

# Tx1000 RS232 Control Protocol.

Models covered

**Tx1000**  
**Tx1500 via RS232/B-BUS converter**

**Building Block Video Ltd.,**  
17 Apex Park  
Diplocks Industrial Estate,  
Hailsham, East Sussex, UK. BN27 3JU  
Tel: +44 (0)1323 842727  
Fax: +44 (0)1323 842728  
Support: +44 (0)1323 444600  
<http://www.bbvccv.com>

## Communications Protocol

Communications between the keypad and the base unit are RS232 8-data, no parity, 1 stop bit at a speed of 9600 baud. Character pacing of data to the base unit should be at least 20mS. Additionally, some commands require larger pacing delays, see further into document.

Direct cable links of up to 50 metres should function normally. Beyond this distance, any of the proprietary cable extenders may be used (e.g. DVST, modems, fibre optics, telephone/infrared/microwave links) without any difficulty. A BBV TxLD can be used to convert RS232 to RS485 allowing operation over upto 500M of twisted pair cable.

## CABLE CONNECTIONS

|                  |       |       |
|------------------|-------|-------|
| Ground           | Pin 5 | White |
| Data to keypad   | Pin 3 | Green |
| Data from keypad | Pin 2 | Blue  |
| Power (optional) | Pin 1 | Red   |

### Data sent

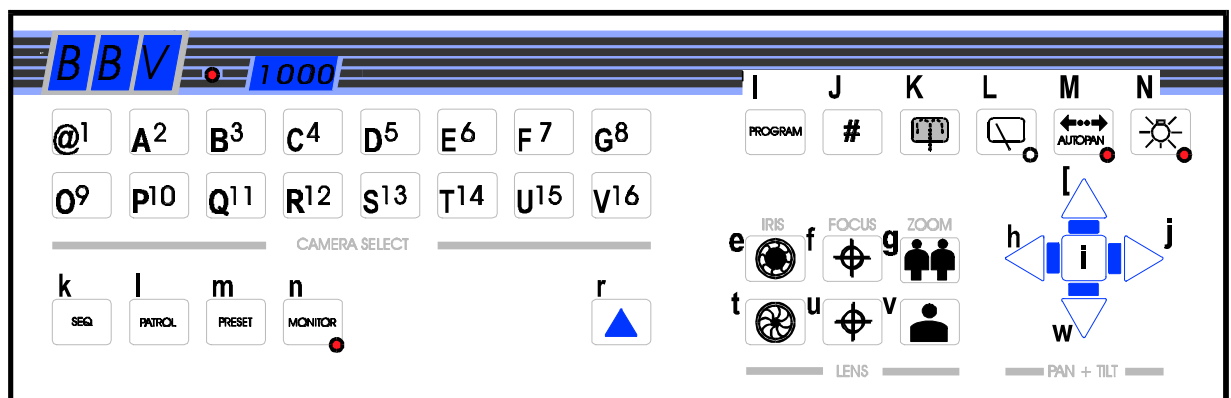
The keypad act as a dumb terminal, with all the intelligence contained within the main unit.

Each key press produces a single ascii code and the release of the key produces the same code with bit 7 set.

ie

|                |      |              |
|----------------|------|--------------|
| Cam 2 pressed  | 0x41 | = 'A'        |
| Cam 2 released | 0xc1 | = 'A' + 0x80 |

See the diagram below



Key to ASCII character mapping

## Extra commands to replace toggle keys

| Data Byte | Action                   |
|-----------|--------------------------|
| 0x78 'x'  | Turn lamps on            |
| 0x79 'y'  | Turn lamps off           |
| 0x7A 'z'  | Turn wipers on           |
| 0x7B '{'  | Turn wipers off          |
| 0x7C      | Select monitor channel 1 |
| 0x7D      | Select monitor channel 2 |
| 0x7E      | Spare                    |
| 0x7F      | spare                    |

## OUTPUT TO KEYPAD

The main unit output to the keypad is straight ascii, what you see on the screen is what you get, with the exception of the LED command bytes which are as follows

<ESC> <[> <L> <BYTE1> <BYTE2> Hex values: **0x1B, 0x5B, 0x4C, XX, YY**

BYTE1 bit 7 (0x80) = LIGHTS  
BYTE1 bit 6 (0x40) = AUTOPAN  
BYTE1 bit 5 (0x20) = WIPER  
BYTE2 bit 5 (0x20) = MONITOR

where bit = 1 led on  
bit = 0 led off

Examples:

LIGHTS and MONITOR leds ON remainder OFF

**0x1B, 0x5B, 0x4C, 0x80, 0x20**

LIGHTS and WIPER leds ON remainder OFF

**0x1B, 0x5B, 0x4C, 0xC0, 0x00**

List of Video commands for Keypad

|    |      |                                                   |
|----|------|---------------------------------------------------|
| ^M | 0x0d | Carriage return                                   |
| ^J | 0x0a | Line feed                                         |
| ^L | 0x0c | cursor right one space                            |
| ^H | 0x08 | cursor left one space to column 0                 |
| ^K | 0x0b | cursor up one line                                |
| ^G | 0x07 | Squeaky bell                                      |
| ^X | 0x18 | Erase to end of line , leave cursor in place **** |
| ^Z | 0x1a | Clear screen, leave cursor in place ****          |
| ^^ | 0x1e | Clear screen , Home cursor ****                   |
| ^B | 0x02 | No background                                     |
| ^A | 0x01 | Full background                                   |
| ^C | 0x03 | Fringe background                                 |
| ^[ | 0x1b | Escape routines                                   |

\*\*\*\* Character padding required is required with the following commands.

EOL 1ms approx 1 char

CLR 5ms approx 5 char

## Escape Commands

|         |       |                                                                                    |
|---------|-------|------------------------------------------------------------------------------------|
| ESC [ U |       | Restore cursor position                                                            |
| ESC [ X |       | Turn off display                                                                   |
| ESC [ Y |       | Turn on display                                                                    |
| ESC [ R |       | Reset keypad, all processing stops while reset!!                                   |
| ESC [ C | 0     | Set screen brightness                                                              |
|         | 1     |                                                                                    |
|         | 2     |                                                                                    |
|         | 3     |                                                                                    |
|         | 4     |                                                                                    |
|         | 5     |                                                                                    |
|         | 6     |                                                                                    |
|         | 7     |                                                                                    |
| ESC [ " | 0     | Set character size                                                                 |
|         | 1     |                                                                                    |
|         | 2     |                                                                                    |
|         | 3     |                                                                                    |
| ESC [ E | xx    | Set erase character(any ASCII character)                                           |
| ESC [ [ |       | Start of direct write feature, end with 0xff                                       |
| ESC [ H | xx xx | xy addressing, Coordinate system from 1,1 to 12,24                                 |
| ESC [ L | xx yy | Led data                                                                           |
| ESC [ S |       | Save current cursor position                                                       |
| ESC [ h | xx    | alter horizontal picture offset (0x00 - 0x1f) masked by and instruction            |
| ESC [ v | xx    | alter vertical picture offset (0x00 - 0x1f) masked by and instruction<br>"" to 'Z' |

KEY LAYOUT Including all unused missing keys – shown inverted!

|          |          |          |             |          |          |          |          |          |          |          |          |   |   |   |
|----------|----------|----------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|---|---|---|
| @        | A        | B        | C           | D        | E        | F        | G        | <b>H</b> | I        | J        | K        | L | M | N |
| O        | P        | Q        | R           | S        | T        | U        | V        | <b>W</b> | <b>X</b> | <b>Y</b> | <b>Z</b> |   | [ |   |
| <b>N</b> | <b>]</b> | <b>^</b> | <b>&lt;</b> | <b>-</b> | <b>a</b> | <b>b</b> | <b>c</b> | <b>d</b> | e        | f        | g        | h | i | j |
| k        | l        | m        | n           | <b>o</b> | <b>p</b> | <b>q</b> | r        | <b>s</b> | t        | u        | v        |   | w |   |

## Variable speed control

Basic control is as described in the earlier pages. Variable speed control is achieved by emulating keypress **left**, **right**, **up** and **down** followed by a speed value. Issue a key release to stop movement.

PAN speed values: 0x30 (slowest) - 0x3F (fastest)

TILT speed values: 0xB0 (slowest) - 0xBF (fastest)

examples:

pan left at maximum speed:

**0x68, 0x3F** ('h' pressed speed=0x3f)

to stop panning issue the following:

**0xE8** ('h' released)

pan right at slowest speed and tilt down at mid-speed:

**0x6A, 0x30, 0x77, 0xB7** ('j' pressed speed=0x30 'w' pressed speed=0xb7)

to stop tilting:

**0xF7** ('w' released)

then stop panning:

**0xEA** ('j' released)

If pan/tilt key press issued without specifying a speed, previous speed is used.

## Control of multiple Tx1000 base units using a BBV EX-4/EX-8 keyboard expander.

Up to 64 or 128 cameras can be controlled with the use of an EX-4/EX-8 keyboard expander. The EX-4/EX-8 functions as a serial data/video switch allowing a single RS232 port to control up to four/eight base units.

The following keystrokes allow selection of a base unit.

Press '#', Press 'Cam 1-8', Release 'Cam 1-8', Release '#'.

RS232 string to achieve the above.

**0x4A, 0x40, 0xc0, 0xCA** Selects base unit 1.

Example:

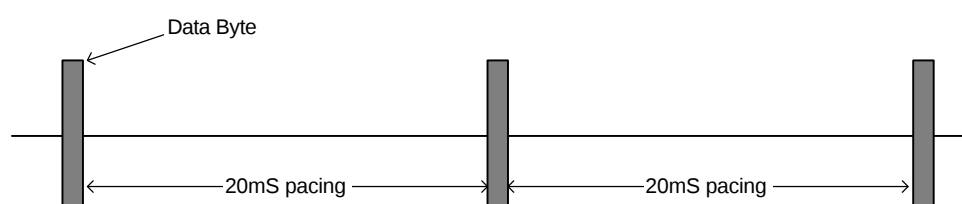
Assuming that four base units are in use to control 64 cameras, to select camera 19 which is camera 3 of base unit 2, the following command sequence is used.

**0x4A, 0x41, 0xc1, 0xCA, 0x42** Select base unit 2 followed by camera 3.

*Note: The character pacing should be at least 20mS.*

*Following a Program key press, a longer delay should be provided to allow menu text to be displayed.*

RS232 Data showing character pacing



## Example commands

| Command            | Bytes 0x = hex value (20mS between bytes unless specified) |
|--------------------|------------------------------------------------------------|
| Select Camera 1    | 0x40, 0xC0                                                 |
| Select Camera 2    | 0x41, 0xC1                                                 |
| Select Camera 3    | 0x42, 0xC2                                                 |
| Select Camera 4    | 0x43, 0xC3                                                 |
| Select Camera 5    | 0x44, 0xC4                                                 |
| Select Camera 6    | 0x45, 0xC5                                                 |
| Select Camera 7    | 0x46, 0xC6                                                 |
| Select Camera 8    | 0x47, 0xC7                                                 |
| Select Camera 9    | 0x4F, 0xCF                                                 |
| Select Camera 10   | 0x50, 0xD0                                                 |
| Select Camera 11   | 0x51, 0xD1                                                 |
| Select Camera 12   | 0x52, 0xD2                                                 |
| Select Camera 13   | 0x53, 0xD3                                                 |
| Select Camera 14   | 0x54, 0xD4                                                 |
| Select Camera 15   | 0x55, 0xD5                                                 |
| Select Camera 16   | 0x56, 0xD6                                                 |
|                    |                                                            |
| Pan Left           | 0x68, (SPEED 0x30 - 0x3f, 0x30 = slowest)                  |
| Stop Left          | 0xE8, 0x30                                                 |
| Pan Right          | 0x6A, (SPEED 0x30 - 0x3f, 0x30 = slowest)                  |
| Stop Right         | 0xEA, 0x30                                                 |
| Tilt Up            | 0x5B, (SPEED 0xB0 - 0xBF, 0xB0 = slowest)                  |
| Stop Up            | 0xDB, 0xB0                                                 |
| Tilt Down          | 0x77, (SPEED 0xB0 - 0xBF, 0xB0 = slowest)                  |
| Stop Down          | 0xF7, 0xB0                                                 |
|                    |                                                            |
| Zoom In            | 0x76                                                       |
| Stop Zoom In       | 0xF6                                                       |
| Zoom Out           | 0x67                                                       |
| Stop Zoom Out      | 0xE7                                                       |
| Focus Near         | 0x66                                                       |
| Stop Focus Near    | 0xE6                                                       |
| Focus Far          | 0x75                                                       |
| Stop Focus Far     | 0xF5                                                       |
| Iris Open          | 0x65                                                       |
| Stop Iris Open     | 0xE5                                                       |
| Iris Close         | 0x74                                                       |
| Stop Iris Close    | 0xF4                                                       |
|                    |                                                            |
| Wash On            | 0x4B                                                       |
| Wash Off           | 0xCB                                                       |
| Wipe On            | 0x7A                                                       |
| Wipe Off           | 0x7B                                                       |
| AutoPan On         | 0x4D                                                       |
| AutoPan Off        | A SHORT PAN RIGHT OR LEFT COMMAND (Example 0x6A, 0xEA)     |
| Lights On          | 0x78                                                       |
| Lights Off         | 0x79                                                       |
|                    |                                                            |
| Triangle relay on  | 0x72                                                       |
| Triangle relay off | 0xF2                                                       |
|                    |                                                            |
| Select Monitor 1   | 0x7C                                                       |
| Select Monitor 2   | 0x7D                                                       |

|                       |                                                     |
|-----------------------|-----------------------------------------------------|
| Goto preset 1         | 0x6D, 0x40, 0xC0, 0xED                              |
| Goto preset 2         | 0x6D, 0x41, 0xC1, 0xED                              |
| Goto preset 3         | 0x6D, 0x42, 0xC2, 0xED                              |
| Goto preset 4         | 0x6D, 0x43, 0xC3, 0xED                              |
| Goto preset 5         | 0x6D, 0x44, 0xC4, 0xED                              |
| Goto preset 6         | 0x6D, 0x45, 0xC5, 0xED                              |
| Goto preset 7         | 0x6D, 0x46, 0xC6, 0xED                              |
| Goto preset 8         | 0x6D, 0x47, 0xC7, 0xED                              |
| Goto preset 9         | 0x6D, 0x4F, 0xCF, 0xED                              |
| Goto preset 10        | 0x6D, 0x50, 0xD0, 0xED                              |
| Goto preset 11        | 0x6D, 0x51, 0xD1, 0xED                              |
| Goto preset 12        | 0x6D, 0x52, 0xD2, 0xED                              |
| Goto preset 13        | 0x6D, 0x53, 0xD3, 0xED                              |
| Goto preset 14        | 0x6D, 0x54, 0xD4, 0xED                              |
| Goto preset 15        | 0x6D, 0x55, 0xD5, 0xED                              |
| Goto preset 16        | 0x6D, 0x56, 0xD6, 0xED                              |
|                       |                                                     |
| Save preset 1         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x40, 0xC0   |
| Save preset 2         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x41, 0xC1   |
| Save preset 3         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x42, 0xC2   |
| Save preset 4         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x43, 0xC3   |
| Save preset 5         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x44, 0xC4   |
| Save preset 6         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x45, 0xC5   |
| Save preset 7         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x46, 0xC6   |
| Save preset 8         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x47, 0xC7   |
| Save preset 9         | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x4F, 0xCF   |
| Save preset 10        | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x50, 0xD0   |
| Save preset 11        | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x51, 0xD1   |
| Save preset 12        | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x52, 0xD2   |
| Save preset 13        | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x53, 0xD3   |
| Save preset 14        | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x54, 0xD4   |
| Save preset 15        | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x55, 0xD5   |
| Save preset 16        | 0x49, 0xC9, (150mS delay), 0x40, 0xC0, 0x56, 0xD6   |
|                       |                                                     |
| Start Patrol 1        | 0x6C, 0x40, 0xC0, 0xEC                              |
| Start Patrol 2        | 0x6C, 0x41, 0xC1, 0xEC                              |
| Stop Patrol           | ANY SHORT PAN/TILT COMMAND (Example 0x6A, 0xEA)     |
|                       |                                                     |
| Start Sequence        | 0x6B, 0xEB                                          |
| Stop Sequence         | ANY CAMERA SELECTION (Example 0x40, 0xC0)           |
|                       |                                                     |
| Function 1 (#WASH)    | 0x4A, 0x4B, 0xCB, 0xCA (dome menu etc)              |
| Function 2 (#WIPE)    | 0x4A, 0x4C, 0xCC, 0xCA (dome menu etc)              |
| Function 3 (#AP)      | 0x4A, 0x4D, 0xCD, 0xCA (dome menu etc)              |
| Function 4 (#LIGHTS)  | 0x4A, 0x4E, 0xCE, 0xCA (dome menu etc)              |
|                       |                                                     |
| Select Unit 1 (EX4/8) | 0x4A, 0x40, 0xC0, 0xCA (routes data to Tx1000 No 1) |
| Select Unit 2 (EX4/8) | 0x4A, 0x41, 0xC1, 0xCA (routes data to Tx1000 No 2) |
| Select Unit 3 (EX4/8) | 0x4A, 0x42, 0xC2, 0xCA (routes data to Tx1000 No 3) |
| Select Unit 4 (EX4/8) | 0x4A, 0x43, 0xC3, 0xCA (routes data to Tx1000 No 4) |
| Select Unit 5 (EX8)   | 0x4A, 0x44, 0xC4, 0xCA (routes data to Tx1000 No 5) |
| Select Unit 6 (EX8)   | 0x4A, 0x45, 0xC5, 0xCA (routes data to Tx1000 No 6) |
| Select Unit 7 (EX8)   | 0x4A, 0x46, 0xC6, 0xCA (routes data to Tx1000 No 7) |
| Select Unit 8 (EX8)   | 0x4A, 0x47, 0xC7, 0xCA (routes data to Tx1000 No 8) |

Examples of camera selection when using multiple Tx1000 units or Tx1500 matrix.

|                  |                                    |
|------------------|------------------------------------|
| Select Camera 1  | 0x4A, 0x40, 0xC0, 0xCA, 0x40, 0xC0 |
| Select Camera 16 | 0x4A, 0x40, 0xC0, 0xCA, 0x56, 0xD6 |
| Select Camera 17 | 0x4A, 0x41, 0xC1, 0xCA, 0x40, 0xC0 |
| Select Camera 32 | 0x4A, 0x41, 0xC1, 0xCA, 0x56, 0xD6 |
| Select Camera 33 | 0x4A, 0x42, 0xC2, 0xCA, 0x40, 0xC0 |
| Select Camera 48 | 0x4A, 0x42, 0xC2, 0xCA, 0x56, 0xD6 |
| Select Camera 49 | 0x4A, 0x43, 0xC3, 0xCA, 0x40, 0xC0 |
| Select Camera 64 | 0x4A, 0x43, 0xC3, 0xCA, 0x56, 0xD6 |

#### Version History

1.8 1 Aug 2002

Added timing diagram showing 20mS character pacing

1.7 30 July 2002

Corrected the following incorrect command strings

FOCUS FAR PRESSED was 0x77 now 0x75

FOCUS FAR RELEASED was 0xF7 now 0xF5

IRIS CLOSE PRESSED was 0x76 now 0x74

IRIS CLOSE RELEASED was 0xF6 now 0xF4

START PATROL 1 was 0x6C, 0xEC, 0x40, 0xC0 now 0x6C, 0x40, 0xC0, 0xEC

START PATROL 2 was 0x6C, 0xEC, 0x41, 0xC1 now 0x6C, 0x41, 0xC1, 0xEC

Added support for Tx1500 64 camera matrix. The Tx1500 uses the BBUS 4 wire RS485, polled control protocol. A separate RS232 – BBUS converter is used to allow remote control using the existing Tx1000 control protocol.