Audio. Control. Power.

TSL UMD Protocol

Introduction

The TSL protocols are widely implemented throughout the industry, especially for Multiviewer use.

There is no charge for the use of these protocols.

- UMD V3.1 is the TSL basic industry standard serial protocol.
- UMD V4.0 extends the basic V3.1 protocol to add full control of text and tally lamp colours.

These two protocols can also be implemented over UDP/IP where each UDP packet contains one serial data packet.

- UMD V5.0 is a new protocol, specifically aimed at multiviewer display devices, over Ethernet.

The following document describes these protocols.

Note these protocols are published without technical support; however In case of difficulty please email Support@TSLproducts.com

Protocol V3.1

1.0 Scope

This protocol sets out to define the method of communication between a TSL controller and peripheral devices on a multi-drop device bus.
The protocol described is for one way communication only. It details physical layer, link layer and message structure.

2.0 Electrical

RS 422/ RS 485
8 bit data
1 stop
even parity
38k4 baud

3.0 Dynamic UMD Protocol

| HEADER | CONTROL BYTE | DISPLAY DATA |

Header (1 byte) = Display address (0-126) + 80 hex (control byte and display data will be sent)

Control (1 byte)
bit 0 = tally 1 (1=on, 0=off)
bit 1 = tally 2 (1=on, 0=off)
bit 2 = tally 3 (1=on, 0=off)
bit 3 = tally 4 (1=on, 0=off)
bits 4-5 = brightness data

bit 4 = 0, bit 5 = 0 (0 brightness)
bit 4 = 0, bit 5 = 1 (1/7 brightness)
bit 4 = 1, bit 5 = 0 (1/2 brightness)
bit 4 = 1, bit 5 = 1 (full brightness)

bit 6 = reserved (clear to 0)
bit 7 = cleared to 0

Display Data (16 bytes) = 16 displayable ASCII characters in the range 20 hex to 7E hex. All 16 characters must be sent.

4.0 Single Dynamic Displays

For 8 character displays only the first 8 characters of the display data are used, the remaining 8 are needed just for padding.
Only tallies 1&2 are use for single displays.

5.0 Dual Dynamic Displays

Dual 8 character displays are treated as a single display of 16 characters, the first 8 characters for the left-hand side and the second 8 characters for the right-hand side.
Tallies 1&2 are for the left display and tallies 3&4 for the right display.

6.0 Triple/Quad Dynamic Displays

These units take two addresses.

Address 1, for display 1, tally 1 & 2
Address 1 for display 2, tally 3 & 4
Address 2 for display 3, tally 5 & 6
Address 2 for display 4, tally 7 & 8

Protocol V4.0

Summary of Enhancements

To support multiple tally channels, more tally control bits are added. Full compatibility with V3.1 (1994) is maintained. Future revisions provided for with version/byte count information.

V3.1 Header

The current format is retained up to and including the final character of the data field;

<0x80+addr><CTRL><DATA>

where CTRL is :
bit 7: 0
bit 6: 0 for display data, 1 for command data
bit 5: brightness MSB
bit 4: brightness LSB
bit 3: tally 3
bit 2: tally 2
bit 1: tally 1
bit 0: tally 0

and DATA is:

16 ASCI characters for messages with CTRL.6 = 0 (i.e. display data messages)
For CTRL.6=1, DATA is defined by the control code formed by CTRL5:0.

NB Version 4.0 enhancements only apply to display data messages; command messages are defined in a separate document.

V4.0 Enhancements

V4.0 and above messages are recognised as having further data following the last byte of <DATA>, as follows:

<0x80+addr><CTRL><DATA><CHKSUM><VBC><XDATA>

CHKSUM = (2's complement of (sum of all V3.1 bytes)) modulo 128
(i.e. hdr+CTRL+DATA)

VBC is:
Bit 7: 0
Bit 6-4: minor Version (V4.0 = 0)
Bit 3-0 Byte count of XDATA

<XDATA> is defined by minor Version number.

Currently the following is defined:-

Minor Version = 0 (i.e. V4.0)

XDATA consists of 2 bytes:
Xbyte 1 has 6 tally bits for Display L, Xbyte 2 has 6 tally bits for display R.

The 6 bits consist of 2 bits each for the LH tally, text, and RH tally as follows:

Bit 7 0
Bit 6 Reserved (ignore (RX) or set to 0 (TX))
Bit 5: LH MSB
Bit 4: LH LSB
Bit 3: Txt MSB
Bit 2: Txt LSB
Bit 1: RH MSB
Bit 0: RH LSB

2 Bit values are:

0 = OFF; 1 = RED, 2 = GREEN, 3 = AMBER.

The four original V3.1 tally bits (in the CTRL packet) are now separately mapped to the four parallel tally outputs from the display.

Protocol V5.0

Overview

This protocol is a new 16 bit UMD protocol, with no reverse compatibility to previous TSL UMD protocols.
The primary points for this protocol to provide over previous versions are as follows:

1. Display addressing up to 65,535 per screen
2. ASCII or Unicode character sets
3. Variable length mnemonics
4. IP based packet communication, with optional wrapper for stream based comms
5. Multiple display updates per packet

Physical Layer

Packets are sent via UDP. Maximum packet length is 2048 bytes.

Optionally, the protocol can operate over TCP/IP, or any other byte stream interface, with the following wrapper scheme:

DLE is defined as 0xFE
STX is defined as 0x02

Packet start is delimited by the sequence DLE/STX.
Any occurrence of the DLE character in the packet is byte stuffed to DLE/DLE.

Any byte count fields in the packet are not affected by the byte stuffing.

Message Format

16 bit values are sent as little-endian, i.e. LSB/MSB.

The packet is defined as follows:

PBC / VER / FLAGS / SCREEN / (<DMSG> (/ <DMSG>)…) or (SCONTROL)

PBC (16 bit):
Total byte count of following packet

VER (8 bit):
Minor version number (e.g. V5.00, VER = 0). Note this byte can be used as versioning control for the following definitions. Whilst any future changes to this protocol will aim to be backward compatible, this is not guaranteed.

FLAGS (8 bit):
Defined as follows:

Bit 0: Clear for ASCII based strings in packet, set for Unicode UTF-16LE
Bit 1: If set, data after SCREEN is screen control data (SCONTROL) – otherwise it's display message data (DMSG)
Bit 2-7: Reserved (clear to 0)

SCREEN (16 bit):

Primary index for use where each screen entity would have display indices (defined below) starting from 0.
Index 0xFFFF is reserved as a “Broadcast” to all screens.
If not used, set to 0.

Display Message (<DMSG>) Definition

This message definition is sent per display, and there can be several in a packet (up to max packet length). Constructed as follows:

INDEX / CONTROL / (LENGTH / TEXT) or (CONTROL DATA)

INDEX (16 bit):
The 0 based address of the display, up to 65534 (0xFFFE). Address 0xFFFF is reserved as a “Broadcast” address to all displays.

CONTROL (16 bit):
Display control and tally data as follows:

Bit 0-1:	RH Tally Lamp state
Bit 2-3:	Text Tally state
Bit 4-5:	LH Tally Lamp state
Bit 6-7:	Brightness value (range 0-3)
Bit 8-14:	Reserved (clear to 0)
Bit 15:	Control Data: following data to be interpreted as Control data rather than Display data when set to 1.

2 Bit Tally values are:
0 = OFF, 1 = RED, 2 = GREEN, 3 = AMBER.

Display Data: (CONTROL bit 15 is cleared to 0)

LENGTH (16 bit):
Byte count of following text.

TEXT:
UMD text, format defined by FLAGS byte.

Control Data: (CONTROL bit 15 is set to 1)

Not defined in this version of protocol.

Screen control (SCONTROL) Definition (FLAGS bit 1 is set to 1)

Not defined in this version of protocol.