Bi-Directional Photometrical Airfield Calibration PAC^2 V5
Support, Installation, Operator's manual

User Manual

DM00009, Rev. A, 2020/03/17

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

ETL certification

The equipment listed as ETL certified means that the product complies with the essential requirements concerning safety and FAA Airfield regulations. The FAA directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

All Products Guarantee

ADB SAFEGATE will correct by repair or replacement per the applicable guarantee above, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, and provided further that Buyer gives ADB SAFEGATE written notice of such defects after delivery of the goods to Buyer. Refer to the Safety section for more information on Material Handling Precautions and Storage precautions that must be followed.

ADB SAFEGATE reserves the right to examine goods upon which a claim is made. Said goods must be presented in the same condition as when the defect therein was discovered. ADB SAFEGATE furthers reserves the right to require the return of such goods to establish any claim.

ADB SAFEGATE's obligation under this guarantee is limited to making repair or replacement within a reasonable time after receipt of such written notice and does not include any other costs such as the cost of removal of defective part, installation of repaired product, labor or consequential damages of any kind, the exclusive remedy being to require such new parts to be furnished.

ADB SAFEGATE's liability under no circumstances will exceed the contract price of goods claimed to be defective. Any returns under this guarantee are to be on a transportation charges prepaid basis. For products not manufactured by, but sold by ADB SAFEGATE, warranty is limited to that extended by the original manufacturer. This is ADB SAFEGATE's sole guarantee and warranty with respect to the goods; there are no express warranties or warranties of fitness for any particular purpose or any implied warranties of fitness for any particular purpose or any implied warranties other than those made expressly herein. All such warranties being expressly disclaimed.

Standard Products Guarantee

Products of ADB SAFEGATE manufacture are guaranteed against mechanical, electrical, and physical defects (excluding lamps) which may occur during proper and normal use for a period of two years from the date of ex-works delivery, and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

Note

See your sales order contract for a complete warranty description.

FAA Certified product installed in the United States or in US Military installations guarantee

ADB SAFEGATE L858 Airfield Guidance Signs are warranted against mechanical and physical defects in design or manufacture for a period of 2 years from date of installation, per FAA AC 150/5345-44 (applicable edition).

ADB SAFEGATE L858(L) Airfield Guidance Signs are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition).

ADB SAFEGATE LED light fixtures (with the exception of obstruction lighting) are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition). .

Note

See your sales order contract for a complete warranty description.

Liability

WARNING

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB SAFEGATE cannot be held responsible for injuries or damages resulting from non-standard, unintended uses of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses and may result in serious personal injury, death or property damage.

Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

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1.0 Safety

Introduction to Safety

This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

1.1 Safety Messages

HAZARD Icons used in the manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbol shown below.

	WARNING Failure to observe a warning may result in personal injury, death or equipment damage.
	DANGER - Risk of electrical shock or ARC FLASH Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.
	WARNING - Wear personal protective equipment Failure to observe may result in serious injury.
	WARNING - Do not touch Failure to observe this warning may result in personal injury, death, or equipment damage.
	CAUTION Failure to observe a caution may result in equipment damage.

Qualified Personnel

	Important Information The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements. Always use required personal protective equipment (PPE) and follow safe electrical work practice.

1.1.1 Introduction to Safety

CAUTION

Unsafe Equipment Use
This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow this instruction can result in serious injury or equipment damage

Additional Reference Materials

Important Information

- IEC - International Standards and Conformity Assessment for all electrical, electronic and related technologies.
- IEC 60364 - Electrical Installations in Buildings.
- FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
- Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- National and local electrical codes and standards.

1.1.2 Intended Use

CAUTION

Use this equipment as intended by the manufacturer
This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

Failure to follow this instruction can result in serious injury or equipment damage

1.1.3 Material Handling Precautions: Storage

CAUTION

Improper Storage
Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

Failure to follow this instruction can result in equipment damage

1.1.4 Operation Safety

CAUTION

Improper Operation
Do Not Operate this equipment other than as specified by the manufacturer

- Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.
- Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.
- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

Failure to follow these instructions can result in equipment damage

1.1.5 Maintenance Safety

DANGER

Electric Shock Hazard
This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

Failure to follow these instructions can result in death or equipment damage

2.0 Photometric Airfield Calibration

Overview

Maintaining the intensity or perceived brightness of your airfield ground lighting at the right level and at all times, is crucial to ensuring aircraft and passenger safety during take-off and landing. Light intensity can, however, diminish due to various factors – dust, rubber deposit, normal wear and tear, and heavy use, thus posing a major risk to runway safety. To mitigate this, the ICAO and FAA have set clear standards for photometric measurement and maintenance of airfield lighting, which airports must comply with globally.

Photometric measurement systems are an essential investment for every airport. The different systems address different environments. Here are some points that can help you decide which one to use:

- The PAC system is designed to monitor onsite, real-time compliance. It is fitted onto a standard vehicle, and measures the intensity of the runway and taxiway lights, as the vehicle passes by
- The PAC Lab System checks and measures the light output of fixtures that are refurbished at the workshop. It also confirms compliance before these lights are reinstalled on the airfield

Airports ideally need both systems, but can share the same sensor strip for both in-field and workshop measurements to enjoy a significant cost advantage.

Preventive Maintenance and Photometric Testing

ICAO Annex 14, Volume I, recommends regular light intensity measurements of airfield lighting installations at least twice a year with a Civil Aviation Certified device. Airports must submit a compliancy report of their installations against the ICAO standards.

In recent years, almost all Civil Aviation Authorities have changed the airfield lighting maintenance rules by stressing the requirement of frequent photometric testing up to once a month for runway lighting.

Optimizing Maintenance Works and Stocks

PAC is a mobile system for evaluating all inset and elevated lights. The test report provides the candela value of each light and identifies any defect requiring action to be taken. It also makes it possible to monitor lamp aging from previous runs so that all the results for a runway or taxiway can be compared.

This enables the airfield lighting department to plan its operations and manage its stocks as efficiently as possible. If the lamp is not defective although the system indicates a low intensity, the identifi cation facility guides the search and thus optimizes maintenance operations.

The mobile Photometric Airfield Calibration (PAC) System fits onto a standard vehicle and monitors light output and compliance of both inset and elevated lights in real-time as the vehicle passes by.

Operation of the PAC System

The system is installed on the front or at the back of any type of vehicle. Measurements are made in real time as the vehicle travels over the lights at a speed up to 60 km/h (37 mph).

The luminous intensity detected by the sensors placed in front of the sensors strip is fed to input/ output modules that are connected in a LAN to a programmable logical controller installed in a separate box fixed on the side of the sensors strip

The PLC allows for industrial grade data collection. Then the data are sent via Wifi or via an Ethernet cable to a portable computer or a tablette operated by the users inside the vehicle.

Up to 65000 samples can be recorded for each light fitting with no limitation of number of fittings (for a laptop computer with sufficient memory).

Alignment Contol

To ensure the best alignment, the driver looks at a video monitor fed by a camera fitted on the PAC strip. Video images are sent to the monitor through the router via WiFi.

Certification and Calibration

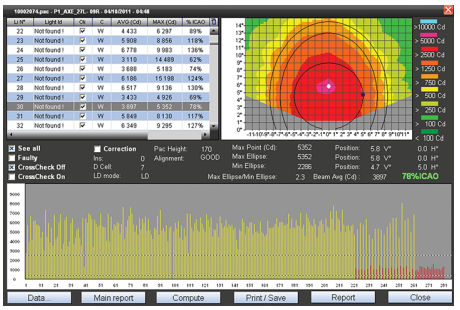
Each unit manufactured by FB Technology is calibrated using a NIST traceable reference light source for quality control. The PAC system has also been certified by the French Civil Aviation Technical Services (STAC.) and the Italian Civil Aviation Authority (ENAC).

Typical report provided by the PAC system: Fitting Id., elevation, maximum and minimum average, isocandela diagram

Description of the Supply

The system is supplied in a carrying case:

1. The measurement strip
2. The programmable logical controller box
3. The distance measurement device
4. The PAC software installed on a laptop computer
5. Only the power supply cables go to the sensors strip box, no cables running inside the vehicle except an Ethernet cable if WiFi communication is not possible between the strip and the laptop computer due to Airport Rules or constraints.
6. Optional DGPS receiver and antenna



Installation

The system can be installed on any vehicle with a 2-inch hitch receiver. Customers can have this done by ADB SAFEGATE or they can do it themselves, in which case they must have the installation checked by an ADB SAFEGATE engineer. This can be done during the Training and Commissioning session.

The radar distance measuring device is connected to the sensors strip, and the sensors strip communicates via Wi-Fi to the laptop monitored by the operator inside the vehicle.

Technical Data

Installation

The system can be installed on any vehicle. The customer can have this done by FB Technology or can do it himself, in which case he must have his installation checked by a FB Technology engineer. This can be done during the Training & Commissioning session.

The distance measuring device is mounted on the side of the vehicle or on the front frame. The sensors strip communicates via WiFi or a Ethernet cable with the laptop monitored by the operator inside the vehicle.

Operating conditions

Operation by night :	yes
Displacement speed:	up to 60 km/h
Measurement range:	up to 30.000 candelas
Weather condition:	dry or wet surface

Guarantee and Calibration

The system is supplied with a full 1-year guarantee. After the guarantee period, a maintenance contract is required to cover yearly calibration and software updates.

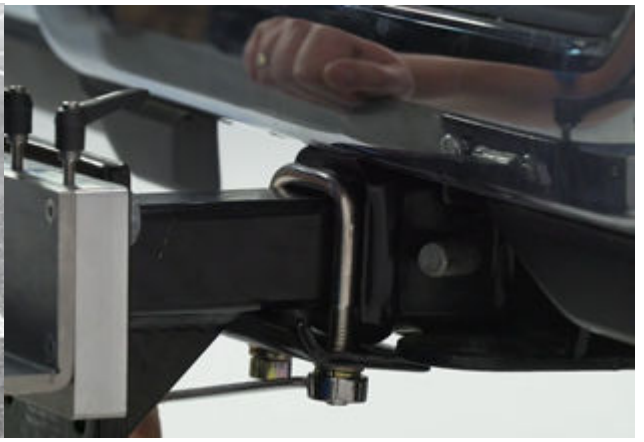
3.0 Setting Up the PAC System

3.1 Setting up the metallic frame

In this section, we explain how to set up metallic frame for the PAC system. In fact, to install the supporting frame on the vehicle, the following steps should be performed:

1. Set the pintle plate mount into the hitch receiver shown in the image below (Fig. a).
2. Attach the hitch stabilizer plate to the pintle plate. (Fig. b).

Figure 1: Figure a and Figure b



3. Slide the second L-shape support and then tighten the four indexing handles (Fig. d) and the other set in the middle (Fig. c). Both supports are mounted now, as shown in figure (Fig. e).

Figure 2: Figure c

Figure 3: Figure d

Figure 4: Figure e

4. Remove the two holding blocks that hold the pivot arm (Fig. f)

Figure 5: Figure f

5. Slide the pivot arm support inside the two holders (Fig. g). Then, replace the holding blocks and tighten the two indexing handles of each holder (Fig. h).

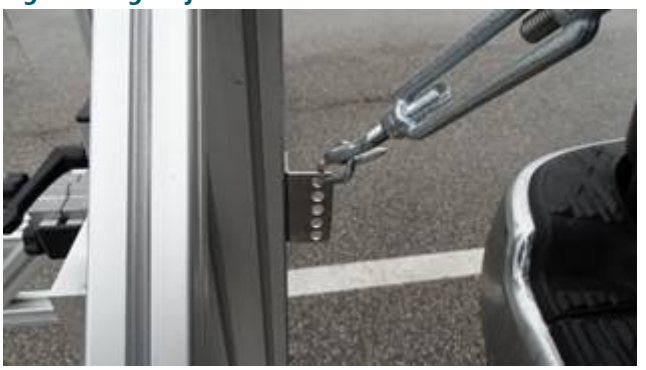
Figure 6: Figure g

Figure 7: Figure h

6. Mount the suction cup grab bar to the vehicle (Fig. i) and attach to the sensor frame (Fig. j)

Figure 8: Figure i

Figure 9: Figure j



7. Mount the doppler sensor to the sensor frame (Fig. k) and attach the gps to the mounting post (Fig. l)

Figure 10: Figure k

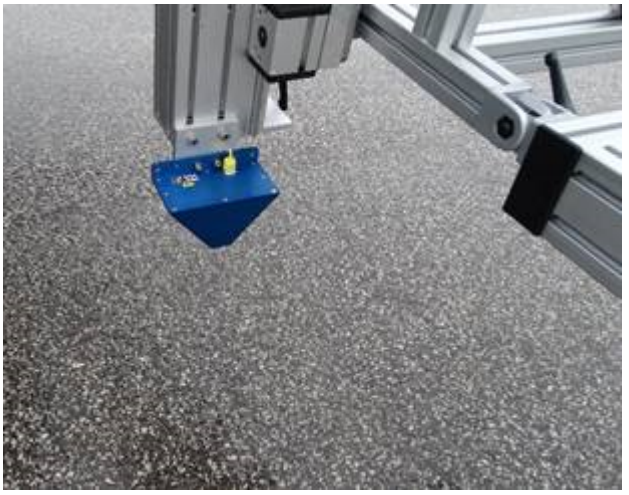
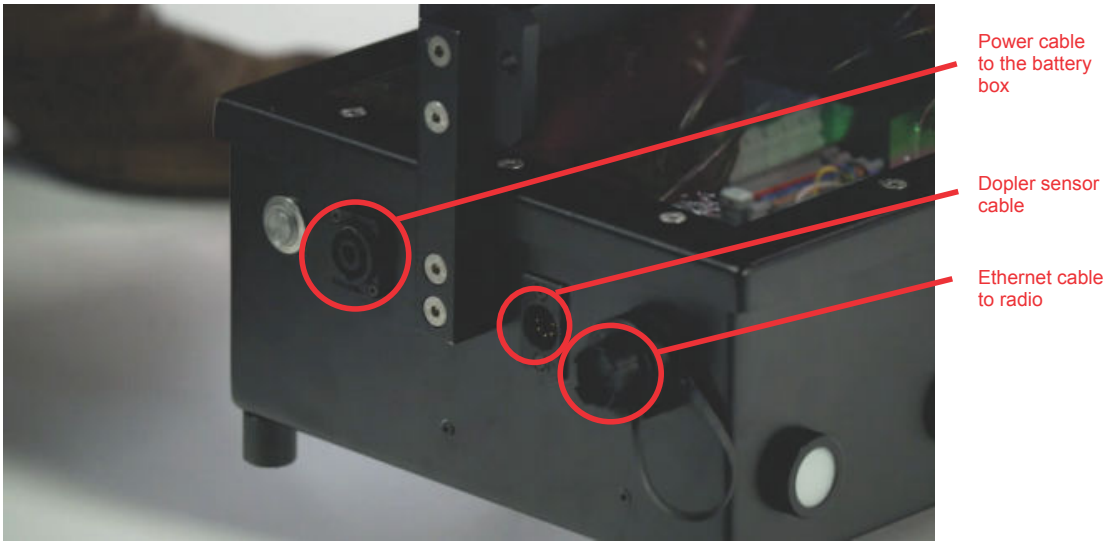


Figure 11: Figure l

8. Attach the cables to the light sensor bar (Fig. m)

Figure 12: Figure m



3.2 Setting the sensors strip in the horizontal configuration

In the case of using the PAC sensors strip in the horizontal configuration for measuring unidirectional and bidirectional lights (TDZ and RCL for example) you should follow the steps as listed below:

1. Loosen the seven indexing handles as shown in figure n. Then, lower the triangular support to the horizontal position. You should, now, tighten the same indexing handles.

Figure 13: DM00009_FBT__topic3_image002.png

Figure 14: DM00009_FBT__topic3_image004.png

Figure n

The seven indexing handles to be loosen

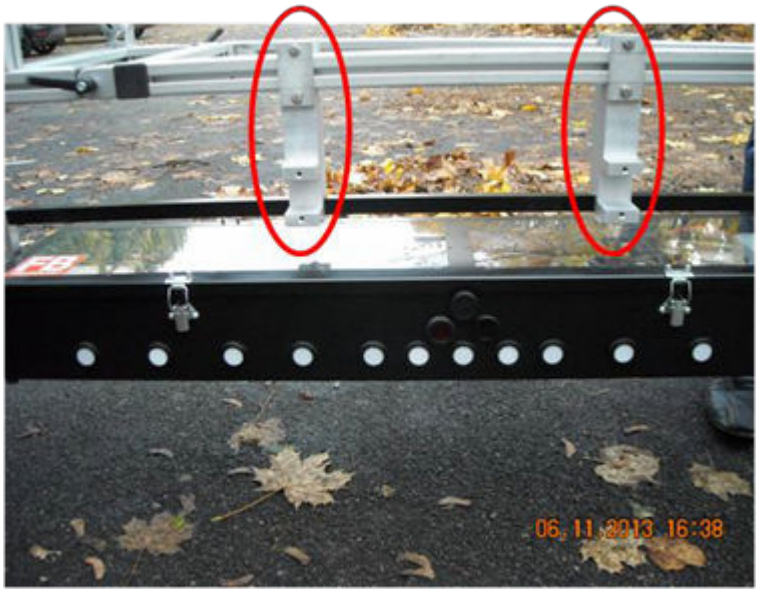
Figure below shows the position obtained:

Figure 15: DM00009_FBT__topic3_image006.png

Horizontal position of the triangular support.

2. Fix the sensors strip on the two “U” supports and tighten the two plates (2 screws each) as shown below. Then, verify that all screws are well tightened.

Figure 16: DM00009_FBT__topic3_image008.png



3. The Quarter Circle-shape metallic piece must be fixed as shown in the following figure:

Figure 17: DM00009_FBT__topic3_image010.png

4. To modify the height, you should slide the vertical carriage by loosening the two indexing handles as shown below:

Figure 18: DM00009_FBT__topic3_image012.png

Setting the height of the PAC sensors strip.

Note

The tolerance of height installation, in regard to the light source, is +/- 1 cm. The recommended height of 17 cm, which should be set when no one is inside the vehicle, could become 16cm with 2 persons inside the vehicle. It is necessary to check this height loss as it will vary from vehicle to vehicle. Installation height will have be adjusted accordingly.

Foreword: When you install the PAC® sensors strip on the vehicle, make sure that it shows minimum movement. It must be perfectly stable to the vehicle chassis and its movements.

3.3 Setting the sensors strip in the vertical configuration

Once the sensors strip is mounted in the horizontal configuration as described in the previous section, you can switch to the vertical position by following the steps listed below:

1. Loosen the seven indexing handles in the triangular support as described in step 1 of the previous section. Then, lift the triangular support to the horizontal position. You should, now, tighten the same indexing handles. Figure o shows the position obtained.

   Figure 19: Figure o

   You can see in this figure that the strip is heading towards the back of the vehicle.

2. To turn the sensor strip towards the light side, you should loosen and remove the screw on the quarter circle-shape metallic piece as shown in the following figures:

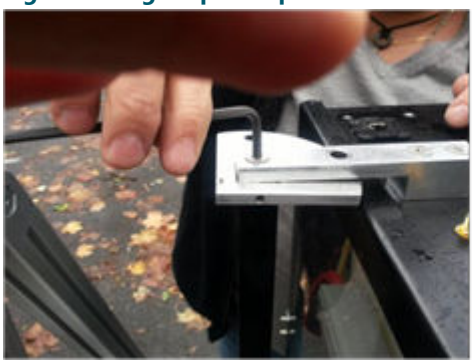
   Figure 20: Figure ?

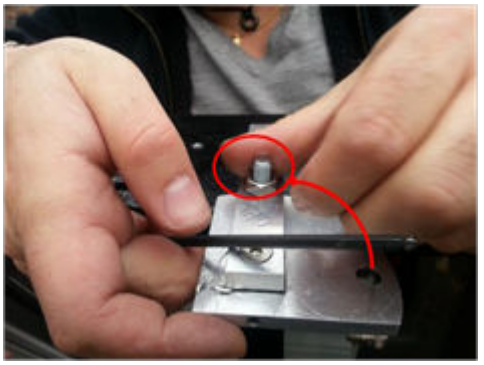
3. Loosen the screw at the top (figure p) and the one at the bottom (figure q).

Figure 21: Figure p and q



4. Turn the sensors strip towards the light side by rotating the sensor 45 degrees to the right in order to place the hole in the bar at top of the other hole of the metallic piece. Then put the screw removed in step 2 through both holes and then tighten it as shown in the following figure:

Figure 22: Figure ?



5. Tighten both screws loosened up in step 3 (at the top and at the bottom of the bar).
6. You should slide the moving carriage by loosening the two indexing handles (figure

r) to lower the sensor strip at a minimum height (about 20 cm) between the ground and the first cell at the bottom.

Figure 23: Figure r

Setting the height of the PAC sensors strip.

Now, the sensors strip is positioned in the vertical configuration (figure s) in order to measure longitudinally the specified lights.

Figure 24: Figure s

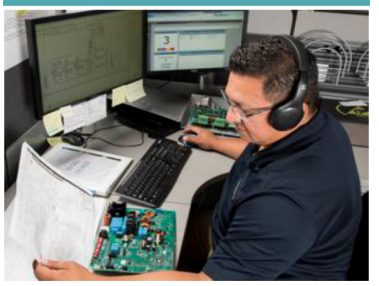
Vertical position of the sensors strip.

Appendix A: SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

ADB SAFEGATE Support

Live Technical Support - Americas
If at any time you have a question or concern about your product, just contact ADB SAFEGATE's technical service department. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone.
ADB SAFEGATE **Americas Technical Service & Support (US & Canada): +1-800-545-4157**
ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304
During regular business hours, you can also Chat with a Service Technician. We look forward to working with you!
Before You Call
When you have an airfield lighting or system control system problem it is our goal to support airfield maintenance staff as quickly as possible. To support this effort we ask that you have the following information ready before calling.



- The *airport code*
- If not with an airport, then company name (prefer customer id number)
- Contact phone number and email address
- Product with part number preferable or product number
- Have you reviewed the product's manual and troubleshooting guide
- Do you have a *True RMS* meter available (and any other necessary tools)
- Be located with the product ready to troubleshoot

Note

For more information, see www.adbsafegate.com, or contact ADB SAFEGATE Support via email at support@adbsafegate.com or
Brussels: +32 2 722 17 11
Rest of Europe: +46 (0) 40 699 17 40
Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.
China: +86 (10) 8476 0106

A.1 ADB SAFEGATE website

The ADB SAFEGATE website, www.adbsafegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

A.2 Recycling

A.2.1 Local authority recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

A.2.2 ADB SAFEGATE recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labelled as follows:

- For *ROHS/WEEE* Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for *EU directives* as and when *EU member states* implement new *regulations* and or *amendments*. It is our aim to maintain our *compliance plan* and assist our customers.

Company Addresses

ADB SAFEGATE	ADB SAFEGATE, Belgium: Leuvensesteenweg 585, B-1930 Zaventem Belgium
Contact: Tel.: +32 2 722 17 11, Fax: +32 2 722 17 64	Email: marketing@adbsafegate.com Internet: www.adbsafegate.com

Americas LLC	ADB SAFEGATE, Americas: 977 Gahanna Parkway, Columbus, OH 43230 USA
Contact: Tel.: +1 (614) 861 1304, Fax: +1 (614) 864 2069	Email: sales.us@adbsafegate.com Internet: www.adbsafegate.com

ADB SAFEGATE Sweden AB	ADB SAFEGATE, Sweden: Djurhagegatan 19 SE-213 76 Malmö Sweden
Contact: Tel.: +46 (0)40 699 17 00, Fax: +46 (0)40 699 17 30	Email: marketing@adbsafegate.com Internet: www.adbsafegate.com

ADB SAFEGATE Airfield Technologies Ltd. China	ADB SAFEGATE, China: Unit 603, D Block, CAMIC International Convention Center, No 3, Hua Jia Di East road, ChaoYang district, Beijing 100102 P.R. China
Contact: Tel.: +86 (10) 8476 0106, Fax: +86 (10) 8476 0090	Email: china@safegate.com Internet: www.adbsafegate.com

ADB SAFEGATE Germany GmbH	ADB SAFEGATE Germany GmbH, Mannheim: Konrad-Zuse-Ring 6, D-68163 Mannheim Germany
Contact: Tel.: +49 (621) 87 55 76-0, Fax: +49 (621) 87 55 76-55	Email: marketing@adbsafegate.com Internet: www.adbsafegate.com

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