# ENGINEERING CHANGE ORDER

| Number 03- | |
|---|---|
| Project Engineer: Stephen L. Robinson | Cross Ref. Doc. Type & Number: None |
| Change Requested By: Stephen L. Robinson | Page 1 of 1 |

Description of Change

Release of technical documentation for archive:

Dedicated Micros Protocol, Mosaic Technology, May 20, 1997

Reason for Change None

**Scope of Change**

- ☐ Changes Form, Fit, or Function
- ☐ Other performance enhancement
- ☒ Internal

**Type of Change**

- ☐ New Product
- ☐ Error
- ☐ Design Improvement
- ☒ Additional Info
- ☐ Cost Reduction
- ☐ Conform to Present Practices

**Material Disposition**

- ☒ None
- ☐ Scrap
- ☐ Rework
  - ☐ Finished Goods
  - ☐ Work In Progress
  - ☐ Stock
- ☐ Running Change

**Documentation Affected**

Product Model Number: None

| Drawing Number | Old Rev | New Rev |
|---|---|---|
| None | | |
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| Approvals | Engineering Signature | | Date |
|---|---|---|---|
| | Materials Signature | | Date |
| Cost Impact | 0 | New Comp. Cost | 0 |
| Obsol. Impact | 0 | New Comp. Lead Time | 0 |

Manager's Initials in Appropriate Box

☐ EWS ☐ Hot ☒ Normal

| Required Tasks (use attachments if necessary) | Initials | Date |
|---|---|---|
| Manufacturing<br>None | | |
| Production<br>None | | |
| Materials<br>None | | |
| Stock Room<br>None | | |
| Sales / Marketing<br>None | | |
| Repair<br>None | | |
| Quality Assurance<br>None | | |
| Other<br>None | | |

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# FACSIMILE COVER SHEET

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# Telemetry Support
# Technical Information

MOSAIC Technology

## 1. Contents

## 2. Introduction

This document describes the software implementation of the DML-PLCOA which provides up the coax telemetry control of Pelco and BBV protocol compatible telemetry heads from VITAA SPCND or SUCNA backboards

It has been agreed that the nominal performance of the system will support cameras connected to the system with up to 300M of RG59 coax. The laboratory test for compliance will be 400M in 2 segments coupled with a non-approved, non coaxial connector to simulate 'worst case' installation practice.

The system will support both BBV and Pelco compatible telemetry selectable on a camera by camera basis along with selection of PAL/NTSC.

## 3. Pelco Protocol

### 3.1 Transmission Line Coding

The transmitted telemetry information is coded as two 16 bit words transmitted on two sequential lines. The voltages transmitted for the high and low states into a 75R locally terminated load is:

Logic High: 525mV above black level.

Logic Low: Black Level.

The transmission lines are:

PAL: lines 14,15.

NTSC: lines 14,15.

Transmission commences 5 uS from the falling edge of Line Sync.

### 3.2 Bit Coding

The individual bits are coded as :

Logic 1: 2uS high followed by 2uS low.

Logic 0: 1uS high followed by 2uS low.

Theoretically it would be possible to code a sequence using 0xFFFF which would be 64uS long. In practice the frame coding is designed to prevent this happening.

## 3.3 Data Frames

The data frames consists of two words. There are two formats depending upon the state of the LS bit of word 0. When this bit is 0 the standard PTZ commands are interpreted, when this bit is 1 the extended command set is interpreted.

Word 0 (PTZ)

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
|---|---|---|---|---|---|---|---|
| See bits 11 and 12 | | | 0:No Action<br>B15=0 and 1: Manual Scan<br>B15=1 and 1: Auto Scan | 0: No Action<br>B15=0 and 1: Camera On<br>B15=1 and 1: Camera Off | 0: No Action<br>1: Iris Close | 0: No Action<br>1: Iris Open | 0: No Action<br>1: Focus Near |

Word 0 (PTZ)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| 0: No Action<br>1: Focus Far | 0: No Action<br>1: Zoom Wide | 0: No Action<br>1: Zoom Tele | 0: No Action<br>1: Tilt Down | 0: No Action<br>1: Tilt Up | 0: No Action<br>1: Pan Left | 0: No Action<br>1: Pan Right | 0: PTZ<br>n/a |

Word 1 (PTZ)

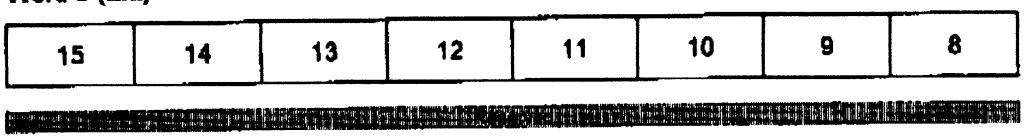
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
|---|---|---|---|---|---|---|---|
| 0 - 0x3F for normal Pan<br>0xFF for Pan Turbo | | | | | | | |

Word 1 (PTZ)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| 0 - 0x3F for Tilt Speed | | | | | | | |

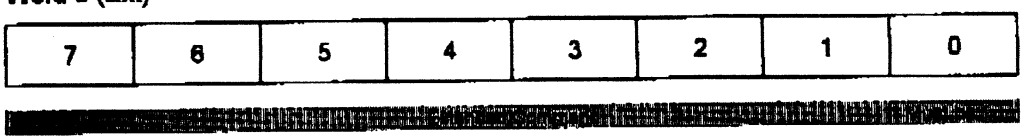
## Extended Command Set

### Word 0 (Ext)



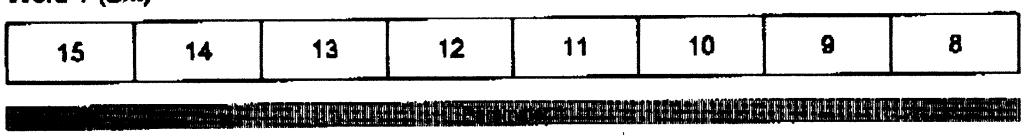

0: Default

### Word 0 (Ext)



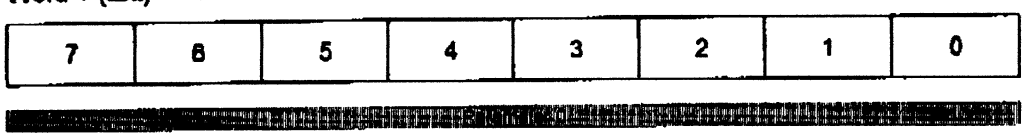

See Table Below

### Word 1 (Ext)




See Table

### Word 1 (Ext)




See Table

## 3.4 Extended Command Table

This table shows the function codes provided to the telemetry head using the extended command set.

| Ext Cmd | Hex Byte Value | Operation | Prm 0 | Prm 1 | Supp-orted |
|---|---|---|---|---|---|
| 0x01 | 0x03 | Store (set) Preset *nn* | *nn* = 1 - 32 | - | Y |
| 0x02 | 0x05 | Clear Preset *nn* | *nn* = 1 - 32 | - | Y |
| 0x03 | 0x07 | Goto Preset *nn*<br>nn=33 causes a 180 FLIP..<br>nn=34 causes head to assume factory determined zero reference point | *nn* = 1 - 34 | - | Y |
| 0x04 | 0x09 | Set Aux *n* | *n* = 1 - 8 | - | Y |
| 0x05 | 0x0b | Clear Aux *n* | *n* = 1 - 8 | - | Y |
| 0x06 | 0x0d | Reserved | - | - | n/a |
| 0x07 | 0x0f | Remote Reset | - | - | Y |
| 0x08 | 0x11 | Program Zone *n* End Point | *n* = 1 - 8 | - | N |
| 0x09 | 0x13 | Program Zone *n* End Point | *n* = 1 - 8 | - | N |
| 0x0A | 0x15 | Write Character *nn* to *yy* | *nn* = 0 - 32 | *yy* (ASCII) | N |
| 0x0B | 0x17 | Clear Screen | - | - | N |
| 0x0C | 0x19 | Reserved | - | - | n/a |
| 0x0D | 0x1b | Zone Scan On | - | - | N |
| 0x0E | 0x1d | Zone Scan Off | - | - | N |
| 0x0F | 0x1f | Pattern Start Point | - | - | N |
| 0x10 | 0x21 | Pattern Stop Point | - | - | N |
| 0x11 | 0x23 | Run Pattern | - | - | N |
| 0x12 | 0x25 | Lens Speed *n* | *n* = 0 - 3 | - | N |

## 3.5 Frame Sequencing

Extended command frames are only transmitted only when their contents have changed. PTZ frames are transmitted whenever they contain non zero data and once when they have just changed to zero data. For the duration of a single Pelco word transmission no I2C processing will be performed so I2C byte transmissions should be at least 64 uS apart to avoid overflows.

## 3.6 Patrol Modes

Patrol modes are not implemented on Pelco heads.

# 4. BBV Protocol

## 4.1 Transmission Line Coding

The transmitted telemetry information is coded as a sequence of sequential data frames.

## 4.2 Bit Coding

The individual bits are coded as two FSK frequencies:

Logic 1: 250k Hz

Logic 0: 222k Hz

## 4.3 Frame Coding

The frame is coded as an asynchronous serial data word, comprising;

1 Start Bit

8 Data Bits

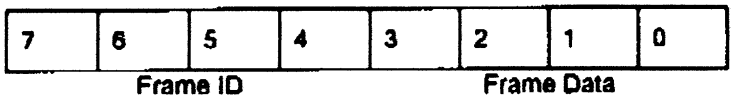
1 Parity Bit (Even)

1 Stop Bit

Approx 150uS of carrier (preamble) is transmitted to ensure that the PLL in the FSK decoder has locked. The data rate is a nominal 19K8 (-0K4+0K7). This yields a nominal bit time of 50.5uS.

## 4.4 Frame Data

The frame data consists of four Frame ID bits and 4 Data Bits.




## 4.5 Transmission Frame Data Formats

The format of each transmitted data frame is as follows:

| Frame ID | D3 | D2 | D1 | D0 |
|---|---|---|---|---|
| 0 | Focus<br>Near = 1<br>Far = 0 | Focus Activate | Zoom<br>In = 1<br>Out = 0 | Zoom Activate |
| 1 | Aux 4 | Lights[1]<br>On = 1<br>Off = 0 | Iris<br>Open = 1<br>Close = 0 | Iris Activate |
| 2 | Tilt<br>Down = 1<br>Up = 0 | Tilt Activate | Pan<br>Right = 1<br>Left = 0 | Pan Activate |
| 3 | Wash[1] | Wipe[1] | Autopan[1] | Power[1] |
| 4 (Rx300) | Default Settings[5] | Back Light Level[4] | White Balance[3] | Shutter[2] |
| (Rx400) | Spare | Spare | Spare | Spare |
| 5 (Not Used) | Spare | Spare | Spare | Spare |
| 6 (Not Used) | - | (AutoIris) | (Standby) | (Pan Speed) |
| 7 (Not Used) | | | | |
| 8 (Not Used) | | | | |
| 9 (Not Used) | | | | |
| 10 (Not Used) | | | | |
| 11 (Not Used) | | | | |
| 12 | Tilt Speed | | | |
| 13 | Pan Speed | | | |
| 14 | Select Operation Preset Number | | | |

| | |
|---|---|
| 15 | Code Function<br>(See table below) |

Notes:

[1] These functions are controlled in the DM telemetry by distinct on and off commands. The telemetry head itself requires the bit to be set continuously in the frame to hold the function active. The VITAA software must therefore support a control bit per function. In addition, each of the 16 cameras must have separate control bits. On power up this table bit can be set to 0.

[2] This is a special function for a Mitsubishi Camera. Each activation of this command steps round the options for the shutter speed of the camera. Feedback is provided by the camera directly on screen. Support from the DX-Pro is provided by a new command *889 002 (suggested).

[3] This is a special function for a Mitsubishi Camera. Each activation executes a white balance sequence in the camera. Support from the DxPro is provided by a new command *889 003 (suggested).

[4] This is a special function for a Mitsubishi Camera. Each activation causes the camera to set a new Back Light level. Support from the Dx-Pro is provided by a new command *889 004 (suggested).

[5] This is a special function for a Mitsubishi Camera. This resets the standard camera defaults. Support from the DX-Pro is provided by new command *889 005 (suggested).

## 4.6 Code Function Table (Frame 15)

This table shows the function codes provided to the telemetry head using frame 15. When a command from this frame is required it is inserted into the normal transmission sequence for a single cycle.

| Function Code | Operation |
|---|---|
| 0 | No Action |
| 1 | Program Iris Level |
| 2 | Goto Preset<br>Preset number is specified in frame 14. |
| 3 | Program Preset<br>Preset number is specified in frame 14. |
| **Below are** | **Rx Series Only** |
| 4 | Initiate Self Test |
| 5 | Erase Preset<br>Preset number is specified in frame 14. |
| 6 | Remove Preset from Patrol 1<br>Preset number is specified in frame 14. |
| 7 | Remove Preset from Patrol 2<br>Preset number is specified in frame 14. |
| 8 | Start Patrol 1 |
| 9 | Start Patrol 2 |
| A | Set Delay Time Patrol 1<br>Delay time is set based on value last transmitted in frame 14. Values shown in table below. |
| B | Set Delay Time Patrol 2<br>Delay time is set based on value last transmitted in frame 14. Values |

| Function Code | Operation |
|---|---|
| | shown in table below. |
| C | Function Unused |
| D | Function Unused |
| E | Function Unused |
| F | Function Unused |

## 4.7 Time Codes

These time codes are used for setting patrol function timings. They control the time delay between moving to the next Preset in the sequence.

| Time | Value |
|---|---|
| 0 | Set Random time 0 -100 seconds delay |
| n | Delay = (n-1)*12 Sec, where n in the range 1-15 |

## 4.8 Frame Sequencing

Under idle conditions frames 0, 1, 2, 3, 4, 12, 13 are transmitted repeatedly. If a function command is required then frames 14,15 are inserted into the sequence at the next available slot. These will only be transmitted once before the normal sequence is resumed.

When the state of a frame changes then it is elevated to the next frame transmission slot to improve response time.

## 4.9 Patrol Modes

The Patrol Mode control techniques of the DM and BBV kit are significantly different and require a substantial amount of compromise in the operation. The following information is designed to clarify the operation of Patrol Modes within the DM (Controller) BBV (Receiver) environment.

The BBV system has two patrol sequences, however in this environment we only propose to use one of them.

### 4.9.1 Selecting Presets for Patrol

It is a requirement that the Presets used in a patrol must be the first 'n' of the 16 possible Presets.

To select the number of Presets that are used in a Patrol, the use must issue the command *857 nnn. All Presets above the selected number will be removed from the Patrol sequence.

To add Presets back into the Patrol sequence, the user must first increase the number of Presets using *857 nnn and then select and re-store each enabled precept.

For example, if the number of Presets is to be increased to 7 from 5 then the sequence would be:

| | |
|---|---|
| *857 007 | Increase Presets |
| *906 | Goto Preset 6 |
| *706 | Store Preset 6 |

| | |
|---|---|
| *907 | Goto Preset 7 |
| *707 | Store Preset 7 |

When Presets are stored they are automatically selected for the Patrol if they are in the range 1 - <Number of Presets in Patrol>. Otherwise they are automatically barred from the Patrol sequence.

### 4.9.2 Starting the Patrol Sequence

The Patrol sequence can be started by the command *854 001(Patrol Mode On).

Command *853 nnn (Set Delay to/in Patrol) selects the interval between movement from one Preset to the next. Currently the delays set are not in minutes, but are selected from the table below:

| Time | Value |
|---|---|
| 0 (*854 000) | Set Random time 0 -100 seconds delay |
| n | where n in the range 2-15 (n-1)*12 Sec |

### 4.9.3 Stopping Patrol Mode

The Patrol mode is stopped by issuing any movement or other telemetry command to the head.

To disable the Patrol the command *854 000 (Patrol Mode OFF) is set.

### 4.9.4 Implementation Detail

***853 nnn (Delay to/in Patrol Mode)**

The value set in this command is issued to the head (Frame 14= value, Frame 15 = 0AH Set Delay Time to Patrol 1).

***854 000 (Patrol Mode Off)**

This issues a small left pan movement to the head to stop the patrol. Equally any movement selected by the user will have the same effect.

***854 001 (Patrol Mode On)**

Issues a Start Patrol 1 (Frame 15 = 08H).

***857 nnn (Number of Presets in Patrol)**

This clears any existing Presets above the specified number from the Patrol. Also, the number is stored locally and any Presets that are Stored above this number are automatically deleted form the Patrol sequence by issuing a Frame 14 = Preset, Frame 15 = 06H (Erase Preset from Patrol).

## 5. DM Code Sequences

This section shows the implementation of translations between the DM telemetry control from a Dx-Pro or equivalent to Pelco and BBV commands.

| Cmd | Range if applicable | Function | BBV Telemetry Equivalencies | Pelco Equivalencies |
|---|---|---|---|---|
| 0 | (Single Tone) | Iris Open | Implemented | Implemented |
| 1 | (Single Tone) | Zoom In | Implemented | Implemented |
| 2 | (Single Tone) | Tilt Up[3] | Implemented | Implemented |
| 3 | (Single Tone) | Zoom Out | Implemented | Implemented |
| 4 | (Single Tone) | Pan Left[3] | Implemented | Implemented |
| 5 | (Single Tone) | Iris Close | Implemented | Implemented |
| 6 | (Single Tone) | Pan Right[3] | Implemented | Implemented |
| 7 | (Single Tone) | Focus Near | Implemented | Implemented |
| 8 | (Single Tone) | Tilt Down[3] | Implemented | Implemented |
| 9 | (Single Tone) | Focus Far | Implemented | Implemented |
| A | (Single Tone) | Stop Tilt | Implemented | Implemented |
| B | (Single Tone) | Stop Pan | Implemented | Implemented |
| C | (Single Tone) | Stop Zoom | Implemented | Implemented |
| D | (Single Tone) | Stop Iris and Focus | Implemented | Implemented |
| # | (Single Tone) | Stop All Motors | Implemented | Implemented |
| 0x20-0x2F | | Pan Speed 0x20 (slowest) through 0x2F (fastest) | Converted to Pan speeds 0-0xF in frame 13 | Converted to Pan speeds 0-0x3F in MSB of PTZ word 0 |
| 0x30-0x3F | | Tilt Speed 0x30 (slowest) through 0x3F (fastest) | Converted to Pan speeds 0-0xF in frame 12 | Converted to Pan speeds 0-0x3F in LSB of PTZ word 0 |
| | | | | |
| *2xx | 01 - 16 | Select Camera 1 - 16 | Implemented Select Camera to apply telemetry information. | Implemented Select Camera to apply telemetry information. |
| | | | | |

| Cmd | Range if applicable | Function | BBV Telemetry Equivalencies | Pelco Equivalencies |
|---|---|---|---|---|
| *4nx | x = 5 On<br>x = 0 Off<br>n = Aux No<br>1-4 (BBV)<br>1-8 (Pelco) | Auxiliary Relay Control | n:=<br>1 = Wipe<br>2 = Lamps<br>3 = Wash<br>4 = Camera Power<br>Setting retained locally in VITAA. | n:= 1 - 8<br>Head dependent functionality.<br>Setting retained by head.<br>Implemented as extended command 0x9 (set) or 0xB (clear) |
| *7xx | 00 - 15 (BBV);<br>00 - 31 (Pelco); | Store Preset nn.[1] | Stores current position as Preset nn on Selected Head | Stores current position as Preset nn on Selected Head. Presets 00 - 31 mapped to 01 - 32. |
| *9xx | 00 - 15 (BBV),<br>00 - 34 (Pelco) | Goto Preset Position xx[3] | Goto Preset xx on Selected Head<br>00 is park position | Goto Preset xx on Selected Head.<br>Presets 00 - 33 mapped to 01 - 34.<br>32 = 180 degree pan rotation<br>33 = Goto zero ref. point |
| *853 nnn | 001 - 999 | Delay to/in Patrol Mode in Minutes[1] | This converts to command A in | |

| Cmd | Range if applicable | Function | BBV Telemetry Equivalencies | Pelco Equivalencies |
|---|---|---|---|---|
| | | | frame 15. The value of the delay is placed in frame 14. Selecting time = 0 will force random patrol delay time. | |
| *854 nnn | 000 - 001 | 000 = Patrol Mode OFF, 001 = Patrol Mode ON[3] | Implemented | |
| *857 nnn | 001 - 015 | Number of Presets for Patrol[1] | Implemented | |
| *858 nnn | 000 - 001 | 000 = Turn Auto Pan Off, 001 = Turn Auto Pan On[3] | Selects AUTOPAN in frame 3. Turned off by any Right/Left movement or *858000 . | |
| *859 161 | | Password for Access to *850, *861 and above, and *7xx Preset Store Commands. | Implemented | Implemented |
| | | | | |
| *862 005 | | Auto Set Up Procedure include Feedback and Alarm Contacts[1][3] | Performs Self Test on BBV unit | Implemented as Remote Reset |
| | | | | |

| Cmd | Range if applicable | Function | BBV Telemetry Equivalencies | Pelco Equivalencies |
|---|---|---|---|---|
| *881 001 | | Clear ALL Presets[1] | Uses command in frame 15 to sequentially erase all 15 presets on a camera. | Uses extended command 0x02 repeatedly to erase all 32 preset on a camera |
| *881 003 | | Set Engineers Mode On[1] | Disables all movement commands including patrols abd autopan | Disables all movement commands. |
| *881 004 | | Set Engineers Mode Off[1] | Re-enable movement commands | Re-enable movement commands |
| *881 911 | | COMPLETE SYSTEM RESET[1] [3] | Enter Self test which clears on completion. | Remote Reset. |
| *883 nnn | 000 - 015 (BBV) 000 - 031 (Pelco) | Clear Preset nnn[1] | Erase Preset nn. 00-15 | Clear Preset nn. 00 - 31. |

| Cmd | Range if applicable | Function | BBV Telemetry Equivalencies | Pelco Equivalencies |
|---|---|---|---|---|
| *889 002 | | Select Mitsubishi camera next shutter speed option | Implemented | |
| *889 003 | | Initiate Mitsubishi camera white balance sequence | Implemented | |
| *889 004 | | Select Mitsubishi camera next back light level | Implemented | |
| *889 005 | | Reset Mitsubishi camera standard defaults | Implemented | |
| *890 m00 | m=0x0-0x7 | Select Telemetry Mode.<br>Selecting camera zero will select the format for all cameras.<br>Values of m are made up of 3 bits:<br>**bit 0:**<br>1 = Telemetry disabled;<br>0 = Telemetry enabled<br>**bit 1:**<br>1 = NTSC;<br>0 = PAL<br>**bit 2:**<br>1 = 16 channel system;<br>0 = non 16 channel system | Stored locally on a camera by camera basis<br>Stored as a single bit applied to all cameras<br>Stored as a single bit applied to all cameras | Stored locally on a camera by camera basis<br>Stored as a single bit applied to all cameras<br>Stored as a single bit applied to all cameras |
| *890 nxx | xx=camera 01-16<br>n=mode 0-2 | Selecting xx=01-16 will set the telemetry protocol format for the individual camera xx<br>Values of n are:<br>0 = No Telemetry<br>1 = BBV Protocol | Stored locally on a camera by camera basis | Stored locally on a camera by camera basis |

| Cmd | Range if applicable | Function | BBV Telemetry Equivalencies | Pelco Equivalencies |
|---|---|---|---|---|
| | | 2 = Pelco Protocol | | |
| | | | | |

Notes:

[1] All commands of this type require the password protected mode to be selected before they can operate.

[2] These commands would require an RS232 interface for operation.

[3] These commands are not performed when unit is in Engineer's Mode

## 5.1 Variable Speed Control

Variable pan and tilt speed control will be implemented using resolution of 16 levels. This will allow fine positioning of cameras at slow speeds whilst also allowing fast movements on wide sweeps.

The PIC software will implement a translation look-up table which converts the incoming speed codes to linearly varying output speeds between the slowest and fastest speed for the type of head in use. The translation table will be linear in this release but could be made non-linear if required in a future release by altering the translation table values in the firmware.

A new range of single byte I2C codes will be used. 16 unique codes will relate to pan movements and 16 unique codes will relate to tilt movements. Single byte codes are used to improve system response time and restrict the amount of I2C traffic. Unlike previous codes these will not possess equivalent DTMF code values and cannot therefore be utilised by the older DTMF controlled systems.

Once a speed code has been transmitted this speed will be used for all subsequent movements in the relevant plane until another speed code supersedes it.

The speed commands consist of single data bytes, utilising previously unused I2C bus values. Hence:

| Command | I2C value |
|---|---|
| Pan speed slowest | 0x20 |
| Pan speed fastest | 0x2F |
| Tilt speed slowest | 0x30 |
| Tilt speed fastest | 0x3F |

The in-between speed values would use the in-between I2C values. This allows 16 speeds in each axis.

Note that there are no direct DTMF values corresponding to these commands.