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Long Range Dual Camera System

Eagle Vision

USER'S MANUAL

EV3000-D

Important Notice

The manual is organized into two main sections, section A describes the system components, system installation, and section B describes system operation.

EXPORT CONTROL

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PROPRIETARY

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Safety Summary

This manual describes processes that may cause injury or death to personnel, or damage to equipment if not properly followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment. Prior to performing any task, the WARNINGS, CAUTIONS and NOTES included in that task shall be reviewed and understood.

WARNINGS, CAUTIONS, NOTES

WARNING

Used to indicate a location, equipment or system where a potential hazard exists capable of producing injury to personnel if approved procedure is not followed.

CAUTION

Used to indicate an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, could result in damage to or destruction of equipment or loss of mission effectiveness or long term health hazards to personnel.

NOTE: Used to indicate an essential operating or maintenance procedure, condition, or statement.

Section A

Installation's Manual

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1. Introduction

The EV3000-D is an Explosion Proof Type Pan Tilt Driver & Camera System with two Cameras and Camera Control Unit.

The 1st camera is infrared (IR) camera intended for use during dark or night time, as a long range thermal imaging surveillance system and the other is Day/Night camera plus zoom lens.

This product can be used where the explosive gas can be produced such as petroleum refining factory, Petro chemistry, Chemical Synthesis Plant and Power plant and it is apt to be corroded in salt such as shore or ship due to its material Stainless Steel 316 against corrosion.

And this product is used in border surveillance for military, police, emergency services incorporating thermal imager.

The remote-control unit can rotate this product vertically or horizontally through the built-in receiver.

2. Specifications

A- Thermal Camera










| Camera Specification | Thermal Camera EV4000 |
|---------------------------|--|
| Sensor | |
| Sensor type | Staring FPA |
| Detector Material | InSb |
| Array Size | 640 X 480 |
| Spectral Band | 3.4-5.1µm |
| FPA Cooling | IDCA |
| Cooldown Time | 6-8 min |
| Optics | |
| Focal Length | 100/500 mm |
| F number | f/4 |
| WFOV | 5.5° x 4.1° |
| NFOV | 1.1° x 0.8° |
| IFOV, Wide | 0.15 mrad |
| IFOV, Narrow | 0.03 mrad |
| Min Focus Distance, WFOV | 10 m |
| Min Focus Distance, NFOV | 10 m |
| Hyperfocal Distance, WFOV | 50 m |
| Hyperfocal Distance, NFOV | 1500 m |
| Image Output | |
| Video Output | 60 or 50 Hz frame rate, interlaced, NTSC or CCIR |
| Symbology Overlay | Selectable On/Off |
| Number of Reticles | 4 |

| Electrical | |
|-----------------------------|-----------------------------------|
| Power Source | 100 to 240 VAC 50-60 Hz |
| On from Standby | 3 seconds |
| External Supply | 12 Vdc, 3 Amps |
| Physical | |
| Weight, Imaging Head | 22 lbs (10 kg) |
| Dimensions (nominal) | |
| | L x Diameter |
| Inches | 22 x 9 |
| Cm | 56 x 13.5 |
| Operating Temp | -32°C to +55°C |
| Storage Temp | -46°C to +71°C |
| Environmental | Fully ruggedized per MIL-STD 810E |
| Tripod Mountable | Yes |

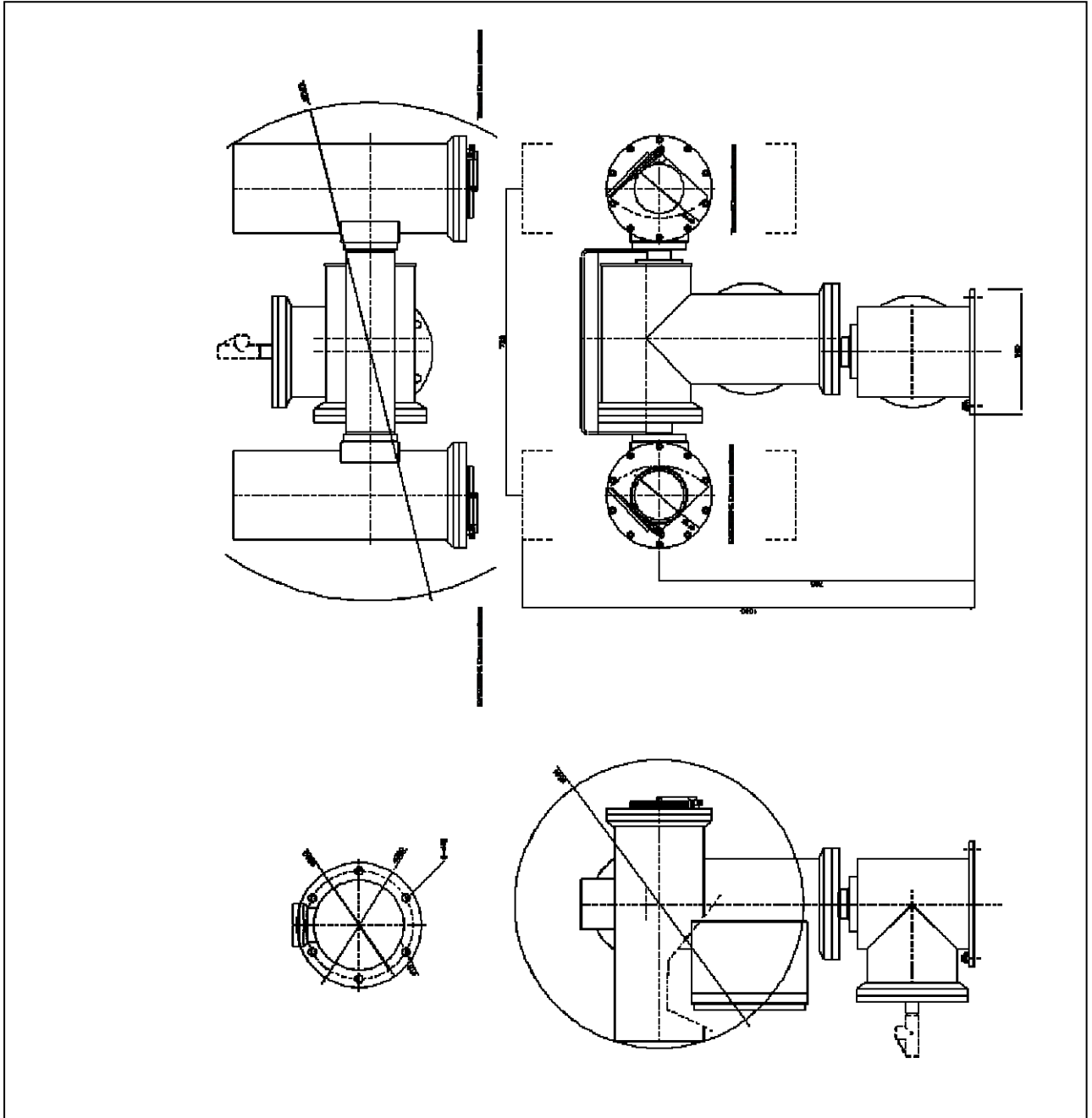
C- Pan/Tilt and Enclosure

| | |
|----------------------------------|---|
| Materials | Stainless steel 316L |
| Enclosure | Pressurized rugged fill with Dry Nitrogen which prevents condensation inside the tube |
| Wiper | 24 VAC wipers, one for each enclosure |
| Washer | Pump with 10 ltr water tank |
| Rotating angle | Pan 0°to 360°/ Tilt -90°to +90°±5° |
| Rotating speed | Pan :0.1°~ 6°/sec, Tilt :0.1°~ 3°/sec Max |
| Motor | Step motor (DC 24V/6A, Pan 96W / Tilt 96W) |
| Power Supply | AC 110 / 220 VAC |
| Temperature | -25 to +50 |
| Weight | About 70 kg |
| Preset | 000~127(128 Presets) |
| Interface | RS-422 |
| Receiver address | 000~254(255 Addresses) |
| Baud rate | Selectable by DIP switch among 2400,4800, &9600 BPS [Default : 2400BPS] |
| Protocol | PELCO-D (8 Data,1 stop, No parity) |
| Camera & Lens Control | 1)Thermal camera : Controlled by RS-422 2)Day/night camera : Zoom-in/out, Focus-near/far |
| AUX Control | 1)Two wipers (Thermal camera and Day/night camera side) 2)One Pump |
| Video | 1)Thermal camera : BNC & SVIDEO (4Pin din connector) 2)Day/night camera : BNC |


3. EV3000-D installation Notes

| | |
|---|--|
|  | <p>Before operation the unit, you must read this user's Manual thoroughly and retain it for future reference.</p> |
|  | <p>Before cleaning the unit, you must remove it from the wall or bracket. You must clean it with a wet cloth. Never use liquid cleanser.</p> |
|  | <p>Enough space must be ensured to installation of this P/T and never rotate PAN/TILT housing forcibly without driving by remote controller.</p> |
|  | <p>Be careful not to put this unit on an unstable stand, tripod, shelf, or Table.</p> |
|  | <p>Do not leave the unit in a location near heat sources or humidifier.</p> |
|  | <p>Be careful of electric overload on the electric terminal or extension cable, otherwise there can be risk of permanent damage.</p> |
|  | <p>You must stop operation this unit and never connect the connector of the cable to the unit in case of the following situations.</p> <ul style="list-style-type: none"> ● In case of the control cable being damaged. ● When any liquid or unfavorable materials fall into the unit. ● When the unit doesn't work properly according to the instruction. ● When the unit fell down or the P/T was damaged. |
|  | <p>You must make an expert examine the accessories whether they have the same specific character when you need replacement of them.</p> |
|  | <p>You must install AC24V power source near the EV3000-D (within 10m) Otherwise The EV3000-D will probably malfunction due to AC voltage drop or critical noise etc.</p> |

4. EV3000-D Drawing



5. EV3000-D Wiring:

- 1) AC 24V Power Connection Terminals (Use AWG16 or 18 Wire)
 - AC24V POWER
 - AC24V COM
- 2) Earth Terminal
 - CONNECT EARTH LINE TO  Terminal
- 2) Thermal camera Video Connection Terminals
 - THERMAL VIDEO (BNC)
 - THERMAL SVIDEO (4-PIN DIN CONNECTOR)
- 3) Day/night camera Video Connection Terminal
 - DAY/NIGHT VIDEO (BNC)
- 4) RS422 Data Communication line Connection Terminals
 - TX+ (FROM EV3000-D TO OUTSIDE CONTROLLER or PC)
 - TX- (FROM EV3000-D TO OUTSIDE CONTROLLER or PC)
 - RX+ (FROM OUTSIDE CONTROLLER or PC TO EV3000-D)
 - RX- (FROM OUTSIDE CONTROLLER or PC TO EV3000-D)
 - SHIELD: NO CONNECTION or CONNECT SHIELD WIRE OF OUTSIDE RS-422 DATA COMMUNICATION LINES
- 5) Pump Connection Terminals: Connect to DC24V+, DC24V- Terminals



6. EV3000-D Enclosure Wiring

6-1. Thermal camera connection at thermal camera terminal

| TERMINAL No. | SIGNAL NAME | FUNCTION | PIN NAME |
|--------------|-------------|---|----------|
| 1 | GND_IR | 12V DC SUPPLY RETURN FOR IR CAMERA | a |
| 2 | GND_IR | 12V DC SUPPLY RETURN FOR IR CAMERA | e |
| 3 | GND_IR | 12V DC SUPPLY RETURN FOR IR CAMERA | s |
| 4 | GND_IR | 12V DC SUPPLY RETURN FOR IR CAMERA | t |
| 5 | VDC+_IR | 12V DC FOR IR CAMERA\ | M |
| 6 | VDC+_IR | 12V DC FOR IR CAMERA | N |
| 7 | VDC+_IR | 12V DC FOR IR CAMERA | h |
| 8 | VDC+_IR | 12V DC FOR IR CAMERA | i |
| 9 | NONE | NONE | |
| 10 | RS422EN | RS-422 ENABLE | p |
| 11 | GNDD | GROUND REFERENCE FOR THE SERIAL COMM. LINES | A |
| 12 | GND_SHASSIS | CHASSIS GROUND | K |
| 13 | RXD1_422+ | RS-422 RECEIVE+(FROM 804D TO CAMERA) | n |
| 14 | RXD1_422- | RS-422 RECEIVE-(FROM 804D TO CAMERA) | T |
| 15 | TXD1_422+ | RS-422 TRANSMIT+(FROM CAMERA TO 804D) | B |
| 16 | TXD1_422- | RS-422 TRANSMIT-(FROM CAMERA TO 804D) | W |
| 17 | NONE | NONE | |
| 18 | NONE | S-VIDEO SHIELD WIRE(Not used) | |
| 19 | SVIDEO_GND | S-VIDEO LUMINANCE GND | u |
| 20 | SVIDEO_GND | S-VIDEO CHROMINANCE GND | H |
| 21 | SVIDEO_Y | S-VIDEO LUMINANCE | v |
| 22 | SVIDEO_C | S-VIDEO CHROMINANCE | J |
| 23 | RS170GND | COMPOSITE VIDEO GND | F |
| 24 | CVIDEO_1 | COMPOSITE VIDEO | b |
| 25 | GND_DF | GROUND RETURN FOR DEFROSTER | C |
| 26 | GND_DF | GROUND RETURN FOR DEFROSTER | X |
| 27 | GND_DF | GROUND RETURN FOR DEFROSTER | m |
| 28 | GND_DF | GROUND RETURN FOR DEFROSTER | q |
| 29 | GND_DF | GROUND RETURN FOR DEFROSTER | CC |
| 30 | GND_DF | GROUND RETURN FOR DEFROSTER | DD |
| 31 | VDC+_DF | DC 12V SUPPLY FOR DEFROSTER | S |
| 32 | VDC+_DF | DC 12V SUPPLY FOR DEFROSTER | k |
| 33 | VDC+_DF | DC 12V SUPPLY FOR DEFROSTER | AA |
| 34 | VDC+_DF | DC 12V SUPPLY FOR DEFROSTER | BB |
| 35 | VDC+_DF | DC 12V SUPPLY FOR DEFROSTER | FF |
| 36 | VDC+_DF | DC 12V SUPPLY FOR DEFROSTER | HH |

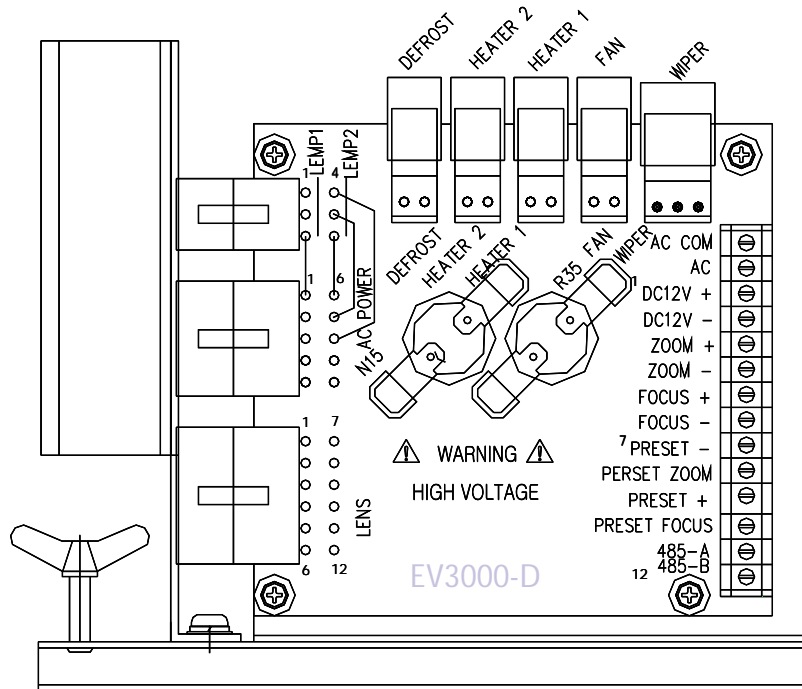
Please connect lead wires from thermal camera correctly to these terminals.

Otherwise, Electronic devices in EV3000-D receiver may be damaged.

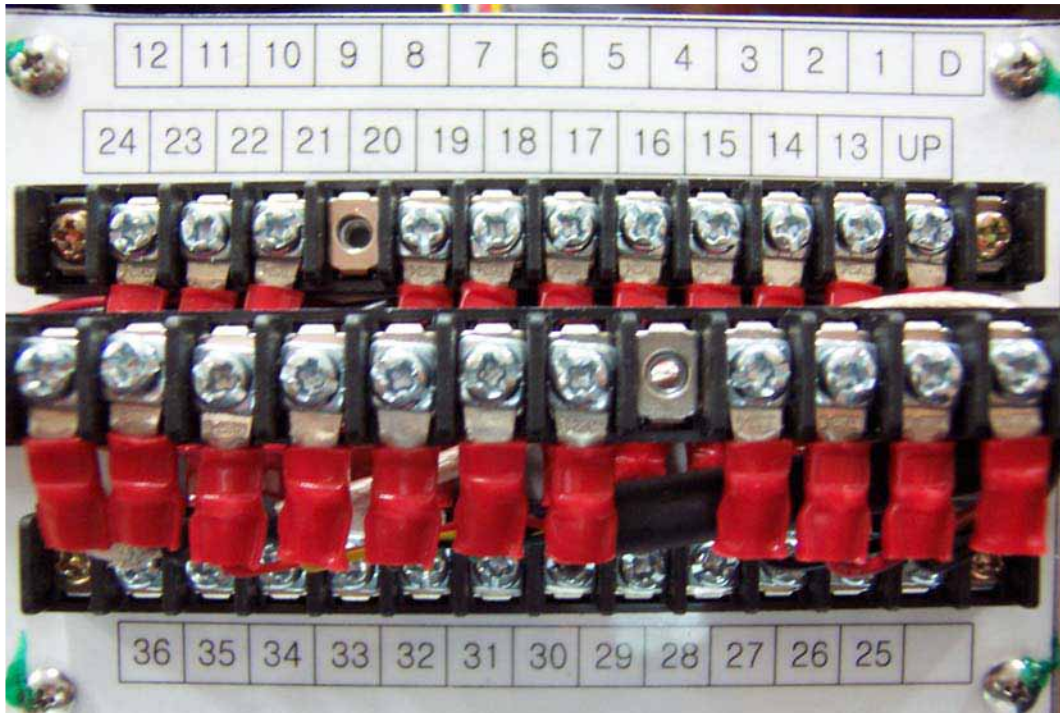
6-2 Day/night camera connection at Day/night camera terminal

| SIGNAL NAME | FUNCTION |
|--------------|----------------------------------|
| DC 12V + | DC 12V CAMERA POWER |
| DC 12V - | DC 12V CAMERA POWER RETURN |
| ZOOM+ | ZOOM MOTOR+ |
| ZOOM- | ZOOM MOTOR- |
| FOCUS+ | FOCUS MOTOR+ |
| FOCUS- | FOCUS MOTOR- |
| PRESET - | DC 5V POTENTIOMETER POWER RETURN |
| PRESET ZOOM | ZOOM_PRESET |
| PRESET + | DC 5V LENS POTENTIOMETER POWER |
| PRESET FOCUS | FOCUS_PRESET |

Camera & lens will be mounted on a bracket with connection PCB as below.



36-pin connection terminals in thermal camera enclosure



(only 33 terminals are used)

- a. "D" of 36-pin Terminals means down-side(lower-side) 12 ea of terminals(Terminal No.1~12).
You can find that Pin No.9 is empty (Not connected) on above Fig 1
- b. "UP" of 36-pin Terminals means up-side(upper-side) 12 ea of Terminals(Terminal No.13~24).
You can find that Pin No.17 is empty (Not connected) on above Fig 1
- c."SIGNAL NAME,FUNCTION, & PIN NAME of the above 36-Pin Terminal Description Table is same as the pin name of 55-pin system cable of thermal camera manual.
- d."TERMINAL No."of above 36-Pin Terminal Description Table is same as Number of above Figure 1.
- e.Don't connect any lead wire to " TERMINAL No. 18(SVIDEO SHIELD WIRE).
Because thermal Camera has no SVIDEO SHIELD terminal.

7. EV3000-D Protocol & Control command list

Protocol: PELC0-D

| BYTE 1 | BYTE 2 | BYTE 3 | BYTE 4 | BYTE 5 | BYTE 6 | BYTE 7 |
|--------|---------|----------|----------|--------|--------|----------|
| FF | Address | Command1 | Command2 | DATA 1 | DATA 2 | Checksum |

- 1) Data Communication Speed: Selectable among 2400, 4800, and 9600 BPS
(Default baud rate: 2400 BPS)
- 2) Byte Format: 1 START, 8 DATA, 1 STOP BIT
- 2) Receiver Address Range: 000~254
(Default address: 001)

Note: Bit Definition of Byte 3

Bit 6 is used to select Camera Between "DAY/NIGHT" Camera with Lens and the thermal Camera.
If set to "1", the Camera is Selected to DAY/NIGHT Camera.
If set to "0", the Camera is Selected to "THERMAL" Camera.

1. Command List for EV3000-D(Basic format is PELCO-D) :

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|---------------------|-------------------|---|-------------|-------|-------|-------|-------|----------|
| 1 | Pan Left | Command | FFh | Receiver ID | 00h | 04h | P1 | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P1 = 00h ~ 3Fh : Pan Speed | | | | | | |
| 2 | Pan Right | Command | FFh | Receiver ID | 00h | 02h | P1 | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P1 = 00h ~ 3Fh : Pan Speed | | | | | | |
| 3 | Tilt Up | Command | FFh | Receiver ID | 00h | 08h | 00h | P2 | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P2 = 00h ~ 3Fh : Tilt Speed | | | | | | |
| 4 | Tilt Down | Command | FFh | Receiver ID | 00h | 10h | 00h | P2 | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P2 = 00h ~ 3Fh : Tilt Speed | | | | | | |
| 5 | Pan Left & Tilt Up | Command | FFh | Receiver ID | 00h | 0Ch | P1 | P2 | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P1=00h~3Fh: Pan Speed ,P2 = 00h ~ 3Fh : Tilt Speed | | | | | | |
| 6 | Pan Right & Tilt Up | Command | FFh | Receiver ID | 00h | 0Ah | P1 | P2 | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P1=00h~3Fh: Pan Speed ,P2 = 00h ~ 3Fh : Tilt Speed | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|--|-------------------|---|-------------|------------|-------|-------|-------|----------|
| 7 | Pan Left & Tilt Down | Command | FFh | Receiver ID | 00h | 14h | P1 | P2 | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P1=00h~3Fh: Pan Speed ,P2 = 00h ~ 3Fh : Tilt Speed | | | | | | |
| 8 | Pan Right & Tilt Down | Command | FFh | Receiver ID | 00h | 12h | P1 | P2 | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P1=00h~3Fh: Pan Speed ,P2 = 00h ~ 3Fh : Tilt Speed | | | | | | |
| 9 | Pan/Tilt/ Zoom & Focus Stop at camera 1 & camera 2 | Command | FFh | Receiver ID | 00h or 40h | 00h | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Pan, Tilt, Zoom and Focus driving will be stopped at both camera 1 & camera 2 regardless of bit6 of Byte 3. | | | | | | |
| 10 | Zoom Wide at Camera 1 | Command | FFh | Receiver ID | 40h | 40h | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 1 is DAY/NIGHT Camera with Lens (Set Bit 6 of Byte3 to Select Camera 1.) | | | | | | |
| 11 | Zoom Tele at Camera 1 | Command | FFh | Receiver ID | 40h | 20h | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 1 is DAY/NIGHT Camera with Lens (Set Bit 6 of Byte3 to Select Camera 1.) | | | | | | |
| 12 | Wide field of view at camera 2 | Command | FFh | Receiver ID | 00h | 40h | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|---|---|-------|-------------|-------|-------|-------|-------|----------|
| 13 | Narrow field of view at camera 2 | Command | FFh | Receiver ID | 00h | 20h | 00h | 00h | Checksum |
| | EV3000-D Response | None | | | | | | | |
| | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | | |
| 14 | Focus Far at Camera 1 | Command | FFh | Receiver ID | 40h | 80h | 00h | 00h | Checksum |
| | EV3000-D Response | None | | | | | | | |
| | Description | Receiver ID=00h~FEh, Camera 1 is DAY/NIGHT Camera with Lens (Set Bit 6 of Byte3 to Select Camera 1.) | | | | | | | |
| 15 | Focus Near at Camera 1 | Command | FFh | Receiver ID | 41h | 00h | 00h | 00h | Checksum |
| | EV3000-D Response | None | | | | | | | |
| | Description | Receiver ID=00h~FEh, Camera 1 is DAY/NIGHT Camera with Lens (Set Bit 6 of Byte3 to Select Camera 1.) | | | | | | | |
| 16 | Focus Near (Increments IR Focus closer) at camera 2 | Command | FFh | Receiver ID | 01h | 00h | 00h | 00h | Checksum |
| | EV3000-D Response | None | | | | | | | |
| | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | | |
| 17 | Focus Far (Increments IR Focus farther) at camera 2 | Command | FFh | Receiver ID | 00h | 80h | 00h | 00h | Checksum |
| | EV3000-D Response | None | | | | | | | |
| | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | | |
| 18 | Set Preset | Command | FFh | Receiver ID | 00h | 03h | 00h | P_ID | Checksum |
| | EV3000-D Response | None | | | | | | | |
| | Description | Receiver ID=00h~FEh, P_ID=00~7Fh,The Receiver Stores Current Pan, Tilt, Zoom, Focus Position of Camera 1 in EEPROM. | | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|----------------------------|-------------------|---|-------------|-------|-------|-------|-------|----------|
| 19 | Clear Preset | Command | FFh | Receiver ID | 00h | 05h | 00h | P_ID | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P_ID=00~7Fh, The Receiver Clears Current Pan, Tilt, Zoom, Focus Position of Camera 1 in EEPROM. | | | | | | |
| 20 | Goto Preset Position | Command | FFh | Receiver ID | 00h | 07h | 00h | P_ID | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, P_ID=00~7Fh, The Pan, Tilt, Zoom & Focus Position of Camera 1 Will be Moved to Stored Preset Position. | | | | | | |
| 21 | Turn on Wiper at Camera 1 | Command | FFh | Receiver ID | 40h | 09h | 00h | 09h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, 09h of Byte 6=Wiper of Camera 1. Camera 1 is DAY/NIGHT Camera with Lens (Set Bit 6 of Byte3 to Select Camera 1 and The Wiper of Camera 1 Will be Driven for Several Seconds) | | | | | | |
| 22 | Turn off Wiper at Camera 1 | Command | FFh | Receiver ID | 40h | 0Bh | 00h | 09h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, 09h of Byte 6=Wiper of Camera 1. Camera 1 is DAY/NIGHT Camera with Lens (Set Bit 6 of Byte3 to Select Camera 1 and The Wiper of Camera 1 Will be stopped.) | | | | | | |
| 23 | Turn on Pump | Command | FFh | Receiver ID | 00h | 09h | 00h | 0Ah | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, 0Ah of Byte 6=Pump. The Pump Will be Driven for Several Seconds. | | | | | | |
| 24 | Turn off Pump | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 0Ah | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, 0Ah of Byte 6=Pump. The Pump Will be stopped. | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|-----------------------------------|-------------------|--|-------------|-------|-------|-------|-------|----------|
| 25 | Turn on Wiper at Camera 2 | Command | FFh | Receiver ID | 00h | 09h | 00h | 0Bh | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, 0Bh of Byte 6=Wiper of Camera 2. Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2 and The Wiper of Camera 2 Will be Driven for Several Seconds.) | | | | | | |
| 26 | Turn off Wiper at Camera 2 | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 0Bh | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, 0Bh of Byte 6=Wiper of Camera 2.Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2 and The Wiper of Camera 2 Will be stopped.) | | | | | | |
| 27 | Toggle Polarity | Command | FFh | Receiver ID | 00h | 09h | 00h | 01h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 28 | Toggle auto span/Histogram Linear | Command | FFh | Receiver ID | 00h | 09h | 00h | 02h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2) | | | | | | |
| 29 | NUC on the internal shutter | Command | FFh | Receiver ID | 00h | 09h | 00h | 03h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 30 | Menu selection one position down | Command | FFh | Receiver ID | 00h | 09h | 00h | 04h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|------------------------------|-------------------|--|-------------|-------|-------|-------|-------|----------|
| 31 | Menu selection left pressed | Command | FFh | Receiver ID | 00h | 09h | 00h | 05h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 32 | Menu selection Right pressed | Command | FFh | Receiver ID | 00h | 09h | 00h | 06h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 33 | Show menu/accept | Command | FFh | Receiver ID | 00h | 09h | 00h | 07h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 34 | Power state on | Command | FFh | Receiver ID | 00h | 09h | 00h | 08h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 35 | Toggle palette | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 01h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 36 | Toggle sensitivity | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 02h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|------------------------------------|-------------------|---|-------------|-------|-------|-------|-------|----------|
| 37 | Toggle e-zoom | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 03h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 38 | One position up | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 04h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 39 | Move menu selection left released | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 05h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 40 | Move menu selection Right released | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 06h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 41 | menu selection cancel/exit | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 07h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |
| 42 | Power state sleep | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 08h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera(Clear Bit 6 of Byte3 to Select Camera 2.) | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|---------------------------|-------------------|--|-------------|--------|-------|-------|--------|----------|
| 43 | AGC auto/on/off | Command | FFh | Receiver ID | 00h | 2Fh | 00h | 00~02h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) Byte 6 = 1 (It will set to continuous auto adjust),Byte6=2 (It will set to manual adjust) | | | | | | |
| 44 | Set shutter speed | Command | FFh | Receiver ID | 00h | 37h | 00h | 00~02h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) Select sensitivity in Byte 6.[0 - low,1 - medium,2 - high] | | | | | | |
| 45 | Adjust white balance(R-B) | Command | FFh | Receiver ID | 00~01h | 3Bh | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) NUC using the internal shutter. | | | | | | |
| 46 | Adjust white balance(M-G) | Command | FFh | Receiver ID | 00~01h | 3Dh | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) NUC using an external surface. | | | | | | |
| 47 | Adjust gain | Command | FFh | Receiver ID | 00~01h | 3Fh | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) Set absolute gain. | | | | | | |
| 48 | Adjust auto iris level | Command | FFh | Receiver ID | 00~01h | 41h | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) Set absolute level. | | | | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|------------------------------|-------------------|--|-------------|-------|-------|-------|-------|----------|
| 49 | Camera Power on at camera 2 | Command | FFh | Receiver ID | 00h | 09h | 00h | 0Ch | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) DC 12V IR power supply of Thermal camera Will be electrically Turned On by EV3000-D Receiver Without any command sending to thermal camera (default state).But DC12V Defroster supply will always be turned on state. | | | | | | |
| 50 | Camera Power off at camera 2 | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 0Ch | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Camera 2 is Thermal Camera (Clear Bit 6 of Byte3 to Select Camera 2.) DC 12V IR power supply of Thermal camera Will be electrically Turned Off by EV3000-D Receiver without any command sending to thermal camera. But DC12V Defroster supply will always be turned on state. | | | | | | |
| 51 | Initialize PAN/TILT | Command | FFh | Receiver ID | 00h | 0Fh | 00h | 00h | Checksum |
| | | EV3000-D Response | None | | | | | | |
| | | Description | Receiver ID=00h~FEh, Pan/Tilt will go to Preset position No."0" which is stored in EEPROM of EV3000-D receiver when manufactured in factory. | | | | | | |

2.Command List for Thermal camera (Basic format is PELCO-D) :

Internal Communication Commands between EV3000-D Receiver and Thermal camera(4-Bytes command response)

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|-----------------------------------|-------------------------|-------|-------------|-------|-------|-------|-------|----------|
| 1 | Toggle Polarity | Command | FFh | Receiver ID | 00h | 09h | 00h | 01h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 2 | Toggle auto span/Histogram Linear | Command | FFh | Receiver ID | 00h | 09h | 00h | 02h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 3 | NUC on the internal shutter | Command | FFh | Receiver ID | 00h | 09h | 00h | 03h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 4 | Menu selection one position down | Command | FFh | Receiver ID | 00h | 09h | 00h | 04h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 5 | Menu selection left pressed | Command | FFh | Receiver ID | 00h | 09h | 00h | 05h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 6 | Menu selection Right pressed | Command | FFh | Receiver ID | 00h | 09h | 00h | 06h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 7 | Show menu/accept | Command | FFh | Receiver ID | 00h | 09h | 00h | 07h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |

| No | Command | | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 |
|----|------------------------------------|-------------------------|-------|-------------|-------|-------|-------|-------|----------|
| 8 | Power state on | Command | FFh | Receiver ID | 00h | 09h | 00h | 08h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 9 | Toggle palette | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 01h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 10 | Toggle sensitivity | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 02h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 00h | 0Eh | | | |
| 11 | Toggle e-zoom | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 03h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 12 | One position up | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 04h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 13 | Move menu selection left released | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 05h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 14 | Move menu selection Right released | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 06h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 00h | 12h | | | |
| 15 | menu selection cancel/exit | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 07h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |

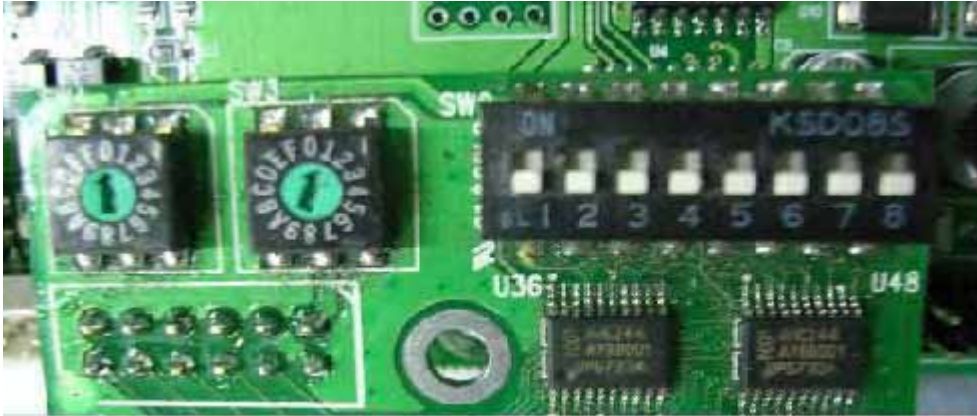
| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|---|-------------------------|-------|-------------|--------|-------|-------|--------|----------|
| 16 | Power state sleep | Command | FFh | Receiver ID | 00h | 0Bh | 00h | 08h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 17 | Narrow field of view | Command | FFh | Receiver ID | 00h | 20h | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 18 | Wide field of view | Command | FFh | Receiver ID | 00h | 40h | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 19 | Focus Near (Increments IR Focus closer) | Command | FFh | Receiver ID | 01h | 00h | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 20 | Focus Far (Increments IR Focus farther) | Command | FFh | Receiver ID | 00h | 80h | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 21 | AGC auto/on/off | Command | FFh | Receiver ID | 00h | 2Fh | 00h | 00~02h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 22 | Set shutter speed | Command | FFh | Receiver ID | 00h | 37h | 00h | 00~02h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 23 | Adjust white balance(R-B) | Command | FFh | Receiver ID | 00~01h | 3Bh | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |

| No | Command | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | |
|----|---------------------------|-------------------------|-------|-------------|--------|-------|-------|-------|----------|
| 24 | Adjust white balance(M-G) | Command | FFh | Receiver ID | 00~01h | 3Dh | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 25 | Adjust gain | Command | FFh | Receiver ID | 00~01h | 3Fh | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |
| 26 | Adjust auto iris level | Command | FFh | Receiver ID | 00~01h | 41h | 00h | 00h | Checksum |
| | | Thermal camera Response | FFh | Receiver ID | 18h | B9h | | | |

[Note for Byte 2]

Byte 2 is EV3000-D receiver address which can be adjusted from "0~254".

8. EV3000-D Address & Baud rate Setting



A) Baud rate Setting

- Set the Switch No.1 & No.2 of 8 POLE DIP Switch as bellows.

| Baud rate | Switch No1 | Switch No2 |
|-----------|------------|------------|
| 2400 BPS | OFF | OFF |
| 4800 BPS | ON | OFF |
| 9600 BPS | ON | ON |

- **Default: 2400 BPS**

B) Receiver Address Setting

- Set the SW3 and SW4 Hex-decimal Switches as bellows.

LSB SIDE (SW3): NO. 0 TO NO. 15, MSB SIDE (SW4): NO. 16 TO NO. 255.

| Receiver address (Decimal number) | Sw4(Hexadecimal switch) MSB of hex-decimal Number | Sw3(Hexadecimal switch) LSB of hex-decimal Number |
|--------------------------------------|--|--|
| 15 | " 0" POSITION | " F" POSITION |
| 28 | " 1" POSITION | " C" POSITION |
| 100 | " 6" POSITION | " 4" POSITION |

- **Default Address: Set to "1" at factory.**

9. WARRANTY

● Product Warranty

| | | |
|--------------------------------------|---------------------------------|----------|
| MODEL No. | | EV3000-D |
| SERIAL No. | | |
| Date of purchased | | |
| Place of Purchased | | |
| c u s t o m e r | n a m e | |
| | a d d r e s s | |

If the product breaks down during proper use, it will be repaired within 1 year from the date of purchase free of charge

Please contact us:

Tel. (413)592-8477

E-mail: tech@unitedvisionsolutions.com

Http://www.unitedvisionsolutions.com

Address: 10 Center st., Suite 401 & 402, Chicopee, MA 01013 USA

(Pleas refer to our web-site)

| date | Detail | Agency | Repairman |
|------|--------|--------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |

Design and specifications are subject to change without notice for improving quality.

Appendix A Care and Handling of EV3000-D

A.1 Cleaning Optics

Follow the lens cleaning instructions below.

a. Examine lens surfaces carefully.

NOTE: Removal of the thin film coating will seriously degrade optical performance. A change in apparent color indicates the loss of coating.

- Remove all dust and debris with a soft bristle brush.
- Gently wipe the surface with a single stroke using pads moistened with a 50/50 mixture of isopropyl alcohol and acetone.

CAUTION: DO NOT rub lens hard!

d. Drag lightly across surface just fast enough for the liquid to evaporate behind the moving pad. Refer to the figure on the next page.

This should leave no streaks.

CAUTION: DO NOT clean the lens in a circular motion!

Follow above procedure with dust cloth to remove any remaining dust.

A.2 Other External Surfaces

Clean as required with nonabrasive household cleaner.

A.3 Handling

Use care to ensure that the EV3000-D is not excessively bumped or dropped. Even though the EV3000-D is a rugged instrument, it should be treated very carefully like any other sophisticated camera.

Appendix B

Glossary

Atmospheric Attenuation – The amount of radiated IR energy that is absorbed by the atmosphere. It is a function of the temperature and humidity, particles in the air (i.e. fog, smoke, smog, etc.) and wavelength, among other factors.

CCIR - Video standard for monochrome, 50 field/sec interlaced video output (i.e. European standard black and white video).

Critical Dimension – The dimension of a target used in calculating the DRI performance. It is a function of length, width and height, as well as what face of the target is presented to the imager.

DRI (Detection-Recognition-Identification) – A method of characterizing the range performance of a thermal imager according to a standard set of criteria using a standard atmospheric model, and a target of alternating black and white stripe (cycles) at different temperatures.

Detection – The minimum distance at which an imager can reproduce a single cycle (black/white stripe) of a target. Typically used to represent the distance at which the imager can first detect a given target (i.e. a hot blob). In addition to the imager, the detection range is also a function of the target size and temperature difference from the background.

Field of View (FOV) – The area in space that is seen by the lens of a thermal imager. Usually expressed in degrees, and specified for both horizontal and vertical dimensions. The FOV is a characteristic of the lens.

FLIR 92 – A set of standards defined by the Night Vision Laboratories for calculating DRI information.

F-Number – Focal Length/Diameter of Lens (same as in a visible lens). A lower F-number means that more IR radiation passes through, but the lens is larger.

Focal Plane Array (FPA) – An integrated circuit with a two dimensional matrix of detector elements that sits in the focal plane of the thermal imager. An imager that uses an FPA is referred to as a “staring” imager because the entire array stares at the scene to collect IR energy to make an image.

Hyperfocal Distance – The distance beyond which all objects are in focus when an imagers’ focus adjust is set to infinity.

Infrared Imager – An Instrument that collects infrared energy and produces a video image where the gray scale values correspond to differences in temperature.

Indium Antimonide (InSB) – Semiconductor material used in the fabrication of a cooled FPA. Typically pronounced “Inns-Bee”, these detectors must be cooled to 77°K to operate.

Identification – The distance at which an imager can resolve six cycles across a given target. Used to describe the distance at which a target can be clearly identified (in the case of a truck, the ability to discriminate between a T-72 and a Humvee). In addition to the imager, the recognition range is also a function of the target size and temperature difference from the background.

Infrared (IR) – The portion of the electromagnetic spectrum located just above visible light. The infrared spectrum extends from just above red (0.7 micron) to about 12 micron.

Instantaneous Field of View (IFOV) - A measure of the spatial resolution of an IR detector. It is defined as the angle seen by an individual pixel in the FPA and is measured in milliradians.

Kelvin Temperature Scale - Absolute temperature scale related to the Celsius (or Centigrade) scale. 0° Kelvin (absolute zero) is equal to -273° C. The units of Kelvin are equal to Centigrade degrees. Therefore, room temperature (23° C) is equal to 296° K.

Long Wave Infra Red (LWIR) - The section of the infrared band from 7 microns to 12 microns.

Micro-Cooler - A miniature Sterling Cycle cooler used to provide cryogenic temperatures for the Focal Plane Array.

Micron – One millionth of a meter (10⁻⁶ m); Micron units are used to express the wavelength of light.

Milliradian (mr) – A measure of angle equal to one thousandth of a radian (1 radian = $180^{\circ}/\pi$).

Typically used to express the IFOV of an imager ($1 \text{ mr} = 0.0573^{\circ}$).

Mid Wave Infra Red (MWIR) – The portion of the infrared spectrum from 3 to 5 microns.

Minimum Resolvable Temperature Difference (MRTD) – A figure of merit for a particular FPA based imager, it defines the minimum temperature difference that can be resolved by the detector.

Narcissus Reflection - The reflection back into the image of the cooled detector. Because the detector is cooled to cryogenic temperatures, it will reflect back as an intense spot in the center of the image (black spot in white-hot mode).

Narrow Field of View (NFOV) – In a dual field of view lens, the NFOV is the smaller of the two fields (more magnification) and is used for identification, recognition and detection at longer ranges.

Noise Equivalent Temperature Difference (NETD) – A figure of merit for an FPA based imager, it defines the temperature difference that produces a signal just equal to the RMS noise signal.

Non-Uniformity Correction – A built in correction routine that calculates a set of field correction coefficients to apply to each pixel in the array to normalize their response for a given scene temperature.

NTSC – Video standard for color, 60 field/sec interlaced video output (i.e.

US standard color video). **PAL** - Video standard for color, 50 field/sec interlaced video output (i.e. European standard color video).

Pixel – Abbreviation for Picture Element, or each individual element that comprises a picture. Typical FPA's are arrays of 640 x 480, 320 x 480, or 256 x 256 pixels.

Radian – The angular measurement equal to the ratio of the arc length of a circle divided by the radius. A circumference of a complete circle is 2 pi times the radius, so a complete circle (360°) equal 2 pi radians, and pi radians = 180° . 1 radian = 57.3° .

Recognition – The distance at which an imager can resolve three cycles across a given target. Typically used to define the distance at which an imager can distinguish between a specific object in a group of similar objects. In addition to the imager, the recognition range is also a function of the target size and temperature difference from the background.

RS170 – Video standard for monochrome, 60 field/sec interlaced video output (i.e. US standard black and white video).

RS232 - Serial communication standard using two wires – transmit and receive – and a common ground. Used for relatively short (<10 meter) cable runs.

RS422 – Serial communication standard using four wires – a transmit differential pair and a receive differential pair. For use where transmission cable runs go beyond ten meters.

Short Wave Infra Red (SWIR)- The portion of the infrared spectrum from 0.70 microns to 3 microns.

Wide Field of View (WFOV) – In a dual field of view lens, the WFOV is the wider of the two fields (less magnification) and is used for scanning a broader area at reduced resolution.

| | | |
|-------------------|---|---|
| Contact us | For repair/service, or if problem(s) still exist after troubleshooting | Call Customer Service +1-413-592-8477 tech@unitedvisionsolutions.com |
| | To order additional items and/or accessories | Call sales 1-413-250-0903 sales@unitedvisionsolutions.com |
| | For application support | info@unitedvisionsolutions.com |