NTI

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RS232 CONTROL INTERFACE SPECIFICATION
(for All units other than SC & ST switches)

REMOTE CONNECTION

The RS232 Interface is designed to meet the RS232C standard and can be controlled from any host computer or other controller with an RS232 communications port. The pinout for the DB-9 connector(s) on the unit is as follows:

RS232 INPUT (DB-9 FEMALE)

PIN	SIGNAL	FUNCTION
1	-	no connection
2	TXD	transmit data (RXD at host)
3	RXD	receive data (TXD at host)
4	DTR	data terminal ready
5	GND	signal ground
6	DSR	data set ready
7	RTS	request to send
8	CTS	clear to send
9	-	no connection

RS232 OUTPUT (DB-9 MALE)

PIN	SIGNAL	FUNCTION
1	-	no connection
2	RXD	receive data
3	TXD	transmit data
4	-	no connection
5	GND	signal ground
6	-	no connection
7	-	no connection
8	-	no connection
9	-	no connection

On the DB-9 female connector, pins 4 (DTR) and 6 (DSR) are shorted and pins 7 (RTS) and 8 (CTS) are shorted. Therefore, host handshaking is bypassed and TXD and RXD are the only active signals. A straight through DB-9 cable (not null modem) will work for most computers. To daisy chain multiple units, the host drives the input port on the first unit and output port is connected to the input port on the next unit etc (see Fig 1). The last unit will have no connection on its output port and should have DIP switch 1 ON (see below).

BAUD RATE

The baud rate can be changed by powering down the unit, changing the DIP switch, and then powering back up. This table shows how to set the baud rate.

DIP SWITCH			BAUD RATE
4	3	2	
OFF	OFF	OFF	300
OFF	OFF	ON	600
OFF	ON	OFF	1200
OFF	ON	ON	2400
ON	OFF	OFF	4800
ON	OFF	ON	9600
ON	ON	OFF	9600
ON	ON	ON	9600

DIP SWITCH

The unit powers up with a default baud rate of 9600 and a fixed data protocol of 8 data bits, no parity, and 1 stop bit. To change the baud rate, unit address, and loop back (more on the unit address and loop back later), an 8-SPST DIP switch on the panel near the DB-9 connectors can be used. This table shows the DIP switch functions and their default positions.

SWITCH	FUNCTION	DEFAULT
1	loop back	ON
2	baud rate 0	ON
3	baud rate 1	ON
4	baud rate 2	ON
5	unit address 0	ON
6	unit address 1	OFF
7	unit address 2	OFF
8	unit address 3	OFF

UNIT ADDRESS AND LOOP BACK

To allow multiple units to be controlled from a single host port, the remote interface is designed to allow "daisy chaining" of up to 15 units. By setting the appropriate DIP switches, each unit can be given a unique address (1-15). Then the unit will only respond to commands on the bus if its address is embedded in the command. The "loop back" DIP switch should be ON for the last unit in the chain, and OFF for all other units. If only one unit is being controlled, the loop back DIP switch should be left ON. This table shows how to set the unit address.

DIP SWITCH				UNIT ADDRESS
8	7	6	5	
OFF	OFF	OFF	OFF	0 (not valid)
OFF	OFF	OFF	ON	1
OFF	OFF	ON	OFF	2
OFF	OFF	ON	ON	3
OFF	ON	OFF	OFF	4
OFF	ON	OFF	ON	5
OFF	ON	ON	OFF	6
OFF	ON	ON	ON	7
ON	OFF	OFF	OFF	8
ON	OFF	OFF	ON	9
ON	OFF	ON	OFF	10
ON	OFF	ON	ON	11
ON	ON	OFF	OFF	12
ON	ON	OFF	ON	13
ON	ON	ON	OFF	14
ON	ON	ON	ON	15

COMMAND PROTOCOL

Host controller commands supported by the unit are defined below. All commands should be terminated with a <CR> (carriage return). When a command is sent, the entire string is echoed back to the host along with a response from the addressed unit as shown in the command definitions. All characters should be upper case, and all numbers below 10 should have a leading 0 (ex: 1 = 01).

NOTE: For units with one output or user port, use 01 for the output select.

RS - reset unit(s) to default power-up configuration
FORMAT: RS AA<CR>
                 RS = "reset unit" command followed by at least one space
                 AA = unit address; if 00, all units on the bus will be reset
                        and no response will be returned
RESPONSE: *<CR> if command received and executed OK
                 ?<CR> if syntax or transmission error occurred

CS - change single output channel
FORMAT: CS AA,XX,YY<CR>
                 CS = "change single output" command followed by at least one space
                 AA = unit address
                 XX = input to connect
                 YY = output to change
RESPONSE: *<CR> (command received and executed OK)
                  ?<CR>   (syntax or transmission error occurred)

CA - change all output channels
FORMAT: CA AA,XX<CR>
                 CA = "change all outputs" command followed by at least one space
                 AA = unit address
                 XX = input to connect to all outputs
RESPONSE: *<CR> (command received and executed OK)
                  ?<CR> (syntax or transmission error occurred)

RO - read single output channel
FORMAT: RO AA,XX<CR>
                 RO = "read output" command followed by at least one space
                 AA = unit address
                 XX = output to read
RESPONSE: 1) *<CR> (command received and executed OK)
                    ?<CR> (syntax or transmission error occurred)
                 2) XX<CR> (XX = input channel connected)

RU - read unit size
FORMAT: RU AA<CR>
                 RU = "read unit size" command followed by at least one space
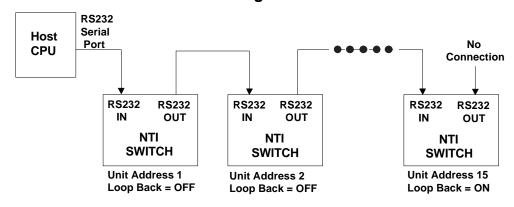   AA = unit address
RESPONSE: 1) *<CR> (command received and executed OK)
                    ?<CR> (syntax or transmission error occurred)
                 2)   XX,YY<CR> (XX = # of inputs, YY = # of outputs)

Fig 1

Host CPU	RS232 Serial Port			

RS232 IN   **RS232 OUT**
NTI SWITCH
Unit Address 1
Loop Back = OFF

RS232 IN   **RS232 OUT**
NTI SWITCH
Unit Address 2
Loop Back = OFF

No Connection

RS232 IN   **RS232 OUT**
NTI SWITCH
Unit Address 15
Loop Back = ON