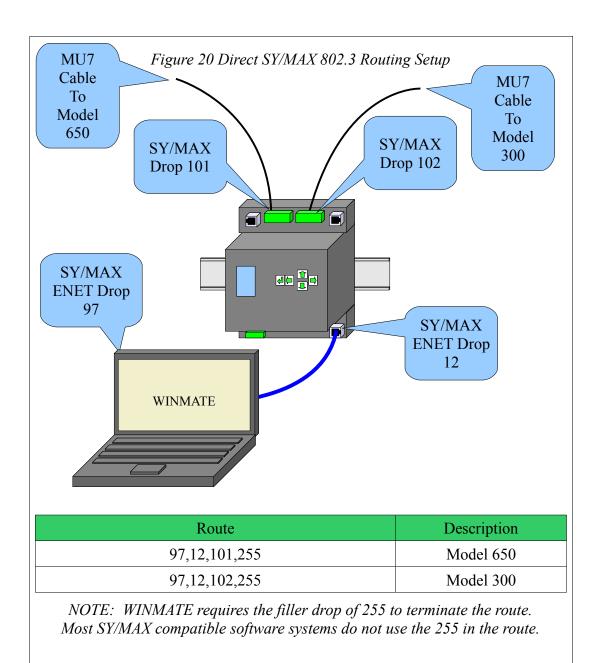


Figure 21: WINMATE Routing to Reach Model 650

Device Type		
802.3 Ethernet	Configuration	
Route: 97 12 101	255	
induce. () ()		
OK Canc	a 1	

Simply change the 101 to 102 to route to the Model 300 PLC.

Figure 22: WINMATE Routing to Reach Model 300

PROGRAM SETUP		×
B02.3 Ethernet	Configuration	
Route: 97 12 102 255		
OK Cancel		

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:

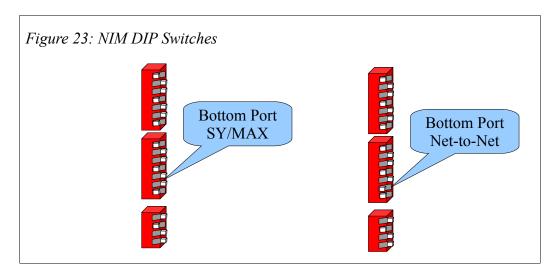
- Both serial ports must be set to Net-to-Net mode.
- Both serial ports must be set to the same Drop number.
- Both serial ports must be set to the same communication parameters (typically 9600, EVEN, 8, 1.

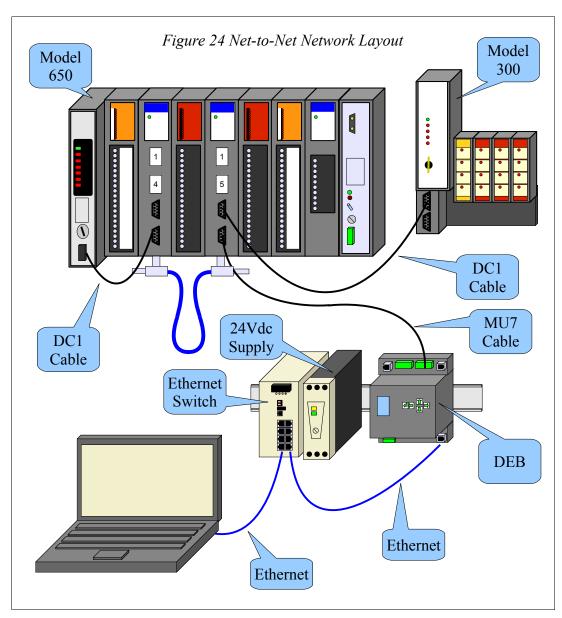
Figure 24 shows the Net-to-Net setup from the video. The simple SY/NET network consists of two CRM510 NIMs set to nodes 14 and 15.

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.





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.

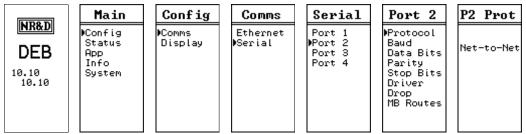


Figure 25: Serial Port 2 Protocol

NR&D DEB 10.10 10.10	Main Config Status App Info System	Config Comms Display	Comms Ethernet MSerial	Serial Port 1 Port 2 Port 3 Port 4	Port 2 Protocol Baud Data Bits Parity Stop Bits Driver	P2 Drop Current: 102 New: 115 Auto-Fix
	System					Auto-Fix Routing Tables? No/ Yas

Figure 26: Serial Port 2 Drop

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

NR&D DEB 192.168 1.19	Main Config Status App Info System	Config ⊫Comms Display	Comms DEthernet Serial	Enet Address Mask Gate IP Source Protocol Drop MB Routes IP Routes Enet Mode	Enet Index 001 MB Route: 115,114, ***,***, ***,*** Other TEST	Enet Index 002 MB Route: 115,015, ***,***, ***,***, ***,*** Other TEST
				Enet Mode	<u>TEST</u>	<u>TEST</u>

Figure 27: Modbus Routes for Ethernet Index 1 and 2

