

iDome/ER2221 Protocols

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¹\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/iDome.tex,v 1.7 2007-07-26 14:24:32-07 Hamilton Exp Hamilton \$

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1 Introduction to the Cohu Protocols[intro]

Cohu has many different systems deployed among their various customers. This results in several different versions of their control protocol. Most of it is similar but there are many differences.

A result of the variations in the various active Cohu protocols, is that it is difficult to determine exactly what commands are valid and will need to be translated. This publication has been extracted from various Cohu protocol sources to put in one place some indication of the breadth of the variations in Cohu's protocol suite. An "annotated" index has been provided to give a quick reference as to which sub-protocol is documented to generate each command. The annotations consist of the sub-protocol type name being prepended to each entry.

1.1 The Cohu Web Site

Cohu has a helpful web site at www.cohu-cameras.com. This web site has much useful data about the Cohu product line and includes a downloadable GUI, instructions on how to use the GUI, information about their protocols and information about their product line.

When the web site is accessed, select the "Tech Center" option to get to the most interesting page which has pointers to most of their technical documents. The web site does not require "registration" prior to being allowed to access/download information.

A typical abridged version of the Cohu Web Site is in Appendix , page 1.

1.2 Cohu Number Representations[intro:cohunumbers]

Cohu has a special version of hexadecimal encoding that they use for transferring data across the communications medium. In the "Cohu-hexadecimal" the characters in Table 1, page 5 are used.

Cohu-Hex	Value	Cohu-Hex	Value	Cohu-Hex	Value	Cohu-Hex	Value
0 _{ASCII}	0 ₁₀ /0 ₁₆	4 _{ASCII}	4 ₁₀ /4 ₁₆	8 _{ASCII}	8 ₁₀ /8 ₁₆	< _{ASCII}	12 ₁₀ /C ₁₆
1 _{ASCII}	1 ₁₀ /1 ₁₆	5 _{ASCII}	5 ₁₀ /5 ₁₆	9 _{ASCII}	9 ₁₀ /9 ₁₆	= _{ASCII}	13 ₁₀ /D ₁₆
2 _{ASCII}	2 ₁₀ /2 ₁₆	6 _{ASCII}	6 ₁₀ /6 ₁₆	: _{ASCII}	10 ₁₀ /A ₁₆	> _{ASCII}	14 ₁₀ /E ₁₆
3 _{ASCII}	3 ₁₀ /3 ₁₆	7 _{ASCII}	7 ₁₀ /7 ₁₆	; _{ASCII}	11 ₁₀ /B ₁₆	? _{ASCII}	15 ₁₀ /F ₁₆

Table 1: Cohu-Hexadecimal to decimal and normal hexadecimal[intro:cohuhex]

It should be noted that, in except for a few places in any of the currently know Cohu protocols, Cohu does not use any value other than "normally printable" ASCII on the communications media. These exceptions are: control characters for AUTOBAUD, ACK, NAK, STX and ETX, the CAMERAADDRESS and for presets on system that support more than 64 presets. In all other places the data that actually appears on the communications media, is printable. In some places this causes some confusion. In the Cohu protocol documents when they want to indicate that they are sending an ASCII "0" they will say that they are sending a 0x30, or sometimes just 30 and in other places it is "0", '0' or just 0.

There has been an effort in this set of documentation to use the phrase "0_{ASCII}" whenever a numeric value is sent in ASCII. There are places where this gets somewhat bizarre. This happens when Cohu is trying to extend the decimal range of numbers into the hexadecimal realm and they start using characters such as :;<=>? to represent ABCDEF. Usually instead of writing the Cohu version of hexadecimal "as is" an effort has been made to say things such as "::_{ASCII}" for 0xA, etc. See the Table 1, page 5 for the equivalences.

²\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/Intro.inc,v 1.16 2007-07-27 08:51:50-07 Hamilton Exp Hamilton \$

In a small number of places, Cohu tries to indicate individual bits in a byte. In some places they will use the phrase “B0” to indicate the least significant bit. There has been an effort in this document to indicate the least significant bit in a byte this way “ B_0 ”.

A common entry in the Cohu documentation is of the form “r##” (this is a variable speed pan right command). By this they are trying to say to use values from “r0” ($r0_{ASCII}$) through “r?”, ($r?_{ASCII}$). The “##” is usually described in the documentation as having a range of “##: 16 variable speed controls (from 30 hex to 3F hex)”. And then on the same page they will say “f#” (variable speed focus far) with the explanation saying: “0’ = (Low Speed)”, etc. Now they are using the actual ASCII character instead of its hexadecimal representation. Again an effort has been made to “translate” statements similar to this into: “ 0_{ASCII} = Low Speed”, etc.

1.3 Basic Types of Cohu Systems

Cohu utilizes several similar protocols to control their line of PTZ units. There are two basic groups of these protocols:

1. The older types of units, called **MPC** types, have fixed speed control in pan/tilt, ten presets and provide pointing values encoded as three Cohu-hexadecimal bytes of data. These include at least the following types:

- 1.1 MPC-D,
- 1.2 ER2221B,
- 1.3 ER2222,
- 1.4 36XX and
- 1.5 27XX

These type names were obtained by reading the choices of camera types in WinMPC rev 4.703.

2. The newer set of units, called **iDome** type units, all have variable speed operation in pan/tilt, have 64 presets and provide pointing information in four bytes of data. These include at least the following types:

- 2.1 iDome,
- 2.2 Dome,
- 2.3 Positioner,
- 2.4 LCU,
- 2.5 iViewII,
- 2.6 596X,
- 2.7 696X and
- 2.8 4200

These type names were obtained by reading the choices of camera types in WinMPC rev 4.703.

1.4 Differences Between Various Cohu Systems

In all of the sample commands below, the boiler plate of AUTOBAUD, address and CHECKSUM have been dumped.

1. MPC type:

- 1.1 Fixed speed operation only. I.e. motion commands are of the form PR, PL, TU, TD etc.
- 1.2 Has **10** presets.
- 1.3 Pointing data is **3** bytes long for each axis.
- 1.4 Does **not** respond to requests for software version (**RS**).
- 1.5 Does **not** respond to requests for DSP status (**cDS**).
- 1.6 Responds to H? (home position) requests **with** extra latch data. I.e. H? causes HIL2A4X0 to be generated.

2. iDome type:

- 2.1 Both fixed and variable speed operation. I.e. motion commands are of the form PR, PL, TU, TD and r2, l3, u4, d5, etc.
- 2.2 Has **64** presets.
- 2.3 Pointing data is **4** bytes long for each axis.
- 2.4 Does respond to requests for software version (**RS**).
- 2.5 Does respond to requests for DSP status (**cDS**).
- 2.6 Responds to H? (home position) requests with **no** latch data. I.e. H? causes HI to be generated.

1.5 Cohu Protocol Documents

The net result of this is that Cohu has many variations of their basic protocol. So far the following protocol documents have been downloaded from the Cohu web site.

- 1. 3500PRO.PDF A modified version of this document is in Section , page 1.
- 2. 3600PRO.PDF This subversion of the protocol did not seem different enough to warrant extracting its information.
- 3. 3810PRO.PDF This subversion of the Cohu protocols is primarily aimed at changing parameters inside a DSP camera and so its information was not extracted. The protocol is based on RS-232 and is incompatible with any other Cohu protocol.
- 4. 3830PRO.PDF This subversion of the protocol did not seem different enough to warrant extracting its information.
- 5. 3850PRO.PDF A modified version of this document is in Section , page 1.
- 6. iDOMEVIEWLCUCOMMPROTOCOL.PDF Modified versions of two revisions (rev 3.0 and rev 5.7) of this document are in Section 2, page 35 and Section 3, page 65.
- 7. MPC2221PRO.PDF A modified version of this document is in Section 4, page 95.

8. MPC232PRO.PDF A modified version of this document is in Section , page 1.

9. MPC422PRO.PDF A modified version of this document is in Section , page 1.

Due to the quantity of differing protocol documents, some customers of Cohu extract a subset of what they expect a Cohu compliant PTZ unit to do and produce their own document. A typical one is this one from Georgia's Department of Transportation: CCTV (REV 8.0) 936 04-18-05 (1).PDF (A modified version is found in Section , page 1.)

Cohu provides, on their web site, a GUI (WINMPC) which is configurable to control many of their PTZ systems. Additionally on their web site there is an out of date, downloadable manual on how to use it (1032V42.PDF).

1.5.1 Other Cohu Originated Documentation

Other items on the Cohu web site that are useful in determining how a Cohu system ties together and works are: (More is available, but these seem to be the most relevant.)

1. 1027_R0 (IVIEW).PDF
2. 1032V42.PDF
3. 1037.PDF
4. 1050A.PDF
5. 5030.PDF
6. 5035.PDF
7. 829A.PDF
8. 836A.PDF

1.6 Standard Latch/Home Response Message[`intro:stdlatch`]

In Table 4, page 11 is shown the “standard” format of a latch status message. Different equipment does not always implement all of the defined bits.

For the “A” series of status data, sometimes the documentation will call B_0 AUX 1 and other times as Auto/Manual Focus. However the general format is correct.

It should be noted that with some equipment when camera power is turned off or on, a noticeable “click” is heard from a relay inside the unit which really does power down the camera.

Alternate locations for these bytes:

- Bytes $2 \rightarrow 7$ are also present, with the same meaning, in the DSP status reply as bytes $13 \rightarrow 18$.
- Bytes $2 \rightarrow 7$ are also present, with the same meaning, in the Home status response as bytes $5 \rightarrow 10$. (*Not on the iViewII.*)

Note

In Table 4, page 11 the notation of B_0 is used to indicate “bit 0” in the byte. This continues on for bits 1, 2 and 3.

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address 0x01 → 0xDF
2	H	Home Status
3	0 — 9 or A I E	ie, 2 = Home position 2 (H0, H1, H2, H3, H4, H5, H6, H7, H8, H9) (HA) Home active (HI) Home Not — at — Home position, or active (HE) Home error could not get to home position
4 → 9	—	These values are identical to bytes 3 → 7 of the L? response shown in Table 4, page 11 (As observed in a data capture from an ER-2222DF unit.) (L0, L1, L2, L3, L4, L5, L6, L7, L8, A0, A1, A2, A3, A4, A5, A6, A7, X0, X1, X2, X3, X4, X5, X6)
10	CHECKSUM	0x80 to 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 2: Format of Home Status[`intro:homestatus`]**Typical Latch/Latch Response Data**

```

413: DCE      222.658693 f8 01 L P 8d
131: DTE      222.664225 06
132: DTE      222.671310 f8 01 L 0 A 4 X 0 80
418: DCE      222.685062 06
419: DCE      224.145021 f8 01 L ? 82
141: DTE      224.150469 06
142: DTE      224.156874 f8 01 L 0 A 4 X 0 80
424: DCE      224.170680 06

```

1. This is a conversation captured between WinMPC running in MPC-D mode and an ER-2222DF at 9600 baud. (The original data capture file is 11JUL07A.TXT.)
2. DCE is WinMPC.

Byte	Data	Description
Manual Iris Toggle	LM	See Table 27, page 99 and Table 28, page 100 for response format
Camera Power Toggle	LP	
Lens Speed Toggle	LL	
Latch Status Request	L?	
Aux Functions (Option 1)	L1 → L3	Toggles Aux 1, Aux 2, or Aux 3 (L1, L2, L3)
Color Balance (Option 2)	L1	Select auto/manual mode
	B1	Increase blue (marked red in WinMPC)
	B2	Increase red (marked blue in WinMPC)
	B0	Balance stop

Table 3: Latch, Receiver Command Data[`intro:latchdata`]

3. DTE is the ER-2222DF.
4. Note that when the camera power is turned off, (with a LP command) that the ER-2222DF automatically generates a latch status command. Following each latch command, an automatically generated latch status message is generated.
5. Then about $1\frac{1}{2}$ seconds later WinMPC requests the status again. (And gets the same answer.)
6. This Latch Status message of L0A4X0 (ignoring the boiler plate) indicates:
 - 6.1 L0 = B₀ = Auto Iris on, B₁ = Camera Power off, B₂ = Lens Speed slow, B₃ = No Communications Error.
 - 6.2 A4 = B₀ = Auto Focus off on, B₁ = Manual Integration, B₂ = Wipe on(?), B₃ = Wash off. In the closest approximation to ER-2222DF's protocol documentation that is available B₂ is indicated as being "AUX 3".
 - 6.3 X0 = B₀ = Remote mode, B₁ = Not low pressure, B₂ = Video present, B₃ = Not used.

1.6.1 Home Status Response Formats[intro:stdhome]

There are two formats for this response which is generated by the H? command. Note that for the ER2222DF, that the status of the latches is included in the response.

1. For an ER-2222DF the format is as shown in Table 5, page 12.
2. For an iViewII the format is as shown in Table 6, page 13.

1.6.2 Command "stacking"

One or more command may be in each command string. A command string starts with an "AUTOBAUD" (0xF8) byte, followed by a unit address, data and a CHECKSUM. The data usually consists of two printable characters. Sometimes there are more than one set of command pairs in a command. Other commands have over 10 bytes of data as a single command. The only way to find the end of data is to look for the CHECKSUM. All CHECKSUMS have an upper nibble of 8 and a lower nibble of the XOR of the lower nibbles of all preceding bytes **except** for the AUTOBAUD character. Valid, and common command formats:

1. F8 01 PRTS 84: This is a command starting with an AUTOBAUD character which is being sent to address "1", saying to do a fixed speed pan right and stop any tilt actions, followed by a CHECKSUM.
2. F8 01 PRL? 80: This is a command starting with an AUTOBAUD character which is being sent to address "1", saying to do a fixed speed pan right and return latch status, followed by a CHECKSUM.
3. F8 01 PR 83: This is a command starting with an AUTOBAUD character which is being sent to address "1", saying to do a fixed speed pan right which is followed by a CHECKSUM.
4. F8 FF JcS 85: This is a command starting with an AUTOBAUD character which is being sent to all addresses, saying to do report the set a Javelin Continuous Motor to Off which is followed by a CHECKSUM.
5. F8 01 mWW04w05m1f001 81: This is a command starting with an AUTOBAUD character which is being sent to address "1", saying to do a configure the wash unit with a Wash value of 04, a Wipe value of 05, run in Mode 1 (manual) and 001 auto wash cycles in a minute, followed by a CHECKSUM.

Format Latch Status Response[<code>intro:latchstatusresponse</code>]		
Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF)
2	L	Latch status
3	$0_{ASCII} \rightarrow ?_{ASCII}$	LS nibble is four bits of status. (L0, L1, L2, L3, L4, L5, L6, L7, L8, L9, L:, L;, L<, L=, L>, L?)
	$B_0 = 1 = \text{Manual Iris}$ $B_0 = 0 = \text{Auto Iris}$	
	$B_1 = 1 = \text{Camera Power On}$ $B_1 = 0 = \text{Camera Power Off}$	
	$B_2 = 1 = \text{Lens Speed Fast}$ $B_2 = 0 = \text{Lens Speed Slow}$	
	$B_3 = 1 = \text{Communications Error}$ $B_3 = 0 = \text{No Communications Error}$	
4	A	Aux status
5	$0_{ASCII} \rightarrow ?_{ASCII}$	LS nibble is four bits of status. (A0, A1, A2, A3, A4, A5, A6, A7, A8, A9, A:, A;, A<, A=, A>, A?)
	$B_0 = 1 = \text{Auto Focus}$ $B_0 = 0 = \text{Manual Focus}$	
	$B_1 = 1 = \text{Auto Integration}$ $B_1 = 0 = \text{Manual Integration}$	
	$B_2 = 1 = \text{Wipe On (for 3965 model only)}$ $B_2 = 0 = \text{Wipe Off (for 3965 model only)}$	
	$B_3 = 1 = \text{Wash On (for 3965 model only)}$ $B_3 = 0 = \text{Wash Off (for 3965 model only)}$	
6	X	Misc. statuses
7	$0_{ASCII} \rightarrow ?_{ASCII}$	LS nibble is four bits of status. (X0, X1, X2, X3, X4, X5, X6, X7, X8, X9, X:, X;, X<, X=, X>, X?)
	$B_0 = 1 = \text{Local Mode}$ $B_0 = 0 = \text{Remote Mode}$	
	$B_1 = 1 = \text{Low Pressure}$ $B_1 = 0 = \text{Not Low Pressure}$	
	$B_2 = 1 = \text{Video Loss}$ $B_2 = 0 = \text{No Video Loss}$	
	$B_3 = \text{Not Used}$	
8	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8

Table 4: Standard Latch Status Response[`intro:stdlatchstatus`]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address 0x01 → 0xDF
2	H	Home Status
3	0 — 9 or A I E	ie, 2 = Home position 2 (H0, H1, H2, H3, H4, H5, H6, H7, H8, H9) (HA) Home active (HI) Home Not — at — Home position, or active (HE) Home error could not get to home position
4 → 9	—	These values are identical to bytes 3 → 7 of the L? response shown in Table 27, page 99 (As observed in a data capture from an ER-2222DF unit.) (L0, L1, L2, L3, L4, L5, L6, L7, L8, A0, A1, A2, A3, A4, A5, A6, A7, X0, X1, X2, X3, X4, X5, X6)
10	CHECKSUM	0x80 to 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 5: Format of Home Status for an ER2222df[`intro:er2222homestatus`]

1.7 Position[`position`]

This section describes how to get the position/presets data and to goto an angular position with the camera.

Cohu utilizes two formats of data to transmit position information. The older format has been called here the “MPC” format and is characterized by utilizing three bytes to transfer pan/tilt information. The newer format is the iDome format as it is documented in the iDome protocol manual. It is characterized by transferring its information in four bytes for pan/tilt data.

1.7.1 Three Byte MPC Formatted Angle Data

These values are three bytes long with a range of 0x303030 → 0x3F3F3F (000_{cohuhex} → ???_{cohuhex}). This gives a full range of 4096 counts. It should be realized that the actual values that are sent over the communications line range from 0 → 9 and are followed by : ; <=> ? all as ASCII values which represent hexadecimal values. See Table 1, page 5. In Cohu documentation this format is called “**Standard**” format. It is important to remember that these values represent hexadecimal values. See the below example.

³\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/Position.inc,v 1.8 2007-07-25 13:22:58-07 Hamilton Exp Hamilton
\$

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address 0x01 → 0xDF
2	H	Home Status
3	0 — 9 or A I E	ie, 2 = Home position 2 (H0, H1, H2, H3, H4, H5, H6, H7, H8, H9) (HA) Home active (HI) Home Not — at — Home position, or active (HE) Home error could not get to home position
4	CHECKSUM	0x80 to 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 6: Format of Home Status for an iViewII[`intro:iviewiihomestatus`]

Command	Data	Response
Pan/Tilt Position Request	“P?”	ACK + Pan/Tilt Response (Table 8, page 14)
Pan/Tilt Goto Command	“pA ₂ A ₁ A ₀ E ₂ E ₁ E ₀ ”	ACK
Zoom/Focus Position Request	“V?”	ACK + Zoom/Focus Response
Zoom/Focus Goto Command	“vZ ₂ Z ₁ Z ₀ F ₂ F ₁ F ₀ ”	ACK (Table 8, page 14)

Table 7: Standard Position Commands[`spc`]

1.7.2 Standard, MPC Format, Position Response Data

Command	Description	Response
P?	Pan/Tilt Position Request	Ppppttt
		ppp = 12 bit data of Pan ($000_{cohuhex} \rightarrow ???_{cohuhex}$) Format: $000_{cohuhex} \rightarrow ???_{cohuhex}$
		ttt = 12 bit data of Tilt ($000_{cohuhex} \rightarrow ???_{cohuhex}$) Format: $000_{cohuhex} \rightarrow ???_{cohuhex}$ See Section 1.2, page 5 for a discussion of Cohu Numbering
V?	Zoom/Focus Position Request	Pzzzfff
		zzz = 12 bit data of Zoom ($000_{cohuhex} \rightarrow ???_{cohuhex}$) Format: $000_{cohuhex} \rightarrow ???_{cohuhex}$
		fff = 12 bit data of Focus (always $000_{cohuhex}$) Format: $000_{cohuhex}$ See Section 1.2, page 5 for a discussion of Cohu Numbering

Table 8: Standard, MPC Format, Position Response Data[mpcpositionresonse]

Typical MPC Format Pan/Tilt Position Request/Response[standardformat]

```

DCE   333   28.247622   0.967634 f8 01 P ? 8e
DTE   338   28.253911   0.001037 06
DTE   339   28.260937   0.007026 f8 01 P < < 8 7 > < 8c
DCE   349   28.276074   0.005713 06

```

1. DCE f8 01 P? 8e Request for Pan/Tilt position: DTE 06 ACK
2. DTE f8 01 P<<87>< 8c Pan = <<8 (0xCC8), Tilt = 7>< (0x7EC): DCE 06 ACK.

For a pan pointing angle of $(12 \times 256) + (12 \times 16) + (8 \times 1) = 3272$ counts. There are $4096/360 = 11.37 +$ counts per degree, thus $3272/11.37 = 287.6^\circ$. Displayed on the Cohu monitor connected to the iViewII, as 288° .

And a tilt angle of $(7 \times 256) + (14 \times 16) + (12 \times 1) = 2028$. There are $4096/190 = 21.55 +$ counts per degree, $2028/21.55 = 94.07^\circ$. Displayed tilt degrees are offset from protocol tilt degrees by 95° thus $95 - 95 = 0^\circ$ which is not displayed on the monitor connected to the iViewII. (-1° is displayed.)

Typical MPC Format Zoom/Focus Position Request/Response

```

DCE   316   27.251567   21.190698 f8 01 V ? 88
DTE   321   27.257036   0.001035 06
DTE   322   27.264900   0.007864 f8 01 V 0 0 0 0 0 0 87
DCE   332   27.279988   0.005661 06

```

1. DCE f8 01 V? 88 Request for Zoom/Focus position: DTE 06 ACK
2. DTE f8 01 V000000 87 Zoom = 000, Focus = 000: DCE 06 ACK

1.7.3 Standard, MPC Format, Goto A Position

Command	Description
paaabbb	Goto a Pan/Tilt Position aaa = 12 bit data of Pan ($000_{cohuhex} \rightarrow ???_{cohuhex}$) Format: $000_{cohuhex} \rightarrow ???_{cohuhex}$
	bbb = 12 bit data of Tilt ($000_{cohuhex} \rightarrow ???_{cohuhex}$) Format: $000_{cohuhex} \rightarrow ???_{cohuhex}$ See Section 1.2, page 5 for a discussion of Cohu Numbering
vccdddd	Goto Zoom/Focus Position ccc = 12 bit data of Zoom ($000_{cohuhex} \rightarrow ???_{cohuhex}$) Format: $000_{cohuhex} \rightarrow ???_{cohuhex}$
	ddd = 12 bit data of Focus (always $000_{cohuhex}$) Format: $000_{cohuhex}$ See Section 1.2, page 5 for a discussion of Cohu Numbering

Table 9: Standard MPC Format Goto A Postion[mpcgotoapositioncommand]

1.7.4 Standard MPC Format Position Encoding

The message data for the “Pan/Tilt Goto Command” in Table 9, page 15 begins with an cohuhex ‘p’ followed by the azimuth ($A_2A_1A_0$) and elevation ($E_2E_1E_0$) positions. The positions are 12-bit values encoded four-bits each in the least significant nibbles of the three bytes whose most significant nibbles are always 0x30. The subscript₂ indicates the byte containing the most significant bytes of the position and subscript₀ indicates the least significant.

1.7.5 Standard MPC Format Position Encoding Example:

(From the GA DOT (Georgia Department of Transportation) document.)

Position MPC Format Encoding Example: From the GA DOT document. This describes the method of encoding position data for an MPC type of unit. The “iSeries” units use a four digit system called “Actual Positions” which is described in Section 1.7.8, page 17 and reads out in scaled parts of a degree. Additional information is in Section 1.7.2, page 14.

1. Encoding an azimuth position value of decimal 2748_{10} or $0xABC$ ($;<_{cohuhex}$), we break it up into three nibbles and add $0x30$ to each so:

$$\begin{aligned} A_2 &= 0x3A (:_{cohuhex}), \\ A_1 &= 0x3B (:_{cohuhex}), \text{ and} \\ A_0 &= 0x3C (<_{cohuhex}). \end{aligned}$$

2. The same encoding scheme is used for the zoom and focus positions in the “Zoom/Focus Goto Command”.
3. Thus we now have:

0xA	0xB	0xC
1010 ₂	1011 ₂	1100 ₂
(10 × 256)+	(11 × 16)+	(12 × 1) =
2560+	176+	12 = 2748

4. The next step in converting from/to Cohu values is to determine what the max and min values for the full 12 bit range of values of $0 \rightarrow 4095$.
5. For pan the calculations are simple when the unit may travel 360° in pan:
 - 5.1 Then $000_{cohuhex} = 0^\circ$ and $???_{cohuhex} = 359^\circ$.
 - 5.2 So each degree is $4096/360 = 11.37+$ counts wide, or approximately 11 counts per degree.
6. For tilt the calculations are not so simple because each unit has its own range of tilt values. Assuming that the unit may point somewhat more than straight down and somewhat past streigh, we get: (Using the iViewII we can go from -95° to $+95^\circ$ for a range of 190° which will be used here.)
 - 6.1 Then $000_{cohuhex} = -95^\circ$ and $???_{cohuhex} = +95^\circ$.
 - 6.2 So each degree is $4096/190 = 22.75+$ counts of width per degree
7. For displayed values tilt 0° is horizontal in orientation. Also down angles have negative values. Pelco's protocol always uses a tilt range of 360° even when the unit can not move to most of the tilt locations. (On Pelco units the value on the video screen does not always match the protocol value. The Spectra III units the value displayed on the screen typically varies for $+2 \rightarrow -92$.) The capabilities and ranges of the Cohu equipment, other than the iViewII, are unknown.

1.7.6 Four Byte iViewII Formatted Angle Data

These values are four bytes long with a range of $0000_{cohuhex} \rightarrow 9999_{cohuhex}$. This gives a full range of up to 10000 counts. These values represent the actual angle times 10, thus they are in “ten-grees”. (The printable cohuhex these values read out “as they are”.) In Cohu documentation this format is called “**Actual**” format.

The maximum down value reads out on the screen as -95° and in the protocol as 0150_{10} , which suggests that all tilt values are biased.

The maximum up value reads out on the screen as $+95^\circ$ and in the protocol as 2150_{10} , which suggests that all tilt values are limited in range.

Thus the span of tilt values is 1900 counts for 190° of motion, giving 10 counts per degree.

1.7.7 Actual iDome Format Position Response Data

Command	Description	Response
cPS	Pan/Tilt Position Request	cPpppptttt pppp = Pan data (0000 to 3599 in cohuhex) tttt = Tilt data (0000 to 1220 in cohuhex)

Table 10: Actual iDome Format Position Response Data[idomepositionresponse]

Typical Actual Position Request/Response

```

21: DCE      42.739252 f8 01 c P S 81
22: DTE      42.745697 06
23: DTE      42.752820 f8 01 c P 2 0 0 6 1 1 0 3 85
24: DCE      42.771141 06

```

1. DCE f8 01 cPS 81 Pan/Tilt Position Request: DTE 06 ACK
2. DTE f8 01 cP20061103 85 Pan/Tilt position reply. Pan = 200.6° , Tilt = $1103 - 0150 = 95.3^\circ$ or about $.3^\circ$ above horizontal (horizontal = 1100 counts): DCE 06 ACK

1.7.8 Actual iDome Format Goto A Position[actualposition]

Command	Description	Response
cpaaaabbbb	Goto a Pan/Tilt Position aaaa = Pan data (0000 to 3599 in cohuhex) bbbb = Tilt data (0000 to 1220 in cohuhex)	

Table 11: Actual iDome Format Goto A Position[idomegotocommand]

Typical Goto Actual iDome Format Az/El/Zoom/Focus Position Commands

```

17: DCE      80.632374 f8 01 c p 2 3 4 5 1 2 3 4 86 Pan  = 234.5 degrees
18: DTE      80.646546 06                               Tilt = 123.4 degrees

19: DCE      80.733918 f8 01 v 0 0 2 0 0 3 86 Zoom  = 002
20: DTE      80.744534 06                               Focus = 003

```

1.7.9 Get Actual iDome Format Presets Position Data

Command	Description	Response
*pp##	Get Preset data stored in camera ## = 0x10 to 0x3E (first 47 positions) ## = 0x60 to 0x70 (last 17 positions)	pP##ppppttttzzzzffff See Table 16, page 28 pppp = Pan Preset Position data tttt = Tilt Preset Position data zzzz = Zoom Preset Position data ffff = Focus Preset Position data

Table 12: Get Actual iDome Format Preset Data[idomegetpresetdata]

1.7.10 Pan/Tilt Positions

Pelco pan readouts are based on the CAL_0 (North or 0°) value of the PTZ. Angular readouts then increment to 90° (East), 180° (South) and to 270° (West) when looking down on the PTZ unit from above.

Pelco tilt readouts are based on the horizon, with 0° meaning that the PTZ is looking at the horizon. As the PTZ points down the protocol readout changes to 45° and then 90° when the PTZ is pointing straight down. The PTZ on-screen display will indicate -45° and then -90° . The discrepancy in the two types of readouts is that the protocol value is unsigned and the on-screen is signed. As tilt passes through straight down (not physically possible, but conceptually convenient,) the protocol values increment until a straight up readout is 270° and the on-screen display shows 90° . At 45° above the horizon the protocol readout will be 315° and the on-screen display will be 45° . Here is a short table to attempt and explain these values along with the Cohu equivalents. Note that the Cohu values in the table are either obviously $(_{10})$ decimal or hexadecimal $(0x)$.

Position	D Reads Out	Displays As	iViewII Reads Out	Displays As	MPC Reads Out
95° up	265	—	2050 ₁₀	95	??? _{cohuhex} (0xFFF)
90° up	270	90	2000 ₁₀	90	?94 _{cohuhex} (0xF94)
45° up	315	45	1450 ₁₀	45	; < _{cohuhex} (0xBCA)
Horizontal - 1°	359	1	1110 ₁₀	1	815 _{cohuhex} (0x815)
Horizontal	0	0	1100 ₁₀	0	800 _{cohuhex} (0x800)
45° down	45	-45	0650 ₁₀	-45	435 _{cohuhex} (0x435)
90° down	90	-90	0200 ₁₀	-90	06; _{cohuhex} (0x06B)
95° down	95	—	0150 ₁₀	-95	000 _{cohuhex} (0x000)

Note

1. **Position:** Physical pointing direction of the enclosure/camera.
2. **D Reads Out:** D protocol returned value for this angle. This write up is designed for the Spectra III and Spectra IV which have maximum tilt values of $2 \rightarrow -92^\circ$. Other Pelco equipment has different limits, both physically and logically.
3. **Displays As:** What is displayed on the Spectra screen. (The Spectra can not reach some of these angular positions.)
4. **iViewII Reads Out:** What comes back from a cPS command.
5. **Displays As:** What Cohu displays on the video screen.
6. **MPC Reads Out:** What comes back from a P? command.

1.7.11 Selected angular readouts

Using WinMPC to send position read out commands to the iViewII resulted in the following readouts for maximum down, horizontal and maximum up:

Tilt Position	Maximum Up		Horizontal		Maximum Down	
Unit Type	iViewII	MPC	iViewII	MPC	iViewII	MPC
Command	cPS	P?	cPS	P?	cPS	P?
On Video Screen	95		0		-95	
cohuhex In Protocol	2050	??? _{cohuhex}	1100	800	0150	000
On WinMPC Display	2050	0xFFF	1100	800	0150	000

Table Notes

Tilt Position The direction that the enclosure is pointing. It has three values:

1. Maximum Up, this is the farthest up that the enclosure will point using only protocol commands. I.e. it was not forced by hand.
2. Horizontal, this is when the enclosure is in a level position and the video display shows 0° .
3. Maximum Down, this is the farthest down that the enclosure will point using only protocol commands. I.e. it was not forced by hand.

Unit Type This is the unit type selected in the WinMPC software. All tests were done with an iViewII type of pan/tilt unit.

Command This is the Cohu Protocol command to get this information to be output by the iViewII.

On Video Screen This is the pan angle as displayed by the unit on a video monitor.

cohuhex In Protocol These are the actual bytes that are transferred over the serial link to represent this tilt angle.

On WinMPC Display This is the value that appears on the tilt read out of WinMPC.

MPC Values The MPC type angular responses, the values in Table 1, page 5 are used.

Tilt Limits, iViewII in iViewII and MPC modes

1. Maximum Tilt Down reads out as 15° and displays on the screen as -95° . (cP17460150, pan was at 174.6°)
2. Maximum Tilt Up reads out as 205° and displays on the screen as 95° . (cP17462050, pan was at 174.6°)
3. Tilt Horizontal reads out as 110° and displays on the screen as 0° .
4. Giving a total tilt readout range of 190° .
5. Any tilt value outside the range of $0150 \rightarrow 2050$ will result in the whole command being ignored. As will any pan value outside the range of $0000 \rightarrow 3599$.
6. For the MPC type readout $4096/190 = 21.55+$ counts per degree. Starting at $0x000$ for -95° (maximum down) through $800_{cohuhex}$ at horizontal and up to $???_{cohuhex}$ for $+95^\circ$ (maximum up).
7. For the iViewII type readout $1900/190 = 10$ counts per degree. Starting at 0150_{10} for -95° (maximum down) through 1100_{10} at horizontal and up to 2050_{10} for $+95^\circ$ (maximum up).
8. Other Cohu units probably have different ranges, however an iViewII was the only piece of Cohu equipment that was available for testing.

1.8 Encoding used with pointing commands

Cohu utilizes two different methods of reporting the current pointing data (pan/tilt). These are:

1. Three byte encoded data.
2. Four byte data.

1.8.1 Three byte encoded data

One of all Cohu protocols characteristics is that the MPC series never send binary data. This also holds for the iDome series except for preset data where some binary (non printable) values are used. Everything is sent in printable cohuhex, except for the ACK, NAK, STX, ETX and AUTOBAUD characters. This means that in the MPC type systems when a pointing angle needs to be sent it will be encoded by breaking down the value into three characters. Each character will have a value assigned to it from $0 \rightarrow 15$. All of the assigned characters will then be sent to represent the angular data. Table 1, page 5 is a table of assigned characters to “real” values.

Example #1 If $123_{cohuhex}$ were sent over the communications medium, this would represent a value of 291_{10} or a pan angle of about 26.99° . For tilt this would represent an angle of about -81.5° which is pointing down. (These values were verified using WinMPC and an iViewII running in MPC mode.)

1. The starting value was obtained as follows: $(1_{10} \times 256_{10}) + (2_{10} \times 16_{10}) + (3_{10} \times 1_{10}) = 291_{10}$.
2. The pan angle was then calculated as follows: each degree in pan = $4096/360 = 10.78+$ counts, and $291_{10}/10.78_{10} = 26.99_{10}^\circ$.
3. The tilt angle was calculated as follows: each degree in tilt = $4096/190 = 21.55+$ counts, and $291_{10}/21.55_{10} = 13.49_{10}$ then the tilt range has a 5° bias, and **display horizontal** displays as 0° and **protocol horizontal** reads out as 95° (or $800_{cohuhex}$) thus $13.49_{10} - 95_{10} = -81.5_{10}^\circ$.

Example #2 If $=>?_{cohuhex}$ were sent over the communications medium, this would represent a value of 3567_{10} .

The starting value was obtained as follows: $(13_{10} \times 256_{10}) + (14_{10} \times 16_{10}) + (15_{10} \times 1_{10}) = 3567_{10}$. (Remember that $=_{cohuhex}$ represents 13_{10} , $>_{cohuhex}$ represents 14_{10} , and $?_{cohuhex}$ represents 15_{10} .)

The pan angle would be 313° ⁴.

The tilt angle would be 70° ⁵.

Special note: When working with WinMPC. WinMPC does not allow the following characters, $;<=>?$, to be entered as pan/tilt “goto” values. Instead, and quite logically but somewhat confusingly, their hexadecimal equivalents of ABCDEF must be entered and those are what get displayed in the “P/T/z/F ?” “Pan Tilt” readout fields. However at the communications medium level, the first set of letters ($;<=>?$) are the only ones sent, not the second set of hexadecimal letters (ABCDEF), which are the only hexadecimal letters that get displayed. (Characters for $0 \rightarrow 9$ always work in the expected way.) Near to bottom of the screen in the “Tx” and “Rx” windows, the actual values sent over the communications media are displayed and, usually, immediately replaced with something else.

Note

1. The values for pan should be correct for any model of Cohu equipment. However it is unclear if the tilt values change between different models of equipment, that might have a different range of tilt motion.
2. **CohuHex:** In CohuHex, values from $0 \rightarrow 9$ are represented as expected. However for values greater than 9 and less than 17, the following values are used: $:$ for A, $;$ for B, $<$ for C, $=$ for D, $>$ for E, $?$ for F.

⁴Details of the calculations are left to the student.

⁵Details of the calculations are left for the student’s enjoyment.

Position	MPC	iViewII	Pelco	Name
0°	000 ₁₆ (0000 ₁₀) 000 _{cohuhex}	0000 _{ASCII}	00000 0x00 0x00	North
90°	400 ₁₆ (1024 ₁₀) 400 _{cohuhex}	0900 _{ASCII}	09000 0x25 0x1C	East
180°	800 ₁₆ (2048 ₁₀) 800 _{cohuhex}	1800 _{ASCII}	18000 0x46 0x50	South
270°	C00 ₁₆ (3072 ₁₀) < 00 _{cohuhex}	2700 _{ASCII}	27000 0x69 0x78	West

Table 13: Typical pan values[`intro:typicalpanvalues`]

Position	MPC	iViewII	Pelco	Name
95°	FFF ₁₆ ??? _{cohuhex}	2050 _{ASCII}	26500 0x67 0x84	Max Up (and back some)
90°	F94 ₁₆ ?94 _{cohuhex}	2000 _{ASCII}	27000 0x69 0x78	Up
45°	BCA ₁₆ ;<: _{cohuhex}	1550 _{ASCII}	31500 0x7B 0x0C	
0°	800 ₁₆ 800 _{cohuhex}	1100 _{ASCII}	00000 0x00 0x00	Horizontal
-45°	435 ₁₆ 435 _{cohuhex}	0650 _{ASCII}	04500 0x11 0x94	
-90°	06B ₁₆ 00; _{cohuhex}	0200 _{ASCII}	09000 0x23 0x28	Down
-95°	000 ₁₆ 000 _{cohuhex}	0150 _{ASCII}	09500 0x25 0x1C	Max Down (plus a little)

Table 14: Typical tilt values[`intro:typicaltiltvalues`]

3. In Table 13, page 21 and Table 14, page 21 the contents are as follows:

- 3.1 **Position:** This is the value that is displayed on the screen. (Without the ° symbol.)
- 3.2 **MPC:** These are the values that are used in MPC type systems. Note that there are two values here. The first value is in conventional Hexidecimal format. The second value is in “CohuHex” format and is the actual value that is on the communications line.
- 3.3 **iViewII:** This is the value that is sent out over the communications line for iDome units.
- 3.4 **Pelco:** This is the readout from a Pelco Spectra III when at the indicated position. It is expressed as two values, the first value is the decimal equivalent of the angle represented in DATA1 and DATA2 (which is the other value shown).
- 3.5 **Name:** Comments as to where the unit is pointing.

1.9 Interpreting Pan and Tilt D Readout Replies

Pan and tilt angle values comes in in two bytes as degrees times 100 “hungrees”.

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

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

In the following set of figures, an attempt has been made to describe the logic behind the way that Pelco displays and reads out, via D Protocol, tilt angles. Then an attempt is made to describe the same using Cohu's logic.

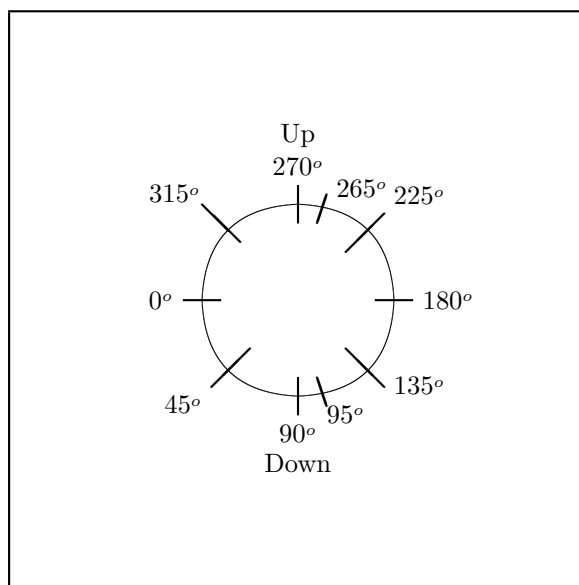
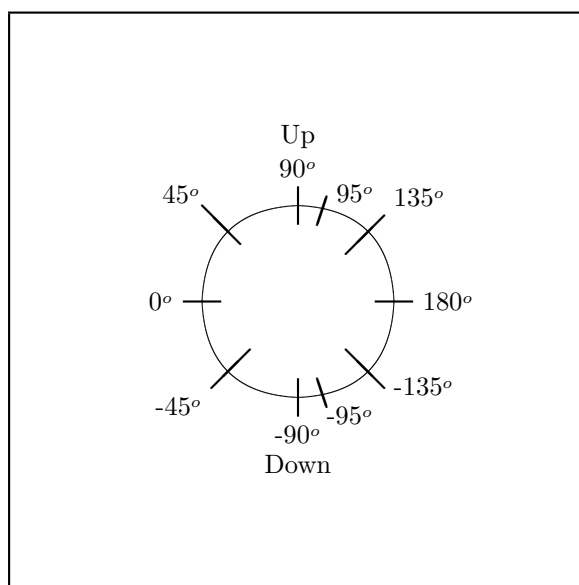
1. Pelco tilt logic.

1.1 Values as read out via D Protocol.

- 1.1.1. In Figure 1, page 23 are the absolute values that are read out as a camera is tilted.
- 1.1.2. It should be noted that it is not possible for any Pelco camera to actually get to all of these positions.
- 1.1.3. Note that the angles increase, starting at the horizontal and continue to straight down at -90°.
- 1.1.4. Then the readouts continue around the circle in a counterclockwise direction until reaching the starting position, or running into limit stops.
- 1.1.5. The values that read out are in two 8-bit unsigned values that represent the actual angle times 100.
- 1.1.6. Therefore a tilt angle of 45° down would be represented as 4500.
- 1.1.7. The actual value of 4500, is transmitted as two 8-bit values as 0x11 and 0x94.

1.2 Values as displayed on the screen. Are the same for Pelco and Cohu units.

- 1.2.1. In Figure 2, page 23 are the values that will appear on the screen as a camera is tilted.
- 1.2.2. Note that when the camera is pointing below the horizon, a negative value will be displayed.
- 1.2.3. Positive values of pointing are used when the camera is pointing above the horizon.
- 1.2.4. It is unclear what will be displayed when the camera is on the "backside". The best prediction is shown on the figure, however no Pelco unit reaches these angles, so no clear decision has yet been made.

Figure 1: Pelco Tilt Protocol Readout Positions[`intro:pelcotiltreadouts`]Figure 2: Pelco Tilt Display Positions[`intro:pelcotilttdisplays`]

2. Cohu tilt logic.

2.1 MPC format hex readout values.

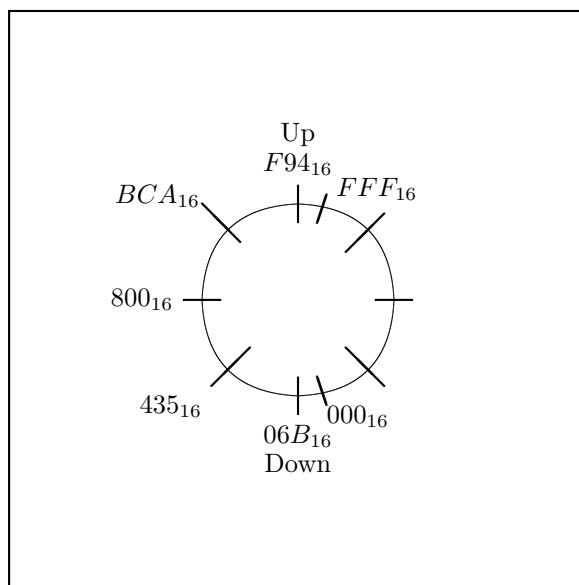
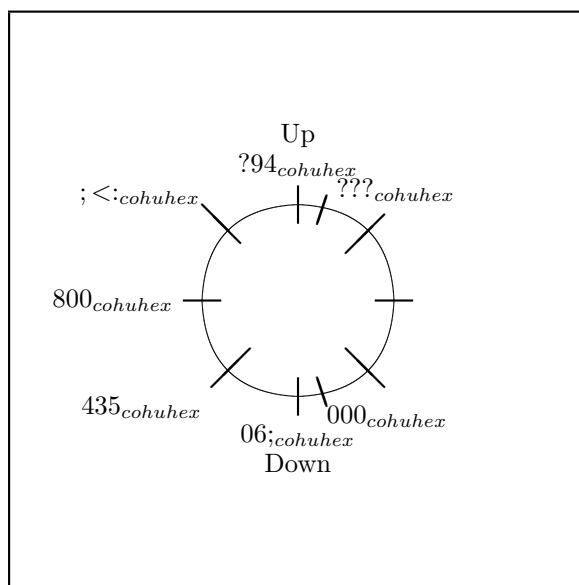
- 2.1.1. In Figure 3, page 25 are the hexadecimal values that apply as a camera is tilted.
- 2.1.2. It should be noted that these “exact” values do not actually appear on the communications lines within the Cohu Protocol.
- 2.1.3. Note that at 5° past streight up (as displayed on the screen), a readout of 0xFF occurs, which indicates that this is the maximum value that may be output. (An iViewII was used to get this value.)
- 2.1.4. Note that at 5° past streight down (as displayed on the screen), a readout of 0x00 occurs, which indicates that this is the minimum value that may be output. (An iViewII was used to get this value.)
- 2.1.5. These values, and ranges, were obtained from an iViewII operating in MPC mode. It is unclear if different models of equipment have a different range of values that are output via the protocol.
- 2.1.6. Horizontal is equal to 0x80.
- 2.1.7. Values increase clockwise as the unit is moved. (Backwards from the Pelco practice.)

2.2 MPC format CohuHex readout values.

- 2.2.1. In Figure 4, page 25 are the Cohu Hexidecimal values that apply as a camera is tilted.
- 2.2.2. These are the actual values that are transmitted over the communications line to the head end.
- 2.2.3. Other comments from Figure 3, page 25 apply here too.

2.3 iDome format readout values.

- 2.3.1. In Figure 5, page 26 are the ASCII values that apply as a camera is tilted.
- 2.3.2. Note that the values start just past the most far down, and then slightly back up, that the camera may point to.
- 2.3.3. Note that at 5° past streight up (as displayed on the screen), a readout of 2050 occurs, which indicates that this is the maximum value that may be output. (An iViewII was used to get this value.)
- 2.3.4. Note that at 5° past streight down (as displayed on the screen), a readout of 0150 occurs, which indicates that this is the minimum value that may be output. (An iViewII was used to get this value.)
- 2.3.5. These values, and ranges, were obtained from an iViewII operating in iDome mode. It is unclear if different models of equipment have a different range of values that are output via the protocol.
- 2.3.6. Horizontal is equal to 1100.
- 2.3.7. Values increase clockwise as the unit is moved. (Backwards from the Pelco practice.)

Figure 3: Cohu MPC Tilt Readout Positions, hex values[`intro:cohutiltreadoutshex`]Figure 4: Cohu MPC Tilt Readout Positions, CohuHex values[`intro:cohutiltreadoutshex`]

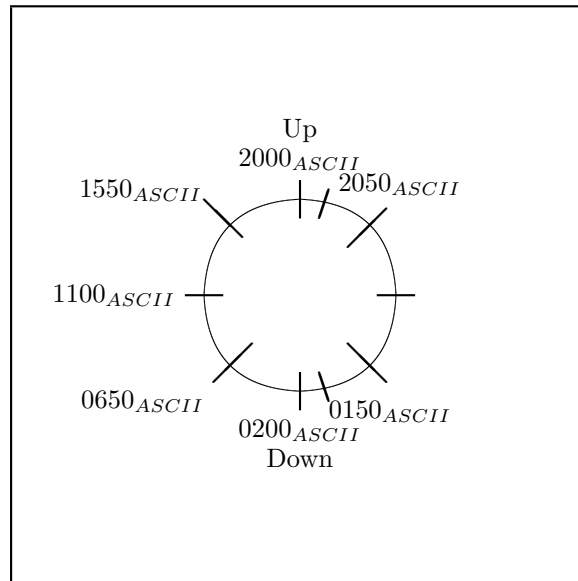


Figure 5: Cohu iDome Tilt Readout Positions, ASCII values[`intro:cohutiltreadoutshei`]

1.9.1 Four Byte Encoded Data

When Cohu designed their newer series of units, the iDome series, they changed the format of the position data. It is now four printable bytes in length. However instead of the older method of encoding a hexadecimal value, they now encode a decimal value at the actual value times ten. This makes it many times easier to understand the actual pointing data as only values $0_{cohuhex} \rightarrow 9_{cohuhex}$ are used.

Example #3 If $1234_{cohuhex}$ were sent over the communications medium, this would represent a value of 123.4° in pan.

In tilt it would represent $123.4_{10} - 110_{10} = 13.4^\circ$ above the horizon.

Maximum down, -95° is encoded as $015.0_{cohuhex}$ and displays as -95° . Thus count $0000_{cohuhex}$ represents -110° or 20° past streight down. The tilt offset must be removed before actually getting the angle. (There is no tilt bias in three byte data.)

1.9.2 Doubbled Preset Points

Since the MPC series of units has only ten presets in the range of $0x30$ through $0x39$ ($0_{cohuhex} \rightarrow 9_{cohuhex}$) and these are in the middle of the iDome's 64 presets. There are some preset numbers that overlap each other. These are listed in Table 15, page 27.

MPC Preset	iDome Preset
$1_{cohuhex}$	$33_{cohuhex}$
$2_{cohuhex}$	$34_{cohuhex}$
$3_{cohuhex}$	$35_{cohuhex}$
$4_{cohuhex}$	$36_{cohuhex}$
$5_{cohuhex}$	$37_{cohuhex}$
$6_{cohuhex}$	$38_{cohuhex}$
$7_{cohuhex}$	$39_{cohuhex}$
$8_{cohuhex}$	$40_{cohuhex}$
$9_{cohuhex}$	$41_{cohuhex}$
$10_{cohuhex}$	$42_{cohuhex}$

Table 15: MPC to iDome preset IDs [mpcidomepresetids]

The TXB-C uses MPC preset 10 to access the menu system, it also must use iDome preset 42 to access the menu system. With the very restricted set of presets available in the older Cohu equipment the unfortunate overlaying of preset IDs had to occur.

Protocol	Preset #	Protocol	Preset #	Protocol	Preset #	Protocol	Preset #
0x10	1 ₁₀	0x20	17 ₁₀	0x30	33 ₁₀	0x61	49 ₁₀
0x11	2 ₁₀	0x21	18 ₁₀	0x31	34 ₁₀	0x62	50 ₁₀
0x12	3 ₁₀	0x22	19 ₁₀	0x32	35 ₁₀	0x63	51 ₁₀
0x13	4 ₁₀	0x23	20 ₁₀	0x33	36 ₁₀	0x64	52 ₁₀
0x14	5 ₁₀	0x24	21 ₁₀	0x34	37 ₁₀	0x65	53 ₁₀
0x15	6 ₁₀	0x25	22 ₁₀	0x35	38 ₁₀	0x66	54 ₁₀
0x16	7 ₁₀	0x26	23 ₁₀	0x36	39 ₁₀	0x67	55 ₁₀
0x17	8 ₁₀	0x27	24 ₁₀	0x37	40 ₁₀	0x68	56 ₁₀
0x18	9 ₁₀	0x28	25 ₁₀	0x38	41 ₁₀	0x69	57 ₁₀
0x19	10 ₁₀	0x29	26 ₁₀	0x39	42 ₁₀	0x6A	58 ₁₀
0x1A	11 ₁₀	0x2A	27 ₁₀	0x3A	43 ₁₀	0x6B	59 ₁₀
0x1B	12 ₁₀	0x2B	28 ₁₀	0x3B	44 ₁₀	0x6C	60 ₁₀
0x1C	13 ₁₀	0x2C	29 ₁₀	0x3C	45 ₁₀	0x6D	61 ₁₀
0x1D	14 ₁₀	0x2D	30 ₁₀	0x3D	46 ₁₀	0x6E	62 ₁₀
0x1E	15 ₁₀	0x2E	31 ₁₀	0x3E	47 ₁₀	0x6F	63 ₁₀
0x1F	16 ₁₀	0x2F	32 ₁₀	0x60	48 ₁₀	0x70	64 ₁₀

Table 16: Extended Preset Values[idomepresets]

1.10 Protocol Changing Commands[[intro:protocolchanging](#)]

Cohu type controllers have the ability to operate with several different protocols. Changing between the different protocols is done with the **cP#** series of commands. There is no complete list in the document, however these values came from observing what WinMPC generates. The same protocol type codes are used in status messages to the head end.

From WinMPC revision 4.810.

Protocol changes are only permitted in the following types of units: iDome/iView, iViewII, 27XX, 596X and 696X.

Camera Communication Protocol Selection		
Select cP#	Reply cPs	Protocol
cP0	P0	Cohu
cP1	P1	American Dynamics
cP2	P2	Pelco D
cP3	P3	Javelin 408R
cP4	P4	Philips
cP5	P5	Vicon
cP6	P6	Telemetry
cP7	P7	Fast Field Device
cP8	P8	Ernitec
cP9	P9	Javelin ER3487D
cP:	P:	ICD
cP;	P;	Ultrak
cP<	P<	Pelco P
cP=	P=	Kalatel
cP>	P>	BBV

Table 17: Protocol Selection Commands/Replies[[intro:protocolselectioncommands](#)]

1.11 Notes on using WinMPC

WinMPC is a Windows based GUI (Glass Keyboard) from Cohu. The version used during development of the TXB-Cohu was rev 4.703 and was obtained from the Cohu web site. It consists of a single executable (.EXE) module which self installs on a PC. It has been used on Windows 98 SE and Windows XP and gives about the same level of performance.

Cohu provides a manual, which is slightly out of date, (1032V42.PDF) on how to use it.

Through use of the WinMPC program, several unexpected problems have been discovered. Some of these are:

1. Whenever “**Camera Setup**” is accessed from the main menu, the program sends a “**reset camera**” (RS) command to the camera.
2. Often times the program seems to get “locked up” sending “queries” to the camera. Usually by “clicking” on the “**status**” button on the main display it will stop doing that, in some cases the “**status**” button must be clicked twice. In a few cases clicking does no good at all.

⁶\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/WinMPC.inc,v 1.6 2007-06-28 14:07:14-07 Hamilton Exp Hamilton \$

3. Near the bottom of the main menu, there is a display of what the GUI is sending out (Tx) and receiving back in (Rx). The format is very convenient, but unexpected.

A typical transmit command would display as: F8_01_cDS_85 [guiformat]⁷

- F8: This is the “AUTO BAUD” character that is the first byte of all commands except for single byte ACKs. It is displayed in hex.
- 01: This is the camera address that this command is being sent to. It is displayed in hex.
- cDS: This is the actual command being sent to the camera. It is displayed in ASCII. In this example if it was being displayed in hex, the display would be 63 44 53.
- 85: This is the CHECKSUM. It is displayed in hex.

An ACK is displayed as “Ack”.

4. When first started, the GUI, sends nothing out to the camera until the program user tells it to.
5. When the GUI “locks up” sending a command, the only way out, is to get out of the program and restart.
6. The GUI does “remember” the last camera, etc., set up data that was selected.
7. The “log” function does work, however it stops logging the first time that an error is detected. Errors are indicated on the screen by having the red “LED” marked **Comm Error** turn on.
8. The only way of getting the **Comm Error** LED to turn off, is to receive a good message or an ACK from the camera. (Or restarting the GUI.)
9. **Lens Function Control** items do not become activated until a reply is received from the camera that indicates that function is present. The only exception for this is that **Zoom** is always turned on.
10. Since different cameras have different capabilities, options in **Latch Commands** are sometimes enabled and sometimes “grayed out”. If a specific latch function is desired, fool around with the choices in **Camera Setup** to find a camera type that uses that latch function.

The TXB-C always returns a status command to the L? command (L7A0) that says:

- The Iris is in Manual mode,
 - The Lens is in Fast mode,
 - That the Camera is Powered on and
 - That all three Auxes are turned off.
11. There is no specific command string that is sent from the GUI to indicate which type of camera it thinks that it is talking to. The most that happens is that if an iDome type is being addressed, then variable speed commands are sent and if a MPC type dome is being accessed then the commands are fixed speed types.
 12. Sometimes the GUI will change the camera address from whatever it used to be to 0xFF. The way to get out of this is to click the **Reset** and then the **Find** buttons and let the GUI reacquire the correct address.

⁷The response from the TXB-C, as of 25AUG06, is

F8 01 63 57 30 53 30 59 30 4D 31 44 30 4C 37 41 30 58 30 48 49 50 30 76 30 70 30 46 6F 73 6F 86 or
 <AUTO BAUD> <CAMERA ADDRESS> c W O S O Y O M 1 D O L 7 A O X O H I P O v O p O F o s o <CHECKSUM>.

1.12 Unexpected and Undocumented Commands [undoc]

Using WinMPC⁹ has revealed some unexpected features of the Cohu Protocol. This section also discusses some important design decisions and other general information about the TXB-C project. As far as known/decided these are:

1. Commands may be stacked. I.e. it OK to say stop pan and stop tilt in the same command such as:
`<AUTO-BAUD> <address> P S T S <CHECKSUM>.` (F8 01 PSTS 85) (This format for data is described in Section 3, page 30.)

There have been no observed cases where more than two commands have been stacked in the same command unit.

2. To send an “Iris Close” (which is useful in Spectra menu mode) the camera must report that it is in manual iris mode. Since Pelco does not differentiate between auto and manual mode, the TXB-C status response always says that the camera is in manual mode.
3. Several undocumented commands have been generated with WinMPC rev 4.703. A table of these commands is in Table 18, page 33.
4. Nothing has been uniquely identified as being sent out by WinMPC to indicate which type of unit it is talking to.

5. For putting a label on a preset the following command string is sent:

The label is blank padded and for camera 1 preset 1 has a default label of:

“Preset_1” (24 characters total)

```
f8 01 64 50 10 50 72 65 73 65 74 20 31 20 20 20 20 20 20 20
20 20 20 20 20 20 20 81
```

This is translated as follows: AUTOBAUD CAMERAADDRESS dP PRESETID <data> CHECKSUM.

6. When a command is received and ACKed, WinMPC assumes that the function works. I.e. when commands for “Manual Color”, and “Manual Integration”, are sent, then WinMPC enables those sections of the GUI. This happens even if a query is sent that indicates those functions are not there.
7. There are some indications that the CHECKSUM is not checked by WinMPC.
8. When using WinMPC rev 4.703, there are two modes of operation that may be selected with the “Camera Setup” option on the main menu. They are:

8.1 **PC to MPC Master:** This is the method of communication to a Master Control Unit. In this mode messages are framed with an STX/ETX character pair (0x02/0x03). Inside the two delimiters the only difference in the command is that there is no “AUTO BAUD” character used. In this mode WinMPC ignores the replies and reports a “Com Error”. The commands are decoded transparently by the TXB-C, however it appears that a problem is occurring because of the internal bug of WinMPC.

8.2 **PC to MPC Receiver:** This is the method of communication to the dome. In this mode an “AUTO BAUD” character (0xF8) is sent as the first byte of a message and the last byte of the message is a CHECKSUM. In this mode everything seems to work correctly. It is the default mode of operation of WinMPC.

⁸\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/UnDoc.inc,v 1.18 2007-07-12 09:49:56-07 Hamilton Exp Hamilton \$

⁹During the development cycle of the TXB-C, several versions of WinMPC have been downloaded and used. They all have approximately the same actions as the rev used for this write up.

1.12.1 Preset Numbering

1. Preset numbering is some what unusual. For starters, with WinMPC presets for the MPC type units are numbered from 1 $\rightarrow$ 10, but the actual protocol values start at 0_{ASCII} and extend to 9_{ASCII} . (In hexadecimal that is 0x30 through 0x39.)

With WinMPC presets for the iDome type units are numbered from 1 $\rightarrow$ 64, but the actual protocol values start at 0x10 and extend up to 0x70 with a gap starting at 0x3F that extends through 0x5F.

- 1.1 With the following: **iDome** Mode, Dome, Positioner, LCU, iViewII, 36XX and 4200 choices, the preset numbering is as follows: (these values were obtained by running WinMPC rev 4.703.) A table of these values is located in: Table 16, page 28.

1.1.1. Presets 1 $\rightarrow$ 47: 0x10 = 1, 0x11 = 2, etc., and 0x3E = 47₁₀. (**Note the gap.**)

1.1.2. Presets 48 $\rightarrow$ 63: 0x60 = 48₁₀, 0x61 = 49₁₀, etc., and 0x70 = 64₁₀.

- 1.2 With the following: **MPC-D** Mode, ER2221B, ER2222 and 27XX choices, the preset numbering is as follows: (these values were obtained by running WinMPC rev 4.703.)

1.2.1. Presets 1 $\rightarrow$ 10: 0_{ASCII} = 1, 1_{ASCII} = 2, etc., and 9_{ASCII} = 10₁₀.

1.2.2. *If WinMPC has previously run in iDome mode then presets up to 64 may be obtained. However if a “fresh” run is being made, then the highest preset # is 10. This probably is indicative of a bug in WinMPC and is not a capability.*

2. The results of the above preset logic is that there may be confusion if presets are sent in both modes.

As can be seen from the above the two modes of preset ranges have some conflicts. This is because the MPC-D preset IDs are in the middle of the iDome preset IDs.

Take “ 0_{ASCII} ” (0x30), for MPC-D systems this is preset 1 however for iDome systems it is preset 33. See Table 15, page 27 for a full listing.

The overall results of this is that it is not possible to uniquely identify some preset IDs. The TXB-C’s internal logic makes the following assumptions:

- 2.1 When in MPC preset mode, the default, preset commands will be sent assuming a total of ten presets, numbered from 0_{ASCII} through 9_{ASCII} (0x30 through 0x39). When in MPC preset mode, presets in the range of 1 $\rightarrow$ 9 will be down converted so that Cohu preset 1 becomes Spectra preset 1. I.e. when 0x30 is received as a preset it will become Spectra preset 1.

- 2.2 When in iDome preset mode, presets commands will be down converted so that iDome preset 1 will become Spectra preset 1. I.e. when 0x10 is received as a preset it will become preset 1.

- 2.3 **In all modes presets 10₁₀ (0x19 in iDome mode or 0x39 in MPC mode) and 42₁₀ (0x39 in iDome mode) will always be translated into Spectra preset 95 for Spectra menu access.**

- 2.4 **Note:** that the data as seen on the communications media, will be different from what gets entered into WinMPC.

Command	Description/use
dpE	In the Set ID Display/Azimuth Elevation menu, selects Enable
dpD	In the Set ID Display/Azimuth Elevation menu, selects Disable
dpt	In the Set ID Display/Azimuth Elevation menu, selects Permanent
dpT	In the Set ID Display/Azimuth Elevation menu, selects TimeOut
dNE	In the Set ID Display/Direct Display menu, selects Enable
dND	In the Set ID Display/Direct Display menu, selects Disable
dNt	In the Set ID Display/Direct Display menu, selects Permanent
dNT	In the Set ID Display/Direct Display menu, selects TimeOut
dNI	In the Set ID Display selects Grouped with IDs
dNi	In the Set ID Display selects Separated from IDs
mNs	In the North Direction selects Set
mNc	In the North Direction selects Clear
mNO	In the North Direction selects Set 8 Zones
mN1	In the North Direction selects Set 16 Zones
mNE	On the main display in the NTCIP Features, selects Enable NTCIP Mode
mND	On the main display in the NTCIP Features, selects Disable NTCIP Mode . An NTCIP Protocol message is sent which followed by the Cohu protocol command. 54 byte message sent in NTCIP Protocol: 7e 05 13 c1 30 2d 02 01 00 04 06 70 75 62 6c 69 63 a3 20 02 01 00 02 01 00 02 01 00 30 15 30 13 06 0e 2b 06 01 04 01 89 36 03 1d 01 06 01 02 0a 02 01 03 d3 ee 7e Followed by this command sent in Cohu Protocol: f8 01 6d 4e 44 86 (mND)
L?H	On the main display in Camera, is used to determine what the camera's address is.

Table 18: Known undocumented commands[knownundoc]

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2 iDome/iView/LCU Communication Protocol, Rev 3.0[idome30]

Rev 3.0
3/29/2004
COHU, INC¹¹

2.1 General

This document¹² defines the Asynchronous communication protocol between the MPC Master Control Panel/Host Computer and an iDome/iView/LCU. Figure 6, page 37, Illustrates the handshake protocol. The communication is full duplex. Typical or default communication parameters will be 9600 baud, 8 data bits, 1 stop bit and no parity¹³.

All paragraphs marked as being "Typical", are the actual data captures between an iViewII and WinMPC rev 4.703. Some of these data captures had unexpected data in them. The entries marked DCE represent data coming from WinMPC and entries marked DTE are data coming from the iViewII.

2.2 Message Format

Anytime a command message is sent to the Camera the camera will respond with an ACK or NAK. The commands are sent using the command message format show in Section 2.2.1, page 36 to Section 2.2.4, page 37. The response message from the camera is shown in Section 2.7, page 51 and Section 2.8.1, page 56.

If the command message contains only a momentary function, no further response beyond the ACK or NAK will occur. If the command requires a status message response, then a message will be returned following the ACK.

The control characters to be used are:

- 0xF8 Start Character
- ACK Acknowledge proper receipt of transmission
- NAK Bad transmission — retransmit
- CHECKSUM (End of Message)
- CAMERAADDRESS
- ## One byte in Hex
- # Number in ASCII
- "*" ASCII Asterisk
- "c" ASCII c
- "d" ASCII d

¹⁰\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/iDome30.inc,v 1.32 2007-07-27 08:51:51-07 Hamilton Exp Hamilton
\$

¹¹Electronics Division, P.O. Box 85623, San Diego, CA 92186-5626 — Telephone: (619) 277-6700 Fax: (619) 277-0221 Web: www.cohu.com/cctv

¹²This document was derived from the Cohu document: "iDomeiViewLCUCommProtocol.pdf"

¹³The original data in the Cohu document have been extensively agumented with data captures from communications between an iViewII and WinMPC rev 4.073

All transmissions will be in one of the following formats:

1. <0xF8> <CAMERAADDRESS> <DATA> <CHECKSUM> (Section 2.2.1, page 36).
2. <0xF8> <CAMERAADDRESS> <c> <DATA> <CHECKSUM> (Section 2.2.2, page 36).
3. <0xF8> <CAMERAADDRESS> <*> <DATA> <CHECKSUM> (Section 2.2.3, page 36).
4. <0xF8> <CAMERAADDRESS> <d> <DATA> <CHECKSUM> (Section 2.2.4, page 37).

2.2.1 Standard Command Message Format[idome30:table1]

For details see Section 2.4, page 40.

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF) Note: 0xFF address is used to read camera address or to assign camera address
2 to $n + 2$	Command Data	
$n + 3$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS Nibbles only) except 0xF8

NOTE: n is the number of command data bytes in the message

2.2.2 DSP Camera Command Message Format[idome30:table2]

For details see Section 2.8, page 53.

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF) Note: 0xFF address is used to read camera address or to assign camera address
2	"c"	Message type (for camera control)
3 to $n + 3$	DSP	Command Data
$n + 4$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS Nibbles only) except 0xF8

2.2.3 Sector/Touring Command Message Format[idome30:table3]

For details see Section 2.9, page 60.

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF) Note: 0xFF address is used to read camera address or to assign camera address
2	"s"	Message type (for sector/touring)
3 to $n + 3$	Touring/Position	Command Data
$n + 4$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS Nibbles only) except 0xF8

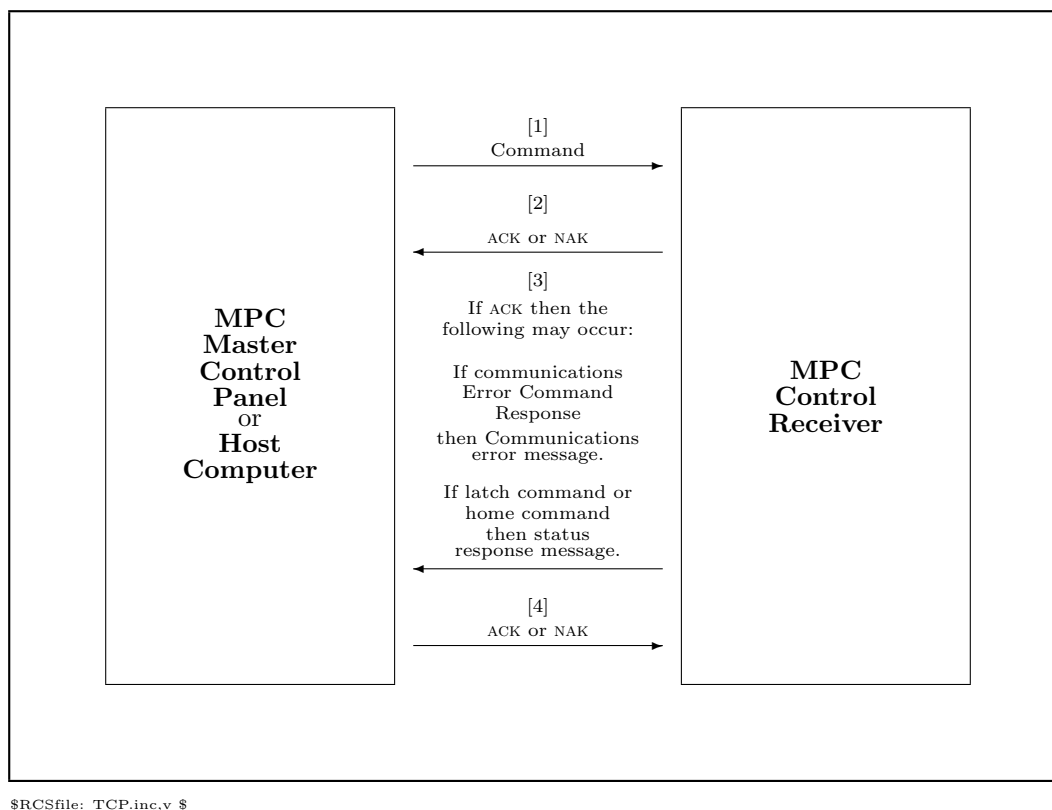


Figure 6: Typical Communications Protocol (From Cohu Document 6X-5046(A)) [idome30:tcp]

2.2.4 Id command Message Format [idome30:table4]

For details see Section 2.6, page 49.

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF) Note: 0xFF address is used to read camera address or to assign camera address
2	"d"	Message type (for ID)
3	Command 1	See Section 2.6, page 49 for command types
4	Command 2	and response
5 to 29 ID Data	24 ID	ASCII characters, or Enable/Disable, or Blinking, etc.
$n + 30$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS Nibbles only) except 0xF8

2.3 Power up sequence of WinMPC with an iViewII connected

```

1: DCE      0.000000  f8 01 R S 80
2: DTE      0.005463  06
3: DTE      0.015002  f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 82
4: DCE      0.048940  06
5: DCE      0.056584  f8 01 f S 84
6: DTE      0.062057  06
7: DCE      1.056635  f8 01 h S 8a
8: DTE      1.061965  06
9: DTE      1.073288  f8 01 h 0 89
10: DCE     1.083871  06
11: DCE     1.094652  f8 ff J c S 85
12: DTE     1.101055  06
13: DTE     1.111641  f8 01 j c 0 88
14: DCE     1.123023  06
15: DCE     1.143488  f8 ff j b S 84
16: DTE     1.150002  06
17: DCE     2.062481  f8 01 s S 81
18: DTE     2.067852  06
19: DTE     2.079486  f8 01 s 1 83
20: DCE     2.090029  06
21: DCE     3.055633  f8 01 S S 81
22: DTE     3.060951  06
23: DTE     3.069545  f8 01 S 0 82
24: DCE     3.080177  06
25: DCE     4.059510  f8 01 m S s 8c
26: DTE     4.065892  06
27: DTE     4.075741  f8 01 m S 0 4 6 6 7 2 8 86
28: DCE     4.092891  06
29: DCE     10.297705 f8 01 h S 8a
30: DTE     10.303044  06
31: DTE     10.310590 f8 01 h 0 89
32: DCE     10.320336  06
33: DCE     10.404135 f8 01 c D S 85
34: DTE     10.410571  06
35: DTE     10.421579 f8 01 c W 0 S 0 Y 0 M 0 D 0 L 2 A 0 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 8d
36: DCE     10.465306  06
37: DCE     11.290869 f8 01 c D S 85
38: DTE     11.297294  06
39: DTE     11.304737 f8 01 c W 0 S 0 Y 0 M 0 D 0 L 2 A 0 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 8d
40: DCE     11.348482  06

```

Initial commands and what they mean, DCE is WinMPC, DTE is the iViewII. After the first 36 lines of data, lines 37 → 40 repeat many times. In the following set of protocol capture explanations, all ACKs have been moved to the end of the line that they are ACKing. For the exact sequencing, see the above capture dump.

1. LINES 1,2 DCE: f8 01 RS 80 Firmware Revision Query: DTE: 06 ACK
2. LINES 3,4 DTE: f8 01 R3960 STD V2.4 82 Firmware Revision Answer: DCE: 06 ACK
3. LINES 5,6 DCE: f8 01 fS 84 Flip Enable Query with no answer. fSE would have meant Enabled and fSD would have meant Disabled: DTE: 06 ACK
4. LINES 7,8 DCE: f8 01 hS 8a RS-232 Handshake Status Request: DTE: 06 ACK
5. LINES 9,10 DTE: f8 01 h0 89 RS-232 Handshake Disabled: DCE: 06 ACK
6. LINES 11,12 DCE: f8 ff JcS 85 Javelin Continuous Motor Mode Status Request. Note that this command uses 0xFF as a device address: DTE: 06 ACK
7. LINES 13,14 DTE: f8 01 jc0 88 Might mean Off. In the document the replies are: Jc0, off and Jc1, on. There is a command of jc0 for Set Javelin Continuous Motor Off. But this is line is for a reply.

Note here that the address in the reply is correct for the unit being addressed, but it was addressed with the “all call” address of 0xFF: DCE: 06 ACK

8. LINES 15,16 DCE: f8 ff jbS 84 Javelin 2 byte address query. With no reply, Jb0 for off, Jb1 for on. Note that this command uses 0xFF as a device address: DTE: 06 ACK
9. LINES 17,18 DCE: f8 01 sS 81 Undocumented command might have to do with Progressive Scan: DTE: 06 ACK
10. LINES 19,20 DTE: f8 01 s1 83 Undocumented command might have to do with Progressive Scan: DCE: 06 ACK
11. LINES 21,22 DCE: f8 01 SS 81 Undocumented command might have to do with Shutter Status: DTE: 06 ACK
12. LINES 23,24 DTE: f8 01 S0 82 Undocumented command might be Shutter Status reply for Automatic: DCE: 06 ACK
13. LINES 25,26 DCE: f8 01 mSs 8c Undocumented command, might be Misc. command for serial number request: DTE: 06 ACK
14. LINES 27,28 DTE: f8 01 mS0466728 86 Serial number of this iViewII: DCE: 06 ACK
15. LINES 29,30 DCE: f8 01 hS 8a RS-232 Handshake Status Request, again: DTE: 06 ACK
16. LINES 31,32 DTE: f8 01 h0 89 RS-232 Handshake Disabled, again: DCE: 06 ACK
17. LINES 33,34 DCE: f8 01 cDS 85 DSP Device Status Request: DTE: 06 ACK
18. LINES 35,36 LINE 1,2 01 cW0S0Y0M0D0L2A0X0HIP0v0p0FoC3n1so1 8d DSP Device Status Response. See Section 2.8.1, page 56 for an explanation. : DCE: 06 ACK

2.4 Standard Commands[idome30:standardcommands]

Command	Description
B1	Integration Up — Continue up to 1/8th shutter speed
B2	Integration Down — Continue back to 1/60th shutter speed
H##	Goto a Preset Position
	## = 0x10 to 0x3E (first 47 positions) See Table 16, page 28
	## = 0x60 to 0x70 (last 17 positions)
P##	Program Preset Position
	## = 0x10 to 0x3E (first 47 positions) See Table 16, page 28
	## = 0x60 to 0x70 (last 17 positions)
FF	Focus Far
FN	Focus Near
FS	Focus Stop
IC	Iris Close
IO	Iris Open
IS	Iris Stop
PL	Pan Left
PR	Pan Right
PS	Pan Stop
TD	Tilt Down
TS	Tilt Stop
TU	Tilt Up
ZI	Zoom In
ZO	Zoom Out
ZS	Zoom Stop

Typical Goto Preset 1 Command

```

9: DCE 37.491588 f8 01 H 10 89
10: DTE 37.496968 06

```

Typical Zoom Commands

```

13: DCE 35.145515 f8 01 c Z 0 88
14: DTE 35.152004 06
15: DCE 35.207093 f8 01 Z S 88
16: DTE 35.212582 06
17: DCE 37.802684 f8 01 c z 0 88
18: DTE 37.809243 06
19: DCE 40.012606 f8 01 Z S 88
20: DTE 40.018140 06

```

1. DCE f8 01 cZ0 88 Zoom In (Tele) Slow: DTE 06 ACK
2. DCE f8 01 ZS 88 Stop Zoom: DTE 06 ACK
3. DCE f8 01 cz0 88 Zoom Out (Wide) Slow: DTE 06 ACK
4. DCE f8 01 ZS 88 Stop Zoom: DTE 06 ACK

2.4.1 Latch Commands[idome30:sc2]

Command	Description
L1	Manual Focus toggle
LL	Lens Speed toggle
LM	Manual Iris toggle
LP	Camera Power ON/OFF

Notes: All latch commands will return the status as the L? command described below.

Typical Camera Power Off Toggle Commands

```

47: DCE    321.917328  f8 01 L P 8d
48: DTE    321.922811  06
49: DTE    321.953202  f8 01 L 0 A 0 X 0 84
50: DCE    321.967062   06
51: DCE    323.405602  f8 01 c D S 85
52: DTE    323.412042  06
53: DTE    323.440339  f8 01 c W O S O Y O M O D O L 0 A 0 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 8f
54: DCE    323.483631  06

```

Standard Status reply with Camera Power Off (L0).

Typical Camera Power On Toggle Commands

```

55: DCE    558.492425  f8 01 L P 8d
56: DTE    558.523352  06
57: DTE    558.531210  f8 01 L 2 A 0 X 0 86
58: DCE    558.545038   06
60: DCE    583.499810  f8 01 c D S 85
61: DTE    583.506232  06
62: DTE    583.517554  f8 01 c W O S O Y O M O D O L 2 A 0 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 8d
63: DCE    583.561292  06

```

Standard Status reply with Camera Power On (L2).

Typical Wipe Command

```

17: DCE    63.192347  f8 01 L 3 8e
18: DTE    63.197877  06
19: DTE    63.208671  f8 01 L 2 A 4 X 0 82
20: DCE    63.222797   06

```

Typical Wash Command

```

21: DCE    69.160145  f8 01 L 2 8f
22: DTE    69.193362  06
23: DTE    69.200595  f8 01 L 2 A 0 X 0 86
24: DCE    69.214404   06

```

Typical Wipe Set Command

1. Read what is in the unit first.

```

5: DCE    10.055952  f8 01 m w ? 84
6: DTE    10.062355  06
7: DTE    10.073043  f8 01 m w r 0 0 0 4 d 0 2 8b
8: DCE    10.091295   06

```

Run = 0004

Delay = 02

2. Junk (Extra status request)

```

9: DCE      14.987518 f8 01 c D S 85
10: DTE     14.993894 06
11: DTE     15.001966 f8 01 c W O S O Y O M O D O L 2 A O X O H 10 P O v O p O
                        F o C 3 n 1 s o 1 84
12: DCE     15.045314 06

```

3. Then write out changes with old stuff.

```

13: DCE     15.082210 f8 01 m w r 0 0 0 4 d 0 2 8b
14: DTE     15.095971 06

```

Run = 0004

Delay = 02

Typical Wash Parameter Setup Command Sequence

1. Read first

```

19: DCE     71.396799 f8 01 m W ? 84
20: DTE     71.403231 06
21: DTE     71.410880 f8 01 m W W 0 4 w 0 4 m 1 f 0 0 1 80
22: DCE     71.433082 06

```

Wash = 04

Wipe = 04

Mode = 1 = Manual

2. Junk (Extra status request)

```

23: DCE     77.290272 f8 01 c D S 85
24: DTE     77.296640 06
25: DTE     77.306914 f8 01 c W O S O Y O M O D O L 2 A O X O H 10 P O v O p O
                        F o C 3 n 1 s o 1 84
26: DCE     77.350228 06

```

3. Write out wash data

```

27: DCE     112.729000 f8 01 m W W 0 4 w 0 5 m 1 f 0 0 1 81
28: DTE     112.747030 06

```

Wash = 04

Wipe = 05

Mode = 1 = Manual

4. Write out wash data

```

29: DCE     117.886303 f8 01 m W W 0 4 w 0 5 m 0 f 0 0 1 80
30: DTE     117.904209 06

```

Wash = 04

Wipe = 05

Mode = 0 = Auto

5. Wipe

```
31: DCE 147.626724 f8 01 L 3 8e
32: DTE 147.632219 06
33: DTE 147.639194 f8 01 L 2 A 4 X 0 82
34: DCE 147.653150 06
```

6. Set Wipe

```
35: DCE 149.832107 f8 01 m w ? 84
36: DTE 149.838501 06
37: DTE 149.846046 f8 01 m w r 0 0 0 4 d 0 2 8b
38: DCE 149.864290 06
```

No change to wipe

7. Set Wash

```
39: DCE 155.024416 f8 01 m W ? 84
40: DTE 155.030789 06
41: DTE 155.041794 f8 01 m W W 0 4 w 0 5 m 0 f 0 0 1 80
42: DCE 155.064027 06
```

8. Change

```
43: DCE 159.815334 f8 01 m W W 0 4 w 0 5 m 1 f 0 0 1 81
44: DTE 159.833216 06
```

Wash = 04

Wipe = 05

Mode = 1 = Manual

9. Junk (Extra status request)

```
45: DCE 162.635617 f8 01 c D S 85
46: DTE 162.642005 06
47: DTE 162.650713 f8 01 c W O S O Y O M O D O L 2 A O X O H 10 P O v O p O
      F o C 3 n 1 s o 1 84
48: DCE 162.693979 06
```

2.4.2 Variable Speed P/T/Z Commands[idome30:sc4]

Command	Description
d##	Tilt Down — Var. Speed ##: 16 variable speed controls (from 0 _{ASCII} to 0x3F) (d0, d1, d2, d3, d4, d5, d6, d7, d8, d9, d:, d;, d<, d=, d>, d?)
dn	Tilt Down — Nudge
f#	Focus Far — Var. Speed f0 Low Speed f1 Medium Speed f2 Fast Speed
i#	Zoom In — Var. Speed i0 Low Speed i1 Medium Speed i2 Fast Speed
l##	Pan Left — Var. Speed (This command uses a lower case L not a 1.) ##: 16 variable speed controls (from 0 _{ASCII} → ? _{ASCII}) (10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 1:, 1;, 1<, 1=, 1>, 1?)
ln	Pan Left — Nudge. (This command uses a lower case L not a 1.)
n#	Focus Near — Var. Speed n0 Low Speed n1 Medium Speed n2 Fast Speed
o#	Zoom Out — Var. Speed o0 Low Speed o1 Medium Speed o2 Fast Speed
r##	Pan Right — Var. Speed ##: 16 variable speed controls (from 0 _{ASCII} → ? _{ASCII}) (r0, r1, r2, r3, r4, r5, r6, r7, r8, r9, r:, r;, r<, r=, r>, r?)
rn	Pan Right — Nudge
u##	Tilt Up — Var. Speed ##: 16 variable speed controls (from 0 _{ASCII} → ? _{ASCII}) (u0, u1, u2, u3, u4, u5, u6, u7, u8, u9, u:, u;, u<, u=, u>, u?)
un	Tilt Up — Nudge
PS	Pan Stop
TS	Tilt Stop

Typical Variable Speed Pan/Tilt Commands

```

113: DCE      74.488599 f8 01 l < T S 86
114: DTE      74.496394 06
115: DCE      74.946620 f8 01 T S l < 86
116: DTE      74.954352 06
117: DCE      75.042323 f8 01 T S l = 87
118: DTE      75.050060 06
119: DCE      75.055651 f8 01 d 1 l = 85
120: DTE      75.063053 06
121: DCE      75.083326 f8 01 d 2 l = 86
122: DTE      75.090722 06
123: DCE      75.127240 f8 01 d 2 l > 85
124: DTE      75.134610 06
125: DCE      75.150663 f8 01 d 3 l > 84
126: DTE      75.158113 06
127: DCE      75.257138 f8 01 d 3 l ? 85
128: DTE      75.264591 06

```

1. DCE f8 01 l<TS 86 Pan Left var speed step 13 (<), Tilt Stop: DTE 06 ACK
2. DCE f8 01 TS1= 87 Tilt Stop, Pan Left var speed step 14 (=): DTE 06 ACK
3. DCE f8 01 d11= 85 Tilt Down var speed step 1 (1), Pan Left var speed step 14 (=): DTE 06 ACK
4. DCE f8 01 d21= 86 Tilt Down var speed step 2 (2), Pan Left var speed step 14 (=): DTE 06 ACK
5. DCE f8 01 d21> 85 Tilt Down var speed step 2 (2), Pan Left var speed step 15 (>): DTE 06 ACK
6. DCE f8 01 d31> 84 Tilt Down var speed step 2 (3), Pan Left var speed step 15 (>): DTE 06 ACK
7. DCE f8 01 d31? 85 Tilt Down var speed step 2 (3), Pan Left var speed step 16 (?): DTE 06 ACK

Various pan/tilt commands in the Cohu 16 step speed system. Note that these commands may be “stacked” and the order of the stacking does not appear to be important.

2.4.3 Misc. Commands[idome30:sc6]

Command	Description	Response
A?	Read CAMERAADDRESS	A### Return the current CMERAADDRESS in ASCII ### = 001 — 223
AS###	Assign CAMERAADDRESS	### = 001 — 223
	NOTE: The above command is also valid if CAMERAADDRESS 0xFF is used.	
b?####	Query LCU Host Baud Rate (b0300, b0600, b1200, b2400, b4800, b9600, b192K)	b#### = 0300, 0600, 1200, 2400, 4800, 9600, 192K
Bs####	Set Camera Baud Rate #### = 0300, 0600, 1200, 2400, 4800, 9600, 192K (Bs0300, Bs0600, Bs1200, Bs2400, Bs4800, Bs9600, Bs192K)	
bs####	Set LCU Host Baud Rate #### = 0300, 0600, 1200, 2400, 4800, 9600, 192K (bs0300, bs0600, bs1200, bs2400, bs4800, bs9600, bs192K)	
E#####	Elevation Level where the camera is mounted. This is used to calibrate the Low Pressure indicator in the camera. ##### = 0 to 10000 in ASCII (in feet)	
fE	Tilt Flip Enabled	
fD	Tilt Flip Disabled	
fS	iDome/iView Flip Enable Query	Return Tilt Flip Enable Status fSE (Tilt Flip Enabled) fSD (Tilt Flip Disabled)
h1	RS-232 Flow Control (RTS/CTS) Enabled	
h0	RS-232 Flow Control (RTS/CTS) Disabled	
Continued on the next page.		

<i>Continued from the previous page.</i>		
Command	Description	Response
hS	RS-232 Flow Control Query	Return RS-232 Handshake Status h1 (Enabled) h0 (Disabled)
Jb0	Set Javelin 2 Bytes Addr for camera OFF	
Jb1	Set Javelin 2 Bytes Addr for camera ON	
JbS	Query Camera for Javelin 2 Bytes Addr status in camera	Jb0 (OFF) Jb1 (ON)
jb0	Set Javelin 2 Bytes Addr for LCU OFF	
jb1	Set Javelin 2 Bytes Addr for LCU ON	
jbS	Query LCU for Javelin 2 Bytes Addr status in LCU	jb0 (OFF) jb1 (ON)
Jc0	Set Javelin Continuous Motor Mode for Camera OFF	
Jc1	Set Javelin Continuous Motor Mode for Camera ON	
JcS	Query Camera for Javelin Continuous Motor Mode status in Camera	Jc0 (OFF) Jc1 (ON)
jc0	Set Javelin Continuous Motor Mode for LCU OFF	
jc1	Set Javelin Continuous Motor Mode for LCU ON	
jcS	Query LCU for Javelin Continuous Motor Mode status in LCU	jc0 (OFF) jc1 (ON)
Lp#	Line Lock Phase Adjust Lp0 (Camera is in Crystal mode) Lp1 (Line Lock — Phase 0 mode — 0°) Lp2 (Line Lock — Phase 1 mode — 30°) Lp3 (Line Lock — Phase 2 mode — 60°) Lp4 (Line Lock — Phase 3 mode — 90°) Lp5 (Line Lock — Phase 4 mode — 120°)	
<i>Continued on the next page.</i>		

<i>Continued from the previous page.</i>		
Command	Description	Response
	Lp6 (Line Lock — Phase 5 mode — 150°)	
mPS	Query the internal pressure data	mPxx.x xx: 2 digits — ASCII data and 1 digit decimal For example: 10.5
mSN	Set True North Offset	
mTS	Query the internal temperature data	mPxx xx: 2 digits — ASCII data in degrees C For example: 30°C
RS	iDome/iView Firmware Revision Query	Return Firmware Revision (Maximum 24 Characters blank padded) “Model#_Firmware_Ver._1.0” For example: RModel#_Firmware_V1.0_
Rs	LCU Firmware Revision Query	Return Firmware Revision (Maximum 24 Characters blank padded) “Model#_Firmware_Ver._1.0” For example: rLCU_Firmware_V1.0_

Typical Set North Command

```

1: DCE      0.000000 f8 01 m N s 81
2: DTE      0.006407 06

```

Typical Clear North Command

```

3: DCE      7.639522 f8 01 m N c 81
4: DTE      7.645918 06

```

2.5 Position

Please see Section 1.7, page 12 for positioning information.

2.6 ID Commands[idome30:idcommands]

Command	Description
cdSc	Get ID Control Data, i.e Enable, Top, Alarm Blink ... Reply is: dC# # = Control Byte (xxx11111)
cdS##	Get Preset ## ID stored in camera ## = 0x10 to 0x3E (first 47 positions) See Table 16, page 28 ## = 0x60 to 0x70 (last 17 positions) Reply is: dP##<DATA>
cdS1#	Get ID Messages cdS11, cdS12, cdS13, cdS14, cdS15 Reply is: dL#<DATA>
cdSS##	Get Sector ## ID stored in camera ## = 1 _{ASCII} → @ _{ASCII} (16 sectors) (cdSS1, cdSS2, cdSS3, cdSS4, cdSS5, cdSS6, cdSS7, cdSS8, cdSS9, cdSS:, cdSS;, cdSS<, cdSS=, cdSS>, cdSS?), cdSS@) Reply is: dST##<DATA> (dST1<DATA>, dST2<DATA>, dST3<DATA>, dST4<DATA>, dST5<DATA>, dST6<DATA>, dST7<DATA>, dST8<DATA>, dST9<DATA>, dST:<DATA>, dST;<DATA>, dST<<DATA>, dST=<DATA>, dST><DATA>, dST?<DATA>), dST@<DATA>)
cdSs##	Get Sector ID State ## = Sector Number (1 _{ASCII} → @ _{ASCII}) (cdSs1, cdSs2, cdSs3, cdSs4, cdSs5, cdSs6, cdSs7, cdSs8, cdSs9, cdSs:, cdSs;, cdSs<, cdSs=, cdSs>, cdSs?), cdSs@) Reply is: dSS#s s = State (1 = On; 0 = Off) (dSS10, dSS20, dSS30, dSS40, dSS50, dSS60, dSS70, dSS80, dSS90, dSS:0, dSS;0, dSS<0, dSS=0, dSS>0, dSS?0, dSS@0) (dSS11, dSS21, dSS31, dSS41, dSS51, dSS61, dSS71, dSS81, dSS91, dSS:1, dSS;1, dSS<1, dSS=1, dSS>1, dSS?1, dSS@1)
dAB	Enable Alarm Blinking
dAb	Disable Alarm Blinking
dAD	Disable Alarm # Display
dAE	Enable Alarm Display
dIB	Display ID on bottom of screen
dIC	Clear All ID Data, include Presets, Sectors, Privacy Zones
Continued on the next page.	

<i>Continued from the previous page.</i>	
Command	Description
dID	Disable ID Display
dIE	Enable ID Display
dIT	Display ID on top of screen
dL#<DATA>	Set content of ID messages dL1 : line 1 (ID line 1) dL2 : line 2 (ID line 2) dL3 : line 3 (Alarm ID line 1) dL4 : line 4 (Alarm ID line 2) dL5 : line 5 (Alarm ID line 3) DATA = 24 ASCII characters
dME	Maintenance Display Enable
dMD	Maintenance Display Disable
dP##<DATA>	Store Preset ID display in the receiver Preset ID will be displayed when a preset is executed, and disappears when a P/T/Z/F command is executed. P## = 0x10 to 0x3E (first 47 positions) See Table 16, page 28 P## = 0x60 to 0x70 (last 17 positions) DATA = 24 ASCII characters
dSS#s	Set Sector ID State # = Sector Number ($1_{ASCII} \rightarrow @_{ASCII}$) s = State 0 = Off: (dSS10, dSS20, dSS30, dSS40, dSS50, dSS60, dSS70, dSS80, dSS90, dSS:0, dSS;0, dSS<0, dSS=0, dSS>0, dSS@0) s = State 1 = On: (dSS20, dSS21, dSS31, dSS41, dSS51, dSS61, dSS71, dSS81, dSS91, dSS:1, dSS;1, dSS<1, dSS=1, dSS>1, dSS@1)
dST#<DATA>	Set Sector ID Text dST# = Sector Number ($1_{ASCII} \rightarrow @_{ASCII}$) (dST1<DATA>, dST2<DATA>, dST3<DATA>, dST4<DATA>, dST5<DATA>, dST6<DATA>, dST7<DATA>, dST8<DATA>, dST9<DATA>, dST:<DATA>, dST;<DATA>, dST<<DATA>, dST=<DATA>, dST><DATA>, dST?<DATA>, dST@<DATA>) DATA = 24 ASCII characters

Typical Get preset ID Command

```

11: DCE    51.083158  f8 01 c d S 10 85
12: DTE    51.090986  06
13: DTE    51.100107  f8 01 d P 10 P R E S E T 20 1 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 81
14: DCE    51.136794  06

```

Typical Set Preset ID Command

```

15: DCE    56.539135  f8 01 d P 10 P R E S E T 20 1 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 81
16: DTE    56.571062  06

```

2.7 Standard Latch/Home Status/Response Message Format[idome30:table5]**2.7.1 Status request**[idome30:sc3]

Command	Description
H?	Home Position Request — See Section 2.7.3, page 52 for response status
L?	Latch Status Request — See Section 2.7.2, page 51 and Section 1.6, page 8 for response status

2.7.2 Format Latch Status Response[idome30:1hr1]

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF)
2	L	Latch status
3	0 _{ASCII} — 7 _{ASCII}	LS nibble is four bits of status Bit Value 0/1 B_0 = Manual Iris/Auto Iris (1/0) B_1 = Camera Power On/Off (1/0) B_2 = Lens Speed Fast/Slow (1/0) B_3 = Not Used (L0, L1, L2, L3, L4, L5, L6, L7, L8)
4	A	Aux status
5	0 _{ASCII} — 7 _{ASCII}	LS nibble is four bits of status Bit Value 0/1 B_0 = Auto/Manual Focus (1/0) B_1 = Auto Integration/Manual Integration (1/0) B_2 = Not used B_3 = Not Used (A0, A1, A2, A3, A4, A5, A6)
6	X	Misc. status
7	0 _{ASCII} — 7 _{ASCII}	LS nibble is four bits of status Bit Value 0/1 B_0 = Not Used B_1 = Low Pressure (1) B_2 = Video Loss (1) B_3 = Not Used (X0, X1, X2, X3, X4, X5, X6, X7)
8	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS Nibbles only) except 0xF8

Typical Latch Request/Responses

```

1: DCE      0.000000  f8 01 L 3 8e
2: DTE      0.005645  06
3: DTE      0.016449  f8 01 L 2 A 4 X 0 82
4: DCE      0.030283  06

```

1. DCE f8 01 L3 8e Latch Status Request: DTE 06 ACK
2. DTE f8 01 L2A4X0 82
 - 2.1 L2 = Auto Iris, Camera Power On, Lens Speed Slow.
 - 2.2 A4 = Might be Auto focus, is listed at Manual Focus. Might be Automatic Integration, is listed at Manual Integration. The 4 option is listed as Not Used.
 - 2.3 X0 = Misc status indication that low pressure is not a problem and that Video is not lost.
3. DCE 06 ACK

Typical Select 8 Zones Command

```

5: DCE      10.887516 f8 01 d N 0 8b
6: DTE      10.893931 06

```

Typical Select 16 Zones Command

```

7: DCE      14.998778 f8 01 d N 1 8a
8: DTE      15.005125 06

```

2.7.3 Format Home Status Response[idome30:1hr2]

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF)
2	H	Home status
3	0x10 — 0x3E 0x60 — 0x70 HI	Home Position See Table 16, page 28 (H0, H1, H2, H3, H4, H5, H6, H7, H8, H9) Home is inactive (camera is not at a preset position)
4	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS Nibbles only) except 0xF8

2.8 DSP Commands[idome30:dspcommands]

Command	Description	Response
cB	Enable Boot Loader to update new firmware in the LCU	
cb	Enable Boot Loader to update new firmware in the iDome/iView	
cD#	Digital Zoom Range cD0 (OFF) cD1 (2X) cD2 (5X) cD3 (10X)	
cFA	Focus Auto	
cFM	Focus Manual	
cFs	Focus Stop	
cFF	Video Freeze ON/OFF toggle	
cF#	Set Video Freeze ON/OFF cF0 (ON) cFo (OFF)	
cIA	Iris Auto	
cIM	Iris Manual	
cC#	Set Camera Head Comm. Baud Rate (ER-8682 only) cC0 for 4800 cC1 for 9600 cC2 for 19.2K cC3 for 38.4K	
cDS	DSP Status Request, See Section 2.8.1, page 56 for response formats	
cLN	Set Normal Light mode (ER8439E — special Camera module)	
cLn	Set Sodium Vapor Light mode (ER8439E — special Camera module)	
cLS	Status request of Light mode setting (ER8439E — special Camera module)	cLN: Normal mode cLn: Sodium Vapor mode
cn#	Set Poll Camera (ER-8682 only) cn0 for OFF cn1 for ON	
<i>Continued on the next page.</i>		

<i>Continued from the previous page.</i>		
Command	Description	Response
cM0	Camera in Day/Night Auto Mode	
cM1	Camera in Day Mode (Color)	
cM2	Camera in Night Mode (Monochrome)	
cP#	Camera Communication Protocol Selection	See Figure 1.10, page 29 for more information.
cPs	Query LCU Communication Protocol	P# LCU Protocol # = 0 _{ASCII} (Cohu) See Figure 1.10, page 29 for more information.
cS#	Shutter cS0 (Auto) cS8 (1/180) cS1 (1/2) cS9 (1/250) cS2 (1/4) cS: (1/500) cS3 (1/8) cS; (1/1000) cS4 (1/15) cS< (1/2000) cS5 (1/30) cS= (1/4000) cS6 (1/60) cS> (1/10000) cS7 (1/120) cS? (1/30000)	
cs0	Set Progressive Scan On	
cso	Set Progressive Scan Off	
cW#	White Balance cW0 (Auto) cW1 (Manual)	
cWB	Increase BLUE	
cWb	Decrease BLUE	
cWQ	Stop Increase/Decrease color	
cWR	Increase RED (in Manual mode only)	
cWr	Decrease RED	
cY0	Wide Dynamic Range OFF	
cY1	Wide Dynamic Range ON	
<i>Continued on the next page.</i>		

<i>Continued from the previous page.</i>		
Command	Description	Response
cZ#	Zoom Tele — Var. Speed cZ0 (Low Speed) cZ1 (Medium Speed) cZ2 (Fast Speed)	
cZs	Zoom Stop	
cz#	Zoom Wide — Var. Speed cz0 (Low Speed) cz1 (Medium Speed) cz2 (Fast Speed)	

Typical Manual Focus On/Off Commands

```

41: DCE 147.803094 f8 01 c F M 89
42: DTE 147.809463 06
43: DCE 157.311656 f8 01 c D S 85
44: DTE 157.318097 06
45: DTE 157.325434 f8 01 c W O S O Y O M O D O L 2 A 1 X O H I P O v 0 p O F o C 3 n 1 s o 1 8 c
46: DCE 157.369188 06

```

Standard Status reply with Manual Focus On (A1)

```

51: DCE 161.522789 f8 01 c F A 85
52: DTE 161.529228 06
53: DCE 164.819409 f8 01 c D S 85
54: DTE 164.825758 06
55: DTE 164.833199 f8 01 c W O S O Y O M O D O L 2 A O X O H I P O v 0 p O F o C 3 n 1 s o 1 8 d
56: DCE 164.876924 06

```

Standard Status reply with Manual Focus Off (A0)

Typical Manual Iris On/Off Commands

```

61: DCE 185.462587 f8 01 c I M 86
62: DTE 185.469019 06
63: DCE 189.465469 f8 01 c D S 85
64: DTE 189.471914 06
65: DTE 189.481870 f8 01 c W O S O Y O M O D O L 3 A O X O H I P O v 0 p O F o C 3 n 1 s o 1 8 c
66: DCE 189.525587 06

```

Standard Status reply with Manual Iris On (L3)

```

75: DCE 193.388239 f8 01 c I A 8a
76: DTE 193.394627 06
77: DCE 196.214380 f8 01 c D S 85
78: DTE 196.220812 06
79: DTE 196.229718 f8 01 c W O S O Y O M O D O L 2 A O X O H I P O v 0 p O F o C 3 n 1 s o 1 8 d
80: DCE 196.273450 06

```

Standard Status reply with Manual Iris Off (L2)

2.8.1 DSP Response Message Format [idome30:table6]

A typical DSP response message from an iViewII type PTZ.

f8 01cW0S0Y0M0D0L2A0X0HIP0v0p0FoC3n1so1 8d
--

The leading 0xF8, the trailing 0x8D and their associated blanks are in Hexadecimal, the rest are as they were transferred on the serial link.

This response decodes as follows:

1. 0xF8: AUTOBAUD character
2. 01: Address
3. c: Camera DSP status message type.
4. W0: White Balance, automatic.
5. S0: Shutter, automatic.
6. Y0: Wide Dynamic Range, off.
7. M0: Day/night mode, auto.
8. D0: Digital Zoom, off.
9. L2: Latch Status, Camera Power on, Auto Iris, Slow Lens Speed.
10. A0: Aux, meaning is not clear.
11. X0: Misc status, all off, i.e. no internal errors.
12. HI: Preset Position is inactive. I.e. not at a preset location.
13. P0: Communications Protocol, Cohu.
14. v0: Video, NTSC.
15. p0: Line Lock status, Camera is in crystal mode.
16. Fo: Video Status, live.
17. C3: Camera Head Comm Rate, 38.4 K baud.
18. n1: Camera Poll, Yes.
19. so: Progress Scan, Off.
20. 1: Odd field, 0 = Even field. Defined in rev 5.7.
21. 0x8D: CHECKSUM

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF)
2	c	DSP status
3	W	White Balance Status
4	W0 = Auto W1 = Manual	
5	S	Shutter Status
6	0 _{ASCII} — 7 _{ASCII}	S0 = Auto cS0 (Auto) cS8 (1/180) cS1 (1/2) cS9 (1/250) cS2 (1/4) cS: (1/500) cS3 (1/8) cS; (1/1000) cS4 (1/15) cS< (1/2000) cS5 (1/30) cS= (1/4000) cS6 (1/60) cS> (1/10000) cS7 (1/120) cS? (1/30000)
7	Y	Wide Dynamic Range Status
8		Y0 = Off Y1 = On
9	M	Day Night Mode
10		M0 = Day/Night in Auto mode M1 = in Day mode M2 = in Night mode
11	D	Digital Zoom Mode
12		D0 = Off D1 = 2X D2 = 5X D3 = 10X
13	L	Latch status (See also Section 1.6, page 8)
14	0 _{ASCII} — 7 _{ASCII}	LS nibble is four bits of status Bit Value 0/1
<i>Continued on the next page.</i>		

Continued from the previous page.		
Byte	Data	Description
		B_0 = Manual Iris/Auto Iris (1/0) B_1 = Camera Power On/Off (1/0) B_2 = Lens Speed Fast/Slow (1/0) B_3 = Not Used (L0, L1, L2, L3, L4, L5, L6, L7, L8)
15	A	Aux status
16	$0_{ASCII} - 7_{ASCII}$	LS nibble is four bits of status Bit Value 0/1 B_0 = Auto/Manual Focus (1/0) B_1 = Auto Integration/Manual Integration (1/0) B_2 = Not used B_3 = Not Used (A0, A1, A2, A3, A4, A5, A6, A7)
17	X	Misc. status
18	$0_{ASCII} - 7_{ASCII}$	LS nibble is four bits of status Bit Value 0/1 B_0 = Not Used B_1 = Low Pressure (1) B_2 = Video Loss (1) B_3 = Not Used (X0, X1, X2, X3, X4, X5, X6, X7)
19	H Home status	
20	0x10 — 0x3E 0x60 — 0x70 HI	Home Position See Table 16, page 28 (H0, H1, H2, H3, H4, H5, H6, H7, H8, H9) Preset is inactive (camera is not at a preset position)
21	P	Camera Communication Protocol
22		See Figure 1.10, page 29 for more information.
23	v	Video Type
24		v0 (NTSC) v1 (PAL)
25	p	Line Lock Phase Status
26		p0 (Camera is in Crystal mode) p1 (Line Lock — Phase 0 mode — 0°) p2 (Line Lock — Phase 1 mode — 30°) p3 (Line Lock — Phase 2 mode — 60°) p4 (Line Lock — Phase 3 mode — 90°) p5 (Line Lock — Phase 4 mode — 120°)
Continued on the next page.		

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Byte	Data	Description
		p6 (Line Lock — Phase 5 mode — 150°)
27	F	Video Status
28		F0 (Video Live mode) F0 (Video Freeze mode)
29	C	Camera Head Comm. Baud Rate (ER-8682)
30		C0 4800 C1 9600 C2 19.2K C3 38.4K
31	n	Poll Camera ON/OFF Status (ER-8682)
32		n0 No Poll n1 Poll
33	s	Progressive Scan
34		so Off s0 On
35	1	Video Field ID 0 = Even, 1 = Odd. Only found on the iViewII. May or may not exist elsewhere.
35(36)	CHECKSUM End of message	0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS Nibbles only) except 0xF8

2.9 Sector/Zone/Touring Message Format [idome30:sectortouringcommands]

2.9.1 Sector Commands

Command	Description	Response
*SC#	Clear Sector Limits # = Sector Number ($0_{ASCII} \rightarrow @_{ASCII}$) If 0_{ASCII} clear all, otherwise clear sector only	
*SL#s	Set Sector Limit # = Sector Number ($1_{ASCII} \rightarrow @_{ASCII}$) s = L — Left Limit or R — Right Limit	
*Sl#	Get Sector Limits # = Sector Number ($1_{ASCII} \rightarrow @_{ASCII}$)	*SS#1111rrrr 1111 and rrrr = $0000_{ASCII} \rightarrow 3599_{ASCII}$
*SX	Set Calibration Position (optional)	
*Sx	Get Calibration Position (optional)	*SXpppp pppp = $0000_{ASCII} \rightarrow 3599_{ASCII}$

2.9.2 Privacy Zone Commands

Command	Description	Response
*PC#	Clear Privacy Zone Limits # = Zone Number ($0_{ASCII} \rightarrow 8_{ASCII}$) If 0_{ASCII} clear all, otherwise clear zone only	
*PL#s	Set Privacy Zone Limit # = Zone Number ($1_{ASCII} \rightarrow 8_{ASCII}$) s = L — Left Limit or R — Right Limit	
*Pl#	Get Privacy Zone Limits # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$)	*Pp#1111rrrr 1111 and rrrr = $0000_{ASCII} \rightarrow 3599_{ASCII}$
*PS#s	Set Privacy Zone State # = Zone Number ($1_{ASCII} \rightarrow 8_{ASCII}$) s = State (1 = On; 0 = Off)	
*Ps#	Get Privacy Zone State # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$)	*PS#s s = State (1 = On; 0 = Off)

2.9.3 Tour Commands

Command	Description	Response
*TC#	Clear all preset/dwell data for Tour # # = Tour Number (1 _{ASCII} → 8 _{ASCII})	
*TD#<data>	Set Tour Dwell Times # = Tour Number (1 _{ASCII} → 8 _{ASCII}) <data> = 32 dwell times in the range 0x10 to 0x4D (0 to 60 sec)	
*Td#	Get Tour Dwell Times	*TD#i<data> _i # = Tour Number (1 _{ASCII} → 8 _{ASCII}) i<data> _i = 32 dwell times in the range of 0x10 to 0x4D (0 to 60 sec)
*TP#<data>	Set Tour Presets # = Tour Number (1 _{ASCII} → 8 _{ASCII}) <data> = 32 preset values in the range 0x10 to 0x50 (i.e. 0 to 64) Note: 0x10 indicates No Preset	
*Tp#	Get Tour Presets # = Tour Number (1 _{ASCII} → 8 _{ASCII}) i<data> _i = 32 preset values in the range of 0x10 to 0x50 (0 to 64)	*TP#i<data> _i
*TS#s	Set Tour State # = Tour Number (1 _{ASCII} → 8 _{ASCII}) s = State (0 = Stop; 1 = Start)	
*Ts#	Get Tour State # = Sector Number (1 _{ASCII} → 8 _{ASCII}) s = State (0 = Stop; 1 = Start)	*TS#s

2.10 Upload Camera Configuration to Camera

This section describes how to upload camera configuration data to the camera. For example, camera IDs, Presets position, Tour/Sector position, etc.

Command	Description
*Pp#1111rrrr	Upload Privacy Zone Limits to camera # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) 1111 and rrrr = $0000_{ASCII} \rightarrow 3599_{ASCII}$
*pP##pppppttttzzzzffff	Upload Presets Data to camera ## = 0x10 to 0x3E (first 47 positions) ## = 0x60 to 0x70 (last 17 positions) pppp = Pan Preset Position data tttt = Tilt Preset Position data zzzz = Zoom Preset Position data ffff = Focus Preset Position data
*PS#s	Upload Privacy Zone State to camera # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) s = State (1 = On; 0 = Off)
*SS#1111rrrr	Upload Sector Limits to camera # = Sector Number ($1_{ASCII} \rightarrow @_{ASCII}$) 1111 and rrrr = $0000_{ASCII} \rightarrow 3599_{ASCII}$
*TD#<data>	Upload Tour Dwell Times to camera # = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) jdataj = 32 dwell times in the range of 0x10 to 0x4D (0 to 60 sec)
*TP#<data>	Upload Tour Presets to camera # = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) jdataj = 32 preset values in the (<i>and nothing more is said</i>)
*TS#s	Upload Tour State to camera # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) s = State (0 = Stop; 1 = Start)
dC#	Upload ID Control Data, i.e Enable, Top, Alarm Blink ... to camera # = Control Byte(xxx11111)
dL#<DATA>	Upload ID Messages # = 1, 2, 3, 4, 5 DATA = 24 ASCII characters
dP##<DATA>	Upload Preset ## ID to camera See Table 16, page 28 ## = 0x10 to 0x3E (first 47 positions)

Continued on the next page.

<i>Continued from the previous page.</i>	
Command	Description
	## = 0x60 to 0x70 (last 17 positions)
dSS##s	Upload Sector ID State to camera ## = Sector Number ($1_{ASCII} \rightarrow @_{ASCII}$) s = State (1 = On; 0 = Off)
dST##<DATA>	Upload Sector ## ID to camera ## = $1_{ASCII} \rightarrow @_{ASCII}$ (16 sectors)

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3 iDome/iView/iViewII LCU Communication Protocol, Rev 5.7 [idome57]

Cohu, Inc
Electronics Division ¹⁵

3.1 General

This document defines the Asynchronous communication protocol between the MPC Master Control Panel/-Host Computer and an iDome/iView/LCU Figure 7, page 67 illustrates the handshake protocol. The communication is full duplex. Typical or default communication parameters will be 9600 baud, 8 data bits, 1 stop bit and no parity.

3.2 Message Format

Anytime a command message is sent to the Camera the camera will respond with an ACK or NAK. The commands are sent using the command message format shown in Table 19, page 66 to Table 22, page 67. The response message from the camera is shown in Table 3.4, page 77 and Table 3.7, page 86.

If the command message contains only a momentary function, no further response beyond the ACK or NAK will occur. If the command requires a status message response, then a message will be returned following the ACK.

The control characters to be used are:

- 0xF8 Start Character (in Hex)
- ACK Acknowledge proper receipt of transmission
- NAK Bad transmission — retransmit
- CHECKSUM End of Message
- CAMERAADDRESS Camera address in Hex
- ## One byte in Hex
- # Number in ASCII
- * ASCII Asterisk
- c ASCII c
- d ASCII d

All transmissions will be in formats:

1. <0xF8> <CAMERAADDRESS> <data> <CHECKSUM>, Table 19, page 66.
2. <0xF8> <CAMERAADDRESS> <c> <data> <CHECKSUM>, Table 20, page 66.
3. <0xF8> <CAMERAADDRESS> <*> <data> <CHECKSUM>, Table 21, page 66.
4. <0xF8> <CAMERAADDRESS> <d> <data> <CHECKSUM>, Table 22, page 67.

NOTE: n is the number of command data bytes in the following messages.

¹⁴\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/iDome57.inc,v 1.13 2007-07-27 13:57:56-07 Hamilton Exp Hamilton

\$¹⁵P.O. Box 85623, San Diego, CA 92186-5626, Telephone: (619) 277-6700 Fax: (619) 277-0221 Web: www.cohu.com/cctv

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	0x01 to 0xDF Note: 0xFF address is used to read camera address or to assign camera address
2 to $n + 2$	Command Data	
$n + 3$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8.

Table 19: Standard Command Message Format [idome57:table1]

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	0x01 to 0xDF Note: 0xFF address is used to read camera address or to assign camera address
2	c	Message type (for camera control)
3 to $n + 3$	DSP Command Data	
$n + 4$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8.

Table 20: DSP Camera Command Message Format [idome57:table2]

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	0x01 to 0xDF Note: 0xFF address is used to read camera address or to assign camera address
2	*	Message type (for sector/touring)
3 to $n + 3$	Touring/Position Command Data	
$n + 4$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8.

Table 21: Sector/Touring Command Message Format [idome57:table3]

Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	0x01 to 0xDF Note: 0xFF address is used to read camera address or to assign camera address
2	d	Message type (for ID)
3	Command 1	See Table 3.3, page 70 for command types and response
4	Command 2	
5 to 29	ID Data	24 ID ASCII characters, or Enable/Disable, or Blinking, etc.
$n + 30$	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8.

Table 22: ID Command Message Format[idome57:table4]

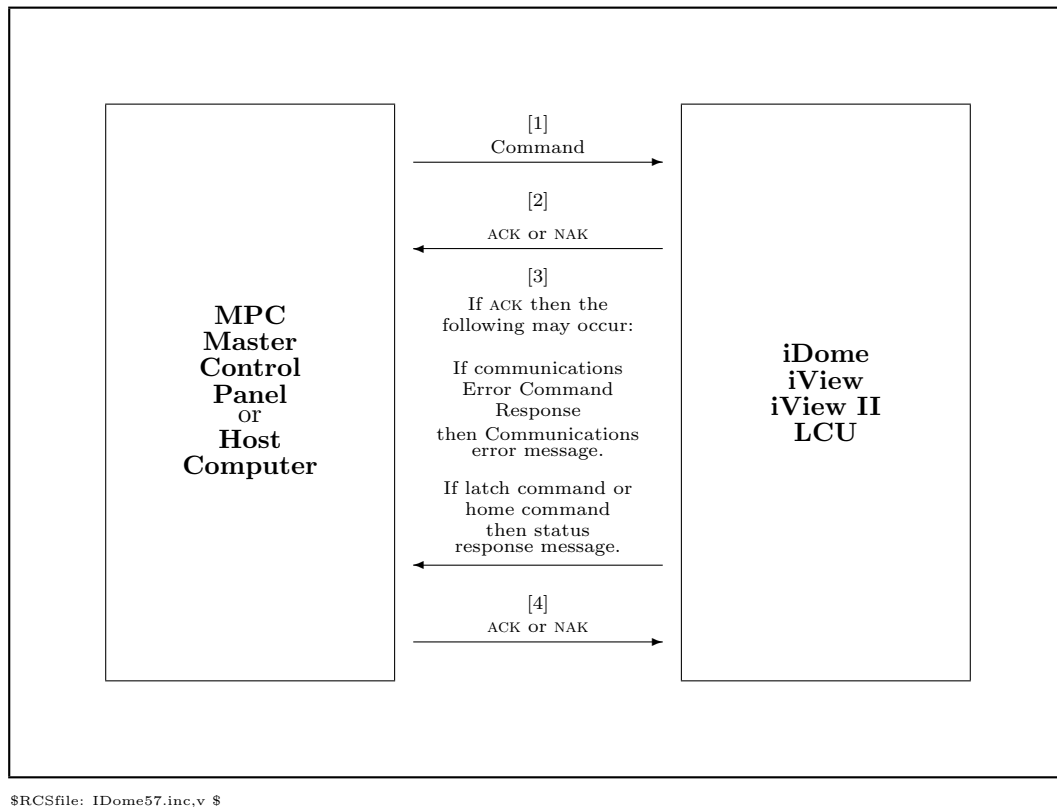


Figure 7: Typical Communications Protocol[idome57:tcpidome]

3.3 Standard Commands[idome57:standardcommands]

Command	Description
PR	Pan Right
PL	Pan Left
PS	Pan Stop
TU	Tilt Up
TD	Tilt Down
TS	Tilt Stop
ZI	Zoom In
ZO	Zoom Out
ZS	Zoom Stop
FN	Focus Near
FF	Focus Far
FS	Focus Stop
IO	Iris Open
IC	Iris Close
IS	Iris Stop
P ##	Program Preset Position, see Table 16, page 28 for more information ## = 0x10 to 0x3E (first 47 positions) = 0x60 to 0x70 (last 16 positions)
H ##	Goto a Preset Position, see Table 16, page 28 for more information ## = 0x10 to 0x3E (first 47 positions) = 0x60 to 0x70 (last 16 positions)
B1	Integration Up Continue up to 1/8th shutter speed
B2	Integration Down Continue back to 1/60th shutter speed

Latch Commands	
Command	Description
LP	Camera Power On/Off
LM	Manual Iris toggle
LL	Lens Speed toggle
L1	Manual Focus toggle
L2	Wash On/Off (3965 model only)
L3	Wipe On/Off (3965 model only)

Notes: All latch commands will return the status as the L? command described below.

Status Request		
Command	Description	Response
L?	Latch Status Request	See Table 3.4, page 77 and Section 1.6, page 8 for response status
H?	Home Position Request	See Table 3.4, page 78 for response status

Variable Speed P/T/Z Commands[idome57:variablespeed]		
Command	Description	Response
r##	Pan Right Var. Speed ##: 16 variable speed controls (from 0 _{ASCII} → ? _{ASCII}) (r0, r1, r2, r3, r4, r5, r6, r7, r8, r9, r:, r;, r<, r=, r>, r?)	
l##	Pan Left Var. Speed ##: 16 variable speed controls (from 0 _{ASCII} → ? _{ASCII}) (l0, l1, l2, l3, l4, l5, l6, l7, l8, l9, l:, l;, l<, l=, l>, l?)	
PS	Pan Stop	
u##	Tilt Up Var. Speed ##: 16 variable speed controls (from 0 _{ASCII} → ? _{ASCII}) (u0, u1, u2, u3, u4, u5, u6, u7, u8, u9, u:, u;, u<, u=, u>, u?)	
d##	Tilt Down Var. Speed ##: 16 variable speed controls (from 0 _{ASCII} → ? _{ASCII}) (d0, d1, d2, d3, d4, d5, d6, d7, d8, d9, d:, d;, d<, d=, d>, d?)	
TS	Tilt Stop	
s#	Set P/T Speed (iViewII) s0: Fixed P/T Speed Use Zoom Pos as proportional speed s1: Var. Speed P/T No Zoom Pos used as speed s2: Var. Speed and use Zoom Pos as proportional and variable speed	
sS	Request for Status of P/T Speed mode	s# , # = 0, 1, 2
rn	Pan Right — Nudge	
ln	Pan Left — Nudge	
un	Tilt Up — Nudge	
dn	Tilt Down — Nudge	

ID Commands[idome57:idcommands]		
Command	Description	Response
dIE dIe#	Enable ID display (All) Enable ID Line # dIe1 Line 1 dIe2 Line 2	
dID dId#	Disable ID display (All) Disable ID Line # dId1 Line 1 dId2 Line 2	
dIT dIB	Display ID on top of screen Display ID on bottom of screen	
dAE dAe#	Enable Alarm display (All) Enable Alarm Line # dAe1 Line 1 dAe2 Line 2 dAe3 Line 3	
dAD dAd#	Disable Alarm # display (All) Disable Alarm Line # dAd1 Line 1 dAd2 Line 2 dAd3 Line 3	
dAB dAb	Enable Alarm Blinking Disable Alarm Blinking	
dME dMD	Maintenance Display Enable Maintenance Display Disable	
dIC	Clear All ID data, include Presets, Sectors, Privacy Zones	
dL#DATA	Set content of ID messages dL1DATA: line 1 (ID line 1) dL2DATA: line 2 (ID line 2) dL3DATA: line 3 (Alarm ID line 1) dL4DATA: line 4 (Alarm ID line 2) dL5DATA: line 5 (Alarm ID line 3) DATA = 24 ASCII characters	
dP##DATA	Store Preset ID display in the receiver Preset ID will be displayed when a preset is executed, and disappears when a P/T/Z/F command is executed.	See Table 16, page 28 for more information

Continued on the next page.

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ID Commands		
Command	Description	Response
	## = 0x10 to 0x3E (first 48 positions) = 0x60 to 0x70 (last 16 positions) DATA = 24 ASCII characters	
dST#s	Set Sector ID Text # = Sector Number (1 _{ASCII} to @ _{ASCII}) s = 24 ASCII characters (dST0, dST1, dST2, dST3, dST4, dST5, dST6, dST7, dST8, dST9, dST:, dST;, dST<, dST=, dST>, dST?, dST@)	
dSS#s	Set Sector ID State # = Sector Number (1 _{ASCII} to @ _{ASCII}) s = State (1=On; 0=Off) (dSS00, dSS10, dSS20, dSS30, dSS40, dSS50, dSS60, dSS70, dSS80, dSS90, dSS:0, dSS;0, dSS<0, dSS=0, dSS>0, dSS?0, dSS@0) (dSS01, dSS11, dSS21, dSS31, dSS41, dSS51, dSS61, dSS71, dSS81, dSS91, dSS:1, dSS;1, dSS<1, dSS=1, dSS>1, dSS?1, dSS@1)	
cdSc	Get ID Control Data, i.e Enable, Top, Alarm Blink ...	dC# # = Control Byte(11111)
cdS1#	Get ID Messages	dL#DATA # = 1,2,3,4,5 (cdS11, cdS12, cdS13, cdS14, cdS15
cdS##	Get Preset ## ID stored in camera	dP##DATA See Table 16, page 28 for more information ## = 0x10 to 0x3E (first 48 positions) = 0x60 to 0x70 (last 16 positions)
cdSS##	Get Sector ## ID stored in camera	dST##DATA ## = 1 _{ASCII} to @ _{ASCII} (16 sectors)
cdSs##	Get Sector ID State (cdSs00, cdSs10, cdSs20, cdSs30, cdSs40, cdSs50, cdSs60, cdSs70, cdSs80, cdSs90, cdSs:0, cdSs;0, cdSs<0, cdSs=0, cdSs>0, cdSs?0, cdSs@0)	dSS#s ## = Sector Number (1 _{ASCII} to @ _{ASCII}) s = State(1=On; 0=Off)
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ID Commands		
Command	Description	Response
	(cdSs01, cdSs11, cdSs21, cdSs31, cdSs41, cdSs51, cdSs61, cdSs71, cdSs81, cdSs91, cdSs:1, cdSs;1, cdSs<1, cdSs=1, cdSs>1, cdSs?1, cdSs@1)	
dM#	Maintenance Mode Display dME Enable dMD Disable	
dp#	Pan Tilt Position Display dpE Enable dpD Disable dpT Use Time Out to clear the display dpt Displayed always	
dN#	North Position Display dNE Enable dND Disable dNT Use TimeOut to clear the display dNt Display always dN0 Display 8 Zones equally dN1 Display 16 Zones equally dNI Display A/Z/N with IDs group dNi Display A/Z/N not with IDs group	

Misc. Commands[idome57:misccommands]		
Command	Description	Response
A?	Read CAMERAADDRESS	A### Return the current CAMERAADDRESS in ASCII ### = 001 — 223
AS###	Assign CAMERAADDRESS ### = 001 — 223 NOTE: This command is also valid if CAMERAADDRESS 0xFF is used.	
E#####	Elevation level where the camera is mounted This is used to calibrate the Low Pressure indicator in the camera. ##### = 0 to 10000 in ASCII (in feet)	
RS	iDome/iView Firmware Revision Query (Maximum 24 Characters) For example:	Return Firmware Revision Model# Firmware Ver. 1.0 RModel# Firmware V1.0
Rs	LCU Firmware Revision Query (Maximum 24 Characters) For example:	Return Firmware Revision rLCU Firmware V1.0
Lp#	Line Lock Phase Adjust Lp0 (Camera is in Crystal mode) Lp1 (Line Lock — Phase 0 mode 0°) Lp2 (Line Lock — Phase 1 mode 30°) Lp3 (Line Lock — Phase 2 mode 60°) Lp4 (Line Lock — Phase 3 mode 90°) Lp5 (Line Lock — Phase 4 mode 120°) Lp6 (Line Lock — Phase 5 mode 150°)	
Bs#####	Set Camera Baud Rate ##### = 0300, 0600, 1200, 2400, 4800, 9600 (Bs0300, Bs0600, Bs1200, Bs2400, Bs4800, Bs9600 and Bs192K)	
bs#####	Set LCU Host Baud Rate ##### = 0300, 0600, 1200, 2400, 4800, 9600 (bs0300, bs0600, bs1200, bs2400, bs4800, bs9600 and bs192K)	
b?#####	Query LCU Host Baud Rate	b##### = 0300, 0600, 1200, 2400, 4800, 9600
fE	Tilt Flip Enabled	

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Misc. Commands		
Command	Description	Response
fD fS	Tilt Flip Disabled iDome Flip Enable Query	Return Tilt Flip Enable Status fE (Tilt Flip Enabled) fD (Tilt Flip Disabled)
h1 h0 hS	RS232 Flow Control (RTS/CTS) Enabled RS232 Flow Control (RTS/CTS) Disabled RS232 Flow Control Query	Return RS232 Handshake Status h1 (Enabled), h0 (Disabled)
Jc0 Jc1 JcS	Set Javelin Continuous Motor Mode for Camera Off Set Javelin Continuous Motor Mode for Camera On Query Camera for Javelin Continuous Motor Mode status in Camera	Jc0(Off), Jc1 (On)
Jb0 Jb1 JbS	Set Javelin 2 Bytes Addr for camera Off Set Javelin 2 Bytes Addr for camera On Query Camera for Javelin 2 Bytes Addr status in camera	Jb0 (Off), Jb1 (On)
jc0 jc1 jcS	Set Javelin Continuous Motor Mode for LCU Off Set Javelin Continuous Motor Mode for LCU On Query LCU for Javelin Continuous Motor Mode status in LCU	jc0 (Off), jc1 (On)
jb0 jb1 jbS	Set Javelin 2 Bytes Addr for LCU Off Set Javelin 2 Bytes Addr for LCU On Query LCU for Javelin 2 Bytes Addr status in LCU	jb0 (Off), jb1 (On)

Maintenance[idome57:maintenance]		
Command	Description	Response
mPS	Query the internal pressure data	mP##.# ##.#: 2 digits — ASCII data and 1 digit decimal For example: 10.5
mTS	Query the internal temperature data	mT## ##: 2 digits — ASCII data in degree C For example: 30°C
mtS	Query the trigger temperature setting for the heater	mt## ##: 2 digits — ASCII data in degree C from 20 to 45 in degree C
mt##	Set the trigger temperature for the heater ##: 2 digits — ASCII data in degree from 20 to 45 in degree C	
mNs mNc mFH	Set True North Offset Clear True North Offset Set Pan Tilt to find Home Position	
mS#####	Set Camera Serial Number # = 0 to 9	
mSs	Query Camera Serial Number data	mS#####, # = 0 to 9
mf#	Video Mode Preset (Freeze/Live) when go to a preset # = 0 (Off — Live) = 1 (On — Frozen)	
mfS	Query Video Mode Preset	mf#
mwr####d## mw?	Set Wiper Run Time and Delay Time (Note: for iViewII Only) #### = 0000 to 9999 Run Time in Sec ## = 00 to 99 Delay Time in Sec Inquiry Wiper Run Time and Delay Time (Note: for iViewII Only)	mwr####d## #### = 0000 to 9999 Run Time in Sec ## = 00 to 99 Delay Time in Sec
Continued on the next page.		

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Maintenance		
Command	Description	Response
mWw##w\$\$m%f***	Set Wash function — Wash Time, Wipe Time, Operation Mode, and Auto Mode Freq (Note: for iViewII Only) ## = 00 to 99 Wash Time in Sec \$\$ = 00 to 99 Wipe Time in Sec % = 0 = Wash Mode — Auto = 1 = Wash Mode — Manual *** = 001 to 010 Auto Wash Cycles in Minute	
mW?	Inquiry Wash function status (Note: for iViewII Only)	mWw##w\$\$m%f*** See above description
mWh	Set Wash Home Position	

Pan Tilt[idome57:pantilt]		
Command	Description	Response
s0	Set Fixed Medium P/T Speed (MPCD-11)	
s1	Set Variable P/T Speed	
s2	Set Variable Proportional P/T Speed based on Zoom Position	
S#	Set P/T Direction # = 0: Normal = 1: Inverted Tilt = 2: Inverted Pan and Tilt	
SS	Pan Tilt Direction Set Status Query	S# # = 0: Normal = 1: Inverted Tilt = 2: Inverted Pan and Tilt

3.4 Standard Latch/Home Response Message Formats

Format Latch Status Response[idome57:latchstatusresponse]		
Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF)
2	L	Latch Status
3	0 _{ASCII} → ? _{ASCII} Bit Value 0/1 B ₀ = Manual Iris/Auto Iris (1/0) B ₁ = Camera Power On/Off (1/0) B ₂ = Lens Speed Fast/Slow (1/0) B ₃ = Not Used	LS nibble is four bits of status
4	A	Aux Status
5	0 _{ASCII} → ? _{ASCII} Bit Value 0/1 B ₀ = Auto/Manual Focus (1/0) B ₁ = Auto Integration/Manual Integration (1/0) B ₂ = Wipe On/Off (1/0) (for 3965 model only) B ₃ = Wash On/Off (1/0) (for 3965 model only)	LS nibble is four bits of status
6	X	Misc. Statuses
7	0 _{ASCII} → ? _{ASCII} Bit Value 0/1 B ₀ = Not Used B ₁ = Low Pressure (1) B ₂ = Video Loss (1) B ₃ = Not Used	LS nibble is four bits of status
8	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8

Format Home Status Response[idome57:homestatusresponse]		
Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF)
2	H	Home Status
3	0x10 0x3E 0x60 0x70 I	Home Position Home is Inactive (camera is not at a preset position)
4	CHECKSUM	End of message 0x80 — 0x8F Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8

3.5 DSP Commands

DSP Commands[idome57:dspcommands]		
Command	Description	Response
cD#	Digital Zoom Range cD0 Off cD1 2X cD2 5X cD3 10X cD4 12X	
cS#	Shutter cS0 (Auto) cS8 (1/180) cS1 (1/2) cS9 (1/250) cS2 (1/4) cS: (1/500) cS3 (1/8) cS; (1/1000) cS4 (1/15) cS< (1/2000) cS5 (1/30) cS= (1/4000) cS6 (1/60) cS> (1/10000) cS7 (1/120) cS? (1/30000)	
cW#	White Balance cW0 (Auto) cW1 (Manual)	
cWR cWr	Increase RED (in Manual mode only) Decrease RED	
cWB cWb	Increase BLUE Decrease BLUE	
cWQ	Stop Increase/Decrease color	
cWL#	Set Sensitive Light Level (ER8011B5) cWL0 (Low) cWL1 (Manual)	
Continued on the next page.		

<i>Continued from the previous page.</i>		
DSP Commands		
Command	Description	Response
cWLS	Query Light Level Status (ER8011B5)	cWL# cWL0 (Low) cWL1 (Manual)
cWSD#	Set Shutter for Day (ER8011B5) cWSD0 (Auto) cWSD8 (1/180) cWSD1 (1/2) cWSD9 (1/250) cWSD2 (1/4) cWSD: (1/500) cWSD3 (1/8) cWSD; (1/1000) cWSD4 (1/15) cWSD< (1/2000) cWSD5 (1/30) cWSD= (1/4000) cWSD6 (1/60) cWSD> (1/10000) cWSD7 (1/120) cWSD? (1/30000)	
cWSDS	Query Shutter for Day (ER8011B5)	cWSD#
cWSN#	Set Shutter for Night (ER8011B5) cWSN0 (Auto) cWSN8 (1/180) cWSN1 (1/2) cWSN9 (1/250) cWSN2 (1/4) cWSN: (1/500) cWSN3 (1/8) cWSN; (1/1000) cWSN4 (1/15) cWSN< (1/2000) cWSN5 (1/30) cWSN= (1/4000) cWSN6 (1/60) cWSN> (1/10000) cWSN7 (1/120) cWSN? (1/30000)	
<i>Continued on the next page.</i>		

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DSP Commands		
Command	Description	Response
cWSNS	Query Shutter for Night (ER8011B5)	cWSN#
cY1	Wide Dynamic Range On	
cY0	Wide Dynamic Range Off	
cM0	Camera in Day/Night Auto Mode	
cM1	Camera in Day Mode (Color)	
cM2	Camera in Night Mode (Monochrome)	
cIA	Iris Auto	
cIM	Iris Manual	
cIO	Iris Open	
cIC	Iris Close	
IS	Iris Stop	
cz#	Zoom Wide Var. Speed	
	cz0 (Low Speed)	
	cz1 (Medium Speed)	
	cz2 (Fast Speed)	
cZ#	Zoom Tele Var. Speed	
	cZ0 (Low Speed)	
	cZ1 (Medium Speed)	
	cZ2 (Fast Speed)	
ZS	Zoom Stop	
cFA	Focus Auto	
cFM	Focus Manual	
cF#	Focus Far Var. Speed	
	cF0 (Low Speed)	
	cF1 (Medium Speed)	
	cF2 (Fast Speed)	
cN#	Focus Near Var. Speed	
	cN0 (Low Speed)	
	cN1 (Medium Speed)	
	cN2 (Fast Speed)	
FS	Focus Stop	
cP#	Camera Communication Protocol Selection	See Section 1.10, page 29 for more details.
cPs	Query LCU Communication Protocol	
P#	LCU Protocol	See Section 1.10, page 29 for more details.
cs0	Set Progressive Scan On	
<i>Continued on the next page.</i>		

<i>Continued from the previous page.</i>		
DSP Commands		
Command	Description	Response
cso	Set Progressive Scan Off	
cs0	Set Progressive Scan — Even Field	
cs1	Set Progressive Scan — Odd Field	
cFF	Video Freeze On/Off toggle	
cF#	Set Video Freeze On/Off cF0 (On) cfo (Off)	
cb	Enable Boot Loader to update new firmware in the iDome/iView	
cB	Enable Boot Loader to update new firmware in the LCU	
cLN	Set Normal Light Mode (ER8439E — special Camera module)	
cLn	Set Sodium Vapor Light Mode (ER8439E — special Camera module)	
cLS	Status request of Light mode setting (ER8439E — special Camera module) cLN: Normal mode cLn: Sodium Vapor mode	
cC#	Set Camera Head Comm. Baud Rate (ER-8682 only) cC0 for 4800 cC1 for 9600 cC2 for 19.2K cC3 for 38.4K	
cn#	Set Poll Camera (ER-8682 only) cn0 for Off cn1 for On	
cG##	Set Max AGC Gain ## = 0x11 to 0x38	
cGS	Current Max AGC Gain Status	cG## ## = 0x11 to 0x38
cA#	Set Aperture Mode cA0: Auto cA1: Manual	
cAH##	Set Horizontal Aperture ## = 0x11 0x2F	
cAV##	Set Vertical Aperture ## = 0x11 0x2F	
<i>Continued on the next page.</i>		

<i>Continued from the previous page.</i>		
DSP Commands		
Command	Description	Response
cAS	Inquiry Aperture Mode	cA#H##V## ## = 0x11 0x2F (H/V level) # = 0: Auto = 1: Manual
cE# cES	Set Electronic Image Stabilizer Mode cE0: Off cE1: On Inquiry Electronic Image Stabilizer	cE# # = 0: Off = 1: On
cEF# cEFS	Set Electronic Image Stabilizer Frequency Level cEF0: 16 Hz (default) cEF1: 5 Hz Inquiry Electronic Image Stabilizer	cEF# Frequency Level # = 0: 16 Hz (default) = 1: 5 Hz
cEP# cEPS	Enable/Disable EIS while Pan/Tilt is moving Frequency Level cEP0: Disabled cEP1: Enabled Inquiry the Enable/Disable EIS While Pan/Tilt Is Moving Status	cEP# # = 0: Disabled = 1: Enabled

3.6 Set Screen Privacy Zone Commands

Note: **Not Implemented Yet In The Standard Firmware (Reserved For Future Development)**

- Maximum of 24 zones per camera.
- Select a Zone to program
- Move the Privacy Zone Object to the center of the screen before programming a zone either using Goto Zone Pos button (if the zone already programmed), or manually using Pan/Tilt Control

Screen Privacy Zone Commands[idome57:screenprivacy]		
Command	Description	Response
csN#	Select Zone for Setting Modification # = A through X (24 Zones) csNA, csNB, csNC, csND, csNE, csNF, csNG, csNH, csNI, csNJ, csNK, csNL, csNM, csNN, csNO, csNP, csNQ, csNR, csNS, csNT, csNU, csNV csNW and csNX.	
csC@## csC?	Set Zone Color for either Program- ming/Live Mode @ = P: Programming Mode = L: Live Mode ## = 0 _{ASCII} → >ASCII (14 Colors: Black, Gray1, Gray2, Gray3, Gray4, Gray5, Gray6, White, Red, Green, Blue, Cyan, Yellow, Magenta Color Setup Inquiry	csCP##@L##@ ## = 0 _{ASCII} → >ASCII (14 Col- ors: as described Above) @ = 0: transparency disabled = 1: transparency enabled = P: Programmed Mode Status = L: Live Mode Status
csT@#	See through privacy zone mode (trans- parency mode) csTP0: Programming Mode Disabled csTP1: Programming Mode Enabled csTL0: Live Mode Disabled csTL1: Live Mode Enabled	

Continued on the next page.

<i>Continued from the previous page.</i>		
Screen Privacy Zone Commands		
Command	Description	Response
csZS@	Privacy Zone Setting Status Request	csZ@# @ = A through X (24 Zones) # = 0: Off = 1: Programmed = 2: Live
csM@#	Set Privacy Zone mode @ = A to X (24 Zones) # = 0: Off = 1: Programmed = 2: Live	
csH@### csH@?	Set Privacy Zone Horizontal size @ = A to X (24 Zones) ### = 000 to 128 Inquiry Horz Size of a Zone	csH@### @ = A to X (24 Zones) ### = 000 to 128
csV@### csV@?	Privacy Zone Vertical size. @ = A to X (24 Zones) ### = 000 to 128 Inquiry Horz Size of a Zone	csV@### @ = A to X (24 Zones) ### = 000 to 128
csH@	Goto a privacy programmed zone positions (P/T/Z) @ = A to X (24 Zones)	
csP@	Put Privacy Zone Setup Area to the center of the screen @ = A to X (24 Zones)	

3.7 cDS DSP Status Request/Response

Format DSP Status Response[idome57:dspstatusresponse]		
Byte	Data	Description
0	0xF8	Start of message
1	CAMERAADDRESS	(0x01 to 0xDF)
2	c	DSP status
3	W	White Balance Status
4	0 = Auto 1 = Manual	
5	S	Shutter Status
6	0 = Auto 8 = 1/180 1 = 1/2 9 = 1/250 2 = 1/4 : = 1/500 3 = 1/8 ; = 1/1000 4 = 1/15 < = 1/2000 5 = 1/30 = = 1/4000 6 = 1/60 > = 1/10000 7 = 1/120 ? = 1/30000	
7	Y	Wide Dynamic Range Status
8	0 = Off 1 = On	
9	M	Day Night Mode
10	0 = Day/Night in Auto mode 1 = in Day mode 2 = in Night mode	
11	D	Digital Zoom Mode
12	0 = Off 1 = 2X 2 = 5X	
<i>Continued on the next page.</i>		

<i>Continued from the previous page.</i>		
Format DSP Status Response		
Byte	Data	Description
	3 = 10X 4 = 12X	
13 14	L 0 _{ASCII} 7 _{ASCII} Bit Value 0/1 B ₀ = Manual Iris/Auto Iris (1/0) B ₁ = Camera Power On/Off (1/0) B ₂ = Lens Speed Fast/Slow (1/0) B ₃ = Not Used	Latch status (See also Section 1.6, page 8) LS nibble is four bits of status
15 16	A 0 _{ASCII} 7 _{ASCII} Bit Value 0/1 B ₀ = Auto/Manual Focus (1/0) B ₁ = Auto Integration/Manual Integration (1/0) B ₂ = Not used B ₃ = Not Used	Aux status LS nibble is four bits of status
17 18	X 0 _{ASCII} 7 _{ASCII} Bit Value 0/1 B ₀ = Not Used B ₁ = Low Pressure (1) B ₂ = Video Loss (1) B ₃ = Not Used	Misc. statuses LS nibble is four bits of status
19 20	H 0x10 0x3E 0x60 0x70 I	Home status Home Position See Table 16, page 28 for more information Preset is inactive (camera is not at a preset position)
21 22	P 0 _{ASCII} 7 _{ASCII}	Camera Communication Protocol See Section 1.10, page 29 for more details.
23 24	v 0 (NTSC) 1 (PAL)	Video Type
25 26	p 0 (Camera is in Crystal mode)	Line Lock Phase Status
<i>Continued on the next page.</i>		

<i>Continued from the previous page.</i>		
Format DSP Status Response		
Byte	Data	Description
	1 (Line Lock — Phase 0 mode 0°) 2 (Line Lock — Phase 1 mode 30°) 3 (Line Lock — Phase 2 mode 60°) 4 (Line Lock — Phase 3 mode 90°) 5 (Line Lock — Phase 4 mode 120°) 6 (Line Lock — Phase 5 mode 150°)	
27 28	F o (Video Live mode) 0 (Video Freeze mode)	Video Status
29 30	C 0 4800 1 9600 2 19.2K 3 38.4K	Camera Head Comm. Baud Rate (ER-8682)
31 32	n 0 No Poll 1 Poll	Poll Camera On/Off Status (ER-8682)
33 34	s o Off 0 On	Progressive Scan
35	0 Set On Even Field 1 Set On Odd Field	
36	CHECKSUM 0x80 — 0x8F	End of message Least significant nibble is XOR of all previous bytes (LS nibbles only) except 0xF8

3.8 Sector/Zone/Touring Message Formats

Sector Commands[idome57:sectorcommands]		
Command	Description	Response
*SC#	Clear Sector Limits # = Sector Number (0_{ASCII} to $@_{ASCII}$) If 0_{ASCII} clear all, otherwise clear sector only	
*SX *Sx	Set Calibration Position (optional) Get Calibration Position (optional)	*SXpppp pppp = $0000_{ASCII} \rightarrow 3599_{ASCII}$
*SL#s *Sl#	Set Sector Limit # = Sector Number (1_{ASCII} to $@_{ASCII}$) s = L - Left Limit R - Right Limit Get Sector Limits	*SS#1111rrrr # = Sector Number (1_{ASCII} to $@_{ASCII}$) 1111 and rrrr = $0000_{ASCII} \rightarrow 3599_{ASCII}$

Privacy Zone Commands[idome57:privacyzonecommands]		
Command	Description	Response
*PC# *PL#s *Pl#	Clear Privacy Zone Limits # = Zone Number ($0_{ASCII} \rightarrow 8_{ASCII}$) If 0_{ASCII} clear all, otherwise clear zone only Set Privacy Zone Limit # = Zone Number ($1_{ASCII} \rightarrow 8_{ASCII}$) s = L - Left Limit or = R - Right Limit Get Privacy Zone Limits	*Pp#1111rrrr # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) 1111 and rrrr = $0000_{ASCII} \rightarrow 3599_{ASCII}$
*PS#s *Ps#	Set Privacy Zone State # = Zone Number ($1_{ASCII} \rightarrow 8_{ASCII}$) s = State (1 = On; 0 = Off) Get Privacy Zone State	*PS#s # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) s = State (1 = On; 0 = Off)

Tour Commands		
Command	Description	Response
*TC#	Clear all preset/dwell data for Tour # # = Tour Number (1 _{ASCII} → 8 _{ASCII})	
*TP#<data>	Set tour Presets # = Tour Number (1 _{ASCII} → 8 _{ASCII}) <data> = 32 preset values in the range 0x10 to 0x50 (i.e. 0 to 64) Note: 0x10 indicates No Preset	
*Tp#	Get tour Presets	*TP#<data> # = Tour Number (1 _{ASCII} → 8 _{ASCII}) <data> = 32 preset values in the range of 0x10 to 0x50 (0 to 64)
*TD#<data>	Set tour Dwell times # = Tour Number (1 _{ASCII} → 8 _{ASCII}) <data> = 32 dwell times in the range 0x10 to 0x4D (0 to 60 sec)	
*Td#	Get tour Dwell times	*TD#<data> # = Tour Number (1 _{ASCII} → 8 _{ASCII}) <data> = 32 dwell times in the range of 0x10 to 0x4D (0 to 60 sec)
*TS#s	Set Tour State # = Tour Number (1 _{ASCII} → 8 _{ASCII}) s = State (0 = Stop; 1 = Start)	
*Ts#	Get Tour State	*TS#s # = Sector Number (1 _{ASCII} → 8 _{ASCII}) s = State (0 = Stop; 1 = Start)

3.9 Position

This section describes how to GET the position/presets data and goto a position of the camera.

Standard Position Response Data[idome57:standardpositionresponse]		
Command	Description	Response
P?	Pan/Tilt Position request	Ppppttt ppp = 12 bit data of Pan ($000_{ASCII} \rightarrow ???_{ASCII}$) Format: $000_{ASCII} \rightarrow ???_{ASCII}$ ttt = 12 bit data of Tilt ($000_{ASCII} \rightarrow ???_{ASCII}$) Format: $000_{ASCII} \rightarrow ???_{ASCII}$
V?	Zoom/Focus Position request	Pzzzfff zzz = 12 bit data of Zoom ($000_{ASCII} \rightarrow ???_{ASCII}$) Format: $000_{ASCII} \rightarrow ???_{ASCII}$ fff = 12 bit data of Focus (always 000_{ASCII}) Format: 000_{ASCII}

Standard Goto a Position[idome57:standardgoto]		
Command	Description	Response
paaabbb	Goto a Pan/Tilt Position aaa = 12 bit data of Pan ($000_{ASCII} \rightarrow ???_{ASCII}$) Format: $000_{ASCII} \rightarrow ???_{ASCII}$ bbb = 12 bit data of Tilt ($000_{ASCII} \rightarrow ???_{ASCII}$) Format: $000_{ASCII} \rightarrow ???_{ASCII}$	
vccddddd	Goto Zoom/Focus Position ccc = 12 bit data of Zoom ($000_{ASCII} \rightarrow ???_{ASCII}$) Format: $000_{ASCII} \rightarrow ???_{ASCII}$ ddd = 12 bit data of Focus (always 000_{ASCII}) Format: 000_{ASCII}	

Position Response Data[idome57:positionresponse]		
Command	Description	Response
cPS	Pan/Tilt Position request	cPpppptttt pppp = Pan data ($0000_{ASCII} \rightarrow 3599_{ASCII}$) tttt = Tilt data ($0000_{ASCII} \rightarrow 1200_{ASCII}$)

Actual Goto a position[idome57:actualgoto]		
Command	Description	Response
cpaaaaabbbb	Goto a Pan/Tilt Position aaaa = Pan data ($0000_{ASCII} \rightarrow 3599_{ASCII}$) bbbb = Tilt data ($0000_{ASCII} \rightarrow 1200_{ASCII}$)	

Get Actual Presets Position Data[idome57:getactualpresets]		
Command	Description	Response
*pp##	Get Preset data stored in camera	pP##ppppttttzzzzffff ## = 0x10 to 0x3E (first 48 positions) = 0x60 to 0x70 (last 16 positions) pppp = Pan Preset Position data tttt = Tilt Preset Position data zzzz = Zoom Preset Position data ffff = Focus Preset Position data

3.10 Upload Camera Configuration to Camera

This section describes how to upload camera configuration data to the camera. For example, camera IDs, Presets position, Tour/Sector position, etc.

Upload Camera Configuration[idome57:uploadcamera]	
Command	Description
dC#	Upload ID Control Data, i.e Enable, Top, Alarm Blink ... to camera # = Control Byte (xxx11111)
dL#<DATA>	Upload ID messages # = 1,2,3,4,5 DATA = 24 ASCII characters
dP##<DATA>	Upload Preset## ID to camera ## = 0x10 to 0x3E (first 48 positions) = 0x60 to 0x70 (last 16 positions) DATA = 24 ASCII characters
dST##<DATA>	Upload Sector ## ID to camera ## = 1 _{ASCII} to @ _{ASCII} (16 sectors) DATA = 24 ASCII characters
dSS##s	Upload Sector ID State to camera ## = Sector Number (1 _{ASCII} to @ _{ASCII}) s = State(1 = On; 0 = Off)
*SS#1111rrrr	Upload Sector Limits to camera # = Sector Number (1 _{ASCII} to @ _{ASCII}) 1111 and rrrr = 0000 _{ASCII} → 3599 _{ASCII}
*Pp#1111rrrr	Upload Privacy Zone Limits to camera # = Sector Number (1 _{ASCII} → 8 _{ASCII}) 1111 and rrrr = 0000 _{ASCII} → 3599 _{ASCII}
*PS#s	Upload Privacy Zone State to camera # = Sector Number (1 _{ASCII} → 8 _{ASCII}) s = State(1 = On; 0 = Off)
*TP#<data>	Upload Tour Presets to camera # = Tour Number (1 _{ASCII} → 8 _{ASCII}) <data> = 32 preset values in the
*TD#<data>	Upload Tour Dwell times to camera # = Tour Number (1 _{ASCII} → 8 _{ASCII}) ;data; = 32 dwell times in the range of 0x10 to 0x4D (0 to 60 sec)
*TS#s	Upload Tour State to camera # = Sector Number (1 _{ASCII} → 8 _{ASCII})
Continued on the next page.	

<i>Continued from the previous page.</i>	
Upload Camera Configuration	
Command	Description
	s = State(0 = Stop; 1 = Start)
*pP##ppppttttzzzzffff	Upload Presets data to camera ## = 0x10 to 0x3E (first 48 positions) = 0x60 to 0x70 (last 16 positions) pppp = Pan Preset Position data tttt = Tilt Preset Position data zzzz = Zoom Preset Position data ffff = Focus Preset Position data

4 MPC System ER-2221B Receiver Communications Protocol [2221pro]

This interface¹⁷ also applies to ER-2221AK and other ER versions. There are some augmentations from observations of how WinMPC interacts with an ER-2222DF which have been included.

4.1 General Description

The¹⁸ MPC Master Control Panel contains an 8031 micro computer with on-board UART for communications with MPC Control Receivers.

This section supplies the details necessary to understand communications between the MPC Master Control Panel (or Host Computer) and Control Receivers as used in the camera control system (Figure 8, page 96).

4.2 Message Format

Anytime a command message is sent from the MPC Master Control Panel (or Host Computer) to a Control Receiver, the Receiver will respond with an ACK or an NAK (Figure 8, page 96). Data is transmitted using 1 start bit, 8 data bits, and 1 stop bit (no parity). The baud rate is set using the monitor 97 function as an entry code. It is typically set to 9600 baud. This process is described in the installation instructions of the Control Panel manual.

The commands are sent using the command message format show in Table 23, page 97. The various commands that may be transmitted are listed in Table 24, page 97 through Table 26, page 98.

If the command message contains a latch function command, then the latch status response (Table 27, page 99, Format of Latch Status Response) will be sent back to the Master Control Panel. If the command message contains a home function command, then the home status response (Table 28, page 100, Format of Home Status Response from MPC) will be sent back to the Master Control Panel¹⁹.

If the command is a position message, the response will be as shown in Table 29, page 101 and Table 29, page 101.

If the command message contains only a momentary function, no further response beyond the ACK or NAK will occur. If the command message contains a communications error (e.g., an address to a non-existent control receiver or a failure in the communications system), then the command error message response (in Table 28, page 100, with B_3 of byte 3 equal to 1) will be sent back.

Table 31, page 102 through Table 36, page 104 gives the ID message formats for communications from the master control panel to a control receiver. An ACK or NAK is returned.

4.3 Maintenance

No maintenance adjustments are required for the circuits on the processor board.

4.4 Parts List

Refer to the processor board for parts identifications.

¹⁶\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/2221pro.inc,v 1.19 2007-07-25 10:05:08-07 Hamilton Exp Hamilton \$

¹⁷Cohu's data: Phone (619) 277- 6700, FAX (619) 277-0221, December 7, 1998, E-mail info@cohu.com

¹⁸This is derived from the Cohu document: "mpc2221pro.pdf", Cohu document number 6X-5046(A).

¹⁹From observations based on data captures between WinMPC and an ER-2222DF, the latch status is included in the home status reply.

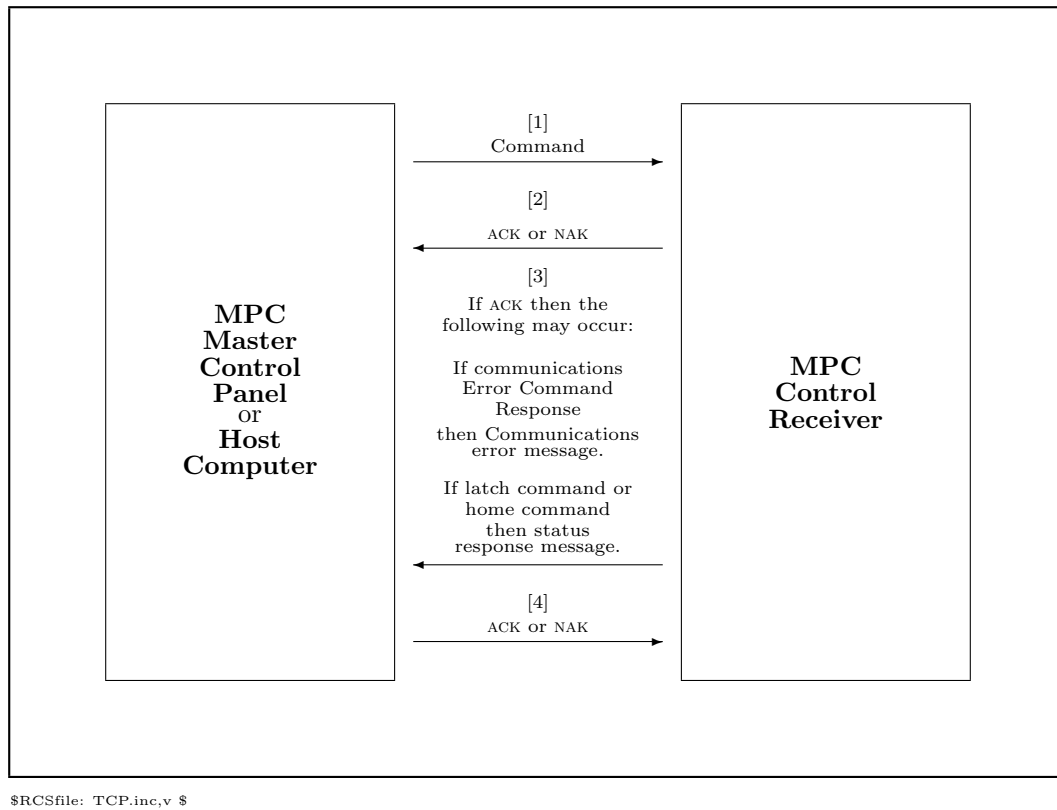


Figure 8: Typical Communications Protocol[2221tcp]

4.5 Schematic Diagrams

Refer to the processor board for the schematic diagram.

4.6 Receiver Command Message Format

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 0xDF)
$2 \rightarrow 2n + 1$	Command Data	See Table 24, page 97 through Table 26, page 98
$2n + 2$	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 23: Receiver Command Message Format [2221table1]

NOTE: n is the number of commands in the message

Byte	Data	Description
Reset Control Receiver	rs	DATA consists of the ASCII codes for the two
Pan Left	PL	letters shown: rs = ASCII codes for r and s
Pan Right	PR	PL = ASCII codes for P and L, etc.
Pan Stop	PS	
Tilt Up	TU	
Tilt Down	TD	
Tilt Stop	TS	
Zoom In	ZI	
Zoom Out	ZO	
Zoom Stop	ZS	
Focus Near	FN	
Focus Far	FF	
Focus Stop	FS	
Iris Open	IO	
Iris Close	IC	
Iris Stop	IS	
P/T Position Request	P?	See Table 29, page 101 and Table 30, page 101 for position format
P/T GoTo Command	$pA_2A_1A_0E_2E_1E_0$	
Lens Position Request	V?	
Lens GoTo Command	$vA_2A_1A_0E_2E_1E_0$	

Table 24: Momentary, Receiver Command Data [2221table2a]

Byte	Data	Description
Manual Iris Toggle	LM	See Table 27, page 99 and Table 28, page 100 for response format
Camera Power Toggle	LP	
Lens Speed Toggle	LL	
Latch Status Request	L?	
Aux Functions (Option 1)	L1 → L3	Toggles Aux 1, Aux 2, or Aux 3 (L1, L2, L3)
Color Balance (Option 2)	L1	Select auto/manual mode
	B1	Increase blue (marked red in WinMPC
	B2	Increase red (marked blue in WinMPC
	B0	Balance stop

Table 25: Latch, Receiver Command Data[2221table2b]

Byte	Data	Description
Home Position GoTo	H0 → H9	Preset 0 → 9 A home active HA will be immediate response. Later a home position H0 to H9 or home error HE will be generated. (H0, H1, H2, H3, H4, H5, H6, H7, H8, H9)
Home Position Store	P0 → P9	Program 0 → 9 (P0, P1, P2, P3, P4, P5, P6, P7, P8, P9)
Home Position Status Request	H?	Will generate a home status response See Table 27, page 99 and Table 28, page 100

Table 26: Home, Receiver Command Data[2221table2c]

4.7 Responses from MPC Control Receiver

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address 0x01 0xDF
2	L	Latch Status
3	0x30 → 0x37	LS Nibble is four bits of status (L0, L1, L2, L3, L4, L5, L6, L7, L8) B_0 = Iris Auto Manual B_1 = Camera power Off/On B_2 = Lens Speed Slow/Fast B_3 = Communications Error No/Yes
4	A	Aux Status
5	0x30 → 0x37	LS Nibble is four bits of status (A0, A1, A2, A3, A4, A5, A6, A7) Bit Value 0/1 B_0 = Aux 1 B_1 = Aux 2 B_2 = Aux 3
6 7	X 0x30 → 0x37	Extra Status LS Nibble is four bits of status (X0, X1, X2, X3, X4, X5, X6) Bit Value 0/1 B_0 = Local Mode B_1 = Pressure Loss B_2 = Video Loss B_3 = Not Used
8	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 27: Format of Latch Status Response[2221table3a]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address 0x01 → 0xDF
2	H	Home Status
3	0 — 9 or A I E	ie, 2 = Home position 2 (H0, H1, H2, H3, H4, H5, H6, H7, H8, H9) (HA) Home active (HI) Home Not — at — Home position, or active (HE) Home error could not get to home position
4 → 9	—	These values are identical to bytes 3 → 7 of the L? response shown in Table 27, page 99 (As observed in a data capture from an ER-2222DF unit.) (L0, L1, L2, L3, L4, L5, L6, L7, L8, A0, A1, A2, A3, A4, A5, A6, A7, X0, X1, X2, X3, X4, X5, X6)
10	CHECKSUM	0x80 to 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 28: Format of Home Status[2221table3b]

4.8 Receiver Position Message

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	P or p	Upper case P is response; Lower case p is GOTO command
3	A ₂ (MS nibble)	Azimuth position (See Section 1.7.2, page 14)
4	A ₁	
5	A ₀ (LS nibble)	
6	E ₂ (MS nibble)	Elevation position (See Section 1.7.2, page 14)
7	E ₁	
8	E ₀ (LS nibble)	
9	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 29: Format of Pan/Tilt Position Message [2221table4a]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	V or v	Upper case V is response; Lower case v is GOTO command
3	A ₂ (MS nibble)	Zoom position (See Notes)
4	A ₁	
5	A ₀ (LS nibble)	
6	E ₂ (MS nibble)	Focus position (See Notes)
7	E ₁	
8	E ₀ (LS nibble)	
9	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 30: Format of Zoom/Focus Position Message [2221table4b]

4.9 Receiver ID Message Format

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	d	Display message
3	M	Mode select
4	M I	(MM) Menu mode (MI) ID mode
5	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 31: Format of Select Mode Message[2221table5a]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	d	Display message
3	I	ID display
4	D E	(ID) Disable ID display (IE) Enable ID display
5	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 32: Format of ID Enable/Disable Message[2221table5b]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	d	Display message
3	C	(dC) Clear screen
4	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 33: Format of ID Clear Screen Message[2221table5c]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	d	Display message
3	I	ID display
4	T	(dIT) ID at top
5	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 34: Format of Select ID Top Message[2221table5d]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	d	Display message
3	I	ID display
4	B	(dIB) ID at bottom
5	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 35: Format of Select ID Bottom Message[2221table5e]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	d	Display message
3	L	Line of text
4	1 — < (0x31 — 0x3C)	Line number (1–12) + 0x30 (dL1, dL2, dL3, dL4, dL5, dL6, dL7, dL8, dL9, dL:, dL;, dL<)
5	(ID text)	ASCII characters (up to 24) for the line starting with the left most character
n	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 36: Format of Update Line Message [2221table5f]

Byte	Data	Description
0	0xF8	AUTO BAUD character
1	CAMERAADDRESS	Camera address (0x01 to 0xDF)
2	d	Display message
3	A	Alarm message
4	1 — 3 (0x31 — 0x33)	Display line number (1–3) + 0x30
5	B E D	Blink alarm message (dA1B, dA2B, dA3B) Enable alarm message (dA1E, dA2E, dA3E) Disable alarm message (dA1D, dA2D, dA3D)
6	CHECKSUM	0x80 0x8F Least significant nibble is XOR of all previous bytes (LS Nibble only) except 0xF8

Table 37: Format of Alarm Display Message [2221table5g]

NOTE: For all messages from master control panel to control receiver, ACK or NAK is returned.

A ER-2222DF initial communications

When the ER-2222DF is connected to WinMPC it generates the following replies to status requests when changing from one camera type to another in the set up screen. No attempts at motion or lens actions was attempted.

When a change of camera type was made, WinMPC usually sends an initial sequence of commands. The first few commands listed below.

- For MPC type units the first few commands was almost always, and thus deleted:
\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/InitER2222.dat,v 1.2 2007-07-11 07:35:43-07 Hamilton Exp Hamilton \$

```
282: DCE      622    90.015261    9.560794 f8 01 R S 80
341: DTE      627    90.020697    0.000868 06
287: DCE      628    92.871751    0.000868 f8 01 s 0 82
342: DTE      633    92.877264    0.001365 06
```

- DCE: Refers to data coming from WinMPC.
- DTE: Refers to data coming from the ER-2222DF.
- These first few commands: requests the software version information. This command is not supported by MPC type units (RS).
- And then indicates that the zoom field is to be used for proportional speed control. This command is not supported by MPC type units (s0).

- For iDome type units the initialization sequence varies and was not deleted.

This data came from the 10JUL07A data capture.

1. For the MPC-D selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/MPC-DER2222.dat,v 1.3 2007-07-26 09:15:15-07 Hamilton Exp Hamilton \$

```
<The initial four lines of commands/replies have been deleted.>
25: DCE      69     3.993104    0.966390 f8 01 L ? 82
45: DTE      74     3.998526    0.001035 06
46: DTE      75     4.006436    0.007910 f8 01 L 2 A 4 X 0 82
30: DCE      84     4.020024    0.005255 06
31: DCE      85     4.993077    0.973053 f8 01 H ? 86
55: DTE      90     4.998480    0.001035 06
56: DTE      91     5.006605    0.008125 f8 01 H I L 2 A 4 X 0 83
36: DCE     102     5.022510    0.005578 06
```

This requests the status of the latches (L?) and gets a reply that indicates Camera power is on (L2), Aux 3 is on (A4) and that pressure/video is OK (X0).

The home status request (H?) indicates that home is inactive (HI).

These two requests, latch and home, repeat indefinitely.

2. For the ER-2221B selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/ER2221BER2222.dat,v 1.2 2007-07-11 07:35:43-07 Hamilton Exp Hamilton \$

```
130: DCE     284     56.667077    0.080413 f8 01 L ? 82
155: DTE     289     56.672469    0.001024 06
156: DTE     290     56.680073    0.007604 f8 01 L 2 A 4 X 0 82
135: DCE     299     56.693831    0.005425 06
136: DCE     300     56.773536    0.079705 f8 01 H ? 86
165: DTE     305     56.778850    0.001035 06
166: DTE     306     56.786934    0.008084 f8 01 H I L 2 A 4 X 0 83
141: DCE     317     56.803069    0.005723 06
```

²⁰\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/ER2222.inc,v 1.5 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

3. For the ER-2222 selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/ER2222ER2222.dat,v 1.4 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

```
<The initial four lines of commands/replies have been deleted.>
292: DCE      634      95.323793      2.446529 f8 01 L ? 82
343: DTE      639      95.329196      0.001139 06
344: DTE      640      95.337320      0.008124 f8 01 L 2 A 4 X 0 82
297: DCE      649      95.351120      0.005472 06
298: DCE      650      96.327691      0.976571 f8 01 H ? 86
353: DTE      655      96.333107      0.001041 06
354: DTE      656      96.340400      0.007293 f8 01 H I L 2 A 4 X 0 83
303: DCE      667      96.356560      0.005909 06
```

4. For the Dome selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/DomeER2222.dat,v 1.3 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

```
<The initial four lines of commands/replies have been deleted.>
398: DCE      918      135.554660      2.397851 f8 01 L ? 82
521: DTE      923      135.560103      0.001035 06
522: DTE      924      135.567291      0.007188 f8 01 L 2 A 4 X 0 82
403: DCE      933      135.581050      0.005434 06
404: DCE      934      136.559510      0.978460 f8 01 H ? 86
531: DTE      939      136.564952      0.001042 06
532: DTE      940      136.571513      0.006561 f8 01 H I L 2 A 4 X 0 83
409: DCE      951      136.587617      0.005686 06
```

5. For the Positioner selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/PositionerER2222.dat,v 1.2 2007-07-11 07:35:44-07 Hamilton Exp Hamilton \$

```
476: DCE      1138      164.170425      16.588618 f8 01 R S 80
663: DTE      1143      164.175810      0.001038 06
481: DCE      1144      168.357844      0.001038 f8 01 s 1 83
664: DTE      1149      168.363274      0.001442 06
486: DCE      1150      170.385194      2.021920 f8 01 L ? 82
665: DTE      1155      170.390577      0.001041 06
666: DTE      1156      170.397765      0.007188 f8 01 L 2 A 4 X 0 82
491: DCE      1165      170.411530      0.005431 06
492: DCE      1166      171.380290      0.968760 f8 01 H ? 86
675: DTE      1171      171.385745      0.001035 06
676: DTE      1172      171.393350      0.007605 f8 01 H I L 2 A 4 X 0 83
497: DCE      1183      171.409440      0.005673 06
```

This time the unit is set to variable pan/tilt speed. (s1).

6. For the iDome/iView selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/iDomeiViewER2222.dat,v 1.2 2007-07-11 07:35:43-07 Hamilton Exp Hamilton \$

```
558: DCE      1354      200.960894      19.548947 f8 01 R S 80
797: DTE      1359      200.966283      0.001042 06
563: DCE      1360      213.209754      0.001042 f8 01 s 1 83
798: DTE      1365      213.215117      0.001215 06
568: DCE      1366      215.434336      2.219219 f8 01 c D S 85
799: DTE      1372      215.441146      0.001048 06
```

The unit is set to variable pan/tilt speed. (s1). Also a request is made for the DSP Status information (cDS).

7. For the LCU selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/LCUEr2222.dat,v 1.2 2007-07-11 07:35:43-07 Hamilton Exp Hamilton \$

```
676: DCE      1492      248.775616      16.337571 f8 01 R S 80
817: DTE      1497      248.781018      0.001036 06
681: DCE      1498      254.543114      0.001036 f8 01 L ? 82
818: DTE      1503      254.548508      0.001246 06
819: DTE      1504      254.556842      0.008334 f8 01 L 2 A 4 X 0 82
686: DCE      1513      254.570634      0.005458 06
687: DCE      1514      255.540162      0.969528 f8 01 H ? 86
828: DTE      1519      255.545550      0.001035 06
829: DTE      1520      255.552635      0.007085 f8 01 H I L 2 A 4 X 0 83
692: DCE      1531      255.568739      0.005686 06
```

8. For the iViewII selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/IVIEWIIER2222.dat,v 1.2 2007-07-11 07:35:43-07 Hamilton Exp Hamilton \$

```
819: DCE    1888    287.613910    11.047526 f8 01 R S 80
1070: DTE    1893    287.619314     0.001042  06
824: DCE    1894    292.878408     0.001042 f8 01 c D S 85
1071: DTE    1900    292.885417     0.001658  06
```

A request is made for the DSP Status information (cDS).

9. For the 36xx selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/36xxER2222.dat,v 1.2 2007-07-11 07:35:42-07 Hamilton Exp Hamilton \$

```
908: DCE    1992    318.397598     0.001035 f8 01 R S 80
1085: DTE    1997    318.403043     0.001249  06
913: DCE    1998    326.181693     7.778650 f8 01 c D S 85
1086: DTE    2004    326.188475     0.001043  06
```

A request is made for the DSP Status information (cDS).

10. For the 4200 selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/4200ER2222.dat,v 1.2 2007-07-11 07:35:42-07 Hamilton Exp Hamilton \$

```
991: DCE    2089    349.932313     0.001042 f8 01 R S 80
1099: DTE    2094    349.937709     0.001248  06
996: DCE    2095    356.456502     6.518793 f8 01 c D S 85
1100: DTE    2101    356.463528     0.001043  06
```

A request is made for the DSP Status information (cDS).

11. For the 27xx selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/27xxER2222.dat,v 1.3 2007-07-26 09:15:13-07 Hamilton Exp Hamilton \$

```
<The initial four lines of commands/replies have been deleted.>
1096: DCE    2212    391.510791     0.001035 f8 01 L ? 82
1117: DTE    2217    391.516221     0.001280  06
1118: DTE    2218    391.523006     0.006785 f8 01 L 2 A 4 X 0 82
1101: DCE    2227    391.536750     0.005562  06
1102: DCE    2228    392.504932     0.968182 f8 01 H ? 86
1127: DTE    2233    392.510348     0.001041  06
1128: DTE    2234    392.516807     0.006459 f8 01 H I L 2 A 4 X 0 83
1107: DCE    2245    392.532862     0.005645  06
```

12. For the 596x selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/596xER2222.dat,v 1.2 2007-07-11 07:35:42-07 Hamilton Exp Hamilton \$

```
1228: DCE    2586    428.024886    15.470859 f8 01 R S 80
1359: DTE    2591    428.030301     0.001034  06
1233: DCE    2592    440.744438     0.001034 f8 01 c D S 85
1360: DTE    2598    440.751260     0.001638  06
```

A request is made for the DSP Status information (cDS).

13. For the 696x selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/696xER2222.dat,v 1.2 2007-07-11 07:35:42-07 Hamilton Exp Hamilton \$

```
1359: DCE    2739    473.143357    12.402202 f8 01 R S 80
1381: DTE    2744    473.148756     0.001043  06
1364: DCE    2745    485.052371     0.001043 f8 01 81
1382: DTE    2748    485.055665     0.001223  06
```

Here an unknown command (f8 01 81) is sent repeatedly.

B iViewII initial communications

When the iViewII is connected to WinMPC, it generates the following replies to status requests when changing from one camera type to another in the set up screen. No attempts at motion or lens actions was attempted.

When working with the iViewII WinMPC sends several “standard” initialization command sequences. The following communications captures important sections are delineated with blank lines. Each section ends up with continuous(?) status requests of one type or another. At the end of each communications capture, the last few sets of lines appear to repeat “forever”.

This data came from the 10JUL07B data capture.

DCE Refers to data coming from WinMPC.

DTE Refers to data coming from the iViewII.

The phrase “<Standard lines 1 ---> 29>” means that the first 18 lines of the capture for MPC-D have been deleted. (In item 1 below.)

1. For the MPC-D selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/MPC-DIviewii.dat,v 1.3 2007-07-11 08:13:43-07 Hamilton Exp Hamilton \$

```

1: DCE      1      0.000000  0.000000 f8 01 R S 80
1: DTE      6      0.005568  0.001041 06
2: DTE      7      0.017099  0.011531 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 20 20 82
6: DCE     35      0.051024  0.005631 06
7: DCE     36      0.062450  0.011426 f8 01 f S 84
30: DTE    41      0.067757  0.001035 06
12: DCE    42      1.062506  0.001035 f8 01 h S 8a
31: DTE    47      1.067832  0.001177 06
32: DTE    48      1.075588  0.007756 f8 01 h 0 89
17: DCE    53      1.086071  0.006290 06
18: DCE    54      2.070286  0.984215 f8 01 s S 81
37: DTE    59      2.075601  0.001083 06
38: DTE    60      2.083875  0.008274 f8 01 s 0 82
23: DCE    65      2.094307  0.006239 06
24: DCE    66      3.066366  0.972059 f8 01 S S 81
43: DTE    71      3.071733  0.001042 06
44: DTE    72      3.079591  0.007858 f8 01 S 0 82
29: DCE    77      3.090113  0.006329 06

30: DCE    78      4.067329  0.977216 f8 01 m S s 8c
49: DTE    84      4.073732  0.001042 06
50: DTE    85      4.080859  0.007127 f8 01 m S 0 4 6 6 7 2 8 86
36: DCE    97      4.097956  0.005570 06
37: DCE    98      8.770368  4.672412 f8 01 h S 8a
62: DTE   103      8.775729  0.001035 06
63: DTE   104      8.786001  0.010272 f8 01 h 0 89
42: DCE   109      8.795765  0.005578 06

43: DCE   110      8.873873  0.078108 f8 01 L ? 82
68: DTE   115      8.879269  0.001042 06
69: DTE   116      8.890278  0.011009 f8 01 L 6 A 0 X 0 82
48: DCE   125      8.904032  0.005376 06
49: DCE   126      9.770361  0.866329 f8 01 H ? 86
78: DTE   131      9.775739  0.001035 06
79: DTE   132      9.786846  0.011107 f8 01 H I 80
54: DCE   137      9.796658  0.005620 06
55: DCE   138     10.768401  0.971743 f8 01 L ? 82
84: DTE   143     10.773864  0.001042 06
85: DTE   144     10.785707  0.011843 f8 01 L 6 A 0 X 0 82
60: DCE   153     10.799517  0.005432 06
61: DCE   154     11.764462  0.964945 f8 01 H ? 86

```

²¹\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/IViewII.inc,v 1.7 2007-07-27 08:51:50-07 Hamilton Exp Hamilton \$

```

94: DTE    159    11.769886    0.001038    06
95: DTE    160    11.777328    0.007442    f8 01 H I 80
66: DCE    165    11.787093    0.005572    06

```

This gives:

- 1.1 Firmware Version Request: (RS); ACK (0x06)
- 1.2 Firmware Version Reply: R3960_STD_V2.4_0000000000; (R3960 STD V2.4); ACK (0x06)
- 1.3 iDome Flip Enable Query: (fS); ACK (0x06)
- 1.4 RS232 Flow Control Query: (hS); ACK (0x06)
- 1.5 RS232 Flow Control Disabled: (h0); ACK (0x06)
- 1.6 Status of P/T speed mode request: (sS); ACK (0x06)
- 1.7 P/T Speed Mode Reply of Fixed Medium Speed: (s0); ACK (0x06) (s1 = Variable speed and s2 = Proportional speed.)
- 1.8 Pan Tilt Direction Set Query: (SS); ACK (0x06)
- 1.9 Pan Tilt Direction Reply of Normal: (S0); ACK (0x06)
- 1.10 Query Camera Serial Number: (mSs); ACK (0x06)
- 1.11 Camera Serial Number Reply: (mS0466728); ACK (0x06)
- 1.12 RS232 Flow Control Query: (hS); ACK (0x06)
- 1.13 RS232 Flow Control Disabled: (h0); ACK (0x06)
- 1.14 Latch Status Request: (L?); ACK (0x06)
- 1.15 Latch Status Reply: (L6A0X0); ACK (0x06)
 - 1.15.1. L6: Auto Iris, Camera Power On, Lens Speed Fast.
 - 1.15.2. A0: Aux 1 off, Aux 2 off, Aux 3 off. Or Manual Focus, Manual Integration, Wipe Off, Wash off.
 - 1.15.3. X0: Pressure OK, Video Present.
- 1.16 Repeating sequence:
 - 1.16.1. Home Status Request: (H?); ACK (0x06)
 - 1.16.2. Home Inactive: (HI); ACK (0x06)

2. For the ER-2221B selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/ER2221bIviewii.dat,v 1.4 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

```

<Standard lines 1 ---> 29>
137: DCE    333    44.075524    1.066457    f8 01 L ? 82
197: DTE    338    44.080954    0.001041    06
198: DTE    339    44.091644    0.010690    f8 01 L 6 A 0 X 0 82
142: DCE    348    44.105479    0.005456    06
143: DCE    349    45.080360    0.974881    f8 01 H ? 86
207: DTE    354    45.085785    0.001034    06
208: DTE    355    45.096078    0.010293    f8 01 H I 80
148: DCE    360    45.105932    0.005583    06
149: DCE    361    46.083284    0.977352    f8 01 L ? 82
213: DTE    366    46.088560    0.001052    06
214: DTE    367    46.100095    0.011535    f8 01 L 6 A 0 X 0 82
154: DCE    376    46.114086    0.005445    06
155: DCE    377    47.079197    0.965111    f8 01 H ? 86
223: DTE    382    47.084756    0.001035    06
224: DTE    383    47.096391    0.011635    f8 01 H I 80
160: DCE    388    47.106174    0.005592    06

```

No camera serial number request.

3. For the ER-2222 selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/ER2222Iviewii.dat,v 1.4 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

```

<Standard lines 1 ---> 29>
249: DCE    600    77.736110    0.974836    f8 01 m S s 8c
352: DTE    606    77.742491    0.001042    06
353: DTE    607    77.752758    0.010267    f8 01 m S 0 4 6 6 7 2 8 86
255: DCE    619    77.769829    0.005542    06
256: DCE    620    79.062339    1.292510    f8 01 h S 8a
365: DTE    625    79.067699    0.001042    06
366: DTE    626    79.077022    0.009323    f8 01 h 0 89

```

```

261: DCE      631      79.086788      0.005573      06
262: DCE      632      79.175515      0.088727 f8 01 L ? 82
371: DTE      637      79.180986      0.001036      06
372: DTE      638      79.188532      0.007546 f8 01 L 6 A 0 X 0 82
267: DCE      647      79.202373      0.005457      06
268: DCE      648      80.069077      0.866704 f8 01 H ? 86
381: DTE      653      80.074523      0.001035      06
382: DTE      654      80.083012      0.008489 f8 01 H I 80
273: DCE      659      80.092776      0.005579      06
274: DCE      660      81.061245      0.968469 f8 01 L ? 82
387: DTE      665      81.066669      0.001042      06
388: DTE      666      81.076310      0.009641 f8 01 L 6 A 0 X 0 82
279: DCE      675      81.090114      0.005417      06
280: DCE      676      82.068061      0.977947 f8 01 H ? 86
397: DTE      681      82.073492      0.001035      06
398: DTE      682      82.081981      0.008489 f8 01 H I 80
285: DCE      687      82.091748      0.005574      06

```

4. For the Dome selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/DomeIviewii.dat,v 1.3 2007-07-11 08:13:42-07 Hamilton Exp Hamilton \$

```

328: DCE      788      105.614620      16.519444 f8 01 R S 80
461: DTE      793      105.620176      0.001043      06
462: DTE      794      105.628450      0.008274 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 82
333: DCE      822      105.662397      0.005646      06
334: DCE      823      105.670182      0.007785 f8 01 f S 84
490: DTE      828      105.675614      0.001146      06
339: DCE      829      106.669288      0.001146 f8 01 h S 8a
491: DTE      834      106.674629      0.001191      06
492: DTE      835      106.683171      0.008542 f8 01 h 0 89
344: DCE      840      106.693652      0.006289      06
345: DCE      841      107.674145      0.980493 f8 01 s S 81
497: DTE      846      107.679511      0.001036      06
498: DTE      847      107.690514      0.011003 f8 01 s 0 82
350: DCE      852      107.701165      0.006459      06
351: DCE      853      107.847913      0.146748 f8 01 s 1 83
503: DTE      858      107.853274      0.001042      06
356: DCE      859      108.676066      0.001042 f8 01 S S 81
504: DTE      864      108.681411      0.001198      06
505: DTE      865      108.692728      0.011317 f8 01 S 0 82
361: DCE      870      108.703222      0.006304      06

362: DCE      871      109.861562      1.158340 f8 01 L ? 82
510: DTE      876      109.867024      0.001042      06
511: DTE      877      109.878970      0.011946 f8 01 L 6 A 0 X 0 82
367: DCE      886      109.892779      0.005424      06
368: DCE      887      110.864495      0.971716 f8 01 H ? 86
520: DTE      892      110.869861      0.001037      06
521: DTE      893      110.880923      0.011062 f8 01 H I 80
373: DCE      898      110.890464      0.005407      06
374: DCE      899      111.860575      0.970111 f8 01 L ? 82
526: DTE      904      111.865995      0.001042      06
527: DTE      905      111.878155      0.012160 f8 01 L 6 A 0 X 0 82
379: DCE      914      111.891966      0.005432      06
380: DCE      915      112.857638      0.965672 f8 01 H ? 86
536: DTE      920      112.863071      0.001035      06
537: DTE      921      112.873697      0.010626 f8 01 H I 80
385: DCE      926      112.883560      0.005503      06

```

Sets Variable P/T Speed: s1

5. For the Positioner selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/PositionerIviewii.dat,v 1.3 2007-07-11 08:13:43-07 Hamilton Exp Hamilton \$

```

440: DCE      1055      139.566234      17.677815 f8 01 R S 80
616: DTE      1060      139.571824      0.001035      06
617: DTE      1061      139.581883      0.010059 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 82
445: DCE      1089      139.615808      0.005639      06
446: DCE      1090      139.624746      0.008938 f8 01 f S 84
645: DTE      1095      139.630189      0.001042      06

```

```

451: DCE    1096    140.623645    0.001042 f8 01 h S 8a
646: DTE    1101    140.629152    0.001191 06
647: DTE    1102    140.639107    0.009955 f8 01 h 0 89
456: DCE    1107    140.649621    0.006313 06
457: DCE    1108    141.620895    0.971274 f8 01 s S 81
652: DTE    1113    141.626062    0.000883 06
653: DTE    1114    141.636185    0.010123 f8 01 s 1 83
462: DCE    1119    141.646809    0.006433 06
463: DCE    1120    142.063225    0.416416 f8 01 s 1 83
658: DTE    1125    142.068592    0.001034 06
468: DCE    1126    142.620843    0.001034 f8 01 S S 81
659: DTE    1131    142.626147    0.001155 06
660: DTE    1132    142.637766    0.011619 f8 01 S 0 82
473: DCE    1137    142.648424    0.006467 06

474: DCE    1138    144.137437    1.489013 f8 01 L ? 82
665: DTE    1143    144.142920    0.001037 06
666: DTE    1144    144.154027    0.011107 f8 01 L 6 A 0 X 0 82
479: DCE    1153    144.167883    0.005471 06
480: DCE    1154    145.136356    0.968473 f8 01 H ? 86
675: DTE    1159    145.141884    0.001037 06
676: DTE    1160    145.149534    0.007650 f8 01 H I 80
485: DCE    1165    145.159307    0.005578 06
486: DCE    1166    146.141307    0.982000 f8 01 L ? 82
681: DTE    1171    146.146715    0.001042 06
682: DTE    1172    146.154053    0.007338 f8 01 L 6 A 0 X 0 82
491: DCE    1181    146.167906    0.005476 06
492: DCE    1182    147.146159    0.978253 f8 01 H ? 86
691: DTE    1187    147.151546    0.001036 06
692: DTE    1188    147.161083    0.009537 f8 01 H I 80
497: DCE    1193    147.170894    0.005618 06

```

Sets Variable P/T Speed: s1

6. For the iDome/iView selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/iDomeiViewIviewii.dat,v 1.4 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

```

<Standard lines 1 ---> 29>
580: DCE    1389    176.591023    0.973526 f8 01 m S s 8c
810: DTE    1395    176.597385    0.001025 06
811: DTE    1396    176.605044    0.007659 f8 01 m S 0 4 6 6 7 2 8 86
586: DCE    1408    176.622106    0.005549 06
587: DCE    1409    177.921088    1.298982 f8 01 h S 8a
823: DTE    1414    177.926368    0.001034 06
824: DTE    1415    177.934852    0.008484 f8 01 h 0 89
592: DCE    1420    177.944600    0.005555 06

593: DCE    1421    178.031416    0.086816 f8 01 c D S 85
829: DTE    1427    178.037769    0.001035 06
830: DTE    1428    178.045731    0.007962 f8 01 c W 0 S 0 Y 0 M 0 D 0 L 6 A 0 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 89
599: DCE    1465    178.089468    0.006008 06
600: DCE    1466    178.923021    0.833553 f8 01 c D S 85
867: DTE    1472    178.929416    0.001040 06
868: DTE    1473    178.938435    0.009019 f8 01 c W 0 S 0 Y 0 M 0 D 0 L 6 A 0 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 89
606: DCE    1510    178.982177    0.006023 06

```

Sets Variable P/T Speed: s1

Requests and gets a DSP status reply which repeats.

- 6.1 cDS: Request DSP Status; ACK (06)
- 6.2 DSP Status Reply: (cW0S0Y0M0D0L6A0X0HIP0v0p0FoC3n1so1); ACK (06)
 - 6.2.1. c: Status Reply ID
 - 6.2.2. W0: White Balance Status: Auto
 - 6.2.3. S0: Shutter Status: Auto
 - 6.2.4. Y0: Wide Dynamic Range Status: Off
 - 6.2.5. M0: Day Night Mode: Auto
 - 6.2.6. D0: Digital Zoom Mode: Off
 - 6.2.7. L6: Latch Status: Lens Speed Fast, Camera Power On

- 6.2.8. A0: Aux Status: Manual Integration, Manual Focus
- 6.2.9. X0: Misc Status: Pressure not low, Video not lost
- 6.2.10. HI: Home Status: Inactive
- 6.2.11. P0: Camera Communications Protocol: Cohu
- 6.2.12. v0: Video Type: NTSC
- 6.2.13. p0: Line Lock Status: Crystal mode
- 6.2.14. Fo: Video Status: Video Live
- 6.2.15. C3: Camera Head End Comm: 38.4K
- 6.2.16. n1: Poll Camera: Poll
- 6.2.17. so: Progressive Scan: Off
- 6.2.18. 1: Odd video field

7. For the LCU selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/LCUIviewii.dat,v 1.3 2007-07-11 08:13:43-07 Hamilton Exp Hamilton \$

```

691: DCE    2051    210.137362    19.151722 f8 01 R S 80
1361: DTE    2056    210.142936    0.001036 06
1362: DTE    2057    210.150170    0.007234 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 82
696: DCE    2085    210.184091    0.005626 06
697: DCE    2086    210.199850    0.015759 f8 01 f S 84
1390: DTE    2091    210.205292    0.001034 06
702: DCE    2092    211.207681    0.001034 f8 01 h S 8a
1391: DTE    2097    211.212956    0.001126 06
1392: DTE    2098    211.222285    0.009329 f8 01 h 0 89
707: DCE    2103    211.232853    0.006382 06

708: DCE    2104    211.254849    0.021996 f8 ff J c S 85
1397: DTE    2110    211.261165    0.001041 06
1398: DTE    2111    211.268710    0.007545 f8 01 j c 0 88
714: DCE    2117    211.280293    0.006341 06
715: DCE    2118    211.295541    0.015248 f8 ff j b S 84
1404: DTE    2124    211.302038    0.001197 06

721: DCE    2125    212.205707    0.001197 f8 01 s S 81
1405: DTE    2130    212.211080    0.001225 06
1406: DTE    2131    212.221036    0.009956 f8 01 s 1 83
726: DCE    2136    212.231575    0.006348 06
727: DCE    2137    213.197824    0.966249 f8 01 S S 81
1411: DTE    2142    213.203235    0.001184 06
1412: DTE    2143    213.211718    0.008483 f8 01 S 0 82
732: DCE    2148    213.222422    0.006511 06

733: DCE    2149    214.201607    0.979185 f8 01 m S s 8c
1417: DTE    2155    214.208168    0.001034 06
1418: DTE    2156    214.215923    0.007755 f8 01 m S 0 4 6 6 7 2 8 86
739: DCE    2168    214.233066    0.005613 06
740: DCE    2169    217.814836    3.581770 f8 01 h S 8a
1430: DTE    2174    217.820349    0.001041 06
1431: DTE    2175    217.829358    0.009009 f8 01 h 0 89
745: DCE    2180    217.839153    0.005601 06

746: DCE    2181    217.918441    0.079288 f8 01 L ? 82
1436: DTE    2186    217.923890    0.001035 06
1437: DTE    2187    217.931125    0.007235 f8 01 L 6 A 0 X 0 82
751: DCE    2196    217.945003    0.005500 06
752: DCE    2197    218.810098    0.865095 f8 01 H ? 86
1446: DTE    2202    218.815538    0.001041 06
1447: DTE    2203    218.822978    0.007440 f8 01 H I 80
757: DCE    2208    218.832737    0.005566 06
758: DCE    2209    219.813023    0.980286 f8 01 L ? 82
1452: DTE    2214    219.818489    0.001045 06
1453: DTE    2215    219.826657    0.008168 f8 01 L 6 A 0 X 0 82
763: DCE    2224    219.840565    0.005524 06
764: DCE    2225    220.809096    0.968531 f8 01 H ? 86
1462: DTE    2230    220.814513    0.001034 06
1463: DTE    2231    220.822163    0.007650 f8 01 H I 80
769: DCE    2236    220.831924    0.005567 06

```

Adds in Javalin motor commands:

- 7.1 Jcs: Query Camera for Javelin Continous Motor Mode; ACK)06)
 7.2 jc0: Javelin Continous Motor Mode reply for Off; ACK (06)
 7.3 jbs: Query LCU for Javelin 2 byte address status; ACK (06)

8. For the iView2 selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/IViewiiIviewii.dat,v 1.3 2007-07-11 08:13:42-07 Hamilton Exp Hamilton \$

```

836: DCE    2393    253.330058    21.490703 f8 01 R S 80
1558: DTE    2398    253.335536    0.001037 06
1559: DTE    2399    253.343821    0.008285 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 82
841: DCE    2427    253.377777    0.005660 06
842: DCE    2428    253.385612    0.007835 f8 01 f S 84
1587: DTE    2433    253.391192    0.001036 06
847: DCE    2434    254.386710    0.001036 f8 01 h S 8a
1588: DTE    2439    254.392038    0.001179 06
1589: DTE    2440    254.402103    0.010065 f8 01 h 0 89
852: DCE    2445    254.412586    0.006292 06
853: DCE    2446    255.384738    0.972152 f8 01 s S 81
1594: DTE    2451    255.389898    0.000869 06
1595: DTE    2452    255.400228    0.010330 f8 01 s 1 83
858: DCE    2457    255.410867    0.006446 06
859: DCE    2458    256.387647    0.976780 f8 01 S S 81
1600: DTE    2463    256.393008    0.001043 06
1601: DTE    2464    256.404330    0.011322 f8 01 S 0 82
864: DCE    2469    256.414875    0.006361 06

865: DCE    2470    257.385682    0.970807 f8 01 m S s 8c
1606: DTE    2476    257.391909    0.001034 06
1607: DTE    2477    257.402662    0.010753 f8 01 m S 0 4 6 6 7 2 8 86
871: DCE    2489    257.419792    0.005602 06
872: DCE    2490    258.949136    1.529344 f8 01 h S 8a
1619: DTE    2495    258.954452    0.001042 06
1620: DTE    2496    258.966293    0.011841 f8 01 h 0 89
877: DCE    2501    258.975885    0.005400 06

878: DCE    2502    259.062348    0.086463 f8 01 c D S 85
1625: DTE    2508    259.068787    0.001103 06
1626: DTE    2509    259.078637    0.009850 f8 01 c W O S O Y O M O D O L 6 A O X O H I P O v 0 p 0 F o C 3 n 1 s o 1 89
884: DCE    2546    259.122429    0.006064 06
885: DCE    2547    259.950088    0.827659 f8 01 c D S 85
1663: DTE    2553    259.956456    0.001099 06
1664: DTE    2554    259.964731    0.008275 f8 01 c W O S O Y O M O D O L 6 A O X O H I P O v 0 p 0 F o C 3 n 1 s o 1 89
891: DCE    2591    260.008450    0.005991 06

```

9. For the 36xx selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/36xxIviewii.dat,v 1.3 2007-07-11 08:13:41-07 Hamilton Exp Hamilton \$

```

1004: DCE    3312    299.936796    23.925044 f8 01 R S 80
2309: DTE    3317    299.942259    0.001034 06
2310: DTE    3318    299.950227    0.007968 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 82
1009: DCE    3346    299.984159    0.005637 06
1010: DCE    3347    299.993372    0.009213 f8 01 f S 84
2338: DTE    3352    299.998852    0.001041 06
1015: DCE    3353    300.994373    0.001041 f8 01 h S 8a
2339: DTE    3358    300.999706    0.001186 06
2340: DTE    3359    301.007043    0.007337 f8 01 h 0 89
1020: DCE    3364    301.017558    0.006330 06

1021: DCE    3365    301.027532    0.009974 f8 ff J c S 85
2345: DTE    3371    301.033872    0.001043 06
2346: DTE    3372    301.041939    0.008067 f8 01 j c 0 88
1027: DCE    3378    301.053501    0.006321 06
1028: DCE    3379    301.063652    0.010151 f8 ff j b S 84
2352: DTE    3385    301.070129    0.001043 06

1034: DCE    3386    301.997276    0.001043 f8 01 s S 81
2353: DTE    3391    302.002649    0.001224 06
2354: DTE    3392    302.013658    0.011009 f8 01 s 1 83
1039: DCE    3397    302.024283    0.006433 06
1040: DCE    3398    302.994354    0.970071 f8 01 S S 81

```

```

2359: DTE 3403 302.999628 0.001187 06
2360: DTE 3404 303.007277 0.007649 f8 01 S 0 82
1045: DCE 3409 303.017903 0.006433 06

1046: DCE 3410 303.998052 0.980149 f8 01 m S s 8c
2365: DTE 3416 304.004561 0.001035 06
2366: DTE 3417 304.011690 0.007129 f8 01 m S 0 4 6 6 7 2 8 86
1052: DCE 3429 304.037406 0.014192 06
1053: DCE 3430 305.041182 1.003776 f8 01 h S 8a
2378: DTE 3435 305.046495 0.001035 06
2379: DTE 3436 305.058131 0.011636 f8 01 h 0 89
1058: DCE 3441 305.067870 0.005549 06

1059: DCE 3442 305.153463 0.085593 f8 01 c D S 85
2384: DTE 3448 305.159896 0.001042 06
2385: DTE 3449 305.170681 0.010785 f8 01 c W O S O Y O M O D O L 6 A O X O H I P O v 0 p O F o C 3 n 1 s o 1 89
1065: DCE 3486 305.213963 0.005554 06
1066: DCE 3487 306.041183 0.827220 f8 01 c D S 85
2422: DTE 3493 306.047556 0.001045 06
2423: DTE 3494 306.055206 0.007650 f8 01 c W O S O Y O M O D O L 6 A O X O H I P O v 0 p O F o C 3 n 1 s o 1 89
1072: DCE 3531 306.098480 0.005548 06

```

10. For the 4200 selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/4200Iviewii.dat,v 1.3 2007-07-11 08:13:41-07 Hamilton Exp Hamilton \$

```

1143: DCE 3982 333.324925 17.226514 f8 01 R S 80
2840: DTE 3987 333.330438 0.001042 06
2841: DTE 3988 333.338605 0.008167 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 20 20 82
1148: DCE 4016 333.372570 0.005670 06
1149: DCE 4017 333.383463 0.010893 f8 01 f S 84
2869: DTE 4022 333.388904 0.001036 06
1154: DCE 4023 334.385464 0.001036 f8 01 h S 8a
2870: DTE 4028 334.390806 0.001190 06
2871: DTE 4029 334.400343 0.009537 f8 01 h 0 89
1159: DCE 4034 334.410844 0.006309 06
1160: DCE 4035 335.388387 0.977543 f8 01 s S 81
2876: DTE 4040 335.393587 0.001041 06
2877: DTE 4041 335.401300 0.007713 f8 01 s 1 83
1165: DCE 4046 335.411964 0.006471 06
1166: DCE 4047 336.391290 0.979326 f8 01 S S 81
2882: DTE 4052 336.396592 0.000869 06
2883: DTE 4053 336.405714 0.009122 f8 01 S 0 82
1171: DCE 4058 336.416359 0.006452 06

1172: DCE 4059 337.389318 0.972959 f8 01 m S s 8c
2888: DTE 4065 337.395660 0.001043 06
2889: DTE 4066 337.404047 0.008387 f8 01 m S 0 4 6 6 7 2 8 86
1178: DCE 4078 337.421163 0.005587 06
1179: DCE 4079 338.921530 1.500367 f8 01 h S 8a
2901: DTE 4084 338.926909 0.001042 06
2902: DTE 4085 338.935087 0.008178 f8 01 h 0 89
1184: DCE 4090 338.944678 0.005564 06

1185: DCE 4091 339.027944 0.083266 f8 01 c D S 85
2907: DTE 4097 339.034332 0.001035 06
2908: DTE 4098 339.043974 0.009642 f8 01 c W O S O Y O M O D O L 6 A O X O H I P O v 0 p O F o C 3 n 1 s o 1 89
1191: DCE 4135 339.087281 0.005579 06
1192: DCE 4136 339.920534 0.833253 f8 01 c D S 85
2945: DTE 4142 339.926922 0.001037 06
2946: DTE 4143 339.935724 0.008802 f8 01 c W O S O Y O M O D O L 6 A O X O H I P O v 0 p O F o C 3 n 1 s o 1 89
1198: DCE 4180 339.979065 0.005764 06

```

11. For the 27xx selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/27xxIviewii.dat,v 1.3 2007-07-11 08:13:41-07 Hamilton Exp Hamilton \$

```

1255: DCE 4541 373.548917 25.575415 f8 01 R S 80
3287: DTE 4546 373.554461 0.001042 06
3288: DTE 4547 373.561591 0.007130 f8 01 R 3 9 6 0 20 S T D 20 V 2 2e 4 20 20 20 20 20 20 20 20 20 20 20 82
1260: DCE 4575 373.595595 0.005710 06
1261: DCE 4576 373.602581 0.006986 f8 01 f S 84
3316: DTE 4581 373.608016 0.001041 06
1266: DCE 4582 374.610443 0.001041 f8 01 h S 8a

```

```

3317: DTE 4587 374.615782 0.001158 06
3318: DTE 4588 374.622912 0.007130 f8 01 h 0 89
1271: DCE 4593 374.633400 0.006303 06
1272: DCE 4594 375.605539 0.972139 f8 01 s S 81
3323: DTE 4599 375.610866 0.001040 06
3324: DTE 4600 375.622293 0.011427 f8 01 s 1 83
1277: DCE 4605 375.633015 0.006531 06
1278: DCE 4606 376.602596 0.969581 f8 01 S S 81
3329: DTE 4611 376.607950 0.001035 06
3330: DTE 4612 376.616960 0.009010 f8 01 S 0 82
1283: DCE 4617 376.627592 0.006439 06

1284: DCE 4618 376.979504 0.351912 f8 01 s 0 82
3335: DTE 4623 376.984811 0.001044 06

1289: DCE 4624 377.610390 0.001044 f8 01 m S s 8c
3336: DTE 4630 377.616764 0.001184 06
3337: DTE 4631 377.625775 0.009011 f8 01 m S 0 4 6 6 7 2 8 86
1295: DCE 4643 377.642857 0.005553 06
1296: DCE 4644 378.960962 1.318105 f8 01 h S 8a
3349: DTE 4649 378.966200 0.001035 06
3350: DTE 4650 378.977502 0.011302 f8 01 h 0 89
1301: DCE 4655 378.987239 0.005547 06

1302: DCE 4656 379.075188 0.087949 f8 01 L ? 82
3355: DTE 4661 379.080624 0.001041 06
3356: DTE 4662 379.091524 0.010900 f8 01 L 6 A 0 X 0 82
1307: DCE 4671 379.105332 0.005424 06
1308: DCE 4672 379.967648 0.862316 f8 01 H ? 86
3365: DTE 4677 379.973216 0.001035 06
3366: DTE 4678 379.985376 0.012160 f8 01 H I 80
1313: DCE 4683 379.995150 0.005586 06
1314: DCE 4684 380.964810 0.969660 f8 01 L ? 82
3371: DTE 4689 380.970021 0.000874 06
3372: DTE 4690 380.982247 0.012226 f8 01 L 6 A 0 X 0 82
1319: DCE 4699 380.996055 0.005431 06
1320: DCE 4700 381.960735 0.964680 f8 01 H ? 86
3381: DTE 4705 381.966327 0.001041 06
3382: DTE 4706 381.977017 0.010690 f8 01 H I 80
1325: DCE 4711 381.986789 0.005586 06

```

12. For the 596x selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/596xIviewii.dat,v 1.4 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

```

<Standard lines 1 ---> 29>
1427: DCE 4957 419.307047 0.977590 f8 01 m S s 8c
3531: DTE 4963 419.313363 0.001043 06
3532: DTE 4964 419.322166 0.008803 f8 01 m S 0 4 6 6 7 2 8 86
1433: DCE 4976 419.339290 0.005594 06
1434: DCE 4977 421.946629 2.607339 f8 01 h S 8a
3544: DTE 4982 421.951942 0.001035 06
3545: DTE 4983 421.962530 0.010588 f8 01 h 0 89
1439: DCE 4988 421.972275 0.005554 06

1440: DCE 4989 422.059713 0.087438 f8 01 c D S 85
3550: DTE 4995 422.066112 0.001042 06
3551: DTE 4996 422.073660 0.007548 f8 01 c W 0 S 0 Y 0 M 0 D 0 L 6 A 0 X 0 H I P 0 v 0 p 0 F o c 3 n 1 s o 1 89
1446: DCE 5033 422.117119 0.005567 06
1447: DCE 5034 422.951472 0.834353 f8 01 c D S 85
3588: DTE 5040 422.957821 0.001034 06
3589: DTE 5041 422.969042 0.011221 f8 01 c W 0 S 0 Y 0 M 0 D 0 L 6 A 0 X 0 H I P 0 v 0 p 0 F o c 3 n 1 s o 1 89
1453: DCE 5078 423.012313 0.005545 06

```

13. For the 696x selection:

\$Header: d:/TXB-Cohu/ProtocolDocument/RCS/696xIviewii.dat,v 1.4 2007-07-26 09:15:14-07 Hamilton Exp Hamilton \$

```

<Standard lines 1 ---> 29>
1567: DCE 5696 463.686205 0.973964 f8 01 m S s 8c
4130: DTE 5702 463.692565 0.001036 06
4131: DTE 5703 463.700743 0.008178 f8 01 m S 0 4 6 6 7 2 8 86
1573: DCE 5715 463.717895 0.005628 06
1574: DCE 5716 466.295441 2.577546 f8 01 h S 8a

```

4143: DTE 5721 466.300964 0.001035 06
4144: DTE 5722 466.308197 0.007233 f8 01 h 0 89
1579: DCE 5727 466.317943 0.005505 06

1580: DCE 5728 466.400945 0.083002 f8 01 81
4149: DTE 5731 466.404193 0.001081 06
1583: DCE 5732 467.291628 0.001081 f8 01 81
4150: DTE 5735 467.294729 0.001199 06

Undocumented repeating sequence of: f8 01 81, ACK (06)

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