



**BR 941**  
**May 1972**

Specification for Miniature Tractive Armature  
A.C. Lamp Proving Relay  
Plug-in Type  
for  
Railway Signalling Purposes

**British Railways Board**



**Specification for Miniature Tractive Armature  
A.C. Lamp Proving Relay  
(Plug-in Type)  
for  
Railway Signalling Purposes**

The information contained in this document is confidential and must not be used reproduced copied or disclosed, other than for the purpose for which this specification was released.

**AMENDMENTS**

| <b>Amd. No.</b> | <b>Date</b> | <b>Text Affected</b> |
|-----------------|-------------|----------------------|
| 1               | Jan. 1974   | Cl. 18.1(a)          |
| 2               | May 1975    | Cl. 18.2             |
| 3               | July 1976   | Cl. 6.11             |

## **NOTE**

This specification supersedes all previous issues. It is issued by:- from whom further copies may be obtained.

British Railway Board,  
Director of S&T Engineering,  
Materials Management Group,  
Room 1103,  
Rail House,  
CREWE.  
Cheshire CW2 6EA

BT (STD) 0270-532494  
BT (STD) 0270-532345 Fax  
BR (ETD) 05-32494  
BR (ETD) 05-32345 Fax

Technical queries should be referred:-

CS & TE  
Melbury House,  
Melbury Terrace,  
London NW16JU

Telephone : PO (STD) 01 262 3232 Extn. 5744  
BR (ETD) 015 5744

# BRITISH RAILWAYS BOARD



## **B.R. SPECIFICATION NO. 941A (Superseding BR Specification 941)**

### **FOR**

### **Miniature Tractive Armature A.C. Lamp Proving Relay (Plug-in Type)**

### **for**

### **Railway Signalling Purposes**

## **1. FOREWORD**

- 1.1 The relay covered by this specification is intended for use in a Railway signalling lamp proving circuit where the relay is connected in series with the primary of the lamp transformer.
- 1.2 These relays must not be used to break circuits in which the energy dissipated at the contact exceeds the limit given in clause 12.1.

## **2. SCOPE**

- 2.1 This specification relates to design requirements for a miniature tractive armature slow release line relay of the plug-in type for use in 110V signalling circuits, incorporating a rectifier feed unit, and suitable for use with SL-34 or SL-35 lamps to BS:469. It is intended to be used without an external resistor and with a lamp circuit having characteristics such that under extreme variations of filament current consumption and supply voltage the line currents will meet the operating values specified in Cl. 18.2.
- 2.2 The design is based on the requirement that the relay shall remain in the operated position long enough to cover the contact transit time of the signal control relay.

## **3. DEFINITIONS**

- 3.1 For the purpose of this specification the following definitions shall apply:-

|               |                                                                                 |
|---------------|---------------------------------------------------------------------------------|
| Operate       | That condition of the relay when all front contacts are just made.              |
| Full Operate  | That condition of the relay when the armature has completed its maximum travel. |
| Release       | That condition of the relay when all front contacts have opened.                |
| Full Release  | That condition which the relay assumes when de-energised.                       |
| Front Contact | A contact which is made when the relay is energised.                            |

|                 |                                                                                                    |
|-----------------|----------------------------------------------------------------------------------------------------|
| Contact Element | The contact piece which is attached to a contact spring.                                           |
| Contact Spring  | The spring strip to the end of which the contact element is secured.                               |
| Direct Current  | Current from a battery or smoothed rectified a.c. with a ripple content not exceeding 1.25% r.m.s. |

#### **4. GENERAL**

4.1 The complete assembly shall consist of two main parts, viz:-

- (a) A relay, incorporating the rectifier feed unit.
- (b) A plugboard into which a relay is plugged.

4.2 The relay shall be designed to have minimum bulk and weight consistent with the prime necessity for safety and reliability, and its construction shall be such as to minimise accidental damage sustained during transit or installation.

4.3 The relay shall include a rigid base plate which shall form part of the plug-socket interconnection between the relay and its plugboard.

4.4 The relay shall be enclosed in a cover which shall be so constructed that the relay shall be clearly visible for inspection. A retaining device shall be provided for the cover such that the cover cannot be removed without breaking a seal.

4.5 There shall be a minimum clearance of 0.125 inch between the cover and any moving part of the relay. The material of the cover and construction of the relay shall be such that the application of a force of 30 lbs. at any point on the surface of the cover of the assembled relay shall not result in its deflection to an extent sufficient to interfere with the operation of the relay. The material shall be of such resilience that after removal of this force it shall restore to its normal condition. The cover shall be free from detrimental warping which may reduce this clearance, either from temperature or moisture changes or long term ageing or release of locked up stresses.

4.6 The cover and baseplate of the relay when assembled shall be dustproof.

4.7 Surface leakage distances shall not be less than 0.125 inch internal and 0.25 inch external. Parts enclosed when the relay is attached to its plugboard may be regarded as internal.

4.8 There shall be a minimum of 0.015 inch clearance between any moving part and any other part which might interfere with its correct operation and the design must be such that this clearance is maintained throughout the rated life of the relay.

4.9 A retaining clip, as indicated in Common appendix 'B2' shall be provided to hold the relay securely in its plugboard without the possibility of the electrical connections becoming disconnected.

- 4.10 The male portion of each interconnection shall make a positive sliding contact with the female portion.
- 4.11 The permanent relay rack wiring to the plugboard shall be terminated either by soldering or crimping to a connector which shall allow up to a maximum of two wires to be connected to each termination. The maximum size of wire to be accommodated will be of overall diameter, not greater than 3.4 mm and a conductor diameter of 1.12 mm. The connector shall be positively locked into the plugboard but shall be capable of being released and withdrawn to permit easy disconnection.

## **5. DIMENSIONS**

- 5.1 The dimensions of the relay and plugboard shall be in accordance with appendices 'A1', 'A2' and 'B1'.
- 5.2 The retaining clip is to be in accordance with appendix 'B2'. The handle of the relay shall be such that with the relay in position on its plugboard the total force exerted by the clip on the handle shall be not less than 20 lbs and shall not exceed 50 lbs.
- 5.3 Relays with the same coding must be interchangeable.

## **6. MATERIALS**

- 6.1 All materials used in the construction of the relay and plugboard shall comply with the appropriate British Standard specification unless otherwise stated.
- 6.2 No materials shall be used in the construction of the relay and plugboard which would cause alteration in performance during storage life, except as provided for in clause 16.1, or which are not capable of maintaining all their essential electrical and mechanical properties during rated service life.
- 6.3 All non-metallic materials used in the relay and plugboard shall be non-hygroscopic, self-extinguishing, free from detrimental warping, deformation, or embrittlement and, when transparent, permanently so, over the external temperature range -40°C to + 60°C when the relay is energised by 0.4 Amp. r.m.s. 50 Hz.
- 6.4 All insulating materials in contact with current carrying parts of the relay and plugboard shall comply with the following test:-
- Two 1/4 inch diameter electrodes shall be placed 1/8 inch apart on a sample of the material, which is at a temperature of not more than 20°C. The sample shall then be transferred to a test chamber having a temperature of 30°C and a humidity of 85%. The insulation resistance measured at a voltage of 500V d.c. between the electrodes shall not then fall below 1 M.ohm while the sample remains in the test chamber for a period of not less than 15 seconds.
- 6.5 No materials shall be used in the construction of the relay and plugboard which are capable of supporting growth of mould, or which are subject to deterioration by exposure to sunlight.

- 6.6 All parts both separately and in combination shall either be resistant to corrosion or be so treated as to resist corrosion. Dissimilar metals used in contact with each other shall be so chosen or protected as to minimize the effect of electro-chemical action.
- 6.7 All materials used in the construction of the relay and plugboard or for the impregnation of coils etc., shall be chemically and physically inert over the temperature range specified in clause 6.3.
- 6.8 All soldered joints in conductors shall be made with soft solder. Non-corrosive flux shall be used in making all soldered joints and after completion of the soldering operation, any excess flux shall be removed.
- 6.9 All screwed fastenings shall be securely locked to prevent movement in service. Mechanical means which do not abrade the surface and produce loose pieces of material shall be used to secure all pins, nuts, screws, etc., against working loose.
- 6.10 Screw threads in parts fabricated of materials which do not lend themselves to successful tapping shall be formed in metal bushes.

## **7. MOUNTING**

- 7.1 The plugboard shall be so designed that when each connector is inserted all live metallic parts are shrouded against accidental contact even when the relay is removed.
- 7.2 The spring tags on the relay shall be so constructed that in the event of the relay being plugged into a plugboard having maximum tolerances, they shall afterwards make effective contact if the relay is later plugged into a plugboard having minimum tolerances.
- 7.3 A registration device shall be provided to prevent an incorrectly coded relay being plugged into a particular plugboard. That portion of the registration device carried on the relay shall be incapable of alteration without breaking a seal and shall be adequately protected against accidental breakage liable to permit the relay to be plugged into the wrong plugboard. The schedule of codes is shown in appendix 'D'.
- 7.4 The code pins on the relay must not extend beyond the joint face and may be up to 1/16 inch short of this.
- 7.5 The electrode potential of the material forming that part of the plugboard connector which makes contact with the spring tags of the relay shall lie between the values of -0.55 V and + 0.10 V as measured against a saturated calomel electrode in sea water at 25°C.

## **8. LIFE**

- 8.1 The rated life of the relay shall be taken as  $10^6$  cycles under specified conditions of operations where one cycle consists of an operation followed by a release. The rate of operation shall be taken as 250 cycles daily.

- 8.2 The relay shall be considered as having a possible period of up to 3 years in reasonable storage conditions prior to being brought into use without verification or examination and without any adverse effect on its rated life.

## **9. MAGNETIC CIRCUIT**

- 9.1 All parts forming the magnetic circuits of the relay, i.e. armature, yoke and core, shall be of suitable quality magnetic materials so as to ensure consistent performance.
- 9.2 A non-adjustable residual stop pin of non-magnetic material shall be provided which shall be so designed that the relay continues to meet the requirements of clause 18.2 throughout its rated life.

## **10. ARMATURE SUPPORTS**

- 10.1 The armature shall be positively located so as to prevent any displacement other than that required for the proper operation of the contacts.
- 10.2 The armature shall be held in place in a manner which permits free movement throughout the normal stroke. There shall be no displacement of the armature as a result of tests carried out under clause 20.1.
- 10.3 In relays fitted with pivot bearings the armature pivots and bearings shall be of dissimilar materials possessing a high resistance to corrosion under service conditions, shall fit rigidly in their supports, and be suitably secured and so constructed that they cannot restrict the desired motion of the armature.
- 10.4 In relays fitted with pivot bearings the armature pivots and bearings shall be cylindrical, and the bearings shall be not less than 0.002 inch nor more than 0.004 inch larger in diameter than the pivots. The end play of the armature shall be not less than 0.01 inch and not more than 0.02 inch.
- 10.5 The design must be such that the breaking of a pivot shall not allow any front contact to close irregularly.

## **11. COILS & RECTIFIER FEED UNIT**

- 11.1 The coil winding shall be formed preferably from one continuous length of conductor. If joints are necessary between coil conductors, these shall be securely soldered and efficiently insulated.
- 11.2 No conductor of a smaller diameter than 4 mils (42 swg) shall be used for coil windings.
- 11.3 Coil impregnation is not mandatory, but if carried out, attention is drawn to clause 6.7.
- 11.4 Coil resistance shall not vary from the nominal value by more than  $\pm 10\%$  measured at 20°C.
- 11.5 The coil shall be so fixed as to prevent movement with respect to its core.



- 11.6 Any resistor used must not be accessible externally and any means of adjustment must be made secure.
- 11.7 A full wave bridge connected rectifier is to be used.
- 11.8 If a resistor is used it must be directly connected to terminals R1 and R2, the rectifier being connected to the resistor in such a way that a disconnected wire will cause the relay to become de-energized. The coil of the relay must be connected internally to the rectifier. The contact prongs in position R3 and R4 must always be provided.
- 11.9 The resistor, where provided, and the rectifier are considered integral parts of the relay and must meet all performance requirements of the appropriate clauses.

## **12. CONTACTS**

### **12.1 Contact ratings shall be as follows:-**

All contacts shall be capable of carrying 3A continuously with the relay in the full operate position, without injurious effect to the contact.

Over the rated life of the relay each contact shall be capable of making and breaking a 12V circuit having a resistive load with a switch-on surge of 5A, dropping to a maximum steady value of 2A after a further 100 ms (equivalent to a normal lamp circuit for a SL 17 lamp).

Over the rated life of the relay, each contact shall be capable of making and breaking the current in an unquenched circuit consisting of three parallel connected relays of a type covered by BR specification 930A.

### **12.2 Each contact pair shall consist of at least one domed element.**

### **12.3 Contacts shall be non-fusible.**

### **12.4 After a contact pair has been loaded to the requirements of clause 12.1 over the period of rated life of the relay, contact pressures shall not be less than 50% of those stipulated in clause 15.1 and there shall remain a minimum distance of 0.020 inch between the metal element of the contact and the metal support of the associated non-fusible element.**

## **13. CONTACT EQUIPMENT**

### **13.1 The standard contact arrangement shall be 4F disposed in accordance with Appendix 'C'.**

## **14. CONTACT ASSEMBLIES**

### **14.1 Contact springs shall be formed in such a way that their main axes lie at not more than 45° from the direction of rolling.**

- 14.2 The design shall be such that springs shall not be subjected to any twist about their longitudinal axis.
- 14.3 Contact elements shall be firmly secured so that they will not become loose in service, and the material used for this purpose shall be such as not to cause corrosion. They shall not be out of centre with respect to each other by more than 0.02 inch.
- When the contact is fully closed the point of contact shall not lie nearer the edge of either element than half the distance from the point to the centre of that element.
- 14.4 When the relay is de-energized the contacts shall have a minimum opening of 0.04 inch.
- 14.5 The contacts shall function approximately simultaneously when the relay is operated or released.
- 14.6 If twin contact elements are employed, these shall be conplanar and shall make or break contact approximately simultaneously.
- 14.7 The relay shall be designed so as to reduce contact chatter bounce and hesitation to a minimum on closure of the contact elements concerned. When the relay is energised at 0.4A r.m.s. 50 Hz, the contact elements shall establish steady contact conditions in not more than 20 ms after the initial contact closure.
- 14.8 Contacts of the non-fusible type shall be so designed that they cannot become mechanically locked or fused to the metal element by abnormal flow of current, and the formation of metal elements shall be such that they will not undercut the non-fusible element by continual rubbing.
- 14.9 The contact tag of the spring shall be composed of un-plated phosphor bronze.

## **15. CONTACT PRESSURE**

- 15.1 The minimum contact pressures shall be one ounce when in the full operate position.

## **16. CONTACT RESISTANCE**

- 16.1 When the relay is in the full operate position a maximum contact resistance of 0.2 ohm is permitted, the resistance being measured when the contact unit concerned is carrying 100mA DC. An additional 0.01 ohm is permitted when measured at the external connections through the plugboard. The contact resistance shall be measured at the manufacturer's works immediately before acceptance or despatch.

## **17. TERMINAL MARKINGS**

- 17.1 Terminal positions on the plugboard shall be marked as indicated in appendix 'C'.

Note:- When reference is made to a terminal position in relays covered by this specification, the letter should always precede the number.

## 18. OPERATING VALUES

18.1 (a) The voltage drop between terminals R1 and R2 shall be  $9 \pm 0.6$  volts at 0.25A 50 Hz r.m.s. at 20°C.

(b) The relay shall be continuously rated for energisation by 0.4A 50 Hz r.m.s. at an ambient temperature of 50°C.

### 18.2 Operating currents

The operating currents shall be as follows with a coil temperature of 20°C:-

|                         |                |
|-------------------------|----------------|
| Full operate 0.18A Max. | } r.m.s. 50 Hz |
| Full Release 0.11A Min. |                |

### 18.2 Operating Times

A delayed release feature (non-mechanical) shall be incorporated so that all front contacts shall remain made when the energising circuit is interrupted for the times given below:-

| Energisation       | Times of Interruption |
|--------------------|-----------------------|
| 0.18A r.m.s. 50 Hz | 0.1 Second            |
| 0.25A r.m.s. 50 Hz | 0.2 Second            |

## 19. ALLOCATION OF REGISTRATION CODES

19.1 Code No. 071 shall apply to relays covered by this specification.

## 20. TYPE TESTS

20.1 Type tests shall be applied in order to prove the following features:-

- That the relay is able to withstand  $10^7$  cycles of operation in the absence of electrical loading of the contacts.
- That the relay is so designed to withstand shocks equivalent to a free drop of 1 inch on to a solid concrete surface.
- That the relay is free of resonance effects under vibration of 0.005 inch amplitude at frequencies between 3 and 40 Hz, and of 0.001 inch amplitude at frequencies between 40 and 100 Hz. Under such conditions, with the relay in the full operate position, all contacts shall give reliable contact, and with the relay energized at 100 mA r.m.s. 50 Hz no contact shall make. This test will be made with the vibration applied to the normally mounted plugboard, with relay attached, in the vertical, side-to-side and front-to-back planes.  
(N.B. Amplitude measurements are peak to peak).

- (iv) That the essential physical characteristics of the relay are unimpaired by the application of the climatic and durability tests described in BS 2011 (1954), clause 4.2.2., Table 2, classification H1 (ambient temperature range -40°C to +55°C). Following the application of these tests the relay shall be allowed recovery in accordance with clause 4.7.3. of BS 2011 (1954) and shall meet the requirements of clauses 10, 11.4, 14, 15 and 18.2 of this specification.
- (v) That the moving parts of the relay are not susceptible to freezing under the following conditions:-

The relay shall be subjected to six cycles of damp heat in accordance with clause 4.7 of BS 2011 (1954) immediately following which it shall be carefully transferred without shaking to a cold chamber at a temperature not higher than -20°C for two hours; at the end of this period the relay shall function properly. The whole of this test shall be carried out with the relay in its plugboard and in its working position. Tests shall be made with the relay energised at 225mA r.m.s. 50 Hz and also when de-energised.

The relevant extracts from BS 2011 (1954) are set out in Appendix 'E' to this specification.

- 20.2 After the coil has been energized continuously for a sufficient length of time for the temperature to reach a stable value, the temperature measured at any point of the winding shall not exceed the maximum permissible for the class of insulation in accordance with BS 2757(1956). This test shall be carried out at an ambient temperature of 60°C and with the relay energized at 0.4A r.m.s. 50 Hz.
- 20.3 Tests will be made to ensure that the requirements of Cl. 18.3 are met with the relay energised at the figures given for a sufficient time for temperature stability to be achieved within the temperature range -20°C to +50°C.
- 20.4 The relay shall withstand without damage the application of a steady voltage of 120V r.m.s. at 50 Hz for five periods of one second each with an interval of ten seconds between each application. Following the application of this test the relay shall comply with the requirements of Cl. 18.
- 20.5 When the relay is de-energised, a steadily applied torque of 3 oz/in shall not cause the armature to move from the full release position. A steadily applied torque of 4 oz/in shall not cause any contact to make.

## **21. ACCEPTANCE TESTS**

- 21.1 The relay shall be subjected to the following tests:-

- (i) A test to check that the relay complies with clauses 18.1(a), 18.2 and 18.3.
- (ii) A test voltage of 1000V a.c. (r.m.s.) of sine wave form at 50 Hz applied for one minute between all metallic parts of the relay and other metallic parts insulated therefrom. This requirement shall include tests between separate coil windings and metallic parts.

## **22. LABELLING AND MARKING**

22.1 A nameplate giving the following information shall be attached to the relay in a conspicuous position:-

- (i) Manufacturer's name.
- (ii) Reference number.
- (iii) Serial number of the relay.
- (iv) P.U. current 0.18A (Max.).
- (v) Contact arrangement
- (vi) Specification and code no.
- (vii) Date tested, (month and year is sufficient).

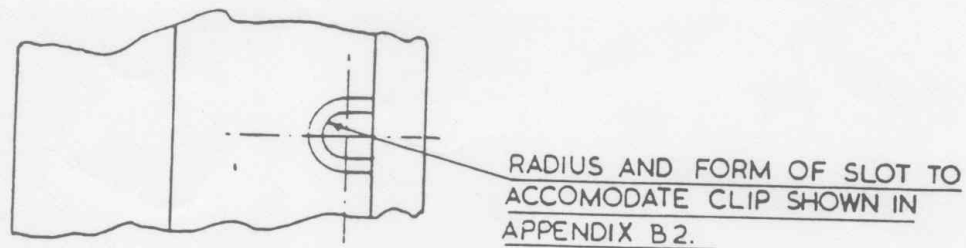
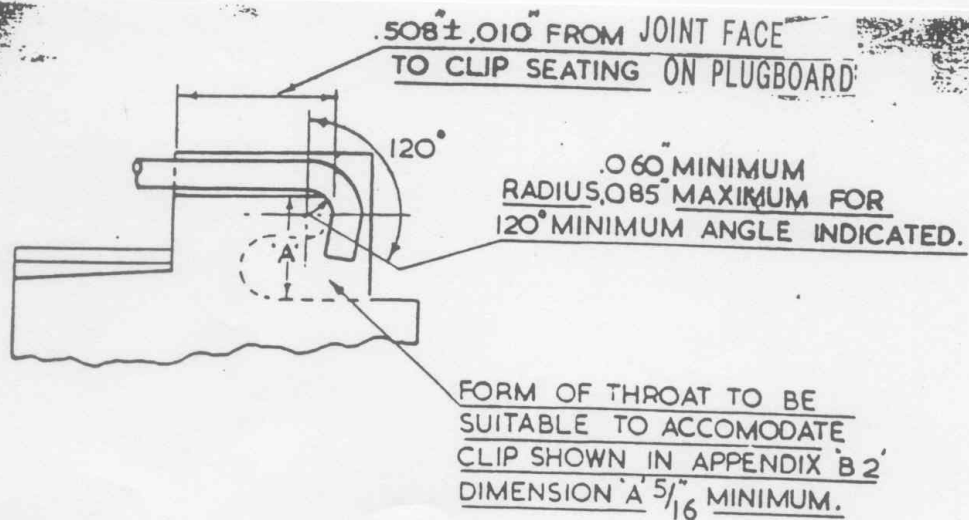
The reference number (item ii) shall incorporate the letters 'ECX'.

22.2 This nameplate shall be so situated that it is readily visible when the relay is in its installed position, and shall be securely fixed in such a manner that it does not obscure the moving parts and cannot interfere with the operation of the relay.

22.3 Each coil shall have attached to it, securely by the outside binding, a tag which shall be clearly and indelibly marked with the following particulars:-

- (i) Manufacturer's reference.
- (ii) Resistance (nominal) at 20°C.





FIRST ANGLE PROJECTION.

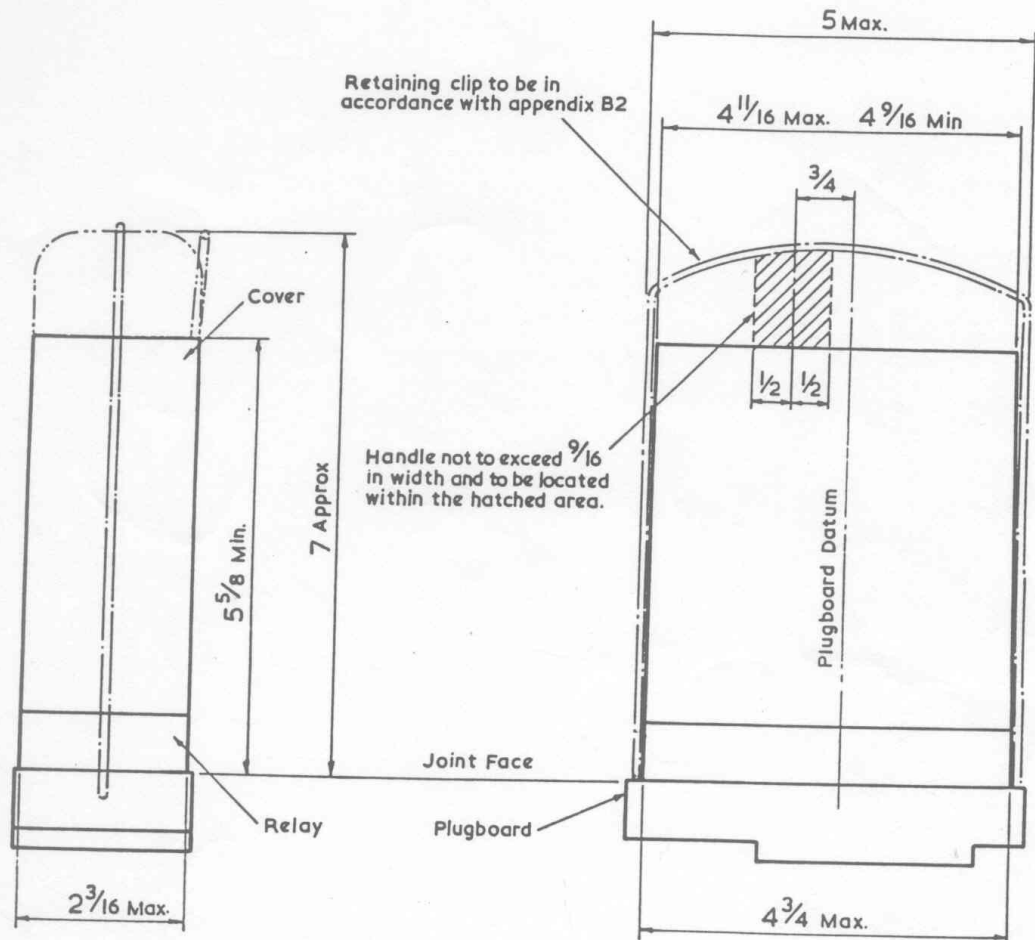
NOT TO SCALE.

BRITISH RAILWAYS BOARD.

COMMON APPENDIX FOR MINIATURE RELAY SPECIFICATIONS.

PLUGBOARD DIMENSIONS.  
SEATING FOR  
RETAINING CLIP.

APPENDIX A2



Dimensions are in inches

British Railways Board

Common Appendix for Miniature

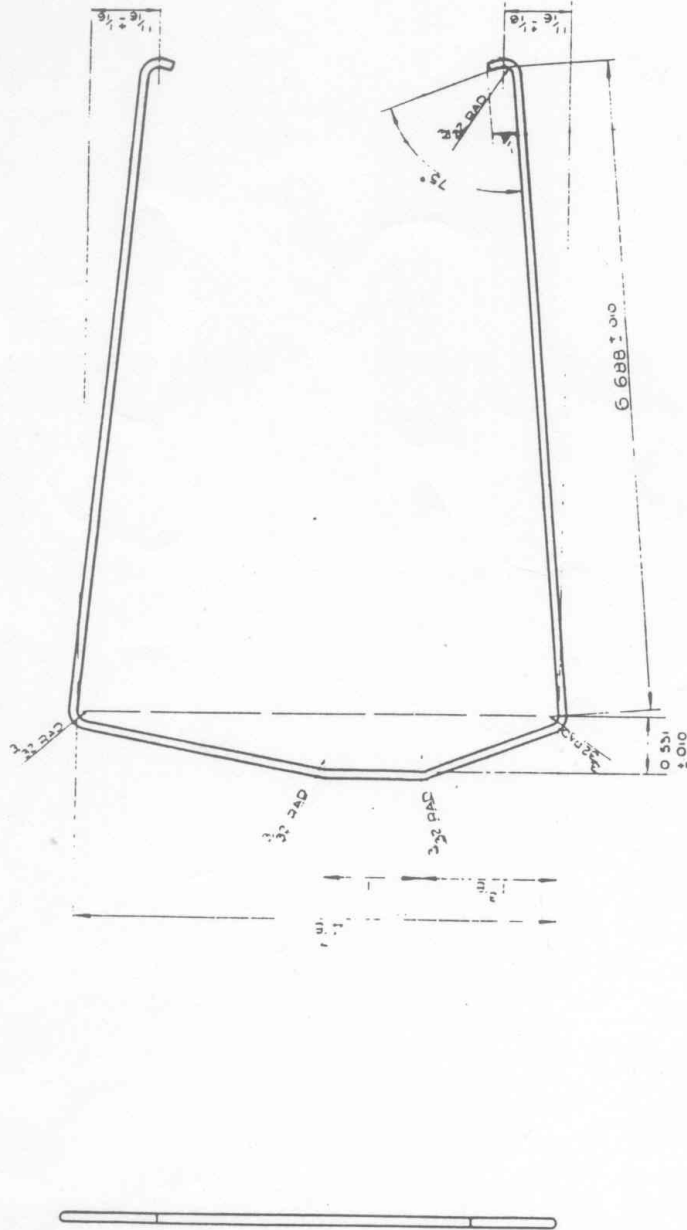
RELAY DIMENSIONS

Scale: Half Size

Appendix B1



# IRST ANGLE PROJECTION



MATERIAL :

HARD DRAWN STEEL WIRE B.S. 5216 ND  
GRADE 2, 13 S.W.G. OR 2.24 mm DIA.

ALL DIMENSIONS ARE IN INCHES

GENERAL TOLERANCE UNLESS OTHERWISE STATED  $\pm .020$

FINISH :

APPROVED ANTI-CORROSIVE

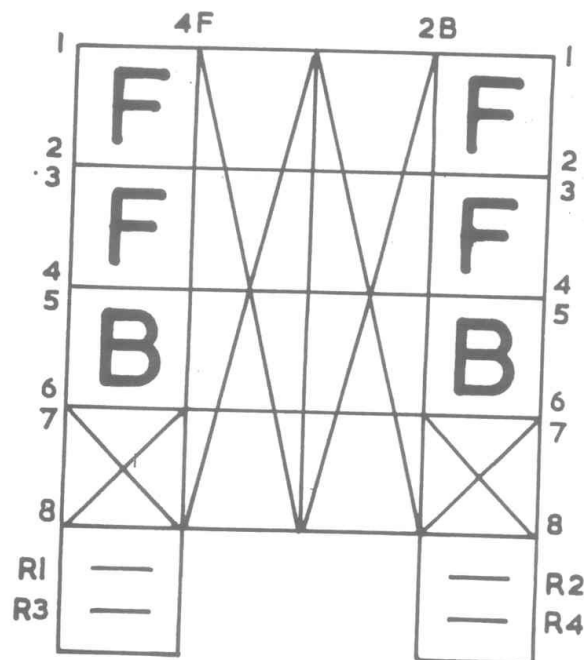
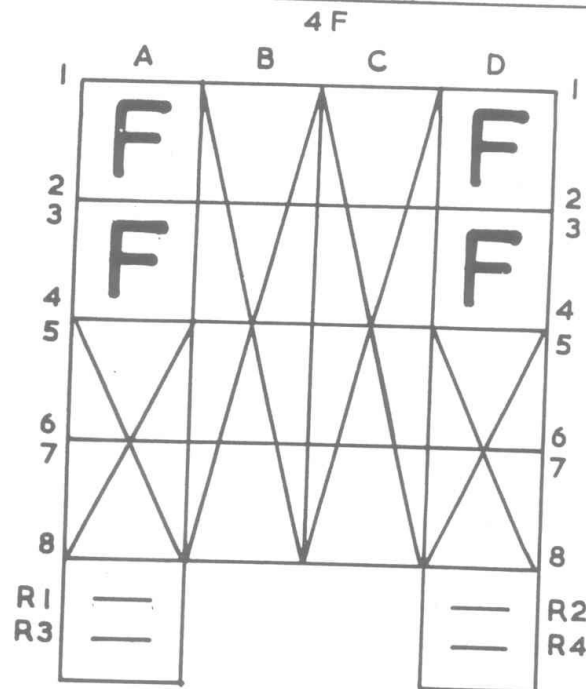
BRITISH RAILWAYS BOARD

COMMON APPENDIX FOR MINIATURE RELAY SPECIFICATIONS.

RETAINING CLIP  
DIMENSIONS  
NOT TO SCALE

APPENDIX 'B2'

JRN 1981



CONTACT MARKING REAR VIEW OF PLUGBOARD.

BRITISH RAILWAYS BOARD

SPECIFICATION No 940 FOR MINIATURE TRACTIVE ARMATURE  
D.C. LAMP PROVING RELAY, (PLUG-IN TYPE)  
FOR RAILWAY SIGNALLING PURPOSES

CONTACT ARRANGEMENT  
& MARKING.

APPENDIX 'C'

**COMMON APPENDIX E  
TO BR MINIATURE RELAY SPECIFICATIONS**

**Basic Climatic and Durability Tests for  
Components for Radio and Allied  
Electronic Equipment**

**Abstracts from BS 2011 ( 1954)**

Paragraph 4.2.2, Table 2, Classification H1.

| <b>Treatment<br/>(in this order )</b> | <b>Clause Reference</b> |
|---------------------------------------|-------------------------|
| One cycle dry heat                    | 4.5                     |
| One cycle accelerated damp heat       | 4.7                     |
| One cycle cold                        | 4.8                     |
| Five cycles accelerated damp heat     | 4.7                     |

An interval of not more than 3 days is permissible between any of the above tests with the following exception:-

Where test 4.8 follows test 4.7, the interval shall not exceed 2 hours.

#### **4. 5 DRY HEAT CYCLE**

##### **4.5.1 Test Chamber**

A chamber used for this test shall be capable of maintaining, in any region where the components may be placed, a temperature of  $55^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .

The Chamber Shall be so constructed that no region where the components may be placed is heated by direct radiation from the heating elements.

##### **4.5.2 Periods of Exposure**

The components shall be introduced into the chamber specified in clause 4.5.1 at the temperature appropriate to their category, and shall remain there for sixteen hours or for such other period as may be specified in the relevant standard, if required, components shall be under load during this exposure.

##### **4.5.3 Recovery after Exposure**

At the end of the period required by clause 4.5.2, the components shall be removed from the chamber. The components shall then be allowed to cool under standard atmospheric conditions for recovery.

#### **4. 7 ACCELERATED DAMP HEAT TEST**

##### **4.7.1 Test Chamber and Conditions of Test**

The chamber used for this test shall be capable of meeting the following requirements :-

The temperature in any region where the components may be placed shall be between 53°C and 57°C and a periodic variation of at least 2°C (total excursion) shall occur within this at least four times an hour. The relative humidity during the periods of maintained elevated temperature shall be not less than 95 per cent.

#### 4.7.2 Period of Exposure

Each test cycle shall have a duration of 24 hours. During this cycle the components shall be subjected to the conditions specified in clause 4.7.1 for 16 hours continuously. After this 16 hour period the sources of heat and humidity shall be turned off and the closed chamber allowed to cool, the air being circulated meanwhile.

At the end of the series of test cycles, the components shall be removed from the chamber and tested in accordance with the relevant component standard. The time at which components are removed from the chamber shall only be between 4 and 5 hours after switching off the sources of heat and humidity.

#### 4.7.3 Recovery after Exposure

After removal from the chamber, the components shall be shaken by hand to remove droplets of water. The components shall then remain under standard atmospheric conditions for recovery for not less than one hour and not more than two hours.

### 4.8 COLD CYCLE

#### 4.8.1 Test Chamber

The chamber used for this test shall be capable of maintaining, in any region where components may be placed, a temperature of  $-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$ .

#### 4.8.2 Periods of Exposure

The components shall be introduced into the chamber specified in clause 4.8.1 at the temperature appropriate to their category and shall remain there for 6 hours or for such other period as may be specified in the relevant component standard. While still at this temperature the components shall be tested in accordance with the relevant component standards.

#### 4.8.3 Recovery after Exposure

At the end of the period mentioned in clause 4.8.2, the components shall be removed from the chamber. The components shall then be allowed to remain under standard atmospheric conditions for recovery for one hour or for such other period as may be specified in the relevant component standard.

Components shall then be shaken by hand to remove droplets of water. The components shall then remain under standard atmospheric conditions for recovery for a further period of not less than one hour and not more than two hours.

**BRITISH RAILWAYS BOARD**



**BR SPECIFICATION NO. 941A  
FOR  
MINIATURE TRACTIVE ARMATURE AC LAMP PROVING RELAY, PLUG-IN  
TYPE, FOR RAILWAY SIGNALLING PURPOSES**

**AMENDMENT NO. 2**

**18 OPERATING VALUES**

18.2

Delete existing clause and substitute the following:-

The operating current shall be as follows with a coil temperature of 20°C:-

|                         |   |              |
|-------------------------|---|--------------|
| Full operate 0.18A Max. | } | r.m.s. 50 Hz |
| Full Release 0.11A Min. |   |              |

May, 1975

**BRITISH RAILWAYS BOARD**



**BR SPECIFICATION NO. 941A  
FOR  
MINIATURE TRACTIVE ARMATURE AC LAMP PROVING RELAY, PLUG-IN  
TYPE, FOR RAILWAY SIGNALLING PURPOSES**

**AMENDMENT NO. 3**

**Clause 6 : MATERIALS**

Add

Clause 6.11

Silver or silver plated components must not be used in combination with insulating materials susceptible to silver migration.

July, 1976



S & T Support Services  
**Signalling Equipment Group**  
BRITISH RAILWAYS BOARD  
Room 1104, Rail House, CREWE, Cheshire CW2 6EA



S & T Support Services is a Division of Production Services

|                |               |                |             |             |
|----------------|---------------|----------------|-------------|-------------|
| Your Reference | Our Reference | Please ask for | Telephone   | Fax         |
|                | E0705AAM      | S.Arthurs      | 0270-533112 | 0270-533115 |

2nd July 1992

To: Attached List

### BR 930 Series Relays: Clarification of Flash Testing Requirements

Pending the issue of specification amendments/updates and workshop overhaul specifications, the enclosed sheets represent BR requirements for the flash testing of relays. This shall be the definition to be used by our QA auditors, when assessing acceptance test methods.

These definitions apply to the following BR relay specifications:

BR 930  
BR 931A  
BR 932A  
BR 933A  
BR 934A  
BR 935A  
BR 936A  
BR 937A  
BR 938A  
BR 939A  
BR 940A  
BR 941A  
BR 942  
BR 943  
BR 945  
BR 946  
BR 947  
BR 960  
BR 961  
BR 962  
BR 963  
BR 966  
BR 968

*T.R.E.*

T.Green  
Electrical Equipment Engineer  
for  
B.Perkin  
Signalling Equipment Engineer



**BR SPECIFICATION FOR MINIATURE RELAYS  
FOR RAILWAY SIGNALLING PURPOSES**

**Clause 21.1 (ii)**

This clause is to be interpreted as follows:-

All parts, which normally carry a current, shall be connected together into a group and all conductive parts which do not normally carry a current shall be connected into another. A test voltage of 1KV AC (r.m.s) of sine wave form at 50 Hz, shall be applied between the two groups for one minute.

The individual base connectors and coil connectors, shall then be connected to the equipment as per Diagram 'G' for relays to specification 930, 940A, 942, 968 and Diagram 'A' for relay to specification 945. The test voltage shall then be applied for a further minute for each test.

All contacts shall be open for these tests, Back contacts shall be wedged open for the duration of the tests, using a suitable insulating material no thicker than 0.9 mm.

No flashover or breakdown of insulation is to occur during these tests.

This clause applies to all the specifications listed below:-

936A, 938A, 939A and 941A.



Test (i)

|    | A | B | C | D |
|----|---|---|---|---|
| 1  | L | N | L | N |
| 2  | N | L | N | L |
| 3  | L | N | L | N |
| 4  | N | L | N | L |
| 5  | L | N | L | N |
| 6  | N | L | N | L |
| 7  | L | N | L | N |
| 8  | N | L | N | L |
| R1 |   |   |   |   |
| R2 |   |   |   |   |
| R3 |   |   |   |   |
| R4 |   |   |   |   |

Test (ii)

|    | A | B | C | D |
|----|---|---|---|---|
| 1  |   |   |   |   |
| 2  |   |   |   |   |
| 3  |   |   |   |   |
| 4  |   |   |   |   |
| 5  |   |   |   |   |
| 6  |   |   |   |   |
| 7  |   |   |   |   |
| 8  |   |   |   |   |
| R1 | L | N | N | N |
| R2 |   |   |   |   |
| R3 | N |   |   |   |
| R4 |   |   |   |   |

Both these tests are to be applied to all relays to the following specifications :-

838A  
838A  
838A  
841A

N - NEUTRAL  
L - LIVE

|          |    |      |        |                                                                                                                                           |  |                                                                                                                                                |  |
|----------|----|------|--------|-------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Dwg. No. |    | Path |        | Director of S & T Engineering<br><br>B.R. SPECIFICATION FOR MINIAUTURE<br>RELAYS FOR RAILWAY SIGNALLING<br>PURPOSES.<br>Acceptance Tests. |  |  British Rail<br>Signalling Equipment Division<br>DIAGRAM M |  |
| Produced | SA | SA   | 2/7/92 |                                                                                                                                           |  |                                                                                                                                                |  |
| Checked  | TG |      | 2/7/92 |                                                                                                                                           |  |                                                                                                                                                |  |
| Scale    |    |      |        |                                                                                                                                           |  |                                                                                                                                                |  |
| Issued   |    |      |        |                                                                                                                                           |  |                                                                                                                                                |  |

2  
Telephone : 451200 Extn. 2394  
Tele Fax : 91-0522-452332



Government of India - Ministry of Railways  
Research Designs & Standards Organisation  
LUCKNOW - 226011



Ref: STS/E/Relays/ECR

20<sup>th</sup> September 2002

The Chief Signal & Telecom Engineer,  
Central Railway, Mumbai CST-400 001.  
Eastern Railway, Fairlie Place, Kolkata-700 001.  
Northern Railway, Baroda House, New Delhi-110 001.  
North-Eastern Railway, Gorakhpur-273 012.  
North-East Frontier Railway, Maligaon, Guwahati-781 011.  
Southern Railway, Park Town, Chennai-600 003.  
South Central Railway, Rail Nilayam, Secunderabad-500 371.  
South Eastern Railway, Garden Reach, Kolkata-700 043.  
Western Railway, Churchgate, Mumbai-400 020.  
CORE, Nawab Yusuf Road, Civil Lines, Allahabad-211 001.  
Metro Railway, 23-A, Jawaharlal Nehru Road, Kolkata-1.

Sub: Universal ECR for 110V AC LED Signal Lamp

\*\*\*

Earlier specification STS/E/Relays/AC Lit LED Signal/03/2000 for Universal ECR AC Lit LED Signal Lamp has now been revised. Copy of the revised specification is enclosed for information please.

Dt: As above.

(A.K.Dwivedi)  
Director/Signal-IV  
for Director General/Signal

STS/E/Relays/DC Lit/LED Sig.  
03/2000

EG RECYSI  
HyM  
ABB (MIM)

35  $\sqrt{\text{A}}$  | AC  
32  $\sqrt{\text{A}}$   
32  $\sqrt{\text{A}}$

No. STS/E/Relays/AC Lit LED Signal/09-2002

## **TENTATIVE SPECIFICATION FOR**

**Universal Plug-in type, tractive armature AC lamp proving relay  
(Metal to Carbon) for 110V AC LED Signal lamp**

1. As far as applicable relay shall comply with clauses 3 to 17 and 20 to 22 of BRS: 941A
2. (i) Temperature range :-  $-10^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$   
(ii) Relative humidity :- 0 to 90%
3. Operating currents:-
  - a) maximum pickup current :- 108 mA, r.m.s. 50Hz, sinusoidal  
(90mA, r.m.s. when ECR is connected in LED lamp circuit)
  - b) minimum release current :- 72 mA, r.m.s. 50Hz sinusoidal  
(60mA, r.m.s. when ECR is connected in LED lamp circuit)
4. Relay should be able to withstand continuous current of 300 mA, r.m.s. 50Hz
5. All front contacts of relay should remain made when energising circuit is interrupted for times given as under
  - a) For energisation of 150 mA, r.m.s. 50Hz, sinusoidal :- 100 msec.
6. Contact configuration:-  
4F - 4B identically in A to D rows
7. Voltage drop across R1 and R2 should be less than 10V at 150 mA, r.m.s. 50Hz, sinusoidal (125mA when ECR is connected in LED lamp circuit)
8. Contact Pressure :- More than 35 gram at 150mA (125mA when ECR is connected in LED lamp circuit)
9. Interlocking Code :- ABDHK

# UNIVERSAL ECR FOR AC LAMP LED SIGNAL LAMP

|    |                        | Normal working current (one aspect) | LED lamp circuit current in mA | ECR                                |                                   |
|----|------------------------|-------------------------------------|--------------------------------|------------------------------------|-----------------------------------|
|    |                        |                                     |                                | When connected in LED lamp circuit | With 50Hz sinusoidal supply alone |
|    |                        |                                     |                                | PU – 90mA<br>DA – 60mA             | PU – 108mA<br>DA – 72mA           |
| 1. | Main Signal            | 125±5%                              | 125±5%                         | ↑                                  |                                   |
| 2. | Calling-on Signal      | 125±5%                              | 125±5%                         | ↑                                  |                                   |
| 3. | Route                  | 25±5%                               | 125±5%                         | ↑                                  |                                   |
|    | 1 aspect not lit       | (Total 125±5%)                      | 100±5%                         | ↑                                  |                                   |
|    | 2 aspects not lit      |                                     | 75±5%                          | ↑                                  |                                   |
|    | 3 aspects not lit      |                                     | 50±5%                          | ↓                                  |                                   |
|    | Cold Start             |                                     |                                |                                    |                                   |
|    | All aspects lit        |                                     | 125±5%                         | ↑                                  |                                   |
|    | 4 aspects lit          |                                     | 100±5%                         | ↑                                  |                                   |
|    | 3 aspects lit          |                                     | 75±5%                          | ↓                                  |                                   |
| 4. | Shunt                  | 55±5%                               |                                |                                    |                                   |
|    | Both aspect lit        | (Total 110±5%)                      | 110±5%                         | ↑                                  |                                   |
|    | 1 shunt aspect not lit |                                     | 55±5%                          | ↓                                  |                                   |

Effective from 1.12.2002

Specification No. STS/E/relays/ AC Lit LED Signal/ 09-2002

Universal Plug-in type, tractive armature AC lamp proving relay (Metal to Carbon) for 110 V AC LED

Specification No.: STS/E/relays/ AC Lit LED Signal/ 09-2002 -  
Amendment No. 1

The amended clauses are given below:

Clause 7 Voltage Drop across R1 & R2

< 10 Volt at 150 mA, r.m.s 50 Hz Sinusoidal,

< 10 Volt when ECR is connected in LED signal lighting circuit at rated voltage (110V AC  $\pm$  25%) and the input current in the circuit is as per RDSO specification no. RDSO/SPN/ 153/2004 Rev: 3 (Draft) for LED Signal lighting units.

Clause 8 Contact Pressure

(Front contacts when ECR is in the full operate position,  
Back contacts when ECR is in the full release position)

>28 grams at 150 mA,

>28 grams when ECR is connected in LED signal lighting circuit at rated voltage (110 V AC  $\pm$  25 %).

----- X -----

Universal Plug-in type, tractive armature AC lamp proving relay (Metal to Carbon) for 110 V AC LED Signal Lamp



सत्यमेव जयते

**Universal Plug-in type, tractive armature AC lamp proving  
relay (Metal to Carbon) for 110 V AC LED Signal Lamp  
(TENTATIVE)**

**SPECIFICATION NO. : STS/E/relays/ AC Lit LED Signal/ 09-2002**

**Amendment: 1**

**Number of pages: 5**

**SIGNAL DIRECTORATE  
RESEARCH DESIGNS & STANDARDS ORGANISATION  
LUCKNOW-226011**

Universal Plug-in type, tractive armature AC lamp proving relay (Metal to Carbon) for 110 V AC LED Signal Lamp

| <b>DOCUMENT DATA SHEET</b>                                                                                                                                                                          |  |  |                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|-----------------------------|
| Designation<br><b>STS/E/relays/ AC Lit<br/>LED Signal/ 09-2002<br/>(TENTATIVE)</b>                                                                                                                  |  |  | <b>Amendment<br/><br/>1</b> |
| Title of Document<br><br><b>Universal Plug-in type, tractive armature AC<br/>lamp proving relay (Metal to Carbon) for 110 V<br/>AC LED Signal Lamp</b>                                              |  |  |                             |
| Authors<br><br><b>Name: R.K.Jain<br/>Designation: Director/Signal/RDSO</b>                                                                                                                          |  |  |                             |
| Approved by<br><br><b>Name: Shri S.K.Vyas<br/>Designation: Executive Director/Signal/RDSO</b>                                                                                                       |  |  |                             |
| <b>Abstract</b><br><br>This document specifies Technical specification for Universal Plug-in type, tractive armature AC lamp proving relay (Metal to Carbon) for 110 V AC LED Signal Lighting units |  |  |                             |

Universal Plug-in type, tractive armature AC lamp proving relay (Metal to Carbon) for 110 V AC LED Signal Lamp

### DOCUMENT CONTROL SHEET

| NAME     | ORGANISATION | FUNCTION | LEVEL   |
|----------|--------------|----------|---------|
| R.K.Jain | RDSO         | Member   | Prepare |
| S.K.Vyas | RDSO         | -        | Approve |



Universal Plug-in type, tractive armature AC lamp proving relay (Metal to Carbon) for 110 V AC LED Signal Lamp

### AMENDMENTS

| Version                                     | Chapter/<br>Annexure | Amendment   | Effective date   |
|---------------------------------------------|----------------------|-------------|------------------|
| STS/E/relays/ AC Lit<br>LED Signal/ 09-2002 | -                    | FIRST ISSUE | 2002             |
| STS/E/relays/ AC Lit<br>LED Signal/ 09-2002 | -                    | Amendment-1 | December 1, 2008 |

**Specification No.: STS/E/relays/ AC Lit LED Signal/ 09-2002 -  
Amendment No. 1**

The amended clauses are given below:

**Clause 7      Voltage Drop across R1 & R2**

< 10 Volt at 150 mA, r.m.s 50 Hz Sinusoidal,  
< 10 Volt when ECR is connected in LED signal lighting  
circuit at rated voltage (110V AC  $\pm$  25%) and the input  
current in the circuit is as per RDSO specification no.  
RDSO/SPN/ 153/2004 Rev: 3 (Draft) for LED Signal  
lighting units.

**Clause 8      Contact Pressure**

(Front contacts when ECR is in the full operate position,  
Back contacts when ECR is in the full release position)  
>28 grams at 150 mA,  
>28 grams when ECR is connected in LED signal lighting  
circuit at rated voltage (110 V AC  $\pm$  25 %).

----- X -----