ALSF/MALSR Flasher Tester Unit

User Manual

96A0131, Rev. G, 2020/06/26

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

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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.

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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.

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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 Maintenance Safety

DANGER

Electric Shock Hazard
This equipment may contain electrostatic devices

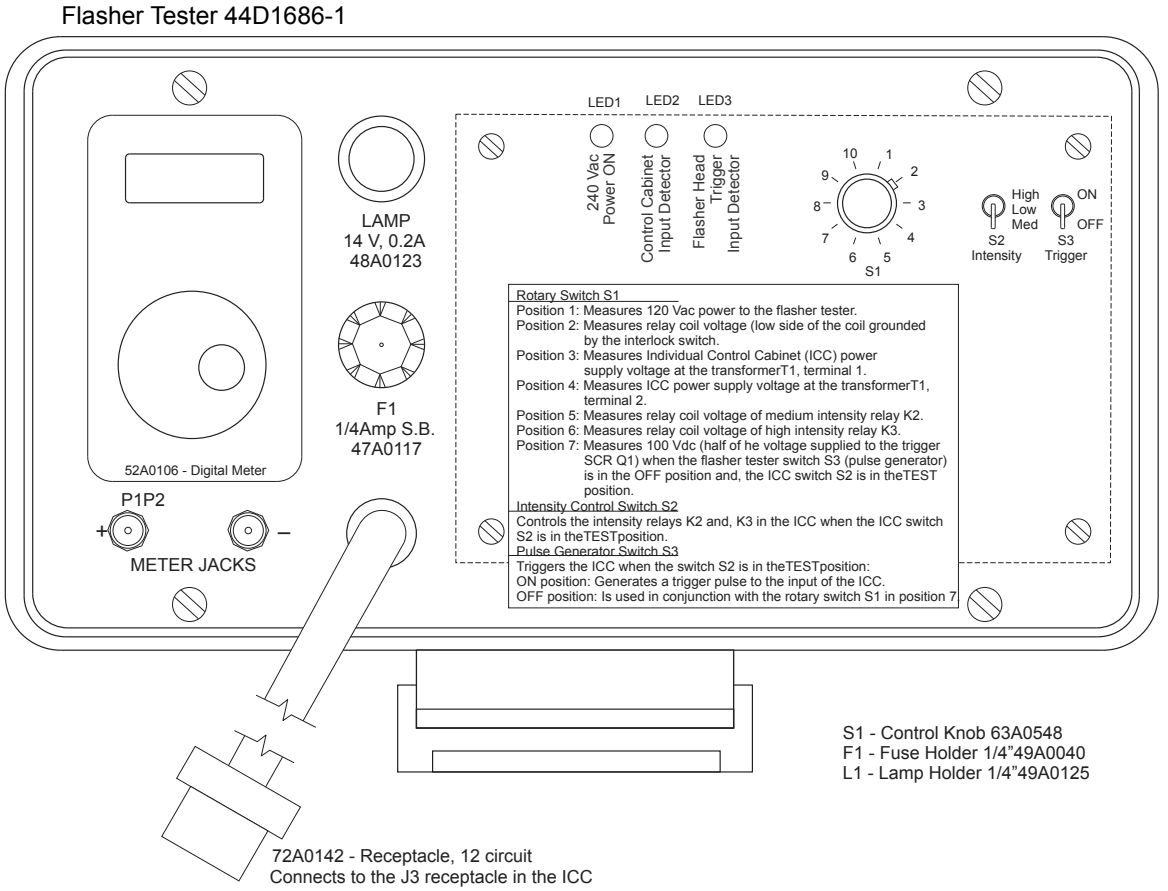
- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided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

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

2.0 Introduction

This section provides an introduction to the Flasher Tester

Figure 1: Flasher Tester 44D1686-1



The portable flasher tester (see Figure 1 and Figure 2) is equipped with a test cable and a twelve-pin rectangular plug which connects to socket J3 on the Flasher PCB (44C1699) (see Figure 4) in the Individual Control Cabinet (ICC) to monitor the operation of the flasher light unit. The flasher tester contains a multimeter, status indication LED, test-selection rotary switch, intensity and trigger control switches and is capable of testing the power circuits and control signals from the Master Control Cabinet (MCC) to the Individual Control Cabinet (ICC) and from the ICC to the flash head.

Figure 2: The Portable Flasher Tester

Note

DM78A Digital Multimeter was used on previous flasher tester units and had equivalent performance for ALSF/MALSR measurements.

DM78 Digital Multimeter

The DM78C is a small multimeter with the ability of much larger models. The DM78C has a 3200 count digital display, analog bar graph, and a data hold feature. The DM78C measures DC volts, AC volts, resistance, diode test, and continuity check. This multimeter has test leads and probes already attached with two 1.5 V LR-44 batteries installed.

DC Voltage : 0.1mV-600V, ±2.0%, **AC Voltage** : 10mV-600V, ±4.0%, **Resistance** : 0.1Ω-32MΩ, ±2.0%

Two jacks (P1 & P2) are present on the flasher tester for internal flasher tester readings. When used, the red lead is connected to P1 (+) and, the black lead is connected to P2 (-). The multimeter can also be removed from the flasher tester for external readings.

Rotary Switch S1 (used to select 7 meter functions)

Position 1 : Measures 120 Vac power to flasher tester

Position 2 : Measures relay coil voltage (low side of coil which is grounded by interlock switch)

Position 3 : Measures the Individual Control Cabinet (ICC) power supply voltage at transformer T1 terminal 1 which is supplied from TB1-1 through switch S1, fuse F1, and power-on/off relay K1

Position 4 : Measures the ICC power supply voltage at transformer T1 terminal 2 which is supplied from TB1-3 through switch S1, fuse F2, resistor R30, and the power-on/off relay.

Note

The nominal voltage from the ICC TB1-1 to neutral (TB1-2) and, TB1-3 to neutral (TB1-2) is 120 Vac.
The nominal voltage from the ICC TB1-1 to TB1-3 is 240 Vac.

Position 5 : Measures the relay coil voltage of the medium intensity relay K2.

Position 6 : Measures the relay coil voltage of the high intensity relay K3.

Position 7 : Measures 100 Vdc (half of voltage supplied to trigger SCR Q1 on the Flasher PCB) when the flasher tester switch S3 (trigger pulse generator) is in the OFF position and switch S2 on the Flasher PCB (44C1699 in ICC) is in the TEST position.

Note

S1 positions 8, 9 and 10 are not used.

Panel Lamp

Uses a 14 V, 0.2 Amp pin-ball lamp #48A0123 with a 3000 hour rated life.

Fuse

Protects the flasher tester from overload, 0.2 Amp, Slow Blow, # 47A0117.

LED Indicators

LED 1 : 240 Vac power-on LED indicator.

LED 2 : ICC Trigger Input Detector LED (indicates input trigger pulse to ICC).

LED 3 : Flasher Trigger Input Detector LED (indicates output trigger pulse from ICC to flash head).

Intensity Control Switch S2

Three-position switch for control of the intensity relays K2 and K3 in the ICC. This switch is used only when S2 on the Flasher PCB (44C1699) in the ICC is in the TEST position.

- Top Position (S2)-High Intensity (energizes relays K2 and K3 in ICC).
- Center Position (S2)-Low Intensity (relays K2 and K3 de-energized in ICC).
- Bottom Position (S2)-Medium Intensity (relay K2 energized and K3 de-energized in ICC).

Trigger Generator Switch S3

- Two-position switch used only when switch S2 on the Flasher PCB (44C1699) in the ICC is in the TEST position.
- Top Position (S3)-ON is used to generate trigger pulses to input of the ICC.
- Bottom Position (S3)-OFF is used in conjunction with rotary switch S1 in position 7.

2.1 MALSR and ALSF System Overview

The MALSR and ALSF systems have in common the following assemblies: master control cabinet, sequenced flasher, individual control cabinet, flasher light unit, aiming device, junction box, and flasher tester. Only the MALSR has the 15 kVA power transformer, PAR-38 lamp holder, and PAR-56 lamp holder assemblies. Refer below for a discussion of each assembly.

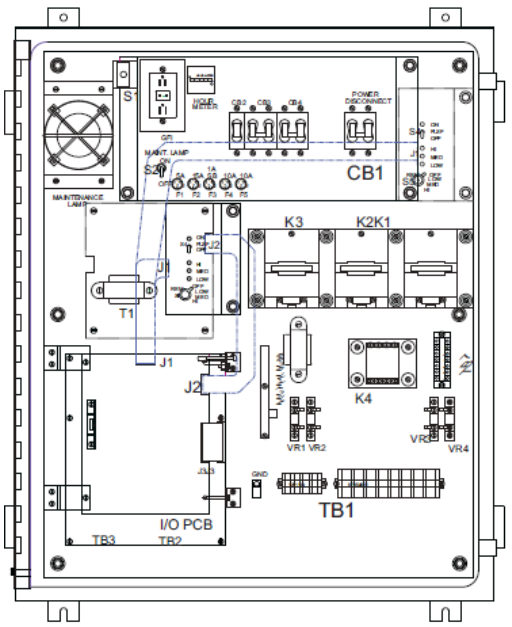
2.1.1 Master Control Cabinet

The master control cabinet contains the control and optional monitoring PCBs and circuitry to operate the sequenced flashers and steady burning lights in remote and local mode. The master operates on 120/240 Vac, 60 Hz, three-wire, single phase input power and provides power and timing signals to the individual flashers. Note that a single phase 480 Vac to 120/240 Vac transformer may be optionally ordered for the master control cabinet. Timing signals are provided by line-synchronous (60 Hz) solid state timing. Three-step 120 Vac intensity control signals are provided to the individual control cabinets that control the flashers.

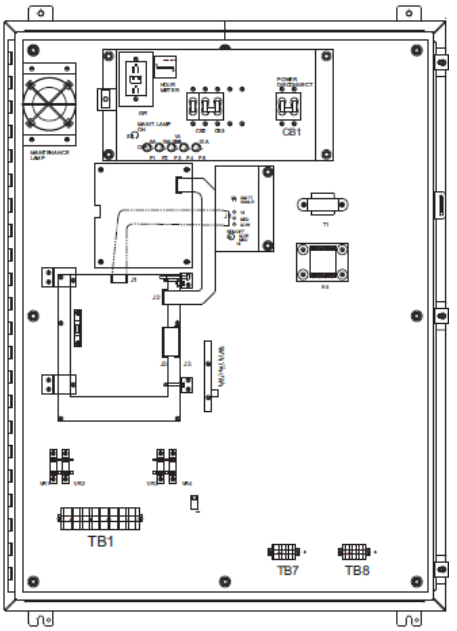
The master also supplies power and three voltage steps to the primary of the 15 kVA power transformer. The transformer powers the steady-burning lamps. A 100 W, 120 Vac light, with protective wire mesh cover, is installed in the master control cabinet to provide adequate illumination for nighttime maintenance operations. A service entrance switch is provided to disconnect incoming 120/240 Vac power to the master for maintenance purposes.

An hour meter is installed in the master control cabinet to indicate the number of hours of flasher operation on the high intensity step. The meter indicates time in hours and tenths of hours up to 9999.9 hours and can be manually reset.

Figure 3: Master Control Cabinet



120/240 MALSR MCC

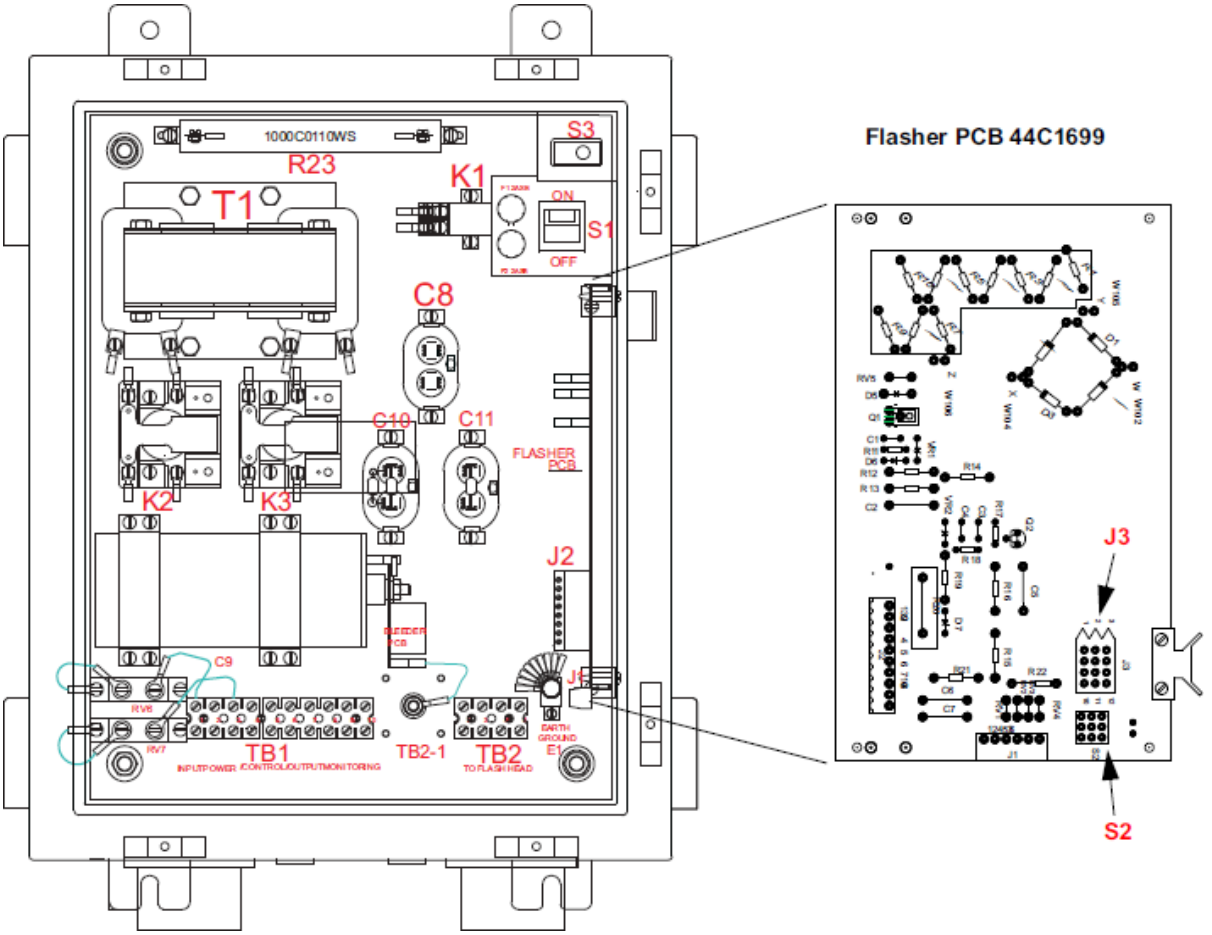


120/240 ALSF MCC

2.1.2 Individual Control Cabinet

Each flasher fixture is controlled by an individual control cabinet (ICC). The ICC is powered from a 120/240 Vac, 60 Hz, three-wire, single phase supply.

Figure 4: Figure 2.4.Individual Control Cabinet



2.1.3 Flasher Light Unit

The flasher light unit consists of a lamp and shell assembly. The shell assembly houses the inner components of the light unit. Clips hold the lens in place and provide a watertight seal in conjunction with the gasket. The lamp assembly is composed of a PAR-56 xenon flash tube, trigger transformer, and internal wiring.

All components in the lamp housing are accessible by removing the lamp. An interlock switch is incorporated in the flasher unit so that opening the unit (by removing the lamp) will disconnect all incoming power and discharge all high-voltage circuits.

Note

See 96A0106 Medium Intensity Approach Lighting System (MALSR) & Approach Lighting System with Sequenced Flashers (ALSF) (Elevated and In-pavement Flashers) user manual for more detailed information on the ALSF/MALSR systems.

3.0 Operation

WARNING

Read the instructions in their entirety before beginning any steps.

3.1 Flasher Tester Unit Operational Procedures

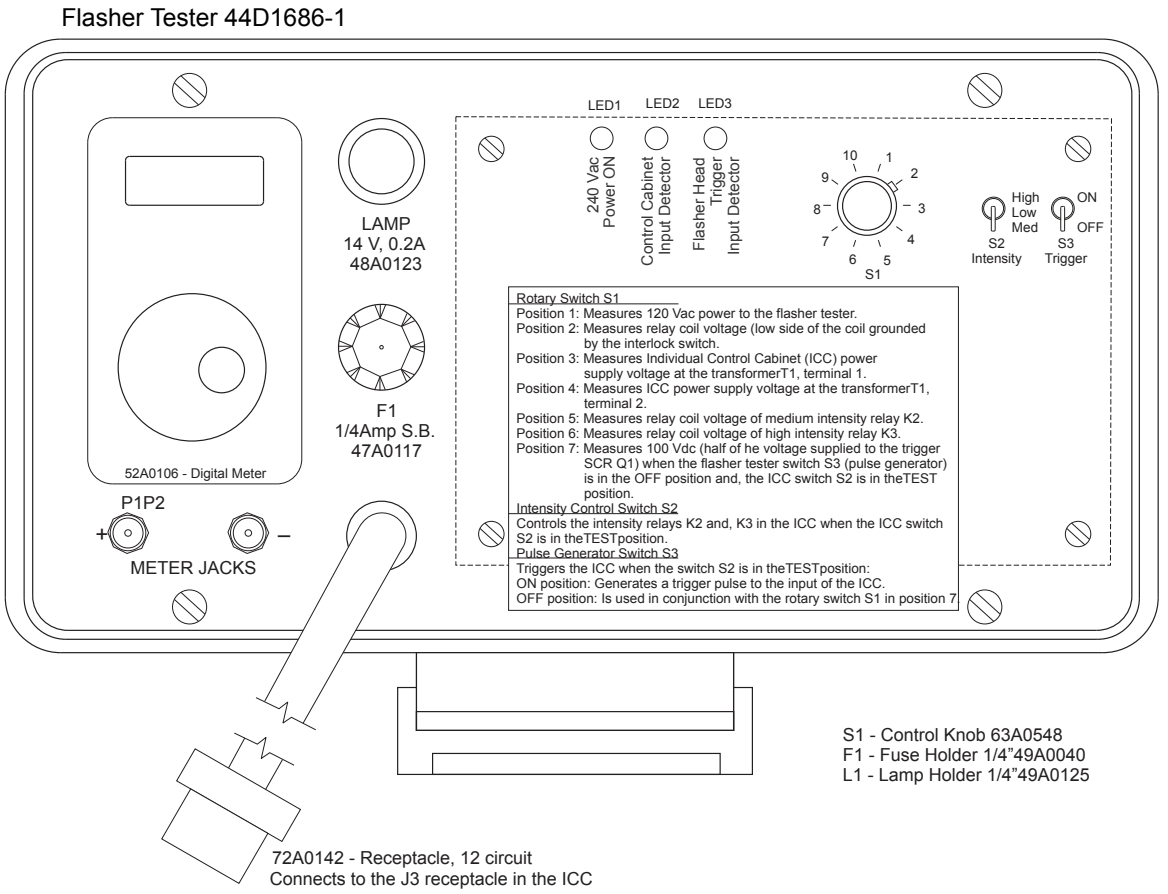
The following operational test procedures are to be followed sequentially. Before proceeding with the next sequential step, make sure that any malfunctions detected in any previous steps are corrected.

At installation perform the complete operational test procedures listed below on each Individual Control Cabinet (ICC), record the voltages and the LED indications measured on the data sheet provided on the back of this instruction booklet for future reference.

Note

A general visual check of the uniformity of the brightness all the flashers should be made periodically on all the brightness steps to detect any flashing lamps which are too dim.

Figure 5: Figure 3.1.The Flasher Tester



3.1.1 Testing of the Power and Control Signals from the MCC and the ICC

WARNING

If the MCC is on, 120/240 Vac is still present at TB1 in the ICC even through the ICC ON/OFF switch S1 is in the OFF position.

Wait a minimum of two minutes for the high voltage capacitors in the ICC to discharge.

2000 Vdc is present in the ICC, DO NOT manually probe 2000 V voltage points in ICC using the leads on a standard meter, which are typically rated at only 1000 V. Use a High Voltage probe such as a Fluke 80K-15.

Prior to starting these procedures, verify the Flasher Tester's meter is operational by testing it on a known voltage source.

3.1.2 Initial Setup

1. If the MCC is ON, turn the MCC OFF by setting CB1, CB2, CB3 and (CB4 for MALSR only) in the MCC to the OFF position. Set the MCC rotary switch S5 to the OFF position.
2. Open the door to the ICC being tested and set S1 in the ICC to OFF. S2 on the ICC Flasher PCB should be in the NORMAL position. Opening the door also opens the door interlock switch S3 on the ICC. Set up the Data Sheet, Data Sheet , and label the ICCs for easy identification during the steps of this procedure. ADB recommends setting ICC 1 as the farthest from the runway threshold.

Note

Match the ICC numbering to the site documentation if possible to reduce confusion.

Table 1: Initial MCC and ICC settings

MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5
	OFF	OFF	OFF	OFF	OPEN	ALSF/ON	OFF
ICC under test	S1	S2	doorinterlock S3 [2]			Flash head, OFF	
	OFF	Normal Position	OPEN				

Notes

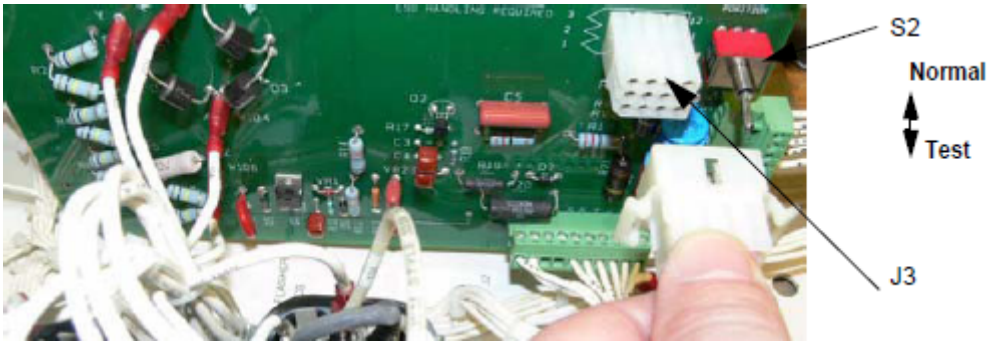
1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

3. See Figure 6. Insert the flasher tester unit plug into receptacle J3 on the ICC Flasher PCB (44C1699) in the ICC, then set switch S2 on the ICC Flasher PCB to the TEST position.

Figure 6: J3 Connection in an ICC



Note

To connect the flasher tester unit plug, firmly grasp the PCB near the J3 receptacle, and then gently wiggle the tester plug into the receptacle. Do not attempt to force the plug into receptacle, as this may damage the PCB. Only 1/8 inch engagement of plug into receptacle is necessary to make a proper connection.

4. Set the Flasher Tester switches S1 to 1, S2 to Low and S3 to ON. In the MCC turn CB1, CB2 and CB3 to ON. Then set S5 in the MCC to LOW. Close the MCC cabinet door or bypass the interlock switch, S1 by pulling out the plunger. See Table 2.

Note

The Master can also optionally be operated in remote control to set the commanded intensity levels.

Table 2: Initial Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	N/A	**N/A**	**N/A**	**1**	**Low**	**ON**	**OFF**	**Connected**
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]			Flash head, OFF		
	OFF	TEST	OPEN					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

3.1.3 Initial Flasher Tester Unit Setup

1. Insure the lamp in the flash head is correctly seated which will close switch S1 in the flash head. Place S1 in the ICC under test to the ON position. Insure CB1 in the MCC is set to ON. The panel indicator labeled LAMP on the flasher tester unit should be on.

Note

If the flasher tester unit panel lamp is not on, check the flasher tester fuse F1. Replace if needed. If OK, replace the lamp (ADB Safegate Part# 48A0123).

Also check the connection between the flasher tester unit and the ICC at J3. See Figure 6.

2. Insure S3 (trigger), on the flasher tester unit is in the ON position and that the ICC door interlock S3 is OPEN.

Note

With S3 OPEN, the flash head will be OFF.

3. Set the digital multimeter dial on the flasher tester unit for AC voltage. Press the DC/AC Button to switch to AC voltage. The meter jacks must be plugged into plug P1 (red to +) and P2 (black to –).

Table 3: Flasher Tester Unit Setup

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	N/A	**N/A**	**N/A**	**1**	**Low**	**ON**	**ON**	**Connected**
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, OFF				
	ON	TEST	OPEN					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

3.1.4 Testing the Flasher Tester

Test #1 measures 120 Vac Power to the Flasher Tester Unit .

3.1.4.1 Test # 1.

1. Set the rotary switch S1, on flasher tester unit, to position 1.

Note
Insure the Master intensity is set to LOW.

Table 4: Test # 1 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	N/A	**N/A**	**N/A**	**1**	**Low**	**ON**	**ON**	**Connected**
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]			Flash head, OFF		
	ON	TEST	OPEN					

Notes
1 MALSR only
2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)
3 ALSF only

The digital meter should read 108 to 132 Vac (record the voltage reading on the data sheet, Table 20).

Troubleshooting:

If the digital meter reading is less than 2 Vac:

Check that switch S1 in the ICC is set to ON. If it is set correctly,

- fuses F1 or F2 in the ICC may be blown,
- ICC switch S1 may be defective or,
- power may not be supplied to the ICC.

Note
Do not proceed until all faults are corrected and this step is completed successfully.

3.1.4.2 Test # 2 - Measure the ICC relay K1 coil voltage

Test #2 and Test #3 checks the input voltage to the ICC ON/OFF relay K1.

1. Set the flasher tester unit rotary switch S1 to position 2. Make sure the ICC interlock switch S3 is in the OPEN position (the plunger is not pulled out). The “240 Vac Power-On” indicator LED 1 on the Flasher Tester should be OFF.

Table 5: Test # 2 Equipment SettingsOperatio

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	OFF	N/A	N/A	**2**	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	**LOW**	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, OFF				
	ON	TEST	**OPEN**					

Notes
1 MALSR only
2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)
3 ALSF only

Note
The meter should read 108 to 132 Vac (record the voltage on the data sheet), which indicates the coil of the ICC power-on/off relay (K1) is receiving proper voltage and the ICC door interlock switch (S3) is in the open (OFF) position.

Troubleshooting:

If Flasher Tester LED 1 is ON, the contacts on the ICC on/off relay K1 may be welded together (check/ replace the relay).

If the digital meter reads less than 80 Vac, then fuse F1 of the ICC may be blown or, the relay coil may be defective or, the interlock switch may be in the CLOSED position or it may be shorted.

Correct the issue or replace the defective part.

3.1.4.3 Test #3

1. Pull out the plunger on the ICC door interlock switch S3 to close the circuit (S3 in the CLOSED/ON position). The flasher tester LED 1 should be ON.

The digital meter reading should change from a range of 108 to 132 Vac to less than 2 Vac (record the final voltage on the data sheet).

WARNING
Pulling out the plunger on door interlock switch S3 energizes the ICC power-on/off relay and turns on the high voltage supply and, if operational, causes the flash head to flash.

Table 6: Test # 3 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	N/A	N/A	2	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing LOW if the ICC has no failures				
	ON	TEST	CLOSED					

Table 6: Test # 3 Equipment Settings (continued)

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Troubleshooting:

If the digital meter reading stays within the range of 108 to 132 Vac, either the ICC door interlock switch S3 has failed to close (and may be defective) or, the interlock switch in the flash head is open.

Correct the issue or replace the defective part.

3.1.5 Measure the ICC Power Voltage at Terminal 1 of the ICC Transformer T1

Test #4 measures the ICC power supply voltage at terminal 1 of transformer T1, which is supplied from TB1-1 through switch S1a, fuse F1, and the ICC power-on/off relay K1.

3.1.5.1 Test # 4

1. Set the flasher tester unit switch S1 to position 3. The flasher tester LED 1 should be ON.

Table 7: Test # 4 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	N/A	N/A	3	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing LOW if the ICC has no failures				
	ON	TEST	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Note

The digital meter should read within the range of 108 to 132 Vac (record the voltage on the data sheet).

Note

The nominal voltage from TB1-1 to TB1-2 and, TB1-3 to TB1-2 is 120 Vac.
The nominal voltage from TB1-1 to TB1-3 is 240 Vac.

Troubleshooting:

If the reading is less than 5 Vac, there is no power on ICC transformer T1 terminal 1. Verify there is proper input voltage at the ICC TB1, 2 and 3. If OK, check the ICC fuse F1.

If OK, replace ICC relay K1.

3.1.6 Measure the ICC Power Supply Voltage at Terminal 2 of the ICC Transformer T1

Test #5 measures the ICC power supply voltage at terminal 2 of transformer T1 which is supplied from TB1-3 through switch S1b, fuse F2, resistor R30, and the power-on/off relay K1.

3.1.6.1 Test # 5

1. Set the flasher tester unit switch S1 to position 4. LED 1 on the flasher tester should be ON.

Table 8: Test # 5 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	N/A	N/A	4	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing LOW if the ICC has no failures				
	ON	TEST	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Note

The reading may vary slightly with each flash, but the meter should read within the range of103 to 132 Vac (record the voltage on the data sheet).

Note

Voltage reading may vary for each flash but should fall in the specified range.

Troubleshooting:

If the reading is less than 5 Vac, there may be no power on ICC transformer T1 terminal 1.

If OK, replace ICC relay K1.

If the meter reading is correct for test #4 and #5, check that the flasher tester unit LED 1 is ON. This indicates 240 Vac is present across the ICC transformer T1 terminals 1 and 2.

If the LED 1 is not ON, ICC fuse F2 may be blown or, the on/off relay K1 contacts may be defective or, the resistor R30 may be open or, a bad contact may exist in the ICC switch S1.

3.1.7 Measure the Relay Coil Voltage of the Medium Intensity Relay K2

Tests #6 and #7 checks the Low and Medium intensity and trigger commands coming into the ICC.

Note

Set switch S2 on the Flasher PCB in the ICC to the NORMAL position. This allows the flasher tester to monitor the intensity control signals from the Master to the ICC.

3.1.7.1 Test # 6

1. Set flasher tester unit switch S1 to position 5. Insure that the Master Control Cabinet still operates the system at the **LOW** intensity step level.

Table 9: Tests # 6a and 6b Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	flashing 2/sec	N/A	5	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing LOW if there is no intensity command failure				
	ON	Normal	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Note

Test 6a The digital meter should read less than 20 Vac (record the voltage on the data sheet).

Troubleshooting 6a:

If the digital meter reading is more than 20 Vac but less than 90 Vac, an abnormal electrical noise is present on the cables leading to the ICC (probable insulation failure).

If the meter reads more than 90 Vac, incorrect intensity commands are being input into theICC. Check the wiring from the MCC. Replace the Master I/O PCB, if necessary.

Note

Test 6b The Flasher Tester input trigger detector LED 2 should flash twice per second (record the flash rate (2/sec) on the data sheet).

Troubleshooting 6b:

If LED 2 in the flasher tester unit is continuously off, either the I/O PCB in the MCC may be defective or, the trigger cable from the MCC to the ICC may be open or, shorted to Earth ground.

If LED 2 in the flasher tester unit is continuously ON, there may be a failure on the I/O PCBin the MCC.

If LED 2 in the flasher tester unit flashes irregularly, there may be excessive noise on the trigger cable from the MCC to the ICC.

3.1.7.2 Test # 7

Leave switch S5 on the ICC Flasher PCB in position 5. With S2 on the Flasher PCB remaining in the Normal Position, operate the system at **MEDIUM** intensity, by setting S5 in the MCC to the **MEDIUM** intensity step level.

Table 10: Tests #7a and 7b Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	flashing 2/sec	N/A	5	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	MED	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing in MEDIUM intensity if there is no intensity command failure				
	ON	Normal	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Note

Test 7a The reading may vary slightly with each flash, but the meter should read within the range of 103 to 132 Vac (record the voltage on the data sheet).

Note

Voltage reading may vary for each flash but should fall in the specified range.

Troubleshooting 7a:

If digital meter reads less than 20 Vac, the ICC switch S2 on Flasher PCB may be in TEST position or, the Flasher PCB may be defective or, there is may be a failure on the Master I/O PCB.

Note

Test 7b The Flasher Tester input trigger detector LED 2 should continue to flash twice per second (record the flash rate (2/sec) on the data sheet).

Troubleshooting 7b:

If LED 2 in the flasher tester unit is continuously off, either the I/O PCB in the MCC may be defective or, the trigger cable from the MCC to the ICC may be open or, shorted to Earth ground.

If LED 2 in the flasher tester unit is continuously ON, there may be a failure on the I/O PCB in the MCC.

If LED 2 in the flasher tester unit flashes irregularly, there may be excessive noise on the trigger cable from the MCC to the ICC.

3.1.8 Measure the Relay Coil Voltage of the High Intensity Relay K3 in the ICC

Tests #8 and #9 checks the medium intensity, high intensity and trigger commands coming into the ICC.

3.1.8.1 Test # 8

1. Leave S2 on the ICC Flasher PCB in the Normal Position. Set the flasher tester unit switch S1 to position 6. Leave the system operating in Medium intensity.

Table 11: Tests #8a and 8b Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	flashing 2/sec	N/A	6	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [2]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	MED	
ICC under test	S1	S2	door interlock S3 [2]	Flash head, Flashing in MEDIUM intensity if there is no intensity command failure				
	ON	Normal	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Note

Test 8a The digital meter should read less than 20 Vac (record the voltage on the data sheet).

Troubleshooting 8a:

If the digital meter reads more than 20 Vac but less than 90 Vac, an abnormal electrical noise is present on cables leading to the ICC (probable insulation failure).

If the meter reading is more than 90 Vac, incorrect intensity commands are being input into the ICC. Check the wiring from the MCC. Then replace the Master I/O PCB if necessary.

Note

Test 8b The Flasher Tester input trigger detector LED 2 should flash twice per second (record the flash rate (2/ sec) on the data sheet).

Troubleshooting 8b:

If LED 2 in the flasher tester unit is continuously off, either the I/O PCB in the MCC may be defective or, the trigger cable from the MCC to the ICC may be open or, shorted to Earth ground.

If LED 2 in the flasher tester unit is continuously ON, there may be a failure on the I/O PCBin the MCC.

If LED 2 in the flasher tester unit flashes irregularly, there may be excessive noise on the trigger cable from the MCC to the ICC.

3.1.8.2 Test # 9

1. Leave S2 on the Flasher PCB in the Normal Position and S1 on the Flasher Tester in position 6. Operate the system at the **HIGH** intensity, by setting S5 in the MCC to the **HIGH** intensity step level.

Table 12: Tests #9a and 9b Equipment Setting

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	flashing 2/sec	N/A	6	Low	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	HIGH	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing in HIGH intensity if there is no intensity command failure				
	ON	Normal	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Note

Test 9a The reading may vary slightly with each flash, but the meter should read within the range of 100 to 117 Vac (record the voltage on the data sheet, Table 20).

Troubleshooting 9a:

If the digital meter reads less than 20 Vac, the switch S2 on the Flasher PCB may be in TEST position or, switch S2 may be defective or, the Flasher PCB may be defective or, there may be a failure on the Master I/O PCB.

Note

Test 9b The Flasher Tester input trigger detector LED 2 should flash twice per second (record the flash rate (2/sec) on the data sheet).

Troubleshooting 9b:

If LED 2 in the flasher tester unit is continuously off, either the I/O PCB in the MCC may be defective or, the trigger cable from the MCC to the ICC may be open or, shorted to Earth ground.

If LED 2 in the flasher tester unit is continuously ON, there may be a failure on the I/O PCBin the MCC.

If LED 2 in the flasher tester unit flashes irregularly, there may be excessive noise on the trigger cable from the MCC to the ICC.

3.1.9 Verify Functional Operation of the ICC Relays K2 and K3

Test #10 and Test #11 checks that ICC relays K2 and K3 functionally operate.

3.1.9.1 Test # 10

1. Set S5 in the MCC to the LOW intensity setting.
2. Set switch S2 on the Flasher PCB in the ICC to the TEST position. This allows the flasher tester unit to provide trigger signals and control voltage for operating the intensity-level relays K2 and K3.
3. On the flasher tester unit, set switch S1 to position 5. Leave the flasher tester unit switch S2 (intensity) in the LOW intensity step. Set the flasher tester unit switch S3 (trigger) to the OFF position.

Note
The digital meter is not used in this step.

Table 13: Test # 10 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	OFF	N/A	5	LOW	OFF	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]			Flash head, OFF		
	ON	TEST	CLOSED					

Notes
1 MALSR only
2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)
3 ALSF only

Note
Test 10 Observe the ICC relay, K2. The K2 relay contacts should be open.

4. Continue observing relay K2 while changing flasher tester switch S2 (intensity) back and forth between the **LOW** position and the **MED** position (MEDIUM intensity step) several times.

Note
The K2 relay contact should open and close with an audible 'click' each time the switch is flipped back and forth. If you observe the expected results, record OK on the data sheet.

Troubleshooting:

If the relay contacts do not move, the contacts may be welded shut or, the K2 relay may have failed. Replace the K2 relay.

3.1.9.2 Test # 11

1. Leave S5 in the MCC at the LOW intensity setting. Leave switch S2 on the Flasher PCB in the ICC in the TEST position. On the flasher tester unit, set switch S1 to position 6 and, switch S2 (intensity) in the **LOW** intensity step. Leave the flasher tester unit switch S3 (trigger) in the OFF position.

Note
The digital meter is not used in this step.

Table 14: Test # 11 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	OFF	N/A	6	LOW	OFF	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]			Flash head, OFF		
	ON	TEST	CLOSED					

Notes
1 MALSR only
2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)
3 ALSF only

Note
Test 11 Observe the ICC relay, K3. The K3 relay contacts should be open.

2. Continue observing relay K3 while changing flasher tester switch S2 (intensity) back and forth between the **LOW** position and the **HIGH** position (HIGH intensity step) several times.

Note
The K3 relay contact should open and close with an audible 'click' each time the switch is flipped back and forth. If you observe the expected results, record OK on the data sheet.

Note
The K2 relay will also operate as the flasher tester switch S2 is flipped between LOW and HIGH.

Troubleshooting:

If the relay contacts do not move, the contacts may be welded shut or, the K3 relay may have failed. Replace the K3 relay.

3.1.10 2000 Vdc Supply and Associated Components Measurement

The following tests are performed with the system operating and the flashers energized and after the previous flasher tester unit steps have been performed without errors.

Test #12 measures the +2000Vdc power supply level.

3.1.10.1 Test # 12

1. On the Flasher PCB in the ICC, leave S2 in the TEST position. On the flasher tester unit, set switch S2 (intensity) to the center position (LOW intensity). Leave the flasher tester unit switch S3 (trigger) in the OFF position.
2. On the flasher tester unit set switch S1 to position 7.

> **Note**
> In order to use the digital meter with the flasher tester unit switch S1 in position 7, the flasher tester unit, switch S3 (trigger) must be in the OFF position. Insure the MCC switch S5 is in the LOW intensity setting.

Table 15: Test # 12 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	OFF	OFF	7	LOW	OFF	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	door interlock S3 [2]			Flash head, OFF		
	ON	TEST	CLOSED					

Notes
1 MALSR only
2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)
3 ALSF only

3. Set the **digital meter dial to DC volts** . Review Using the Multimeter .

> **Note**
> The digital meter test probes must be plugged into jacks P1 (red or +) and P2 (black or –).
> The digital meter should digital meter read between +90 Vdc and +120 Vdc (record the voltage on the data sheet).

Troubleshooting:

If the digital meter reads greater than + 120 Vdc, there may be an over-voltage condition in the +2000 Vdc power supply.

If the digital meter reads between +2 and +89 Vdc, this indicates a failure in which the High Voltage power supply is less than +2000 Vdc, such as a failed High Voltage transformer T1 or, a shorted high voltage bridge D1, D2, D3, D4 on the ICC Flasher PCB or, a shorted ICC resonant capacitor C8 or, a shorted ICC low intensity capacitor C11 or, a shorted +2000 V cable from the ICC to the flash head.

If the digital meter reads less than +2 Vdc and flash-head trigger-input-detector LED 3 is continuously **ON** , there may be either a shorted trigger SCR Q1 on the ICC Flasher PCB or, flash head capacitor C11 on the ICC or, a complete failure of the +2000 Vdc power supply.

3.1.11 Flashing Circuitry Measurements

Tests #13, #14 and #15 measures the ICC triggering circuitry.

3.1.11.1 Test # 13

1. Set the flasher tester unit switch S1 to position 3.

The Flasher Tester switch S3 should be in the OFF position.

On the flasher tester unit, LEDs 2 and 3 should be continuously OFF.

Table 16: Test # 13 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	OFF	OFF	3	LOW	OFF	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, OFF				
	ON	TEST	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

3 ALSF only

Note

If the flasher tester unit LED indications are correct, write **OK** on the data Table 20 .

Troubleshooting:

On the flasher tester unit, if the input pulse detector, LED 2, flashes twice per second, then switch S2 on the flasher PCB, in the ICC, may be in the Normal position. Set it to TEST.

3.1.11.2 Test # 14

1. On the flasher tester unit, set switch S3 (the pulse generator) to the ON position. On the flasher tester unit, both LED 2 and LED 3 should flash simultaneously (twice per second).

Table 17: Test # 14 Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	flashing 2/sec	flashing 2/sec	3	LOW	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing in LOW if both ICC and flash head has no failures				
	ON	TEST	CLOSED					

Notes

1 MALSR only

2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)

Table 17: Test # 14 Equipment Settings (continued)

[3] ALSF only

2. **Set the digital meter switch to read AC volts** . The digital meter reading should be in the range of 103 to 132 Vac (record the voltage on the data sheet, Table 20).

Note
Voltage reading may vary for each flash but should fall in the specified range.

Note
The voltage reading should not vary more than 3 or 4 volts during the flashing operation.

Troubleshooting:

On the flasher tester unit, if the input pulse detector, LED 2, is continuously OFF, then there may be a failure in the triggering circuitry on the Flasher PCB.

On the flasher tester unit, if the output pulse detector LED 3 is continuously OFF, then there may be a failure in the triggering circuitry on the Flasher PCB or, a failed trigger capacitor C1 in the flash head or, the flash lamp has failed. Correct the faulty component before you continue.

3.1.11.3 Test # 15

1. Set the flasher tester unit switch, S2 (intensity), to the HIGH intensity.

Table 18: Test # 15 Equipment Settings

Flasher Tester	LED 1	LED 24	LED 34	S1	S2	S3	Lamp	J3
	ON	flashing 2/sec	flashing 2/sec	3	HIGH	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	door interlock S3 [2]	Flash head, Flashing in HIGH if both ICC and flash head has no failures				
	ON	TEST	CLOSED					

Notes
[1] MALSR only
[2] Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)
[3] ALSF only

Note
The digital meter should read in the range of 100 to 132 Vac (record the voltage on thedata sheet).

Troubleshooting:

If the voltage is too low, either the ICC input power cable gauge is too small or there are bad ICC to flash head connections. Check the cable and tighten all the connections.

3.1.12 Restoring the System to Operational Condition

1. Turn the meter in the Flasher Tester to **OFF** . Set S5 in the MCC to **OFF** and Turn **OFF** CB1.
2. Turn the power **OFF** in the ICC by turning S1, in the ICC, to the OFF position.
3. Place the door interlock switch, S3 in the OFF position by depressing the plunger of the switch momentarily.

WARNING
Wait two minutes before removing the flasher tester unit plug from the flasher PCB, receptacle J3, in the ICC.

4. After all tests have been completed and, the system is found to be operating satisfactorily, remove the flasher tester unit plug from the flasher PCB, receptacle J3, in the ICC.
5. Set S2 on the flasher PCB, in the ICC, to the **Normal Position** . Set switch S1 in the ICC to the **ON** position. Close the ICC cabinet door.

Note
Disengage the flasher tester plug from receptacle J3, by holding the flasher PCB near the receptacle firmly and then gently wiggling the plug out of the receptacle using a rocking motion.

Make sure switch S2 on the flasher PCB, in the ICC, remains in the NORMAL position and close the ICC doors.

6. Restore the MCC to its normal operational settings.

3.2 Using the Multimeter

Figure 7: Model DM78C Digital Multimeter Spec Sheet

DM78C Digital Multi-Tester — Data Sheet

General Specifications

Display:	3¾ digits LCD, max reading 3400
Range selection:	Autoranging and manual range lock
Overrange indication:	OL
Polarity indication:	- is displayed; + is implied
Battery warning:	displayed when <1.25 V ±0.1 V
Sampling rate:	2/sec display. 20/sec bargraph
Environment:	Indoor operation, 2000 m (6561 ft) max
Temperature/Humidity:	Operation: 0 °C to 40 °C (32 °F to 104 °F), <70 % RH non-condensing Storage: -20 °C to 60 °C (-4 °F to 140 °F), <80 % RH non-condensing
Battery type:	Two 1.5 V (L1154F or LR-44)
Battery life:	70 hours continuous operation
Continuity test:	Beeper alert
Auto-OFF:	After 10 minutes of non-use
Dimensions (H x W x D):	130 x 77 x 18 mm (5.1" x 3.1" x 0.6")
Weight (including battery):	110 g (3.9 oz) including case

Specifications 23 °C ±5 °C, 80 % RH Max; Maximum input, all functions/ranges: 600 VDC or AC rms

Function	Range	Accuracy
DC Voltage		
340 mV, 3.4, 34, 340, 600 V	3.4 V range	±1.0 % rdg + 2 dgts
	All other ranges	±2.0 % rdg. + 2 dgts
Resolution	100 µV in 340 mV range	
Input Impedance	340 mV range: > 100 M Ω	
	3.4 V range: 10 M Ω	
	All other ranges: 9.1 M Ω	
AC Voltage (50–60 Hz)		
	3.4, 34, 340, 600 V	±4.0 % rdg. + 5 dgts
Resolution	1 mV in 3.4 V range	
Input Impedance	3.4 V range: 10 M Ω	
	All other ranges: 9.1 M Ω	
Resistance		
Ranges	340 Ω, 3.4, 34, 340 kΩ, 3.4, 34 MΩ	
Resolution	100 mΩ in 340 Ω range	
	340 Ω, 3.4, 34, 340 kΩ ranges:	± 2.0 % rdg + 4 dgts
	3.4 MΩ range:	± 3.0 % rdg + 4 dgts
	34 MΩ range:	± 5.0 % rdg + 5 dgts
Test Voltage	-0.45 Vdc typical (-1.2 Vdc on 340 Ω rng)	
Diode Test		
Range	3.4 V	± 3.0% rdg + 3 dgts
Test Current	0.6 mA (Vf = 0.6 V)	
Continuity Check		
Range	340 Ω	
Indication	at approx R <35 Ω	
Test Current	0.7 mA	

GENERAL

Ranging: The meter defaults to auto ranging when turned on, and selects the range automatically. For Manual Ranging: press "Range Lock" Button to hold selected range (on the display) Pressing ⦿ "Range Lock" again steps to next range. Hold button for 2sec. to return to Auto range mode.

Data Hold: Press the "Data Hold" Button to toggle in ("H" displayed) and out of mode. Last reading is held on the display. Press button again to release and display present readings.

Selector Switch. When the Selector Switch is in the Ω ◁)) ⊣⊢ position, press the Function Button to step between resistance, continuity test (◁)) and Ω displayed), and diode test(⊣⊢). When the Selector Switch is in VOLTS position, press the Function Button to step between AC voltage and DC voltage.

3.2.1 Measuring DC Voltages

WARNING
For safety, do not attempt to measure voltages greater than 450VDC.

1. Set Selector Switch to **VOLTS** .
2. Press Function Button to select **DC.**
3. Connect black test lead to negative side of circuit being measured and red lead to positive side.
4. Read the value on display.

WARNING
For safety, do not attempt to measure voltages greater than 450VAC.

3.2.2 Measuring AC Voltages

1. Set Selector Switch to **VOLTS** .
2. Push Function Button so that “AC” appears in display.
3. Connect test leads to circuit.

Note
Connection must be in parallel with circuit being measured.

4. Read value on the display

3.2.3 Resistance Measurements

WARNING
Before taking any in-circuit resistance measurements, remove power to the circuit being tested and discharge all capacitors in the circuit.

1. Set Selector Switch to Ω.
2. Press Function Button until O.L. and MΩ appear on display.
3. Connect test leads to circuit.
4. Read value on the display.

3.2.4 Battery Replacement

Power is supplied by two button-type batteries (NEDA 1166A or IEC LR-44).

“B” appears on the LCD display when replacement is needed.

WARNING
Before attempting to replace the battery, first disconnect the test leads from any energized circuit.

1. Set Function Switch to **OFF** .
2. Remove battery cover screw.
3. Slide off battery cover, note polarity, and change the batteries.
4. Replace battery cover and screw.

3.3 Using the Flasher Tester as a Master Control Cabinet

WARNING
Read the instructions in their entirety before beginning any steps.

As an optional troubleshooting method, the Flasher Tester may be used as a substitute for the MCC intensity and trigger signals. This may be useful in isolating MCC or external wiring faults.

1. Turn all incoming power to the MCC OFF. Turn MCC CB1 OFF. Remove TB3 from the I/O PCB in the MCC. This eliminates outgoing trigger commands to the ICCs.
2. Remove TB2 from the I/O PCB in the MCC. This eliminates outgoing intensity commands to the ICCs.
3. Open the door to the ICC to be tested and turn ICC switch S1 OFF. Plug the Flasher Tester plug J3 into the Flasher PCB. Set the Flasher PCB switch S2 into the TEST position. Set the Flasher Tester switches as follows: S1 to **1** , S2 to **LOW** and, S3 to **ON** .

Note
The meter is not used for these procedures.

4. Restore incoming power to the MCC and turn CB1 ON and S5 to LOW. Turn on S1 in the ICC.
5. Power is now supplied to all ICCs, but only the ICC under test will be able to operate.

Table 19: Flasher Tester Control Equipment Settings

Flasher Tester	LED 1	LED 2	LED 3	S1	S2	S3	Lamp	J3
	ON	flashing 2/sec	flashing 2/sec	1	LOW	ON	ON	Connected
MCC	CB1	CB2	CB3	CB4 [1]	S1 [2]	S3 [3] /S4 [1]	S5	
	ON	ON	ON	OFF	CLOSED	ALSF/ON	LOW	
ICC under test	S1	S2	doorinterlock S3 [2]	Flash head, Flashing in LOW if the ICC and flash head are operational				
	ON	TEST	CLOSED					

Notes
1 MALSR only
2 Door interlock - close door or pull out the plunger toward you to close circuit. (bypass interlock)
3 ALSF only

The Flash Head should be flashing in LOW if there are no equipment failures.

Flasher Tester LED 1 should be ON, and LED 2 and 3 should be flashing simultaneously.

Note
You can change the intensity by setting Flasher Tester switch S2 to the MED or HIGH positions.
You can turn the flash head OFF by setting the Flasher Tester S3 in the OFF position.

3.3.1 Restoring the system to operational condition after troubleshooting

1. Set S5 in the MCC to **OFF** and Turn **OFF** CB1.
2. Turn the power **OFF** in the ICC by turning S1 in the ICC to the OFF position.
3. Place the door interlock switch, S3 in the OFF position by depressing the plunger of the switch momentarily.

WARNING
Wait two minutes before removing the flasher tester unit plug from the flasher PCB, receptacle J3, in the ICC.

4. After all tests have been completed and the system is found to be operating satisfactorily, remove the flasher tester unit plug from the flasher PCB, receptacle J3, in the ICC.
5. Set S2 on the flasher PCB, in the ICC, to the **Normal Position** . Close the ICC cabinet door.

Note
Disengage the flasher tester plug from receptacle J3, by holding the flasher PCB near the receptacle firmly and then gently wiggling the plug out of the receptacle using a rocking motion.
Make sure switch S2 on the flasher PCB, in the ICC, remains in the NORMAL position and close the ICC doors.

6. Reinstall the MCC I/O PCB terminal blocks TB2 and TB3.
7. Return the MCC to its operational settings

Note
Running the ICC directly from the Flasher Tester Unit at a Maintenance Shop: To run an individual control cabinet (ICC) at a test station directly from the flasher tester at a maintenance shop, connect 120/240 Vac to the ICC at TB1 (TB1-1= 120 Vac, TB1-2 =Neutral, TB1-3 = 120 Vac).
You can then plug the flasher tester into receptacle J3 in the ICC and operate the ICC in the same manner as described above.

3.4 Data Sheet

Table 20: Data Sheet for the Flasher Tester Voltage Measurements

		TESTS																	
		1	2	3	4	5	6a	6b	7a	7b	8a	8b	9a	9b	10	11	12	13	14	15
ICC No.	Local ICC I.D.	108-132 Vac	108-132 Vac	<2 Vac	108-132 Vac	103-132 Vac	< 20 Vac	2/sec	103-132 Vac	2/sec	< 20 Vac	2/sec	100-117 Vac	2/sec	OK	OK	+90 VDC to +120 VDC	OK	103-132 Vac	100-132 Vac
ICC 1																				
ICC 2																				
ICC 3																				
ICC 4																				
ICC 5																				
ICC 6																				
ICC 7																				
ICC 8																				
ICC 9																				
ICC 10																				
ICC 11																				
ICC 12																				
ICC 13																				
ICC 14																				
ICC 15																				
ICC 16																				
ICC 17																				
ICC 18																				
ICC 19																				
ICC 20																				
ICC 21																				

Note

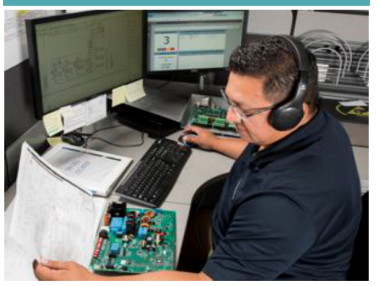
[1] ICC1 is normally the unit farthest from the runway threshold

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 labeled 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.

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