

Titan Dot Matrix Display

(A05)

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Communications

Overview

Communication format is 38400, 8, N, 1 via RS232 or RS485. Ethernet is supported via the London Electronics Ethernet to Serial module.

Standard Message Format:

Start Character	(1 byte)
Message Type	(1 byte ASCII encoded)
Device Address	(1 byte ASCII encoded)
Command Code	(1 byte ASCII encoded)
Sub-command Code	(1 byte ASCII encoded)
Flags	(1 byte ASCII encoded)
Data	(0 to [MAX_DATA_LENGTH] bytes)
Checksum	(1 byte ASCII encoded)
End Character	(1 byte)

Start Character:

0x02

Message type:

0xF8 to 0xFF

The message type provides for multiple message formats. The value range is outside that of the panel meter device address range allowing meters and displays to co-exist on the same bus.

0xF8	Standard Message format (detailed above)
0xF9	Standard Message format (detailed above) but without the checksum field
0xFA	Reserved
0xFB	Reserved
0xFC	Response to F8 Message
0xFD	Response to F9 Message
0xFE	Reserved
0xFF	Reserved

Device Address:

0x00 to 0xF7

0x00 is the broadcast address. A response must not be requested unless it's guaranteed that there is only one device within the specified group.

Command Code:

0x00 to 0xF7

Sub-Command Code:

0x00 to 0xF7

Flags:

0x00 to 0xFF

For command messages:

Bit 0,	0 = Do not respond, 1 = Response required
Bit 1,	0 = Don't Beep, 1 = Beep when command completed
Bit 2,	
Bit 3,	
Bit 4,	
Bit 5,	
Bit 6,	
Bit 7,	

The beep will sound for all recognised messages including broadcast messages and those with parameter errors. The beep will not sound for messages with invalid command or invalid sub command code.

For response messages:

Bit 0,	0 = Command completed successfully, 1 = An error occurred
Bit 1,	
Bit 2,	
Bit 3,	
Bit 4,	
Bit 5,	
Bit 6,	
Bit 7,	1 = Port is locked and command was ignored. No data returned

If an error occurs, a 16-bit error code is returned in the data field

Data:

This field can be zero length depending on the command code.

Checksum:

Not yet implemented.

End Character:

0x03

Read Contact Closure States – Command 0x01

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Cmd: 0x01

Sub: 0x00 Read Contact 0, return 0 for open or 1 for closed
Sub: 0x01 Read Contact 1, return 0 for open or 1 for closed
Sub: 0x02 Read Contact 2, return 0 for open or 1 for closed
Sub: 0x03 Read Contact 3, return 0 for open or 1 for closed
Sub: 0x04 Read Contact 4, return 0 for open or 1 for closed
Sub: 0x05 Read Contact 5, return 0 for open or 1 for closed
Sub: 0x06 Read Contact 6, return 0 for open or 1 for closed
Sub: 0x07 Read Contact 7, return 0 for open or 1 for closed

Sub: 0x10 Read All Contacts as a byte value

Flags: 0x01

Sample Cmd: <STX> F9 01 01 10 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x01
Sub: 0xSS
Flags: 0x00

Data: ASCII encoded

Sample Resp: <STX> F9 01 01 10 00 XX <LRC> <ETX>

Read Display Bounds – Command 0x02

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Cmd: 0x02

Sub: 0x00 Read X, Y as 16 bit integer ASCII encoded
Sub: 0x01 Read X as 16 bit integer ASCII encoded
Sub: 0x02 Read Y as 16 bit integer ASCII encoded

Flags: 0x01

Sample Cmd: <STX> F9 01 02 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x02
Sub: 0xSS
Flags: 0x00

Data: ASCII encoded

Sample Resp: <STX> FD 01 02 00 00 XX XX YY YY <LRC> <ETX>

Read Switch Setting – Command 0x03

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x03
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 03 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x03
Sub: 0x00
Flags: 0x00
Data: 0x00 (1-Byte Switch Data ASCII encoded)

Sample Resp: <STX> FD 01 03 00 00 XX <LRC> <ETX>

Read Inventory – Command 0x04

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x04
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 04 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x03
Sub: 0x00
Flags: 0x00
Data: 0x00 (1-Byte EEP Installed ASCII encoded)
Data: 0x00 (1-Byte FRAM Installed ASCII encoded)
Data: 0x00 (1-Byte RTC Installed ASCII encoded)
Data: 0x00 (1-Byte Message Store Size ASCII encoded)

Sample Resp: <STX> FD 01 04 00 00 XX XX XX XX<LRC> <ETX>

Device Identity – Command 0x30

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x30
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 30 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x03
Sub: 0x00
Flags: 0x00

Data: XXXX

Sample Resp: <STX> FD 01 30 00 00 Titan Message Display, HW:xxxx, FW:yyyy <LRC>
<ETX>

Identify Comms Channel – Command 0x31

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x31
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 31 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x31
Sub: 0x00
Flags: 0x00
Data: 0x00 (1-Byte Comms Channel ASCII encoded)

Sample Resp: <STX> FD 01 31 00 00 XX <LRC> <ETX>

Read RS485 Comms Parameters – Command 0x42

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x42
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 42 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x42
Sub: 0x00
Flags: 0x00

Data: 0x00 (1-Byte Comms BaudID (ASCII encoded))
Data: 0x00 (1-Byte Comms Device Address (ASCII encoded))
Data: 0x00 (1-Byte Comms Start Character (ASCII encoded))
Data: 0x00 (1-Byte Comms End Character (ASCII encoded))
Data: 0x00 (1-Byte Comms Response Delay (ASCII encoded))

Sample Resp: <STX> FD 01 42 00 00 XX XX XX XX XX<LRC> <ETX>

Baud Rate IDs

```
#define SCI_300      0
#define SCI_600      1
#define SCI_1200     2
#define SCI_2400     3
#define SCI_4800     4
#define SCI_9600     5
#define SCI_19200    6
#define SCI_38400    7
```

Write RS485 Comms Parameters – Command 0x43

Command:

Message:	0xF8 / 0xF9
Device Address:	0x00 to 0xF7
Command:	0x43
Sub:	0x00
Flags:	0x01
Data:	0x00 (1-Byte Comms BaudID (ASCII encoded))
Data:	0x00 (1-Byte Comms Device Address (ASCII encoded))
Data:	0x00 (1-Byte Comms Start Character (ASCII encoded))
Data:	0x00 (1-Byte Comms End Character (ASCII encoded))
Data:	0x00 (1-Byte Comms Response Delay (ASCII encoded))

Sample Cmd: <STX> F9 01 43 00 01 XX XX XX XX XX<ETX>

Response:

Message Type:	0xFE/0xFF
Cmd:	0x43
Sub:	0x00
Flags:	0x00

Sample Resp: <STX> FD 01 43 00 00 <LRC> <ETX>

Notes:

The comms parameters are not committed to NV Storage automatically. Use the Write NVRAM command.

The communications interface will use the new parameters after the next reboot. This can be via a power cycle of the Reboot command.

Baud Rate IDs

#define SCI_300	0
#define SCI_600	1
#define SCI_1200	2
#define SCI_2400	3
#define SCI_4800	4
#define SCI_9600	5
#define SCI_19200	6
#define SCI_38400	7

Read RS232 Comms Parameters – Command 0x44

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x44
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 44 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x44
Sub: 0x00
Flags: 0x00

Data: 0x00 (1-Byte Comms BaudID (ASCII encoded))
Data: 0x00 (1-Byte Comms Device Address (ASCII encoded))
Data: 0x00 (1-Byte Comms Start Character (ASCII encoded))
Data: 0x00 (1-Byte Comms End Character (ASCII encoded))
Data: 0x00 (1-Byte Comms Response Delay (ASCII encoded))

Sample Resp: <STX> FD 01 44 00 00 XX XX XX XX XX<LRC> <ETX>

Baud Rate IDs

```
#define SCI_300      0
#define SCI_600      1
#define SCI_1200     2
#define SCI_2400     3
#define SCI_4800     4
#define SCI_9600     5
#define SCI_19200    6
#define SCI_38400    7
```

Write RS232 Comms Parameters – Command 0x45

Command:

Message:	0xF8 / 0xF9
Device Address:	0x00 to 0xF7
Command:	0x45
Sub:	0x00
Flags:	0x01
Data:	0x00 (1-Byte Comms BaudID (ASCII encoded))
Data:	0x00 (1-Byte Comms Device Address (ASCII encoded))
Data:	0x00 (1-Byte Comms Start Character (ASCII encoded))
Data:	0x00 (1-Byte Comms End Character (ASCII encoded))
Data:	0x00 (1-Byte Comms Response Delay (ASCII encoded))

Sample Cmd: <STX> F9 01 45 00 01 XX XX XX XX XX<ETX>

Response:

Message Type:	0xFE/0xFF
Cmd:	0x45
Sub:	0x00
Flags:	0x00

Sample Resp: <STX> FD 01 45 00 00 <LRC> <ETX>

Notes:

The comms parameters are not committed to NV Storage automatically. Use the Write NVRAM command.

The communications interface will use the new parameters after the next reboot. This can be via a power cycle of the Reboot command.

Baud Rate IDs

#define SCI_300	0
#define SCI_600	1
#define SCI_1200	2
#define SCI_2400	3
#define SCI_4800	4
#define SCI_9600	5
#define SCI_19200	6
#define SCI_38400	7

Reload NVRAM – Command 0x48

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x48
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 48 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x48
Sub: 0x00
Flags: 0x00

Sample Resp: <STX> FD 01 48 00 00 <LRC> <ETX>

Write NVRAM – Command 0x49

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x49
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 49 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x49
Sub: 0x00
Flags: 0x00

Sample Resp: <STX> FD 01 49 00 00 <LRC> <ETX>

Reboot Display – Command 0x4A

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x4A
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 4A 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x4A
Sub: 0x00
Flags: 0x00

Sample Resp: <STX> FD 01 4A 00 00 <LRC> <ETX>

Load Defaults – Command 0x4B

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x4B
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 31 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x4B
Sub: 0x00
Flags: 0x00

Sample Resp: <STX> FD 01 4B 00 00 <LRC> <ETX>

Clear Display – Command 0x60

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Command: 0x60
Sub: 0x00
Flags: 0x01

Sample Cmd: <STX> F9 01 60 00 01 <ETX>

Response:

Message Type: 0xFE/0xFF
Cmd: 0x03
Sub: 0x00
Flags: 0x00

Sample Resp: <STX> FD 01 60 00 00 <LRC> <ETX>

Delete a Stored Message – Command 0x65

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Cmd: 0x65
Sub: 0x00
Flags: 0x01

Slot: 01 to nn Message Store Location

Sample Cmd: <STX> F9 01 65 00 01 01 <ETX>

Sample Resp: <STX> FD 01 65 00 00 <LRC> <ETX>

Display Multiline Message – Command 0x99

Command:

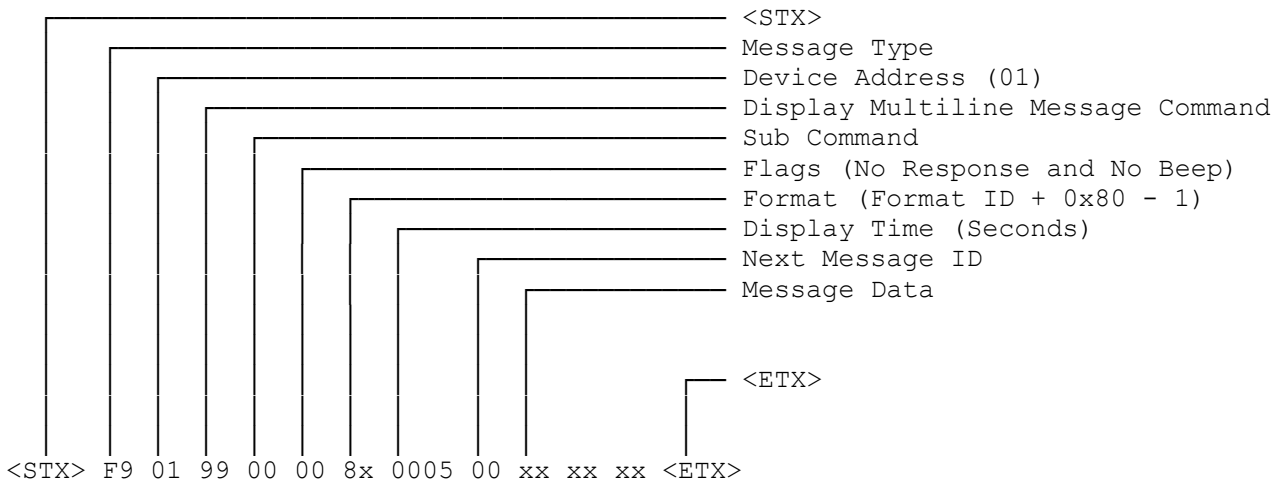
Message: 0xF8 / 0xF9
 Device Address: 0x00 to 0xF7
 Cmd: 0x99
 Sub: 0x00
 Flags: 0x01

 Format: 0x80 + 0 to 7 (depends on hardware installed) (ASCII encoded)
 Display Time: 0 to 65536 Seconds (ASCII encoded, big endian)
 Next Message ID: 0 to nn (ASCII encoded)

 Message: Message Data

Sample Cmd: <STX> F9 01 99 00 01 00 00 00 00 [Test Message] <ETX>

Sample Resp: <STX> FD 01 61 00 00 <LRC> <ETX>



Message Data:

<Justification><Mode>Message Data ~n (the new line codes are not required if)
 <Justification><Mode>Message Data ~n (the following lines are empty)
 <Justification><Mode>Message Data ~n
 <Justification><Mode>Message Data

// Newline codes

// ~n0x Newline justified left
 // ~n1x Newline centred
 // ~n2x Newline justified right
 // ~nx0 Newline rotate left
 // ~nx1 Newline fixed
 // ~nx2 Newline rotate right

Example Message Data:

11~c0Centred Red
 11~c1Centred Green
 11~c2Centred Yellow

 11~c0Centred Red Top Line~n11~c1Centred Green Bottom Line
 11~c0~f1Flashing On ~f0Flashing Off
 00Test Message Line 1 Rotating Left~n22Test Message Line 2 Rotating Right

Write Multiline Message to store – Command 0x9A

Command:

Message:	0xF8 / 0xF9
Device Address:	0x00 to 0xF7
Cmd:	0x9A
Sub:	0x00
Flags:	0x01
Slot:	0 to nn Message Store Location (ASCII encoded)
Format:	0x80 + 0 to 7 (depends on hardware installed) (ASCII encoded)
Display Time:	0 to 65536 Seconds (ASCII encoded, big endian)
Next Message ID:	0 to nn (ASCII encoded)
Message:	Message Data

Sample Cmd: <STX> F9 01 99 00 01 80 00 05 00 [Message Data] <ETX>

Sample Resp: <STX> FD 01 99 00 00 <LRC> <ETX>

Setting the Format value to zero will disable the saved message.

Message Data:

<Justification><Mode>Message Data ~n
<Justification><Mode>Message Data ~n
<Justification><Mode>Message Data ~n
<Justification><Mode>Message Data

e.g. 00Test Message Line 1 Rotating Left~n22Test Message Line 2 Rotating Right

// Newline codes

//	~n0x	Newline justified left
//	~n1x	Newline centred
//	~n2x	Newline justified right
//	~nx0	Newline rotate left
//	~nx1	Newline fixed
//	~nx2	Newline rotate right

Read a Stored Message – Command 0x9B

Command:

Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Cmd: 0x9B
Sub: 0x00
Flags: 0x01

Slot: 01 to nn Message Store Location (ASCII encoded)

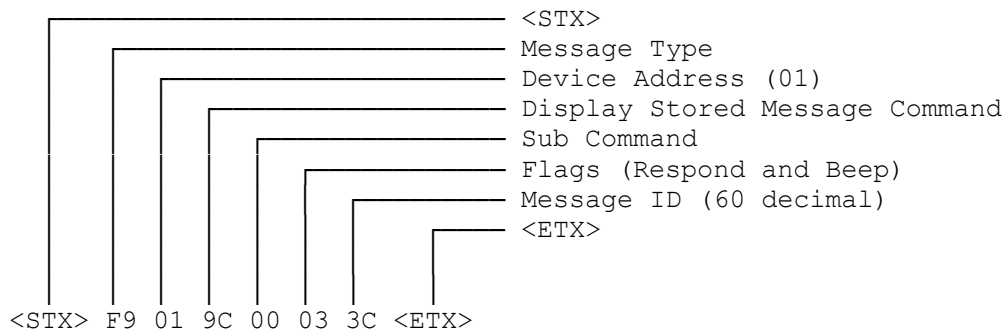
Sample Cmd: <STX> F9 01 9B 00 01 01 <ETX>

Sample Resp: <STX> FD 01 9B 00 00 [Message Data] <LRC> <ETX>

Display Stored Message – Command 0x9C

Command:
Message: 0xF8 / 0xF9
Device Address: 0x00 to 0xF7
Cmd: 0x9C
Sub: 0x00
Flags: 0x01

Slot: 01 to nn Message Store Location



The message ID is in hex.
0A will display message 10, 3C with display message 60.

Multiline Message format codes, escape codes and data format

Text Message Escape Codes

Colour change:

~c0 = Red
~c1 = Green
~c2 = Yellow

If SW1, 7 is ON the colour will be overridden to Yellow (Red + Red for DLV displays)

Flashing Characters:

~f0 = Flash Off
~f1 = Flash On

Symbols:

~s0 = Half-Space

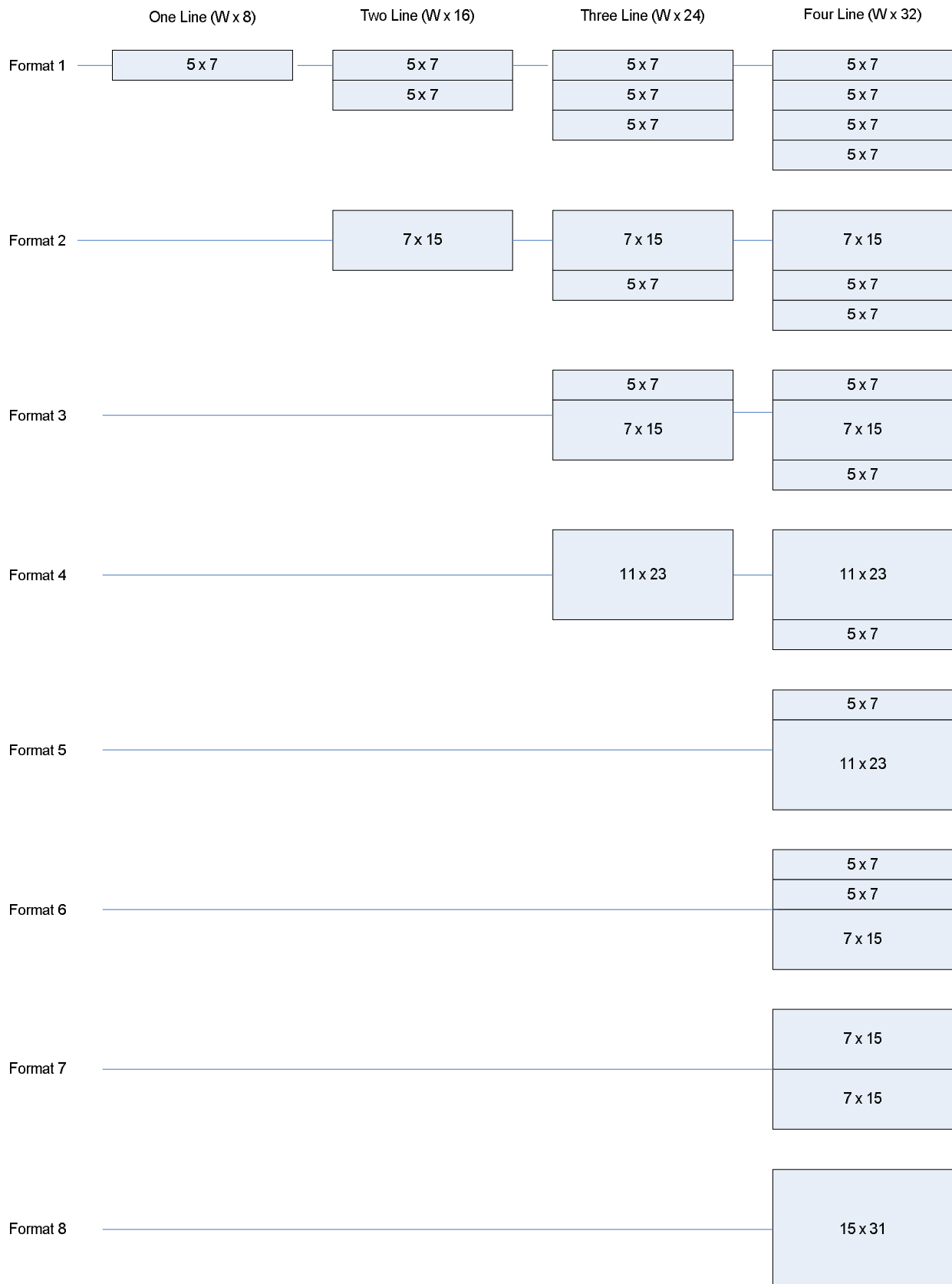
Tilde:

~~ = ~

```
// Newline codes
// ~n0x      Newline justified left
// ~n1x      Newline centred
// ~n2x      Newline justified right
// ~nx0      Newline rotate left
// ~nx1      Newline fixed
// ~nx2      Newline rotate right
```

Display Formats:

Display Formats vs Hardware



Note: Setting a format value of zero disables the message.

Error Codes

```
// Command Code Errors
#define MP_UNSUPPORTED_COMMAND          0x4000
#define MP_UNSUPPORTED_SUBCOMMAND      0x4002

// File System Errors
#define MP_MSG_WRITE_FAILED            0x5000
#define MP_INVALID_SLOT                0x5001
#define MP_NVRAM_WRITE_FAILED          0x5002
#define MP_NVRAM_READ_FAILED           0x5003

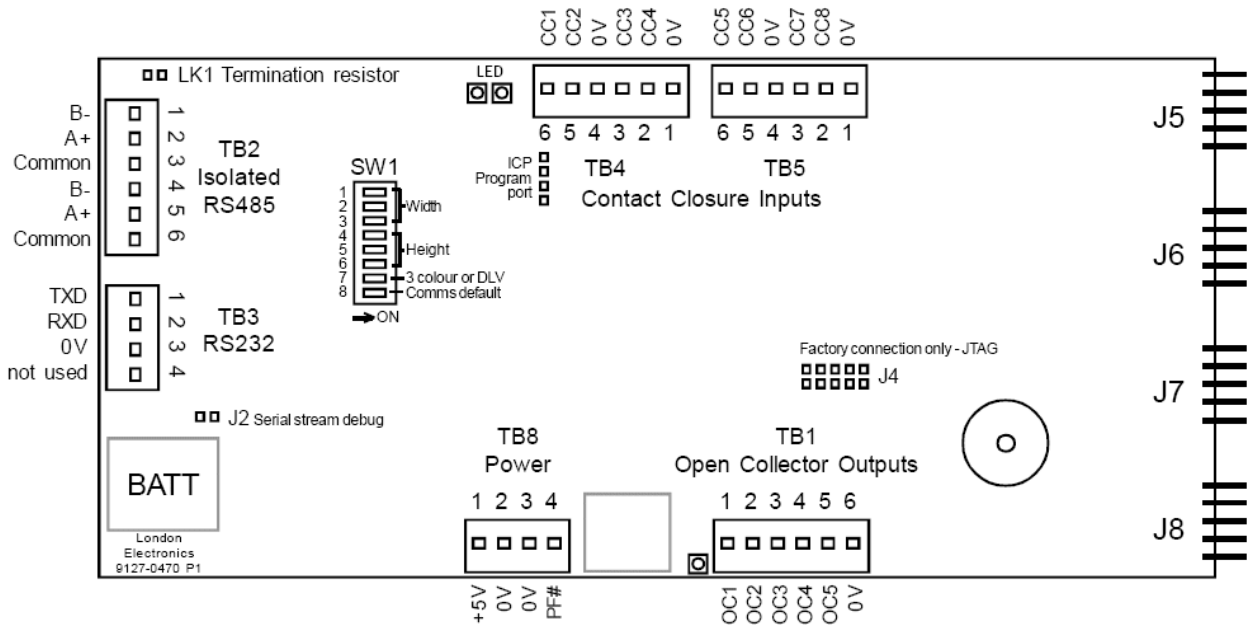
// Parameter Errors
#define MP_INVALID_PARAMETER            0x9000
#define MP_INVALID_LINE                 0x9001 (also invalid format)
#define MP_INVALID_FONT                 0x9002
#define MP_INVALID_MODE                 0x9003
#define MP_INVALID_J_HORIZ              0x9004
#define MP_MESSAGE_TOO_LONG            0x9005

// Other Errors
#define MP_PORT_LOCKED                  0xB000

#define MP_OTHER_ERROR                  0xFE00
```

Connections

Controller Board Diagram



Power

TB8 Pin 1	+5V
TB8 Pin 2	0V
TB8 Pin 3	0V
TB8 Pin 4	PF#

RS232 Interface

TB3 Pin 1	TX Output
TB3 Pin 2	RX Input
TB3 Pin 3	0V

RS485 Interface

TB2 Pin 1	B-
TB2 Pin 2	A+
TB2 Pin 3	COMMON
TB2 Pin 4	B-
TB2 Pin 5	A+
TB2 Pin 6	COMMON

Contact Closure Inputs

TB4 Pin 6	CC1
TB4 Pin 5	CC2
TB4 Pin 4	0V
TB4 Pin 3	CC3
TB4 Pin 2	CC4
TB4 Pin 1	0V

Open Collector Outputs

TB1 Pin 1	OC1
TB1 Pin 2	OC2
TB1 Pin 3	OC3
TB1 Pin 4	OC4
TB1 Pin 5	OC5
TB1 Pin 6	0V

TB5 Pin 6	CC5
TB5 Pin 5	CC6
TB5 Pin 4	0V
TB5 Pin 3	CC7
TB5 Pin 2	CC8
TB5 Pin 1	0V

Switch Settings

Display Size

Display Width

SW1,3	SW1,2	SW1,1	
OFF	OFF	OFF	32 pixels
OFF	OFF	ON	64 pixels
OFF	ON	OFF	96 pixels
OFF	ON	ON	128 pixels
ON	OFF	OFF	160 pixels
ON	OFF	ON	192 pixels
ON	ON	OFF	224 pixels
ON	ON	ON	256 pixels

Display Height

SW1,5	SW1,4	
OFF	OFF	8 pixels
OFF	ON	16 pixels
ON	OFF	24 pixels
ON	ON	32 pixels
OFF	OFF	Reserved
OFF	ON	Reserved
ON	OFF	Reserved
ON	ON	Reserved

Factory Test

SW1,6	
OFF	No function
ON	Reserves for factory test

Display Type

SW1,7	
OFF	Red/Green Tiles Fitted for Tri-colour display
ON	Red/Red Tile Fitted for Red DLV display (Forces all colours to yellow)

Communications Default

SW1,8	
OFF	Communications controlled by on-board configuration
ON	Communications forced to 38400, 8, N, 1 with Device Address = 0x01