

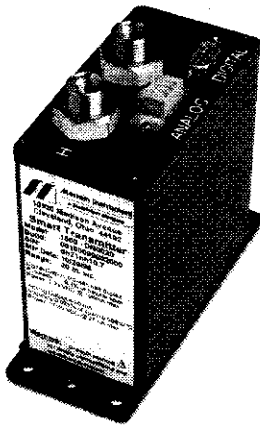


Meriam Instrument

a Scott Fetzer company

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EO 5098

1500 SMART TRANSMITTER OPERATING INSTRUCTIONS



The Meriam Instrument Model 1500 Smart Transmitter is a precision pressure measurement instrument. The Model 1500 is available in a variety of pressure ranges to measure pressure in differential, gage or absolute modes. All transmitters in the Model 1500 series have provisions for digital data interface and analog output. Analog output options include 4-20 mA current loop and voltage output.

The Smart Transmitter is available with either a voltage or current output. The configuration of the current output option is a 4-20 mA current loop. The Smart Transmitter is powered by the current in the output loop and therefore can be used as a two-wire device. Current loop outputs are generally preferable when long cable lengths are required or in electrically noisy environments.

The voltage output option is 0-5 Volt and can be configured for any span within the 0-5V range. For example, a 1-5V span may be more convenient in some applications. Unlike the current loop version, the voltage output model of the Smart Transmitter requires a separate power supply. As a result, a four-wire connection is required for voltage output operation. The output type (voltage or current) is not configurable, and therefore must be specified at the time of purchase.

The digital interface of the Smart Transmitter provides the following benefits:

Accuracy - The digital data from the Smart Transmitter is more accurate than the analog output. Digital data is transmitted directly from the internal microprocessor and therefore is not subject to the inaccuracies caused by field wiring or the receiving device.

Economy - The RS-485 digital interface allows multiple Smart Transmitters to share a single cable in a multi-drop configuration. In addition, the digital interface eliminates the need for analog input channels at the receiving device.

Flexibility - The digital interface allows for simple reconfiguration of the Smart Transmitter, including engineering unit selection, output span and offset, damping rate, etc.



Caution!

When using multiple Smart Transmitters, always check the position of internal jumpers JP1 - JP4 before wiring to the DIGITAL connector pins 1, 2, 6 and 7.

If the analog output circuit is enabled, a common connection between multiple outputs will result in permanent damage to the device.

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FIGURES AND SCHEMATICS

Figure 1. Smart Transmitter, Current Output

Figure 2. Smart Transmitter, Voltage Output

Figures 3, 4 & 5. Jumper Settings, Current Output

Figures 6 & 7. Jumper Settings, Voltage Output

Figure 8. Adapter Terminal Block Signals

Figures 9(a), 9(b) and 9(c). Single Transmitter Cables

Figure 10. RS-485 Only Cable

Figure 11(a). Multi-drop with High Side Loop and External Supply

Figure 11(b). Multi-drop with High Side Loop and Integral Supply

Figure 12(a). Multi-drop with Low Side Loop and External Supply

Figure 12(b). Multi-drop with Low Side Loop and Integral Supply

Figure 13(a). Multi-drop with Voltage Output and External Supply

Figure 13(b). Multi-drop with Voltage Output and Integral Supply

Figure 13(c). Single Transmitter Cable with Voltage Output

PC Interface

To simplify the digital connection to the Smart Transmitter, a communication interface kit is available as an accessory package. The kit includes the following:

- Configuration Software
- 24V Power Supply
- RS-232 to RS-485 Converter
- Cables

Smart Transmitters can be pre-configured for a specific application at the time of purchase. A user specified output span can be set at the factory prior to shipment. In this case, the user can install and operate the Smart Transmitter without using the computer interface or PC software.

Mounting Options

Smart Transmitter mounting options include panel mount and DIN rail mount. The panel mount enclosure has a back plate with four #10 clearance holes for convenient wall or panel installation. The DIN rail mount has a smaller back plate and includes a DIN clip instead of mounting holes. Consult the factory for other mounting options.

Pressure Connection

Smart Transmitters that are configured for differential pressure measurement have two pressure ports. The ports are labeled **H** and **L**. The higher-pressure connection must be made to the **H** port and the lower-pressure connection must be made to the **L** port.

Absolute and gage pressure versions of the Smart Transmitter have a single pressure port. Absolute pressure measurements are referenced to vacuum and gage pressure measurements are referenced to the ambient atmospheric conditions.

Pressure port connections are 1/8" NPT female. Be careful not to loosen the large nut on the pressure port when making and removing connections.

Specifications

Smart Transmitters are available with the pressure ranges listed in the table below:

Type	Range	Accuracy
Differential	20" water column	0.1% FS
	200" water column	0.025% FS
	2000" water column	0.025% FS
Gage	20 PSI	0.025% FS
	200 PSI	0.025% FS
	2000 PSI	0.025% FS
Absolute	900 mmHg	0.02% FS
	2000 mmHg	0.025% FS

Consult factory for availability of other pressure ranges.

The sensor accuracy ratings listed in the table above pertain to the digital data only, and is valid over the operating temperature range of -5°C to 50°C. In addition, analog output accuracy is $\pm 0.025\%$ of span, $\pm 0.005\%$ of span/°C.

INSTALLATION AND OPERATION

Wiring Instructions (Current Output Version)

To utilize the 4-20 mA current loop output, only a two wire connection is required. On the connector labeled “ANALOG,” terminal 1 is the **loop+** connection and terminal 2 is the **loop-** connection. The Smart Transmitter is powered by the current in the circuit and therefore does not require a separate power supply. Refer to Figure 1 for connector pinout.

The Smart Transmitter can be connected in either the high side or the low side of the loop as shown in Figures 11 and 12. Typically, a 24V power supply should be used to power the loop. However, lower voltage supplies can be used as long as the voltage across the loop terminals of the Smart Transmitter exceeds 17 volts.

The Smart Transmitter also contains loop connection terminals internally. These terminals can be accessed through an optional ½” conduit hole in the side of the case. The internal terminals are connected directly to the external terminals. Be sure to observe the polarity indicated on the circuit board.

The 9 position connector labeled “DIGITAL” on the front of the Smart Transmitter also has provisions for loop connections. Pin 7 is the **loop+** connection and pin 2 is **loop-**. Internal jumpers must be set properly to activate the analog connections on the “DIGITAL” connector.

Jumper Settings (Current Output Version)

Figures 3, 4 and 5 show the internal jumper setting configurations. The jumpers are located on the main circuit board inside the Smart Transmitter. The jumpers can be accessed by removing the four screws on the front panel and carefully sliding the internal circuit boards out of the enclosure. Use extreme care not to damage the internal components when changing jumper settings.

Figure 3 shows the **default** position of the internal jumpers. In this mode, the **loop+** and **loop-** terminals on the “ANALOG” connector are connected to the corresponding terminals on the “DIGITAL” connector. This configuration allows the convenience of making all required wiring on one cable connection.

Figure 4 shows an alternate setting in which the **loop+** and **loop-** terminal on the “DIGITAL” connector are disconnected. This mode may simplify the cabling required when multiple units are connected with ribbon cable.

Figure 5 shows a jumper configuration to be used when only digital data communication will be used. In this mode, the device will be no longer be powered from

the current loop, but will be powered by the digital data interface instead. More information is provided in the Interface Adapter section of this manual.

Wiring Instructions (Voltage Output Version)

To utilize the analog voltage output, a four-wire connection is required. On the connector labeled “ANALOG,” terminal 1 is the negative voltage output connection and terminal 5 is the positive voltage output connection. The Smart Transmitter will draw a maximum of 10mA from a power supply of at least 10 volts DC and not more than 30 volts DC. Refer to Figure 2 for connector pinout.

The voltage output circuitry of the Smart Transmitter can drive an output load having an impedance of 100K ohms or more.

The 9 position connector labeled “DIGITAL” on the front of the Smart Transmitter also has provisions for voltage output connections. Pin 6 is the positive voltage output connection and pin 1 is the negative voltage output connection. Internal jumpers must be set properly to activate the analog connections on the “DIGITAL” connector.

Jumper Settings (Voltage Output Version)

Figures 6 and 7 show the internal jumper setting configurations. The jumpers are located on the main circuit board inside the Smart Transmitter. The jumpers can be accessed by removing the four screws on the front panel and carefully sliding the internal circuit boards out of the enclosure. Use extreme care not to damage the internal components when changing jumper settings.

Figure 6 shows the **default** position of the internal jumpers. In this mode, the positive voltage output and negative voltage output terminals on the “ANALOG” connector are connected to the corresponding terminals on the “DIGITAL” connector. This configuration allows the convenience of making all required wiring on one cable connection.

Figure 7 shows an alternate setting in which the voltage output terminals on the “DIGITAL” connector are disconnected. This mode may simplify the cabling required when multiple units are connected with ribbon cable.

Serial Communications

In addition to the analog output of the Smart Transmitter, the device contains a digital interface. The digital interface is a RS-485 link, allowing multi-drop communication. The RS-485 serial channel is optically isolated to eliminate the effects of ground loops.

Generally, the digital interface requires a separate power supply connection, which can be disconnected when digital communication is unused. The power supply must be between 6 and 30 volts DC. The digital interface draws 100mA of current or less.

In some cases, the analog circuitry can derive power from the digital interface, eliminating the need for two power supplies. (See Smart Transmitter Jumper Settings for more details.) In this wiring configuration, the power supply must be between 12 and 30 volts.

An accessory kit is available from Meriam Instrument to setup and operate Smart Transmitters through the serial interface. The kit includes an RS-232 to RS-485 converter, power supply, cables and software. The software allows for changing the output span, damp rate and other parameters. The Interface Adapter provides a convenient means of powering and communicating with multiple Smart Transmitters.

For a description of software features, refer to the Smart Transmitter Software Instruction Manual.

Interface Adapter

The Interface Adapter is shown in Figure 8. It provides the connections listed below.

Connection	Type	Purpose
XMTR	DB9-F	RS-485 Connection to Smart Transmitters
PC	DB9-F	RS-232 Connection to Computer
PWR	Round, Center Positive	DC Power, 24 V nominal
1	Screw Terminal	- 24V [XMTR DB9 pin 8]
2	Screw Terminal	- Loop [XMTR DB9 pin 2]
3	Screw Terminal	+ 24V [XMTR DB9 pin 3]
4	Screw Terminal	+ Loop [XMTR DB9 pin 7]
5	Screw Terminal	-Voltage Output [XMTR DB9 pin 1]
6	Screw Terminal	+Voltage Output [XMTR DB9 pin 6]

The Adapter may be connected directly to the PC if desired or may be connected using a standard DB-9 extension cable. This type of cable has one male and one female connector, and is connected straight through from pin to pin. Plug the female end of the cable into the COM port of the PC and plug the male end of the cable into the end of the Interface Adapter marked "PC." (If the PC has a 25 pin RS-232 connector, a 25 pin to 9 pin adapter will be required.)

DO NOT connect the cable end marked Smart Transmitter to the PC. This may result in damage to the PC!

DO NOT connect the Smart Transmitter directly to the RS-232 port on the PC.

DO NOT use a serial cable with complex internal wiring such as crossed or shorted conductors or open pins!

Connecting the Interface Adapter to Smart Transmitters

Several example schematics are included for reference. Each example schematic assumes that the internal jumpers are set to the default positions. In each example, make note of the positions of connections on the screw terminals of the Interface Adapter. These connections can be used to power the Smart Transmitters and provide access to output signals.

FIGURE 1
CURRENT OUTPUT

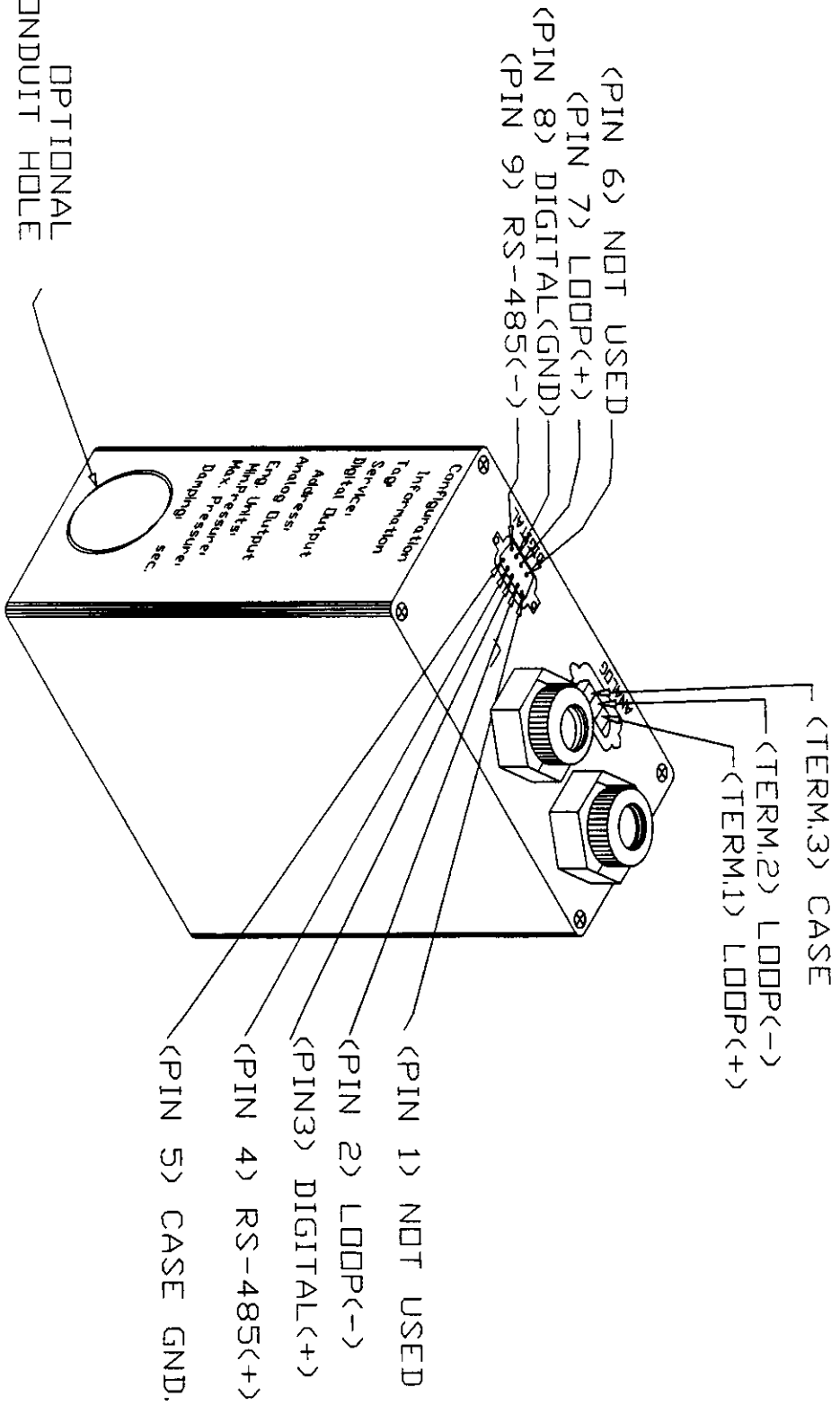


FIGURE 2

VOLTAGE OUTPUT

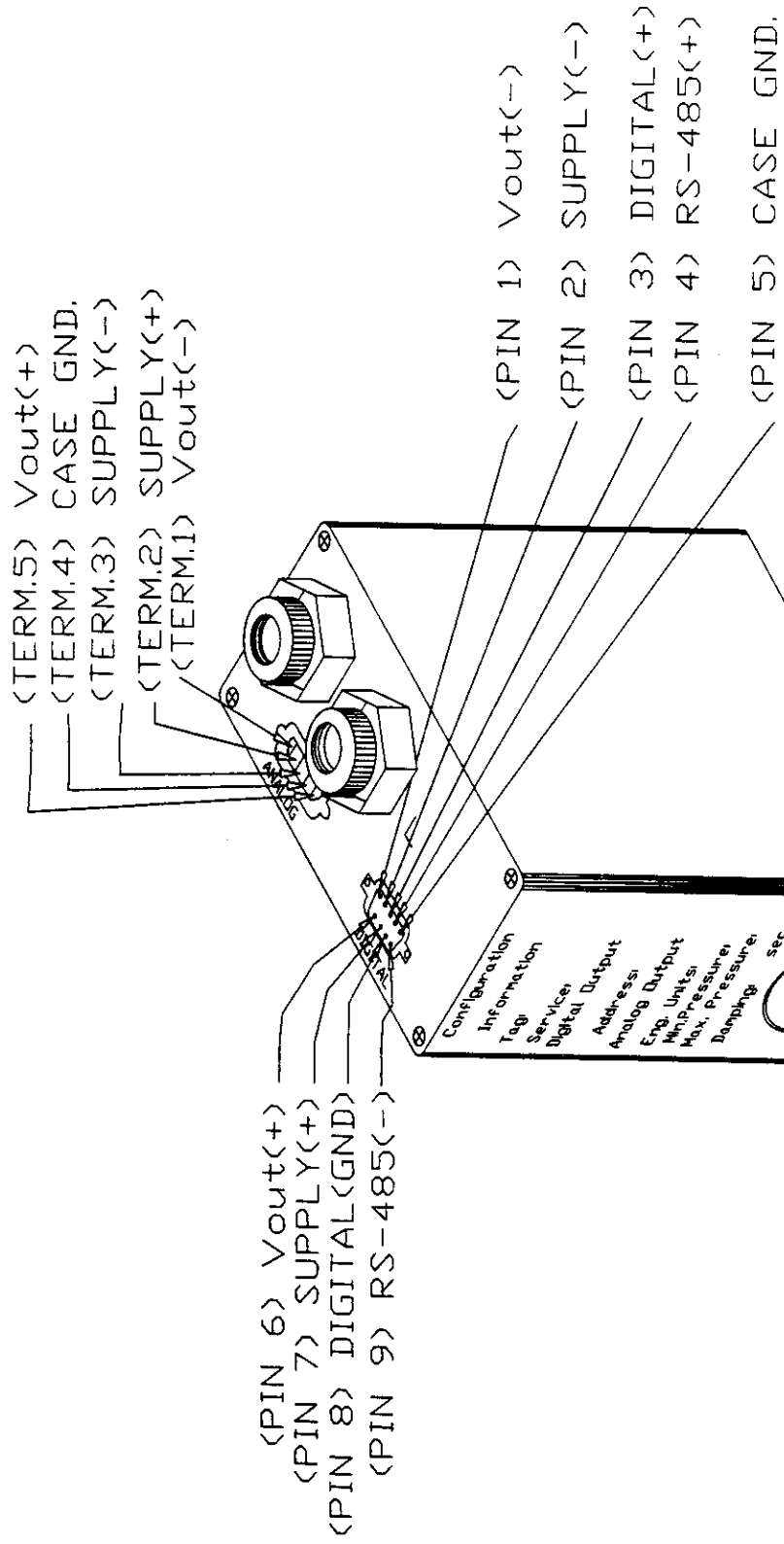


FIGURE 3
CURRENT OUTPUT- INTERNAL
CONNECTION BETWEEN ANALOG
AND DIGITAL CONNECTORS
DEFAULT CONFIGURATION

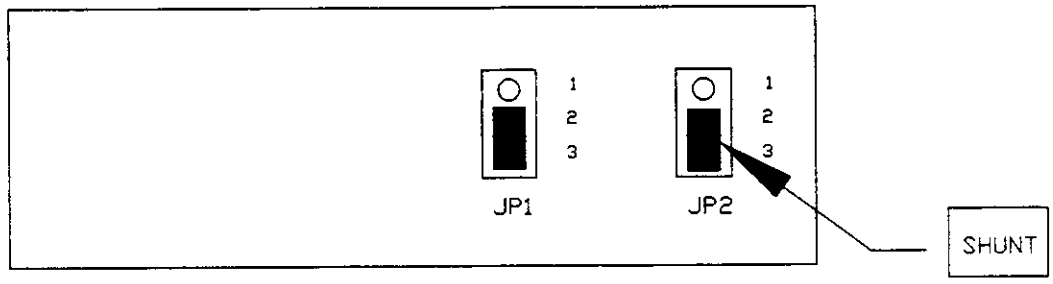


FIGURE 4
CURRENT OUTPUT-OUTPUT
SIGNAL NOT CONNECTED
TO DIGITAL CONNECTOR

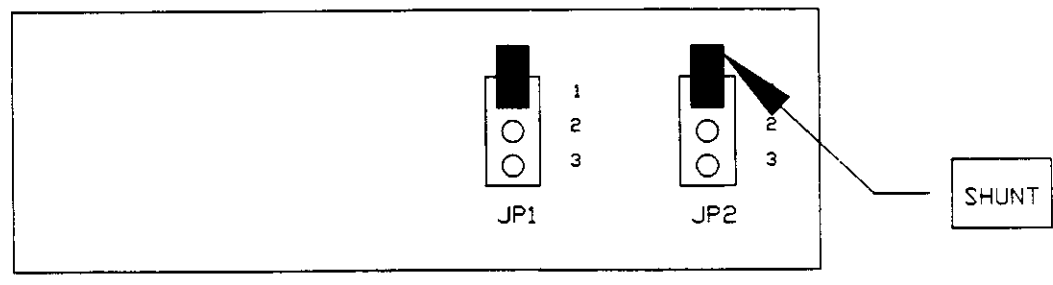


FIGURE 5
DIGITAL ONLY
NO OUTPUT- OUTPUT SIGNAL
NOT CONNECTED
TO DIGITAL CONNECTOR

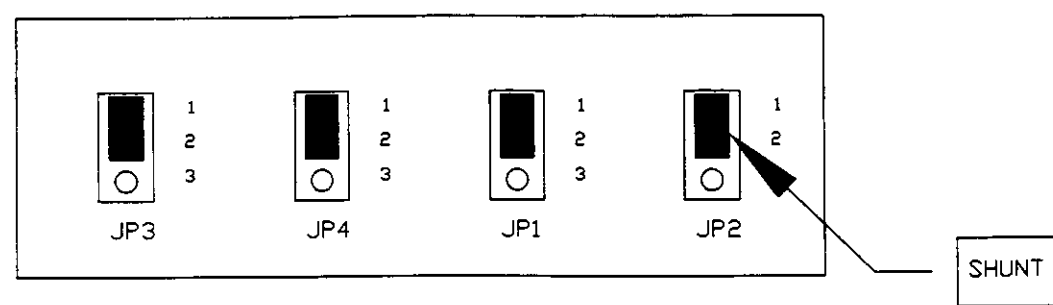


FIGURE 6
VOLTAGE OUTPUT-INTERNAL
CONNECTION BETWEEN ANALOG
AND DIGITAL CONNECTORS
DEFAULT CONFIGURATION

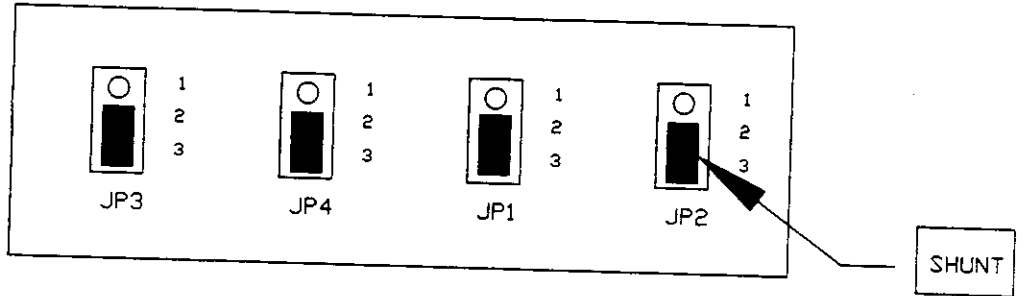


FIGURE 7
VOLTAGE OUTPUT- OUTPUT
SIGNAL NOT CONNECTED
TO DIGITAL CONNECTOR

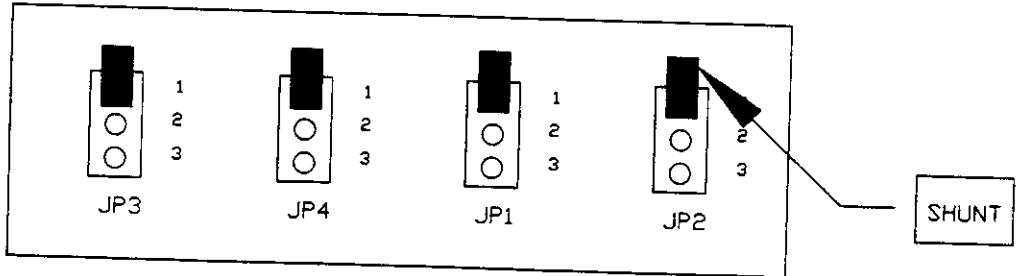
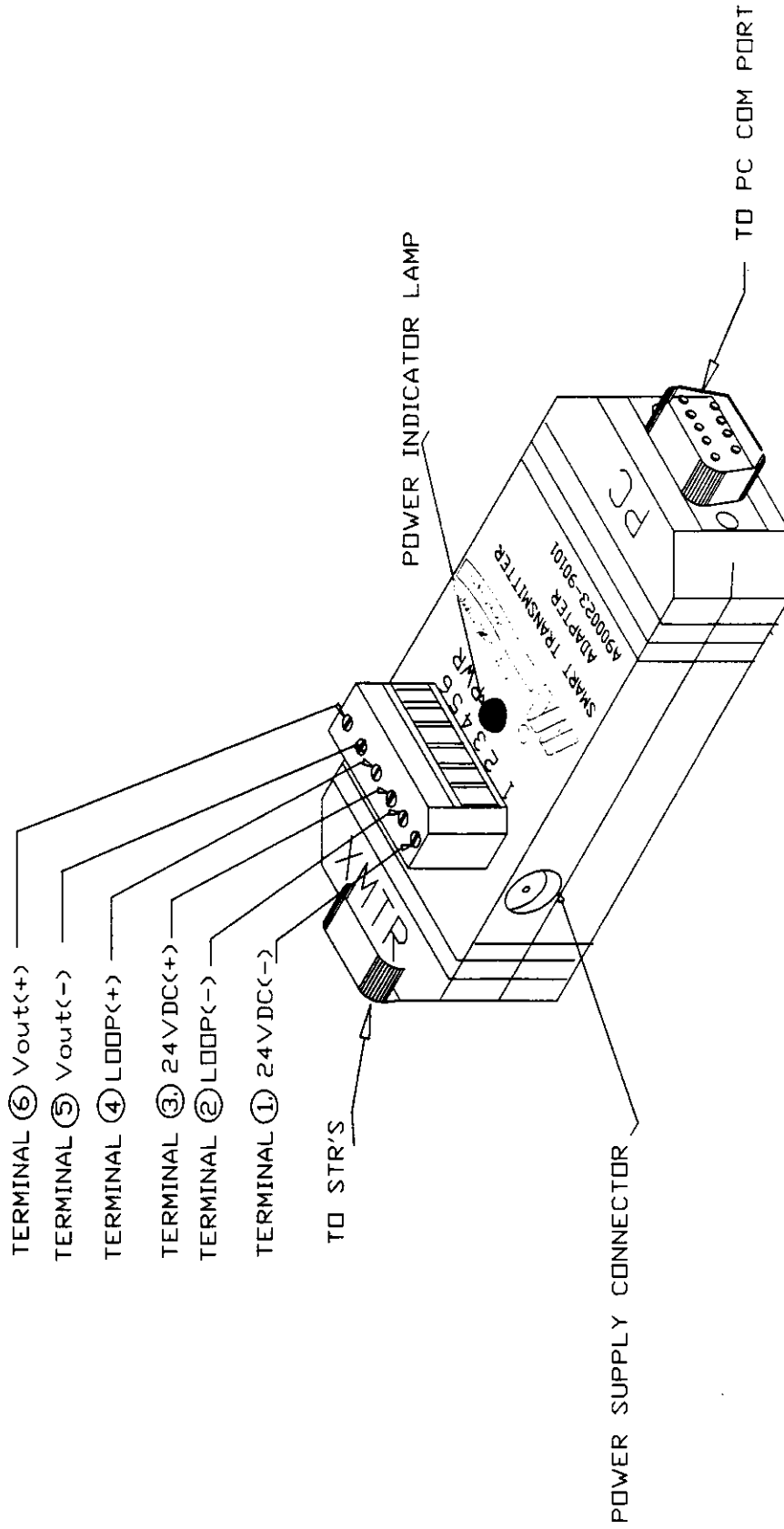
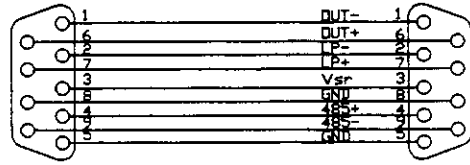
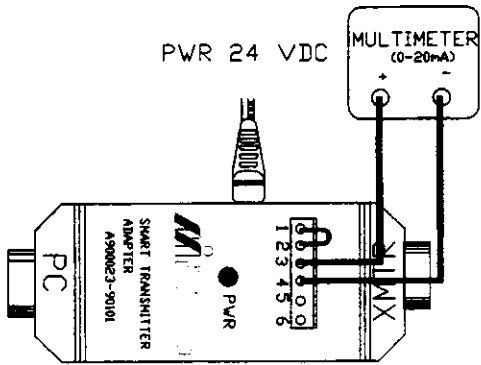


FIGURE 8
ADAPTER TERMINAL BLOCK SIGNALS



NOTE:
TERMINAL 5 AND TERMINAL 6 ARE
NOT USED ON 4--20mA UNITS

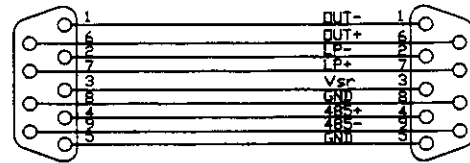
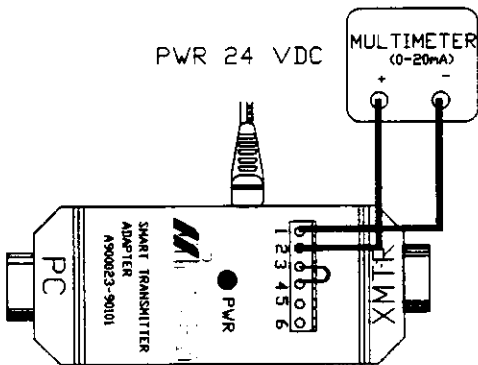
FIGURE 9
SINGLE TRANSMITTER CABLES



DB-9M

DB-9F
TO STR'S

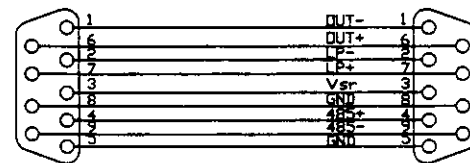
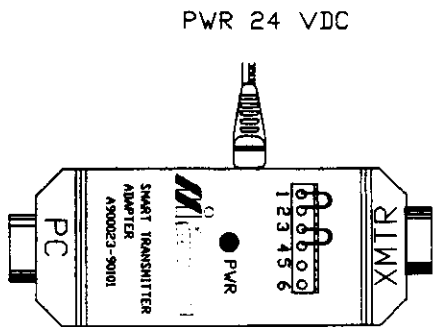
a) SINGLE UNIT RS-485 WITH HIGH SIDE CURRENT LOOP ON INTEGRAL SUPPLY



DB-9M

DB-9F
TO STR'S

b) SINGLE UNIT RS-485 WITH LOW SIDE CURRENT LOOP ON INTEGRAL SUPPLY

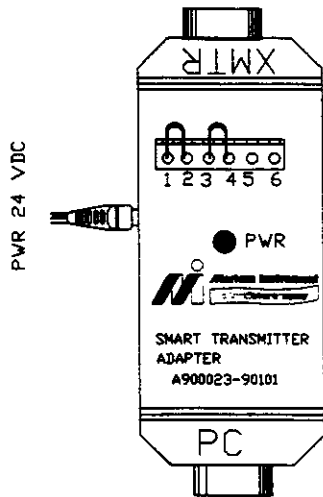


DB-9M

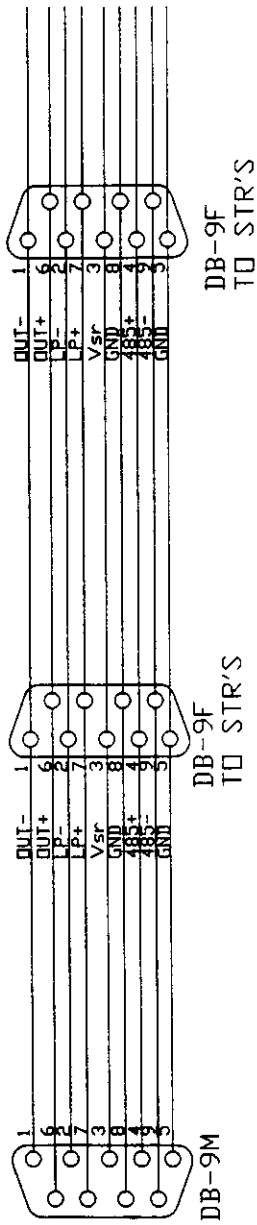
DB-9F
TO STR'S

c) SINGLE UNIT RS-485 ONLY ON INTEGRAL SUPPLY

FIGURE 10
RS-485 ONLY CABLE



TO OTHER STR



MULTI-DROP RS-485 ONLY ON INTEGRAL SUPPLY

INSTALLATION INSTRUCTIONS:

- PIN 5, 1 AND 6 ARE NOT REQUIRED IF USING SOLDER CUP TYPE CONNECTORS
- INDIVIDUAL LOOP CURRENTS CANNOT BE MEASURED USING THIS CABLE
- ADAPTER MUST HAVE JUMPERS INSTALLED ON TERMINAL BLOCK TO BE USED WITH THIS CABLE

FIGURE 11 (a)
 MULTI-DROP WITH HIGH SIDE LOOP
 (EXTERNAL SUPPLY)

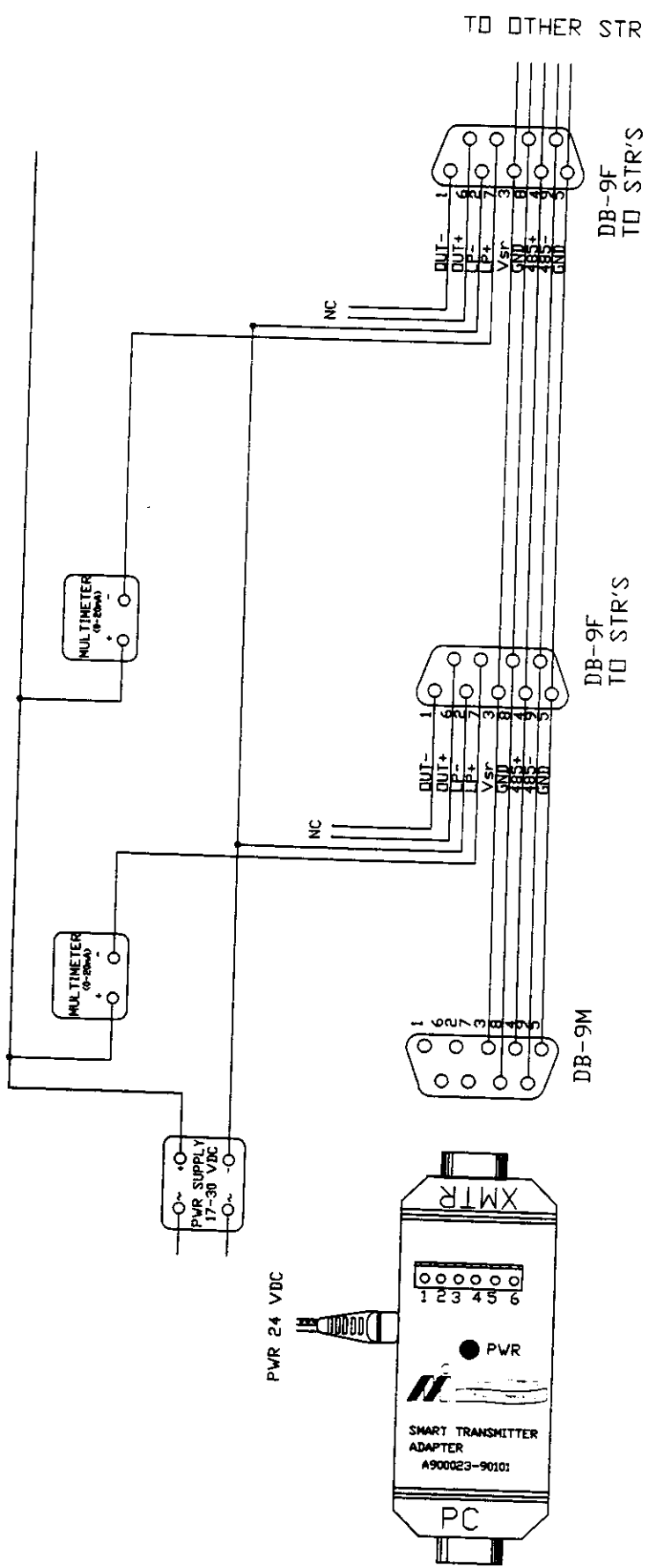


FIGURE 12 (a)
 MULTI-DROP WITH LOW SIDE LOOP
 (EXTERNAL SUPPLY)

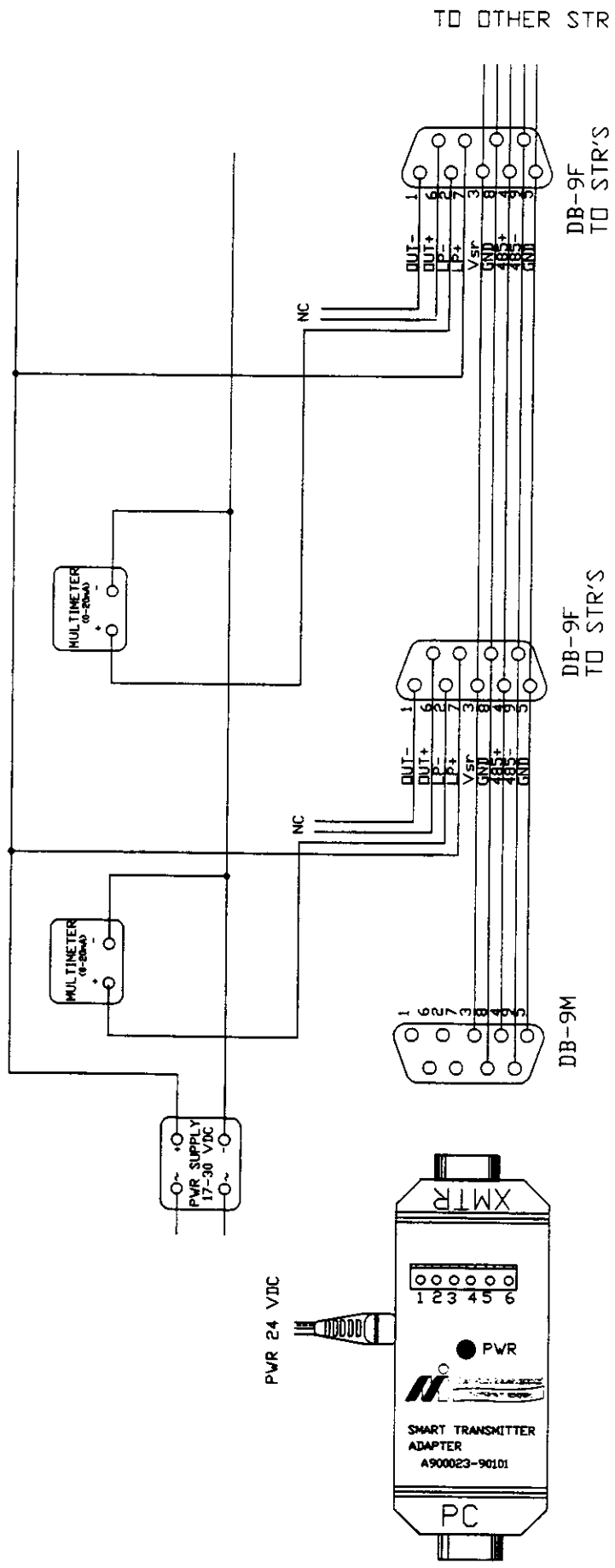


FIGURE 12 (b)
 MULTI-DROP WITH LOW SIDE LOOP
 (INTEGRAL SUPPLY)

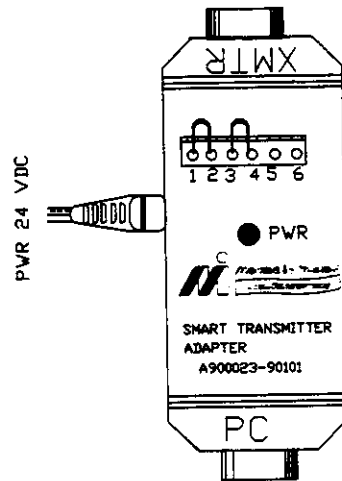
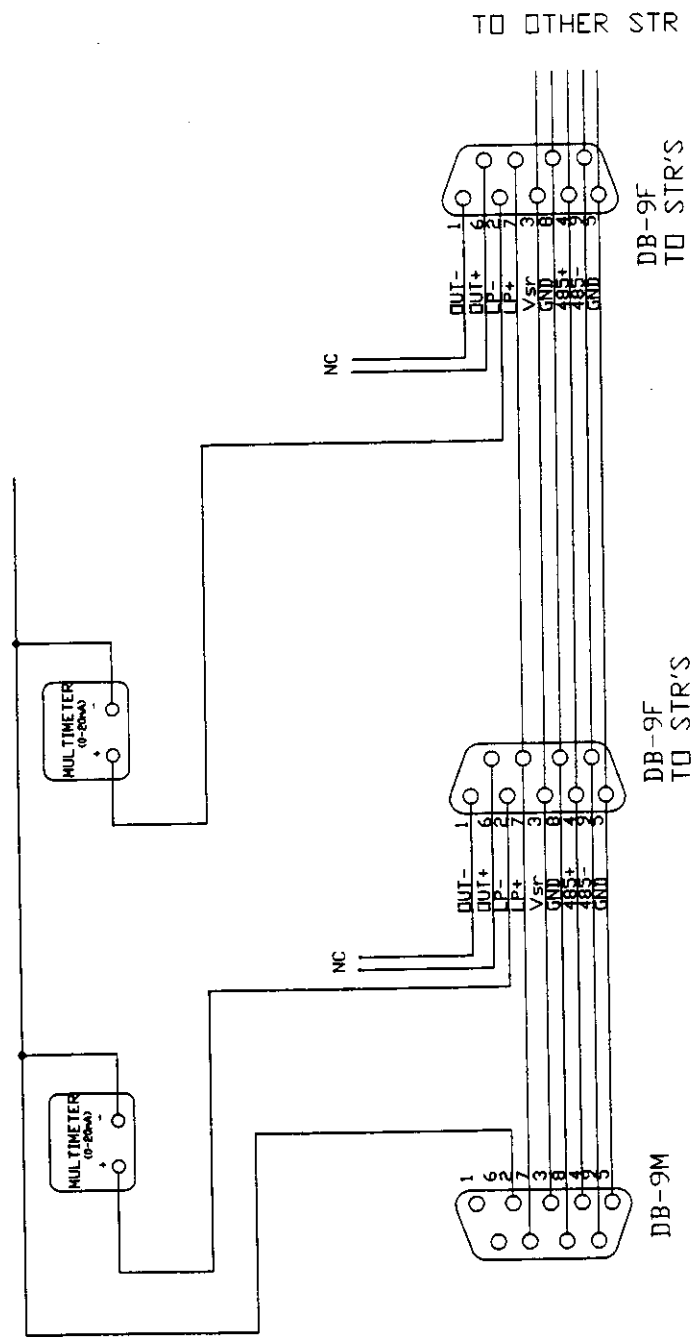


FIGURE 13 (α)
 MULTI-DROP WITH VOLTAGE OUTPUT
 (EXTERNAL SUPPLY)

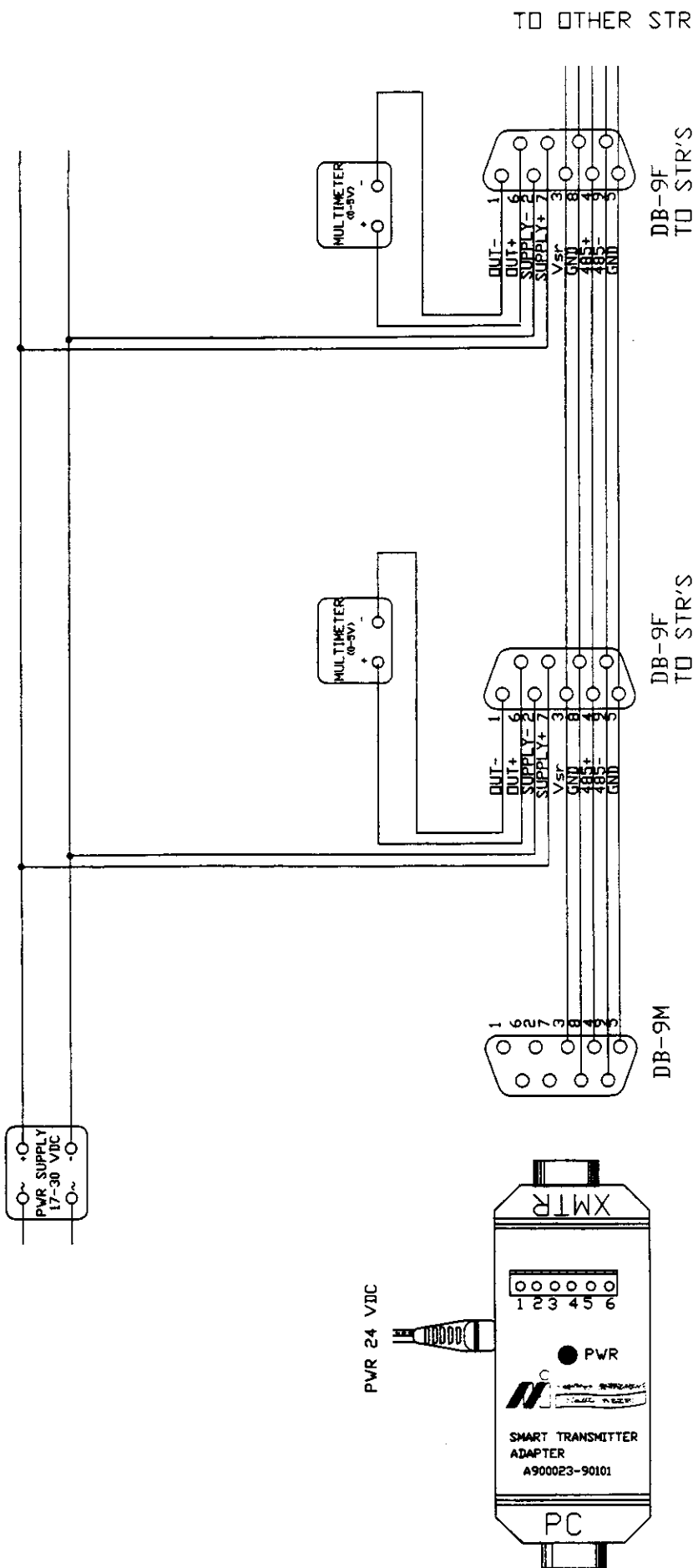


FIGURE 13 (b)
 MULTI-DROP WITH VOLTAGE OUTPUT
 <INTEGRAL SUPPLY>

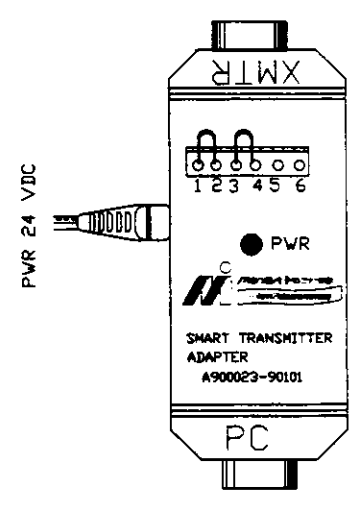
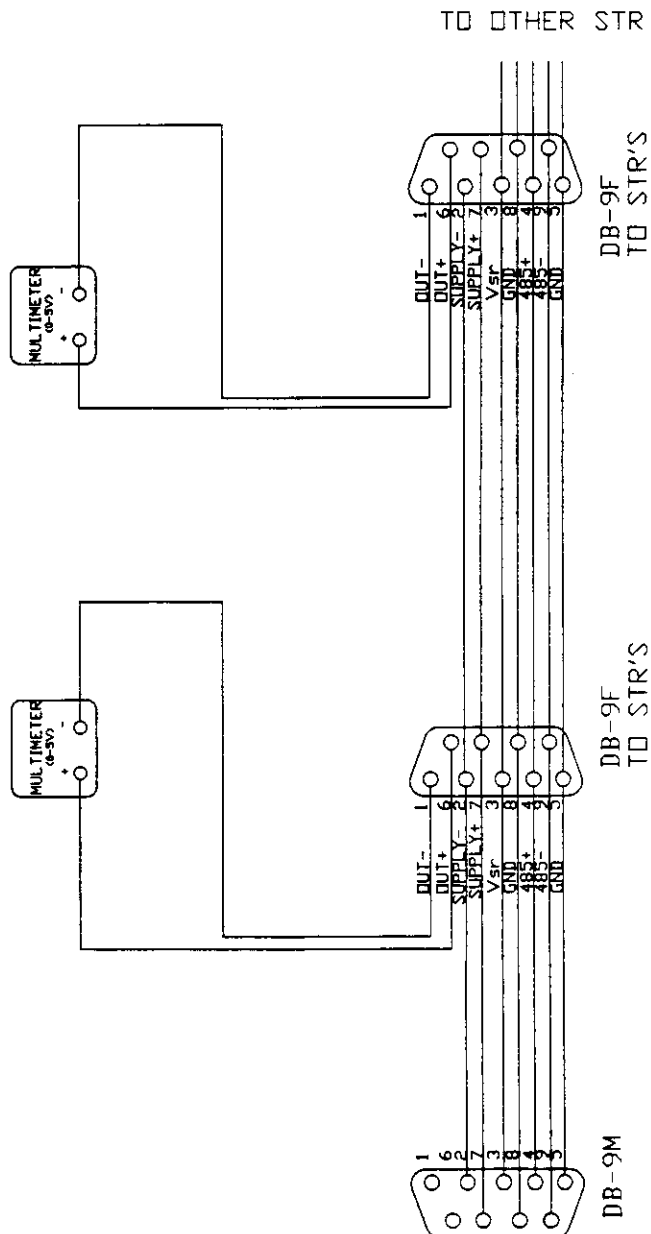
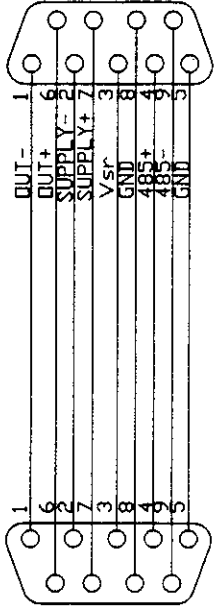
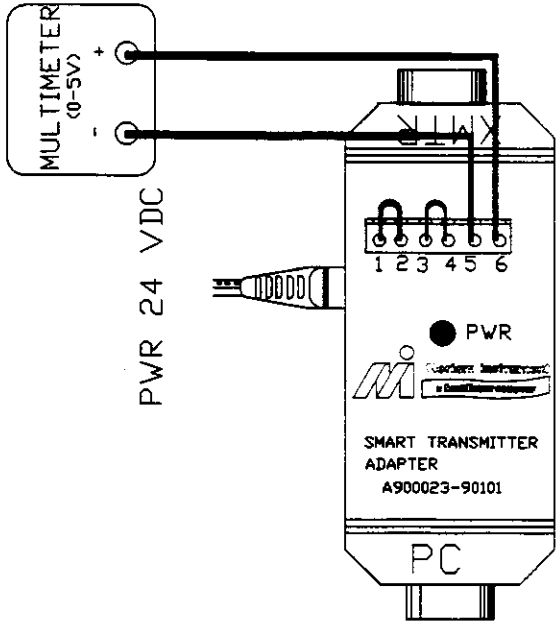


FIGURE 13 (c)
 SINGLE TRANSMITTER CABLE
 VOLTAGE OUTPUT



DB-9M

DB-9F
 TO STR'S