

Annexure-11: Specification for Annunciation panel

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SPECIFICATION FOR ANNUNCIATION PANEL

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Abbreviations:

AC	Alternating Current
BIS	Bureau of Indian Standards
BS	British Standards
CEA	Central Electricity Authority
CRCA	Cold Rolled Cold Annealed
CT	Current Transformer
DC	Direct Current
EIL	Engineers India Ltd
EPDM	Ethylene Propylene Diene Monomer
FRLS	Flame Retardant Low Smoke
HDPE	High Density Poly Ethylene
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Ingress Protection
ISA	Instrument Society of America
LED	Light Emitting Diode
MCB	Miniature Circuit Breaker
MSL	Mean Sea Level
NEMA	National Electrical Manufacturers Association
PVC	Poly Vinyl Chloride
VDE	Verband Der Electrotechnik, Electronik und Information Technik
VT	Voltage Transformer

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1.0 SCOPE

- 1.1 This specification defines the requirements for design, engineering, manufacture, testing, packing and supply of solid-state alarm annunciation panel.

2.0 CODES AND STANDARDS

- 2.1 The equipment shall comply with the requirements of latest revision of following standards issued by BIS unless otherwise specified.

IS-5	: Colours for Ready Mixed Paints & Enamels.
IS-694	: PVC Insulated Cables for Working Voltages upto & including 1100V
IS-4794	: Push Button Switches: General Requirements and Tests.
IS-5578	: Guide for Marking of Insulated Conductors.
IS-5786	: Fixed Resistors, General Purpose, Low Power
IS-6553	: Environmental Requirements for Semiconductor Devices and Integrated Circuits.
IS-11353	: Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals.
IS-12021	: Specifications for Control Transformers for Switchgear and Control gear for Voltages not exceeding 1000V AC.
IS-13703	: Low Voltage Fuses
IS-14901	: Semiconductor Devices: Discrete Devices & Integrated Circuits
IS/IEC-60529	: Degrees of Protection Provided by Enclosures (IP Code).
IS/IEC-60947	: LV Switchgear and Control gear

- 2.2 In case of imported equipment, standards followed in the country of origin shall be applicable if these standards are equivalent or more stringent than the applicable Indian Standards.
- 2.3 The equipment shall also conform to the provisions of CEA regulations and other statutory regulations currently in force in the country.
- 2.4 In case Indian standards are not available for any equipment, standards issued by IEC/BS/VDE/IEEE/NEMA or equivalent agency shall be applicable.
- 2.5 In case of any conflict between requirements specified in various applicable documents for the project, the most stringent one shall prevail. However, Owner's decision in this regard will be final and binding.

3.0 SITE CONDITIONS

The annunciation panel shall be suitable for installation in a closed room with restricted natural air ventilation in tropical, humid and corrosive atmosphere. The equipment shall be designed to operate under site conditions as specified in the data sheet. If not specifically indicated therein, design ambient temperature of 40⁰ C and altitude not exceeding 1000 m above MSL shall be considered.

4.0 GENERAL REQUIREMENTS

- 4.1 The offered equipment shall be brand new with state of art technology and proven field track record. No prototype equipment shall be offered.
- 4.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment at least for 10 years from the date of supply.
- 4.3 Vendor shall give a notice of at least one year to the end user of equipment and EIL before phasing out the product / spares to enable the end user for placement of order for spares and services.

5.0 TECHNICAL REQUIREMENTS

5.1 Constructional Features

- 5.1.1 The panel shall be sheet steel enclosed, dust and vermin proof having minimum degree of protection as IP-41. The panel shall be free standing, floor mounting type, mounted on a supporting structure so as to form a rigid enclosure suitable for the application.

The frames shall be fabricated by using minimum 2mm thick CRCA sheet steel while the doors and covers shall be made from 1.6 mm thick CRCA sheet steel. Wherever, required suitable stiffeners shall be provided. All openings, covers and doors shall be provided with gaskets of Neoprene/HDPE/EPDM or equivalent around the perimeter to make the panel dust and vermin proof. Hinged doors shall be complete with door handles, lock and latching facility. Ventilating covers, if provided shall have screens and filters.

- 5.1.2 The floor mounting type panel shall be provided with integral base frame suitable for tack welding to floor embedded insert plate/flat/channel. Where wall mounting type panel is specified, suitable arrangement for installation on wall shall be provided.
- 5.1.3 The height of floor mounting type panel shall not exceed 2400 mm. In case more than one panel is used, all the panels shall be arranged to form a continuous line up of uniform height and depth.
- 5.1.4 The bottom of floor mounting type panel shall have a 100 mm kick plate all around.
- 5.1.5 Cable entry shall be from bottom. A suitable removable undrilled gland plate shall be provided for cable entry.
- 5.1.6 Suitable hooks shall be provided for lifting the panel.
- 5.1.7 The panel shall be designed to be suitable for installation against a wall. Access shall be provided from front for maintenance of all equipment including cables and terminations.
- 5.1.8 All control equipment shall be located at convenient height for ease of operation. The centreline of switches, push buttons etc. shall be not less than 750 mm and shall not be more than 1800 mm from the bottom of the panel. Alarm fascia shall be located at a minimum height of 900 mm from panel bottom.
- 5.1.9 The panel shall be designed to ensure maximum safety during operation, inspection, connection of cables, maintenance and servicing under energised condition. Means shall be provided to prevent accidental shorting of circuit terminals and wiring. Checking and removal of components shall be possible without disturbing adjacent equipments. All components shall be easily accessible, without impeding the access to internal wiring and other components.

5.2 Wiring & Terminals

- 5.2.1 All wiring inside the panel shall be done with adequately sized, BIS approved, PVC insulated, FRLS type, 660V grade, single-core, stranded, annealed copper conductors wires.
- 5.2.2 Each wire shall be identified at both ends with wire numbers by means of PVC ferrules.
- 5.2.3 All external connections shall be through terminal block. The terminal blocks shall be mounted minimum 300 mm above the gland plate. Each wire shall be terminated at a separate terminal. However, in no case more than 2 wires shall be terminated on a terminal.
- 5.2.4 All spare contacts of relays, timers etc. shall be wired up to the terminal block.
- 5.2.5 Terminal block shall be moulded piece made of non-inflammable plastic and complete with insulating barriers, stud type terminals, washers, nuts, lock nuts, inserts etc. Marking on the terminal strip shall correspond to wire number and terminal numbers on the wiring diagram. Minimum 20 % spare terminals shall be provided in each terminal block.
- 5.2.6 Clamp type terminals suitable for termination of crimped type lugs shall be provided for all control cable connections. Suitable power terminals shall be provided for incoming power cables.
- 5.2.7 All terminals shall be properly shrouded against accidental contact.

5.3 Panel Illumination and Space Heaters

- 5.3.1 LED lamps working on 240V AC, operated by door switches shall be provided for internal panel illumination.
- 5.3.2 A 240V, single Phase, 5 A, 3 pin socket shall be provided for each cubicle with on-off switch for connection of hand lamps.
- 5.3.3 The panels shall be provided with space heaters controlled through MCB and thermostat with an adjustable setting.

5.4 Earthing

- 5.4.1 All panels shall be connected to an earth bus bar of suitable size having continuity throughout the length of the panel line-up. All doors and movable parts shall be connected to the earth bus with flexible copper connections. Provision shall be made to connect the earthing bus bar to the plant earthing grid at two ends. All non-current-carrying metallic parts of the equipment and components shall be earthed.

5.5 Nameplates

- 5.5.1 Engraved nameplates indicating the panel designation shall be provided at the top (on front and back) of the panel. These shall be fixed in such a way that these can be removed and refitted when desired.
- 5.5.2 Nameplate or polyester adhesive 'identification' shall be fixed on each component mounted inside the panel and shall be provided on panel walls, to indicate permanent location of the components. Labels shall be provided for every component on the cards, connecting wires, as well as, for the terminals in the terminal strip inside the panel.
- 5.5.3 Nameplates shall also be fixed on the exterior of the panels at appropriate places to indicate the description/ function of various control switches, push buttons, lamps and other equipment.
- 5.5.4 Special warning plates shall be provided on all removable covers or doors giving access to energised metallic parts above 24V.

5.6 Painting

- 5.6.1 All metal surfaces shall undergo manufacturer's standard cleaning /painting cycle.
- 5.6.2 After preparation of the under surface, the panels shall be painted with two coats of epoxy based final paint. Colour shade of final paint shall be 631 of IS: 5/RAL 7032.
- 5.6.3 All unpainted steel parts shall be suitably treated to prevent rust formation. If these parts are moving elements then they shall be greased.

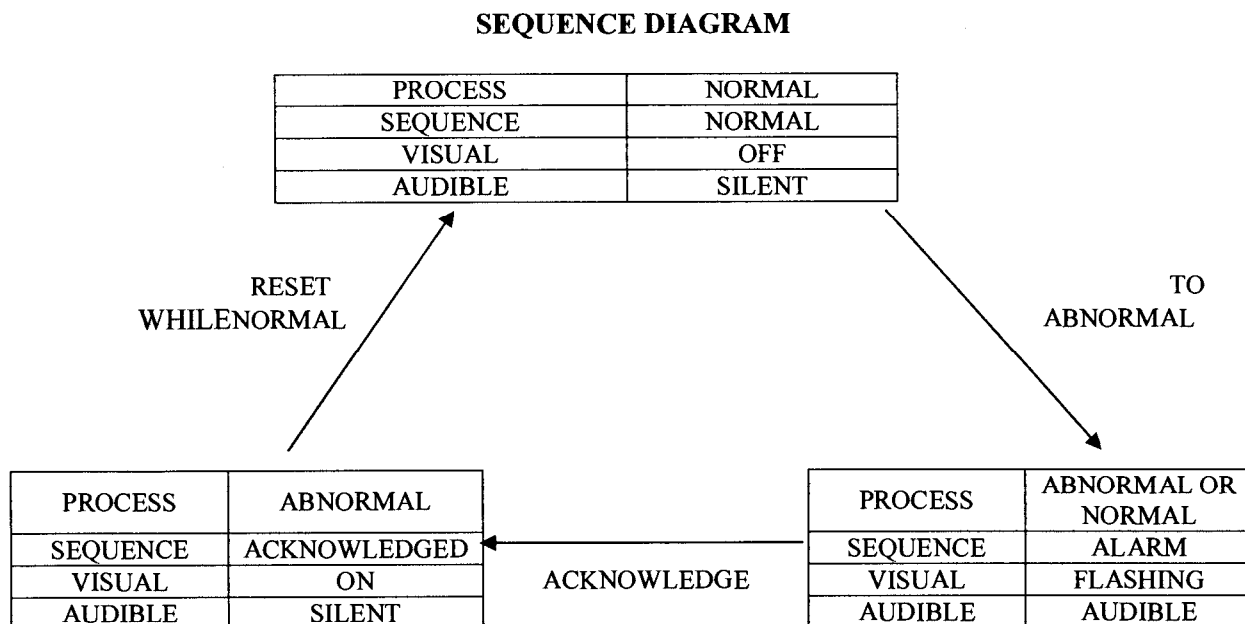
5.7 Annunciator / Annunciation Schemes

- 5.7.1 The annunciator shall be solid state, window facia type, of modular construction.
- 5.7.2 Visual indication shall be flush mounted, back lighted type, consisting of translucent facia of unbreakable acrylic material. Trip and non-trip alarms shall be segregated. The colour of windows shall be 'Red' for trip alarms and 'White' for all other alarms.
- 5.7.3 Annunciation facia shall be suitable for accommodating at least 15 standard capital size letters/ numerals in Gothic form per line with 4 lines. Minimum size of the letter shall be 4 mm. Spacing between the 2 lines shall be minimum 2 mm. The facia window shall have a minimum display area of 1500 mm².
- 5.7.4 Each facia window shall be provided with at least two sets of super bright cluster LEDs in parallel to ensure highly reliable visual annunciation of adequate light intensity.
- 5.7.5 On occurrence of fault (s) one of the alarm sequences, as per Figure A (Sequence M of ISA S 18.1) or as per Figure B (Sequence F2M-1 of ISA S 18.1) shall be provided, as stated in the data sheet. If not specified therein, sequence as Figure A (Sequence M of ISA S 18.1) shall be provided.
- 5.7.6 Static control circuits shall be used for alarm logics incorporating audible and visual alarms. These shall be mounted on PCBs. The PCBs for identical logic units shall be interchangeable.
- 5.7.7 All requisite accessories including separate push buttons for ACKNOWLEDGE /ACCEPT, RESET, SILENCE, and TEST functions shall be provided common for all annunciator windows. These shall be located on front of the panel.
- 5.7.8 Annunciator shall be designed to lock in even during TEST mode if the field contacts get actuated at that instant.
- 5.7.9 The annunciator circuit design shall ensure that momentary short circuits in lamp circuit do not affect it. Visual and audible alarm circuits shall be independent i.e. the failure of one shall not affect the other.
- 5.7.10 The annunciators shall be suitable for operation with normally open fault contact which closes on a fault. It shall be possible to make them suitable for normally closed fault contact by modification in field.
- 5.7.11 Annunciator shall be able to lock in for momentary actuation of field contacts.
- 5.7.12 The system shall have protection against malfunctioning due to voltage spikes.
- 5.7.13 DC Control supply, at the specified voltage, shall be provided by the Purchaser at one / two points in the panel as indicated in the data sheet. Necessary power supply module(s), if required, to generate different voltages for various annunciator elements shall be included in Vendor's scope. DC supply failure indication shall be provided separately with DC under voltage relays. On failure of DC supply to the panel, a lamp and an audio buzzer fed from

AC supply shall operate. There shall be provision for silencing/ acknowledging the buzzer. This buzzer shall have distinctly separate tone from other audible alarms.

- 5.7.14 The annunciator circuit shall be designed to be suitable for proper operation, free of any spurious actuation, considering field wiring cable length up to 1.5 km, using PVC insulated cable of 2.5 mm² copper conductor cables/ 1.5 mm² twisted pair overall shielded copper conductor cables.

FIGURE A: SEQUENCE-M, MANUAL RESET



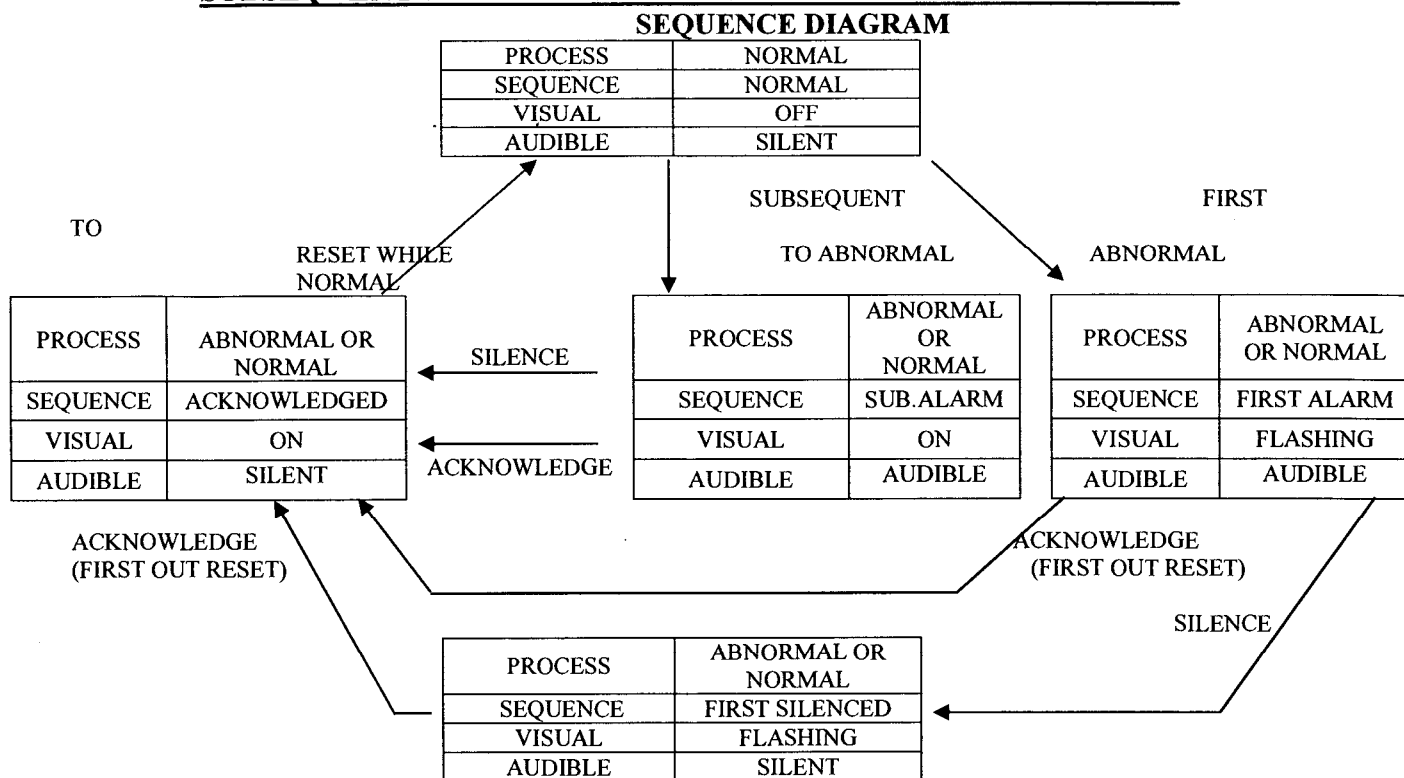
SEQUENCE TABLE

LINE	PROCESS CONDITION	PUSHBUTTON OPERATION	SEQUENCE STATE	VISUAL DISPLAY	ALARM AUDIBLE DEVICE	REMARKS
1	NORMAL	-	NORMAL	OFF	SILENT	
2	ABNORMAL	-	ALARM	FLASHING	AUDIBLE	LOCK-IN
3	ABNORMAL OR NORMAL	ACKNOWLEDGE	ACKNOWLEDGED	ON	SILENT	MANUAL RESET REQUIRED
4A	ABNORMAL	RESET	TO LINE 3			
4B	NORMAL		NORMAL	OFF	SILENT	MANUAL RESET

SEQUENCE FEATURES :

1. ACKNOWLEDGE, RESET AND TEST PUSHBUTTONS.
2. ALARM AUDIBLE DEVICE.
3. LOCK-IN OF MOMENTARY ALARMS UNTIL ACKNOWLEDGED.
4. THE AUDIBLE DEVICE IS SILENCED & FLASHING STOPS WHEN ACKNOWLEDGED.
5. MANUAL RESET OF ACKNOWLEDGED ALARM INDICATIONS AFTER PROCESS CONDITIONS RETURN TO NORMAL.
6. OPERATIONAL TEST.

**FIGURE B: SEQUENCE-F2M 1, MANUAL RESET FIRST OUT WITH NO
SUBSEQUENT ALARM FLASHING AND SILENCE PUSH BUTTON**



SEQUENCE TABLE

LINE	PROCESS CONDITION		PUSHBUTTON OPERATION	SEQUENCE STATE	VISUAL DISPLAY	ALARM AUDIBLE DEVICE	REMARKS
1	NORMAL		-	NORMAL	OFF	SILENT	
2	FIRST	ABNORMAL	-	FIRST ALARM	FLASHING	AUDIBLE	LOCK-IN
3	SUB			SUB ALARM	ON	AUDIBLE	LOCK-IN
4	FIRST	ABNORMAL OR NORMAL	ACKNOWLEDGE BEFORE SILENCE	TO LINE-7			FIRST OUT RESET
5	SUB	ABNORMAL OR NORMAL					
6	FIRST	ABNORMAL OR NORMAL	SILENCE	FIRST SILENCED	FLASHING	SILENT	
7	SUB	ABNORMAL OR NORMAL		ACKNOWLEDGED	ON	SILENT	MANUAL RESET REQUIRED
8	FIRST	ABNORMAL OR NORMAL	ACKNOWLEDGE AFTER SILENCE	TO LINE-7			FIRST OUT RESET
9	NORMAL		RESET	NORMAL	OFF	SILENT	MANUAL RESET

SEQUENCE FEATURES:

1. SILENCE, ACKNOWLEDGE, RESET AND TEST PUSHBUTTONS.
2. ALARM AUDIBLE DEVICE.
3. LOCK-IN OF MOMENTARY ALARMS UNTIL ACKNOWLEDGED.
4. OPTION-1: SILENCE PUSHBUTTON TO SILENCE THE ALARM AUDIBLE DEVICE WHILE RETAINING FIRST OUT FLASHING INDICATION.
5. FLASHING INDICATION FOR FIRST ALARMS ONLY. NEW SUBSEQUENT ALARMS HAVE THE SAME VISUAL INDICATION AS ACKNOWLEDGED ALARMS.
6. FIRST OUT INDICATION IS RESET WHEN ACKNOWLEDGED.
7. MANUAL RESET OF ACKNOWLEDGED ALARM INDICATIONS AFTER PROCESS CONDITIONS RETURN TO NORMAL.
8. OPERATIONAL TEST.

5.8 Clock

- 5.8.1 An electronic digital clock having 7 segment LED display (Red Colour) shall be provided on the top of the panel. The display shall have date, hour and minute display with blinking dots. The AM/PM or 24 hour mode shall be field selectable. The display shall be visible from a distance of 7 metre arc covering an angle of 120°. The numeral height of the digit shall be 5 cm. The intensity of the display shall be sufficient to view in broad daylight. The accuracy of the clock shall be better than ± 10 sec. per month.
- 5.8.2 Power supply for the clock shall be derived from the incoming main supply to the annunciation panel and shall be backed by lithium batteries.

6.0 INSPECTION, TESTING AND ACCEPTANCE

- 6.1 During fabrication, panel shall be subjected to inspection by EIL / Owner or by an agency authorised by the Owner to assess the progress of work, as well as to ascertain that only quality raw material is used. Manufacturer shall furnish all necessary information concerning the supply to EIL / Owner's representative.

For testing requirements, refer Inspection & Test Plan No. 6-81-1005. Prior notice of minimum 3 weeks shall be given to EIL/owner for witnessing the final testing of panel to ensure satisfactory operation of all components. Tests shall be carried out at manufacturer's works under his care and expense.

7.0 PACKING AND DESPATCH

All equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by selected mode i.e. by ship / rail or trailer. The equipment shall be wrapped in polythene sheets, before being placed in the crates / cases to prevent damage to finish. Crates / cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up' 'Centre of Gravity', 'Weight', 'Owner's particulars', PO nos. etc. shall be clearly marked on the package together with other details as per purchase order.

The equipment may be stored outdoors for long periods before erection. The packing shall be completely suitable for outdoor storage in areas with heavy rains / high ambient temperature, unless otherwise agreed. A set of instruction manuals for installation, testing and commissioning, a set of operation & maintenance manuals and a set of final drawing shall be enclosed in a waterproof cover along with the shipment.