

## Using the Modicon Bridge/MUX BM85

The Bridge Mux is used to connect multiple Modbus master devices to one Modbus network.

See Appendix A for a typical system using the BM-85. Note that Modicon sells several versions of the BM-85. The NW-BM85-000 offers 4 RS-232 ports (programmable as either Modbus master or Modbus slave ports) and one Modbus Plus port.

Modicon literature advises that the NW-BM85-000 has been superceded by the NW-BM85C002. Note the NW-BM85C002 features dual Modbus Plus ports. This is a feature that we do not use.

### BM-85 Configuration

Plug cable into Port 1 of the BM-85 and COM1 of PC. Run HyperTerminal and configure it in VT100 mode and Direct to COM1. Set the communication settings to 9600. Locate the two banks of 8 DIP switches on the rear panel of the BM-85-000. Set all DIP switches up (towards the top of the BM-85). This selects "configuration mode" and configures Port 1 on the BM-85 as the configuration with 9600 baud, no parity and 1 stop bit (refer to figure 10 in the BM-85 operating manual). Apply power to the BM-85.

System boots and displays opening default configuration screen. To change the settings for Port 1, type **p1** ↵. Note that ↵ means to press the Enter key on the keyboard. Next to select that port as a "master" (that is, you intend to connect a Modbus Master device to that port), type **tm** ↵. Some units may require that the baud be set to 2400 to insure reliable configuration (DIP switch 1 position 5 - Down, position 4 - up)

```
MODICON MODBUS BRIDGE/MUX - Ver 1.01
Copyright (c) 1989 MODICON Inc., Industrial Automation Systems Group
MODBUS PORTS CONFIGURATION [V1]
[Modbus Plus Address = 1]

<COMMANDS>                                [OPTIONS]

<P>PORT NUMBER#      1          2          3          4          [1, 2, 3, 4]
<T>Port Type         master      network   master     network   [m, s, n, x]
<N>Slave Dev Addr    -          -          -          -          [1 - 247]
<B>Baud Rate         9600      9600      9600      9600      [300 - 19200]
<S>Stop Bits         1          1          1          1          [1, 2]
<R>Parity            none       none       none       none       [n, o, e]
<M>Mode              rtu        rtu        rtu        rtu        [a, r]
<Y>Priority           1          2          3          4          [1 - 4]
<L>Link Timeout      -          600       -          600       [1 - 3000]
<F>Modem Booster    -          no         -          no         [y, n]
>>Valid Commands: [V1 V2 V3 V4 P T N B S R M Y L F] Keys:[Enter Esc ?-help]<<
Active Port 4>>
```

This port will receive messages from a Modbus master

Note:  
V1 - display this page  
V2 - display 2<sup>nd</sup> page  
V3 - display 3<sup>rd</sup> page  
V4 - display 4<sup>th</sup> page (permits saving configuration in non-volatile memory)

This port will be connected to a network of Modbus slaves

This screen can be displayed at any time by typing **v1** ↵.

...written to:  
 000: local port or  
 001: } Modbus Plus  
 002: } (MB+)  
 : } Addresses  
 064: } of another BM-85 on  
 the MB+ LAN.

...and sent out  
 Port 4 on the  
 BM-85 with that  
 MB+ address...

... to device with  
 Modbus address 001

A message  
 received on  
 Port 1  
 intended for  
 Modbus  
 address 001  
 will be...

```

MODBUS ADDRESS MAP FOR [E1-E32] [V2]
MAPS: Modbus Address to Destination Address [Port Type: Master]
Table Modbus Destination Address Table Modbus Destination Address
Entry Address (5 bytes) Entry Address (5 bytes)
<E1 > [001]= 000 004 001 000 000 <E17> [000]= 000 000 000 000 000
<E2 > [002]= 000 004 002 000 000 <E18> [000]= 000 000 000 000 000
<E3 > [003]= 000 004 003 000 000 <E19> [000]= 000 000 000 000 000
<E4 > [004]= 000 002 004 000 000 <E20> [000]= 000 000 000 000 000
<E5 > [000]= 000 000 000 000 000 <E21> [000]= 000 000 000 000 000
<E6 > [000]= 000 000 000 000 000 <E22> [000]= 000 000 000 000 000
<E7 > [000]= 000 000 000 000 000 <E23> [000]= 000 000 000 000 000
<E8 > [000]= 000 000 000 000 000 <E24> [000]= 000 000 000 000 000
<E9 > [000]= 000 000 000 000 000 <E25> [000]= 000 000 000 000 000
<E10> [000]= 000 000 000 000 000 <E26> [000]= 000 000 000 000 000
<E11> [000]= 000 000 000 000 000 <E27> [000]= 000 000 000 000 000
<E12> [000]= 000 000 000 000 000 <E28> [000]= 000 000 000 000 000
<E13> [000]= 000 000 000 000 000 <E29> [000]= 000 000 000 000 000
<E14> [000]= 000 000 000 000 000 <E30> [000]= 000 000 000 000 000
<E15> [000]= 000 000 000 000 000 <E31> [000]= 000 000 000 000 000
<E16> [000]= 000 000 000 000 000 <E32> [000]= 000 000 000 000 000

>>Valid Commands:[V1 V2 V3 V4 P E] Keys:[Enter Esc ?-help]<<
Active Port 1>>
  
```

The routing  
 tables shown  
 are for Port 1  
 on the BM-85

```

MODBUS ADDRESS MAP FOR [E1-E32] [V2]
MAPS: Modbus Address to Destination Address [Port Type: Network]
Table Modbus Destination Address Table Modbus Destination Address
Entry Address (5 bytes) Entry Address (5 bytes)
<E1 > [000]= 000 000 000 000 000 <E17> [000]= 000 000 000 000 000
<E2 > [000]= 000 000 000 000 000 <E18> [000]= 000 000 000 000 000
<E3 > [000]= 000 000 000 000 000 <E19> [000]= 000 000 000 000 000
<E4 > [000]= 000 000 000 000 000 <E20> [000]= 000 000 000 000 000
<E5 > [000]= 000 000 000 000 000 <E21> [000]= 000 000 000 000 000
<E6 > [000]= 000 000 000 000 000 <E22> [000]= 000 000 000 000 000
<E7 > [000]= 000 000 000 000 000 <E23> [000]= 000 000 000 000 000
<E8 > [000]= 000 000 000 000 000 <E24> [000]= 000 000 000 000 000
<E9 > [000]= 000 000 000 000 000 <E25> [000]= 000 000 000 000 000
<E10> [000]= 000 000 000 000 000 <E26> [000]= 000 000 000 000 000
<E11> [000]= 000 000 000 000 000 <E27> [000]= 000 000 000 000 000
<E12> [000]= 000 000 000 000 000 <E28> [000]= 000 000 000 000 000
<E13> [000]= 000 000 000 000 000 <E29> [000]= 000 000 000 000 000
<E14> [000]= 000 000 000 000 000 <E30> [000]= 000 000 000 000 000
<E15> [000]= 000 000 000 000 000 <E31> [000]= 000 000 000 000 000
<E16> [000]= 000 000 000 000 000 <E32> [000]= 000 000 000 000 000

>>Valid Commands:[V1 V2 V3 V4 P E] Keys:[Enter Esc ?-help]<<
Active Port 2>>
  
```

Note no routing information for Port 2. Port 2  
 in this example is configured as a network (of  
 slave devices)

A message received on Port 3 intended for Modbus address 001 will be...

...sent out Port 4 on the BM-85..

... to Modbus address 001

```
MODBUS ADDRESS MAP FOR [E1-E32] [V2]
MAPS: Modbus Address to Destination Address [Port Type: Master]
Table Modbus Destination Address      Table Modbus Destination Address
Entry Address      (5 bytes)          Entry Address      (5 bytes)
<E1 > [001]= 000 004 001 000 000     <E17> [000]= 000 000 000 000 000
<E2 > [002]= 000 004 002 000 000     <E18> [000]= 000 000 000 000 000
<E3 > [003]= 000 004 003 000 000     <E19> [000]= 000 000 000 000 000
<E4 > [004]= 000 002 004 000 000     <E20> [000]= 000 000 000 000 000
<E5 > [000]= 000 000 000 000 000     <E21> [000]= 000 000 000 000 000
<E6 > [000]= 000 000 000 000 000     <E22> [000]= 000 000 000 000 000
<E7 > [000]= 000 000 000 000 000     <E23> [000]= 000 000 000 000 000
<E8 > [000]= 000 000 000 000 000     <E24> [000]= 000 000 000 000 000
<E9 > [000]= 000 000 000 000 000     <E25> [000]= 000 000 000 000 000
<E10> [000]= 000 000 000 000 000    <E26> [000]= 000 000 000 000 000
<E11> [000]= 000 000 000 000 000    <E27> [000]= 000 000 000 000 000
<E12> [000]= 000 000 000 000 000    <E28> [000]= 000 000 000 000 000
<E13> [000]= 000 000 000 000 000    <E29> [000]= 000 000 000 000 000
<E14> [000]= 000 000 000 000 000    <E30> [000]= 000 000 000 000 000
<E15> [000]= 000 000 000 000 000    <E31> [000]= 000 000 000 000 000
<E16> [000]= 000 000 000 000 000    <E32> [000]= 000 000 000 000 000

>>Valid Commands:[V1 V2 V3 V4 P E]      Keys:[Enter Esc ?-help]<<
Active Port 3>>
```

Notice that, as with Port 1 (shown earlier), a message received on Port 3 intended for Modbus slave address 004 will be routed out Port 2.

Port 3 is also a Master port.

```
MODBUS ADDRESS MAP FOR [E1-E32] [V2]
MAPS: Modbus Address to Destination Address [Port Type: Network]
Table Modbus Destination Address      Table Modbus Destination Address
Entry Address      (5 bytes)          Entry Address      (5 bytes)
<E1 > [000]= 000 000 000 000 000     <E17> [000]= 000 000 000 000 000
<E2 > [000]= 000 000 000 000 000     <E18> [000]= 000 000 000 000 000
<E3 > [000]= 000 000 000 000 000     <E19> [000]= 000 000 000 000 000
<E4 > [000]= 000 000 000 000 000     <E20> [000]= 000 000 000 000 000
<E5 > [000]= 000 000 000 000 000     <E21> [000]= 000 000 000 000 000
<E6 > [000]= 000 000 000 000 000     <E22> [000]= 000 000 000 000 000
<E7 > [000]= 000 000 000 000 000     <E23> [000]= 000 000 000 000 000
<E8 > [000]= 000 000 000 000 000     <E24> [000]= 000 000 000 000 000
<E9 > [000]= 000 000 000 000 000     <E25> [000]= 000 000 000 000 000
<E10> [000]= 000 000 000 000 000    <E26> [000]= 000 000 000 000 000
<E11> [000]= 000 000 000 000 000    <E27> [000]= 000 000 000 000 000
<E12> [000]= 000 000 000 000 000    <E28> [000]= 000 000 000 000 000
<E13> [000]= 000 000 000 000 000    <E29> [000]= 000 000 000 000 000
<E14> [000]= 000 000 000 000 000    <E30> [000]= 000 000 000 000 000
<E15> [000]= 000 000 000 000 000    <E31> [000]= 000 000 000 000 000
<E16> [000]= 000 000 000 000 000    <E32> [000]= 000 000 000 000 000

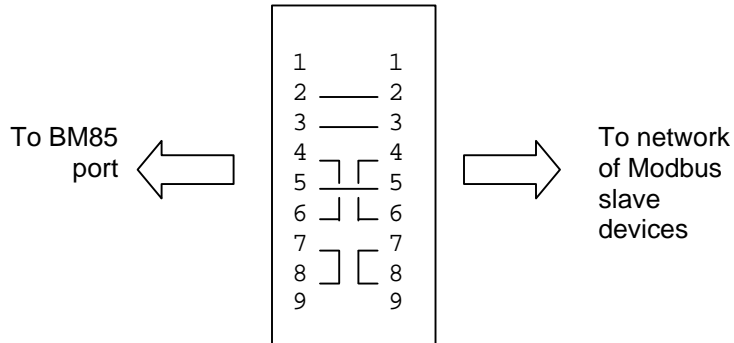
>>Valid Commands:[V1 V2 V3 V4 P E]      Keys:[Enter Esc ?-help]<<
Active Port 4>>
```

Port 4 is also a network port.

Once you have made all necessary changes to the setup, select the V4 page by typing from the prompt **v4** ↵. The system will ask you to confirm that you wish to save your changes to non-volatile memory. Confirm your selection by typing **y** ↵.

## Troubleshooting

Any port programmed as a slave network port *must* see both DSR (Data Set Ready - pin 6) **and** CTS (Clear To Send - pin 8) high before any message will be transmitted from the BM85 to the Modbus network. A simple solution is to make sure the RS-232 cable connected to any slave network port on the BM85 has RTS (pin 7) jumpered to CTS (pin 8). Also jumper DSR (pin 6) to DTR (pin 4) at the BM85.



If either the CTS or the DSR line is not high, a message sent to that port from a Modbus master on another port will be rejected with exception code 4, illegal data address.

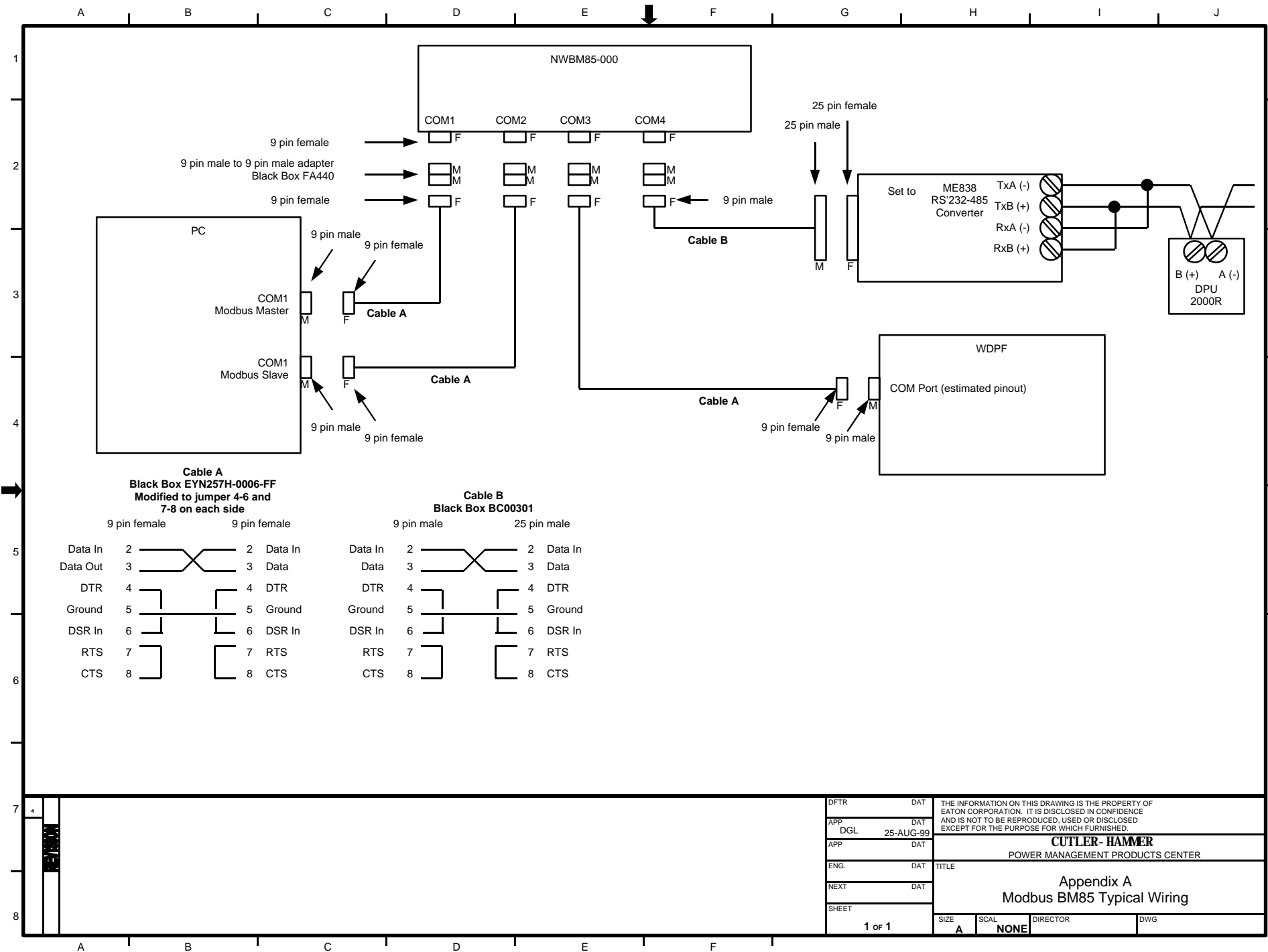
Display the Help screen by typing ? ǂ.

```
HELP SCREEN FOR MODBUS PORTS CONFIGURATION [V6]
      (All numbers in decimal)

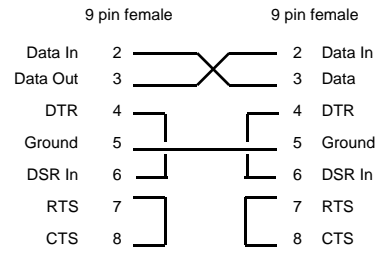
<V> View screens: V1-Modbus ports configuration, V2-Modbus address MAP [E1-E32]
      V3-Modbus address MAP [E33-E64], V4-Save & default configuration
<P> Modbus port selection: P1, P2, P3, P4
<T> Port type: Tm-master, Ts-slave, Tn-network, Tx-xmaster (silent mode)
<N> Slave device address: [N1-N247]
<B> Baud rate: B300, B600, B1200, B1800, B2000, B2400, B3600, B4800, B7200,
      B9600, B19200 bits/sec
<S> Stop bits: S1, S2
<R> Parity: Rn-no parity, Ro-odd, Re-even
<M> Mode: Ma-ascii, Mr-rtu
<Y> Priority: [Y1-Y4]
<L> Link timeout in multiples of 100 ms: [L1-L3000]
<F> Modem network performance booster (FCN126-->13 translation): Fy=yes, Fn=no
      Note that 584 controller does not respond to fcn13 in DIMWIT (SAFE584)

Example: To Set Port 1: Type=master, Baud=9600, Stop bits=2, Mode=ascii
      Enter following commands: P1 Tm B9600 S2 Ma <Enter>

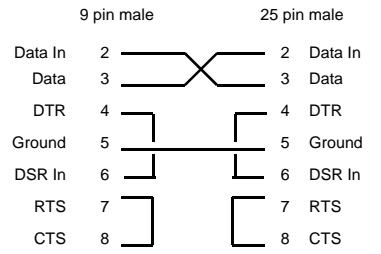
>>Use <Esc> to return back to previous menu or <?> for help directory<<
Active Port 3>>
```



**Cable A**  
**Black Box EYN257H-0006-FF**  
 Modified to jumper 4-6 and 7-8 on each side

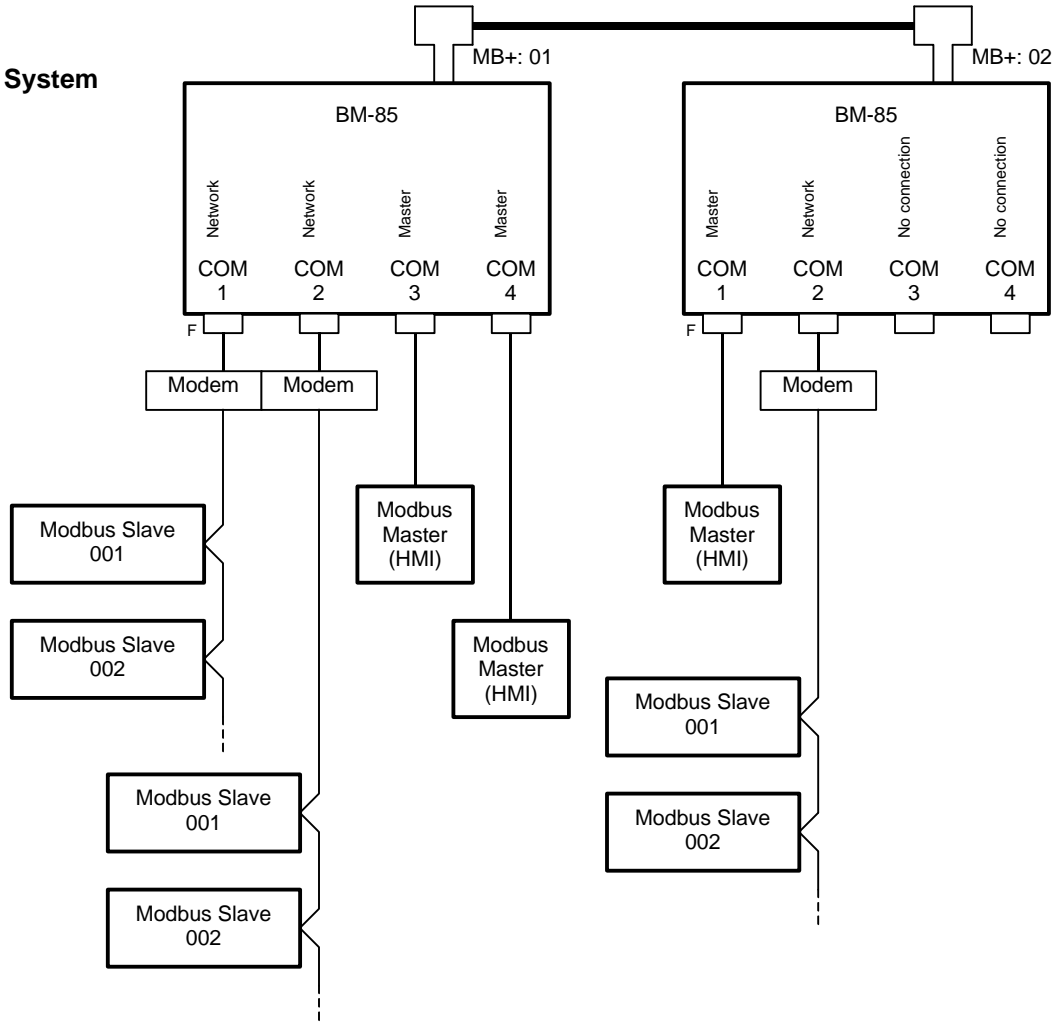


**Cable B**  
**Black Box BC00301**



DFTR	DAT	THE INFORMATION ON THIS DRAWING IS THE PROPERTY OF EATON CORPORATION. IT IS DISCLOSED IN CONFIDENCE AND IS NOT TO BE REPRODUCED, USED OR DISCLOSED EXCEPT FOR THE PURPOSE FOR WHICH FURNISHED.			
APP	DGL	25-AUG-99	<b>CUTLER-HAMMER</b> POWER MANAGEMENT PRODUCTS CENTER		
APP	DAT				
ENG.	DAT		TITLE <b>Appendix A</b> <b>Modbus BM85 Typical Wiring</b>		
NEXT	DAT				
SHEET	1 of 1	SIZE	SCAL	DIRECTOR	DWG
		A	NONE		

## Example System



Description	MB+	Port	Port Type	Actual Modbus Address	Comments
Generator 1 GPC PLC	1	1	Network	1	←
Generator 1 GPC Sync	1	1	Network	2	
Generator 2 GPC PLC	1	2	Network	1	←
Generator 2 GPC Sync	1	2	Network	2	
D500 HMI Gen 1	1	3	Master	n/a	link to addresses 001 or 002 via port 1 ←
D500 HMI Gen 2	1	4	Master	n/a	link to addresses 001 or 002 via port 2 ←
Computer	2	1	Master	n/a	map to addresses 001 and 002 via MB+ 1, port 1 as addresses 003 and 004 ←
					map to addresses 001 and 002 via MB+ 1, port 2 as addresses 005 and 006 ←
					map to addresses 001 and 002 via MB+ 2, port 2 as addresses 001 and 002 ←
Softload GPC utility main PLC	2	2	Network	1	←
Softload GPC utility main Sync	2	2	Network	2	

The next step is to enter the data into the BM-85 "Modbus Address Map" tables. Note that only ports configured as masters must include the mapping. Any port designated as a network port does not require mapping. Therefore, from the table above we see that we need three ports mapped:

- Left BM-85 (MB+ address = 01)
  - Port 3 has the D500 HMI for Gen 1
  - Port 4 has the D500 HMI for Gen 2
- Right BM-85 (MB+ address = 02)
  - Port 1 has the Computer

Note: In our example, the "Gen 1" D500 unit is only intended to access the two Modbus slaves (001 and 002) connected to port 1 of the left BM-85. Likewise the "Gen 2" D500 unit is only intended to access the two Modbus slaves (001 and 002) connected to port 2 of the left BM-85. The computer, meanwhile, is programmed to access any of the six Modbus slaves in the system. The Modbus Address Map tables within the BM-85s must be configured to allow this intent. See next page for the programming required to accomplish this intent.

Request to access Modbus address 004 from port 1 on this BM-85 (MB+ address 02) ...

... is routed to BM-85 with MB+ address 01...

... and port 1 on that BM-85...

... thus translating the original request for Modbus address 004 on port 1 into a request for Modbus address 002 on the Modbus network connected to port 1 of that BM-85.

This is the programming for the 2<sup>nd</sup> BM-85 (MB+ add. = 02).

Master connected to Serial Port :1

**Example:**  
Any Modbus master connected to port 1 of this BM-85 when trying to access Modbus address 004 will have this request routed to the left BM-85 (MB+ address 01), port 1 and will have its request remapped to requesting Modbus address 002.

```

MODBUS ADDRESS MAP FOR [E1-E32] [V2]
MAPS: Modbus Address to Destination Address [Port Type: Master]
Table Modbus Destination Address Table Modbus Destination Address
Entry Address (5 bytes) Entry Address (5 bytes)
<E1 > [001]= 000 002 001 000 000 <E17> [000]= 000 000 000 000 000
<E2 > [002]= 000 002 002 000 000 <E18> [000]= 000 000 000 000 000
<E3 > [003]= 001 001 001 000 000 <E19> [000]= 000 000 000 000 000
<E4 > [004]= 001 001 002 000 000 <E20> [000]= 000 000 000 000 000
<E5 > [005]= 001 002 001 000 000 <E21> [000]= 000 000 000 000 000
<E6 > [006]= 001 002 002 000 000 <E22> [000]= 000 000 000 000 000
<E7 > [000]= 000 000 000 000 000 <E23> [000]= 000 000 000 000 000
<E8 > [000]= 000 000 000 000 000 <E24> [000]= 000 000 000 000 000
<E9 > [000]= 000 000 000 000 000 <E25> [000]= 000 000 000 000 000
<E10> [000]= 000 000 000 000 000 <E26> [000]= 000 000 000 000 000
<E11> [000]= 000 000 000 000 000 <E27> [000]= 000 000 000 000 000
<E12> [000]= 000 000 000 000 000 <E28> [000]= 000 000 000 000 000
<E13> [000]= 000 000 000 000 000 <E29> [000]= 000 000 000 000 000
<E14> [000]= 000 000 000 000 000 <E30> [000]= 000 000 000 000 000
<E15> [000]= 000 000 000 000 000 <E31> [000]= 000 000 000 000 000
<E16> [000]= 000 000 000 000 000 <E32> [000]= 000 000 000 000 000

>>Valid Commands:[V1 V2 V3 V4 P E] Keys:[Enter Esc ?-help]<<
Active Port (1)>>

```

```

MODBUS ADDRESS MAP FOR [E1-E32] [V2]
MAPS: Modbus Address to Destination Address [Port Type: Master]
Table Modbus Destination Address Table Modbus Destination Address
Entry Address (5 bytes) Entry Address (5 bytes)
<E1 > [001]= 000 001 001 000 000 <E17> [000]= 000 000 000 000 000
<E2 > [002]= 000 001 002 000 000 <E18> [000]= 000 000 000 000 000
<E3 > [000]= 000 000 000 000 000 <E19> [000]= 000 000 000 000 000
<E4 > [000]= 000 000 000 000 000 <E20> [000]= 000 000 000 000 000
<E5 > [000]= 000 000 000 000 000 <E21> [000]= 000 000 000 000 000
<E6 > [000]= 000 000 000 000 000 <E22> [000]= 000 000 000 000 000
<E7 > [000]= 000 000 000 000 000 <E23> [000]= 000 000 000 000 000
<E8 > [000]= 000 000 000 000 000 <E24> [000]= 000 000 000 000 000
<E9 > [000]= 000 000 000 000 000 <E25> [000]= 000 000 000 000 000
<E10> [000]= 000 000 000 000 000 <E26> [000]= 000 000 000 000 000
<E11> [000]= 000 000 000 000 000 <E27> [000]= 000 000 000 000 000
<E12> [000]= 000 000 000 000 000 <E28> [000]= 000 000 000 000 000
<E13> [000]= 000 000 000 000 000 <E29> [000]= 000 000 000 000 000
<E14> [000]= 000 000 000 000 000 <E30> [000]= 000 000 000 000 000
<E15> [000]= 000 000 000 000 000 <E31> [000]= 000 000 000 000 000
<E16> [000]= 000 000 000 000 000 <E32> [000]= 000 000 000 000 000

>>Valid Commands:[V1 V2 V3 V4 P E] Keys:[Enter Esc ?-help]<<
Active Port 3>>

```

This is the programming for the 1<sup>st</sup> BM-85 (MB+ add. = 01).

Master connected to Serial Port :3

```

MODBUS ADDRESS MAP FOR [E1-E32] [V2]
MAPS: Modbus Address to Destination Address [Port Type: Master]
Table Modbus Destination Address Table Modbus Destination Address
Entry Address (5 bytes) Entry Address (5 bytes)
<E1 > [001]= 000 002 001 000 000 <E17> [000]= 000 000 000 000 000
<E2 > [002]= 000 002 002 000 000 <E18> [000]= 000 000 000 000 000
<E3 > [000]= 000 000 000 000 000 <E19> [000]= 000 000 000 000 000
<E4 > [000]= 000 000 000 000 000 <E20> [000]= 000 000 000 000 000
<E5 > [000]= 000 000 000 000 000 <E21> [000]= 000 000 000 000 000
<E6 > [000]= 000 000 000 000 000 <E22> [000]= 000 000 000 000 000
<E7 > [000]= 000 000 000 000 000 <E23> [000]= 000 000 000 000 000
<E8 > [000]= 000 000 000 000 000 <E24> [000]= 000 000 000 000 000
<E9 > [000]= 000 000 000 000 000 <E25> [000]= 000 000 000 000 000
<E10> [000]= 000 000 000 000 000 <E26> [000]= 000 000 000 000 000
<E11> [000]= 000 000 000 000 000 <E27> [000]= 000 000 000 000 000
<E12> [000]= 000 000 000 000 000 <E28> [000]= 000 000 000 000 000
<E13> [000]= 000 000 000 000 000 <E29> [000]= 000 000 000 000 000
<E14> [000]= 000 000 000 000 000 <E30> [000]= 000 000 000 000 000
<E15> [000]= 000 000 000 000 000 <E31> [000]= 000 000 000 000 000
<E16> [000]= 000 000 000 000 000 <E32> [000]= 000 000 000 000 000

>>Valid Commands:[V1 V2 V3 V4 P E] Keys:[Enter Esc ?-help]<<
Active Port 4>>

```

This also is the programming for the 1<sup>st</sup> BM-85 (MB+ add. = 01).

Master connected to Serial Port :4