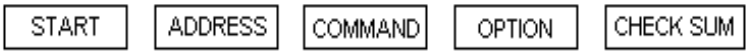
Eagle/Hitachi Pan/tilt head system Commands & Protocol (AMX sample code at end of document)

Commands are sent from the controller to the PT head by means of a five-byte transmission. The following diagram shows the sequence:



START: The first byte is always the start signal. The value is 255. This byte value is unique and cannot appear anywhere else in the command.

ADDRESS: Number of the PT head that the command is going to. Valid values are from 0 to 32. 0 represents ALL, and the command is executed by all heads on the communication line.

COMMAND: Which command to execute. Valid numbers are 1 to 254. See next section for detail descriptions of each command.

OPTION: A command may have options or parameters associated with it. Valid numbers are 0 to 254. See next sections for descriptions.

CHECK SUM: This byte provides data communication integrity by checking the previous bytes. Valid values are 0 to 127. Formula for CHECK SUM is (ADDRESS + COMMAND + OPTION) MOD 128. An example would be: CHECK SUM = (2 + 21 + 230) MOD 128 = 125.

The command is sent serially, via RS-485 network. The format for the transmission is 9600 baud, no parity, 8 bits, 1 stop bit. Please see the installation manuals for more on the RS-485 network.

NOTE: ALL COMMANDS MUST BE SENT IN HEX; NUMERIC CODES SHOWN FOR REFERENCE!!

Commands

1 - Save Preset:	Save current position, lens setting. Depending on lens type, lens must be in position mode.
Options:	Preset number, 1 to 31 (without extended memory).
Example:	Save Preset 5 on PT #2: 255 2 1 5 8

2 – Go to Preset:	Sends head and lens to previously saved position.
Options:	Preset number, 1 to 31 (without extended memory).
Example:	Go to Preset 2 on all heads: 255 0 2 2 4

3, 4 - Pan:	3 will pan to the left, 4 pans to the right. This also depends on the setting of the invert command.
Options:	Speed, 1 to 254. Normally, do not go below 20. 0 is stop. Pan runs until stop is received.
Example:	Go left slowly on PT #1: 255 1 3 50 54

5, 6 - Tilt:	5 will tilt up, 6 tilts down. This also depends on the setting of the invert command.
Options:	Speed, 1 to 254. Normally, do not go below 20. 0 is stop. Tilt runs until stop is received.
Example:	Tilt stop on PT #5: 255 5 5 0 10

NOTE: It is recommended to send the STOP command twice for pan and tilt. While not necessary, it guarantees the motion will stop if there is noise on the RS-485 line.

7, 8 - Zoom:	7 will zoom in, 8 zooms out.
Options:	Speed, 1 to 254. 0 is stop. Zoom runs until stop is received. This byte not used if in position mode.
Example:	Zoom in fast on PT #3: 255 3 7 254 8

9, 10 - Focus:	9 will focus in, 10 focuses out.
Options:	Speed, 1 to 254. 0 is stop. Focus runs until stop is received. This byte not used if in position mode.
Example:	Stop focus on PT #4: 255 4 9 0 13

13 - Status:	Request current status of camera Do not request status of ALL cameras..
Options:	None.
Example:	Request status of PT #1: 255 1 13 0 14
Response:	Five byte string, refer to next section.

14 - Delete Preset:	Delete preset information.
Options:	Preset number, 1 to 31 (without extended memory).
Example:	Delete Preset 2 on PT #1: 255 1 14 2 17

15 - Set Address:	Change address of camera.
Options:	New camera number, 1 to 32.
Example:	Change PT head from 1 to 4: 255 1 15 4 20

16 - Set Lens:	Set type of lens in software. If head is marked with lens type 5, Lens Mode does not have to be set (see command 17)
Options:	1 (Rainbow-CCTV), 2 (Fujinon/Canon telecon), 5 (telecon with no need for speed/position mode switch)
Example:	Set Lens to Fujinon on PT #1: 255 1 16 2 19

17 - Lens Mode:	Set lens mode to speed or position. Only useful with telecon lens (such as Fujinon) that uses the two modes. If head has type 5 lens control this is not necessary to use.
Options:	0 - Speed , 1 - Position
Example:	Set PT #2 to position mode: 255 2 17 1 20

18 - Chain to:	After head is sent to a preset, this command links that preset to the preset number in option.
Options:	Preset number, 1 to 31 (without extended memory).
Example:	Chain to Preset 10 on PT #5: 255 5 18 10 33

19 - Invert:	Changes movement from right to left, up to down.
Options:	None
Example:	Invert movement on PT #2: 255 2 19 0 21

20 - Set Limit:	Sets movement limit right, left, up, and down.
Options:	1 - Clear all limits (prepare to set new limits). 2 - Set right limit. 3 - Set left limit. 4 - Set up limit. 5 - Set down limit.
Example:	Clear all limits on PT #1: 255 1 20 1 22

21 - Chain Time:	Sets time for delay between presets on chain. Command should be sent immediately after chain command, 18.
Options:	Time, 1 to 16 (seconds).
Example:	Set chain time of 10 seconds on PT #1: 255 1 21 10 32

22 - Preset Speed:	Sets speed for a specific preset. Command should be sent immediately after recalling desired preset.
Options:	Speed, 1, 2, 3 (1 fastest)
Example:	Set preset to speed of 3 on PT #1: 255 1 22 3 26

23 - Preset Scene:	Sets camera scene number for a specific preset. Command should be sent immediately after recalling desired preset.
Options:	Scene number, 1, 2, 3, 4.
Example:	Set preset to camera scene 2 on PT #3: 255 3 23 2 28

24 - Max Speed:	Sets maximum speed for pan and tilt on head. Presets set after this command will follow that speed as well.
Options:	Speed, 1, 2, 3 (1 fastest).
Example:	Set head speed to 2 on PT #2: 255 2 24 2 28

31 - Switch Camera:	Does nothing to the head. This command is placed on the RS-485 network to notify the switcher interface to select a new video channel.
Options:	Camera number, 1 to 32.
Example:	Switch to head PT #5: 255 0 31 5 36

CAMERA CONTROL - MISCELLANEOUS

32 - H Phase:	Adjust horizontal phase.
Options:	0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example:	H phase up one notch on camera #2 255 2 32 0 34

33 - SC Coarse:	Adjust coarse subcarrier phase.
Options:	0 - setting up one, 254 - setting down one
Example:	SC Coarse down one notch on camera #1 255 1 33 254 32

34 - SC Fine:	Adjust fine subcarrier phase.
Options:	0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example:	Set SC fine to absolute value of 35 on camera #3. 255 3 34 35 72

35 - R Gain:	Adjust red gain.
Options:	0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example:	Red gain up one notch on camera #1. 255 1 35 0 36

36 - B Gain:	Adjust blue gain
Options:	0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example:	Blue gain up one notch on camera #2. 255 2 36 0 38

37 - R Black:	Adjust red black.
Options:	0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example:	Red black down one notch on camera #5. 255 5 37 254 40

38 - B Black:	Adjust blue black.
Options:	0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example:	Set blue black to absolute value of 240 on camera #3. 255 3 38 240 25

39 - Bar/Cam:	Switch between bar or camera.
Options:	1 - Bar, 2 - Camera
Example:	Camera #1 to bar. 255 1 39 1 41

40 - White Bal:	Set white balance.
Options:	1 - Memory 2, 2 - Memory 1, 3 - Preset
Example:	Camera #2 to preset.

255 2 40 3 45

41 - Gain: Set master gain.
Options: 0 to 24 (db), +128 for ultra gain (if supported). On HV-C10 only 0, 9, 18 are valid.
Example: Master gain of camera #5 to 9.
255 5 41 9 55

42 - Iris: Set iris mode.
Options: 1 - Manual, 2 - Remote, 3 - Auto
Example: Set iris to remote on camera #1.
255 1 42 2 45

43 - DTL: Set detail level
Options: 1 - High, 2 - Normal, 3 - Low, 4 - Off
Example: Set DTL of camera #2 to low.
255 2 43 3 48

44 - M Black: Set master black level.
Options: 0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example: Increase master black level of camera #2 by one.
255 2 44 0 46

45 - Iris Level: Set iris level.
Options: 0 - setting up one, 254 - setting down one, 1 - 253 set absolute value from 1 to 253. This could be signed or unsigned value depending your type of camera.
Example: Decrease iris level by one on camera #1.
255 1 45 254 44

46 - Auto White: Auto white.
Options: 0 - On, 254 - Off. (normally a toggle)
Example: Set auto white on, camera #2
255 2 46 0 48

47 - Auto Black: Auto Black
Options: 0 - On, 254 - Off. (normally a toggle)
Example: Set auto black off, camera #2
255 2 46 254 46

48 - Option 1: Nothing at this time
Options:
Example:

49 - Option 2:	Nothing at this time
Options:	
Example:	

50 - Set:	Store current settings in controller as default Only on certain cameras..
Options:	0 (none)
Example:	Save current settings in camera #1. 255 1 50 0 51

51 - Shutter:	Rotate through shutter options.
Options:	0 (none)
Example:	Go to next shutter option on camera #2. 255 2 51 0 54
53 –Filter Wheel:	Choose filter wheel/electronic color balance options.
Options:	1,2,3,4
Example:	Go to filter #3 option on camera #2. 255 2 51 3 54

54 - Contrast:	Rotate through contrast options.
Options:	1, 254 (up down)
Example:	Go to next contrast option on camera #3. 255 3 54 1 58

55 - Function:	Enter function option on camera
Options:	1, 254
Example:	Function on camera #1. 255 1 55 1 57

56 – Save Scene:	Save current camera settings in scene file
Options:	0 (default), 1-4 (scene file)
Example:	Save current settings to scene file #2 on camera #3. 255 3 56 2 61

57 – Recall File:	Recall scene file
Options:	1-4
Example:	Recall scene file #1 on camera #2. 255 2 57 1 60

58 - Lens Ext:	Turn lens extender on/off. For Fuji and Canon lenses with this option.
Options:	0 - On, 254 - Off.
Example:	Activate lens extender on camera #2 255 2 58 0 60

61 - Wiper:	Activate the wiper (for approximately three seconds).
Options:	0 (none)
Example:	Turn on wiper. 255 3 61 0 64

62 - Wash,Wiper:	Activate the washer and wiper (for three seconds).
Options:	0 (none)
Example:	Washer and wiper will pulse. 255 1 62 0 63

70, 71, 72, 73: Camera Feedback	Request camera feedback for those cameras capable and heads with camera controller option.
Options:	0 to 254 (mode)
Example:	On HV-D15 R2 & HV-D5W cameras Control bytes: 70 = 22H, 71 = 2AH, 72 = 32H, 73 = 40H Specific status commands are too lengthy to list here, but as an example - CTL - 22H, Mode - 02H 255 1 70 2 73 Request Status of camera on head #1 Will return byte with status of Gamma, Knee, White, Detail, M. Shade, and Masking.

Advanced Camera Control Settings—WARNING !! Use of some of these functions can seriously impair the correct working of the camera; many of these are factory level setups, and should not be adjusted.
DO NOT PLAY WITH THESE IF YOU DON'T KNOW EXACTLY WHAT YOU'RE DOING!!!!

COMMAND	NAME	OPTION
80	Green Black	A. Level
81	Red Flare	A. Level
82	Green Flare	A. Level
83	Blue Flare	A. Level
84	Red Pulse Cancel	A. Level
85	Green Pulse Cancel	A. Level
86	Blue Pulse Cancel	A. Level
87	Red Hue Chroma	A. Level
88	Green Hue Chroma	A. Level

89	Blue Hue Chroma	A. Level
90	Red Hue Chroma Y	A. Level
91	Green Hue Chroma C	A. Level
92	Blue Hue Chroma M	A. Level
93	Red Sat Chroma	A. Level
94	Green Sat Chroma	A. Level
95	Blue Sat Chroma	A. Level
96	Red Sat Chroma Y	A. Level
97	Green Sat Chroma C	A. Level
98	Blue Sat Chroma M	A. Level
99	Red Axis Left Trim	A. Level
100	Green Sat Left Trim	A. Level
101	Blue Sat Left Trim	A. Level
102	Red Axis HS	A. Level
103	Green Axis HS	A. Level
104	Blue Axis HS	A. Level
105	Red Axis HP	A. Level
106	Green Axis HP	A. Level
107	Blue Axis HP	A. Level
108	Red Mod VS	A. Level
109	Green Mod VS	A. Level
110	Blue Mod VS	A. Level
111, 112	Red, Yellow, Green Flesh Phase	111 - A. Level 112 - low order byte to 16 bit word
113	Red Paint Gain	A. Level
114	Blue Paint Gain	A. Level
115	Red Paint Black	A. Level
116	Blue Paint Black	A. Level
117	Hor position Iris Gate	A. Level
118	Ver position Iris Gate	A. Level
119	Hor position White Gate	A. Level
120	Ver position White Gate	A. Level
121	Gain Flesh	A. Level
122	Width Flesh	A. Level
123	Variable Gain	A. Level
124	Detail	A. Level
125	Y Level	A. Level
126	C Level	A. Level
127	White Clip	A. Level
128	Black Trim	A. Level
129	Auto Knee Trim	A. Level
130	Var Shutter	A. Level
131	AGC mode	1-preset, 2-var, 3-auto
132	DNR	1-off, 2-mode 1, 3-mode 2

133	Signal Output	1-RGB, 2-Y/R-Y/B-Y, 3-Y/C
134	Contrast	1-off, 2-normal, 3-high
135	Iris Gate Size	1-64x16, 2-128x32, 3-256x64, 4-512x128
136	ID	1-off, 2-top, 3-bottom
137	Title	1-off, 2-top, 3-bottom
138	Indicator	1-off, 2-white/black, 3-iris gate, 4-flesh tone
139	Gain High	1 to 10 (db)
140	Gain Max	11 to 20 (db)
141	AGC limit	6 to 19 (db)
142	Shutter	1-off, 2-1/100, 3-1/250, 4-1/500, 5-1/1000, 6-1/2000, 7-1/4000, 8-1/10000, 9-var, 10-AES
143	Mono On/Off	A. Level
144	White Gate On/Off	A. Level
145	Iris Gate On/Off	A. Level
146	Gamma On/Off	A. Level
147	Auto Knee On/Off	A. Level
148	Knee On/Off	A. Level
149	Flesh Tone On/Off	A. Level
150	White On/Off	A. Level
151	Flare On/Off	A. Level
152	Detail On/Off	A. Level
153	Sync on G On/Off	A. Level
154	M Shading On/Off	A. Level
155	GL Ext	0-VBS, 254-HD-VD
156	Masking On/Off	A. Level
157	GL in	0-75ohm, 254-high
158	Hi Chroma On/Off	A. Level
159	Msg Rtn On/Off	A. Level
160	Field/Frame	1-Field, 2-Frame
161	Proc Test On/Off	A. Level
162	Test Saw On/Off	A. Level
163	Camera Mode	1-Auto, 2-Manual
164	White Balance	1-Auto, 2-Preset 3200, 3-mem1, 4-mem2
165	Auto Shading On/Off	A. Level
166	Gain	1-normal, 2-high, 3-max
167	ALC override	A. Level
168	File Initialize	none
169	Iris Gate Up/Down	0-up, 254-down

170	White Gate Up/Down	0-up, 254-down
171	Iris Gate Left/Right	0-left, 254-right
172	White Gate Left/Right	0-left, 254-right
173	Dyna Chroma On/Off	A. Level
174	Chroma Gain	A. Level
175	Masking Initialize	None
176	Aspect Ratio Switch	0-16:9, 1-4:3
177	Flesh Tone Phase	A. Level
178	DTL Freq Sel	1-soft, 2-standard, 3-sharp
180	Menu Button Push (similar to pressing button on ctrl. panel of camera; functional only on some cameras)	2 – Setup 16 – Up 32 – Down 64 – Right 128 – Left

A. Level = 0-Up or On, 254-Down or Off, 1-253 absolute value (analog level)

220 - Relays: Control PT-MFA relay/serial interface

Options: 0-254 as per following table:

0	0	0	0	0	r	r	r	Open Relay
0	0	0	0	1	r	r	r	Close Relay
0	0	0	1	0	r	r	r	Toggle Relay
0	0	0	1	1	s	s	s	Do Sequence
0	0	1	0	0	r	r	r	program relay as normaly open
0	0	1	0	1	r	r	r	program relay as normaly closed
0	0	1	1	0	s	s	s	Start learning sequence
0	0	1	1	1	0	0	0	End learning sequence
1	t	t	t	t	t	t	t	Set pulse time, 1/10 sec inc, max = t = 126 = 12.6 sec

r r r = 0 to 7, relay #1 to #8

s s s = Sequence number, 1 to 8 (0 to 7)

t t t t t t t = pulse time, 1 to 126

Example: Toggle Relay #5 on head #1.

255 1 220 20 113

221 - Multiplexer: Reserve head on PT-MP1 multiplexer

Options: 0-253 as per following bits:

7 6 5 4 3 2 1 0

h h h h h c c c

Head # = h h h h h = 0 to 31 (heads 1 to 32)

Controller # = c c c = 0 to 5 (controllers 1 to 6)

Example: Reserve head #2 to controller #3

255 1 221 10 104 (note: byte 2, address, not used)

222 - Multiplexer: Release head on PT-MP1 multiplexer

Options: 0-253 as per following bits:

7 6 5 4 3 2 1 0

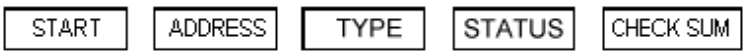
h h h h h c c c

	Head # = h h h h h = 0 to 31 (heads 1 to 32) Controller # = c c c = 0 to 5 (controllers 1 to 6) (note: ccc not used at this time)
Example:	Release head #2 255 1 222 8 103 (note: byte 2, address, not used)

ADDRESS 254 - Shot Box:	Address 254 is reserved for the shot box. Commands 1 to 5 are then used.
Commands:	1 - Learn a shot 2 - Stop Learning 3 - Recall a shot 4 - Stop Recalling 5 - Delete a shot
Options:	1 to 16, shot numbers
Example:	Start Learning Shot #2: 255 254 1 2 1 Delete Shot #4: 255 254 5 4 7

Pan-Tilt Head to Controller Return Strings

All returning strings are the same format as outgoing strings (refer to 1st page). Heads never initiate a communication sequence; they respond to status request from controllers or will send an immediate status after receiving a command. The address byte distinguishes them from outgoing communications.



ADDRESS = 65, TYPE OPTIONS:

1 - Head:	Pan-Tilt head status
Status:	Each bit in the byte represents an error condition. Thus 0 would be no error. The error bits are as follows: Bit 1 - Over Temperature Bit 2 - Over Current

	Bit 3 - Under Voltage Bit 4 - Serial Check Sum Failure Bit 5 - Serial Port Failure Bit 6 - Incorrect Address Bit 7 - Invalid Command Bit 8 - Pan Tilt Moving
Example:	255 65 1 128 66 status return, no errors, Pan Tilt is moving

2 - Shotbox:	Shotbox status
Status:	1 - Memory not clear 2 - Out of memory 3 - Done Recalling
Example:	255 65 2 1 68 After requesting a 'Learn', shotbox replied that memory is not empty.

ADDRESS = 64, CAMERA RETURN STATUS

After sending commands 70 to 73, if the head is equipped with a camera controller, feedback will be returned. In the five-byte string, type and status is now data1 and data2. Data1 is for 8-bit feedback, data1 & data2 is for 16-bit feedback. The string itself does not contain which setting that data applies to, but is the immediate response to the last request for camera data. Thus the controller knows what the feedback data is referring to. Example:

Controller: request red gain
Head: 255 64 128 0 64 - red gain level is 128

Example
AMX Control Code

As an example, here is a simple interface to the Eagle system from an AMX control system.

```
PROGRAM_NAME='EAGLE SAMPLE PROGRAM'
(*   DATE:02/04/99    TIME:13:39:03    *)
(***********************************************************
)
```

```
(*          DEVICE NUMBER DEFINITIONS GO BELOW
*)
(***********************************************************
)
DEFINE_DEVICE

EAGLE = 1    (* RS-485 PORT *)

TP    = 128  (* TOUCH SCREEN *)

(***********************************************************
)
(*               CONSTANT DEFINITIONS GO BELOW
*)
(***********************************************************
)
DEFINE_CONSTANT

PAN_LEFT   = 1     (* BUTTONS ON TOUCH SCREEN FOR PANNING *)
PAN_RIGHT  = 2     (* AND TILTING                         *)
TILT_UP    = 3
TILT_DOWN  = 4

(***********************************************************
)
(*             THE ACTUAL PROGRAM GOES BELOW
*)
(***********************************************************
)
DEFINE_PROGRAM
                              (* PAN-TILT ADDRESS = 1
*)
                              (* SPEED SET AT 50%
*)
PUSH[TP,PAN_LEFT]
  SEND_STRING EAGLE,"255,1,3,128,4"
RELEASE[TP,PAN_LEFT]
  SEND_STRING EAGLE,"255,1,3,0,4"

PUSH[TP,PAN_RIGHT]                    (* PUSHING BUTTON
STARTS MOVEMENT *)
  SEND_STRING EAGLE,"255,1,4,128,5"
RELEASE[TP,PAN_RIGHT]                 (* RELEASING BUTTON
STOPS MOVEMENT *)
  SEND_STRING EAGLE,"255,1,4,0,5"

PUSH[TP,TILT_UP]
  SEND_STRING EAGLE,"255,1,5,128,6"
RELEASE[TP,TILT_UP]
  SEND_STRING EAGLE,"255,1,5,0,6"
```

```
PUSH[TP,TILT_DOWN]
  SEND_STRING EAGLE,"255,1,6,128,7"
RELEASE[TP,TILT_DOWN]
  SEND_STRING EAGLE,"255,1,6,0,7"
(***********************************************************
)
(*                      END OF PROGRAM
*)
(*         DO NOT PUT ANY CODE BELOW THIS COMMENT
(***********************************************************
```