

Signal-Tech LED Count Display Protocol

Format Instructions

Modular 7 Segment

Version: V1 05/2018

The LED Count Display accepts data via an RS-485 2-wire network. The serial data shall be sent as: 9600bps, parity None, 8 data bits, 1 stop bit. The display is capable of displaying digits 0-9, a period, as well as a specific set of alphabetic characters.

Each display shall be assigned an address of 0-255. A response packet may optionally be requested when a display receives and processes a command. If this response packet is to be used by a control system for verification of data receipt, each display on the network segment must have a unique address. If no responses are required, then identical addresses may exist on a single network segment.

Standard Protocol Format (Four Digit Display)

Each data packet shall be formatted as follows:

SYN, SYN, STX, SA, CM, CD, X, X, X, X, CS, ETX (12 bytes)

SYN = 0x16 (Hex)

STX = 0x02 (Hex)

SA = Sign Address (Hex)

Example: 0x3C = Sign #60

CM = Command Mode (Hex)

0x00 = Display a number (deprecated)

0x03 = Display CLSd

0x01 = Display FULL

0x04 = Blank display

0x02 = Display OPEn

0x06 = Display a number

CD = Enable or disable response packet (Hex)

0x00 = Display will not send a response packet.

0x01 = Display will generate and send a response packet.

X = An ASCII character, used with Command Modes 0x00, and 0x06. Permissible characters are shown below. Number of digits connected to display in ASCII characters must always be sent, in order to maintain the correct packet length. If 5 digits are connected the packet length will be 13 (5 X's).

CS = Checksum (Hex). This is an XOR value of the data packet. Calculation of it is shown in pseudocode on Page 5 of this document.

ETX = 0x03 (Hex)

NOTE: If Command Types 0x01, 0x02, 0x03, or 0x04 are used, ASCII X bytes may be given any value by the system generating the packet. However, the values of the X bytes **must** still be included in the checksum calculation.

Characters Available for Display	
Digits:	0 - 9 (ASCII)
Characters:	Space, A, b, C, c, d, e, E, F, H, L, u, U, P, n, o, r

Other:

ASCII "N" or "n" (0x4E) will display a tall lowercase n

XOR Checksum Routine Pseudocode (X4 assumes 4 digits connected)

Packet structure: SYN, SYN, STX, SA, CM, CD, X1, X2, X3, X4, CS, ETX

```
temp_value = SA <XOR> CM
temp_value = temp_value <XOR> CD
temp_value = temp_value <XOR> X1
temp_value = temp_value <XOR> X2
temp_value = temp_value <XOR> X3
CS = temp_value <XOR> X4
```

The checksum must always be calculated and sent with a data packet, whether or not a response is requested. If a display receives a packet and the packet's checksum does not match the checksum value calculated by the display's processor, it will not update or change the characters being displayed. Only a properly formatted, addressed, and verified data packet will cause a display update.

If the data packet's CD byte indicates that a response is requested, the display to which the packet was addressed will generate one of two responses:

If the packet's checksum matches the calculated checksum:

SYN, SYN, STX, ACK, ETX

SYN = 0x16

STX = 0x02

ACK = 0x06

ETX = 0x03

(All values are hex.)

If the packet's checksum does NOT match the calculated checksum:

SYN, SYN, STX, NAK, ETX

SYN = 0x16

STX = 0x02

NAK = 0x15

ETX = 0x03

(All values are hex.)

Examples based off of 4 digit display

PACKET: 0x16, 0x16, 0x02, 0x3A, 0x06, 0x01, 0x00, 0x00, 0x32, 0x33, 0x3C, 0x03

RESULT: Sign #58 displays "23"

PACKET: 0x16, 0x16, 0x02, 0x19, 0x06, 0x01, 0x4F, 0x4F, 0x32, 0x33, 0x1F, 0x03

RESULT: Sign #25 displays "0023"

PACKET: 0x16, 0x16, 0x02, 0x01, 0x01, 0x01, 0x30, 0x31, 0x32, 0x33, 0x01, 0x03

RESULT: Sign #1 displays "FULL"

PACKET: 0x16, 0x16, 0x02, 0x0A, 0x03, 0x01, 0x30, 0x30, 0x30, 0x30, 0x08, 0x03

RESULT: Sign #10 displays "CLSD"