Type MVAX
Trip Circuit Supervision Relay

01/03 Service Manual R8010L

ALSTOM

HANDLING OF ELECTRONIC EQUIPMENT

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of ALSTOM T&D - Energy Automation & Information products are immune to the relevant levels of electrostatic discharge when housed in their cases. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are a same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors.
3. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
4. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as yourself.
5. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 60147-0F.

If you are making measurements on the internal electronic circuitry of an equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.

Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available you should maintain regular contact with the case to prevent the build up of static. Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

ALSTOM T&D - Energy Automation & Information strongly recommends that detailed investigations on the electronic circuitry, or modification work, should be carried out in a Special Handling Area such as described in BS5783 or IEC 60147-0F.

CONTENT

1. SAFETY SECTION

This Safety Section should be read before commencing any work on the equipment.

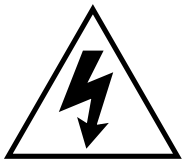
1.1 Health and safety

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

1.2 Explanation of symbols and labels

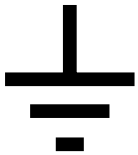
The meaning of symbols and labels may be used on the equipment or in the product documentation, is given below.

Caution: refer to product documentation



Caution: risk of electric shock

Protective/safety *earth terminal



Functional *earth terminal

Note: This symbol may also be used for a protective/safety earth terminal if that terminal is part of a terminal block or sub-assembly e.g. power supply.

*NOTE: THE TERM EARTH USED THROUGHOUT THE PRODUCT DOCUMENTATION IS THE DIRECT EQUIVALENT OF THE NORTH AMERICAN TERM GROUND.

2. INSTALLING, COMMISSIONING AND SERVICING

Equipment connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electrical shock or energy hazards.

Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5mm^2, unless otherwise stated in the technical data section of the product documentation.

Before energising the equipment, the following should be checked:

- Voltage rating and polarity;
- CT circuit rating and integrity of connections;
- Protective fuse rating;
- Integrity of earth connection (where applicable)
- Remove front plate plastic film protection
- Remove insulating strip from battery compartment

3. EQUIPMENT OPERATING CONDITIONS

The equipment should be operated within the specified electrical and environmental limits.

3.1 Current transformer circuits

Do not open the secondary circuit of a live CT since the high level voltage produced may be lethal to personnel and could damage insulation.

3.2 External resistors

Where external resistors are fitted to relays, these may present a risk of electric shock or burns, if touched.

3.3 Battery replacement

Where internal batteries are fitted they should be replaced with the recommended type and be installed with the correct polarity, to avoid possible damage to the equipment.

3.4 Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

3.5 Insertion of modules and pcb cards

These must not be inserted into or withdrawn from equipment whist it is energised since this may result in damage.

3.6 Fibre optic communication

Where fibre optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.

4. OLDER PRODUCTS

Electrical adjustments

Equipments which require direct physical adjustments to their operating mechanism to change current or voltage settings, should have the electrical power removed before making the change, to avoid any risk of electrical shock.

Mechanical adjustments

The electrical power to the relay contacts should be removed before checking any mechanical settings, to avoid any risk of electric shock.

Draw out case relays

Removal of the cover on equipment incorporating electromechanical operating elements, may expose hazardous live parts such as relay contacts.

Insertion and withdrawal of extender cards

When using an extender card, this should not be inserted or withdrawn from the equipment whilst it is energised. This is to avoid possible shock or damage hazards. Hazardous live voltages may be accessible on the extender card.

Insertion and withdrawal of heavy current test plugs

When using a heavy current test plug, CT shorting links must be in place before insertion or removal, to avoid potentially lethal voltages.

5. DECOMMISSIONING AND DISPOSAL

Decommissioning: The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

Disposal: It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner. Any products containing batteries should have them removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation, may apply to the disposal of lithium batteries.

6. TECHNICAL SPECIFICATIONS

Protective fuse rating

The recommended maximum rating of the external protective fuse for this equipment is 16A, Red Spot type or equivalent, unless otherwise stated in the technical data section of the product documentation.

Insulation class:	IEC 601010-1 : 1990/A2 : 2001 Class I EN 61010-1: 2001 Class I	This equipment requires a protective (safety) earth connection to ensure user safety.
Insulation Category (Overvoltage):	IEC 601010-1 : 1990/A2 : 1995 Category III EN 61010-1: 2001 Category III	Distribution level, fixed insulation. Equipment in this category is qualification tested at 5kV peak, 1.2/50µs, 500Ω, 0.5J, between all supply circuits and earth and also between independent circuits.
Environment:	IEC 601010-1 : 1990/A2 : 1995 Pollution degree 2 EN 61010-1: 2001 Pollution degree 2	Compliance is demonstrated by reference to generic safety standards.
Product Safety:	72/23/EEC	Compliance with the European Commission Low Voltage Directive.
CE	EN 61010-1: 2001 EN 60950-1: 2002	Compliance is demonstrated by reference to generic safety standards.

CONTENTS

1. INSTALLATION

1.1 General

Protective relays, although generally of robust construction, require careful treatment prior to installation on site. By observing a few simple rules the possiblity of premature failure is eliminated and a high degree of performance can be expected.

Relays are either despatched individually or as part of a panel/rack mounted assembly in cartons specifically designed to protect them from damage.

Relays should be examined immediately they are received to ensure that no damage has been sustained in transit.

If damage has been sustained in transit, a claim should be made to the transport company concerned immediately, and the nearest ALSTOM T&D Energy Automation & Information representative should be promptly notified.

1.2 Unpacking

Care must be taken when unpacking and installing the relays so that none of the parts are damaged or their settings altered, and must at all times be handled by skilled persons only.

Relays should be examined for any wedges, clamps, or rubber bands necessary to secure moving parts to prevent damage during transit and these should be removed after installation and before commissioning.

Relays which have been removed from their cases should not be left in situations where they are exposed to dust or damp. This particularly applies to installations which are being carried out at the same time as constructional work.

1.3 Storage

If relays are not installed immediately upon receipt they should be stored in a place free from dust and moisture in their original cartons and where de-humidifier bags have been included in the packing they should be retained. The action of the de-humidifier crystals will be impaired if the bag has been exposed to ambient conditions and may be restored by gently heating the bag for about an hour, prior to replacing it in the carton.

Dust which collects on a carton may, on subsequent unpacking, find its way into the relay; in damp conditions the carton and packing may become impregnated with moisture and the de-humidifying agent will lose its efficiency.

The storage temperature range is –25°C to +70°C.

1.4 Relay mounting

The installation should be clean, dry and reasonably free from dust and excessive vibration. The site should preferably be well illuminated to facilitate inspection.

An outline diagram is normally supplied showing panel cut-outs and hole centres. For individually mounted relays these dimensions will also be found in Publications R6103 MVAX 11 and R6010 MVAX 12, 21, 31 and 91.

Publication R7012 is a Parts Catalogue and Assembly Instructions. This document will be useful when individual relays are to be assembled as a composite rack or panel mounted assembly.

Publication R6001 is a leaflet on the modular integrated drawout system of protective relays.

Publication R6014 is a list of recommended suppliers for the pre-insulated connectors.

2. COMMISSIONING

2.1 General

Before leaving the factory all relays are accurately adjusted, tested and carefully packed. Hence there should be no need for any re-adjustment on commissioning.

Moving parts are held in position during transit by rubber bands and packing. These should be removed carefully.

To gain access to the relay first loosen the captive cover screws. Then carefully remove the cover from the case.

The module can then be removed from the case by grasping the handles at the top and bottom of the front plate and pulling forwards.

Care must be taken to ensure that mechanical settings of the element are not disturbed.

Carefully remove the rubber band securing the flag mechanism.

Check that the ends of the push rods are located in the holes in the contact springs.

Carefully actuate the armature of each unit in turn with a small screwdriver/probe. Note immediately after the point where any make contacts just close there is a further small movement of the armature. This ensures that contact follow through and wiping action is present. Repeat similarly with break contacts on armature release.

On units fitted with hand reset flag indicators, check that the flag is free to fall before, or just as, any make contacts close.

Replace the module in the case and refit the cover. Make sure that the reset mechanism in the cover is correctly located with respect to the relay element, and that the flag (or mechanism) can be reset.

2.2 Wiring

Check that ratings of the relay agree with the supplies to which it is to be connected.

Check all wiring connections to the relay, including the case earthing connection above the terminal block. It is especially important that dc supplies are wired with the correct polarity. The relay diagram number appears inside the case.

2.3 Insulation

The relay, and its associated wiring, may be insulation tested between:

a) all electrically isolated circuits

b) all circuits and earth

An electronic or brushless insulation tester should be used, having a dc voltage not exceeding 1000V. Accessible terminals of the same circuit should first be strapped together. Deliberate circuit earthing links, removed for the tests, subsequently must be replaced.

2.4 MVAX 11

With MVAX 11 relays check that all wiring complies to the appropriate application diagram to ensure that the relay is wired correctly.

2.5 MVAX 12

With MVAX 12 relays, check that terminal 13 of the relay case is wired to the POSITIVE of the trip supply.

2.6 MVAX 21, 31, 91

For MVAX 21, 31 and 91 relays, check the external wiring to ensure the correct values of external resistors (where appropriate) are wired to the correct relay terminals, in accordance with the following table and the appropriate application diagram.

Supply volts	Alarm supply circuit $R_{EXT}1$	Trip supply circuit $R_{EXT}2$ and $R_{EXT}3$, as appropriate
24/27	-	270 ohm
30/34	–	470 ohm
48/54	240 ohm	1,500 ohm
110/125	1,500 ohm *1,200 ohm	4,000 ohm
220/250	4,100 ohm	2 off 4,000 ohm in series

* S/R reverse flag

2.7 Electrical operation tests

2.7.1 MVAX 11 only

Isolate the MVAX from the trip supply batteries by removing fuses/links as necessary.

Connect a supply across relay terminals 21 – 27 and supply the relevant voltage from the list below. Check that the current is within those figures stated in the same column. Repeat again only using terminals 27 – 28.

Rated voltage range (V)	30/34	48/54	110/125	120/250
Test voltage (V)	30	48	110	220
Terminals 21 – 27	46.1/56.3mA	24.1/29.5mA	11/13.4mA	11.4/14mA
Terminals 27 – 28	46.1/56.3mA	24.1/29.5mA	11/13.4mA	11.4/14mA

2.7.2 MVAX 12 only

Isolate the relay from the trip supply batteries by removing fuses/links as necessary.

Using an ohmmeter check the resistance across the relay side of the fuses/links. Provided there are no parallel paths, the resistance should be within ±10% of the following:

MVAX 12 rating range (V)		24/27	30/34	48/54	110/125	220/250
Relay resistance (Ohms): No flag/hand reset flag	2 contacts 4 contacts	710 416	1170 620	2970 1760	10370 7470	33100 23100
Relay resistance (Ohms): No flag/hand reverse flag	2 contacts 4 contacts	590 407	940 590	2330 1740	8670 6770	27100 22100

Connect a variable dc supply to the isolated circuit ensuring correct polarity is observed (Terminal 13 of the relay must be maintained POSITIVE).

Apply 75% of the relay's lower voltage of the voltage rating range. Check that the relay operates satisfactorily and that the flag indication can be reset. Reduce the voltage slowly until the relay drops-off. Check that this occurs between 25% to 40% of the lower voltage rating, as indicated below:

V rating range	24/27	30/34	48/54	110/125	220/250
75% of lower (V)	18	22.5	36	82.5	165
25-40% of lower (V)	6 – 9.6	7.5 – 12	12 – 19.2	27.5 – 44	55 – 88

Replace all links and fuses. Check that the relay operates and manually reset the flag. With alarm circuits operational, temporarily remove a trip supply fuse. Check that the appropriate alarms are initiated. Replace the fuse and reset the relay flag.

2.7.3 MVAX 21 only

The following tests assume trip and alarm supply battery voltages are equal to the maximum voltage of the relay's voltage rating range. For other voltages within the relays normal voltage rating range, tolerance bands for other measured supply voltages should be altered pro-rata.

A table (Table 1) of acceptable tolerances for each test is given below.

Measure the trip supply and alarm supply voltages immediately prior to the tests and note.

Test 1

With the circuit breaker open, check that no voltage appears across terminals 13 and 14 of the relay. Check that the voltage appearing across terminals 21(+) and 28 comply with that given in Table 1 (alarm supply) and that the front relay, RL1, has operated. Reset its flag.

Test 2

With the circuit breaker closed, check that the front relay remains operated. Measure the voltage across terminals 13(+) and 14. Ensure that it complies with Table 1 (Trip supply).

Test 3

With the circuit breaker closed, apply a temporary short circuit across the external resistor $R_{EXT}2$* of the trip supply circuit. Ensure the CB does not trip. Remove the short circuit and re-apply it across terminals 13 and 14 of the relay. Check that RL1 drops-off to initiate alarm circuits and that RL1 flag indication is given. Ensure the CB does not trip. Remove the short circuit and reset the flag/alarms.

*Note: Where 2 resistors are used in series for $R_{EXT}2$, a temporary short circuit should be applied across each resistor in turn.

Test 4

With the circuit breaker closed, operate, or simulate operation of the associated trip relay. Note that the CB trips but ensure that RL1 of the MVAX does not operate. RL1 and RL2 units are slugged on drop-off to prevent mal-operation during the transition period.

Relay V. rating		24/27	30/34	48/54	110/125	220/250
Ref. V. for tolerance		27	34	48	110	220
Test 1 (Alarm supply)	Hand reset flag	Full volts (no ext. R)	Full volts (no ext. R)	35.3 – 38.8	29.1 – 36.3	24.9 – 32.5
	Self reset flag	Full volts (no ext. R)	Full volts (no ext. R)	37.1 – 40.4	38.2 – 46.6	28.5 – 37.0
Test 2 (Trip supply)	Hand reset flag	15.0 – 17.0	18.0 – 20.5	25.8 – 29.8	53.6 – 61.2	107.0 – 120.9
	Self reset flag	12.0 – 14.0	18.0 – 20.5	25.8 – 29.8	53.6 – 61.2	107.0 – 120.9

Table 1

2.7.4 MVAX 31 (MVAX 91 – 3 separate MVAX 31's in a size 8 case)

The following tests assume trip and alarm battery voltages are equal to the maximum voltage of the relay's voltage rating range. For other voltages within the relay's normal voltage rating range, tolerance bands for other measured supply voltages should be altered pro-rata. A table (Table 2) of acceptable tolerances for each test is given below.

Measure the trip supply and alarm supply voltages immediately prior to the tests and note.

Tests 1 and 2

With the circuit breaker open, check the voltage across terminals 13(+) and 14(–ve) of the relay. This should comply with the voltage tolerance limited given in Table 2. Repeat for terminals 21(+) and 22(–ve) of the relay. The same voltage limits apply. Both these voltages are derived from the trip supply.

Check the voltage across terminals 27(+) and 28(–ve) of the relay. This should be within the limits given in Table 2 for the alarm supply. Note that the front relay unit RL1 is picked-up and reset its flag.

Test 3

With the circuit breaker closed check that the front relay RL1, remains operated. Check that no voltage appears across terminals 21 and 22 of the relay. Ensure the voltage across terminals 13(+) and 14(–ve) has increased from that obtained in Test 1 to that indicated in Table 2.

Test 4

With the circuit breaker closed, as in test 3 above, check that the voltage between terminals 14(+) and 22(–ve) is zero. Measure the resistance between terminals 14 and 22 which should comply within ±10% of the values given in Table 2. (Note: This test check that contact 52–b is open in the breaker closed condition).

Test 5

With the circuit breaker closed, as above, apply a temporary short circuit across $R_{EXT}2$* of the trip supply circuit. Ensure the CB does not trip. Remove the short circuit and re-apply it across terminals 13 and 14 of the relay. Check that RL1 drops off to initiate alarm circuits and that RL1 flag indication is given. Remove the short circuit and reset the flag/alarms.

*Note: Where 2 resistors are used in series for $R_{EXT}2$, a temporary short circuit should be applied across each resistor in turn.

Test 6

With the circuit breaker closed, operate, or simulate operation of the associated trip relay. Ensure the CB trips but ensure that RL1 of the MVAX does not operate. The MVAX relay units are slugged on drop-off to prevent mal-operation during the transition period.

Relay V. rating		24/27	30/34	48/54	110/125	220/250
Ref. V. for tolerance		27	34	54	125	250
Test 1 (Trip supply)	Hand reset flag	7.8 – 8.2V	9.4 – 9.8V	13.6 – 14.2V	27.9 – 29.4V	55.3 – 58.4V
	Self reset flag	6.3 – 6.7V	9.4 – 9.8V	13.6 – 14.2V	27.9 – 29.4V	55.3 – 58.4V
Test 2 (Alarm supply)	Hand reset flag	Full volts (no ext. R)	Full volts (no ext. R)	36.5 – 42.7V	31.3 – 38.8V	27.3 – 33.8V
	Self reset flag	Full volts (no ext. R)	Full volts (no ext. R)	38.2 – 39.3V	40.9 – 43.7V	31.1 – 34.0V
Test 3 (Trip supply)	Hand reset flag	15.7 – 16.3V	18.8–19.7V	27.1 – 28.5V	55.8 – 58.9V	110.6 –116.8V
	Self reset flag	12.7 – 13.3V	18.8–19.7V	27.1 – 28.5V	55.8 – 58.9V	110.6 –116.8V
Test 4	Hand reset flag	665	1085	3100	7400	14700
	Self reset flag	522	1085	3100	7400	14700

Table 2

2.7.5 MVAX 31 04 only

The following test assume trip and alarm supply battery voltages are equal to the maximum voltage for the relays voltage rating range. For other voltages within the relays normal voltage rating range, tolerance bands for other measured supply voltages should be altered pro-rata. A Table (Table 1) of acceptable tolerance for the test is given.

Measure the trip supply and alarm supply voltages immediately prior to tests and note.

Test 1

With the circuit breakers open, check that no voltage appears across terminals 13 and 14, 21 and 22 of the relay. Check that the voltage appearing across terminals 27(+) and 28 comply with that given in Figure 1 (alarm supply) and that the front relay RL1, has operated. Reset the flag.

Test 2

With the circuit breakers closed, check that the front relay remains operated. Measure the voltage across terminals 13(+), 14, 21(+) and 22. Ensure that these comply with Figure 1 (trip supply).

Test 3

With the circuit breakers closed, apply a temporary short circuit across each of the external resistors $R_{EXT}2(1)$* and $R_{EXT}2(2)$* of the trip supply circuits. Ensure the circuit breakers do not trip. Remove the short circuits and reapply them across terminals 13 and 14 and 22 of the relay. Check that RL1 drops-off to initiate alarm circuits and

that the RL1 flag indication is given. Ensure the circuit breakers do not trip. Remove the short circuits and reset the flag/alarms.

*Note: Where 2 resistors are used in series for $R_{EXT}2$, a temporary short circuit should be applied across each resistor in turn.

Test 4

With the circuit breakers closed, operate or simulate operation of the associated trip relays. Note that the circuit breakers trip but ensure that RL1 of the MVAX does not operate. RL1, RL2(1) and RL2(2) units are slugged on drop-off to prevent mal-operation during the transition period.

Restore any external wiring connections that may have been disturbed during the above tests.

3. MAINTENANCE

Periodic maintenance is not necessary. However, periodic inspection and test is recommended. This should be carried out every 12 months or more often if the relay is operated frequently or is mounted in poor environmental conditions.

Tests 2.3, 2.4, 2.5, and 2.6 should be carried out to prove operation.

4. MECHANICAL SETTINGS

4.1 General

Armature gap measurements should be made with the top of the feeler gauge level with the centre line of the core.

Contact pressures are measured with a gramme gauge at the contact tips.

In general contact gaps and follow through are defined by quoting an armature gap at which the tips should be just closed or just open.

The relay contact state is always defined with the relay in the unenergised position, unless otherwise specified on the appropriate circuit diagram.

Contact Type	Symbol used on diagrams
	Normal duty
Make (Normally open)	M
Break (Normally closed)	B

4.1.1 With the armature closed the clearance between the back of the armature and the back stop should be 0.075/0.2mm (0.003"/0.008").

4.1.2 Nominal armature gap open.

MVAX 11	Unit RL_1	1.38mm (0.055")
MVAX 12		1.5mm (0.060")
MVAX 21, 31 and 91	Unit RL_1	
MVAX 21	Unit RL_2	0.7mm (0.030")
MVAX 31, 91	Unit RL_2 and RL_3	

Note: On the MVAX 12 a screw is fitted to the armature. It must protrude by 0.075/0.2mm (0.003"/0.008").

4.2 Contact settings

4.2.1 MVAX 11 (Unit RL_1.)

With the armature closed onto a 0.25mm (0.011") feeler gauge the make contacts should be closed, but should be open using a 0.38mm (0.015") feeler gauge.

Force to just close the break contacts: 20/25 grams.

Force to just open the break contacts: 18/23 grams.

Contact gap: 1.5/1.75mm (0.06/0.07").

4.2.2 MVAX 12, MVAX 21, 31 (Unit RL_1.)

With the armature closed onto a 0.25mm (0.011") feeler gauge the make contacts should be closed, but should be open using a 0.35mm (0.013") feeler gauge.

With the armature closed onto a 0.75mm (0.029") feeler gauge the break contact should be open, but should be closed using a 0.8mm (0.031") feeler gauge.

Force to just close the make contacts: 20/25 grams.

Force to just open the break contacts: 20/25 grams.

Force to just lift the fixed contact off its support: 15/20 grams.

Contact gap for make and break contacts: 1.75/2mm (0.07/0.08").

Note: On MVAX 21, 31 Relays - To measure the force to just close or the force to just break on the lower right hand contact when viewed from the front of the module, it is necessary to carefully lift the upper moving contact blade to remove the pressure on the lower contact.

4.2.3 MVAX 21 (Unit RL_2), MVAX 31 (Units RL_2 and RL_3)

With the armature closed onto a 0.25mm (0.011") feeler gauge the make contact should be closed, but should be open using a 0.35mm (0.013") feeler gauge.

Force to just close the make contact: 10/15 grams.

Force to just lift the fixed contact off its support: 10/15 grams.

Contact gap: 1.0/1.1mm (0.038/0.042").

4.3 Mechanical flag settings

4.3.1 Hand reset reverse flags

With the armature closed onto a 0.45mm (0.018") feeler gauge, the flag should be free to fall, but should not fall using a 0.35mm (0.013") feeler gauge. Adjustment is made to the catch spring on the flag.

4.3.2 Self reset reverse flags

Adjust the flag operating lever such that the flag side arm is parallel to the frame, when viewed from the side and the flag covers the flag label.

5. PROBLEM ANALYSIS

5.1 Failure to operate/reset

Check diagram for correct input connections. Check the correct voltages are applied. Ratings values are shown on module front plate.

Ensure the power supply is capable of supplying the necessary power. Ensure correct series resistors are used and connected to correct relay terminals. Flag spring may have been distorted and is holding the armature open or closed.

Check internal wiring.

Check continuity – result open circuit.

Coil open circuit.

Internal wiring damaged.

Series resistor open circuit (resistors may be internal or external).

5.2 Output contacts not changing state.

Pushrod not in position. Check output terminals with reference to diagram. Contamination of contacts.

MVAX 21, 31, 91. Units RL_2, RL_3 contacts not closing.

5.3 Reset time on MVAX 12 too short.

Check capacitor C_1 is not open circuit or short circuit.

Contacts should be cleaned with the burnishing tool supplied in relay tool kits.

On no account should knives, files or abrasive materials be used.

Check mechanical settings as per Section 4.

6. SPARES

When ordering spares, quote the full relay model number and any component references numbers, or briefly describe the parts required.

6.1 Repairs

Should the need arise for the equipment to be returned to ALSTOM T&D Energy Automation and Information for repair, then the form at the back of this manual should be completed and sent with the equipment together with a copy of any commissioning test results.

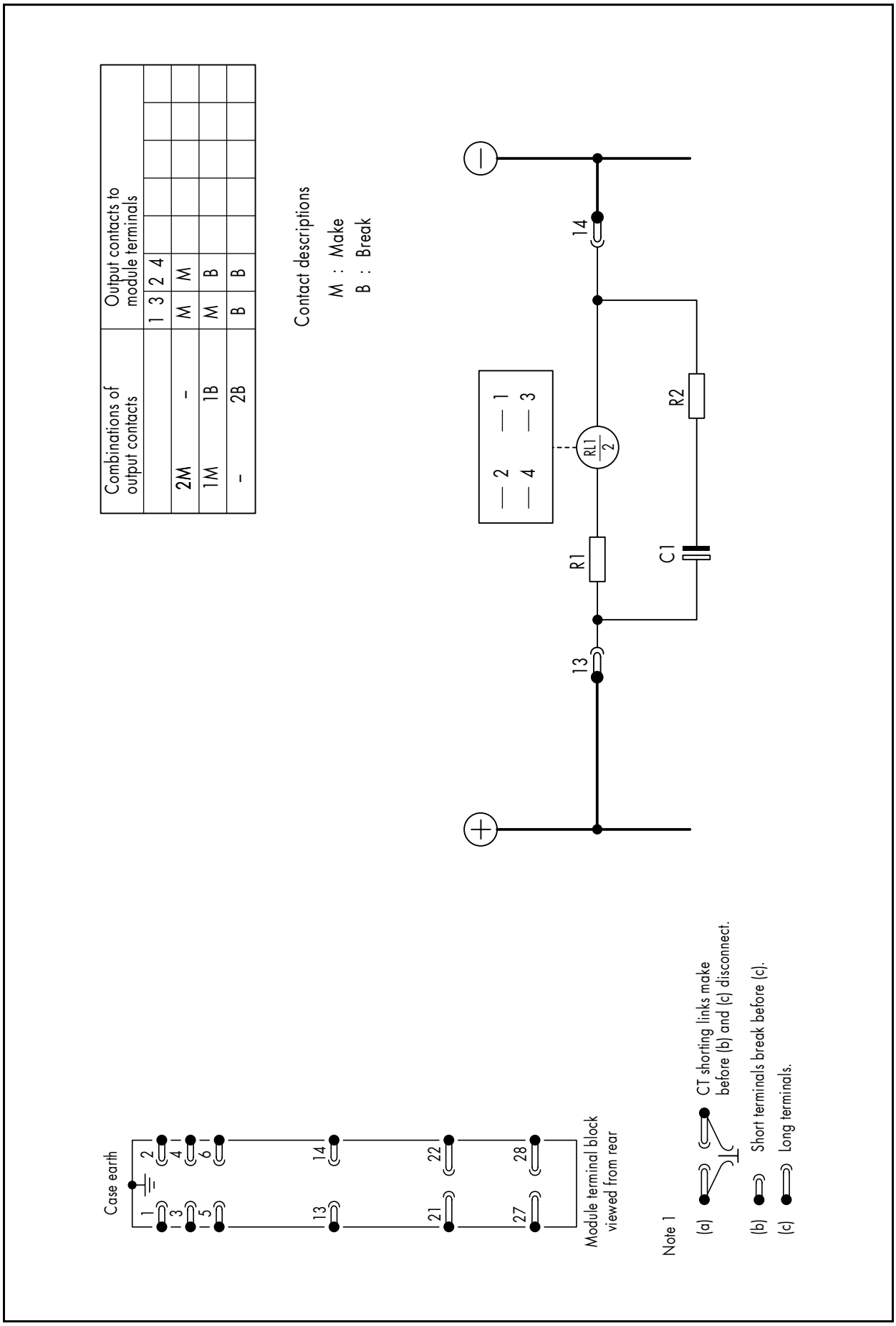


Figure 1: Circuit and application diagram – trip supply supervision relay

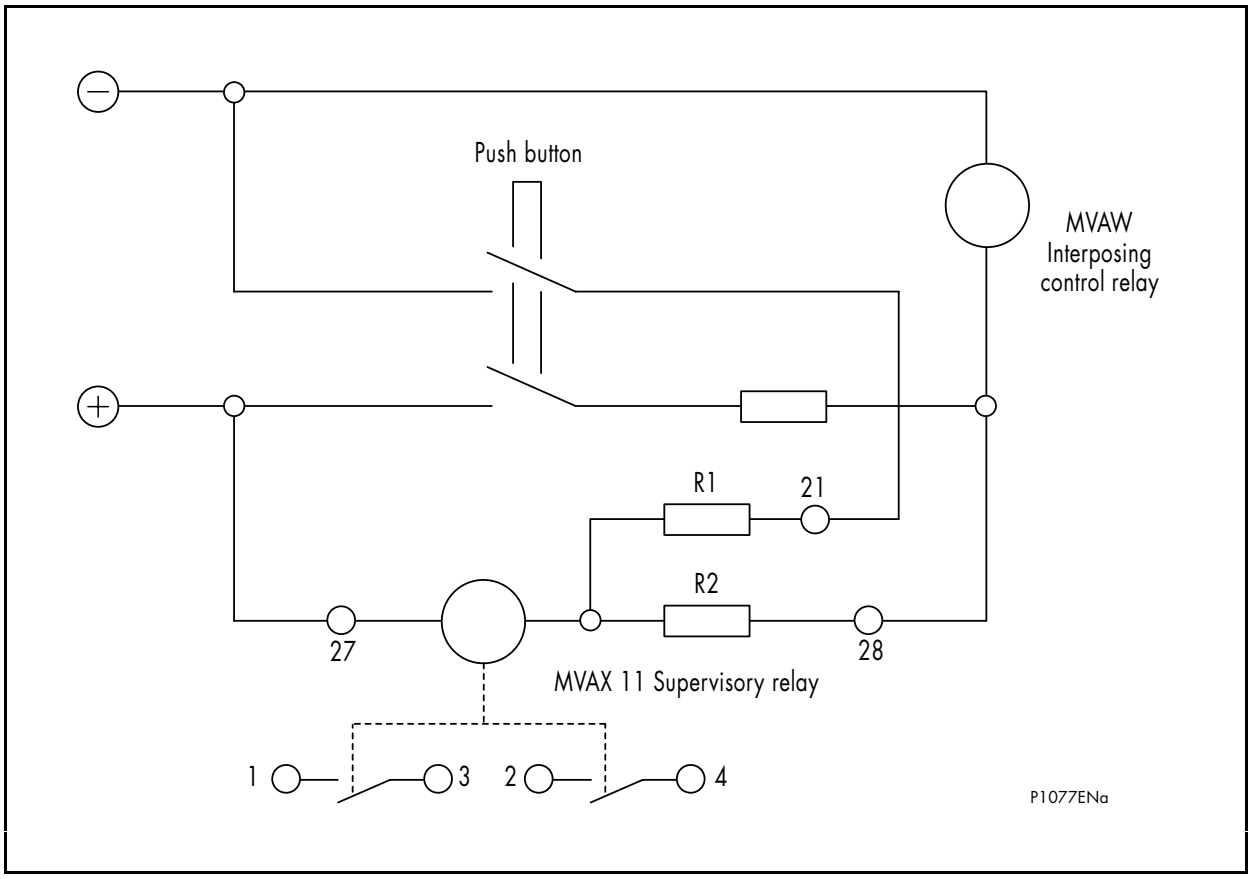


Figure 2: Supervision of interposing control relay type MVAW

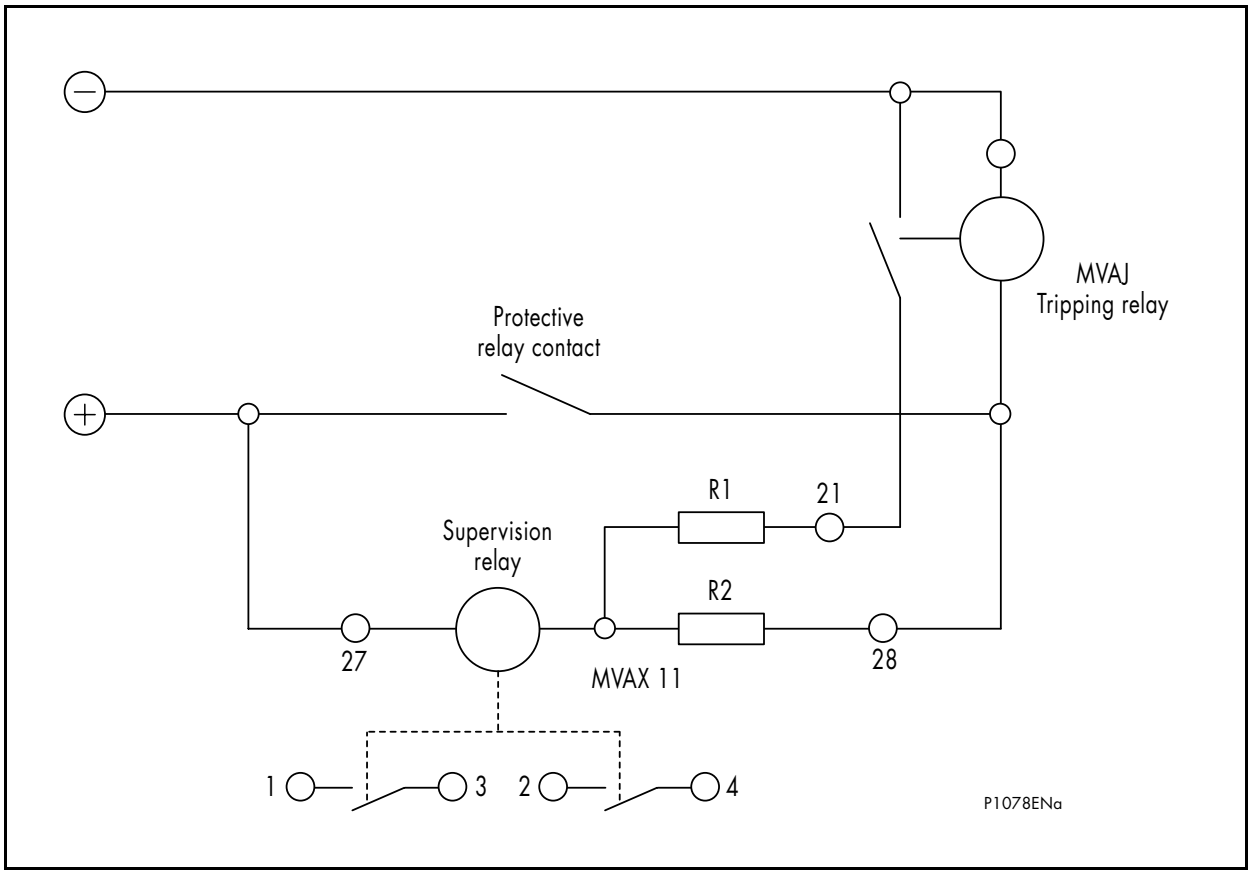


Figure 3: Supervision of tripping relay type MVAJ

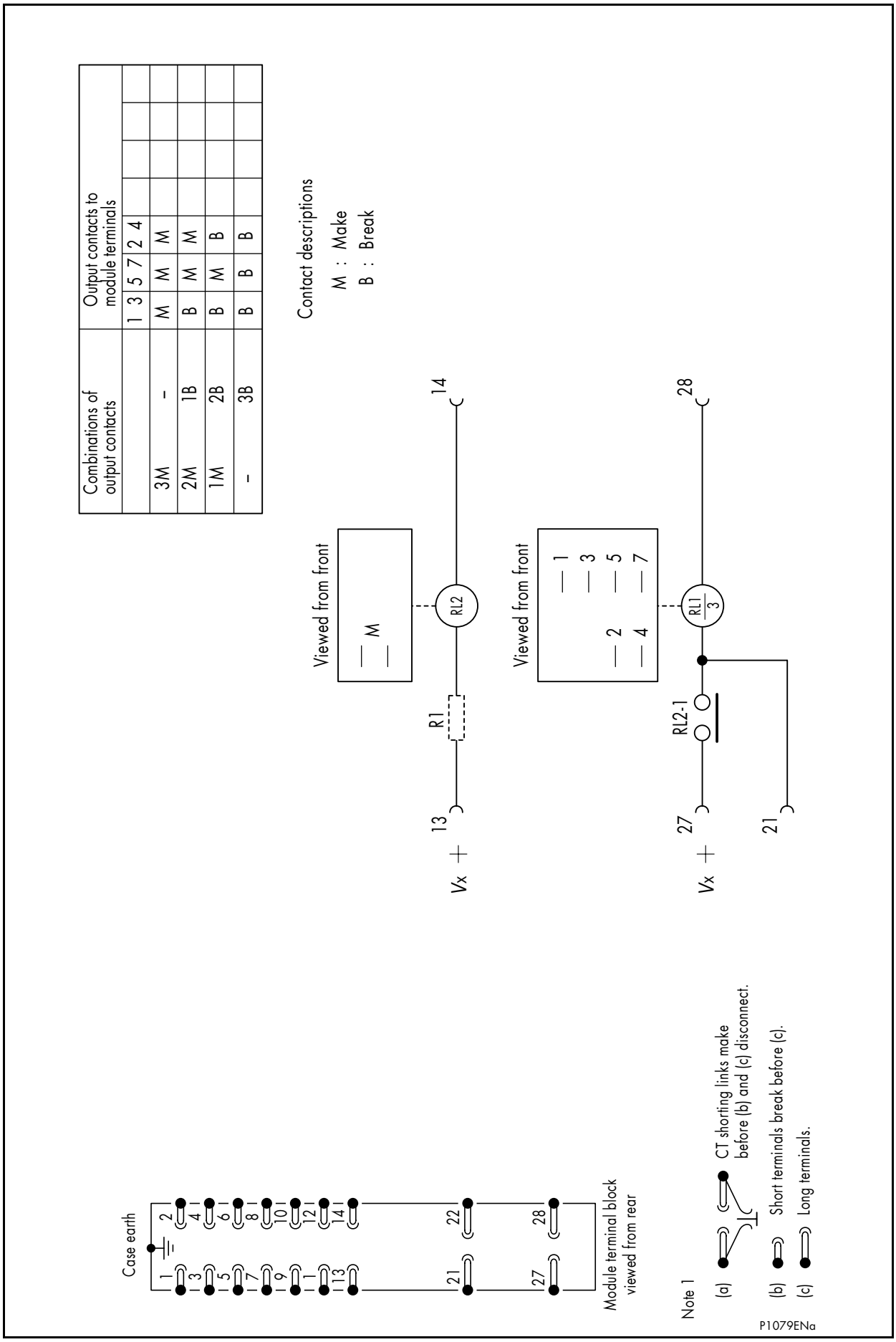


Figure 4: Circuit diagram – MVAX21 trip circuit supervision relay without preclosing supervision

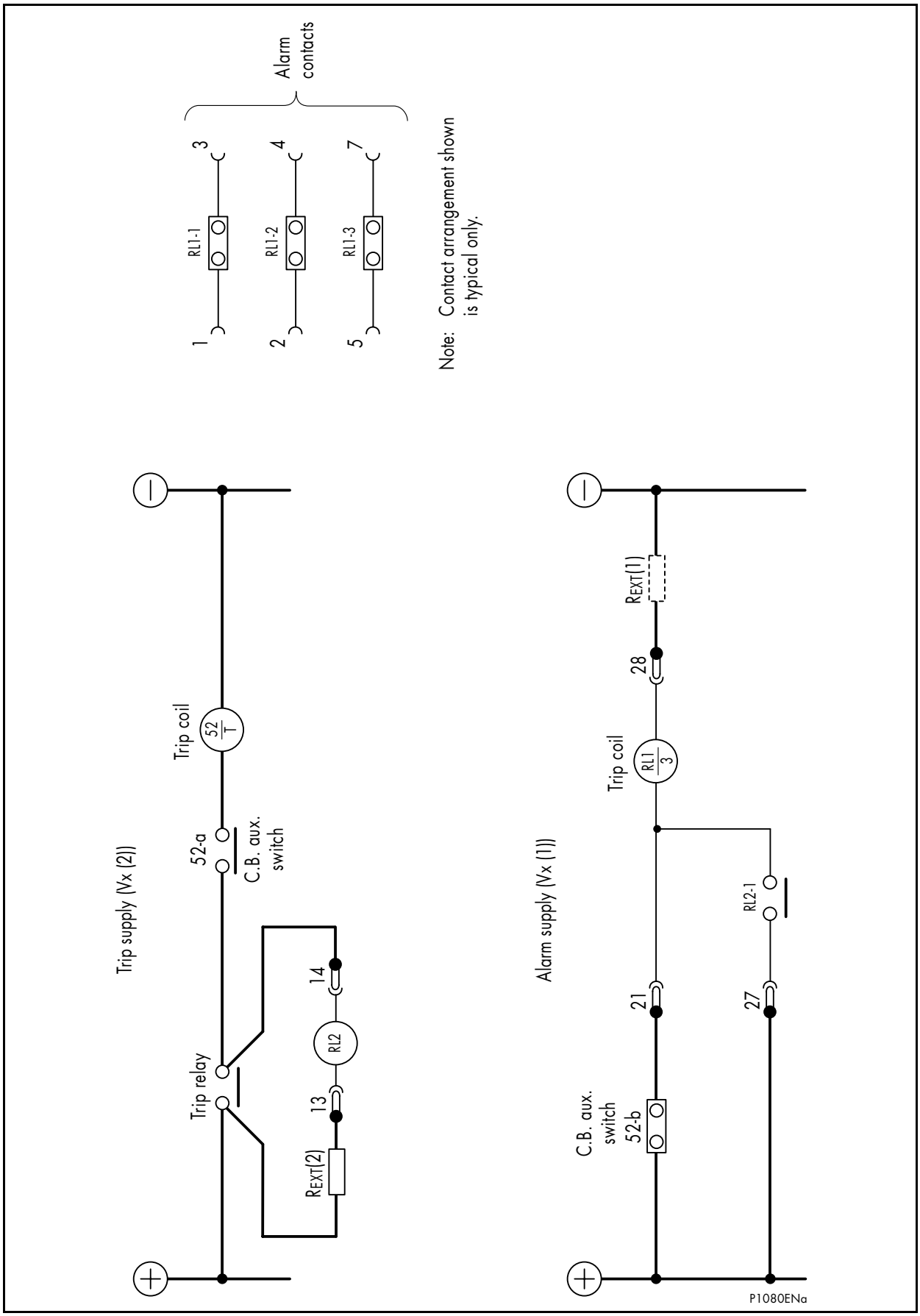


Figure 5: Application diagram – MVAX21 trip circuit supervision relay without preclosing supervision

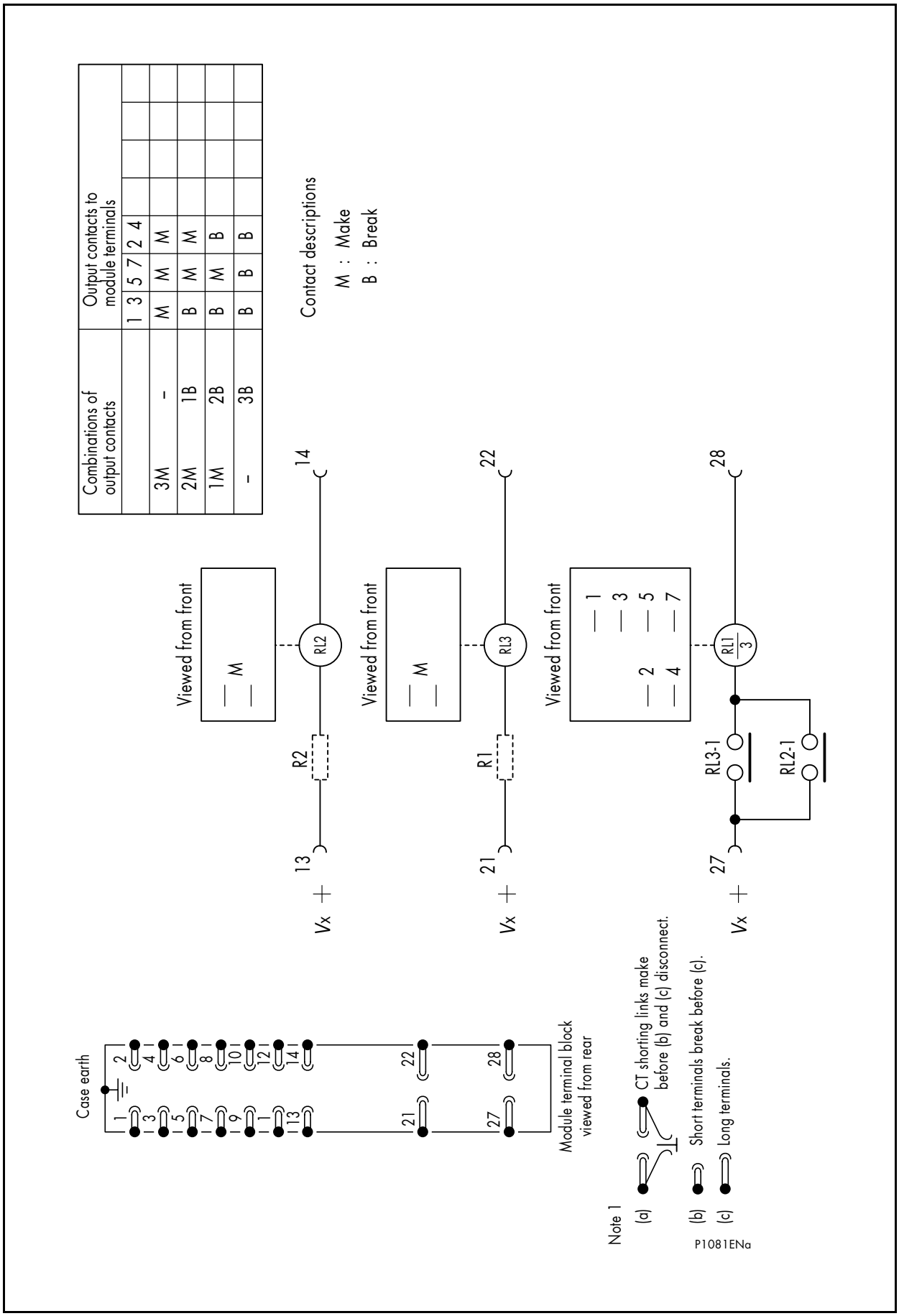


Figure 6: Circuit diagram – MVAX31 trip circuit supervision relay with preclosing supervision

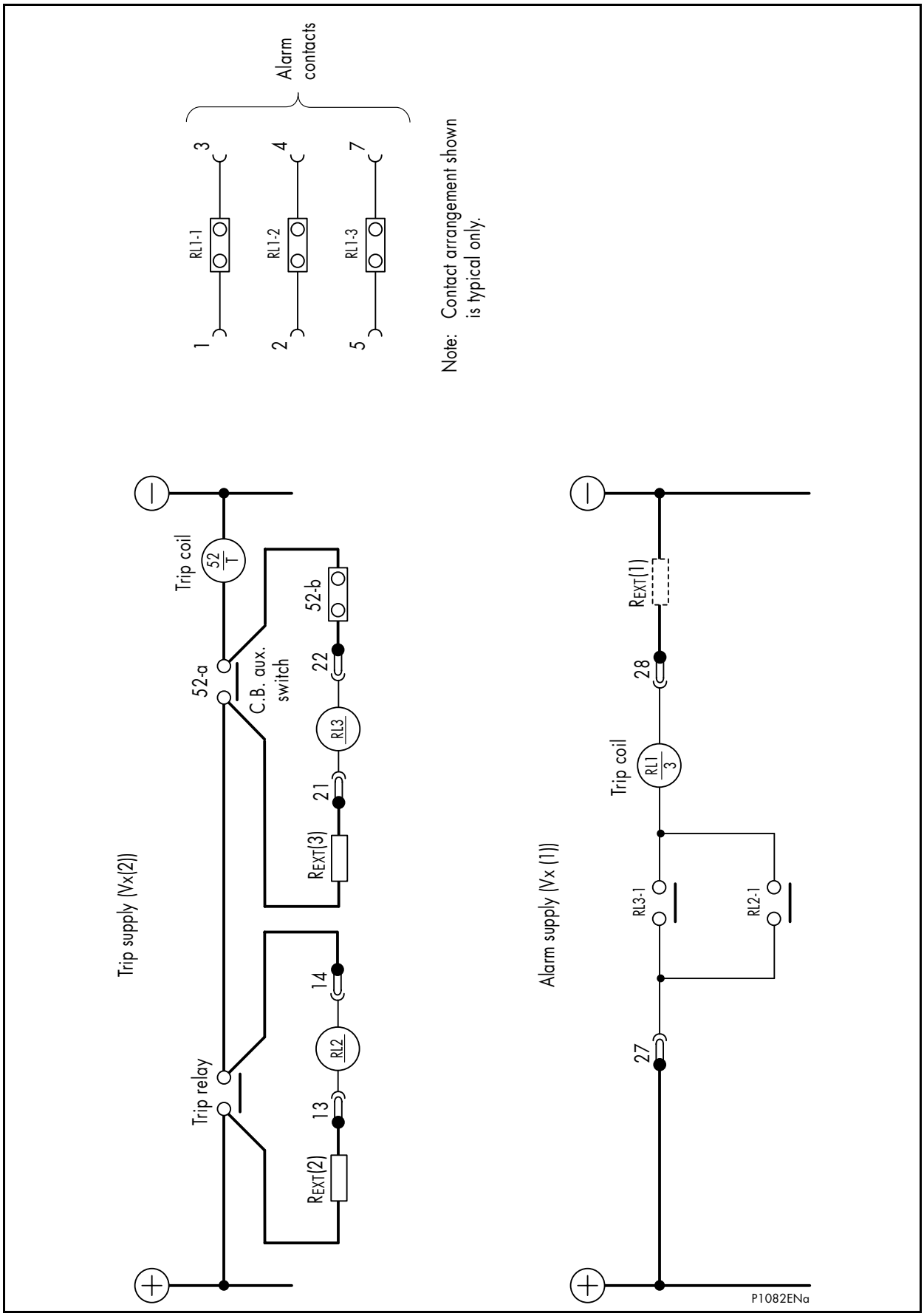


Figure 7: Application diagram - MVAX31 trip circuit supervision relay with preclosing supervision

7. COMMISSIONING TEST RECORD

Trip Supply Supervision Relay

Type MVAX 11 – Type MVAX 12 – Type MVAX 21 – Type MVAX 31 – Type MVAX 91

(delete as appropriate)

Date _____

Station _____ Circuit _____

Reay Model No _____ Serial No _____

Relay type	Circuit/supply ref.	V. rating range	Value of ext. resistor fitted
MVAX 11	Trip/Vx1	/ V	N/A
MVAX 12	Trip/Vx1	/ V	$R_{EXT}1$ ohms
MVAX 21	Alarm/Vx1	/ V	$R_{EXT}1$ ohms
	Trip/Vx2	/ V	$R_{EXT}2$ ohms
MVAX 31/91	Alarm/Vx1	/ V	$R_{EXT}1$ ohms
	Trip/Vx2	/ V	$R_{EXT}2/3$ ohms

Commissioning preliminaries ☐ Tick if satisfactory

Insulation tests: ☐ Satisfactory ☐ Not required

Test results: MVAX 11 relay

Test 2.7.1 Resistance across terminals 21 – 27 _____ / _____ Ω

27 – 28 _____ / _____ Ω

Trip supply voltage _____ V

CB open Relay stable ☐

CB closed Relay stable ☐

Trip circuit open Relay operates ☐

Contacts checked ☐

Test results: MVAX 12 relay

*Test 2.7.2 * Relay resistance _____ ohms

* Relay operates satisfactlorily at _____ Volts

* Relay drops off at Volts

Fuse removal. Alarm initiation satisfactory ☐ tick

* Note: These tests omitted only at site engineers discretion

Test results: MVAX 21 relay

Test 2.7.3	Measured trip supply		V	alarm supply		V	
1	CB open			Volts across terminals 13 and 14		V	
				Volts across terminals 21 and 28		V	
2	CB closed			Volts across terminals 13 and 14		V	
3	☐ (tick)		4	☐ (tick)			

Test results: MVAX 31 relay

Test 2.7.4	Measured trip supply		V	alarm supply		V	
(1 and 2)	CB open			Volts across terminals	13 and 14	V	
					21 and 22	V	
					27 and 28	V	
3	CB closed	21 & 2		V	13 and 14	V	
4	CB closed			Resistance between	14 and 22	ohms	
5	☐ (tick)		6	☐ (tick)			

Note: For details of the above tests, see Publication R8010.

Comments:

Commissioning Engineer

Customer Witness

Date

Date

REPAIR FORM

Please complete this form and return it to ALSTOM T&D - Energy Automation & Information with the equipment to be repaired. This form may also be used in the case of application queries.

ALSTOM T&D – Energy Automation & Information
St. Leonards Works
Stafford
ST17 4LX
England

For : After Sales Service Department

Customer Ref: _____ Model No: _____

ALSTOM Contract Ref: _____ Serial No: _____

Date: _____

1. What parameters were in use at the time the fault occurred?

   AC Volts _____ Main VT/Test set

   DC Volts _____ Battery/Power supply

   AC current _____ Main CT/Test set

   Frequency _____

2. Which type of test was being used? _____
3. Were all the external components fitted where required? Yes / No
   (Delete as appropriate)
4. List the relay settings being used

   _____

   _____

   _____

5. What did you expect to happen?

   _____

   _____

   _____

   _____

continued overleaf

6. What did happen?

_____

_____

_____

7. When did the fault occur?

Instant	Yes / No	Intermittent	Yes / No
Time delayed	Yes / No	(Delete as appropriate)	
By how long?	_____		

8. What indications if any did the relay show?

_____

_____

_____

_____

9. Was there any visual damage?

_____

_____

_____

10. Any other remarks which may be useful:

_____

_____

_____

_____	_____
Signature	Title
_____	_____
Name (in capitals)	Company name

ALSTOM T&D Energy Automation & Information St Leonards Works, Stafford, ST17 4LX England
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