CAUTION

All wiring must be done by qualified technicians and must conform to national or local electrical codes.

Do not exceed maximum voltage limits given in Table 1-1.

Which terminals to connect to?

There are 4 main input/output hardware types: Analog Input (AI1 through AI12), Analog Outputs (AO1 through AO4), Discrete Input (DI1 through DI16), and Discrete Outputs (DO1 through DO 24) (your instrument may have fewer, depending on options ordered). Table 2-3 gives typical applications for each type. Before wiring your process, you must decide which terminals to connect to your process. The terminals you connect to correspond with the software in the instrument. For example, the device you connect to AI1 will be seen by the instrument's software as AI1. If you connect your PV to AI1, then you must remember that AI1 is your PV; the instrument's software has a labeling feature that lets you identify each component by a name of your choice.

Your instrument has the terminals shown in either Figure 2-3, Figure 2-3 or 2-4

Table 2-3 shows typical applications for the various devices that you connect to the terminals.

Table 2-3 Terminal Designators And Their Associated Applications

Terminal designator	Typical application
24V	• Power a transmitter • Power relay(s)
AO	• Drive control element(s) • Retransmit to another instrument
AI	• PV(s) • Remote setpoint(s). • Auxiliary input(s) to be recorded.
DI	• Trigger events, like remote operation • Remote selection of parameters
DO	• Alarm outputs • Event outputs • Control outputs

ATTENTION

Refer to Section B.4 for more details and recommended wiring practices.

ATTENTION

For CE Instruments:
The connection between protective earth ground (TB1 Pin1) and Earth Ground for the Communications connection (TB2 Pin 6) is essential for CE compliance with Communications. This wire is installed at the factory, be sure not to remove it.

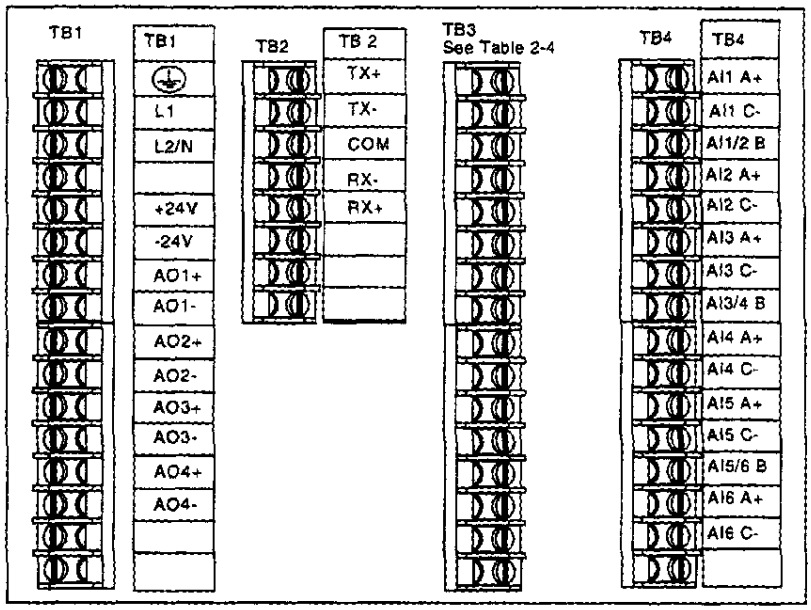

Figure 2-3 Terminal Connections (TB3)

Table 2-4 Optional Cards for Terminal Board TB3

Contents of cards					
TB3					
6 AC Solid State Relays	6 Mechanical Relays (Form C)	6 DC Solid State Relays	4 Mechanical Relays/ 3 Event Input Relays	4 AC Solid State Relays/ 3 Event Input Relays	4 DC Solid State Relays/ 3 Event Input Relays
			DI1	DI1	DI1
	DO6 NC		DI1/2 C	DI1/2 C	DI1/2 C
DO6 NO	DO6 NO	DO6 NO (-)	DI2	DI2	DI2
DO5/6 C	DO5/6 C	DO5/6 C (+)	DI3 C	DI3 C	DI3 C
	DO5 NC		DI3	DI3	DI3
DO5 NO	DO5 NO	DO5 NO (-)			
	DO4 NC		DO4 NC		
DO4 NO	DO4 NO	DO4 NO (-)	DO4 NO	DO4 NO	DO4 NO (-)
DO3/4 C	DO3/4 C	DO3/4 C (+)	DO3/4 C	DO3/4 C	DO3/4 C (+)
	DO3 NC		DO3 NC		
DO3 NO	DO3 NO	DO3 NO (-)	DO3 NO	DO3 NO	DO3 NO (-)
	DO2 NC		DO2 NC		
DO2 NO	DO2 NO	DO2 NO (-)	DO2 NO	DO2 NO	DO2 NO (-)
DO1/2 C	DO1/2 C	DO1/2 C (+)	DO1/2 C	DO1/2 C	DO1/2 C (+)
	DO1 NC		DO1 NC		
DO1 NO	DO1 NO	DO1 NO (-)	DO1 NO	DO1 NO	DO1 NO (-)
Note: Terminal label may contain options not installed on your instrument.					

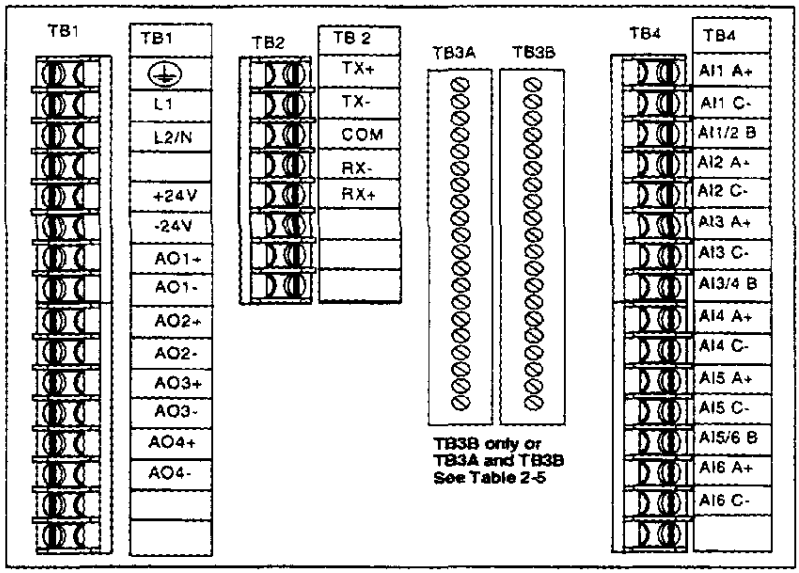

Figure 2-4 Terminal Connections (TB3A & TB3B)

Table 2-5 Optional Cards for Terminal Boards TB3A & TB3B

Contents of cards				
8 DI/8 Open Collector Outputs	16 DI/16 Open Collector Outputs		8 DI/24 Open Collector Outputs	
TB3B	TB3A	TB3B	TB3A	TB3B
DI1	DI9	DI1	DO9	DI1
DI2	DI10	DI2	DO10	DI2
DI3	DI11	DI3	DO11	DI3
DI4	DI12	DI4	DO12	DI4
DI5	DI13	DI5	DO13	DI5
DI6	DI14	DI6	DO14	DI6
DI7	DI15	DI7	DO15	DI7
DI8	DI16	DI8	DO16	DI8
COM	COM	COM	COM	COM
COM	COM	COM	COM	COM
COM	COM	COM	COM	COM
COM	COM	COM	COM	COM
DO1	DO17	DO1	DO17	DO1
DO2	DO18	DO2	DO18	DO2
DO3	DO19	DO3	DO19	DO3
DO4	DO20	DO4	DO20	DO4
DO5	DO21	DO5	DO21	DO5
DO6	DO22	DO6	DO22	DO6
DO7	DO23	DO7	DO23	DO7
DO8	DO24	DO8	DO24	DO8
Note: terminal label may contain options not installed on your instrument.				

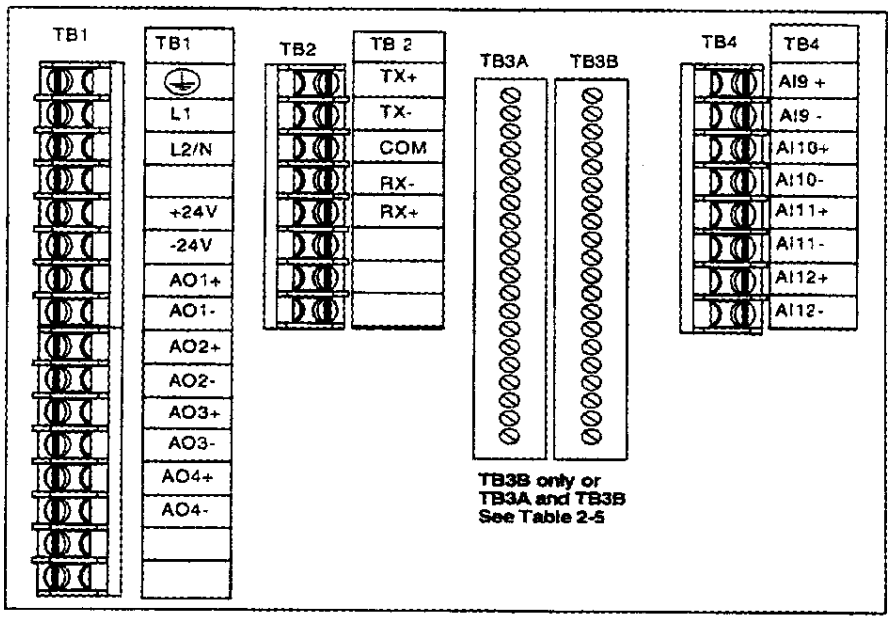

Figure 2-5 Terminal Connections (TB3A & TB3B)

Table 2-6 Optional 12 PT AI Card Terminal Boards TB3A & TB3B

Contents of 12 pt AI Card	
TB3A	TB3B
DI1	AI1+
DI2	AI1-
DI3	AI2+
DI4	AI2-
DI5	AI3+
DI6	AI3-
DI7	AI4+
DI8	AI4-
COM	RJ C
COM	RJ O
COM	RJ I
COM	RJ I
DO1	AI5+
DO2	AI5-
DO3	AI6+
DO4	AI6-
DO5	AI7+
DO6	AI7-
DO7	AI8+
DO8	AI8-

General Wiring Recommendations

In general, use stranded copper wire for non-thermocouple electrical connections. Keep in mind that the maximum load resistance for many process instruments includes the interconnecting wire. Separation of low level and high level wiring is recommended.

Twisted signal pairs and shielded cable will improve noise immunity if wire routing is suspect.

Observe all national and local electrical codes when making power connections. Unless local electrical codes dictate otherwise, the recommended minimum wire size for connections is given in Table 2-7.

Table 2-7 Recommended Minimum Wire Size

Gage No.	Description
14	Earth ground wire to common power supply. Earth ground wire to single instrument, AC line leads, +24V and common leads, 24VDC power supply
20	DC current and voltage field wiring
22	DC current and voltage wiring in control room

Make all connections at the terminals outside the case as shown in Figure 2-3 through 2-4 and Tables 2-4 through 2-6. Do not run low level signal leads close to or parallel with line voltage leads or other power leads, in order to avoid electrical interference with signals.

A mains disconnect switch must be installed that breaks all current carrying conductors.

An external switch should be used for all other hazardous voltage connections.

Disconnect all power before making any wiring connections. More than one switch may be required to de-energize the instrument.

Power Connections

The instrument can be connected to a power mains source of from 85 to 265 VAC (50 or 60 Hz) with no conversion or special installation requirements.

Safety Grounding

The protective ground terminal is to be connected to the mains supply ground.

Noise Suppression

To protect the instrument from noise and to comply with CE, see Appendix B.

Analog Input Connections

See Table 1-1 Specifications for acceptable voltage and current signal inputs. Connect current and voltage inputs to the appropriately labeled terminals as in Figure 2-5.

CAUTION

Safety isolation exceeding the safe working level of 30 V RMS (42.4V peak) is not provided between analog inputs. If the working voltage of *any* analog input exceeds this level, use suitable wire gauge and insulation on *all* analog inputs, and use proper safety precautions when handling all analog input wiring.

ATTENTION

1. For current inputs, shunt resistors are **not** provided.
2. When required, current shunts are mounted on these terminals, see Figure 2-5. Use Part No. 311285 for 4-20 mA input conversion to 1-5V.
3. Thermocouples may be grounded or ungrounded, since each point is isolated using solid state relays.
4. Connect RTD input leads to the proper terminals for the RTD input card. Note that an RTD has three leads. The A, B, and C leads must be equal length and gage, i.e., the same resistance.
5. In the same instrument, avoid the following input ground connections.
   - Both a thermocouple input tied to ground and an RTD input tied to ground. The thermocouple measurement would be incorrect.
   - A thermocouple at a common mode voltage and an RTD tied to ground. The common mode voltage would be connected to the ground.
   - A thermocouple at a common mode voltage and an RTD which is ungrounded. The common mode voltage would be placed on the RTD.

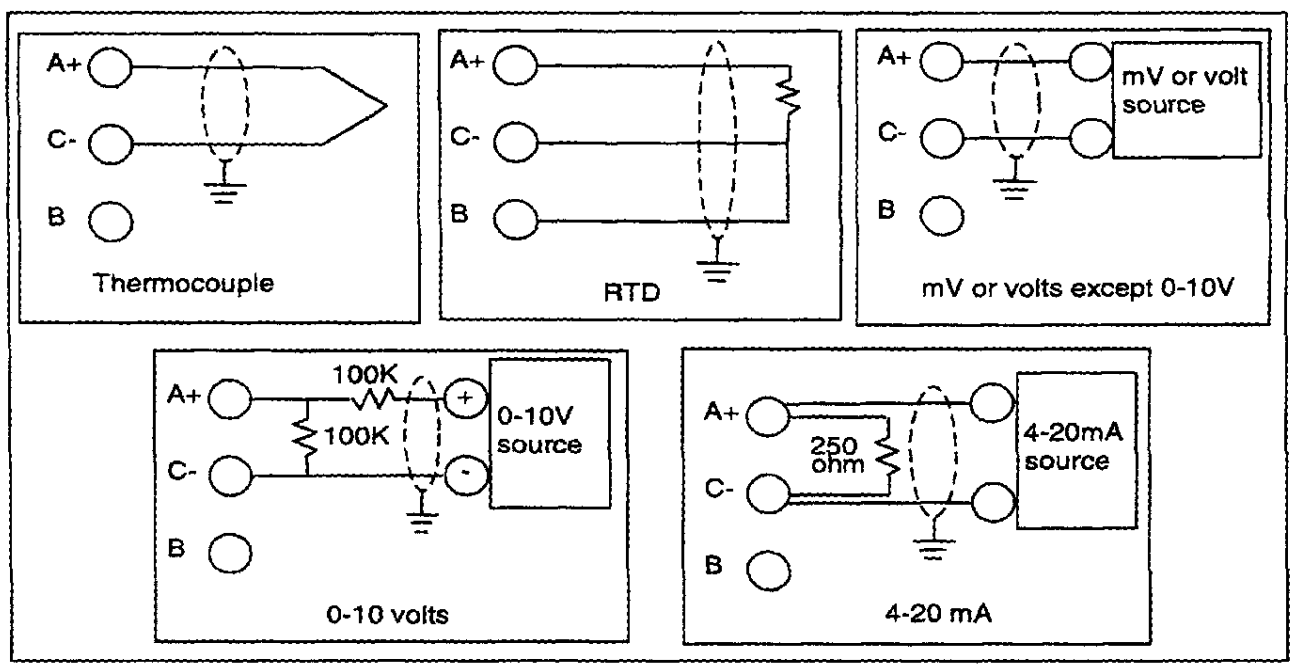

Figure 2-6 Analog Input Wiring Connections

Analog Output Connections

Analog outputs may be Current Output (CAT), Voltage Output (VAT), Time Proportion Output (DAT) or Position Proportional Type (PP). For CAT or VAT wiring, see Figure 2-7. For DAT wiring, use general purpose output relays or open collector outputs. For Position Proportional wiring, see Figure 2-10. See Discrete Output Connections.

See Table 1-1 Specifications for output signal specifications for output circuit card modules.

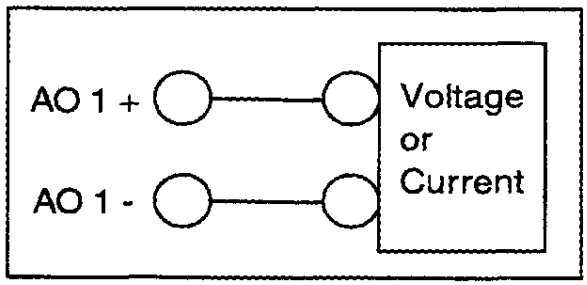

Figure 2-7 CAT or VAT Wiring Connection

Discrete Input Connections

See the Specifications section for input specifications for circuit card modules. Connect the wires according to Figure 2-8 if your instrument has TB3, or Figure 2-9 if it has TB3A or TB3B. For TB3A and TB3B, you can connect to any COMM terminal on the terminal board.

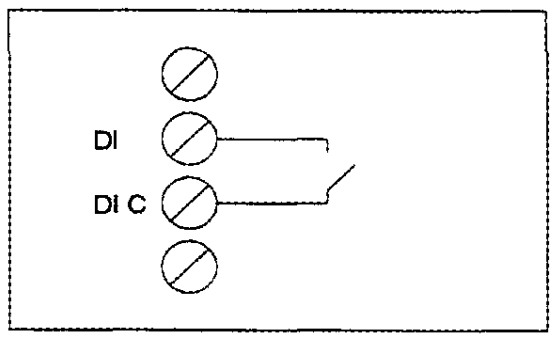

Figure 2-8 Discrete Input Connections on TB3

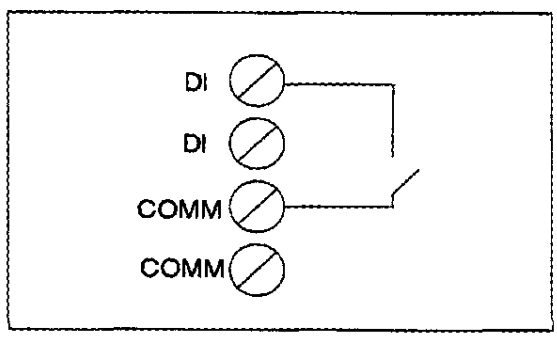

Figure 2-9 Discrete Input Connections on TB3A & TB3B

Discrete Output Connections

The instrument has the following discrete output types.

- Mechanical relay
- Solid state AC/DC
- Open collector

Make connections according to Figure 2-10.

See Table 1-1 Specifications for output signal specifications (switch characteristics) for output circuit card modules.

The solid state relay switches are each optically isolated and also fully isolated from all other outputs. For common power, interconnect all module commons (see Figure 2-10C). Power to all modules is supplied by the user.

The relay will provide protection by removing power to the outputs whenever system power is lost.

ATTENTION

In exceptional cases where the device connected to a relay contact requires a very low nominal energizing current, it is possible that the current through the snubber network capacitor(s) (located on the circuit card and used to protect relay contacts from arcing (when the relay contacts are open)) will be sufficient to continue to energize the relay. To prevent this unwanted energizing, install a load resistor in parallel with the device.

ATTENTION

The solid state relays have minimum output current requirements. See solid state relay specifications in Table 1-1. ***If these requirements are not met, the discrete output may not turn on.***

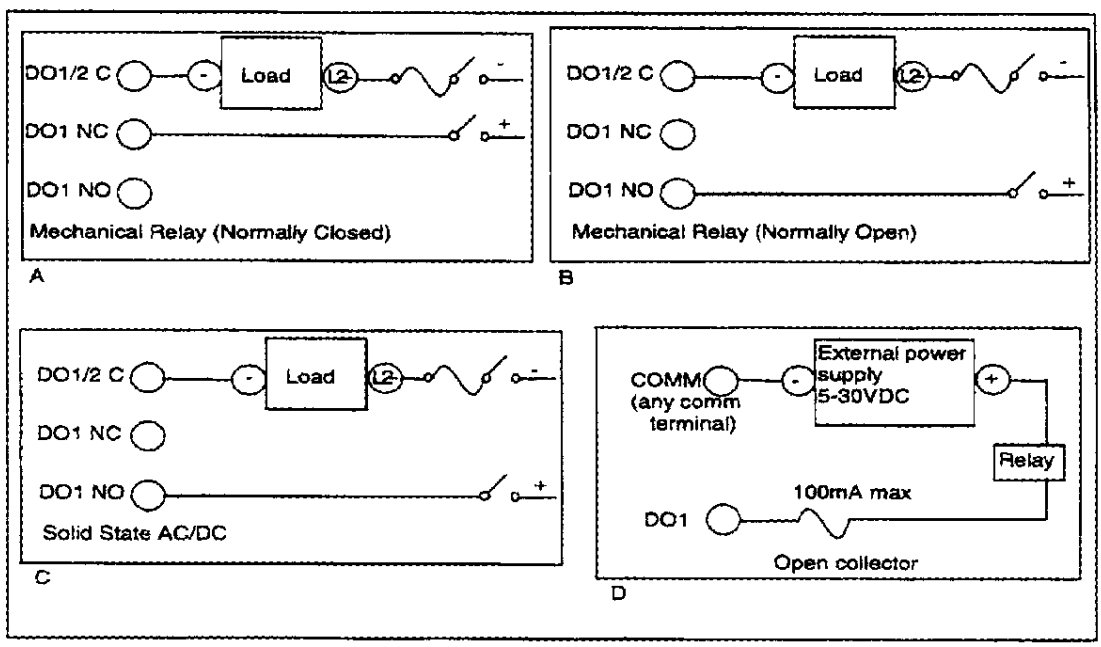

Figure 2-10 Discrete Output Connections

Note: Figure 2-10 shows example wiring for DO1 and should be used for any Discrete Output.

Position Proportional output connections

Position Proportional type controls require two analog inputs (PV, Slidewire), two discrete outputs (INC, DEC) and one analog output (Slidewire Power). The analog output must be a voltage type (VAT) programmed to provided a constant 1 V to power the slidewire feedback. See Section 3.13 for sample PP feedback configuration.

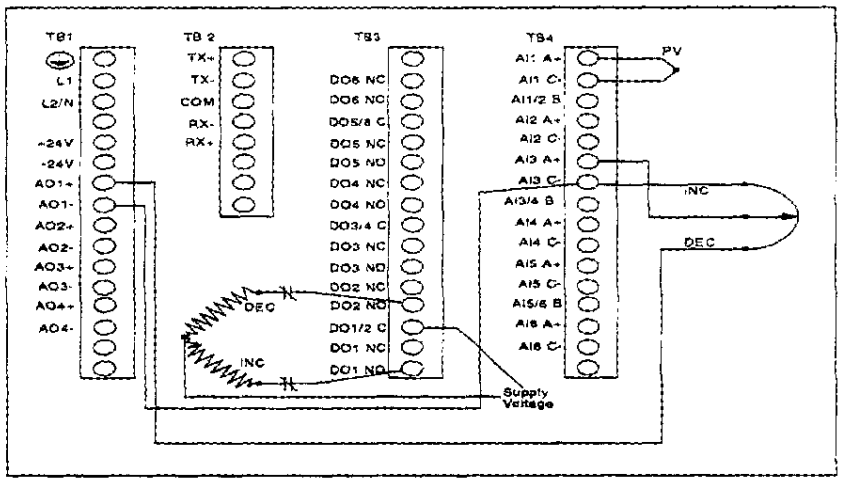

Figure 2-11 Position Proportional Typical Wiring

DIAT output connections

DIAT type control requires 1 analog input (PV) and 2 discrete outputs (INC, DEC). This type of control doesn't require a slidewire.

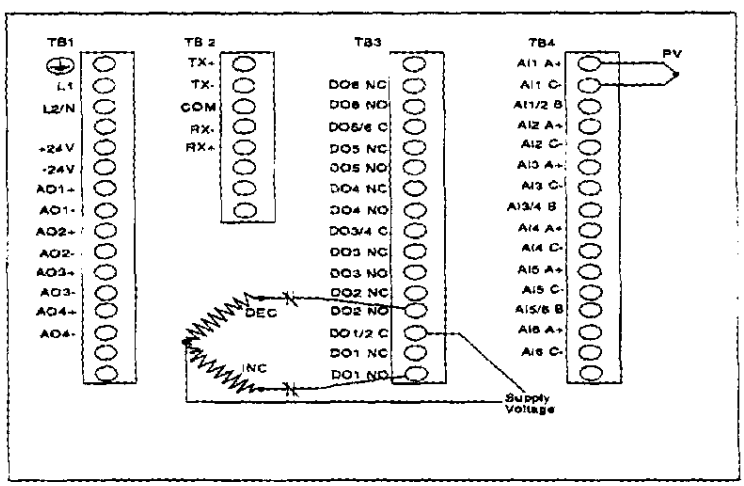

Figure 2-12 DIAT Typical Wiring

Communications

The communications network is based on Honeywell protocols with a Master/Slave relationship. These are the two protocols available; Binary and Modbus RTU. This network is configured around the IEEE RS-422/485 multi-drop standard. The Master is a PC host running any software compatible with these Honeywell protocols. A slave can be any instrument equipped with serial communications capability. Refer to the product communications manual for additional details on the protocol. Binary: 51-52-25-54 and Modbus RTU: 51-52-25-66.

All communication equipment supporting the 422/485 (differential drive) must be correctly installed and properly terminated to ensure a reliable network.

Table 2-8 shows the five connections per device.

Table 2-8 Communicatiqns Connections

Connection	Meaning
TX+	The positive signal of the transmitter
TX-	The negative signal of the transmitter
COM	The shield of the communications cable
RX+	The positive signal of the receiver
RX-	The negative signal of the receiver

We recommend using a conduit for each cable, or at least separating them from high voltage lines or magnetic fields.

Table 2-9 shows the communications wiring procedure. See Figure 2-12.

Table 2-9 Communications Wiring Procedure

Step	Action
1	Connect the Master's TX signals to each of the RX signals of the Slaves, and all the Slave's TX signals to the Master's RX terminals, plus-to-plus and minus-to-minus.
2	Connect instrument to instrument in a serial or daisy chain fashion with the Master instrument at one end and the last instrument at the other as shown in Figure 2-12.
3	Set only the last instrument's termination ON. All other slave instruments must be unterminated. To change a termination setting, see "Setting The Communications Link Termination Jumper" in Section 9.4 for instructions.

ATTENTION

For CE compliance, a triple shielded cable (a shield around each of the twisted pairs, (which are tied together and connected to the com. Terminal, TB2 Pin 3) plus an overall shield (the insulated outer shield is connected to TB2 Pin 6, which is then connected to TB1 Pin 1 (earth ground)). The recommended cable of this type is Belden 8728, 80C. **DO NOT** connect the outer shield to the internal shield ground. This will not provide adequate immunity protection.

Required for CE application, but recommended for general use.

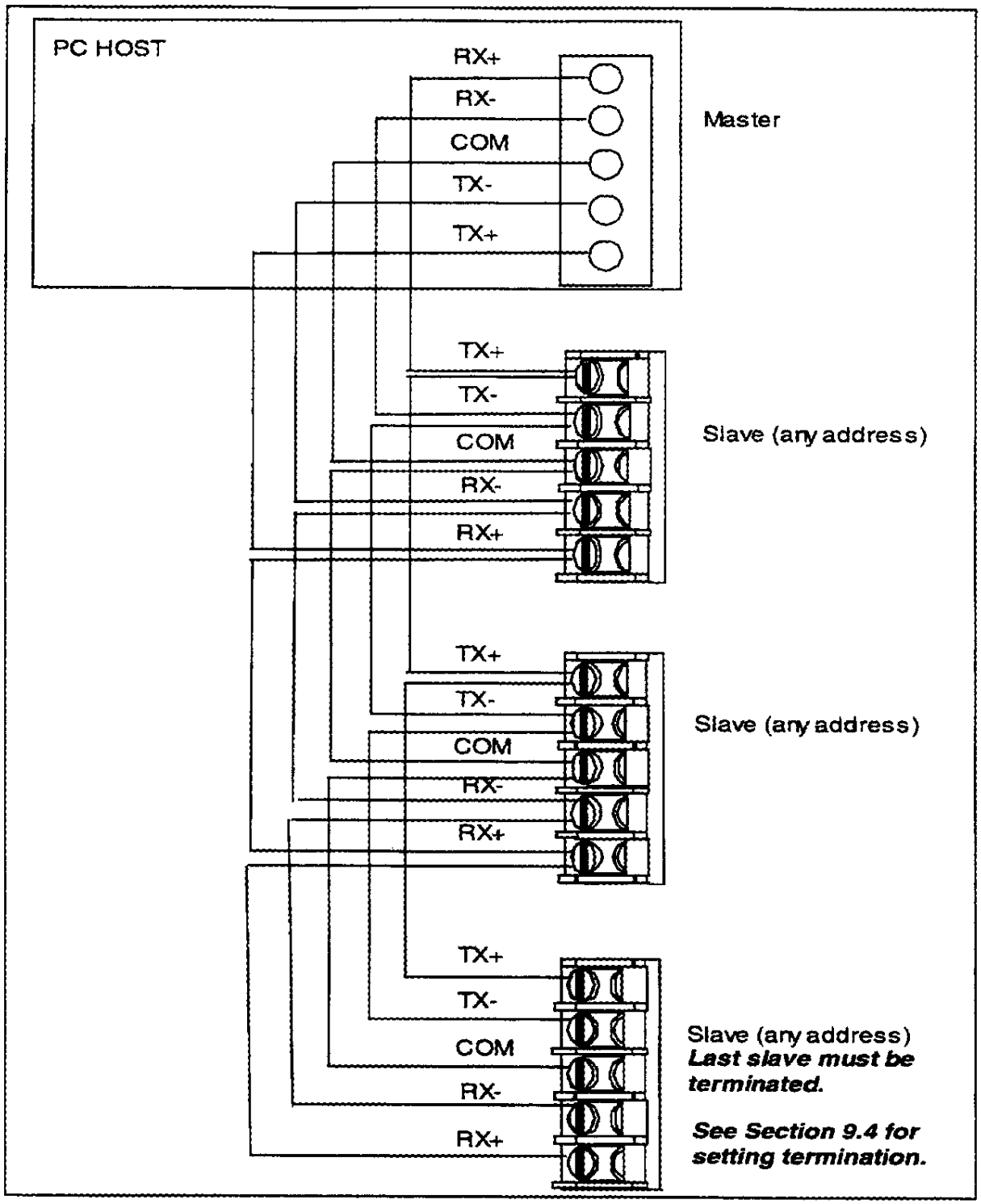

Figure 2-13 Network Data Cable Connections