BIDIRECTIONAL DATA CONVERTERS
RS232/RS422 AND RS422/RS232
MODELS AA1709/DC1709, DC2102 AND DC2170

AA1709/DC1709
RS232-DB25S/RS422-DB9S

DC2170
RS232-DB9S/RS422-DB9P

DC2102
RS232-DB25S/RS422-DB9P

INTRODUCTION

These bidirectional data converters are used to change RS232 data streams into RS422 compatible data streams. It will also make RS422 data look like RS232 compatible signal levels. This is done with solid state, level shifter Integrated Circuits. See Figure 2 for system block diagram. These modules make it possible for RS232 equipped devices, such as an IBM personal computer, to interface with an RS422 equipped device, such as the Anaheim Automation CL1694 Control Links board or the DPB11VA Series Driver Pack.

FEATURES

These small modules can be mounted in a location that is convenient and can be mounted in any plane. The mounting tabs can be used to bolt the unit to a chassis or two-sided tape can be used to stick it out of the way. See Fi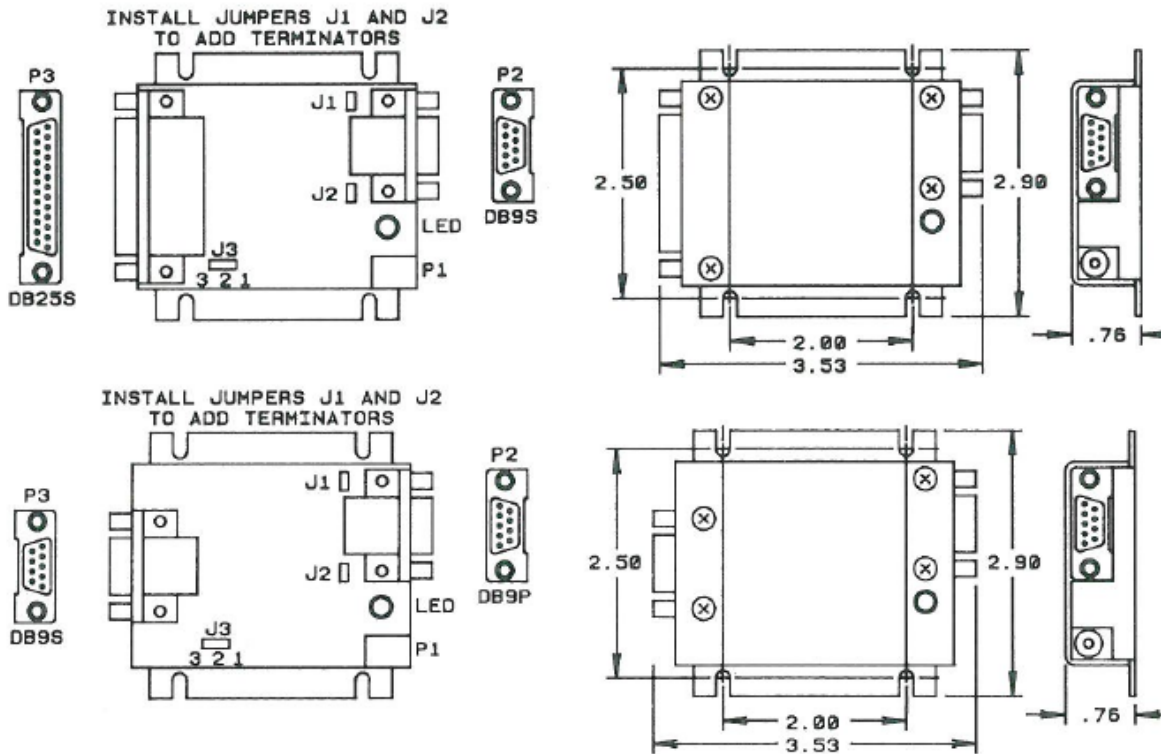gure 1. Since the RS422 interface is intended to have excellent noise immunity over long distances, it would be wise to install the converter close to the RS232 source. For long transmission lines (up to 4,000 feet) a jumper added terminating resistor of 180 ohms is made available (J1 and J2). In most applications this termination is not required. See Figure 1 for locations.

POWER SUPPLY OPTIONS

These converters operate off a small wall mount power supply, that provides 9 volts of filtered DC at 150 milliamps. This power supply is provided with each unit. Current drains of 75 milliamps without terminating and 120 milliamps with terminating resistors can be expected. The converter has an onboard regulator and can take voltages from another source, if connected inside the module. The external power supply can range from +7 to +20 volts without terminating and +7 to +15 volts with terminating resistors in. By connecting to the proper pin on J3, a +5 volt source can also be used. See Figure 7 for schematic.

DC Series Dimension Drawings, Figure 1

INSTALLATION

These modules are designed to be inserted between the two devices that are communicating. Since each installation will require different lengths of cable, we do not supply the RS232 or RS422 cables. The RS232 cable plugs into the female DB25S or DB9S connector P3 and the RS422 cable plugs into the female DB9S or male DB9P connector P2. The user must supply the mating DB25P and DB9P/S. See Chart 1 for pinouts. The power supply output plugs into the power connector P1. See Figure 1. There is no set up or configuration required for these modules. Request To Send (RTS) and Clear To Send (CTS) are handshake lines supported by these modules. See Figure 2. When the converter is powered, the red LED in the cover of the enclosure will be illuminated.

TROUBLESHOOTING

These converters are a level shifter that has an onboard voltage regulator. The red LED is wired across the +5 volt supply so that any power problem will not allow the LED to be properly illuminated. If the supply is connected with wrong polarity (center pin is +) or if supply is defective, the LED will not light. Communication problems may manifest themselves as system hangup or lockup. The test circuit shown in Figure 4 will check each element of the converter. This test requires wiring of the two connectors into a test set and looking at the CTS pin of the RS232 connector pin 5 (DC1709 and DC2102) or pin 8 (DC2170) with a oscilloscope. See Testing.

TESTING

The test of the RS232 to RS422 converter is achieved by using a set of connectors that turns the board into an oscillator. The connectors are wired such that each element of the converter is used as an inverter or buffer and forms an oscillator. See Figure 3. Figure 4 shows the Integrated Circuit pin connections as wired by the test set. The equivalent circuit is shown in Figure 5. Across the 470K resistor is a rectangular waveform that oscillates at approximately 5.5KHz. The frequency is not too critical and the waveform should go + and -9 volts. If the circuit does not oscillate a pulse generator can be used to inject a signal at the 10K and .01 junction for further troubleshooting.

CHART 1

RS-232			RS-422	
DB9S PIN #	DB25S PIN #	FUNCTION	DB9S or DB9P PIN #	FUNCTION
	1	GROUND	1	GROUND
3	2	XMIT. DATA (TXD)	2	+ BUSY
2	3	REC. DATA (RXD)	3	- BUSY
7	4	REQ. SEND (RTS)	4	+ RX
8	5	CLR. SEND (CTS)	5	- RX
6	6	NO CONNECTION	6	+ REQ
5	7	0Vdc RETURN	7	- REQ
1	8	NO CONNECTION	8	+ TX
9	9	NO CONNECTION	9	- TX
4	10-25	NO CONNECTION		
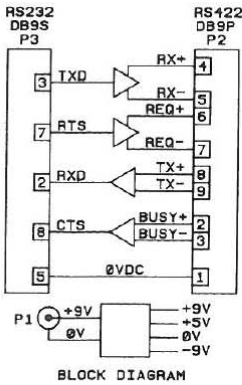
Figure 2
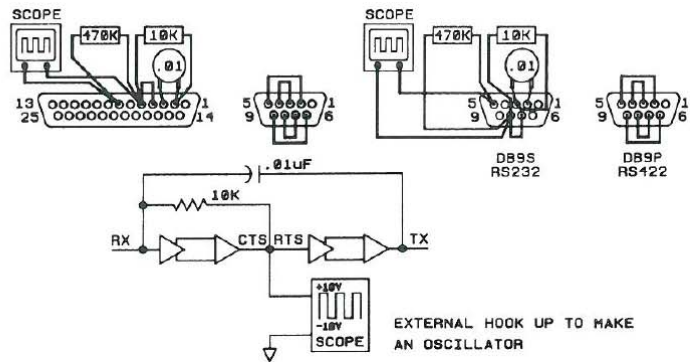
Figure 3
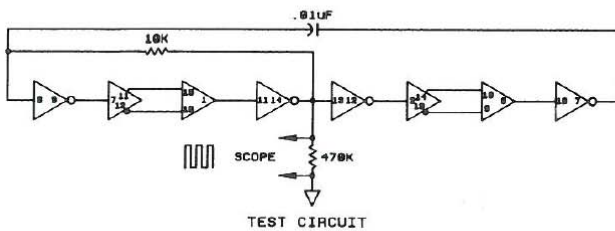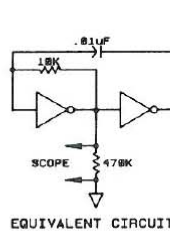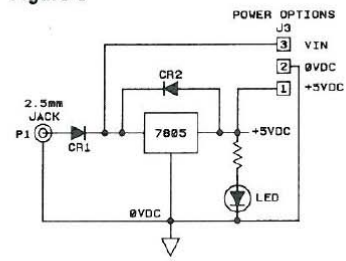

Figure 4

Figure 5

Figure 6

RS232 INTERFACE WIRING SCHEMES

GENERAL

Since there is no standard for the RS422 connector, the RS422 pinouts are defined to conform to our Control Link interface modules. Occasionally problems will occur on the RS232 wiring due to the many different standards in the commercial computer industry.

SIGNAL INPUTS/OUTPUTS

These modules have two RS232 to RS422 converters and two RS422 to RS232 converters. A schematic showing the RS232 and RS422 internal converters is shown on the cover of the modules. The RS232 to RS422 converter inputs are connected to pins 2 and 4 (DC1709 and DC2102) or pins 3 and 7 (DC2170) of P3 and are labeled TXD (Transmit) and RTS (Request To Send). These are outputs from the user's terminal. The converter outputs are connected to P2, pins 4 and 5 and 6 and 7 respectively.

The RS422 to RS232 converter outputs are connected to pins 3 and 5 (DC1709 and DC2102) or pins 2 and 8 (DC2170) of

P3 and are labeled RXD (Receive) and CTS (Clear To Send). These are outputs to the user's terminal. The inputs to these come from the RS422 connector P2, pins 8 and 9 and 2 and 3 respectively. See schematic in Figure 7.

## SYSTEM OPERATION AND HANDSHAKING (DC1709 and DC2102)

Since there are many ways to connect the RS232 system, the user must first determine what type of system is operating. There are two standard types of operating systems, DCE (Data Communications Equipment) and DTE (Data Terminal Equipment). The type of handshaking (hardware, XON/XOFF or software), must be determined. And finally, the user must determine if RTS, CTS or DTR is required.

In a DTE (Data Terminal Equipment) system, pin 2 is always a transmit (TXD) line and pin 3 is always the receive (RXD) line on the RS232 port. Pin 4 is the output Request To Send (RTS) and pin 5 is the

input Clear to Send (CTS). These two lines are normally used for handshaking. Pin 7 is the Signal Ground and must be wired. Pin 1 (for DC2170 do not use) is Earth Ground in some systems and pins 1 and 7 are connected internally. In some computers pin 4 and pin 20 DTR (Data Terminal Ready) are wired together for a hardware handshake. These two pins are not connected and the user must make the required connections in their cable.

WIRING SCHEMES

The following diagrams show some common connection schemes for wiring the RS232 cable. The drawings show only the required pins that need to be wired. Most "store bought" cables have all 25 or 9 wires connected in the cable. These extra wires should not cause any problems. It should be noted that the drawings do not show pin 1 connected. This pin is used as earth ground (DB25), and although not required for operation, functions similar to the ground plug on a three contact AC line cord.
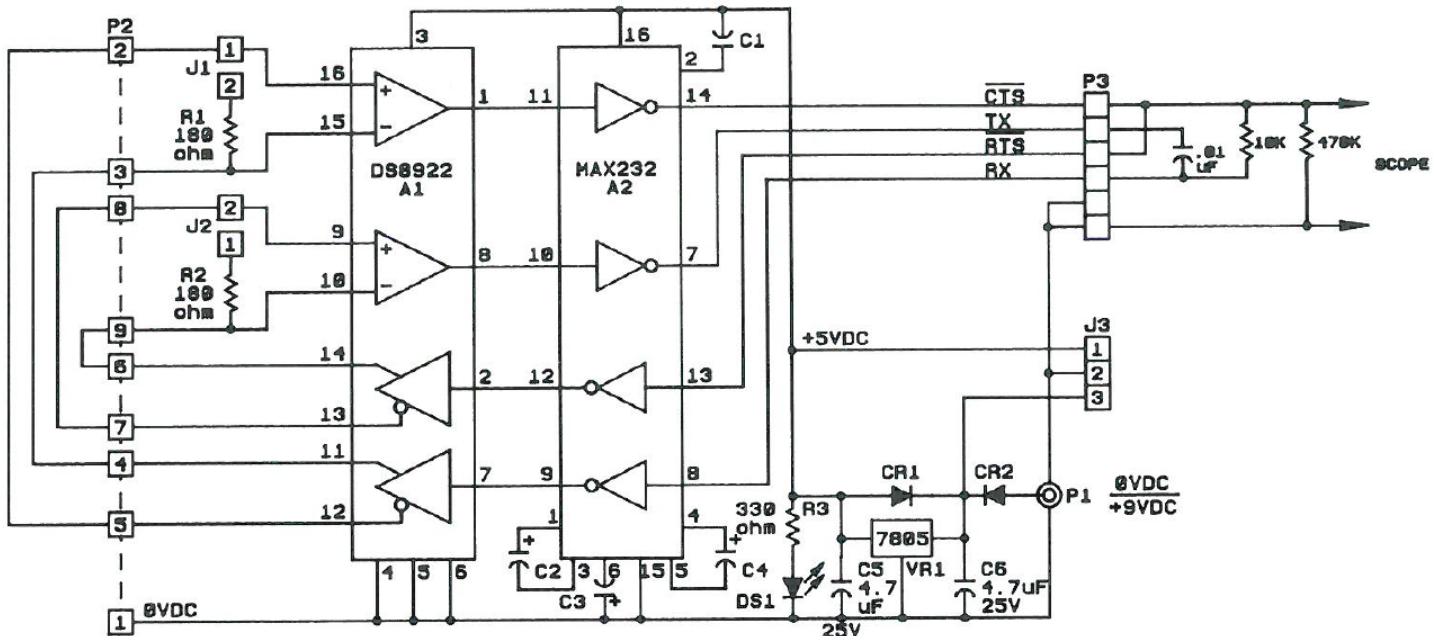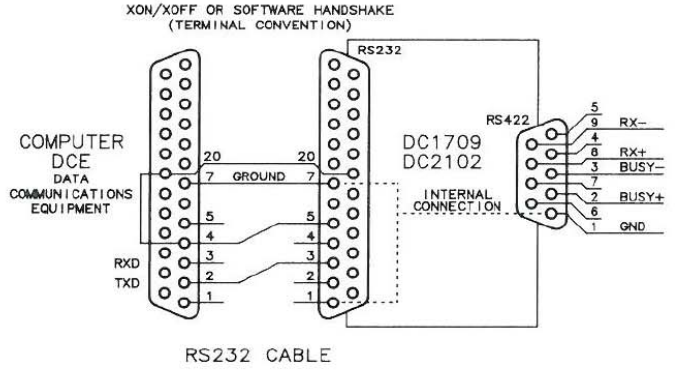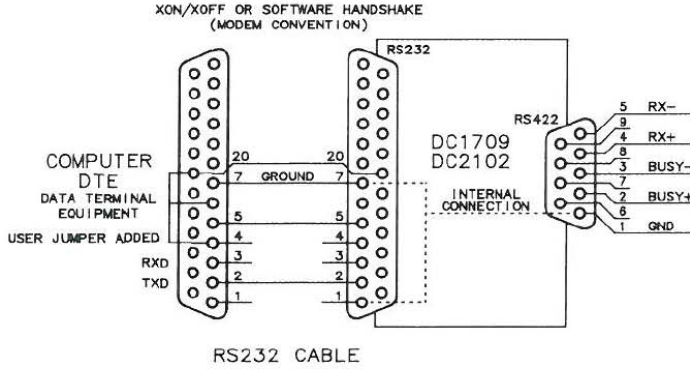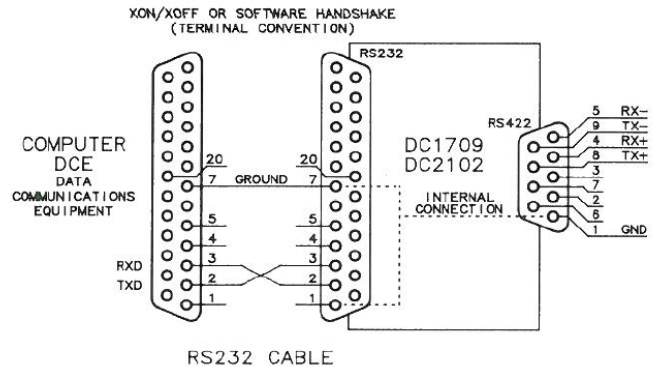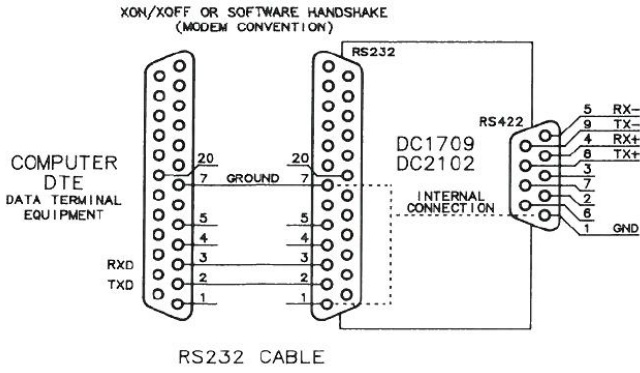

Schematic
See Chart 1 For P3 Pin Assignments
Figure 7
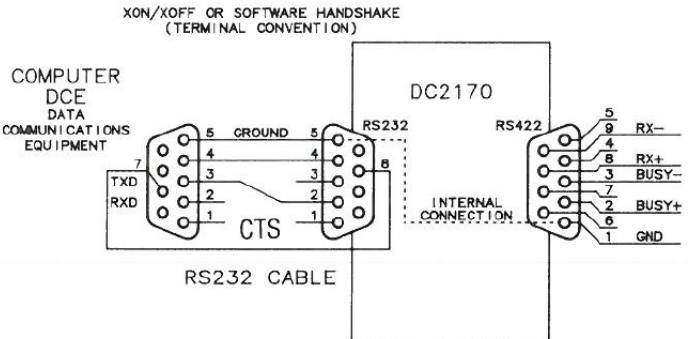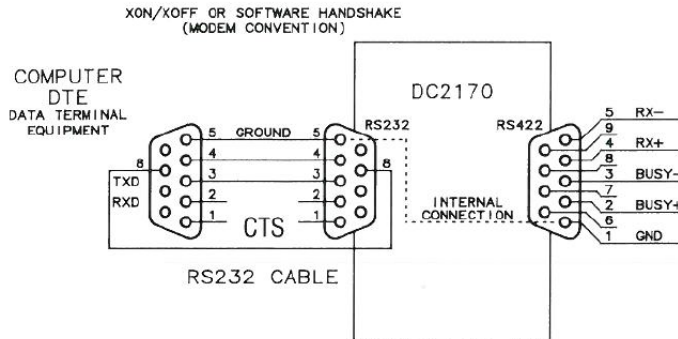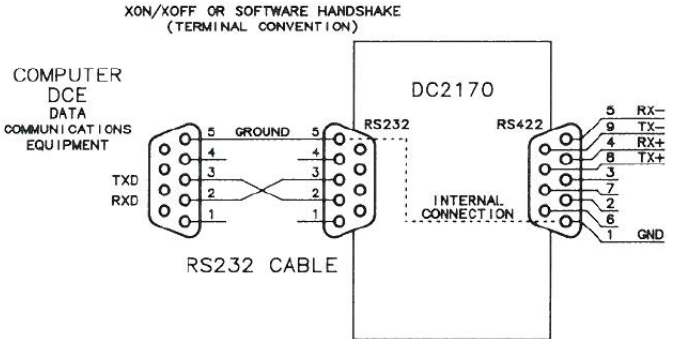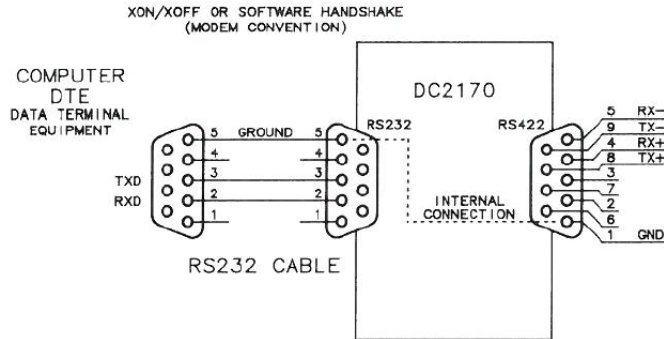
DC1709 and DC2102 Wiring

DC2170 Wiring

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