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Discipline
Engineering Standard - NSW

Category
Signalling

Title
Specification - Battery Voltage Monitor and Alarm

Reference Number
SPS 09 - (RIC Standard: SC 01 51 09 00 SP)

Document Control

Status	Date	Prepared	Reviewed	Endorsed	Approved
Issue 1 Revision 2	May 05	Standards and Systems	Standards Engineer	GM Infrastructure Strategy & Performance	Safety Committee
		Refer to Reference Number	H Olsen	M Owens	Refer to minutes of meeting 12/08/04

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The technical content of this document has been approved by the relevant ARTC engineering authority and has also been endorsed by the ARTC Safety Committee.

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About This Standard

This specification details the requirements for the “Battery Voltage Monitor and Alarm” (BVMA).

This specification is intended to be read by persons involved in the design, manufacture, installation or maintenance of BVMA.

The BVMA will generally be used for the monitoring of 12-15V DC Level Crossing Battery supplies. The alarm is used to indicate a low voltage condition to maintenance staff.

The terminal arrangement specified for the back panel of the unit is the same as an existing alarm card currently in use at a number of locations.

Document History

Primary Source – RIC Standard SC 01 51 09 00 SP Version 2.0

List of Amendments –

ISSUE	DATE	CLAUSE	DESCRIPTION
1.1	14/03/2005	Disclaimer	Minor editorial change
1.2	06/05/2005	All	Document reformatted

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1. Introduction

1.1. Purpose of this Document

This specification details the requirements for the “Battery Voltage Monitor and Alarm” (BVMA).

This specification is intended to be read by persons involved in the design, manufacture, installation or maintenance of BVMA.

This specification presumes a reasonable familiarity with printed circuit board construction practices and of electronic theory.

The BVMA is intended as a stand alone rack mounted equipment, or as a replacement for the existing Low Voltage Alarm Card, which is mounted inside the Level Crossing Battery Charger.

1.2. Production materials and rights

All printed circuit board production materials used in manufacturing this unit shall become property of the ARTC, to be used as the purchaser sees fit.

The manufacturer shall provide a hard copy and a magnetic copy of all production materials.

If production materials are supplied with the order it will remain the responsibility of the manufacturer to produce a unit compliant with the requirements of the specification.

2. Functional Specification

BVMA shall monitor the battery voltage and indicate with an alarm when the voltage has fallen below a preset trip voltage. The accuracy of the BVMA shall be 0.1 / 0 V DC.

BVMA alarm condition shall be indicated by the output relay de-energised. Alarm output shall be by Normally Open contacts of the output relay. Alarm output shall be maintained until unit is deliberately reset.

The Alarm shall not be cleared by loss and restoration of the power to the Monitor.

Alarm reset requires the input voltage to be above the threshold voltage and operation of the reset button on the front of BVMA or shorting of the reset terminals E & F by an external Normally Open Contact.

BVMA shall be powered from the Battery being monitored. A mode selector switch is required :

Mode 1 for normal operation

Mode 2 for setting up the alarm trip voltage

The switch shall have spring return to normal mode.

Alarm output shall operate after battery voltage has remained below the threshold for more than 10 sec.

In the adjustment mode the alarm relay shall be held energised, the 10sec delay shall be disabled and alarm relay latching function shall be bridged out by contacts of the mode selector switch.

BVMA requires two (2) 4mm banana socket terminals on the front panel for connecting a meter when adjusting reference voltage and setting alarm trip voltage.

The terminals on the rear of the BVMA shall be numbered as shown in Diagram 1.

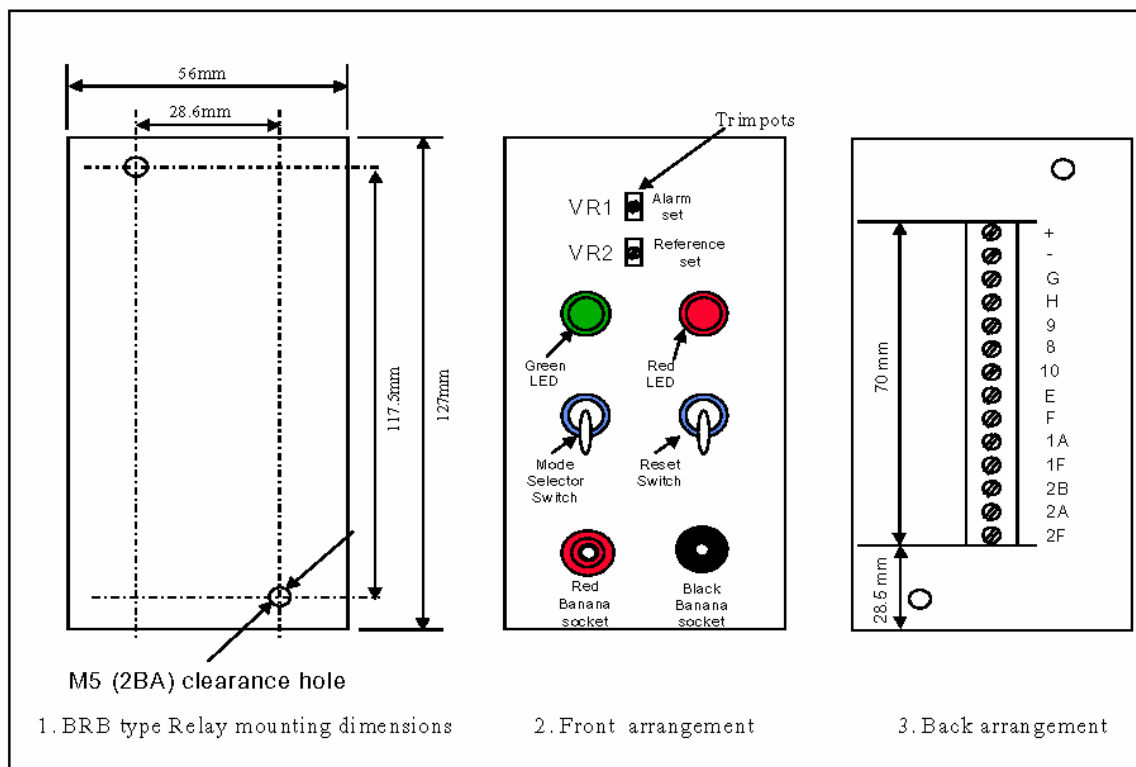


Diagram 1. Arrangement for the BRB Type Relay Mounting

Two indicating LEDs shall be provided as follows:

GREEN - Battery voltage above threshold

RED - Battery voltage below threshold

LEDs shall be 5mm High Intensity (>100mcd) in water clear packages.

Output Relay requires 4 (four) sets of contacts, contact rating 120V AC, 1.25A per contact, wired as detailed in M08-843 (5/8/92) (Appendix A).

The voltage sensing input (terminals and) shall have a maximum input impedance 20 K and protection against reverse polarity connection. No single failure of BVMA shall result in premature discharge of the battery monitored

BVMA shall be designed on safe-fail dynamic operating principles, so that no component failure can result in BVMA failing to give an alarm indication.

3. Performance Specification

BVMA shall operate over the supply voltage range of 9.8 - 20V with ripple not greater than 5%.

BVMA voltage threshold shall be continuously adjustable over the range of 10 - 18V by means of a multiple turn potentiometer (VR2) accessible from the front panel.

BVMA shall have an internal threshold voltage reference continuously adjustable over the range 10-18V with the resolution of 0.1V by means of a multiple turn potentiometer (VR1) accessible from the front panel.

BVMA shall maintain its operating threshold within specified limits over the operating temperature range and over a period of not less than 3 month without adjustment.

BVMA shall have a minimum life of 20 years with no preventative maintenance.

4. Mechanical Specification

4.1. Physical Characteristics

All copper areas of the printed circuit board, all soldered terminations and component leads shall be insulated using a solder-through lacquer such as ISONEL 642 or equivalent.

The threshold adjustment shall be via an instrument quality multi-turn potentiometer, with 6 mm shaft, slotted for screwdriver operation, installed flush with face panel or slightly recessed, with a lockable collar. If an alternative adjustment is proposed, it shall provide an equal degree of adjustment control and stability. In either case, the design shall permit easy access for adjustment while the unit is installed and operating.

In screw type terminals the screw shall not press directly onto the wire that is being secured. Screw type terminals shall use a wire protector that will not foul the terminal hole or come loose when the wire is withdrawn from the terminal. The terminals shall be able to take up to 4mm² solid conductors.

4.2. Construction

BVMA shall be housed in a case with dimensions not exceeding those of a single BRB rack module (56mm wide, 127mm high, 180mm deep).

4.3. Mounting

BVMA shall be suitable for mounting on BRB relay rack with two (2) 5mm captive nuts in the rear panel in positions as shown in Diagram 1.

For mounting in place of the existing Low Voltage Alarm Card, BVMA shall be provided with an adaptor plate as shown in Diagram 2, such that the terminal block position and orientation shall match those on the Low Voltage Alarm Card.

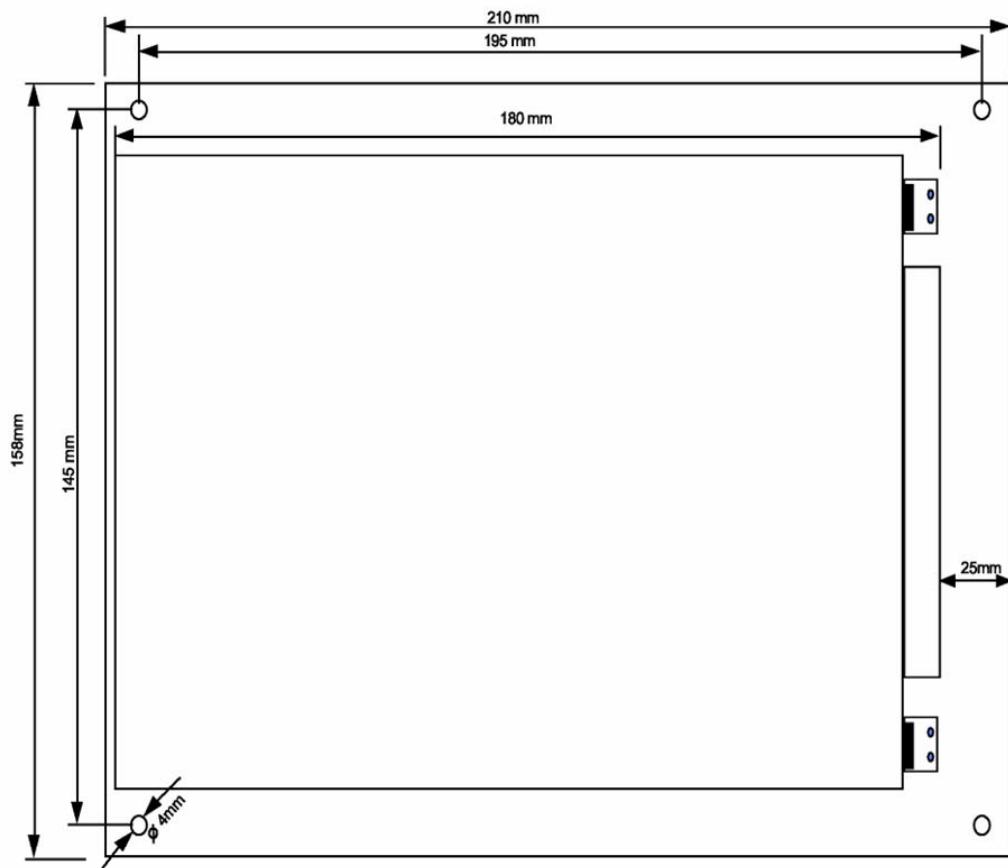


Diagram 2. Arrangement for Panel Mounting

5. Environmental Specification

BVMA shall perform as specified in:

- ambient temperatures of 0 C to +70C and in humidity up to 90% non-condensing.
- electrically noisy environment
 - 50Hz AC.
 - high voltage back EMF from BRB relays.
 - switchmode power supplies in close proximity.
 - 5W UHF radios at 2m range.
- BVMA housing shall provide protection to at least IP54 standard.

6. Maintenance Aspects

6.1. Labelling

The printed circuit board shall have printed on the component side of the board in Large Characters, the manufacturer's name, a batch number, component labels, and the label "BATTERY VOLTAGE MONITOR AND ALARM".

A Unique serial number (Unique for the manufacturers batch number) shall be indelibly marked on the panel visible when mounted.

The terminals shall be labelled with their terminal number, and polarity as shown in Diagram1.

All labels shall be in English, clearly legible and sufficiently hardy so that they shall not fade due to weathering over the years and/or with continuous handling. The lettering shall be as large as practicable. All symbols used in the identification of components, sub-assemblies, wires, terminals etc. shall coincide with those on drawings.

Two LEDs to be labelled:

BATTERY VOLTS



Mode selector switch to be labelled:



6.2. Components

BVMA shall be designed to utilise generally accepted standard components wherever possible and shall maintain its guaranteed performance of operation under all the conditions laid down in this specification without adjustment following any replacement of components with parts having equivalent characteristics.

7. Acceptance tests

The threshold voltage shall be set for an initial value of 11.8V.

A minimum of one unit from each batch manufactured shall be selected at random, and tested for the following:

- a) Threshold adjustment.
- b) Labelling and serial number are as specified.
- c) Manufacture quality of printed circuit board, components, etc.

A test report showing the results of each test, including any calibration carried out shall be provided with each delivery of the units.