

<b>UNIVERSAL RS-232/422/485 CONVERTER FA-UNICON</b>
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### **Universal RS-232/422/485 Converter**

The FA-UNICON converter may be used to convert RS-232 signal levels to RS-422/485 signal levels or RS-422/485 signal levels to RS-232 signal levels.

The FA-UNICON kit contains the following components:

- (A) RS-232/422/485 Converter (RS-232 = DB25 Female, RS-422 = DB25 Male)
- (B) DB25 Male to Male Gender Changer
- (C) DB25 Male to RJ12 6P6C Connector
- (D) 3' Cable with RJ12 6P6C Plug and RJ12 4P4C Plug
- (E) 7' Cable with RJ12 6P6C Plug and RJ12 6P6C Plug
- (F) DB9 Female to RJ12 6P6C connector

### **D3-422-DCU RS-422 Data Communications Unit Connection**

The RS-232/422/485 Converter may be used to convert the RS-422 port of a DL305 Data Communications Unit, D3-422-DCU, into RS-232 signal levels. Use component A for this connection. The male DB-25 connector of the Converter plugs directly onto the female DB-25 connector socket on the D3-422-DCU.

The RS-232 connection to an external device is made at the female DB-25 connector on the other side of the Converter. Use component C (DB25 Male), E (6P6C Cable), and F (DB9) for this connection to a PC with a DB9 Male connection.

This converter configuration must be powered by an external 24 V dc supply.

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## **DL240 Connection**

The RS-232/422/485 Converter, may be used to convert either RS-232 port of a DL240 CPU into RS-422 signal levels. Use components A, C, and E for this connection. The RJ12 6P6C modular plug on component E plugs directly into the Port 1 or Port 2 female connector socket on the DL240 CPU. The 6P6C modular plug on component E plugs into the 6P6C modular connector on component C.

The RS-422 connection to an external device or **Automationdirect.com** Network is made at the male DB-25 plug connector on component A.

When Port 1 is used, the RS-422 connection is point to point only since there is no RTS line to control the RS-422 transmitters.

When Port 2 is used, the RS-422 connection may be a multidrop RS-422 or RS-485 network since the RTS line on Port 2 controls the RS-422/485 differential transmitter.

This converter configuration requires no external 24 V dc supply. The converter is powered by the 5 V dc provided by the DL240 CPU.

**NOTE:** The red and black leads on the converter must remain unconnected when 5 V dc power is used.

## **DL340 Connection**

The RS-232/422/485 Converter, may be used to convert the RS-232 ports of a DL340 CPU into RS-422 signal levels. Use components A, C, and D for this connection. The RJ12 4P4C modular plug on component D plugs directly into the Port 1 or Port 2 female connector socket on the DL340 CPU. The 6P6C modular plug on component D plugs into the 6P6C modular connector on component C.

The RS-422 connection to an external device or **Automationdirect.com** Network is made at the male DB-25 plug connector on component A. This RS-422 connection may be connected to a multidrop RS-422 network since the RTS line controls the RS-422 transmitters.

This converter configuration must be powered by an external 24 V dc supply.

## **D3-232-DCU RS-232 Data Communications Unit Connection**

The RS-232/422/485 Converter may be used to convert the RS-232 port of a DL305 Data Communications Unit, D3-232-DCU, into RS-422 signal levels. Use components A and B for this connection. Plug DB25 male to male gender changer onto the Converter's female DB-25 connector. Then plug the gender changer directly onto the female DB-25 connector socket on the D3-232-DCU.

The RS-422 connection to an external device or **DirectNET** Network is made at the male DB-25 plug connector on component A. This RS-422 connection is point to point only since there is no RTS line to control the RS-422 transmitters.

This converter configuration must be powered by an external 24 V dc supply.

## External Power Requirements

When the converter is used with a DL205 CPU, no external power is required.

The Converter is typically externally powered from the 24 V dc supply on a DL305 High Capacity Rack, however, any 24 V dc power source capable of supplying 100 mA may be used. Connect the red and black wires to the external 24 V dc supply.

The converter may also be powered from a regulated 5 V dc supply. Please refer to the wiring diagram on page 9.

## General Purpose Bi-Directional RS-232 to RS-422 and RS-485 Conversion

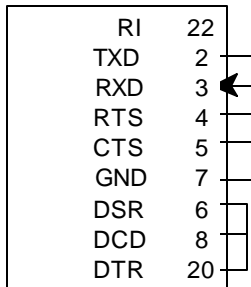
The RS-232/422/485 converter may be used to bi-directionally translate RS-232 signals to high current differential RS-422 or RS-485 signals. See pages 5-7 for RS-422 and RS-485 multidrop wiring examples.

Serial Communication Specifications	RS-232C	RS-422/485
Driver Load	3K - 7K	120 $\Omega$ max.
Maximum Cable Length	50 ft	4000 ft
Maximum Data Rate (bits per second)	19.2K	10 M
Driver Voltage	$\pm 3$ - $\pm 10$ V	$\pm 1.5$ V min.
Driver Active State	TXD > +3V	RXD+ < RXD-

General Specifications	
Supply Voltage	22-26 V dc or 5 V dc $\pm 10\%$
No Load Supply Current	65 mA (when connected to D3-422-DCU)
Maximum Load Supply Current	100 mA (120 $\Omega$ Termination Maximum)
Maximum Operating Temperature	45 <sup>0</sup> C 24 V dc or 60 <sup>0</sup> C 5 V dc supply

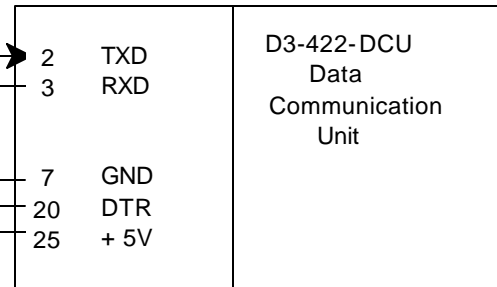
## RS-232 Devices to Converter Wiring Diagrams

Personal Computer



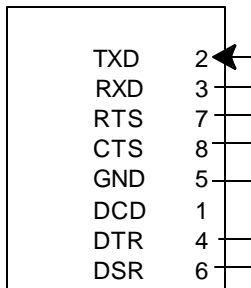
25 Pin DTE

Converter



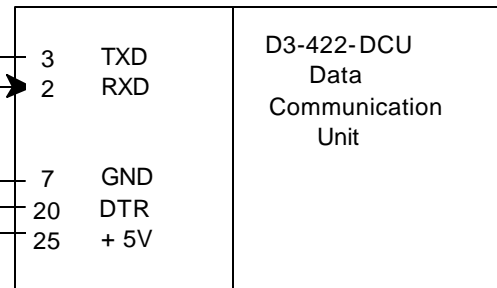
25 Pin DCE

Personal Computer



9 Pin DTE

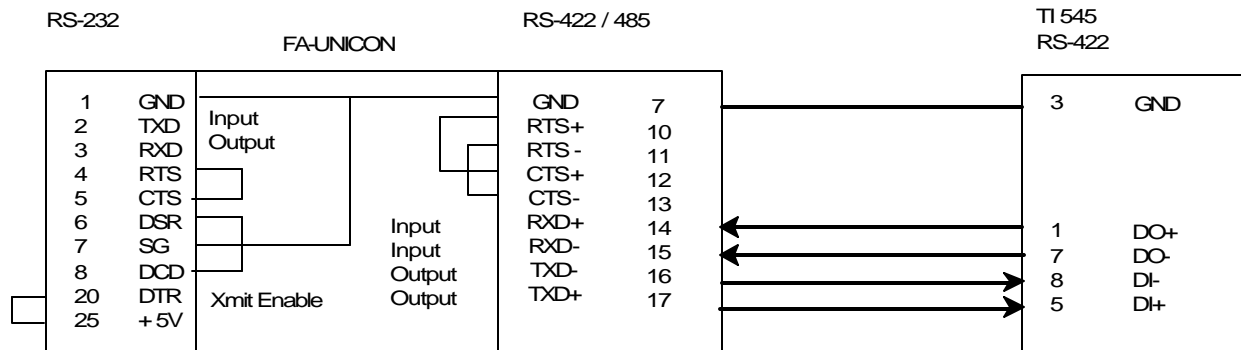
Converter



25 Pin DCE

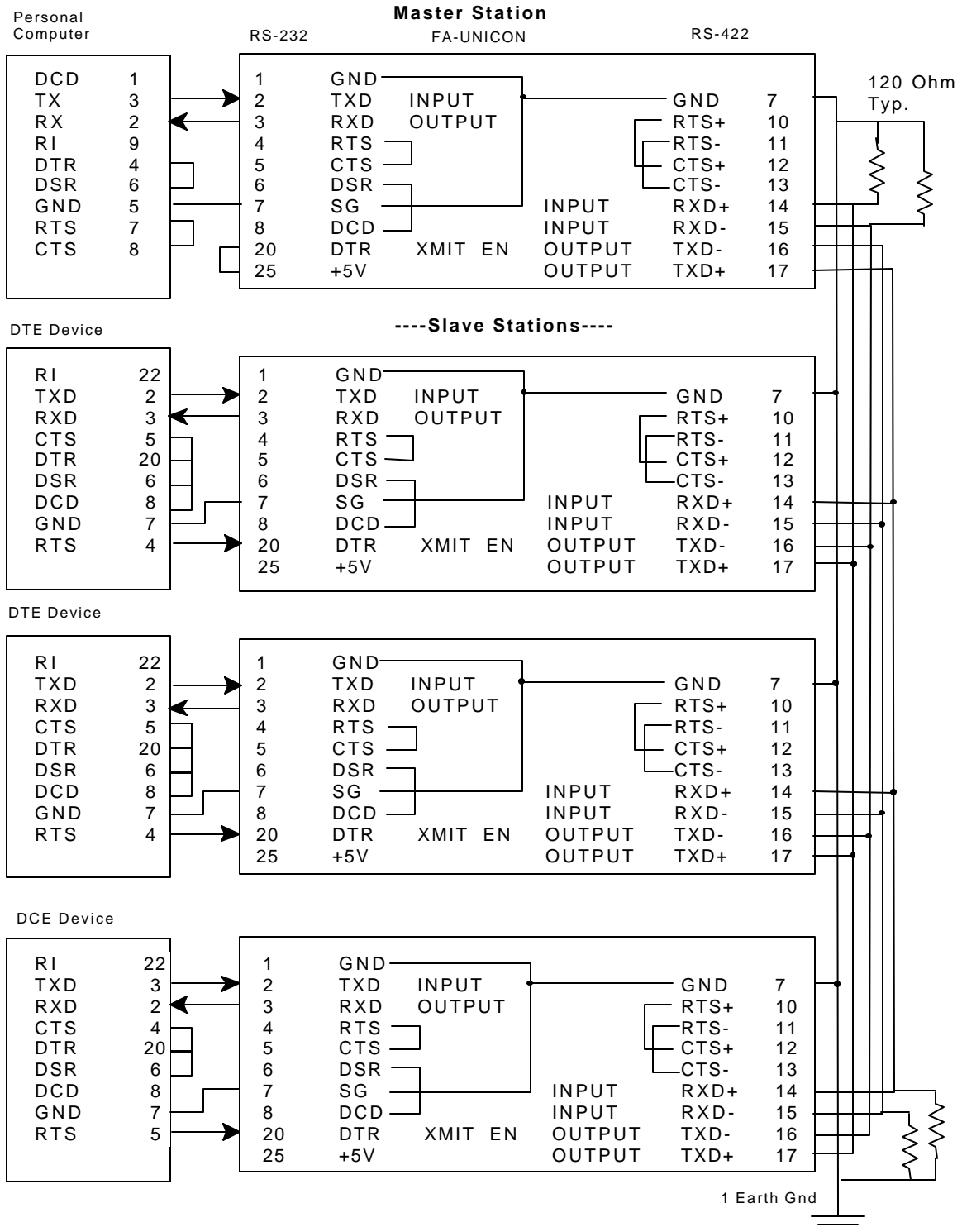
Note: This document follows the EIA standard for RS-232 pin names. TXD and RXD are pin names and do not indicate signal direction. Please see page 6 for additional information.

## Convert SIMATIC TI 545 RS-422 to RS-232



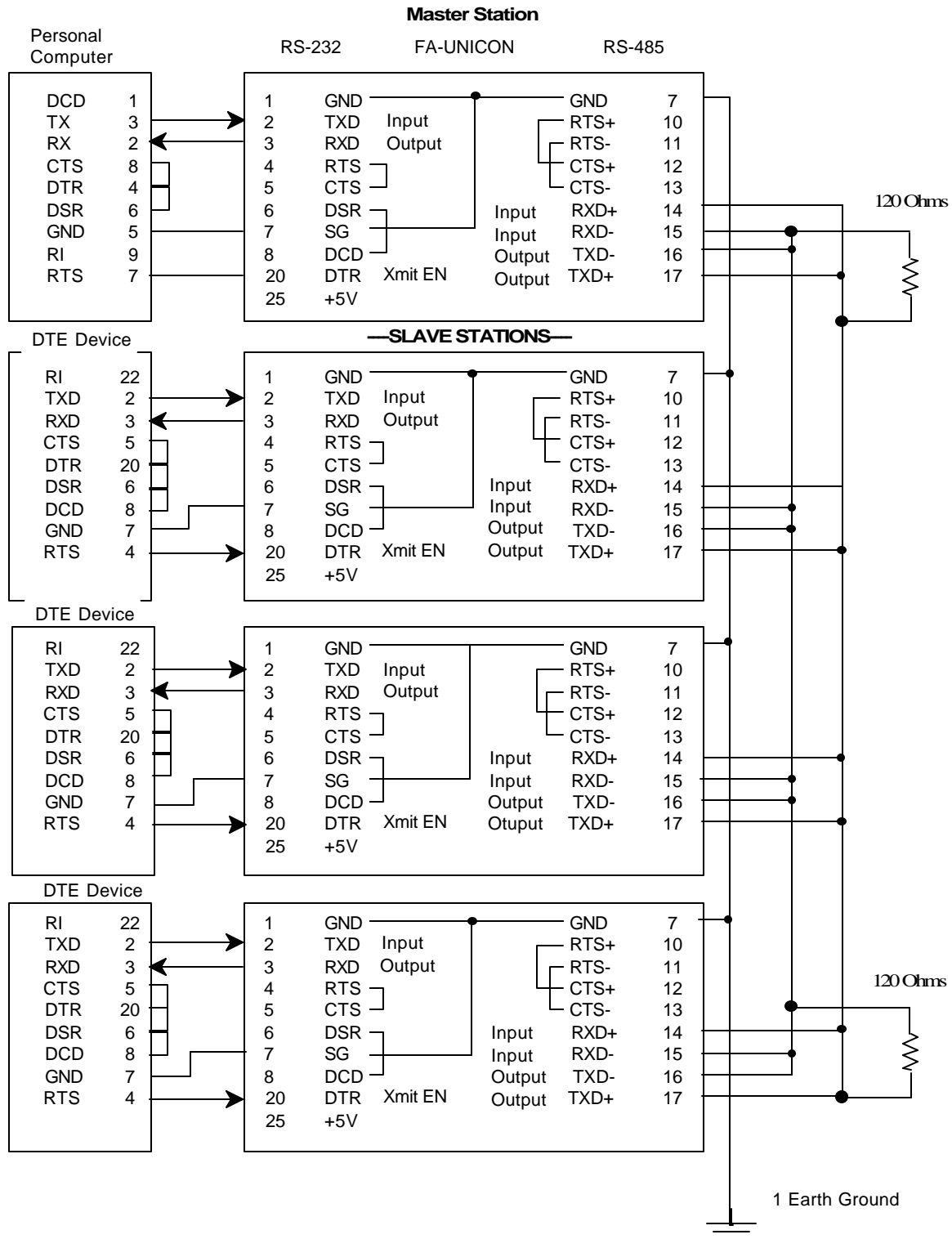
# Four Wire (RS-422) Multi-Drop Wiring

Recommended for *Automationdirect.com* PLC applications.



## Two Wire (RS-485) Multi-Drop Wiring

Not recommended for **Automationdirect.com** PLC applications. All transmitted data is echoed with this configuration. The RS232 device must be able to process the echoed data.



## Cable Shielding

Shielding improves noise immunity (magnetic field protection). It is important to ground the shield at the receiver end only. Grounding the receiver end only provides the least high frequency signal attenuation and the best rejection of unwanted signals.

Grounding both ends of the shield will cause magnetic field induced noised currents to flow through ground. Noise may then appear on the data lines due to transformer like coupling with the shield.

If the cable shield must be used as the system ground conductor then placing a  $100\ \Omega$  resistor in series with the shield and the ground connection will reduce noise producing ground currents.

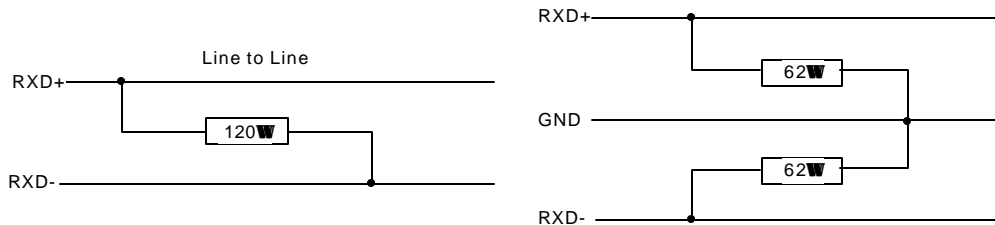
## Connecting Cables and Line Termination

A dual, RS-422, or single, RS-485, twisted pair plus ground connection between devices is recommended. Proper termination of the balanced transmission line is required to prevent data errors. A typical AWG 22 solid wire with .060 inch plastic cover, twisted 4.5 times per foot has a characteristic impedance of about  $120\ \Omega$ . Thus the selection of the two  $62\ \Omega$  line-to-ground terminating resistors (see below).

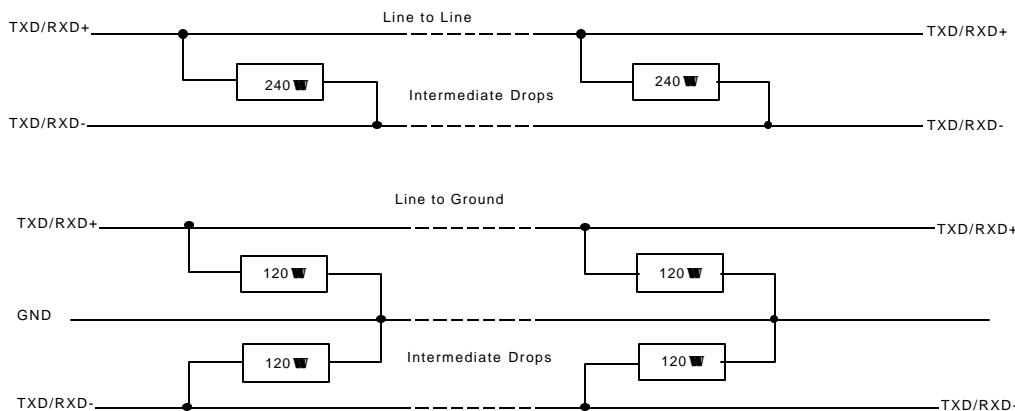
Line-to-ground termination is preferred to the often shown line-to-line  $120\ \Omega$  termination. In noisy or long line applications the much better line-to-ground (signal ground) common-mode rejection capability is particularly important.

RS-422 and RS-485 line terminations should be at the extreme ends of the cable runs only. Addition of intermediate terminations will adversely load the line.

### RS-422 Line Termination (At RXD± extreme end of each Line)



### RS-485 Line Termination (extreme ends only)



## MORE ABOUT RS-232

RS-232-C (RS-232) is an interface standard from the Electronic Industries Association (EIA). The standard names and defines 20 communication signals, assigned to separate pins in a 25-pin connector. The five unassigned pins may carry nonstandard signals required by any individual system.

Each signal is transmitted as a positive or negative electric current between 3 and 15 volts (usually 12 volts). The signal assigned to each pin flows in one direction only. Signals **output**, for example, from a computer must **input** to a terminal, and vice versa.

RS-232 signals travel over a serial interface cable that may have up to 25 wires, each of which can be attached to a pin in the connector at either end of the cable. Since most signals are not required for simple communication, cables have as few as 2 or 3 wires, with only the necessary wires attached to the connectors. Often it is necessary to install jumpers at one or both of the connectors to ensure that control signals are satisfied.

The signals flow between two types of interface ports, data communication equipment (DCE) and data terminal equipment (DTE). The pin names are the same for both DCE and DTE equipment, however, the direction of signal flow is reversed. The table below shows names, pin assignments, and directions of signal flow for the commonly used RS-232 signals.

**RS-232 DTE and DCE Pin Names and Signal Flow**

Pin	Abbrev.	Name	Signal Direction		Description
			DCE	DTE	
1	FG	Frame Ground	None	None	
2	TXD	Transmit Data	Input	Output	DTE Output Data Path
3	RXD	Receive Data	Output	Input	DCE Output Data Path
4	RTS	Request to Send	Input	Output	DTE has data to XMIT
5	CTS	Clear to Send	Output	Input	DTE may XMIT data
6	DSR	Data Set Ready	Output	Input	DCE has data to XMIT
7	SG	Signal Ground	Input	Output	
8	DCD	Data Carrier Detect	Output	Input	Modem has carrier
20	DTR	Data Terminal Ready	Input	Output	DCE may XMIT data
22	RI	Ring Indicator	Output	Input	

### Identifying the Communication Port as DCE or DTE

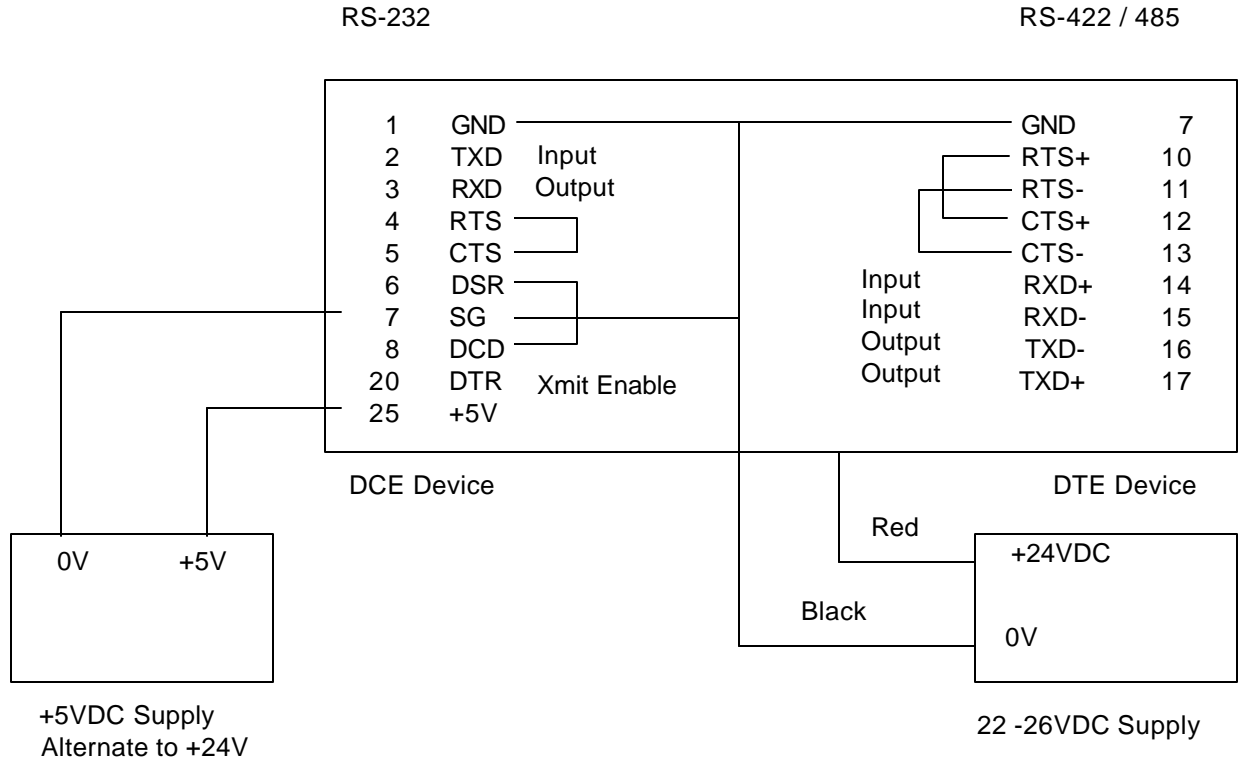
With an unknown RS-232 port powered, measure the dc voltage between pin-2 and ground (pin-7) and pin-3 and ground. If the most negative pin is pin-2 then the port is DTE. If the most negative pin is pin-3 then the port is DCE. Improper connection of pins 2 and 3 will not damage the interface.



Date: \_\_\_\_\_

**RS-232 TO RS-422/485 CONVERTER WIRING DIAGRAM**

FA-UNICON



**Project** \_\_\_\_\_  
**Location** \_\_\_\_\_

\* +5V dc, pin 25, may be connected to RS-232 DTR, pin 20, to turn ON the RS-422/485 differential transmitter. Or an RS-232 hardware handshaking line (RTS or DTR typically) may be connected to DTR to control the ON/OFF state of the RS-422/485 transmitters.

If the Converter is powered by a regulated 5 V dc supply connected to pins 25 and 7 then no connection should be made to the tinned and stripped red and black 24 V dc supply wires exiting the case.