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DDC2x   RS-232 <> RS-485 Converter

Introduction

The DDC2I and DDC2D are DIN rail mounted RS-232 <> RS-422/485 converters. The two models operate the same with the only difference being the DDC2I is optically isolated.

The DDC2x provides an RJ45 modular RS-232 port that is configured to allow the use of a straight-through cable from a standard Modicon RJ45 port (such as a Modicon® Micro®, TSX Momentum®, or NR&D QUCM-S). A variety of serial cables are available from Niobrara to convert the RJ45 port to other standard pinouts.

The RS-422/485 port has a sub-D 9-pin SY/MAX® pinout port as well as a removable screw terminal connector. The port may be configured for 4-wire RS-422, 4-wire RS-485 multidrop, and 2-wire RS-485 multidrop. The RS-485 termination and biasing may be selected through DIP switches.

External 9V-24VDC power for the converter may be provided through a removable screw terminal connector. Power may also be applied through the RS-232 RJ45 port and the unit will power itself from the 5VDC provided from the Modicon Micro PLC or the Niobrara QUCM-S modules. A Niobrara TR92 wall mount transformer is provided for external powering.

LED indicators show the state of POWER, Transmit Enable (TxEN), Transmit (Tx), and Receive (Rx).   The green POWER LED should be on if the DDC2x is properly powered. The green TxEN light comes on when the RS-485 transmitter is enabled. The Yellow Tx light comes on when the RS-232 device is transmitting. while the yellow Rx light shows the state of the RS-232 receiver.
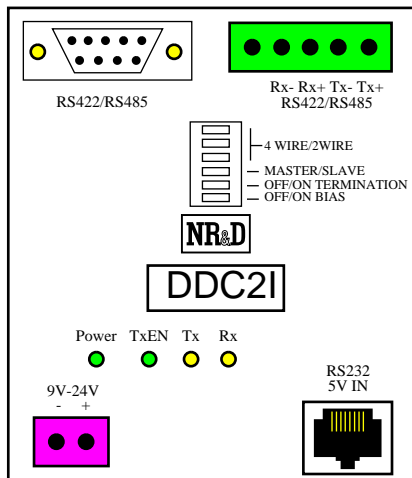

Figure 1   DDC2x Layout

RS422/485 DIP Switch Configuration

The DDC2x's RS422/485 port is configured through a 6 position DIP switch on its front. This switch is used to set the unit for 4-wire/2-wire, transmitter enable/tri-state, receiver termination, and receiver bias.

Switches 1, 2, and 3 control 4-wire/2-wire operation. All three switches should be OFF (left) for 4-wire RS-422/485 networks.   For 2-wire RS-485 operation set all three switches ON (right).   Switch 1 shorts the RX+ and TX+ connections while switch 2 shorts the RX- and TX- connections.   Switch 3 disables the RS-485 receiver while the DDC2I is transmitting to prevent echoes of the transmitted data to the RS-232 port.

Switch 4 determines the Master/Slave operation. If the switch is OFF (left) then the RS-485 transmitter is always enabled (ON). When the switch is ON (right) the RS-485 transmitter follows the state of the RS-232 RTS line. This switch should always be ON (right) when the units is set for 2-wire operation (even if the RS-232 device is the network master). If the switch is OFF (left) and the DDC2x is set for 4-wire then the port is RS-422 and would be a master for a 4-wire multidrop network.

Switch 5 sets the termination on the RS-485 receiver. When the switch is OFF (left) the termination is disabled. When the switch is ON (right) the terminator is enabled. Typically the terminator is enable only on the end devices of the daisy-chain.

Switch 6 sets the biasing on the RS-485 receiver. When the switch is OFF (left) the biasing is disabled.   When the switch is ON (right) the receiver is biased to a known state. Typically, only one node on the network will have the biasing enabled and usually this node is the master.

Electrical Connections

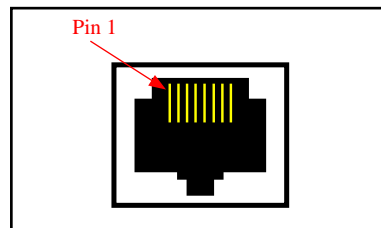The RS-232 port is a Modicon DCE pinout and the description is shown in Table 1.

Figure 2   RJ45 Pin Numbering

Table 1   RS-232 Pinout

RJ45 Pin	Description
1	+5VDC IN
2	No Connection
3	TX (data from RS-232 device)
4	RX (data to RS-232 device)
5	Signal Ground
6	RTS (from RS-232 device)
7	CTS (to RS-232 device)
8	Ground

Table 2 give the common Niobrara RS-232 cables for connecting the DDC2x to various devices.

Table 2   Niobrara RS-232 Cables for DDC2x

Cable Name	Description	Connected Device
MM0	RJ45 Straight-through	QUCM-S, Micro, TSX Compact, TSX Momentum
MM3	RJ45 to 9-pin male	Modicon PLC, BM85
MM5	RJ45 to 9-pin female	Computer COM port, SPE4-xS
MM6	RJ45 to 25-pin male	Modem

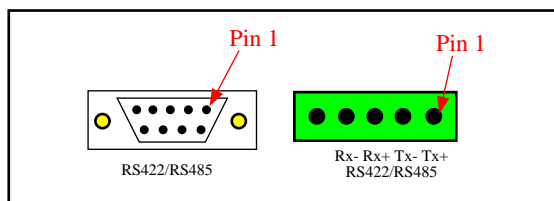The RS-422485 ports are electrically wired together with the pinout shown in Table 3 and Figure 3.

Figure 3   RS-422/485 Connectors

Table 3   RS-422/485 Pinouts

DE9S Pin	Screw Term.	Description
1	2	TX- (data from RS-232 device)
2	1	TX+ (data from RS-232 device)
3	4	RX- (data to RS-232 device)
4	3	RX+ (data to RS-232 device)
5,6,7,8		No Connection
9	5	Shield

Example 1

A DDC2I is used to connect a Niobrara QUCM-SE to a string of POWERLOGIC® Circuit Monitors. The DDC2I will be configured as an RS-422/485 4-wire Master with Termination and Biasing. The QUCM will be connected with an MM0 cable and provides power for the DDC2I. The DIP switches will be set with 1,2,3,4=OFF and 5,6=ON. The RS-485 daisy chain may be attached with a POWERLOGIC CAB-107 cable or the Belden® 8723 cable can be connected to the screw terminals shown in Table 4.

Table 4   CM Master RS-485 Screw Terminal Wiring

DDC2x	CMs	Color
TX+	IN+	Green
TX-	IN-	White
RX+	OUT+	Red
RX-	OUT-	Black
Shield	Shield	Bare

Example 2

A DDC2I is used to connect a Modicon Compact-984® to 2-wire RS-485 network as a slave. The DDC2I will be configured as an RS-485 2-wire Slave without Termination or Biasing. The Compact will be connected with an MM3 cable. External power for the DDC2I must be provided. The DIP switches will be set with 1,2,3,4=ON and 5,6=OFF The RS-485 daisy chain may be attached with the (+) wire to the TX+ connector and the (-) wire to the TX- connector. If the DDC2I is at the end of the 2-wire network then Switch 5 should be ON to provide network termination.

Example 3

A DDC2I is used to connect a Modicon Micro to the 4-wire RS-485 network in Example 1 as a slave. The DDC2I will be configured as an RS-485 4-wire Slave without Termination or Biasing. The Micro will be connected with an MM0 cable and it provides power for the DDC2I. The DIP switches will be set with 1,2,3=OFF, 4=ON, and 5,6=OFF The RS-485 daisy chain may be attached with the (+) wire to the TX+ connector and the (-) wire to the TX- connector.

Table 5   CM Slave RS-485 Screw Terminal Wiring

Master DDC2I	CMs	Slave DDC2I	Color
TX+	IN+	RX+	Green
TX-	IN-	RX-	White
RX+	OUT+	TX+	Red
RX-	OUT-	TX-	Black
Shield	Shield	Shield	Bare