

## **Precision Approach Path Indicator**

**PAPI-LED-066 / PAPI-LED-220**

### **Operation Manual**



Please read this manual carefully before construction, installation and operation of the product.

Please keep this manual properly for further reference.

This manual is subject to change without prior notice.

Airsafe Airport Equipment Co., Ltd.

## Revision Description

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## **1.0 Foreword**

ICAO *Airport Service Manual* Part 9 “Airport Maintenance Practices” and FAA AC150/5345-26 *Maintenance of Airport Visual Aid Facilities* are the highest criterions for site installation and maintenance of such lighting fixtures. This manual was compiled with considerable reference to these two criterions.

The content stated in this manual is absolutely important, so construction personnel must read it carefully before construction. After properly understanding the entire content of this manual, construction personnel should carry out the construction in strict accordance with the methods specified herein, to ensure that the product is safely and properly installed in place.

Routine airport maintenance personnel should carry out the routine maintenance in strict accordance with the methods specified by relevant provisions, to ensure that the lighting fixtures are in the best operation condition.

Related personnel must strictly follow safety criterion. Any personnel without specialized training are strictly forbidden to touch the lighting fixtures and devices. Live line work should be avoided under any circumstances. Construction or maintenance personnel should get acquainted with first-aid knowledge, in case of any unexpected events.

## 1.1 Illustrations and Meanings

- Following illustrations will appear in this manual where necessary to remind or warn construction or maintenance personnel.
- Please continue reading the subsequent content of this manual after properly understanding the meanings of these illustrations.



- To remind that the behavior may cause serious injury or death.
- ※ Detailed description will be given in the box.



- To remind that the behavior may cause injury to people or damage to product.
- ※ Detailed description will be given in the box.



- To notify that the behavior is prohibited.
- ※ Detailed description will be given in the box.

## 1.2 Safety Rules and Notices



- Using the light fixtures outside of airport is strictly prohibited.
- ※ Inadequate maintenance or casual touch will cause light faults.



- Be careful when handling the precision approach path indicator.
- ※ Falling to the ground or collision will damage the parts or cause personal injury.



- During installation or maintenance, making sure that the power source is disconnected.
- ※ The unknown current impact may damage the device



- Making sure effective earthing according to the requirements of the specification.
- ※ Otherwise it may cause electric leakage or shock



- Making sure that the constant current is no greater than 6.6A.
- ※ Otherwise it may cause internal electric damage, or even failure of power supply



- There is a frangible groove at the lower part of the landing leg and great external force shall not be applied during installation.
- ※ Otherwise the frangible groove on the landing leg may be broken.



- Maintenance of the precision approach path indicator by the non-professional electrician is prohibited.
- ※ Otherwise it may cause electric shock or other personal injuries.



- Touching the lighting fixtures with wet hand is strictly prohibited.
- ※ It may cause electric shock or other accident.



- The power source entry or internal electric wire shall be replaced immediately when it is damaged.
- ※ Otherwise it may cause equipment failure or electric shock.

### **1.3 Quality Assurance and Responsibility**

Any defect in design, material or workmanship, which may occur during proper and normal use over a period of one year from date of installation but less than 15 months from date of shipment, or within the warranty period of the tender, will be repaired or replaced by manufacturer free of charge. The warranty doesn't cover the failures resulting from lamp burnt out, improper maintenance, installation or operation, or damages due to snow ploughs. Manufacturer shall not be liable to any further claims or particularly claims for damages not affecting the goods themselves.

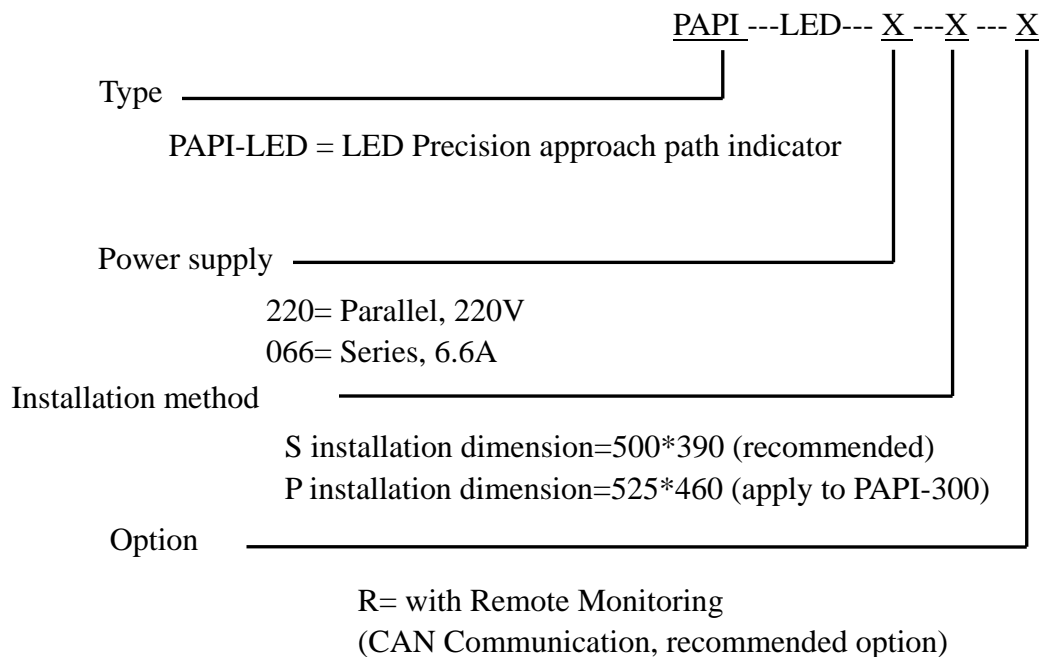


## 2.0 Introduction

- Introduction and application

The PAPI system shall consist of a wing bar of four sharp transition multi-lamp (or paired single lamp) units equally spaced. The system shall be located on the left side of the runway unless it is physically impracticable to do so.

- Model description



Type 066 PAPI is powered by a constant current regulator. One lamp is equipped with a 100W / 6.6A isolation transformer, which is installed under the lamp or separately.

Type 220 PAPI is powered by 220 VAC power supply without isolation transformer. It can be dimming by monitoring the ambient light intensity through the light control board.

It is recommended to purchase the PAPI system with monitoring module. The status and fault information of PAPI system can be accurately fed back to the light station through the CAN communication cable of the monitoring module, and information is timely fed back to the monitoring system through 485 standard communication cable to help the user timely, reliably and efficiently monitor it.

## 2.1 Technical Specifications

This product conforms to the provisions of the following standards or technical specifications. For dated standards or technical specifications, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- Convention on International Civil Aviation Annex 14- *Aerodromes* Volume I;
- International Civil Aviation Organization (ICAO)- *Aerodrome Design Manual*- Part 4 & Part 6;
- Federal Aviation Administration (FAA) AC150/5345-28;
- Department of Airport of Civil Aviation Administration of China: Advisory Circular, *General Technical Requirements for Civil Airport LED Navigation Aid Lighting Fixtures* (AC-137-CA-2015-01-R1)
- Department of Airport of Civil Aviation Administration of China, Advisory Circular, *Technical Requirements for Precision Approach Path Indicator* (AC-137-CA-2015-07)

## 2.2 Application Environment

- Altitude: below 4,500m;
- Outdoor: -40 °C ~ +55 °C;
- Relative air humidity: not more than 95%;
- In rain, snow, ice and water;
- Expose to corrosive salt atmosphere
- Basic earthquake intensity VII.

## 2.3 Application Scope

Precision approach path indicator for Category I, II and III airports.

Heliport precision approach path indicator.



- Using the lighting fixtures beyond the specified scope is strictly prohibited.
- ※ Application beyond the specified scope will cause damage or risk to any component.

## 2.4 Technical Parameters

Name	Precision approach path indicator (066)	Precision approach path indicator (220)
Type	PAPI-LED-066	PAPI-LED-220
Environmental conditions 1	Inside the light box: ambient temperature $> 55\text{ }^{\circ}\text{C}$ , ambient humidity $< 45\%$	
Power / remarks	58W/normal operation	
Environmental conditions 2	Inside the light box: ambient temperature $< 55^{\circ}\text{C}$ , ambient humidity $< 45\%$	
Power / remarks	64W/ normal operation, the additional electric heating module works	
Environmental conditions 3	Inside the light box: ambient temperature $> 55\text{ }^{\circ}\text{C}$ , ambient humidity $> 45\%$	
Power / remarks	64W/ normal operation, the additional demisting module works	
Environmental conditions 4	Inside the light box: ambient temperature $< 55^{\circ}\text{C}$ , ambient humidity $> 45\%$	
Power / remarks	71W/ normal operation, additional electric heating & defogging	

	modules work simultaneously
Light source life	$\geq 100000\text{h}$ (L70)

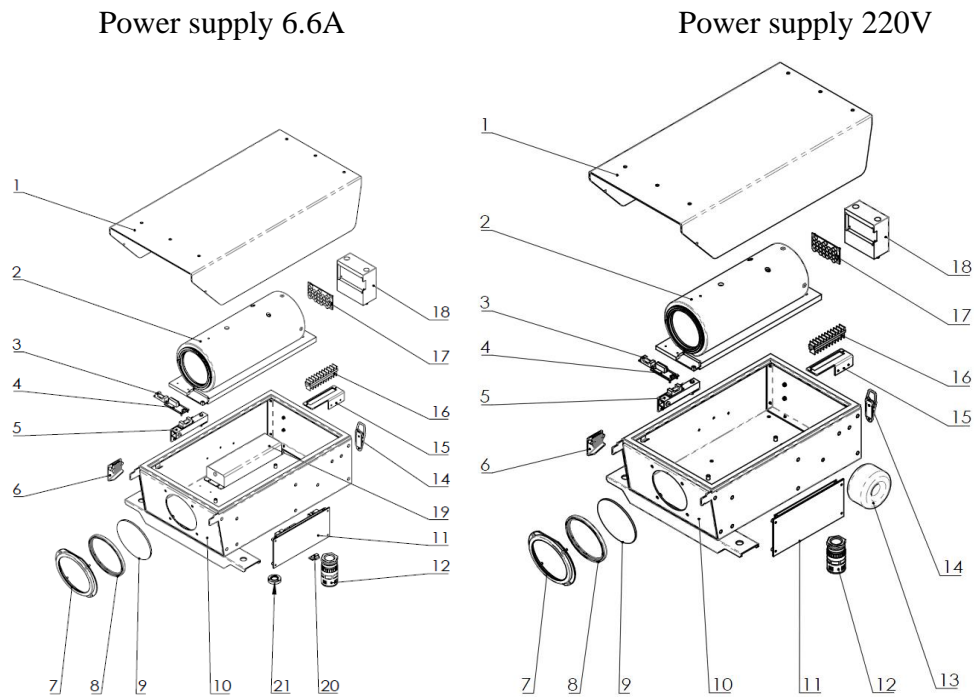
## **2.5 Technical Features**

- Light distribution and color of the lighting fixtures meet the requirements of Attachment 14 of ICAO & FAA AC 5345-28.
- Excellent optical system design makes excellent red and white transition of PAPI with straight transition line.
- Use LED light source, max power consumption at low temperature is less than 72W.
- Intelligent electrical control system can automatically turn off the light in case of abnormal conditions.
- Each lighting fixture has a 4-digit LED digital tube to timely display the elevation angle of the lighting fixture with high precision.
- Slight changes in lateral horizontal angle can be displayed through LED indicators.
- The unit controller achieves one key operation, easy to operate and master.
- “Operation” and “Calibrate Flight” are set for the control panel for easier use.
- No condensation design ensures that there is no abnormal light output of lamps on the windshield in wet and dew weather
- The data of LED PAPI system can be uploaded to ALCMS directly with matched communication module.
- Compact overall structure with small windward area and strong wind resistance.
- The main body of the light fitting is made of corrosion-resistant aluminum alloy with anti-corrosion surface treatment. All fasteners are made of stainless steel, suitable for various harsh environments.
- The aluminum alloy leg has the frangible function. After precision mechanical processing, it complies with the requirements of FAA, with stable and reliable performance.
- IP66-grade ingress protection of the lighting fixture, which could keep interior from dust and rain.

- Three leg type horizontal support and height adjustment structure for convenient and accurate on-site installation and adjustment.
- Equipped with independent level in horizontal and longitudinal direction for convenient installation and maintenance.
- The maximum windward area of the lighting fixture is 0.48m<sup>2</sup>.
- The external plug of the lamp is A6 double core plug, which meets the requirements of FAA AC 5345-26, and matches with the output lead of isolation transformer.

## 2.6 Structure

### 2.6.1 Key Components of Upper Box

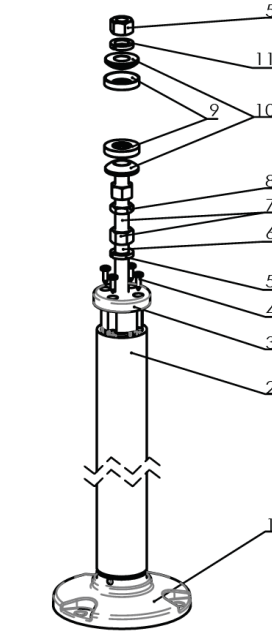


Common parts of power supply 6.6A and 220V:

- |                            |                           |  |
|----------------------------|---------------------------|--|
| 1. Upper cover plate assy. | 12. Hose connector        | <b>Spare parts of 6.6A power supply:</b> |
| 2. Optical lens assy.      | 14. Hasp                  |  |
| 3. Horizontal indicator    | 15. Bracket               |  |
| 4. Digital display board   | 16. Terminal block        | <b>Spare parts of 220V power supply:</b> |
| 5. Longitudinal indicator  | 17. LED light source assy |  |
| 6. Refrigeration module    | 18. Light source holder   | 13. Transformer                          |
| 7. Seal pressing bracket   |                           | 19. Switch power supply                  |
| 8. Glass sealing ring      |                           | 20. Optical control circuit board        |
| 9. Front glass             |                           | 21. Optical control module               |
| 10. Box                    |                           |  |
| 11. Driver                 |                           |  |

## 2.6.2 Key Components of Landing Leg Assy

1. Flange
2. Landing leg
3. Front cover of landing leg
4. Tapping screw ST5.5
5. Spring washer 16
6. Screw stem
7. Hex nut M16
8. Hex thin nut M16
9. Lower spherical washer
10. Upper spherical washer
11. Wave spring washer 16





## 2.7 Interpretation of System Terminology

### 2.7.1 Elevation

The beam centers of all lighting fixtures in the PAPI system aim at the approach slope according to the defined subtle deviation and the elevation means the included angle of the beam center of the lighting fixtures and the horizontal plane.

### 2.7.2 Key Buttons and Plug-ins

The general framework of the PAPI control panel is shown in Figure below and definitions of the key buttons and plug-ins are as follows:

J1: Power input socket of Type 066 PAPI

J2: CAN communication and power input socket of type 220 PAPI

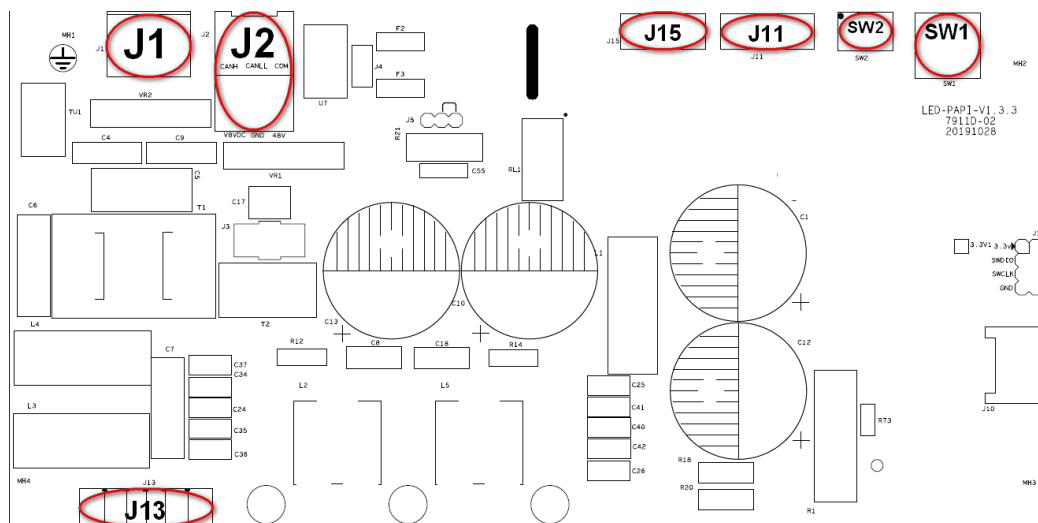
J15: Sub-plate socket

J11: LED Light source socket

SW2: Dial switch, which is used to set CAN address

SW1: Mode switching button, which is used to switch between state modes

J13: Light control plate socket



Users are prohibited to switch SW2 in their daily use. It's only needed to switch

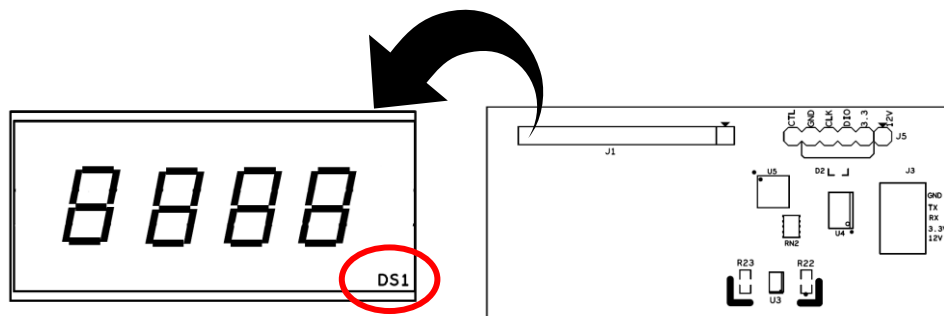
SW2 and set the system to Factory Setup Status when setting CAN address or replacing the control plate.

The PAPI system has four lamps, each with a different address, which can be configured as 1, 2, 3, 4, 5, 6, 7, 8. The eight addresses are divided into two groups, 1, 2, 3, 4 as one group and 5, 6, 7, 8 as the other group. When a lamp is abnormal, other lamps in the same group will be linked, not lamps in the different group.

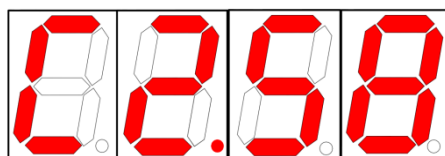
Setting the address to 0.9 is prohibited in daily use unless you want to enter the factory setup state. When the address is set to 0.9, the lamp will turn off to remind the user to set the address correctly.

The overall framework of the PAPI display panel is shown in the following figure. The main plug-ins in the diagram is defined as follows:

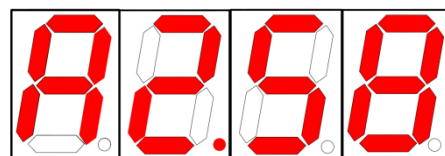
DS1: Four-digit digital tube.



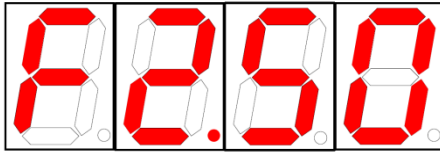
**Four-digit Digital tube:** There is a four-digit digital tube embedded on the PAPI control panel (as shown in Figure DS1 above), which timely displays the current mode and elevation of PAPI. The angle displayed by the digital tube has four characters, with the first character of a letter, showing the mode of PAPI and the last three characters showing the “current angle”.



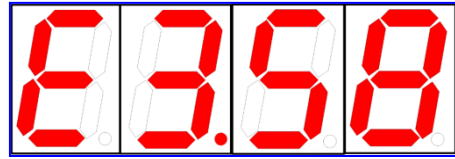
Display under “Calibrate Flight”



Display under “Operation”



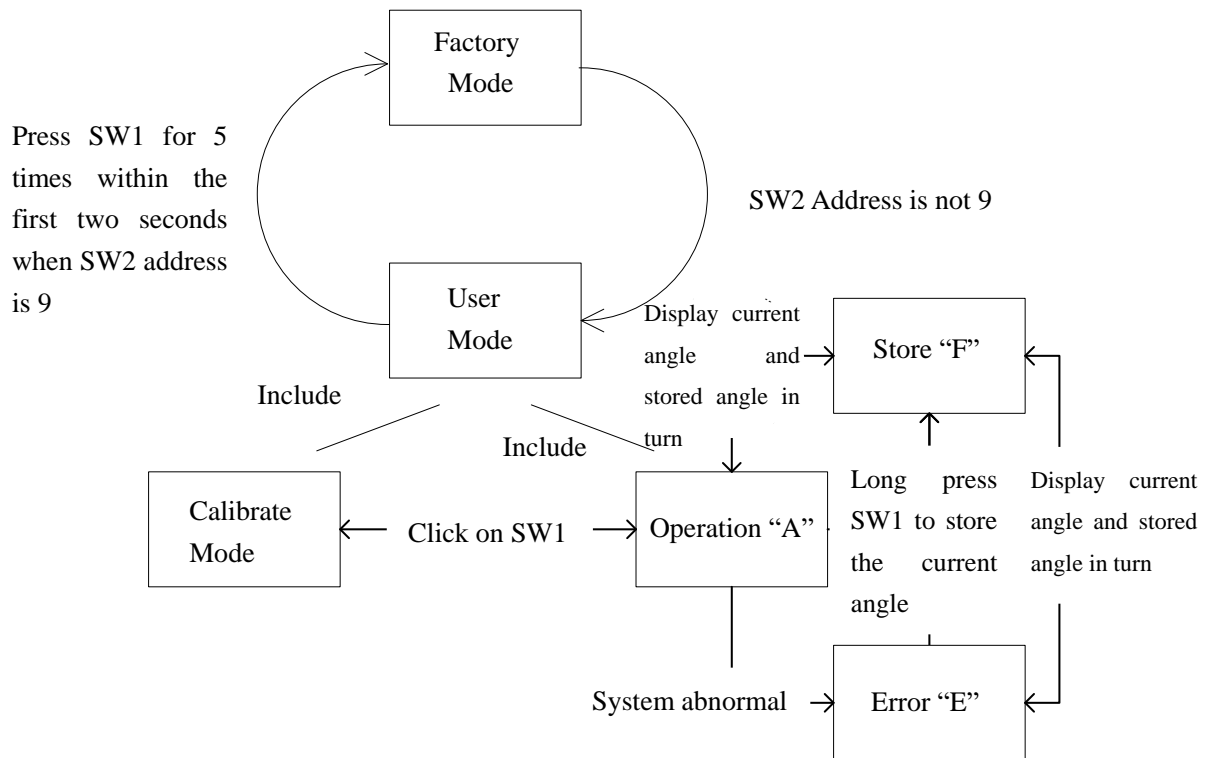
Display under "Store"



Display under "Error"

### 2.7.3 Two Working Conditions and Four Modes

This PAPI system has two working conditions and four modes, whose relations are shown in Figure below:



When the "User Mode" of PAPI is switched to "Factory Mode", user should set address SW2 to 9 first, and press SW1 quickly for 5 times within the first 2 seconds to achieve the switch.

The "Factory Mode" of PAPI can be switched to "User Mode" when the address SW2 is not 9.

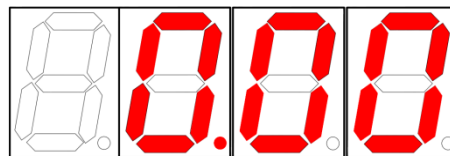
On "User Mode", click "SW1" to switch between "Calibrate Flight Mode" and "Operation Mode". Long press "SW1" for more than 5 seconds to enter the "Store Mode" and store the current angle.

Generally, the system is under the "Operation Mode" and "Store Mode", and the mode switches on time, with a cycle of every 5 seconds. The current angle is displayed

under the “Operation Mode” every 3 seconds, and the stored angle is displayed under the “Store Mode” every 2 seconds. When the system is abnormal, the “Operation Mode” changes to the “Error Mode”.

**(1) “Factory Mode”:**

When PAPI is under “Factory Mode”, the digital tube only displays the current angle. “Factory Mode” is only used for the standard calibration of PAPI when it leaves the factory or clearing the angle when the control panel of PAPI is replaced. During daily normal use, user shall not enter “Factory Mode”. Otherwise, the digital tube will reset and “Stored Angle” of the system will be automatically cleared, as shown in Figure below:



Display under “Factory Mode”



- In daily use, do not enter “Factory Mode”.
- ※ “Stored Angle” of the system will be automatically cleared.

**(2) “User Mode”:**

“User Mode” includes “Calibrate Flight Mode”, “Operation Mode”, “Store Mode”, “Error Mode”.

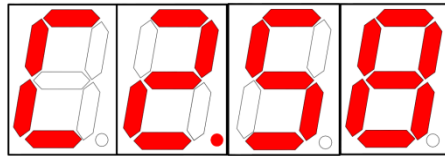
Under "User Mode", the "Error Prompt" will appear in a certain state. After the PAPI enters "Error Prompt", the system will automatically turn off the light.

Under “User Mode”, PAPI system supports to store the current angle into the system and display the “Stored Angle” through the digital tube.

**(3) “Calibrate Flight Mode”**

During flight calibration or daily maintenance, the system shall set PAPI to “Calibrate Flight Mode”. Under this mode, PAPI will not appear "error prompt" or turn

off the light to ensure the normal flight calibration or maintenance work. The display method of the four-digit digital tube is 4 characters initiated by letter C (the digital tube displays “C+ value of the current elevation”), with the display shown in Figure below:



Display under “Calibrate Flight”

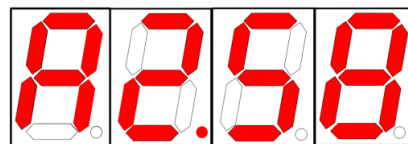
The above-mentioned digital tube information means that PAPI is in “Calibrate Flight” and the current angle is 2.58.

Under this mode, the angle displayed by the digital tube is immediate. When the real angle of PAPI has any subtle change, the angle of the digital tube will change accordingly.

#### (4) “Operation Mode”

After the system is powered on, the control panel will automatically enter “Operation Mode”.

Under “Operation Mode”, PAPI works normally and achieves control of various states, including such preset functions as error alarm. Therefore, after the flight calibration or daily maintenance is completed, PAPI is switched to “Operation Mode” from “Calibrate Flight Mode” through the SW1 button. The display method of the four-digit digital tube is 4 characters initiated by letter A (the digital tube displays “A+ value of the current elevation”), as shown in Figure below:



Display under “Operation”

The above-mentioned digital tube information means that PAPI is under “Operation” and the current angle is 2.58.

Under this mode, the angle displayed by the digital tube is immediate. When the real angle of PAPI has any subtle change, the angle of the digital tube will change accordingly.

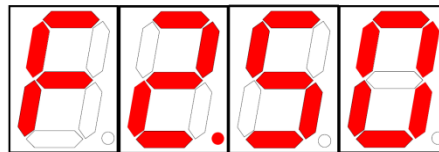


- PAPI must be set to “Operation Mode” for work.
- ※ PAPI cannot achieve error alarm.

**(5) “Store Mode”:**

Long press the SW1 button for more than 5s to store the current angle confirmed through flight calibration into the PAPI system. We call the angle stored into the system “Stored Angle”.

The expression form of “Stored Angle” is four characters initiated by the letter F displayed by the four-digit digital tube (the digital tube displays “F+ currently memory angle”):

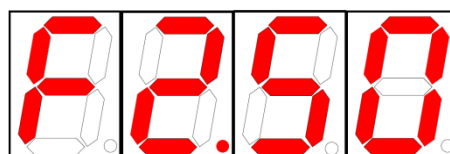


Display under “Stored Angle”

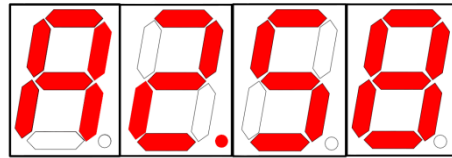
The above-mentioned digital tube information displays “Stored Angle” and the angle recorded into the system is 2.50.

When PAPI under “Operation Mode”, the digital tube alternately displays the current angle and stored angle with a cycle of every 5 seconds. “Current Angle” is displayed every 3 seconds, and “Stored Angle” every 2 seconds. User may understand the difference between the current real angle of PAPI and previously stored angle of the flight calibration.

For example, the current operating angle is “A2.58”. When the current “Stored Angle” (designed angle) is “F2.50”, the digital tube will display the following two legends alternately:



Display within 2s



Display within 3s

These two data are displayed alternately under “Operation Mode”.

Take the above-mentioned figures as an example, although the difference between the current operating angle and the current stored angle is  $0.08^\circ$ , it is still within the allowable range and PAPI will not have any action.

When PAPI leaves the factory, the stored angle in the system is zero. After flight calibration, user must store the confirmed angle into the system according to the instructions in paragraph (5) above, and user shall record the value in words in relevant documents according to the regulations.



- As an important datum, the “stored Angle” shall not be changed randomly.
- ※ Otherwise it may cause PAPI to lose standard, so as to generate malfunction.

### (6) “Error Mode”

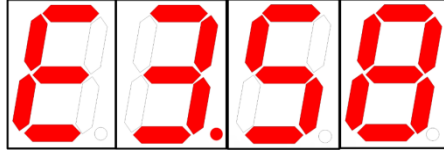
When the control panel detects the anomaly of the PAPI system, it turns off the system within several seconds and the error will be prompted on the digital tube. This function of the system is called “Error Prompt”. The system provides two kinds of “Error Prompt”, the display format is: E + the current elevation angle in degree.

I) The operating angle deviation is greater than the specified value:

Under “Operation Mode”, compared with the “Stored Angle”, if the downward angle deviation is more than  $0.38^\circ$  or above, or the upward angle deviation is more than  $0.75^\circ$  or above, PAPI will enter “Error Mode” and alarm. The four-digit digital



tube will display 4 characters initiated by letter E (the digital tube displays “E+ currently stored angle value”):

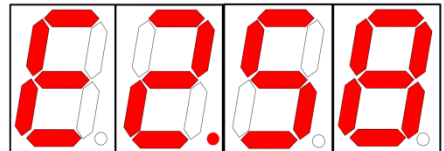


Display under “Error Mode” when there is an angle deviation

The above-mentioned digital tube information displays “Error Mode” and the current angle is 3.58. Because the “Stored Angle” in the system is 2.50, the “Current Angle” displays that PAPI deviates upward, with 0.75 ° above greater than the “Stored Angle”. After “Error Mode” appears, the system will turn off all lamps after 20s according to the provisions. Meanwhile, the monitoring module alarms.

II) Damage to LED light source:

When the LED light source of a certain PAPI unit is damaged, PAPI will enter “Error Mode” and alarm (the digital tube displays “E+ current elevation value”).



Display under “Error Mode” when the light intensity does not comply with the standard

The above-mentioned digital tube information means PAPI is under “Error Mode” and current angle is 2.58.

The system turns off all lights. Meanwhile, the monitoring module alarms.

## **2.7.4 Power Supply of PAPI**

PAPI-LED-066 is powered by a constant current regulator.

PAPI-LED-220 is powered by 220 V AC and dimmed by monitoring the light intensity of the external environment through the light control panel. When the external ambient light intensity is above 600Lux, the lamp enters the day mode; when the external ambient light intensity is below 300lux, the lamp enters the night mode. There are two night modes, 5% and 20% of the day mode light intensity respectively.

The local switching night mode is as follows:

When the SW2 address is 1, 2, 3, 4, the night mode is low light intensity and brightness is 5% of the day mode.

When the SW2 address is 5, 6, 7, 8, the night mode is high light intensity and the brightness is 20% of the day mode.

Low Light  
Intensity

High Light  
Intensity

### 3.0 Installation of Lighting Fixtures

From the view of the runway threshold, the PAPI system shall be set on the left of the runway, unless it is impracticable according to the actual situation.

The PAPI system must consist of four lighting fixture units with equal distance.

### 3.1 Location of PAPI system

The distance between the inside edge of the PAPI lighting fixture unit closest to the runway and the runway edge shall be 15m ( $\pm 1$ m); and the distance between the PAPI unit and other taxiway, parking apron or runway shall not be less than 14m.

The distance between PAPI units is often 9m ( $\pm 1$ m); the distance of no less than 6m may be used only when the width of the takeoff and landing strip is insufficient to accommodate 4 units with the distance of 9m. At this time, the distance between the PAPI unit closest to the runway and the runway edge shall not be less than 10m ( $\pm 1$ m).

Note that the four units of PAPI have been arranged in the order of 1, 2, 3, 4 when they leave the factory. The same serial number is marked on the PAPI packaging carton and the internal marking knob of PAPI, as shown in Fig. 3-1 and Fig. 3-2.

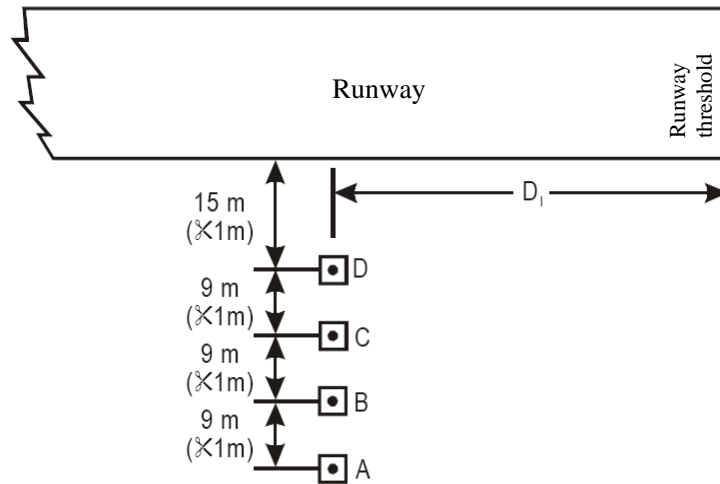


Serial number position of outer package  
(figure 3-1)



Marking knob position  
(figure 3-2)

During installation, it can be installed in positive or reverse order according to the factory label. As shown in Figure 3-3, A, B, C and D corresponding to the positive sequence 1, 2, 3, 4 of PAPI or reverse sequence 4, 3, 2, 1 respectively.



Typical PAPI unit Layout (Figure 3-3)

Note: D1 means the distance between the runway threshold and central location of the PAPI lighting fixtures.

### 3.2 Boundary Dimension

The maximum installation height of the lighting fixtures is 900mm and the dimension of the corresponding luminous center is 814mm.

There are two installation methods, and the corresponding information is as follows:

Installation method	feature
S	Miniaturization
P	Apply to PAPI-300

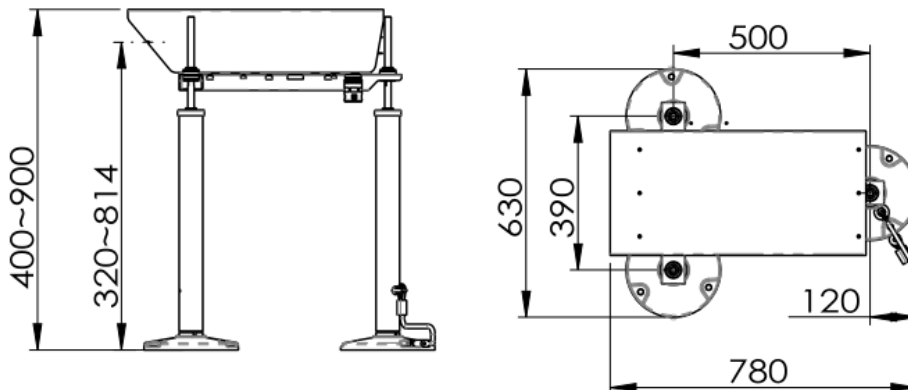


Figure 3-4 Overall dimensions of installation mode S

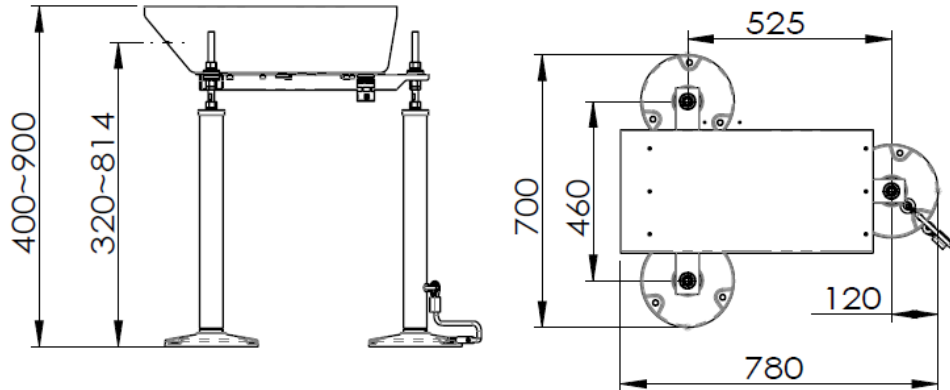



Figure 3-5 Overall dimensions of installation mode P

	<ul style="list-style-type: none"> <li>■ In any case, the maximum installation height of PAPI shall not exceed 1m</li> <li>※ Meet the standard requirements</li> </ul>
---	--

### 3.3 On-site Installation of PAPI Lighting Fixtures

In order to ensure the operating stability of the PAPI system, the manufacturer suggests that the PAPI lighting fixtures should be installed on a prefabricated cement foundation. For the dimension of the prefabricated cement foundation, please refer to the Figure below. If the designer has a specific drawing, such specific drawing shall prevail.

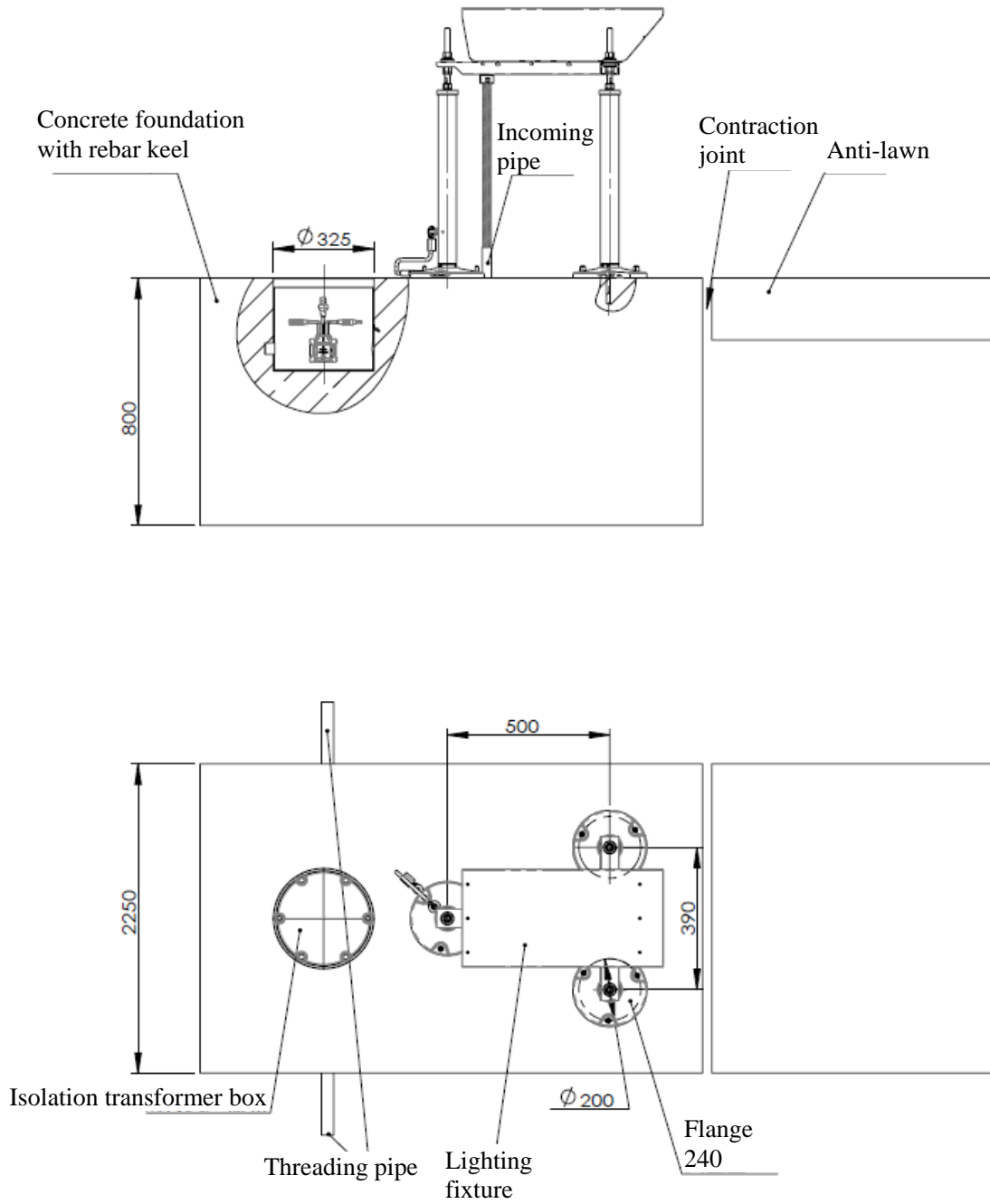


Figure 3-6 on-site installation dimension of mode S

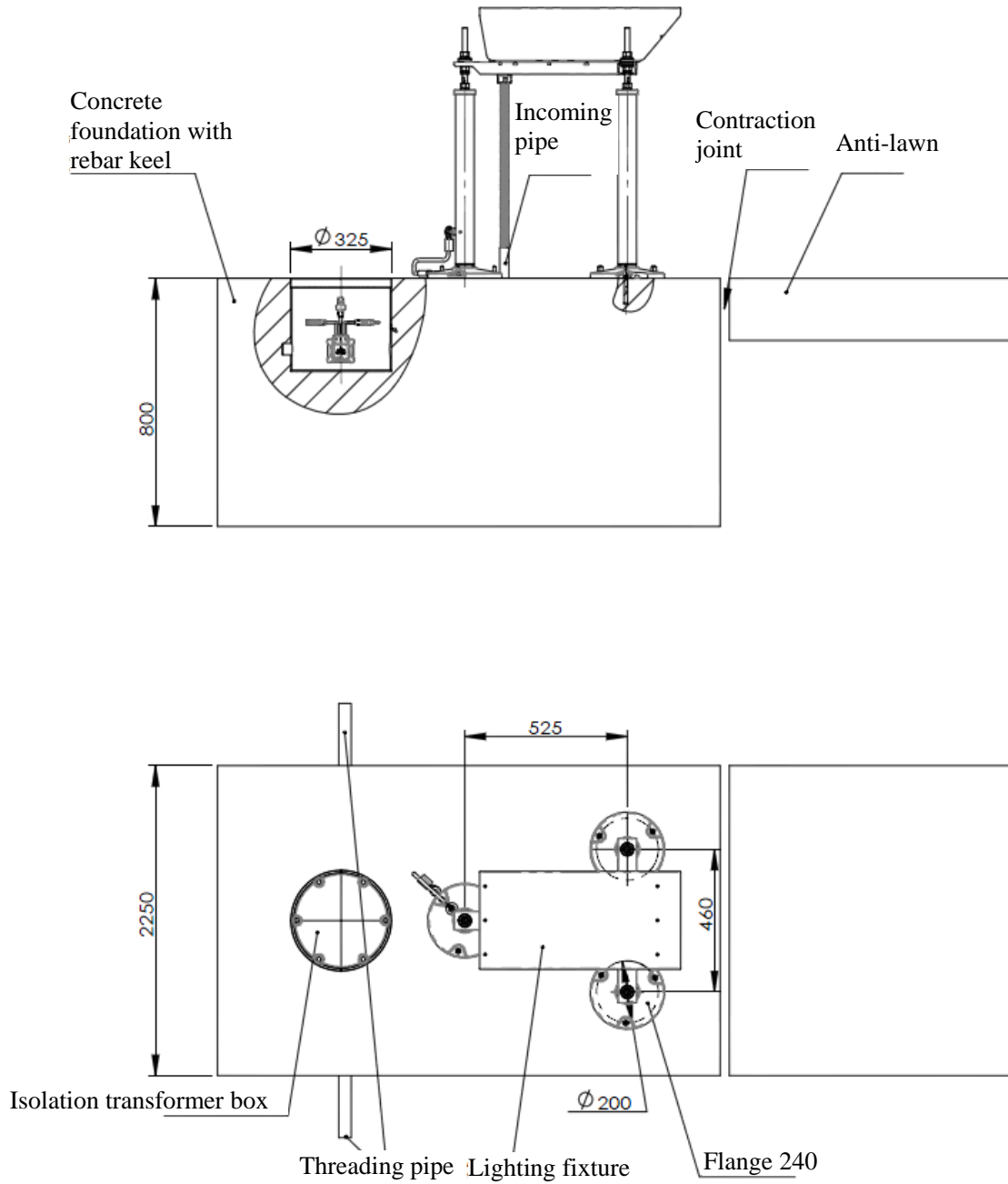



Figure 3-7 on-site installation dimension of mode P

	<p>■ Make sure that the luminous channel is not blocked by weeds after installation</p>
	<p>※ Affect the lighting effect or even cannot see the light of the lamp</p>



### 3.3.1 Flange Fixation

In order to ensure that the lighting fixtures are installed firmly and reliably, the manufacturer suggests using the method to embed the foundation bolt in the prefabricated base. It is suggested to use the stainless steel M10 foundation bolt (with the length of greater than 150mm), as shown in Figure 3-8.

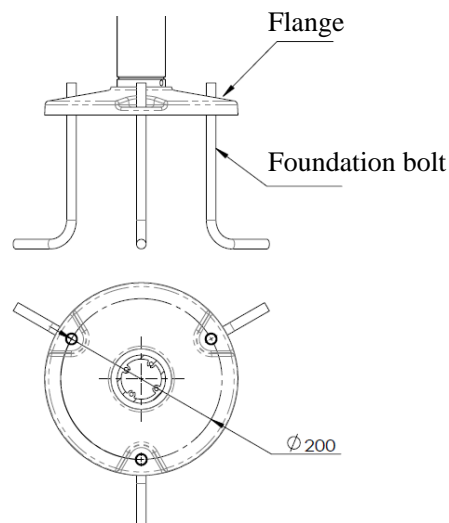


Figure 3-8

When embedding the foundation bolt in the cement foundation, the auxiliary installation plate (Figure 3-9 & 3-10) may be used. According to the location of the lighting fixtures, 9\* $\varnothing 10$  holes position the location of the embedded bolt.

For the convenient installation of the lighting fixtures, the manufactures distributes a set of installation plate. The corresponding location and dimension of the installation sample and lighting fixtures is shown in Figure below:

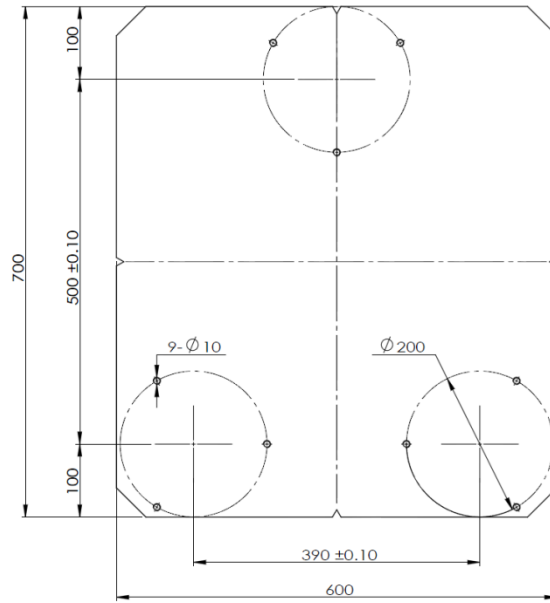


Figure 3-9 installation plate of installation method S

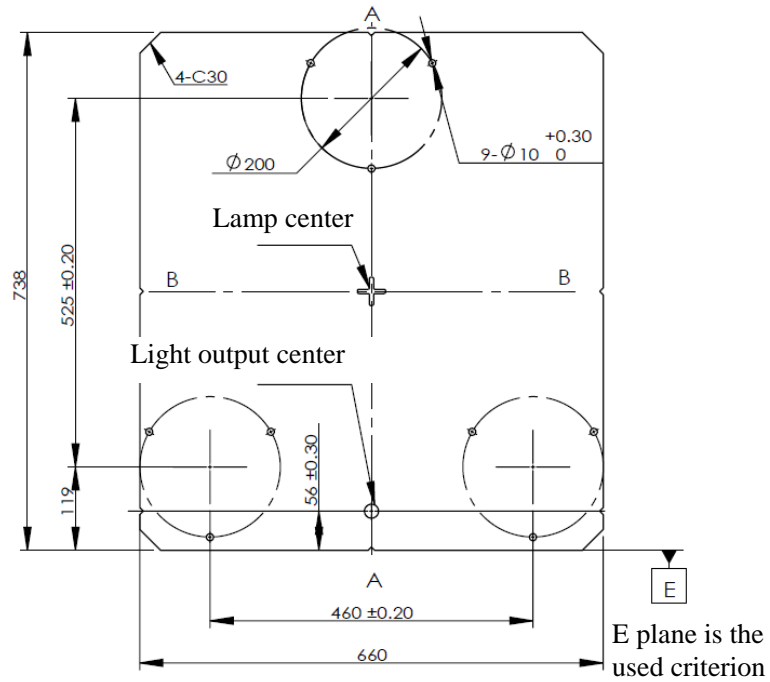


Figure 3-10 installation plate of installation method P

When it is impracticable to embed the foundation blot in the cement foundation, the stainless steel expansion bolt may be used, with the bolt dimension of no less than M10×120. When the expansion bolt is installed, it is first positioned with the installation plate. After  $\Phi 10$  central hole is drilled, remove the installation plate, expand the hole to  $\Phi 14$  and load the stainless steel expansion bolt into it.

The manufacturer does not recommend the use of expansion bolt fixation. Although this method is convenient for construction, if the construction is not in place, there is a risk of loose fixation.



- The fixation method with the expansion bolt shall be avoided.
- ※ The fixation with the expansion bolt is unreliable, which may be loosened in case of operation for a long time.



- The stainless steel products shall be used for embedding the foundation bolt or expansion bolt.
- ※ The airport environment is harsh and thus the iron products may be easily corroded, resulting in fixation loose.

### 3.3.2 Installation of Legs

First, put three flanges into the embedded foundation bolt and fix them with nuts.

According to the height design requirements of PAPI and on-site actual situation, determine the length of the extension pole of the PAPI lighting fixtures. Please note that the lengths of the extension pole of four lighting fixtures are inconsistent. The length of each extension pole shall be carefully calculated. An aluminum alloy cutter is used to cut the remaining part of the end without thread, see as figure 3-9.

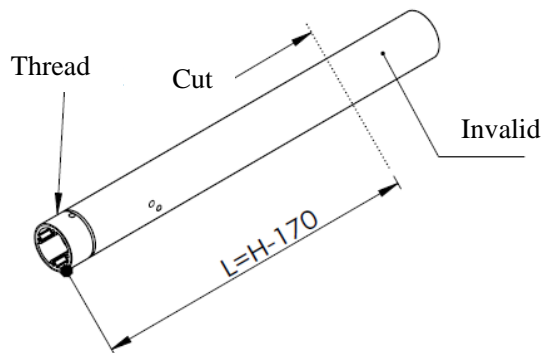


Figure 3-11

Calculation method of leg:  $L=H-170$  (unit: mm)

$L$ = length after adjustment of the leg and  $H$ = designed height of the PAPI beam



- A special aluminum alloy cutter must be used when cutting the extension pole.
- ※ The inferior causes burr on the cutting surface, resulting in difficulty to subsequently install the front cover.



- Please reconfirm it when cutting partial length on the upper part of the landing leg.
- ※ Casual cutting may cause leg too short.

Screw three landing legs with determined length into the flange and tighten them to ensure that they are vertical and tightened. Place the end cover on the extension pole and fix it with four tapping screws, make sure to tighten them in place. See as figure 3-12, step 1.

Screw the adjusting screw with nut into the end cover thread on the extension pole. Please note that the adjusting screw protrudes about 190mm from the landing leg and tighten the M16 hex nuts of the end cover of the landing leg and lower end of the screw to make it fixed. See as figure 3-12, step 2.

Take out the first half spherical washer and nut on three adjusting screws, place the spherical washer and nut on the screw in the middle of the adjusting screw (about 100mm height), see as figure 3-12, step 3. Thus there will enough space when the unified height of 4 PAPI boxes is adjusted.

Load the lighting fixture box into the screw. Re-screw the first half spherical washer and nut into the adjusting screw.

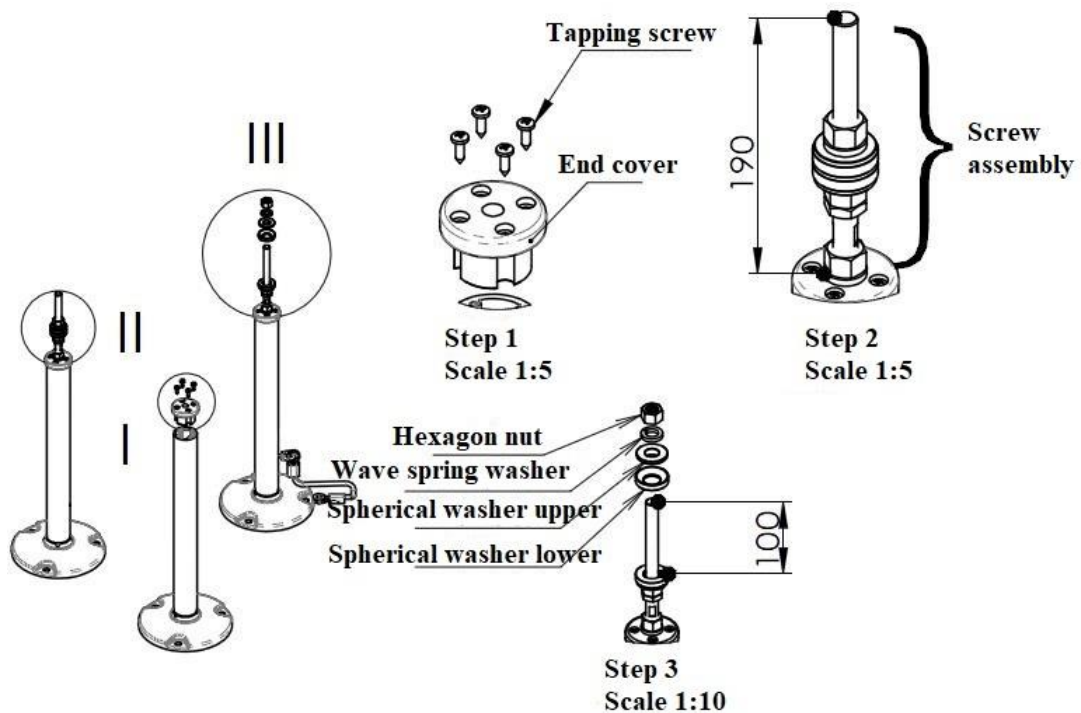


Figure 3-12

### 3.3.3 Same Height Setting of Lighting Fixtures

When the PAPI lighting fixture system is installed, it must be ensured that the beam centers of four luminous units are on the same level while ensuring that the height of the beam center of the PAPI system meets the design requirements.

There is a gap in front of the upper cover of the PAPI lighting fixture box, which is on the same level with the beam center (see Figure 3-7). The height of this gap from the ground is the same with that of the beam center of the lighting fixture. During construction, this gap is used as a standard measuring point to adjust the height of all light boxes.

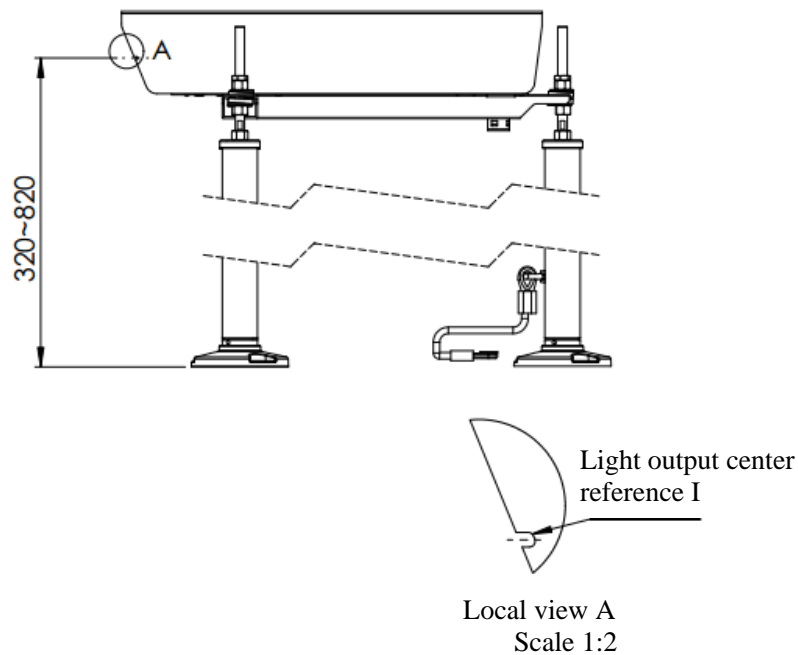


Figure 3-13

A central datum line with the beam height meeting the design requirements in front of all lighting fixture boxes of the PAPI system. Unscrew M16 hex nut and hex thin nut M16 under the stay (see Figure 3-14). Adjust the upper and lower positions of these nuts (see Figure 3-14) to make the central indicating gap or hole (see Figure 3-13) in front of 4 lighting fixture boxes to be aligned with the standard level.

On this basis, continuously adjust M16 hex nuts on both sides of PAPI slightly

(see Figure 3-8) to make the bubble of the horizontal bubble level indicators of all lighting fixtures in the middle.

If PAPI box is always basically in a horizontal state, the height adjustment of PAPI can be more accurate.

By adjusting the M16 hexagon nut behind PAPI, the elevation angle of PAPI can be adjusted.

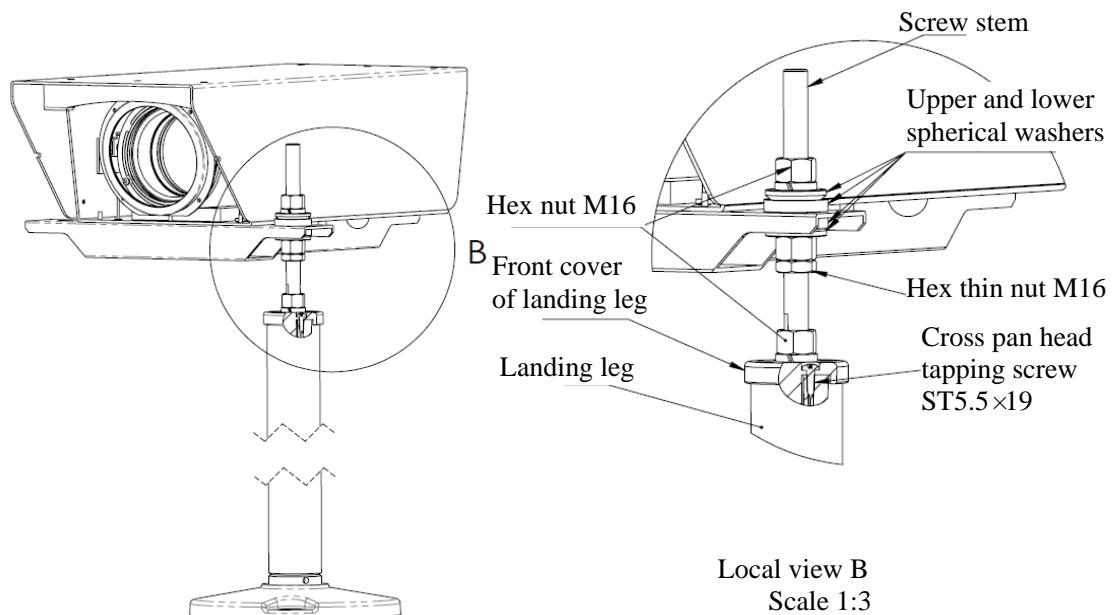


Figure 3-14

The height error of the beam center (lens center) of all lighting fixtures adjusted is not greater than  $\pm 2.5\text{cm}$ .

	<ul style="list-style-type: none"> <li>■ Making sure that the screw is naturally threaded to the center of the stay screw hole under the box</li> <li>※ Loading the screw with brute force may break the frangible part.</li> </ul>
--	---

	<ul style="list-style-type: none"> <li>■ When the screw is inserted into the box, the thread on the screw shall not be scratched</li> <li>※ Damage of the thread impacts the angle adjustment of PAPI.</li> </ul>
--	---



- Unless it is necessary, keep the upper cover in a closed state during installation
- ※ The on-site dust may impact the optical system in PAPI.



- Touching the optical components with naked or dirty hands is strictly prohibited
- ※ Otherwise it may impact the luminous accuracy of PAPI.



### 3.3.4 System matched power/communication cable selection

Communication Cable:

In order to avoid impacts of the external interference, the cable used to transmit data must be twisted pair with shielding layer and the shielding layer shall be connected to the reference ground.

It is recommended to use double shielded cables,  
model ASTP-120Ω 2×2×2mm<sup>2</sup> or 2×2×4mm<sup>2</sup>.

Double shielded soft core twisted pair copper wire has less attenuation to the communication signal.

Notes: 2 x 2 x 4 represents two groups of 4 mm<sup>2</sup>(two pairs of twisted pairs); 1 represents one 1mm<sup>2</sup>auxiliary grounding.

Figure 3-15 and 3-16 respectively list the CAN cable analysis and connection line demonstration with single / double shielded layer.

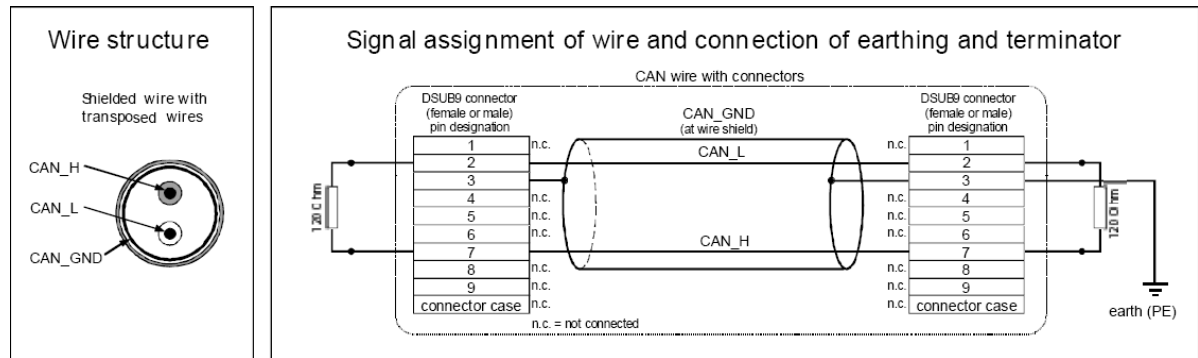


Figure 3-15 Analysis and Connection of CAN Cable with Single Shielded Layer

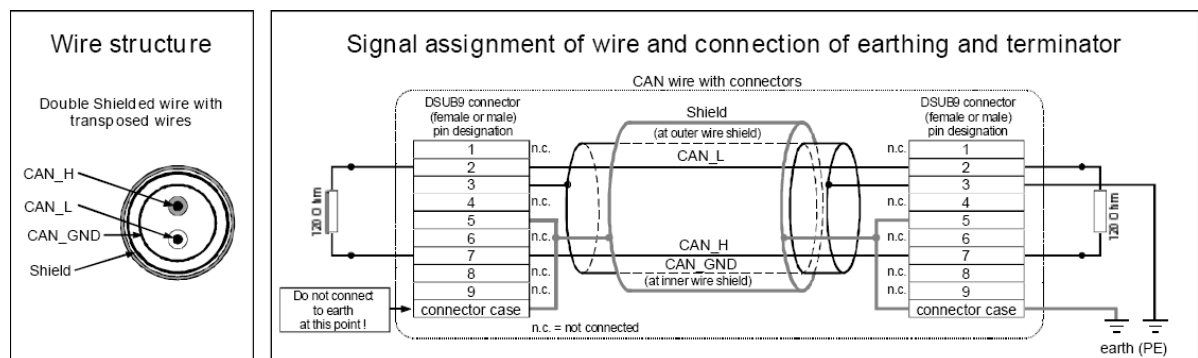



Figure 3-16 Analysis and Connection of CAN Cable with Double Shielded Layers

Serial No.	Description Rules
1	There must be two terminal resistances of $118\Omega < RT < 130\Omega$ at both network ends (between signals CAN_L and CAN_H)!
2	The reference potential “CAN_GND” is connected to the ground (PE) at a certain point. There must be one-point grounding!
3	When the cable with double shielded layers, the external shielded layer is connected to the ground at a certain point. There must be one-point grounding!
4	The unused branch must be short as much as possible (its length is shorter than 0.3m)!
5	Use the appropriate cable type! The cable voltage attenuation must be confirmed!
6	Do not lay the CAN bus near the interference source. If it has to be done so, the cable with double shielded layers is suggested.

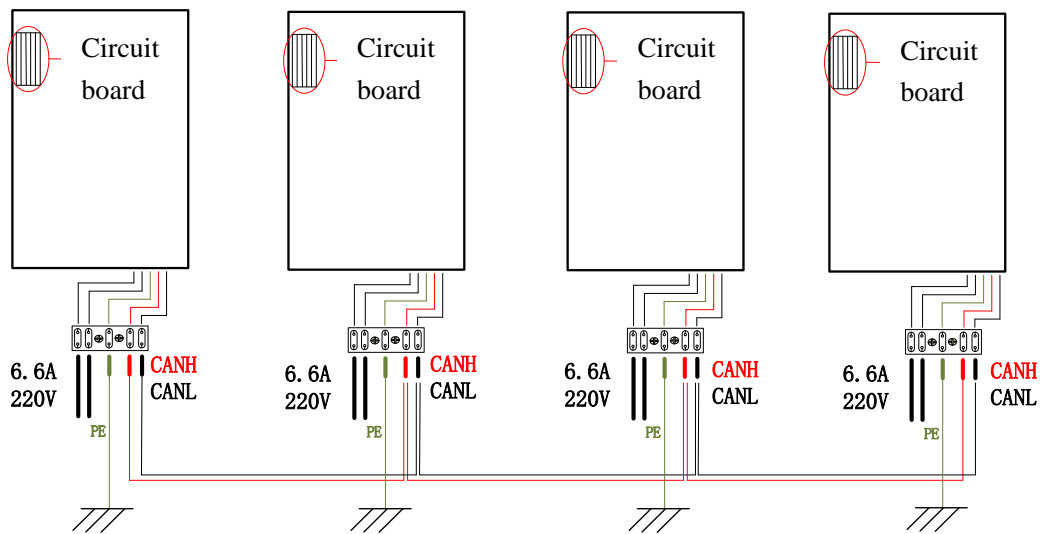
Figure 3-17 Connection Rules for CAN-bus Network



- The communication cable must use shielded wire.
- ※ Unshielded wire may cause poor communication due to the presence of inductive current.

### 3.3.5 Electrical Wiring of Lighting Fixtures

PAPI system is consisted of four lighting units. The control between the units is realized by bus. The red bus is positive, and the black bus is negative. It must not be reversed.



Overall Wiring Diagram of PAPI-LED



- All wires connected to the terminal block shall be crimped with terminals.
- ※ Looseness may burn the wiring base.

If PAPI is with remote monitoring mode (PAPI-LED-R), the corresponding installation mode is shown in the following figure:

It is recommended that to configure PAPI with monitoring module to ensure the maximum operation safety of the system.

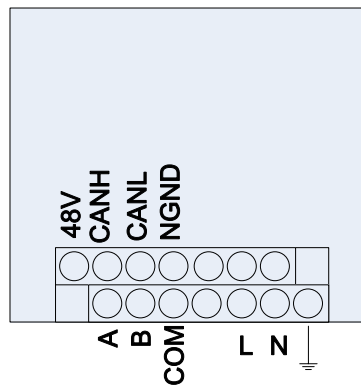
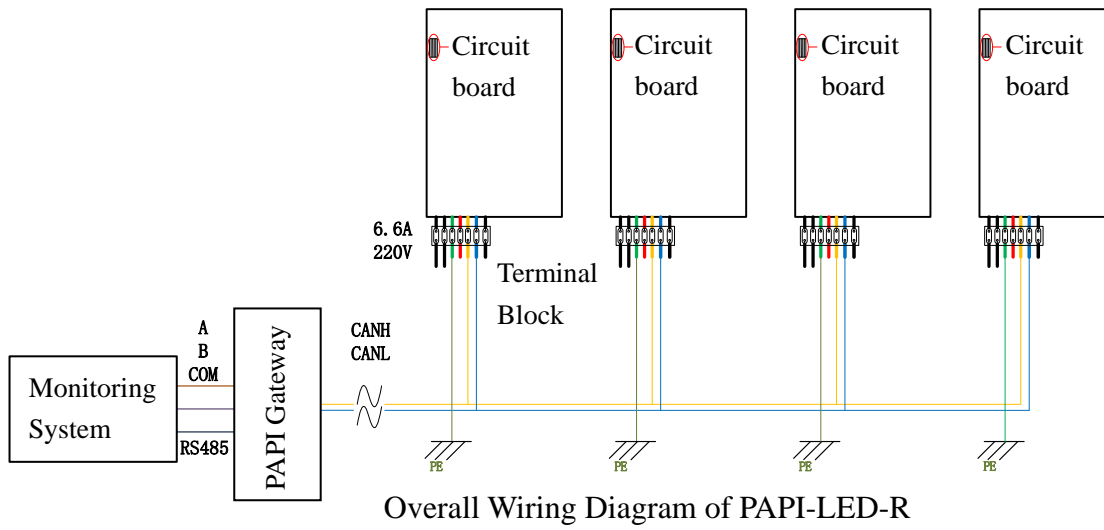
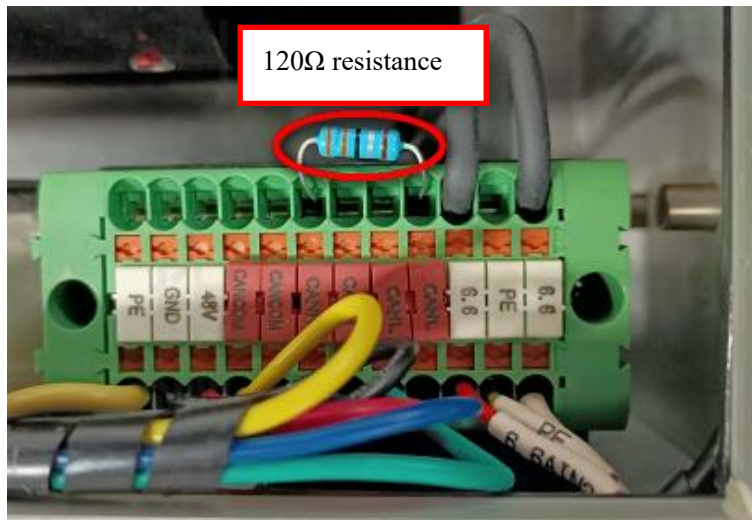


Diagram of PAPI Gateway Terminal

Connect CAN bus and gateway correctly.

The address knob of the circuit board starts from 1, ends with 4.

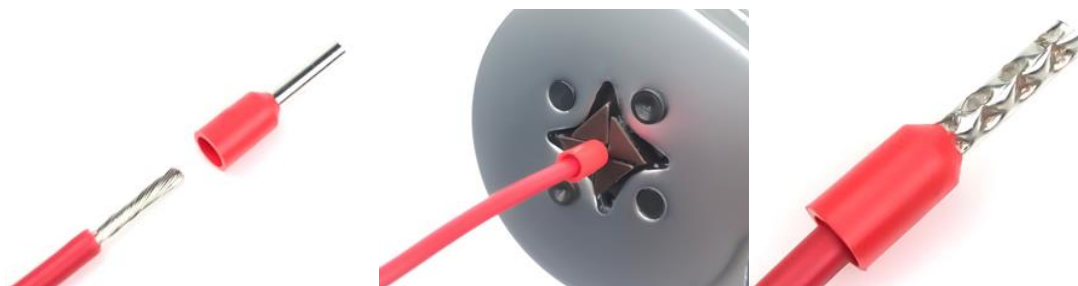
For the PAPI unit farthest from the gateway, a 120  $\Omega$  resistor shall be connected in parallel between CANH and CANL on its wiring block.



Wiring requirements:

The maximum cable applicable to the terminal block is  $4\text{mm}^2$ , and the recommended cable is  $2\text{mm}^2$ .

Insert the cable into the copper pipe, crimp the copper pipe according to the following steps, and then insert it into the socket of the wiring block.



1. Prepare the copper tube and peel off the cable skin by 5-10mm.
2. Insert one end of the stripped wire into the copper pipe and crimp it.
3. After the crimping is completed, confirm that it is firm, and the effect is as shown in the figure.
4. Insert the terminal into the socket of the terminal block with a slotted screwdriver PH3.5, press down the orange switch and then insert the terminal. After insertion, ensure that the cable is not loose and the wiring is firmly fixed. If the cable comes out, repeat step 4.



- CAN connection shall be reliably wired in strict accordance with the instructions of the wiring block.
- ※ Any wiring problems may cause abnormal work of the system.



- Making sure that all wiring is firm and reliable.
- ※ High current during operation may burn out the connector.



- Ensure that the input power supply is constant AC of 6.6A.
- The communication buses of all lighting fixtures are connected in parallel and reverse wiring is prohibited.
- ※ Otherwise it may damage the circuit.

### 3.3.6 Adjustment and Setting of Lighting Fixture Elevation

Four PAPI units placed on site have different elevations respectively. Therefore, elevation setting is an important step for installing the PAPI lighting fixture units. The correct elevation ensures that the PAPI system works. According to the provisions, the unit with the greatest elevation in the PAPI system shall be at the position close to the runway and that with the lowest elevation in the PAPI system shall be on the most outside which is the farthest from the runway.

The elevation angle of PAPI is adjustable from 2 ° to 8 ° with accurate positioning.

When leaving the factory, PAPI lighting fixtures are set to “Calibrate Flight” and the elevation may be directly adjusted.

Gently unscrew two M16 hex nuts in the left and right on the PAPI stay (see Section 3.3.2 and figure 3-18). Adjust the vertical height of the M16 hex nut under the screw stay of the rear extension pole of the lighting fixtures (see Section 3.3.2 and figure 3-18) and observe the lighting fixture elevation angle (figure 3-19) changing displayed by the digital tube on the control panel until such angle is equal to the design elevation.

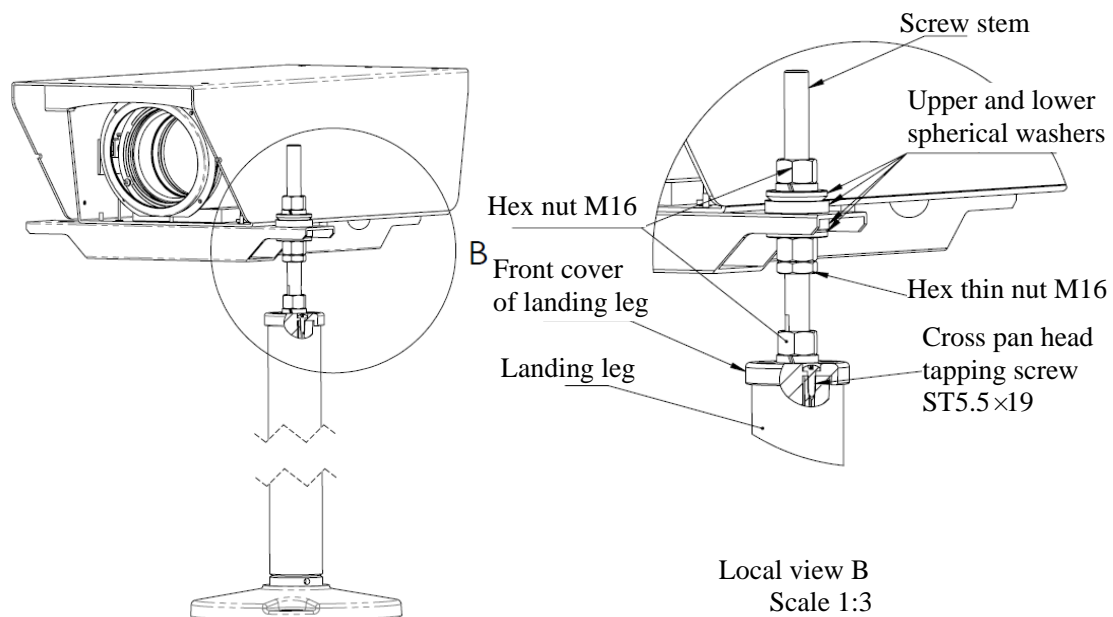


Figure 3-18



Figure 3-19

Because the elevation display by the digital tube on the control panel is a decimal degree, while the designed elevation is often a degree of degree-minute system, the fractional part of the designed elevation shall be converted into the decimal degree value prior to adjustment. The decimal degree value may be obtained by dividing the fractional value with 60, or the conversion may be performed according to the conversion table in Chapter 8.0. Assume that the design elevation is  $2^{\circ}32'$ , first convert the fractional value  $32'$  into a decimal degree value  $0.53^{\circ}$  (namely, first convert  $2^{\circ}32'$  into  $2.53^{\circ}$ ), then make an adjustment until the digital tube displays  $2.53^{\circ}$ .

Due to mutual impacts of the horizontal level and longitudinal angle, the slight adjustment of the horizontal level indicator and longitudinal elevation must be made alternately and repetitively. M16 hex nuts are finally used for locking (see section 3.3.3).



Figure 3-20



Repeat the above-mentioned steps until the elevation setting of four PAPIs is completed.

After adjustment and setting of 4 lighting fixtures are completed, the on-site installation of the PAPI system is basically completed.

Reconfirm whether the bubble of the level angle instrument is in the middle and the angle displayed by the digital tube is equal to the designed elevation.

Reconfirm whether all screws of PAPI are tightened and reliable.



- Elevation is the most important parameter of PAPI, which shall be accurate.
- ※ Incorrect elevation may impact safe landing of the aircraft.

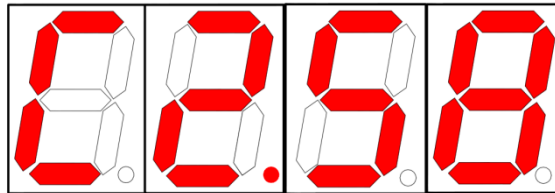
## 4.0 Flight Calibration Inspection and Adjustment of Lighting

### Fixtures

Before the PAPI system is formally put into use, flight calibration must be performed.

The airport may independently perform the flight calibration for the PAPI system, or arrange it with that of the airport runway at the same time.

During flight calibration, making sure that the electrical control of all lighting fixture units is in “Calibrate Flight”. If not, click button SW1 on the control panel to make the display of the digital tube shown in Figure below:



Display under “Calibrate Flight”

When the system is in “Calibrate Flight”, if the elevation exceeds the limited deviation or the lamp of the light box of certain unit is damaged during flight calibration, the system will not turn off the lamp to cause failure of flight calibration.



- After flight calibration, all lighting fixtures must be switched to “Operation”
- ※ During operation, the system will not turn off the light

During flight calibration, the ground coordination personnel must be experienced, who shall properly adjust the lighting fixture elevation through slightly adjusting M16 nut under the stay behind the box according to the instructions of the flight calibration pilot.

Because all light boxes of PAPI have been set to the design elevation prior to flight calibration, the elevation adjustment must be fine during flight calibration if any.



- During flight calibration, adjustment of the M16 nut must be very slight.
- ※ Casual amplitude adjustment may cause repetitive work.

The flight calibration of PAPI is usually completed once. If the pilot thinks it is necessary, the secondary flight may be performed.

After all the requirements are met, lock M16 nuts on the rear stay of four light boxes.

Now, the flight calibration of the PAPI system is completed.

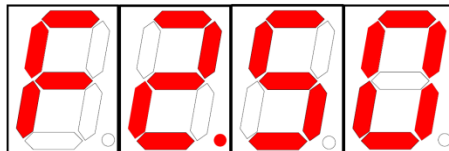
## 4.1 Disposal after Flight Calibration

After flight calibration, the correct elevations of all lighting fixtures obtained through flight calibration must be recorded and archived for maintenance reference in the future. Except production of various documents specified by the airport management authority and flight calibration procedures, this PAPI system provides the following storage.

### (1) Angle storage in electrical system

This PAPI system requires that the user must store the angle confirmed after flight calibration into the PAPI unit, based on which the system may control the PAPI system.

Continuously press the button for longer than 5S and the digital tube displays “F” as shown in figure below:





Display under “Calibrate Flight”

After “F” appears, release the button. The unit recovers back to its original state. Now, the current angle value has been stored into the controller chip.

After the angle is stored, release the button, the digital tube recovers its display: “C+ current elevation value”, namely, “Calibrate Flight”. Repress the button to make the mode to be switch to “Operation” and the digital tube will alternately display “A+ current elevation value” and “F+ Memory Angle of flight calibration”.


With the same method, adjust and set other lighting fixtures in the PAPI system and finally confirm that all lighting fixtures are in “Operation”.

	<ul style="list-style-type: none"> <li>■ After flight calibration, all lighting fixtures must be switched to “Operation”</li> <li>※ During operation, the system will not turn off the light</li> </ul>
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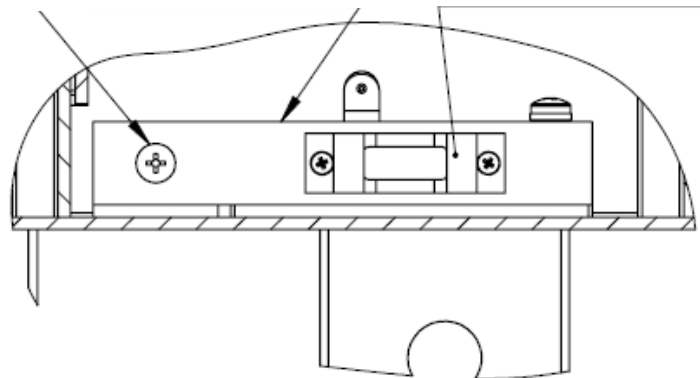
	<ul style="list-style-type: none"> <li>■ After the angle confirmed through flight calibration is stored, repressing the button for longer than 5s is prohibited</li> <li>※ Otherwise the elevation stored in the chip confirmed through flight calibration will be removed.</li> </ul>
---	--

(2) Memory through longitudinal level indicator

Unscrew the adjusting screw in Figure below and the rack will rotate along the spindle to make the bubble in the longitudinal level indicator locate in the middle of the scale.

	<ul style="list-style-type: none"> <li>■ The elevation indicator must be set according to the requirements.</li> <li>※ When the control panel is out of order, the bubble may prompt whether the PAPI elevation is correct or not.</li> </ul>
---	---

Adjusting screw      Longitudinal indicator rack      Longitudinal level indicator



(3) Label recording

A blank label is pasted on the longitudinal indicator rack of the PAPI lighting fixtures for recording the angle after actual flight calibration of the PAPI unit. After flight calibration, the actual elevation of the lighting fixtures could be recorded on the label paper posted on the longitudinal indicator rack with an oily marking pen for reference.



- Check whether all fastening screws on the PAPI unit have been tightened.
- ※ Otherwise it may cause failure of the PAPI system.



- Check whether all 4 PAPI units are in “Operation”
- ※ Otherwise PAPI may not work normally.



- Make sure to check whether the safety buckles at the rear end of the upper cover of the PAPI is firmly tightened.
- ※ Otherwise upper cover may be overturned by strong wind.



- The angle after calibration must be recorded.
- ※ Otherwise it may cause PAPI elevation to lose reference.

## 5.0 Replacement of Components of Lighting Fixtures

When any damage or failure occurs to any consumable or other component of the lighting fixtures, it is required to timely dismantle the lighting fixtures for replacement of the component. Replacement of components needs to dismount the lighting fixtures, so any minor error will cause adverse consequences. The manufacturer requires users to attach importance to the following warnings. It is required to be careful during disassembly, to conduct comprehensive inspection of lighting fixtures, to replace some vulnerable parts as required, conduct the air seal test and to ensure the performance of the lighting fixtures after disassembly.



- Take care when opening and closing the upper cover of the lighting fixtures.
- ※ Otherwise it may hurt your hands or be damaged due to drop.



- Maintenance of the lighting fixtures on the rainy day is prohibited without rain-proof measures.
- ※ Otherwise it may damage the circuit and optical parts.



- Touching any internal optical device is prohibited.
- ※ The position change or surface contamination of the optical device may cause change of the light path.



- Handling the internal electrical device is prohibited without authorization.
- ※ Otherwise it may cause damaged to the circuit.

## 5.1 How to Replace Light Source Assembly

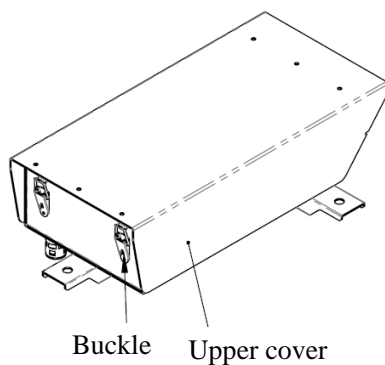
If the LED chips in a PAPI fails to work and the light output is lower than normal brightness level during daily inspection and maintenance, the user shall immediately replace the light source.

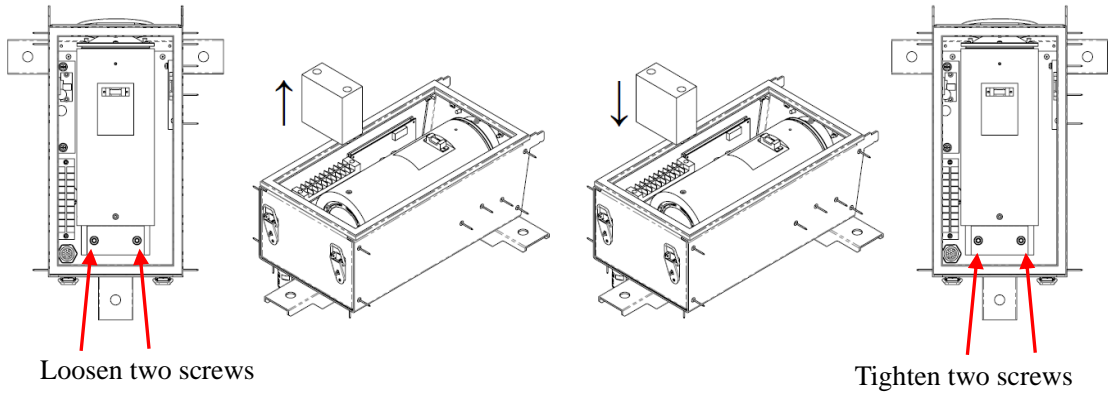
Before replacing the light source, turn off the power supply of the relevant circuit. When replacing the light source, please do not touch the optical lens.

Open the upper cover of PAPI, pull out the light source connector from the control board, loosen the two screws that fix the heat dissipation block of the light source; take out the heat dissipation block of the light source (including the LED light source); put the new heat dissipation block of the light source (including the light source) into the box, align it with the pin, and tighten the two screws; after the light source wire is sorted in the box, insert the light source connector into the corresponding plug of the control board.

After light source replacement, power on again. After powered on, the PAPI control panel will re-inspect the whole system and light up all the light sources.

If the service life of the lamp expires, the manufacturer suggests to replace 12 lamps on four units to ensure the reliability of the PAPI system.





- During installation, making sure that the power supply is disconnected.
- ※ Otherwise it may cause electric leakage or shock.



- Touching the optical lens directly without gloves is strictly prohibited.
- ※ Otherwise it may damage the lens film.



## 5.2 How to Replace Main Control Board

Before replacing the control board, make sure that the power supply is off.

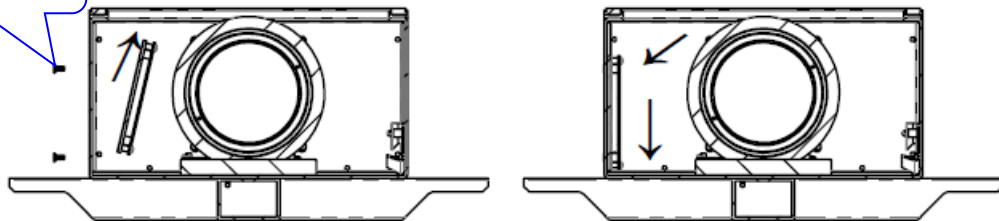


- Turn off the power before replacing the control board.
- ※ If the isolation transformer is open circuit, electric shock may occur.

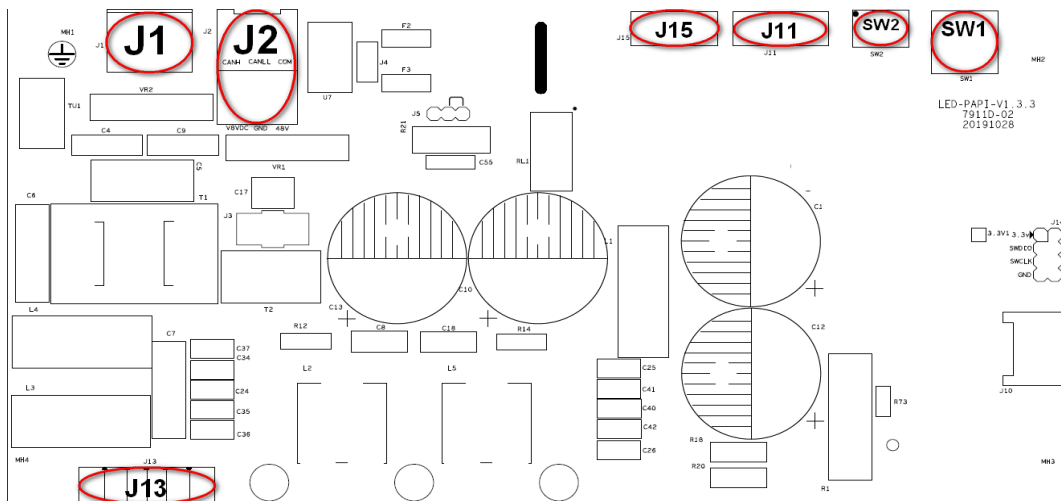
First unplug all the connectors on the main drive board, and then loosen 4 fixing screws from the side; Tilt the circuit board and take it out of the box;

Put the new main drive plate into the box obliquely and lock the four screws;

Loosen 4 screws



After the main drive board is installed, insert the connectors in turn and power on. Ensure that PAPI can operate normally, and the installation of main drive board is completed.





- During installation, make sure that the power supply is disconnected.
- ※ Otherwise it may cause electric leakage or shock.

### 5.3 How to Replace Digital Display Panel

Before replacing the digital display panel, confirm and record the current accurate angle. If the "storage angle" cannot be read on the panel, it can be obtained on the longitudinal level indicator device.

You can also check the recorded values in the light station.



- Turn off the power before replacing the digital display panel.
- ※ Plug and unplug action may cause abnormal function of digital display panel.

First unplug the 5-position connector on the digital display board, and loosen 3 fixing screws from the top; Take out the circuit board from the box.

Put the new digital display board into the box and lock the three screws.



After the digital display panel is installed, carry out the following operations:

1. Plug in the 5-position connectors in turn and power on.
2. After the digital tube displays, switch SW2 to "9", and long press SW1 to

enter "factory setting state".

3. After the digital tube displays "0.00", press SW1 continuously, and the angle will increase by 0.01 ° for each press.
4. Long press SW1 for more than 1 second, and the angle will increase at the speed of 0.2 ° / s.
5. When the angle is close to the recording angle, release SW1, and gradually increase the angle of the four digit digital tube by clicking SW1.
6. When the angle reaches the set value, switch SW2 to "0" to return to "user set state".

The installation of control board is finished.

When pressing SW1, the angle will only increase. Therefore, when setting the angle, if the angle value has exceeded the set value, you can continue to press and hold the button, and when the angle exceeds 9.99 °, it will start counting from 0.00 degrees again; in addition, you can re-enter the "factory setting state", so that the angle can also return to zero.

When returning from "factory setting state" to "user setting state", the setting angle has been stored by default, so it is unnecessary to long press SW1 to save.



- During installation, ensure that the power supply is off.
- ※ It may cause electric leakage or electric shock accidents



- After flight calibration, all lighting fixtures must be switched to "operation mode".
- ※ Otherwise the system will not turn off the lighting fixtures.

## 5.4 Replace Terminal Block

If the connector is burnt out due to failure, replace it according to the following steps.

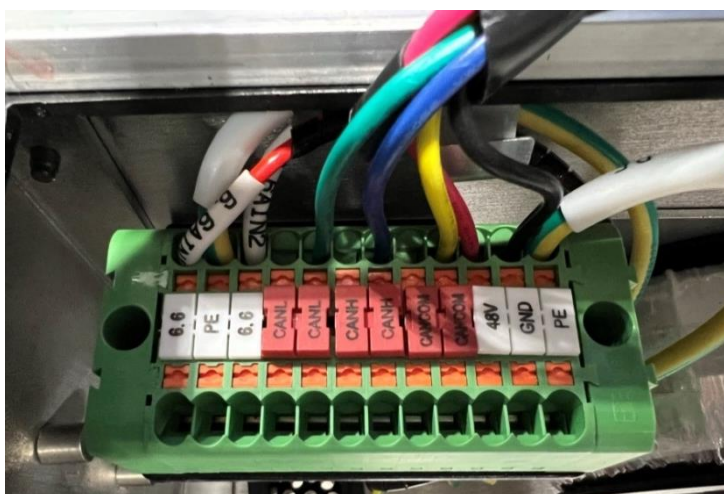
1. Use a slotted screwdriver 3.5 × 100, press the orange switch and pull all cable terminals out of the terminal block.

2. Unscrew the two fixing screws in the red circle from the top and remove the old terminal block from the box.



3. Put the new terminal block into the box and lock the two screws.

4. As shown in the figure, re connect all cables according to the wiring requirements in Chapter 3.3.5 of this manual. Please match the label on the cable with the label on the terminal strip one by one.



## 6.0 Maintenance of Precision Approach Path Indicator

### 6.1 Daily Inspection and Maintenance

Maintenance of the lighting fixtures shall comply with the “Airport Maintenance Practice” of Section 9 of ICAO’s Airport Service Manual and FAA’s AC150/5345-26 Maintenance of Visual Nav aids at Airport. Because the PAPI system is a very precision optical system, the daily maintenance must be performed by the professional.

#### 6.1.1 Daily Inspection and Maintenance Items

The daily inspection system and correct maintenance method are very crucial to normal operation of the PAPI system. We suggest the follow items for the user to refer during actual maintenance. We do not make rigid regulations on the frequency of daily inspection and maintenance. Users can decide according to the on-site situation of the airport.

1. Lamp inspection. Visually check whether the LED particles are damaged: Take a piece of white paper in front of the lamp to find the focus of the optical structure, and observe the light source particles at the focus
2. Elevation inspection. Facing PAPI, you may observe the "current angle" of the 4-digit digital tube through the observation window. If necessary, the upper cover of PAPI can be opened to visually check whether the bubbles of horizontal and longitudinal horizontal indicators are in the middle



Angle display

Horizontal level indicator

Vertical level indicator



- Make sure that the light intensity of PAPI and the boundary between red and white is clear
- ※ Otherwise it may cause incorrect judgment of the pilot.

3. Inspection of PAPI fixation. Check that all the adjusting nuts on the landing leg are locked and the chassis connection is reliable. The PAPI box may be pushed with hands to check if it shakes or not.

4. Airtightness inspection. Visually check that there is no water spot, trace or sand in the box.

5. Environmental inspection. Visually check that there is no weed or other barrier shading the light in the luminous direction of PAPI.

6. Inspection of optical components. Visually check that the optical components are not damaged, the front glass is not corroded by the wind or sand and there is no burr. If necessary, clean the optical parts such as front and rear lens.

7. Check whether the switching between operation mode and flight calibration mode is normal, and confirm that the communication between control board and display board is normal.

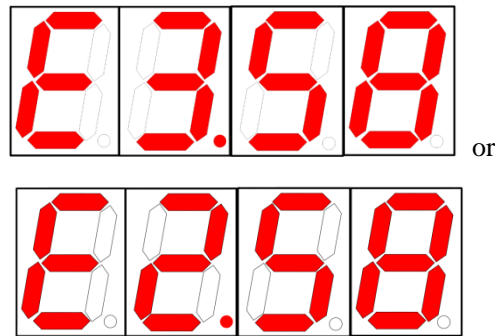
8. Check whether the address is set correctly.



- The lens and front glass, etc. shall be cleaned by the optical professional.
- ※ Stain on the optical device may reduce the light output, or even impact the red and white interface.

## 6.1.2 Troubleshooting of Common Error of Control Board

Under “Operation”, when the elevation of any unit in the PAPI system is greater than the set limit or all lamps are damaged, this unit will enter “Error” and the digital tube will display the “E+ decimal system value of the current elevation”, as shown in figure below:



Displays under two “Error”

PAPI unit control board will have “Error” in the following two cases and the determination methods and solutions are as follows.

(1) The elevation deviation is beyond the set limit.

After 20s, the control board will turn off the light of the unit with over-deviation and transmit the signal to other PAPI units through the BUS, make the whole PAPI system to turn off the light and the monitoring module alarms.

Determination method: For the PAPI unit with “error state” in the system, if the longitudinal bubble observed is not in the middle and there is a big difference between the stored angle and real angle, it may be determined that the cause of light turnoff is that “the elevation deviation is beyond the set limit”. When the abnormal unit is switched to “Calibrate Flight”, all system lights may light up, such cause may be further determined.

Solution: Make the faulty unit enters “Calibrate Flight” and reset its elevation according to the operation requirements in 3.3.4.

(2) Damaged light source

Under “Operation”, when the light source in any unit of the PAPI system is damaged, the digital tube of the unit with damaged lamps will enter “Error Mode”, and transmit the signal to other PAPI units through the BUS, make the whole PAPI system to turn off the light and the monitoring module alarms.

Determination method: For the PAPI unit with “Error” in the system, if the longitudinal bubble observed is in the middle and there is no big difference between the stored angle and real angle, it may be determined that the cause of light turnoff is that “light sources are damaged”.

Solution: Switch this unit to “Calibrate Flight” and lamps of this damaged unit do not light up. After powering off, replace the damaged lamps according to the operation requirements in Section 5.1 “How to Replace Light Source Assembly”.



- During installation, make sure that the power supply is disconnected.
- ※ Otherwise it may cause electric leakage or shock.



- After maintenance, PAPI shall be switched to “Operation Mode”.
- ※ Otherwise the system will not work normally.



### 6.1.3 Inspection Method of Elevation

Visually inspect the angle displayed by the digital tube on the control panel to confirm that the displayed angle is within the allowable deviation range of the elevation of this lighting fixture. At this moment, bubbles of the horizontal and vertical level indicator systems shall be in the middle. As the digital display is an electronic product, if any slight changes due to season change or temperature difference between day and night, it is normal, which may be neglected and may not affect the normal operation of the system. If the deviation of elevation angle exceeds the allowable value, first observe whether the longitudinal and horizontal blisters are centered. If the deviation from the center position is large, the elevation angle of the lamp shall be reset according to the operation requirements of section 3.3.6 “Adjustment and Setting of Lighting Fixture Elevation”.

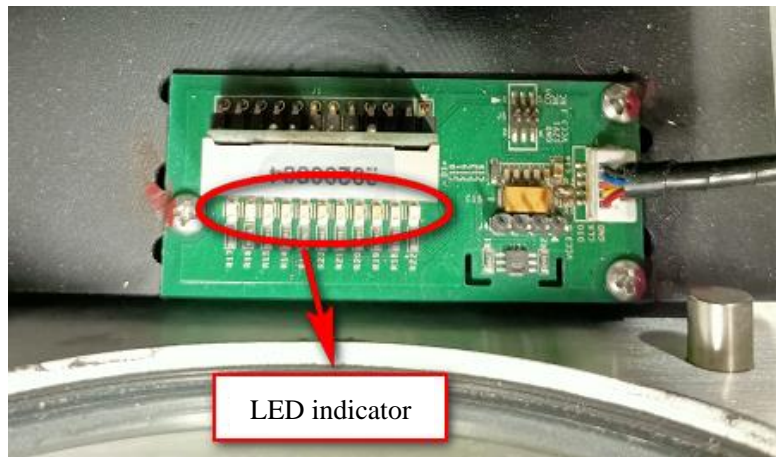


- The PAPA elevation must be adjusted by a professional.
- ※ Otherwise it may cause loss of standard of the PAPI elevation.

### 6.1.4 Inspection Method of Transverse Horizontal Angle

The digital display tube in PAPI only displays the longitudinal horizontal angle, and the transverse horizontal angle is generally simply identified and verified by only one blister. It is necessary to open the upper cover of the lamp, and the process is cumbersome.

Our PAPI has been technically upgraded. It can simply identify the transverse horizontal angle through the LED indicator on the digital display board and distinguish the slight angle within  $\pm 0.5^\circ$ .



The diagram between the color of LED indicator and the corresponding transverse horizontal angle is as follows (the above figure is from left to right in turn):

Color of LED indicator	RED	ORANGE	GREEN	GREEN	GREEN	BLUE	GREEN	GREEN	GREEN	ORANGE	RED
transverse horizontal angle (°)	-	-	-	-	-	±	+	+	+	+	+
	0.5	0.4	0.3	0.2	0.1	0.05	0.1	0.2	0.3	0.4	0.5

When the transverse horizontal angle is within  $\pm 0.05^\circ$ , the indicator displays as follows:



When the transverse horizontal angle is within  $\pm 0.2-3^\circ$ , the indicator displays as follows:



When the transverse horizontal angle exceeds  $\pm 0.4^\circ$ , the indicator displays as follows:



The on and off of the transverse horizontal angle indicator is identified and controlled by the angle sensor. As the angle sensor is an electronic product, if the seasonal change or the temperature difference between day and night is huge, it may cause slight changes in the on and off of the indicator, which is a normal phenomenon and can be ignored, which will not affect the normal operation of the system. If the transverse horizontal angle exceeds  $\pm 0.4^\circ$ , first observe whether the longitudinal and transverse blisters are centered. If the deviation from the center position is large, the elevation of the lamp shall be reset according to the operation requirements of section 3.3.6 "Adjustment and Setting of Lighting Fixture Elevation".



- The PAPA elevation must be adjusted by a professional.
- ※ Otherwise it may cause loss of standard of the PAPI elevation.

## 6.2 Troubleshooting of Common Faults

SN	Common Faults	Fault Causes	Troubleshooting Methods
1	The lamp does not light up.	<ol style="list-style-type: none"> <li>1. Light source damage</li> <li>2. Wrong wire connection Loose wire connector of light source CAN bus off Abnormal CAN bus address</li> <li>3. Damage of Type 066 PAPI isolation transformer</li> <li>4. Damage of Type 220 PAPI switch power supply</li> <li>5. Control board damage</li> <li>6. Elevation deviation greater than the set value.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the lamp</li> <li>2. Correctly and reliably connect the circuit</li> <li>3. Replace isolation transformer</li> <li>4. Replace switch power supply</li> <li>5. Replace control board</li> <li>6. Recover the elevation value of the lighting fixtures.</li> </ol>
2	The light is dim.	<p>Check whether the lamp reaches its expected life</p> <p>Check whether the lamp is burnt out</p> <p>Check whether the optical path is dirty.</p>	<p>Replace the lamp</p> <p>Replace the lamp</p> <p>Clean the optical components.</p>
3	Light intensity of type 220 PAPI can't be switched	<p>The optical control hole of type 220 PAPI is blocked by foreign matter</p> <p>The optical control module of 220 PAPI is damaged.</p>	<p>Clean the foreign matter</p> <p>Replace the optical control module.</p>

## 7.0 List of Components and Ordering of Spare Parts and Accessories

The list of parts of this product and relevant ordering information of the spare parts and accessories are shown in the Table of this Chapter. The manufacturer accepts to order in a manner of component or separate ordering of the parts. When ordering, please contact the manufacturer or deal according to the ordering No. listed in the Table. The manufacturer recommends to purchase some key parts from the original manufacturer to ensures all indexes of the lighting fixtures.

List of components and spare articles of upper box:

Structure No.	Component Name	Order No.	Remarks
1	Upper cover plate assembly	94661A	Upper cover assembly plate 575x246
3	Horizontal level indicator	ZJ4-4814	
4	Digital display board	7911L	
5	Longitudinal level module	946315	
6	Refrigeration module	94661R	
7	Seal ring	46391	
8	Glass seal ring	41185	
9	Front glass	31149	
10	Box assembly	4661B	
11	Driver	7911D	
12	Hose connector	036717	
13	Transformer	7912S	
14	Hasp	5102B	
15	Bracket	4661S	Terminal bracket
16	Terminal block	48522	
17	Light source assembly	979247	
18	Light source holder	4640C	
19	Switch power supply	7914H	220V power supply
20	Optical control circuit board	7911N	220V power supply
21	Optical control module	97911N	220V power supply
22	A6 dual core plug	70620	Length of 2m

List of components and spare parts of landing leg assembly:

Structure No.	Component Name	Order No.	Remarks
1	Flange	276A1	
2	Landing leg	46322	
3	Front cover of landing leg	46317	
4	Tapping screw ST5.5	GB/T845	ST5.5×19
5	Spring washer 16	GB/T7244	
6	Screw stem	61101	
7	Hex nut M16	GB/T41	
8	Hex thin nut M16	GB/T6142	
9	Lower spherical washer	61103	
10	Upper spherical washer	61104	
11	Wave spring washer 16	GB/T7246	

List of spare articles to keep normal operation:

Structure No.	Component Name	Order No.	Remarks	Qty
1	Driver assembly	7911D	Control board	1
2	Transformer	7912S	Toroidal transformer	1
3	Digital display board	7911L	Angle display	1
4	Light source assembly	979247	LED light source 88x45 assembly	4
5	Optical control circuit board	7911N	220V power supply	1
6	Optical control module	97911N	220V power supply	1



- Make sure that the annual necessary spare parts are in stock
- ※ Make sure that the system works normally

List of supporting accessories of this product is as follows (needing additional order):

Serial No.	Order No.	Description
1	TJB-12	Isolation transformer box
2	ITF-100-066	100W isolation transformer
3	HT 70603	A6 dual core plug (assembly) (flat shape-high temperature)

## 8.0 Conversion Table

$$1^{\circ} = 60''$$

$$1'' = 0.016^{\circ}$$

Decimal degree	Minute
0.017	1
0.033	2
0.050	3
0.067	4
0.083	5
0.100	6
0.117	7
0.133	8
0.150	9
0.167	10
0.183	11
0.200	12
0.217	13
0.233	14
0.250	15
0.267	16
0.283	17
0.300	18
0.317	19
0.333	20

Decimal degree	Minute
0.350	21
0.367	22
0.383	23
0.400	24
0.417	25
0.433	26
0.450	27
0.467	28
0.483	29
0.500	30
0.517	31
0.533	32
0.550	33
0.567	34
0.583	35
0.600	36
0.617	37
0.633	38
0.650	39
0.667	40

Decimal degree	Minute
0.683	41
0.700	42
0.717	43
0.733	44
0.750	45
0.767	46
0.783	47
0.800	48
0.817	49
0.833	50
0.850	51
0.867	52
0.883	53
0.900	54
0.917	55
0.933	56
0.950	57
0.967	58
0.983	59
1.000	60



## **9.0 Packaging, Transportation and Storage**

### **9.1 Packaging and Weight**

Packaging of upper box: 1 pc / box

Gross weight of upper box: 35 KG / box

Volume of upper box: 780×580×280 mm<sup>3</sup>

Packaging of landing leg: 12 pcs / box (including flange)

Gross weight of landing leg: 40KG/ box (including flange)

Volume of landing leg: 835×540×290 mm<sup>3</sup>

### **9.2 Transportation Mode**

Well packed products may be transported in three modes- railway, highway and air according to factors such as transportation distance, quantity of lights and delivery cycle.

### **9.3 Storage**

This product shall be stored in a place which is dry, well ventilated and far away from heat source and has no caustic gas. Custody should be checked on a regular basis.

The final right to interpret this manual is reserved by Airsafe Airport Equipment Co., Ltd.

Thanks for your purchasing and using AIRSAFE product!

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