

MILLE APPLIED RESEARCH CO., INC.

FSK MODEM 166-101 USERS MANUAL

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INTRODUCTION

The MARC 166-101 FSK modem is a frequency shift keyed modem capable of operating at speeds up to 1200 baud. This modem fits into a single slot of the Allen-Bradley SLC 500 rack and connects to the backplane for +5V power only and requires no PLC programming; the SLC 500 treats the modem module as an empty I/O slot.

This manual covers the setup for the different modes of operation of the 166-101 FSK modem. First, the jumper configuration, the connector pinout, and the phone line pinout is discussed. The next chapter, transmit mode, tells how to select the transmit level of the modem. The modem mode chapter offers a table listing the different modes of operation. Then, the LEDs functions are covered followed by a simple example configuration which serves as a general guideline to setting up the 166-101 FSK modem. The example suggests a way to test the modem rather than a standard means of communication.

CONNECTORS

The MARC 166-101 FSK modem for Allen-Bradley SLC500 PLCs standard factory configuration sets up the modem for Bell 202 compatibility and for operation on a 4-wire leased telephone line. Other modes of operation are user selectable by changing jumpers located on the FSK modem printed circuit board. This chapter describes the modem option jumpers and connections.

The standard configuration uses port 1 (upper connector) for RS232 communication and the RJ11 jack for the telephone line connection. Port 2 is not used.

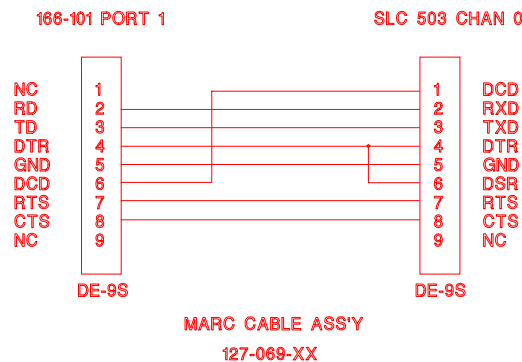
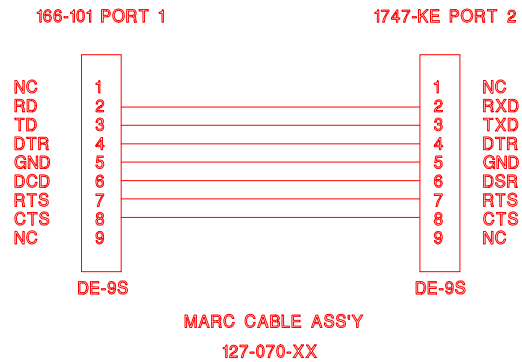
STANDARD JUMPER CONFIGURATION

J1	3-4	
	7-8	P1=RS232
	10-12	
J2	3-4	
	7-8	P2=RS232
	10-12	
J3	1-2	
J4	1-2	
J5	2-3	4-WIRE OPERATION
J6	2-3	
J7	1-2	P1-PIN 4 IS ACTIVE
J8	1-2	P2-PIN 4 IS ACTIVE
J10	1-3, 4-6, 7-9, 10-12, 13-15 & 16-18	P1 IS DCE PINOUT
P5	5-6	P1-PIN 6 IS DCD
	9-10	ON-LINE LED IS DCD
	11-12	P1-PIN 8 IS CTS
	13-14	P1-PIN 2 IS RECEIVED DATA
	15-16	P1-PIN 7 IS RTS
	17-18	P1-PIN 3 IS TRANSMIT DATA
P4	1-2	ERROR LED IS ENABLED
	5-21	MODEM IS ENABLED
	6-22	DSR IS HIGH
	13-14	DTR DIALING ENABLED
	25-24	ON-LINE LED IS DCD

CONNECTOR PINOUT

Connector P1 is used for RS232 communication. The pin-out of connector P1 with standard jumpers installed is shown below. The connections shown below are DCE connections. Connector P1 can be setup to have DTE connections by changing jumper j10 to have the following connections: 2-4, 3-5, 8-10, 9-11, 14-16 and 15-17. This will effectively reverse the signals on 2, 3, 4, 6, 7 and 8. Connector P2 is always a DTE connector.

- | | | |
|---|-----|---|
| 1 | NC | USED ONLY FOR RS422/485 OPERATION |
| 2 | RD | OUTPUT DATA RECEIVED BY MODEM |
| 3 | TD | INPUT DATA TO BE TRANSMITTED FROM MODEM |
| 4 | DTR | INPUT DATA TERMINAL READY |
| 5 | GND | SIGNAL REFERENCE |
| 6 | DCD | OUTPUT DATA CARRIER DETECTED |
| 7 | RTS | INPUT REQUEST TO SEND TO MODEM |
| 8 | CTS | OUTPUT CLEAR TO SEND FROM MODEM |
| 9 | NC | USED ONLY FOR RS422/485 OPERATION |

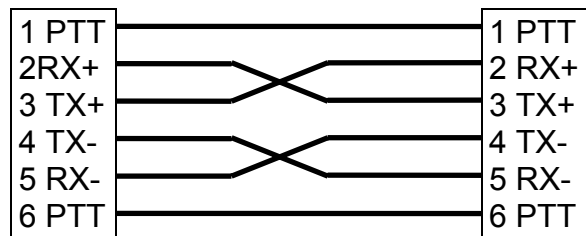


PHONE LINE CONNECTIONS

The RJ-11 connector is used for connection to the telephone line. As standard modular line cord can be used for the telephone connection; the telephone company should switch the transmits and receives. The RJ-11 pin-out is shown below.

1	PTT	OUTPUT
2	RX+	YELLOW
3	TX+	GREEN
4	TX-	RED
5	RX-	BLACK
6	PTT	COMMON

When connecting two modems back-to-back remember to reverse the transmit and receive wires so that the transmit output of one modem goes to the receive input of the other modem.



The PTT output can be used as a “Push-to-Talk” signal to key a radio transmitter when using the FSK modem with a radio. The PTT output is an isolated dry relay contact output that will be closed when the FSK modem is ready to transmit (its RTS input is high). The PTT relay is enabled by installing jumper J12. The output can be referenced to the modems digital ground by installing jumper J11. Standard configuration does not have the jumpers installed.

TRANSMIT LEVEL

The transmit level is set by setting switch SW1 as shown below. For standard output levels only one position should be on at a time. Lower output levels can be obtained by turning on more than one switch at a time.

SW1	1	+2dB
	2	0dB
	3	-2dB
	4	-4dB
	5	-6dB
	7	-10dB
	8	-12dB

MODEM MODE

1	2	3	4	5	6	7	8	OPERATING MODE
X	X	1	1	1	1	1	X	Bell 103 Originate, 300 bps, Full duplex
X	X	1	1	1	1	0	X	Bell 103 Answer, 300 bps, Full duplex
X	X	1	1	1	0	1	X	Bell 202, 1200 bps, Half duplex
X	X	1	1	1	0	0	X	Bell 202, 1200 bps, Half duplex with equalizer
X	X	1	1	0	1	1	X	CCITT V.21 Originate, 300 bps, Full duplex
X	X	1	1	0	1	0	X	CCITT V.21 Answer, 300 bps, Full duplex
X	X	1	1	0	0	1	X	CCITT V.23 Mode 2, 1200 bps, Half duplex
X	X	1	1	0	0	0	X	CCITT V.23 Mode 2, 1200 bps, Half duplex with equalizer
X	X	1	0	1	1	1	X	CCITT V.23 Mode 1, 600 bps, Half duplex
X	X	1	0	0	1	1	X	CCITT V.23 Mode 1, 600 bps, Half duplex with Soft Turn Off
X	X	1	0	0	0	1	X	CCITT V.23 Mode 2, 1200 bps, Half duplex with Soft Turn Off
X	X	1	0	0	0	0	X	CCITT V.23 Mode 2, 1200 bps, H-D w/ equalizer & Soft Turn Off
X	X	0	1	1	0	1	X	Bell 202, 1200 bps, Full duplex
X	X	0	1	1	0	0	X	Bell 202, 1200 bps, Full duplex with equalizer
X	X	0	1	0	0	1	X	CCITT V.23 Mode 2, 1200 bps, Full duplex
X	X	0	1	0	0	0	X	CCITT V.23 Mode 2, 1200 bps, Full duplex with equalizer
X	X	0	0	1	1	1	X	CCITT V.23 Mode 1, 600 bps, Full duplex

LED DESCRIPTION

Five LEDs display the modem's communication lines: the ONLINE, P1RXD, P1TXD, MDMRXD, and the MDMTXD. The ONLINE LED lights up when the 166-101 receives a carrier signal on its DCD pin. A receive and transmit signal on port 1 triggers the P1RXD and P1TXD LEDs respectively. The MDMRXD and the MDMTXD LEDs respond to a receive or transmit signal on the modem port. The P2RXD, P2TXD and ERROR LEDs are disabled for the modem function.

EXAMPLE CONFIGURATIONS

This example demonstrates a possible configuration to allow two SLC500s to communicate through two MARC 166-101 leased line modems. Configure both modems for Bell 202, 1200 bps, Full Duplex according to the modem mode table and the transmit level at 0 dB. Next, set up each SLC500's channel 0 according to figures 6.1 and 6.2.

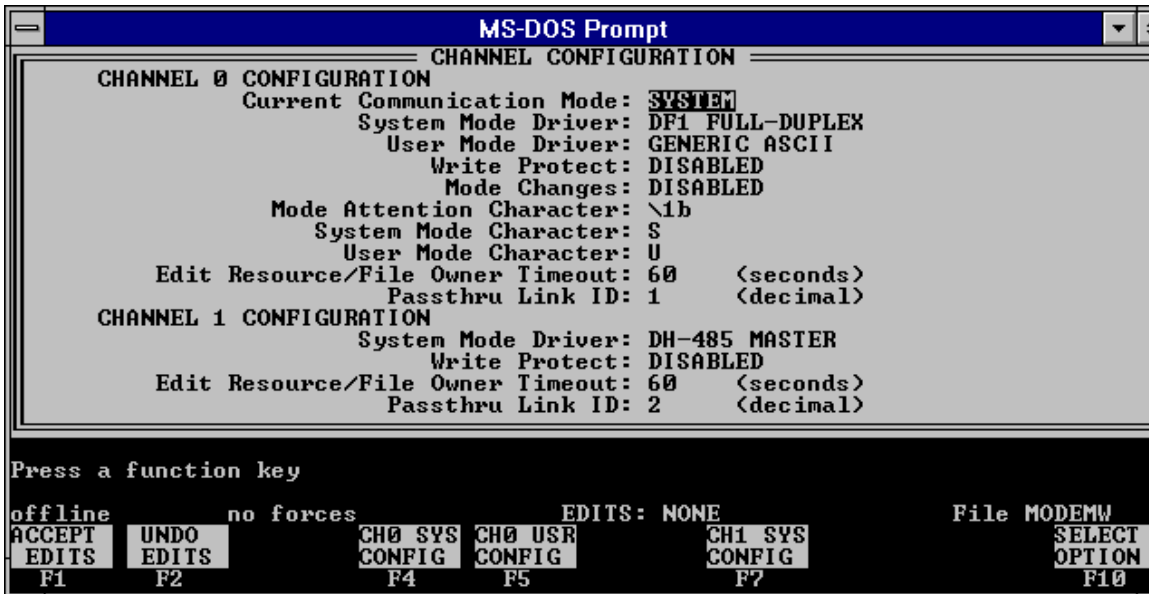


Figure 6.1

166-101 EXAMPLE CONFIGURATION

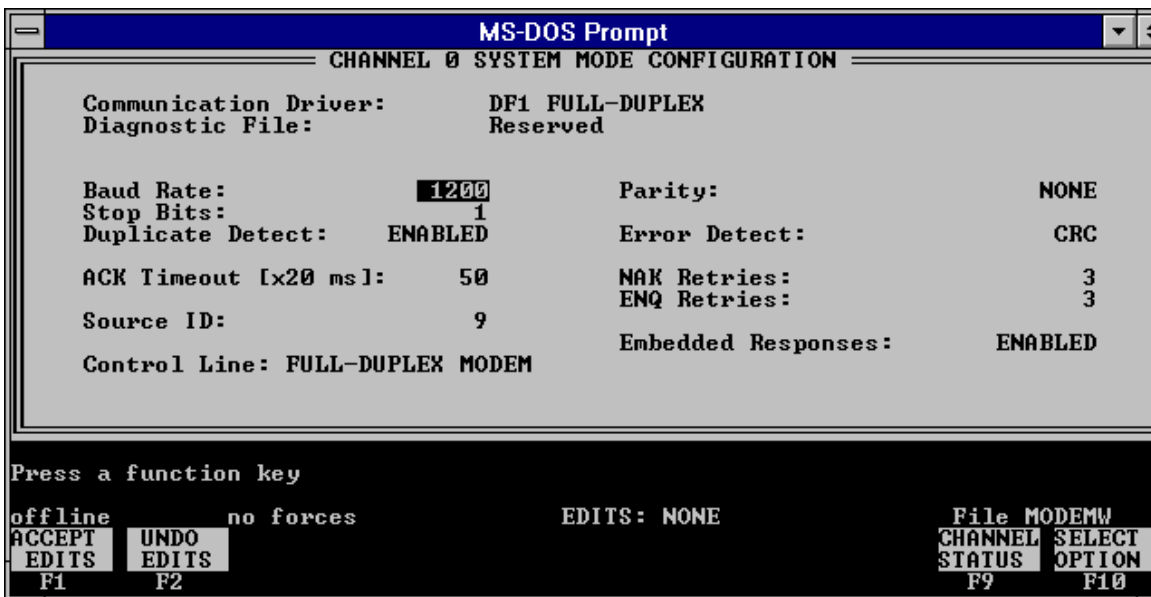


Figure 6.2

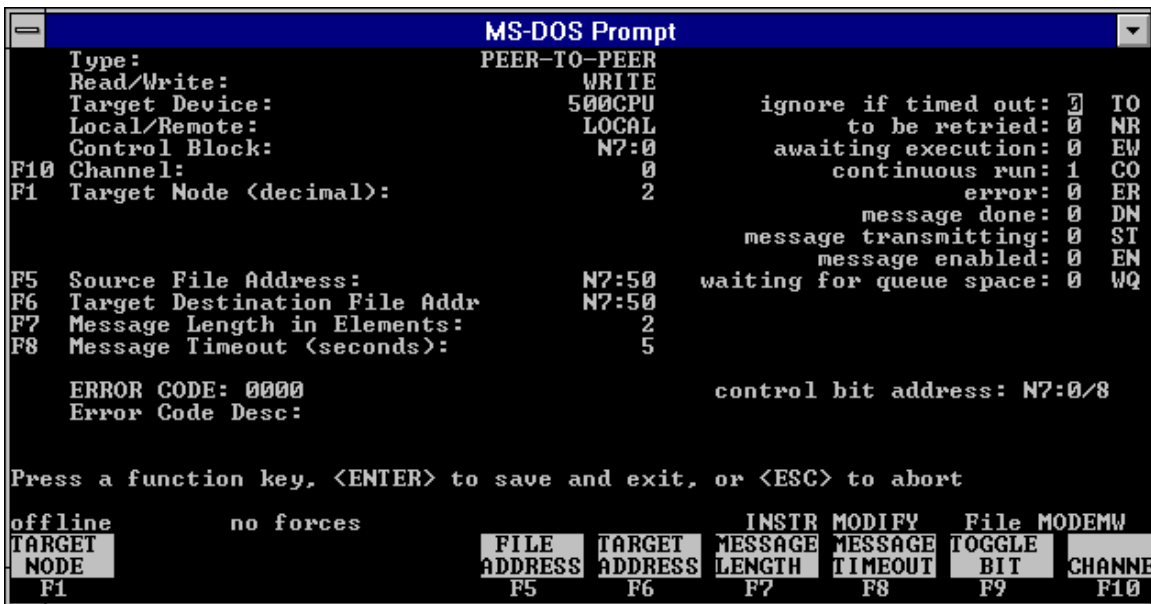


Figure 6.3

```

MS-DOS Prompt
Type: PEER-TO-PEER
Read/Write: READ
Target Device: 500CPU ignore if timed out: 0 TO
Local/Remote: LOCAL to be retried: 0 NR
Control Block: N7:20 awaiting execution: 0 EW
F10 Channel: 0 continuous run: 1 CO
F1 Target Node (decimal): 1 error: 0 ER
message done: 0 DN
message transmitting: 0 ST
message enabled: 0 EN
F5 Destination File Address: N7:40 waiting for queue space: 0 WQ
F6 Target Source File Address: N7:40
F7 Message Length in Elements: 2
F8 Message Timeout (seconds): 5

ERROR CODE: 0000 control bit address: N7:20/8
Error Code Desc:

Press a function key, <ENTER> to save and exit, or <ESC> to abort
offline no forces
TARGET INSTR MODIFY File MODEMW
MODE ADDRESS ADDRESS MESSAGE MESSAGE TOGGLE CHANNE
F1 F5 F6 F7 F8 F9 F10
  
```

Figure 6.4

After configuring channel 0, write the ladder logic program shown in figure 6.5. Figure 6.3 and figure 6.4 describe the write and read message commands in greater detail. When the SLC500 with this program is put into the run mode, the LEDs will flicker in a see-saw manner; the P1RXD and the MDMTXD blink simultaneously with P1TXD and MDMRXD following. The ONLINE LED should remain on.

```

                                Rung 2:0
                                WRITE MESSAGE RUNG
|
| enabled if
| not first
| scan
|   S:1
|-----] / [-----+MSG-----+
|   15                                     +READ/WRITE MESSAGE +- (EN) -
|                                           |Type      PEER-TO-PEER+- (DN)
|                                           |Read/Write  WRITE+- (ER)
|                                           |Target Device  500CPU|
|                                           |Local/Remote   LOCAL|
|                                           |Control Block  N7:0|
|                                           |Control Block Length 14|
|                                           +-----+
|
|                                Rung 2:1
|                                READ MESSAGE RUNG
|
| enabled if
| not first
| scan
|   S:1
|-----] / [-----+MSG-----+
|   15                                     +READ/WRITE MESSAGE +- (EN) -
|                                           |Type      PEER-TO-PEER+- (DN)
|                                           |Read/Write  READ+- (ER)
|                                           |Target Device  500CPU|
|                                           |Local/Remote   LOCAL|
|                                           |Control Block  N7:20|
|                                           |Control Block Length 14|
|                                           +-----+
|
|                                Rung 2:2
|                                THIS RUNG RETRIGGERS MESSAGE INSTRUCTION AFTER COMPLETION OR ON ERROR AND ALSO
|                                RESETS MESSAGE RUNGS THAT ERROR OUT AND HANG UP.
|
|   MSG done      not
|                 enabled
|                 and
|                 waiting
|
|   N7:0          N7:0
|   13           10
| (2:0)         (2:0)
|-----] [-----] / [-----+-----+-----+-----+-----+
|   12           8           8
| (2:0)         (2:2)
|
|                                Rung 2:3
|-----] [-----+-----+-----+-----+-----+
|                                Unlatch
|                                MSG enable
|                                N7:0
|                                (U)
|
|   If MSG timeout is MSG
|   on then... timeout
|   |bit
|   N7:0 N7:0
|-----] [-----+-----+-----+-----+
|                                (U)
|
|                                +END+

```

Figure 6.5

NOTES

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