

Seven Segment Tower System

Manual

PARKING

The Mall
at
Cedar Trace



LEVEL 1
HOURLY ONLY

FULL

LEVEL 2
HOURLY ONLY

354

LEVEL 3
DAY PARKING

OPEN

LEVEL 4
DAY PARKING

329

LEVEL 5
PERMIT PARKING

CLSD



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Six Level Unit



Five Level Unit

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Introduction

This protocol is designed for our standard seven segment LED display. Our protocol will handle simple protocol data transfer from an external data source. The configuration of our seven segment display allows for the display of a four-digit number (with or without colon) as well as "OPEN," "FULL," "CLSD," blank, and +/- temperature using the standard seven segment arrangement. Our display unit is set up for 9600, N, 8, 1 serial communication. In addition, each unit is field addressable for a total of 255 signs to be operated off of one system. Address 255 is reserved for a segment display test (for 3 and 4 digit signs), making addresses 0-254 available for data transfer. For 1 and 2 digit displays, address 0's reserved for the segment display test. Our control unit implements an error checking which will transmit an "ACK" or "NAK" code back to the control unit indicating whether or not the message had been correctly received.

Protocol Format

Each packet should follow the same format as below:
 SYN, SYN, STX, SA, CM, CD, XXXX, CS, ETX

Where:

SYN - Is sent in hex (\$16)

SYN - Is sent in hex (\$16)

STX - Is sent in hex (\$02)

SA - Is the Sign Address sent as a hex value

\$07 = sign #7

\$1E = sign #30

CM - Is the command sent as a HEX

\$00 - Display number (w/colon or decimal) \$04 - Display blank

\$01 - Display FULL

\$05 - Display positive temperature

\$02 - Display OPEN

\$06 - Display number (w/o colon)

\$03 - Display CLSD

\$07 - Display negative temperature

CD - \$00 - Disables checksum (for one-way communication)

\$01 - Enables Checksum

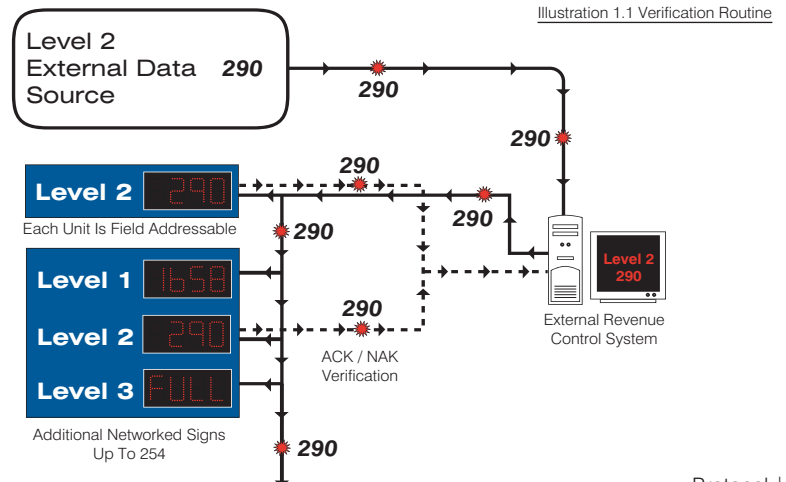
XXXX - Is the four digit number as ASCII (Note: preceding zeros must be present)

CS - Checksum is sent as a HEX (see checksum routine)

ETX - Is sent in hex as (\$03)

Numbers/Characters Available for Display	
Numbers:	0-9
Characters:	'O', 'P', 'E', 'N', 'C', 'L', 'S', 'D', 'F', 'U', '-', '@', '(space)'

*Note: The '@' character is used to represent the degree symbol displayed with a temperature



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Checksum Routine

The checksum routine uses the XOR command on all significant data to ensure data has not been corrupted. By using the following routine a checksum should be created and transmitted with the data being sent.

SYN, SYN, STX, SA, CM, CD, XXXX, CS, ETX

- Step 1: temp = SA XOR CM
- Step 2: temp = temp XOR CD
- Step 2: temp = temp XOR X(1)
- Step 3: temp = temp XOR X(2)
- Step 4: temp = temp XOR X(3)
- Step 5: CS = temp XOR X(4)

Attention: If two signs are on the same network with the same address, the checksum **MUST** be disabled in order to prevent a collision with the acknowledgements back to the controller.

The control module will repeat this calculation and the results will be checked. If and only if the results of the checksum match, and the sign address matches the field set address will the data be displayed.

Example:

For sign 1 to display 0017 with a checksum being used the packet would be:

Bytes that are included in checksum calculation

\$16, \$16, \$02, \$01, \$00, \$01, \$30, \$30, \$31, \$37, \$06 (Checksum Result), \$03

Verification Routine - ACK and NAK

Illustration 1.1 Verification Routine

The verification routines will send data back to the control unit in one of two formats.

If the data has been verified by the correct unit, that sign will transmit:

SYN, SYN, STX, ACK, ETX

Where:

- SYN** is sent as hex (\$16)
- STX** is sent as hex (\$02)
- ACK** is sent as hex (\$06)
- ETX** is sent as hex (\$03)

In the event the data has been corrupted, the addressed sign, and only the addressed sign will transmit the following:

SYN, SYN, STX, NAK, ETX

Where:

- SYN** is sent as hex (\$16)
- STX** is sent as hex (\$02)
- NAK** is sent as hex (\$15)
- ETX** is sent as hex (\$03)

Examples

If the following packets were sent out on a network of our signs with field addresses 01 – 100 you would expect these results:

PACKET:

\$16, \$16, \$02, \$11, \$00, \$01, 1234, \$14, \$03

RESULT:

Sign #17 would display “1234” and \$16, \$16, \$02, \$06, \$03 would be sent back by sign #17

PACKET:

\$16, \$16, \$02, \$11, \$01, \$01, 0000, \$10, \$03

RESULT:

Sign #17 would not change its display and \$16, \$16, \$02, \$15, \$03 would be sent back by sign #17 because the CS should have been \$11

PACKET:

\$16, \$16, \$02, \$14, \$01, \$01, 0000, \$14, \$03

RESULT:

Sign #20 would display “FULL” and \$16, \$16, \$02, \$06, \$03 would be sent back by sign #20

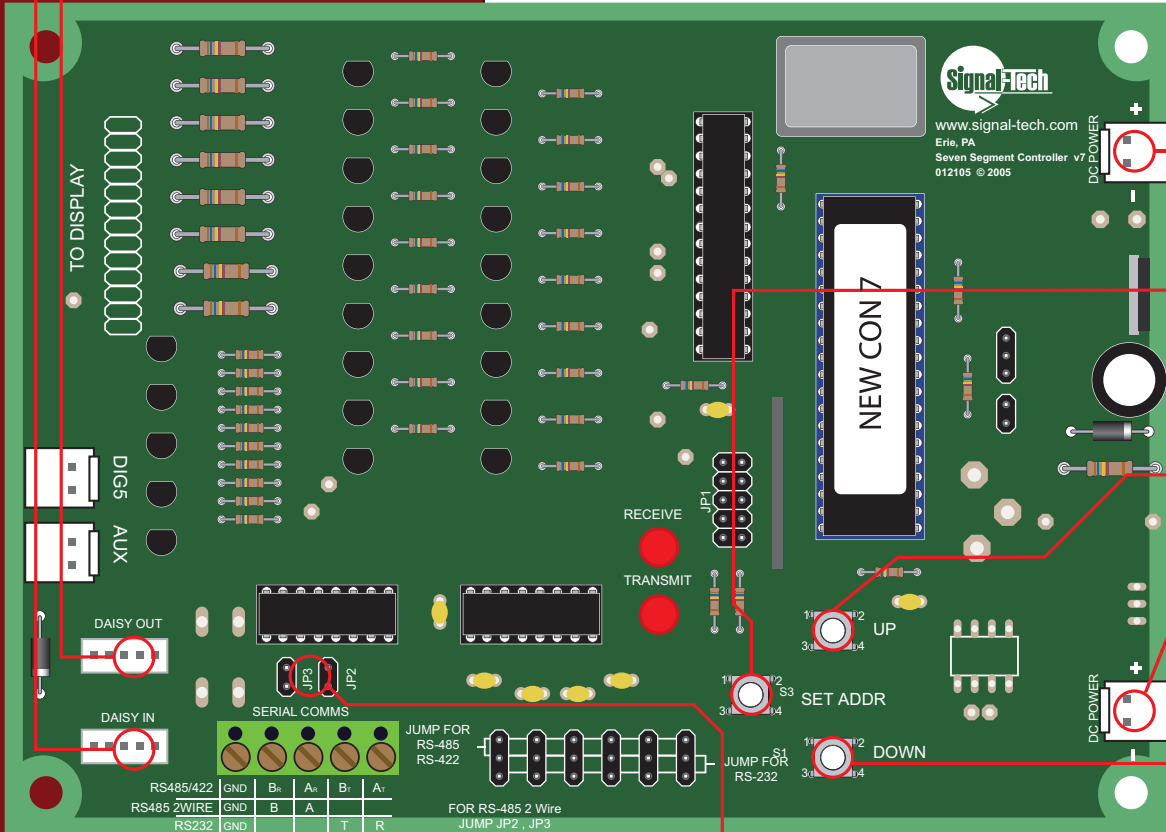
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Setting Sign Addresses

Each individual sign has three button switches on its circuit board that are used to assign it a unique address from 0000 to 0255 (255 is a reserved for 3 and 4 digit displays, 0 is reserved for 1 and 2 digit signs). To assign an address, press and hold the SET ADDRESS button; the current sign address will illuminate on the front of the sign. Simultaneously pressing and holding the SET ADDRESS button with either the UP or DOWN button will enable scrolling. To scroll forward through the sign addresses, press the SET ADDRESS button while pressing the UP button. Alternately, you can press the DOWN button to scroll backwards from 255. To complete the programming, release the SET ADDRESS button.

Daisy Chain Connection
Ports for connecting communications to multiple units.



Power Connector
Daisy chain to next display board controller.

Sign Address Set
Press and hold to place control board into Sign Address Set Mode.

Address Advance
Press to advance sign address. Address will be shown on seven segment board.

Power Connector
Incoming power connection from Gen III Power Supply.

Address Decrease
Press to decrease sign address. Address will be shown on seven segment board.

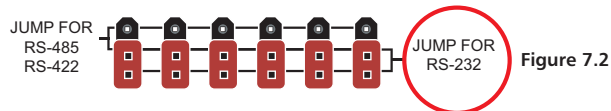
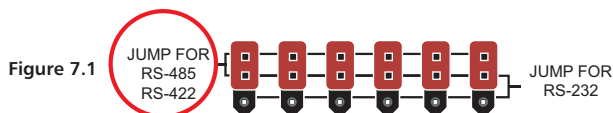
JP2 / JP3 2-Wire Pins
Shunt both JP2 and JP3 pins to work with 2-Wire RS-485.

Steps to Connect...

RS-485/422 4 Wire
Make appropriate connections at Serial Comms Port
A_T - A Transmit
B_T - B Transmit
A_R - A Receive
B_R - B Receive
G - Ground
Shunt the 6 upper pins as shown in figure 7.1

RS-485 2 Wire
Make appropriate connections at Serial Comms Port
A - A
B - B
G - Ground
Shunt JP2 and JP3 pins.
Shunt the 6 upper pins as shown in figure 7.1

RS-232 2 Wire
Make appropriate connections at Serial Comms Port
T - Transmit
R - Receive
G - Ground
Shunt the 6 lower pins as shown in figure 7.2

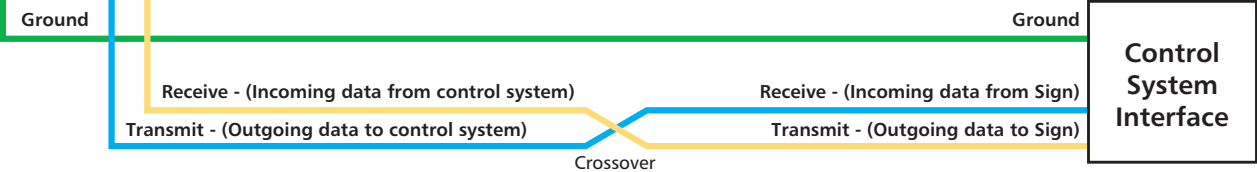
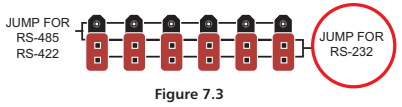
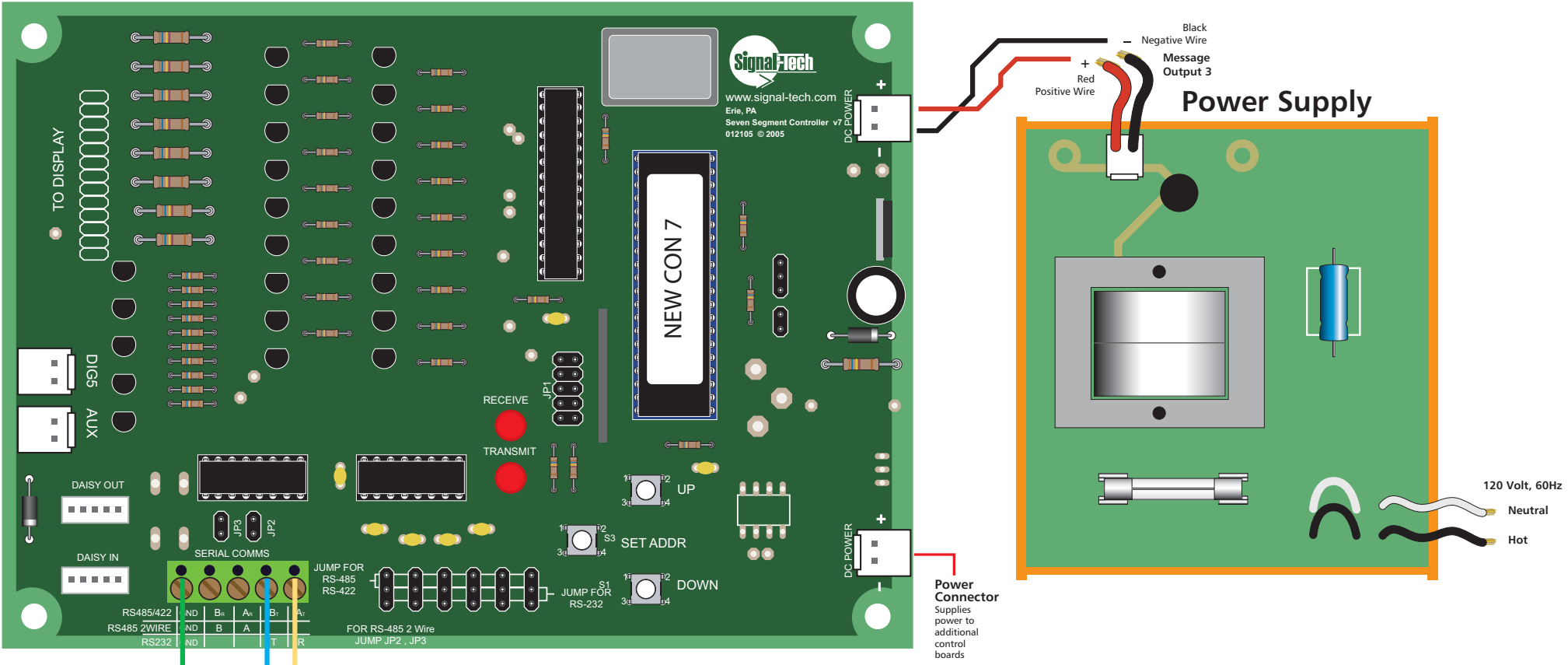


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Seven Segment Control Board

RS232 2-Wire Wiring Diagram

Control Board



Steps to Connect...

- RS-232 2-Wire**
 Make appropriate connections at Serial Comms Port
 T - Transmit
 R - Receive
 G - Ground
 Shunt the 6 pins as shown above in figure 7.3

Seven Segment Control Board

RS485 2-Wire Wiring Diagram

Control Board

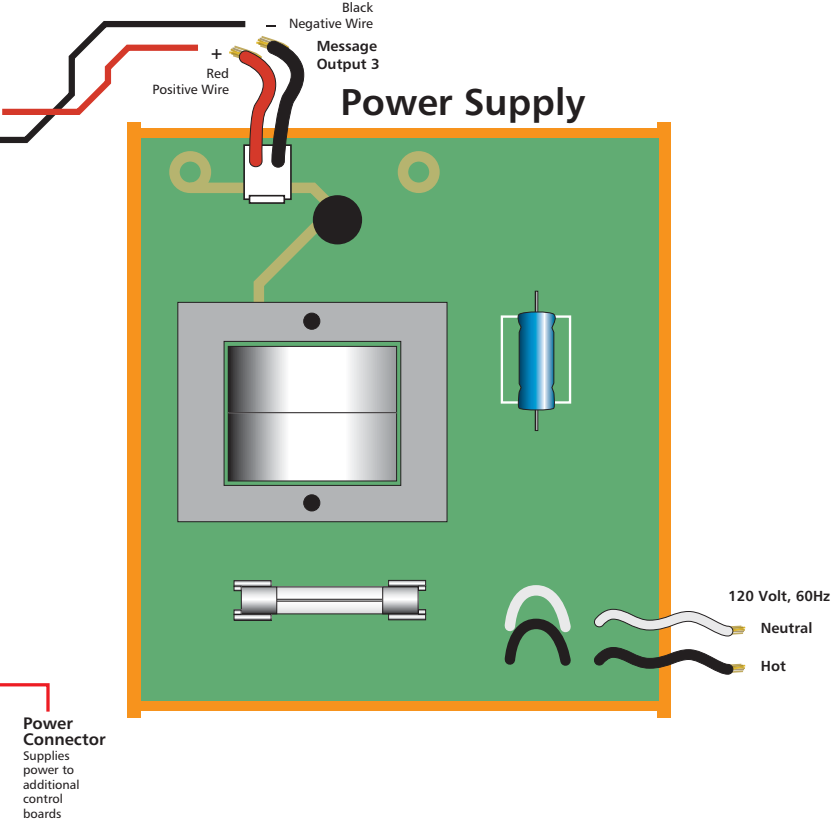
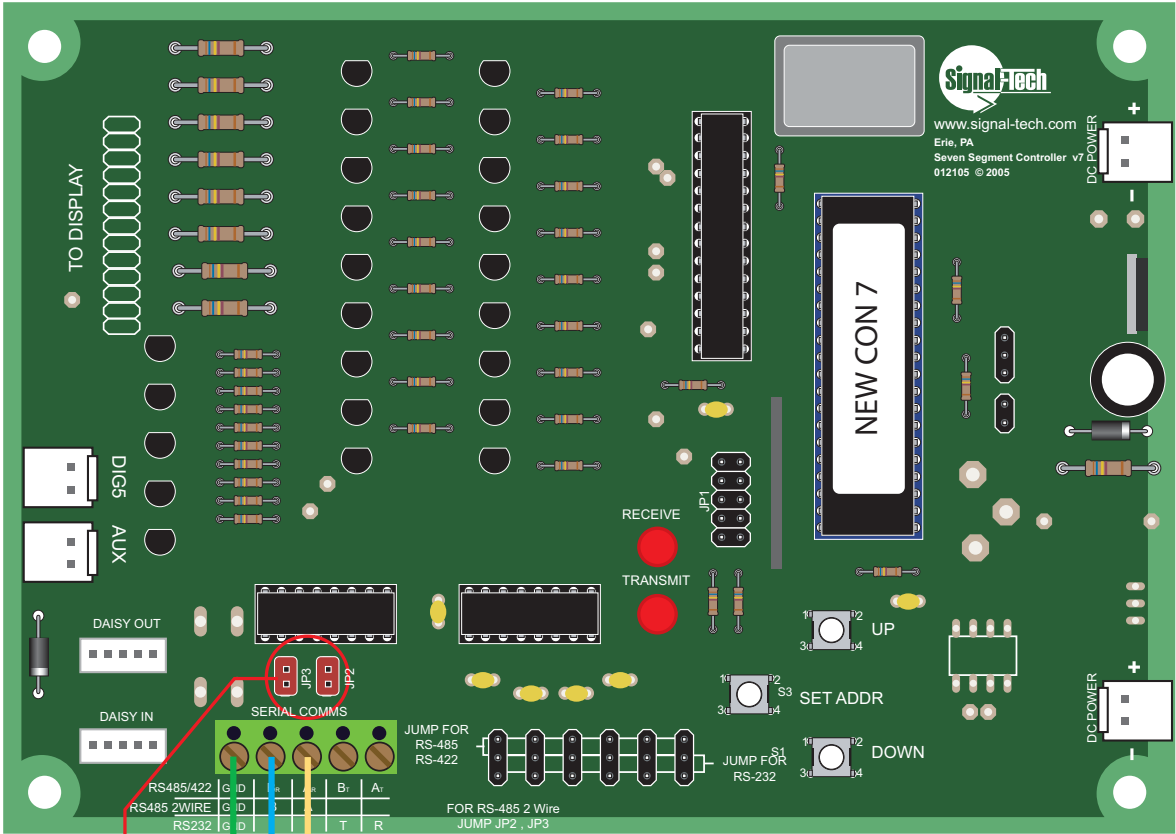


Figure 7.4

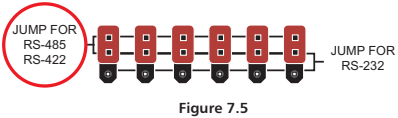
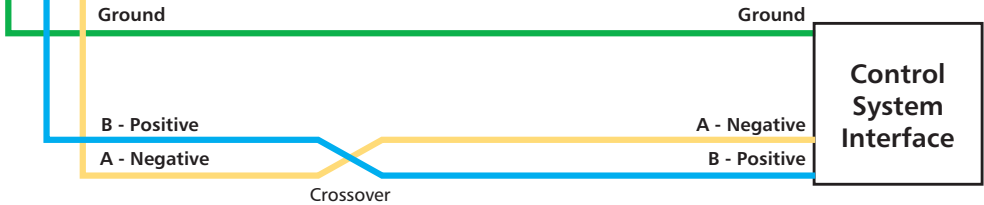


Figure 7.5



Steps to Connect...

- RS-485 2-Wire**
 Make appropriate connections at Serial Comms Port
 A - A (Negative)
 B - B (Positive)
 G - Ground
 Shunt the 6 pins as shown above in figure 7.5
 Shunt JP3 and JP2 pins as shown in figure 7.4



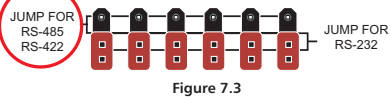
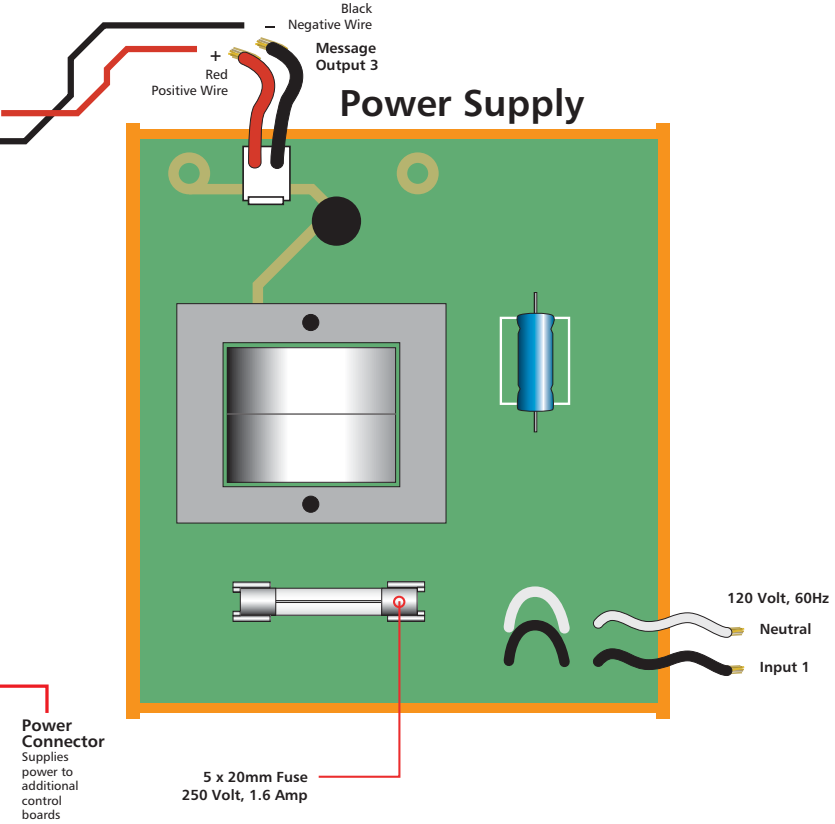
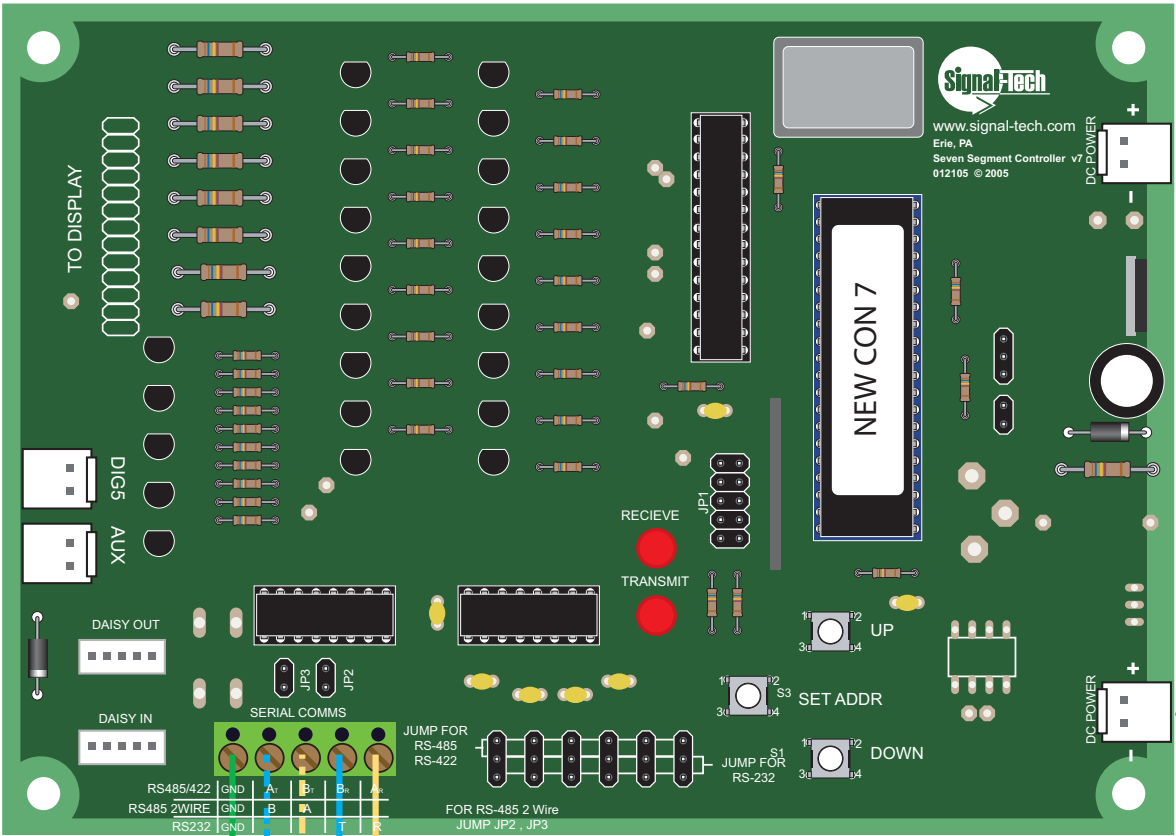
Seven Segment Control Board

RS485/422 4-Wire Wiring Diagram

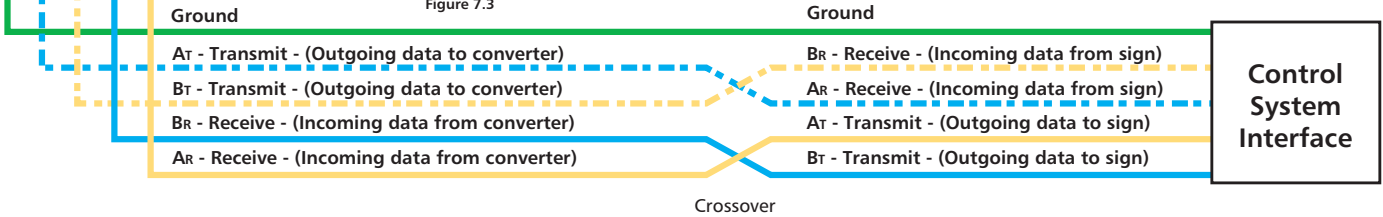
Rev 7

Control 03/03/09

Control Board



RS485/422 4-Wire Wiring Diagram



Steps to Connect...
RS-485 4 Wire
Make appropriate connections at Serial Comms Port
AT - A Transmit
BT - B Transmit
AR - A Receive
BR - B Receive
G - Ground
Shunt the 6 pins as shown above in figure 7.3.

Seven Segment Troubleshooting Guide

Nothing is displayed when the sign(s) is/are powered up

- Check voltage level at power inputs
- Make sure the chips are secure
- Try setting the address

Only dashes are displayed

- Make sure the chips are secure
- Make sure you are able to scroll through addresses by simultaneously pressing the SET ADDRESS button and the UP or DOWN button.

The display does not change when data is sent

- Check sign addresses, making sure they match the address sent in the data packet
- Recheck wiring diagram, making sure wiring corresponds with the communication protocol selected

(For 5 digit signs) The 5th digit is not displayed

- Make sure JST from the leftmost digit is connected to the 2-pronged connector on the control board labeled "DIG5"

Only one of the ### signs shows anything on the display

- Recheck all daisy chain and power connections (*see wiring diagram*)
- Check for matching sign addresses for signs on the same network (*if two signs are on the same network with the same address, the checksum MUST be disabled in order to prevent a collision with the acknowledgements back to the controller*)

One or more of the digits does not work

- Contact your sales representative for further assistance

**Any additional questions/concerns may be directed to your sales representative*

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