

# “SAFETY SHOE”®

## PBB AUTO-LEVELER BACKUP & AIRCRAFT DOOR PROTECTION

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### PRODUCT MANUAL

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The “Safety Shoe” (shown below):



Protects the Aircraft Door as Auto-Leveler backup in normal passenger loading and unloading operations.

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## 1. GENERAL DESCRIPTION

The “Safety Shoe”® is a sensor and electronics control used to protect open Aircraft doors. It functions as a backup to the Passenger Boarding Bridge (PBB) Auto-Leveler function. Should the PBB Auto-Leveler fail, the Safety Shoe® and Black Box control electronics will automatically lower the PBB-Cab floor to avoid damage to the Aircraft Door and Black Box will sound an Alarm to alert the PBB operator or other personnel to the sensor activation.

When the aircraft door is opened and the PBB is set to “Auto-Level” mode, the “Safety Shoe” is activated and will sound an alarm to alert and remind the operator to place the “Safety Shoe” sensor under the Aircraft door.

The startup and sensor activation alarm is silenced by the “Alarm Reset” button. At startup (when PBB is set to “Auto-Level” mode), the alarm serves as both a reminder to place the “Safety Shoe” sensor under the Aircraft door AND as a self-test of the “Safety Shoe” sensor and electronics at each operation. Should the self-test fail, the alarm will NOT reset and the operator should then call maintenance.

The Black Box electronics has configurable timeouts for single and multiple sensor activations. This allows adjustments per various Passenger Boarding Bridge (PBB) types or as desired on a per gate/PBB basis. The timing adjustments are set according to minimum drop level (single activation) and maximum (multiple activations) so as to avoid damage to the Aircraft Cabin Door.

## 2. “SAFETY SHOE”® FEATURES

The “Safety Shoe”® sensor and “Black Box” electronics provides backup to the Passenger Boarding Bridge (PBB) Auto-Leveler function and has the following features:

- Flexible for use on various PBBs.
- Does not require update of PBB configuration or programming.
- Automatic self-test at each operation (when PBB is set to Auto-Level mode).
- Self-contained alarm not coupled to the general PBB-alarm.
- Adjustable timeouts for single and multiple “Safety Shoe” sensor activations.

## 3. “SAFETY SHOE”® OPERATION

In normal operation, with the “Safety Shoe” sensor placed under the open aircraft cabin door, the sensor and “Black Box” electronics await any contact of the aircraft door to the sensor as an “activation” of the sensor. Should an “activation” occur anytime while in operation, the “Black Box” electronics will signal to the PBB “Vertical Down” controls to lower the PBB to avoid damage to the aircraft door (due to excessive force when aircraft level lowers due to loading of aircraft and Auto-Leveler fails to sense the change).

### 3.1 STARTUP OPERATION

The “Safety Shoe” is in operation when the aircraft door is opened and the PBB is set to “Auto-Level” mode. At startup activation (each time it is put into operation), the “Safety Shoe” alarm is sounded to alert and remind the operator to place the “Safety Shoe” sensor under the Aircraft door.

The alarm is silenced by the “Alarm Reset” button unless the self-test of the “Safety Shoe” sensor or electronics has failed. This provides a continual testing for each use.

### 3.2 SELF-TEST OPERATION

The “Safety Shoe” has a self-test function which is performed at each startup activation. There is also continuous monitoring of the sensor and cable for disconnect or failure.

Should the self-test fail or the “Safety Shoe” sensor or its wiring fail at any point in its operation, the alarm will NOT reset and the operator should then call maintenance.

### 3.3 “SAFETY SHOE” SENSOR ACTIVATION AND FUNCTIONALITY

When the “Safety Shoe” sensor is activated from contact with the aircraft door, the “Black Box” electronics will activate the PBB “Vertical Down” and alert the PBB-operator via the “Alarm”.

The PBB “Vertical Down” stays activated and lowers the PBB-cab floor for a minimum timeout as defined by the internal “T1” timer setting. The “T1” timer is usually set for the amount of time it takes to lower the PBB-cab floor about 100-160mm (or roughly 4-6 inches). The “T2” timer defines the maximum amount of PBB “Vertical Down” activation time and usually set for about 250mm of movement (or roughly 10 inches).

After the “Safety Shoe” sensor activation, the alarm will continue until the PBB-operator or other personnel press the “Alarm Reset” button on the “Black Box” to acknowledge the PBB Auto-Leveler fail or whatever condition caused the activation. At that time the aircraft cabin door and the “Safety Shoe” sensor should also be immediately checked to confirm there is no further concern.

The “Black Box” provides an “Alarm” contact output which can be used to activate an external alarm (outside the “Black Box”). The alarm and “Alarm” contact output is reset via the “Alarm Reset” button on the “Black Box”. The “Black Box” also provides for an external “Alarm Reset” button which can be connected to perform the same function.

## 4. THE “SAFETY SHOE”® SETUP

The “Safety Shoe” setup consists of the following:

- **“Safety Shoe” sensor and cable.** The lightweight sensor incorporates a purpose built sensing mechanism to provide contact closure when pressure is applied to the sensor surface. The flexible and extendable cable is an integral part of the sensor. The sensor and cable is wired to the “Black Box” and can be stowed out of the way in the PBB-cab area.
- **“Black Box”** with internal pc-board and electronics providing “Alarm”, “Alarm” indicator light, “Alarm Reset” button, “Power On” indicator, and dry-contact signal interface to Passenger Boarding Bridge (PBB) controls (see Figure-1 below). The “Black Box” electronics provides all functionality to monitor the “Safety Shoe” sensor and cable and provide contact closure output to the PBB “Vertical Down” control.

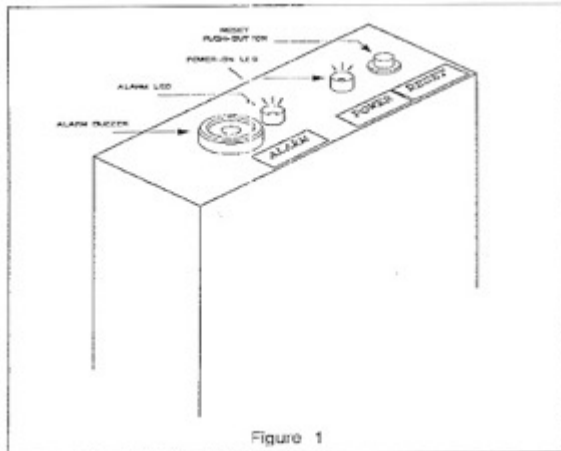


Figure-1: "Black Box" electronics enclosure

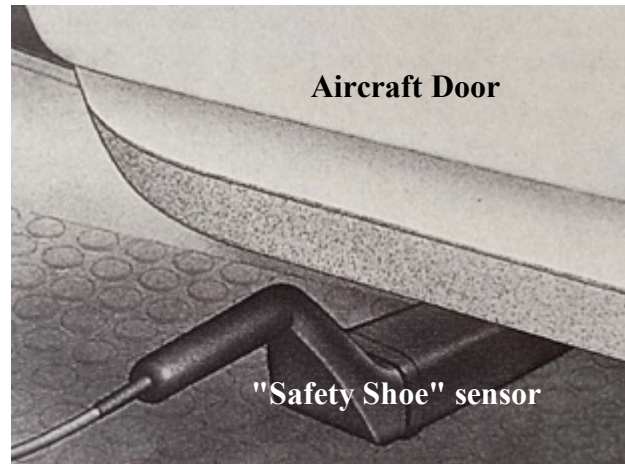


Figure-2: "Safety Shoe" sensor (under aircraft door)

## 5. OPERATOR INSTRUCTIONS

The "Safety Shoe" Bridge Auto-Leveler Backup and Aircraft Door Protection is simple to operate and provides a self-test functionality on each use. The operational procedure at each aircraft docking is as follows:

1. **Place the "Safety Shoe" sensor under the aircraft door** after opening (between the door and Bridge floor).
2. **Set Bridge to "Auto-Level" mode.** This simultaneously powers-up and activates the "Safety Shoe" and "Black Box" electronics (note that "Power" LED is On).
3. **When the ALARM sounds, confirm the aircraft door is safely above the PBB-floor then push the RESET button** to acknowledge and silence alarm. The self-test functionality is performed by the alarm being silenced indicating all is OK and the "Black Box" is actively monitoring the "Safety Shoe" sensor.
4. **If the ALARM signal continues without "Safety Shoe" sensor activation or there is any safety concern to the aircraft door, call service or maintenance.** This indicates a problem with the "Safety Shoe" sensor, its cable, or the "Black Box" electronics AND in need of maintenance attention and the "Safety Shoe" setup cannot be used until corrected.

## 6. SERVICE AND MAINTENANCE

The service and maintenance of the "Safety Shoe" Bridge Auto-Leveler Backup and Aircraft Door Protection setup is limited to checkout of the "Safety Shoe" sensor, its cable, and the "Black Box" electronics functionality. The "Safety Shoe" setup is not designed to be repairable on site.

### 6.1 MAINTENANCE CHECKUP PROCEDURE

The "Safety Shoe" setup can be checked for proper operation as follows:

1. **Set Bridge to "Auto-Level" mode.** This powers-up and activates the "Safety Shoe" and "Black Box" electronics.

2. **Step on the "Safety Shoe" sensor to cause a sensor activation and verify the alarm sounds.** The PBB-cab floor will also lower.
3. **Step on the "Safety Shoe" sensor and verify the PBB-cab floor lowers for about 100-160mm** (roughly 4-6 inches or as per proper setting for the PBB). If needed, open the "Black Box" and adjust the "T1" timer trimpot.
4. **Step on and off the "Safety Shoe" sensor until PBB-cab floor no longer lowers or goes down further than desired limit. The floor should stop lowering for about 250mm for all activations** (roughly 10 inches or as per proper setting for the PBB). If needed, open the "Black Box" and adjust the "T2" timer trimpot.
5. **Press the "Alarm RESET" button to complete self-test functionality and acknowledge the "Safety Shoe" sensor is operational by silence of the alarm.**

## 6.2 ALARM CANNOT BE RESET

If the alarm cannot be reset, it indicates a problem with either the "Safety Shoe" sensor, its cable, or the "Black Box" electronics. Checks are broken down to the "Safety Shoe" sensor and its cable OR the "Black Box" electronics. Refer to sections 6.3 and 6.6 to check these items. If the problem cannot be found in those checks, replace the "Black Box" pc board to restore proper operation.

## 6.3 ALARM DOES NOT SOUND

If the alarm does not sound at startup self-test or when the "Safety Shoe" sensor is activated (contacted by aircraft door), it indicates a problem with the "Black Box" electronics. The alarm is sounded at each startup to check the "Safety Shoe" sensor and cable to assure the "Safety Shoe" setup is operational and ready to backup the PBB Auto-Leveler.

The likely problem is that the Alarm/buzzer or electronics in the "Black Box" has failed. To confirm, simply startup the "Safety Shoe" setup as per normal operations and check that the PBB lowers upon "Safety Shoe" sensor activation. If needed, replace the "Black Box" to restore proper operation.

## 6.4 "POWER" LED DOES NOT LIGHT

If the "Power" LED does not light at startup self-test, it indicates a problem with the wiring to the "Black Box" electronics in the PBB controls console or inside the "Black Box".

Check for any loose or misplaced wires for the "Safety Shoe" setup in the PBB controls console or inside the "Black Box". There is a fuse "F1" (1/16 amp picofuse) on the "Black Box" internal pc-board which can be checked for continuity. Make sure power to the "Black Box" is Off before checking within (set PBB operation switch to "Off").

If the problem is that the electronics in the "Black Box" has failed, replace the "Black Box" to restore proper operation.

## 6.5 INSPECTION AND TEST OF THE "SAFETY SHOE" SENSOR AND ITS CABLE

The "Safety Shoe" sensor and its cable are a combined unit. Check these as follows:

1. Turn-Off the Passenger Boarding Bridge (PBB) and confirm the "Power-On" LED of the "Black Box" is Off.
2. Open the "Black Box" enclosure and disconnect the "TB1" connector at positions 1-4.
3. Check continuity from TB1-pin1 to TB1-pin4 AND TB1-pin2 to TB1-pin3. If either fails, there is a problem in the cable or the "Safety Shoe" sensor.

4. Check there is NO continuity from TB1-pin1 to TB1-pin2 (make sure sensor is not activated). If this fails, there is a problem in the cable or the “Safety Shoe” sensor, replace with spare.
5. Repair the cable or replace the “Safety Shoe” sensor and cable, if needed, then restore the “Safety Shoe” setup to normal operation.

## 6.6 INSPECTION OF THE “BLACK BOX” ELECTRONICS

A visual inspection of the “Black Box” may reveal loose wiring problem otherwise problem could be in circuitry. Check as follows:

1. Turn-Off the Passenger Boarding Bridge (PBB) and confirm the “Power-On” LED of the “Black Box” is Off.
2. Open the “Black Box” electronics enclosure and inspect for loose wiring or other problems. Refer to supplied wiring diagram for details.
3. Reconnect any loose wiring or replace the “Black Box” pc board, if needed, then test & restore the “Safety Shoe” setup to normal operation.

## 7. INSTALLATION DETAILS

The installation of the “Safety Shoe” setup to the Passenger Boarding Bridge (PBB) consists of physical mounting, wiring interface to the PBB, and adjustment of PBB Vertical-down timeout trimpots. A self-test is performed at each power-On startup of “Safety Shoe” setup when the PBB is set to “Auto-Level” operation and the aircraft door is opened.

### 7.1 “BLACK BOX” MOUNTING

The “Black Box” is typically mounted to the backside of the PBB control-console or in the PBB-cab near the aircraft door area when opened. The wiring between the “Black Box” and the PBB control-console is done as per convenience to the mounting and per local electrical codes. Size and mounting template as shown below.

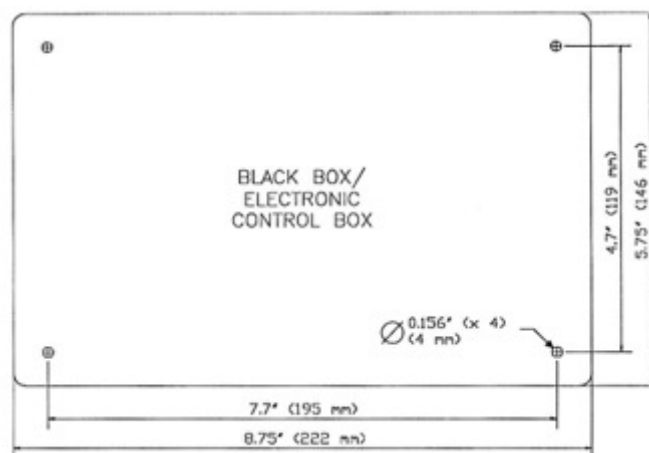


Figure-3: “Black Box” internal pc-board layout

**7.2 TYPICAL WIRING DIAGRAM**

The typical wiring of “Safety Shoe” setup to the Passenger Boarding Bridge (PBB) using 120VAC power (from the PBB) is shown below.

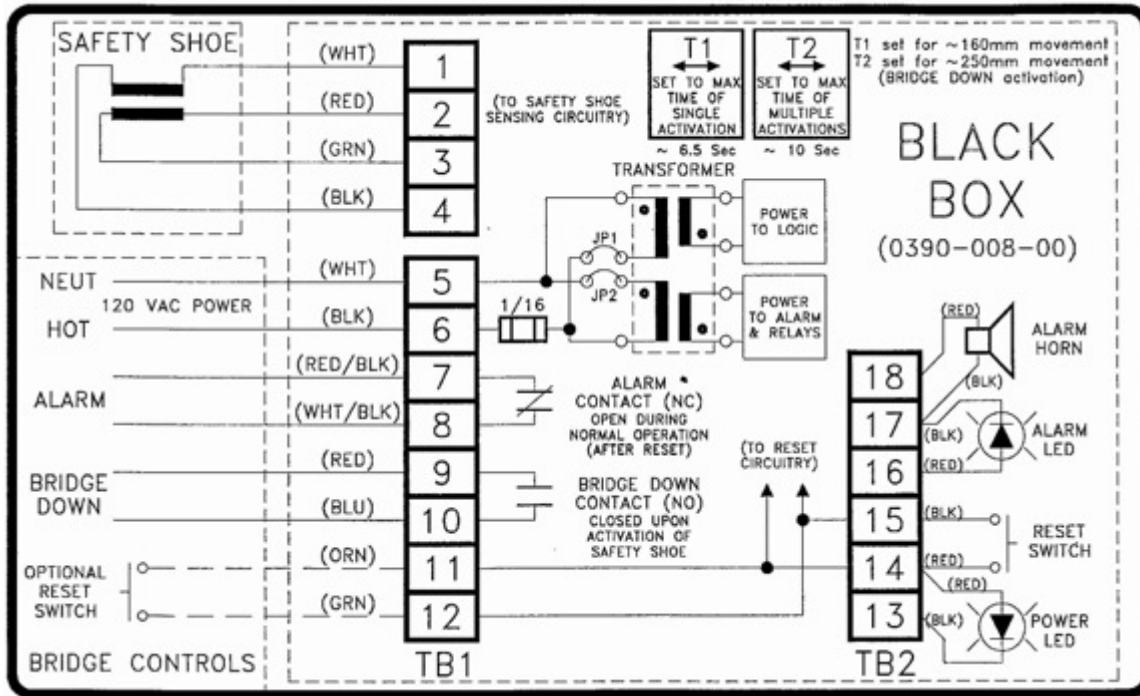


Figure-4: Typical wiring diagram (for “Black Box” to PBB)

**7.3 “BLACK BOX” SIGNAL INTERFACE**

The “Black Box” has 2 output signals to the PBB-controls as follows (see detail above):

- 1) “Bridge Down” normally-open dry contact closure: Closes upon “Safety Shoe” activation. Refer to section “6.1 Maintenance Checkup Procedure” for detail on “T1” and “T2” trimpot settings and activation details.
- 2) “Alarm” normally-closed dry contact closure (optional): Opens upon “Safety Shoe” activation or failure of the “Safety Shoe” and “Black Box” setup.

The “Black Box” allows 1 input signal from the PBB-controls as follows:

- 3) “Alarm Reset” using normally-open dry contact closure (optional): This provides for an external means to acknowledge the “Safety Shoe” sensor activation and silence the alarm as per the same functionality of the RESET switch on the “Black Box”.

**7.4 “BLACK BOX” INTERNAL ADJUSTMENTS**

The “Black Box” has 3 configurable items on the pc-board: 1) the “T1” timer trimpot (per minimum PBB Vertical-down time per single activation), 2) the “T2” timer trimpot (per maximum PBB Vertical-down time per multiple activations), and 3) Voltage select jumpers (per power from the PBB-



controls). The voltage select jumpers are typically set from the factory per use of 120VAC power. Refer to section “6.1 Maintenance Checkup Procedure” for detail on “T1” and “T2” trimpot settings.

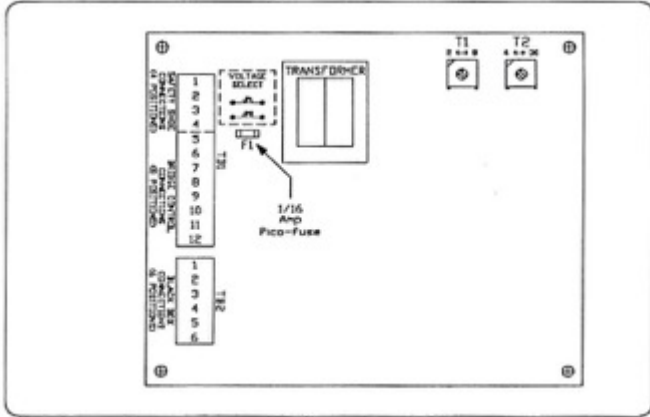


Figure-5: “Black Box” internal pc-board layout

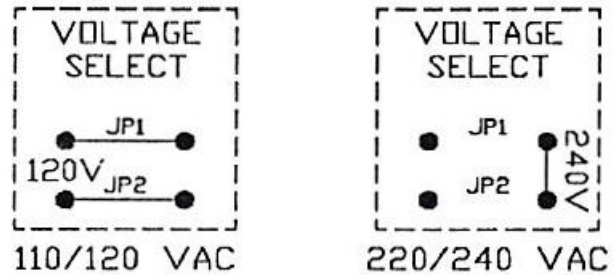


Figure-6: “Black Box” voltage select (on pc-board)

## 8. ELECTRICAL SPECIFICATIONS

The “Black Box” electronics and “Safety Shoe” have the following electrical specifications:

- Power Supply: 110-125 or 220-250 VAC
- Power Consumption: Less than 2W
- Output Relay Contacts: Maximum 250V, 5A, 100W, 1000VA
- Timers adjustable between: T1 2-8 seconds – T2 4-30 seconds
- “Safety Shoe” sensor voltage: 12-15VDC (low current)

*Note: Specifications subject to change without notice.*

## 9. STATUS-LED OPERATIONAL INDICATIONS

The “Black Box” LED indicators are as follows per “Safety Shoe’ operational status:

LED Indicator	LED color	Detail:
Power	Green	Indicates Power-On of “Black Box” electronics. <i>Note: This does NOT confirm “Black Box” electronics is operational. Refer to self-test for details.</i>
Alarm	Red	<ul style="list-style-type: none"> <li>Indicates “Safety Shoe” sensor has been activated via contact with aircraft-door (and PBB lowered) during normal operation after startup and passing self-test.</li> <li>Indicates “Black Box” electronics in startup and awaiting pass of self-test (alarm silenced and Red-LED Off after press of “Alarm RESET” button).</li> <li>Press “Alarm RESET” button and check safety of aircraft-door to acknowledge Alarm condition to continue “Safety Show” operation.</li> </ul>