



BR960

Revised Sept 1981

Specification for
Miniature Twin Tractive Armature
D.C. Neutral Line Relay Unit (Plug-in type)
For Railway Signalling Purposes

British Railways Board



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Amendments

Amd.No.	Date	Text Affected
1	Sept 1982	Clause 18: Operating Values
2	NOV 1985	APPENDIX A1

British Railways Board

BRITISH RAILWAYS BOARDB.R. SPECIFICATION FOR MINIATURE RELAYS
FOR RAILWAY SIGNALLING PURPOSESAMENDMENT NO. 2APPENDIX A1

Withdraw the existing Appendix A1 dated September, 1981 and substitute the attached.

The maximum allowable overall (length) dimensions have been increased as follows:-

dimension 2.746" (Max.) was 2.708" (Max)

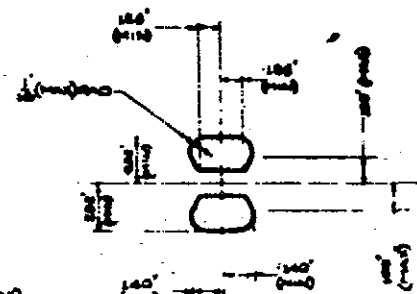
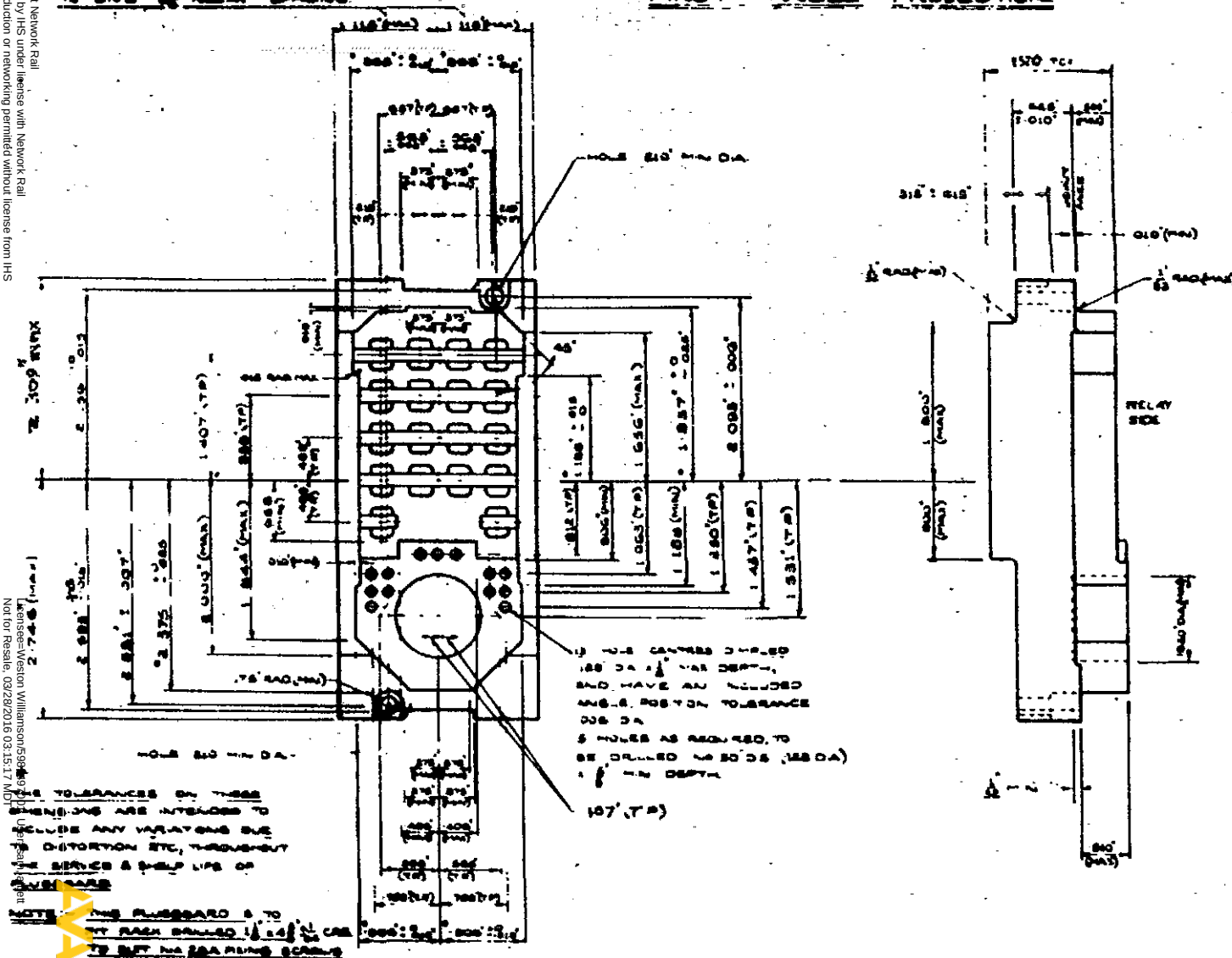
dimension 2.309" (Max.) was 2.271" (Max)

This Appendix applies to all the Specifications listed below:-

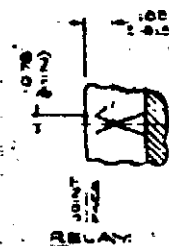
930A, 931A, 932A, 933A, 934A, 936A, 938A, 939A, 940A, 941A, 942, 943, 946, 949, 960, 961, 963, 966 and 968.

THE GIVE AWAY RELAY CHALLENGE

FIRST ANGLE PROJECTION



ORGANIZATION OF COLLECTOR STATE

[illegible]

NOTE INDIVIDUAL DESIGNS MUST BE SUCH THAT
WHEN THE RELAY IS PLUGGED IN ANY PLUGBOARD
THE END OF THE CABLE (X) WILL NOT POLE THE
ROOF OF THE PLUGBOARD UNDER ANY
CONDITIONS
(T) DENOTES TRUE POSITION IN ACCORDANCE WITH BS 20F

BRITISH RAILWAYS BOARD.
COMMON APPENDIX FOR MINITURE RELAY SPECIFICATIONS

PLUGBOARD DIMENSIONS.

NET TO SALE

Sept : 1985

APPENDIX 'A.1'

BRITISH RAILWAYS BOARD

SPECIFICATION NO. 960

FOR

MINIATURE TWIN TRACTIVE ARMATURE

D.C. NEUTRAL LINE RELAY UNIT (PLUG-IN TYPE)

FOR RAILWAY SIGNALLING PURPOSES

FOREWORD

This specification supersedes the issue dated February 1972.

This specification is issued by the Director of S & T Engineering, British Rail, Materials Management Group, Room 1103, Rail House, Gresty Road, Crewe, CW2 6EA; from whom further copies may be obtained.

Technical queries shall be referred to the above address. For telephone enquiries the numbers are:-

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

REFERENCES

Reference in this specification is made to:-

British Railways specification	831 - Connectors for BR miniature relays
	930 - Miniature tractive armature d.c. neutral line relay
British Standard	2757 - Classification of insulating materials for electrical machinery and apparatus on the basis of thermal stability in service.

Where this specification requires reference to BR specifications and British Standards the latest issue shall apply, unless specially stated. Where reference is made to 'Common appendices', these are the 'Common appendices' for miniature relay specifications, for specifications in the BR 930 series.

1. GENERAL

- 1.1 The twin relay unit covered by this specification may be used for all applications in which the d.c. neutral line relays covered by BR Specification no. 930 are employed, provided that their particular characteristics are suitable.
- 1.2 These relays must not be used to break circuits in which the energy dissipated at the contacts exceeds the limit given in clause 12.1. In general, this means that equipment such as lever locks must be spark quenched.

- 1.3 Units to this specification shall consist of two relays which in effect are electrically and mechanically independent, housed in a single enclosure to the dimensions of a single relay to BR specification no. 930. Each of the relays may be fitted with a single winding or with two electrically separate windings and will always have the same nominal characteristics.

Circuit design involving the use of this relay must have regard to the provisions of clause 11.1.

2. SCOPE

- 2.1 This specification relates to design requirements for miniature twin tractive armature d.c. neutral line relays of the plug-in type for use in railway signalling circuits.

3. DEFINITIONS

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

<u>Operate</u>	That condition of a relay when all front contacts are just made.
<u>Full Operate</u>	That condition of a relay when the armature has completed its maximum travel.
<u>Release</u>	That condition of a relay when all front contacts have opened.
<u>Full Release</u>	That condition which either relay assumes when de-energised.
<u>Front Contact</u>	A contact which is made when its relay is energised.
<u>Contact Element</u>	The contact piece which is attached to a contact spring.
<u>Contact Spring</u>	The spring strip to the end of which the contact element is secured.
<u>L.H. Relay</u>	The relay which is on the left-hand side when viewed from the front in its working position.
<u>R.H. Relay</u>	The relay which is on the right-hand side when viewed from the front in its working condition.
<u>Direct Current</u>	Current from a battery or smoothed rectified a.c. with a ripple content not exceeding 1.25% r.m.s.

4. DESIGN

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

- (a) A twin relay unit containing two similar relays.
- (b) A plugboard into which a relay is plugged.

- 4.2 The unit 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 unit shall include a rigid baseplate which shall form part of the plug-socket interconnection between the relay and its plugboard.
- 4.4 The unit 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 relays. The material of the cover and construction of the unit shall be such that the application of a force of 30 lbs. at any point on the surface of the cover of the assembled unit, shall not result in its deflection to an extent sufficient to interfere with the operation of the relays. 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 unit 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 unit 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 unit.
- 4.9 A retaining clip, as indicated in Common appendix 'B2' shall be provided to hold the unit 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 allows 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 with 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.

Such a connector is described in BR specification no. 831

5. DIMENSIONS

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

6. MATERIALS

- 6.1 All materials used in the construction of the twin relay unit and plugboard shall comply with the appropriate British Standard unless otherwise stated.
- 6.2 No materials shall be used in the construction of the unit and plugboard which during storage life, would cause alteration in performance, except as provided for in clause 16.1. Neither shall any materials be used which are not capable of maintaining their relevant electrical and mechanical properties during rated service life as specified.
- 6.3 All non-metallic materials used in the unit 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 $+60^{\circ}\text{C}$ when both relays are continuously energised at 20% above rated voltage. (Only one winding on each relay in the case of double wound relays).
- 6.4 All insulating materials in contact with current carrying parts of the relays and plugboard shall comply with the following test:-
- Two $\frac{1}{4}$ inch diameter electrodes shall be placed $\frac{1}{8}$ 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 500 V d.c. between the electrodes shall not then fall below 1 M Ω 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 unit 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 minimise the effect of electro-chemical action.
- 6.7 All materials used in the construction of the unit 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.
- 6.11 Silver or silver plated components must not be used in combination with insulating materials susceptible to silver migration.

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 unit is removed.
- 7.2 The spring tags on the unit shall be so constructed that in the event of the unit being plugged into a plugboard having maximum tolerances, they shall afterwards make effective contact if the unit is later plugged into a plugboard having minimum tolerances.
- 7.3 A registration device shall be provided to prevent an incorrectly coded unit being plugged into a particular plugboard. That portion of the registration device carried on the unit shall be incapable of alteration without breaking a seal and shall be adequately protected against accidental breakage liable to permit the unit to be plugged into the wrong plugboard.

The schedule of codes is shown in Common appendix 'D', which is an extract from BR specification no. 944.

- 7.4 The code pins on the relay unit must not extend beyond the joint face and may be up to $\frac{1}{16}$ 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 unit 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 operation 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 unit 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 circuit of the relays i.e. armatures yokes and cores shall be of suitable quality magnetic material so as to ensure consistent performance.
- 9.2 Non-adjustable residual stop pins of non-magnetic material shall be provided which shall be so designed that each relay continues to meet the requirements of clause 18.2 throughout its rated life.
- 9.3 The magnetic circuits may use common components, provided that the design is such as to minimise inter-action between the two relays. Attention is drawn to clause 18.2(c) on this point.