BA300

Battery Alarm

Commissioning Instructions

For use with Substation and Telecontrol Batteries

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GRID

ALSTOM

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HANDLING OF ELECTRONIC EQUIPMENT

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of Alstom Grid products are immune to the relevant levels of electrostatic discharge when housed in their cases. Do not expose them to the risk of damage by withdrawing modules unnecessarily.
Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors.
3. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
4. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as you.
5. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 60147-0F.

If you are making measurements on the internal electronic circuitry of equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.
Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available, you should maintain regular contact with the case to prevent the build up of static.
Instrumentation which may be used for making measurements should be earthed to the case whenever possible.
Alstom Grid strongly recommends that detailed investigations on the electronic circuitry, or modification work, should be carried out in a Special Handling Area such as described in BS5783 or IEC 60147-0F.

This Safety Section should be read before commencing any work on the equipment.

Health and safety

The information in the Safety Section of this manual is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

Explanation of symbols and labels

The meaning of symbols and labels which may be used on the equipment or in the product documentation, is given below.

Caution: refer to product documentation

Caution: risk of electric shock

Protective/safety *earth terminal

Functional *earth terminal. Note: this symbol may also be used for a protective/safety earth terminal if that terminal is part of a terminal block or sub assembly eg. power supply.

*Note: The term earth used throughout the product documentation is the direct equivalent of the North American term 'ground'.

Installing, Commissioning and Servicing

Equipment connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous live voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

Voltage and output connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal. The recommended minimum earth wire size is 1.0 mm^2. Omitting or disconnecting the equipment earth may cause a safety hazard.

Before energising the equipment, the following should be checked:

Voltage rating and polarity;

Protective fuse rating;

Integrity of earth connection

Equipment operating conditions

The equipment should be operated within the specified electrical and environmental limits.

Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

Disposal

It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner.

Technical Specifications

Protective fuse rating

The recommended maximum rating of the external protective fuse for this equipment is 2A, Red Spot type or equivalent.

Insulation class:	IEC 61010-1: Class I	1990/A2:	1995	This equipment requires a protective (safety) earth connection to ensure user safety.
	EN 61010-1: Class I	1993/A2:	1995	
Installation Category (Overvoltage):	IEC 61010-1: Category III	1990/A2:	1995	Distribution level, fixed installation. Equipment in this category is qualification tested at 5kV peak, 1.2 50µs, 500Ω, 0.5J, between all supply circuits and earth and also between independent circuits.
	EN 61010-1: Category III	1993/A2:	1995	
Environment:	IEC 61010-1: Pollution degree 2	1990/A2:	1995	Compliance is demonstrated by reference to generic safety standards.
	EN 61010-1: Pollution degree 2	1993/A2:	1995	
Product safety: CE	73/23/EEC			Compliance with the European Commission Low Voltage Directive.
	EN 61010-1:	1993/A2:	1995	Compliance is demonstrated by reference to generic safety standards.
	EN 60950:	1992/A11:	1997	

Applications

For situations where batteries are located in unmanned substations it is important that the security of the supply is maintained. This means, not only that the battery voltage is within required limits, but that Earth Leakage is minimised and any latent faults in the battery and its connections will not result in failure to initiate tripping when a heavy current is demanded.

The Battery Alarm is suitable for use on all batteries with an impedance exceeding 0.1Ω.

Connections

Figure 1 below shows how the Battery Alarm should be included in the system. The Battery Alarm positive and Battery Alarm negative leads should be connected as near to the battery terminals as possible via 2A rated fuses.

For safety reasons, the earth terminal must be connected to earth. If either the positive or negative of the battery is earthed, the standard Battery Alarm 300 will indicate an earth fault alarm. In the case when an earth relay is already fitted, a Battery Alarm 300 model without earth fault is recommended.

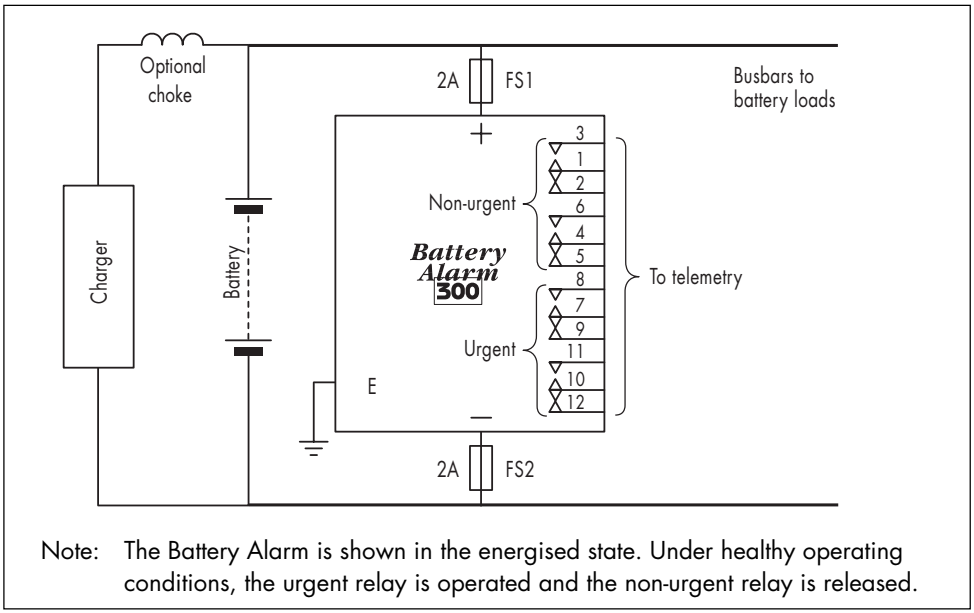
Test Method for Battery Alarm

The unit can be tested using the equipment shown in Figure 2. With this set-up, carry out the following tests:

WARNINGS

i) E(GND) is not connected to earth for this test. The metal backplate will be at half the battery voltage, current limited to 5mA.

ii) Ensure that the 220μF capacitor is safely discharged using a suitable resistor.



Note: The Battery Alarm is shown in the energised state. Under healthy operating conditions, the urgent relay is operated and the non-urgent relay is released.

Figure 1: External Wiring Diagram

1. **Power Supply**

   Set the power supply voltage mid way between the two voltage trip settings. Check the current indicated on the milliammeter (3) is approximately 20mA.

   NB: Replace the milliammeter (3) with a link for the following tests.

2. **Over Voltage Trip**

   Slowly increase the voltage until the over voltage alarm LED lights.

3. **Over Voltage Reset**

   Slowly reduce the voltage until the over voltage alarm LED extinguishes

4. **Under Voltage Trip**

   Slowly reduce the voltage until the under voltage alarm LED lights.

5. **Under Voltage Reset**

   Slowly increase the voltage until the under voltage alarm LED extinguishes

6. **Cut-off Facility**

   For units with cut-off facility, slowly increase the supply voltage until the over voltage LED lights and check that the cut-off relay alarm trips after the specified time delay.

7. **Timer**

   Increase the voltage to a value above the over voltage trip point. Note the time between the over voltage alarm LED coming on and the output relay alarm tripping.

8. **High Impedance**

   Set the power supply voltage midway between the two voltage trip points. Increase the series resistance (5) from zero until the high impedance LED comes on.

   NB: Reset the series resistance to zero.

9. **Earth Fault, Positive (Negative)**

   Connect point A to the positive (negative) terminal of the alarm. Slowly decrease the resistor (10) from 100kΩ until the positive (negative) EARTH FAULT LED lights. The earth fault current is proportional to the reading on the voltmeter (9). The total resistance (8) + (10) should be specified value ±10%.

10. **Output Contacts**

    The correct operation of the relay contacts can be checked using a battery operated test lamp or buzzer.

    A version with both relays designated as non-urgent is also available: Refer either to the connection label or the Operating and Maintenance manual for relay connections.

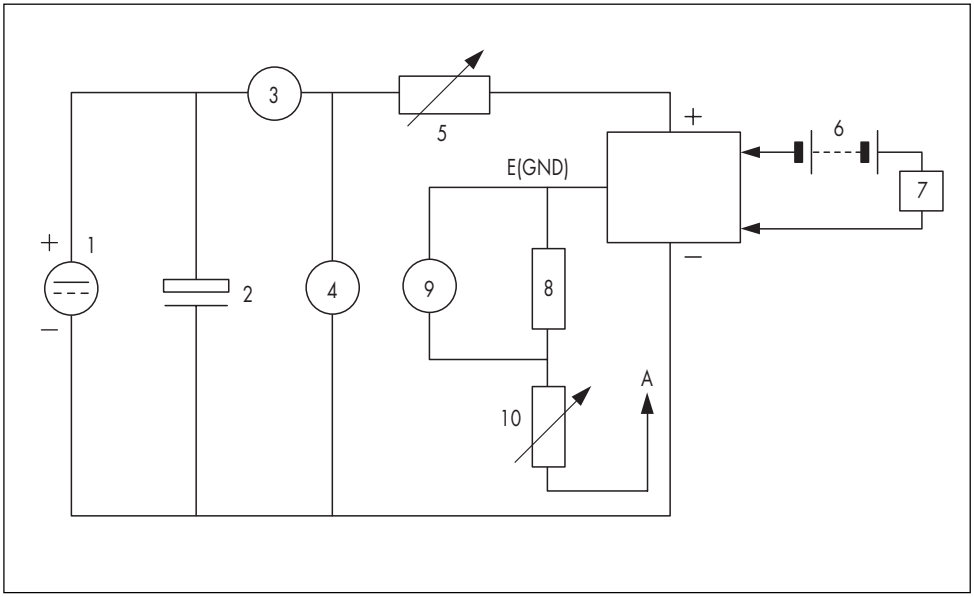


Figure 2: Connection diagram for Battery Alarm test sequence

Key

1. Variable dc power supply, 0–1A output.
   Output impedance less than 0.2Ω
2. Capacitor 220μF, 400V (required if power supply output impedance is greater than 0.2Ω)
3. Low impedance milliammeter, to indicate 20mA dc
4. Voltmeter (10,000Ω/V or better)
5. Variable resistance, 0–5Ω in 0.1Ω increments
6. Battery
7. Bulb or buzzer to suit (6)
8. 1kΩ precision resistor
9. 0–1V voltmeter
10. Variable resistor 0–100kΩ (increments of 100Ω)

Application note

Battery charger systems with an inductive output element only, should have a suitable load connected, such as a battery, during commissioning and normal operation.
This is to avoid resonance of the output inductor with the system capacitance which may produce damaging high peak output voltages.

For use with inductor only filtered chargers, a small standing drain will be required on the battery busbars so that a high resistance alarm is given for a completely open circuit battery, eg. typical drain of 0.3A for a 110V system.

For battery charger systems with capacitor filtered outputs, the Battery Alarm requires a choke of ≥2mH to be fitted at the output of the battery charger to ensure correct operation of the high impedance alarm (see Figure 1).

In normal operation, the non-urgent (earth fault or high volts cut-off) relay is de-energised and the urgent relay is energised, thus providing a 'fail to safety' feature.

If the supply voltage falls below 66% nominal for longer than 50 milliseconds, an instantaneous urgent alarm is given. When the supply voltage returns to above 66% nominal a 'power on reset' occurs after a time delay of 1 second.

Operation

The Battery Alarm derives its power supply from the battery being monitored. The current consumption is approximately 20mA. Four monitoring functions are provided:

A. Earth fault alarm (positive and negative).

B. Over voltage alarm.

C. Under voltage alarm.

D. High battery impedance alarm.

A common configuration for alarm relay outputs is routing functions B, C and D via a timer circuit to the urgent relay.

Six LED indicators are provided for diagnostic purposes and under normal healthy conditions only the one monitoring the power supply is lit.

The LEDs for all four functions listed above will light instantaneously when a fault is detected and the urgent and non-urgent alarm relays will trip after their preset time delays.

Commissioning

Battery Alarms are available calibrated for other battery voltages between 24V and 220V. They are designed for flush panel mounting in a cut-out measuring 92mm square (+0.8, –0), and secured in position with the clamps provided. Before connecting up, ensure that the unit supplied is suitably rated for the battery installation to be monitored, otherwise damage could be sustained. Connect the + and – terminals and also connect the E terminal to earth. Connect the output contacts to the telemetry or other alarm annunciators as required.

After carefully removing the small access window, the front-mounted potentiometers can be adjusted as follows:

1. High Impedance

   Rotate this control anticlockwise until the associated LED is lit, then slowly rotate clockwise until the LED is just extinguished. This gives maximum sensitivity. Further clockwise rotation increases the trip impedance.

2. Over Voltage – preset at factory.*

3. Under Voltage – preset at factory.*

   * A limited amount of adjustment is possible to suit a particular installation but an injection test is preferred (apply to factory for details).

Technical Specifications

Battery Voltage Ranges

Battery voltages (VB)	24V, 30V, 32V, 48V, 50V, 60V, 110V, 125V, 220V.
Operating Range	80…140%VB
Burden	20mA nominal
Voltage alarm levels (adjustable)	
Under voltage range	80…110%VB
Over voltage range	105…140%VB
Accuracy of setting	±0.5%
Hysteresis on setting	0.5%
Earth leakage protection (preset)	
Trip level range	5kΩ to 90kΩ
Accuracy of trip level	±10%
Hysteresis on trip level	5%
Short circuit current	<5mA
High impedance alarm (adjustable)	
Setting range	0.1Ω …5.0Ω
Accuracy of setting	±0.05Ω
Hysteresis on setting	0.05Ω

Temperature

Nominal range of use	–20°…+60°C
Reference temperature	23°C
Temperature coefficient	
Voltage alarms	±0.006%/°C
Earth leakage alarm	±0.06%/°C
Timer settings	±0.06%/°C
High impedance alarm	<0.1Ω deviation in setting over temperature range

Electromagnetic Compatibility Directive 89/336/EEC

Emissions standard	EN 50081-2 1994 Industrial environment
Immunity standard	EN 50082-2 1995 Industrial environment (IEC 60801 parts 2, 3 and 4)
Susceptibility to Electrostatic Discharge	8kV air discharge/4kV contact.

Warning: This specification applies when the front cover is fitted. If the front cover is removed to gain access to the adjustment potentiometers then appropriate ESD protection must be taken.

Low Voltage Directive 72/23/EEC

Designed to EN61010-1 1993 safety requirements.

CE

Timers

Alarm time delay settings	1, 2, 4, 8, 16, 32, 64, 128s (other settings available on request)
Accuracy of setting	±10% (±0.25s)

Output relays

URGENT alarm relay	2 changeover contacts
NON-URGENT alarm relay	2 changeover contacts

Contact ratings

Max. switching power	60W; 62.5VA
Max. switching voltage	220V dc; 250V ac
Max. switching current	2A

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