Pelco PTZ Protocols

D Protocol

Version 5.0.1

1 April 2008

Eric Hamilton

Proprietary Notice

The contents of this document are considered to be the property of Pelco. Users of this protocol agree to use the protocol only in the interests of Pelco. Any use of this protocol to Pelco's detriment is prohibited.

Those receiving this protocol cannot redistribute the protocol without the expressed written consent of Pelco.

Notice of Disclaimer

Pelco makes no claims, expressed or implied, regarding the usefulness of this protocol, it's implementation, or it's correctness. Any use of this protocol is the sole responsibility of the agency implementing the protocol. The contents of this document and the function of the protocol are subject to change without notice.

Questions

Questions regarding this protocol, it's implementation, use, and distribution should be addressed to:

Pelco	(559) 292-1981 Voice
3500 Pelco Way	(800) 289-9100 Voice
Clovis, California, USA	(559) 292-1018 FAX
93612-5699	`www.pelco.com`

Change Log

This is a total rewrite of the previously available protocol documentation for D protocol. Thus it is a new document.

The base line document for D Protocol was the former "Pelco Engineering 'D' Protocol Manual" TF-0001, Version 4, Revision 1, dated 4/7/2004, many e-mails and code inspection.

This is an abbreviated change log, the full change log is in Appendix F, page 92.

Contents

[2] `tocdepth = 2`

List of Figures

This page intentionally left blank

1 What this Manual Covers

This manual describes the minimum requirements for implementing a common Pelco protocol. This protocol is used to communicate between a controlling device (e.g. a matrix switching system or keyboard) and a receiver/driver (e.g. a dome drive). **Pelco's primary protocol for controlling PTZ units is D Protocol**.

Not all devices will be able to accommodate all of the features available in these protocols. These protocols are designed to cover the feature sets of a wide variety of equipment.

D Protocol is a "serial" protocol. This means that it is normally transmitted over a 4 wire, RS-422 circuit. There is nothingthat actually requires usage of one or another format, however all Pelco PTZ units receive and transmit with RS-422[3] levels. If another communications media is desired, then it is the user's responsibility to turn the signals at the PTZ unit into RS-422 levels.

1.1 Protocol overview

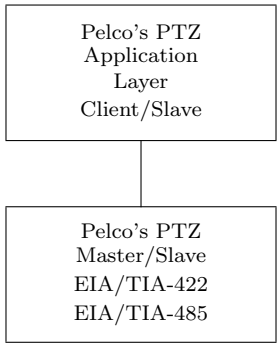
Pelco's PTZ Serial Line protocols are a Master-Slave protocol. These protocols takes place at levels 1, 2 and 7 of the OSI model.

A master-slave type system has one node (the master node) that issues explicit commands to one of the "slave" nodes and processes responses. Slave nodes do not transmit data without a request from the master node, and do not communicate with other slaves.

At the physical level, Pelco's PTZ over Serial Line systems may use different physical interfaces (RS422, RS485, RS232). TIA/EIA-422 (RS422) Four-Wire, interface is the most common. As an option, TIA/EIA-485 (RS485) Four-Wire and TIA/EIA-485 (RS485) Two-Wire interface may also be implemented.

The following table gives a general representation of Pelco's PTZ serial communication stack compared to the 7 layers of the OSI model.

Layer	ISO/OSI Model	
7	Application	Pelco's PTZ Application Protocols
		D bytes 3 → 6
6	Presentation	Empty
5	Session	Empty
4	Transport	Empty
3	Network	Empty
2	Data Link	Pelco's PTZ Serial Line Protocol
		D Protocol, bytes 1, 2 and 7
1	Physical	EIA/TIA-422 or EIA/TIA-485



$RCSfile: Intro.inc,v $

[3]The Spectra IV has introduced RS-485 logic levels.

Pelco's PTZ application layer messaging protocol, positioned at level 7 of the OSI model, provides client/-server communication between devices connected on buses or networks. On Pelco's PTZ Serial Line the client role is provided by the Master of the serial bus and the Slave nodes act as servers.

1.2 Pelco's PTZ Master/Slave protocol principle

Pelco's PTZ Serial Line protocol is a Master-Slave protocol. Only one master is connected to the bus, and one or several (255 maximum number) slave nodes are also connected to the same serial bus. Pelco's PTZ communication is always initiated by the master. The slave nodes will never transmit data without receiving a request from the master node. The slave nodes will never communicate with each other. The master node initiates only one Pelco PTZ transaction at the same time. (I.e. there is no broadcast capability which addresses all units at the same time.)

The master node issues a Pelco PTZ request to the slave nodes in only a unicast mode, where master addresses an individual slave. After receiving and processing the request, the slave returns a message (a 'reply') to the master. In this mode, a Pelco PTZ transaction consists of 2 messages: a request from the master, and a reply from the slave. Each slave must have an unique address (from 1 to 255) so that it can be addressed independently from other nodes.

Pelco's PTZ Master node has no specific address, only the slave nodes have an address. The slave address must be unique on a Pelco PTZ serial bus.

There is no broadcast mode, where the the master can send a request to all slaves.

1.3 Fine Print Notes

In the descriptions of each command there is usually a set of notes that are marked "**FPN**". These are known as "**F**ine **P**rint **N**otes". While these are not part of the protocol they are indented to help with the understanding of the protocol. There is additional information about the protocol in the various appendices.

1.4 Byte Format

Transmitters will format a single character and receivers will be able to decipher a single character with: 1 start bit, 8 data bits, 1 stop bit, and no parity.

All units that support D Protocol have an ability to operate at 2400 baud. Other baud rates are supported on a device by device basis. There are Pelco units that operate with baud rates as high as 115,200. 2,400 is the lowest baud rate supported.

- Coding System: 8-bit binary
- Bits per Byte: 1 start bit
- 8 data bits, least significant bit sent first
- 1 stop bit
- No parity

FPN

1.5 Various Protocol Baud Rate Dependent Times

All units that support D Protocol have the ability to operate at 2400 baud. Most units also support 4800 and 9600 baud. Newer equipment supports baud rates of up to 115200 for special purposes (downloading of revised software). 2400 baud is the lowest speed supported by any Pelco PTZ units. Some of the TXBs supported by Pelco products need to work at slower speeds. In the following table the slower known baud rates used by our competitors is included for information.

1. The items in **bold** font are the standard D Protocol baud rates.
2. Some of the items in the table are not usually supported directly by Pelco products. However our competitors do use these baud rates and they are used with TXBs.
3. **Baud:**, the baud rate that this information applies to.
4. **Bit:**, time in seconds to send one bit at this baud.
5. **Byte:**, time in seconds to send one byte of 1 start, 8 data and 1 stop bit. (10 bits total)
6. **General:**, transmission time, in seconds of a general response. This does not include the time that the PTZ takes to generate the reply.
7. **Extended:**, transmission time, in seconds of a command or of an extended response. This does not include the time that the PTZ takes to generate the reply.
8. **Query:**, transmission time, in seconds to receive the query response. This does not include the time that the PTZ takes to generate the reply.

Baud Rate	Bit Duration	Byte 10-bits	General 4-bytes	Extended 7-bytes	Query 18-bytes
300	0.003 333	0.033 333	0.133 333	0.233 333	0.600 000
600	0.001 667	0.016 667	0.066 667	0.116 667	0.300 000
1,200	0.000 833	0.008 333	0.033 333	0.058 333	0.150 000
2,400	**0.000 417**	**0.004 167**	**0.016 667**	**0.029 167**	**0.075 000**
4,800	**0.000 208**	**0.002 083**	**0.008 333**	**0.014 583**	**0.037 500**
9,600	**0.000 104**	**0.001 042**	**0.004 167**	**0.007 292**	**0.018 750**
14,400	0.000 069	0.000 694	0.002 778	0.004 861	0.012 500
19,200	0.000 052	0.000 521	0.002 083	0.003 646	0.009 375
28,800	0.000 035	0.000 347	0.001 389	0.002 431	0.006 250
38,400	0.000 026	0.000 260	0.001 042	0.001 823	0.004 688
115,200	0.000 009	0.000 087	0.000 347	0.000 608	0.001 563

2 General Command Information

Command format All commands are seven (D Protocol)bytes long. Note in the following formats that several bytes have been marked with double vertical lines. These are the portion of the message that comprise ISO level 7 data. The other bytes are ISO level 2 data.

D Protocol Command Format/Names								
Byte	1	2	3	4	5	6	7	
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM	
	0xFF	—	0x00	0x00	0x00	0x00	—	

1. **D Protocol:**

1.1 SYNC: Always `0xFF` to indicate the start of a command.

1.2 ADDR: Camera address. Range is 1 → 255 (`0x01` → `0xFF`). `0x01` is for camera #1, etc.

1.3 CMND1: Extension of the basic command. The basic command is in the CMND2 position.

1.4 CMND2: The basic command. For extended commands, all of these are odd numbers.

1.5 DATA1: Usually this is `0x00` or the Pan speed index. However on a command by command basis it may have additional information. The most typical use is to make up a 16-bit value when concatenated with DATA2. For details, see the actual command description in Section 5, page 23.

1.6 DATA2: Usually is the argument for "this" command or the Tilt speed index. When a 16-bit value is required, it is the lower half of the value. (See Section 5, page 23)

1.7 CKSM: This is the arithmetic sum of all bytes except for the SYNC byte and itself.

2.1 General Notes

Note

1. Values in this document prefixed with "`0x`" are hexadecimal numbers.
2. The symbol "—" is used to indicate variable data and is normally used in the ADDR and CKSM fields only.
3. The synchronization byte (SYNC) is always `0xFF` in D Protocol.
4. The Address (ADDR) is the logical address of the receiver/driver device being controlled. I.e. `0x05` in D Protocol will address camera #5.
5. The Checksum (CKSM) is calculated by performing an 8 bit (modulo 256) sum of the payload bytes (bytes $2 \rightarrow 6$) of the message in D Protocol.

3 Command Sets

There are two sets/types of commands:

1. "Motion" commands, i.e. pan, tilt, iris, zoom and focus; are "bit encoded" commands that always have bit 0 in CMND2 set to `0`. Any number of non-exclusive bits may be set in the CMND1 and CMND2 bytes for this format of command.

   It is not legal to set bits for pan right **and** pan left in the same command, however it is legal to have control of up to five different motions in the same command. For historical reasons these commands are usually called "Standard Commands". (Section 3.1, page 11)

2. "Non-motion" commands, i.e. call preset, request pan angular position; are "numerically encoded". These commands always have bit 0 in CMND2 set to a `1`. Thus all of these commands have "odd" numerical values and each command may only do one thing at a time. For historical reasons these commands are usually called "Extended Commands". (Section 3.2, page 12)

3.1 Standard Commands

3.1.1 Command bytes 1 and 2

cmnd1 and **cmnd2** are represented as follows in D:

D Protocol/Coaxitron®: Byte 3, CMND1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Sense	0	0	Auto/-Manual Scan	Camera On/Off	Iris Close	Iris Open	Focus Near

D Protocol/Coaxitron®: Byte 4, CMND2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Focus Far	Zoom Wide	Zoom Tele	Down	Up	Left	Right	Always 0

All devices that support D , support these bit encoded commands.

A value of '1' entered in the bit location for the function desired will enable that function. A value of '0' entered in the same bit location will disable or 'stop' the function.

Most Pelco equipment incorporates a "runaway protect" feature on all motion commands. What this means is that all motion causing commands will time out in about 15 seconds. (Some older equipment has a different timeout, but 15 seconds is used in the Spectra and Esprit systems.) To obtain continuous motion, a motion causing command should be sent about every 5 seconds.

The sense bit has meaning in D Protocolonly, it (CMND1 bit 7) indicates the meaning of bits 4 and 3. If the sense bit is on (value of '1'), and bits 4 and 3 are on, the command will enable auto-scan and turn the camera on. If the sense bit is off (value of '0'), and bits 4 and 3 are on the command will enable manual scan and turn the camera off. Of course, if either bit 4 or bit 3 are off then no action will be taken for those features.

CMND1 bits $7 \rightarrow 3$ are not used with newer equipment in D Protocol.

Sense bit Bit 7	Auto/-Manual Scan Bit 4	Camera On/Off Bit 3	Results
0	0	0	Nothing Happens
0	0	1	Camera Off
0	1	0	Manual Scan On
0	1	1	Manual Scan On, Camera Off
1	0	0	Nothing Happens
1	0	1	Camera On
1	1	0	Auto Scan On
1	1	1	Auto Scan On, Camera On

It should be pointed out that newer Pelco units such as the Spectra and Esprit systems, always have their cameras turned on and that this command does not turn them off.

All reserved bits ($6 + 5$ or $7 \rightarrow 4$) must be set to 0.

3.1.2 Data bytes 1 and 2

Pan/Data1 Byte 5 (**data1**) contains the pan speed. Pan speed is in the range of '0x00' to '0x3F' (high speed) and '0x40' for "turbo" speed. Turbo speed is the maximum speed the device can obtain and is considered separately because it is not generally a smooth step from high speed to turbo. That is, going from one speed to the next usually looks smooth and will provide for smooth motion with the exception of going into and out of turbo speed. A pan speed value of '0x00' results in very slow motion, not cessation of motion. To stop pan motion both the Left and Right direction bits must be turned off — set to '0' — regardless of the value set in the pan speed byte. This is because a speed of 0x00 is a valid, but slow, speed. Typical pan speeds vary from 0.1^o/sec to 80^o/sec.

Tilt/Data 2 Byte 6 (**data2**) contains the tilt speed. Tilt speed is in the range of '0x00' to '0x3F' (maximum speed). Turbo speed is not allowed for the tilt axis. A tilt speed value of '0x00' results in very slow motion, not cessation of motion. To stop tilt motion both the Down and Up direction bits must be turned off — set to '0' — regardless of the value set in the tilt speed byte. This implies that when the Up and Down bits are set to 0, this value must be ignored by decoding devices. Having Up and Down set at the same time is an error. Typical tilt speeds vary from 0.1^o/sec to 40^o/sec.

3.1.3 Checksum byte

In D Protocol, byte 7 is the checksum (**cksm**). The checksum is the 8 bit (modulo 256) sum of the payload bytes (bytes 2 → 6) in the message.

3.2 Extended Commands

In addition to the "PTZ" commands shown in Section 3.1, page 11, there are control commands that allow access to the more advanced features of some equipment. Byte 4 (CMND2) can be thought of as the command's opcode. Byte 3 (CMND1 can be thought of as the command's sub-opcode. Byte 4's value is given in hexadecimal and decimal formats as in many listings this value is used either way in the #defines.See the description of each command type for details.

Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Standard Extended Response Section 5.1, page 23	ACK/-NAK	0x01/1	Future Use	Future Use	Not Applicable This is not a command it is a reply.
Set Preset Section 5.2, page 23	0x00	0x03/3	0x00	PRESET ID	General
Clear Preset Section 5.3, page 24	0x00	0x05/5	0x00	PRESET ID	General
Go To Preset Section 5.4, page 25	0x00	0x07/7	0x00	PRESET ID	General
Flip (180^o about) Section 5.4, page 25	0x00	0x07/7	0x00	0x21/33	General

Continued on the next page.

Continued from the previous page.

Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Go To Zero Pan Section 5.4, page 25	0x00	0x07/7	0x00	0x22/34	General
Set Auxiliary Section 5.5, page 26	SUB OP-CODE	0x09/9	0x00	AUX ID	General
Clear Auxiliary Section 5.6, page 27	SUB OP-CODE	0x0B/11	0x00	AUX ID	General
Dummy Section 5.7, page 28	SUB OP-CODE	0x0D/13	0x00	0x00	General
Remote Reset Section 5.8, page 28	0x00	0x0F/15	0x00	0x00	General
Set Zone Start Section 5.9, page 29	0x00	0x11/17	0x00	ZONE ID	General
Set Zone End Section 5.10, page 30	0x00	0x13/19	0x00	ZONE ID	General
Write Character to Screen Section 5.11, page 30	0x00	0x15/21	Column $0 \rightarrow 39_{10}$	ASCII Value	General
Clear Screen Section 5.12, page 31	0x00	0x17/23	0x00	0x00	General
Alarm Acknowledge Section 5.13, page 32	SUB OP-CODE	0x19/25	0x00	ALARM ID	General
Zone Scan On Section 5.14, page 32	0x00	0x1B/27	0x00	0x00	General
Zone Scan Off Section 5.15, page 34	0x00	0x1D/29	0x00	0x00	General
Record Pattern Start Section 5.16, page 34	0x00	0x1F/31	0x00	PATTERN ID	General
Record Pattern Stop Section 5.17, page 36	0x00	0x21/33	0x00	0x00	General
Run Pattern Section 5.18, page 37	0x00	0x23/35	0x00	PATTERN ID	General
Set Zoom Speed Section 5.19, page 38	0x00	0x25/37	0x00	ZOOM SPEED	General
Set Focus Speed Section 5.20, page 38	0x00	0x27/39	0x00	FOCUS SPEED	General
Reset Camera defaults Section 5.21, page 39	0x00	0x29/41	0x00	0x00	General
Auto-focus auto/on/off Section 5.22, page 39	0x00	0x2B/43	0x00	AUTO FOCUS CTRL	General

Continued on the next page.

Continued from the previous page.

Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Auto Iris auto/on/off Section 5.23, page 40	0x00	0x2D/45	0x00	AUTO IRIS CTRL	General
AGC auto/on/off Section 5.24, page 40	0x00	0x2F/47	0x00	AGC CONTROL	General
Backlight compensation on/off Section 5.25, page 41	0x00	0x31/49	0x00	BLC CONTROL	General
Auto white balance on/off Section 5.26, page 42	0x00	0x33/51	0x00	AWB CONTROL	General
Enable device phase delay mode Section 5.27, page 42	0x00	0x35/53	0x00	0x00	General
Set shutter speed Section 5.28, page 43	0x00	0x37/55	SPEED MSB	SPEED LSB	General
Adjust line lock phase delay Section 5.29, page 44	SUB OPCODE	0x39/57	DELAY MSB	DELAY LSB	General
Adjust white balance (R-B) Section 5.30, page 45	SUB OPCODE	0x3B/59	WB-RB MSB	WB-RB LSB	General
Adjust white balance (M-G) Section 5.31, page 46	SUB OPCODE	0x3D/61	WB-MG MSB	WB-MG LSB	General
Adjust gain Section 5.32, page 46	SUB OPCODE	0x3F/63	GAIN MSB	GAIN LSB	General
Adjust auto-iris level Section 5.33, page 47	SUB OPCODE	0x41/65	0x00	AIL VALUE	General
Adjust auto-iris peak value Section 5.34, page 48	SUB OPCODE	0x43/67	0x00	AIP VALUE	General
Query Section 5.35, page 48	SUB OPCODE	0x45/69	0x00	0x00	Query Section 4.4, page 21.
Preset Scan Section 5.36, page 51	0x00	0x47/71	0x00	DWELL	General
Set Zero Position Section 5.37, page 51	0x00	0x49/73	0x00	0x00	General
Set Pan Position Section 5.38, page 52	0x00	0x4B/75	PAN MSB	PAN LSB	General

Continued on the next page.

Continued from the previous page.

Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Set Tilt Position Section 5.39, page 52	0x00	0x4D/77	TILT MSB	TILT LSB	General
Set Zoom Position Section 5.40, page 53	0x00	0x4F/79	ZOOM MSB	ZOOM LSB	General
Query Pan Position Section 5.41, page 54	0x00	0x51/81	0x00	0x00	Extended Section 5.45, page 55
Query Tilt Position Section 5.42, page 54	0x00	0x53/83	0x00	0x00	Extended Section 5.46, page 56
Query Zoom Position Section 5.43, page 54	0x00	0x55/85	0x00	0x00	Extended Section 5.47, page 58
Download Section 5.44, page 55	0x00	0x57/87	0x00	0x00	General
Query Pan Response Section 5.45, page 55	0x00	0x59/89	PAN MSB	PAN LSB	Not Applicable This is not a command it is a reply.
Query Tilt Response Section 5.46, page 56	0x00	0x5B/91	TILT MSB	TILT LSB	Not Applicable This is not a command it is a reply.
Query Zoom Response Section 5.47, page 58	0x00	0x5D/93	ZOOM MSB	ZOOM LSB	Not Applicable This is not a command it is a reply.
Set Magnification Section 5.48, page 58	SUB OPCODE	0x5F/95	MAG MSB	MAG LSB	General
Query Magnification Section 5.49, page 59	0x00	0x61/97	0x00	0x00	Extended Section 5.50, page 60
Query Magnification Response Section 5.50, page 60	0x00	0x63/99	MAG MSB	MAG LSB	Not Applicable This is not a command it is a reply.
Activate Echo Mode Section 5.51, page 60	0x00	0x65/101	0x00	0x00	General
Set Remote Baud Rate Section 5.52, page 61	SUB OPCODE	0x67/103	0x00	00-05	General
Start Download Section 5.53, page 61	0x00	0x69/105	0x00	0x00	General
Query Device Type Section 5.54, page 62	0x00	0x6B/107	0x00	0x00	Extended Section 5.55, page 63
Query Device Type Response Section 5.55, page 63	0x00	0x6D/109	SOFTWARE TYPE	HARDWARE TYPE	Not Applicable This is not a command it is a reply.

Continued on the next page.

Continued from the previous page.

Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Query Diagnostic Info Section 5.56, page 63	0x00	0x6F/111	0x00	0x00	Extended Section 5.57, page 64
Query Diagnostic Info Response Section 5.57, page 64	0x00	0x71/113	Device Dependent	Device Dependent	Not Applicable This is not a command it is a reply.
Version Information Macro Opcode Section 5.58, page 64	SUB OPCODE	0x73/115	Various	Various	Extended Section 5.58, page 64
Everest Macro Opcode Section 5.59, page 67	SUB OPCODE	0x75/117	Various	Various	Extended Section 5.59, page 67
Time Set Opcode Section 5.60, page 75	SUB OPCODE	0x77/119	Various	various	Extended Section 5.60, page 75
Screen Move Section 5.61, page 79	SUB OPCODE	0x79/121	MAG MSB	MAG LSB	General
Return Status	0x00	0xFD/253	0x00	0x00	Firmware status
Invalid op code	0x00	0xFF/255	0x00	0x00	General

3.3 Creating Labels

Many devices have an ability to display labels on the video. Labels that identify the preset or zone being scanned are common. There is a special technique to establish a label that is associated with either a preset or a zone. First, send the label to the receiver/driver using the "Write Character to Screen" (Section 5.11, page 30) command. After the label is on the screen, then set the preset or zone (Section 5.9.3, page 29). That will establish the label and associate it with that preset or zone.

FPN

3.3.1 Label Logic in Spectra IV

In response to questions on labels as used in the Spectra IV[4], This is an informal spec on how they currently work in Spectra IV. There is additional information in Section 5.14, page 32.

1. Azimuth Elevation, Direction, and Zoom Magnification:
   - 1.1 PTZ
     - 1.1.1. Labels pop on-screen when there is movement and disappear after movement stops and the display time has expired.
   - 1.2 Patterns
     - 1.2.1. While recording, the labels are shown while there is movement just like normal PTZ.
     - 1.2.2. While playing, the labels are hidden.
   - 1.3 Presets
     - 1.3.1. On a preset GO command, the labels are hidden.
   - 1.4 Scans
     - 1.4.1. While scanning, the labels are hidden.

   Of course if a label's display time is set to `CONSTANT`, it always shows no matter what (except in menus of course).
2. Alarm:
   - 2.1 1 Alarm Active
     - 2.1.1. Alarm label is displayed for display time, then goes off until alarm clears and retriggers.
   - 2.2 Greater than 1 Alarm Active
     - 2.2.1. Alarm labels will sequence on-screen (switching every X seconds) to the next active label in the sequence.
     - 2.2.2. If the sequence time is greater than the display time for the alarm labels, the alarm will disappear until the next sequence.

   In the case of `CONSTANT` display time, alarm labels will remain on-screen until that alarm clears or the next alarm in sequence fires.

   How are alarm priorities handled when two different levels are active? Do they alternate, or only the higher priority displayed?

   Only alarms of the highest priority count... If there are 4 alarms present and only 1 is HIGH priority, it falls into the 1 alarm active category.
3. Preset, Zone:
   - 3.1 On a preset GO command, the preset label pop on-screen when the preset is reached.
     - 3.1.1. In the case of `CONSTANT` display time, this label remains as long as the camera sits at the preset.
   - 3.2 When the camera passes through a zone or is sitting on a zone, the zone label is displayed.
     - 3.2.1. In the case of `CONSTANT` display time, this label remains as long as the camera remains in the zone, otherwise it dissapears after the display time has expired.
4. Time/Date:
   - 4.1 Time/Date information is either on the screen at all times or not.

[4]This information about labels came from: Jeremy Watson in November 2006.

3.4 Example D Protocol Messages

D Protocol Sample Commands		
Sample #	Message to send	Message
1	Camera 2, Pan Left	0xFF, 0x02, 0x00, 0x04, 0x20, 0x00, 0x26
2	Camera 2, Stop	0xFF, 0x02, 0x00, 0x00, 0x20, 0x00, 0x22
3	Camera 10, Camera on, Focus far, Tilt Down	0xFF, 0x0A, 0x88, 0x90, 0x00, 0x20, 0x42

Note

1. In sample message 2, please note that the pan speed field has not been set to 0x00, but rather has a value in it. When the pan bits in CMND2 are both set to '0', the motion value is ignored.
2. The checksum calculation for message #3 goes like this:

0xFF	1111 1111	Sync byte is not used for the checksum
0x0A	0000 1010	
0x88	1000 1000	
Subtotal	1001 0010	0x92
0x90	1001 0000	
Subtotal	0010 0010	0x22 (modulo 256 allows the high bit to roll off)
0x00	0000 0000	
Subtotal	0010 0010	0x22
0x20	0010 0000	
Subtotal	0100 0010	0x42
	0100 0010	0x42 Final checksum value

D Protocol Command Format/Names								
Byte	1	2	3	4	5	6	7	
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM	
	0xFF	—	0x00	0x00	0x00	0x00	—	

D Protocol/Coaxitron®: Byte 3, CMND1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Sense	0	0	Auto/-Manual Scan	Camera On/Off	Iris Close	Iris Open	Focus Near

D Protocol/Coaxitron®: Byte 4, CMND2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Focus Far	Zoom Wide	Zoom Tele	Down	Up	Left	Right	Always 0

4 Responses

Devices that receive a "D"protocol command always generate a response[5]. The response formats are described below. There is no "negative acknowledge" response in D protocol.Units that implement Dprotocol

[5]Samples of command/response pairs are in Appendix A, page 80.

have a receive timer that expects all bytes to be received in less than about 250 milliseconds. If it takes longer than the timeout, then the unit discards the current command and attempts to receive a new command. If a command is "half sent" and then a long delay (over 250 ms.) occurs and then the command finishes up it will be ignored unless a second command is immediately initiated. When this happens, the second command, at some intermediate point, is assumed to be a checksum. If this random byte is an actual checksum, then anomolyus behavior will occur.

This is caused by the fact that there is no unique "first byte" in D protocol. The sync byte of `0xFF` is also a data byte in many commands. The only way to be sure that a command is accepted in D protocol is to check the response. To ensure that no "confusion" occurs in the Pelco receiving equipment, a delay of at least 300 milliseconds must be inserted between sending commands. Also when a command is sent, do not have long delays in the middle.

1. **D Protocol:** Most D Protocol commands generate a response. When they generate a response there are three/four different lengths for these responses. The lengths are:

   1.1 **0 bytes:** For some commands no response is generated.

   1.2 **4 bytes:** This is called the "**General Response**" and almost all commands generate it.

   1.3 **7 bytes:** This is called the "**Extended Response**" and is normally sent as a response when asking for data. It is also sent when some commands are not understood.

   1.4 **18 bytes:** This is generated by the "**Query**" command and its variants. It originally was the software part number, then it became the equipment model number. Recently it has also provided the unit's serial number.

4.1 The Standard Extended Response

A seven byte response, see Section 5.1, page 23 for details

4.2 The General Response

The General Response is four bytes in length and has the following format:

General Response Format				
Byte	1	2	3	4
	SYNC	ADDR	ALARMS	CKSM
	`0xFF`	—	`0x00`	—

1. SYNC: Always `0xFF` to indicate the start of a response.

2. ADDR: Camera address. Range is 1 → 255 (`0x01` → `0xFF`). `0x01` is for camera #1, etc.

3. ALARMS: This is a bit encoded byte of information. Bit 0 = Alarm 1, etc.

4. CKSM: This is the arithmetic sum of **the checksum of the command that caused this reply** and the ALARMS field of this reply. (Not exactly what might be expected.)

In the following data capture, several commands with no alarms active are sent: Note the General Responses.

1. A ZOOM IN is sent for camera 1.
2. A MOTION STOP is sent to stop the zooming.
3. A CALL PRESET 1 is sent.

```
DTE = D Protocol GlassKeyboard
DCE = Spectra III

     1,       1:  DTE     0.000000   0.000000 ff 01 00 20 00 00 21   Zoom In
     2,       1: DCE      0.011001   0.004762 ff 01 00 21            Response
     2,       8:  DTE     0.219946   0.001041 ff 01 00 00 00 00 01   Motion Stop
     3,       5: DCE      0.413586   0.187405 ff 01 00 01            Response
     3,      15:  DTE    85.024799   0.001041 ff 01 00 07 00 01 09   Call Preset 1
     4,       9: DCE     85.035699   0.004666 ff 01 00 09            Response
```

4.3 The Extended Response

The Extended Response is seven bytes in length and has the following format:

Extended Response Format							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x00	0x00	0x00	—

1. SYNC: Always `0xFF` to indicate the start of a reply.
2. ADDR: Camera address. Range is 1 → 255 (`0x01` → `0xFF`). `0x01` is for camera #1, etc.
3. RESP1: Reply specific data.
4. RESP2: Reply specific data. Usually a secondary op-code.
5. DATA1: Reply specific data.
6. DATA2: Reply specific data.
7. CKSM: This is the arithmetic sum of all bytes except for the SYNC byte and its self.

In the following data capture, several commands are sent: Note the General Responses and Extended Responses.

```
DCE = D Protocol GlassKeyboard
DTE = Spectra IV

    14,      92: DCE     44.237911   1.136292 ff 01 00 07 00 22 2a   Goto Preset 34
    14,      87:  DTE    44.276490   0.004139 ff 01 00 2a            General Response
    15,      99: DCE     49.423430   5.134441 ff 01 00 51 00 00 52   Get Pan Position
    15,      91:  DTE    49.453440   0.004168 ff 01 00 59 00 00 5a   Pan 0 degrees Extended Response
```

4.4 The Query Response

The Extended Response is eighteen bytes in length and has the following format:

Query Response Format						
Byte	1	2	3	. . . .	17	18
	SYNC	ADDR	DATA1	. . . .	DATA15	CKSM
	0xFF	—	0x00	. . . .	0x00	—

1. SYNC: Always `0xFF` to indicate the start of a reply.
2. ADDR: Camera address. Range is 1 → 255 (`0x01` → `0xFF`). `0x01` is for camera #1, etc.
3. DATA1 → DATA15: 15 bytes of reply specific data.
4. CKSM: This is the arithmetic sum of all bytes **and the checksum of the command that caused this reply** except for the SYNC byte and its self. (Again not what might be expected.)
5. See Section 5.35, page 48 and Appendix A, page 80 for more details and samples of operation.

FPN

Typical QUERY command and its response: This is a data capture from a QUERY command and its response. The system was running at 2400 baud and the Spectra III SE was running rev 3.31 software.

Table Notes

The table consists of two parts:

- In the first part, the various command/response bytes have been assembled to make the command/-response easier to identify.
- In the second part is the semi-raw data returned by the data capture software.

This raw data capture files has been "post-processed" to change the date time stamp so as to have all times be relative to the start of the data capture and to get Δ times between bytes and messages.

Column headings are:

Msg # This is the message number. Numbers are sequential within each data source. I.e. there is one set of message numbers for each of DCE and DTE sources.

Byte # this is the total byte number within each data source.

DTE/DCE Byte This is the source identifier for each data source type. The abbreviations are:

- **DCE** = Data Communications Equipment, in this case the Spectra III and
- **DTE** = Data Terminal Equipment, which is a TXB that is under development.

Total Byte # This is the total byte number. I.e. it is the total of both DCE and DTE bytes.

Total Time This time has been normalized to start at 0.00000. The data capture software provides a date and time tag for each byte. The post-processing software deletes the date, knows that there 60 seconds in a minute and 60 minutes in an hour and knows how to work with the transition between noon (12:00) and one o'clock (01:00). This has been done to eliminate unexpected time jumps in the time record.

Δ Time This is the time between this byte and the previous byte.

Data This is the hexadecimal value of the byte recorded.

Msg #	Byte #	DTE/DCE Source	Total Byte #	Total Time	Δ Time	Data
1	1	DTE	1	0.000000	0.000000	ff 01 00 45 00 00 46
2	1	DCE	8	0.029773	0.004778	ff 01 44 44 35 33 43 42 57 00 00 00 00 00 00 00 13

Msg #	Byte #	DTE/DCE Source	Total Byte #	Total Time	Δ Time	Data
1	1	DTE	1	0.000000	0.000000	ff
1	2	DTE	2	0.004162	0.004162	01
1	3	DTE	3	0.008329	0.004167	00
1	4	DTE	4	0.012496	0.004167	45
1	5	DTE	5	0.016661	0.004165	00
1	6	DTE	6	0.020828	0.004167	00
1	7	DTE	7	0.024995	0.004167	46
2	1	DCE	8	0.029773	0.004778	ff
2	2	DCE	9	0.033939	0.004166	01
2	3	DCE	10	0.038107	0.004168	44 “D”
2	4	DCE	11	0.042274	0.004167	44 “D”
2	5	DCE	12	0.046442	0.004168	35 “5”
2	6	DCE	13	0.050608	0.004166	33 “3”
2	7	DCE	14	0.054747	0.004139	43 “C”
2	8	DCE	15	0.058934	0.004187	42 “B”
2	9	DCE	16	0.063081	0.004147	57 “W”
2	10	DCE	17	0.067248	0.004167	00 “null”
2	11	DCE	18	0.071414	0.004166	00 “null”
2	12	DCE	19	0.075613	0.004199	00 “null”
2	13	DCE	20	0.079747	0.004134	00 “null”
2	14	DCE	21	0.083914	0.004167	00 “null”
2	15	DCE	22	0.088086	0.004172	00 “null”
2	16	DCE	23	0.092294	0.004208	00 “null”
2	17	DCE	24	0.096414	0.004120	00 “null”
2	18	DCE	25	0.100581	0.004167	13

Calculations for the checksum for the QUERY response goes like this:

1. Add up all bytes in the QUERY response, except for the SYNC byte. (DCE bytes 2 → 17 in message 2 above.)
2. Add in the checksum from the **originating** QUERY command. (DTE byte 7 in message 1 above.)
3. Use the lower eight bits of the sum as the checksum. (DCE byte 18 in message 2 above.)

```
0x01 + 0x44 + 0x44 + 0x35 + 0x33 + 0x43 +
0x42 + 0x57 + 0x00 + 0x00 + 0x00 + 0x00 +
0x00 + 0x00 + 0x00 + 0x00 = 0x1CD
0x1CD + 0x46 = 0x213
0x213 & 0xFF = 0x13
```

5 Detailed Command Descriptions

5.1 Response 0x01 (1_{10}), Standard Extended Response

5.1.1 Response format

Standard Extended Response D_EC_STD_EXT_RESP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	RESP TYPE	0x01	FUTURE USE	FUTURE USE	—
	0xFF	—	ACK	0x01	0x00	0x00	—
	0xFF	—	NAK	0x01	0x00	0x00	—

FPN

1. This response is used by the Endura/Atlas project.
2. This response is generated when a command may not be executed (these commands generate a NAK) or when some of the newer commands have been accepted (these may generate a NAK or an ACK).
   In systems prior to Spectra IV, if a command was not understood, a General Response was always sent if the command had a "proper" structure. I.e. a first Sync byte, the correct address, was seven bytes long and had a good checksum. Some of the newer commands in the Spectra IV, do a logical check to see if a command is correct. As of December 2007, the only commands that do this are the commands for setting the time (Section 5.60, page 75).

5.1.2 Description

1. RESP TYPE: indicates whether the response is a NAK or an ACK.
   - 0x00 = NAK (D_ECS_STD_EXT_RESP_NAK)
   - 0x01 = ACK (D_ECS_STD_EXT_RESP_ACK)

The information in the FUTURE USE bytes is specific to the command that is being responded to. If the FUTURE USE bytes are not used for particular response, the bytes must be set to zero.

5.2 Command 0x03 (3_{10}), Set Preset

5.2.1 Command format

Set Preset D_EC_SET_PRESET							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x03	0x00	PRESET ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0003 SET_PRESET
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: ERD97P21, Esprit 3012, Intercept and LRD.
5. The defined presets may be determined by using QUERY DEFINED PRESETS (Section 5.59.17, page 72) and its reply of QUERY DEFINED PRESETS RESPONSE (Section 5.59.18, page 73).
6. A list of typical presets is in Appendix E, page 89.

5.2.2 Description

Presets can be moved to, set, or cleared.

When a move to preset command is received, the preset position stored for the preset number specified in the command is checked. If the position is not valid, the command is ignored. Otherwise the unit moves to the preset pan, tilt, zoom, and focus positions. Once the preset has been reached, the preset label is displayed on the second video line or where it has been moved through use of the SET 95 menu system.

If any command which causes motion is received during a move to preset, the move will be aborted and the new command will start. These commands are: a motion command, or another move to preset command, Also if the move is not completed within a timeout period, the move is aborted and motion is stopped.

When a SET PRESET command is received, the current pan, tilt, focus, and zoom positions are saved for the preset number specified in the command and the label for that preset becomes whatever is currently on the second video line.

Usually this command will cause the camera system to remember where it is currently pointing. Other times it will cause a specific action to occur. The most common of specific action is a menu call command with either SET PRESET 95 (or SET PRESET 28 in 32 preset mode).

Pre-assigned presets may not be used for position setting. If an attempt to do so is done, then the command is ignored with a General Reply being returned.

1. DATA2 This is the preset number. The range of this value is: `0x01` → `0xFF`, $1 \rightarrow 255_{10}$. Different camera systems have differing number of preset numbers. Preset `0` is invalid.

Spectra III and ExSite saves in addition to the pan/tilt/zoom information for a preset through use of the menu system all items in the appropriate "preset camera setting screens". A total of ten (10) presets may have this special capability. With the Spectra IV this capability has been increased to all available presets.

When the unit has a password enabled, this command will cause the unit to display the password request screen and not proceed until a correct password is entered. There is no way to enter a password directly via DProtocol.

5.3 Command `0x05` (5_{10}), Clear Preset

5.3.1 Command format

Preset Clear D_EC_CLEAR_PRESET							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	`0xFF`	—	`0x00`	`0x05`	`0x00`	PRESET ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 `0x0005 CLEAR_PRESET`
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: ERD97P21, Esprit 3012, Intercept and LRD.
5. See SET PRESET (Section 5.2, page 23) for more information about this command.
6. The defined presets may be determined by using QUERY DEFINED PRESETS (Section 5.59.17, page 72) and its reply of QUERY DEFINED PRESETS RESPONSE (Section 5.59.18, page 73).
7. A list of typical presets is in Appendix E, page 89.

5.3.2 Description

The CLEAR PRESET command makes the stored preset for the preset number specified in the command invalid so that it can not be moved to.

Clears the requested preset's information from the camera system. Does not affect any of the preassigned presets.

It is not necessary to clear a preset before setting it.

Pre-assigned presets may not be cleared.

1. DATA2 This is the preset number. The range of this value is: 0x01 → 0xFF, $1 \rightarrow 255_{10}$. Different camera systems have differing number of preset numbers. Preset 0 is invalid.

When the unit has a password enabled, this command will cause the unit to display the password request screen and not proceed until a correct password is entered. There is no way to enter a password via DProtocol.

5.4 Command 0x07 (7_{10}), Call Preset

5.4.1 Command format

Call Preset D_EC_MOVE_PRESET							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x07	0x00	PRESET ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   - 2.1 0x0007 GO_TO_PRESET
   - 2.2 0x0007 FLIP
   - 2.3 0x0007 GO_TO_ZERO_PAN
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: ERD97P21, IRD/ERD, Esprit 3012, Intercept and LRD.
5. See SET PRESET (Section 5.2, page 23) for more information about this command.
6. The defined presets may be determined by using QUERY DEFINED PRESETS (Section 5.59.17, page 72) and its reply of QUERY DEFINED PRESETS RESPONSE (Section 5.59.18, page 73).
7. A list of typical presets are in Appendix E, page 89.

5.4.2 Description

Causes the camera unit to move, at preset speed, to the requested position.

1. DATA2 This is the preset number. The range of this value is: 0x01 → 0xFF, $1 \rightarrow 255_{10}$. Different camera systems have differing number of preset numbers. Preset 0 is invalid.

FPN

5.4.3 Special Presets

Flip (rotate 180^o) D_EC_MOVE_PRESET							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x07	0x00	0x21	—

Go To Zero Pan (cal_0) D_EC_MOVE_PRESET							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x07	0x00	0x22	—

5.5 Command 0x09 (9_{10}), Set Auxiliary

5.5.1 Command format

Set Auxiliary D_EC_SET_AUX							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	SUB-OPCODE	0x09	0x00	AUX ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0009 SET_AUXILIARY
   2.2 0x0109 SET_INDICATOR
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: ERD97P21, IRD/ERD, Esprit 3012, Intercept and LRD.
5. This[6] op-code was changed. The changes are available in the Spectra IV only.

5.5.2 Description

Causes an auxiliary function in the camera unit to be activated.

There are two sub-opcodes for this command:

1. 0x00 D_ECS_SET_AUX_RELAY
2. This sub-opcode is used by the Endura/Atlas projects.
   2.1 AUX ID This is the auxiliary number. The range of this value for relay control is: $1 \rightarrow 8$.
3. 0x01 D_ECS_SET_AUX_LED This is allows control of the Spectra IV's single two color LED via D Protocol.
   3.1 Timed on and off functions are effectively independent. If an ON command is sent with a time, the LED will immediately display the requested color for the time specified. If no timed OFF command is sent it will not repeat. Sending a timed OFF will work in the same way. Sending a timed OFF with an "illegal" color will allow blinking the LED on and off at whatever rate and ON color is desired. An ON or OFF with zero time will stop any timing function.

[6]From an e-mail by Robert Sexton dated: Wednesday, September 26, 2007 4:27 PM with a subject of SP4 LED control.

3.2 Sending an ON command with a time of 0 will result in having the LED turned on constantly.

3.3 Sending an OFF command with a time of 0 will result in having the LED turned off constantly.

3.4 Any combination of other than on/off times of zero, will result in a blinking LED.

3.5 The colors are 0xFE for green, 0xFD for red and 0xFC for amber. (To get amber, it is necessary to alternate rapidly between red and green but the rate is rather slow and is biased 2:1 for green so it blinks noticeably.) Any other color is treated as off.

0xFE	Green	D_ECD_SET_AUX_LED_GREEN
0xFD	Red	D_ECD_SET_AUX_LED_RED
0xFC	Amber	D_ECD_SET_AUX_LED_AMBER

3.5.1. DATA1 contains the "rate" of the toggling in 0.1 second increments (0 = permanent, either ON or OFF. An opcode of OFF, with a rate of non-zero means that the LED will go OFF for the specified duration then back ON for the duration that was initially identified in the previous ON value, see the below example.

3.5.2. DATA2 contains the affected LED by numeric value. Because LEDs are very much specific to the receiving device, and may vary in number and color, the receiving device identifies which LED or color is LED 1, 2, etc.

5.6 Command 0x0B (11_{10}), Clear Auxiliary

5.6.1 Command format

Clear Auxiliary D_EC_CLEAR_AUX							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	SUB-OPCODE	0x0B	0x00	AUX ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x000B CLEAR_AUXILIARY
   2.2 0x010B CLEAR_INDICATOR
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: ERD97P21, IRD/ERD, Esprit 3012, Intercept and LRD.
5. See SET AUXILIARY (Section 5.5, page 26) for more information about this command.

5.6.2 Description

Causes an auxiliary function in the camera unit to be deactivated.

1. CMND1 There are two sub-opcodes for this command:
   1.1 0x00 D_ECS_CLEAR_AUX_RELAY This sub-opcode is used by the Endura/Atlas projects.
   1.2 0x01 D_ECS_CLEAR_AUX_LED
2. DATA2 This is the numerically encoded auxiliary number. The range of this value for relay control is: $1 \rightarrow 8$.

3. DATA2 This is the numerically encoded auxiliary number. The range of this value for LED control is:

0xFE	Green	D_ECD_CLEAR_AUX_LED_GREEN
0xFD	Red	D_ECD_CLEAR_AUX_LED_RED
0xFC	Amber	D_ECD_CLEAR_AUX_LED_AMBER

5.7 Command 0x0D (13_{10}), Dummy

5.7.1 Command format

Dummy D_EC_DUMMY_1							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	ACTION	0x0D	SUB-DEVICE ID	ON/OFF/TEMP	—

FPN

1. This command generates a "General Reply" or nothing. See below.
2. Command Names as used by the Spectra IV software:
   2.1 0x000D DUMMY

5.7.2 Description

Originally an unused command. Because of the method used in decoding commands in the domes, all command opcodes must be defined. Thus, even though this value is usually unused, it must be defined and decoded.

When ACTION (byte 3) is set to 0x00 this command is decoded and a general response is sent except for the ExSite that gives no response at all. Nothing else occurs by any Pelco equipment.

5.8 Command 0x0F (15_{10}), Remote Reset

5.8.1 Command format

Remote Reset D_EC_RESET							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x0F	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x000F REMOTE_RESET
3. This command is used and decoded on the: ERD97P21, Esprit 3012, Intercept and LRD.
4. This command resets the system. It will take several seconds before the system is ready to resume normal operation.

5.8.2 Description

Causes the dome to be reset. This is the same as turning the dome off and then back on.

5.9 Command 0x11 (17_{10}), Set Zone Start

5.9.1 Command format

Set Zone Start D_EC_ZONE_START							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x11	0x00	ZONE ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0011 SET_ZONE_START
3. This command is used and decoded on the: Esprit 3012 and Intercept.
4. See ZONE SCAN ON (Section 5.14, page 32) for more information about this command.

5.9.2 Description

This command is used to define the start point of up to eight zones (ZONE ID). Zones are defined by setting a start point and then moving the dome in a clockwise direction (looking down from above the dome or pan/tilt when it is installed in its normal position) to set an end point. Higher numbered zones override lower numbered zones. Zone numbers are in byte 6 (ZONE ID) and are 1 based, not 0 based. I.e. 0x03 = Zone 3.

When the unit has a password enabled, this command will cause the unit to display the password request screen and not proceed until a correct password is entered. There is no way to directly enter a password via a Protocol.

FPN

5.9.3 Zones

When a SET ZONE START command (Section 5.9, page 29) is received, the current pan position is saved as the start position for the zone number specified in the command. If the zone was previously defined the end position is invalidated and the new start position is set. Also whatever is displayed on the Zone label (i.e. columns 0 → 19 of write character to screen command 0x15, 21_{10} (Section 5.11, page 30) though not displayed directly on some systems) on the logical first video line is saved as the zone label. When a SET ZONE END command (Section 5.10, page 30) is received, the monitor is unlocked How was the monitor locked?[-DGS], and the current pan position is saved as the end position for the zone number specified (ZONE ID) in the command.

Zones extend from the start point clockwise to the end point. This means that if a zone start point is set, the Spectra is panned slightly clockwise, and the zone end point is set, the zone will be small. But if the Spectra is panned slightly counterclockwise between the start and end points, the zone will be almost all the way around the pan circle.

A zone may not be specified that is 360^o in size. Starting with the Spectra III the end and start points of the same zone may not be within 1^o of each other. On earlier models the start/end points had to be at least 10^o apart.

There are commands to turn SET ZONE SCAN ON (Section 5.14, page 32) and SET ZONE SCAN OFF (Section 5.15, page 34). If zone scan has been turned on, during normal pan/tilt operation the current pan position is continuously read. If the current position is within a zone, the label for that zone is displayed on the logical first video line. If the current position is not within any zone, the line is cleared. If the current position is within more than one zone, the label for the highest-numbered zone will be displayed.

Note

For units previous to Spectra III SET ZONE SCAN OFF (Section 5.15, page 34) must be sent off before this command is received or the zone programming will not work correctly.
Spectra III and Spectra IV does not require Zone Scan to be off to operate properly.

5.10 Command 0x13 (19_{10}), Set Zone End

5.10.1 Command format

Set Zone End D_EC_ZONE_END							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x13	0x00	ZONE ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0013 SET_ZONE_END
3. This command is used and decoded on the: Esprit 3012 and Intercept.
4. See SET ZONE SCAN START (Section 5.9, page 29) and SET ZONE SCAN ON (Section 5.14, page 32) for more information about this command.

5.10.2 Description

This is used to define the end point of up to eight zones. Zones are defined by setting a start point and then moving the dome in a clockwise direction (looking down from above the dome or pan/tilt when it is installed in its normal position) to set an end point. Higher numbered zones override lower numbered zones. Zone numbers are in byte 6 and are 1 based, not 0 based. I.e. 0x04 = Zone 4. See the write up in SET ZONE START (Section 5.9, page 29) for more details on setting zones.

When the unit has a password enabled, this command will cause the unit to display the password request screen and not proceed until a correct password is entered. There is no way to enter a password via a Protocol.

5.11 Command 0x15 (21_{10}), Write Character To Screen

5.11.1 Command format

Write Character To Screen D_EC_WRITE_CHAR							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x15	SCREEN COLUMN	ASCII CHAR	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0015 WRITE_CHARACTER_TO_SCREEN
3. This command is used and decoded on the: Esprit 3012 and Intercept.

5.11.2 Description

1. The parameter in byte 5, SCREEN COLUMN of this command indicates the column to write to. This parameter is interpreted as follows:

   1.1 Columns $0 \rightarrow 19$ with byte 3 = `0x00` are used to receive Zone Labels.

   1.2 Columns $20 \rightarrow 39$ with byte 3 = `0x00` are used to receive Preset Labels.

   Starting with Spectra III (and ExSite), characters written to these positions are not written directly to the screen. Once the SET ZONE START (opcode `0x11`) command is received, the characters are displayed.

   Starting with Spectra III, characters written to these positions are not written directly to the screen. However, if characters are written to these columns and no SET PRESET (opcode Section 5.2, page 23) command is received within 250 milliseconds of receipt of the last character, the characters will be displayed on the screen beginning at the first column of the second row of the display.

   With the Spectra IV, following the first command on after a power cycle, characters in the Preset label locations are not displayed except when followed by a SET PRESET (Section 5.2, page 23) command within 250 milliseconds.

2. DATA2, ASCII CHAR, is the character to be displayed. The exact representation on the screen will be controled by the current font that is selected.

5.12 Command `0x17` (23_{10}), Clear Screen

5.12.1 Command format

Clear Screen D_EC_CLEAR_SCREEN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	`0xFF`	—	`0x00`	`0x17`	`0x00`	`0x00`	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:

   2.1 `0x0017 CLEAR_SCREEN`
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: Esprit 3012 and Intercept.

5.12.2 Description

Clears all generated characters from the screen.

Does not clear following on-screen data that is displayed with a "`CONSTANT`" attribute:

1. Active Alarms
2. Azimuth
3. Elevation

4. Direction, Spectra III and following.
5. Zoom Level, Spectra III and following.
6. Date/Time, Spectra IV only.

5.13 Command 0x19 (25_{10}), Alarm Acknowledge

5.13.1 Command format

Alarm Acknowledge D_EC_ALARM_ACK							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	TYPE	0x19	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0019 ALARM_ACKNOWLEDGE
3. This command, with a TYPE SUB OP-CODE of 0x01, is used by the Endura/Atlas projects.
4. This opcode is used by the ERD97P21.

5.13.2 Description

Usage of the TYPE SUB OPCODE:

1. 0x00: When an alarm is enabled (through a SET 95 menu action) and it occurs, the dome will perform whatever action it is programmed to do (again through a SET 95 menu action), until the alarm is acknowledged. Alarm numbers are in byte 6 and are 1 based not 0 based. Sending an ALARM ACKNOWLEDGE when no alarm is active is harmless.

   The ERD97 has Alarms in the range of 1 to 8. When the alarm number is sent over the communications line the range is 2 to 9. I.e. it is TWO based.

2. 0x01:[7] The response will be the General Response of 4 bytes which includes the Alarm Status data

5.14 Command 0x1B (27_{10}), Zone Scan On

5.14.1 Command format

Zone Scan On D_EC_ZONE_ON							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x1B	0x00	0x00	—

FPN

1. This command generates a "General Reply".

[7] This information comes from an e-mail from Alfio Marrone, dated Friday, January 23, 2004 12:54 PM.

2. Command Names as used by the Spectra IV software:
   2.1 0x001B ZONE_SCAN_ON
3. This command is used and decoded on the: Esprit 3012 and Intercept.
4. See SET ZONE START (Section 5.9, page 29) for more information about this command.

5.14.2 Description

Used to turn the displaying of zone labels on.

If zone scan has been turned on, the current pan position is continuously read. If the current position is within a zone, the label for that zone is displayed on the first video line. If the current position is not within any zone, the line is cleared. If the current position is within more than one zone, the label for the highest-numbered zone will be displayed. For more information about lables, see Section 3.3.1, page 17.

FPN

Using[8] the word "Scan" to describe these commands (Section 5.14, page 32 and Section 5.15, page 34) implies saying that the PTZ is expected to scan on its own. These commands simply enable/disable the zone label display. In earlier PTZ's (pre-Spectra III), these commands would enable/disable zone labels without any extra setup in the menus. Spectra III started this 2-tiered idea of enabling zone labels in the menus before they can be enabled with the zone scan on/off commands. A more sensible naming for these commands would be "Zone Labels On" and "Zone Labels Off".

This opcode is used by the following Pelco equipment:

Esprit, Spectra, ExSite

5.14.3 Zone Blanking

Zone blanking is used to blank out a defined zone. It is set up in the set 95 menu system and is the only way to blank out an area in the Spectra II and Esprit type systems. It is usable on all of the newer systems by using their set 95 menus.

5.14.4 Creating Zone Labels

Many devices have an ability to display labels on the video. Labels that identify the preset or zone being scanned are common. There is a special technique to establish a label that is associated with either a preset or a zone. First, send the label to the receiver/driver using the "Write Character to Screen" (Section 5.11, page 30) command. After the label is on the screen, then set the preset or zone. That will establish the label and associate it with that preset or zone.

- ZONE SCAN ON (Section 5.14, page 32): Used to turn the display of zone labels on.
- ZONE SCAN OFF (Section 5.15, page 34): Used to turn the display of zone labels off.

For the Spectra III, Spectra III SE and ExSite, characters written to these zone addresses positions are not written directly to the screen. Once the SET ZONE START (Section 5.9, page 29) command is received, the characters are displayed.

Defining a Zone

1. Send "SET ZONE SCAN OFF" (Section 5.15, page 34)
2. Send characters to positions 0 $\longrightarrow$ 19.
3. Send a "SET ZONE START" (Section 5.9, page 29)
4. Do any reqired pan motion. On newer units presets may be called.

[8] From: Hannen, Craig. Tuesday, April 18, 2006 10:11 AM

5. Send a "SET ZONE END" (Section 5.10, page 30)
6. Send a "SET ZONE SCAN ON" (Section 5.14, page 32)

Now when the camera is in one of the eight zones, the zone message will appear. The internal logic of the software, copies what is in the zone label buffer into EEPROM when it gets a "SET ZONE END" (Section 5.10, page 30) command. With the older units, all units prior to the Spectra III, the zone label was always on the first displayed line. With the Spectra III the zone label can be anywhere on the screen and the logic to move it is internal to the Spectra III software.

5.15 Command 0x1D (29_{10}), Zone Scan Off

5.15.1 Command format

Zone Scan Off D_EC_ZONE_OFF							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x1D	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x001D ZONE_SCAN_OFF
3. See Section 5.14, page 32 for more information about this command.
4. This command is used and decoded on the: Esprit 3012 and Intercept.

5.15.2 Description

Used to turn the displaying of zone labels off.

5.16 Command 0x1F (31_{10}), Record Pattern Start

5.16.1 Command format

Set Pattern Start D_EC_START_RECORD							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x1F	0x00	PATTERN ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x001F SET_PATTERN_START
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: Esprit 3012 and Intercept.
5. The defined patterns may be determined by using QUERY DEFINED PATTERNS (Section 5.59.19, page 73) and QUERY DEFINED PATTERNS RESPNSE (Section 5.59.20, page 73).
6. A pattern may be deleted by using DELETE PATTERN (Section 5.59.9, page 69).

5.16.2 Description

Recording of a pattern starts when a start pattern record command is received. It ends when either an end pattern record command is received, or 60 seconds has elapsed since the start pattern record command was received. The message "`PROGRAMMING PATTERN`" is put on the first video line. When recording stops (either by command, timeout or when pattern memory fills up on the newer types of PTZ units[9]), the message is cleared.

FPN

Playing of the recorded pattern starts when a start pattern play command is received. When the end of the recorded pattern is reached, playback starts over again at the beginning of the pattern. This continues until any other command is received. If zones have not been enabled, the message "`RUNNING PATTERN`" is put on the first video line and remains there until playback stops, at which point it is cleared. If zones have been enabled, the "`RUNNING PATTERN`" message will not be shown. Instead, the zone labels will be shown as the pattern moves through the zones. When playback is stopped, the first video line is cleared.

There are two types of pattern processing: record and playback. Pattern processing occurs once each timer tick (14 times a second[10]). If recording, the current command is stored in the EEPROM/flash. If the current command is not one that can be played back, an illegal command is saved (it will be skipped during playback). If playing back, a command is read out of the EEPROM/flash and decoded. If it is an illegal command, it is skipped.

When the unit has a password enabled, this command will cause the unit to display the password request screen and not proceed until a correct password is entered. There is no way to enter a password via a Protocol.

The parameter in byte 6 of this command indicates the pattern number. Used when starting to record a pattern. Spectra III, ExSite and Spectra IV interpret byte 6 as follows:

PATTERN ID	
Value	Action
0 or 1	Sets/runs pattern 1
2	Sets/runs pattern 2
3	Sets/runs pattern 3
4	Sets/runs pattern 4
5	Sets/runs pattern 5
6	Sets/runs pattern 6
7	Sets/runs pattern 7
8	Sets/runs pattern 8

Spectra I, Spectra II and Esprit interpret byte 6 as follows:

PATTERN ID	
Value	Action
0	Sets/runs the single "long pattern"
1	Sets/runs the first "short pattern"
2	Sets/runs the second "short pattern"

FPN

[9]The newer unit types are: Spectra III, Mini Spectra, ExSite and Spectra IV.

[10]Or depending on the model it may be each vertical interrupt (60 or 50 times a second depending on whether the video is NTSC or PAL).

5.16.3 Pattern numbers

The method of saving a pattern has changed over time. The original method was to save what the unit was doing every vertical sync time. This resulted in getting 60 (50 with PAL based cameras) records a second. Older units had patterns defined in maximum minutes of run time. With these systems the choice is one one minute pattern (pattern 0) or two one half minute patterns (patterns 1 and 2).

Starting with the Spectra III/ExSite series of units. Saving what the unit was doing each vertical sync time is used, however if the unit is doing the same thing on several vertical sync times in a row, then an eight bit counter is incremented and saved when a change is detected. This Run Length Limited (RLL) technique makes it so that the saved pattern length may be of greater duration. The total duration is now unknown in advance as it depends on the number of **changes** in what the unit is told to do while recording the pattern. (A patent is pending on this method of saving a pattern.)

The numbering and quantity of patterns varies on different units:

1. On many Intercept type units there was one pattern. On other Intercept units, those with out presets, there were no patterns.
2. The Spectra I, Spectra II and Esprit have pattern numbers from 0 ⟶ 2.
3. On the Spectra II Lite the only pattern is numbered 0.
4. On the Spectra III the only pattern is numbered 1.
5. With the Spectra III SE and ExSite patterns are numbered in the range of 1 ⟶ 4.
6. On the Spectra IV SE the patterns are numbered in the range of 1 ⟶ 8.
7. With low cost units utilizing the “434” (18X), and the “934” (16X) type of camera, there is only one pattern.

5.17 Command 0x21 (33_{10}), Record Pattern End

5.17.1 Command format

Set Pattern End D_EC_END_RECORD							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x21	0x00	PATTERN ID	—

FPN

1. This command generates a “General Reply”.
2. Command Names as used by the Spectra IV software:
   2.1 0x0021 SET_PATTERN_STOP
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: Esprit 3012 and Intercept.
5. See RECORD PATTERN START Section 5.16, page 34 for more information about this command.

5.17.2 Description

Stops the current pattern to stop being recorded and have its data written into persistent memory.

5.18 Command 0x23 (35_{10}), Run Pattern

5.18.1 Command format

Set Pattern Start D_EC_START_PLAY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x23	0x00	PATTERN ID	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0023 RUN_PATTERN
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: Esprit 3012 and Intercept.
5. The defined patternss may be determined by using QUERY DEFINED PATTERNS (Section 5.59.19, page 73) and its response QUERY DEFINED PATTERNS RESPONSE (Section 5.59.20, page 73).
6. See RECORD PATTERN START Section 5.16, page 34 for more information about this command.

5.18.2 Description

The parameter in byte 6 of this command indicates the pattern number. Used to get a pattern running. Spectra III, EsSite and Spectra IV interpret byte 6 as follows:

PATTERN ID	
Value	Action
0 or 1	Sets/runs pattern 1
2	Sets/runs pattern 2
3	Sets/runs pattern 3
4	Sets/runs pattern 4
5	Sets/runs pattern 5
6	Sets/runs pattern 6
7	Sets/runs pattern 7
8	Sets/runs pattern 8

Spectra I, Spectra II and Esprit interpret byte 6 as follows:

PATTERN ID	
Value	Action
0	Sets/runs the single "long pattern"
1	Sets/runs the first "short pattern"
2	Sets/runs the second "short pattern"

5.19 Command 0x25 (37_{10}), Set Zoom Speed

5.19.1 Command format

Set Zoom Speed D_EC_ZOOM_SPEED							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x25	0x00	ZOOM SPEED	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0025 SET_ZOOM_SPEED
3. This opcode is are used by the: ERD97P21.
4. This command is used and decoded on the: Intercept.
5. The current value of the zoom speed may not be read out.

5.19.2 Description

This command accepts values of 0 through 3, in byte 6, to change the speed of the indicated function. Some cameras (such as the X12 camera in the Spectra I) do not support these functions. If the camera does support this function, the command is ignored. 0 is the slowest speed, 3 is the fastest. Because of the vast number of variations in camera capabilities, it is usually best to use the SET 95 menu for this type of control change.

ZOOM SPEED		
Value	Use	
0	Slowest Speed	D_ECD_ZOOM_SPEED_SLOW
1	Low Medium Speed	D_ECD_ZOOM_SPEED_MEDIUM
2	High Medium Speed	D_ECD_ZOOM_SPEED_FAST
3	Highest speed	D_ECD_ZOOM_SPEED_FASTEST

5.20 Command 0x27 (39_{10}), Set Focus Speed

5.20.1 Command format

Set Focus Speed D_EC_FOCUS_SPEED							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x27	0x00	FOCUS SPEED	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0027 SET_FOCUS_SPEED
3. This opcode is used by the: ERD97P21 and the Intercept.
4. The current value of the focus speed may not be read out.

5.20.2 Description

This command accepts values of 0 through 3, in byte 6, to change the speed of the indicated function. Some cameras (such as the X12 camera in the Spectra I) do not support these functions. If the camera does support this function, the command is ignored. 0 is the slowest speed, 3 is the fastest. Because of the vast number of variations in camera capabilities, it is usually best to use the SET 95 menu for this type of control change.

FOCUS SPEED		
Value	Use	
0	Slowest Speed	D_ECD_FOCUS_SPEED_SLOW
1	Low Medium Speed	D_ECD_FOCUS_SPEED_MEDIUM
2	High Medium Speed	D_ECD_FOCUS_SPEED_FAST
3	Highest speed	D_ECD_FOCUS_SPEED_FASTEST

5.21 Command 0x29 (41_{10}), Reset Camera to Defaults

5.21.1 Command format

Reset camera to defaults D_EC_CAMERA_RESET							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x29	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0029 RESET_CAMERA_DEFAULTS
3. The Spectra IV does not acknowledge a CAMERA RESET command. It just does the reset.

5.21.2 Description

Resets the camera to its default condition, except that the current phase delay is not changed.

5.22 Command 0x2B (43_{10}), Auto Focus

5.22.1 Command format

Auto focus D_EC_AUTO_FOCUS							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x2B	0x00	AUTO FOCUS CTRL	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x002B AUTO_FOCUS_MODE
3. This command is used by the Endura/Atlas projects.
4. The current value of auto focus may not be read out.

5.22.2 Description

If byte 6 is 0 the device automatically controls whether auto focus is on (default) or off. If byte 6 is 1, auto focus is turned off. Other values are ignored.

AUTO FOCUS CTRL		
Value	Use	
0	Automatic operation (default)	D_ECD_AUTO_FOCUS_AUTO
1	Auto focus is off	D_ECD_AUTO_FOCUS_OFF

5.23 Command 0x2D (45_{10}), Auto Iris

5.23.1 Command format

Auto iris D_EC_AUTO_IRIS							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x2D	0x00	AUTO IRIS CTRL	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x002D AUTO_IRIS_MODE
3. This command is used by the Endura/Atlas projects.
4. The current value of auto iris may not be read out.

5.23.2 Description

If byte 6 is 0 the device automatically controls whether auto iris is on (default) or off. If byte 6 is 1, auto iris is turned off. Other values are ignored.

AUTO IRIS CTRL		
Value	Use	
0	Automatic operation (default)	D_ECD_AUTO_IRIS_AUTO
1	Auto iris is off	D_ECD_AUTO_IRIS_OFF

5.24 Command 0x2F (47_{10}), AGC

5.24.1 Command format

AGC D_EC_AGC							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x2F	0x00	AGC CTRL	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x002F AGC_MODE
3. The current value of AGC may not be read out.

5.24.2 Description

If byte 6 is 0 the device automatically controls whether AGC (automatic gain control) is on or off (default), If byte 6 is 1, AGC is turned off (manual gain). Other values are ignored. Sending an ADJUST GAIN command (Section 5.32, page 46) turns AGC off.

AGC CTRL		
Value	Use	
0	Automatic operation (default)	D_ECD_AUTO_AGC_AUTO
1	AGC is off	D_ECD_AUTO_AGC_OFF

5.25 Command 0x31 (49_{10}), Backlight Compensation

5.25.1 Command format

Backlight compensation D_EC_BLC							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x31	0x00	BLC CTRL	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0031 BACKLIGHT_COMPENSATION
3. The current value of BLC may not be read out.

5.25.2 Description

If byte 6 is 1, backlight compensation is turned off (default). If byte 6 is 2, backlight compensation is turned on. Other values are ignored.

BLC CTRL		
Value	Use	
1	BLC is off (default)	D_ECD_AUTO_BLC_OFF
2	BLC is on	D_ECD_AUTO_BLC_ON

Change for Spectra IV If byte 6 is 0, backlight compensation is turned off (default). If byte 6 is non-zero, backlight compensation is turned on.

BLC CTRL	
Value	Use
0	BLC is off (default)
1	BLC is on

5.26 Command 0x33 (51_{10}), Auto White Balance

5.26.1 Command format

Auto white balance D_EC_AWB							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x33	0x00	AWB CTRL	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0033 AUTO_WHITE_BALANCE
3. The current value of AWB may not be read out.

5.26.2 Description

If byte 6 is 1, auto white balance is turned on (default). If byte 6 is 2, auto white balance is turned off. Other values are ignored. Sending an ADJUST WHITE BALANCE command turns auto white balance off. (Section 5.30, page 45, Section 5.31, page 46)

AWB CTRL		
Value	Use	
1	AWB is on (default)	D_ECD_AUTO_AWB_ON
2	AWB is off	D_ECD_AUTO_AWB_OFF

Change for Spectra IV If byte 6 is 0, auto white balance is turned on (default). If byte 6 is non-zero, auto white balance is turned off. Sending an ADJUST WHITE BALANCE command turns auto white balance off. (Section 5.30, page 45, Section 5.31, page 46)

AWB CTRL	
Value	Use
0	AWB is on (default)
1	AWB is off

5.27 Command 0x35 (53_{10}), Enable Device Phase Delay Mode

5.27.1 Command format

Enable device phase delay mode D_EC_DEVICE_PHASE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x35	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0035 ENABLE_DEVICE_PHASE_DELAY_MODE

5.27.2 Description

When device phase delay is set, the phase delay is set by the device (there may be a manual adjustment). Sending an ADJUST LINE LOCK phase delay command will disable device phase delay mode.

See Section 5.29, page 44.

5.28 Command 0x37 (55_{10}), Set Shutter Speed

5.28.1 Command format

Set shutter speed D_EC_SHUTTER_SPEED							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x37	SHUTTER CTRL 1	SHUTTER CTRL 2	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0037 SET_SHUTTER_SPEED

5.28.2 Older Shutter Speed Codes

Spectra II and older Shutter Speed Codes Byte[11] 5 and byte 6 are the high and low bytes respectively of 1 divided by the shutter speed. The shutter speed is limited internally to the range from $\frac{1}{60}$ second (NTSC) or $\frac{1}{50}$ second (PAL) to $\frac{1}{30000}$ second, corresponding to a sent number range from 60 (or 50) to 30000. If the sent number is, 0 the shutter speed is reset to its default value ($\frac{1}{60}$ or $\frac{1}{50}$ second). If the sent number is 1, the shutter speed is moved to the next faster speed in the shutter speed table (below). If the sent number is 2, the shutter speed is set to the next slower speed in the table. Because of the vast number of variations in camera capabilities, it is usually best to use the SET 95 menu for this type of control change.

SHUTTER CTRL	
Byte 5,6	Speed (seconds)
0	Use default of $\frac{1}{60}$ or $\frac{1}{50}$
1	Increment in table
2	Decrement in table
50	50 (PAL)
60	60 (NTSC)
100	100
120	120
250	250
500	500
1000	1000
2000	2000
4000	4000
10000	10000
30000	30000

[11] Up until Spectra II rev 3.21.

5.28.3 Newer Shutter Speed Codes

With[12] the Spectra III series of units this has been changed as follows: Byte 6 is the only byte processed. Byte 6 is an index into an array of usable shutter speeds. An index of `0x00` represents auto-shutter, and indexes from 1 $\longrightarrow$ 16 represent the supported shutter speeds. The actual shutter speed values vary depending on the exact make and rev of camera installed. Because of the vast number of variations in camera capabilities, it is usually best to use the SET 95 menu for this type of control change.

Spectra III, Spectra IV, ExSite and Esprit IOP/IOC Shutter Speed Codes All times in the below list are the denominator of a fraction with 1 being the numerator. I.e. using an index of 9 generates a shutter speed of $\frac{1}{250}$ second.

Spectra MINI Shutter Speed Codes All times in the below list are the denominator of a fraction with 1 being the numerator. I.e. using an index of 6 generates a shutter speed of $\frac{1}{500}$ second. The 1/100 shutter speed was added in for the Esprit series starting with rev 3.30.

	Spectra III and newer		**MINI Spectra**	
	SHUTTER CTRL		SHUTTER CTRL	
Index	NTSC	PAL	NTSC	PAL
0	Auto Shutter	Auto Shutter	Auto Shutter	Auto Shutter
1	2	1.5	60	50
2	4	3	100	100
3	8	6	120	100
4	15	12	180	150
5	30	25	250	250
6	60	50	500	500
7	120	100	1000	1000
8	180	150	2000	2000
9	250	250	4000	4000
10	500	500	10000	10000
11	1000	1000	30000	30000
12	2000	2000	—	—
13	4000	4000	—	—
14	10000	10000	—	—
15	30000	30000	—	—
16	100	reserved	—	—

5.29 Command `0x39` (57_{10}), Adjust Line Lock Phase Delay

5.29.1 Command format

Adjust line lock phase delay D_EC_ADJUST_PHASE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	`0xFF`	—	LL CTRL	`0x39`	LL DELAY MSB	LL DELAY LSB	—

[12]Starting with Spectra II, rev 3.22, and all Spectras since.

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0039 ADJUST_LINE_LOCK_PHASE_DELAY
   2.2 0x0139 SET_LINE_LOCK_PHASE_DELAY

5.29.2 Description

If byte 3 is 0, byte 5 and byte 6 are the high and low bytes respectively of an unsigned 16-bit number which is the new phase delay. If byte 3 is 1, byte 5 and byte 6 are the high and low bytes respectively of a signed 16-bit number which is the change to the current phase delay. The phase delay is the delay between the zero crossing of the AC power waveform and the line lock signal sent to the camera. It is in units of 1.085 microseconds. The phase delay is limited internally to the range from 0 to 32767. If an attempt is made to set or change the delay to a value outside this range, the delay will be set to the appropriate end of the range. This command disables device phase delay mode (ENABLE PHASE DELAY MODE Section 5.27, page 42).

LL CTRL/DELAY			
Byte	Bytes	—	
3	5, 6	Use	
0	16-bit unsigned value	New phase delay value	D_ECS_ADJUST_PHASE_NEW
1	16-bit signed value	Phase delay change	D_ECS_ADJUST_PHASE_DELTA

5.30 Command 0x3B (59_{10}), Adjust White Balance (R-B)

5.30.1 Command format

Adjust white balance (R-B) D_EC_ADJUST_RB_WB							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	WB CTRL	0x3B	WB-RB MSB	WB-RB LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x003B ADJUST_WHITE_BALANCE_RB
   2.2 0x013B SET_WHITE_BALANCE_RB

5.30.2 Description

If byte 3 is 0, byte 5 and byte 6 are the high and low bytes respectively of an unsigned 16-bit number which is the new red-blue white balance value. If byte 3 is 1, byte 5 and byte 6 are the high and low bytes respectively of a signed 16-bit number which is the change to the current red-blue white balance value. The balance value is limited internally to the range from 192 (0xC0) to 768 (0x300). If an attempt is made to set or change the balance to a value outside this range, the balance will be set to the appropriate end of the range. This command turns off AUTO WHITE BALANCE (Section 5.26, page 42).

CTRL/WB-RB VALUE			
Byte	Bytes	—	
3	5, 6	Use	
0	16-bit unsigned value	New red-blue white balance value	D_ECS_ADJUST_RB_WB_NEW
1	16-bit signed value	Red-blue white balance change	D_ECS_ADJUST_RB_WB_DELTA

5.31 Command 0x3D (61_{10}), Adjust White Balance (M-G)

5.31.1 Command format

Adjust white balance (M-G) D_EC_ADJUST_MG_WB							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	WB CTRL	0x3D	WB-MG MSB	WB-MG LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x003D ADJUST_WHITE_BALANCE_MG
   2.2 0x013D SET_WHITE_BALANCE_MG

5.31.2 Description

If byte 3 is 0, byte 5 and byte 6 are the high and low bytes respectively of an unsigned 16-bit number which is the new magenta-green white balance value. If byte 3 is 1, byte 5 and byte 6 are the high and low bytes respectively of a signed 16-bit number which is the change to the current magenta-green white balance value. The balance value is limited internally to the range from 192 (0xC0) to 768 (0x300). If an attempt is made to set or change the balance to a value outside this range, the balance will be set to the appropriate end of the range. This command turns off AUTO WHITE BALANCE (Section 5.26, page 42).

WB CTRL/WB-RB VALUE			
Byte	Bytes	—	
3	5, 6	Use	
0	16-bit unsigned value	New Magenta-green white balance phase delay value	D_ECS_ADJUST_MG_WB_NEW
1	16-bit signed value	Magenta-green white balance change	D_ECS_ADJUST_MG_WB_DELTA

5.32 Command 0x3F (63_{10}), Adjust Gain

5.32.1 Command format

Adjust gain D_EC_ADJUST_GAIN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	GAIN CTRL	0x3F	GAIN MSB	GAIN LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x003F ADJUST_GAIN
   2.2 0x013F SET_GAIN

5.32.2 Description

If byte 3 is 0, byte 5 and byte 6 are the high and low bytes respectively of an unsigned 16-bit number which is the new gain. If byte 3 is 1, byte 5 and byte 6 are the high and low bytes respectively of a signed 16-bit number which is the change to the current gain. The gain is limited internally to the range from 0 to 448 (0x1C0). If an attempt is made to set or change the gain to a value outside this range, the gain will be set to the appropriate end of the range.

GAIN CTRL/GAIN VALUE			
Byte	Bytes	—	
3	5, 6	Use	
0	16-bit unsigned value	New gain value	D_ECS_ADJUST_GAIN_NEW
1	16-bit signed value	Gain change	D_ECS_ADJUST_GAIN_DELTA

5.33 Command 0x41 (65_{10}), Adjust Auto-Iris Level

5.33.1 Command format

Adjust auto-iris level D_EC_ADJUST_AI_LEVEL							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	AI CTRL	0x41	AIL MSB	AIL LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0041 ADJUST_AUTO_IRIS_LEVEL
   2.2 0x0141 SET_AUTO_IRIS_LEVEL
3. This command is used by the Endura/Atlas projects.

5.33.2 Description

If byte 3 is 0, byte 5 and byte 6 are the high and low bytes respectively of an unsigned 16-bit number which the new level. If byte 3 is 1, byte 5 and byte 6 are the high and low bytes respectively of a signed 16-bit number which is the change to the current level. The level is limited internally to the range from 0 to 255 (0xFF). If an attempt is made to set or change the level to a value outside this range, the gain will be set to the appropriate end of the range.

AWB CTRL/AIL VALUE			
Byte	Bytes	—	
3	5, 6	Use	
0	16-bit unsigned value	New auto iris level value. This sub-opcode is used by the Endura/Atlas projects.	D_ECS_ADJUST_AI_LEVEL_NEW
1	16-bit signed value	Auto iris level change	D_ECS_ADJUST_AI_LEVEL_DELTA

5.34 Command 0x43 (67_{10}), Adjust Auto-Iris Peak Value

5.34.1 Command format

Adjust auto-iris peak value D_EC_ADJUST_AI_PEAK							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	AI CTRL	0x43	AI PEAK MSB	AI PEAK LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0043 ADJUST_AUTO_IRIS_PEAK_VALUE
   2.2 0x0143 SET_AUTO_IRIS_PEAK_VALUE

5.34.2 Description

If byte 3 is 0, byte 5 and byte 6 are the high and low bytes respectively of an unsigned 16-bit number which the new peak value. If byte 3 is 1, byte 5 and byte 6 are the high and low bytes respectively of a signed 16-bit number which is the change to the current peak. The peak is limited internally to the range from $0 \rightarrow 255$ (0xFF) for older cameras. With the current Hitachi cameras the range is $0 \rightarrow 127$ (0x00 $\rightarrow$ 0x7F). If an attempt is made to set or change the peak to a value outside this range, the peak will be set to the appropriate end of the range.

AI CTRL/PEAK VALUE			
Byte	Bytes	—	
3	5, 6	Use	
0	16-bit unsigned value	New auto iris peak value	D_ECS_ADJUST_AI_PEAK_NEW
1	16-bit signed value	Auto iris peak change	D_ECS_ADJUST_AI_PEAK_DELTA

5.35 Command 0x45 (69_{10}), Query

5.35.1 Command format

Query D_EC_QUERY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	QUERY TYPE	0x45	0x00	0x00	—

FPN

1. This command generates a "Query Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0045 QUERY
3. This command is used by the Endura/Atlas projects.
4. This command is used and decoded on the: Esprit 3012.
5. This command is not supported in ERD, IRD or LRD units.

5.35.2 Description

This command does not utilize the address field. This is so that the address of a unit may be determined programmabily.

The response to the Query command is:

The address field is the address of the device responding to the query. The content of the part number field is dependent on the type and version of the device being programmed, please refer to the table that follows.

The checksum is the 8 bit (modulo 256) sum of the transmitted query command's checksum, the address of the response, and the 15-byte part number.

Phase in of the part number/model number/serial number readouts. Note the change over from program number to model number to additions of the serial number.

1. Spectra ASCII text string of the **program** number and version of device. The string was internal to the software and this op-code was unsupported. Thus there was no way to readout the value. E.G. `PG53-0001-R206`

2. Spectra II ASCII text string of the **program** number and version of device. E.G. `PG53-0060-R331`

3. Spectra III prior to version 1.20. ASCII text string of the **program** number and version of device. E.G. `PG53-0060-R400`

4. Spectra III version 1.22 and later. ASCII text string of the device **model** number. E.G. `DD53C22-X`

5. Esprit prior to version 3.10. ASCII text string of the **program** number and version of device. E.G. `PG53-0097-R306`

6. Esprit version 3.10 and later. ASCII text string of the device **model** number. E.G. `ES31CBW18`

7. All units then those above, have the ASCII text string of the device **model** number. E.G. `ES31CBW18`

8. Spectra IV and Esprit TI also have the ASCII text string of the device **serial** number available through use of an enhanced SUB OP-CODE of `0x01`. E.G. `123456`

Esprit model number generation The Esprit selects a string from the following table to use as a reply to Query commands. (Note ␣ is used to indicate a "blank" (`0x20`).)

ES31C16␣␣␣␣␣␣␣␣	ES31C16X␣␣␣␣␣␣␣	ES30C16␣␣␣␣␣␣␣␣	ES30C16X␣␣␣␣␣␣␣
ES31C22␣␣␣␣␣␣␣␣	ES31C22X␣␣␣␣␣␣␣	ES30C22␣␣␣␣␣␣␣␣	ES30C22X␣␣␣␣␣␣␣
ES31CBW18␣␣␣␣␣␣	ES31CBW18X␣␣␣␣␣	ES30CBW18␣␣␣␣␣␣	ES30CBW18X␣␣␣␣␣
ES31PC16␣␣␣␣␣␣␣	ES31PC16X␣␣␣␣␣␣	ES30PC16␣␣␣␣␣␣␣	ES30PC16X␣␣␣␣␣␣
ES31PC22␣␣␣␣␣␣␣	ES31PC22X␣␣␣␣␣␣	ES30PC22␣␣␣␣␣␣␣	ES30PC22X␣␣␣␣␣␣
ES31PCBW18␣␣␣␣␣	ES31PCBW18X␣␣␣␣	ES30PCBW18␣␣␣␣␣	ES30PCBW18X␣␣␣␣

Sample model number for a X18 Esprit with wiper: "`ES31PCBW18␣␣␣␣␣`". In this example the ␣ symbol indicates blank (`0x20`) padding being used.

Spectra III Part number generation The Spectra III generates a response to a Query command which is composed of two or three contatenated fields. These fields are selected from the following table (by selecting one entry from each column) depending on the exact model of Spectra III. The resulting string is NULL padded to be 15 bytes long with no trailing delimiter.

DD53	TC16	-X
	C22	
	M22	
	CBW	

Sample model number for a X22 Spectra III SE: "DD53C22␣␣␣␣␣␣␣␣". In this example the ␣ symbol indicates NULL (0x00) padding being used.

Spectra IV Part number generation

DD4	TC16	-X	
	C22		
	M22		
	CBW23		
	CBW35		
DD4H	CBW35		Look Up dome

Sample model number for a X35 Spectra IV SE: "DD4CBW35␣␣␣␣␣␣␣". In this example the ␣ symbol indicates NULL (0x00) padding being used.

Esprit TI Model number generation

ES30		TI			Esprit Thermal Imager
	14				14.25mm focal length lens
	35				35mm focal length lens
	50				50mm focal length lens
			X		PAL instead of NTSC video format
				1	Frame rate of 9 Hz instead of 30 Hz (25 Hz for PAL) rate

Esprit TI sample part numbers:

1. "ES3035TI␣␣␣␣␣␣␣". A unit with 30 Hz frame rate NTSC video output and a 35mm lens.
2. "ES3035TI1␣␣␣␣␣␣". A unit with 9 Hz frame rate NTSC video output and a 35mm lens.
3. "ES3035TIX␣␣␣␣␣␣". A unit with 25 Hz frame rate PAL video output and a 35mm lens.
4. "ES3035TIX1␣␣␣␣␣". A unit with 9 Hz frame rate PAL video output and a 35mm lens.

In these examples the ␣ symbol indicates NULL (0x00) padding being used.

5.36 Command 0x47 (71_{10}), Preset Scan

5.36.1 Command format

Preset Scan D_EC_PRESET_SCAN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x47	0x00	DWELL	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0047 PRESET_SCAN
3. This command is decoded on the: Esprit 3012.

5.36.2 Description

This command tells a PTZ to visit every defined preset for a given number of seconds (the number of seconds are defined in DWELL). So this is a method of implementing a preset tour at the PTZ level. **This command is not used as a Dcommand** . It is a 32-bit Coaxitron® only command.

5.37 Command 0x49 (73_{10}), Set Zero Position

5.37.1 Command format

Set Zero Position D_EC_SET_ZERO							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x49	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0049 SET_ZERO_POSITION
3. This command is used by the Endura/Atlas projects.
4. The angular value of where the displayed "zero point" has been moved to may be read out with the command/response pair of QUERY AZIMUTH ZERO (Section 5.59.2, page 67) and QUERY AZIMUTH ZERO RESPONSE (Section 5.59.3, page 68).

5.37.2 Description

This command is used to set the pan position that the unit uses as a zero reference point for the azimuth on-screen display. The unit's current pan position when this command is received becomes the zero reference point for on screen Pan display. This command performs the same function as the "SET AZIMUTH ZERO" menu item.

5.38 Command 0x4B (75_{10}), Set Pan Position

5.38.1 Command format

Set Pan Position D_EC_SET_PAN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x4B	PAN MSB	PAN LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x004B SET_PAN_POSITION
3. This command is used by the Endura/Atlas projects.
4. This position may be read out using the command/response pair QUERY PAN POSITION (Section 5.41, page 54) and QUERY PAN POSITION RESPONSE (Section 5.45, page 55).

5.38.2 Description

This command is used to set the pan position of the device. The position is given in hundredths of a degree and has a range from $0 \rightarrow 35999$ (decimal).

FPN

Example: the value to use to set the pan position to 45 degrees is 4500.

Note that the value used here is always the "absolute" pan position. It does not take into account any adjustment to the screen display that may have been made by using the "SET ZERO POSITION", opcode (0x49) command or the "SET AZIMUTH ZERO" menu item. See Appendix C, page 85 for more information on pan positioning.

5.39 Command 0x4D (77_{10}), Set Tilt Position

5.39.1 Command format

Set Tilt Position D_EC_SET_TILT							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x4D	TILT MSB	TILT LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x004F SET_ZOOM_POSITION
3. This command is used by the Endura/Atlas projects.
4. This position may be read out using the command/response pair QUERY TILT POSITON (Section 5.42, page 54) and QUERY TILT POSITON RESPONSE (Section 5.46, page 56).

5.39.2 Description

This command is used to set the tilt position of the device. The position is given in hundredths of a degree and has a range from $0 \rightarrow 35999$ (decimal).

Generally these values are interpreted as follows: Zero degrees indicates that the device is pointed horizontally (at the horizon). Ninety degrees indicates that the device is pointed straight down.

FPN

Examples:

1. The value used to set the tilt position to 45 degrees below the horizon is 4500.
2. The value used to set the tilt position to 45 degrees above the horizon, is 31500.

Note that different equipment will have different ranges of tilt motion. To determine the abilities of a specific piece of equipment, refer to that device's operation manual.

5.40 Command 0x4F (79_{10}), Set Zoom Position

5.40.1 Command format

Set Zoom Position D_EC_ZOOM							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x4F	ZOOM MSB	ZOOM LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x004F SET_ZOOM_POSITION
3. This position may be read out using the command/response pair QUERY ZOOM POSITION (Section 5.43, page 54) and QUERY ZOOM POSITION RESPONSE (Section 5.46, page 56).

5.40.2 Description

This command is used to set the zoom position of the device. The position is given as a ratio based on the device's Zoom Limit setting. The position is calculated as follows:

Position = (desired_zoom_position / zoom_limit) * 65535

Where desired_zoom_position and zoom_limit are given in units of magnification.

FPN

Example: Given that the zoom limit of the device's camera is X184, calculate the value needed to set the zoom position to X5:

Position = (5 / 184) * 65535 = approximately 1781

This works out to: decimal 1781 = 0x06F5 with byte 5 = 0x06 and byte 6 = 0xF5.

Commands in D protocol can not send floating point numbers. Since the result of this division is ALWAYS smaller than 1, we multiply it by 64K and round (or truncate) to get an integer. (Here we rounded the result.) To use this method the maximum zoom value must be known. There is no command to ask the Spectra what the maximum zoom value is.

Maximum zoom limit is set in one of the menus that the Spectra supports. The exact value varies depending on the exact type of camera installed.

5.41 Command 0x51 (81_{10}), Query Pan Position

5.41.1 Command format

Query Pan Position D_EC_QUERY_PAN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x51	0x00	0x00	—

FPN

1. This command generates an "Extended Reply".
2. This command is used by the Endura/Atlas projects.
3. This command generates a QUERY PAN POSITION RESPONSE (Section 5.45, page 55)

5.41.2 Description

This command is used to query the current pan position of the device. The response to this command uses opcode 0x59. See QUERY PAN POSITION RESPONSE (Section 5.45, page 55) for more information.

5.42 Command 0x53 (83_{10}), Query Tilt Position

5.42.1 Command format

Query Tilt Position D_EC_QUERY_TILT							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x53	0x00	0x00	—

FPN

1. This command generates an "Extended Reply".
2. This command is used by the Endura/Atlas projects.
3. This command generates a QUERY TILT POSITION RESPONSE

5.42.2 Description

This command is used to query the current tilt position of the device. The response to this command uses opcode 0x5B. See QUERY TILT POSITION RESPONSE (Section 5.46, page 56) for more information.

5.43 Command 0x55 (85_{10}), Query Zoom Position

5.43.1 Command format

Query Zoom Position D_EC_QUERY_ZOOM							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x55	0x00	0x00	—

FPN

1. This command generates an "Extended Reply".
2. This command generates QUERY ZOOM POSITION RESPONSE (Section 5.47, page 58)

5.43.2 Description

This command is used to query the current zoom position of the device. The response to this command uses opcode 0x5D. See QUERY ZOOM POSITIOIN RESPONSE (Section 5.47, page 58) for more information.

5.44 Command 0x57 (87_{10}), Prepare For Download

5.44.1 Command format

Prepare For Download D_EC_DOWNLOAD							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x57	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0057 DOWNLOAD

5.44.2 Description

Places the device into a state where it is prepared to receive a firmware update.

D_EC_DOWNLOAD forces a baud rate of 2400 and expects a reply at the original baud rate. I.e. if the Spectra is running at 4800 baud, when it receives an D_EC_DOWNLOAD command it will send a response at 4800 baud and then reconfigure to operate at 2400 baud.

Use of this command in a download sequence is outlined in Appendix D, page 87.

5.45 Response 0x59 (89_{10}), Query Pan Position Response

5.45.1 Response format

Query Pan Position Response D_EC_PAN_RESP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x59	PAN MSB	PAN LSB	—

FPN

1. This response is an "Extended Reply".
2. This response is the reply to a QUERY PAN POSITION (Section 5.41, page 54)

5.45.2 Description

The position is given in hundredths of a degree and has a range from 0 → 35999 (decimal).

FPN

Example: a position value of 4500 indicates 45 degrees.

Note that the value returned is always the "absolute" pan position. It does not take into account any adjustment to the screen display that may have been made by using the "SET ZERO POSITION", opcode (see Section 5.37, page 51) command or the "SET AZIMUTH ZERO" menu item.

For more information about how the interactions between how "SET ZERO POSITION" (Section 5.37, page 51) and "QUERY PAN POSITION" (Section 5.41, page 54) opcodes operate see Appendix C, page 85.

5.46 Response 0x5B (91_{10}), Query Tilt Position Response

5.46.1 Response format

Query Tilt Position Response D_EC_TILT_RESP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x5B	TILT MSB	TILT LSB	—

FPN

1. This response is an "Extended Reply".
2. This response is the reply to a QUERY TILT POSITION (Section 5.42, page 54)

5.46.2 Description

The position is given in hundredths of a degree and has a range from 0 → 35999 (decimal). Refer to examples listed in description of the "SET TILT POSITION", opcode Section 5.39, page 52.

Tilt angle values comes in in two bytes as degrees times 100 "hungrees".

Position	D reads out as	Spectra displays as
90^o up	27000	90^o
45^o up	31500	45^o
Horizontal - 1^o	35900	1^o
Horizontal	000	0^o
45^o down	4500	-45^o
90^o down	9000	-90^o

Position Pointing direction of the enclosure/camera

D reads out as D protocol returned value for this angle

Spectra displays as What is displayed on the Spectra screen

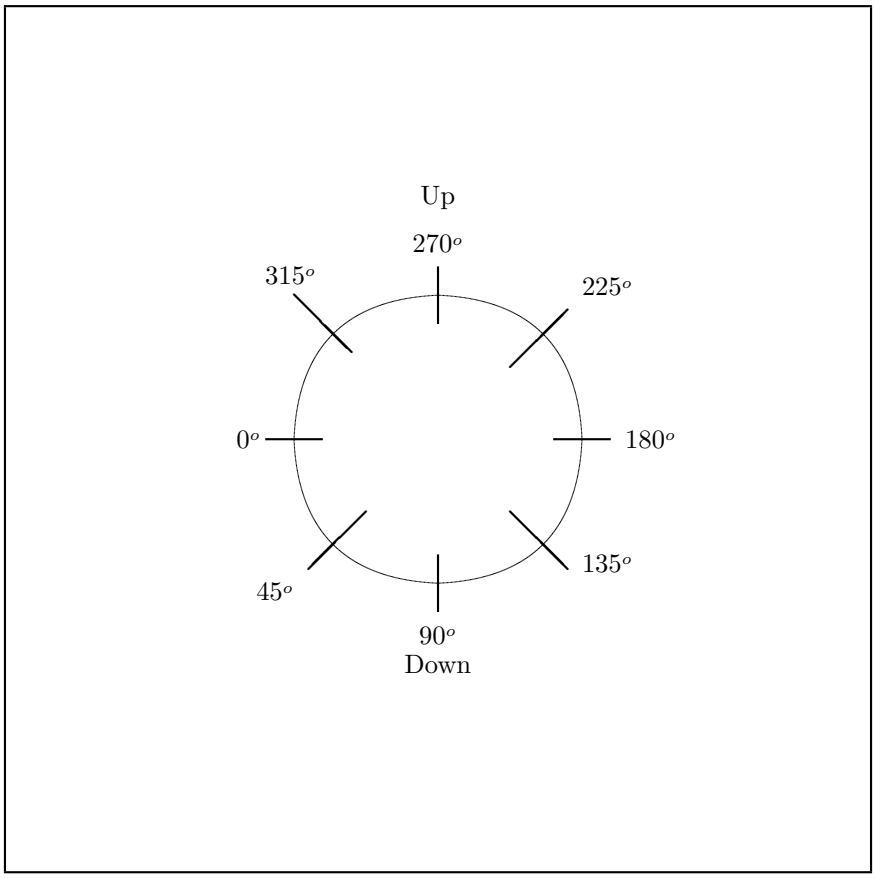


Figure 1: D Protocol Tilt Readout Positions

5.47 Response 0x5D (93_{10}), Query Zoom Position Response

5.47.1 Response format

Query Zoom Position Response D_EC_ZOOM_RESP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x5D	ZOOM MSB	ZOOM LSB	—

FPN

1. This response is an "Extended Reply".
2. This response is the reply to a QUERY ZOOM POSITION (Section 5.43, page 54) command

5.47.2 Description

The position is given as a ratio based on the device's Zoom Limit setting. This value can be converted into units of magnification by using the following formula:

current_magnification = (position / 65535) * zoom_limit

Where current_zoom_position and zoom_limit are given in units of magnification.

FPN

Example: Given that the zoom limit of the device's camera is X184, position value is 1781, calculate the current magnification:

Current magnification = (1781 / 65535) * 184 = approximately X5.

5.48 Command 0x5F (95_{10}), Set Magnification

5.48.1 Command format

Set Magnification D_EC_SET_MAG							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	REL/ABS	0x5F	MAG MSB	MAG LSB	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x005F SET_MAGNIFICATION
   2.2 0x015F SCREEN_SET_MAG
3. This command is used by the Endura/Atlas projects.
4. This position may be read out using the command/response pair in QUERY MAGNIFICATION (Section 5.49, page 59) and QUERY MAGNIVICATION RESPONSE (Section 5.50, page 60).

5.48.2 Description

This command is used to set the zoom position of the device.

The position (MAG MSB and MAG LSB) form a signed, 16-bit, 2's complement value expressing the desired setting, or change in setting, in hundredths of units.

Maximum zoom limit is set in one of the menus that the Spectra supports. The exact value varies depending on the exact type of camera installed.

There is no command to ask the Spectra what the maximum zoom value is.

FPN

Example: A value of 500 means X5.

For example if we want a zoom level of X5 then we have to send a value of 5 * 100 = 500. 500 decimal = 0x01F4 or byte 5 = 0x01 and byte 6 = 0xF4. The Spectra will not zoom "past the end" of its range as set by the maximum zoom value.

Changes: The relative change in magnification was added in to support the Atlas project and is available on the Spectra IV only.

1. REL/ABS = 0x00 indicates that the value in DATA1 and DATA2 represent an absolute change in magnification value.

   That is, a value of 200 indicates a setting of 2X for absolute,

2. REL/ABS = 0x01 indicates that the value in DATA1 and DATA2 represent a relative change in magnification value.

   That is, a value of 200 indicates a setting of 2X for a change of setting of 2.00 for relative.

FPN

If a relative magnification value of 350 is sent when the current setting is 1.5X, the resulting magnification will be 3.5×1.5, or 5.25X. The sign indicates the direction of change for relative values and must always be positive for absolute settings. For relative changes, a negative value indicates that the result should be smaller than the current setting. That is, if the value is -3.5 and the current setting is 12X, the result will be 3.43X. In no case will the result be less than 1.00X.

5.49 Command 0x61 (97_{10}), Query Magnification

5.49.1 Response format

Query Magnification D_EC_QUERY_MAG							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x61	0x00	0x00	—

FPN

1. This command generates an "Extended Reply".
2. This command is used by the Endura/Atlas projects.
3. This opcode was first implemented in Spectra III version 1.14. It is not in version 1.16.
4. This command generates QUERY MAGNIFICATION RESPONSE (Section 5.50, page 60)

5.49.2 Description

This command is used to query the current zoom position of the device. The response to this command uses opcode `0x63`. See QUERY MAGNIFICATION RESPONSE (Section 5.50, page 60) for more information.

5.50 Response `0x63` (99_{10}), Query Magnification Response

5.50.1 Response format

Query Magnification Response D_EC_MAG_RESP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x63	MAG MSB	MAG LSB	—

FPN

1. This response is an "Extended Reply".
2. This opcode was first implemented in Spectra III version 1.14. It is not in version 1.16.
3. This response is the reply to a QUERY MAGNIFICATION (Section 5.49, page 59) command
4. The Esprit TI generates a General Response, not an Extended Response, because it does not have a lens capable of "zooming".

5.50.2 Description

The value returned is given in hundredths of units of magnification.

Example: a value of 500 means X5.

5.51 Command `0x65` (101_{10}), Activate Echo Mode

5.51.1 Command format

Activate Echo Mode D_EC_ECHO_MODE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x65	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 `0x0065 ACTIVATE_ECHO_MODE`

5.51.2 Description

Places the device into a mode in which characters that are received by the unit are immediately retransmitted. The unit exits this mode when one of the following occurs: more than 100 milliseconds pass without receipt of a character or more than 180 characters have been received.

This command is sent at the current `D_EC_SET_BAUD` rate.

Use of this command in a download sequence is outlined in Appendix D, page 87.

5.52 Command 0x67 (103_{10}), Set Remote Baud Rate

5.52.1 Command format

Set Remote Baud Rate D_EC_SET_BAUD							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	MODE	0x67	0x00	BAUD CODE	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 0x0067 SET_REMOTE_BAUD_RATE
   2.2 0x0167 SET_CURRENT_BAUD_RATE
3. This command is used by the Endura/Atlas projects.

5.52.2 Description

Sets the unit's baud rate. Valid values for this command are:

Download baud rates		
Value	Baud	
0	2400	D_ECD_SET_BAUD_2400
1	4800	D_ECD_SET_BAUD_4800
2	9600	D_ECD_SET_BAUD_9600
3	19200	D_ECD_SET_BAUD_19200
4	38400	D_ECD_SET_BAUD_38400
5	115200	D_ECD_SET_BAUD_115200

1. D_EC_SET_BAUD is always sent at 2400 baud and its response is always sent at 2400 baud. This works because a delay of at least 100 milliseconds has occurred since the last data byte transferred. Thus the Spectra has returned to the "recovery state" of 2400 baud.
2. The unit sends its response to this command before changing its baud. The baud automatically returns to 2400 after 100 milliseconds of no activity when the MODE is 0x00.
3. The Spectra III always sends a General Response for all baud rate changes (CMND1 = 0x00) at 2400 baud and then changes its baud rate to the selected rate.

Use of this command in a download sequence is outlined in Appendix D, page 87.

5.53 Command 0x69 (105_{10}), Start Download

5.53.1 Command format

Start Download D_EC_START_DOWNLOAD							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x69	0x00	0x00	—

FPN

1. This command generates a "General Reply".
2. Command Names as used by the Spectra IV software:
   2.1 `0x0069 START_DOWNLOAD`

5.53.2 Description

Places the device into a state where it is expecting download commands and down load data — instead of "D" protocol commands.

Use of this command in a download sequence is outlined in Appendix D, page 87.

Change with Spectra IV: This command's actions have been changed with the Spectra IV. Now when this command is received, the Spectra IV starts sending `0x02`s to the head end. Earlier versions did not do this if the entire sequence of command outlined in Appendix D, page 87 had not been previously sent.

(`DTE` is the GlassKeyboard at 2400 baud, `DCE` is a Spectra IV running 1.070 software.)

```
160,    1135:  DTE   1849   707.100414   0.004167 ff
160,    1136:  DTE   1850   707.104551   0.004137 01
160,    1137:  DTE   1851   707.108551   0.004000 00
160,    1138:  DTE   1852   707.112696   0.004145 69
160,    1139:  DTE   1853   707.117035   0.004339 00
160,    1140:  DTE   1854   707.121167   0.004132 00
160,    1141:  DTE   1855   707.125331   0.004164 6a

161,     715: DCE    1856   707.133968   0.008637 ff
161,     716: DCE    1857   707.138108   0.004140 01
161,     717: DCE    1858   707.142277   0.004169 00
161,     718: DCE    1859   707.146444   0.004167 6a
161,     719: DCE    1860   708.772541   1.626097 02 These are a new action
161,     720: DCE    1861   710.396525   1.623984 02
161,     721: DCE    1862   712.020927   1.624402 02
161,     722: DCE    1863   713.645158   1.624231 02
161,     723: DCE    1864   715.269754   1.624596 02
161,     724: DCE    1865   716.894154   1.624400 02
```

5.54 Command `0x6B` (107_{10}), Query Device Type

5.54.1 Command format

Query Device Type D_EC_QUERY_DEV_TYPE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x6B	0x00	0x00	—

FPN

1. This command generates an "Extended Reply".

5.54.2 Description

This command is used to query the device for information about the hardware platform the device is using and the type of software that is running on the platform. The response to this command uses opcode `0x6D`. See QUERY DEVICE TYPE RESPONSE (Section 5.55, page 63) for more information.

5.55 Response 0x6D (109_{10}), Query Device Type Response

5.55.1 Response format

Query Device Type Response D_EC_DEV_TYPE_REP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x6D	HARD TYPE	SOFT TYPE	—

FPN

1. This response is an "Extended Reply".
2. This response is the reply to a QUERY MAGNIFICATION (Section 5.49, page 59) command

5.55.2 Description

1. The value returned in "byte 5" (HARD TYPE) indicates the software type. Valid values are:

   1.1 01 Spectra III Application

   1.2 02 Spectra III BIOS

   1.3 03 ExSite Application

   1.4 04 ExSite BIOS

2. The value returned in "byte 6" (SOFT TYPE) indicates the hardware type. Valid values are:

   2.1 0x17 MMC2107 processor.

   2.2 0x1E MMC2114 processor

5.56 Command 0x6F (111_{10}), Query Diagnostic Information

5.56.1 Command format

Query Diagnostic Information D_EC_QUERY_DIAG_INFO							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x6F	0x00	0x00	—

FPN

1. This response is an "Extended Reply" or a "Super Extended Reply".
2. This command generates QUERY DIAGNOSTIC INFORMATION RESPONSE (Section 5.57, page 64)

5.56.2 Description

This command is used to query the device for diagnostic information. The response to this command uses opcode 0x71. See QUERY DIAGNOSTIC INFORMATION RESPONSE (Section 5.57, page 64) for more information.

1. Spectra IV starting with rev 1.072, has a reply using opcode 0x71 (Section 5.57, page 64) having the unit's temperature in it.

5.57 Response 0x71 (113_{10}), Query Diagnostic Information Response

5.57.1 Response format

Query Diagnostic Information Response D_EC_QUERY_DIAG_RESP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x71	TEMP	SENSOR ID	—

FPN

1. This response is an "Extended Reply".
2. This response is the reply to a QUERY DIAGNOSTIC INFORMATION (Section 5.56, page 63) command.

5.57.2 Description

The contents of the message may vary based on the type of device that is being queried. For Spectra III the contents of the message are defined as follows:

1. Byte 5, DATA1, of the message is always 0x00 for the ExSite, Esprit, Spectra II, Spectra III.
2. Byte 5, DATA1, has been changed in newer versions of the PTZ units:
   2.1 Spectra IV starting with rev 1.072. DATA1 is now the internal temperature of the unit in degrees F. The range is $0 \rightarrow 255$.
3. Byte 6, DATA2, of the message is a sensor position indicating bit:
   3.1 SENSOR ID: Bit 0 of byte 6 is the pan sensor indicator. If the bit is on then the unit is oriented such that the pan sensor is being detected.
   3.2 SENSOR ID: Bit 1 of byte 6 is the tilt sensor indicator. If the bit is on then the unit is oriented such that the tilt sensor is being detected.

5.58 Command 0x73 (115_{10}), Version Information Macro Opcode

5.58.1 Command format

Version Information Macro Opcode D_EC_VERSION_INFO							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	SUB OPCODE	0x73	Various	Various	—

Cmnd	Section 5.58.2, page 65	0x00	Request software version number
Resp	Section 5.58.3, page 65	0x01	Application version number
Cmnd	Section 5.58.4, page 66	0x02	Request build number
Resp	Section 5.58.5, page 66	0x03	Build number

Cmnd	Section 5.58.2, page 65	0x00	VERSION_REQUEST
Resp	Section 5.58.3, page 65	0x01	VERSION_RESPONSE
Cmnd	Section 5.58.4, page 66	0x02	BUILD_REQUEST
Resp	Section 5.58.5, page 66	0x03	BUILD_RESPONSE

FPN

1. These commands generate "General Responses" and "Extended Responses" including a "Standard Everest Response".
2. This command is used by the Endura/Atlas projects.
3. Note: ACK and NAK message types are seven bytes in length. For a detailed description of ACK and NAK type replies refer to Section 5.1, page 23.

5.58.2 Command for Request Software Version 0x73 Sub Op-Code 0x00

Version Information Macro Opcode D_EC_VERSION_INFO D_ECS_VERSION_INFO_MAIN_CPU_VERSION_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x73	0x00	0x00	—

FPN

1. This command generates an "Extended Reply".
2. Typical useage of this command, and its reply, is shown in Appendix A, page 80.
3. This sub-opcode is used by the Endura/Atlas projects.
   3.1 The version number request was added in for the Esprit starting with rev 3.77.

Request the software version number. It comes in as Section 5.58.3, page 65.

5.58.3 Response to Request Software Version 0x73 Sub Op-Code 0x01

Version Information Macro Opcode D_EC_VERSION_INFO D_ECS_VERSION_INFO_MAIN_CPU_VERSION_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x01	0x73	VERSION MSB	VERSION LSB	—

FPN

1. This response is an "Extended Reply".
2. Typical useage of this command, and its reply, is shown in Appendix A, page 80.
3. This response is the reply to a APPLICATION VERSION NUMBER (Section 5.58, page 64 SUB-OPCODE 01) command.
4. This sub-opcode response is used by the Endura/Atlas projects.

The VERSION number is returned as a 16 bit integer in bytes 5 and 6 as either the rev number ×100 or ×1000 for the Spectre IV.

5.58.4 Command for Request Build Number`0x73` Sub Op-Code `0x02`

Version Information Macro Opcode D_EC_VERSION_INFO D_ECS_VERSION_MAIN_CPU_BUILD_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x02	0x73	0x00	0x00	—

FPN

1. This command generates an “Extended Reply”.

2. Typical useage of this command, and its reply, is shown in Appendix A, page 80.

Request the software build number. It comes in as Section 5.58.5, page 66.

5.58.5 Response to Request Build Number`0x73` Sub Op-Code `0x03`

Version Information Macro Opcode D_EC_VERSION_INFO D_ECS_VERSION_MAIN_CPU_BUILD_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x03	0x73	BUILD MSB	BUILD LSB	—

FPN

1. This response is an “Extended Reply”.

2. Typical useage of this command, and its reply, is shown in Appendix A, page 80.

3. This response is the reply to a REQUEST BUILD NUMBER (Section 5.58, page 64 SUB-OPCODE `03`) command.

The BUILD number is returned as an unsigned 16 bit integer in bytes 5 and 6.

5.59 Command 0x75 (117_{10}), Everest Macro Opcode

5.59.1 Command format

Everest Macro Opcode D_EC_EVEREST							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	SUB OPCODE	0x75	Various	Various	—

Cmnd	Section 5.59.2, page 67	0x00	Query azimuth zero offset command
Resp	Section 5.59.3, page 68	0x01	Query azimuth zero offset response
Cmnd	Section 5.59.4, page 68	0x02	Set zoom limit command
Cmnd	Section 5.59.5, page 68	0x03	Query zoom limit command
Resp	Section 5.59.6, page 69	0x04	Query zoom limit response
Cmnd	Section 5.59.7, page 69	0x05	Query alarms command
Resp	Section 5.59.8, page 69	0x06	Query alarms response
Cmnd	Section 5.59.9, page 69	0x07	Delete pattern command
Cmnd	Section 5.59.10, page 70	0x08	Set manual left pan limit command
Cmnd	Section 5.59.11, page 70	0x09	Set manual right pan limit command
Cmnd	Section 5.59.12, page 71	0x0A	Set scan left pan limit command
Cmnd	Section 5.59.13, page 71	0x0B	Set scan right pan limit command
Cmnd	Section 5.59.14, page 71	0x0C	Query limit command
Resp	Section 5.59.15, page 72	0x0D	Query limit response
Cmnd	Section 5.59.16, page 72	0x0E	Enable/disable limits command
Cmnd	Section 5.59.17, page 72	0x0F	Query defined presets command
Resp	Section 5.59.18, page 73	0x10	Query defined presets response
Cmnd	Section 5.59.19, page 73	0x11	Query defined patterns command
Resp	Section 5.59.20, page 73	0x12	Query defined patterns response

FPN

1. These commands are responses are used by the Endura/Atlas projects.
2. ACK and NAK message types are seven bytes in length. For a detailed description of ACK and NAK type replies refer to Section 5.1, page 23.

   For the Spectra III with SUB OP-CODEs greater than 0x12 a General Response is always generated.

5.59.2 Command for Query Azimuth Zero 0x75 Sub Op-Code 0x00

Query azimuth zero offset command D_EC_EVEREST D_ECS_EVEREST_AZIMUTH_ZERO_OFFSET_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x75	0x00	0x00	—

FPN

1. This command generates an "Extended Reply" of Section 5.59.3, page 68.
2. This sub-opcode is used by the Endura/Atlas projects.

5.59.3 Response to Query Azimuth Zero 0x75 Sub Op-Code 0x01

Query azimuth zero offset response D_EC_EVEREST D_ECS_EVEREST_AZIMUTH_ZERO_OFFSET_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x01	0x75	OFFSET MSB	OFFSET LSB	—

FPN

1. This response is an "Extended Reply".
2. This response sub-opcode is used by the Endura/Atlas projects.
3. OFFSET is a 16-bit number in hundredths of degrees.

5.59.4 Command for Set Zoom Limit 0x75 Sub Op-Code 0x02

Set zoom limit command D_EC_EVEREST D_ECS_EVEREST_SET_MAX_MAG							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x02	0x75	LIMIT MSB	LIMIT LSB	—

FPN

1. The response to this command is ACK or NAK.
2. LIMIT is in hundredths. EG a value of 18400 means x184. Acceptable values are device specific.

5.59.5 Command for Query Zoom Limit 0x75 Sub Op-Code 0x03

Query zoom limit command D_EC_EVEREST D_ECS_EVEREST_MAX_MAG_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x03	0x75	0x00	0x00	—

FPN

1. This command generates an "Extended Reply" of Section 5.59.6, page 69.
2. This sub-opcode is used by the Endura/Atlas projects.

5.59.6 Response to Query Zoom Limit 0x75 Sub Op-Code 0x04

Query zoom limit response D_EC_EVEREST D_ECS_EVEREST_MAX_MAG_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x04	0x75	LIMIT MSB	LIMIT LSB	—

FPN

1. This response is an "Extended Reply".
2. This response sub-opcode is used by the Endura/Atlas projects.
3. Limit is in hundredths. E.G. a value of 18400 means x184.

5.59.7 Command for Query Alarms 0x75 Sub Op-Code 0x05

Query alarms command D_EC_EVEREST D_ECS_ALARM_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x05	0x75	0x00	0x00	—

FPN

1. This command generates an "Extended Reply" of Section 5.59.8, page 69.

5.59.8 Response to Query Alarms 0x75 Sub Op-Code 0x06

Query zoom limit response D_EC_EVEREST D_ECS_ALARM_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x06	0x75	0x00	ALARM BIT MASK	—

FPN

1. This response is an "Extended Reply".
2. The format of the ALARM BIT MASK is the same as the format of the alarms in the General Response.

5.59.9 Command for Delete Pattern 0x75 Sub Op-Code 0x07

Delete pattern command D_EC_EVEREST D_ECS_DELETE_PATTERN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x07	0x75	0x00	PATTERN NUMBER	—

FPN

aann

This sub-opcode is used by the Endura/Atlas projects.

2. Pattern numbers start at 1. Valid PATTERN NUMBERS for Spectra III are 1 → 4. Valid pattern numbers for Spectra IV are 1 → 8.
3. The response is ACK if the pattern was deleted. The response is NAK if the pattern was not deleted or the PATTERN NUMBER is out of range. The reasons a pattern would not be deleted are if it was not defined or if pattern recording is in progress.

5.59.10 Command for Set Manual Left Pan Limit `0x75` Sub Op-Code `0x08`

Set manual left pan limit command D_EC_EVEREST D_ECS_SET_MAN_PAN_LEFT_LIMIT							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x08	0x75	LIMIT MSB	LIMIT LSB	—

FPN

1. The response is ACK if the LIMIT is in range. The response is NAK if the LIMIT is out of range.
2. Units for LIMIT are hundredths of degrees. The range of values is 0 → 35999.
3. General note regarding setting limits: Setting a limit does not automatically move the camera so that it is within the limits.
4. See also Section 5.59.16, page 72.

5.59.11 Command for Set Manual Right Pan Limit `0x75` Sub Op-Code `0x09`

Set manual right pan limit command D_EC_EVEREST D_ECS_SET_MAN_PAN_RIGHT_LIMIT							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x09	0x75	LIMIT MSB	LIMIT LSB	—

FPN

1. The response is ACK if the LIMIT is in range. The response is NAK if the LIMIT is out of range.
2. Units for LIMIT are hundredths of degrees. The range of values is 0 → 35999.
3. See also Section 5.59.16, page 72.

5.59.12 Command for Set Scan Left Pan Limit 0x75 Sub Op-Code 0x0A

Set scan left pan limit command D_EC_EVEREST D_ECS_SET_SCAN_PAN_LEFT_LIMIT							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x0A	0x75	LIMIT MSB	LIMIT LSB	—

FPN

1. The response is ACK if the LIMIT is in range. The response is NAK if the LIMIT is out of range.
2. Units for LIMIT are hundredths of degrees. The range of values is 0 → 35999.
3. See also Section 5.59.16, page 72.

5.59.13 Command for Set Scan Right Pan Limit 0x75 Sub Op-Code 0x0B

Set scan right pan limit command D_EC_EVEREST D_ECS_SET_SCAN_PAN_RIGHT_LIMIT							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x0B	0x75	LIMIT MSB	LIMIT LSB	—

FPN

1. The response is ACK if the LIMIT is in range. The response is NAK if the LIMIT is out of range.
2. Units for LIMIT are hundredths of degrees. The range of values is 0 → 35999.
3. See also Section 5.59.16, page 72.

5.59.14 Command for Query Limit 0x75 Sub Op-Code 0x0C

Query limit command D_EC_EVEREST D_ECS_EVEREST_LIMIT_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x0C	0x75	0x00	LIMIT ID	—

FPN

1. This command generates an "Extended Reply".
2. This sub-opcode is used by the Endura/Atlas projects.
3. Request a limit. The following IDs are used:
   - 3.1 0x00: D_ECD_EVEREST_MAN_LEFT_PAN Manual left pan limit
   - 3.2 0x01: D_ECD_EVEREST_MAN_RIGHT_PAN Manual right pan limit
   - 3.3 0x02: D_ECD_EVEREST_SCAN_LEFT_PAN Scan left pan limit
   - 3.4 0x03: D_ECD_EVEREST_SCAN_RIGHT_PAN Scan right pan limit
4. The response is opcode 0x75, sub opcode 0x0D. (Section 5.59.15, page 72)
5. If the ID is not supported by the device the response is NAK.
6. This command generates an "Extended Reply" of Section 5.59.15, page 72.

5.59.15 Response to Query Limit 0x75 Sub Op-Code 0x0D

Query limit response D_EC_EVEREST D_ECS_EVEREST_LIMIT_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x0D	0x75	LIMIT MSB	LIMIT LSB	—

FPN

1. This response is an "Extended Reply".
2. This response sub-opcode is used by the Endura/Atlas projects.
3. This is the response to opcode 0x75, sub opcode 0x0C.
4. Units for LIMIT are hundredths of degrees. The range of values is 0 → 35999.
5. The LIMIT that is returned depends on the LIMIT ID in the command that is being responded to.

5.59.16 Command for Enable/Disable Limits 0x75 Sub Op-Code 0x0E

Enable/Disable limits command D_EC_EVEREST D_ECS_EVEREST_ENABLE_LIMITS							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x0E	0x75	0x00	NEW LIMITS STATE	—

FPN

1. These sub-opcodes for commands and responses are used by the Endura/Atlas projects.
2. Enables or disables the manual limits and scan limits. Allowed values for NEW LIMITS STATE are:
   2.1 0x00: D_ECD_EVEREST_ENABLE_LIMITS_DISABLE disables the limits.
   2.2 0x01: D_ECD_EVEREST_ENABLE_LIMITS_ENABLE enables the limits.
3. The response to this command is ACK if NEW LIMITS STATE is a valid value. Otherwise the response is NAK.

5.59.17 Command for Query Defined Presets 0x75 Sub Op-Code 0x0F

Query Defined presets command D_EC_EVEREST D_ECS_EVEREST_DEFINED_PRESETS_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x0F	0x75	0x00	PRESET GROUP	—

FPN

1. This command generates an "Extended Reply" of Section 5.59.18, page 73.
2. This sub-opcode is used by the Endura/Atlas projects.
3. This command is used to determine which presets are defined on a device.
4. PRESET GROUP indicates which group of 16 presets are being queried. For Spectra III and Spectra IV preset groups can range from 0 to 15 (0xF). Group 0 covers presets 1 → 16, group 1 covers presets 17 → 32, etc.
5. The response to this command is opcode 0x75, sub opcode 0x10.

5.59.18 Response to Query Defined Presets `0x75` Sub Op-Code `0x10`

Query Defined presets response D_EC_EVEREST D_ECS_EVEREST_DEFINED_PRESETS_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x10	0x75	BITMASK MSB	BITMASK LSB	—

FPN

1. This response is an "Extended Reply".
2. This is the response to opcode `0x75`, sub opcode `0x0F`.
3. The bits in the BITMASK indicate which presets are defined on the unit. An on bit indicates the preset is defined. An off bit indicates the preset is not defined. The range of presets represented depends on the preset group parameter of the command that is being responded to. The lowest number preset in the BITMASK is calculated as follows:
   (preset_group x 16) +1

5.59.19 Command for Query Defined Patterns `0x75` Sub Op-Code `0x11`

Query Defined patterns command D_EC_EVEREST D_ECS_EVEREST_DEFINED_PATTERNS_QRY							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x11	0x75	0x00	PATTERN GROUP	—

FPN

1. This command generates an "Extended Reply" of Section 5.59.20, page 73.
2. This sub-opcode is used by the Endura/Atlas projects.
3. This command is used to determine which patterns are defined on a device.
4. PATTERN GROUP indicates which group of 16 patterns are being queried. For Spectra III the only valid pattern group is 0. Since the maximum number of patterns that Spectra allows is 8, only the 8 least significant bits will ever be set to 1.
5. The response to this command is opcode `0x75`, sub opcode `0x12`.

5.59.20 Response to Query Defined Patterns `0x75` Sub Op-Code `0x12`

Query Defined presets response D_EC_EVEREST D_ECS_EVEREST_DEFINED_PATTERNS_RSP							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x12	0x75	BITMASK MSB	BITMASK LSB	—

FPN

1. This response is an "Extended Reply".
2. The response for unsupported SUB OP CODEs is NAK.
3. This response sub-opcode is used by the Endura/Atlas projects.
4. This is the response to opcode `0x75`, sub opcode `0x11`.
5. The bits in the BITMASK indicate which patterns are defined on the unit. An on bit indicates the pattern is defined. An off bit indicates the pattern is not defined. The range of patterns represented depends on the pattern group parameter of the command that is being responded to. The lowest number pattern in the BITMASK is calculated as follows:

   (pattern_group x 16) +1

5.60 Command/Responses 0x77 (119_{10}), Time Commands

5.60.1 Command format

Time Commands D_EC_TIMESET_MACRO_OPCODE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	TIME SUB OPCODE	0x77	0x00	0x00	—
Cmnd	Section 5.60.3, page 76		0x00	0x77	Set seconds and synchronize time		
					seconds		
Cmnd/Resp	Section 5.60.4, page 76		0x01	0x77	Report seconds		
					seconds		
Cmnd	Section 5.60.5, page 76		0x02	0x77	Set hour and minutes		
					hour	minute	
Cmnd/Resp	Section 5.60.6, page 77		0x03	0x77	Report hour and minutes		
					hour	minute	
Cmnd	Section 5.60.7, page 77		0x04	0x77	Set month and date		
					month	day	
Cmnd/Resp	Section 5.60.8, page 78		0x05	0x77	Report month and date		
					month	day	
Cmnd	Section 5.60.9, page 78		0x06	0x77	Set year		
					year		
Cmnd/Resp	Section 5.60.10, page 78		0x07	0x77	Report year		
					year		

5.60.2 Description

The sub-opcodes are assigned such that even values (0x00, 0x02, etc.) are time setting commands, and odd value (0x01, 0x03, etc.) are time reporting sub-opcodes.

Set commands return an ACK if successful, or NAK if not. Report commands will return a NAK if time is not set. In order to assure a successful time setting operation, time and date should be sent top-down, that is, year, month-date, hour-minute, seconds. Similarly, a time request will only be guaranteed to be correct if no intervening transmissions occur.

Note

1. These commands/replies are only implemented on the Spectra IV.
2. When D_ECS_SET_SECONDS is received, all updated times are copied over into the active time array.
3. If the upper byte of the data field of SET_YEAR is equal to 0 (00), then 2000 is added to the year value.

5.60.3 Command 0x77, Sub Op-Code 0x00, Set seconds and synchronize time

Time Commands, Set seconds and synchronize time D_EC_TIMESET_MACRO_OPCODE D_ECS_SET_SECONDS							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x77	0x00	NEW SECOND	—

FPN

1. The response to this command is either an ACK or NAK depending on the validity of the arguments.

0x00 Set seconds and synchronize time	
byte 5	0x00
byte 6	NEW SECOND to set (0-59)

On receipt of this command, the receiver clock will be set to the time and date previously transmitted. If an unrelated transmission occurs between this command and other time setting commands, no action will be taken. The response to this command is ACK if the seconds value is in range and time is set. It is NAK if out of range or time is not set.

5.60.4 Command 0x77, Sub Op-Code 0x01, Report seconds

Time Commands, Report seconds D_EC_TIMESET_MACRO_OPCODE D_ECS_GET_SECONDS							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x01	0x77	0x00	CURRENT SECOND	—

FPN

1. This command generates an "Extended Response".

When reporting any segment of the clock data, the current time will be read and held in a buffer until an unrelated transmission occurs. Thus no ambiguities or anomalies will be reported if the time requests occur in succession.

5.60.5 Command 0x77, Sub Op-Code 0x02, Set hour and minutes

Time Commands, Set hour and minutes D_EC_TIMESET_MACRO_OPCODE D_ECS_SET_HR_MIN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x02	0x77	NEW HOUR	NEW MINUTE	—

FPN

1. The response to this command is either an ACK or NAK depending on the validity of the arguments.

0x02 Set hour and minutes	
byte 5	NEW HOUR to set (0-23)
byte 6	NEW MINUTE to set (0-59)

Time will always be transmitted in 24-hour format. That is, midnight is 00:00, etc.

5.60.6 Response 0x77, Sub Op-Code 0x03, Report hour and minutes

Time Commands, Report hour and minutes D_EC_TIMESET_MACRO_OPCODE D_ECS_GET_HR_MIN							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x03	0x77	CURRENT HOUR	CURRENT MINUTE	—

FPN

1. This command generates an "Extended Response".

5.60.7 Command 0x77, Sub Op-Code 0x04, Set month and date

Time Commands, Set month and date D_EC_TIMESET_MACRO_OPCODE D_ECS_SET_MON_DATE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x04	0x77	NEW MONTH	NEW DATE	—

FPN

1. The response to this command is either an ACK or NAK depending on the validity of the arguments.

0x04 Set month and date	
byte 5	NEW MONTH (1-12)
byte 6	NEW DATE (1-31)

The date will be out of range if not valid for the month specified. If the month specified is February, the range is limited to 1 — 28 unless the year has been determined to be a leap year, in which case 29 is an acceptable value. If the year has not been set, it is assumed that it is not a leap year.

5.60.8 Response 0x77, Sub Op-Code 0x05, Report month and date

Time Commands, Report month and date D_EC_TIMESET_MACRO_OPCODE D_ECS_GET_MON_DATE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x05	0x77	CURRENT MONTH	CURRENT DATE	—

FPN

1. This command generates an "Extended Response".

Month and date are reported in the same format as the corresponding set command.

5.60.9 Command 0x77, Sub Op-Code 0x06, Set year

Time Commands, Set year D_EC_TIMESET_MACRO_OPCODE D_ECS_SET_YEAR							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x06	0x77	YEAR MSB	YEAR LSB	—

FPN

1. The response to this command is either an ACK or NAK depending on the validity of the arguments.

The year may be sent as a complete value (i.e. 2006) or as the last two digits (i.e. 06.) If only the last two digits are sent, the century value is assumed to be 2000 and is added to the value sent to determine the year.

5.60.10 Response 0x77, Sub Op-Code 0x07, Report year

Time Commands, Report year D_EC_TIMESET_MACRO_OPCODE D_ECS_GET_YEAR							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x07	0x77	YEAR MSB	YEAR LSB	—

FPN

1. This command generates an "Extended Response".

The year reported is always the absolute value, that is, 2006 is always sent as 2006, not 06.

5.61 Command 0x79 (121_{10}), Screen Move

5.61.1 Command format

Screen Move D_EC_SCREEN_MOVE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	ABS	0x79	PAN Δ	TILT Δ	—
	0xFF	—	REL	0x79	PAN Δ	TILT Δ	—

FPN

1. This command generates a "General Reply".
2. This command is used by the Endura/Atlas projects.

5.61.2 Description

For screen moves the REL/ABS SUB OPCODE indicates if this is a relative or absolute move.

1. ABS 0x00 (D_ECS_SET_ABS_MAG) for an absolute move
2. REL 0x01 (D_ECS_SET_REL_MAG) for a relative move

The data bytes are PAN Δ (byte 5): screen relative pan position, TILT Δ (byte 6): screen relative tilt position.

The pan/tilt positions are percentage of distance from center of screen to the corresponding edge expressed as a signed, 8-bit 2's complement value. Positive values are right for pan and up for tilt. The command will return a standard response with ACK if values are in range, NAK if not.

This command has been added to the D Protocol to support the Atlas project for use with the Spectra IV only.

A Software Revision Reporting

Different versions of the Spectra/Esprit/Exsite series of integrated PTZ units have responded in different ways to query commands for their make, model number and software revision data requests.

A.1 Spectra II

This is the older format of reply to the query command. In this format the reply consists of the program number which is null padded. It does not give an extended reply to additional software build data.

```
 1  $Header: d:/DprotoDoc/RCS/S2Rev.dat,v 1.1 2007-11-13 10:49:28-08 Hamilton Exp Hamilton $
 2  Spectra II, Rev S3.31
 3  DCE      34    11.462325     2.093332  2.080832 ff 01 00 45 00 00 46  Part number query
 4                                                    P  G  5  3  -  0  0  6  0  -  S  3  3  1
 5   DTE     41    11.492682     0.030357  0.004166 ff 01 50 47 35 33 2d 30 30 36 30 2d 53 33 33 31 00 50
 6  DCE      59    12.590205     1.097523  1.026731 ff 01 01 45 00 00 47  Serial number query
 7                                                    P  G  5  3  -  0  0  6  0  -  S  3  3  1
 8   DTE     66    12.621544     0.031339  0.004142 ff 01 50 47 35 33 2d 30 30 36 30 2d 53 33 33 31 00 51
 9  DCE      84    13.718040     1.096496  1.025762 ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.748785     0.030745  0.004120 ff 01 00 74
11  DCE      95    14.846040     1.097255  1.084758 ff 01 02 73 00 00 76  Build query
12   DTE    102    14.877727     0.031687  0.004141 ff 01 00 76
```

A.2 Spectra III

In this reply to the query command it begins to respond with its marketing model number and repeats its marketing name instead of a serial number both of which are null padded. Additonal information is available in the special software rev fields. However the range of the software rev is in the format `n.nn`. Thus the rev usually fits in one byte of return data.

```
 1  $Header: d:/DprotoDoc/RCS/S3Rev.dat,v 1.1 2007-11-13 10:49:32-08 Hamilton Exp Hamilton $
 2  Spectra III, Rev 1.34
 3  DCE      34    11.462343     2.098037  2.085538 ff 01 00 45 00 00 46  Part number query
 4                                                    D  D  5  3  C  2  2
 5   DTE     41    11.492664     0.030321  0.004167 ff 01 44 44 35 33 43 32 32 00 00 00 00 00 00 00 00 de
 6  DCE      59    12.590233     1.097569  1.026763 ff 01 01 45 00 00 47  Serial number query
 7                                                    D  D  5  3  C  2  2
 8   DTE     66    12.620557     0.030324  0.004141 ff 01 44 44 35 33 43 32 32 00 00 00 00 00 00 00 00 df
 9  DCE      84    13.718149     1.097592  1.026787 ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.747879     0.029730  0.004169 ff 01 01 73 00 86 fb  1.34
11  DCE      98    14.846066     1.098187  1.073205 ff 01 02 73 00 00 76  Build query
12   DTE    105    14.875918     0.029852  0.004141 ff 01 03 73 00 00 77  0
```

A.3 Spectra MINI

The reply to the query command consists of its marketing name (this one happens to be a PAL type of unit) which is null padded and it does not have a serial number to give out. It does not give an extended reply to additional software build data.

```
 1  $Header: d:/DprotoDoc/RCS/MRev.dat,v 1.1 2007-11-13 10:49:17-08 Hamilton Exp Hamilton $
 2  Spectra Mini, Rev 1.23
 3  DCE      12     1.100139   1.079117 ff 01 00 45 00 00 46  Part number query
 4                                        M  I  N  I     1  1  4  R  -  X
 5   DTE     19     1.114932   0.002073 ff 01 4d 49 4e 49 20 31 31 34 52 2d 58 00 00 00 00 01
 6  DCE      37     2.251495   1.101227 ff 01 01 45 00 00 47  Serial number query
```

```
 7                                          M  I  N  I     1  1  4  R  -  X
 8   DTE     44     2.266214   0.002087 ff 01 4d 49 4e 49 20 31 31 34 52 2d 58 00 00 00 00 02
 9  DCE     185    12.619487   1.126122 ff 01 00 73 00 00 74  Software rev query
10   DTE    192    12.634248   0.002083 ff 01 00 74
11  DCE     196    13.770828   1.130343 ff 01 02 73 00 00 76  Build query
12   DTE    203    13.785538   0.002084 ff 01 00 76
```

A.4 Spectra IV

The reply to the query command consists of its marketing name which is null padded and a serial number. In this case the software rev number has been changed to have a format of `n.nnn` and starts to take up two bytes of data.

```
 1  $Header: d:/DprotoDoc/RCS/S4Rev.dat,v 1.1 2007-11-13 10:49:36-08 Hamilton Exp Hamilton $
 2  Spectra IV, Rev 1.050
 3  DCE      34    11.470258     2.097307  2.084807 ff 01 00 45 00 00 46  Part number query
 4                                                    D  D  4  C  B  W  3  5
 5   DTE     41    11.500216     0.029958  0.004142 ff 01 44 44 34 43 42 57 33 35 00 00 00 00 00 00 00 47
 6  DCE      59    12.598173     1.097957  1.027125 ff 01 01 45 00 00 47  Serial number query
 7                                                    5  7  7  9  8  4  2
 8   DTE     66    12.628027     0.029854  0.004166 ff 01 35 37 37 39 38 34 32 00 00 00 00 00 00 00 00 c2
 9  DCE      84    13.726064     1.098037  1.027230 ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.756231     0.030167  0.004140 ff 01 01 73 04 1a 93  1.050
11  DCE      98    14.854007     1.097776  1.072777 ff 01 02 73 00 00 76  Build query
12   DTE    105    14.884018     0.030011  0.004165 ff 01 03 73 00 01 78  1
```

A.5 Spectra IV TC16

The reply to the query command consists of its marketing name which is null padded and a serial number. In this case the software rev number has been changed to have a format of `n.nnn` and starts to take up two bytes of data.

```
 1  $Header: d:/DprotoDoc/RCS/s4tc16.dat,v 1.2 2008-02-04 13:59:34-08 Hamilton Exp Hamilton $
 2  Spectra IV, TC-16, Rev 1.07
 3   DTE     34    10.365612   0.004163  ff 01 00 45 00 00 46  Part number query
 4                                          D  D  4  T  C  1  6
 5  DCE      41    10.394552   0.004022  ff 01 44 44 34 54 43 31 36 00 00 00 00 00 00 00 00 01
 6   DTE     59    11.518137   0.003999  ff 01 01 45 00 00 47  Serial number query
 7                                          7  4  5  6  7  4  7
 8  DCE      66    11.547364   0.004310  ff 01 37 34 35 36 37 34 37 00 00 00 00 00 00 00 00 c0
 9   DTE     84    12.670377   0.004147  ff 01 00 73 00 00 74  Software rev query
10  DCE      91    12.699736   0.004443  ff 01 01 73 04 2e a7  1.070
11   DTE     98    13.822615   0.004165  ff 01 02 73 00 00 76  Build query
12  DCE     105    13.851712   0.004179  ff 01 03 73 00 01 78  1
```

A.6 Spectra IV Horizon

The reply to the query command consists of its marketing name which is null padded and a serial number. In this case the software rev number has been changed to have a format of `n.nnn` and starts to take up two bytes of data.

```
 1  $Header: d:/DprotoDoc/RCS/s4h.dat,v 1.1 2008-02-04 08:48:04-08 Hamilton Exp Hamilton $
 2  Spectra IV Horizon, rev 1.071
 3   DTE     34    10.430965    0.001054 ff 01 00 45 00 00 46  Part number query
 4                                        D  D  4  H  3  5
 5  DCE      41    10.438667    0.001436 ff 01 44 44 34 48 33 35 00 00 00 00 00 00 00 00 00 b3
```

```
 6   DTE     59    11.583296    0.001221 ff 01 01 45 00 00 47  Serial number query
 7                                        8  4  5  4  0  8  0
 8  DCE      66    11.591231    0.001683 ff 01 38 34 35 34 30 38 30 00 00 00 00 00 00 00 00 b5
 9   DTE     84    12.735633    0.001047 ff 01 00 73 00 00 74  Software rev query
10  DCE      91    12.743471    0.001585 ff 01 01 73 04 2f a8  1.071
11   DTE     98    13.886954    0.001042 ff 01 02 73 00 00 76  Build query
12  DCE     105    13.894669    0.001462 ff 01 03 73 00 01 78  1
```

A.7 Esprit

In this reply to the query command is the marketing name which is blank padded and repeats its marketing name instead of a serial number. For the software revison commands, it returns with an Endura NAK to indicate that it does not support the command.

```
 1  $Header: d:/DprotoDoc/RCS/EsRev.dat,v 1.1 2007-11-13 11:04:11-08 Hamilton Exp Hamilton $
 2  Esprit 24X, Rev 3.36 PAL, With wiper
 3  DCE      34    10.558229     1.120800  1.108300 ff 01 00 45 00 00 46  Part number query
 4                                                    E  S  3  1  C  B  W  2  4  X
 5   DTE     41    10.588681     0.030452  0.004141 ff 01 45 53 33 31 43 42 57 32 34 58 20 20 20 20 20 7d
 6  DCE      59    11.709581     1.120900  1.050069 ff 01 01 45 00 00 47  Serial number query
 7                                                    E  S  3  1  C  B  W  2  4  X
 8   DTE     66    11.742013     0.032432  0.004140 ff 01 45 53 33 31 43 42 57 32 34 58 20 20 20 20 20 7e
 9  DCE      84    12.862889     1.120876  1.050043 ff 01 00 73 00 00 74  Software rev query
10   DTE     91    12.892847     0.029958  0.004164 ff 01 00 01 00 00 02  Endura Nak
11  DCE      98    14.014217     1.121370  1.096372 ff 01 02 73 00 00 76  Build query
12   DTE    105    14.045763     0.031546  0.004298 ff 01 00 01 00 00 02  Endura Nak
```

A.8 Esprit TI

In this reply to the query command is the marketing name which is null padded and it sends out its serial number. For the software revison commands, it returns with an Endura NAK to indicate that it does not support the command.

```
 1  $Header: d:/DprotoDoc/RCS/TIRev.dat,v 1.2 2007-11-30 15:39:15-08 Hamilton Exp Hamilton $
 2  Esprit TI, Rev unknown
 3  DCE      34    11.463211     2.096565  2.084064 ff 01 00 45 00 00 46  Part number query
 4                                                    E  S  3  0  1  4  T  I
 5   DTE     41    11.497948     0.034737  0.004165 ff 01 45 53 33 30 31 34 54 49 00 00 00 00 00 00 00 44
 6  DCE      59    12.591196     1.093248  1.022412 ff 01 01 45 00 00 47  Serial number query
 7                                                    6  7  2  4  3  7  0
 8   DTE     66    12.621723     0.030527  0.004141 ff 01 36 37 32 34 33 37 30 00 00 00 00 00 00 00 00 b5
 9  DCE      84    13.711300     1.089577  1.018744 ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.745056     0.033756  0.004166 ff 01 00 01 00 00 02  Endura Nak
11  DCE      98    14.831403     1.086347  1.061347 ff 01 02 73 00 00 76  Build query
12   DTE    105    14.862998     0.031595  0.004168 ff 01 00 01 00 00 02  Endura Nak
```

A.9 ExSite

The ExSite responds with its marketing model number which is blank padded, and does not have a serial number to respond with. The software rev information is the same as that provided by the Spectra III.

```
 1  $Header: d:/DprotoDoc/RCS/ExRev.dat,v 1.1 2007-11-13 10:49:43-08 Hamilton Exp Hamilton $
 2  ExSite, Rev 1.13
 3  DCE      34    10.462784     1.090123  1.077623 ff 01 00 45 00 00 46  Part number query
 4                                                    I  P  S  X  M  3  0  C  2  2
 5   DTE     41    10.492636     0.029852  0.004143 ff 01 49 50 53 58 4d 33 30 43 32 32 20 20 20 20 20 82
```

```
 6  DCE      59    11.582862     1.090226  1.019417 ff 01 01 45 00 00 47  Serial number query
 7                                                    I  P  S  X  M  3  0  C  2  2
 8   DTE     66    11.612609     0.029747  0.004165 ff 01 49 50 53 58 4d 33 30 43 32 32 20 20 20 20 20 83
 9  DCE      84    12.702991     1.090382  1.019574 ff 01 00 73 00 00 74  Software rev query
10   DTE     91    12.733001     0.030010  0.004167 ff 01 01 73 00 71 e6  1.13
11  DCE      98    13.823069     1.090068  1.065095 ff 01 02 73 00 00 76  Build query
12   DTE    105    13.852974     0.029905  0.004162 ff 01 03 73 00 00 77  0
```

A.10 ExSite, fixed mount, PAL

The Fixed ExSite responds with a modified version of the marketing model number which is blank padded, but does not have a serial number to respond with. This is for an ExSite Fixed mount with a CBW23, PAL camera installed. The software rev information is the same as that provided by the Spectra III.

```
 1  $Header: d:/DprotoDoc/RCS/FExRevP.dat,v 1.2 2007-12-31 12:37:57-08 Hamilton Exp Hamilton $
 2  Fixed ExSite rev 1.13
 3  DCE      34    10.463435   0.004167 ff 01 00 45 00 00 46  Part number query
 4                                        X  M  3  1  C  B  W  2  3  X
 5   DTE     41    10.493028   0.004673 ff 01 58 4d 33 31 43 42 57 32 33 58 20 20 20 20 20 89
 6  DCE      59    11.583435   0.004167 ff 01 01 45 00 00 47  Serial number query
 7                                        X  M  3  1  C  B  W  2  3  X
 8   DTE     66    11.612976   0.004621 ff 01 58 4d 33 31 43 42 57 32 33 58 20 20 20 20 20 8a
 9  DCE      84    12.703515   0.004171 ff 01 00 73 00 00 74  Software rev query
10   DTE     91    12.732950   0.004518 ff 01 01 73 00 71 e6  1.13
11  DCE      98    13.823617   0.004167 ff 01 02 73 00 00 76  Built query
12   DTE    105    13.853314   0.004779 ff 01 03 73 00 00 77  0
```

A.11 ExSite, fixed mount, NTSC

The Fixed ExSite responds with a modified version of its marketing model number which is blank padded, but does not have a serial number to respond with. This is for an ExSite Fixed mount with a C22, NTSC camera installed. The software rev information is the same as that provided by the Spectra III.

```
 1  $Header: d:/DprotoDoc/RCS/FExRevN.dat,v 1.3 2008-01-04 11:55:16-08 Hamilton Exp Hamilton $
 2  Fixed ExSite rev 1.13
 3    DTE     34    10.558073   0.004166 ff 01 00 45 00 00 46  Part number query
 4                                        X  M  3  0  C  2  2
 5   DCE      41    10.587717   0.004724 ff 01 58 4d 33 30 43 32 32 20 20 20 20 20 20 20 20 f6
 6    DTE     59    11.710315   0.004167 ff 01 01 45 00 00 47  Serial number query
 7                                        X  M  3  0  C  2  2
 8   DCE      66    11.739750   0.004495 ff 01 58 4d 33 30 43 32 32 20 20 20 20 20 20 20 20 f7
 9    DTE     84    12.860571   0.004166 ff 01 00 73 00 00 74  Software rev query
10   DCE      91    12.890114   0.004493 ff 01 01 73 00 71 e6  1.13
11    DTE     98    14.014062   0.004164 ff 01 02 73 00 00 76  Build query
12   DCE     105    14.043369   0.004388 ff 01 03 73 00 00 77  0
```

B Camera Characteristics

Although not a part of the protocol, in many places it is convenient to know how a Pelco PTZ units operates in order to understand these protocols.

B.1 Focusing

The default focus mode is auto mode (the mode after a dome or camera reset). This means that the device (the dome) controls whether auto-focus is turned on or off. There is also an always off mode. The mode is set/changed by a command (Section 5.22, page 39) or menu option.

When in auto mode, the camera starts out with auto-focus on. If the receiver receives a focus near or far command, auto-focus is turned off. It stays off until a pan or tilt command is received or the dome or camera is reset (Section 5.21, page 39) or the unit has panned at least 15^o.

B.2 Iris

The default iris mode is auto mode (the mode after a dome or camera reset). This means that the device (the dome) controls whether auto-iris is turned on or off. There is also an always off mode. The mode is set/changed by a command (Section 5.23, page 40) or menu option.

When in auto mode, the camera starts out with auto-iris on. If the receiver receives an iris open or close command, auto-iris is turned off. It stays off until the device pans or tilts more than 15^o from the position where auto iris was turned off or the dome or camera is reset (Section 5.21, page 39).

If the Spectra is in auto mode for auto iris and also in auto mode for AGC (see below), the following happens. If the iris is all the way open and the Spectra receives an iris stop command and then an iris open command within one second of receiving the stop, then AGC is turned off and the camera gain is slowly increased until an iris stop is received or the upper gain limit (Section 5.34, page 48) is increased.

If the gain has been increased by an auto iris command and a close iris command is received, the gain is slowly decreased until it reaches the value it had when the gain started to increase. Then AGC is turned back on and the iris is closed.

B.3 Speed Ramping

To avoid abrupt speed changes (which could cause clunking noises or even motor stalling), the speeds (angular velocities in degrees/second) are ramped up or down. A command that causes a speed change (such as a motion command or a move to preset) does not set the speed directly. Instead, it sets a desired speed and direction. The ramping task compares the current speed (degrees/second) and direction to the desired speed and direction and calculates a new current speed and direction. This new speed is calculated to keep the angular acceleration (degrees/second/second) approximately constant.

B.4 Zooming

When zooming in (tele), the camera first does optical zoom, meaning that the elements of the lens move to do the zooming. After reaching maximum optical zoom (the lower zoom limit), the camera then does electronic zooming. Electronic zooming involves no lens movement, until it reaches a preset limit (the higher zoom limit). If the receiver receives a zoom stop command after reaching the lower zoom limit, and then another zoom in command within one second of receiving the stop, the receiver increases electronically to the higher zoom limit.

When zooming out (wide), the camera zooms out through the electronic zoom range and then the optical zoom range. It does not stop at the lower zoom limit.

C Interpreting Pan D Readout Replies

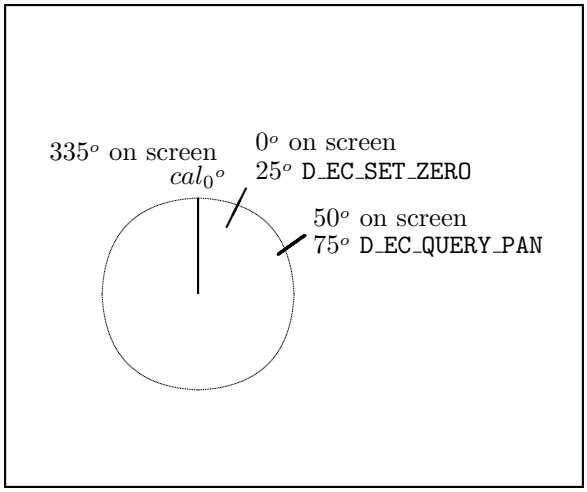


Figure 2: D Protocol Pan Readout Positions

In the below example several variables and functions are used:

1. Protocol Command Values:
   1.1 `SDcmnd1` and `SDcmnd2`, UNSIGNED CHARs are used to hold commands to the Spectra.
2. Calculated Intermediate Values:
   2.1 `HR_offset` is a SIGNED INT which holds the results of asking the Spectra what the Azimuth offset is.
   2.2 `HR_temp` is a SIGNED LONG which holds the result of modifying the reported value from the Spectra by the offset.
3. Macros/defines used:
   3.1 `D_EC_EXTENDED_REPLY_LENGTH` is the length of a D Protocol reply that contains Azimuth or Elevation data. It is currently 7 (seven).
   3.2 `DREPLY_DATA1` with an index value of 5 and
   3.3 `DREPLY_DATA2` which has an index value of 6.
4. Arrays used:
   4.1 `Dreply` is a 7 UNSIGNED CHAR to receive the Spectra reply into. The two positions used here are:
      4.1.1. `DREPLY_DATA1` with an index value of 5 and
      4.1.2. `DREPLY_DATA2` which has an index value of 6.
5. Functions called:

5.1 `SCheckSumD()`

5.2 `GetDReply()`

6. The results are in two UNSIGNED CHARs:

6.1 `HpanU` this is the upper half of the pan angle when modified by the Set Azimuth Zero value.

6.2 `HpanL` this is the lower half of the pan angle when modified by the Set Azimuth Zero value.

```
// Get pan angle offset from zero
SDcmnd1 = D_ECS_EVEREST_AZIMUTH_ZERO_OFFSET_QRY;
SDcmnd2 = D_EC_EVEREST;      // This is an Everest op-code
SCheckSumD(YES_REPLY);
GetDReply(D_EC_EXTENDED_REPLY_LENGTH);  // Put it in the reply buffer
HR_offset = ((DReply[DREPLY_DATA1]*256) + DReply[DREPLY_DATA2]);

// Get pan angle SDcmnd1, SDdata1 and SData2 don't change anymore
SDcmnd1 = 0x00;
SDcmnd2 = D_EC_QUERY_PAN;   // What is the current azimuth reading
SCheckSumD(YES_REPLY);
GetDReply(D_EC_EXTENDED_REPLY_LENGTH);  // Put it in the reply buffer

// Pan angle comes in in two bytes as degrees times 100 "hungrees"
// Value has to be rounded (i.e. that is why there is a "+ 50" here)
//
// The pan angle reported by an D_EC_QUERY_PAN command is not
// offset by the D_EC_SET_ZERO command. But the on screen display
// is. So here we have to modify the reported output by the
// changed pan offset value.
//
// If D_EC_SET_ZERO has been used to set pan zero to 25 degrees,
// and the on-screen display is now reading 50 degrees in pan,
// then the reply from a D_EC_QUERY_PAN command will be 75 degrees.
// In general we should have the angle reported to the outside
// world match what is seen on the screen. Thus there is logic to
// request the actual offset value and to use that in modifying
// the reported value so that it matches the on-screen value.
//
HR_temp  = ((DReply[DREPLY_DATA1]*256) + DReply[DREPLY_DATA2]);

HR_temp -= HR_offset;           // Get difference of real vs display
if (HR_temp < 0)                // Too small
{
    HR_temp += 36000;           // Yep, let it wrap up
}
HR_temp += 50;                  // Round
HR_temp /= 100;                 // Convert from hungrees to decimal
HpanU    = (unsigned char) (HR_temp/256);
HpanL    = HR_temp & 0xFF;
```

D Spectra Download Process Used Via The 422/485 Port

10/31/2002
Eric Bopp
Original name = "`sp3 download.doc''`

D.1 Background

At the start of the process the download app (Windows, Palm or Ipaq). does not know whether the Spectra application is running or if the unit is already at the "Ready for download" prompt. So the first step is to make sure we are at the "Ready for download" prompt. Additionally, our spec says that the user should not be able to set the baud used by the download app. This means that the download app will have to test communications at all possible baud rates. The possible initial baud rates are as follows: if the BIOS is running the baud will be 2400, if the app is running the baud could be 2400, 4800 or 9600 (as set by the DIP switches).

D.2 Getting the unit into "Ready for download" mode

Send a D Protocol message containing the "download" opcode (`0x57` Section 5.44, page 55). Cycle through the possible bauds (2400, 4800, 9600) starting with 2400, until a valid response is received. Once we have acknowledgement that this message has been received by the unit, we can be sure that the unit is at the "Ready for download" prompt and that the baud is 2400.

D.3 New Opcodes

Three D Protocol opcodes are used for the purpose of determining the optimum baud for the download and for starting the download process. The following is a brief description of each opcode.

1. **Activate Echo Mode** message (opcode `0x65` Section 5.51, page 60). Sending this command puts the 422/485 port into a state where any character that is received is immediately retransmitted. The unit automatically comes out of this state when one of the following happens: more than 100 milliseconds pass without a character being received or more than 180 characters having been received.

2. **Set Baud** message (opcode `0x67` Section 5.52, page 61). Sending this command changes the baud at which the unit communicates at on the 422/485 port. The unit does not change its baud until after it has sent a response to this message. The unit automatically falls back to 2400 baud if no characters are received for 100 milliseconds. (Note that this fallback condition does not apply once the unit begins the download process).

3. **Start Download** message (opcode `0x69` Section 5.53, page 61). This message starts the download process.

D.4 Determining the optimum baud for downloading

The next step is to determine the maximum baud that can be reliably used for the download. Spectra supports 2400, 4800, 9600, 19200, 38400 and 115200 bauds for downloads via the 422/485 port. The following is the step-by-step process for determining the optimum baud for downloading. The term "recovery state" is used in the description below. "Recovery state" is defined as waiting more than 100 milliseconds and resetting your baud to 2400.

1. Start testing the communications link at 2400 baud.

2. Send the SET BAUD message to set the baud to rate to be tested. If a valid response is received, the app should change its baud to the rate being tested and go to step 3. If a valid response is not received go to the recovery state, then resend the SET BAUD message. Note that retry counts for the purpose of dropping to a lower baud do not need to be implemented for this action because we are always transmitting 2400 baud (the lowest baud).

3. Send the ACTIVATE ECHO MODE message (`0x65` Section 5.51, page 60). If a valid response is received go to step 4, otherwise increment the retry count, go to the recovery state and do one of the following:

   3.1 If the maximum number of retries have occurred then step back to next lower baud and go to step 6.

   3.2 Retry by going back to step 2.

4. Send the test packet. Go to step 5.

5. Receive the echoed back message and confirm that there are no errors. Go to the recovery state (this needs to be done regardless of success or failure). If there are no errors in the echo back data: if you are at the maximum baud then go to step 6 otherwise increment to the next baud and go to step 2. If there are errors in the echo back data or a timeout occurs then increment the retry count and do one of the following:

   5.1 If the maximum number of retries have occurred then begin the download at the next lower baud.

   5.2 Retry by going back to step 2.

6. Send the SET BAUD message to set the units baud to the "current baud" (the highest baud the passed the tests above). Repeat until a valid response is received. Once a valid response is received then go to step 7.

7. Send the START DOWNLOAD message. Repeat until a valid response is received. Once a valid response is received then continue the download using the algorithm that is used on the RJ-45 port.

E Typical Predefined Presets

In the following table, preset numbers in parentheses are the numbers when operating in "32 preset mode". Presets without parentheses are not available in 32 preset mode. When in 32 preset mode, if limit stops are turned off then presets 23 → 26 may be used as normal presets.

PRESET ID	Name	Set/-Call	Use
0x21/33_{10}	PRESET_FLIP	Call	Standard in all units, causes a 180° turn.
0x22/34_{10}	PRESET_ZERO	Call	Standard in all units, causes pan to move to calibrate 0 (*cal_0*).
0x54/84_{10}	PRESET_AUX1	Set Call	Turns on AUX 1 with the ExSite. Turns off AUX 1 with the ExSite.
0x55/85_{10}	PRESET_AUX2	Set Call	Turns on AUX 2 with the ExSite. Turns off AUX 2 with the ExSite.
0x55/85_{10}	—	Call Set	"Black Hot" choice with the Esprit TI No effect with the Esprit TI
0x56/86_{10}	PRESET_WIPER	Call	Turns on the wiper with ExSite.
0x56/86_{10}	—	Call Set	"White Hot" choice with the Esprit TI No effect with the Esprit TI
0x57/87_{10}	PRESET_WASHER	Call	Turns on the Wash cycle on the ExSite.
0x57/87_{10}	—	Call Set	"Color 1" choice with the Esprit TI No effect with the Esprit TI
0x58/88_{10} (0x15/21_{10})	PRESET_IR_FILTER_IN	Call	Used with CBW type cameras. (Section E.1, page 90)
0x58/88_{10} (0x15/21_{10})	—	Call Set	"Rain 1" choice with the Esprit TI No effect with the Esprit TI
0x59/89_{10} (0x16/22_{10})	PRESET_IR_FILTER_OUT	Call	Used with CBW type cameras.
0x59/89_{10} (0x16/22_{10})	—	Call Set	Force an FFC Calibration cycle in the Esprit TI. No effect with the Esprit TI
0x5A/90_{10} (0x17/23_{10})	PRESET_MANUAL_LEFT_-LIMIT	Set Call	Standard in all units, sets a left hand motion limit. Clears this limit
0x5B/91_{10} (0x18/24_{10})	PRESET_MANUAL_-RIGHT_LIMIT	Set	Standard in all units, sets a right hand motion limit.

Continued on the next page.

Continued from the previous page.			
PRESET ID	Name	Set/- Call	Use
		Call	Clears this limit
0x5C/92_{10} (0x19/25_{10})	PRESET_SCAN_LEFT_- LIMIT	Set Call	Standard in all units, sets a left hand scanning limit. Clears this limit
0x5D/93_{10} (0x1A/26_{10})	PRESET_SCAN_RIGHT_- LIMIT	Set Call	Standard in all units, sets a right hand scanning limit. Clears this limit
0x5E/94_{10} (0x1B/27_{10})	PRESET_RESET	Set Call	Reserved for future use. On Esprit units only, starting with rev 3.70, will cause the WatchDog timer to time out and reset the unit.
0x5F/95_{10} (0x1C/28_{10})	PRESET_MENU_MODE	Set Call	Standard in all units, accesses the menu system. Ignored, to get into menu mode a set **must** be used.
0x60/96_{10} (0x1D/29_{10})	PRESET_STOP_SCAN	Set Call	Standard in all units, stops automatic scans. Same as a Set command
0x61/97_{10} (0x1E/30_{10})	PRESET_RANDOM_SCAN	Set Call	Standard in all units, starts random scanning. Same as a Set command
0x62/98_{10} (0x1F/31_{10})	PRESET_FRAME_SCAN	Set Call	Standard in all units, starts frame scanning. Same as a Set command
0x63/99_{10} (0x20/32_{10})	PRESET_AUTO_SCAN	Set Call	Standard in all units, starts automatic scanning. Same as a Set command

E.1 IR Cut Filter

How I can turn on/off the IR-filter[13]?

With cameras that have an IR cut-filter and we can capture the same scene in Black and White with no "noise" artifacts we can limit the source to the color burst and its phase/saturation/etc properties.

With a camera capable of C/BW such as, the 23x or 18x, Spectra III, the IR cut filter can be put into manual mode Via the menus...

```
<MAIN>
  |
  |--<DOME SETTINGS>
       |
       |--<CAMERA>
```

[13]From an e-mail by Derek Springer, 24APR06.

```
|
|--IR CUT FILTER --- Set to "OFF" for manual control
```

Once the camera is set to "OFF" for IR cut filter control, Preset 89 can be used to switch the cut filter out and put the camera into black and white mode. Preset 88 puts the IR cut filter back in for normal color operation. If the "noise" artifacts are no longer present in the same scene [i.e. we don't now have black and white image artifacts] we would then be able to deduct that the artifacts are coming from the color properties....

F Change Log

1. March 2008, revision 5.0.1:

   1.1 Several spelling and grammar fixes.

   1.2 Added in information about reading out the internal temperature of a Spectra IV.

   1.3 Added in information about features of the Esprit series of PTZs gained from reading the "Esprit Software Release" log for software revision 3.80.

Index