AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline
Engineering Standard – NSW

Category
Signalling

Title
Repair/Replacement of Signalling Wires

Reference Number
SMP 12 – (RIC Standard: SC 00 52 00 12 SI)

Document Control

Status	Date	Prepared	Reviewed	Endorsed	Approved
Issue 1 Revision 1	Mar 05	Standards and Systems	Standards Engineer	GM Infrastructure Strategy & Performance	Safety Committee
		Refer to Reference Number	H Olsen	M Owens	Refer to minutes of meeting 12/08/04

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About This Standard

This Standard defines the signalling procedures to be implemented for the repair and or replacement of signalling wires and cables.

Document History

Primary Source – RIC Standard SC 00 52 00 12 SI Version 2.0

List of Amendments –

ISSUE	DATE	CLAUSE	DESCRIPTION
1.1	14/03/2005	Disclaimer	Minor editorial change

Contents

1 Emergency Repair/Replacement Procedures

Whenever wires are broken or defective or otherwise in need of repair or replacement, extreme care is necessary to ensure that wires are not cross connected or circuits interconnected.

The following emergency repair/replacement procedures for signalling wires are to be followed.

2 Single Wire Replacement

If a new wire is needed to replace a single broken or defective wire the signalling maintainer shall:

- Advise the signaller and book out of use the apparatus controlled by the affected circuit.
- Identify and label both terminal ends of the broken or defective wire; hand trace where possible; ensure that there are no intermediate terminals or contacts; and ensure the wiring is in accordance with the circuit books. With external cables ensure that the cable does not go through any intermediate location.
- Run the new wire and prepare ends for changeover. Keep ends clear and insulated from working circuits. Label ends with identity of terminal to which they will be connected.
- Disconnect the affected circuits.
- Disconnect the broken or defective wire and immediately connect the new wire, one end at a time. Cut back all ends of the broken or defective wire and carefully remove the wire. If the redundant wire cannot be removed then cut, turn back and insulate all ends securely (including ends at the break) and label with tags as "Defective".
- Insulation test the new circuit wire to earth.
- Test as required (see Note below).
- Re-connect the affected circuit.
- Advise the signaller and restore the apparatus into use.
- Promptly advise the Signal Engineer and certify the repairs by submitting a Detailed Report advising details of the repair. The Signal Engineer shall check and assure themselves that the work was performed correctly.

Note: If the identity of the terminal ends of the broken wire cannot be established with absolute certainty, then the testing shall be extended to include

EITHER

tracing and verifying the existing wiring to the circuit book to one clear series contact, fuse or link each side of the new wire

OR

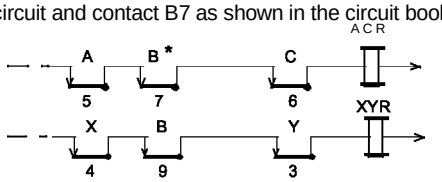
strap and function testing to one clear series contact, fuse or link inclusive each side of the new wire.

[REFER TO ACCOMPANYING ILLUSTRATION RE: NECESSITY TO CORRECTLY IDENTIFY THE TERMINAL ENDS OF A DEFECTIVE WIRE]

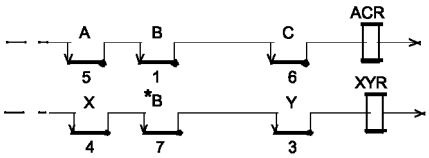
Note: Throughout the process ensure there is no possibility of there being a disconnected wire with one end loose and uninsulated with the other end connected to, or able to come into contact with, any "live" circuit elements.

Illustration Of Necessity To Correctly Identify The Terminal Ends Of A Defective Wire And Change Over Onto Those Same Terminals

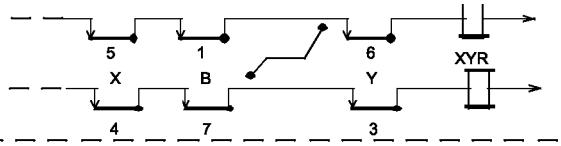
ARC circuit and contact B7 as shown in the circuit book



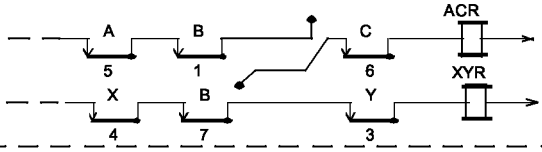
ARC circuit and contact B7 as it actually is



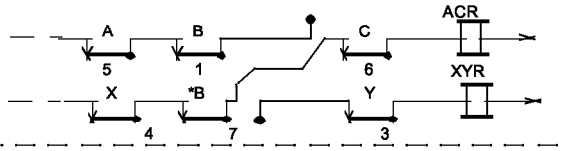
Suppose ACR circuit has failed and there is no positive voltage on the coil. Suppose in checking back through the circuit as shown in the circuit book the first positive voltage is found on B7 armature and it is checked that there is no continuity between B7 armature and C6 point. Suppose the maintainer assumes that the wire between B7 armature and C6 point is defective, open circuit somewhere along its length, and decides to replace the wire. ACR



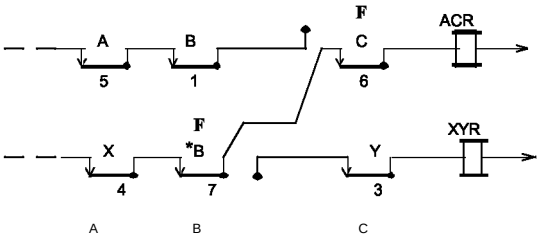
Change over at C6 point



Change over at B7 armature (suppose ACR relay picks up)



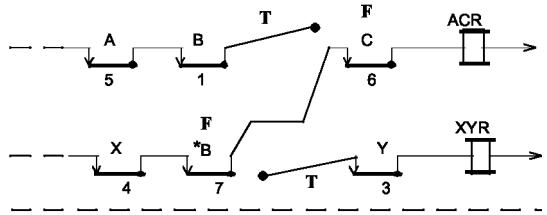
Strap and function test B7 and C6



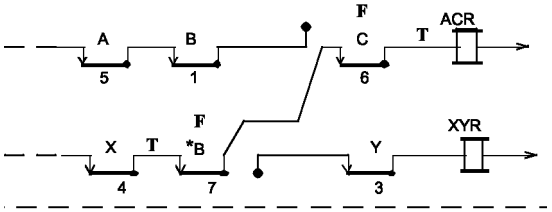
Run new wire to replace wire between B7 and C6

At this stage the test seem to indicate that the failure has been rectified, but in fact two separate circuits has been wrongly interconnected. **The following inspection and test are also necessary to verify the correct repair.**

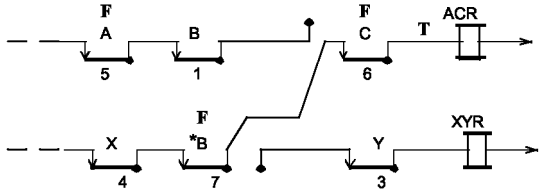
EITHER
Handtrace defective wire end to end



OR
Trace and verify wires on the other side of the contact at each point of connection



OR
Strap and function test to one contact clear of each point of connection (as shown in the circuit book)



The above precautions apply whether the defective wire is connected to contacts, fuses or links. When carrying out circuit modifications the same potential for wrongly interconnecting circuits exists if contact terminals, fuses or links are wrongly identified.

3 Single Wire Repair

If a signalling failure is traced to a single broken wire or cable, the signalling maintainer shall correctly identify the ends of the wire and the circuit to which the wire belongs and, if it is obvious that only one wire is broken, the signalling maintainer shall join the broken wire ends together with a reliable, secure connection after otherwise disconnecting the circuit concerned.

Joins in wires shall be properly insulated and the signalling maintainer shall insulation test to earth joints made in external wires.

The signalling maintainer shall reconnect and test the circuit and ensure that the failure is rectified.

4 Track Circuit Wires-Repair, Replacement

Should two or more track circuit leads to a location be broken or in need of replacement then the signalling maintainer shall follow the same procedure to that in Paragraphs 2.0 and 3.0 changing over one wire at a time and shall include the following.

The signalling maintainer shall ensure that the wires have not been cross connected, test that the track relay of the track circuit concerned de-energises with a shunt across the rails, and carry out a polarity test and a shunt test on the adjacent track circuit at the location on the lines affected.

Where cut tracks are involved, the signalling maintainer shall test that a shunt across the rails of the adjacent track circuit removes the voltage from the rails of the cut track.

5 Multicore Cables - Repair, Replacement

Should cores in a multicore cable be broken or defective then the signalling maintainer shall follow the same procedure to that in Paragraphs 2.0 and 3.0, changing over one wire at a time, and shall also observe the following.

5.1 Transfer to a spare cable core

Follow the same procedure to that in paragraphs 2.0 and 3.0, as applicable, and also observe the following:

Should a core of a multicore cable used in a signalling circuit become open circuit or defective then replace the cable core concerned with a spare core of the same cable which is not defective, if available.

Identify and open the cable termination link at each end of the defective cable core after verifying the cable core number to the terminal and after verifying that the circuit connected to the cable termination link at each end is the same circuit.

Test the cable core identified to be the defective core. Fit the defective cable core with labels marked "Defective" at both termination ends. Open the respective cable termination link at each end and disconnect the defective cable core from the link terminal. Cut all ends cleanly off, turn back and insulate.

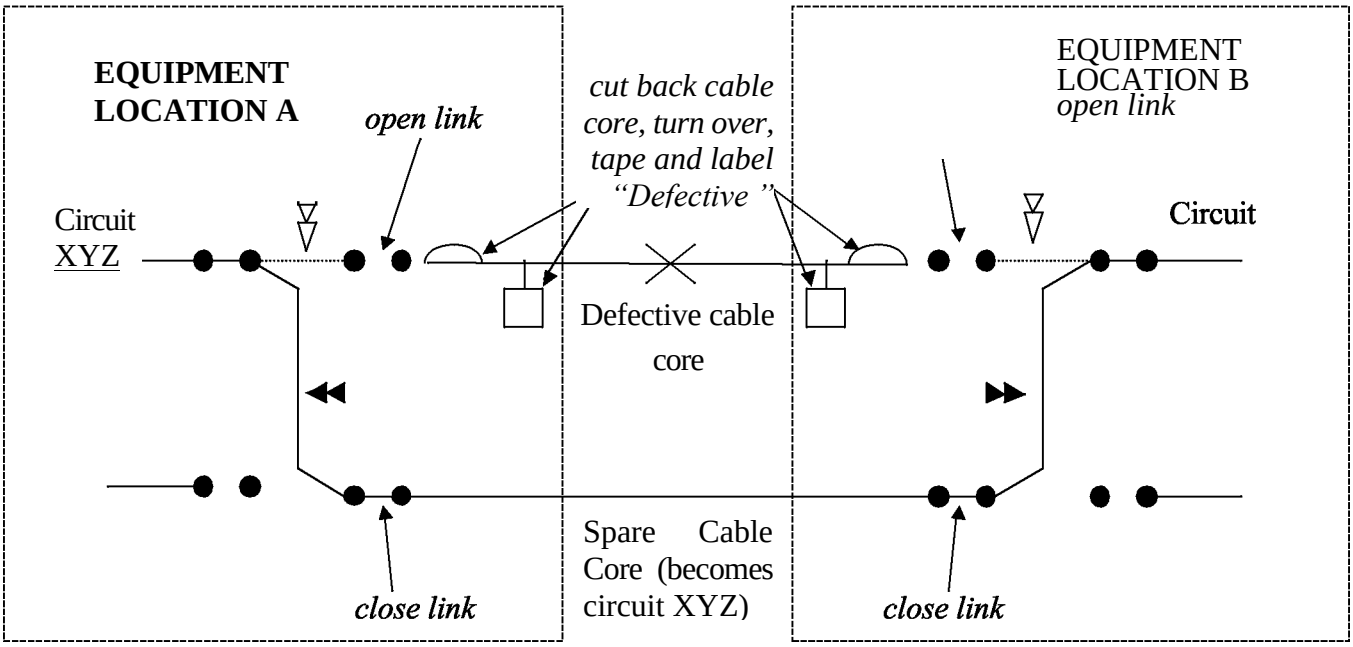


FIGURE 5.1 - TRANSFERRING A CIRCUIT FROM A DEFECTIVE CABLE CORE TO SPARE CABLE CORE

Check the circuit book to ensure that the cable is directly connected between the locations housing the cable links and that there are no intermediate terminals.

Continuity test the spare cable core selected using a separate spare cable core or the sheath as a test return wire, and also insulation test the selected spare to earth, to sheath and to other spare cores.

Transfer the circuit wire at each end from the cable termination link for the defective cable core to the cable termination link for the selected spare cable core.

Function test the circuit by opening and closing the link at each end in turn and observing the circuit function energise and de-energise accordingly. Connect a voltmeter across the circuit function and check that the voltage returns from the correct voltage to zero when the circuit is opened.

When more than one cable core is defective and more then one spare cable core is involved, close the cable termination links at each end for each circuit, one cable core at a time, and function test each circuit over the respective cable core and termination links prior to closing the links for the next cable core.

The Signal Engineer shall be advised and shall arrange for the maintenance documentation to be updated.

5.2 Jointing of broken cores

Follow the same procedure to that in paragraphs 2.0 and 3.0, as applicable, and also observe the following.

Where cores in a multicore cable have been broken and it is intended to rejoin the broken cores then identify and label the cores at the break and at the immediate terminal ends, and identify the circuit to which each cable core belongs.

Open the cable termination links of the defective cores at the immediate terminal ends. Conduct a continuity test between these corresponding terminations (at each end) to further check that there is no continuity because of the break.

Joint the corresponding ends at the break of each of the cable cores and carry out a continuity test on each jointed cable core from the cable termination link to the corresponding cable termination link at the other end.

Then carry out an insulation test on the jointed cable cores to earth, to sheath, to one another and to any spare cores in the cable.

Function test each circuit by closing and opening the link at each end in turn and observing the circuit function energise and de-energise accordingly. Connect a voltmeter across the circuit function and check that the voltage returns from the correct voltage to zero when the circuit is opened.

Close the cable termination links at each end for each circuit, one cable core at a time, and function test each circuit over the respective cable core and termination links prior to closing the links for the next cable core.

5.3 Replacement with another multicore cable

Follow the same procedure to that in paragraphs 2.0 and 3.0, as applicable, and also observe the following.

Where a multicore cable is damaged or defective and is being replaced with another multicore cable then open the cable termination links at the immediate terminal ends of the defective multicore cable, and check the cable core numbers to be connected to the corresponding cable link terminal numbers at each end, and check that the circuit connected to the corresponding cable link terminals at both ends is the same circuit, and in accordance with the circuit book.

Disconnect the defective multicore cable and connect the replacement multicore cable, each cable core number corresponding to the cable link terminal number the same as the cable replaced. Carry out a continuity test and an insulation test on the cable cores as above.

Function test each circuit by opening and closing the link at each end in turn and observing the circuit function energise and de-energise accordingly. Connect a voltmeter across the circuit function and check that the voltage returns from the correct voltage to zero when the circuit is opened.

Close the cable termination links at each end for each circuit, one cable core at a time, and function test each circuit over the respective cable core and termination links prior to closing the links for the next cable core.

6 Multiple Wires-Repair, Replacement

Should a number of single wires or multicore cables be broken then follow the same procedure to that above in Paragraphs 2.0, 3.0, and 5.0, changing over one wire at a time, with the following exception.

A Signal Engineer, or other suitably accredited, competent person, shall test and certify the repairs prior to the apparatus being restored into use