User Manual

ASeries A440

Interface Converter
RS-232 ⇔ RS-422

ALFATRON

The interfacing specialists

A440 User Manual

Version 2.02
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Alfatron Pty Ltd ACN: 005 410 819
P.O. Box 4161
Unit 9/36 New St.
Ringwood VIC   3134
AUSTRALIA

Web Site: www.alfatron.com.au

AUSTRALIAN MADE

1.0   PRODUCT DESCRIPTION

The ASeries A440 allows RS-232 serial devices to communicate with RS-422 devices. As well as transferring data, this unit also provides one pair of handshaking lines, either DTR/DSR or CTS/RTS, for the control of the data flow.

The following illustration shows the location of all the connectors, indicators and switches of the A440:
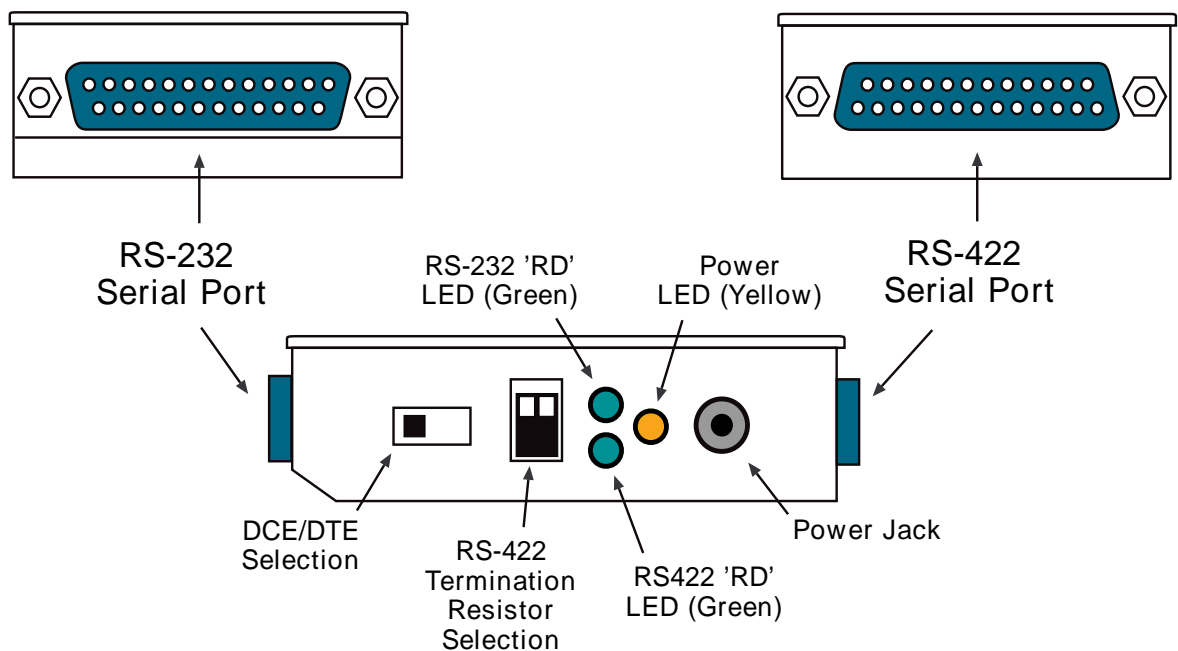
Figure 1 - A440 viewed from all sides

Features

- Switch select the RS-232 port as either DCE or DTE.
- Switch select Termination Resistors on the RS-422 port.
- Transient protection using Transorbs.
- LED indicators for Data Activity and Power.
- Quality nickel plated metal case will withstand the most rugged application.

Using A440s as RS-232 Line Extenders

A pair of A440s may be used to achieve connection of RS-232 devices over an extended distance. The A440s are connected via their RS-422 ports to take advantage of the greater data transfer distances available using the RS-422 Serial protocol. Please refer to Section 6.6 for cable details.

2.0   INSTALLATION

The A440 does not require configuration but it does provide the convenience of being able to select the RS-232 port as either DCE or DTE. Before connecting power to the unit please make sure that the RS-232 and RS-422 cables are securely connected to the A440 and associated devices.

Sections 5 and 6 contain details on cabling, along with some examples of typical uses for the A440.

After all cables have been connected and secured, insert the power plug into the jack socket and turn the power ON. The A440 is now ready for use.

2.1   Function of LED indicators

The 'RS-232' LED indicator monitors the activity on the 'RD' pin of the RS-232 serial port. The LED will flash each time data is received by the A440 on this line.

The 'RS-422' LED indicator monitors the activity on the 'RD+' and 'RD-' data pair pins of the RS-422 serial port. The LED will flash each time data is received by the A440 on these data pair lines.

The 'RS-232' and 'RS-422' LED indicators will not operate at any other time.

The 'Power' LED will remain ON when the A440 has power.

2.2   Termination Resistors for RS-422

The A440 provides switch selectable termination resistors for the Receive Data (RD) and Data Set Ready (DSR) incoming lines. Termination resistors are only required when the cable length exceeds 50 metres.

The A440 provides termination resistors on the 'receiver' side only. The reason for this is that, in most environments, cable lengths greater than 300 metres require termination only on the 'receiver' side.

The location of termination resistor switch is at the side of the A440 as shown in Figure 1. The selection of the termination resistors is as follows:

	Switch 1 Receive Data (RD)	**Switch 2** Data Set Ready (DSR)
OFF	Termination Resistor NOT ACTIVE	Termination Resistor NOT ACTIVE
ON	Termination Resistor ACTIVE	Termination Resistor ACTIVE

3.0   RS-232 SERIAL PORT PINOUT

The RS-232 Serial Port of the A440 is factory configuired as DCE.

Pin	Status and Usage		Set for DCE	Set for DTE
1	Used	- (Ground)	FG	FG
2	Input / Output-	(Data)	RD	TD
3	Output / Input-	(Data)	TD	RD
4	Not used	- (Pulled High 4K7)	CTS	RTS
5	Not used	- (Pulled High 4K7)	RTS	CTS
6	Output / Input-	(Handshaking)	DTR	DSR
7	Used	- (Ground)	SG	SG
8	Not used	- (Pulled High 4K7)	DCD	DCD
20	Input / Output-	(Handshaking)	DSR	DTR

Note: Pins 4, 5, 6, 8 and 20 are pulled to the correct levels to allow a PC serial port to operate under most conditions without any additional loopback connections.

The Factory Default RS-232 Serial switch setting is DCE as shown here:

DCE < > DTE

4.0   RS-422A PORT PINOUT

Pin	Status and Usage	Signal	Description
1	Used - (Ground)	FG	Frame Ground
7	Used - (Ground)	SG	Signal ground
13	Output- (Data)	TD+	Transmit Data +
25	Output- (Data)	TD-	Transmit Data -
12	Input - (Data)	RD+	Receive Data +
24	Input - (Data)	RD-	Receive Data -
11	Output- (Handshaking)	DTR+	Data terminal ready +
23	Output- (Handshaking)	DTR-	Data terminal ready -
9	Input - (Handshaking)	DSR+	Data Set Ready +
21	Input - (Handshaking)	DSR-	Data Set Ready -

4.1 Transient Protection on RS-422 Port

Power surges, or electrical transient voltages, can be induced into cabling by nearby lightening strikes, electric motors, switches and the operation of heavy industrial equipment, to name a few. The use of long cables, as with RS-422 connections, increases the exposure to transient voltages.

In an unprotected converter, a transient of the correct magnitude can destroy the RS-422 transceiver chip on the RS-422 port. However, it is also possible for certain transients to pass through a converter and therefore damage any RS-232 attached equipment at the other end.

By using High Speed Transient Voltage Suppressors on the RS-422 port, the A440 absorbs much of the transient energy on data lines and helps clamp these surge voltages to a safe level, thereby protecting itself and other connected equipment from the common damage due to transients.

Transient voltage suppressor diodes are used on each RS-422 line. Each diode has a response time of less than 1 ps with power dissipation of 600Watts for 1 ms and a steady state power dissipation rating of 5Watts.

5.0 CABLE REQUIREMENTS

Alfatron recommends the use of shielded cable with its products. It reduces Electro Magnetic Radiation and improves noise immunity. This helps minimise interference to other equipment and improves communication reliability.

5.1 Cable Construction

The recommended shielded cable construction is as follows:

- Solder the shield (surrounding cable wires) to the Frame Ground (FG) pin. If FG is not available, use Signal Ground (SG) but in this case always use a separate wire for ground which is connected at both ends.

- Make sure that the shield is connected at <u>both</u> ends of the cable.
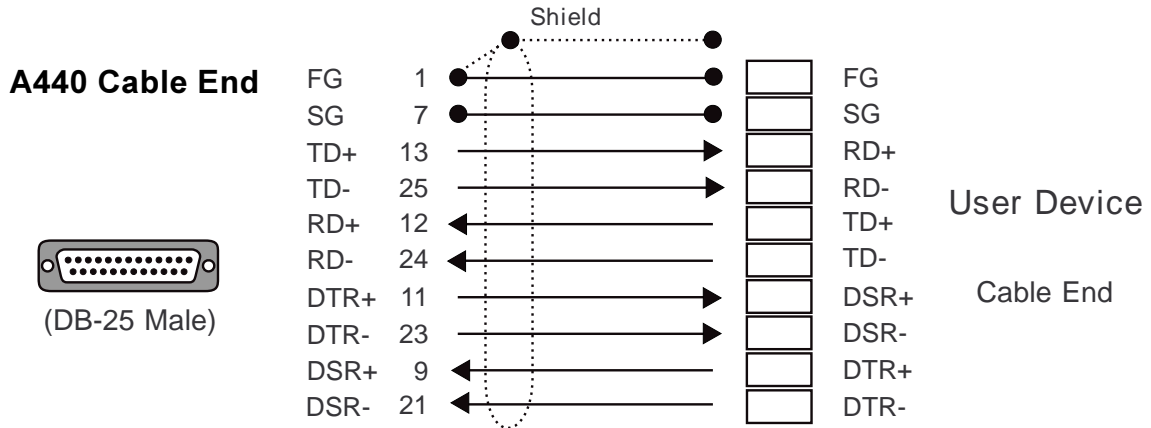
5.2 Cable Diagrams

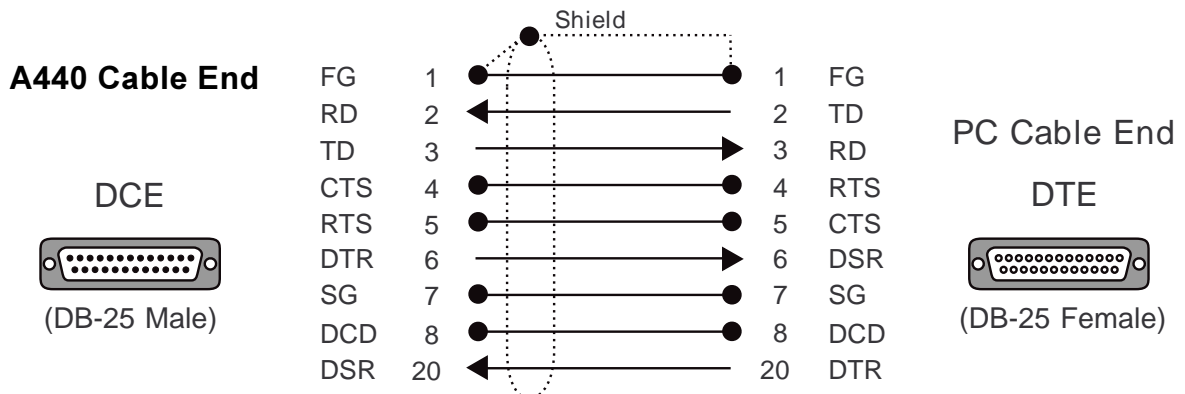Cable diagrams represent cable shield in the following manner:
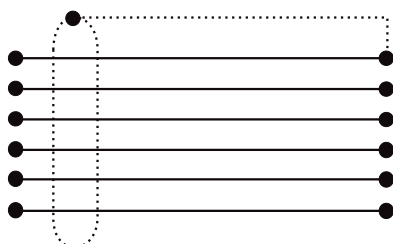
This shows the cable shield soldered to FG at both ends of the cable and shows the shield running the full length of the cable. Please note that the shield is treated as a totally separate wire.

6.0   CABLE EXAMPLES
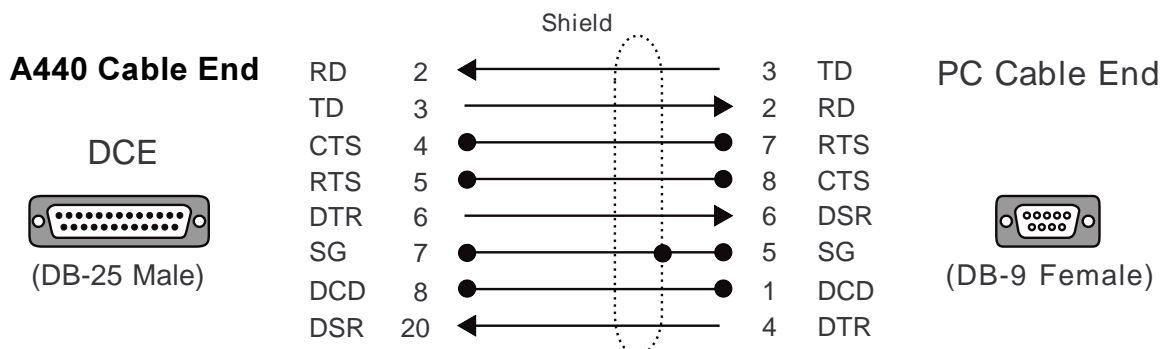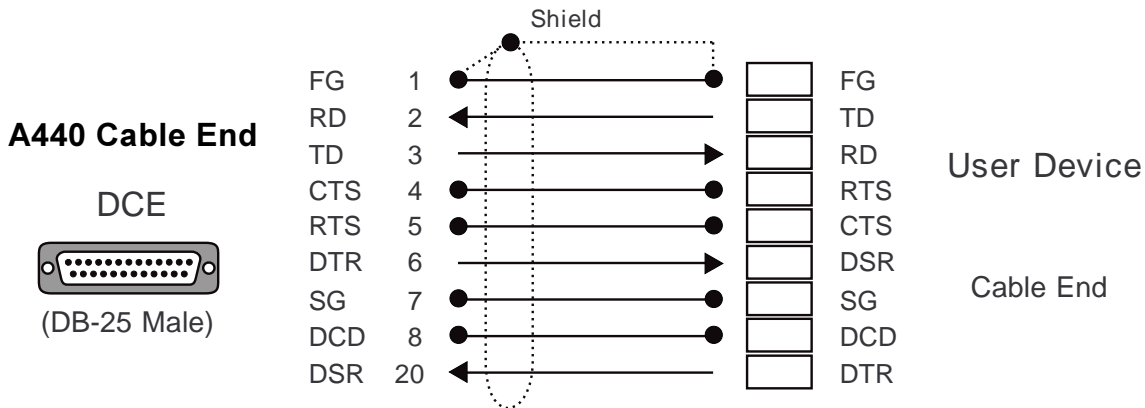
6.1   RS-422 Connection to Other RS-422 Devices

A440 Cable End

(DB-25 Male)

A440	Pin		User Device
FG	1	→	FG
SG	7	→	SG
TD+	13	→	RD+
TD-	25	→	RD-
RD+	12	←	TD+
RD-	24	←	TD-
DTR+	11	→	DSR+
DTR-	23	→	DSR-
DSR+	9	←	DTR+
DSR-	21	←	DTR-

Shield

User Device

Cable End

6.2   RS-232 Connection to a PC with DB-25 Serial Connector

A440 Cable End

DCE

(DB-25 Male)

Shield

A440	Pin		Pin	PC
FG	1	←	1	FG
RD	2	←	2	TD
TD	3	→	3	RD
CTS	4		4	RTS
RTS	5	→	5	CTS
DTR	6	→	6	DSR
SG	7		7	SG
DCD	8		8	DCD
DSR	20	←	20	DTR

PC Cable End

DTE

(DB-25 Female)

6.3   RS-232 Connection to a PC with DB-9 Serial Connector

A440 Cable End

DCE

(DB-25 Male)

Shield

A440	Pin		Pin	PC
RD	2	←	3	TD
TD	3	→	2	RD
CTS	4		7	RTS
RTS	5		8	CTS
DTR	6	→	6	DSR
SG	7		5	SG
DCD	8		1	DCD
DSR	20	←	4	DTR

PC Cable End

(DB-9 Female)

6.4 RS-232 connection to other RS-232 Devices

A440 Cable End

DCE

(DB-25 Male)

Shield

FG	1		FG	
RD	2		TD	
TD	3		RD	User Device
CTS	4		RTS	
RTS	5		CTS	
DTR	6		DSR	Cable End
SG	7		SG	
DCD	8		DCD	
DSR	20		DTR	

6.5 Using RTS / CTS Handshaking with the A440

The following diagram shows the A440 connected to a 'Host' RS-232 serial device and a 'Remote' RS-422 serial device. In this example the 'Host' is a 'DTE' device so the A440 is selected as 'DCE' on the RS-232 port.
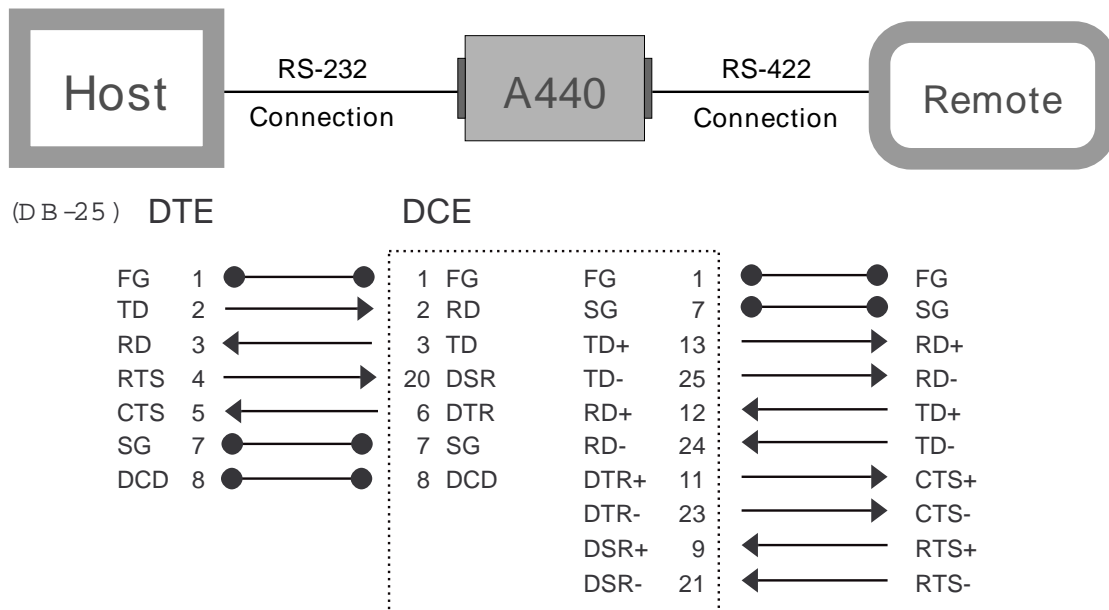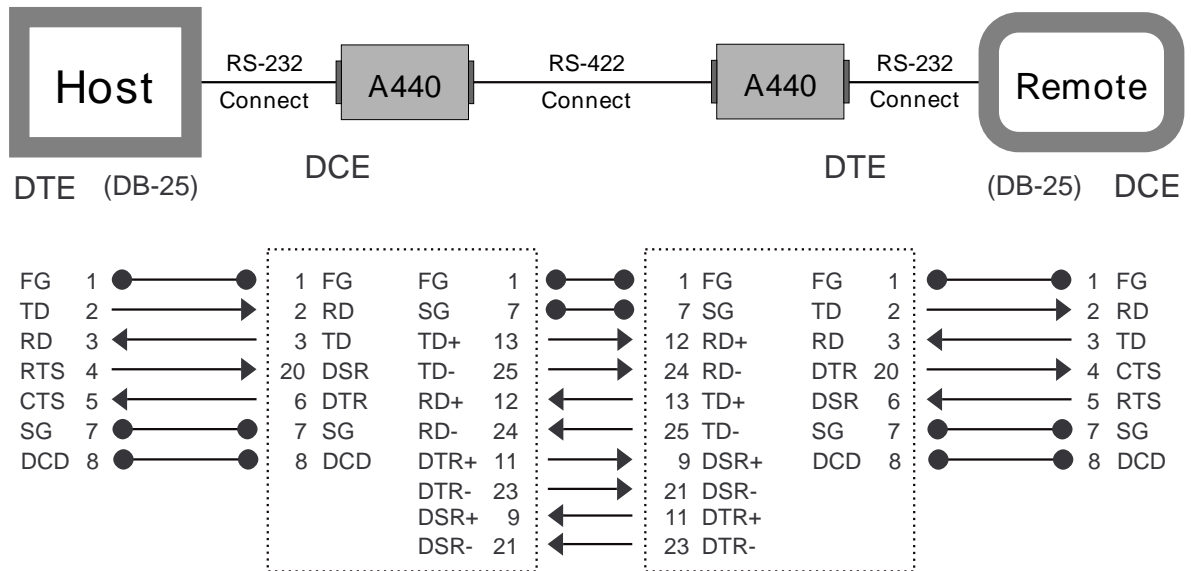

6.6 A440s used as RS-232 LINE EXTENDERS

A common use for the A440 is to use them in pairs to provide a reliable line extension setup for RS-232 devices. The following three diagrams show how two A440s may be used as RS-232 line extenders while adopting different RS-232 handshaking methods.
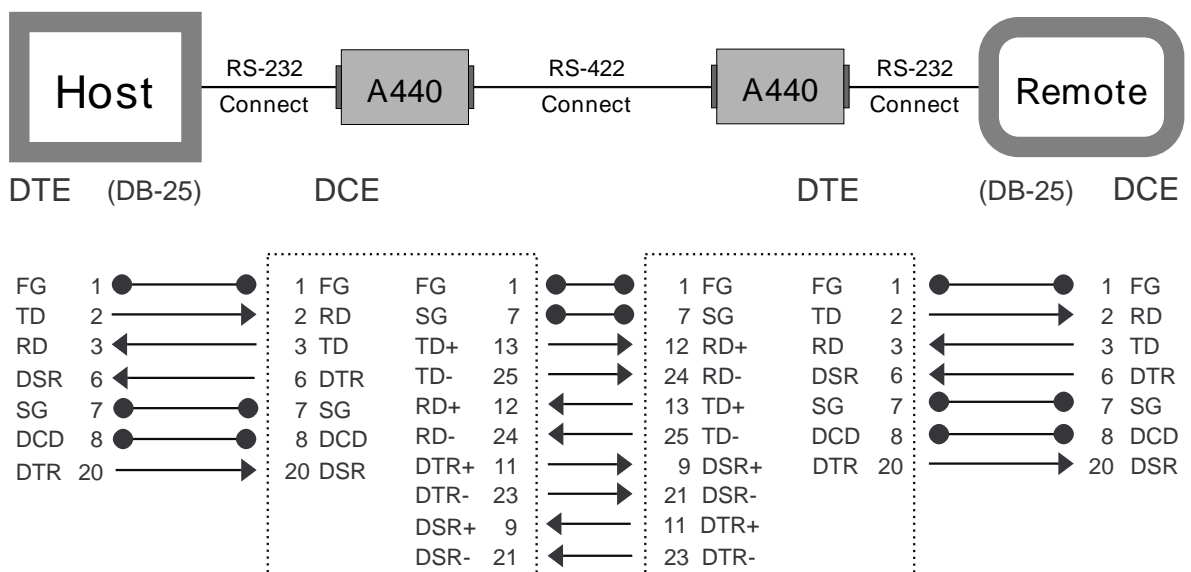
6.6.1 Example showing RTS / CTS handshaking

The following diagram shows A440s being used as line extenders in an RS-232 RTS/CTS Handshaking situation. In this example the 'Host' is 'DTE' and the 'Remote' is 'DCE', which allows the use of the same 'straight through' cable for each RS-232 connection to the A440.


6.6.2 Example showing DTR / DSR handshaking

The following diagram shows A440s being used as line extenders in an RS-232 DTR/DSR Handshaking situation. In this example the 'Host' is 'DTE' and the 'Remote' is 'DCE', which allows the use of the same 'straight through' cable for each RS-232 connection to the A440.

6.6.3 Example showing Xon / Xoff handshaking

The following diagram shows A440s being used as line extenders in an RS-232 Xon/Xoff Software Handshaking situation. In this example the 'Host' is 'DTE' and the 'Remote' is 'DCE', which allows the use of the same 'straight through' cable for each RS-232 connection to the A440.
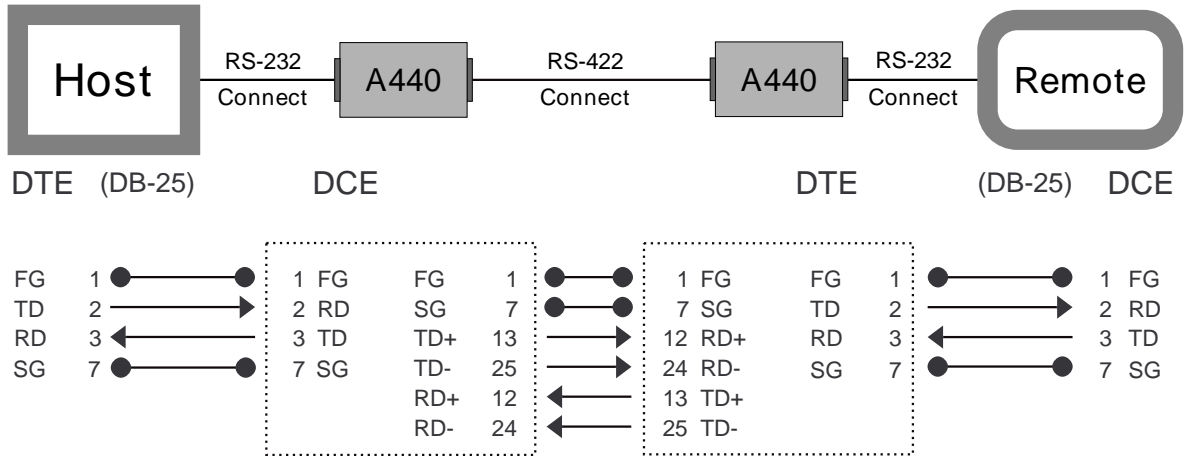
6.7 Unused Handshake Lines

Please note that many RS-232 devices still require their handshaking lines to be set to the correct levels, even if Xon/Xoff software handshaking is used. When in doubt about any particular RS-232 device simply connect all the lines to the A440 RS-232 port as it will pull those lines to the correct level for operation.

7.0   SPECIFICATIONS

RS-232C Port:	Asynchronous RS-232C/V.24 Select as DCE or DTE DB-25 female connector Speed capability dependant on cable length up to 64k bits per second
RS-422A Port:	RS-422A DB-25 female connector 120W Termination Resistor Selection for the incoming handshaking lines 'RD' & 'DSR'.
Transient Protection:	Transient Voltage Suppression Diode
(RS-422 Port only)	Surge handling capacity 600W per wire @ 1ps Response time per diode < 1ms Steady state power dissipation rate of 5W
Handshaking:	Xon / Xoff Software Handshaking DTR / DSR Hardware Handshaking
LED Indicators:	Receive Data - RS-232 (Green) Receive Data - RS-422 (Green) Power (Yellow)
Power Supply:	9V (200mA) DC Power Adapter Reverse polarity protection Plug jack - 5.5mm outer/2.5mm inner diameter Outer Negative: (−)——(●)——(+)
Dimensions:	84mm x 58mm x 23mm
Weight:	160 grams
Operating Temperature:	10° to 35° C
Stroage Temperature:	0° to 45° C

All specifications subject to change without notice

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CE

DECLARATION OF CONFORMITY

according to the European Commissions EMC Directive 89/336/EEC

We,   Name of Manufacturer: ALFATRON PTY. LTD

of,   Address of Manufacturer: UNIT 9, 36 NEW ST.
                                             RINGWOOD   VIC   3134
                                             AUSTRALIA

           Australian Company Number: ACN: 005 410 819

declare under sole responsibility that the product:

                    Product Name: ASeries RS-232 to RS-422
                                            Interface Converter

                    Model Number: A440

to which this declaration relates is in conformity with the following standards:

CISPR-22 / EN 55022 class B   EMI from Information Technology Equipment (ITE)
IEC 801-2 / prEN55024-2   Electro Static Discharge Immunity
IEC 801-3 / prEN55024-3   Radiated RF Immunity
IEC 801-4 / prEN55024-4   Electrical Fast Transients Immunity