2-2.3. Personality Module

The Link Controller Personality module provides two (J1 and J2) male DB9 connectors for the desired serial links (see Figure 2-1).

There are two Personality module groups for the Link Controller Module. Select the appropriate group for the desired serial link.

Group One Personality Module

Group One (**1C31169G01**) provides for an RS-232 serial link.

- J1 Port is an RS-232 Programming Port which is used to interface to a Personal Computer (used for keyboard input, CRT display, and file transfer functions).
- J2 Port is an RS-232 Applications Port (in **CE Mark certified systems**, the application port cable must be less than 10 meters (32.8 ft)).

Group Two Personality Module

Group Two (**1C31169G02**) provides for an RS-485/RS-422 four-wire full duplex serial link.

- J1 Port is an RS-232 Programming Port which is used to interface to a Personal Computer.
- J2 Port is an RS-485 Applications Port (also may be used as an RS-422 serial link).
  - — The J2 Port transmitter has a software controlled tri-state enable input (TX-ENA). TX-ENA must be asserted (high or logic one) if the J2 Applications port is to transmit RS-485/RS-422 serial data. It is the responsibility of the Link Controller's application program to ensure that TX-ENA is asserted whenever serial data is transmitted from the J2 port.
  - — The application program must use Bit 1 of the Applications port UART Modem Control register (MCR) to control the state of the UART's RTS/ output. MCR is an eight-bit register mapped to the LC processor I/O address 03FCH.

— RTS/ directly controls the state of the TX-ENA signal as shown below:

MCR Bit 1	UART RTS/ Output State	TX-ENA State	RS-485 Transmitter Output State
0	1	0	Tri-stated (disabled)
1	0	1	Enabled

If two-wire half duplex communication is desired, connect the Link Controller's base unit terminal block input terminals to the output terminals (that is, connect RX- to TX-, and connect RX+ to TX+). See Figure 2-5.

Caution

If the LC's RS-485 output terminals are connected to the RS-485 input terminals, the RS-485 receiver is enabled whenever the applications program enables the RS-485 transmitter. This means that the RS-485 receiver can receive the data being transmitted by the RS-485 transmitter. The applications program must be able to handle this situation.

Installing Personality Module into Base Unit

The Personality module (used to configure the Electronics module) fits into the base unit beside the appropriate Electronics module. Note that the Personality module is installed in the base unit **first**. Then, the Electronics module is installed and interlocks with the Personality module. The blue corner latches on the Electronics module secure both modules into the base unit.

The wires from the customer field devices are connected to the terminal block in the base unit (see Figure 2-2).

The wiring connections to the terminal block for each combination of Electronics module and Personality module are printed on each Personality module and are illustrated in each module description in the following sections.

Note

Be sure that each wire opening in the terminal block is **fully open** before inserting the wire. This will ensure that the wire is clamped securely when the screw is tightened.

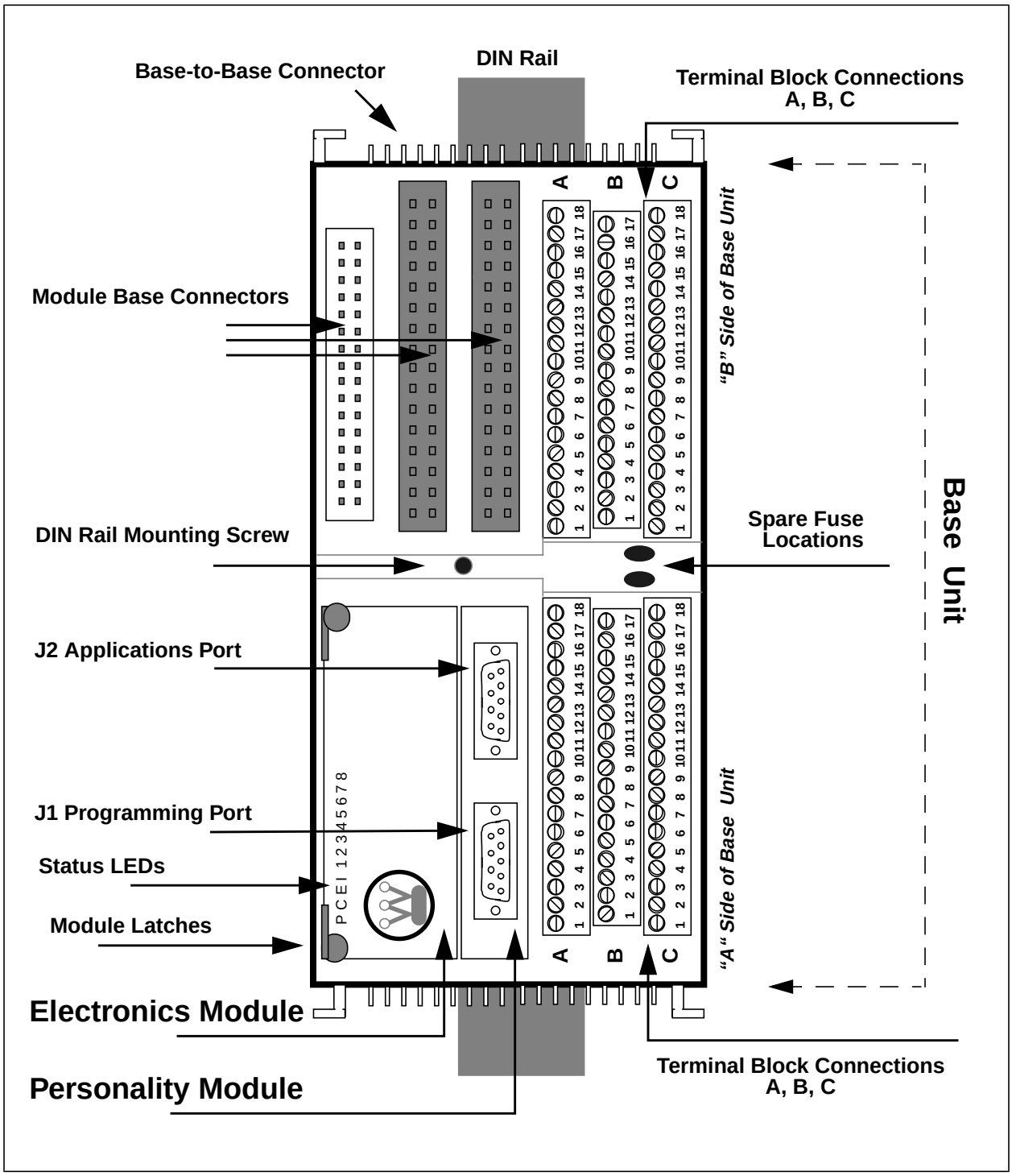


Figure 2-1. Link Controller Modules (Top View)

2-3. Module Specifications

Table 2-1. Link Controller Module Specifications

Description	Value
Number of serial ports	2
Applications serial port (In **CE Mark certified systems**, the Link Controller must be used only in communication fault tolerant systems. That is, communication retries must be tolerated.)	Signals are galvanically isolated from logic common. This port may be interfaced via the Personality module's J2 male DB9 connector (refer to Table 2-2 or Table 2-3) OR via the Base unit terminal block (refer to Figure 2-2). (1C31169G01) RS-232 signal levels: Note that standard IBM PC/AT COM1 port pin assignments are present at the J2 DB9 connector OR (1C31169G02) RS-485/RS-422 signal levels: four wire link, RS-485/RS-422 transmitter/receiver. Resistor terminations are user selectable.
Applications serial port baud rate	300, 600, 1200, 2400, 4800, 9600, or 19200
Applications serial port dielectric isolation: (Port to logic)	1000 V AC peak/DC
Programming serial port	Signals are not galvanically isolated from logic common. RS-232 signal levels (TX/ and RX/) This port must be interfaced via the Personality module's J1 male DB9 connector (refer to Table 2-7)
Programming serial port baud rate	19200 baud (default) OR 9600 baud (user selectable option)
Processor	80C186EC 16-bit
Program RAM	640 Kbytes
Dual port RAM	4 Kwords (data interface between the I/O bus and the Link Controller module)
Module power	3 W typical 4 W maximum
Operating temperature range	0 to 60°C (32°F to 140°F)
Storage temperature range	-40°C to 85°C (-40°F to 185 °F)
Humidity (non-condensing)	0 to 95%

2-4. Interface Connections

2-4.1. Terminal Block Wiring Information

The field connection to the LC module can be made either at the nine pin J2 connector of the personality module or at the terminal block of the base unit. It is common for RS-422 and RS-485 communication, because the cable length is typically longer, for the connection to be made as field wiring rather than as a pre-manufactured cable. The terminal block connection is convenient for these cases.

Each Personality module has a simplified wiring diagram label on its side, which appears above the terminal block. This diagram (see Figure 2-2) indicates how the wiring from the field is to be connected to the terminal block in the base unit. The following table lists and defines the abbreviations used in the diagram.

Abbreviation	Definition
BAU	Programming port baud rate select jumper
BT.	Link Controller boot-up option select jumper
COM *	Applications port signal common reference
CTS *	RS-232 Clear To Send (Input)
DCD *	RS-232 Data Carrier Detect (Input)
DSR *	RS-232 Data Set Ready (Input)
DTR *	RS-232 Data Terminal Ready (Output)
Earth GND *	Application port cable assembly shield connection (for locally grounded shields). Connects to the Base Unit DIN rail.
RES	A14 = RS-485/RS-422 receive data termination resistor (tie to RX+ (A15) if used) B14 = RS-485/RS-422 transmit data termination resistor (tie to TX+ (B15) if used)
RI *	RS-232 Ring Indicator (Input)
RTS *	RS-232 Request To Send (Output)
RX/ *	RS-232 Receive Data (Input)
RX+ *	RS-485/RS-422 Receive Data (Input)
RX- *	RS-485/RS-422 Receive Data (Input)
SEL	B8 = Programming port baud rate select jumper C8 = Link Controller boot-up option select jumper

Abbreviation	Definition
SH *	Applications port cable assembly shield connection (for remotely grounded shields) (for non-CE Mark certified systems)
TX/ *	RS-232 Transmit Data (Output)
TX+ *	RS-485/RS-422 Transmit Data (Output)
TX- *	RS-485/RS-422 Transmit Data (Output)
* Applications port	

Notes

1. Do not use unmarked terminal block locations.
2. Shield terminals (SH) are not connected in **CE Mark certified systems**.

RS-232 Applications: (1C31169G01)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A													RI	CTS	RX/	DCD		
B								BAU	SEL					DSR	RTS	TX/	DTR	
C							BT.	SEL					COM			SH	Earth GND	Earth GND

RS-485/RS-422 Four Wire Applications: (1C31169G02)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A														RES	RX+	RX-		
B								BAU	SEL						RES	TX+	TX-	
C							BT.	SEL					COM			SH	Earth GND	Earth GND

Notes

1. COM is the galvanically isolated common terminal of the Applications Port.
2. Use an overall shield conductor for the Applications Port cable:
   A. To ground the cable shield locally, connect the cable shield to terminal C17 (Earth Ground).
   B. To ground the cable shield remotely, connect the cable shield to terminal C16 (SH).
3. Connect a wire jumper for the following:
   A. To boot-up from an external IBM-compatible PC, connect a jumper between SEL and BT.
   B. To set Programming Port baud rate to 9600 (default is 19200), connect a jumper between SEL and BAU.
4. For RS-485/RS-422 four wire applications, connect a wire jumper for the following:
   A. To use a transmitter termination resistor, connect a jumper between RES (B14) and TX+ (B15).
   B. To use a receiver termination resistor, connect a jumper between RES (A14) and RX+ (A15).

   For a four wire RS-485/RS-422 communications network, a receiver termination resistor is recommended if the receiver is located at the end of the communications link. A transmitter termination resistor is recommended if the transmitter is at the end of the communications link and if the transmitter is tri-stated (disabled) when data is not being transmitted. Otherwise, a transmitter termination resistor is not necessary.

Figure 2-2. Terminal Block Connections for the Link Controller Personality Module

2-4.2. Applications Port Terminal Block Field Connections

Non-CE Mark Certified Systems

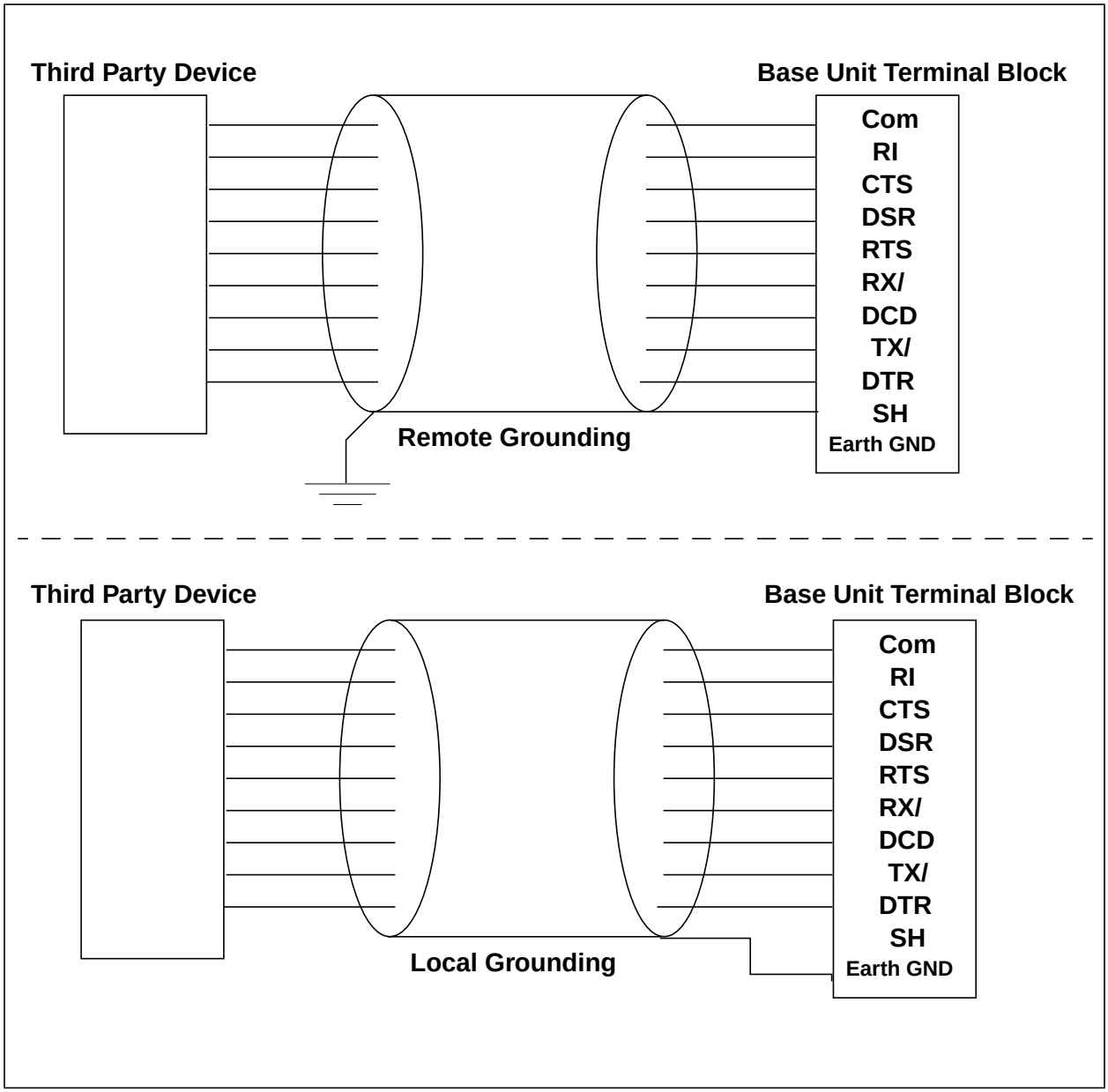


Figure 2-3. Terminal Block RS-232 Interface (1C31169G01) (Non-CE Mark)

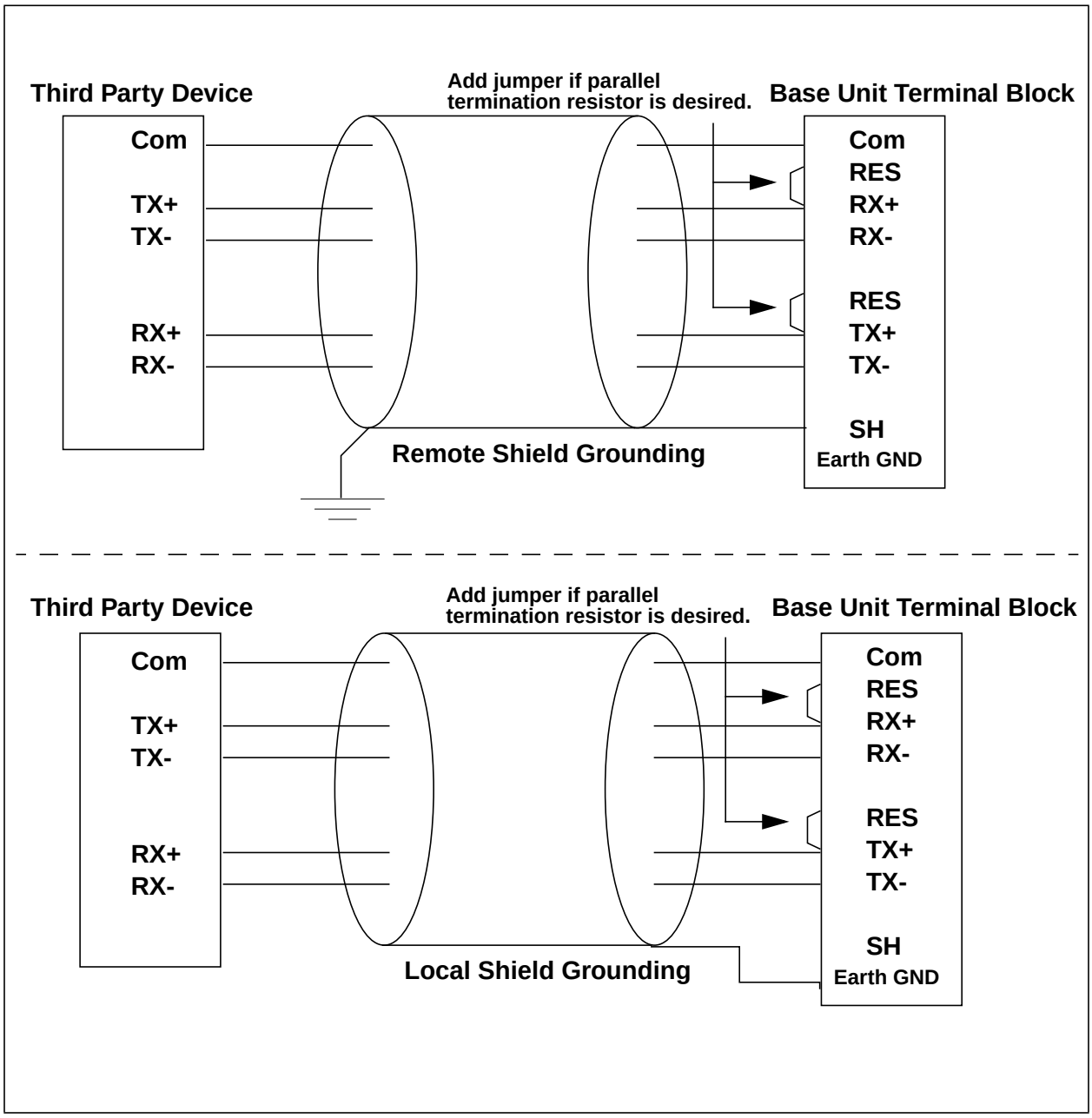
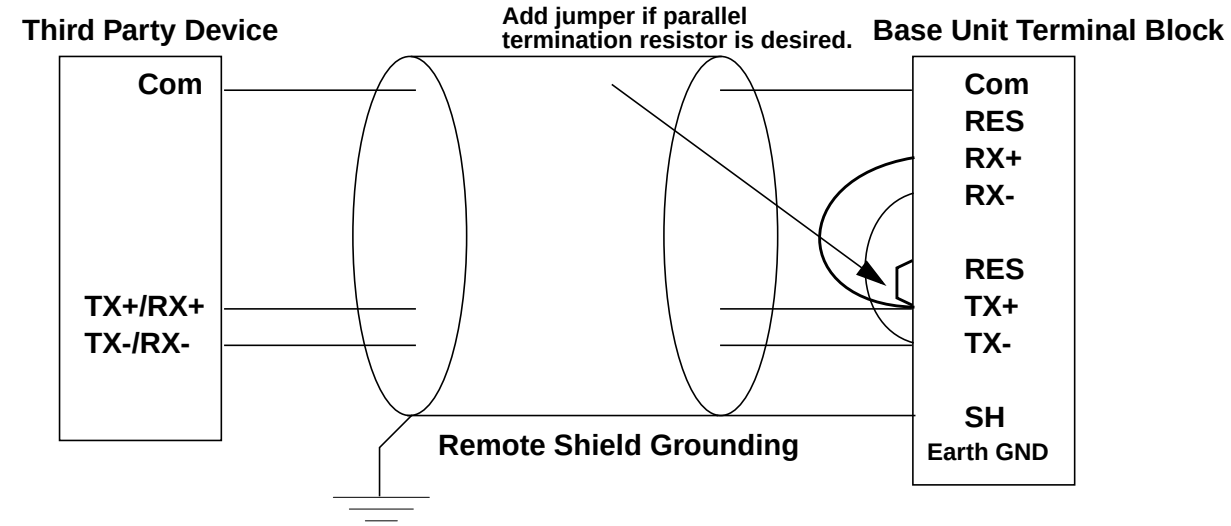
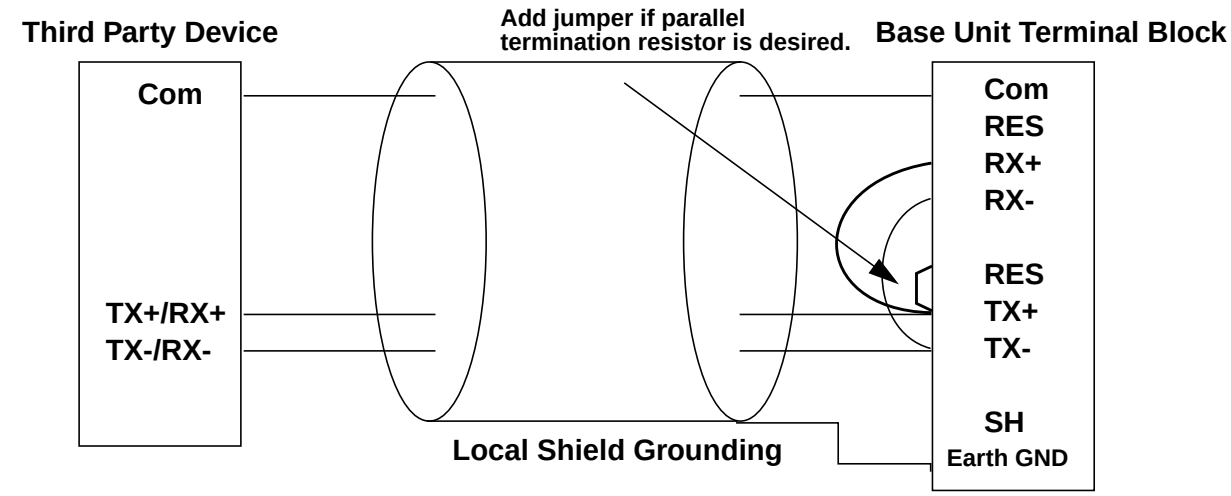


Figure 2-4. Terminal Block RS-485/RS-422 Four-Wire Serial Interface (1C31169G02) (Non-CE Mark)



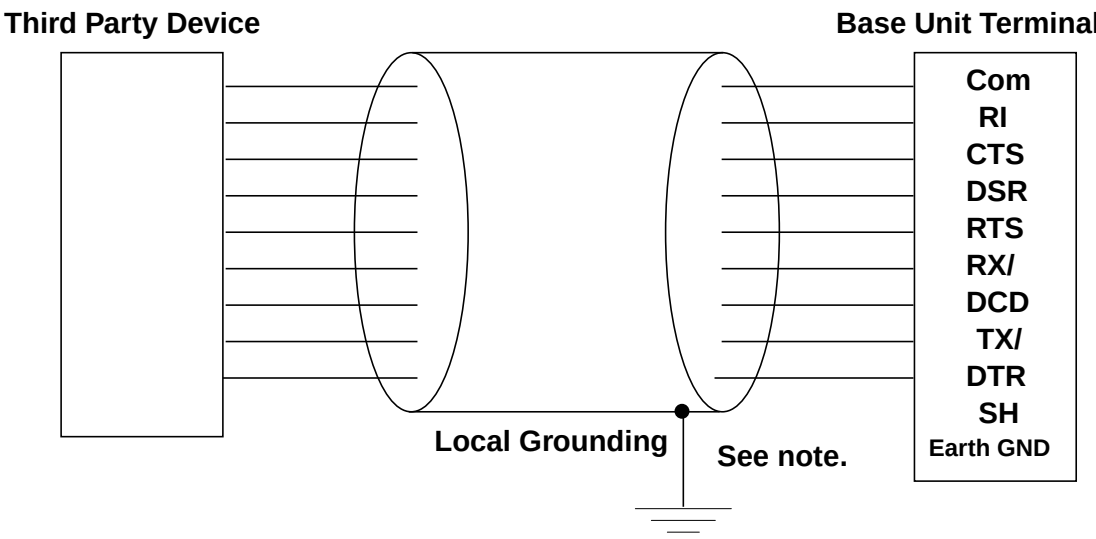


Note

When using a two-wire RS-485 communication network, a termination resistor is recommended if the LC is located at the end of the communication link. To use the termination resistor, connect a jumper between RES (B14) and TX+ (B15) at the terminal block.

Figure 2-5. Terminal Block RS-485 Two-Wire Serial Interface (1C31169G02) (Non-CE Mark)

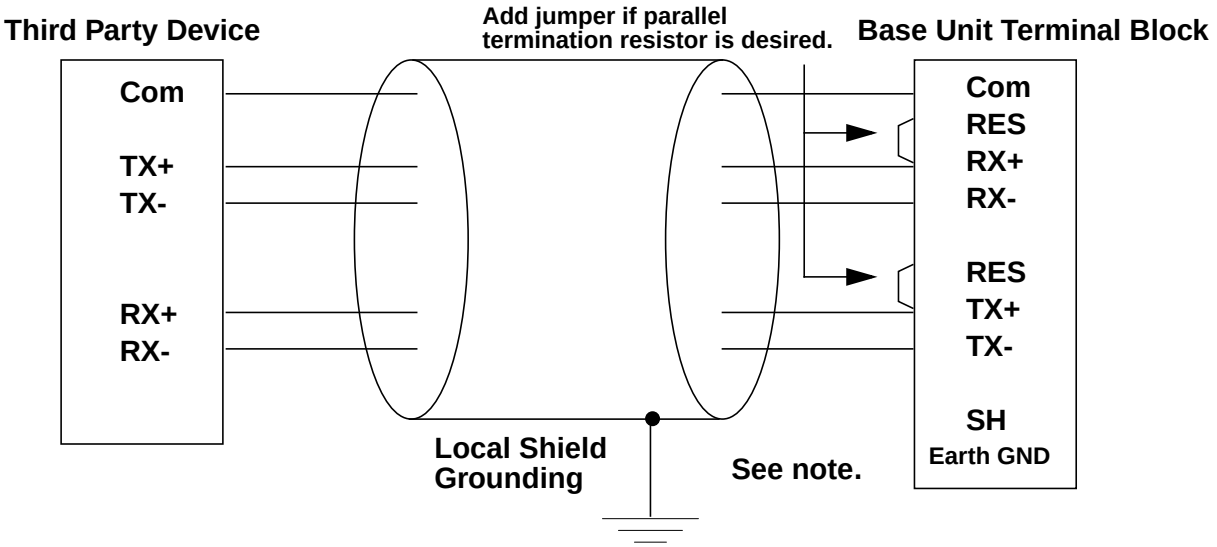
CE Mark Certified Systems



Note

All field wiring must be braid-shielded and grounded at the entry point of the cabinet using the recommended hardware (refer to "Cable Guidelines" in U3-1000).

Figure 2-6. Terminal Block RS-232 Interface (1C31169G01) (CE Mark)



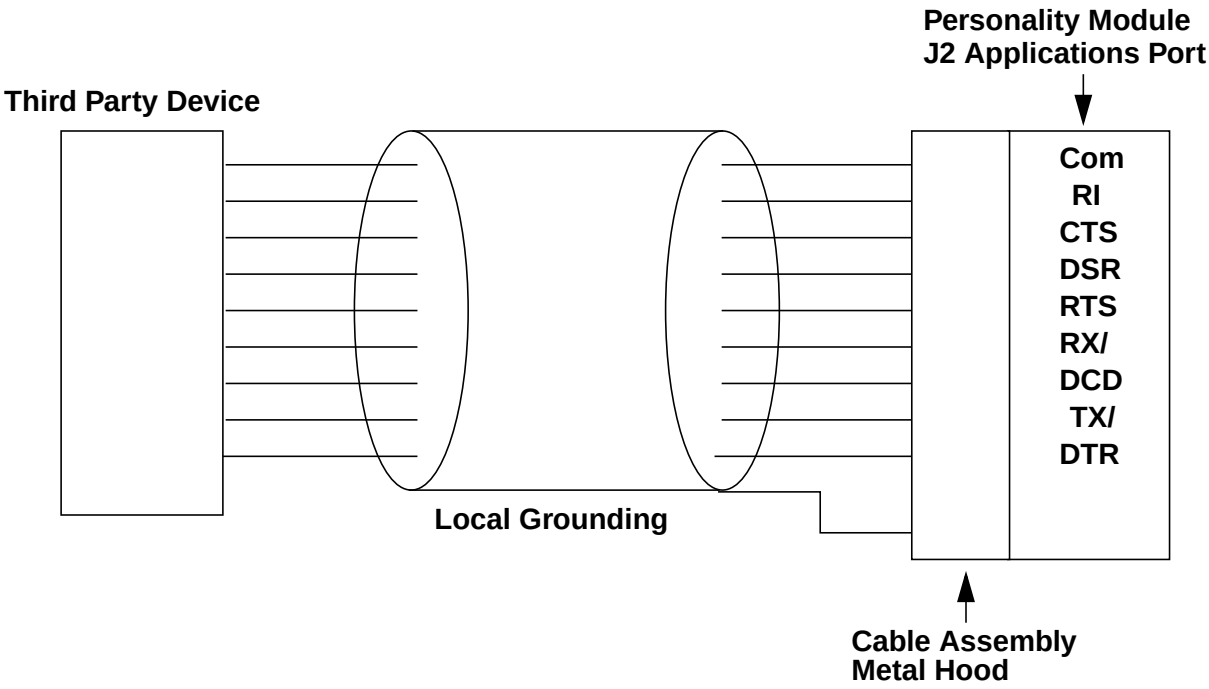
Note

All field wiring must be braid-shielded and grounded at the entry point of the cabinet using the recommended hardware (refer to "Cable Guidelines" in U3-1000).

Figure 2-7. Terminal Block RS-485/RS-422 Four-Wire Serial Interface (1C31169G02) (CE Mark)

2-4.3. Applications Port (J2) Field Connections

Non-CE Mark Certified Systems



Note

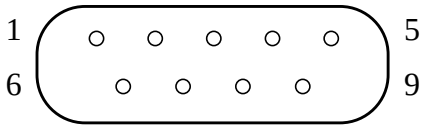
If the Personality module's J2 RS-232 Applications port DB9 connector is used in place of the base unit terminal block, only local shield grounding may be implemented. The cable assembly metal hood must be in electrical contact with the cable's shield. Refer to Table 2-2 for pin assignments.

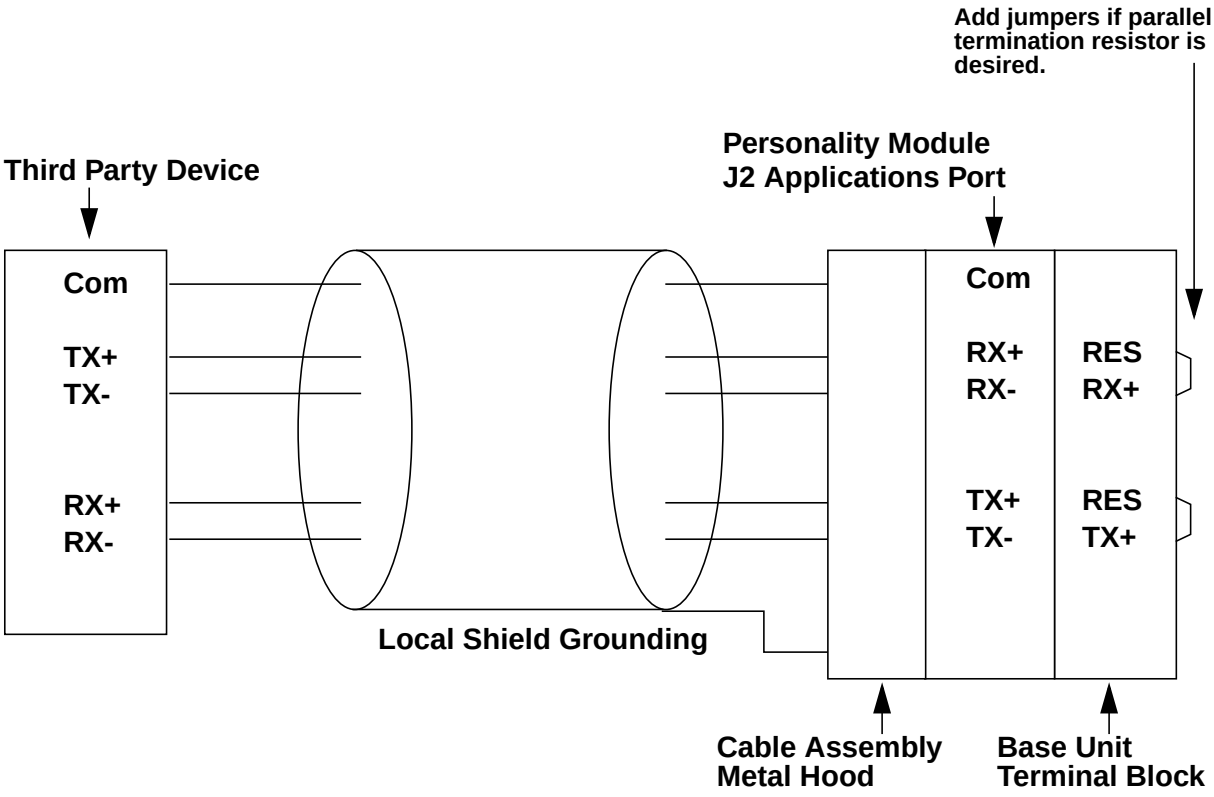
Figure 2-8. J2 RS-232 Interface (1C31169G01) (Non-CE Mark)

Table 2-2. Pin Assignments for J2 Applications Port RS-232 Interface

Pin Number	Signal Name (Function)	Signal Direction
1	DCD (Data Carrier Detect)	Input
2	RX/ (Receive Data)	Input
3	TX/ (Transmit Data)	Output
4	DTR (Data Terminal Ready)	Output
5	Com (Isolated Common)	
6	DSR (Data Set Ready)	Input
7	RTS (Request to Send)	Output
8	CTS (Clear to Send)	Input
9	RI (Ring Indicator)	Input

Top View of J2 Connector





Note

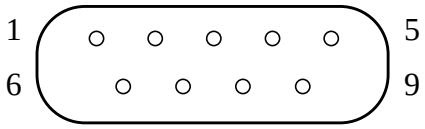
If the Personality module's J2 RS-485/RS-422 Applications port DB9 connector is used in place of the base unit terminal block, only local shield grounding may be implemented. The cable assembly metal hood must be in electrical contact with the cable's shield.
If parallel termination resistors are desired, jumpers must be added to the terminal block (as shown above). Refer to Table 2-3 for pin assignments.

Figure 2-9. J2 RS-485/RS-422 Four-Wire Serial Interface (1C31169G02) (Non-CE Mark)

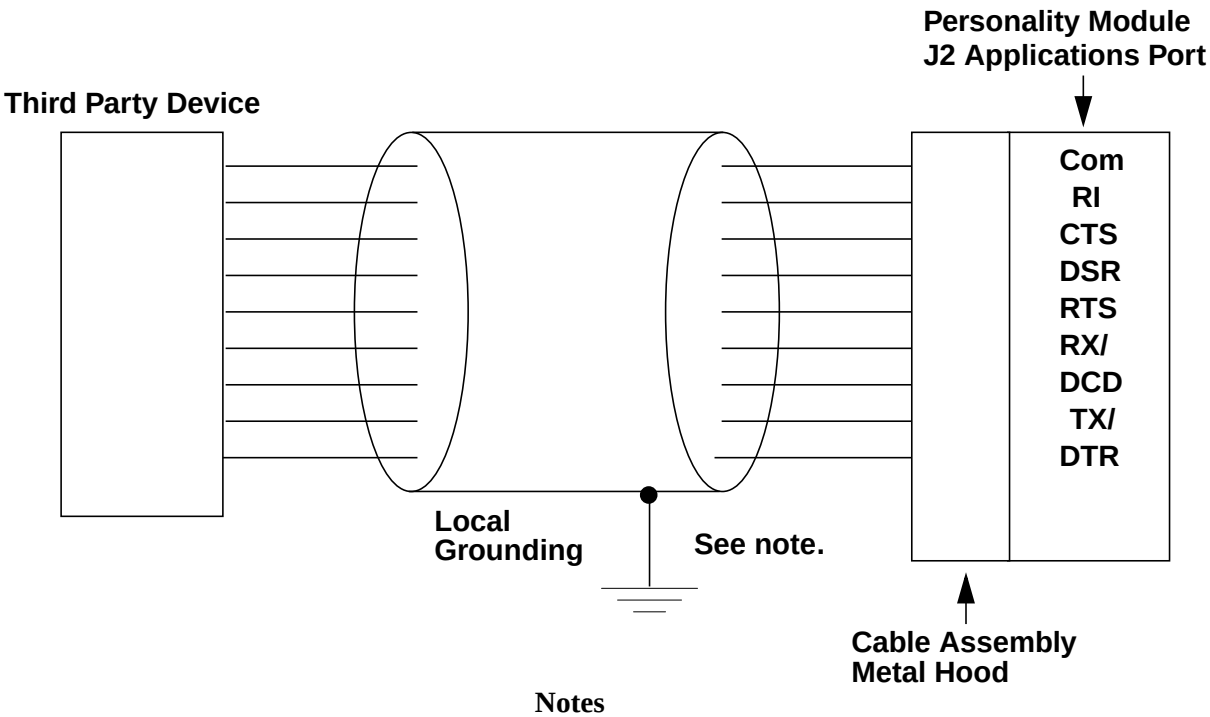
Table 2-3. Pin Assignments for J2 Applications Port RS-485/RS-422 Four-Wire Interface

Pin Number	Signal Name (Function)	Signal Direction
1	RX-	Input
2	RX+	Input
3	TX+	Output
4	TX-	Output
5	Com (Isolated Common)	
6		
7		
8		
9		

Top View of J2 Connector



CE Mark Certified Systems



Notes

If the Personality module's J2 RS-232 Applications port DB9 connector is used in place of the base unit terminal block, only local shield grounding may be implemented. The cable assembly metal hood must NOT be in electrical contact with the cable's shield. Refer to Table 2-4 for pin assignments.

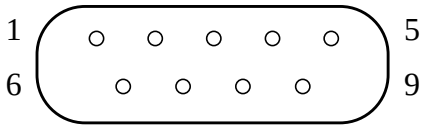
The cable MUST be braid-shielded and grounded at the entry point of the cabinet using the recommended hardware (refer to "Cable Guidelines" in U3-1000).

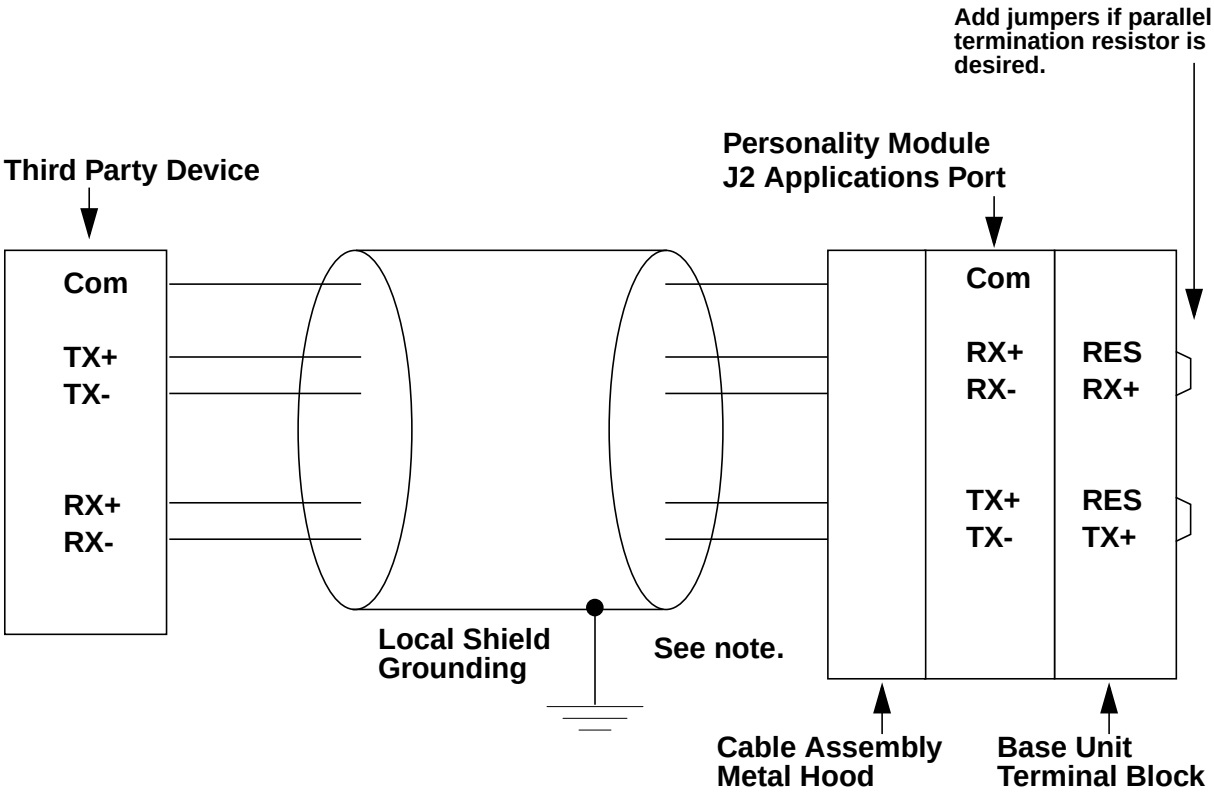
Figure 2-10. J2 RS-232 Interface (1C31169G01) (CE Mark)

Table 2-4. Pin Assignments for J2 Applications Port RS-232 Interface

Pin Number	Signal Name (Function)	Signal Direction
1	DCD (Data Carrier Detect)	Input
2	RX/ (Receive Data)	Input
3	TX/ (Transmit Data)	Output
4	DTR (Data Terminal Ready)	Output
5	Com (Isolated Common)	
6	DSR (Data Set Ready)	Input
7	RTS (Request to Send)	Output
8	CTS (Clear to Send)	Input
9	RI (Ring Indicator)	Input

Top View of J2 Connector





Notes

If the Personality module's J2 RS-485/RS-422 Applications port DB9 connector is used in place of the base unit terminal block, only local shield grounding may be implemented. The cable assembly metal hood must NOT be in electrical contact with the cable's shield. If parallel termination resistors are desired, jumpers must be added to the terminal block (as shown above). Refer to Table 2-5 for pin assignments.

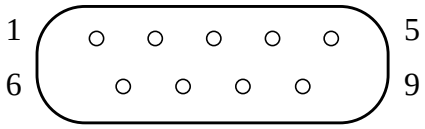
The cable MUST be braid-shielded and grounded at the entry point of the cabinet using the recommended hardware (refer to "Cable Guidelines" in U3-1000).

Figure 2-11. J2 RS-485/RS-422 Four-Wire Serial Interface (1C31169G02) (CE Mark)

Table 2-5. Pin Assignments for J2 Applications Port RS-485/RS-422 Four-Wire Interface

Pin Number	Signal Name (Function)	Signal Direction
1	RX-	Input
2	RX+	Input
3	TX+	Output
4	TX-	Output
5	Com (Isolated Common)	
6		
7		
8		
9		

Top View of J2 Connector



2-4.4. Generic Cabling Schemes

Once the pin-out of the other device's serial port connector has been determined, a cable can be made to connect the device to the J2 Port of the LC module. The module's transmit signal (RS-232) or signal pair (RS-485/RS-422) must be connected to the receive signal (RS-232) or signal pair (RS-485/RS-422) of the other device. Likewise, the LC receive signal or signal pair is connected to the transmit of the other device.

Generic RS-232 and RS-485/RS-422 cables are shown in Figure 2-12 and Figure 2-13. Many manufacturers use DB-9 or DB-25 connectors for the serial connection. Terminal blocks instead of connectors are also common for RS-485/RS-422.

These figures show no pin numbers for the other device since there is much variation among manufacturers.

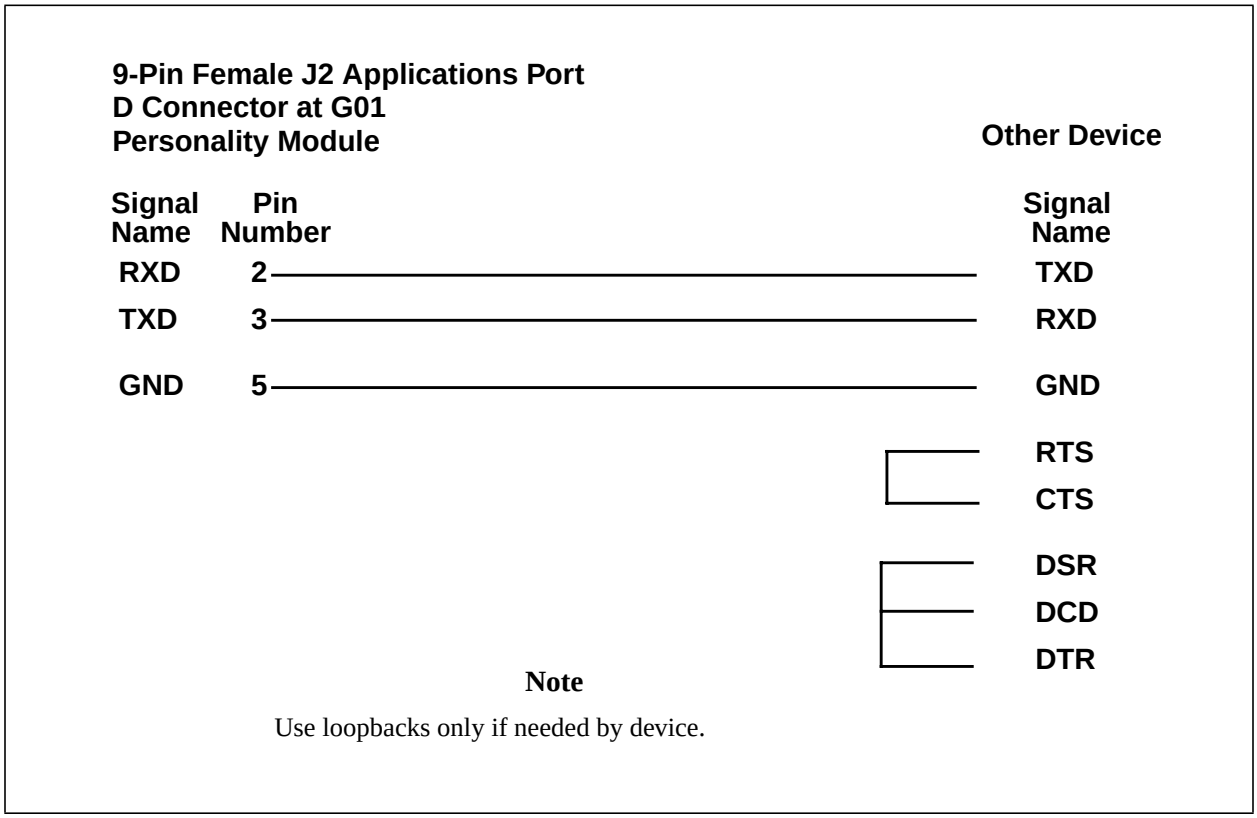


Figure 2-12. Generic RS-232 Cabling Scheme

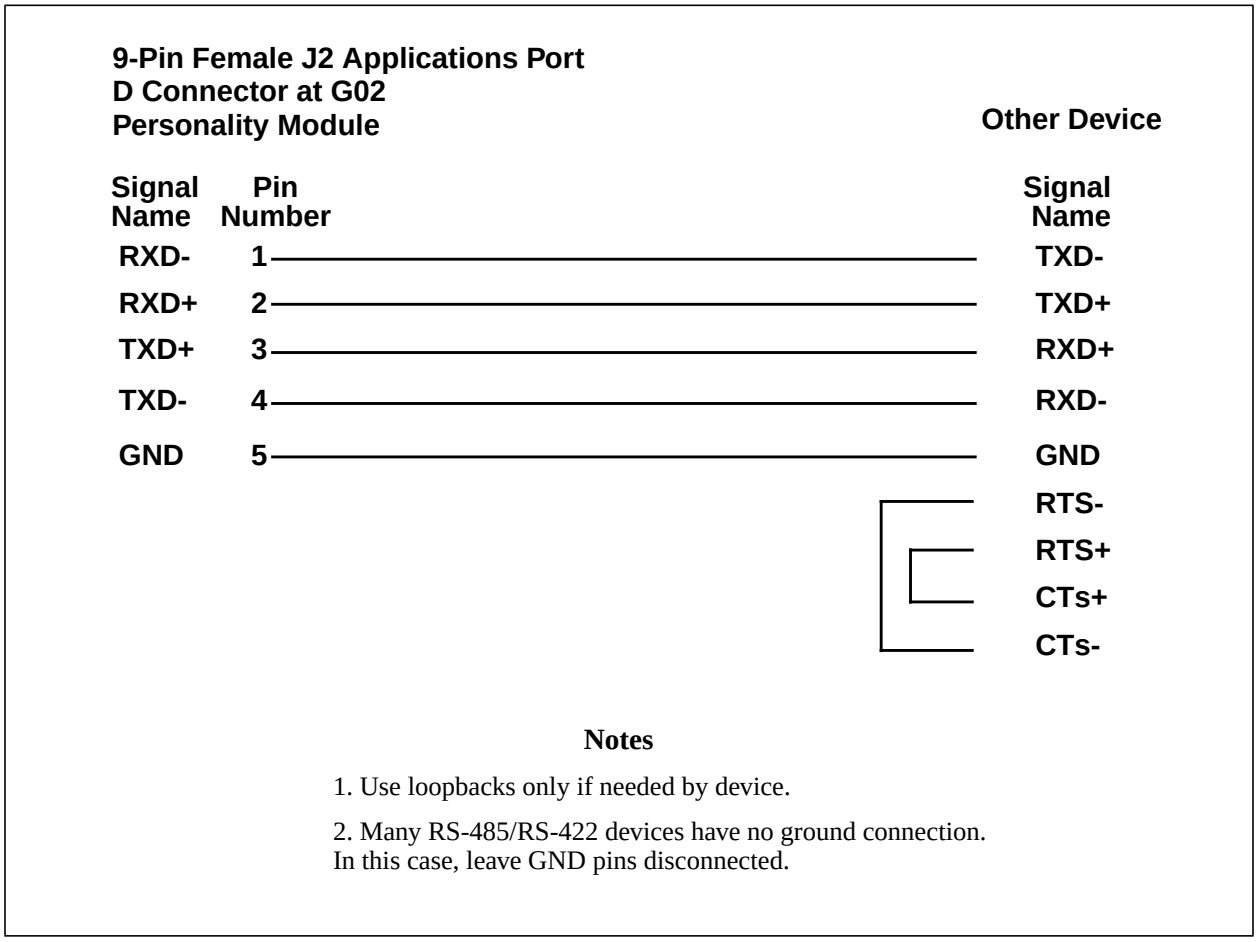


Figure 2-13. Generic RS-485/RS-422 LC Cabling Scheme

2-4.5. Cable Selection

Cable for RS-232 serial communication should be multiple conductor with shield. The shield drain wire should be used for the ground connection.

Cable for RS-485/RS-422 serial communication should be multiple twisted pairs, overall or individually shielded. Each signal's two differential connections should be made within a twisted pair; signals should not cross pairs.

The RS-485/RS-422 Group 2 personality module includes terminating resistors which can be placed across each signal pair by jumpering the base unit terminal block between B14 and B15 for transmit and between A14 and A15 for receive. Refer to Figure 2-2.

Some field devices will have resistors which can be switched in. For other devices, terminating resistors may need to be added. A typical value is 120 ohms across the + and - pins. In particularly noisy environments, the resistor can be split into 60 ohms from + to ground and 60 ohms from - to ground.

Refer to the "Cable Guidelines" section in U3-1000 for detailed information about cable usage and installation.

2-5. Jumpers

Wire jumpers may be installed in the Base Unit terminal block to select different Link Controller options. Table 2-6 describes the options and the jumpers used to select those options.

Table 2-6. LC Jumper Options

Option	Jumper Positions	Description
Baud Rate (for J1 Programming Port)	B7 and B8 connected	Baud rate = 9600
	B7 and B8 not connected	Baud rate = 19200 (default)
Boot LC module	C7 and C8 connected	Can boot from an external computer and load DOS (through the Programming Port). Typically, these jumpers are not used since DOS is installed on the LC module at the factory. However, if the module's RAM disk becomes corrupted, the jumpers must be installed so that the module can be reloaded with DOS and rebooted.
	C7 and C8 not connected	Can boot from LC Flash memory (by removing module from Base Unit and then replacing it) (default)
Enable Pmod (1C31169G02) J2 Applications Port RS-485/RS-422 **transmitter** termination resistor	B14 and B15 connected	Termination resistor enabled
	B14 and B15 not connected	Termination resistor isolated (default)
Enable Pmod (1C31169G02) J2 Applications Port RS-485/RS-422 **receiver** termination resistor	A14 and A15 connected	Termination resistor enabled
	A14 and A15 not connected	Termination resistor isolated (default)