Pelco PTZ Protocols

D Protocol

Including Portions of

P Protocol and Coaxitron®

Version 5.1.6

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Proprietary Notice

[1] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/PDF.tex,v 1.12 2011-02-02 13:12:41-08 Hamilton Exp Hamilton $

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

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Change Log

This is a total rewrite of the previously available protocol documentation for D and P protocols. 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.

The base line document for P Protocol was the "Intercept/97XX Protocol", section of the "Protocol Manual, Pelco System 97XX", dated August 14, 2005 document. This information was augmented through code analysis of existing, and past, software releases.

Most of the information about Coaxitron® came from code analysis. Some came from Pelco document TF-0019 dated 4/12/2004.

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

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[2] tocdepth = 2

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1 What this Manual Covers

This manual describes the minimum requirements for implementing three common Pelco protocols. These protocols are used to communicate between a controlling device (e.g. a matrix switching system or a keyboard) and a receiver/driver (e.g. a dome drive). **Pelco's primary protocol for controlling PTZ units is D Protocol** and for other protocols, only the differences will be mentioned.

A description of P Protocol, as it applies to control of PTZ units, is included in this document. P Protocol is very similar to D Protocol and differences are listed in subsection 1.5. P Protocol is primarily used for control of a matrix system and is considered to be a proprietary protocol.

A description of Coaxitron® as it applies to control of PTZ units is included in this document. Coaxitron® utilizes a proprietary modulation technique of the video signal to send commands "up the wire" over the same wire that the video signal is coming "down" over. The details of this are beyond the scope of this document. The details of how this modulation is done are contained in Pelco Document TF-0019. This document limits its description of the protocol to the logical content of the commands. Important differences of the command data are listed in subsection 1.6.

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 and P Protocols are both "serial" protocols. This means that they are normally transmitted over a 4 wire, RS-422 circuit. There is nothing in either protocol that actually requires usage of one or another format, however all Pelco PTZ units receive and transmit with RS-422[4] 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.

Due to the similarity in the protocols, in most of the sections that follow, only D Protocol will be mentioned.

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.

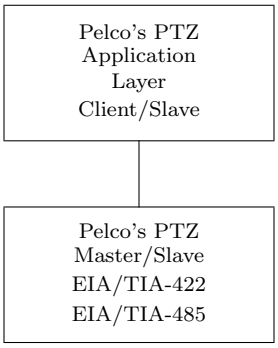
At the physical level, Pelco's PTZ over Serial Line systems may use different physical interfaces (RS422, RS485, RS232). TIA/EIA-422 (RS422) Four-Wire, interface is the most common. As an option, TIA/EIA-485 (RS485) Four-Wire and TIA/EIA-485 (RS485) Two-Wire interface may also be implemented. A Pelco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

[3] `$Header: d:/Binder06.Protocols/DProtoDoc/RCS/Intro.inc,v 1.25 2008-03-20 07:09:12-08 Hamilton Exp Hamilton $`

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

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 and P Protocol bytes 3 → 6
		Coaxitron®, one 15-bit word or Coaxitron®, two 16-bit words.
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
		P Protocol, bytes 1, 2, 7 and 8
1	Physical	EIA/TIA-422 or EIA/TIA-485
		or Propriatary Coaxitron® data



$RCSfile: Intro.inc,v $

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.

This protocol document is available in two versions. One, this one, is the more complete of the two and has information that customers do not need. All parts that get deleted to make the external version have a "changebar" by the places that are for internal information only.

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[5]. 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

1.5 Differences Between D Protocol and P Protocol

P Protocol is very similar to D Protocol. However the full P Protocol is oriented to control various parts of a Matrix system and D Protocol is directed at controlling PTZ type units. Within P Protocol there is limited support for PTZ control and there is nothing that P Protocol may do that may not be done in D Protocol. The primary differences between the two protocols, as they effect PTZ control are:

1. Command length is 8 bytes *vs.* 7 bytes for D Protocol.
2. Responses, or replies, from the PTZ units in P Protocol are always one byte in length.
3. There is use of several unique bytes, none of these may be used in any way other than as indicated:
   - 3.1 An ACK (`0xA2`) indicates that the command was OK.
   - 3.2 A almost end byte ETX (`0xAF`) which is the marker byte preceeding the checksum.
   - 3.3 A full FUL (`0xAD`) indicator. This byte is defined in a header file for the CM9760 but was unused in 1999.
   - 3.4 A NAK (`0xAA`) indicates that there was an error with the command.

[5] Some versions of P Protocol utilize even parity.

3.5 A start byte called STX (0xA0) which is the first byte of each command.

4. The checksum calculations are different.
5. The SYNC byte (called STX (0xA0) in P Protocol) is different.
6. There is a unique next to end byte called ETX (0xAF) in P Protocol.
7. Retransmission of commands is specified to be happen up to two times, or a total of having each command sent three times when a NAK (0xAA) is received. In D Protocol there is no specified retransmission requirement.
8. Bit assignments on bit encoded command are somewhat different. See section 2.

1.6 Differences Between D Protocol and Coaxitron®

Logically Coaxitron® commands are similar to D Protocol, however it is a "one way" protocol that has no return data from the PTZ unit. Coaxitron® consists of either one 15-bit word or two 16-bit words.

1. Coaxitron® utilizes a proprietary modulation technique that provides for command data being transmitted "up the wire" to the PTZ unit over the same wire that the video is comming down on.
2. When the 15-bit word is left shifted by one bit position, the resulting 16-bit word is almost identical to D Protocol bytes 3 and 4 when they are concatenated together.
3. The 15-bit shifted word is identical to the first 16-bit word in 32-bit Coaxitron®.
4. The second 16-bit word of 32-bit Coaxitron® is identical to D Protocol bytes 5 and 6 concatenated together.
5. There is no special first byte, such as D and P Protocols have.
6. There is no camera address byte as Coaxitron® goes up the same coaxial cable that the camera video is coming down.
7. There is no special last byte such as P Protocol has.
8. There is no checksum, such as D and P Protocols have.
9. Bit encoded "motion" commands are sent continuously until the function goes inactive. In both D and P Protocols the bit encoded motion commands are only sent once.

FPN

1.7 Various Protocol Baud Rate Dependent Times

All units that support D and PProtocols 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) or eight (P 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. A special case arises with Coaxitron® in that there is no ISO level 2 data and there are two formats for the ISO level 7 data.

It is convinent to consider the two CMND bytes as either two 8-bit `unsigned char` bytes or one 16-bit `unsigned int` when the two CMND bytes are concatenated together. The same hold true for the two DATA bytes. They may be considered to be two 8-bit `unsigned char` bytes or one 16-bit `unsigned int` value when contatenated together. The DATA bytes are always `unsigned char` or `unsigned int` values. Thus when a floating point value is needed the "real" value is multiplied by 10 or 100, depending on the actual command. Likewise since they are `unsigned` they are never negative. There is a problem in only one place in the protocol where this is a problem and that is in representing tilt readout angles. Pelco uses horizontal as 0^o and displays it that way on the PTZ video, however when the camera in pointing down, i.e. below the horizon, the value on the screen is displayed as negative values (-12^o is a value pointing down) and the protocol returns a value of 1200_{10} (`0x04B0`), see subsection 5.39 and subsection 5.46 for more details.

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	—	

P Protocol Command Format/Names								
Byte	1	2	3	4	5	6	7	8
	STX	ADDR	CMND1	CMND2	DATA1	DATA2	ETX	CKSM
	0xA0	—	0x00	0x00	0x00	0x00	0xAF	—

15-bit Coaxitron® Command Format/Names								
Word			15-bit word					
			CMND1	CMND2				
			0x00	0x00				

32-bit Coaxitron® Command Format/Names								
Word			16-bit word 1		16-bit word 2			
			CMND1	CMND2	DATA1	DATA2		
			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 $1 \rightarrow 255$ (`0x01` $\rightarrow$ `0xFF`). `0x01` is for camera #1, etc.

[6] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Commands.inc,v 1.34 2010-12-13 09:16:04-08 Hamilton Exp Hamilton $

[7] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Dbytes.inc,v 1.6 2007-12-18 10:08:28-08 Hamilton Exp Hamilton $

[8] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Pbytes.inc,v 1.6 2007-12-18 10:08:31-08 Hamilton Exp Hamilton $

[9] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/CBytes.inc,v 1.2 2008-01-24 15:16:56-08 Hamilton Exp Hamilton $

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.

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)

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

1.8 All D Protocol commands get replies. These may be General Response (4 bytes long subsection 4.2), Extended Response (7 bytes long subsection 4.3) or Query Response (18 bytes long subsection 4.4)[10]

2. **P Protocol:**

2.1 STX: Always `0xA0` to indicate the start of a command.

2.2 ADDR: Camera address. Range is $0 \rightarrow 255$ (`0x00` $\rightarrow$ `0xFF`)[11]. `0x01` is for camera #2, etc.

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

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

2.5 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.

2.6 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.

2.7 ETX: Always `0xAF` to indicate the end of the command and that the checksum follows.

2.8 CKSM: This is the exclusive or (`XOR`) of all bytes except for the checksum itself.

2.9 All P Protocol commands generate a single byte reply of either an ACK or NAK.

3. Coaxitron®

3.1 15-bit Coaxitron®.

When this word is left shifted by one, then the following hold for each byte.

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

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

Since there is not enough room for pan/tilt speed information, a fixed speed of about 22°/sec is used.

3.2 32-bit Coaxitron® word 1.

The two bytes in the first 16-bit word have the following meanings:

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

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

[10] There is also a "Super Extended Response" of 11 bytes length which is only used on one Pelco PTZ product. See subsection 5.57 for information about this response.

[11] In most Pelco PTZ units the decode is as indicated. In the "official" P Protocol document the range is $1 \rightarrow 32$.

3.3 32-bit Coaxitron® word 2.

The two bytes in the second 16-bit word have the following meanings:

3.3.1. 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.

3.3.2. 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.

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 and is always `0xA0` in P Protocol.
4. The Address (ADDR) is the logical address of the receiver/driver device being controlled. D and P Protocols interpret these values differently such that for any given binary value, P Protocol will interpret the address as one greater than will D Protocol.I.e. `0x05` in D Protocol will address camera #5 and in P Protocol it will address camera #6.
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. In P Protocol it is the exclusive or of bytes $1 \rightarrow 7$ of the message..
6. The phrase "This command does not exist in P Protocol." Indicates that this command/-response has not been implemented in P Protocol as documented in the P Protocol document.
7. The phrase "This command is in P Protocol and is identical in operation." Indicates that the extended command has been implemented in P Protocol as documented in the P Protocol document. However the exact format of the command is slightly different due the the byte assignments of the full message. Bytes $3 \rightarrow 6$ are always identical in all common commands. I.e. in the SET PRESET command `0x03` (subsection 5.2) the PRESET ID is in the same byte and has the same range of values in both protocols.
8. Starting with the software for the Spectra IV, the method of decoding commands has changed. The method used previously involved decoding commands "a byte at at time". In Spectra IV, the first two payload bytes (CMND1 and CMND2) are concatenated into an `unsigned int` and the decode is based on the resulting 16-bit value. In the section on command details (section 5), the `#define`[12] names for the 8 bit decode values are indicated.

[12]The `#defines` indicated here were not used for every project. However they have been used on the Atlas software build. A similar 8 bit set were used for the previous Spectras, current Esprits and ExSite systems.

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[13].

   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". (subsection 3.1)

   All Motion commands generate a 4-byte General Response subsection 4.2 if the command is good. A NAK reply is never generated.

   In Coaxitron®, Motion commands are sent continuously.

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". (subsection 3.2)

   In Coaxitron®, Non-Motion commands are sent once.

3. Bit assignments in Bytes 3 and 4 are identical in Coaxitron® and D Protocols. They are somewhat different in P Protocol.

4. Numeric values in Bytes 5 and 6 are identical in all three protocols.

[13] With the current camera manfacturer it has been found that setting Tele or Wide and either of Near or Far resunts in the camera module doing the Tele/Wide action for about $\frac{1}{4}$ second and then nothing. It is not recomended that combining Tele/Wide with Near/Far be used.

3.1 Standard Commands

3.1.1 Command bytes 1 and 2

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

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

P Protocol: Byte 3, CMND1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	Iris Close	Iris Open	Focus Near	Focus Far
P Protocol: Byte 4, CMND2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Zoom Wide	Zoom Tele	Down	Up	Left	Right	Always 0

All devices that support D or P Protocol , 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 Protocol and Coaxitron® only, 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 → 3 are not used with newer equipment in D Protocol. In P Protocol bits 7 → 4 must be zero (0).

[14] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/DBits.inc,v 1.8 2009-05-01 07:38:52-07 Hamilton Exp Hamilton $

[15] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/PBits.inc,v 1.5 2009-05-01 07:38:53-07 Hamilton Exp Hamilton $

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 $2 \rightarrow 6$) in the message.

In P Protocol, byte 7 is the ETX character of `0xAF`. It is followed by the checksum which is the exclusive or (`XOR`) of bytes $1 \rightarrow 7$ of the command.

There is no checksum with Coaxitron® commands.

3.2 Extended Commands

In addition to the "PTZ" commands shown in subsection 3.1, 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 `#define`s. When implemented in P Protocol, these commands and their arguments are identical. See the description of each command type for details.

Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Standard Extended Response subsection 5.1	ACK/-NAK	0x01/1	Future Use	Future Use	Not Applicable This is not a command it is a reply.
Set Preset subsection 5.2	0x00	0x03/3	0x00	PRESET ID	General
Clear Preset subsection 5.3	0x00	0x05/5	0x00	PRESET ID	General
Go To Preset subsection 5.4	0x00	0x07/7	0x00	PRESET ID	General
Flip (180^o about) subsection 5.4	0x00	0x07/7	0x00	0x21/33	General
Go To Zero Pan subsection 5.4	0x00	0x07/7	0x00	0x22/34	General
Set Auxiliary subsection 5.5	SUB OP-CODE	0x09/9	0x00	AUX ID	General
Clear Auxiliary subsection 5.6	SUB OP-CODE	0x0B/11	0x00	AUX ID	General
Dummy subsection 5.7	SUB OP-CODE	0x0D/13	0x00	0x00	General
Remote Reset subsection 5.8	0x00	0x0F/15	0x00	0x00	General
Set Zone Start subsection 5.9	0x00	0x11/17	0x00	ZONE ID	General
Set Zone End subsection 5.10	0x00	0x13/19	0x00	ZONE ID	General
Write Character to Screen subsection 5.11	0x00	0x15/21	Column 0 $\rightarrow$ 39_{10}	ASCII Value	General
Clear Screen subsection 5.12	0x00	0x17/23	0x00	0x00	General
Alarm Acknowledge subsection 5.13	SUB OP-CODE	0x19/25	0x00	ALARM ID	General

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Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Zone Scan On subsection 5.14	0x00	0x1B/27	0x00	0x00	General
Zone Scan Off subsection 5.15	0x00	0x1D/29	0x00	0x00	General
Record Pattern Start subsection 5.16	0x00	0x1F/31	0x00	PATTERN ID	General
Record Pattern Stop subsection 5.17	0x00	0x21/33	0x00	0x00	General
Run Pattern subsection 5.18	0x00	0x23/35	0x00	PATTERN ID	General
Set Zoom Speed subsection 5.19	0x00	0x25/37	0x00	ZOOM SPEED	General
Set Focus Speed subsection 5.20	0x00	0x27/39	0x00	FOCUS SPEED	General
Reset Camera defaults subsection 5.21	0x00	0x29/41	0x00	0x00	General
Auto-focus auto/on/off subsection 5.22	0x00	0x2B/43	0x00	AUTO FOCUS CTRL	General
Auto Iris auto/on/off subsection 5.23	0x00	0x2D/45	0x00	AUTO IRIS CTRL	General
AGC auto/on/off subsection 5.24	0x00	0x2F/47	0x00	AGC CONTROL	General
Backlight compensation on/off subsection 5.25	0x00	0x31/49	0x00	BLC CONTROL	General
Auto white balance on/off subsection 5.26	0x00	0x33/51	0x00	AWB CONTROL	General
Enable device phase delay mode subsection 5.27	0x00	0x35/53	0x00	0x00	General
Set shutter speed subsection 5.28	0x00	0x37/55	SPEED MSB	SPEED LSB	General
Adjust line lock phase delay subsection 5.29	SUB OPCODE	0x39/57	DELAY MSB	DELAY LSB	General
Adjust white balance (R-B) subsection 5.30	SUB OPCODE	0x3B/59	WB-RB MSB	WB-RB LSB	General

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Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Adjust white balance (M-G) subsection 5.31	SUB OP-CODE	0x3D/61	WB-MG MSB	WB-MG LSB	General
Adjust gain subsection 5.32	SUB OP-CODE	0x3F/63	GAIN MSB	GAIN LSB	General
Adjust auto-iris level subsection 5.33	SUB OP-CODE	0x41/65	0x00	AIL VALUE	General
Adjust auto-iris peak value subsection 5.34	SUB OP-CODE	0x43/67	0x00	AIP VALUE	General
Query subsection 5.35	SUB OP-CODE	0x45/69	0x00	0x00	Query subsection 4.4.
Preset Scan subsection 5.36	0x00	0x47/71	0x00	DWELL	General
Set Zero Position subsection 5.37	0x00	0x49/73	0x00	0x00	General
Set Pan Position subsection 5.38	0x00	0x4B/75	PAN MSB	PAN LSB	General
Set Tilt Position subsection 5.39	0x00	0x4D/77	TILT MSB	TILT LSB	General
Set Zoom Position subsection 5.40	0x00	0x4F/79	ZOOM MSB	ZOOM LSB	General
Query Pan Position subsection 5.41	0x00	0x51/81	0x00	0x00	Extended subsection 5.45
Query Tilt Position subsection 5.42	0x00	0x53/83	0x00	0x00	Extended subsection 5.46
Query Zoom Position subsection 5.43	0x00	0x55/85	0x00	0x00	Extended subsection 5.47
Download subsection 5.44	0x00	0x57/87	0x00	0x00	General
Query Pan Response subsection 5.45	0x00	0x59/89	PAN MSB	PAN LSB	Not Applicable This is not a command it is a reply.
Query Tilt Response subsection 5.46	0x00	0x5B/91	TILT MSB	TILT LSB	Not Applicable This is not a command it is a reply.
Query Zoom Response subsection 5.47	0x00	0x5D/93	ZOOM MSB	ZOOM LSB	Not Applicable This is not a command it is a reply.

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Command	Byte 3	Byte 4	Byte 5	Byte 6	Response Type
Set Magnification subsection 5.48	SUB OP-CODE	0x5F/95	MAG MSB	MAG LSB	General
Query Magnification subsection 5.49	0x00	0x61/97	0x00	0x00	Extended subsection 5.50
Query Magnification Response subsection 5.50	0x00	0x63/99	MAG MSB	MAG LSB	Not Applicable This is not a command it is a reply.
Activate Echo Mode subsection 5.51	0x00	0x65/101	0x00	0x00	General
Set Remote Baud Rate subsection 5.52	SUB OP-CODE	0x67/103	0x00	00-05	General
Start Download subsection 5.53	0x00	0x69/105	0x00	0x00	General
Query Device Type subsection 5.54	0x00	0x6B/107	0x00	0x00	Extended subsection 5.55
Query Device Type Response subsection 5.55	0x00	0x6D/109	SOFTWARE TYPE	HARDWARE TYPE	Not Applicable This is not a command it is a reply.
Query Diagnostic Info subsection 5.56	0x00	0x6F/111	0x00	0x00	Extended subsection 5.57
Query Diagnostic Info Response subsection 5.57	0x00	0x71/113	Device Dependent	Device Dependent	Not Applicable This is not a command it is a reply.
Version Information Macro Opcode subsection 5.58	SUB OP-CODE	0x73/115	Various	Various	Extended subsection 5.58
Everest Macro Opcode subsection 5.59	SUB OP-CODE	0x75/117	Various	Various	Extended subsection 5.59
Time Set Opcode subsection 5.60	SUB OP-CODE	0x77/119	Various	various	Extended subsection 5.60
Screen Move subsection 5.61	SUB OP-CODE	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" (subsection 5.11) command. After the label is on the screen, then set the preset or zone (subsubsection 5.9.3). That will establish the label and associate it with that preset or zone.

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3.3.1 Label Logic in Spectra IV

In response to questions on labels as used in the Spectra IV[17], This is an informal spec on how they currently work in Spectra IV. There is additional information in subsection 5.14.

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.

[16] `$Header: d:/Binder06.Protocols/DProtoDoc/RCS/Labels.inc,v 1.7 2007-12-13 09:39:42-08 Hamilton Exp Hamilton $`

[17] 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

[18] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Dbytes.inc,v 1.6 2007-12-18 10:08:28-08 Hamilton Exp Hamilton $

[19] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/DBits.inc,v 1.8 2009-05-01 07:38:52-07 Hamilton Exp Hamilton $

3.5 Example P Protocol Messages

P Protocol Sample Commands		
Sample #	Message to send	Message
1	Camera 2, Pan Left	0xA0, 0x01, 0x00, 0x04, 0x20, 0x00, 0xAF, 0x2A
2	Camera 2, Stop	0xA0, 0x01, 0x00, 0x00, 0x20, 0x00, 0xAF, 0x2E
3	Camera 10, Focus far, Tilt Down	0xA0, 0x09, 0x01, 0x10, 0x00, 0x20, 0xAF, 0x17

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:

0xA0	1010 0000	STX 0xA0
0x09	0000 1001	
Sub-XOR	1010 1001	0xA9
0x01	0000 0001	
Sub-XOR	1010 1000	0xA8
0x10	0001 0000	
Sub-XOR	1011 1000	0xB8
0x00	0000 0000	
Sub-XOR	1011 1000	0xB8
0xAF	1010 1111	ETX 0xAF
Sub-XOR	0001 0111	0x17
	0001 0111	0x17 Final checksum value

P Protocol Command Format/Names								
Byte	1	2	3	4	5	6	7	8
	STX	ADDR	CMND1	CMND2	DATA1	DATA2	ETX	CKSM
	0xA0	—	0x00	0x00	0x00	0x00	0xAF	—

P Protocol: Byte 3, CMND1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	Iris Close	Iris Open	Focus Near	Focus Far
P Protocol: Byte 4, CMND2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Zoom Wide	Zoom Tele	Down	Up	Left	Right	Always 0

[20] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Pbytes.inc,v 1.6 2007-12-18 10:08:31-08 Hamilton Exp Hamilton $

[21] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/PBits.inc,v 1.5 2009-05-01 07:38:53-07 Hamilton Exp Hamilton $

4 Responses

Devices that receive a "D" or "P" protocol command always generate a response[23]. The response formats are described below. There is no "negative acknowledge" response in D protocol.However there is one in "P" Protocol. Units that implement D or P protocol 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.

In P Protocol the STX and ETX bytes are unique and do not have some of the problems that D Protocol does in finding the start of a command.

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 (subsection 4.2).

   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 (subsection 4.3).

   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 (subsection 4.4).

2. **P Protocol:**

   2.1 Both responses are one byte long and are:

   2.1.1. ACK, `0xA2` — acknowledges the correct receipt of a command.

   2.1.2. NAK, `0xAA` — indicates that a command was not received correctly. The software sending the command may make two additional attempts to send the command and should then terminate the action.

4.1 The Standard Extended Response

A seven byte response, see subsection 5.1 for details

[22] `$Header: d:/Binder06.Protocols/DProtoDoc/RCS/Response.inc,v 1.22 2009-08-19 08:04:35-07 Hamilton Exp Hamilton $`

[23] Samples of command/response pairs are in Appendix A.

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 subsection 5.35 and Appendix A for more details and samples of operation.

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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

Note

1. Terms used in the "**Used/Implemented on**" tables when applied to commands:

Decoded	Does this command get some response? It is not necessary that the unit actually do something useful with the data to get a "Yes" here. It is only necessary that a response of some type is generated.
Used	Indicates that the contents of the command are used for some purpose in the PTZ. If this line is missing, it is to be assumed that something happens in all of the listed units.
In Coaxitron®	Indicates that this command is decoded in 15 and 32 bit Coaxitron®. In one place (subsection 5.36), there is amplifying information that the command is only used in 32 bit Coaxitron®.
In P	Does this command exist in P Protocol? Usually this is determined the contents of the P Protocol specification. However it is also generated on some units through code analysis.
General	Does this PTZ type generate a 4 byte General Response? Some units will generate a General response for some commands, based on the contents of byte 3, and at other times they will generate a 7 byte Extended response.
Extended	Does this PTZ type generate a 7 byte Extended Response?
Query	Does this PTZ type generate an 18 byte Query Response?
No Reply	Does this PTZ send no reply to the command?

2. In addition to code analysis the following types of Pelco PTZ equipment were used in evaluating the protocol as being the most representative of typical Pelco PTZ units:

Model	Revision
Esprit TI	1.05
Esprit IOP	4.03
ExSite	1.13
Spectra II	3.31
Spectra III, C22	1.34
Spectra IV, CBW35	1.070
Spectra Mini	1.23

3. Intercept and Spectra I units were not used due to difficulty in finding operating models.
4. ERD, IRD, LRD units were not used due to the small numbers being manufactured.
5. No Pelco equipment generates many of the higher numbered Coaxitron® commands that the Spectra IV decodes. Code analysis was relied on for these decodes.

5.1 Response 0x01 (1), 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 (subsection 5.60).
3. This response is generated as follows:

Response Generated on Command Receipt							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	—	3.19	Yes
In P	No.	No.	No.	No.	—	No.	No.
General	Yes.	Yes.	Yes	No.	—	No .	No.
ACK	No.	No.	No	ACK.	—	No.	No.
NAK	No.	NAK.	No	NAK.	—	NAK.	NAK.

4. When this response is sent as a command he following responses are generated:

When received as a command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	Yes	Yes	Yes	Yes	—	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	—	Yes.	Yes.

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.

[24] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/01.inc,v 1.30 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.2 Command 0x03 (3), 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" (subsection 4.2).
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 (subsubsection 5.59.17) and its reply of QUERY DEFINED PRESETS RESPONSE (subsubsection 5.59.18).
6. A list of typical presets is in Appendix E.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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. To get a model specific count of the available presets see the unit's manual.

[25] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/03.inc,v 1.49 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

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 D or P Protocol.

5.3 Command 0x05 (5), 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 (subsection 5.2) for more information about this command.
6. The defined presets may be determined by using QUERY DEFINED PRESETS (subsubsection 5.59.17) and its reply of QUERY DEFINED PRESETS RESPONSE (subsubsection 5.59.18).
7. A list of typical presets is in Appendix E.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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. To get a model specific count of the available presets see the unit's manual.

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 D or P Protocol.

[26] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/05.inc,v 1.40 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.4 Command 0x07 (7), 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" (subsection 4.2).
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 (subsection 5.2) for more information about this command.
6. The defined presets may be determined by using QUERY DEFINED PRESETS (subsubsection 5.59.17) and its reply of QUERY DEFINED PRESETS RESPONSE (subsubsection 5.59.18).
7. A list of typical presets are in Appendix E.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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. To get a model specific count of the available presets see the unit's manual.

FPN

5.4.3 Special Presets

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

[27] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/07.inc,v 1.41 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

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), 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" (subsection 4.2).
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[29] op-code was changed. The changes are available in the Spectra IV only.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes/1.07	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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.
   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.

[28] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/09.inc,v 1.38 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $
[29] From an e-mail by Robert Sexton dated: Wednesday, September 26, 2007 4:27 PM with a subject of SP4 LED control.

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), 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" (subsection 4.2).
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 (subsection 5.5) for more information about this command.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes/1.07	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[30] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/0B.inc,v 1.41 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.7 Command 0x0D (13), 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" (subsection 4.2) or nothing. See below.
2. Command Names as used by the Spectra IV software:
   2.1 0x000D DUMMY
3. Responses by PTZ type:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Used	No	No	No	No	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	Yes	Yes	Yes	Yes	Yes	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	No.
Extended	No.	No.	No	No.	Yes.	No.	No.
No Reply	False.	False.	False.	False.	False.	False.	True.

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. Other than sending a response nothing else occurs in any Pelco equipment.

For the ExSite system if ACTION (byte 3) is non-zero special operations/replies occur.

5.7.3 Special ExSite usage of the Dummy Command

The ExSite[32] uses the Dummy command as follows:

1. ACTION: On/Off testing or temperature readout.
   1.1 0x00: On/Off testing
      1.1.1. SUB-DEVICE ID: Device select:
         1.1.1.1. 0x00: Reset all options and return to normal operation.
         1.1.1.2. 0x01: Pan/Tilt Heater
         1.1.1.3. 0x02: Pan/Tilt Blower

[31] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/0D.inc,v 1.44 2010-03-12 12:16:16-08 Hamilton Exp Hamilton $
[32] From: Brad Buce, Tuesday, May 18, 2004

1.1.1.4. `0x03`: Enclosure Heater
1.1.1.5. `0x04`: Enclosure ITO (Window heater)
1.1.1.6. `0x05`: Enclosure Blower
1.1.1.7. `0x06`: Power Module Heater
1.1.1.8. `0x07`: Power Module Blower

```
ff 01 00 0d 01 01 10     Pan and Tilt Heater On
ff 01 00 0d 01 00 0f     Pan and Tilt Heater Off

ff 01 00 0d 02 01 11     Pan and Tilt Blower On
ff 01 00 0d 02 00 10     Pan and Tilt Blower Off

ff 01 00 0d 03 01 12     Enclosure Heater On
ff 01 00 0d 03 00 11     Enclosure Heater Off

ff 01 00 0d 04 01 13     Enclosure ITO On
ff 01 00 0d 04 00 12     Enclosure ITO Off

ff 01 00 0d 05 01 14     Enclosure Blower On
ff 01 00 0d 05 00 13     Enclosure Blower Off

ff 01 00 0d 06 01 15     Power Module Heater On
ff 01 00 0d 06 00 14     Power Module Heater Off

ff 01 00 0d 07 01 16     Power Module Blower On
ff 01 00 0d 07 00 15     Power Module Blower Off

ff 01 01 0d 00 00 0f     Reset
```

1.1.2. ON/OFF/TEMP: On/Off control.
1.1.2.1. `0x00`: Off
1.1.2.2. `not 0x00`: On

2. `0x01`: Temperature request (item 5.7.3)

2.1 `0x00`: Future use for replies
2.2 SUB-DEVICE ID: Device select for commands
2.2.1. `0x00`: Window
2.2.2. `0x01`: Enclosure
2.2.3. `0x02`: Pan/Tilt unit
2.2.4. `0x03`: Power Module

```
ff 01 01 0d 00 00 0f     Enclosure Window Temperature Readout Request
ff 01 00 00 00 1c 1d     28 Enclosure Window

ff 01 01 0d 01 00 10     Enclosure Temperature Readout Request
ff 01 00 01 00 20 22     32 Enclosure

ff 01 01 0d 02 00 11     Pan and Tilt Temperature Readout Request
```

```
ff 01 00 02 00 2c 2f     44 Pan and Tilt

ff 01 01 0d 03 00 12     Power Module Temperature Readout Request
ff 01 00 03 00 1e 22     30 Power Module
```

2.3 ON/OFF/TEMP: Future use for commands

2.3.1. 0x00: Always

2.4 SUB-DEVICE ID: Temperature MSB for replies

2.4.1. ANYTHING: MSB of the temperature in C°

2.5 ON/OFF/TEMP: Temperature LSB for replies

2.5.1. 0x00:

2.5.2. ANYTHING: LSB of the temperature in C°

ExSite Dummy Factory Calibration Commands D_EC_DUMMY_1					
Byte	3 CMND1	4 CMND2	5 DATA1	6 DATA2	Use
	ACTION	0x0D	SUB-DEVICE ID	ON/OFF/TEMP	
	0x0A	0x0D	0xE0	0x10	Factory Calibrate Step 1
	0x5A	0x0D	0xEA	0x21	Factory Calibrate Step 2
	0x1A	0x0D	0x5A	0x32	Factory Calibrate Step 3

All of these responses are "Extended Replies" (subsection 4.3).

ExSite Dummy Temperature Commands/Responses D_EC_DUMMY_1					
Byte	3 CMND1	4 CMND2	5 DATA1	6 DATA2	Use
	ACTION	0x0D	SUB-DEVICE ID	ON/OFF/TEMP	
Cmnd	0x01	0x0D	0x00	0x00	Enclosure Window Temperature Readout Request
Resp	0x00	0x00	0x00	0x1C	28°C Enclosure Window
Cmnd	0x01	0x0D	0x01	0x00	Enclosure Temperature Readout Request
Resp	0x00	0x01	0x00	0x20	32°C Enclosure
Cmnd	0x01	0x0D	0x02	0x00	Pan and Tilt Temperature Readout Request
Resp	0x00	0x02	0x00	0x2C	44°C Pan and Tilt
Cmnd	0x01	0x0D	0x03	0x00	Power Module Temperature Readout Request
Resp	0x00	0x03	0x00	0x1E	30°C Power Module

5.8 Command 0x0F (15), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

5.8.2 Description

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

[33] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/0F.inc,v 1.29 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.9 Command 0x11 (17), 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" (subsection 4.2).
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 (subsection 5.14) for more information about this command.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 (subsection 5.9) 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} (subsection 5.11) 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 (subsection 5.10) 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.

[34] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/11.inc,v 1.37 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

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 (subsection 5.14) and SET ZONE SCAN OFF (subsection 5.15). 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 (subsection 5.15) 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), 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" (subsection 4.2).
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 (subsection 5.9) and SET ZONE SCAN ON (subsection 5.14) for more information about this command.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 (subsection 5.9) 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.

[35] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/13.inc,v 1.32 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.11 Command 0x15 (21), 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	—	DATA TYPE	0x15	SCREEN COLUMN	ASCII CHAR	—

FPN

1. This command generates a "General Reply" (subsection 4.2).
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, Intercept and on the Everest/Atlas projects.
4. There is no protocol command to read out this data via a serial link.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

5.11.2 Description

1. DATA TYPE is used to indicate the use of this byte.

   1.1 0x00 (D_ECS_WRITE_CHAR_LABEL) is used to indicate that the data is to be displayed on the screen in the label buffer.

   There are several places/data sub-types for the characters to be displayed:

   1.1.1. The parameter in DATA1 (byte 5), SCREEN COLUMN of this command indicates the column to write to. This parameter is interpreted as follows:

   1.1.1.1. Columns 0 → 19 are used to receive ZONE LABELS.

   1.1.1.2. Columns 20 → 39 are used to receive PRESET LABELS.

   Starting with Spectra III (and ExSite):

   1.1.1. 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.

   1.1.2. If characters are written to these columns and no SET PRESET (opcode subsection 5.2) 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 (subsection 5.2) command within 250 milliseconds.

   1.2 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.

[36] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/15.inc,v 1.45 2010-03-12 12:16:16-08 Hamilton Exp Hamilton $

2. 0x01 (D_ECS_WRITE_CHAR_TITLE_LABEL) (**Future use**) provides a unit a title capability. Data is written to EEPROM/Flash.
3. 0x02 (D_ECS_WRITE_CHAR_MESSAGE_LABEL) (**Future use**) provides a unit a message capability. Data is (**not**) written to EEPROM/Flash.
4. 0x03 (D_ECS_WRITE_CHAR_CONTROLLER_IP) is used to indicate the unit's IP address.
5. 0x04 (D_ECS_WRITE_CHAR_CONTROLLER_MODEL) is used to indicate the controller model's name.

5.11.3 Logic behind on screen lables

< The original e-mail has been edited>

```
From:  Springer, Derek
Sent:  Friday, September 26, 2008 10:11 AM
To:  Hamilton, Eric; Johnson, Todd
Cc:  Wright, David
Subject:  RE: Pelco Protocol Download

Eric and Todd,
```

The result of the "Write Character To Screen" command has changed throughout the Spectra and Esprit product line history. There are some specific reasons for this.

Originally the labeling mechanism in Esprit and Spectra II utilized a generic on-screen labeling method that fell apart in many edge cases.

The method was simply this (As I can best describe).

1. Origianlly, Intercept and Spectra I, there were two on-screen rows that were used on-screen label display for presets, zones, pattern record status messages, etc. Internal buffers kept track of what was written to these areas and what was supposed to be displayed. Write Character To screen commands would write to this buffer area directly and the buffer would be displayed. The characters would remain displayed until a preset was saved or zone was saved. At that point, the data in the buffer would be copied to the appropriate preset or zone information and the display and buffers would be cleared when moving away from the preset or zone.
2. Later on (For Esprit mostly) other on-screen information was displayed in other areas of the screen. (Az/El and Zoom information). These I believe used the same display buffers (though I believe at this time it had been extended to the whole screen [Write Character To Screen continued to have access to only the first 2 rows].
3. All these extensions and changes made the display logic very complex and made it difficult to ensure no articles would remain displayed on the screen when not intended and also caused some situations where preset/zone label buffers would get mangled or cleared improperly until a bug fix came to a correct the problem.
4. Spectra III improved management of the screen display. For many labels, their position and display time were tracked with timers and events and separate buffers. The system would manage the display and clearing of these labels individually. Write Character To Screen commands used separate buffers that would be copied to preset/zone label buffers when a set preset or set zone end command was issued. They added a timeout for writes to the second line to allow TXB information to be displayed on the screen at power-up but didn't restrict this behavior after PTZ operation.

5. Spectra IV has similar management of labels, but also included pre-determined status messages like pattern record, zone blanking, and other infrequent information that gets display into the managed on-screen info. WRITE CHARACTER TO SCREEN commands are still used to setup preset/zone labels but if the set preset/zone end is not received the text is **not written to the screen**. Provisions are still made to allow for TXB devices to write their information to the second line but after normal PTZ operation is initiated this is disabled.

The progression of these changes have in effect created a more controlled environment to manage the on-screen display and prevent most if not all the cases that would result in random characters remaining stuck on-screen or bad characters being copied into preset/zone label data.

Note

The information above has been created from my best working knowledge of the systems described and may have errors or mistakes. The general idea still holds true.

Kind regards,

Derek Springer
Software Engineer
Pelco

5.12 Command 0x17 (23), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes

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.

[37] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/17.inc,v 1.29 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.13 Command 0x19 (25), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	No	No	Yes/1.07	No	No	No
In Coaxitron®	No	No	No	Yes	No	No	No
In P	No	No	No	Yes	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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:[39] The response will be the General Response of 4 bytes which includes the Alarm Status data

[38] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/19.inc,v 1.35 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $
[39] This information comes from an e-mail from Alfio Marrone, dated Friday, January 23, 2004 12:54 PM.

5.14 Command 0x1B (27), 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" (subsection 4.2).
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 (subsection 5.9) for more information about this command.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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/blanking for the highest-numbered zone will be displayed. For more information about lables, see subsubsection 3.3.1.

FPN

Using[41] the word "Scan" to describe these commands (subsection 5.14 and subsection 5.15) 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.

[40] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/1B.inc,v 1.43 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $
[41] From: Hannen, Craig. Tuesday, April 18, 2006 10:11 AM

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" (subsection 5.11) 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 (subsection 5.14): Used to turn the display of zone labels on.
- ZONE SCAN OFF (subsection 5.15): 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 (subsection 5.9) command is received, the characters are displayed.

Defining a Zone

1. Send "SET ZONE SCAN OFF" (subsection 5.15)
2. Send characters to positions 0 $\longrightarrow$ 19.
3. Send a "SET ZONE START" (subsection 5.9)
4. Do any reqired pan motion. On newer units presets may be called.
5. Send a "SET ZONE END" (subsection 5.10)
6. Send a "SET ZONE SCAN ON" (subsection 5.14)

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" (subsection 5.10) 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), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x001D ZONE_SCAN_OFF
3. See subsection 5.14 for more information about this command.
4. This command is used and decoded on the: Esprit 3012 and Intercept.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

5.15.2 Description

Used to turn the displaying of zone labels off.

[42] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/1D.inc,v 1.29 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.16 Command 0x1F (31), 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" (subsection 4.2).
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 (subsubsection 5.59.19) and QUERY DEFINED PATTERNS RESPNSE (subsubsection 5.59.20).
6. A pattern may be deleted by using DELETE PATTERN (subsubsection 5.59.9).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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[44]), 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[45]). 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.

[43] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/1F.inc,v 1.40 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

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

[45] 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).

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

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 $\longrightarrow$ 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 $\longrightarrow$ 4.
6. On the Spectra IV SE the patterns are numbered in the range of 1 $\longrightarrow$ 8.
7. With older low cost Spectra units utilizing the reduced capability types of cameras, there is only one pattern.
8. With low cost Spectra IV units utilizing the reduced capability types of cameras, there are four patterns.

5.17 Command 0x21 (33), 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" (subsection 4.2).
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 subsection 5.16 for more information about this command.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	3.40	Yes.	Yes.

5.17.2 Description

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

[46] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/21.inc,v 1.36 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.18 Command 0x23 (35), Run Pattern

5.18.1 Command format

Run Pattern 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" (subsection 4.2).
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 (subsubsection 5.59.19) and its response QUERY DEFINED PATTERNS RESPONSE (subsubsection 5.59.20).
6. See RECORD PATTERN START subsection 5.16 for more information about this command.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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"

[47] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/23.inc,v 1.37 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.19 Command 0x25 (37), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

Note: In the reduced capability type of Spectra IV units Zoom speed may not be changed.

[48] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/25.inc,v 1.32 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.20 Command 0x27 (39), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Used	No	No	No	No	No	No	No
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[49] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/27.inc,v 1.32 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.21 Command 0x29 (41), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	No.	Yes.	Yes.	Yes.
No Reply	False.	False.	False.	True.	False.	False.	False.

5.21.2 Description

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

FPN

5.21.3 Typical Reset Values

	AI Level		AI Peak	
Camera Type	NTSC	PAL	NTSC	PAL
X16	0x42	0x39	0x08	0x10
X18	0x5B	0x5B	0x10	0x10
X22	0x3A	0x3A	0x10	0x10
X22R	0x42	0x42	0x10	0x10
X23	0x5B	0x54	0x10	0x10
X23R	0x5B	0x5B	0x10	0x10

Misc Values	
Item	Value
AWB	On
MG_WB	678
RB_WB	402
Zoom	Medium Speed (1)

[50] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/29.inc,v 1.36 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.22 Command 0x2B (43), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[51] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/2B.inc,v 1.33 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.23 Command 0x2D (45), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[52] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/2D.inc,v 1.34 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.24 Command 0x2F (47), AGC

Discontinued Command

In July 2004 the use of this command was discontinued as a protocol item. This function is only supported via the menu system.

This command does not apply to the Esprit TI.

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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	—	—	Yes
Used	No	No	No	No	—	—	No
In Coaxitron®	Yes	Yes	Yes	Yes	—	—	Yes
In P	No	No	No	No	—	—	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 (subsection 5.32) 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

[53] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/2F.inc,v 1.36 2010-11-29 07:23:16-08 Hamilton Exp Hamilton $

5.25 Command 0x31 (49), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[54] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/31.inc,v 1.33 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.26 Command 0x33 (51), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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. (subsection 5.30, subsection 5.31)

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. (subsection 5.30, subsection 5.31)

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

[55] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/33.inc,v 1.35 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.27 Command 0x35 (53), Enable Device Phase Delay Mode

Discontinued Command

In July 2004 the use of this command was discontinued as a protocol item. This function is only supported via the menu system.

This command does not apply to the Esprit TI.

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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x0035 ENABLE_DEVICE_PHASE_DELAY_MODE

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Used	No	No	No	No	No	No	No
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 subsection 5.29.

[56] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/35.inc,v 1.32 2010-11-29 07:23:16-08 Hamilton Exp Hamilton $

5.28 Command 0x37 (55), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x0037 SET_SHUTTER_SPEED

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

5.28.2 Older Shutter Speed Codes

Spectra II and older Shutter Speed Codes Byte[58] 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

[57] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/37.inc,v 1.37 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $
[58] Up until Spectra II rev 3.21.

5.28.3 Newer Shutter Speed Codes

With[59] 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	—	—

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

5.29 Command 0x39 (57), Adjust Line Lock Phase Delay

Discontinued Command

In July 2004 the use of this command was discontinued as a protocol item. This function is only supported via the menu system.

This command does not apply to the Esprit TI.

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	—

FPN

1. This command generates a "General Reply" (subsection 4.2).
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

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 subsection 5.27).

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

[60] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/39.inc,v 1.35 2010-11-29 07:23:16-08 Hamilton Exp Hamilton $

5.30 Command 0x3B (59), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x003B ADJUST_WHITE_BALANCE_RB
   2.2 0x013B SET_WHITE_BALANCE_RB

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 (subsection 5.26).

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

[61] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/3B.inc,v 1.32 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.31 Command 0x3D (61), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x003D ADJUST_WHITE_BALANCE_MG
   2.2 0x013D SET_WHITE_BALANCE_MG

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 (subsection 5.26).

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

[62] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/3D.inc,v 1.32 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.32 Command 0x3F (63), Adjust Gain

Discontinued Command

In July 2004 the use of this command was discontinued as a protocol item. This function is only supported via the menu system.

This command does not apply to the Esprit TI.

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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x003F ADJUST_GAIN
   2.2 0x013F SET_GAIN

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	—	—	Yes
Used	No	No	No	No	—	—	No
In Coaxitron®	No	No	No	No	—	—	No
In P	No	No	No	No	—	—	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[63] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/3F.inc,v 1.37 2010-11-29 07:23:16-08 Hamilton Exp Hamilton $

5.33 Command 0x41 (65), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[64] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/41.inc,v 1.34 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.34 Command 0x43 (67), 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" (subsection 4.2).
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

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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

[65] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/43.inc,v 1.33 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.35 Command 0x45 (69), 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" (subsection 4.4).
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** type units.
6. In the **Esprit** starting with rev 4.00 the following information is provided for the QUERY_TYPE field. All of these are 15 bytes of ASCII characters and are not terminated or are terminated with a NULL (`0x00`):
   6.1 `0x00`: The Esprit model number.
   6.2 `0x01`: Reserved (Planned use is for the serial number)
   6.3 `0x02`: Camera type and model number from the power up screen.
   6.4 `0x03`: Code status. This will consist of the words:
      6.4.1. "`Production Code`" for fully released software.
      6.4.2. "`Debug Test Code`" for software in debug status.
      6.4.3. "`Rel Candidate x`" for software submitted to T&V for testing.
      6.4.4. "`SMR x-xxxxxxxxx`" for SMR specific software.
   6.5 `0x04`: **PG**, or **PX** for SMRs, number. There are four different software (`.HEX`) part numbers for the **Esprit** that are built based on the type/age of **Esprit**. They are:
      6.5.1. `PG53-0094-0xxx`: For a wiper model with the old text chip. (Logic board number `PA02-0001-00D0` and earlier.
      6.5.2. `PG53-0098-0xxx`: For a non-wiper model with the old text chip. (Logic board number `PA02-0001-00D0` and earlier.)
      6.5.3. `PG53-0096-0xxx`: For a wiper model with the new text chip. (Logic board number `PA02-0001-00E0` and newer.)
      6.5.4. `PG53-0097-0xxx`: For a non-wiper model with the new text chip. (Logic board number `PA02-0001--00E0` and newer.)
   6.6 `0x05`: Build Date in C `__DATE__` format ("`Mar 11 2009`").
   6.7 `0x06`: Build Time in C `__TIME__` format ("`13:31:16`").
   6.8 Any undefined QUERY_TYPE fields generate the same reply as a QUERY_TYPE of `0x00`.
7. In the below two tables:
   7.1 **MN** indicates that the unit generates a model number.
   7.2 **PN** indicates that the unit generates a program number.
   7.3 **SN** indicates that the unit generates a serial number.
8. QUERY TYPE = `D_ECS_QUERY_PART_NUMBER`:

[66] `$Header: d:/Binder06.Protocols/DProtoDoc/RCS/45.inc,v 1.51 2010-11-03 13:58:04-08 Hamilton Exp Hamilton $`

Used/Implemented on D_ECS_QUERY_PART_NUMBER (0x00)							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	No.	No.	No.	No.	No.	No.	No.
Query	PN.	MN.	MN	MN.	MN.	MN.	MN.

9. QUERY TYPE = D_ECS_QUERY_SERIAL_NUMBER:

Used/Implemented on D_ECS_QUERY_SERIAL_NUMBER (0x01)							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	Yes	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	No.	No.	No.	No.	No.	No.	No.
Query	PN.	MN.	MN	SN	MN.	SN.	MN.

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. **Spectra IV** prior to rev 2.000 is identical the **Spectra III** versions 1.22 and later.
6. **Spectra IV** versions following rev 2.000, have a shortened part number of the genera form `DD4nn` with `nn` being the maximum optical zoom level.
7. **Esprit** prior to version 3.10. ASCII text string of the **program** number and version of device. E.G. `PG53-0097-R306`
8. **Esprit** version 3.10 and later. ASCII text string of the device **model** number. E.G. `ES31CBW18`

9. All units than those above, have the ASCII text string of the device **model** number. E.G. `ES31CBW18`
10. **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** combines the following strings to build up the curent model type, all of the resulting model numbers are blank "␣" filed.

"ES30"	For non-wiper models
"ES31"	For wiper models
"P"	For IOC models (IOP models have no special flag)
"C16"	For 16X camera types
"C22"	For 22X camera types
"CBW18"	For 18X CBW camera types
"CBW24"	For 24X CBW camera types
"CBW35"	For 35X CBW camera types
"X"	For PAL models (For NTSC models there is no suffix)

These are some typical values for X18 **Esprit** models:

ES31CBW18␣␣␣␣␣␣	ES31CBW18X␣␣␣␣␣	ES30CBW18␣␣␣␣␣␣	ES30CBW18X␣␣␣␣␣
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.

Camera modules *vs.* **Esprit model numbers** The Esprit software, starting in 2010 with rev 4.00, supports at least 11 different models of Hitachi camera. Support is for both NTSC and PAL versions:

Type	Hitachi camera types
"C16"	VK-S934, VK-934R
"C22"	VK-S274, VK-274R
"CBW18"	VK-S454, VK-454R, VK-454N
"CBW24"	VK-P554
"CBW35"	VK-S654, VK-654R, VK-654N

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		
DD4	23		
	27		
	35		
DD4H	CBW35		Look Up dome

Sample model number for a X35 Spectra IV SE prior to rev 2.000: "DD4CBW35␣␣␣␣␣␣␣". In this example the ␣ symbol indicates NULL (0x00) padding being used.

Sample model number for a X35 Spectra IV SE following rev 2.000: "DD435␣␣␣␣␣␣␣␣␣␣". In this example the ␣ symbol indicates NULL (0x00) padding being used.

Camera modules *vs.* **Esprit model numbers** The Spectra IV, starting in 2009, supports 11 different models of Hitachi camera. These are:

Type	Hitachi camera types
"TC16"	Unknown
"C22"	VK-S274, VK-S274R
"M22"	VK-K274, VK-K274R
"CBW23"	VK-S454, VK-S454R, VK-S454N
"CBW35"	VK-S654, VK-S654R
"23"	VK-S454N (Defeatured)
"27"	VK-S654N (Defeatured) , VK-S624
"35"	VK-S654N

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), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x0047 PRESET_SCAN
3. This command is decoded on the: Esprit 3012.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	No	No	Yes	Yes	Yes
Used	No	No	No	No	No	No	No
In Coaxitron®15	No	No	No	No	No	No	No
In Coaxitron®32	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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. The Spectra II/Spectra III source code says that this command is only processed if it's received as a 32-bit Coaxitron® command.**This command is not used as a D or P Protocol command**. It is a 32-bit Coaxitron® only command.

[67] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/47.inc,v 1.40 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.37 Command 0x49 (73), 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" (subsection 4.2).
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 (subsubsection 5.59.2) and QUERY AZIMUTH ZERO RESPONSE (subsubsection 5.59.3).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	Yes	Yes	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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.

[68] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/49.inc,v 1.32 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.38 Command 0x4B (75), 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" (subsection 4.2).
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 (subsection 5.41) and QUERY PAN POSITION RESPONSE (subsection 5.45).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.
Extended	No.	No.	Yes	3.89	No.	No.	No.

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 → 35999 (decimal).

Sub-op codes used in CMND1

1. 0x00 is used for setting the pan position.

   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

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 for more information on pan positioning.

[69] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/4B.inc,v 1.36 2010-03-12 12:16:17-08 Hamilton Exp Hamilton $

5.39 Command 0x4D (77), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x004D SET_TILT_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 (subsection 5.42) and QUERY TILT POSITON RESPONSE (subsection 5.46).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.
Extended	No.	No.	No.	3.89	No.	No.	No.

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 → 35999 (decimal).

Sub-op codes used in CMND1

1. 0x00 is used for setting the tilt position.

   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.

[70] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/4D.inc,v 1.35 2010-03-12 12:16:17-08 Hamilton Exp Hamilton $

5.40 Command 0x4F (79), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x004F SET_ZOOM_POSITION
3. In the Esprit, if Electronic Image Stabilization (EIS) is turned on, this command is ignored with a General Reply being sent back.
4. This position may be read out using the command/response pair QUERY ZOOM POSITION (subsection 5.43) and QUERY ZOOM POSITION RESPONSE (subsection 5.46).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	Yes	Yes	Yes
Used	No	Yes.	Yes	Yes	3.36	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes	Yes.	Yes.	Yes.

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.

[71] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/4F.inc,v 1.33 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.41 Command 0x51 (81), 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" (subsection 4.3) of QUERY PAN POSITION RESPONSE (subsection 5.45).
2. This command is used by the Endura/Atlas projects.
3. This command generates a QUERY PAN POSITION RESPONSE (subsection 5.45) as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	No.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 (subsection 5.45) for more information.

[72] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/51.inc,v 1.31 2010-03-11 15:05:43-08 Hamilton Exp Hamilton $

5.42 Command 0x53 (83), 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" (subsection 4.3) of QUERY TILT POSITION RESPONSE (subsection 5.46).
2. This command is used by the Endura/Atlas projects.
3. This command generates a QUERY TILT POSITION RESPONSE (subsection 5.46) replie as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	No.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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 (subsection 5.46) for more information.

[73] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/53.inc,v 1.32 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.43 Command 0x55 (85), 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" (subsection 4.3) of QUERY ZOOM POSITION RESPONSE (subsection 5.47).
2. This command generates QUERY ZOOM POSITION RESPONSE (subsection 5.47)
3. In Esprit rev 3.71 support was added for the 35X camera. One of the features of the 35X camera is that it has Electronic Image Stabilization (EIS). When EIS is **off**, then the Esprit will generate a QUERY MAGNIFICATION RESPONSE (subsection 5.50) and when EIS is **on** then a "General Reply" (subsection 4.2) will be generated. The Spectra IV always generates a QUERY MAGNIFICATION RESPONSE (subsection 5.50).

   replies as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.36	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	Yes.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	No.	Yes.

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 POSITION RESPONSE (subsection 5.47) for more information.

[74] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/55.inc,v 1.31 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.44 Command 0x57 (87), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:

   2.1 0x0057 DOWNLOAD

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.22	Yes	Yes	Yes	Yes	Yes
Used	No	Yes	Yes	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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.

[75] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/57.inc,v 1.28 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.45 Response 0x59 (89), 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" (subsection 4.3).
2. This response is the reply to a QUERY PAN POSITION (subsection 5.41) command as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	No.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

3. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In P	No.	No.	No.	No.	No.	No.	No.
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes

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 subsection 5.37) command or the "SET AZIMUTH ZERO" menu item.

For more information about how the interactions between how "SET ZERO POSITION" (subsection 5.37) and "QUERY PAN POSITION" (subsection 5.41) opcodes operate see Appendix C.

[76] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/59.inc,v 1.30 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.46 Response 0x5B (91), 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" (subsection 4.3).
2. This response is the reply to a QUERY TILT POSITION (subsection 5.42) command as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	No.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

3. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In P	No.	No.	No.	No.	No.	No.	No.
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes

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 subsection 5.39.

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

[77] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/5B.inc,v 1.27 2010-03-12 12:16:17-08 Hamilton Exp Hamilton $

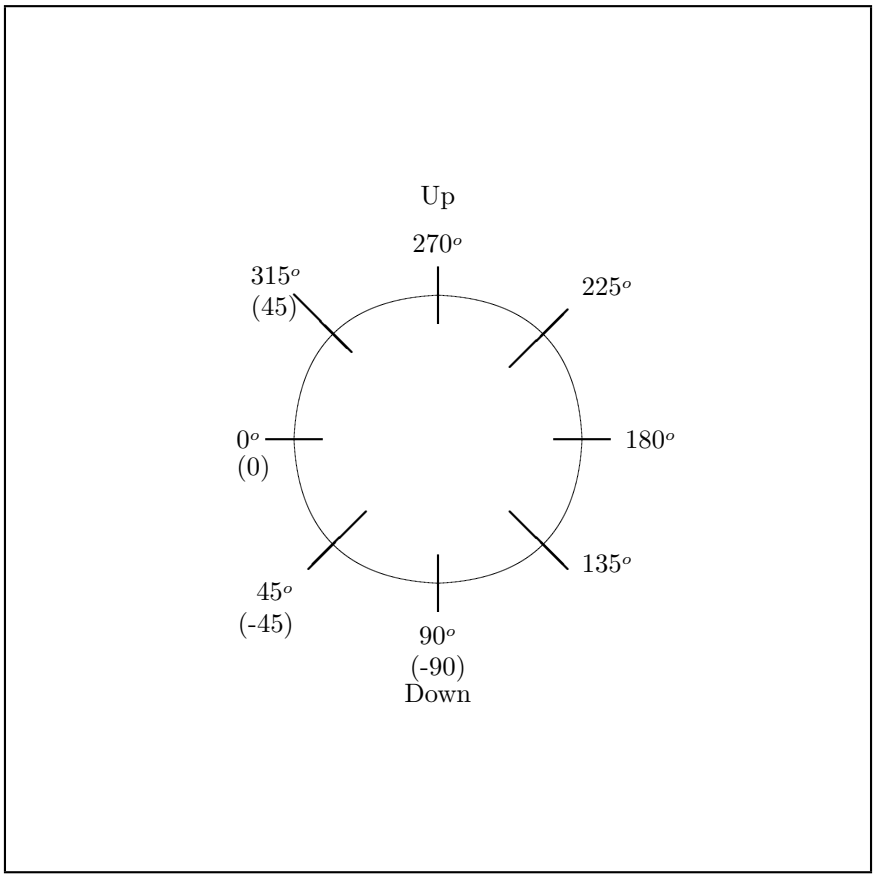

Figure 1: D Protocol Tilt Readout Positions. Values in parentheses are the values displayed on PTZ units.

5.47 Response 0x5D (93), 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" (subsection 4.3).
2. This response is the reply to a QUERY ZOOM POSITION (subsection 5.43) command as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	No.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

3. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In P	No.	No.	No.	No.	No.	No.	No.
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes

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.

[78] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/5D.inc,v 1.28 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.48 Command 0x5F (95), 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" (subsection 4.2).
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. In the Esprit, if Electronic Image Stabilization (EIS) is turned on, this command is ignored with a General Reply being sent back.
5. This position may be read out using the command/response pair in QUERY MAGNIFICATION (subsection 5.49) and QUERY MAGNIVICATION RESPONSE (subsection 5.50).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.14	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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,

[79] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/5F.inc,v 1.34 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

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), Query Magnification

5.49.1 Command 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" (subsection 4.3) of QUERY MAGNIFICATION RESPONSE (subsection 5.50).
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. In indexitEsprit rev 3.71 support was added for the 35X camera. One of the features of the 35X camera is that it has Electronic Image Stabilization (**EIS**). When EIS is **off**, then the Esprit will generate a QUERY MAGNIFICATION RESPONSE (subsection 5.50) and when EIS is **on** then a "General Reply" (subsection 4.2) will be generated. The Spectra IV always generates a QUERY MAGNIFICATION RESPONSE (subsection 5.50).
5. This command generates QUERY MAGNIFICATION RESPONSE (subsection 5.50) replies as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.14	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	Yes.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	No.	Yes.

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 (subsection 5.50) for more information.

[80] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/61.inc,v 1.35 2010-03-12 12:16:17-08 Hamilton Exp Hamilton $

5.50 Response 0x63 (99), 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" (subsection 4.3).
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 (subsection 5.49) command as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	No	No.	No.	No.	No.
Extended	No.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

4. The Esprit TI generates a General Response, not an Extended Response, because it does not have a lens capable of "zooming".
5. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In P	No.	No.	No.	No.	No.	No.	No.
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes

5.50.2 Description

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

Example: a value of 500 means X5.

[81] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/63.inc,v 1.27 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.51 Command 0x65 (101), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:
   2.1 0x0065 ACTIVATE_ECHO_MODE

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.20	Yes	Yes	Yes	Yes	Yes
Used	No	Yes	Yes	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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.

[82] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/65.inc,v 1.28 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.52 Command 0x67 (103), 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" (subsection 4.2).
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	1.20	Yes	Yes/1.07	Yes	Yes	Yes
Used	No	Yes	Yes	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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. When the MODE byte is equal to 0x00, the normal mode, this command does not function until the unit is in download mode. (Appendix D) Which must have been sent prior to this command.
   3.1 With MODE of 0x00, the reply is sent at 2400 baud and this command is valid only at 2400 baud.

[83] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/67.inc,v 1.35 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

3.2 When the MODE byte is equal to `0x01`, this command operates at any time and the results of the baud rate change remain until the next power cycle or other baud rate change.

4. 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.

5. This command always sends back a General Response and does not change the baud rate, unless it is in "Download" mode subsection 5.44. For all models before the Spectra IV running version 1.07 software.

Change: For the Atlas project an enhancement to this command was made to make the baud rate selectable in a long term manner.

1. MODE (CMND1) = `0x00` = Normal download mode baud rate change.

2. MODE (CMND1) = `0x01` = Atlas mode baud rate change.

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

5.53 Command 0x69 (105), 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" (subsection 4.2).
2. Command Names as used by the Spectra IV software:

   2.1 0x0069 START_DOWNLOAD

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.20	Yes	Yes	Yes	Yes	Yes
Used	No	Yes	Yes	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.

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.

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 0x02s to the head end. Earlier versions did not do this if the entire sequence of command outlined in Appendix D 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
```

[84] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/69.inc,v 1.31 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.54 Command 0x6B (107), 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" (subsection 4.3) of QUERY DEVICE TYPE RESPONSE (subsection 5.55).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	1.20	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	Yes.	Yes.	No.
Extended	No	Yes.	Yes	Yes.	No.	No.	Yes.

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 (subsection 5.55) for more information.

[85] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/6B.inc,v 1.30 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.55 Response 0x6D (109), 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" (subsection 4.3).
2. This response is the reply to a QUERY MAGNIFICATION (subsection 5.49) command as follows:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	Yes	1.20	Yes	Yes	Yes	Yes	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	Yes.	Yes.	No.
Extended	No	Yes.	Yes	Yes.	No.	No.	Yes.

3. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In P	No.	No.	No.	No.	No.	No.	No.
General	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes

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

[86] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/6D.inc,v 1.29 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.56 Command 0x6F (111), 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" (subsection 4.3) of QUERY DIAGNOSTIC INFORMATION RESPONSE (subsection 5.57). Or a "Super Extended Reply" (subsubsection 5.57.2) of QUERY DIAGNOSTIC INFORMATION RESPONSE (subsubsection 5.57.2).
2. This command generates QUERY DIAGNOSTIC INFORMATION RESPONSE (subsection 5.57) replies as follows:

	Used/Implemented on						
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.20	Yes	Yes	Yes	Yes	Yes
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	Yes.	Yes.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	Yes.
Super Extended	No.	No	Yes	No.	No.	No.	No.

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 (subsection 5.57) for more information.

1. **Spectra IV** starting with rev 1.072, has a reply using opcode 0x71 (subsection 5.57) having the unit's temperature in it.
2. **Esprit** starting with rev 4.06, has a reply (subsection 5.57) with additonal internal status information.
3. The **Spectra Mini** has a "Super Extended Reply" (subsubsection 5.57.2) with a length of 6, 7 or 11 bytes (subsubsection 5.57.2) for this command depending on the value in CMND1. See subsection 5.57 for more information.

   Starting with **Spectra Mini** rev 1.23 some additional actions are available with this command and its reply of opcode 0x71 subsection 5.57:

   3.1 CMND1 = 0x00, PARAM_EC_DIAG_INFO: This causes the reply to have the unit temperature in the DATA1 byte. **And** the unit version number in four new bytes placed between DATA2 and the CKSM. The new positions are named DATA3, DATA4, DATA5 and DATA6. The version number is formatted "x.xx" in ASCII. The CKSM is calculated starting with the ADDR byte up to and including the DATA6 byte.

   3.2 CMND1 = 0x55, PARAM_EC_SPOT_CANCEL: This causes a call being made to a spot cancel routine and power to be turned off to the camera for five seconds. Then a Special 4 byte Extended Response is returned with DATA1 being set to 0x55 (EC_QUERY_DIAG_RESP) and the DATA2 byte being set to the reply from the spot cancel routine. The CKSM is calculated starting with the ADDR byte up to and including the DATA2 byte.

[87] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/6F.inc,v 1.47 2010-11-03 12:39:55-08 Hamilton Exp Hamilton $

3.3 CMND1 = 0x57, PARAM_EC_TEST_CURRENT: This causes a call to be made to a motor test routine with a Special 4 byte Extended Response being sent with DATA1 being set to 0x57 (EC_QUERY_DIAG_RESP) and the DATA2 byte being set to the reply from the motor test routine. The CKSM is calculated starting with the ADDR byte up to and including the DATA2 byte. These replies are six bytes long.

The value in DATA2 is the Motor Test Value to use for this test. The range is 0 → 16 with 0 indicating to not do the test. A typical set of replies to these commands is shown in section 5.57.3.

5.57 Response 0x71 (113), 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" (subsection 4.3).
2. This response is the reply to a QUERY DIAGNOSTIC INFORMATION (subsection 5.56) command.
3. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	3.17	Yes	Yes
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	Yes	Yes.	Yes.	Yes

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 $0 \rightarrow 255$.

   2.2 **Spectra Mini** starting with rev 1.23 this reply has become a "Super Extended Reply" of 11 bytes. Depending on the value in byte 3, RESP1 of opcode 0x6F (subsection 5.56).

   2.2.1. PARAM_EC_DIAG_INFO 0x00: The internal temperature of the unit in degrees F will be in DATA1. The range is $0 \rightarrow 255$. The version number will be in four new bytes in locations between DATA2 and the CKSM. These new byte positions are named DATA3, DATA4, DATA5 and DATA6. The format of the version number is: "x.xx" as ASCII characters.

Super Extended Query Diagnostic Information Response, Spectra Mini D_EC_EXTENDED_QUERY_DIAG_RESP								
Byte	1	2	3	4	5	6	$7 \rightarrow 10$	11
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	DATA3 $\rightarrow$ 6	CKSM
	0xFF	—	0x00	0x71	TEMP	SENSOR ID	VERSIONNUMBER	—

The format of the VERSIONNUMBER is: n.nn as ASCII characters.

[88] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/71.inc,v 1.41 2010-11-03 12:39:55-08 Hamilton Exp Hamilton $

2.2.2. Values of 0x55, PARAM_EC_SPOT_CANCEL and 0x56, PARAM_EC_TEST_CURRENT are processed as outlined in opcode 0x6F (subsection 5.56) as "Special 4 byte Extended Response".

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.

5.57.3 Typical Spectra MINI replies for the 0x6F opcode

Example #1

```
ff 01 00 6f 00 00 70
ff 01 00 71 60 01 31 2e 32 33 97
```

Here the temperature is 96°F, the unit is at the pan sensor and the software rev is 1.23.

Example #2

```
ff 01 55 6f 00 00 c5
ff 01 00 71 00 03 75
```

Here the result of the spot cancel command indicates that there are 3 spots.

Example #3 (In two column format.)

```
ff 01 57 6f 00 00 c7            ff 01 57 6f 00 09 d0
ff 01 00 71 fe 70               ff 01 00 71 09 7b

ff 01 57 6f 00 01 c8            ff 01 57 6f 00 0a d1
ff 01 00 71 01 73               ff 01 00 71 0a 7c

ff 01 57 6f 00 02 c9            ff 01 57 6f 00 0b d2
ff 01 00 71 02 74               ff 01 00 71 0b 7d

ff 01 57 6f 00 03 ca            ff 01 57 6f 00 0c d3
ff 01 00 71 03 75               ff 01 00 71 0c 7e

ff 01 57 6f 00 04 cb            ff 01 57 6f 00 0d d4
ff 01 00 71 04 76               ff 01 00 71 0d 7f

ff 01 57 6f 00 05 cc            ff 01 57 6f 00 0e d5
ff 01 00 71 05 77               ff 01 00 71 0e 80

ff 01 57 6f 00 06 cd            ff 01 57 6f 00 0f d6
ff 01 00 71 06 78               ff 01 00 71 0f 81

ff 01 57 6f 00 07 ce            ff 01 57 6f 00 10 d7
ff 01 00 71 07 79               ff 01 00 71 ff 71

ff 01 57 6f 00 08 cf
ff 01 00 71 08 7a
```

Note here that the replies are six (yes 6) bytes long and the meaning of the value in byte 5 is unknown.

5.57.4 Esprit Rev 4.06 and newer diagnostic responses

0x71, Query Diagnostic Information Response

CMND1	CMND2	Use
0x01	0x6F	Returns two bytes (or one `16 bit unsigned int`) of internal status bits as follows, all bits are or'ed together:

DATA1:	Internal Data #1
0x80:	Non-English/English Menus 0 = english, 1 = non-english
0x40:	`IR Level state` Dusk, 1 = Dark
0x20:	`IR Mode state` Auto, 1 = off
0x10:	`TOL type` 0 = T1, 1 = T2
0x08:	`FNR state` 0 = off, 1 = on
0x04:	`Pict Mode` 0 = 1, 1 = 2
0x02:	`Sure Focus state` = = off, 1 = on
0x01:	`WDR state` 0 = off, 1 = on

DATA2:	Internal Data #2
0x80:	`EIS Center Frequency` 5hz/10hz
0x40:	`EIS state` 0 = off, 1 = on
0x20:	`BLC state` 0 = off, 1 = on
0x10:	`WDR state` 0 = off, 1 = on
0x08:	`Auto Iris state` 0 = off, 1 = auto
0x04:	`Auto Sharpness state` 0 = off, 1 = on
0x02:	`Auto Focus state` 0 = off, 1 = auto
0x01:	`AWB state` 0 = off, 1 = auto

5.58 Command 0x73 (115), 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	subsubsection 5.58.2		0x00	Request software version number			
Resp	subsubsection 5.58.3		0x01	Application version number			
Cmnd	subsubsection 5.58.4		0x02	Request build number			
Resp	subsubsection 5.58.5		0x03	Build number			
Cmnd	subsubsection 5.58.2		0x00	VERSION_REQUEST			
Resp	subsubsection 5.58.3		0x01	VERSION_RESPONSE			
Cmnd	subsubsection 5.58.4		0x02	BUILD_REQUEST			
Resp	subsubsection 5.58.5		0x03	BUILD_RESPONSE			
Cmnd			0x04	BL_VERSION_REQUEST			
Resp			0x05	BL_VERSION_RESPONSE			
Cmnd			0x06	FONT_VERSION_REQUEST			
Resp			0x07	FONT_VERSION_RESPONSE			
Cmnd			0x08	STRING_VERSION_REQUEST			
Resp			0x09	STRING_VERSION_RESPONSE			
Cmnd			0x0A	LAT_TABLE_REQUEST			
Resp			0x0B	LAT_TABLE_RESPONSE			
Cmnd			0x0C	LONG_TABLE_REQUEST			
Resp			0x0D	LONG_TABLE_RESPONSE			

FPN

1. These commands generate "General Responses" (subsection 4.2) and "Extended Responses" (subsection 4.3) including a "Standard Everest Response" (subsection 5.1).
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 subsection 5.1.
4. With the Spectra IV additional SUB OP-CODEs were introduced. Samples of their responses are shown in subsubsection 5.58.6. Other than the sample readouts and the SUB OP-CODEs names, nothing further is known.

[89] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/73.inc,v 1.47 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

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" (subsection 4.3).
2. Typical useage of this command, and its reply, is shown in Appendix A.
3. This sub-opcode is used by the Endura/Atlas projects.
4. Typical replies for this command:

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	Yes	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	**x100**	**x100**	**x1000**	**x100**	No.	**x100**
NAK	No	No	No	No	No.	Yes.	No.

4.1 The version number request was added in for the Esprit starting with rev 3.77.

Request the software version number. It comes in as subsubsection 5.58.3.

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" (subsection 4.3).
2. Typical useage of this command, and its reply, is shown in Appendix A.
3. This response is the reply to a APPLICATION VERSION NUMBER (subsection 5.58 SUB-OPCODE 01) command.
4. This sub-opcode response is used by the Endura/Atlas projects.
5. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	Yes	3.17	Yes
In P	No.	No.	No.	No.	No	No.	No.
General	Yes.	No.	No	No.	No.	No.	No.
Extended	No.	NAK.	Yes	NAK.	No.	NAK.	NAK.

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 Spectra 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" (subsection 4.3).
2. Typical useage of this command, and its reply, is shown in Appendix A.

Used/Implemented on							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	Yes	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	Yes.	Yes.
No Reply	False.	False.	False	False.	True.	False.	False.

Request the software build number. It comes in as subsubsection 5.58.5.

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" (subsection 4.3).
2. Typical useage of this command, and its reply, is shown in Appendix A.
3. This response is the reply to a REQUEST BUILD NUMBER (subsection 5.58 SUB-OPCODE 03) command.
4. When this response is sent as a command, the following responses are generated:

When Received as a Command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	Yes	Yes	Yes	Yes	3.17	Yes
In P	No.	No.	No.	No.	No	No.	No.
General	Yes.	No.	No	No.	No.	No.	No.
Extended	Yes.	NAK.	Yes	NAK.	No.	NAK.	NAK.
No Reply	False.	False.	False	False.	True.	False.	False.

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

FPN

5.58.6 Spectra IV, Version Op-Codes for 0x73

```
 1  15NOV07B.dlt
 2  $Header: d:/Binder06.Protocols/DProtoDoc/RCS/S473x.dat,v 1.2 2010-03-12 12:16:20-08 Hamilton Exp Hamilton $
 3  Spectra IV SE, Rev 1.07
 4
 5  FTS capture buffer (11/15/2007 10:46:51 AM)
 6
 7  DCE      34    10.673617  ff 01 00 45 00 00 46  Query Model number
 8                                 D  D  4  C  B  W  3  5
 9   DTE     41    10.718208  ff 01 44 44 34 43 42 57 33 35 00 00 00 00 00 00 00 47
10
11  DCE      59    11.830283  ff 01 01 45 00 00 47  Query Serial number
12                                  5  7  7  9  8  4  2
13   DTE     66    11.860580  ff 01 35 37 37 39 38 34 32 00 00 00 00 00 00 00 00 c2
14
15  DCE      84    12.963905  ff 01 00 73 00 00 74  Query Software Rev
16   DTE     91    12.994197  ff 01 01 73 04 2e a7  1.070
17
18  DCE      98    14.133720  ff 01 02 73 00 00 76  Query Build number
19   DTE    105    14.163652  ff 01 03 73 00 01 78  1
20
21  DCE     193    31.334526  ff 01 04 73 00 00 78  Query Bl Version
22   DTE    200    31.399715  ff 01 05 73 03 13 8f  7.870?
23
24  DCE     221    33.705669  ff 01 06 73 00 00 7a  Query Font Version
25   DTE    228    33.744480  ff 01 07 73 00 65 e0  1.010?
26
27  DCE     249    36.070997  ff 01 08 73 00 00 7c  Query String Version
28   DTE    256    36.101303  ff 01 09 73 00 d6 53  2.300?
29
30  DCE     277    38.386424  ff 01 0a 73 00 00 7e  Query Lat Table
31   DTE    284    38.416459  ff 01 0b 73 00 01 80  1
32
33  DCE     305    40.776919  ff 01 0c 73 00 00 80  Query Long Table
34   DTE    312    40.811614  ff 01 0d 73 00 01 82  1
```

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	Yes	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No	No.	No	No.
Extended	No.	No	No	Yes.	No.	No	Yes.
NAK	No	Yes.	No	Yes.	No.	Yes.	No.
No Reply	False.	False.	False	False.	True.	False.	False.

5.59 Command 0x75 (117), 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	subsubsection 5.59.2		0x00	Query azimuth zero offset command			
Resp	subsubsection 5.59.3		0x01	Query azimuth zero offset response			
Cmnd	subsubsection 5.59.4		0x02	Set zoom limit command			
Cmnd	subsubsection 5.59.5		0x03	Query zoom limit command			
Resp	subsubsection 5.59.6		0x04	Query zoom limit response			
Cmnd	subsubsection 5.59.7		0x05	Query alarms command			
Resp	subsubsection 5.59.8		0x06	Query alarms response			
Cmnd	subsubsection 5.59.9		0x07	Delete pattern command			
Cmnd	subsubsection 5.59.10		0x08	Set manual left pan limit command			
Cmnd	subsubsection 5.59.11		0x09	Set manual right pan limit command			
Cmnd	subsubsection 5.59.12		0x0A	Set scan left pan limit command			
Cmnd	subsubsection 5.59.13		0x0B	Set scan right pan limit command			
Cmnd	subsubsection 5.59.14		0x0C	Query limit command			
Resp	subsubsection 5.59.15		0x0D	Query limit response			
Cmnd	subsubsection 5.59.16		0x0E	Enable/disable limits command			
Cmnd	subsubsection 5.59.17		0x0F	Query defined presets command			
Resp	subsubsection 5.59.18		0x10	Query defined presets response			
Cmnd	subsubsection 5.59.19		0x11	Query defined patterns command			
Resp	subsubsection 5.59.20		0x12	Query defined patterns response			
SMR-Y Cmnd	subsubsection 5.59.21		0x13	Query the horizontal field-of-view			
SMR-Y Resp	subsubsection 5.59.22		0x14	Report the horizontal field-of-view			

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 subsection 5.1.
3. Information for SMR-Y came from several e-mails between Craig Hannen and Chien-Min Huang dated 21APR06 and an additional e-mail between Craig Hannen and morison.6@osu.edu dated 07SEP06.

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

[90] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/75.inc,v 1.46 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

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" (subsection 4.3) of subsubsection 5.59.3.
2. This sub-opcode is used by the Endura/Atlas projects.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	Yes.	Yes.	Yes.

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" (subsection 4.3).
2. This response sub-opcode is used by the Endura/Atlas projects.
3. OFFSET is a 16-bit number in hundredths of degrees.
4. If this response is sent as a command, the response will be as follows:

When received as a command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

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.

	Used/Implemented on						
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	No.	No	No.	No.	No.	No.
ACK	No.	Yes.	No	Yes.	No.	No.	Yes.
NAK	No.	Yes.	No	Yes.	Yes.	Yes.	Yes.

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" (subsection 4.3) of subsubsection 5.59.6.
2. This sub-opcode is used by the Endura/Atlas projects.

	Used/Implemented on						
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No	No	No	No.
Extended	No.	Yes.	No	Yes.	No	No.	Yes.
ACK	No.	No	No	No.	No.	No.	No.
NAK	No.	No	No	No.	Yes.	Yes.	No.

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" (subsection 4.3).
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.
4. If this response is sent as a command, the response will be as follows:

When received as a command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No.	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

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" (subsection 4.3) of subsubsection 5.59.8.

Used/Implemented on							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No	No	No	No.
Extended	No.	Yes.	No	Yes.	No	No.	Yes.
ACK	No.	No	No	No.	No.	No.	No.
NAK	No.	No	No	No.	Yes.	Yes.	No.

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" (subsection 4.3).
2. The format of the ALARM BIT MASK is the same as the format of the alarms in the General Response.
3. If this response is sent as a command, the response will be as follows:

When received as a command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No.	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

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.

Used/Implemented on							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	No.	No	No.	No.	No.	Yes.
ACK	No.	Yes.	No	Yes.	No.	Yes.	No.
NAK	No.	Yes.	No	Yes.	Yes.	Yes.	No.

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 subsubsection 5.59.16.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	No.	No	No.	No.	No.	Yes.
ACK	No.	Yes.	No	Yes.	No.	Yes.	No.
NAK	No.	Yes.	No	Yes.	Yes.	Yes.	No.

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 subsubsection 5.59.16.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	No.	No	No.	No.	No.	Yes.
ACK	No.	Yes.	No	Yes.	No.	Yes.	No.
NAK	No.	Yes.	No	Yes.	Yes.	Yes.	No.

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 subsubsection 5.59.16.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	No.	No	No.	No.	No.	Yes.
ACK	No.	Yes.	No	Yes.	No.	Yes.	No.
NAK	No.	Yes.	No	Yes.	Yes.	Yes.	No.

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 subsubsection 5.59.16.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	No.	No	No.	No.	No.	Yes.
ACK	No.	Yes.	No	Yes.	No.	Yes.	No.
NAK	No.	Yes.	No	Yes.	Yes.	Yes.	No.

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" (subsection 4.3).
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. (subsubsection 5.59.15)
5. If the ID is not supported by the device the response is NAK.
6. This command generates an "Extended Reply" (subsection 4.3) of subsubsection 5.59.15.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	Yes.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	No.

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" (subsection 4.3).
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.
6. If this response is sent as a command, the response will be as follows:

When received as a command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No.	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

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.

Used/Implemented on							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No.	No.	No.	No.
Extended	No.	No.	No	No.	No.	No.	Yes.
ACK	No.	Yes.	No	Yes.	No.	Yes.	No.
NAK	No.	Yes.	No	Yes.	Yes.	Yes.	No.

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" (subsection 4.3) of subsubsection 5.59.18.
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No	No	No	No.
Extended	No.	Yes.	No	Yes.	No	No.	Yes.
ACK	No.	No	No	No.	No.	No.	No.
NAK	No.	No	No	No.	Yes.	Yes.	No.

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" (subsection 4.3).
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
4. If this response is sent as a command, the response will be as follows:

When received as a command							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No.	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

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" (subsection 4.3) of subsubsection 5.59.20.
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.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	1.25	No	Yes	No	No	Yes
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	No.	Yes	No	No	No	No.
Extended	No.	Yes.	No	Yes.	No	No.	Yes.
ACK	No.	No	No	No.	No.	No.	No.
NAK	No.	No	No	No.	Yes.	Yes.	No.

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" (subsection 4.3).
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
6. If this response is sent as a command, the response will be as follows:

When received as a command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No.	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

5.59.21 SMR-Y Command Query the Horizontal Vield-of-view 0x75 Sub Op-Code 0x13

Query the horizontal field-of-view D_EC_EVEREST D_ECS_EVEREST_xxx							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x13	0x75	0x00	0x00	—

FPN

1. This command generates an "Extended Reply" (subsection 4.3).
2. Query the horizontal field-of-view.

When received as a command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No.	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

5.59.22 SMR-Y Response Report the Horizontal Vield-of-view0x75 Sub Op-Code 0x14

Report the horizontal field-of-view D_EC_EVEREST D_ECS_EVEREST_xxx							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	RESP1	RESP2	DATA1	DATA2	CKSM
	0xFF	—	0x14	0x75	FOV MSB	FOV LSB	—

FPN

1. This response is an "Extended Reply" (subsection 4.3).
2. The data bytes report the "zoomed out" horizontal field-of-view of the camera installed in the PTZ (this is a constant value for each camera). The units of the field-of-view are degrees multiplied by a factor of 10 (field of view is often reported by the camera with a tenth degree of accuracy).
   FOV MSB $== (FOV \times 10)/256$
   FOV LSB $= (FOV \times 10) \pmod{256}$

When received as a command							
	Spectra	Spectra	Spectra	Spectra	Esprit	Esprit	ExSite
	II	III	Mini	IV	IOP	TI	
Decoded	No	1.25	No	Yes	No	No	Yes
General	Yes.	No.	Yes	No.	No.	No.	No.
NAK	No.	No	No	Yes.	Yes.	Yes.	No.
No Reply	False.	True.	False	False.	False.	False.	True.

5.60 Command/Responses 0x77 (119), Time Commands

5.60.1 Command format

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

[91] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/77.inc,v 1.41 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

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 (subsection 5.1) depending on the validity of the arguments.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

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" (subsection 4.3).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

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 (subsection 5.1) depending on the validity of the arguments.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

`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” (subsection 4.3).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

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 (subsection 5.1) depending on the validity of the arguments.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

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" (subsection 4.3).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

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 (subsection 5.1) depending on the validity of the arguments.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

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" (subsection 4.3).

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	Yes	Yes	Yes	No	No	No
In Coaxitron®	No	No	No	No	No	No	No
In P	No	No	No	No	No	No	No
General	Yes.	Yes.	Yes	No.	No.	No.	No.
Extended	No.	Yes.	No	Yes.	No.	No.	No.
ACK	No.	No.	No	No.	No.	No.	No.
NAK	No.	No.	No	No.	Yes.	Yes.	Yes.

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

FPN

5.60.11 Background

The[92] Pelco D Protocol does not include any remote time setting commands, simply because a real-time clock has never before been implemented. For Spectra IV, such a feature is included and requires an extension in the protocol to accommodate this.

A time setting function must be handled as a set of commands. This is because the structure of D packets includes only four bytes of data, including the command identifier. Effectively, only two bytes (16 bits) of data can be passed to or from the receiver per transmission.

One solution to this limitation is effectively to extend the command value to 16 bits, rather than the 8 bits of the standard commands. This method has been employed in the Version Information Macro Opcode, and the Everest Macro Opcode commands. These commands employ a primary opcode (`0x73` (subsection 5.58) and `0x75` (subsection 5.59) respectively) and a set of sub-opcodes to expand the utility of the command. The opcode is transmitted as data byte 4, the sub-opcode as byte 3, and any data as bytes 5 and 6. Where data is returned, the same opcode is used with a different sub-opcode. Where the command sends data to the receiver, the responses are ACK or NAK in the extended response format (subsection 5.1). It must also be noted that the opcodes are limited to odd numbers, the least significant bit must be binary 1 to identify it as an opcode as opposed to a motion command.

[92] This write up was originally by: Robert D. Sexton, Sr. Software Engineer, Pelco, March 2, 2006

5.61 Command 0x79 (121), 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" (subsection 4.2).
2. This command is used by the Endura/Atlas projects.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	No	No	1.07	—	No	No
In Coaxitron®	No	No	No	No	—	No	No
In P	No	No	No	No	—	No	No
General	Yes.	Yes.	Yes	Yes.	—	Yes.	Yes

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.

[93] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/79.inc,v 1.28 2010-03-11 15:05:44-08 Hamilton Exp Hamilton $

5.62 Command 0x7B (123_{10}), Video Mode

5.62.1 Command format

VIDEO MODE D_EC_VIDEO_MODE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	CMND1	CMND2	DATA1	DATA2	CKSM
	0xFF	—	0x00	0x7B	Bit Field	Bit Field	—

FPN

1. This command generates either a "General Response" (subsection 4.2) or an "Extended Response" (subsection 4.3). On PTZ units that do not support this command, the reply will be a "General Reply" which indicates the command is not supported. On PTZ units that do support this command, the reply will be a D Protocol ACK or NAK (subsection 5.1). to indicate which features are supported.
2. This command is in P Protocol and Coaxitron® and is identical in operation when received. However P Protocol does not generate the extended or general reply types. And Coaxitron® is a "one-way protocol". Thus in P Protocol and Coaxitron® this is a "write only" command.
3. This command has been implemented in Spectra IV starting with rev 1.09 only when a progressive scan type of camera is installed. These are VK-S434N, VK-S454N and all VK-S654 type cameras[95]. Future versions of the PTZ systems may support additional camera types.
4. A limited sub-set of this function is supported on the Esprit starting with revision 4.04 and following through use of the Esprit's built in menu system only.
5. Not all progressive scan features will be implemented on all models.

Used/Implemented on							
	Spectra II	Spectra III	Spectra Mini	Spectra IV	Esprit IOP	Esprit TI	ExSite
Decoded	No	No	No	1.09	No	No	No
In Coaxitron®	No	No	No	1.09	No	No	No
In P	No	No	No	1.09	No	No	No
General	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Extended	No	No	No	1.09	No	No	No
Standard	No	No	No	1.09	No	No	No

5.62.2 Description

1. Enables various options for Progressive Scan.

   Decoding of this command is done by concatenating DATA1 and DATA2 together and processing them as a single unsigned 16 bit integer.

   1.1 0x0000 VIDEO_MODE_GET_INFO Request the current and supported modes without modifying them. See the Video ACK Response, item 2, below for details.

   1.2 0x0001 VIDEO_MODE_SET_INTERLACED Request to set the video mode to interlaced sensor scan with interlaced video output.

   1.2.1. If this mode is supported the camera will set the mode to interlaced then send a Video Mode ACK reply with updated current mode data (see Video Mode ACK Response, item 2, below).

[94] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/7B.inc,v 1.5 2010-04-15 15:04:23-07 Hamilton Exp Hamilton $
[95] This list is correct in Fall 2008. It is anticipated that in the future additional camera types will be added to the list.

1.2.2. If this mode is not supported for the camera a NAK will be sent.
Note: video will appear smoothest on pure analog devices and devices not supporting field aligned, progressive scan, segmented frame output when set to either `VIDEO_MODE_INTERLACED` or `VIDEO_MODE_PROGRESSIVE_NOT_ALIGNED` video modes.

1.3 `0x0002` `VIDEO_MODE_SET_PROGRESSIVE_NOT_ALIGNED` Request to set the video mode to progressive sensor scan without field aligned segmented frames.

1.3.1. If this mode is supported the camera will set the mode to interlaced then send a Video Mode ACK Response with updated current mode data (see Video Mode ACK Response below).

1.3.2. If this mode is not supported for the camera a NAK will be sent.
Note: video will appear smoothest on pure analog devices and devices not supporting field aligned, progressive scan, segmented frame output when set to either `VIDEO_MODE_INTERLACED` or `VIDEO_MODE_PROGRESSIVE_NOT_ALIGNED` video modes.

1.4 `0x0004` `VIDEO_MODE_SET_PROGRESSIVE_UPPER_ALIGNED` Request to set the video mode to progressive sensor scan with upper field aligned segmented frames.

Digital devices encoding the video, that always adhere to the temporal order of the fields (upper → lower) when combining them into frames, will get frames that were progressively read from the sensor. When combined properly, digital devices will have the benefit of frames that were read at one time period, thus removing jagged edges seen from objects moving horizontally across the video without progressively scanned sensor data with field aligned output.

Note: For maximum resolution digital devices encoding the video must disable any "deinterlacing" algorithms when using this mode.

1.4.1. If this mode is supported the camera will set the mode to interlaced then send a Video Mode ACK Response with updated current mode data (see Video Mode ACK Response, below).

1.4.2. If this mode is not supported for the camera a NAK will be sent.

1.5 `0x0008` `VIDEO_MODE_SET_PROGRESSIVE_LOWER_ALIGNED` Request to set the video mode to progressive sensor scan with lower field aligned segmented frames.

Digital devices encoding the video, that always adhere to the temporal order of the fields (lower → upper) when combining them into frames, will get frames that were progressively read from the sensor. When combined properly, digital devices will have the benefit of frames that were read at one time period, thus removing jagged edges seen from objects moving horizontally across the video without progressively scanned sensor data with field aligned output.

Note: For maximum resolution digital devices encoding the video must disable any "deinterlacing" algorithms when using this mode.

1.5.1. If this mode is supported the camera will set the mode to interlaced then send a Video Mode ACK Response with updated current mode data (see Video Mode ACK Response, below).

1.5.2. If this mode is not supported for the camera a NAK will be sent.

2. Responses to this command are as follows:

2.1 Video Mode ACK Response

This response uses the two data bytes to convey information about the installed camera capabilities. DATA1 reports the current video mode(s) and DATA2 reports the capabilities of the camera.

Video modes supported (by bit):

2.1.1. `0x01` Interlaced

2.1.2. `0x02` Unaligned Progressive Scan

2.1.3. `0x04` Upper Field Aligned Progressive Scan

2.1.4. `0x08` Lower Field Aligned Progressive Scan

Thus if DATA1 and DATA2 are equal to `0x0103` that would indicate that the camera is running in interlaced mode and supports interlaced and unaligned progressive scan modes.

Video Mode ACK Response D_EC_STD_RESPONSE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	ACK	`0x01`	DATA1	DATA2	CKSM
	`0xFF`	—	`0x01`	`0x01`	Bit Field	Bit Field	—

2.2 Video Mode NAK Response

2.2.1. Video Mode NAK uses standard NAK response with no additional data in the data bytes.

2.2.2. Video Mode NAK is issued when a `VIDEO_MODE_SET` request is not a supported mode or if multiple bits (modes) were set in the command.

Video Mode NAK Response D_EC_STD_RESPONSE							
Byte	1	2	3	4	5	6	7
	SYNC	ADDR	NAK	`0x01`	DATA1	DATA2	CKSM
	`0xFF`	—	`0x00`	`0x01`	`0x00`	`0x00`	—

5.62.3 Pelco Questions to Hitachi about these Video Modes

```
From:  Springer, Derek
Sent:  Tuesday, September 30, 2008 11:35 AM
```

Springer, Derek wrote:
Steve,
I'm a little confused about the differences between the 4 different modes available,

1. Interlaced Signal Process Mode,
2. Progressive Signal Process Mode with frame output turned off.
3. Progressive Signal Process Mode with Even (aligned) segmented frame output,
4. Progressive Signal Process Mode with Odd (aligned) segmented frame output, and

I believe I understand all the modes except the last one above, Progressive Signal Process Mode with Frame Output turned off.

The attached pdf has a representation of what I believe the video signal looks like for Progressive Scan with Even alignment, and Interlaced Scan.

I'm not clear what the representation would be for Progressive Scan with Frame Output set to 'Off'.

Would it look like the interlaced scan diagram with 16ms (NTSC) between fields? If so, what is happening with the progressively processed signal information?

Or in this mode is the alignment just not guaranteed (and it may switch back and forth at any given time) but frames (i.e. fields with no time delta between them) do exist in the video output.

Let me know if you, or one of your colleagues, can shed some light on the situation.

Thanks,
Derek Springer
Software Engineer

5.62.4 Answer from Hitachi about these Video Modes

<Edited somewhat>

```
From:  Steve Hodgman [mailto:steve.hodgman@hhea.hitachi.com]
Sent:  Wednesday, October 01, 2008 1:47 PM
To:  Springer, Derek
Cc:  Kevin Komatsu
Subject:  Re:  Frame Output Modes (in Progressive Signal Process Mode), OFF
Vs.  Odd/Even Vs Interlaced Signal Process Mode
```

Hi Derek,

OK, I will try to explain the differences among the various output options with our 35X VK-S654 series and the new 23X VK-S454N series cameras.

1. **Signal Processing Modes**

   1.1 **Interlace Signal Processing Mode** (Not available on the Esprit) Figure 2 block marked "Interlaced Sensor Processing".

   In the interlaced processing mode the CCD is operated in interlace scanning mode.

   1.1.1. For each of the "CCD Field" time periods, the CCD will output half of the lines in a combined format.

   1.1.2. For the Odd CCD "field", lines 1 & 2 will be combined, lines 3 & 4, 5 & 6, and so on.

   1.1.3. For the Even CCD "field", lines 2 & 3 will be combined, 4 & 5, 6 & 7, and so on.

   The actual combination takes place during the next "field" when the pixel charges accumulated during the previous "field" are output from the CCD via the horizontal and vertical shift registers.

   In the interlaced processing mode the DSP IC and all of the algorithms will function using only half of the CCD lines during each "field" time period.

   The benefit of interlace processing mode is a theoretical 6db increase in camera sensitivity due to the CCD line combination in interlaced scanning mode.

   1.2 **Progressive Signal Processing Mode** (Default mode for the Esprit) Figure 2 block marked "Progressive Sensor Processing".

   In the progressive processing mode the CCD is operated in progressive scanning mode.

   1.2.1. For each of the "CCD Field" time periods, the CCD will output all of the lines in a separated format. All CCD lines are output in order from 1, 2, 3, 4, and so on exactly the same for each "field".

   1.2.2. In the progressive processing mode the DSP IC and all of the algorithms will function using all of the CCD lines during each "field" time period. The additional CCD lines in progressive processing mode enable more accurate algorithm performance and produce better video.

2. **Output Options**

   As you know, in order to maintain compatibility with all of the installed standard interlaced video monitors, **all of our analog cameras will always output an interlaced signal regardless of internal signal processing mode**.

2.1 **Interlaced Signal Processing Mode** (Not available in the Esprit) Figure 2 block marked "Video Frame Output Off".

In this mode the camera output will follow the interlace CCD output signal. So the Odd interlaced camera output field signal will consist of the CCD lines 1 & 2 combined, lines 3 & 4 combined, 5 & 6, and so on. The Even interlaced camera output field signal will consist of the CCD lines 2 & 3 combined, 4 & 5 combined, 6 & 7, and so on.

2.2 **Progressive Signal Processing Mode**

2.2.1. **Frame Output mode OFF** Figure 2 block marked "Video Frame Output Off".
In this mode all of the CCD lines are processed by the DSP IC and are available at the final progressive-to-interlace converter block.

2.2.1.1. The Odd interlaced camera output field will consist of the Odd CCD lines, 1, 3, 5, 7, and so on from the "first" CCD output "field".

2.2.1.2. The Even interlaced camera output field will consist of the Even CCD lines, 2, 4, 6, 8, and so on, from the "next" CCD output "field".

2.2.1.3. The remaining CCD output lines from each CCD "field" are not output. Whether the "first" CCD output "field" is the "Odd CCD field" or the "Even CCD field" will depend upon the camera mode and the setting in register `$FF54/$144F`.

2.2.1.4. In normal camera output mode the "first" CCD output "field" will be the "Odd CCD field" while the "next" CCD output "field" will be the "Even CCD field".

In the Frame Output, WDR, DSS, Freeze, Reverse, or Mirror modes, the order will be selected by the value in register `$FF54/$144F`.

2.2.2. **Frame Output mode ON — Odd Field**
Frame Output mode ON — Even Field Figure 2 block marked "Video Frame Output Odd" and "Video Frame Output Even".
In the Frame Output mode both camera interlaced output fields will come from the same processed CCD "field" output.

2.2.2.1. So the Odd interlaced camera output field will consist of the Odd CCD lines, 1, 3, 5, 7, and so on from the "first" CCD output "field".

2.2.2.2. The Even interlaced camera output field will consist of the Even CCD lines, 2, 4, 6, 8, and so on, from the exact same CCD output "field".

2.2.2.3. The signal from the next CCD output is not output. So you are only seeing the video information from every other CCD "field". Since each camera interlaced output field originated from the same CCD "field" (i.e. the same moment in time), there will be no position displacement between the same objects in each "field" image.

2.2.2.4. If this interlaced output frame is captured by a "full frame" video capture device or "frame" DVR/NVR, the frame stills will be perfectly motionless and clear with double the vertical resolution, even if there was motion in the captured scene. Of course the capture device/DVR/NVR must match the Odd/Even field order or the motion artifacts will be twice as bad.

2.2.2.5. The Odd/Even field order is again selectable by the value in register `$FF54/$144F`.

3. It is somewhat difficult to explain/understand what is happening with the different modes of a camera that has Interlace mode, Progressive mode (with interlaced output), and our Frame Output mode (with field order selection). Also, that is why I put the word "field" in quotes when referring to a progressive scan CCD. The word "field" will have different meanings depending for a progressive scan CCD and an interlace output camera and video monitors.

Anyhow, look this stuff over and let me know if you have any follow up questions.
Regards,
Steve

```
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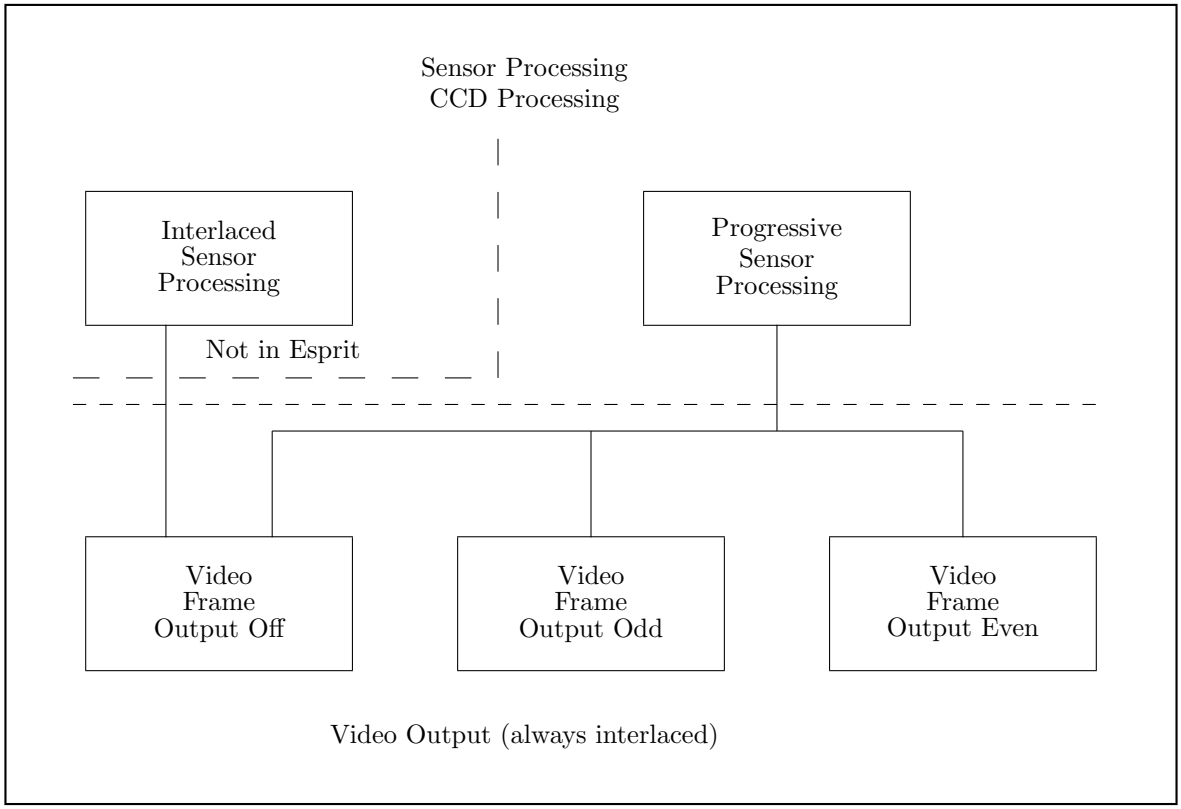
5.62.5 Understanding Interlaced/Progressive modes

The exact interlationship between Interlaced and Progressive (and more recently Normal and High Sensitivity[96]) modes of camera operation is beyond the scope of a protocol document. The following Hitachi Confidential Proprietary documents describe the various features of these modes as the modes apply to each of their camera modules. Hitachi frequently updates the camera module software and so only the information contained in these documents should be used for using these various camera module modes.

When searching Hitachi manuals, look for the following hexadecimal addresses: `1221`, `144F` and `FF54`. Hitachi changed the names of these items from time to time.

Manual Name	Page
`434N_NewComm_E10`	17
`454N_NewComm_E11`	17
`P554_Comm_E14`	54
`P554_NewComm_E12`	33
`S624N_Comm_E10`	75
`S624N_NewComm_E10`	32, 45
`S654_Comm_E131`	59
`S654_NewComm_E12`	34
`S654N_Comm_E13`	83
`S654N_NewComm_E13`	34, 46
`S654R_Comm_E10_R1`	55
`S654R_NewComm_E11`	42

[96] Starting with the VK-S654N camera series the terms Interlaced and Progressive were renamed to become High-Sensitivity and Normal modes. (Or it may be the other way around.)



$RCSfile: dots.inc,v $

Figure 2: Interlace/Progressive Mode Processing and Video Output

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:/Binder06.Protocols/DProtoDoc/RCS/S2Rev.dat,v 1.2 2010-03-12 12:16:20-08 Hamilton Exp Hamilton $
 2  Spectra II, Rev S3.31
 3  DCE      34    11.462325  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  ff 01 50 47 35 33 2d 30 30 36 30 2d 53 33 33 31 00 50
 6  DCE      59    12.590205  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  ff 01 50 47 35 33 2d 30 30 36 30 2d 53 33 33 31 00 51
 9  DCE      84    13.718040  ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.748785  ff 01 00 74
11  DCE      95    14.846040  ff 01 02 73 00 00 76  Build query
12   DTE    102    14.877727  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:/Binder06.Protocols/DProtoDoc/RCS/S3Rev.dat,v 1.2 2010-03-12 12:16:20-08 Hamilton Exp Hamilton $
 2  Spectra III, Rev 1.34
 3  DCE      34    11.462343  ff 01 00 45 00 00 46  Part number query
 4                                  D  D  5  3  C  2  2
 5   DTE     41    11.492664  ff 01 44 44 35 33 43 32 32 00 00 00 00 00 00 00 00 de
 6  DCE      59    12.590233  ff 01 01 45 00 00 47  Serial number query
 7                                  D  D  5  3  C  2  2
 8   DTE     66    12.620557  ff 01 44 44 35 33 43 32 32 00 00 00 00 00 00 00 00 df
 9  DCE      84    13.718149  ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.747879  ff 01 01 73 00 86 fb  1.34
11  DCE      98    14.846066  ff 01 02 73 00 00 76  Build query
12   DTE    105    14.875918  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:/Binder06.Protocols/DProtoDoc/RCS/MRev.dat,v 1.2 2010-03-12 12:16:19-08 Hamilton Exp Hamilton $
 2  Spectra Mini, Rev 1.23
 3  DCE      12     1.100139  ff 01 00 45 00 00 46  Part number query
```

[97] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Revs.inc,v 1.14 2009-05-01 07:38:53-07 Hamilton Exp Hamilton $

```
 4                                    M  I  N  I     1  1  4  R  -  X
 5   DTE     19     1.114932  ff 01 4d 49 4e 49 20 31 31 34 52 2d 58 00 00 00 00 01
 6  DCE      37     2.251495  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  ff 01 4d 49 4e 49 20 31 31 34 52 2d 58 00 00 00 00 02
 9  DCE     185    12.619487  ff 01 00 73 00 00 74  Software rev query
10   DTE    192    12.634248  ff 01 00 74
11  DCE     196    13.770828  ff 01 02 73 00 00 76  Build query
12   DTE    203    13.785538  ff 01 00 76
```

The software rev data is read out using the diagnostic information query (`0x6F` subsection 5.56) opcode: (This data comes from a different dome than the previous readout.)

```
 1  $Header: d:/Binder06.Protocols/DProtoDoc/RCS/MRev71.dat,v 1.2 2010-03-12 12:16:19-08 Hamilton Exp Hamilton
$
 2  Spectra Mini, Rev 1.23
 3  DCE    1875   812.401611 ff 01 00 6f 00 00 70 Diagnostic Information Query
 4                                     1  .  2  3
 5   DTE   1882   812.409717 ff 01 00 71 60 01 31 2e 32 33 97
```

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:/Binder06.Protocols/DProtoDoc/RCS/S4Rev.dat,v 1.2 2010-03-12 12:16:20-08 Hamilton Exp Hamilton $
 2  Spectra IV, Rev 1.050
 3  DCE      34    11.470258  ff 01 00 45 00 00 46  Part number query
 4                                    D  D  4  C  B  W  3  5
 5   DTE     41    11.500216  ff 01 44 44 34 43 42 57 33 35 00 00 00 00 00 00 00 47
 6  DCE      59    12.598173  ff 01 01 45 00 00 47  Serial number query
 7                                    5  7  7  9  8  4  2
 8   DTE     66    12.628027  ff 01 35 37 37 39 38 34 32 00 00 00 00 00 00 00 00 c2
 9  DCE      84    13.726064  ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.756231  ff 01 01 73 04 1a 93  1.050
11  DCE      98    14.854007  ff 01 02 73 00 00 76  Build query
12   DTE    105    14.884018  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:/Binder06.Protocols/DProtoDoc/RCS/s4tc16.dat,v 1.3 2010-03-12 12:16:21-08 Hamilton Exp Hamilton
$
 2  Spectra IV, TC-16, Rev 1.07
 3   DTE     34    10.365612  ff 01 00 45 00 00 46  Part number query
 4                                    D  D  4  T  C  1  6
 5  DCE      41    10.394552  ff 01 44 44 34 54 43 31 36 00 00 00 00 00 00 00 00 01
 6   DTE     59    11.518137  ff 01 01 45 00 00 47  Serial number query
 7                                    7  4  5  6  7  4  7
 8  DCE      66    11.547364  ff 01 37 34 35 36 37 34 37 00 00 00 00 00 00 00 00 c0
 9   DTE     84    12.670377  ff 01 00 73 00 00 74  Software rev query
10  DCE      91    12.699736  ff 01 01 73 04 2e a7  1.070
11   DTE     98    13.822615  ff 01 02 73 00 00 76  Build query
12  DCE     105    13.851712  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:/Binder06.Protocols/DProtoDoc/RCS/s4h.dat,v 1.2 2010-03-12 12:16:21-08 Hamilton Exp Hamilton $
 2  Spectra IV Horizon, rev 1.071
 3   DTE     34    10.430965  ff 01 00 45 00 00 46  Part number query
 4                                D  D  4  H  3  5
 5  DCE      41    10.438667  ff 01 44 44 34 48 33 35 00 00 00 00 00 00 00 00 b3
 6   DTE     59    11.583296  ff 01 01 45 00 00 47  Serial number query
 7                                8  4  5  4  0  8  0
 8  DCE      66    11.591231  ff 01 38 34 35 34 30 38 30 00 00 00 00 00 00 00 b5
 9   DTE     84    12.735633  ff 01 00 73 00 00 74  Software rev query
10  DCE      91    12.743471  ff 01 01 73 04 2f a8  1.071
11   DTE     98    13.886954  ff 01 02 73 00 00 76  Build query
12  DCE     105    13.894669  ff 01 03 73 00 01 78  1
```

A.7 Esprit

A.7.1 Esprit CBW24 PAL

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:/Binder06.Protocols/DProtoDoc/RCS/EsRev.dat,v 1.2 2010-03-12 12:16:18-08 Hamilton Exp Hamilton $
 2  Esprit 24X, Rev 3.36 PAL, With wiper
 3  DCE      34    10.558229  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  ff 01 45 53 33 31 43 42 57 32 34 58 20 20 20 20 20 7d
 6  DCE      59    11.709581  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  ff 01 45 53 33 31 43 42 57 32 34 58 20 20 20 20 20 7e
 9  DCE      84    12.862889  ff 01 00 73 00 00 74  Software rev query
10   DTE     91    12.892847  ff 01 00 01 00 00 02  Endura Nak
11  DCE      98    14.014217  ff 01 02 73 00 00 76  Build query
12   DTE    105    14.045763  ff 01 00 01 00 00 02  Endura Nak
```

A.7.2 Esprit CBW NTSC

This is similar to the older Esprit response (subsubsection A.7.1), however it has an additional "`a`" character to indicate that this 23X camera is a newer model (type "`N`") with more lines of resolution. Also additional information is available starting at rev Esprit 3.86. The additional information is the camera data with DIP switch settings and an SMR number if applicable.

```
 1  # Esprit 23X NTSC IOP rev 3.86, SMR 1-11UXTS
 2  # $Header: d:/Binder06.Protocols/DProtoDoc/RCS/ES18a.dat,v 1.4 2009-02-09 14:23:24-08 Hamilton Exp Hamilton
$
 3   DTE     1     0.000000 ff 01 00 00 00 00 01
 4  DCE      8     0.033389 ff 01 00 01
 5   DTE    12     1.027500 ff 01 00 45 00 00 46 Part number query
 6                            E  S  3  1  C  B  W  1  8  X
 7  DCE     19     1.065135 ff 01 45 53 33 31 43 42 57 31 38 61 20 20 20 20 20 89
 8   DTE    37     2.053855 ff 01 01 45 00 00 47 Serial number query
```

```
 9                                E  S  3  1  C  B  W  1  8  X
10  DCE     44     2.087545 ff 01 45 53 33 31 43 42 57 31 38 61 20 20 20 20 20 8a
11   DTE    62     3.080182 ff 01 02 45 00 00 48 Camera and DIP switch query
12                                E  0  0  5  -  0  1  0  4     0  0     0  1
13  DCE     69     3.116516 ff 01 45 30 30 35 2d 30 31 30 34 20 30 30 20 30 31 16
14   DTE    87     4.106563 ff 01 03 45 00 00 49 SMR, if any, query
15                                S  M  R     1  -  1  1  U  X  T  5
16  DCE     94     4.143677 ff 01 53 4d 52 20 31 2d 31 31 55 58 54 35 20 20 20 b2
17   DTE   162     7.186588 ff 01 00 73 00 00 74 Software rev query
18  DCE    169     7.220552 ff 01 01 73 01 82 f8 3.86
19   DTE   176     8.215364 ff 01 02 73 00 00 76 Software build query
20  DCE    183     8.271880 ff 01 00 01 00 00 02 Endura NAK reply
21   DTE   190     9.244689 ff 01 00 6f 00 00 70 Mini-Spectra software query
22  DCE    197     9.274875 ff 01 00 70          General response
```

A.7.3 Esprit CBW PAL

This is similar to the older Esprit response (subsubsection A.7.1), however it has an additional "a" character to indicate that this 23X camera is a newer model (type "N") with more lines of resolution. Also additional information is available starting at rev Esprit 3.86. The additional information is the camera data with DIP switch settings and an SMR number if applicable.

```
 1  # Esprit 23X PAL IOP rev 3.86, SMR 1-11UXTS
 2  # $Header: d:/Binder06.Protocols/DProtoDoc/RCS/ES18xa.dat,v 1.4 2009-02-09 11:48:52-08 Hamilton Exp Hamilton
$
 3   DTE    12     1.027267 ff 01 00 45 00 00 46 Part number query
 4                                E  S  3  1  C  B  W  1  8  X  a
 5  DCE     19     1.056938 ff 01 45 53 33 31 43 42 57 31 38 58 61 20 20 20 20 c1
 6   DTE    37     2.054585 ff 01 01 45 00 00 47 Serial number query
 7                                E  S  3  1  C  B  W  1  8  X  a
 8  DCE     44     2.089324 ff 01 45 53 33 31 43 42 57 31 38 58 61 20 20 20 20 c2
 9   DTE    62     3.081902 ff 01 02 45 00 00 48 Camera type and DIP switch query
10                                E  0  1  5  -  0  1  0  4     0  0     0  1
11  DCE     69     3.114570 ff 01 45 30 31 35 2d 30 31 30 34 20 30 30 20 30 31 17
12   DTE    87     4.109273 ff 01 03 45 00 00 49 SMR number query, if there
13                                S  M  R     1  -  1  1  U  X  T  5
14  DCE     94     4.142982 ff 01 53 4d 52 20 31 2d 31 31 55 58 54 35 20 20 20 b2
15   DTE   162     7.190236 ff 01 00 73 00 00 74 Software rev query
16  DCE    169     7.224439 ff 01 01 73 01 82 f8 3.86
17   DTE   176     8.217060 ff 01 02 73 00 00 76 Software build query, no reply
18   DTE   183     9.244398 ff 01 00 6f 00 00 70 Mini-Spectra Software rev query
19  DCE    190     9.277514 ff 01 00 70          General response reply
```

A.7.4 Esprit CBW PAL

This is similar to the older Esprit response (subsubsection A.7.1), Additional information is available starting at rev Esprit 3.86. The additional information is the camera data with DIP switch settings and an SMR number if applicable.

```
 1  # Esprit 24X PAL IOP rev 3.86, SMR 1-11UXTS
 2  # $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Es24x.dat,v 1.2 2010-03-12 12:16:18-08 Hamilton Exp Hamilton
$
 3   DTE    12     1.007127 ff 01 00 45 00 00 46
 4                                E  S  3  1  C  B  W  2  4  X
 5  DCE     19     1.016280 ff 01 45 53 33 31 43 42 57 32 34 58 20 20 20 20 20 7d
 6   DTE    37     2.013908 ff 01 01 45 00 00 47
 7                                E  S  3  1  C  B  W  2  4  X
```

```
 8  DCE     44     2.025306 ff 01 45 53 33 31 43 42 57 32 34 58 20 20 20 20 20 7e
 9   DTE    62     3.021745 ff 01 02 45 00 00 48
10                                 1  0  1  1  -  0  1  0  5     0  2     0  1
11  DCE     69     3.033189 ff 01 31 30 31 31 2d 30 31 30 35 20 30 32 20 30 31 02
12   DTE    87     4.027591 ff 01 03 45 00 00 49
13                                 S  M  R     1  -  1  1  U  X  T  5
14  DCE     94     4.039407 ff 01 53 4d 52 20 31 2d 31 31 55 58 54 35 20 20 20 b2
15   DTE   162     7.049995 ff 01 00 73 00 00 74
16  DCE    169     7.058781 ff 01 01 73 01 82 f8
17   DTE   176     8.058290 ff 01 02 73 00 00 76
18  DCE    183     8.066562 ff 01 00 01 00 00 02
19   DTE   190     9.067144 ff 01 00 6f 00 00 70
20  DCE    197     9.075385 ff 01 00 70
```

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:/Binder06.Protocols/DProtoDoc/RCS/TIRev.dat,v 1.3 2010-03-12 12:16:21-08 Hamilton Exp Hamilton $
 2  Esprit TI, Rev unknown
 3  DCE      34    11.463211  ff 01 00 45 00 00 46  Part number query
 4                                E  S  3  0  1  4  T  I
 5   DTE     41    11.497948  ff 01 45 53 33 30 31 34 54 49 00 00 00 00 00 00 00 44
 6  DCE      59    12.591196  ff 01 01 45 00 00 47  Serial number query
 7                                6  7  2  4  3  7  0
 8   DTE     66    12.621723  ff 01 36 37 32 34 33 37 30 00 00 00 00 00 00 00 00 b5
 9  DCE      84    13.711300  ff 01 00 73 00 00 74  Software rev query
10   DTE     91    13.745056  ff 01 00 01 00 00 02  Endura Nak
11  DCE      98    14.831403  ff 01 02 73 00 00 76  Build query
12   DTE    105    14.862998  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:/Binder06.Protocols/DProtoDoc/RCS/ExRev.dat,v 1.2 2010-03-12 12:16:18-08 Hamilton Exp Hamilton $
 2  ExSite, Rev 1.13
 3  DCE      34    10.462784  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  ff 01 49 50 53 58 4d 33 30 43 32 32 20 20 20 20 20 82
 6  DCE      59    11.582862  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  ff 01 49 50 53 58 4d 33 30 43 32 32 20 20 20 20 20 83
 9  DCE      84    12.702991  ff 01 00 73 00 00 74  Software rev query
10   DTE     91    12.733001  ff 01 01 73 00 71 e6  1.13
11  DCE      98    13.823069  ff 01 02 73 00 00 76  Build query
12   DTE    105    13.852974  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:/Binder06.Protocols/DProtoDoc/RCS/FExRevP.dat,v 1.3 2010-03-12 12:16:19-08 Hamilton Exp Hamilton
$
 2  Fixed ExSite rev 1.13
 3  DCE      34    10.463435  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  ff 01 58 4d 33 31 43 42 57 32 33 58 20 20 20 20 20 89
 6  DCE      59    11.583435  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  ff 01 58 4d 33 31 43 42 57 32 33 58 20 20 20 20 20 8a
 9  DCE      84    12.703515  ff 01 00 73 00 00 74  Software rev query
10   DTE     91    12.732950  ff 01 01 73 00 71 e6  1.13
11  DCE      98    13.823617  ff 01 02 73 00 00 76  Built query
12   DTE    105    13.853314  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:/Binder06.Protocols/DProtoDoc/RCS/FExRevN.dat,v 1.4 2010-03-12 12:16:19-08 Hamilton Exp Hamilton
$
 2  Fixed ExSite rev 1.13
 3    DTE     34    10.558073  ff 01 00 45 00 00 46  Part number query
 4                                X  M  3  0  C  2  2
 5   DCE      41    10.587717  ff 01 58 4d 33 30 43 32 32 20 20 20 20 20 20 20 20 f6
 6    DTE     59    11.710315  ff 01 01 45 00 00 47  Serial number query
 7                                X  M  3  0  C  2  2
 8   DCE      66    11.739750  ff 01 58 4d 33 30 43 32 32 20 20 20 20 20 20 20 20 f7
 9    DTE     84    12.860571  ff 01 00 73 00 00 74  Software rev query
10   DCE      91    12.890114  ff 01 01 73 00 71 e6  1.13
11    DTE     98    14.014062  ff 01 02 73 00 00 76  Build query
12   DCE     105    14.043369  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 (subsection 5.22) 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 (subsection 5.21) 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 (subsection 5.23) 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 (subsection 5.21).

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 (subsection 5.34) 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.

[98] `$Header: d:/Binder06.Protocols/DProtoDoc/RCS/CC.inc,v 1.1 2007-10-30 07:09:33-08 Hamilton Exp Hamilton $`

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

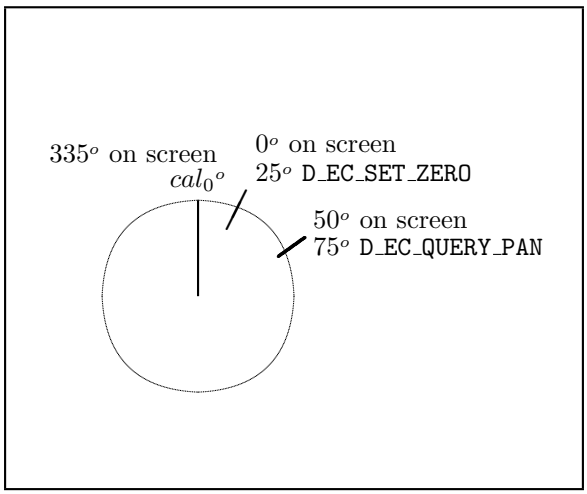


Figure 3: D Protocol Pan Readout Positions

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.

[99] `$Header: d:/Binder06.Protocols/DProtoDoc/RCS/PTdata.inc,v 1.6 2008-08-20 09:06:12-07 Hamilton Exp Hamilton $`

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 subsection 5.44). 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 subsection 5.51). 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 subsection 5.52). 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 subsection 5.53). 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.

[100] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Sp3Down.inc,v 1.5 2007-12-26 14:37:09-08 Hamilton Exp Hamilton $

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` subsection 5.51). 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 only. Turns off AUX 1 with the ExSite.
0x55/85_{10}	PRESET_AUX2	Set Call	Turns on AUX 2 with the ExSite only. 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 only.
	—	Call	"White Hot" choice with the Esprit TI
	—	Call	Toggles inversion of video **only** on Spectra IV units with 23X and 35X cameras installed. Does not invert controls. I.e. left/right pan do the "backwards thing" when the video is inverted. Originally an SMR (SMR 1-1B9GVC) planned for Spectra IV rev 2.01 and following.
	—	Set	No effect with the Esprit TI or Spectra IV.
0x57/87_{10}	PRESET_WASHER	Call	Turns on the Wash cycle on the ExSite only.
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. (subsection E.2)
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

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[101] $Header: d:/Binder06.Protocols/DProtoDoc/RCS/Presets.inc,v 1.9 2011-02-02 13:12:41-08 Hamilton Exp Hamilton $

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PRESET ID	Name	Set/-Call	Use
0x5A/90_{10} (0x17/23_{10})	PRESET_MANUAL_LEFT_-LIMIT	Set	Standard in all units, sets a left hand motion limit.
		Call	No effect
		Clear	Clears this limit
0x5B/91_{10} (0x18/24_{10})	PRESET_MANUAL_-RIGHT_LIMIT	Set	Standard in all units, sets a right hand motion limit.
		Call	No effect
		Clear	Clears this limit
0x5C/92_{10} (0x19/25_{10})	PRESET_SCAN_LEFT_-LIMIT	Set	Standard in all units, sets a left hand scanning limit.
		Call	No effect
		Clear	Clears this limit
0x5D/93_{10} (0x1A/26_{10})	PRESET_SCAN_RIGHT_-LIMIT	Set	Standard in all units, sets a right hand scanning limit.
		Call	No effect
		Clear	Clears this limit
0x5E/94_{10} (0x1B/27_{10})	PRESET_RESET	Set	Reserved for future use.
		Call	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	Standard in all units, accesses the menu system.
		Call	Ignored, to get into menu mode a set **must** be used.
0x60/96_{10} (0x1D/29_{10})	PRESET_STOP_SCAN	Set	Standard in all units, stops automatic scans.
		Call	Same as a Set command
0x61/97_{10} (0x1E/30_{10})	PRESET_RANDOM_SCAN	Set	Standard in all units, starts random scanning.
		Call	Same as a Set command
0x62/98_{10} (0x1F/31_{10})	PRESET_FRAME_SCAN	Set	Standard in all units, starts frame scanning.
		Call	Same as a Set command
0x63/99_{10} (0x20/32_{10})	PRESET_AUTO_SCAN	Set	Standard in all units, starts automatic scanning.
		Call	Same as a Set command

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PRESET ID	Name	Set/-Call	Use

E.1 Note on preset processing in a Spectra III

Tests[102] seem to show a general trend in how Spectra III processes back-to-back presets (or back-to-back commands in general). The Spectra III will queue all commands and handle them in the order of arrival. If the commands happen to be back-to-back preset commands, Spectra III requires about 1.5 seconds (or more) to go to each preset position. So it's easy for a Spectra III to fall behind if commands are arriving every .5 seconds. Spectra III will eventually "catch up" with the commands in the queue or the queue will overflow (causing dropped commands). The Spectra III queue can hold up to 128 bytes (or 18 D Protocol commands).

Testing consisted of sending D Protocol commands directly with variable timing. 3 preset commands were sent in the same order over and over. When the queue filled up and the controller sending the commands war halted, the Spectra III would play "catch up" and execute the left over preset commands in the queue.

There is a known case where a preset will be dropped. If the custom camera settings on 2 back-to-back presets are different (specifically if the focus mode of the 2 presets is different), Spectra III will drop the second preset.

It is unclear why 1.5 seconds are required to get to a preset. It may be that the pan/tilt motion is almost immediate. Getting the camera into the correct position might be the part of the preset that takes the longest. There's a set of internal commands that are sent to the camera on every preset.

E.2 IR Cut Filter

How I can turn on/off the IR-filter[103]?

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>
            |
            |--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....

[102] Originally by: Craig Hannen, Wednesday, October 26, 2005 12:13 PM
[103] From an e-mail by Derek Springer, 24APR06.

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.
   - 1.4 Added in information about newly discovered replies from the Mini Spectra that relate to:
     - 1.4.1. Spot cancel action.
     - 1.4.2. Revision level.
     - 1.4.3. Motor current check.
     - 1.4.4. Unit temperature.
   - 1.5 Added in information about reporting of the internal temperature of the Spectra IV.
   - 1.6 Added in information about the P Protocol single byte replies.
2. June 2008, revision 5.0.2:
   - 2.1 Several spelling and grammar fixes.
   - 2.2 Added in cross references between reply types and their definitions.
3. March 2010, revision 5.1.1:
   - 3.1 Added hyper links to the document.
   - 3.2 Added new information about the query command (subsection 5.35).
   - 3.3 Minor english fixes through out.
4. April 2010, revision 5.1.2:
   - 4.1 Documented op-code `0x7B`, which was missed earlier. It has been in shipping products for at least 6 months.

[104] `$Header: d:/Binder06.Protocols/DProtoDoc/RCS/ChngeLog.inc,v 1.4 2010-04-20 14:44:49-07 Hamilton Exp Hamilton $`

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