Temp labels [232pro] [3500pro] [3850pro] [422pro] [cohuweb] [gacohu]

iDome/ER2221 Protocols

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Contents

[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. IDOMEIVIEWLCUCOMMPROTOCOL.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 → 7 are also present, with the same meaning, in the DSP status reply as bytes 13 → 18.
- Bytes 2 → 7 are also present, with the same meaning, in the Home status response as bytes 5 → 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 `LOA4X0` (ignoring the boiler plate) indicates:
   - 6.1 `L0` = B_0 = Auto Iris on, B_1 = Camera Power off, B_2 = Lens Speed slow, B_3 = No Communications Error.
   - 6.2 `A4` = B_0 = Auto Focus off on, B_1 = Manual Integration, B_2 = Wipe on(?), B_3 = Wash off. In the closest approximation to ER-2222DF's protocol documentation that is available B_2 is indicated as being "`AUX 3`".
   - 6.3 `X0` = B_0 = Remote mode, B_1 = Not low pressure, B_2 = Video present, B_3 = 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 `[intro:latchstatusresponse]`		
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?`)
	$B_0 = 1$ = Manual Iris $B_0 = 0$ = Auto Iris	
	$B_1 = 1$ = Camera Power On $B_1 = 0$ = Camera Power Off	
	$B_2 = 1$ = Lens Speed Fast $B_2 = 0$ = Lens Speed Slow	
	$B_3 = 1$ = Communications Error $B_3 = 0$ = 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?`)
	$B_0 = 1$ = Auto Focus $B_0 = 0$ = Manual Focus	
	$B_1 = 1$ = Auto Integration $B_1 = 0$ = Manual Integration	
	$B_2 = 1$ = Wipe On (for 3965 model only) $B_2 = 0$ = Wipe Off (for 3965 model only)	
	$B_3 = 1$ = Wash On (for 3965 model only) $B_3 = 0$ = 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?`)
	$B_0 = 1$ = Local Mode $B_0 = 0$ = Remote Mode	
	$B_1 = 1$ = Low Pressure $B_1 = 0$ = Not Low Pressure	
	$B_2 = 1$ = Video Loss $B_2 = 0$ = No Video Loss	
	$B_3 =$ = 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 infomration. 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 hexidecimal 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	"`p`$A_2A_1A_0E_2E_1E_0$"	ACK
Zoom/Focus Position Request	"`V?`"	ACK + Zoom/Focus Response
Zoom/Focus Goto Command	"`v`$Z_2Z_1Z_0F_2F_1F_0$"	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	Pppptttppp = 12 bit data of Pan ($000_{cohuhex}$ →$???_{cohuhex}$) Format: $000_{cohuhex}$ →$???_{cohuhex}$
		ttt = 12 bit data of Tilt ($000_{cohuhex}$ — $???_{cohuhex}$) Format: $000_{cohuhex}$ →$???_{cohuhex}$ See Section 1.2, page 5 for a discussion of Cohu Numbering
V?	Zoom/Focus Position Request	Pzzzfffzzz = 12 bit data of Zoom ($000_{cohuhex}$ →$???_{cohuhex}$) Format: $000_{cohuhex}$ →$???_{cohuhex}$
		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 $(12\times256)+(12\times16)+(8\times1) = 3272$ counts. There are $4096/360 = 11.37+$ counts per degree, thus $3272/11.37 = 287.6^o$. Displayed on the Cohu monitor connected to the iViewII, as 288^o.

   And a tilt angle of $(7 \times 256) + (14 \times 16) + (12 \times 1) = 2028$. There are $4096/190 = 21.55+$ counts per degree, $2028/21.55 = 94.07^o$. Displayed tilt degrees are offset from protocol tilt degrees by 95^o thus $95 - 95 = 0^o$ which is not displayed on the monitor connected to the iViewII. (-1^o 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 ($000_{cohuhex}$ — $???_{cohuhex}$) Format: $000_{cohuhex} \rightarrow ???_{cohuhex}$ See Section 1.2, page 5 for a discussion of Cohu Numbering
`vcccddd`	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 subscript$_2$ indicates the byte containing the most significant bytes of the position and subscript$_0$ 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. Additonal 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:

   A_2 = `0x3A` ($:_{cohuhex}$),
   A_1 = `0x3B` ($;_{cohuhex}$), and
   A_0 = `0x3C` ($<_{cohuhex}$).

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
$(10 \times 256)+$	$(11 \times 16)+$	$(12 \times 1) =$
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^o in pan:

   5.1 Then $000_{cohuhex} = 0^o$ and $???_{cohuhex} = 359^o$.

   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^o to +95^o for a range of 190^o which will be used here.)

   6.1 Then $000_{cohuhex}$ = -95^o and $???_{cohuhex}$ = +95^o.

   6.2 So each degree is $4096/190 = 22.75+$ counts of width per degree

7. For displayed values tilt 0^o is horizontal in orientation. Also down angles have negative values. Pelco's protocol always uses a tilt range of 360^o 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^o 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 $+95^o$ 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^o of motion, giving 10 counts per degree.

1.7.7 Actual iDome Format Position Response Data

Command	Description	Response
`cPS`	Pan/Tilt Position Request	`cPppppttt` `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^o, Tilt = 1103 − 0150 = 95.3^o or about .3^o 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^o) value of the PTZ. Angular readouts then increment to 90^o (East), 180^o (South) and to 270^o (West) when looking down on the PTZ unit from above.

Pelco tilt readouts are based on the horizon, with 0^o meaning that the PTZ is looking at the horizon. As the PTZ points down the protocol readout changes to 45^o and then 90^o when the PTZ is pointing straight down. The PTZ on-screen display will indicate -45^o and then -90^o. 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^o and the on-screen display shows 90^o. At 45^o above the horizon the protocol readout will be 315^o and the on-screen display will be 45^o. 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 hexidecimal (`0x`).

Position	D Reads Out	Displays As	iViewII Reads Out	Displays As	MPC Reads Out
95^o up	265	—	2050_{10}	95	$???_{cohuhex}$ (`0xFFF`)
90^o up	270	90	2000_{10}	90	$?94_{cohuhex}$ (`0xF94`)
45^o up	315	45	1450_{10}	45	$;<:_{cohuhex}$ (`0xBCA`)
Horizontal - 1^o	359	1	1110_{10}	1	$815_{cohuhex}$ (`0x815`)
Horizontal	0	0	1100_{10}	0	$800_{cohuhex}$ (`0x800`)
45^o down	45	-45	0650_{10}	-45	$435_{cohuhex}$ (`0x435`)
90^o down	90	-90	0200_{10}	-90	$06;_{cohuhex}$ (`0x06B`)
95^o 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 $2 \rightarrow -92^o$. 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 uning 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^o.
3. Maximum Down, this is the farthest down that the enclosure will point uning 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^o and displays on the screen as -95^o. (`cP17460150`, pan was at 174.6^o)
2. Maximum Tilt Up reads out as 205^o and displays on the screen as 95^o. (`cP17462050`, pan was at 174.6^o)
3. Tilt Horizontal reads out as 110^o and displays on the screen as 0^o.
4. Giving a total tilt readout range of 190^o.
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^o (maximum down) through $800_{cohuhex}$ at horizontal and up to $???_{cohuhex}$ for $+95^o$ (maximum up).
7. For the iViewII type readout $1900/190 = 10$ counts per degree. Starting at 0150_{10} for -95^o (maximum down) through 1100_{10} at horizontal and up to 2050_{10} for $+95^o$ (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 characteristicts 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^o. For tilt this would represent an angle of about -81.5^o 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 $291_{10}/10.78_{10} = 26.99_{10}{}^o$.
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^o bias, and **display horizontal** displays as 0^o and **protocol horizontal** reads out as 95^o (or $800_{cohuhex}$) thus $13.49_{10} - 95_{10} = -81.5_{10}$.

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^o[4].

The tilt angle would be 70^o[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 hexidecimal 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 hexidecimal letters (`ABCDEF`), which are the only hexidecimal 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 diplayed 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`.

[4]Details of the calculations are left to the student.

[5]Details of the calculations are left for the student's enjoyment.

Position	MPC	iViewII	Pelco	Name
0^o	000_{16} (0000_{10}) $000_{cohuhex}$	0000_{ASCII}	00000 0x00 0x00	North
90^o	400_{16} (1024_{10}) $400_{cohuhex}$	0900_{ASCII}	09000 0x25 0x1C	East
180^o	800_{16} (2048_{10}) $800_{cohuhex}$	1800_{ASCII}	18000 0x46 0x50	South
270^o	$C00_{16}$ (3072_{10}) $< 00_{cohuhex}$	2700_{ASCII}	27000 0x69 0x78	West

Table 13: Typical pan values[intro:typicalpanvalues]

Position	MPC	iViewII	Pelco	Name
95^o	FFF_{16} $???_{cohuhex}$	2050_{ASCII}	26500 0x67 0x84	Max Up (and back some)
90^o	$F94_{16}$ $?94_{cohuhex}$	2000_{ASCII}	27000 0x69 0x78	Up
45^o	BCA_{16} $;<:_{cohuhex}$	1550_{ASCII}	31500 0x7B 0x0C	
0^o	800_{16} $800_{cohuhex}$	1100_{ASCII}	00000 0x00 0x00	Horizontal
-45^o	435_{16} $435_{cohuhex}$	0650_{ASCII}	04500 0x11 0x94	
-90^o	$06B_{16}$ $00;_{cohuhex}$	0200_{ASCII}	09000 0x23 0x28	Down
-95^o	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 ^{o} 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^o up	27000	90^o
45^o up	31500	45^o
Horizontal - 1^o	35900	1^o
Horizontal	000	0^o
45^o down	4500	-45^o
90^o down	9000	-90^o

Position Pointing direction of the enclosure/camera

D reads out as D protocol returned value for this angle

Spectra displays as What is displayed on the Spectra screen

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 possiable for any Pelco camera to actuall get to all of these positions.

   1.1.3. Note that the angles increase, starting at the horizontal and continue to streight down at -90^o.

   1.1.4. Then the readouts continou 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^o 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 horizion, a negative value will be displayed.

   1.2.3. Positive values of pointing are used when the camera is pointing above the horizion.

   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.

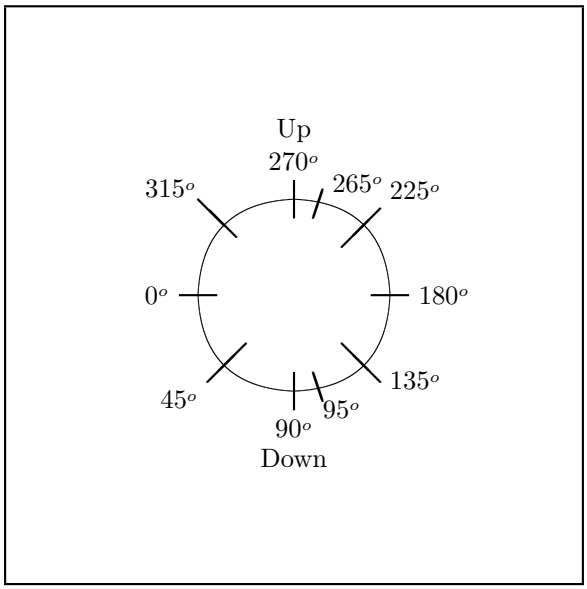

Figure 1: Pelco Tilt Protocol Readout Positions [intro:pelcotiltreadouts]

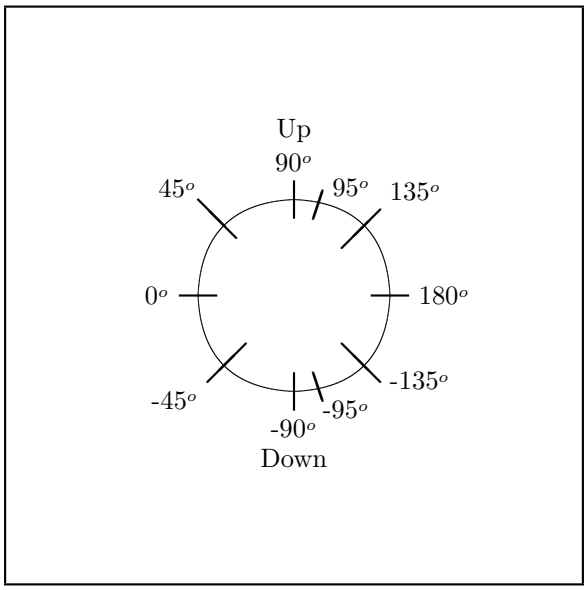

Figure 2: Pelco Tilt Display Positions [intro:pelcotiltdisplays]

2. Cohu tilt logic.

2.1 MPC format hex readout values.

2.1.1. In Figure 3, page 25 are the hexidecimal 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^o past streight up (as displayed on the screen), a readout of `0xFFF` 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^o past streight down (as displayed on the screen), a readout of `0x000` 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 `0x800`.

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^o 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^o 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.)

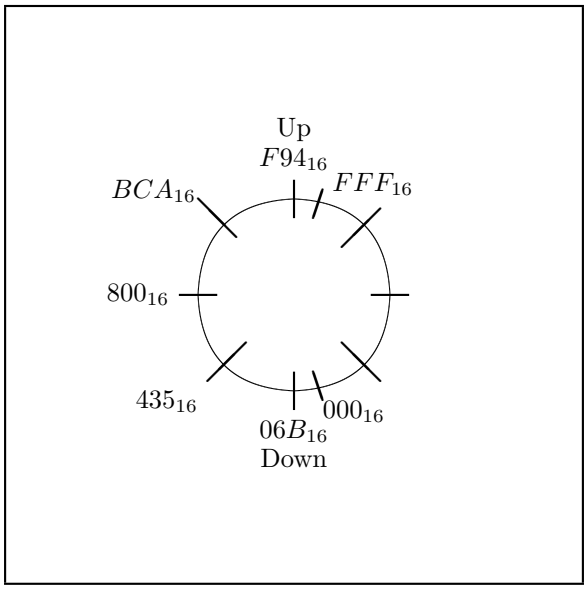

Figure 3: Cohu MPC Tilt Readout Positions, hex values [intro:cohutiltreadoutshex]

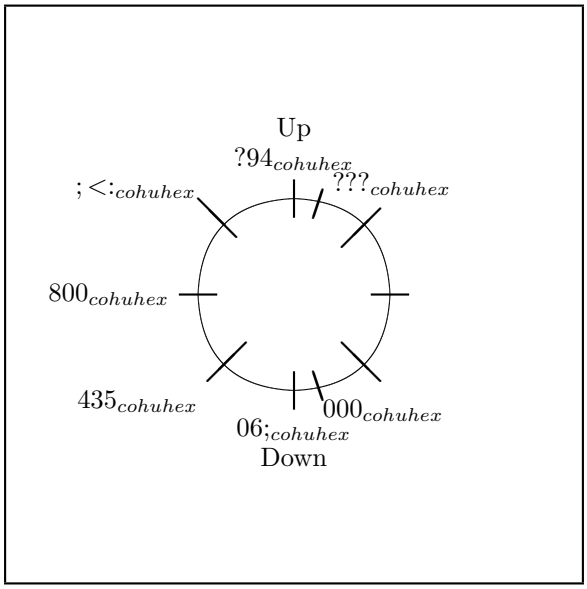

Figure 4: Cohu MPC Tilt Readout Positions, CohuHex values [intro:cohutiltreadoutshec]

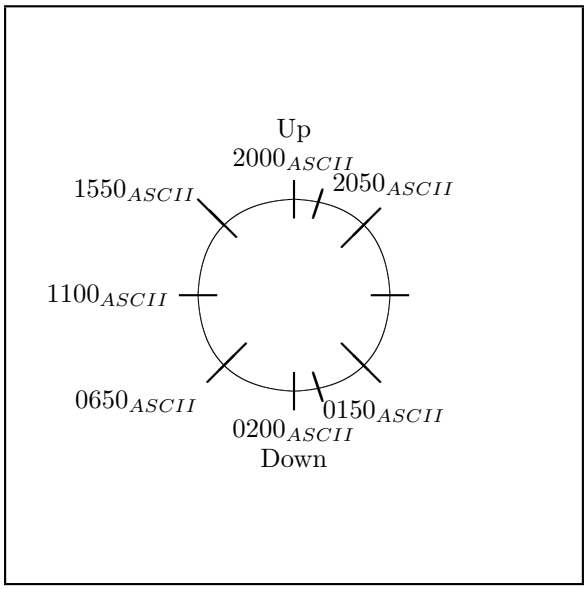

Figure 5: Cohu iDome Tilt Readout Positions, ASCII values `[intro:cohutiltreadoutshei]`

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 hexidecimal 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^o in pan.

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

Maximum down, -95^o is encoded as $015.0_{cohuhex}$ and displays as -95^o. Thus count $0000_{cohuhex}$ represents -110^o or 20^o 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 acceess 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`	Telemetrics
`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.

[7] The 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 0 S 0 Y 0 M 1 D 0 L 7 A 0 X 0 H I P 0 v 0 p 0 F o s o` <CHECKSUM>.

1.12 Unexpected and Undocumented Commands [undoc]

Using WinMPC[9] has reveled 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 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 $

[9] During 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 $\longrightarrow$ 10, but the actual protocol values start at 0_{ASCII} and extend to 9_{ASCII}. (In hexidecimal that is `0x30` through `0x39`.)

   With WinMPC presets for the iDome type units are numbered from 1 $\longrightarrow$ 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 $\longrightarrow$ 47: `0x10` = 1, `0x11` = 2, etc., and `0x3E` = 47_{10}. (**Note the gap.**)

   1.1.2. Presets 48 $\longrightarrow$ 63: `0x60` = 48_{10}, `0x61` = 49_{10}, etc., and `0x70` = 64_{10}.

   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 $\longrightarrow$ 10: 0_{ASCII} = 1, 1_{ASCII} = 2, etc., and 9_{ASCII} = 10_{10}.

   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 possable to uniquely identify some preset IDs. The TXB-C's internal logic makes the following assumtions:

   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** 10_{10} **(`0x19` in iDome mode or `0x39` in MPC mode) and** 42_{10} **(`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`
`mN0`	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, INC[11]

2.1 General

This document[12] 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 parity[13].

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 combing 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 $`

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

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

[13] The 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]

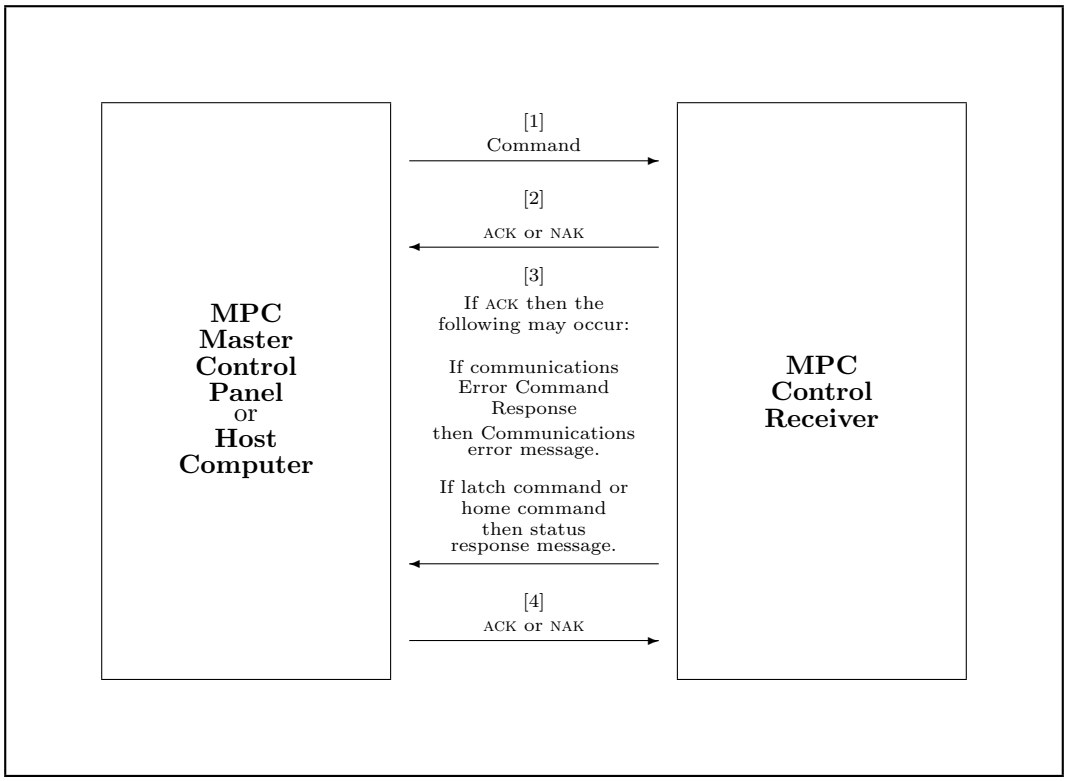
For details see Section 2.8, page 53.

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	"*"	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



$RCSfile: TCP.inc,v $

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 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 thay 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 0 S 0 Y 0 M 0 D 0 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 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
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 0 S 0 Y 0 M 0 D 0 L 2 A 0 X 0 H 10 P 0 v 0 p 0
                                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 0 S 0 Y 0 M 0 D 0 L 2 A 0 X 0 H 10 P 0 v 0 p 0
                                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 0 S 0 Y 0 M 0 D 0 L 2 A 0 X 0 H 10 P 0 v 0 p 0
                                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 $0_{ASCII} \rightarrow ?_{ASCII}$) (l0, l1, l2, l3, l4, l5, l6, l7, l8, l9, l:, l;, l<, l=, l>, l?)
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 $0_{ASCII} \rightarrow ?_{ASCII}$) (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 $0_{ASCII} \rightarrow ?_{ASCII}$) (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 TSl= 87` Tilt Stop, Pan Left var speed step 14 (`=`): `DTE 06` ACK
3. `DCE f8 01 d1l= 85` Tilt Down var speed step 1 (`1`), Pan Left var speed step 14 (`=`): `DTE 06` ACK
4. `DCE f8 01 d2l= 86` Tilt Down var speed step 2 (`2`), Pan Left var speed step 14 (`=`): `DTE 06` ACK
5. `DCE f8 01 d2l> 85` Tilt Down var speed step 2 (`2`), Pan Left var speed step 15 (`>`): `DTE 06` ACK
6. `DCE f8 01 d3l> 84` Tilt Down var speed step 2 (`3`), Pan Left var speed step 15 (`>`): `DTE 06` ACK
7. `DCE f8 01 d3l?  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	

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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^o) `Lp2` (Line Lock — Phase 1 mode — 30^o) `Lp3` (Line Lock — Phase 2 mode — 60^o) `Lp4` (Line Lock — Phase 3 mode — 90^o) `Lp5` (Line Lock — Phase 4 mode — 120^o)	

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Command	Description	Response
	`Lp6` (Line Lock — Phase 5 mode — 150^o)	
`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`^{o}`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>
cdSl#	Get ID Messages cdSl1, cdSl2, cdSl3, cdSl4, cdSl5
	Reply is: dL#<DATA>
cdSS##	Get Sector ## ID stored in camera ## = $1_{ASCII} \rightarrow @_{ASCII}$ (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 ($1_{ASCII} \rightarrow @_{ASCII}$)
	(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

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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 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:lhr1]

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:lhr2]

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	

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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)	
csO	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	

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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 0 S 0 Y 0 M 0 D 0 L 2 A 1 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 8c
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 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
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 0 S 0 Y 0 M 0 D 0 L 3 A 0 X 0 H I P 0 v 0 p 0 F o C 3 n 1 s o 1 8c
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 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
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} — $?_{ASCII}$	`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

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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°)

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Byte	Data	Description
		`p6` (Line Lock — Phase 5 mode — 150^o)
27	`F`	Video Status
28		`Fo` (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 elsewhare.
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#llllrrrr llll 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#llllrrrr llll 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 ($1_{ASCII} \rightarrow 8_{ASCII}$)	
`*TD#<data>`	Set Tour Dwell Times `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `<data>` = 32 dwell times in the range `0x10` to `0x4D` (0 to 60 sec)	
`*Td#`	Get Tour Dwell Times	`*TD#`¡data¿ `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) ¡data¿ = 32 dwell times in the range of `0x10` to `0x4D` (0 to 60 sec)
`*TP#<data>`	Set Tour Presets `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `<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 ($1_{ASCII} \rightarrow 8_{ASCII}$) ¡data¿ = 32 preset values in the range of `0x10` to `0x50` (0 to 64)	`*TP#`¡data¿
`*TS#s`	Set Tour State `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `s` = State (`0` = Stop; `1` = Start)	
`*Ts#`	Get Tour State `#` = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `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#llllrrrr`	Upload Privacy Zone Limits to camera `#` = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `llll` and `rrrr` = $0000_{ASCII} \rightarrow 3599_{ASCII}$
`*pP##ppppttttzzzzffff`	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#llllrrrr`	Upload Sector Limits to camera `#` = Sector Number ($1_{ASCII} \rightarrow @_{ASCII}$) `llll` and `rrrr` = $0000_{ASCII} \rightarrow 3599_{ASCII}$
`*TD#<data>`	Upload Tour Dwell Times to camera `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) ¡data¿ = 32 dwell times in the range of `0x10` to `0x4D` (0 to 60 sec)
`*TP#<data>`	Upload Tour Presets to camera `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) ¡data¿ = 32 preset values in the (*and nothing more is said*)
`*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)

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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 $`

[15] P.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.

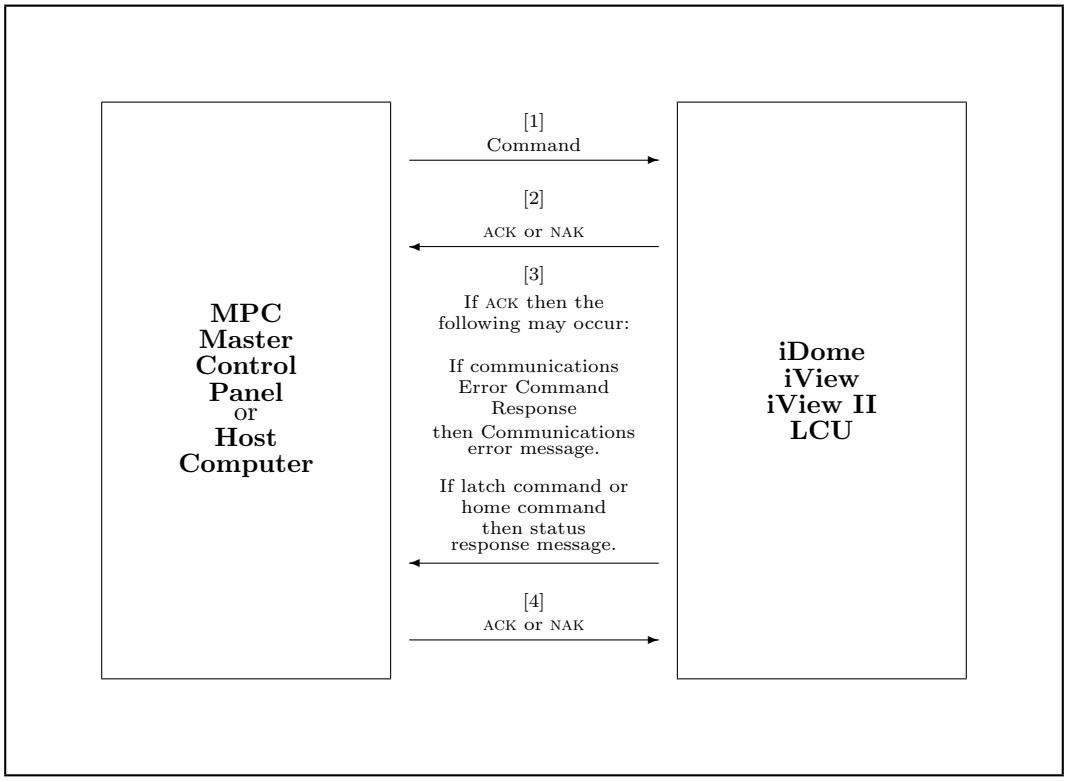
Table 20: DSP Camera Command Message Format [idome57:table2]

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
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`.

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



$RCSfile: IDome57.inc,v $

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 $0_{ASCII} \rightarrow ?_{ASCII}$) (`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 $0_{ASCII} \rightarrow ?_{ASCII}$) (`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 $0_{ASCII} \rightarrow ?_{ASCII}$) (`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 $0_{ASCII} \rightarrow ?_{ASCII}$) (`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

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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(xxx11111)
cdSl#	Get ID Messages	dL#DATA # =1,2,3,4,5 (cdSl1, cdSl2, cdSl3, cdSl4, cdSl5
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## cdSs##	Get Sector ## ID stored in camera 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)	dST##DATA ## = 1_{ASCII} to $@_{ASCII}$ (16 sectors) 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:miscommands]		
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^o) Lp2 (Line Lock — Phase 1 mode 30^o) Lp3 (Line Lock — Phase 2 mode 60^o) Lp4 (Line Lock — Phase 3 mode 90^o) Lp5 (Line Lock — Phase 4 mode 120^o) Lp6 (Line Lock — Phase 5 mode 150^o)	
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`	Tilt Flip Disabled	
`fS`	iDome Flip Enable Query	Return Tilt Flip Enable Status `fE` (Tilt Flip Enabled) `fD` (Tilt Flip Disabled)
`h1`	RS232 Flow Control (RTS/CTS) Enabled	
`h0`	RS232 Flow Control (RTS/CTS) Disabled	
`hS`	RS232 Flow Control Query	Return RS232 Handshake Status `h1` (Enabled), `h0` (Disabled)
`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)
`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)
`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)
`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)

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####### mSs	Set Camera Serial Number # = 0 to 9 Query Camera Serial Number data	 mS#######, # = 0 to 9
mf# mfS	Video Mode Preset (Freeze/Live) when go to a preset # = 0 (Off — Live) = 1 (On — Frozen) 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

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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 s1 s2	Set Fixed Medium P/T Speed (MPCD-11) Set Variable P/T Speed 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	$0_{ASCII} \rightarrow ?_{ASCII}$ 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	$0_{ASCII} \rightarrow ?_{ASCII}$ 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	$0_{ASCII} \rightarrow ?_{ASCII}$ 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`	Home Position
	`0x60 0x70`	
	`I`	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)	

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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)	

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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.
csO	Set Progressive Scan On	

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DSP Commands

Command	Description	Response
cso	Set Progressive Scan Off	
cs0 cs1	Set Progressive Scan — Even Field Set Progressive Scan — Odd Field	
cFF cF#	Video Freeze On/Off toggle Set Video Freeze On/Off cF0 (On) cfo (Off)	
cb cB	Enable Boot Loader to update new firmware in the iDome/iView Enable Boot Loader to update new firmware in the LCU	
cLN cLn cLS	Set Normal Light Mode (ER8439E — special Camera module) Set Sodium Vapor Light Mode (ER8439E — special Camera module) 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## cGS	Set Max AGC Gain ## = 0x11 to 0x38 Current Max AGC Gain Status	 cG## ## = 0x11 to 0x38
cA# cAH## cAV##	Set Aperture Mode cA0: Auto cA1: Manual Set Horizontal Aperture ## = 0x11 0x2F Set Vertical Aperture ## = 0x11 0x2F	

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DSP Commands

Command	Description	Response
`cAS`	Inquiry Aperture Mode	`cA#H##V##` `##` = `0x11` `0x2F` (H/V level) `#` = `0`: Auto = `1`: Manual
`cE#`	Set Electronic Image Stabilizer Mode `cE0`: Off `cE1`: On	
`cES`	Inquiry Electronic Image Stabilizer	`cE#` `#` = `0`: Off = `1`: On
`cEF#`	Set Electronic Image Stabilizer Frequency Level `cEF0`: 16 Hz (default) `cEF1`: 5 Hz	
`cEFS`	Inquiry Electronic Image Stabilizer	`cEF#` Frequency Level `#` = `0`: 16 Hz (default) = `1`: 5 Hz
`cEP#`	Enable/Disable EIS while Pan/Tilt is moving Frequency Level `cEP0`: Disabled `cEP1`: Enabled	
`cEPS`	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@##`	Set Zone Color for either Programming/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	
`csC?`	Color Setup Inquiry	`csCP##@L##@` `##` = 0_{ASCII} →>$_{ASCII}$ (14 Colors: as described Above) `@` = `0`: transparency disabled = `1`: transparency enabled = `P`: Programmed Mode Status = `L`: Live Mode Status
`csT@#`	See through privacy zone mode (transparency mode) `csTP0`: Programming Mode Disabled `csTP1`: Programming Mode Enabled `csTL0`: Live Mode Disabled `csTL1`: Live Mode Enabled	

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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@###	Set Privacy Zone Horizontal size @ = A to X (24 Zones) ### = 000 to 128	
csh@?	Inquiry Horz Size of a Zone	csh@### @ = A to X (24 Zones) ### = 000 to 128
csv@###	Privacy Zone Vertical size. @ = A to X (24 Zones) ### = 000 to 128	
csv@?	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 4	W 0 = Auto 1 = Manual	White Balance Status
5 6	S 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	Shutter Status
7 8	Y 0 = Off 1 = On	Wide Dynamic Range Status
9 10	M 0 = Day/Night in Auto mode 1 = in Day mode 2 = in Night mode	Day Night Mode
11 12	D 0 = Off 1 = 2X 2 = 5X	Digital Zoom Mode

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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

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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) O (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 O 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#llllrrrr`
		# = Sector Number (1_{ASCII} to @$_{ASCII}$)
		`llll` and `rrrr` = $0000_{ASCII} \rightarrow 3599_{ASCII}$

Privacy Zone Commands `[idome57:privacyzonecommands]`		
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	`*Pp#llllrrrr` # = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `llll` 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 ($1_{ASCII} \rightarrow 8_{ASCII}$)	
`*TP#<data>`	Set tour Presets `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `<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 ($1_{ASCII} \rightarrow 8_{ASCII}$) `<data>` = 32 preset values in the range of `0x10` to `0x50` (0 to 64)
`*TD#<data>`	Set tour Dwell times `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `<data>` = 32 dwell times in the range `0x10` to `0x4D` (0 to 60 sec)	
`*Td#`	Get tour Dwell times	`*TD#<data>` `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `<data>` = 32 dwell times in the range of `0x10` to `0x4D` (0 to 60 sec)
`*TS#s`	Set Tour State `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `s` = State (`0` = Stop; `1` = Start)	
`*Ts#`	Get Tour State	`*TS#s` `#` = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `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	`Pppptttppp` = 12 bit data of Pan (000_{ASCII} →$???_{ASCII}$) Format: 000_{ASCII} →$???_{ASCII}$ `ttt` = 12 bit data of Tilt (000_{ASCII}-$???_{ASCII}$) Format: 000_{ASCII} →$???_{ASCII}$
`V?`	Zoom/Focus Position request	`Pzzzfff` `zzz` = 12 bit data of Zoom (000_{ASCII} →$???_{ASCII}$) Format: 000_{ASCII} →$???_{ASCII}$ `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} →$???_{ASCII}$) Format: 000_{ASCII} →$???_{ASCII}$ `bbb` = 12 bit data of Tilt (000_{ASCII}-$???_{ASCII}$) Format: 000_{ASCII} →$???_{ASCII}$	
`vcccddd`	Goto Zoom/Focus Position `ccc` = 12 bit data of Zoom (000_{ASCII} →$???_{ASCII}$) Format: 000_{ASCII} →$???_{ASCII}$ `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	`cPppppttttpppp` = Pan data (0000_{ASCII} → 3599_{ASCII}) `tttt` = Tilt data (0000_{ASCII} → 1200_{ASCII})

Actual Goto a position `[idome57:actualgoto]`		
Command	Description	Response
`cpaaaabbbb`	Goto a Pan/Tilt Position `aaaa` = Pan data (0000_{ASCII} → 3599_{ASCII}) `bbbb` = Tilt data (0000_{ASCII} → 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#llllrrrr`	Upload Sector Limits to camera `#` = Sector Number (1_{ASCII} to $@_{ASCII}$) `llll` and `rrrr` = $0000_{ASCII} \rightarrow 3599_{ASCII}$
`*Pp#llllrrrr`	Upload Privacy Zone Limits to camera `#` = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `llll` and `rrrr` = $0000_{ASCII} \rightarrow 3599_{ASCII}$
`*PS#s`	Upload Privacy Zone State to camera `#` = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `s` = State(`1` = On; `0` = Off)
`*TP#<data>`	Upload Tour Presets to camera `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) `<data>` = 32 preset values in the
`*TD#<data>`	Upload Tour Dwell times to camera `#` = Tour Number ($1_{ASCII} \rightarrow 8_{ASCII}$) ¡data¿ = 32 dwell times in the range of `0x10` to `0x4D` (0 to 60 sec)
`*TS#s`	Upload Tour State to camera `#` = Sector Number ($1_{ASCII} \rightarrow 8_{ASCII}$)

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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 interface[17] also applies to ER-2221AK and other ER versions. There are some augmentations from obversations of how WinMPC interacts with an ER-2222DF which have been included.

4.1 General Description

The[18] 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 messsage 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 Panel[19].

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 an 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

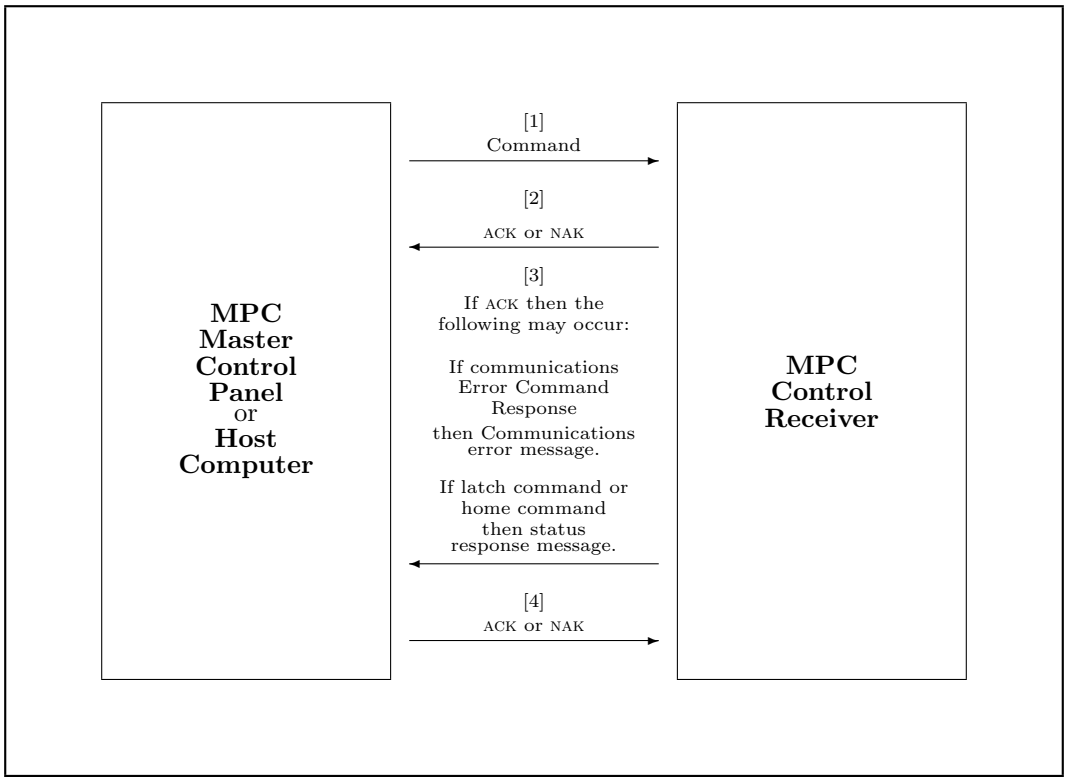
Refer to the processor board for parts identifications.

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

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

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

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



$RCSfile: TCP.inc,v $

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	p$A_2A_1A_0E_2E_1E_0$	
Lens Position Request	V?	
Lens GoTo Command	v$A_2A_1A_0E_2E_1E_0$	

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	X	Extra Status
7	0x30 ⟶ 0x37	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	(MM) Menu mode
	I	(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	(ID) Disable ID display
	E	(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 (`sO).`

- 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 indefinately.

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 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␣␣␣␣␣␣␣␣␣␣; (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 Medimum 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 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 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`: Reqiest 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 Comminications 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 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 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 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
 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 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
 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 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 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
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 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
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 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
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 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
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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