PTZ Platform

Interface Control Document.

General ICD.

Telemetry Control – Pelco D protocol.

Telemetry communication to the PT units is by TIA-485 (RS-485), 2-wire simlpex/half-duplex interface
In most cases this will be through a twisted pair cable set of one Yellow and one Blue jacketed conductors.
Yellow – Data (+) – Non-inverting (Tx/Rx+),
Blue – Data (-) – Inverting (Tx/Rx-).

In general, the platforms also support Pelco D Over IP by use of a TCP Server either hosted within the IP encoders or an embedded MOXA Nport. Details as follows;

1. Encoder
    a. Default Port: 6791
2. MOXA Nport
    a. Default Port: 4001
    b. Operating mode must be TCP Server.

Pelco command protocol support in Silent Sentinel PTZ cameras.

Derived from Pelco-D version 5.0.1
.
Pelco Standard commands for operating Progressive Pan, Tilt, Zoom and Iris operation.
Support messages in the Pelco Extended format.

Pelco-D has been adopted as the primary command set for the Silent Sentinel PTZ camera platform ranges.
Standard and Extended commands are employed, although not all message types may be supported.

Some commands may apply the data segment differently to Pelco's suggested methods as used on their hardware. These are Adapted Pelco D messages. Some Expanded (UDC) commands have been included. These follow the Pelco format but are not part of the Pelco standard and will not be supported by third-party control systems.

Pre-requisites.

This protocol description is confined to systems (unless indicated) where the following protocol settings are selected;
PelcoD Mode set to STRICT mode.
Pan/Tilt Control mode set to Normal.
Refer to **Appendix A** for configuration of these parameters.

Notations.

0x63 Hexadecimal (Base 16) numbers.
63h Alternate hexadecimal format.
99d Denary (decimal Base 10) numbers.
99 Alternate denary – where format not indicated numerics are in Denary, Base 10 (e.g. free text).

General Packet Description.

	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7		
	SYNC	ADDR	CMND 1	CMND 2	DATA 1	DATA 2	CHECK		
	0xFF	0x -	0xnn	0xnn	0xnn	0xnn	0x -		

Byte 1 : SYNC - All messages start with 0xFF which is used as a synchronisation byte.
Byte 2 : ADDR - The device address value may be in range 0x01 – 0xFF {1 – 255d}.
Primary address of Silent Sentinel systems is configured as Camera Number by parameter or (Oculus/Aeron) switch settings
But if Dualled Camera setting is not Off, system will also respond to Camera Number +1 (see Camera Control)
And if the system includes a camera typed as “PelcoD” its commands use highest Camera Control address +1
Byte 3 : CMND 1 - Basic command's extension. 0x00 in most cases of implemented messages.
Byte 4 : CMND 2 - Basic command byte. Odd value in all extended commands. Even value for standard command.
Byte 5 : DATA 1 - Data 1 byte, (16-bit high byte).
Byte 6 : DATA 2 - Data 2 byte, (16-bit low byte)
Byte 7 : Check value. Arithmetic sum of the bytes (2 to 6) after the Sync byte, (Byte 2 .. Byte 6) anded with 0xFF.

General Reply
Standard messages and some Extended commands result in the General Reply response message.
This is a Four byte message.

General Reply Description.

	Byte 1	Byte 2	Byte 3	Byte 4
	SYNC	ADDR	ALARMS	CHECK

	0xFF	0x -	0x00	0x -

Byte 1 : SYNC - All messages start with 0xFF which is used as a synchronisation byte.
Byte 2 : ADDR - The device address from command message that caused the reply; value may be in range 0x01 – 0xFF {1 – 255d}.
Byte 3 : ALARM – Reserved – Not Used.
Byte 4 : Check value. Arithmetic sum of the Checksum from command message that caused the reply and the Alarm field byte of this reply, (Byte 7 of original message and Byte 3 of this reply message).

Extended Reply.
The Extended Reply message has the same seven byte structure as the General Packet Description.
The Address byte being that from command (query) message that caused the reply.

Camera Control

Standard PelcoD protocol only has the concept of a single camera
However Silent Sentinel camera systems can have 2 or even 3 cameras

So the systems have the concept of a Primary camera and an Alternate camera, and means of setting which one is currently controlled.
All PelcoD protocol commands and queries applying to a camera apply to the currently controlled camera.
If a system has 3 cameras, the Alternate camera designation can be switched between the second and third camera

Camera control can be switched by a functional preset (see **Appendix C**) or by PelcoD Address if Dualled Camera mode is not Off
It can also be set explicitly for one single following command (see Command 0x7F)

Standard Command Messages.
Standard messages use both the Command-1 and Command-2 bytes in every instance.
The bytes are encoded with bit level meaning.
A value of 1 activates the corresponding function for that bit – start or continue action.
A value of 0 de-activates the corresponding function for that bit – stop or do not perform action.

All bits are applied in every instance. There are no do-not-apply circumstances.
To stop a motion all applicable bits should be set to zero.
Zoom and Focus bits apply to the currently controlled camera within the system (see Command 7F)
Generally, conflicting bits must not be set set (e.g. Tilt-Up and Tilt-Down).
An exception to this is a special "illegal" command with both Pan bits and both Tilt bits On, and all other bits Off.
This is used with late JaegarHMD v3.001 firmware to shortcut the optional startup phase "delay before POST"
Bits 7-3 of CMND 1 are always ignored by Silent Sentinel firmware.

COMMAND 1 (Byte 3 – CMND 1)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
128	64	32	16	8	4	2	1
Sense	0	0	Scan	Imager	Iris Close (-)	Iris Open (+)	Focus Near (-)

COMMAND 2 (Byte 4 – CMND 2)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
128	64	32	16	8	4	2	1
Focus Far	Zoom Wide (-)	Zoom Tele (+)	Tilt Down	Tilt Up	Pan Left	Pan Right	0

Standard Message Data.

Command – –	[--]	**Standard Command**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x– –	0x– –	PanSpeed	TiltSpeed

PanSpeed Range: 0x00 – 0x40 {0 – 64d} Normal
TiltSpeed Range: 0x00 – 0x3F {0 – 63d} Normal

Reply: General Reply.

Command Bytes (CMND 1, CMND 2) are bit-coded instructions (see **Standard Commands**) and will vary in value depending on required actions.

If Pan or Tilt actions are called the corresponding speed values are located in the Data 1 and Data 2 bytes.
If no Pan or Tilt actions are called Data bytes should both be set to 0x00 (but if not they will be ignored).

Pan/Tilt Control as Normal.
Data bytes Speed values are from 0x00 (Slowest), 0x01 (very slow) to 0x3F (High speed). 0x40 is Turbo mode providing the highest speed response – Maximum available. Higher values may not be accepted as valid.

Linear255.
If the PT unit is configured with the PT Control parameter as Linear255 the system accepts an extended range of Pan and Tilt speed values so as to allow a finer level of control over the speed.
Data bytes Speed values are from 0x00 (Slowest), 0x01 (very slow) to 0xFF (Highest speed) – providing 256 steps of control.

Quadratic.
Data values are applied to the speed as a quadratic function (n*n)/(max*max) of full speed. Data increments at the lower end of the range will produce small change in speed. Similarly small increments of data values at the upper end of the range will result in significantly larger speed changes. This bias towards the lower end allows for finer control of speed at slower movements.
Quadratic– Range: 0x00 – 0x3F {0 – 63d} (n*n)/(63*63) (0x40 will be treated as 0x3F)
Quad255 – Range: 0x00 – 0xFF {0 – 255d} (n*n)/(255*255)

The Pan/Tilt Control setting can be selected within the equipment's menu system. Please refer to the product's user guide.

Extended Command Messages.

Command 03	[03d]	**Set (store) Preset Position**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x03	0x00	PresetNum	PresetNum: 0x01 – 0xFF {1 – 255d}

Reply: General Reply given.

PresetNum value is the identifier number of the desired preset to store.
Normally configured systems have 128 available preset positions (1-128) that can store Pan,Tilt,Zoom,Focus position..
Systems configured as DoubleCamera have 83 preset positions (1-83) that can store Pan,Tilt,Zoom1,Focus1,Zoom2,Focus2.
Presets 140-149 can be used to store camera or lens settings for certain cameras or lenses..
If an attempt is made to store a protected verctored preset (see Command 07) the vector target preset wil be set instead.
(The highest numbered storage preset (128 or 83} is reserved for Washer Position)

Command 05	[05d]	**Erase Preset Position**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x05	0x00	PresetNum	PresetNum: 0x01 – 0xFF {1 – 255d}

Reply: General Reply given.

PresetNum value is the identifier number of the desired preset to erase.
Only unprotected storage or camera storage presets can be erased
If an attempt is made to erase a protected vectored preset (see Command 07) the vector target preset will be erased instead.

Command 07	[07d]	**Call (Go to) Preset Position**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x07	0x00	PresetNum	PresetNum: 0x01 – 0xFF {1 – 255d}

Reply: General Reply given.

PresetNum value is the identifier number of the desired preset to recall.

PresetNum range: 0x01 – 0x80 {128d} or 1-83 (Double Camera) Storage Preset positions.
PresetNum range: 0x81 – 0xFF {129 – 255d} Additional direct control functions or unused.
(The highest numbered storage preset (128 or 83 }is reserved for Washer Position)

Function Presets.
A user selectable block of presets (default: Presets 2 – 21) are reserved for direct control of PTZ camera functions.
This block may be relocated to a higher block of 20 consecutive preset numbers They mask any storage presets that they overlap.
The same functions are also always mapped to Presets 199 – 218. Preset 1 always functions as Set or Select in OSD menus.
Depending on hardware configuration, other blocks of functions may exist to control or store settings for particular hardware.

Enhanced Storage Presets.
Presets 140 – 149 {den} reserved for storing Enhanced Lens/Camera (DSP) settings.

Vectored Presets.
Any storage preset can instead be set to execute another preset number, or start a designated tour. This allows the main function block to be relocated to a higher range, and then specific selected functions to be accessed from low-numbered presets. Only one level of indirection is allowed. Vectored presets can be protected against being altered or erased.

*Ref **Appendix C**.*

Command 09	[09d]	**Set Auxiliary**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x09	0x00	AuxNum	AuxNum: 0x01 – 0x10 {1 – 16d}

Reply: General Reply given.

AuxNum is the identifier number of the desired auxiliary control to turn On.
Osiris and Jaegar systems reserve 1-9 for internal use but have 10-16 that could be wired for special use
Larger AuxNum values (0x11 to 0xFF) may sometimes be used by extra equipment on the same RS485 bus, but will be ignored by the camera system.

Command 0B	[11d]	**Clear Auxiliary**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x0B	0x00	AuxNum	AuxNum: 0x01 – 0x10 {1 – 16d}

Reply: General Reply given.

AuxNum is the identifier number of the desired auxiliary control to turn Off.
See Command 09 for notes on AuxNum

Command 0D		[13d]	**Dummy**
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x0D	0x00	0x00
Reply: General Reply given.			
With later firmware there is a Fast Ack option; if enabled and a Dummy command is sent to the primary PelcoD address, the general reply will be returned as soon as the packet is seen.			

Dummy command (just causes 4-byte general reply)

Command 0F		[15d]	**Remote Reset**
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x0F	0x00	0x00
Reply: General Reply given.			

Causes a system restart (Soft Boot)

Commands 0x11, 0x13, 0x15 are ignored

Command 17		[23d]	**Clear Screen**
			Changed Usage
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x17	0x00	0x00
Reply: General Reply given.			

Toggles OSD Debug messages On/Off

Commands 0x19, 0x1B, 0x1D are ignored

Command 1F	[31d]	**Record Pattern Start**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x1F	0x00	0xnn
Reply: General Reply given.			
Starts recording commands as a Mimic Tour (1-4) while still executing them as they are received			

Starts recording designated Mimic Tour (1-4)(0 means 1)

Command 21	[33d]	**Record Pattern End**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x21	0x00	0xnn
Reply: General Reply given.			
Ends recording commands as the currently recording Mimic Tour (DATA 2 is ignored)			

Ends recording Mimic Tour

Command 23	[35d]	**Run Pattern**	
			Enhanced
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x23	0x00	0xnn
Reply: General Reply given.			
Tours 1-16 are normal tours with sequences of preset positions Tours 17-20 are Mimic Tours 1-4 that record actual command sequences and timings The system may be configured to use 1-4 to run Mimic Tours 1-4 instead of Normal Tours 1-4			

Runs Tour nn (0x01 to 0x14) (1-20) (0 means 1)

Command 25		[37d]	**Set Zoom Speed**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x25	0x00	0xnn	Sets Zoom Speed for currently controlled camera to nn (0-3)
Reply: General Reply given.				
For cameras whose zoom speed can be controlled, this sets Zoom speed for subsequent Zoom commands to one of 0-3 0=Slowest, 1=Medium Slow, 2=Medium Fast, 3=Fastest (typically 10%, 30%, 60%, 100% of fastest Zoom Speed) See Command 7F for explanation of currently controlled camera				

Command 27		[39d]	**Set Focus Speed**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x27	0x00	0xnn	Sets Focus Speed for currently controlled camera to nn (0-3)
Reply: General Reply given.				
For cameras whose focus speed can be controlled, this sets Focus speed for subsequent Focus commands to one of 0-3 0=Slowest, 1=Medium Slow, 2=Medium Fast, 3=Fastest (typically 10%, 30%, 60%, 100% of fastest Focus Speed) See Command 7F for explanation of currently controlled camera				

Command 0x29 is ignored

Command 2B	[43d]	**Auto Focus**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x2B	0x00	0xnn

For cameras with AF capability Sets AF On or Off

0=On, 1=Off

Reply: General Reply given.

For cameras with AF capability this sets AutoFocus for currently controlled camera to On or Off (Manual Focus)
See Command 7F for explanation of currently controlled camera

Command 2D	[45d]	**Auto Iris**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x2D	0x00	0xnn

For cameras with AI capability Sets AI On or Off

0=On, 1=Off

Reply: General Reply given.

For cameras with AI capability this sets AutoIris for currently controlled camera to On or Off (Manual Iris)
See Command 7F for explanation of currently controlled camera

Command 2F	[47d]	**Automatic Gain Control (AGC)**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x2F	0x00	0xnn

For DRS cameras with AGC capability Sets AGC On or Off

0=On, 1=Off

Reply: General Reply given.

For DRS cameras with AGC capability this sets AGC for currently controlled camera to On or Off (Manual Gain)
See Command 7F for explanation of currently controlled camera

Command 31		[49d]	**Back Light Compensation (BLC)**
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x31	0x00	0xnn

For Sony block cameras with BLC capability Sets BLC On or Off

0=Off, 1=On

Reply: General Reply given.

For Sony block cameras with BLC capability this sets BLC for currently controlled camera to On or Off
See Command 7F for explanation of currently controlled camera

Command 0131		[303d]	**Wide Dynamic Range (WDR)**
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x01	0x31	0x00	0xnn

For Sony block cameras with WDR capability Sets WDR On or Off

0=Off, 1=On

Reply: General Reply given.

For Sony block cameras with WDR capability this sets WDR for currently controlled camera to On or Off
See Command 7F for explanation of currently controlled camera

Commands 0x33, 0x35, 0x37, 0x39, 0x3B, 0x3D are ignored

Commands 0x3F and 0x13F are ignored

Command 023F		[575d]	**Set Thermal AGC Gain Bias**	
				Expanded Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x02	0x3F	0xnn	0xnn	For DRS thermal cameras Sets AGC Gain Bias to nnnn (0-4095d)
				(For FLIR TAU thermal cameras range is 0-255d)
Reply: General Reply given.				
For DRS or FLIR TAU thermal cameras this sets AGC Gain Bias for currently controlled camera to nnnn See Command 7F for explanation of currently controlled camera				

Command 033F		[831d]	**Set Thermal AGC Level Bias**	
				Expanded Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x03	0x3F	0xnn	0xnn	For DRS thermal cameras Sets AGC Level Bias to nnnn (0-4095d)
				(For FLIR TAU thermal cameras range is 0-16383d)
Reply: General Reply given.				
For DRS or FLIR TAU thermal cameras this sets AGC Level Bias for currently controlled camera to nnnn See Command 7F for explanation of currently controlled camera				

Command 043F		[1087]	**Set DRS ICE Level**	
				Expanded Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x04	0x3F	0x00	0xnn	For DRS thermal cameras Sets ICE Level to nn
				(00-07 for DRS with New ICE, 00-0F for DRS with Old ICE)
Reply: General Reply given.				
For DRS thermal cameras this sets ICE Level for currently controlled camera to nn See Command 7F for explanation of currently controlled camera				

Commands 0x41, 0x43, 0x45, 0x47 are ignored

Command 49		[73d]	**Set Azimuth Zero Position**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x49	0x00	0x00	Set current Pan Position to be Pan position zero
Reply: General Reply given.				

Command 4B	[75d]	**Set Pan Position (Abs Pos)**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x4B	PanPos_MSB	PanPos_LSB	PanPos Range: 0x0000 – 0x8CA0 {0 – 36000d}

Reply: General Reply.

PanPos value is the absolute position (distance) along the rotation from the home position (0x0000) in a clockwise direction
(View from above / moving rightwards from camera's point-of-view).

PanPos is Angle-in-degrees x 100. Where angle is from Home/Origin in a clockwise direction, each increment is of 0.01 degrees..
e.g. 91-degree Right – (91x100) : 0x238C {9100d}

For Oculus, Aeron. Osiris and Jaegar cameras.
Pan range: 0x0000 (Home) – 0x8CA0 {36000d} **

Out of range: 0x8CA1 – 0xFFFF - Beyond achievable Pan range.
Out of range data may result in a modulo result, (+390 degrees => +30 degrees) or negative angle (0x8CA1 means -295.35 deg).

**Limited Pan systems (non-continuous) will have a void region within this range.

Command 4D	[77d]	**Set Tilt Position (Abs Pos)**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x4D	TiltPos_MSB	TiltPos_LSB	TiltPos Range: 0x0000 – 0x8CA0 {0 – 36000d}

Reply: General Reply given.

TiltPos value is the absolute position (distance) along the curve in a region above or below the Horizontal in units of 1/100th degree.

Tilt above horizontal; TiltPos is Angle-in-degrees x 100. Where angle is from Horizontal forwards to the required position through a Downwards direction, each increment is of 0.01 degrees..

Ref. ***Appendix B***

Tilt ranges:	0x0000 {0000d} – 0x2328 {9000d}	Level to 90deg below level.
	0x6978 {2700d} – 0x8CA0 {36000d}	90 deg above level to Level)
	0x2329 {9001d} – 0x6977 {2699d}	Numerically valid data but out of mechanical range.

In Upright mode Oculus/Aeron downward tilt motion restricted to 0x0BB8 {3000d} (-30deg) below level.
In Hanging or Tilted modes Oculus/Aeron have corresponding upward or downward restrictions

The tilt mode can can be changed to reverse the positive direction by setting the PelcoD Mode to RevTilt (Strict) rather than Strict.
This will produce upward inclination for increasing tilt values.
Hardware or software limits may prevent full motion to these positions on some PT configurations.

Command 4F	[79d]	**Set Zoom Position (Abs Pos) for currently controlled camera**

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x4F	ZoomPos_MSB	ZoomPos_LSB	ZoomPos Range: 0x0000 – 0xFFFF {0 – 65535d}

Reply: General Reply given.

ZoomPos value is the absolute position (distance) along the maximum describable zoom range that the lens is to move to.
For almost all cameras and lenses, PelcoD ZoomPos zero is the Full Wide position and 65535 is the Full Tele position
Sony block cameras and thermal cameras with gen2 Ophir 225 lenses are treated slightly differently, unless Zoom Cam<->Proto mode is set to Full Range
Sony block cameras can be set to combined zoom mode, where digital magnification is used to extend the Zoom range once full Optical zoom has been reached. If Zoom Cam<->Proto mode is set to Traditional, then if Sony combined zoom is Off, camera zoom values are multiplied by 4 to provide PelcoD Zoompos values; if Sony combined zoom is On, camera zoom values are multiplied by 2 to provide PelcoD Zoompos values. If a request is made to set to too high a value for the camera, the value is reduced to max allowed
For thermal cameras with gen2 Ophir225 lenses the lens Zoompos is between 25 and 225 EFL. This is translated by *200 to provide an equivalent PelcoD value between 5000 and 45000. Lower values are taken as 5000 and higher values as 45000

Command 014F	[335d]	**Set Focus Position (Abs Pos) for currently controlled camera**

Expanded Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x01	0x4F	FocusPos_MSB	FocusPos_LSB	FocusPos Range: 0x0000 – 0xFFFC {0 – 65532d}

Reply: General Reply given.

FocusPos value is the absolute position (distance) along the maximum describable focus range that the lens is to move to.
For Sony block cameras and thermal cameras with gen2 Ophir225 lenses the valid range may vary from 0-65535 depending on settings. But if a Focuspos value is too low or too high it is adjusted to the current Min or Max allowed
If Focus Cam<->Proto mode is set to Full Range,then the full range of 0-65532 is always valid. (Ref. ***Appendix A***).

Special Meaning of 0xFFFE
If the currently controlled camera is capable of AutoFocus, a Focus value of 0xFFFE is interpreted as AutoFocus operation
This is why the explicit FocusPos range is limited to a max of 0xFFFC
This makes negligible difference because these values are at full Far (infinity Focus)

Command 51		[81d]	**Query Pan Position**		
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**		No optional data.
0x00	0x51	0x00	0x00		
Reply: Query Pan Position response - 0x59					

Command 53		[83d]	**Query Tilt Position**		
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**		No optional data.
0x00	0x53	0x00	0x00		
Reply: Query Tilt Position response - 0x5B					

Command 55		[85d]	**Query Zoom Position for currently controlled camera**		
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**		No optional data.
0x00	0x55	0x00	0x00		
Reply: Query Zoom Position response - 0x5D					

Command 155		[341d]	**Query Focus Position for currently controlled camera**		
					Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**		No optional data.
0x01	0x55	0x00	0x00		
Reply: Query Focus Position response - 0x015D					

Command 0x57 is ignored

Command 59		[89d]	**Reply - Query Pan Position Response**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x59	PanPos_MSB	PanPos_LSB	PanPos Range: 0x0000 – 0x8C9F {0 – 35999d}
PanPos value is the position (distance) along the rotation from the home position (0x0000) in a clockwise direction. PanPos is Angle-in-degrees x 100. Where angle is from Home/Origin in a clockwise direction, each increment is of 0.01 degrees.. e.g. 91-degree Right (91x100) : 0x238C {9100d} Pan range: 0x0000 (Home) – 0x8C9F {35999d} Out of range: 0x8CA0– 0xFFFF - Beyond achievable Pan range.				

Command 5B		[91d]	**Reply - Query Tilt Position Response**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x5B	TiltPos_MSB	TiltPos_LSB	TiltPos Range: 0x0000 – 0xFFFF {0 – 65535d}
TiltPos value is the position (distance) along the curve in a region above or below the Horizontal in units of 1/100th degree. Tilt above horizontal; TiltPos is Angle-in-degrees x 100. Where angle is from Horizontal forwards to the required position through a Downwards direction, each increment is of 0.01 degrees.. *Ref. Appendix B.* Tilt ranges: 0x0000 {0000d} – 0x2328 {9000d} Level to 90deg below level. 0x6978 {2700d} – 0x8C9F {35999d} 90 deg above level to 0.01 degree above level) 0x2329 {9001d} – 0x6977 {2699d} Numerically valid data but out of mechanical range. 0x8CA0 can be applied as equivalent of 0x0000 for Horizontal forwards. In upright mode Oculus/Aeron tilt motion restricted to 0xF448 {62536d} (-30deg) below level. The tilt mode can can be changed to reverse the positive direction by setting the PelcoD Mode to RevTilt (Strict) rather than Strict. This will produce upward inclination for the first Tilt range and downward for the second Hardware or software limits may prevent full motion to these positions on some PT configurations.				

Command 5D		[93d]	**Reply - Query Zoom Position Response**	
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x5D	ZoomPos_MSB	ZoomPos_LSB	ZoomPos Range: 0x0000 – 0xFFFF {0 – 65535d}
ZoomPos value is the position (distance) along the maximum describable zoom range for the camera/lens Special considerations may apply for Sony block cameras, thermals with gen2 Ophir 225 lenses and lenses with extenders (Ref. Appendix *A).*				

Command 015D		[349d]	**Reply - Query Focus Position Response**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x01	0x5D	FocusPos_MSB	FocusPos_LSB	FocusPos Range: 0x0000 – 0xFFFC {0 – 65532d}
				0xFFFE means camera in AF mode – Focuspos is volatile
FocusPos value is the position (distance) along the maximum describable focus range for the lens Zero (Near) to 0xFFFC (Far).				

Commands 0x5F, 0x61, 0x63, 0x65, 0x67, 0x69 are ignored

Command nn6B	[nnnnd]	**Query Device Information (was Query Device Type)**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0xnn	0x6B	0xnn	0xnn

Provides extensive ability to query system settings and status.

CMND 1 is the primary function distinguisher (0x00 to 0x7F)
DATA 1 and DATA 2 are further used to distinguish sub-functions

Reply: Query Device Information response – 0xnn6D

In general, lower numbered functions should be used first to establish hardware configuration and settings, so that reply values from higher numbered functions can be correctly decoded

Command nn6D	[nnnnd]	**Reply - Query Device Information (was Query Device Type Response)**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0xnn	0x6D	Data_MSB	Data_LSB

Data Range: 0x0000 – 0xFFFF {0 – 65535d}

CMND 1 is always the same as in the query that generated the reply

The meaning of data value is specific to the query that generated it.
It can be a 16-bit signed or unsigned value, or a set of bit-fields containing several pieces of information

Note that although the primary function can be identified from CMND 1, if DATA 1 and DATA 2 are used to indicate subfunctions, the actual subfunction that generated the reply cannot be determined from the information in the reply packet.
It usually has to be inferred from the last query sent before the reply is received
So care must be taken to wait for reply before sending another query whose reply will have the same format.

For ease of understanding, each 0xnn6B function and subfunction description is followed by a description of its 0xnn6D reply

Command 006B	[107d]	**Query System Capabilities**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x6B	0x00	0x00

No optional data

Reply: Query System Capabilities response – 0x006D

Command 006D	[109d]	**Reply - Query System Capabilities**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x00	0x6D	Data MSB	Data LSB

Reply Data consists of 5 bit-mapped fields

bits 0-2 coded motor steps per axis revolution
- 0 motors disabled or not present
- 1 Oculus/Aeron 32000 steps per rev
- 2 Osiris belt drive 72000 steps per rev
- 3 Osiris/Jaegar harmonic drive 50:1 160000 steps per rev
- 4 Osiris/Jaegar harmonic drive 51:1 163200 steps per rev
- 5 Osiris/Jaegar harmonic drive 100:1 320000 steps per rev

For Hardware Motor Drive, Osiris/Jaegar steps/rev are 8 times larger; Oculus/Aeron steps/rev are 4 times higher

bits 3-4 Number of cameras configured in system (0-3)
bits 5-13 Reserved. Should be zero
bit 14 1 if Sightline processor detected in system; 0 if not
bit 15 1 if Osiris/Jaegar; 0 if Oculus/Aeron

Command	**016B**	[363d]	**Sub-function 0x00 Query System Firmware Version**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x01	0x6B	0x00	0x00
Reply: Query System Firmware Version response – 0x016D			

Command	**016D**	[365d]	**Reply - Query System Firmware Version**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x01	0x6D	Data MSB	Data LSB
e.g. 0x3001 means System Firmware Version 3.001 NOTE This reply has the same format as System Board Serial Number (high part or low part)			

Command	**016B**	[363d]	**Sub-functions 0x01 and 0x02 Query System Board Serial Number**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x01	0x6B	0x00	0xnn
Reply: Query System **Board Serial Number (part)** response – 0x016D			

Command	**016D**	[365d]	**Reply - Query System Board Serial Number (part)**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x01	0x6D	Data MSB	Data LSB
e.g.If Subfunction 0x01 replies 0x8437 that means System Board Serial Number starts with 8437 If Subfunction 0x02 replies 0x5348 that means System Board Serial Number ends with 5348 NOTE This reply has the same format as System Firmware Version			

Command	**026B**	[619d]	**Sub-function 0x00 Query System Firmware Checksum (build code)**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x02	0x6B	0x00	0x00
Reply: Query System **Firmware Checksum** response – 0x026D			

Command	**026D**	[621d]	**Reply - Query System Firmware Checksum**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x02	0x6D	Data MSB	Data LSB
e.g. 0x1FA7 means build code is (1FA7). This uniquely identifies the specific firmware build NOTE This reply has the same format as for Query System RH Number			

Command	**026B**	[619d]	**Sub-function 0x01 Query System RH Number**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x02	0x6B	0x00	0x01
Reply: Query System **RH Number** response – 0x026D			

Command	**026D**	[621d]	**Reply - Query System RH Number**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x02	0x6D	Data MSB	Data LSB
e.g. Reply Data of 0x345F means RH code is RH13407. NOTE This reply has the same format as for Query System Firmware Checksum			

Command	**036B**	[875d]	**Sub-function 0x00 Query System Settings1**
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x03	0x6B	0x00	0x00	DATA 2 is 0x00 indicating subfunction zero

Reply: Query System **Settings1** response – 0x036D

Command	**036D**	[877d]	**Reply - Query System Settings1**
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x03	0x6D	Data MSB	Data LSB	Reply Data consists of 11 bit-fields within the 16-bit reply

Reply Data is formatted as follows – note that bits 10-11 are not usually 3, which they always are for the subfunction one reply

bit 0 1 if Pan is limited; 0 if not

bit 1 1 if Tilt is limited; 0 if not

bits 2-3 Pan/Tilt Response Mode: (note that if motion bit is On, a speed of 0 will always move at the slowest speed possible)
- 0 Normal (Pan/Tilt Speeds of 0-63 with 64 being Pan Turbo Speed) (standard PelcoD)
- 1 Linear255 (Pan/Tilt Speeds of 0-255 giving n/255 of max speed)
- 2 Quadratic (Pan/Tilt Speeds of 0-63 (64 means 63) giving (n*n)/(63*63) of max speed)
- 3 Quad255 (Pan/Tilt Speeds of 0-255 giving (n*n)/(255*255) of max speed)

bits 4-5 Cam2 Control Setting (Alternate camera control):
- 0 Timed (Cam1 is Primary camera; UseCAM2 switches control between Primary and Alternate Cams; With control on Alternate, 30 secs of no Cam control activity switches control back to Primary)
- 1 Sticky (UseCAM2 switches control between Primary and Alternate Cams; no 30-sec timeout)
- 2 FollowV (UseCAM2 preset is disabled; Cam control follows selection of current Video source)
- 3 DualCamera (System responds to 2 consecutive PelcoD addresses; Cam commands to main address control PT and Primary camera; Cam commands to address+1 control PT and Alternate camera

bit 6 UseCAM2 state (Camera control bit):
- 0 Control is currently on Primary camera
- 1 Control is currently on Alternate camera

bit 7 Current Video source selection:
- 0 Video source is currently Video1
- 1 Video source is currently Video2

bits 8-9 Zoom Dependent Speed Mode:
- 0 Off (Pan/Tilt speeds are independent of any Camera Zoom position)
- 1 Primary (Pan/Tilt speeds are reduced as Primary Cam is zoomed further In)
- 2 FollowV (Pan/Tilt speeds are reduced by an amount depending on Zoompos of currently viewed Cam)
- 3 FollowC (Pan/Tilt speeds are reduced by an amount depending on Zoompos of currently controlled Cam)

bits 10-11 PelcoD Mode: (see Appendix A for more details)
- 0 Traditional (No Command Acks;On/Off commands toggle; Pan/Tilt positions can be negative with Up +ve)
- 1 Strict (Commands are Acked; commands,queries, responses should be as in PelcoD Std Rev 5)
- 2 RevTilt (As Strict except that increasing Tilt angles go anticlockwise from horizontal, nit clockwise)
- 3 Legacy (As Traditional but for use with ancient control system that expect pre-2014 behaviour)

bits 12-13 Current Extended Dual Camera state
- 0 Off or not implemented
- 1 On (Comms to base PelcoD address controls PT and Primary Cam; to address+1 controls PT and Alt Cam)
- 2 C1&2;C2 (as On but UseCAM2 can toggle base PelcoD address between Primary and Alt Cam control)
- 3 C1;C2&1 (as On but UseCAM2 can toggle PelcoD Address+1 between Alt Cam and Primary Cam control)

bit 14 Gyro Stabilisation state (Not currently implemented – always 0)

bit 15 Sightline Processor detected and active
- 0 No Sightline Processor detected
- 1 Sightline Processor detected

NOTE This reply has the same format as for **Query System Settings1a**

Command	**036B**	[875d]	**Sub-function 0x01 Query System Settings1a**
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x03	0x6B	0x00	0x01	DATA 2 is 0x01 indicating subfunction one

Reply: Query System **Settings1a** response – 0x036D

Command	**036D**	[877d]	**Reply - Query System Settings1a**
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x03	0x6D	Data MSB	Data LSB	Reply Data consists of 4 bit-fields within the 16-bit reply

Reply Data is formatted as follows – note that bits 10-11 are always 3, which they rarely are for the subfunction zero reply
bit 0 Alternate Camera setting
0 Alternate Camera is currently Camera 2
1 Alternate Camera is currently Camera 3
bits 1-9 Reserved – always 0
bits 10-11 Always Set – value 3 to confirm Settings1a
bits 12-15 Reserved – always 0
NOTE This reply has the same format as for **Query System Settings1**

Command	**046B**	[1131d]	**Query System Settings2**
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x04	0x6B	0x00	0x00	No optional data

Reply: Query System **Settings2** response – 0x046D

Command	**046D**	[1133d]	**Reply - Query System Settings2**
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x04	0x6D	Data MSB	Data LSB	Reply Data consists of 2 bit-fields within the 16-bit reply

Reply Data is formatted as follows:
bits 0-11 Current Max Pan Rate in tenth degrees per sec
e.g. 500 would mean 50.0 degrees/sec
(This is based on Current Effective Max Pan Speed modified by Positioning Speed setting)
bits 12-15 Max Tilt Rate percent reduction on Current Max Pan Rate in 2% increments (usually 0)
e.g. 4 would mean Max Tilt Rate should be 92% of Max Pan Rate
(If Effective Max Tilt Speed is > Effective Max Pan Speed then 0 is returned;
If Effective Max Tilt Speed is < 70% of Effective Max Pan Speed then 15 is returned)

Command	**056B**	[1387d]	**Query Pan/Tilt Limits1**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x05	0x6B	0x00	0x00
Reply: **Query Pan/Tilt Limits1** response – 0x056D			

Command	**056D**	[1389d]	**Reply - Query Pan/Tilt Limits1**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x05	0x6D	Data MSB	Data LSB
Reply Data is formatted as follows: bits 0-8 Pan Left Limit in degrees left from Pan Zero e.g. 280 would mean 280 degrees left which is a Pan Position of 80.0 degrees (Non-zero value is only valid if System Settings1 says Pan IS limited) bits 9-15 Tilt Down Limit in degrees down from Tilt Zero e.g. 20 would mean 20 degrees down (Non-zero value is only valid if System Settings1 says Tilt IS limited)			

Command	**066B**	[1643d]	**Query Pan/Tilt Limits2**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x06	0x6B	0x00	0x00
Reply: **Query Pan/Tilt Limits2** response – 0x066D			

Command	**066D**	[1645d]	**Reply - Query Pan/Tilt Limits2**
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x06	0x6D	Data MSB	Data LSB
Reply Data is formatted as follows: bits 0-8 Pan Right Limit in degrees right from Pan Zero e.g. 280 would mean 280 degrees right (Non-zero value is only valid if System Settings1 says Pan IS limited) bits 9-15 Tilt Up Limit in degrees up from Tilt Zero e.g. 70 would mean 70 degrees up which is a Tilt position of 290 degrees (Non-zero value is only valid if System Settings1 says Tilt IS limited)			

Command	**076B**	[1899d]	**Query POST Result**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x07	0x6B	0x00	0x00	No optional data
Reply: **Query POST Result** response – 0x076D				

Command	**076D**	[1901d]	**Reply - Query POST Result**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x07	0x6D	Data MSB	Data LSB	Reply Data consists of 16 individual result bits, one for each issue

Reply Data is formatted as follows:
bit 0 Pan Motion/Encoder test failed
bit 1 Not used – always 0
bit 2 Tilt Motion/Encoder test failed
bit 3 Not used – always 0
bit 4 Pan Homing test failed
bit 5 Tilt Homing test failed
bit 6 Analogue Lens Zooming test failed
bit 7 Analogue Lens Focusing test failed
bit 8 External UART test failed (now not used)
bit 9 Temperature or Humidity sensor test failed
bit 10 Camera1 and/or Lens1 test failed
bit 11 Camera2 and/or Lens2 test failed
bit 12 Camera3 and/or Lens3 test failed (or Add-on processor test failed)
bit 13 POST was not run because it was inhibited (POST parameter set to zero)
bit 14 OSD Menu Construction failed (overflowed RAM or bad firmware)
bit 15 BATRAM was garbaged – restored from EEPROM or defaults if EEPROM was also garbaged

Command	**086B**	[2155d]	**Query Current Camera and Lens Capabilities**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x08	0x6B	0x00	0x00	No optional data.
Reply: Query **Currently Controlled Camera and Lens Capabilities** response – 0x086D				

Command	**086D**	[2157d]	**Reply - Query Currently Controlled Camera and Lens Capabilities**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x08	0x6D	Data MSB	Data LSB	Reply Data consists of 9 bit-fields within the 16-bit reply

Reply Data is formatted as follows:

bits 0-3 Camera Type 0-15
- 0 None (camera not present)
- 1 Dumb (camera provides image but is not controlled by this firmware)
- 2 Separate Daylight camera with on-image camera menu (e.g. Hitachi KPHD, Carina/Kowa)
- 3 Separate Camera with direct PelcoD pass-through control from additional PelcoD address
- 4 Camera with built-in IP encoder for PT control
- 5 Sony Block camera
- 6 Hitachii Block camera
- 7 Reserved – should never be used
- 8 DRS thermal camera
- 9 FLIR TAU2 thermal camera
- 10 Irisys 5 or 6 thermal camera
- 11 Integrated uncooled thermal block camera (e.g. VindenLR)
- 12 Integrated cooled thermal block camera (e.g. Ventus, Selex Horizon, G5, AtticaM1)
- 13 Other tyoe of device treated as a “camera” (e.g. Illuminator)
- 14 Intelligent Tube Day Camera (NYI)
- 15 Intelligent Tube Thermal Camera (NYI)

bits 4-8 Lens Type 0-31 (values depend on Camera Type – see **Appendix E**)
- 31 Lens Type is Unknown for this Camera Type

bits 9-14 Extra capabilities bits (layout depends on whether Camera Type is Daylight, Thermal or Other – see **Appendix E**)

bit 15 Camera Type class
- 0 Daylight Type class
- 1 Thermal or Other Type class (bit 9 distinguishes Thermal (0) and Other (1))

Command	**096B**	[2411d]	**Query Current Camera and Lens HFOV at Full Tele**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x09	0x6B	0x00	0x00	No optional data.
Reply: Query **Currently Controlled Camera and Lens HFOV at Full Tele** response – 0x096D				

Command	**096D**	[2413d]	**Reply - Query Current Camera and Lens HFOV at Full Tele**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x09	0x6B	Data MSB	Data LSB	Unsigned 16-bit value
Data value is HFOV at Full Tele in hundredth degree units (e.g. 0x024E says HFOV at Full Tele is 5.90 degrees)				

Command	**0A6B**	[2667d]	**Query Current Camera and Lens HFOV at Full Wide**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0A	0x6B	0x00	0x00	No optional data.
Reply: Query **Currently Controlled Camera and Lens HFOV at Full Tele** response – 0x096D				

Command	**0A6D**	[2669d]	**Reply - Query Current Camera and Lens HFOV at Full Wide**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0A	0x6B	Data MSB	Data LSB	Unsigned 16-bit value
Data value is HFOV at Full Wide in hundredth degree units (e.g. 0x0703 says HFOV at Full Wide is 17.95 degrees)				

Command	**0B6B**	[2923d]	**Query Current Camera/Lens Settings1**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0B	0x6B	0x00	0x00	No optional data.
Reply: Query Currently Controlled Camera/Lens Settings1 response – 0x0B6D				

Command	**0B6D**	[2925d]	**Reply - Query Current Camera/Lens Settings1**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0B	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing various bit-fields
Format of reply data depends on Camera Type and Lens Type given by Query 0x086B above (See **Appendix F**)				

Command	**0C6B**	[3179d]	**Query Current Camera/Lens Settings2**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0C	0x6B	0x00	0x00	No optional data.
Reply: Query Currently Controlled Camera/Lens Settings2 response – 0x0C6D				

Command	**0C6D**	[3181d]	**Reply - Query Current Camera/Lens Settings2**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0C	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing various bit-fields
Format of reply data depends on Camera Type and Lens Type given by Query 0x086B above (See **Appendix F**)				

Command 0D6B		[3435d]	**Query Current Camera/Lens Settings3**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0D	0x6B	0x00	0x00	No optional data.
Reply: Query Currently Controlled Camera/Lens Settings3 response – 0x0D6D				

Command 0D6D		[3437d]	**Reply - Query Current Camera/Lens Settings3**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0D	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing various bit-fields
Format of reply data depends on Camera Type and Lens Type given by Query 0x086B above (See **Appendix F**)				

Command 0E6B		[3691d]	**Query Current Camera/Lens Settings4**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0E	0x6B	0x00	0x00	No optional data.
Reply: Query Currently Controlled Camera/Lens Settings4 response – 0x0E6D				

Command 0E6D		[3693d]	**Reply - Query Current Camera/Lens Settings4**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0E	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing various bit-fields
Format of reply data depends on Camera Type and Lens Type given by Query 0x086B above (See **Appendix F**)				

Command 0F6B		[3947d]	**Query Current Camera/Lens Readiness**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0F	0x6B	0x00	0x00	No optional data.
Reply: Query Currently Controlled Camera/Lens **Readiness** response – 0x0F6D				

Command 0F6D		[3949d]	**Reply - Query Current Camera/Lens Readiness**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x0F	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing various status bits

Reply data format is as follows:

0x0000 Always means that camera/lens are ready –no problems
0x8000 Camera/Lens not currently operational (but may become so if caller waits)
Other bits within 0x7FFF may be set to indicate various readiness issues
If any of these issues prevent the Camera/Lens being operation then bit 0x8000 MUST also be set

Command	**106B**	[4203d]	**Query System Circular IO Buffer Counters**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x10	0x6B	0x00	0x00	No optional data.
Reply: Query **System Circular IO Buffer Counters** response – 0x106D				

Command	**106D**	[4205d]	**Reply - Query System Circular IO Buffer Counters**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x10	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing 2 8-bit fields
Format of reply data is: bits 0-7 Count of bytes currently in Circular Input Buffer (received from comms UART but not yet seen by PelcoD processing) bits 8-15 Count of bytes currently in Circular Output Buffer (waiting to send out of comms UART, usually because RD485 is busy)				

Command	**116B**	[4459d]	**Query More System Buffer Counters**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x11	0x6B	0x00	0x00	No optional data.
Reply: Query More **System Buffer Counters** response – 0x116D				

Command	**116D**	[4461d]	**Reply - Query More System Buffer Counters**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x11	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing 2 8-bit fields
Format of reply data is: bits 0-7 Count of bytes currently in PelcoD Command Queue awaiting command processing bits 8-15 Number of times PelcoD commands have been discarded because PelcoD command queue was full				

Commands 0x126B through to 0x5F6B and corresponding replies 0x126D through to 0x5F6D are ignored

Command	**606B**	[24683d]	**Query Historic Error Counters Status**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x60	0x6B	0x00	0x00	No optional data.
Reply: Query **Historic Error Counters Status** response – 0x606D These are status of error counters just before last reboot				

Command	**606D**	[24685d]	**Reply - Query Historic Error Counters Status**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x60	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing status bits
Reply data format is: bit 0 1 if Historic Error Counter1 is On (value is >100ms) bit 1 1 if Historic Error Counter2 is On (value is >0) bit 2 1 if Historic Error Counter3 is On (value is >0) bit 3 1 if Historic Error Counter4 is On (value is >0) bit 4 1 if Historic Error Counter5 is On (value is >0) bit 5 1 if Historic Error Counter6 is On (value is >0) bits 6-15 0 (not currently used)				

Command	**616B**	[24939d]	**Query Historic Max PelcoD Command Stream Inattention Time msec**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x61	0x6B	0x00	0x00	This gets the value of error counter1 just before last reboot
Reply: Query **Historic Max PelcoD Command Stream Inattention Time msec** response – 0x616D				

Command	**616D**	[24941d]	**Reply – Historic Max PelcoD Command Stream Inattention Time msec**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x61	0x6D	Data MSB	Data LSB	Unsigned 16-bit historic value of error counter1
Reply data format is unsigned 16-bit integer giving Max PelcoD Command Stream Inattention Time in msec				

Command	**626B**	[25195d]	**Query Historic Number of PelcoD Packets seen with bad checksum**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x62	0x6B	0x00	0x00	This gets the value of error counter2 just before last reboot
Reply: Query **Historic Number of PelcoD Packets seen with bad checksum** response – 0x626D				

Command	**626D**	[25197d]	**Reply –Historic Number of PelcoD Packets seen with bad checksum**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x62	0x6D	Data MSB	Data LSB	Unsigned 16-bit historic value of error counter2
Reply data format is unsigned 16-bit integer giving Number of PelcoD Packets seen with bad checksum				

Command	**636B**	[25451d]	**Query Historic Number of times Comms Look Ahead buffer has gone full (input lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x63	0x6B	0x00	0x00	No optional data.
				This is value of error counter3 just before last reboot
Reply: Query **Historic Number of times Comms Look Ahead buffer has gone full (input lost)** response – 0x636D				

Command	**636D**	[25453d]	**Reply - Historic Number of times Comms Look Ahead buffer has gone full (input lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x63	0x6D	Data MSB	Data LSB	Unsigned 16-bit historic value of error counter3
Reply data format is unsigned 16-bit integer giving Historic Number of times Comms Look Ahead buffer has gone full (input lost)				

Command	**646B**	[25707d]	**Query Historic Number of times Comms Put-Ahead buffer has gone full (output lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x64	0x6B	0x00	0x00	No optional data.
				This is value of error counter4 just before last reboot
Reply: Query **Historic Number of times Comms Put-Ahead buffer has gone full (output lost)** response – 0x646D				

Command	**646D**	[25709d]	**Reply - Number of times Comms Put-Ahead buffer has gone full (output lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x64	0x6D	Data MSB	Data LSB	Unsigned 16-bit historic value of error counter4
Reply data format is unsigned 16-bit integer giving Historic Number of times Comms Put Ahead buffer has gone full (output lost)				

Command	**656B**	[25963d]	**Query Historic Number of times RS485 Input discarded because RS485 sending**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x65	0x6B	0x00	0x00	No optional data.
				This is value of error counter5 just before last reboot
Reply: Query **Historic Number of times RS485 Input discarded because RS485 sending** response – 0x656D				

Command	**656D**	[25965d]	**Reply - Number of times RS485 Input discarded because RS485 sending**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x65	0x6D	Data MSB	Data LSB	Unsigned 16-bit historic value of error counter5
Reply data format is unsigned 16-bit integer giving Number of times RS485 Input discarded because RS485 sending				

Command 666B		[26219d]	**Query Historic Number of RS485 Input bytes discarded because RS485 sending**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x66	0x6B	0x00	0x00	No optional data.
				This is value of error counter6 just before last reboot
Reply: Query **Historic Number of RS485 Input bytes discarded because RS485 sending** response – 0x666D				

Command 666D		[26221d]	**Reply - Number of RS485 Input bytes discarded because RS485 sending**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x66	0x6D	Data MSB	Data LSB	Unsigned 16-bit historic value of error counter6
Reply data format is unsigned 16-bit integer giving Number of RS485 Input bytes discarded because RS485 sending				

Commands 0x676B through to 0x6F6B and corresponding replies 0x676D through to 0x6F6D are ignored

Command	**706B**	[28779d]	**Query Live Error Counters Status**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x70	0x6B	0x00	0x00	No optional data.
				These are current values of error counters
Reply: Query **Live Error Counters Status** response – 0x706D				

Command	**706D**	[28781d]	**Reply - Query Live Error Counters Status**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x70	0x6D	Data MSB	Data LSB	Unsigned 16-bit value containing status bits
Reply data format is: bit 0 1 if Live Error Counter1 is On (value is >100ms) bit 1 1 if Live Error Counter2 is On (value is >0) bit 2 1 if Live Error Counter3 is On (value is >0) bit 3 1 if Live Error Counter4 is On (value is >0) bit 4 1 if Live Error Counter5 is On (value is >0) bit 5 1 if Live Error Counter6 is On (value is >0) bits 6-15 0 (not currently used)				

Command	**716B**	[29035d]	**Query Live Max PelcoD Command Stream Inattention Time msec**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x71	0x6B	0x00	0x00	No optional data.
				This is current value of error counter1
Reply: Query **Live Max PelcoD Command Stream Inattention Time msec** response – 0x716D				

Command	**716D**	[29037d]	**Reply – Live Max PelcoD Command Stream Inattention Time msec**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x71	0x6D	Data MSB	Data LSB	Unsigned 16-bit live value of error counter1
Reply data format is unsigned 16-bit integer giving Max PelcoD Command Stream Inattention Time in msec				

Command	**726B**	[29291d]	**Query Live Number of PelcoD Packets seen with bad checksum**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x72	0x6B	0x00	0x00	No optional data.
				This is current value of error counter2
Reply: Query **Live Number of PelcoD Packets seen with bad checksum** response – 0x726D				

Command	**726D**	[29293d]	**Reply –Live Number of PelcoD Packets seen with bad checksum**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x72	0x6D	Data MSB	Data LSB	Unsigned 16-bit live value of error counter2
Reply data format is unsigned 16-bit integer giving Number of PelcoD Packets seen with bad checksum				

Command	**736B**	[29547d]	**Query Live Number of times Comms Look Ahead buffer has gone full (input lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x73	0x6B	0x00	0x00	No optional data.
				This is current value of error counter3
Reply: Query **Live Number of times Comms Look Ahead buffer has gone full (input lost)** response – 0x736D				

Command	**736D**	[29549d]	**Reply - Live Number of times Comms Look Ahead buffer has gone full (input lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x73	0x6D	Data MSB	Data LSB	Unsigned 16-bit current value of error counter3
Reply data format is unsigned 16-bit integer giving Live Number of times Comms Look Ahead buffer has gone full (input lost)				

Command	**746B**	[29803d]	**Query Live Number of times Comms Put-Ahead buffer has gone full (output lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x74	0x6B	0x00	0x00	No optional data.
				This is current value of error counter4
Reply: Query **Live Number of times Comms Put-Ahead buffer has gone full (output lost)** response – 0x746D				

Command	**746D**	[29805d]	**Reply - Number of times Comms Put-Ahead buffer has gone full (output lost)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x74	0x6D	Data MSB	Data LSB	Unsigned 16-bit current value of error counter4
Reply data format is unsigned 16-bit integer giving Live Number of times Comms Put Ahead buffer has gone full (output lost)				

Command	**756B**	[30059d]	**Query Live Number of times RS485 Input discarded because RS485 sending**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x75	0x6B	0x00	0x00	No optional data.
				This is current value of error counter5
Reply: Query **Live Number of times RS485 Input discarded because RS485 sending** response – 0x756D				

Command	**756D**	[30061d]	**Reply - Number of times RS485 Input discarded because RS485 sending**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x75	0x6D	Data MSB	Data LSB	Unsigned 16-bit current value of error counter5
Reply data format is unsigned 16-bit integer giving Number of times RS485 Input discarded because RS485 sending				

Command 766B	[30315d]	**Query Live Number of RS485 Input bytes discarded because RS485 sending**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x76	0x6B	0x00	0x00
Reply: Query **Historic Number of RS485 Input bytes discarded because RS485 sending** response – 0x766D			

Command 766D	[30317d]	**Reply - Number of RS485 Input bytes discarded because RS485 sending**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x76	0x6D	Data MSB	Data LSB
Reply data format is unsigned 16-bit integer giving Number of RS485 Input bytes discarded because RS485 sending			

Commands 0x776B through to 0x7F6B and corresponding replies 0x776D through to 0x7F6D are ignored

Commands 0x806B through to 0xFF6B are reserved for setting various parameters (NYI)
Commands 0x806D through to 0xFF6D are ignored

Commands 0x6F through to 0x79 are ignored

Commands 0x007B through to 0x1F7B are reserved for setting Thermal Camera/Lens Parameters
Commands 0x207B through to 0x3F7B are reserved for setting Daylight Camera/Lens Parameters
Commands 0x407B through to 0xFF7B are ignored

Command 7B	[124d]	**Set Thermal Image Effect**	
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x7B	FuncNum	FuncVal	DATA1 indicates function
				Data 2 indicates function value to set

Reply: General Reply given.

This command sets various effects of the Thermal Camera/Lens.
Each function is assigned a Function Number identified in the Data 1 byte (FuncNum).
Each function can be set with a value or attribute which is assigned in the Data 2 byte (FuncVal).

FuncNum
0x00 Polarity (DRS,FLIR TAU2,Irisys5/6,G5,Selex Horizon,Ventus/Vinden,SSTI,AtticaM1)
FuncVal 0x00 Polarity Normal (White Hot)
0x01 Polarity Inverse (Black Hot)
This effect can also be toggled using a call to Preset 205 (or Preset Function Base+6)

0x01 Edge Enhancement (AtticaM1)
FuncVal 0xnn : Edge Enhancement level (0-3)

*Ref **Appendix C**.*

Command 017B	[379d]	**Do Thermal Camera/Lens Function Control.**	
			Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x01	0x7B	FuncNum	FuncVal	DATA1 indicates function
				ICEFunc Range: 0x00 – 0x01{0 – 1d}

Reply: General Reply given.

This command operates various functions of the Thermal Camera/Lens.
Each function is assigned a Function Number identified in the Data 1 byte (FuncNum).
Each function can be set with a value or attribute which is assigned in the Data 2 byte (FuncVal).

FuncNum
0x00 ICE Control (DRS,FLIR TAU2 {ACE},Ventus/Vinden {CLAHE},SSTI {DDE})
FuncVal 0x00 : ICE Off
0x01 : ICE On
This contrast function can also be toggled using a call to Preset 213 (or Preset Function Base+14)

0x01 Do NUC (DRS,FLIR TAU2,G5,Selex Horizon,Ventus/Vinden,AtticaM1)
FuncVal 0x00 : Perform Standard NUC

*Ref **Appendix C**.*

Command 207B	[8315d]	**Day Camera/Lens Function Control.**

Expansion Command

CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x20	0x7B	FuncNum	FuncVal

Reply: General Reply given.

This command operates various functions of the lens and lens DSP processor if one is fitted.
Each function is assigned a Function Number identified in the Data 1 byte (FuncNum).
Each function can be set with a value or attribute which is assigned in the Data 2 byte (FuncVal).
Functions 6-10 will force DSP Processing On if required (on PAIR lens only)

FuncNum

0x00 DSP Processing (Cam with PAIR lens)
- FuncVal 0x00 : DSP Off
- 0x01 : DSP On

0x01 Stabiliser (Sony,Selex Horizon,Ventus/Vinden,Cam with PAIR/FUJI1000/TamronF1 lens)
- FuncVal 0x00 : Stabiliser Off
- 0x01 : Stabiliser On

This setting can also be toggled using a call to Preset 216 (or Preset Function Base+17)

0x02 Enable Extender Status (Lens with Extender e.g. PAIR,FUJI1000)
- FuncVal 0x00 : Allow Least Significant bit of Zoom value to Set/Indicate Extender status.
- 0x01 : Least Significant bit of Zoom value is part of lens zoom value.

0x03 Extender (Lens with Extender e.g. PAIR,FUJI1000)
- FuncVal 0x00 : Extender Off (Out)
- 0x01 : Extender On (In)

0x04 Optical Filter (FUJI1000 lens with Optical Filter only)
- FuncVal 0x00 : Visible Light Cut filter
- 0x01 : No Filter – Clear
- 0x02 : Neutral Density 1/8 filter
- 0x03 : Neutral Density 1/64 filter

0x05 Infrared Filter (FUJI1000 or Yamano lens with IR Filter only)
- FuncVal 0x00 : No Filter – Clear
- 0x01 : 850nm Filter
- 0x02 : 880nm Filter
- 0x03 : 850nm Filter

0x06 Anti-Fog (Sony or Carina/Kowa Cam or PAIR lens)
- FuncVal 0x00 : Anti-Fog Off
- 0x01 : Anti-Fog On / Level 1 (Low)
- 0x02 : Anit-Fog Level 2 (Medium)
- 0x03 : Anit-Fog Level 3 (High)

0x07 Anti-fog time (PAIR lens)
- FuncVal 0x00 : Manual Anti-fog timing.
- 0x01 : Automatic Anti-fog timing.

0x08 Colour priority bias (PAIR lens)
- FuncVal 0x00 : Normal – No colour priority
- 0x01 : Colour priority mode enabled.

0x09 Chromatic correction (PAIR lens)
- FuncVal 0x00 : Low – Chromatic correction level.
- 0x01 : Normal / Medium – Chromatic correction level.
- 0x02 : High – Chromatic correction level.

0x0A Emphasis adjustment - (PAIR lens)
- FuncVal 0x00 : Low – Emphasis adjustment level.
- 0x01 : Normal / Medium – Emphasis adjustment level.
- 0x02 : High – Emphasis adjustment level.

0xFF Reset Lens (PAIR or FUJI1000 lens)
FuncVal 0x01 : Perform DSP Reset.

Command 107D	[4221d]	**Pan Right at Fine rate**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x10	0x7D	0xnn	0xnn

Speed Range: 0x00 – 0xFFFF {0 – 65535d}

Reply: General Reply given.

Starts Pan movement to Right with fine speed control.
Speed value is determined as a fraction of the system's current maximum Pan speed.
Data value as n/65535 of maximum speed; (1/65535 minimum rate, 65535/65535 maximum rate).
Data value of 0000 (Zero) defines a stop of Pan (Azimuth) movement at fine rate.

A General command of Pan Stop will not interrupt this Fine Rate movement.
This is to prevent a normal command that just manipulates Zoom/Focus/Iris from stopping a current fine-control movement command.
Alternative ways to stop the movement are a General Pan Left or Pan Right command followed by a General Pan Stop,
a Pan-Abspos absolute position command or to recall a Goto-Stored-Preset position.

Example: Pan Right at 32768/65535 of Max speed. Data value 32768d is 0x8000. Message: FF 01 10 7D 80 00 0E

Command 117D	[4477d]	**Pan Left at Fine rate**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x11	0x7D	0xnn	0xnn

Speed Range: 0x00 – 0xFFFF {0 – 65535d}

Reply: General Reply given.

Starts Pan movement towards Left with fine speed control.
The same comments as above apply about Speed and Stop behaviour

Example: Pan Left at 256/65535 of Max speed. Data value 256d is 0x0100. Message: FF 01 11 7D 01 00 90

Command 127D	[4733d]	**Tilt Up at Fine rate**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x12	0x7D	0xnn	0xnn

Speed Range: 0x00 – 0xFFFF {0 – 65535d}

Reply: General Reply given.

Starts Tilt movement towards Up with fine speed control.
Speed value is determined as a fraction of the system's current maximum Tilt speed.
Data value as n/65535 of maximum speed; (1/65535 minimum rate, 65535/65535 maximum rate).
Data value of 0000 (Zero) defines a stop of Tilt (Elevation) movement at fine rate.

A General command of Tilt Stop will not interrupt this Fine Rate movement. (Same reason as for Pan)
Alternative ways to stop the movement are a General Tilt up or Tilt down command followed by a General Tilt Stop,
a Tilt-Abspos absolute position command or to recall a Goto-Stored-Preset position.

Example: Tilt Up at 32768/65535 of Max speed. Data value 32768d is 0x8000. Message: FF 01 12 7D 80 00 10

Command 137D	[4989d]	**Tilt Down at Fine rate**	
			Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**
0x13	0x7D	0xnn	0xnn

Speed Range: 0x00 – 0xFFFF {0 – 65535d}

Reply: General Reply given.

Starts Tilt movement towards Down with fine speed control.
The same comments as above apply about Speed and Stop behaviour

Example: Tilt Down at 256/65535 of Max speed. Data value 256d is 0x0100. Message: FF 01 13 7D 01 00 92

Command 147D		[5245d]	**Pan Abs with Fine position control (Set high 16 bits of target position)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x14	0x7D	0xnn	0xnn	High 16 bits of Pan Abs target position: 0x0000 – 0xFFFF
Reply: General Reply given.				
Specifies High 16 bits of 32-bit signed PanAbs target position in raw motor step units This just remembers the value until the following 0x157D command which actually triggers the move. Example: Pan Abs to 1000000 (0x000F4240) Data values 0x000F and 0x4240. Message: FF 01 14 7D 00 0F A1				

Command 157D		[5501d]	**Pan Abs with Fine position control (Set low 16 bits of target position and execute)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x15	0x7D	0xnn	0xnn	Low 16 bits of Pan Abs target position: 0x0000 – 0xFFFF
Reply: General Reply given.				
Adds this Low 16 bits of Pan target position to High value already supplied and then executes the PanAbs move Example: Pan Abs to 1000000 (0x000F4240) Data values 0x000F and 0x4240. Message: FF 01 15 7D 42 40 15				

Command 167D		[5757d]	**Tilt Abs with Fine position control (Set high 16 bits of target position)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x16	0x7D	0xnn	0xnn	High 16 bits of Tilt Abs target position: 0x0000 – 0xFFFF
Reply: General Reply given.				
Specifies High 16 bits of 32-bit signed TiltAbs target position in raw motor step units This just remembers the value until the following 0x177D command which actually triggers the move. Example: Tilt Abs to -310000 (0xFFFB4510) Data values 0xFFFB and 0x4510. Message: FF 01 16 7D FF FB 8E				

Command 177D		[6013d]	**Tilt Abs with Fine position control (Set low 16 bits of target position and execute)**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x17	0x7D	0xnn	0xnn	Low 16 bits of Tilt Abs target position: 0x0000 – 0xFFFF
Reply: General Reply given.				
Adds this Low 16 bits of Tilt target position to High value already supplied and then executes the TiltAbs move Example: Tilt Abs to -310000 (0xFFFB4510) Data values 0xFFFB and 0x4510. Message: FF 01 17 7D 45 10 EA				

Command 7F		[127d]	**One Time Select of Controlled Camera**	
				Expansion Command
CMND 1	**CMND 2**	**DATA 1**	**DATA 2**	
0x00	0x7F	0x00	CamNum	CamNum Range: 0x01 – 0x03 {1 – 3d}
Reply: General Reply given.				
This command temporarily assigns the Camera Control to the chosen camera/payload. The next command sent to the same PelcoD address as the 0x7F command, if it controls a camera or lens, will apply to the nominated device instead of the currently controlled camera. This function will only apply to the single, following command (even if that is not camera/payload specific) and the Camera Control setting will return to its previous value once the follow-on command has been received. This allows for payload (Camera, Lens) queries or commands to be specified as to which of the payloads they are for without changing the current Camera Control which may be unknown or have been set by another operator.				

Appendix A.

Pre-requisite configurations.
The telemetry control described in this document is applicable where particular configurations of some settings are in place.
These settings can be checked and selected within the On Screen Display menus of the PT unit.
Where these settings are not configured as defined herein the operation of the telemetry control may differ from that which is described and expected.

Pelco D Mode: PelcoD Mode must be set to **STRICT**.
(OSD Menu – SETUP > COMMUNICATION > PELCOD MODE : STRICT)

Pan/Tilt Control: Pan/Tilt Control mode set to **Normal**.
(OSD Menu – Main Root Menu>PAN/TILT CONTROL : NORMAL)

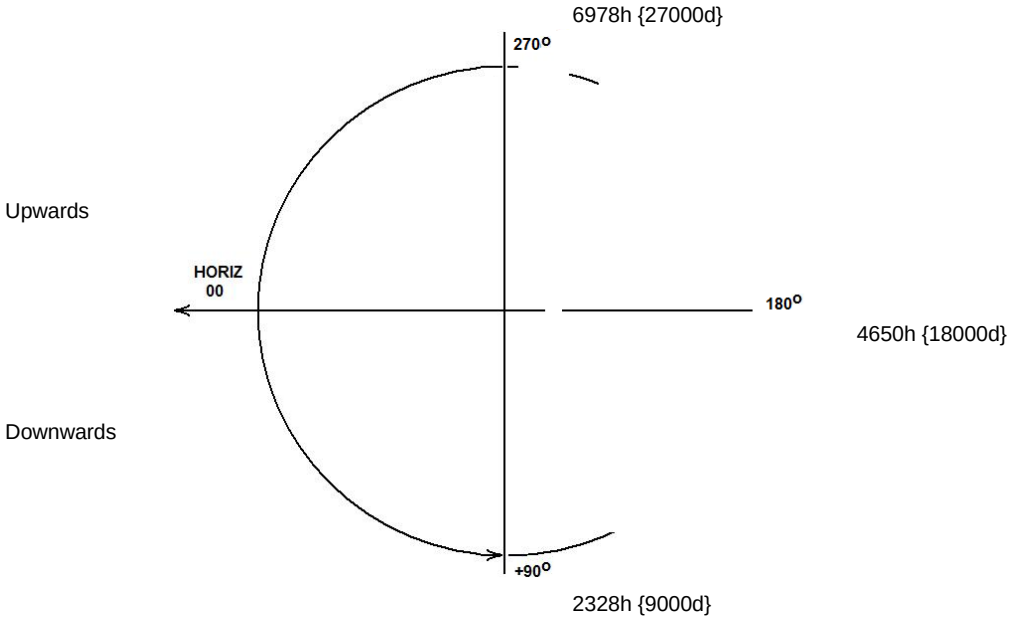
Zoom Camera<->Protocol Mapping: Zoom Cam<->Proto set to **FullRng**.
(OSD Menu – SETUP > COMMUNICATION > ZOOM CAM<->PROT : FullRng)

Focus Camera<->Protocol Mapping: Focus Cam<->Proto set to **FullRng**.
(OSD Menu – SETUP > COMMUNICATION > FOCUS CAM<->PROT : FullRng

Note that FullRng only makes a difference for Sony Block cameras and thermals with Gen2 Ophir225 thermal lenses.
Tradtnl mapping for these was chosen to make it easy to predict Cam/Lens values from PelcoD values.
With hindsight, this was not a great idea. All other Cameras and Lenses always use FullRng mappings.

Appendix B.

Tilt Co-ordinate scheme.



The angle values increase as the tilt motion rotates **downwards** from the Horizontal (level-forwards) and continues around.
Each value increments 1/100th of one degree of angle.

Horizontal :	At level (forwards).	Angle of Zero degrees.	Data value 0x00.
Straight downwards:	90 degrees below level.	Angle value of 9000.	Data value 0x2328.
Straight upwards:	90 degrees above level.	Angle value of 27000.	Data value 0x6978.
Horizontal :	At level (forwards).	Angle value of 36000..	Data value 0x8CA0.

Appendix C.

Implementation of Presets in Silent Sentinel camera systems

Classic PelcoD Presets have associated storage that can remember and recall Pan, Tilt, Zoom and Focus positions for a single PT mounted camera. For Silent Sentinel systems, this is always the Primary camera and there are 137main storage presets provided that can do this (only first 128 available to users). Since Silent Sentinel camera systems can have 2 or 3 zoomable Camera assemblies, if it is important to remember and recall Zoom and Focus positions for 2 camerasinstead of just one, the system can be configured to do this, at the cost of reducing the number of available user storage presets to 83 (because each preset now takes 1.5 times as much storage space as for normal configuration (Double Camera mode).

Classic PelcoD cameras also have 10 storage locations that can store and recall blocks of camera settings. Silent Sentinels systems have the same facility provided for a few specific Cameras and lenses, which occupy 10 consecutive Preset numbers at 140 to 149.

Preset calls (recall Preset) may also be used to invoke special functions instead of restoring PTZF positions. Most of these are located at numbers which do not have any associated storage, but some may overlap storage presets. In this case, a recall will usually invoke the function rather than recalling any stored PTZF positions.

A couple of blocks of functional presets have a moveable base location, and can be disabled en-block or moved so that they overlap other functional numbers. In such cases the moveable blocks usually take priority, and mask any fixed numbers that they overlap. Decoding is done in a fixed order (see below) and the first meaning that matches a preset number will be taken.

Storage presets can also be configured on an individual basis to vector to any alternative preset number, or to start running a predefined preset tour or mimic tour. This allows the main block of functional presets to be moved away from its normal low-numbered position, and then certain selected functions within it to be individually mapped to low preset numbers. This vectoring is one stage only, and causes any vectored preset number to be re-analysed by the same procedure as the original executable number went through.

The preset number analysis procedure is as follows (steps applied in this order):

Start analysing Preset number:

If 95 and "Preset 95 menus" mode is On, change number to 199 and continue.

If system has an Illuminator and special Illuminator function block is enabled and preset number lies within Illuminator function block, then execute Illuminator function
This special Illuminator function block is usually based at Preset 184 (but can be moved)
Assuming base of 184, functions are at (base) to (base+6):
184 Stop Zooming Illuminator
185 Start Zooming Illuminator In at desired rate
186 Start Zooming Illuminator Out at desired rate
187 Force Illuminator Off
188 Force Illuminator On in Steady Beam mode (with current strength)
189 Force Illuminator On in Strobe mode (with current Strobe settings)
190 Illuminator On in temporary Boost mode (certain Illuminators only)

(Special Radiometric systems use Presets 190-192 for Alarm handling)

193 Take control of IR lamp and invert its On/Off state
194 Revert control of IR lamp to current OSD menu setting

If system has a Ventus or Vinden camera and preset is between 175 & 183 then for this Thermal camera:
175 Do procedural NUC
176 Step AGC Brightness down by 1 level
177 Step AGC Brightness up by 1 level
178 Step AGC Contrast down by 1 level
179 Step AGC Contrast up by 1 level
180 Force False Colour and Polarity to Monochrome and Normal
181 Cycle through occupied settings in Ventus/Vinden False Colour display list
182 Magnify image by 1 step less
183 Magnify image by 1 step more

196 Toggle OSD Debug display On/Off
198 If OSD quick menu is enabled, enter it as base OSD level

199 Fixed base of main block of functional presets. Alternative base is ext-pos (usually 2). This main block extends for a further 18 (2-camera firmware) or 19 (3-camera firmware) numbers. If the called preset lies within either of these ranges it will be actioned.

(If Special system with auxiliary Fusion Processor presets 220-244 invoke special functions)
(If Special system with auxiliary SLVT Tracking Processor presets 220-233 invoke special functions)

1 If in OSD menus then "Set" or "Select" on current menu item.

If called preset number is in the storage preset range (1-128 for normal layout, or 1-83 for Double Camera preset layout) then analyse preset storage content. If it vectors to another preset then go back and start analysing the new Preset, using the same procedure as above. If it vectors to a tour, start the tour. If it contains a stored position, then recall the stored position. Else complain.

If called preset number is in the Camera/Lens preset range (140-149) then attempt to recall the stored Cam/Lens settings.

(If special system with auxiliary processor and preset number is in range (150-159) then attempt to recall auxiliary processor settings (Fusion and SLVT Tracking).)

If called preset number is >250 then do special OSD processing.

If called preset number is 197 then escape back to autoprotocol detection.

End analysing Preset number:

Main Block of Preset Function Assignments.

Preset Function values that have been assigned for direct control of non-position functionality for the equipment.

Defined Preset Functions :

Preset No.		Extended Functions
1	Fixed 1	**Select** - when in OSD menus; Preset Position No.1 otherwise.
2(Default) Base Value	Fixed 199	**Menu** Display On-Screen Menu (or exit to parent menu if in OSD menu tree)
3(Default) Base+1	Fixed 200	**Night** Mode Toggle (Colour/Mono)
4(Default) Base+2	Fixed 201	**Start Wiper** function (turns off after timed interval) Do not wipe when window is dry.
5(Default) Base+3	Fixed 202	**Start Washer** function - Aux 1 Will trigger Washer relay on equipped models.
6(Default) Base+4	Fixed 203	**Aux 2**
7(Default) Base+5	Fixed 204	**Video Swap** (Only for twin camera modules)
8(Default) Base+6	Fixed 205	**Magnifier** - Lens Extender (if Primary imager) **Thermal Polarity** - Black hot / White hot toggle (if Secondary imager)
9(Default) Base+7	Fixed 206	**CAM2** Control - Secondary Imager Control [SIC] (Only for multi camera modules)
10(Default) Base+8	Fixed 207	**PAIR** Enhancement View (Only applicable to PAIR DSP lenses.) **BLC** Back Light Compensation Toggle (On/Off) (On certain models)
11(Default) Base+9	Fixed 208	**WDR** - Wide Dynamic Range – On/Off toggle. (Applicable models only)
12(Default) Base+10	Fixed 209	**Auto-focus** (for keyboard without AF key)
13(Default) Base+11	Fixed 210	**Auto-Iris** (for keyboards without AI key)
14 (Default) Base+12	Fixed 211	**White LED** - Lamp toggle (On/Off) (Only applicable to White LED models.)
15(Default) Base+13	Fixed 212	**End Mimic Recording** Stop recording of motion for use in Mimic Tour. (Only if doing Mimic recording.)
16(Default) Base+14	Fixed 213	**ICE** On/Off toggle (Only for Thermal Image models.)
17(Default) Base+15	Fixed 214	**ICE Level Increase** (Only for Thermal Image models.)
18(Default) Base+16	Fixed 215	**ICE Level Decrease** (Only for Thermal Image models.)
19(Default) Base+17	Fixed 216	**Image Stabiliser** Toggle (On/Off) (Only applicable to particular models)
20(Default) Base+18	Fixed 217	**Slave Zoom** Toggle (On/Off) (2 camera firmwares) **Alt Cam is 2 or 3** Toggle (Cam2/Cam3) (3 camera firmwares) **Tracking On/Off** Toggle (On/Off) (Special SLVT Tracking firmware)
21(Default) Base+19	Fixed 218	**Slave Zoom** Toggle (On/Off) (3 camera firmwares)

CAM2 control re-directs some optical controls (Zoom, Focus, Iris) between the installed imagers. Entering this mode will display CAM2 on the OSD and the zoom and focus functions will be isolated to the Alternate camera or lens (where fitted). The command can be used to toggle between modes or normal operation will resume after 30 seconds (if CAM2 is configured as Timed).

This functional preset is normally disabled if system is set to Dualled Camera mode, where 2 consecutive PelcoD addresses are used to direct control to Primary or Alternate camera. However the Dualled Camera mode can also be set to allow either the first or the second PelcoD address to still be toggled between Primary and Alternate camera control by the CAM2 control preset.

If CAM2 Control is to the Secondary (Thermal) camera, the Iris controls will be assigned to alternative functions:-
AutoIris (or AutoIris preset e.g. 209) will cycle through several Thermal Control modes, each using Iris Open & Iris Close for control e.g.
Iris open(+) – Thermal Polarity – Toggles White-as-hot / Black-as-hot.
Iris close(-) – Digital Enlargement – cycles through values.

The low-numbered values for the Main Functional Preset block are defined by the setting of the Menu Preset (Default Preset-2).
This can be re-assigned within the OSD menu set-up of the PTZ unit. (ExtPos value)
Adjusting the value (Default: 2) will change the Preset position number that recalls the OSD Menu and other functions.

OSD Menu – SETUP > CONFIGURATION > EXT POS : 2.

Please ensure that the selected value can be requested by the control equipment BEFORE changing the setting!
(Not all controllers can request all preset position values.)

Appendix D.

Format of Data Field in 0x086D Reply to 0x086B Query Current Camera and Lens Capabilities

Reply Data is formatted as follows:

Bits 0-3 contain Camera Type 0-15

These Camera Types can be grouped as follows:

Type 0	No camera (therefore also No lens – Reply Data will be 0x0000)
Types 1-4	C-mount Day cameras that support an add-on Day lens
Type 5	Sony Block camera with an integrated Sony Day lens
Type 6	Hitachi Block camera with an integrated Hitachi Day lens
Type 7	Reserved – should never appear
Types 8-10	C-mount Thermal cameras that support an add-on Thermal lens
Type 11	Uncooled Thermal Block camera with an integrated Thermal lens
Type 12	Cooled Thermal Block camera with an integrated Thermal lens
Type 13	Other Type of “Camera” with no lens (lens type identifies exact device type)
Type 14	Day Intelligent Tube Camera with integrated components
Type 15	Thermal Intelligent Tube Camera with integrated components

Bits 4-8 contain Lens Type 0-31, but the value assignments are different for each of the Camera Type groups

Lens Type 0 always means No lens attached, or a fixed FOV non-controllable lens

Lens types for Camera Types 1-4:

1	Analogue drive lens with analogue encoder feedback
2	Pentax PAIR1
3	Pentax PAIR2
4	Pentax PAIR2 (new version)
5	Fuji1000
6	Yamano(500/750/1000)
31	Unknown

Lens types for Camera Type 5 (Sony Block – lens type identifies camera type):

1	Sony10
2	Sony18
3	SonyHD20
4	Sony28
5	SonyHD30
6	Sony36
7	Sony40
31	Unknown

Lens types for Camera Type 6 (Hitachi Block – lens type identifies camera type):

1	Hitachi18
31	Unknown

Lens types for Camera Types 8-10: (Index of thermal lens from Ophir60 to Tamron150)
Current list at 4-Oct-2020 is:

1	Ophir60 (SSTI camera returns 1 for Ophir225 lens which is its only valid option)
2	Ophir100
3	Ophir105
4	Ophir150
5	Ophir225
6	Ophir2 (gen2 Ophir225)
7	Ronit100
8	ISP
9	Tamron105
10	TamronF1

11 Tamron150
31 Unknown
However older firmware versions and builds will not have included some of these lenses
And newer versions and builds may add more
So the safest way of confirming this list is to explore the available list of lens types in the firmware
From Ophir60 onwards, up to Tamron150, which will generate indexes 1-n

Lens types for Camera Type 11: (Index of thermal lens from Vinden75 to largest Vinden)
Current list at 4-Oct-2020 is:
1 Vinden75
2 Vinden150
3 Vinden225
4 Vinden300
31 Unknown
However older firmware versions and builds may not have included some of these lenses
And newer versions and builds may add more
So the safest way of confirming this list is to explore the available list of lens types in the firmware
From Vinden75 onwards, up to Vinden300, which will generate indexes 1-n

Lens types for Camera Type 12: (Index of thermal lens from Ventus275 to largest Ventus)
(Or for G5 or Selex Horizon or AtticaM1 cooled thermals, lens type indicates the type of camera)
Current list at 4-Oct-2020 is:
1 Ventus275
2 Ventus300
3 Ventus330
4 Ventus550
5 Ventus690
6 Ventus825
7 Ventus900
28 AtticaM1
29 Selex Horizon
30 G5
31 Unknown
However older firmware versions and builds may not have included some of these lenses
And newer versions and builds may add more
So the safest way of confirming this list is to explore the available list of lens types in the firmware
From Ventus275 onwards, up to Ventus900, which will generate indexes 1-n
Lens types for Camera Type 12: (Index of thermal lens from Ventus275 to largest Ventus)

Lens types for Camera Type 13: (Lens type identifies exact Other device)
1 Peak Beam spotlight
2 Sheenrun Laser Illuminator
3 Silent Sentinel LED Illuminator
4 Laser Dazzler Illuminator
5 Megaray Illuminator

Lens types for Camera Types 14-15: (Not Yet Defined)
Bits 9-15 Extra capabilities bits (layout depends on whether Camera is Daylight, Thermal or Other
Layout for Daylight Cameras:
bit 9 If magnifier is present: 0 x2 (default if no magnifier)
1 x2.5
bit 10 If WDR-capable then 1 else 0
bit 11 If BLC-capable then 1 else 0
bit 12 If AutoIris-capable then 1 else 0
bit 13 If AutoFocus-capable then 1 else 0
bit 14 If Magnifier present then 1 else 0
bit 15 Always 0 for Daylight Cameras (check this bit before decoding bits 9-14)
Layout for Thermal Cameras:

bit 9 Will be 0 to indicate Thermal, not Other
bits 10-11 Not used (will be 0)
bit 12 1 if DRS with New ICE else 0
bit 13 1 if DRS with ICE else 0
bit 14 1 if DRS640 else 0
bit 15 Will be 1 to indicate Not Daylight (check this bit first, then bit 9)
Layout for Other “Cameras”:
bit 9 Will be 1 to indicate Other, not Thermal
bits 10-14 Not used (will be 0)
bit 15 Will be 1 to indicate Not Daylight (check this bit first, then bit 9)

Appendix E.

Format of Data Fields in 0x0B6D to 0x0E6D Replies to 0x0B6B to 0x0E6B Queries

These replies are potentially formatted differently for every individual Cam/Lens type combination. Not all queries are available for every Cam/Lens combination

Reply Data is formatted as follows:

For Camera Types 1-4 only queries 0x0B6B and 0x0C6B are supported; the others return 0x0000
Reply Data for 0x0B6D reply:
For Camera Types 1,3,4 the camera bits 0-13 are always 0. Only the lens bits 14-15 are supported
For Camera Type 2 bits 0-1 show actual Camera variety:
- 0 Hitachi HPHD/KPD camera (bits 2-13 are always 0)
- 1 Carina/Kowa camera (bits 2-13 give camera settings):
  - i. bits 2-6 ALC level 0-31
  - ii. bits 7-10 Sense-Up value (0-4) * 3 + Day/Night value (0-3
    - a) Sense-Up values are 0 (Off), 1 (Signal-to-Noise), 2 (Standard), 3 (Moving), 4 (Manual)
    - b) Day/Night values are 0 (Auto), 1 (Colour), 2 (Black/White)
  - iii. bits 11-12 Day/Night switch level
    - a) Day/Night switch level values are 0 (Dark), 1 (Mid), 2 (Bright), 3 (Manual)
  - iv. bit 13 Always 0
- 2 Undefined
- 3 Undefined

For Camera Types 1-4 if lens is PAIR2 or Fuji1000 or has Extender the lens bits 14-15 mean:
- bit 14 1 if Extender state occupies Zoompos LS bit, else 0
- bit 15 1 if Stabiliser is On, else 0

For Camera Type 5 (Sony block) reply bits mean:
- bit 0 1 if AF is On, else 0
- bit 1 1 if AI is On, else 0
- bit 2 1 if Combined Optical and Digital Zoom in On, else 0 if only Optical
- bit 3 1 if Stabiliser is On, else 0
- bit 4 1 if BLC is On, else 0
- bit 5 1 if WDR is On, else 0
- bit 6 1 if White Balance is On, else 0
- bit 7 1 if AF Sensitivity is Low, 0 if Normal
- bits 8-9 AF Mode: 0 (Normal), 1 (Interval), 2 (ZoomTrig)
- bits 10-13 Always 0
- bit 14 PelcoD Focus Conversion: 0 (Traditional), 1 (FullRange)
- bit 15 PelcoD Zoom Conversion: 0 (Traditional), 1 (FullRange)

For Camera Type 6 (Hitachi block) reply bits mean:
- bit 0 1 if AF is On, else 0
- bit 1 1 if AI is On, else 0
- bits 2-3 Always 0
- bit 4 1 if BLC is On, else 0
- bit 5 1 if WDR is On, else 0
- bit 6 1 if White Balance is On, else 0
- bit 7 Always 0
- bits 8-9 Picture Mode: 0 (Mode1), 1 (Mode2), 2 (Mono), 3 (Colour)
- bits 10-12 Gain (0-7)
- bits 13-15 Always 0

For Camera Type 8 (DRS Thermal) reply bits mean:

bit 0	Polarity: 1 if Inverse, 0 if Normal
bits 1-4	Palette: 0 for Monochrome
bit 5	1 if ICE is On, else 0
bits 6-7	AGC Mode: 0 (Auto), 1 (Manual), 2 (Freeze)
bits 8-9	Slave Zoom: 0 (Off), 1 (On), 2 (FOV)
bits 10-13	Zoom Mag level: 0 (x1), 1 (x1.25),…12 (x4)
Plus (only if DRS lens is gen2 Ophir225)	
bit 14	PelcoD Focus Conversion: 0 (Traditional), 1 (FullRange)
bit 15	PelcoD Zoom Conversion: 0 (Traditional), 1 (FullRange)
Plus (only if DRS lens is TamronF1)	
bit 14	Athermal compensation: 0 (Off), 1 (On)
bit 15	Stabilisation: 0 (Off), 1 (On)

For Camera Type 9 (FLIR TAU2) reply bits mean:

bit 0	Polarity: 1 if Inverse, 0 if Normal
bits 1-3	Palette: 0 for Monochrome
bit 4	Always 0
bit 5	1 if ACE is On, else 0
bits 6-7	AGC Mode: 0 (Auto), 1 (Freeze)
bits 8-9	Slave Zoom: 0 (Off), 1 (On), 2 (FOV)
bits 10-13	Zoom Mag level: 0 (x1), 1 (x2), 2 (x4)
Plus (only if TAU2 lens is gen2 Ophir225)	
bit 14	PelcoD Focus Conversion: 0 (Traditional), 1 (FullRange)
bit 15	PelcoD Zoom Conversion: 0 (Traditional), 1 (FullRange)
Plus (only if TAU2 lens is TamronF1)	
bit 14	Athermal compensation: 0 (Off), 1 (On)
bit 15	Stabilisation: 0 (Off), 1 (On)

For Camera Type 10 (Irisys5 or 6) reply bits mean:

bit 0	Polarity: 1 if Inverse, 0 if Normal
bits 1-4	Palette: 0 for Monochrome
bits 5-7	Always 0
bits 8-9	Slave Zoom: 0 (Off), 1 (On), 2 (FOV)
bits 10-11	Zoom Mag level: 0 (x1), 1 (x2), 2 (x4)
bit 12	Always 0
bit 13	Irisys type: 0 (Irisys5) or 1 (Irisys6)
Plus (only if Irisys lens is gen2 Ophir225)	
bit 14	PelcoD Focus Conversion: 0 (Traditional), 1 (FullRange)
bit 15	PelcoD Zoom Conversion: 0 (Traditional), 1 (FullRange)
Plus (only if Irisys lens is TamronF1)	
bit 14	Athermal compensation: 0 (Off), 1 (On)
bit 15	Stabilisation: 0 (Off), 1 (On)

For Camera Type 11 (Uncooled Thermal Block) reply bits (Vinden) are the same as Ventus (below)

For Camera Type 12 (Cooled Thermal Block – Ventus,G5,Selex Horizon,AtticaM1) reply bits mean:

bit 0	Polarity: 1 if Inverse, 0 if Normal
bits 1-4	Palette (Ventus): 0 for Monochrome
(also	1:Rainbow,2:Iron,3:HotCold,4:Jet,5:Hot,6:HSV,7:470CLR,8:Col1, 9:Col2,10:Col3,11:HotIron,12:IceFire,13:IDDEF,14:Iron256,15:Rain256 And because of field size limitations, XVolcano,Red,Green,Blue all give 15 as well)
bit 5	Contrast Enhancement (Selex) or CLAHE (Ventus): 1 On, 0 Off
bits 6-7	AGC mode: 0 (Auto), 1 (Manual), 2 (Freeze) (Not for Ventus)
bits 8-9	Slave Zoom: 0 (Off), 1 (On), 2 (FOV)
bits 10-13	Zoom Mag level: 0 (x1), 1 (x1.25),…12 (x4)
bit 14	Not used (0)
bit 15	Stabilisation: 0 (Off), 1 (On)

For Camera Type 13 (Other “Camera” devices – Illuminators) reply bits mean:

bits 0-1	Off/On state: 0 (Off), 1 (On in Beam mode), 2 (On in Steady mode)
bits 2-3	Beam Strength: 0 (Low), 1 (Medium), 2 (High)
bit 4	Illuminator Permit Region: 1 (Defined) else 0
bit 5	Illuminator pointing outside Permit Region: 1 (Yes) else 0 (All OK)
bits 6-7	Permit Region Action: 0 (None), 1 (LampOff if Outside), 2 (Keep within Region)
bits 8-15	Net Yet defined (always 0)

Reply Data for 0x0C6D reply

For Camera Types 1-4 with PAIR or Fuji1000 lenses we can return lens status information.
For Camera Types 1-4 with other lens types, reply data is always 0x0000

For PAIR1 lens:

bit 0	1 (Extender is present and In), else 0
bits 2-15	Always 0

For PAIR2 lens (old type):

bit 0	1 (Extender is present and In), else 0
bit 1	1 (DSP On), else 0
bits 2-3	Fog Reduction level: 0 (Off), 1 (Low), 2 (Medium), 3 (High)
bits 4-5	Haze Reduction level: 0 (Off), 1 (Low), 2 (Medium), 3 (High)
bits 6-7	BLC level: 0 (Off), 1 (Low), 2 (Medium), 3 (High)
bits 8-9	IR Enhancement level: 0 (Off), 1 (Low), 2 (Medium), 3 (High)
bits 10-15	Always 0

For PAIR2 lens (new type):

bit 0	1 (Extender is present and In), else 0
bit 1	1 (AntiFog processing On), else 0
bits 2-3	Fog Reduction level: 0 (Off), 1 (Low), 2 (Medium), 3 (High)
bit 4	AntiFog Timing: 1 (Auto), 0 (Manual)
bit 5	Colour Priority: 1 (Colour), 0 (Normal)
bits 6-7	Chromatic Correction: 0 (Low), 1 (Normal), 2 (High)
bits 8-9	Emphasis level: 0 (Low), 1 (Normal), 2 (High)
bits 10-15	Always 0

For Fuji1000 lens (new type):

bit 0	1 (Extender is present and In), else 0
bit 1	Always 0
bits 2-3	Optical Filter setting: 0 (VLC), 1 (None), 2 (ND1/8), 3 (ND1/64)
bits 4-5	IR Filter setting: 0 (None), 1 (850nm), 2 (880nm), 3 (950nm)
bits 6-15	Always 0

For Camera Type 5 (Sony block) with integrated lens reply bits mean:
- bits 0-3 Gain: (0-15)
- bits 4-7 Edge Enhancement: (0-15)
- bits 8-12 AE Response less 1 (0-31) i.e. 1 means AE Response level 2
- bits 13-15 AE Mode (0-4)(Auto,Bright,Shutter,Iris,Manual)

For Camera Type 6 (Hitachi block) reply bits mean:
- bits 0-7 AE Response (0-127)
- bits 8-11 AE Mode (0-9)(AE.AER-1,AER-2.AE+,AER+1,AER+2,AER+3,Shutter,Exposr,AGC)
- bits 12-15 Always 0

For Camera Types 8-12 (Thermal cameras and blocks) reply bits mean:
- bits 0-11 AGC Gain Bias level (Contrast): (0-4095)(Ventus/Vinden 0-15)
- bits 12-15 Always 0

For Camera Type 13 (Peak Beam only) reply bits mean:
- bits 0-5 Strobe Frequency: (0-63)
- bits 6-11 Strobe Duty Cycle: (0-63)
- bits 12-15 Always 0

Reply Data for 0x0D6D reply

Only supported for Camera Types 5-6 and 8-12; all others return 0x0000.
For Camera Type 5 (Sony block) with integrated lens reply bits mean:
- bits 0-4 Brightness: (0-31)
- bits 5-6 Picture Mode: 0 (Colour/Mono), 1 (Mono), 2 (Colour)
- bit 7 Focus Trace: 0 (Off), 1 (On)
- bits 8-12 ICR Threshold (0-31)
- bits 13-15 Always 0

For Camera Type 6 (Hitachi block) reply bits mean:
- bits 0-7 ICrf Threshold (0-127)
- bits 8-15 Always 0

For Camera Types 8-12 (Thermal cameras and blocks) reply bits mean:
- bits 0-11 AGC Level Bias level (Brightness): (0-4095)(Ventus/Vinden 0-15)
- bits 12-15 Always 0

Reply Data for 0x0E6D reply

Only supported for Camera Types 8-9 and 11-12; all others return 0x0000.
For Camera Types 8-9 (DRS,FLIR TAU2) reply bits mean:
- bits 0-3 ICE/ACE Level: (0-15)
- bits 4-15 Always 0

For Camera Types 11-12 (Ventus/Vinden,Selex Horizon,AtticaM1) reply bits mean:
- bits 0-3 LCE/CLAHE level (0-15)(Ventus/Vinden & AtticaM1 only)
- bits 4-9 Edge Enhancement level (0-63)(Selex Horizon & AtticaM1 only)
- bits 10-15 Always 0