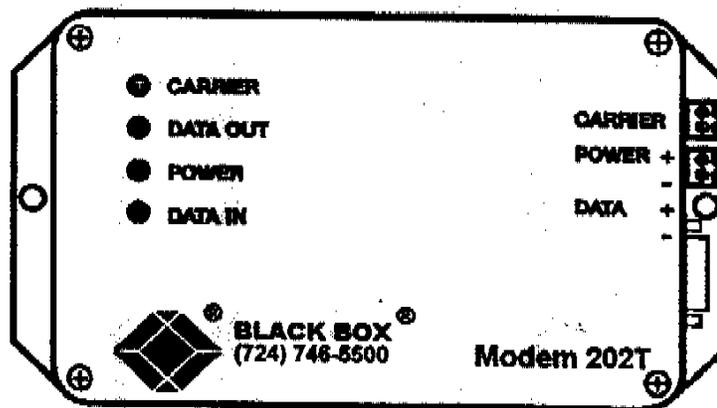




BLACK BOX[®]
(724) 746-5500

MD845A

Modem 202
Full Duplex / Half Duplex
4 Wire
Long Lines Modem



User's Guide

MODEM 202

INTRODUCTION

The BLACK BOX MODEM 202 is a 4 wire, full duplex, Bell 202 / CCITT V.23 compatible, 0 to 1200 baud modem. It can also be configured for half duplex / simplex operation on 2 wires. It is designed to be used on private, leased unswitched telephone lines or any dedicated two conductor wire (twisted or untwisted, shielded or unshielded). Its range is twenty miles on any ordinary wire pair, or unlimited on "loaded" telephone company voice grade leased lines.

The operating supply voltage for the MODEM 202 is 8 to 18VDC (Absolute Maximum). An isolated or ungrounded supply, such as a plug-in 120VAC to 12VDC transformer should be used. An on-board voltage regulator sets internal operating voltage at 5VDC.

A four position pluggable terminal block (Table 1), a two position pluggable terminal block (Table 2), and a 9 pin female DB connector (Table 3) on the back right side of the unit are provided for external connection (see page 4).

Table 1: Four Position Terminal Block Connections

Position	Marking	Function
1&2	Transmitter	FSK carrier transmission line (no polarity)
3	Power +	Supply power positive side
4	Power -	Supply power negative side

Table 2 : Two Position Terminal Block Connections

Position	Marking	Function
1&2	Receiver	FSK carrier receiver line (no polarity)

Table 3: DB-9F Pin Connections

Pin	Nomenclature	Function
1	CDC	Carrier Detect
2	Tx	RS-232 Data Out of Modem
3	Rx	RS-232 Data Into Modem
4	NC (not connected)	
5	Grd	Signal Ground
6	DSR	Data Send Ready (connected to CDC)
7	RTS	Ready to Send (transmit enable)
8	CTS	Clear to Send (connected to CDC)
9	NC	

There are four LEDs on the MODEM 202. The function indication for each is shown in Table 4 below.

Table 4: LED Indications

Position	Marking	Color	Function
1	Carrier	Yellow	Carrier Present
2	Data Out	Green	Data flowing out of the MODEM 202 RS-232 port
3	Power	Red	Power On
4	Data In	Green	Data flowing into the MODEM 202 RS-232 port

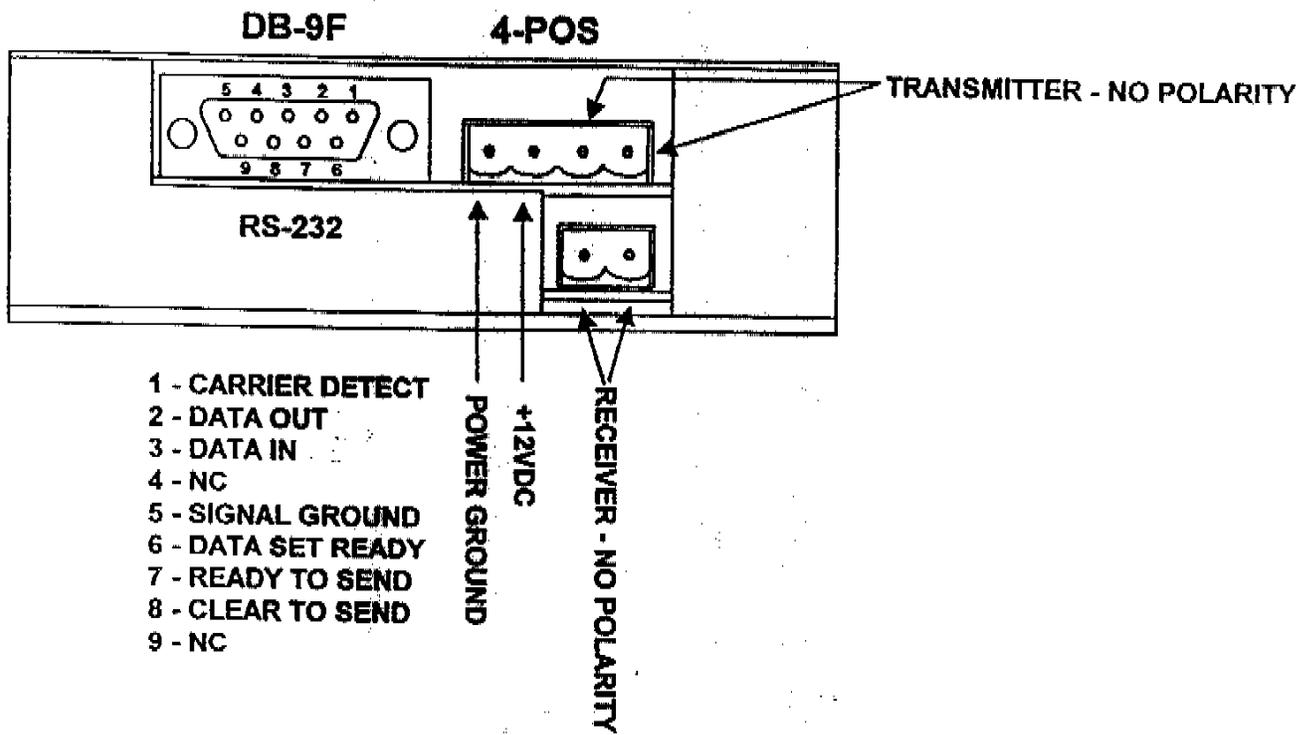
The BLACK BOX MODEM 202 Long Lines Modem is factory adjusted and ready to function when connected. There are no settings required on the MODEM 202. The data rate is transparent from 0 to 1200 baud. Do not adjust any potentiometers on the modem board.

Full Duplex Installation and Operation

- 1) Connect the data-in line to the terminal block marked RECEIVE on the diagram (page 4), positions shown. There is no polarity requirement for this connection.
- 2) Connect the data-out line to the terminal block marked TRANSMIT on the diagram, positions shown. There is no polarity requirement for this connection. Units can be connected point-to-point or multi-dropped. If multi-drop connected, either daisy chain or "T" connections can be made.
- 3) Connect and plug in the Power Transformer. Note the Polarity. The power input is diode protected. Reversing the voltage will not harm the unit, but it will not operate.
- 4) Attach male DB-9 data cable from operators device (PLC, PC etc.) to DB-9 female connector on the MODEM 202.
The unit is now ready to operate. There are no startup procedures required. There should be a minimum of a 50 millisecond delay between the initiation of RTS High and the start of data to allow the carrier to stabilize. This is set by the device that the BELL 202 is connected to.
- 5) When two or more units are connected (both TRANSMIT and RECEIVE), all modem Carrier Detect LED's will be on. Data presented at Pin 3 will then be transmitted, causing the "DATA IN" LED to light on the transmitting MODEM 202 and the "DATA OUT" LED on all receiving MODEM 202's to light. The transmitter has been set at 0 dB.
- 6) There are no restart procedures required for the MODEM 202. If power or the data line are disconnected, the units will operate again as soon as they are reconnected.

Note: Units covered by these instructions are factory configured with CCITT V.23 carrier frequencies (1300 and 2100 Hz). For optional Bell 202 configuration (1200 and 2200 Hz), see "Communications Standard" jumper settings table on page 6 of this manual.

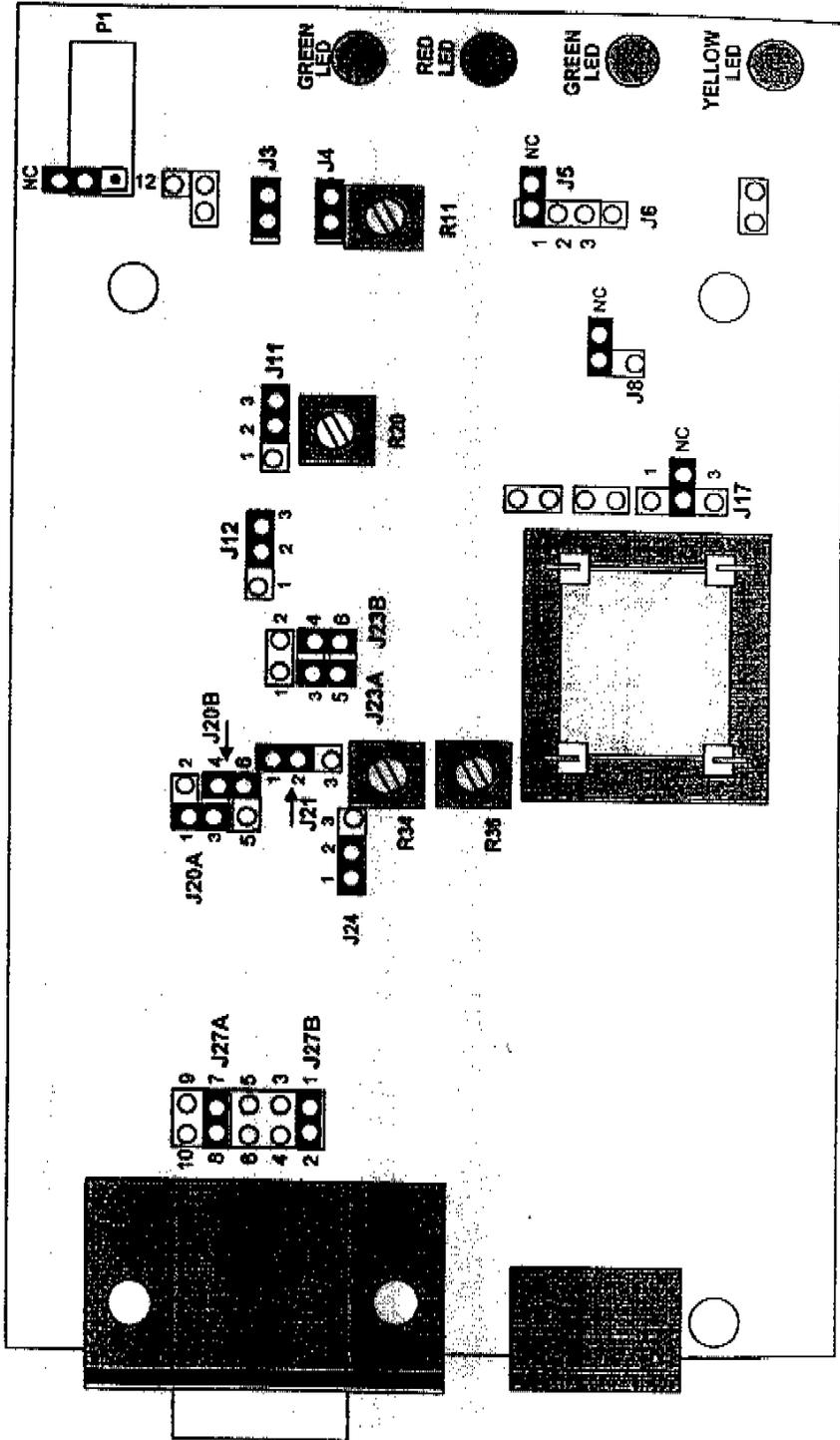
MODEM 202 CONNECTION DIAGRAM



- 1 - CARRIER DETECT
- 2 - DATA OUT
- 3 - DATA IN
- 4 - NC
- 5 - SIGNAL GROUND
- 6 - DATA SET READY
- 7 - READY TO SEND
- 8 - CLEAR TO SEND
- 9 - NC

JUMPER LOCATIONS
FACTORY CONFIGURATION

aw



Operating Mode Jumper Controlled Options for MODEM 202 (Full Duplex Mode)

YES = JUMPER INSTALLED

NO = JUMPER NOT INSTALLED

COMMUNICATIONS STANDARD

CCITT V.23 / BELL 202:

Sets the carrier frequencies to CCITT V.23 or BELL 202 standards.

JUMPER	V.23	BELL 202
J11	YES PINS 2-3	YES PINS 1-2
LOGIC LOW FREQ.*	2100 Hz	2200 Hz
LOGIC HIGH FREQ.*	1300 Hz	1200 Hz

* Conventional RS-232. For inverted High/Low frequencies, see "Logic - Conventional / Inverted", below.

LOGIC

CONVENTIONAL / INVERTED:

Sets the carrier frequencies for RS-232 logic high and logic low.

JUMPER	CONVENTIONAL	INVERTED
J12	YES PINS 2-3	YES PINS 1-2
J21	YES PINS 1-2	YES PINS 2-3

HANDSHAKING

CARRIER DETECT, RTS, CTS, DSR ROUTING:

Connects specific trace paths to route Carrier Detect, RTS, and DSR signals for proper handshaking with different makes and models of PLCs.

JUMPER #	FACTORY CFG.	COMPACT 984	SLC-5/03	G.E./FANUC
J5	NO	YES	YES	NO
J20A	YES PINS 2-3	YES PINS 2-3	YES PINS 3-5	YES PINS 2-3
P1	NO	NO	NO	NO
J8	NO	NO	NO	NO
J17	NO	NO	NO	NO

JUMPER SETTINGS NOT TO BE CHANGED

Below is a list of PCB reference designators/Jumper locations that are used during the manufacturing process. The jumpers in this list are set at the factory and normally should not be moved.

JUMPER	FUNCTION
P1	RTS On Data Out Squelch
J1	Data In Test Point
J2	Force Data In Logic High
J3	Standard /Bit Rate Select
J4	Standard /Bit Rate Select
J6	CD Test Point
J7	CD Off Data Out Squelch
J9	8 Pin Header -- Lower PCB
J10	Clock Test Point
J13	Data In Test Point
J14	Data Out Test Point
J15	RTS On Data Out Squelch
J16	Force RTS Logic High
J18	Receive Carrier Test Point
J19	Transmit Carrier Test Point
J20B	RTS/CTS Path Selection
J22	Data Out Test Point
J23	Data In/Out Path Selection
J25	Voltage Sense
J26	Voltage Sense
J27	CD to CTS & DSR

Half Duplex/Simplex 2 wire Installation and Operation

The BLACK BOX MODEM 202 can also be configured for half duplex or simplex operation on 2 wires. As in full duplex operation, it is designed to be used on private, leased unswitched telephone lines or any dedicated two conductor wire (twisted or untwisted, shielded or unshielded). Its range is twenty miles on any ordinary wire pair, or unlimited on "loaded" telephone company voice grade leased lines.

The operating supply voltage for the MODEM 202 is 8 to 18VDC (Absolute Maximum). An isolated or ungrounded supply, such as a plug-in 120VAC to 12VDC transformer should be used. An on-board voltage regulator sets internal operating voltage at 5VDC.

Connections for half duplex 2 wire utilize only the transmit plug on the upper terminal block on the back of the unit (see page 4). Half duplex operation is controlled by jumper settings on the modem (see page 9).

1. Connect the data line to the terminal block marked TRANSMIT on the diagram, positions shown. There is no polarity requirement for this connection. Units can be connected point-to-point or multi-dropped. If multi-drop connected, either daisy chain or "T" connections can be made.
2. Attach male DB-9 data cable from operators device (PLC, PC etc.) to DB-9 female connector on the MODEM 202.
3. The unit is now ready to operate. There are no startup procedures required. There should be a minimum of a 50 millisecond delay between the initiation of RTS high and the start of data to allow the carrier to stabilize. This is set by the device that the MODEM 202 is connected to.
4. When a logic high (+5 to 12VDC) is sent to Pin 7 (RTS), the MODEM 202's transmitter is enabled and the Carrier Detect LED's on all connected MODEM 202's will light. Data presented at Pin 3 will then be transmitted, causing the "DATA IN" LED to light on the transmitting MODEM 202 and the "DATA OUT" LED on all receiving MODEM 202's to light. The transmitter has been set at 0 dB.
5. There are no restart procedures required for the MODEM 202. If power or the data line are disconnected, the units will operate again as soon as they are reconnected.
6. The setup for simplex operation is the same as that for half duplex setup.

**Operating Mode Jumper Controlled Options
for
MODEM 202 (Half Duplex or Simplex Mode)**

YES = JUMPER INSTALLED

NO = JUMPER NOT INSTALLED

**TRANSMIT ON / OFF
HALF DUPLEX and SIMPLEX SLAVE:**

--Sets the carrier transmitter OFF for half duplex and simplex receiver (slave) or ON for simplex transmitter (master) operation with four wires and disables the receive-out squelch.

JUMPER	HALF DUPLEX & SIMPLEX SLAVE	SIMPLEX MASTER
J8	YES	NO
P1	YES	YES
J17	YES PINS 1-2	YES PINS 1-2
J24/C8	YES PINS 2-3	YES PINS 2-3

**HANDSHAKING
CARRIER DETECT, RTS, CTS, DSR ROUTING:**

Connects specific trace paths to route Carrier Detect, RTS, and DSR signals for proper handshaking with different makes and models of PLCs.

JUMPER #	FACTORY CFG.	COMPACT 984	SLC-5/03	G.E./FANUC
J5	NO	YES PINS 2-3	YES PINS 1-2	NO
J20A	YES PINS 1-3	YES PINS 1-3	YES PINS 3-5	YES PINS 1-3

MODEM 202 SPECIFICATIONS:

Power requirements	8 to 18VDC with and option for 24VDC operation
Quiescent and load current	38mA rest current / 60mA under load
Transmission range	20 miles on unloaded lines / unlimited on loaded lines
Operating frequency	1200/2200 Hz (Bell 202 or CCITT V.23 compatibility)
Frequency modulation	FSK (Frequency Shift Key)
Data rate	0-1200 baud full duplex, half duplex or simplex
Enclosure	High temperature, High impact, Noryl® plastic
Dimensions	Length: 6.5" over mounting flanges; Width: 3.75"; Height: 1.3"

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