# Vital Signalling Relays

## ESP-05-02

### Applicability

ARTC Network Wide

### Publication Requirement

Internal / External

### Primary Source

SMP 24 (v1.2), ESM-05-11

### Document Status

| Version # | Date Reviewed | Prepared by | Reviewed by | Endorsed | Approved |
|---|---|---|---|---|---|
| 1.0 | 13 Sep 23 | Signal Standards Engineer | Stakeholders | Manager Standards | Head of Engineering Standards 19/09/2023 |

### Amendment Record

| Version | Date Reviewed | Clause | Description of Amendment |
|---|---|---|---|
| 1.0 | 13 Sep 23 | various | Document renumbered from ESM-05-11. Included the procedure for the QTD4 timer and other minor editorial changes. |

# Table of Contents

# 1 Introduction

## 1.1 Purpose

This document defines the procedures to be followed when it is necessary to carry out installation or maintenance of vital signalling relays.

## 1.2 Scope

This document covers the pre-installation and maintenance requirements for vital signalling relays.

## 1.3 Responsibilities

The Head of Engineering Standards is the standard owner and is the initial point of contact for all queries relating to the standard.

The Signal Maintenance Engineer/Team Manager Signal Maintenance is responsible for the application of the standard for activities within the corridor and should be consulted with regard to application of the standard.

## 1.4 Reference Documents

The following documents support this standard:

- ESI-05-15 Work Instruction for Testing BR930 series Relays using the RelayDoc Test Tool
- ESM-00-20 Like for Like Renewals
- SPS 10 Relays Plug-in Vital

## 1.5 Definitions

The following terms and acronyms are used within this document:

| Term or acronym | Description |
|---|---|
| RelayDoc | RelayDoc is an automatic test tool for the testing of BR930 series relays and the recording and management of test reports. |

# 2 General

The Signal Maintenance Engineer/Team Manager Signal Maintenance shall ensure there is an up-to-date program for the changing and overhaul of relays as required by the policy.

As the proper working of all relays is essential, the following instructions shall be most carefully observed and where signalling maintainers are in doubt with regard to the condition of any relay they shall report it to the Signal Maintenance Engineer/Team Manager Signal Maintenance immediately.

## 2.1 Sealing of Relays

All vital relays supplied by manufacturers and workshops are sealed, and all relays installed in the field that are not presently sealed, shall be considered as sealed and not opened.

This seal shall not be broken in the field except in exceptional circumstances when directed by a Signal Maintenance Engineer/Team Manager Signal Maintenance. In the event of a defect being observed in a relay the seal shall be left intact until the relay is examined by a Signal Maintenance Engineer/Team Manager Signal Maintenance.

## 2.2 Cyclic Changing and Overhaul of Relays

### 2.2.1 General Policy

The policy for changing and overhauling all shelf mounted relays and AC vane type plug-in relays is based on two (2) main classifications of relays, "Proved" and "Unproved".

Unproved shelf relays shall be changed after 15 years in service and overhauled in the workshops or scrapped.

Relays which are proved to release (down proved in circuit) are not to be changed on a regular basis but on an as required basis as determined by the normal inspections by the signal electricians.

Shelf or AC vane plug-in type track relays used for cut tracks are to be changed on a 10 year basis.

In the case of all plug-in relays, except AC vane type, a regular overhaul period is not laid down.

Samples of plug-in relays, other than AC vane type, from typical installations are to be inspected in detail after 20 years in service to assess the need for overhaul or replacement of the complete group, or to assess the period to the next sample inspection.

This inspection shall be carried out in an approved Signal Workshop and shall be arranged by the signal electrician in conjunction with the Signal Maintenance Engineer/Team Manager Signal Maintenance. The relays are to be completely dismantled during the inspection.

The Workshop Manager shall forward a copy to the nominated Signalling representative. After the inspection report is accepted the relays which were dismantled for inspection may be discarded.

When shelf type relays are required to be changed where possible they shall be replaced by a shelf mounted plug-in relay conversion unit. eg:

- BRB miniature 50v BRB miniature 12v dc
- BRB miniature dc track (QT2, QTMI on cut tracks)

The policy to be progressively implemented is to discontinue the practice of workshop servicing of shelf type line relays and shelf type dc track relays.

If in service it is recommended they are to be replaced, preferably with a shelf mounted plug-in relay conversion unit and where this is not practical by a DN 11 type shelf relay.

### 2.2.2 Jeumont Schneider Track relays

This type of relay is to be kept under review until a fault or deterioration rate requires their replacement.

## 2.3 Type of wire connecting to shelf relays

When a shelf relay is fitted with a detachable top, flexible stranded wire (eg 9/0.3mm) may be terminated on the detachable top using appropriate insulated crimp lugs. Ensure that Bakelite terminal covers are fitted and the lugs on different terminals do not cross one another.

When a shelf relay is not fitted with a detachable top, flexible stranded wire shall not be terminated directly onto the relay.

Single strand, stiff wire (eg 1/1.7mm) without crimp lugs is to be used on these relays. Where this is required to run to a “Q” type relay or similar which will not accept this wire, an interfacing terminal block shall be used.

In cases where flexible, stranded wire has already been terminated directly onto shelf relays the following is required:

Ensure that crimp lugs do not touch one another or other terminals.

Whenever it is necessary to change the relay or to disconnect then reconnect the wiring for any reason,

a. each wire shall be labelled with its relay terminal number and

b. each crimp lug shall be insulated as it is removed from the relay with either suitable sized plastic tubing which will fit tightly over the crimp lug or with another equally secure product.

# 3 Placing Signalling Relays into Service

(Refer also to “ESM-00-20 Like for Like Renewals”)

## 3.1 General

The integrity of all vital signalling relays to be placed into service is paramount particularly as they may be installed in circuits where they are not proved to release when de-energised.

Signalling relays shall be handled, transported and stored with care and not in any manner, condition or circumstance that would subject them to damage or deterioration.

The relays shall be stored on racks in enclosed buildings in a clean, dry and non-corrosive environment. They shall always be kept in the upright position in case of any undetected foreign matter which has fallen to the bottom of the case moves to a critical position.

Spare overhauled relays with workshop testing dates in excess of that specified below shall not be placed into service and shall be resubmitted to the Signal Maintenance Engineer/Team Manager Signal Maintenance for retesting.

- Plug In D.C Relays Seven (7) Years
- Plug In A.C Relays Three (3) Years
- D.C Shelf Relays Five (5) Years
- A.C Shelf Relays Three (3) Years

New BR930 series plug-in relays which have been stored in their original boxes or packaging for periods up to seven (7) years may be used without being overhauled provided that the relay passes the visual examination specified in Clause 9.1 and the operating tests specified in Clause 9.2.

Relays which do not pass the inspection and/or test should be forwarded to the Signal Maintenance Engineer/Team Manager Signal Maintenance as described in Clause 9.1 & 9.2.

Prior to placing any plug-in relay in service it shall be closely inspected to see that the contacts are aligned correctly and that it has not been damaged in transit. When plug-in relays are to be changed, before insertion into the plug-in base, the signalling maintainer shall ensure that the replacement relay is the same voltage, the same contact arrangement (by direct examination of the contacts) and that the code pins are present in the same indexing locations. The base shall be fitted with one set only of five index holes. The signalling maintainer shall check the contacts to ensure they are not high resistance. Where a relay test unit (eg RelayDoc) is provided, it shall be utilised to test the relay before being placed into service. The signalling maintainer shall check the operation of the relay in circuit and ensure that the functions controlled by it operate correctly.

Immediately prior to any relay being placed in service it shall be examined at a bench under full lighting conditions by the signal maintainer who is to install the relay. The signalling maintainer shall also arrange a test circuit to check the relay under operation.

In this test, the signalling maintainer is to examine the relay under normal electrical operation, observing the energise/de-energise cycle several times to ensure that the mechanical operation is normal, unrestricted but not pounding, and that the relay drops fully away.

Where there is any cause to suspect that the relay is not operating correctly it shall be immediately labelled accordingly and sent to the Signal Maintenance Engineer/Team Manager Signal Maintenance for more detailed testing together with written advice of the problem.

Once the relay has been installed it shall be observed to function fully in its operating circuit and shall not be certified until the signalling maintainer is satisfied that it is operating correctly.

The nominated Signalling representative shall be promptly advised of all incidents of an unsafe condition whether in use or in storage of a vital signalling relay and shall nominate a Signal Maintenance Engineer/Team Manager Signal Maintenance from the approved Signal Workshops to examine the relay before it is unsealed.

Before placing a shelf-mounted relay in service special care shall be taken to remove the armature securing screw provided to prevent damage during transport. The arrangement of terminals vary for different manufacturers of shelf-mounted relays, it is therefore necessary that signalling maintainers take special care when replacing a relay by one of a different manufacture to see that the connections are placed on the correct relative terminals and that circuit diagrams are updated for any change in contact numbers. The relay shall be examined and bench tested by the signalling maintainer prior to installation.

Also before placing the shelf-mounted relay in service the suitably accredited signalling maintainer shall remove the nuts on the studs and check that the bottom nut is tightened down. This is to ensure that the pigtail is securely maintained by a tight armature stud or that the carbon pillar is securely maintained in position by a tight point stud. Excessive force shall not be applied on the bottom nut as this could cause the stud to fracture.

When a shelf-mounted relay has been replaced the signalling maintainer changing the relay is responsible for seeing that a thorough test and check is made of all circuits passing through the relay to ensure that no incorrect connections have been made and that the circuits are in accordance with the circuit diagrams.

In addition when any dc shelf-mounted relay or dc plug-in track relay or dc standard 'B' size plug-in relay is changed the "pick-up", "drop-away" and "working" currents of the new relay shall be tested.

ESM0511-F01 "Relay Changed Forms", at present, shall be made out in duplicate by the signalling maintainer for all shelf relays replaced and these forms shall be forwarded to the Signal Maintenance Engineer/Team Manager Signal Maintenance immediately after the relay or relays have been changed. The signalling maintainer shall show all relevant particulars on these forms and certify that the circuits through the shelf-mounted relays have been tested and are correct.

## 3.2 Shelf type relay - Recording relay change information

In the event of a shelf type relay being tested, installed or removed from service the signalling maintainer shall fill out the relay changed form ESM0511-F01 ‘Rev.1 Relays Changed’ and forward it to Signal Maintenance Engineer/Team Manager Signal Maintenance for recording.

When a relay has been replaced, newly installed or removed permanently from service the local relay records or database is to be bought up to date to reflect the change. Details of newly installed or replaced relays including the install date are to be included.

# 4 Miniature Plug-In Relays BRB Series: Care of / Handling

Miniature Plug-In relays shall be managed during transport, storage and preparation for installation. Staff shall ensure appropriate care is taken and consideration of the following hazards.

- Cases have occurred where newly installed miniature plug-in signalling relays have failed to operate, and it was found that their contacts were out of adjustment due to distortion of their stationary contact support brackets.
- It has been demonstrated that this fault was a result of the relay having been dropped or struck during transport or installation. Extreme care shall be exercised in transporting and handling relays. Any relay which is bumped or dropped should be closely examined and tested, and if need be sent to the workshops for overhaul.
- Because of the risk that relays may have been dropped or damaged without knowledge, any relay which is to be placed in service shall be visually inspected, then inserted in a relay test unit and observed to operate correctly before being plugged into service.
- If there is any sign of damage to the case or to the relay or if the operation or the relay is in any way suspect if shall not be put into service but sent for overhaul.
- Another case involved metal swarf from drilling becoming stuck in the contacts in the base of the relay, shorting some of the contacts.

# 5 Large Size (Standard ‘B’ Type) Plug-In-Relays: Distorted Contact Carrier

Special note should be taken, by all signalling maintainers concerned with the handling and placing into service of large size plug in relays that contacts can become seriously out of adjustment due to rough handling.

Before placing a relay into service it shall be carefully examined to see that all contacts, both front and back, make with sufficient over travel and open sufficiently (when applicable). If a relay is suspect or in any way damaged it shall be sent to the Signal Maintenance Engineer/Team Manager Signal Maintenance for inspection.

Large size plug-in relays are particularly prone to maladjustment of contacts due to the alloy casting which carries the coil becoming misaligned at some angle other than 90 degrees relative to the relay base. This is usually caused by the relay being dropped during transit or installation.

When these relays are transported by any means they shall be packed with the contact springs vertical and "THIS SIDE UP" labels applied appropriately.

# 6 Precautions to be taken when changing Magnetically Latched Relays

Magnetically latched relays remain in the position to which they were last operated and for this reason special precautions are required to ensure that a relay is "down" before it is plugged into service. Magnetically latched relays are used for the parent relay of the route, point and release lock relays and the procedure for changing these relays is as follows.

## 6.1 Route NLR and RLR Relays

1. Prior to unplugging a route NLR or RLR relay the signalling maintainer shall:

   a. Ensure that the signal to which the route lock relay applies is at stop, the route normalised, and that any train which is approaching the signal has been brought to a stand.

   b. The magnetically latched relay which is to be placed in service shall then be plugged into the magnetically latched relay test base (not required when using the MRD RelayDoc) and the indicator lamp observed to ensure that the relay is down.

   The relay to be withdrawn from service is then unplugged and the new relay removed from the test base and plugged into service.

***Note:*** *After changing a route NLR relay both the route NLR and RLR may be down. This will be indicated by a steady white light in the button knob controlling the route and the button shall be pulled to energise the NLR.*

## 6.2 Point NLR and RLR relays

2. Prior to unplugging a point NLR or RLR relay the signalling maintainer shall:

   a. Ensure that no trains are standing foul of or passing over or approaching the points concerned.

   b. Ensure that all signals which protect the points concerned are at stop and that any trains which may be approaching those signals have been brought to a stand.

   c. The magnetically latched relay which is to be placed in service shall then be plugged into the magnetically latched relay test base and the indicator lamp observed to ensure that the relay is down.

   d. The relay to be withdrawn from the service is then unplugged and the new relay is removed from the test base and plugged into service.

***Note:*** *After changing a point lock relay both point NLR and RLR relays may be down. This will be indicated by both point position lights extinguished, and the transit light flashing. Under these conditions it will be necessary to move the point lever to the centre position and then to return the lever to its previous position and thereby energises the point lock relay for the position in which the points are laying.*

## 6.3 Release Switch NLR or RLR Relays

3. Prior to unplugging a release NLR or RLR relay the signalling maintainer shall:

   a. Ensure that no trains are standing foul of or passing over or approaching the ground frame points concerned.

   b. Ensure that all signals which protect the ground frame points are at stop and that any trains which may be approaching those signals have been brought to a stand.

c. The magnetically latched relay which is to be replaced into service shall then be plugged into the magnetically latched relay test base and the indicator lamp observed to ensure that the relay is down.

d. The relay to be withdrawn from service is then unplugged and the new relay is removed from the test base and plugged into service.

# 7 Routine Examinations and Tests

## 7.1 Examination of AC Relays, Vane all types

Vane and polyphase AC relays, including contacts, pigtails and terminals, shall be inspected periodically for any signs of abnormal conditions.

Examine all non-proved vane AC relays every 52 weeks and whenever the opportunity presents.

Particular attention shall be paid to the working of the vane and for any indication of the following conditions, by observation through the glass case.

The relay shall be observed to operate correctly.

Check for abnormal release operation of a relay, eg sluggish, jerky or not falling fully to the stop position may be due to defective bearings, warped Bakelite tops, wax or other foreign matter in the bearings, vane obstructions, etc.

Check that there is no foreign matter or flaking plating or paint inside the relay.

Check for deposits of wax, varnish or paint on the vane which may indicate overheating of coils or contact with pole faces.

Check for scratches or abrasions on the vane which may indicate that the vane is distorted or that air gap tolerances are incorrect.

Check if the bottom of the vane could be spread due to striking the bottom of the relay case. This condition can first be detected by a mark in the paint of the case bottom. A vane allowed to spread could become jammed between the pole faces.

Check that the vane is central between and clear of pole faces. Vane distortion may be evident from observing the relay in operation.

Check the surface of the vane spindle for any accumulation of dust or discolouration which may be attributed to wear of the bearings.

Do not place in service A.C. vane shelf relays fitted with black coils without coil formers, as some these are suspected of releasing wax from the coils when hot.

If other types of relays in service exhibit evidence of wax deposits then details are to be reported.

Examine all non-proved AC vane shelf relays with black coils without coil formers for the presence of wax coatings and, where noted, check the release operation of the relay. Also examine the contacts for any noticeable presence of wax contamination.

Immediately change out non-proved A.C. vane shelf relays with black coils without coil formers and with evidence of wax and program those without evidence of wax for priority change out, and have the Signal Maintenance Engineer/Team Manager Signal Maintenance scrap this type of relay after removal from service.

Keep on record in the section depot a separate list of each and every non-proved relay circuit function on the section which is fitted with an A.C. vane shelf relay. This list would include track relays, track indicating relays, signal N1 relays, release switch normal relays, detector relays etc., etc.,

If correct operation of a relay is in doubt advise the Signal Maintenance Engineer/Team Manager Signal Maintenance and change out the relay immediately and label it accordingly. The Signal Maintenance Engineer/Team Manager Signal Maintenance is to promptly examine the relay as follows.

Check that ends of split pins are properly spread.

Check that the counter weight lock nut is locking the counter weight and that they have not moved.

Examine roller stops for evidence of grooving.

Examine spring type stops for evidence of grooving and ensure that the spring is effective and is not fouled by its bracket when the relay is energised and that they are tight and there is no sign of cracking.

## 7.2 Examination of DC Relays, Shelf-Mounted

Signalling maintainers are responsible for the inspection of all dc shelf-mounted relays on their section. These relays shall be inspected every 52 weeks and whenever the opportunity presents for any unusual condition and to see that the armature is operating freely and drops away promptly when the relay is de-energised. If any sluggishness or failure of the armature to drop away promptly is observed, the relay shall be replaced immediately and the Signal Maintenance Engineer/Team Manager Signal Maintenance advised. When making this check due allowance should be made for a slow release relay.

## 7.3 Examination of Plug-in Relays

4. Signalling maintainers shall examine, to the extent practical without removal, all plug-in relays, both Standard `B' size and miniature, on their sections every 52 weeks and whenever the opportunity presents. They shall particularly be on the look out for:

   a. any signs of the clear plastic in the covers fouling the contact assembly due to warping or cracking.

   b. any signs of contact burning, or pitting of the carbon contacts, and any signs of displaced carriers.

   c. any signs of rust on plated components or signs of excessive deterioration of the plating.

   Signalling maintainers shall replace relays if any of these or other defects are detected and advise the Signal Maintenance Engineer/Team Manager Signal Maintenance.

## 7.4 Testing of Time Limit Relays

Electro-mechanical type and thermal type time limit relays shall be regularly tested at not more than two years intervals to see that they operate at the specified timing and the necessary details entered on a ESP0502-F02 form and forwarded to the Signal Maintenance Engineer/Team Manager Signal Maintenance.

The relay shall be considered defective if the timing varies by more than ten percent of the specified timing.

Defective relays shall be sent to the Signal Maintenance Engineer/Team Manager Signal Maintenance for attention.

ARTC type approved electronic time limit relays, such as QTD5 time limit relays are not required to be tested.

## 7.5 Examination of Suspect Relays, All Types

The Signal Maintenance Engineer/Team Manager Signal Maintenance or suitably competent signals representative is to promptly arrange for a relay replaced because of doubtful operation to be examined by a nominated Signalling representative, or approved Signal Workshop.

# 8 Dispatch, Transport and Handling of Relays

Relays removed or replaced shall be forwarded to the approved Signal Workshop for overhaul or scrapping with a label detailing the reasons for its removal.

Relays should be handled and transported at all times with care and always be kept in the upright position in case any foreign matter has escaped detection and can move into a critical position to prevent proper operation.

See section 4 for precautions to be taken.

# 9 Re-Use of BR930 series Relays

Before BR930 series miniature plug in relays, which have been in service for ten years or less, are considered for reuse in new or altered works, the following procedure of inspection and operating tests shall be carried out and the relay shall meet all performance criteria.

## 9.1 Visual Inspection

5. Visually examine the relay to ensure that:
   a. Seals are intact
   b. The cover and base (base of the relay itself) mouldings are not chipped, cracked or warped.
   c. Register pins are straight and correctly coded
   d. Plug-in contact fingers are not bent, distorted or burnt and have not lost tension
   e. There is no sign of overheating within the relay
   f. There are no signs of the plastic cover fouling the contact assembly or the assembly being misaligned.
   g. Plated components are not corroded and are not showing signs of deterioration
   h. There is no loose or foreign matter inside the cover
   i. The cover is still transparent and there is no internal coating of a rust coloured, metallic or greasy nature.

   If the relay has any of the defects listed above or if the seals are broken, the relay is to be returned to the workshops for scrapping or overhaul.

   Relays which in all respects pass the visual test shall be operationally tested as follows.

## 9.2 Operating Tests

6. Type Approved Relay Testing devices for BR930 relays should preferably be used to perform advanced tests on the relays. Where these are not available a miniature relay test rack may be used for Go-No Go testing only. A relay test rack may also be used for testing of non BR930 relays. Any test meters used shall be appropriately calibrated.
   The Instruction ESI-05-15 details how the type approved MRD RelayDoc is used to conduct tests.
   a. Pick up and drop away values (see Relays Manual)
   b. Normal operation i.e. no chatter, excessive hum, slow to pick up or drop away (except where this is a function of the particular relay).
   c. Pick up and drop away times (where applicable).

      If the relay fails a) or b) it shall be scrapped. If it fails c) it shall be returned to the workshops for scrapping or overhaul.

   d. Check the contact resistance of each contact pair in the relay.

   If the resistance is greater than 2 ohms, the contact may be able to be cleaned by cycle testing the contact at its full rated current. Retest for resistance. If now less than 2 ohms the relay may be re-used. If still more than 2 ohms the relay shall be sent to the workshops for mechanical cleaning and service.

***Note:*** *A relay with contact resistance readings up to 7.5 ohms may be re-used as a temporary measure if no replacement is available. This relay shall be replaced without delay. Such relays shall be marked "High resistance contacts, relay to be replaced".*

## 9.3 Contact Full Current Cleaning

All relays which have had contacts full current cleaned shall have a permanent label affixed. For relays which have their contacts current cleaned using MRD RelayDoc (contact conditioning), the labeling instructions are found in ESI-05-15, otherwise the label shall state “Nos contacts full current cleaned on Signed ”.

## 9.4 Relays with more than Ten Years Use

Any ‘Q’ type relay removed from service which has been in operational use for more than ten years shall, provided it passes visual inspection, be returned to the workshops for overhaul.

## 9.5 Relays in Service

The above procedure for carrying out visual inspections and operating tests may also be used to test and clean relay contacts which are in service or which have been removed from service with suspected or proven high resistance contacts.

## 9.6 Alterations requiring spare contacts to be brought into service

Whenever there are circuit alterations and circuits are connected to spare contacts that have not been in use for some time there is a probability that the contact may be high resistance. Again cycle testing the spare relay contact with its full rated current before it is connected in service may reduce the contact resistance and should be carried out, as required.

# 10 QTD4 Timer relay

QTD4 relays are special relays allowing slow-to-release functionality via an electronic timer.

Dependent on the strappings used and the fine adjustment of the potentiometer a slow-to-release time can be achieved anywhere between 3 and 100 seconds range.

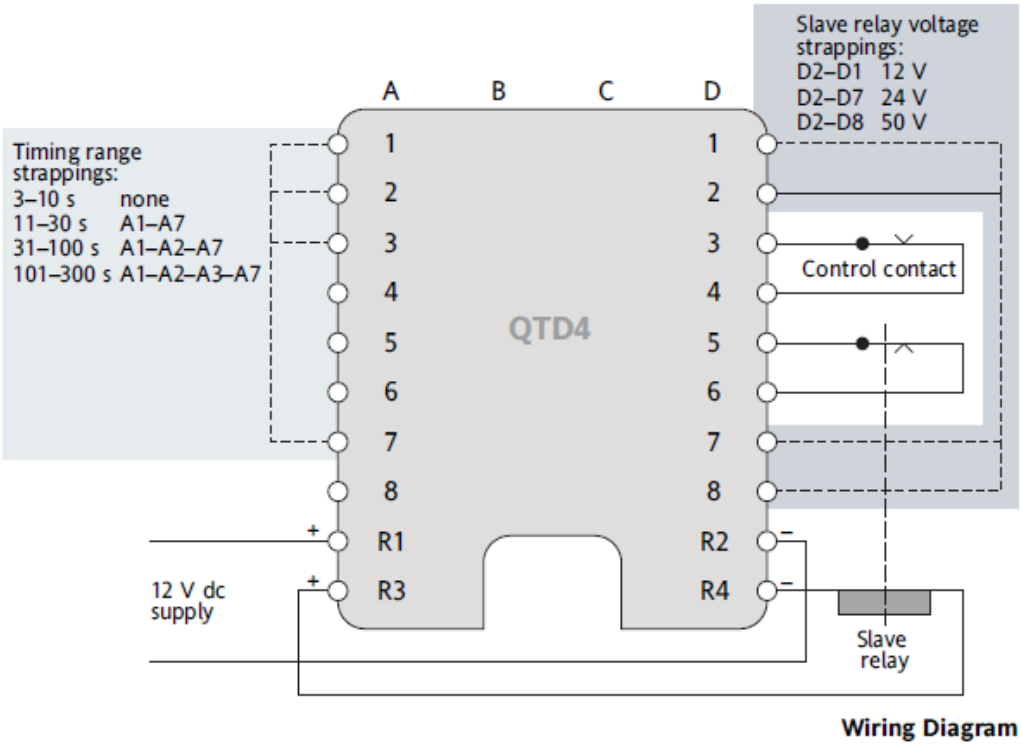
The signalling maintainer shall ensure the timing of the existing relay that requires change out is accurately recorded. The Signalling Maintenance Engineer/Team Manager Signal Maintenance shall be informed if the timing of the relay is different to the circuit book.

The new relay should be strapped for the timing range required as per the table below. The potentiometer should be used for fine adjustment to reach the desired timer setting. New QTD4 relay should be placed in the relay test panel where available; and tested to ensure the accuracy of the timer.

Only after satisfactory testing of the relay should the timer be booked into service.

| Timing range | Strapping |
|---|---|
| 3-10 seconds | None |
| 11-30 seconds | A1-A7 |
| 31-100 seconds | A1-A2-A7 |
| 101-300 seconds | A1-A2-A3-A7 |

*QTD4 Wiring Diagram:*




**Wiring Diagram**

# 11 QTD5 Timer relay

QTD5 relays are special relays allowing slow-to-pick functionality via an electronic timer. Dependent on the strappings used and the fine adjustment of the potentiometer a slow-to-pick time can be achieved anywhere between 3 and 300 seconds. Refer to the table below for strapping terminal allocations.

The signalling maintainer shall ensure the timing of the existing relay that requires change out is accurately recorded. The signalling circuits should be referred to but not relied upon for the time of the relay (changes to the relay timer may not have been recorded accurately). The Signalling Maintenance Engineer/Team Manager Signal Maintenance shall be informed if the timing of the relay is different to the circuit book.

The new relay should have the appropriate coarse and fine terminals (Reference the strapping table within datasheet) strapped and the potentiometer wound for fine adjustment to reach the desired timer setting. Where available, the new QTD5 relay should be placed in the relay test panel and tested to ensure the accuracy of the timer. Only after satisfactory testing of the relay should the timer be booked into service.

*Note: The relay is dispatched with the potentiometer set to maximum.*

| Nominal Time (s) | Strap Terminals | |
|---|---|---|
| | Coarse | Fine |
| 2.5 | A1-B7 | B7-B8 |
| 7.5 | A1-B7 | B7-A8 |
| 13.5 | A1-B7 | A8-B8 |
| 18.5 | A1-B7 | - |
| 26 | A1-A7 | B7-B8 |
| 31 | A1-A7 | B7-A8 |
| 37 | A1-A7 | A8-B8 |
| 42 | A1-A7 | - |
| 50 | A1-B6 | B7-B8 |
| 55 | A1-B6 | B7-A8 |
| 61 | A1-B6 | A8-B8 |
| 66 | A1-B6 | - |
| 73 | A1-A6 | B7-B8 |
| 78 | A1-A6 | B7-A8 |
| 84 | A1-A6 | A8-B8 |
| 89 | A1-A6 | - |
| 97 | A1-B5 | B7-B8 |
| 102 | A1-B5 | B7-A8 |
| 108 | A1-B5 | A8-B8 |
| 113 | A1-B5 | - |

| Nominal Time (s) | Strap Terminals | |
|---|---|---|
| | Coarse | Fine |
| 120 | A1-A5 | B7-B8 |
| 125 | A1-A5 | B7-A8 |
| 131 | A1-A5 | A8-B8 |
| 136 | A1-A5 | - |
| 144 | A1-B4 | B7-B8 |
| 149 | A1-B4 | B7-A8 |
| 155 | A1-B4 | A8-B8 |
| 160 | A1-B4 | - |
| 167 | A1-A4 | B7-B8 |
| 173 | A1-A4 | B7-A8 |
| 178 | A1-A4 | A8-B8 |
| 184 | A1-A4 | - |
| 191 | A1-B3 | B7-B8 |
| 196 | A1-B3 | B7-A8 |
| 202 | A1-B3 | A8-B8 |
| 207 | A1-B3 | - |
| 214 | A1-A3 | B7-B8 |
| 220 | A1-A3 | B7-A8 |
| 226 | A1-A3 | A8-B8 |
| 231 | A1-A3 | - |

| Nominal Time (s) | Strap Terminals | |
|---|---|---|
| | Coarse | Fine |
| 238 | A1-B2 | B7-B8 |
| 243 | A1-B2 | B7-A8 |
| 249 | A1-B2 | A8-B8 |
| 254 | A1-B2 | - |
| 262 | A1-A2 | B7-B8 |
| 267 | A1-A2 | B7-A8 |
| 273 | A1-A2 | A8-B8 |
| 278 | A1-A2 | - |
| 285 | A1-B1 | B7-B8 |
| 290 | A1-B1 | B7-A8 |
| 296 | A1-B1 | A8-B8 |
| 301 | A1-B1 | - |
| 309 | - | B7-B8 |
| 314 | - | B7-A8 |
| 320 | - | A8-B8 |
| 325 | - | - |
| | | |
| | | |
| | | |
| | | |

# 12 Forms

The following forms are to be used in conjunction with this standard where required:

- ESP0502-F01 ‘Rev.1 Relays Changed’ Previously referenced as SF J135/B
- ESP0502-F02 ‘2 Yearly Test of Electromechanical or Thermal Timing Relays’

**RELAYS CHANGED**

| **DISPLACED RELAY** | | | | | | **NEW RELAY** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **No.** | **TYPE** | **MAKERS** | **LOCATION** | **CIRCUIT** | **REPAIR** | **DATE** | **No.** | **TYPE** | **MAKERS** | **PICK UP** | **DROP AWAY** | **WORKING** | **WORKSHOP TESTS** | |
| | | **NAME** | | | **REQN. No.** | | | | **NAME** | | | **CURRENT** | **PICK UP** | **DROP AWAY** |
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I certify that all connections to the relays are correct as per circuit.

Name: ……  Section: ……

Signature: ……  Date: ……..

**2 Yearly Test of Electromechanical or Thermal Timing Relays**

**Month:**_____ **Section:**_____

| Circuit Name | Relay Type | Time Setting (Design) | Tested Time (Actual) |
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I certify that all connections to the relays are correct as per circuit.

Name: …….. Section: ……

Signature: …… Date: ……