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**Specification for Miniature Relay Unit, Plug-in Type,
for Railway Signalling Purposes Incorporating a D.C.
Neutral Thermal Time Element Relay and an Independ-
ant Tractive Armature D.C. Neutral Line Relay**

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Amendments

Amnd No	Date	Text Affected
1	November 1972	Various Clauses
2	May 1973	Appendix 'C'
3	August 1973	Appendix 'E'
4	January 1981	Various Clauses
5	September 1981	Appendix 'E'

NOTE

This specification supersedes all previous issues. It is issued by:-

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BRITISH RAILWAYS BOARD

B.R. SPECIFICATION 962

FOR

MINIATURE RELAY UNIT, PLUG-IN TYPE, FOR RAILWAY SIGNALLING
PURPOSES INCORPORATING A D.C. NEUTRAL THERMAL TIME ELEMENT
RELAY AND AN INDEPENDENT TRACTIVE ARMATURE D.C. NEUTRAL LINE RELAY

1. FOREWORD

- 1.1 The relay unit covered by this specification includes a thermal time element relay which may be used for railway signalling applications where a nominal time delay between 30 seconds and 120 seconds is required; in addition the unit contains a d.c. neutral line relay which may be used in association with or independently from the thermal time element relay.

The independent d.c. neutral line relay is single wound and is similar in construction and function to the right hand relay covered by B.R. Specification 960.

- 1.2 The basic construction of this relay unit makes it unsuitable for use in extreme climatic conditions and the type tests (Clause 15) which are applied to the thermal unit are less severe than those applied to other relays in this series.

- 1.3 The thermal relay to this specification is suitable for operating one line relay of the B.R. miniature type.

2. SCOPE

- 2.1 This specification relates to design requirements for the thermal unit. The time delay is obtained by the consecutive heating and cooling of a thermal element.

- 2.2 The following clauses define additions and amendments to B.R. Specification 960.



3. DEFINITIONS

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

<u>Thermal element</u>	A heat sensitive device carrying a heater winding and which is capable of operating electrical contacts.
<u>Hot contact</u>	A contact closed by the thermal element at the end of its heating period.
<u>Cold contact</u>	A contact closed by the thermal element when cold.
<u>Thermal unit</u>	The unit comprising the thermal element and the associated hot and cold contacts.
<u>Heating period</u>	The time which elapses between the energisation of the heater winding when the thermal unit is at ambient temperature and the making of the hot contact.
<u>d.c.</u>	Current from a battery or smoothed rectified a.c. with a ripple content not exceeding 1.25% r.m.s.
<u>J S</u>	A d.c. neutral line relay associated with the thermal unit which picks up and sticks up electrically if the thermal unit has closed its hot contact.
<u>- R</u>	A d.c. neutral line relay which may be used in association with or independently from the thermal unit.

4. GENERAL

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

- (a) A relay unit containing two tractive armature d.c. neutral line relays and a thermal unit.
- (b) A plugboard into which the unit is plugged.

5. LIFE

5.1 Clause 8 of B.R. Specification 960 is replaced by the following :-

5.2 The rated life of the thermal unit and the associated relay (JS) shall be taken as 10^5 cycles under specified conditions of operation where one cycle consists of an operation following by a release. The maximum rate of operation shall be taken as 100 cycles daily.

5.3 The rated life of the independent d.c. neutral line 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.

- 5.4 The relay 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.

6. CONTACTS

- 6.1 The contact springs of the relay JS in Appendix "E" shall be fitted in "C" bank, the thermal shall be fitted in "D" bank, and banks "A" and "B" shall be available for the independent (-R) relay.

7. CONTACT EQUIPMENT

- 7.1 The standard contact equipment shall be as shown in the following tables and they shall be disposed in accordance with Appendix "C" :-

R.H. Relay (-R)		L.H. Relay (JS)	
Front	Back	Front	Back
6	2	2	1
4	4	2	1

8. THERMAL UNIT

- 8.1 The thermal unit shall be mounted in the space normally occupied by the "D" bank of contacts. The connections must be made in accordance with Appendix "E" to this specification.

- 8.2 The heater winding shall be rated for operation on supply voltages of either 24 volts or 50 volts as specified.

The maximum power consumption shall be 15 watts at rated voltage.

- 8.3 The heater winding shall be carried on and may be electrically connected to a heat sensitive device. This heat sensitive device must not be used as a contact and must be insulated from any other metallic part of the relay unit except as required to provide a circuit connection for the heater winding.

9. THERMAL UNIT CONTACT SPRINGS

- 9.1 Clauses 12, 14, 15 and 16 of B.R. Specification 960 are not applicable to the contacts of the thermal unit.

- 9.2 Metal/metal "hot" and "cold" contacts shall be provided. The hot contacts shall be suitable for closing the circuit of the JS relay throughout the rated life of the thermal unit and provision must be made to minimise burning due to intermittent initial contact.

- 9.3 When the cold contact is just broken the hot contact must be open at least 0.02" and vice versa (see also Appendix "E").

This dimension may be reduced to 0.015" provided an independent stop prevents absolutely reduction of this gap. This stop is to be entirely separate from the stops called for in Clause 11.4.



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- 9.4 Contact pressure on the cold contact at an ambient temperature of 40°C. shall not be less than $\frac{1}{2}$ oz. throughout the range of adjustment.

10. AMBIENT TEMPERATURE RANGE

- 10.1 The thermal unit shall be designed to operate satisfactorily over an ambient temperature range of 0°C. - 40°C.

11. ADJUSTMENT OF THERMAL UNIT

- 11.1 The adjusting device must be accessible from the front of the relay unit and adjustment must be effected without the use of any special tools. Access must be obtained with the unit located in the rack and without removal of the relay cover. A minimum vertical gap of 1" between adjacent rows of relays may be assumed. Opening of the means of access for adjustment must not permit access to be obtained to any other part of the unit.

- 11.2 The means of access for adjustment must be capable of being sealed by means of a standard wire and lead seal.

- 11.3 The thermal unit shall be capable of adjustment so that the overall operating time of the time element relay can be varied at least between 30 seconds and 120 seconds at an ambient temperature of 20°C. This range of adjustment must be available both on a smooth d.c. supply and on an unsmoothed full wave rectified single phase sinusoidal a.c. supply at nominal voltage as measured on a moving coil-type instrument.

- 11.4 The range of adjustment is to be limited by means of stops such that the requirements of Clause 9.3 is maintained and that at maximum time adjustment the hot contact would be closed before any permanent damage could occur to the actual thermal element through overheating.

12. EFFECT OF VOLTAGE VARIATION

- 12.1 An increase of 10% in the applied voltage must not result in a decrease in time of more than 10% and a decrease of 10% in applied voltage must not cause an increase in time of more than 20%.

- 12.2 The relay must be capable of accepting, without damage, a voltage of 20% above nominal for the duration of the heating cycle.

13. EFFECT OF TEMPERATURE VARIATION

- 13.1 An increase or decrease of 20°C. above or below an ambient temperature of 20°C. shall not cause a variation in time of more than 10%.

14. REGISTRATION CODES

14.1 The following codes shall apply to the relay unit covered by this specification :-

Code No.	Voltage	Contact arrangement of JS	Contact arrangement of -R
127	24	2F 1B	6F 2B
128	24	2F 1B	4F 4B
129	50	2F 1B	6F 2B
130	50	2F 1B	4F 4B

This replaces the table in Clause 19.1 of B.R. Specification 960.

15. TYPE TESTS

15.1 The following tests are to be applied to the thermal time element relay in place of those defined in Clause 20 of B.R. Specification 960.

- (i) The relay shall be subjected to 10,000 operations at nominal voltage and an ambient temperature of 20°C., an interval of 10 minutes being allowed between the commencement of each cycle. Each operation shall include the energisation of a miniature neutral relay to B.R. Specification 930A, and throughout the test this relay shall pick up without hesitation and shall remain energised until the end of each cycle.

This test shall be carried out with the thermal relay adjusted to its maximum nominal setting and at the conclusion of the test the actual time shall lie between 5% less and 30% more than the original setting.

- (ii) A test to prove that the relay unit will withstand shocks equivalent to a free drop of 1" on to a solid concrete surface.

- (iii) A test to prove that the unit is free of resonance effects under vibration of 0.005" amplitude at frequencies between 3 and 40 Hz and of 0.001" amplitude at frequencies between 40 and 100 Hz. Under such conditions, with the relay in the full operate position, the front contact of the relay JS in Appendix "E" shall give reliable contact and with the relay in the full release position the back contact of this relay shall give reliable contact. The cold contact of the thermal unit shall also give reliable contact under the same conditions when tested not less than 5 minutes after the completion of an operating cycle. 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) The unit, with the exception of the thermal element, shall meet the requirements of Clause 20.1(iv) of B.R. Specification 960.
- (v) The complete unit, including the thermal unit, shall be subjected to the frequency of climatic conditions set out in B.S.2011 (1954), Clause 4.2.2, Classification H3, but with the accelerated damp-heat test repeated five times. The tests shall be made over a temperature range from -20°C to $+45^{\circ}\text{C}$. Following the application of these conditions the thermal element shall be dried out by the application of current for a maximum period of 2 hours, after which the thermal unit shall meet the requirements of Clause 9 of this specification and the whole relay shall be subjected to a complete cycle of operation at rated voltage at 20°C . The variation from the set time shall not exceed $\pm 20\%$.
- (vi) After the coils of the neutral relays have been energised 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 B.S. 2757 (1956). This test shall be carried out at an ambient temperature of 60°C . and with the relay energised at 20% above its rated voltage.

The relevant extracts from B.S.2011 (1954) are set out in Appendix "F" to this specification.

16. ACCEPTANCE TESTS

16.1 The relay shall be subjected to the following tests in place of those defined in Clause 21 of B.R. Specification 930A :-

- (i) With the relay adjusted at nominal voltage to operate at its minimum time, a check to ensure compliance with Clause 12.1 of this specification. A similar check is to be made with the relay at its maximum time. An interval of 10 minutes will be allowed between successive operations.

- (ii) A test voltage of 1000 volts a.c. (r.m.s.) of sine wave form at 50Hz, applied for one minute between all metallic parts of the relay and other metallic parts insulated therefrom. This requirement shall include the tests between separate coil windings, where applicable, and between coil windings and metallic parts. This test will not apply to the thermal element whether or not the heater winding is connected to it.
- (iii) A test on the contact springs of the relay unit similar to that defined in Clause 21.1 (iii) of B.R. Specification 930A. A similar test to ensure that no current flows between the hot and cold contacts during the heating and cooling cycle of the thermal unit.
- (iv) Additionally a voltage test to check that the independent neutral line relay (-R) complies with Clause 18.2 (a) of B.R. Specification 960.

17. LABELLING AND MARKING

17.1 Clause 22.1 of B.R. Specification 960 is to be replaced by the following :-

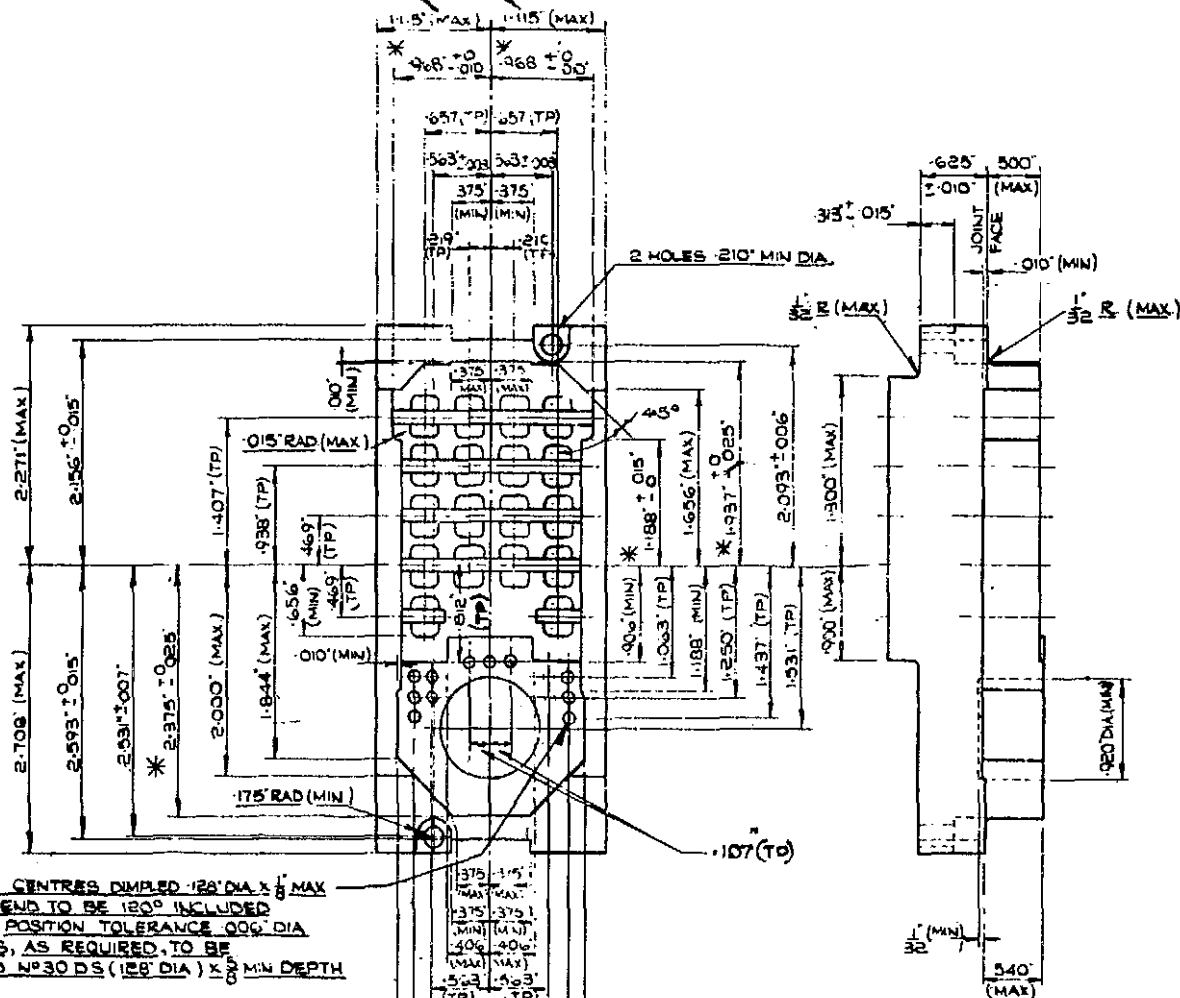
- (i) Manufacturer's name.
- (ii) Reference No.
- (iii) Serial number of the relay unit.
- (iv) Rated voltage.
- (v) Range of timing adjustment.
- (vi) Contact arrangement.
- (vii) Specification and Code No.
- (viii) Date tested (month and year is sufficient)

The reference number (Item (ii)) shall incorporate the letters "JN".

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TO GIVE 2' RELAY SPACING

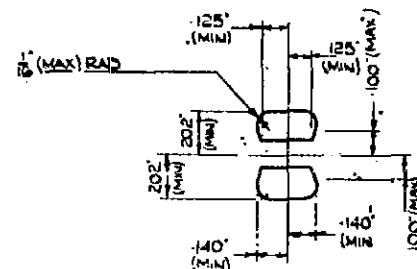
FIRST ANGLE PROJECTION



15 HOLE CENTRES DIMPLED .125" DIA X 1/8" MAX DEPTH. END TO BE 180° INCLUDED ANGLE, POSITION TOLERANCE .000" DIA 3 HOLES, AS REQUIRED, TO BE DRILLED N°30 DS (.125" DIA) X 1/8" MIN DEPTH

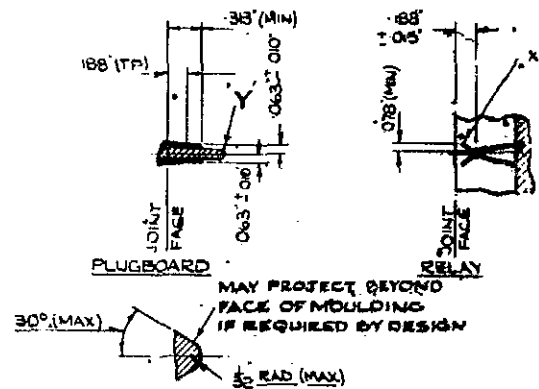
NOTE THIS PLUGBOARD IS TO FIT RACK DRILLED 1/8" X 48" CRS TO SUIT N° 2 BA FIXING SCREWS

* THE TOLERANCES ON THESE DIMS ARE INTENDED TO INCLUDE ANY VARIATIONS DUE TO DISTORTION ETC. THROUGHOUT THE SERVICE & SHELF LIFE OF PLUGBOARD



DIMENSIONS OF CONNECTOR SLOTS

THESE SLOTS MAY BE ANY SHAPE OR SIZE PROVIDED THE DIMENSIONS GIVEN ABOVE ARE NOT INFRINGED TO THE DEPTH OF THE JOINT FACE BETWEEN RELAY & PLUGBOARD



ENLARGED DIM' VIEW OF POINT 'Y'

NOTE INDIVIDUAL DESIGNS MUST BE SUCH THAT WHEN THE RELAY IS PLUGGED ON ANY PLUGBOARD, THE END OF THE CURL (X) WILL NOT FOUL THE ROOF OF THE PLUGBOARD UNDER LIMIT CONDITIONS (TP) DENOTES TRUE POSITION IN ACCORDANCE WITH BS 308.