



Allen-Bradley Line Driver/Receiver Module

(Cat. No. 1772-DR)

Product Data

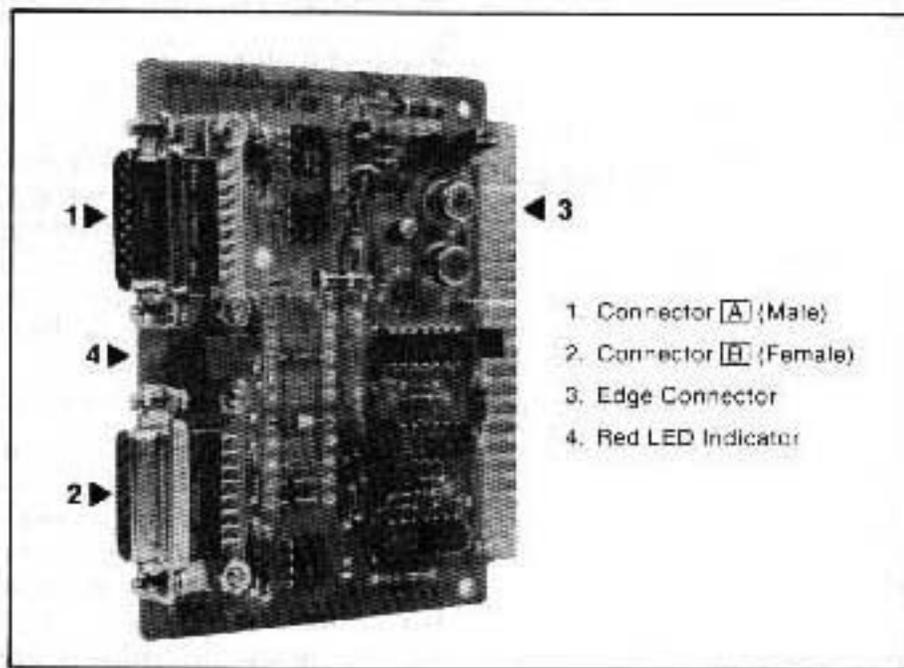
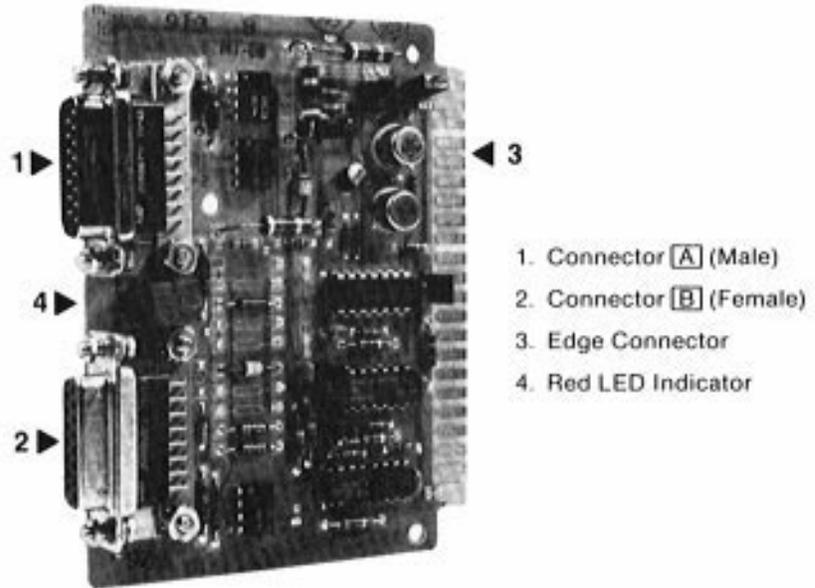


Figure 1 — Line Driver/Receiver Module

Introduction

The Line Driver/Receiver Module (cat. no. 1772-DR) permits extending the cable distance between a PLC®-2 family processor and industrial terminal up to 5,000 feet. The module (figure 1) provides the isolation, signal amplifications, and waveform squaring required to maintain satisfactory signal levels at this distance.

Figure 1
Line Driver/Receiver Module



The Industrial Terminal System (cat. no. 1770-T1, -T2, -T3) may be connected to any of the following PLC-2 family processors.

- Mini-PLC-2 Processor (cat. no. 1772-LN1, -LN2, -LN3)
- Mini-PLC-2/15 Processor (cat. no. 1772-LV)
- PLC-2 Processor (cat. no. 1772-LR)
- PLC-2/20 Processor (cat. no. 1772-LP1, -LP2)
- PLC-2/30 Processor (cat. no. 1772-LP3)

NOTE: The data links described in this document are used only for moderate distance communication (up to 5,000 feet) between PLC-2 family processors and industrial terminals. They cannot be used to connect a computer RS-232-C port to the PC processor. In order to connect an RS-232-C port to a PLC-2 family processor, use one of two hardware options available from Allen-Bradley.

- For a PC processor that is interfaced with an Allen-Bradley data highway via a Communications Adapter Module (cat. no. 1771-KA), the computer's RS-232-C port can be interfaced to the data highway via a Communications Controller Module (cat. no. 1771-KC, -KD, -KF).
- For a PC processor that is not interfaced to a data highway, the computer's RS-232-C port can be interfaced with the PC processor via a PLC-2 Family/RS-232-C Interface Module (cat. no. 1771-KG).

Two different line driver/receiver setups can be used.

- Dual full duplex
- Single full duplex

The dual full duplex configuration is recommended because it ensures communication integrity between the PLC-2 family processor and the industrial terminal. This is extremely important especially if force functions are used. If forcing functions have been entered from the industrial terminal and had not been cleared from the industrial terminal before it was turned off, they will remain active until the line driver/receiver power supply associated with the PC processor is de-energized.

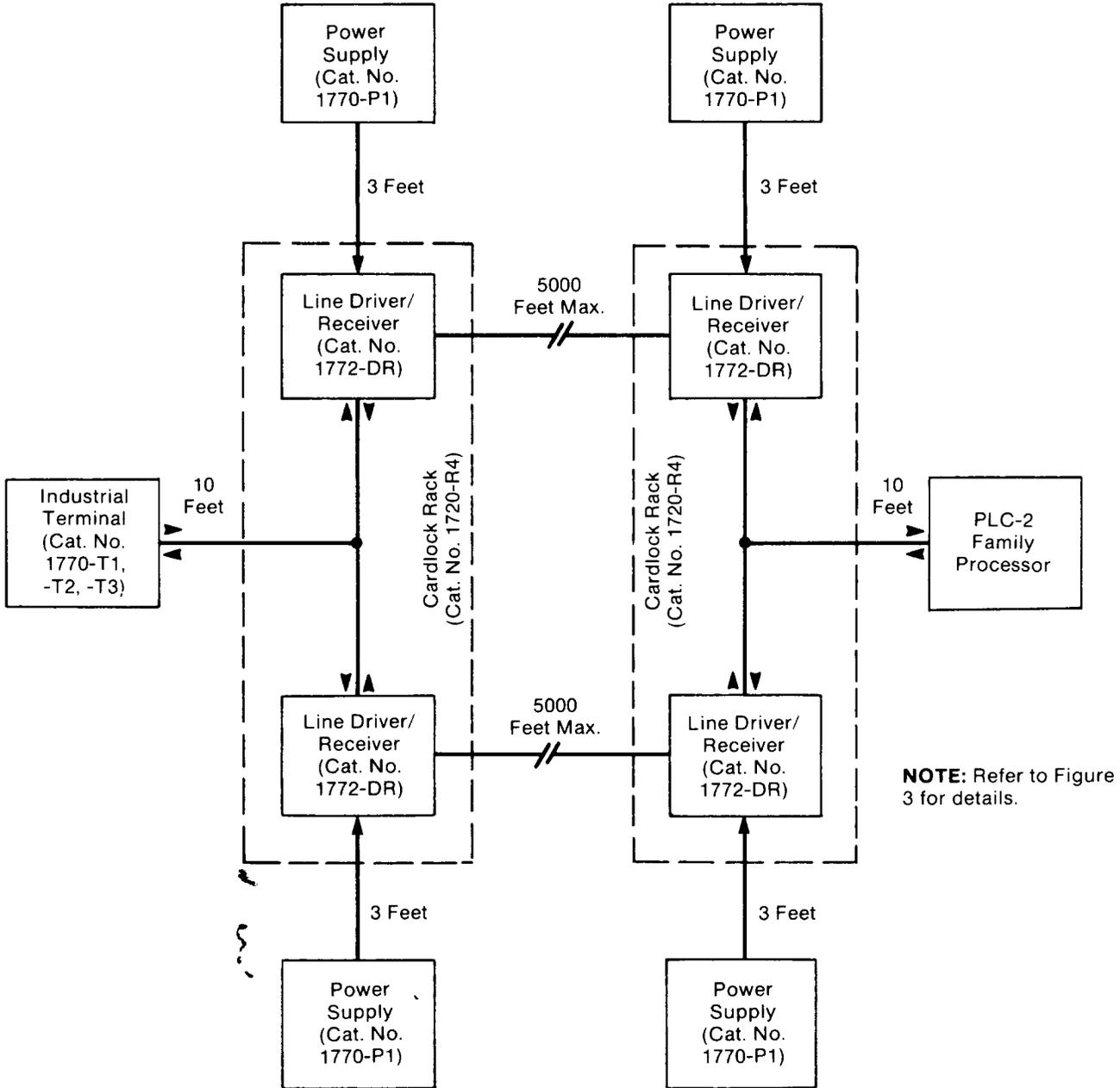
NOTE: The remainder of this document is intended for users who have not purchased Line Driver/Receiver Chassis (cat. no.1772-DQ). Four of these units are required for a dual full duplex configuration and two for a single full duplex configuration. These chassis units are discussed in publication 1772-927, Line Driver/Receiver Chassis (cat. no. 1772-DQ). These chassis replace the separate units of hardware — line driver/receiver modules, power supplies, and cardlock racks listed in the Material Required sections below.

Dual Full Duplex

Description

Four line driver/receiver modules are used in the dual full duplex arrangement (figure 2). It has two full duplex data links, each link requiring two modules. One link handles data communications while the other link accommodates handshaking for communications integrity. The dual full duplex configuration is recommended over the single full duplex because of the latter. This characteristic is described below in the description of the single full duplex.

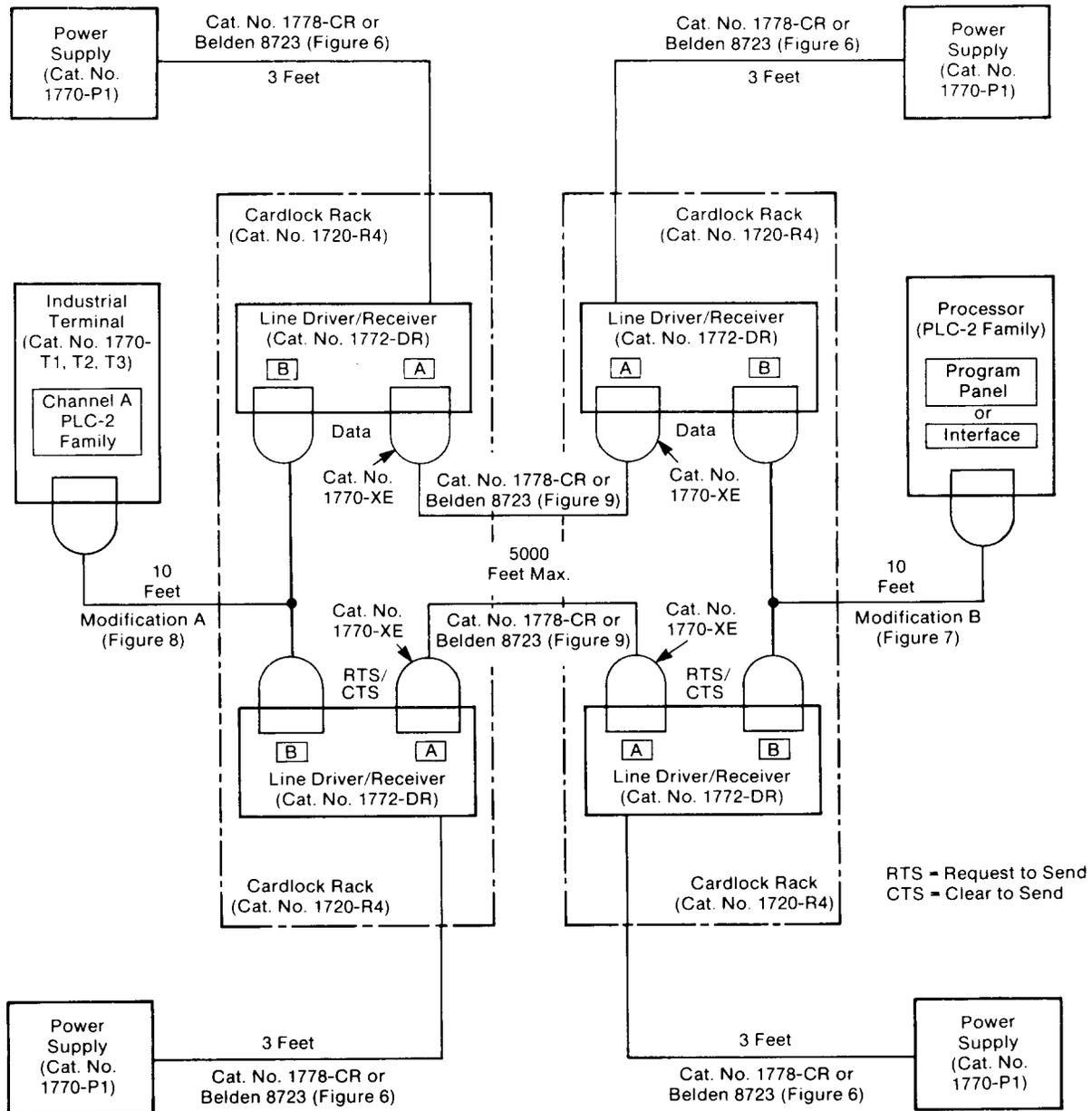
Figure 2
Dual Full Duplex Data/Communication Link



The line driver/receiver module is a plug-in module that mounts in one slot of a Cardlock Rack (cat. no. 1720-R4), which has four slots. The module is held securely by guide rails on the top and bottom of the rack and snap-locks at the front. The module's edge connector receives DC operating voltages from an external Power Supply (cat. no. 1770-P1), which must be wired to the module's rack-slot receptacle. Mounted on the front of each module are two 15-pin connectors, one male and one

female. Two cables connect between connectors A of the four required modules, two modules at each end of the link (figure 3). Connectors B, on the modules at one end of the link connect via a three-connector cable to the industrial terminal (cat. no. 1770-T1, -T2, -T3). Connectors B, on the other two modules connect via a three-connector cable to the PLC-2 family processor.

Figure 3
Cabling, Dual Full Duplex



Also mounted on the front end of each module is a red LED indicator that lights when connection is made to the distant end module.

Material Required

The following items are required to install a dual full duplex data link.

- Four Line Driver/Receiver Modules, cat. no. 1772-DR
- Four Power Supplies, cat. no. 1770-P1
- Two Cardlock Racks, cat. no. 1720-R4
- Four 15 pin, female, D-shell, solder cup type connectors such as cat. no. 1770-XE
- Two shielded cables (5000 ft or less) with two twisted pair
- Two shielded cables with four twisted pair and length of 10 ft or less to connect the industrial terminal and processor to the line drivers (figure 3)
- Six 15 pin, male, D-shell, solder type connectors

Installation

The following general steps may be performed in the most expedient order.

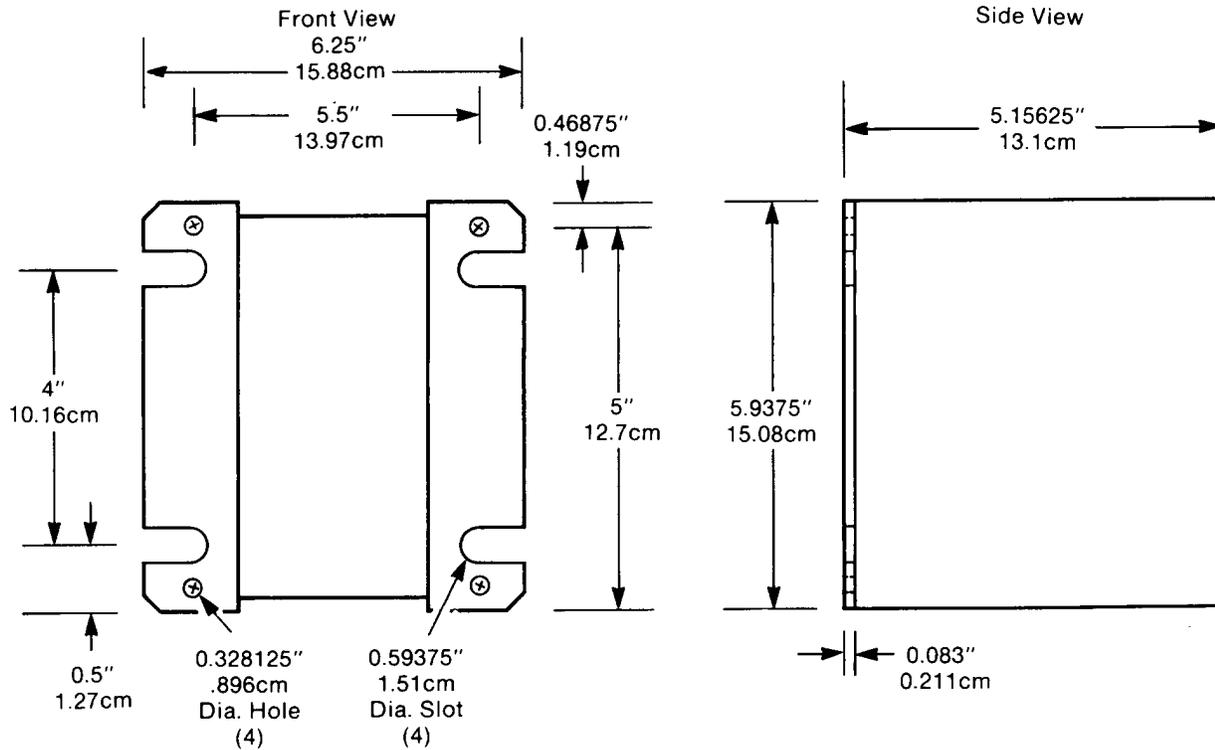


WARNING: Do not apply power to the four power supplies until after the installation is complete and checked. When installation is complete and checked, apply power to the power supplies only in accordance with the power up procedure given in the section following this installation procedure. Failure to observe this warning might result in injury to personnel and damage to equipment.

NOTE: If using the cat. no. 1772-DQ line driver/receiver chassis, proceed to step 4 after properly mounting the chassis. Mounting instructions are in publication 1772-927, Line Driver/ Receiver Chassis.

Step 1—Mount one cardlock rack within 10 cable feet of the PC processor and mount the other within 10 cable feet of the proposed site of the industrial terminal. (Refer to figure 4 for cardlock rack mounting dimensions.)

Figure 4
Cardlock Rack Mounting Dimensions



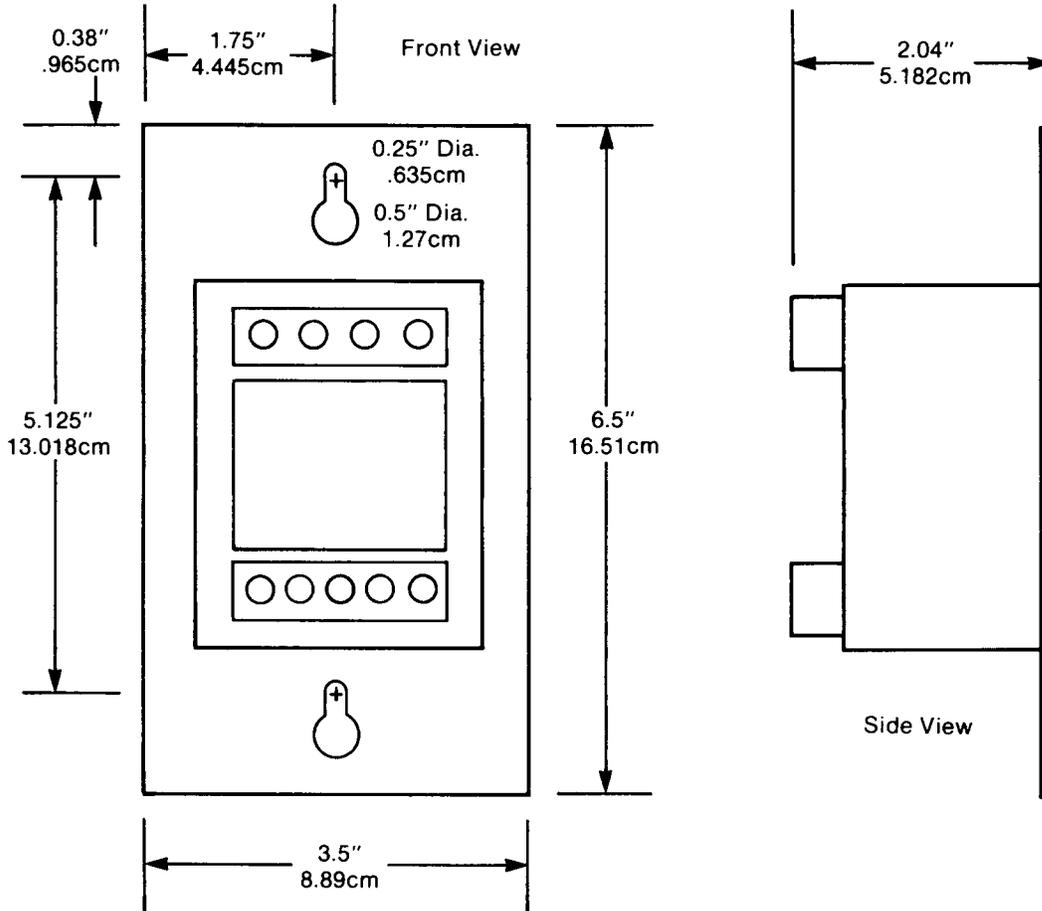
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Step 2 —Mount two power supplies within 3 cable feet of each cardlock rack and near 120V AC or 220/240V AC line power outlets. (Refer to figure 5 for power supply mounting dimensions.)

Step 3 —Using an appropriate length of cable (this can be remote I/O interconnect cable (cat. no. 1778-CR) or Belden 8723), wire each of the four power supplies to a rack-slot position module receptacle in the associated cardlock rack. Do so for each power supply as shown in figure 6.

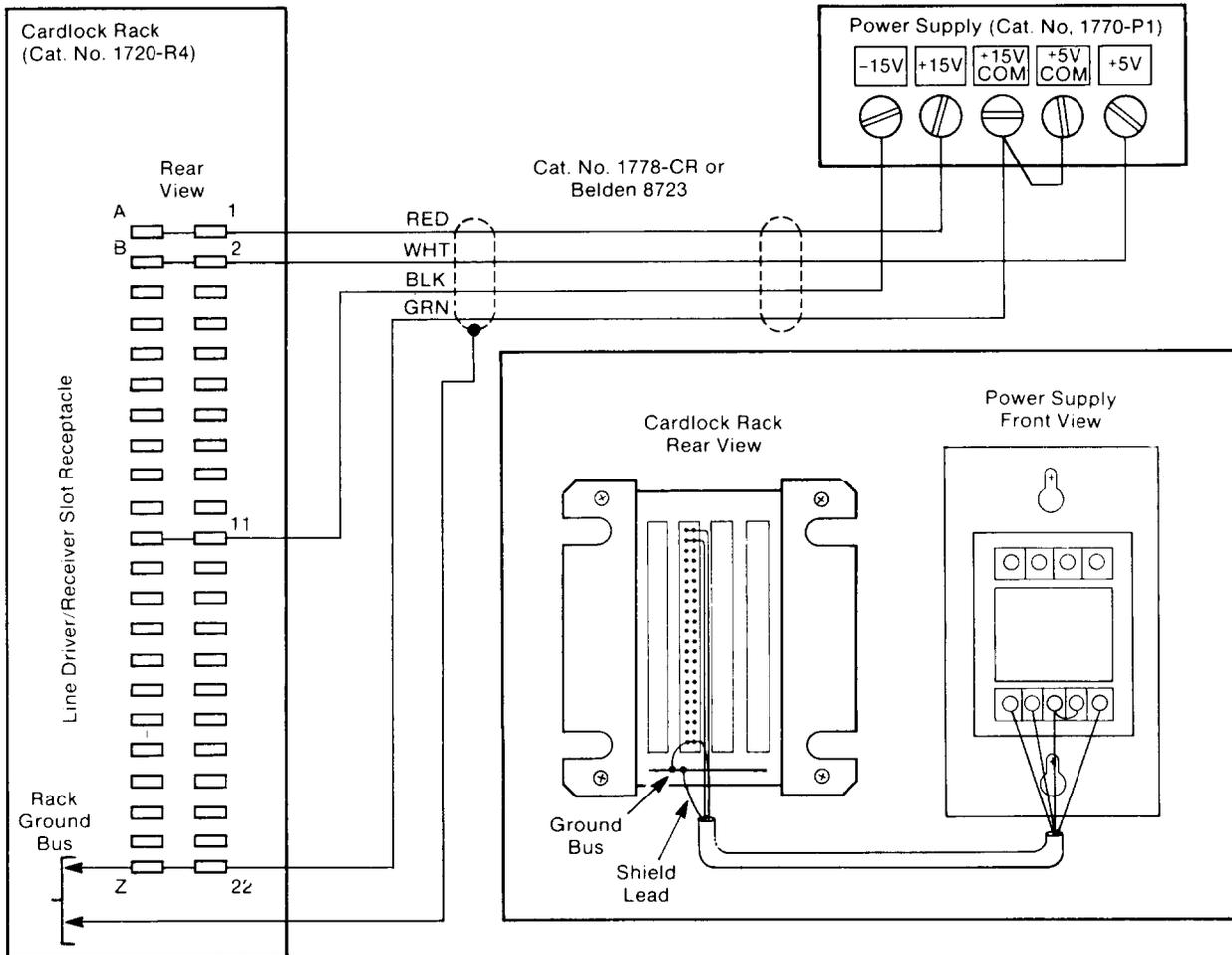
Step 4 —At the PC processor end of the link, insert two line driver/receiver modules into the two rack slots that are connected to the two power supplies. At the industrial terminal end of the link, insert two line driver/receiver modules into the two rack slots that were connected to the two power supplies.

Figure 5
Power Supply Mounting Dimensions



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Figure 6
Power Cable



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To connect the PLC-2 program panel or interface to two line driver B connections (modification B, figure 3) the Y shaped cable and D-shell harness must be wired as shown in figure 7. It is composed of three 15 pin, male, D-shell, solder type connectors and not more than 10 feet of shielded cable with four twisted pair conductors. The individual cable connections should have insulating heat shrinkable tubing applied at the terminal points. Attach cables so that stress is relieved at the connector hoods.

To connect the industrial terminal CHANNEL A PLC-2 FAMILY connector to the two line drivers B connections (modification A, figure 3), a Y shaped cable and D-shell harness of figure 3 must be fabricated. This harness must be wired as shown in figure 8. It is composed of three 15 pin, male, D-shell, solder type connectors and not more than 10 feet of shielded cable with four twisted pair conductors. The individual cable connections should have insulating heat shrinking tubing applied at the termination points. Attach cables so that stress is relieved at the connector points.

Figure 7
Modification B

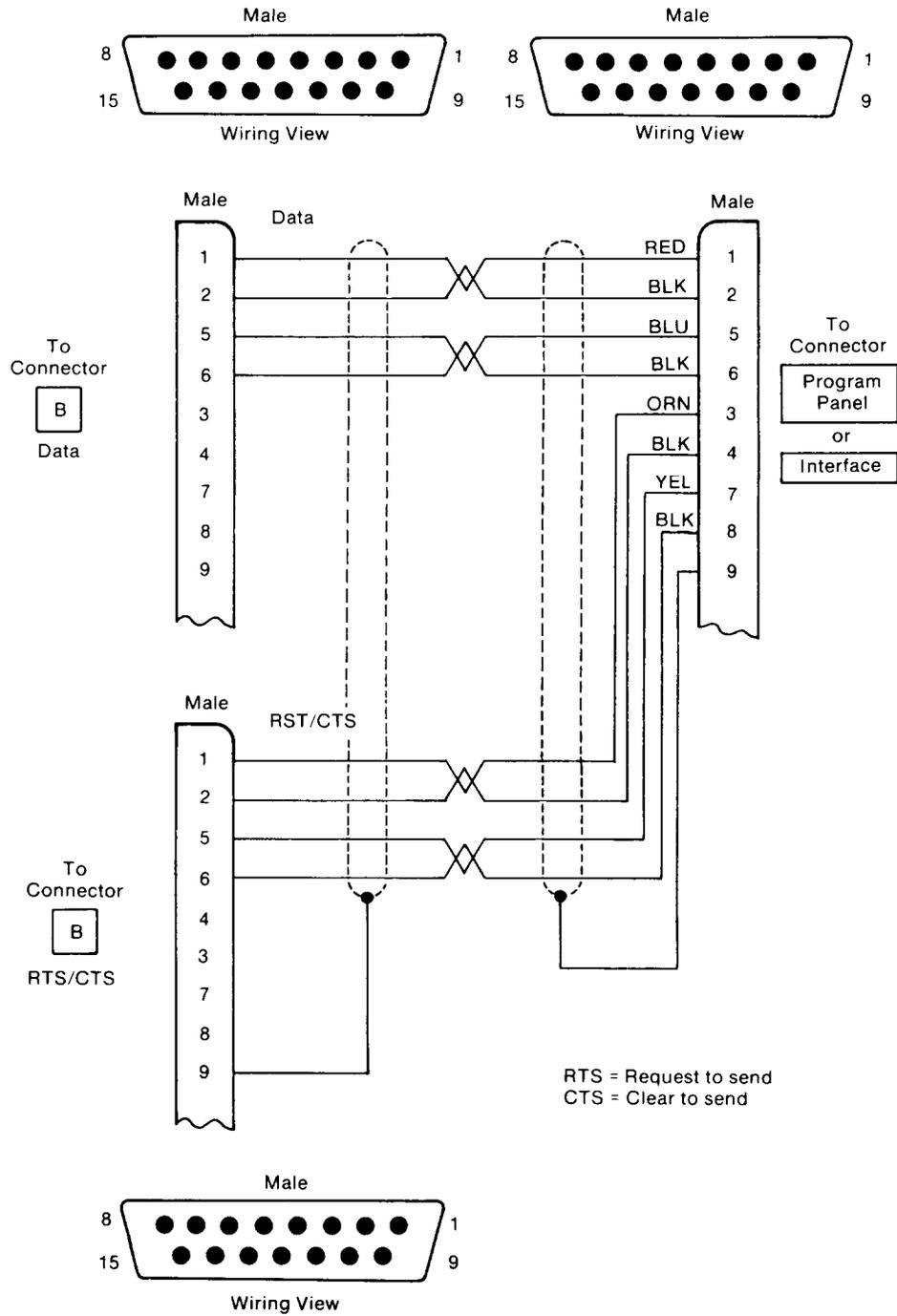
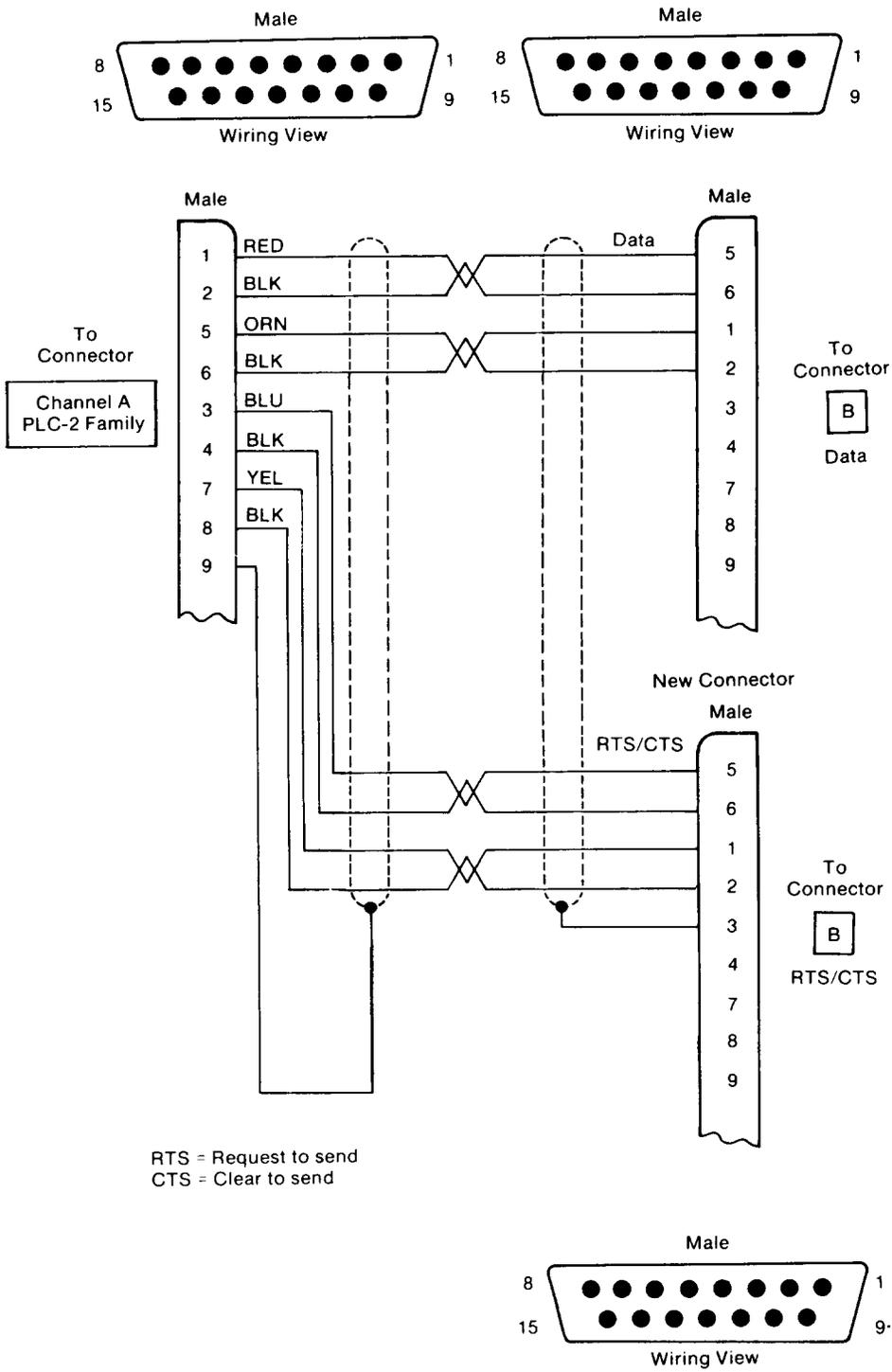


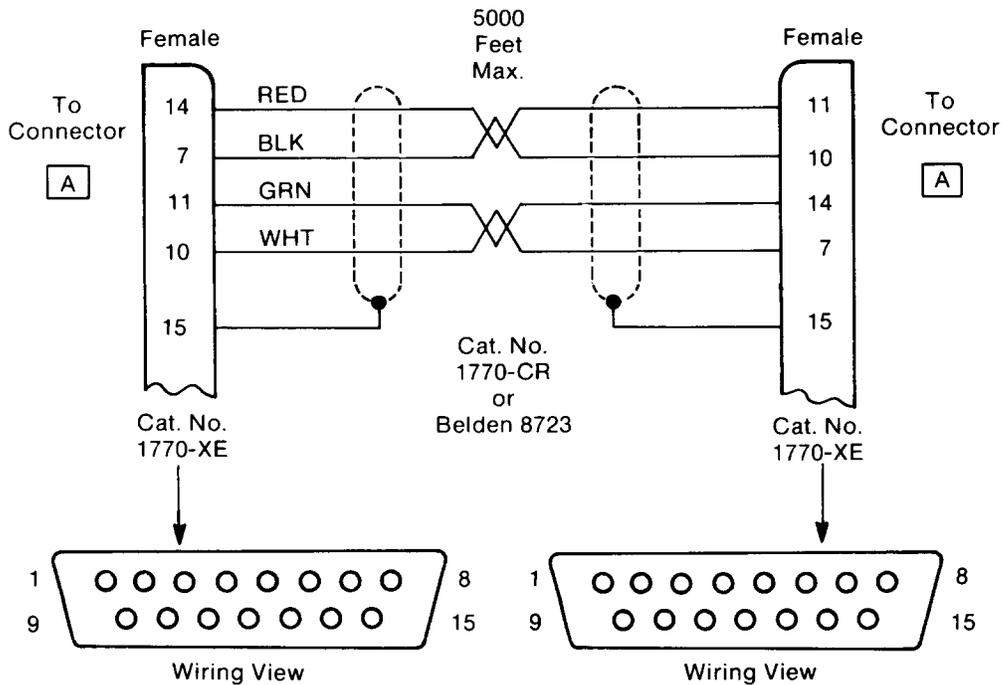
Figure 8
Modification A



Step 5 — Using two desired lengths (not exceeding 5,000 feet) of remote I/O interconnect cable (or Belden 8723) and four 15pin connectors (cat. no. 1770-XE), make up two cables, each as shown in figure 9. Connect those cables to connectors A on the four line driver/receiver modules (figure 3).

Step 6 — Check all power supply and cable wiring against the above steps and figures 3 and 6 through 9.

Figure 9
Remote I/O Interconnect Cable (Cat. No. 1778-CR) and Connections (Cat. No. 1770-XE)



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Step 7 — Connect appropriate line cords to the four power supplies, but do not connect them to the power mains, except in accordance with the following power-up procedure.

Power-Up

After the two data link installations are completed and checked, apply power to the system by performing the following steps in the order given. This sequence is necessary to properly establish communication between the processor and industrial terminal.

Step 1 — Energize the two line driver/receiver power supplies associated with the PC processor.

Step 2 — Energize the two line driver/receiver power supplies associated with the industrial terminal.

Step 3 — Energize the industrial terminal.

Power has now been properly applied. Communications between the programmable controller and industrial terminal is now established.

Power Shutdown

Remove power from the system by performing the following steps in the order given:

Step 1 — De-energize the industrial terminal.

Step 2 — De-energize the two line driver/receiver power supplies associated with the industrial terminal.

NOTE: Steps 2 and 3 may be performed simultaneously.

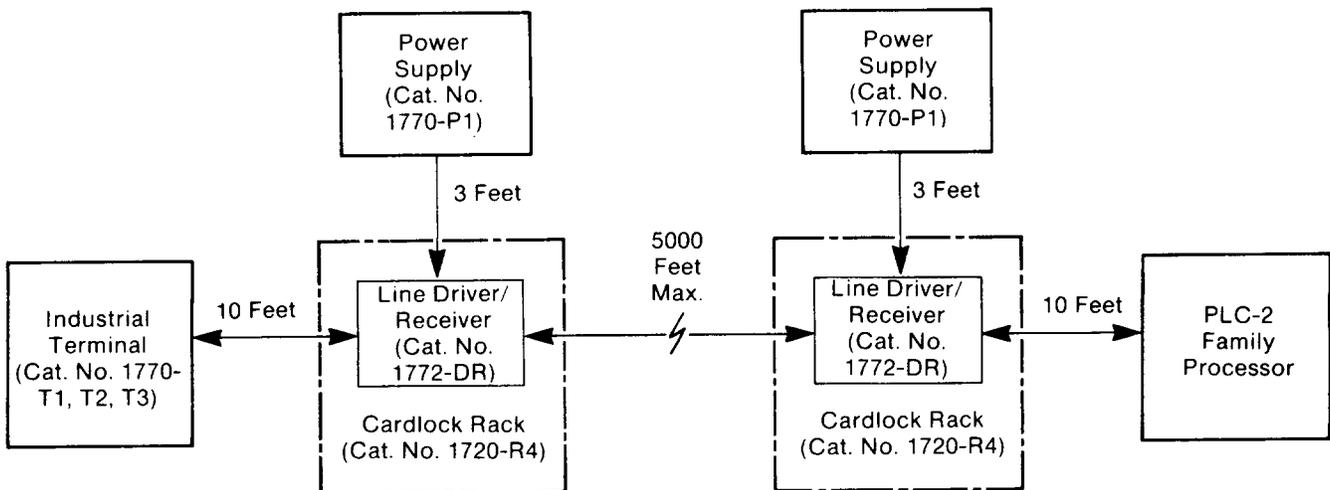
Step 3 — De-energize the two line driver/receiver power supplies associated with the PC processor.

Single Full Duplex

Description

The single full duplex configuration (figure 10) is less costly than the dual full duplex since it uses only two line driver/receiver modules. However the following characteristics of this configuration must be noted so that it will not be used in applications where these characteristics could result in hazardous operation.

Figure 10
Single Full Duplex Data Link



NOTE: Refer to figure 11 for details.



WARNING: With the single full duplex configuration, when an industrial terminal is disconnected, the processor's force table is not cleared as it is with the dual full duplex configuration. Thus the single full duplex configuration masks the industrial terminal's disconnect response from that of the standard industrial terminal hookup. Use the dual full duplex configuration if forcing function capability is required.

Also, the single full duplex configuration “ties up” the handshake lines to a PLC-2 processor so that it always believes that an industrial terminal is connected when in fact it might not be at the remote end. A PLC-2 family processor monitors the handshake lines to determine if the industrial terminal has “gone away” – and if it has, it clears the force table.

The line driver/receiver module is a plug-in module that mounts in one slot of a Cardlock Rack (cat. no. 1720-R4), which has four slots. The module is held securely by guide rails on the top and bottom of the rack and snap-locks at the front. The module's edge connector receives DC operating voltages from an external Power Supply (cat. no. 1770-P1) which must be wired to the module's rack-slot receptacle. Mounted on the front of the module are two 15-pin connectors (one male and one female). A cable connects between connectors A of the two required modules, one module at each end of the link (figure 11). Connector B on the module at one end of the link connects to channel A or the industrial terminal (cat. no. 1770-T1, -T2, -T3). Connector B on the other module connects to the PLC-2 family processor.

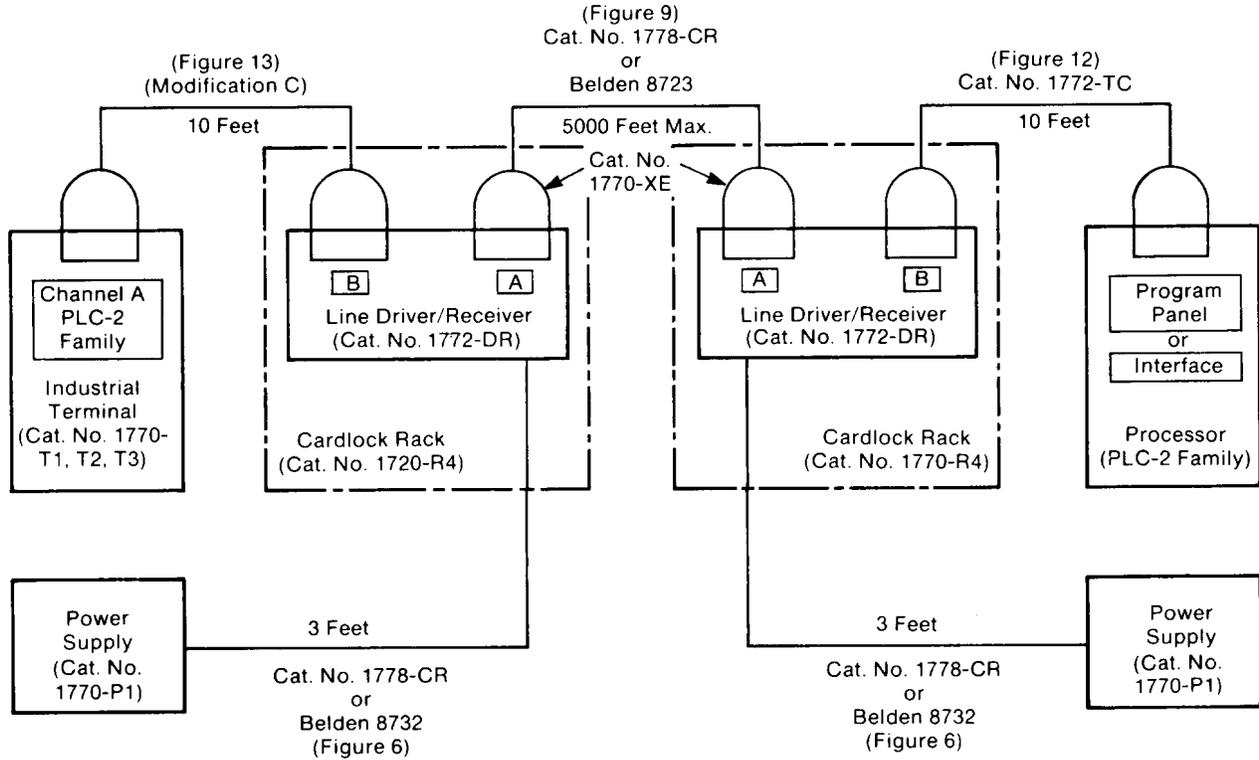
Also mounted on the front end of each module is a red LED indicator that lights when connection is made to the distant end module.

Material Required

The following items are required to install a single full duplex data link.

- Two Line Driver/Receiver Modules, cat. no. 1772-DR
- Two Power Supplies, cat. no. 1770-P1
- Two cardlock racks, cat. no. 1720-R4
- Two 15 pin, female, D-shell, solder cup type connectors such as cat. no. 1770-XE
- One shielded cable (5000 ft or less) with two twisted pair
- Four 15 pin, male, D-shell, solder type connectors

Figure 11
Data Link Cabling, Single Full Duplex



Installation

The following general steps may be performed in the most practicable and expedient order.



WARNING: Do not apply power to the power supplies being installed until after the installation is complete and checked. When installation is complete and checked, apply power to the power supplies only in accordance with the power up procedure given in the section following this installation procedure. Failure to observe this warning might result in injury to personnel and damage to equipment.

NOTE: If using the cat. no. 1772-DQ line driver/receiver chassis, proceed to step 4 after properly mounting the chassis. Mounting instructions are in publication 1772-927, Line Driver/ Receiver Chassis.

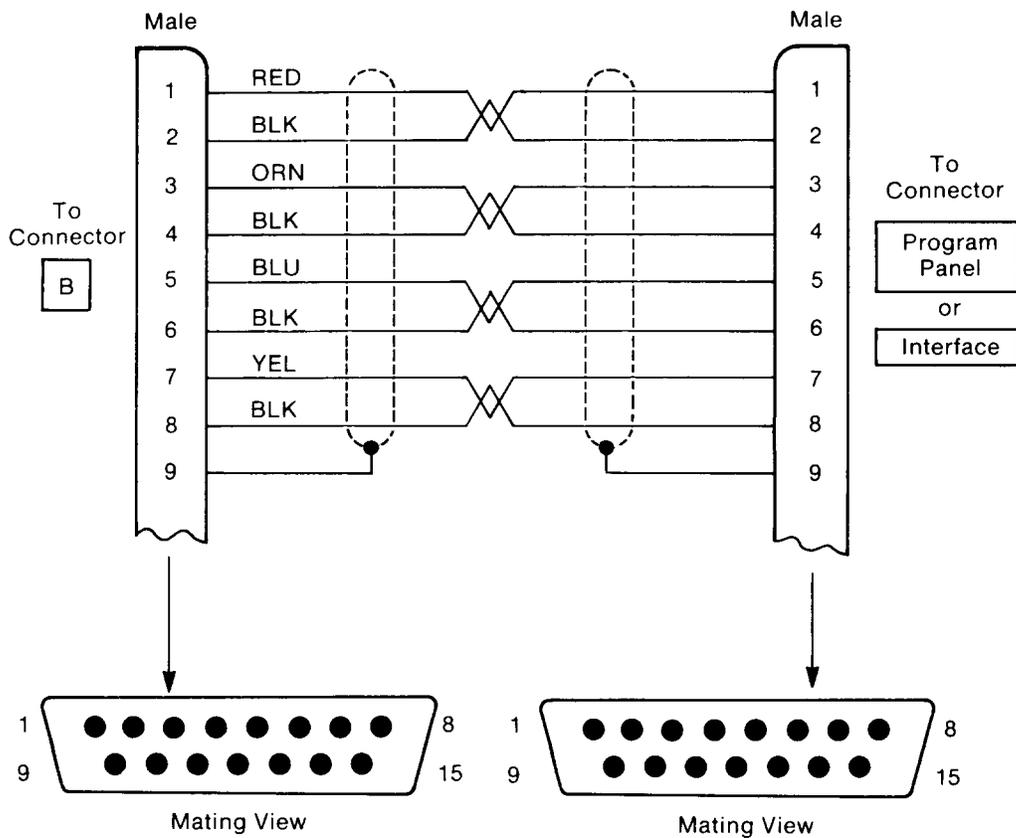
Step 1 — Mount one cardlock rack within 10 cable feet of the PC processor and mount another within 10 cable feet of the proposed site of the industrial terminal. (Refer to figure 4 for cardlock rack mounting dimensions.)

Step 2 — Mount one power supply within 3 cable feet of each cardlock rack and near a 120V AC or 220/240V AC line power outlet. (Refer to figure 5 for power supply mounting dimensions.)

Step 3 — Using an appropriate length of cable (this can be remote I/O interconnect cable (cat. no. 1778-CR or Belden 8723), wire the power supply to any one of the four rack-slot position module receptacles as shown in figure 6. Any one of the four rack slots can be used. Perform this operation for both power supplies.

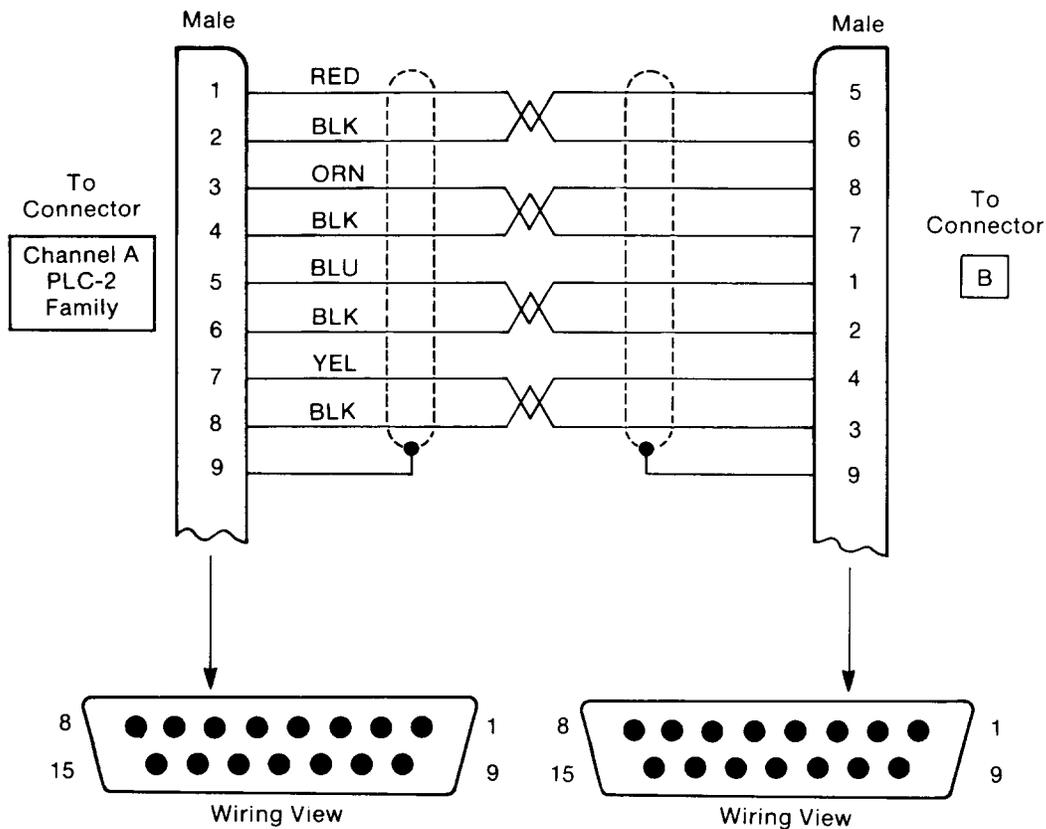
Step 4 — At the PC processor end of the link, insert a line driver/receiver module into the rack slot that was connected to the power supply. At the industrial terminal end of the link, insert a line driver/receiver into the rack slot that was connected to the power supply. Connect a program panel interconnect cable (cat. no. 1772-TC) from the module B connector to the PC processor PROGRAM PANEL or INTERFACE connector (figure 12).

Figure 12
Program Panel, Interconnect Cable (Cat. No. 1772-TC)



To connect the industrial terminal CHANNEL A PLC-2 FAMILY connector to the line driver module B connector, the harness shown as modification C in figure 11 must be fabricated. It is composed of not more than 10 feet of shielded cable with four twisted pair conductors. At each end there is a 15 pin, male, D-shell, solder type connector. The cable and connectors must be wired as shown in figure 13.

Figure 13
Modification C



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The individual cable should have insulating heat shrinking tubing applied at the termination points. Attach the cable so that stress is relieved at the connection hoods.

Step 5 — Using the required length of cable (remote I/O interconnect cable or Belden 8723) and two 15-pin connectors (cat. no. 1770-XE), make up a cable as shown in figure 9. Connect this cable to connectors A on the two line driver/receiver modules (figure 11).

Step 6 — Check all power supply and cable wiring against the above steps and figures 6, 9, 11, and 13.

Step 7 — Connect appropriate line cords to the two power supplies, but do not connect them to the power mains, except in accordance with the following power-up procedure.

Power-Up

After the data link installation has been completed and checked, apply power to the system by performing the following steps in the order given. This sequence is necessary to properly establish communication between the processor and industrial terminal.

Step 1 — Energize the line driver/receiver power supply associated with the PC processor.

Step 2 — Energize the line driver/receiver power supply associated with the industrial terminal.

Step 3 — Energize the industrial terminal.

Power has now been properly applied. Communication between the programmable controller and industrial terminal is now established.

Power Shutdown

Remove power from the system by performing the following steps in the order given.



WARNING: If forcing functions have been entered from the industrial terminal and had not been cleared by the industrial terminal before it was turned off, they will remain active until the line driver/receiver power supply associated with the PC processor is de-energized. Use the dual full duplex configuration if forcing function capability is required.

Step 1 — De-energize the industrial terminal.

Step 2 — De-energize the line driver/receiver power supply associated with the industrial terminal.

NOTE: Steps 2 and 3 may be performed simultaneously.

Step 3 — De-energize the line driver/receiver power supply associated with the PC processor. This supply must be off when the industrial terminal is not being used in the PLC-2 mode or an industrial terminal is not connected.

Troubleshooting

Figures 3, 6 through 9, and 11 through 13 provide hardware information required to troubleshoot the data link. The only replaceable parts are the individual items in the materials required lists.

Most installation and down-time troubles can be analyzed by the following preliminary considerations:

- Does wiring agree with figures 4, 5, and 8 through 13?
- Are the two long cables connected to the correct modules at both ends of the link?
- Are line driver/receiver modules firmly seated in their receptacles?
- Are all cable connectors firmly seated?
- Are power supply DC voltages present on module receptacle pins?
- Are power supplies receiving primary input power?
- Line driver/receiver front panel LED indicator goes out if the remote I/O interconnect cable opens or if the far end line driver/receiver loses its operating voltages.
- When using a 1772-LN1, -LN2, -LN3, -LP1, -LP2 PC processor with a 1770-T1, -T2 industrial terminal, an open remote I/O interconnect cable or shorted cable is not indicated on the industrial terminal screen.
- When using one of the above listed processors or the 1772-LV or 1772-LP3 and the 1770-T3 industrial terminal, an open remote I/O interconnect cable or shorted cable will cause the message PROCESSOR COMMUNICATIONS LINK NOISY – ALPHANUMERIC ENABLED ONLY, to be displayed on the screen.

Specifications

Function

- Four line driver/receiver modules extend cable distance (5000 ft max) between industrial terminal and programmable controller.

Electrical Interface

- Two modules connect to PLC-2 family PC processor via a Y shaped cable and D-shell harness.
- The other two modules connect to Industrial Terminal (cat. no.1770-T1, -T2, or T3) via a Y shaped cable and D-shell harness. The connection between the four modules is via two Remote I/O Interconnect Cables (cat. no. 1778-CR) or Belden 8723 with two connectors (cat. no. 1770-XE) per cable.

Module Locations

- Two Cardlock Racks (cat. no.1720-R4) located one within 10 cable feet of PC processor and the other within 10 cable feet of industrial terminal.

Power Requirements

- +5V DC and $\pm 15V$ DC provided by Power Supply (cat. no.1770-P1)
- One power supply required for each line driver/receiver module

Isolation

- 1500V peak (optoelectronic coupled)

Ambient Temperature Rating

- Operational 0° C to 60°C (32°F to 140°F)
- Storage -40°C to 85°C (-40°F to 185°F)

Relative Humidity Rating

- 5% to 95% (without condensation)

Weight

- 3oz, .085kg



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