LD200/400 Laser Globe Camera

User Operation Manual

Thank you for using our company's products. Please read this operation manual carefully before using it, as it can provide you with correct technical indicators and the things that you should pay attention to!

Please contact us if you come across problems that are not mentioned in this instruction. We will supply you with satisfying technical support.

Active Laser Dome Camera

- ❖ integrate laser illumination, color block camera into a whole dome camera；

- ❖ synchronous zoom + super wide angle： 2°～45°；

- ❖ 23X visible CCD camera；

- ❖ Independent developed laser diode; long lifetime up to 20000 hours；

- ❖ 0.05°~360°/s high speed；

❖ Intelligence function：auto reversal、presetting、cruise、self-checking、record pattern etc；

Technical Indicators

	Power supply	AC24V±10%	
	Interface	RS485、compound video output、AC24V	
Technical Indicators	Performance	Night vision distance＞200m（to people）； day vision distance＞400m	
	MTBF	≥10000 hours	
	Fatigue Test	Continuously 10000 times test	
Safety Indicators	Laser spot	When power on, laser spot is biggest (default)	
	Thunder proof	Consistent with GB / T 17626.5-1998 AC power cord less than Grade Three; DC, signal, control and other input line can afford surge (impact) interference of Grade Two	
Environmental Indicators	Working temperature	-25℃～+55℃	
	Storage temperature	-40℃～+80℃	
	Protection Grade	IP65	
	Vibration Indicators	Comply with GB/T 1857.10	
Color CCD Camera	Model	23X, 1/4'' infrared sensitive CCD	
Pantilt Function	Pan Speed	0.05°~360°/s	
	Pan Range	360°	
	Tilt Speed	0.05°~180°/s	
	Tilt Range	0°~180°, auto reversal	
	Presets	At most 256	
	Scan speed	0.5°～30 °/s	
	Cruise function	6 tracking paths	
	Self-checking	40s	
	Wiper	Has wiper	
Illuminating function	Laser power	4W	
	Lighting Angle	2°~45°, big angle synchronous zoom	
	Illuminating Zoom Speed	3S quick zoom	

By Laseroptronix www.laseroptronix.se

Warning：Remind user of potential danger!

1. Please read this instruction carefully before installing this device.
2. Please obey the warnings on the device and the instruction.
3. During the process of transporting and using, please avoid strong vibration and compress in order to protect the optic and electronic components.
4. Please use the power supply equipped by us and obeys the methods of instruction to connect the wire.
5. Don't open the device by yourself, or else it may cause electric shock or machine damage. If there are problems, please contact us and remember that never try to mend it by yourself.
6. In order to protect the machine and people, this device need to be settled on firm pan-tilt.
7. Please install appropriate lightning proof equipment to avoid thunder.
8. Use this device within the limitation of humidity and temperature.
9. To protect the imaging components from damaging, please don't let the camera aim at sun and other objectives of high light or aim at static bright objectives for a long time.
10. Don't look the laser window in close distance, or else it may hurt your eyes.
11. This is a class 3B laser unit so it is dangerous for the eyes at short ranges. Do never stare into the laser aperture at front.

Attention

1. Don't hide the sensitive components in front of the machine in order to make sure the device would work normally.
2. If the night vision device is out of power supply, please restart it after 30 seconds.

Safety Warning:

Non insulation voltage to people

Please don't stare at Laser Window when power on. Class 3B laser unit
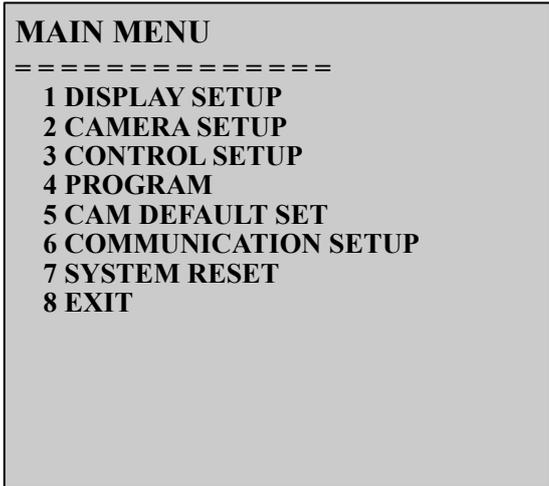

Avoid eyes staring straight

The First Part   Introduction

Part I---Features

- Adopt laser illuminating system, long lighting distance and wide lighting field

- low light color to black camera, can realize continuous monitoring day and night

- shifting pan-tilt, realize omnidirectional no blind spot monitoring and high accurate orientation

- high intelligence, easy to operate and maintain

- uneasy to be discovered

- smart shell with professional design, light, firm, thermostabilization, anti-corrosion, waterproof and acid rain proof

- low power consumption, little heat, stable performance

Part II---Technical Indicators

| Item		LD200/400 PTZ
Configuration	camera	Integrated camera
	illuminator	Infrared laser illuminator
	Power supply	AC24V±15% I_{in}≥2.5A
	interface	RS485、video output、AC 24V power supply
Technical indicators	capability	Night vision distance＞200m; Daytime vision distance＞400m
	Power consumption	≤50W
	weight	7.5Kg
	dimension	404*280*280
	Working temperature	-25℃～+ 55℃
Environment indicators	Storage tempeature	-40℃～+ 80 ℃
	Anti-impact	≥4G
	Salt-fog proof	Continuously spray fog for 48 hours under PH6.5-7.2
	Protection Grade	IP65
	Relative Humidity	90%
Video camera indicators	Valid pixel	752（H）X582（V）
	Focal length	f＝4.1~73.8mm
	FOV	2.8°～48°
	Signal-to-noise	≥50db
	Video output	VBS：1.0Vp-p
	Electronic Shutter	Quick 1/50,1/75,1/100,1/120,1/150,1/215,1/300,1/425, 1/600,1/1000,1/1250,1/1750,1/2500,1/3500,1/6000,1/10000 Slow 1x,2x,3x,6x,12x,25x
Illuminator	Illuminating elements	Infrared laser illuminator
	Wave length	808nm
	Lighting angle	2°~45° Field of view

```
MAIN MENU
= = = = = = = = = = = = =
  1 DISPLAY SETUP
  2 CAMERA SETUP
  3 CONTROL SETUP
  4 PROGRAM
  5 CAM DEFAULT SET
  6 COMMUNICATION SETUP
  7 SYSTEM RESET
  8 EXIT
```

	Power consumption	10w
	Illuminator control	automatic/ menu manual control
Basic function of pan-tilt	Pan speed	0.05°~360°/s
	Tilt speed	0.05°~180°/s
	Presets	256
	Scanning speed	0.5°～30 °/s
	Cruising function	6
	Self-check	40s

Note: The AC24V power supply's input voltage should be AC187V~AC253V. The voltage cannot be higher than AC253V, or else it will cause product damage.

Part III---Function Introduction

1. infrared laser illuminating system

a. Realize electronic varifocus adjust of lighting source, laser beam angle continuously adjustable

b. Laser beam expanding and shaping, light intensity homogenization, light spot uniformity, good lighting effect

```
DISPLAY SETUP
= = = = = = = = = = = = = = = =
  1 ID DISPLAY    ON
  2 ID POS        TOP-L
  3 TITLE DIS     OFF
  4 PRESET POS   0 1
  5 CAM DISPLAY  OFF
  6 RETURN
```

c. Using the technology of laser power soft starting and illuminator automatically control the temperature, the lifetime of the laser illuminator is prolonged.

d. High laser output efficiency, low power consumption, stable performance

e. Using sensitive components to realize the automatic "ON" or "OFF" of the laser. At daytime, the laser illuminator will not start; when the illumination is lower than set , the illuminator will automatically start.
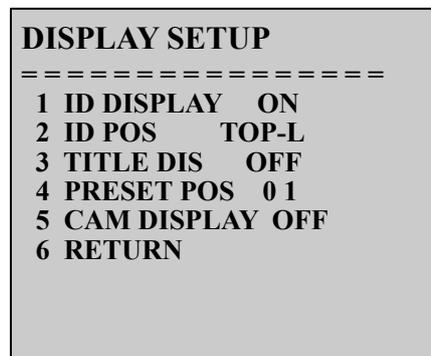
f.   Menu control of illuminator: the system normally in a state of "**AUTO**", using the sensitive components to inspect the outside light, automatically open or close the illuminator; if you need to open the illuminator in special conditions, you can use the menu to change the state into "**ON**", at this time the laser illuminator will start (not affected by outside); similarly, if you need to close laser illuminator, you can use the menu to change the state into "**OFF**", at this time the laser illuminator will close (not affected by outside).

2.low light level color to black integrated camera

a.   Use menu to set the function of camera.

b.   Automatic switch between color and black/ white: when the light intensity is higher than set, the camera is in a state of "color"; when the light intensity is lower than set, the camera is will automatically change into a state of "black/white", combining with laser illuminator to realize night monitoring.

c.   Zoom adjust: you can adjust "WIDE" or "TELE" according to your needs to realize the adjust of image.

d.   Auto focusing: the camera uses the image identity technology to realize automatic focus; the image is clear and steady.

```
CAMERA SETUP
= = = = = = = = = = = = = = = = = = =
 1 SHUTTER  +2
 2 BACK LIGHT     OFF
 3 ICR SHOT       AUTO
 4 D-ZOOM          OFF
 5 WB SET         AUTO
 6 SSNR        MIDDLE
  7 APERTURE         5
 8 AGC          AUTO
 9 RETURN
```

e.   Back light compensation: when the background is too dark, you can open the back light compensation according to your need.

f.   White balance: when confronted with the situation of image color distortion , you can choose the best imaging mode according to your practical situation (there are six modes to choose,   ① indoor mode ② outdoor mode ③one push mode ④automatic following mode ATW ⑤ automatic mode

g.   Low light level set: normally the camera is in a state of automatic working; when the environment brightness is lower than 1Lux, the camera will automatically change into zero level state. You can also use manual method to make the camera in a state of zero level.

3.   Integrated full range shift pan-tilt

a. Pan rotate 360º, tilt rotate 0º～95º with 180°auto moving function.

b. Pan rotate can realize 0.05~360°/s continuous shift adjust, tilt rotate can realize 0.05~180°/s continuous shift adjust.

c. Low speed steady rotate, little noise, clear and steady image.

d. Realize full range no spot monitoring, exact orientation could reach ±0. 1°.

```
CONTROL SETUP
= = = = = = = = = = = = = = = =
 1 HOME OPTION
  2 LASER LIGHT     AUTO
 3 WIPER                OFF
 4 WIPER MODE       SERIES
 5 DEFOGGER          OFF
 6 ZOOM RATIO        0 1
 7 RETURN
```

4.   High intelligence level

a. Can save at most 256 pre-setting points.
b. Pan scanning between two points. You can choose the scanning speed and direction. Thermal camera could scan about 180°between two points via menu.

```
HOME OPTION
= = = = = = = = = = = = = = = = =
 1  AUTO HOME    ON
 2  HOME POS      0 1
 3  DWELL TIME  0 5 MIN
 4  RETURN
```

c. Six tracking paths can be programmed: Each path has 20 pre-setting points. You can separately set the speed and staying time between two points.
d. Self-inspection function: The system can remember the PTZ paths in 40 seconds and imitate; it can finish the action according to your operation; and data saves when power off.
e. Character adding function: Screen can show camera's address and number of pre-setting.
f. Short/long focal length automatic shift function: according to camera's focal length, system could automatically adjust its pan and tilt rotating speed. Higher magnification camera, its slower rotation speed to ensure an accurate search and lock control objectives; smaller magnification camera, the faster rotation, to ensure the movement speed of the night vision, in order to monitor targets quickly .

Part IV---Menu Set Instruction

1.Menu basic operation

a) Use keyboard or matrix to call No. 64 pre-setting position to open the main menu.

b) When the menu is on the screen, with the keyboard, you can control rocker to move; turn up or down to move cursor to the item that need set, turn left or right to amend the contents or enter this item to set;

```
PROGRAM
= = = = = = = = = = = = = = = = =
 1   AUTO PAN START POS
 2   AUTO PAN END POS
 3   RUN AUTO PAN
 4   SET TITLE        0 1
 5   SET PATROL       0 1
 6   RUN PATROL       0 1
 7   RECORD PATTERN
 8   RUN PATTERN
 9   RETURN
```

When using matrix, operate "**TILT UP**"、"**TILT DOWN**" to move cursor to the item that

need set, operate "**PAN LEFT**"、"**PAN RIGHT**" to

amend the contents or enter the item to set.

c) Night vision camera has the function of memory when power off, with which the data can't be lost

d) Main set of the menu, please refer to the "Menu Setup"

2.Menu Setup

a. MAIN MENU

● DISPLAY SETUP：Enter the submenu of screen display set. You can set ID display、pre-setting position title display and camera display mode。

● CAMERA SETUP: Enter the submenu of camera parameter set.

● CONTROL SETUP：Enter the submenu of night vision control parameter set.

● PROGRAM: enter the submenu of night-vision enhancements.

● CAM DEFAULT SET: restore default settings.

● COMMUNICATION SET: enter sub-menu of communication parameter.

● SYSTEM RESET: achieve System reset function.

● EXIT：exit the main menu.

b. DISPLAY SETUP

● ID DISPLAY: When this item is **ON,** the screen will show the address of the night vision camera, for example, "CAM 006". Default set is ON.

● ID POS：Set the address display position. The address can be displayed at the three corners of the screen: TOP-L(top left), BOTT-R (bottom right), BOTT-L (bottom left).

```
COMMUNICATION SETUP
= = = = = = = = = = = = = = = =
1  CAM ID       001
2  PROTOCOL    PELCO-D
3  BAUD         2400bps
4  RETURN
```

● TITLE DIS：If this item is set ON, the left of the screen will show the title of pre-setting position when you call the pre-setting position. For example, "NO.001 ABCDEFGH". If there is no title of this position, it will only display "PRESET NO.001 NO TITLE". The set of amendment of pre-setting position's title is under the menu of PROGRAM. When the title of show off, the screen only shows preset number.

```
PRESET POINT: NO. 001
TILT ：   NO TITLE
CLOSE：    EXIT
```

● PRESET POS：Set the display position of pre-setting position's title. It could be the first line to the tenth line. The first line is on the top of the screen.

● CAM DISPLAY: If this item is set "ON", the camera's screen display will be open. the camera function parameters is on the screen.

● RETURN: return to the main menu.

2.3 CAMERA PARAMETER SETTINGS

Frame accumulation: there are three options: automatic, shutter and slow gate. The door series of slow gate and shutter are 16 and 6 separately. If a slow shutter and door state, when the camera screen display is open, the monitor will display the frame rate of

accumulation. (If the night is slow to focus, check the settings for the automatic.)

.1   SLOW SHUTTER: three options: automatic, shutter and slow gate. Slow shutter and door series were 12 and 12. when under shutter and slow gate situation. once the camera screen display is open, the monitor will display the frame rate of accumulation. (If slow to focus in night, please check whether the settings is automatic.

```
NO  POS  TM    NO  POS  TM
01  002  10    02  003  20
03  005  15    04  008  05
05  000  00    06  000  00
07  000  00    08  000  00
09  000  00    10  000  00
11  000  00    12  000  00
13  000  00    14  000  00
15  000  00    16  000  00
17  000  00    18  000  00
19  000  00    20  000  00

SEQ:1          CLOSE:EXIT
```

.2BACK LIGHT: there are two operation options: open / closed.

.3ICR SHOT: turn on manually, or automatically control.

.4D-ZOOM: set to turn on / off two states

.5WB SET: ATW / INDOOR / OUTDOOR / ONEPUSH / AUTO / MANU

.6SSNR：Noise reduction options, there are three models: low, medium and high.

.7EXP COMP VALUE: SET the range 1~16.

.8AGC: there is a total of 14 options Automatic gain, ranging from 2dB to 28dB. Frame accumulation and gain only work in the laser opened.

.9   RETURN：return to the main menu.

.4 CONTROL SETUP

.4.1   HOME OPTION：Enter the submenu

of setting automatic return function.

.4.1.1AUTO HOME：When this item is **"ON"**

open the automatic return function.
It means that if the user has no action within
a period of time, the night vision will return to HOME.
When the night vision camera is in a state of patrol,
it will not return to HOME. When without the need to
return to HOME, please set this item in "**OFF**".

.4.1.2HOME POS：HOME is the return position. For example, when you need to setup a scene as HOME, you should first adjust to this scene, setup the pre-setting position as No.3, then move to the menu and enter this submenu; change the number behind HOME POS into 3. This is OK. If you want to make the automatic function take effect, donot forget to setup the AUTO HOME in **"ON"**. HOME POS can be pre-setting position 1-50.

.4.1.3DWELL TIME：Setup the automatic return time, which means how long it will return to HOME without control. The time can be one minute to 99 minutes.

.4.1.4RETURN：return to the last menu.

.4.2   LASER LIGHT：Laser illuminator open item: normally, the system will automatically inspect the outside lighting level, automatically open or close laser illuminator; if the user changes this item into "**ON**", this system's laser control is changed into manual. If you need to return to the automatic state, you must change this laser menu into the state of "**AUTO**".

.4.3   WIPER：Wiper control item, with wiper mode, controls the wiper to move once or

continuously.

.4.4   WIPER MODE： you can choose the ONCE mode or CONTINUOUS mode, the

default is CONTINUOUS mode.

.4.5   DEFOGGER：Defogger control item, if you open this function, the system will start

for 2 minutes and close after 2 minutes.

.4.6   ZOOM RATIO: Set the zoom minimum of lens, 8 classes.

.4.7   RETURN：Return to the main menu.

.5   PROGRAM

.5.1   AUTO PAN START POS：Setup Auto pan start position. After you enter, use the

rocker to adjust the night vision monitoring position. Push **CLOSE** key-press to
save the current position and return.

.5.2   AUTO PAN END POS：Setup Auto pan end position. After you enter, use the

rocker to adjust the night vision monitoring position. Push **CLOSE** key-press to
save the current position and return.

.5.3   RUN AUTO PAN： pan function run line between two points, run and press OPEN key

to exit the menu. Please set a good run before the start and end line scan, line scan
from the beginning to the end with the menu item settings 1 and 2.

.5.4   SET TITLE：Set the title of pre-setting position. Only the former 63 pre-setting

positions can have title. Use PAN LEFT/PAN RIGHT to choose pre-setting position
number, push OPEN key-press to enter the edit state; push CLOSE key-press to
leave the edit state. The operation under the edit state please refers to the back.

.5.5   SET PATROL：Edit patrol parameter. Use PAN LEFT/PAN RIGHT to choose paths

number; use OPEN to enter the edit state, push CLOSE key-press to leave the edit
state. The operation under the edit state please refers to the back.

.5.6   RUN PATROL：Run patrol function. Use PAN LEFT/PAN RIGHT to choose paths

number, push OPEN key-press to run and leave.

.5.7   RECORD PATTERN：Edit tracking self-inspection, can record PTZ operation

within 40 seconds at most. The 40 seconds is up or push CLOSE key-press to
finish edit.

.5.8   RUN PATTERN：Run tracking self-inspection. After it is run, you will leave the

menu. The control of the rocker can stop its run.

.5.9   RETURN：Return to the main menu.

.6   COMMUNICATION SETUP

.6.1   ADDRESS: set address range is 1-255.

.6.2   PROTOCOL: PELCO-D option or PELCO-P.

.6.3   BAUD: Baud rate from 2400bps to 19200bps optional.

.6.4   RETURN: return to the main menu.

   Note: The communication parameters need to reboot after saving changes.

3   Menu Appendix

.1   PRESET TITLE EDIT MODE OPERATION

Enter into edit mode, the screen shown in figure:

From the figure we can see that the current setting is No. 1 preset point, the title is "NO TITLE". With PAN LEFT / RIGHT to move the cursor, TILT UP / DOWN can modify the value. CLOSE exit edit mode press the button and save the changes. Preset title can contain up to 8 characters, these characters can be 0 ~ 9, A ~ Z, +, - and blank.

3.2 MULTI-POINTS INSPECCTION EDIT MODE OPERATION

Into edit mode, the screen displays as follow:

NOTE：

NO: tracking point number
POS: pre-setting positions number
TM: the staying time at this pre-setting position
SEQ: 01 displays the current setup is 1
CLOSE:EXIT push CLOSE to exit

The top line and bottom line show the indicating information, the middle shows every tracking paths information. Every line shows 2 tracking points parameter. Use PAN LEFT/ RIGHT to move cursor, use TILT UP/DOWN can amend the number. Continuously push it for one second will accelerate. Push CLOSE key-press to exit the edit state and save the amendment. The program will search the first POS with the position of **"000"**, and will save the former data and treat the latter data as invalid. As the picture above, the program saves the four tracking points. The scope of POS is 1-128. When POS is "000", it means the end of the tracking scope. TM's scope is from 0 to 99 seconds.

Part V---Night Vision camera's Connection Instruction

The power supply input, control signal input and video signal output uses one group of compound cable, which will be fetched out by the seven cores aviation outlet.
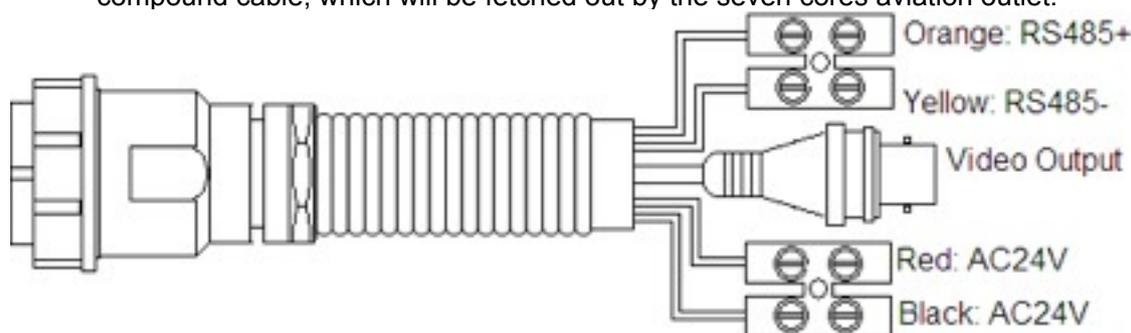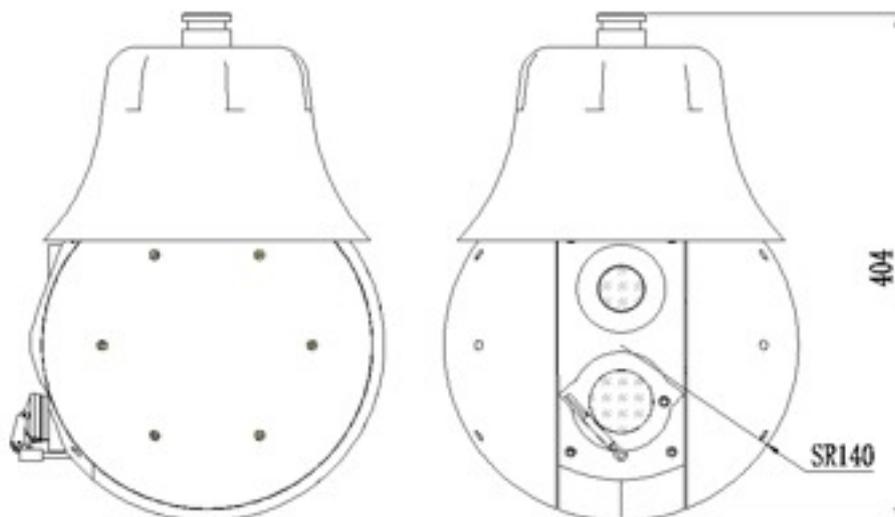

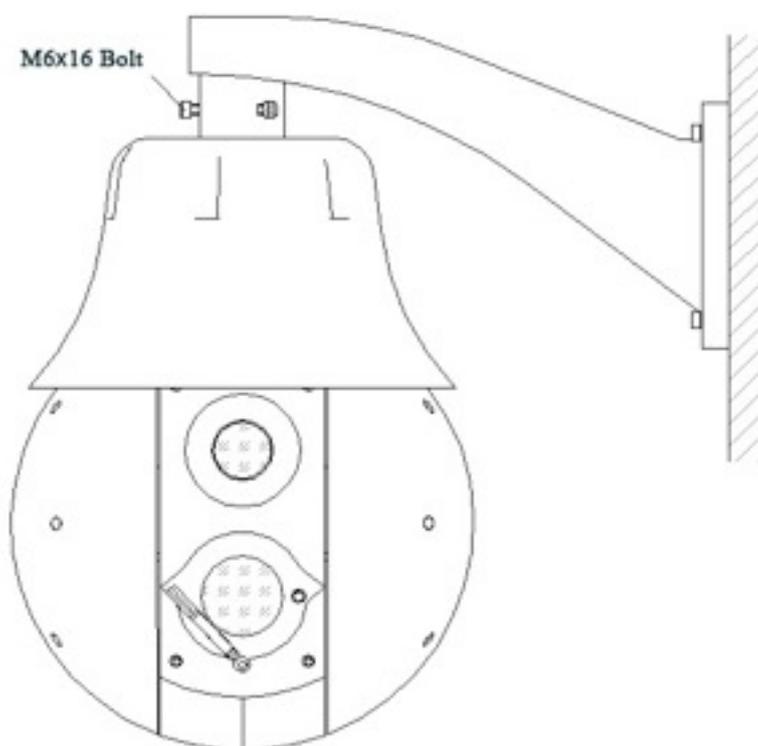| Part No	Definition	Remarks
1	AC24V: Red	AC24V Input
2	AC24V: Black	AC24V Input
3	RS485-: Yellow	485 Controls B
5	RS485+: orange	485 controls A
6	Video+	video output +

7	Video-	video output -

The Second Part   Installation Instruction

1. Shape and dimension

Night vision camera's shape and dimension (mm)

Installation reference diagram

Installation Graphics

a)   Please go ahead with the M6X16 bolts factory offered in the box.
b)   Avoid shaking and extrusion during fixing for protecting key components and optics

inside. Signal transmission line should be kept 50m away from high voltage devices and cables.

c)   Circuit thunder prevention and grounding design should be in accordance with construction demand and standard of local regulations and industry. The ground resistance is less than 4Ω, and the ground wire section should more than 25mm^2 connected.

d)   The out connecting cables should be fixing tightly to the outlet to keep form water.

2. System Connection Reference

Night Vision should be combined with other equipment into the system, using simple system diagram below shows:
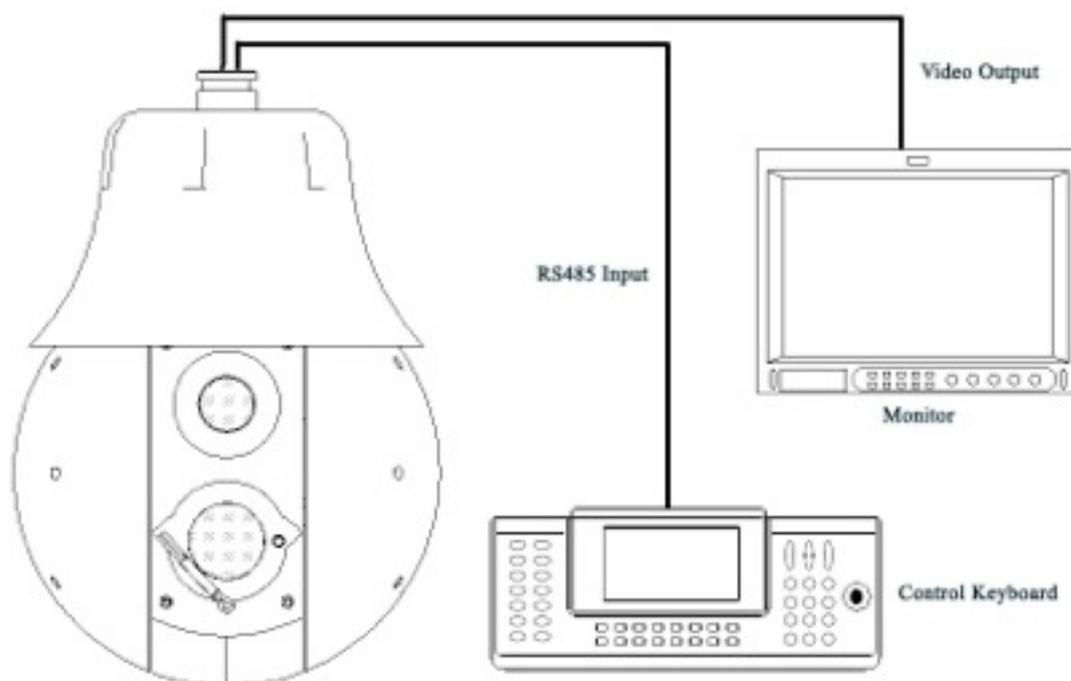
3. Common Failure Analysis

problem	possible reason	solving method
the night vision camera has no action and no image in the state of power-on	the power supply is damaged or the power is not sufficient	Change
	wrong connection of power supply line	correctly connect
	line failure	Eliminate
Unusual self-inspect, has	Engine failure	Mend

image but also has motor noise	Insufficient power	Use the right power
Good self-inspect, but has no image	Wrong connection of video cable	Change
	Not good connection of video cable	eliminate
	Video camera is damaged	change
Good self-inspect, but can not control	Wrong connection of control signal line	change
	Wrong match of address	Reset the controller's address
	Wrong match of protocol	Adjust the controller's protocols to match the night vision camera
Not steady image	Not good connection of video line	eliminate
	Insufficient power	change
Night vision camera out of control	Unusual self-inspect	Restart the electricity
	Not good connection of control line	eliminate
	Problems with the mainframe operation	Restart the electricity of the mainframe
	Too much load or too long distance of communication	Connect the farthest 120 ohm resistor, others are cut. Add …..
Manual/ automatic lose effect	Illuminator maybe damaged	Return us to mend
Wiper not moving	Location biased	Check wipers whether in the correct position

We have listed the reasons of the common problems and solvent to the problems,which is just for reference. If you have come across some other new special problems, please contact us directly. **We will provide you with satisfactory technical support.**

The Third Part
Instructions of quality guarantee and after-sales service

Quality guarantee and after-sales service by Laseroptronix

We do business based on customers' satisfactions and quality is the most important thing for us. Our company has many kinds of military industry technologies and unique key technology. Our products have advanced properties and the quality is reliable.

Because we have advanced technology, much experience and the customer-centered service idea, we can manufacture products according to your needs and give you a system that is practical and of good-quality.

All our products have the attachment of detailed installation and operation instructions. Therefore, it is very convenient. And with the permission of the situation, we can send technicians to install for you.

If you have any problem of the quality, technology and operation, welcome to contact us. And we will give you the satisfactory reply within 2 hours after we received your call. Then we will solve the problem for you as soon as possible.

Welcome all the customers to give us different kinds of suggestions. Your support is the driving force for our development forever, thank you!

Appendix l : RS 485 LINE

1.　RS485 Features

RS485 Industry Line is communication line of speciality impedance 120Ω, and support 32 node at most, including controlling and controlled equipments.
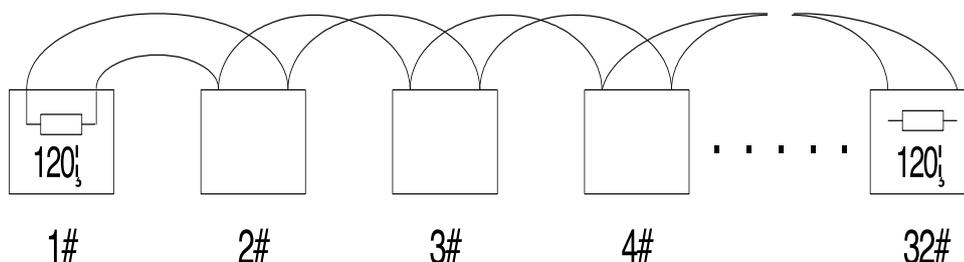
2.　RS485 Transmission Distance
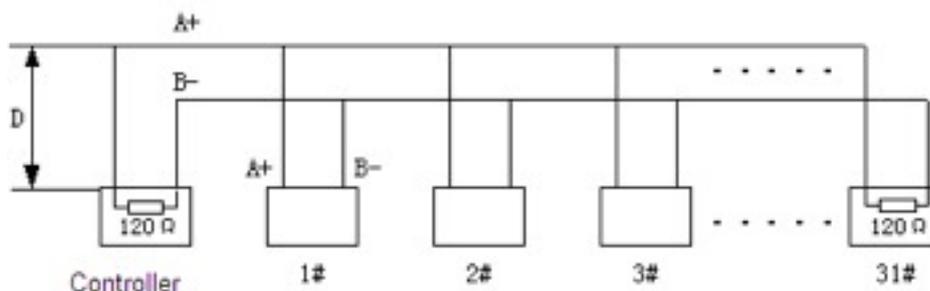
0.56mm(24AWG)twisted pair line as communication line

Baud Rate	Farthest Transmission Distance
2400 Bps	1800m
4800 Bps	1200m
9600 Bps	800m

3.　Connection and terminal resistance

RS485 industry line requires chain connection among all devices, and both ends should be with 120Ωterminal resistance.


But" D" section should not exceed 7 m.

Connection of 120Ω resistance: this resistance has been ready on circuit board, and default isthat it's on 2~3, and 120Ωisn't connected. When needs to connect to 120Ω, please replace it on 1~2 circuit.

4. Problems in cases

Customers often uses Star Chain in cases, and terminal resistance must connect farthest two devices. As following sketch, 1 # and 15 # can't accord with RS485,

it result to signal reflection and anti-jamming ability reduction. Regarding this problem, we recommend to use RS485 Divider, which can change Star Chain to suitable connection way, and avoid problems to promote communication.
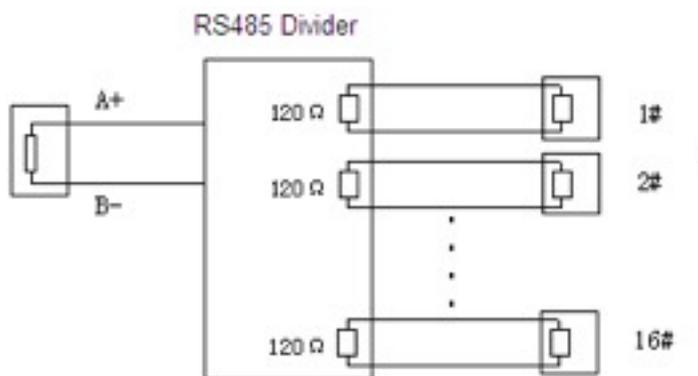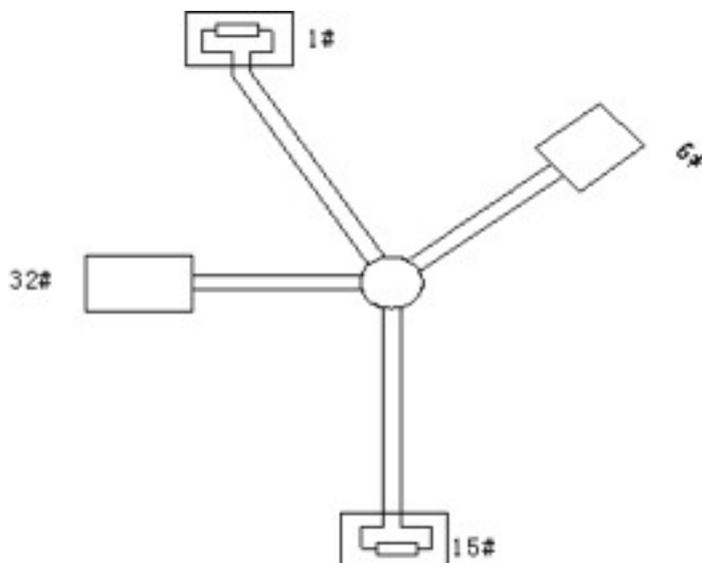
Appendix Ⅱ 24VAC relationship table between diameter and distance table

When the diameter of a certain size, 24VAC voltage loss rate of less than 10%, the recommended maximum transmission distance.(For AC powered equipment, the maximum allowable voltage loss rate of 10%. For example: a device rated at 80VA, installed 35 feet away from the transformer (10m) diameter size of the minimum required 0.8000 mm.)

Transmission distance feet(m) transmission power va	Diameter (mm)			
	0.8000	1.000	1.250	2.000
10	283（86）	451（137）	716（218）	1811（551）
20	141（42）	225（68）	358（109）	905（275）
30	94（28）	150（45）	238（72）	603（183）
40	70（21）	112（34）	179（54）	452（137）
50	56（17）	90（27）	143（43）	362（110）
60	47（14）	75（22）	119（36）	301（91）
70	40（12）	64（19）	102（31）	258（78）
80	35（10）	56（17）	89（27）	226（68）
90	31（9）	50（15）	79（24）	201（61）
100	28（8）	45（13）	71（21）	181（55）
110	25（7）	41（12）	65（19）	164（49）
120	23（7）	37（11）	59（17）	150（45）
130	21（6）	34（10）	55（16）	139（42）
140	20（6）	32（9）	51（15）	129（39）
150	18（5）	30（9）	47（14）	120（36）
160	17（5）	28（8）	44（13）	113（34）
170	16（4）	26（7）	42（12）	106（32）
180	15（4）	25（7）	39（11）	100（30）
190	14（4）	23（7）	37（11）	95（28）
200	14（4）	22（6）	35（10）	90（27）

Appendix Ⅲ：Cable Spec List all countries

Metric System （mm）	American Standard AWG	Britain Standard SWG	Section Square （mm²）
0.050	43	47	0.00196
0.060	42	46	0.00283
0.070	41	45	0.00385
0.080	40	44	0.00503
0.090	39	43	0.00636
0.100	38	42	0.00785

0.110	37	41	0.00950
0.130	36	39	0.01327
0.140	35		0.01539
0.160	34	37	0.02011
0.180	33		0.02545
0.200	32	35	0.03142
0.230	31		0.04115
0.250	30	33	0.04909
0.290	29	31	0.06605
0.330	28	30	0.08553
0.350	27	29	0.09621
0.400	26	28	0.1237
0.450	25		0.1602
0.560	24	24	0.2463
0.600	23	23	0.2827
0.710	22	22	0.3958
0.750	21		0.4417
0.800	20	21	0.5027
0.900	19	20	0.6362
1.000	18	19	0.7854
1.250	16	18	1.2266
1.500	15		1.7665

Thank you and good luck in your installation work

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