Alpha TR User Guide

High Speed Tripping Relay

relay monitoring systems pty ltd

Advanced Protection Devices

User Guide

CERTIFIED QUALITY MANAGEMENT SYSTEM ISO9001

Visit *www.rmspl.com.au* for the latest product information.

Alpha TR User Guide

About This Manual

This User Guide covers all Alpha TR relays manufactured from September 2013. Earlier relays do not necessarily incorporate all the features described. Our policy of continuous development means that extra features & functionality may have been added.

The Alpha TR User Guide is designed as a generic document to describe the common operating parameters for all relays built on this platform. Some relay applications are described but for specific model information the individual "K" number Product / Test manuals should be consulted.

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To download a PDF version of this guide:
http://www.rmspl.com.au/userguide/Alpha_TR_user_guide.pdf

To download the model specific Product Test Manual:
http://www.rmspl.com.au/search.asp

Part 1

How this Guide is Organised

This guide is divided into five parts:

Part 1	Overview
Part 2	Documentation
Part 3	Application
Part 4	Installation Preliminaries
Part 5	Maintenance

Part 2

Documentation

Technical Bulletin

The detailed technical attributes, functional description & performance specifications for the Alpha TR are described in the product Technical Bulletin. For the most up to date version go to:

www.rmspl.com.au/handbook/Alpha TR.pdf

The order of precedence for product information is as follows:

- Product Test Manual (PTM)
- Technical Bulletin
- User Guide

User Guide

This User Guide covers all Alpha TR relay versions & describes the generic features & attributes common across all versions.

Different relay versions are required to cater for varying customer requirements such as auxiliary voltage range, I/O configuration, case style, relay functionality etc.

The product ordering code described in the Technical Bulletin is used to generate a unique version of the relay specification & is called a Type Number. This code takes the form Alpha TRKxx where the Kxx is the "K" or version number. For a complete description of the RMS "K" number system refer to: *www.rmspl.com.au/handbook/parta3.pdf*

Product Test Manual

Each Alpha TR version has a specific PTM which provides details on the unique attributes of the relay. Each PTM includes the following information:

- Specific technical variations from the standard model if applicable
- Wiring diagram

If you require a copy of the PTM for an RMS product the following options are available:

- Check the RMS web site at: *www.rmspl.com.au/search.asp*
- RMS CD catalogue select: *List all Product/Test Manuals* under *Technical Library*
- Contact RMS or a representative & request a hard copy or PDF by email.

Part 3

Application

Introduction

The Alpha TR relay is a withdrawable High Speed Tripping relay with low contact bounce time and high contact rating.

The relay design incorporates a user settable high or low operate input burden.

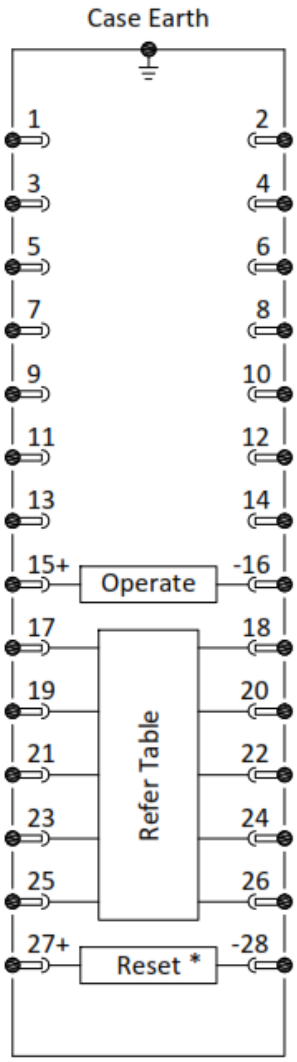
The high burden setting allows for applications that have specific Capacitor Discharge Immunity requirements to ESI 48-4 EB2.

The Alpha TR relay may be ordered in 5 or 12 contact variants with either self resetting or latched contacts and flexible contact arrangements.

Relay models are available for hand reset and/or electrical reset contacts and self reset or hand reset flags.

Scheme Wiring

Alpha TR5 Connection diagram



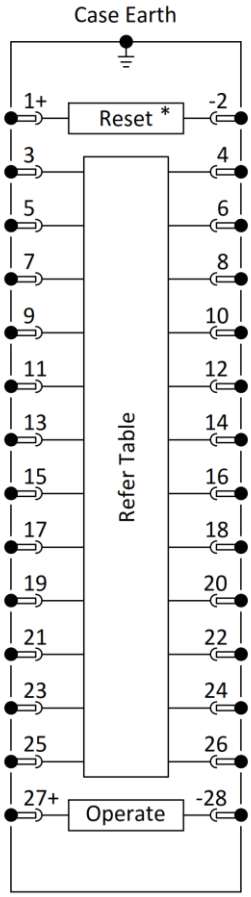
* Electrical reset where specified.
Refer Technical Bulletin

TR5 Terminal Number Pairs						
Code	Contacts	17-18	19-20	21-22	23-24	25-26
N	5M 0B	M	M	M	M	M
P	4M 1B	M	M	M	M	B
Q	3M 2B	B	M	M	M	B
R	2M 3B	B	M	M	B	B
S	1M 4B	B	B	M	B	B

M: Make

B: Break

Alpha TR12 Connection diagram



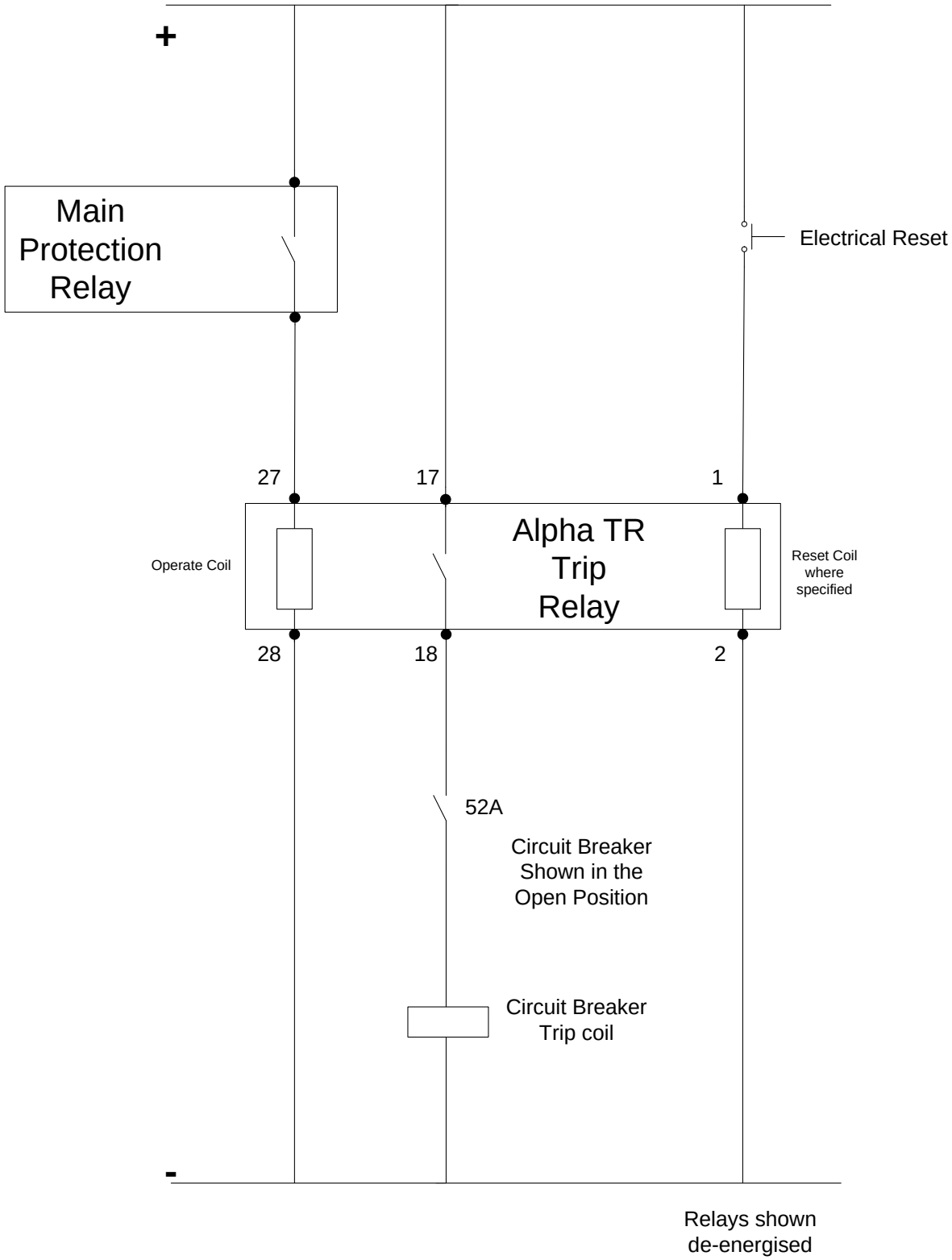
* Electrical reset where specified.
Refer Technical Bulletin

TR12 Terminal Number Pairs													
Code	Contacts	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26
C	10M 02B	B	M	M	M	M	M	M	M	M	M	M	B
D	09M 03B	B	M	M	M	M	M	M	M	M	M	B	B
E	08M 04B	B	B	M	M	M	M	M	M	M	M	B	B
F	07M 05B	B	B	M	M	M	M	M	M	M	B	B	B
G	06M 06B	B	B	B	M	M	M	M	M	M	B	B	B

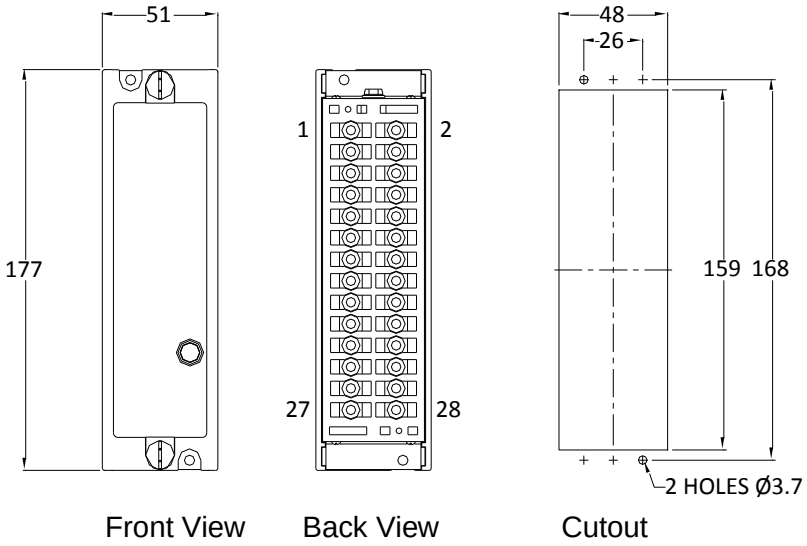
M: Make

B: Break

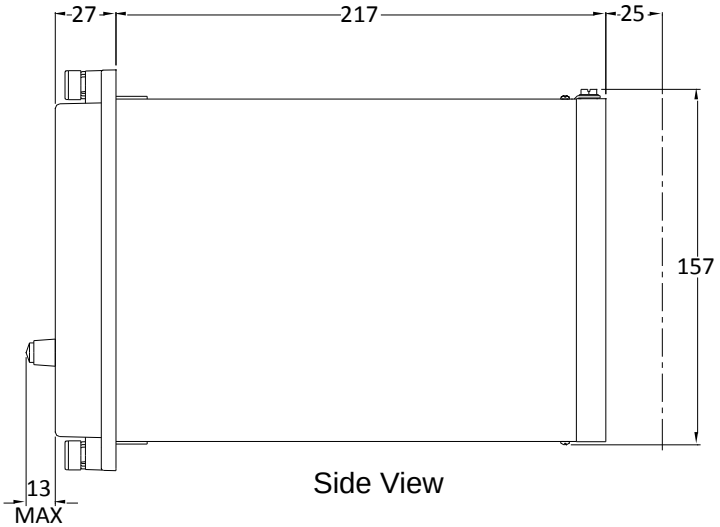
Example Schematic – Typical Trip Application



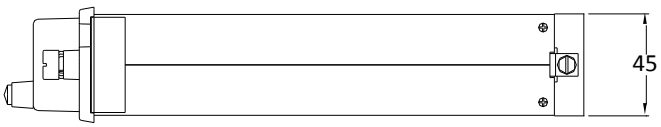
Terminal Layout and Relay Dimensions



Front View Back View Cutout



Side View



Top View

The relay module is designed for rack or panel mounting.

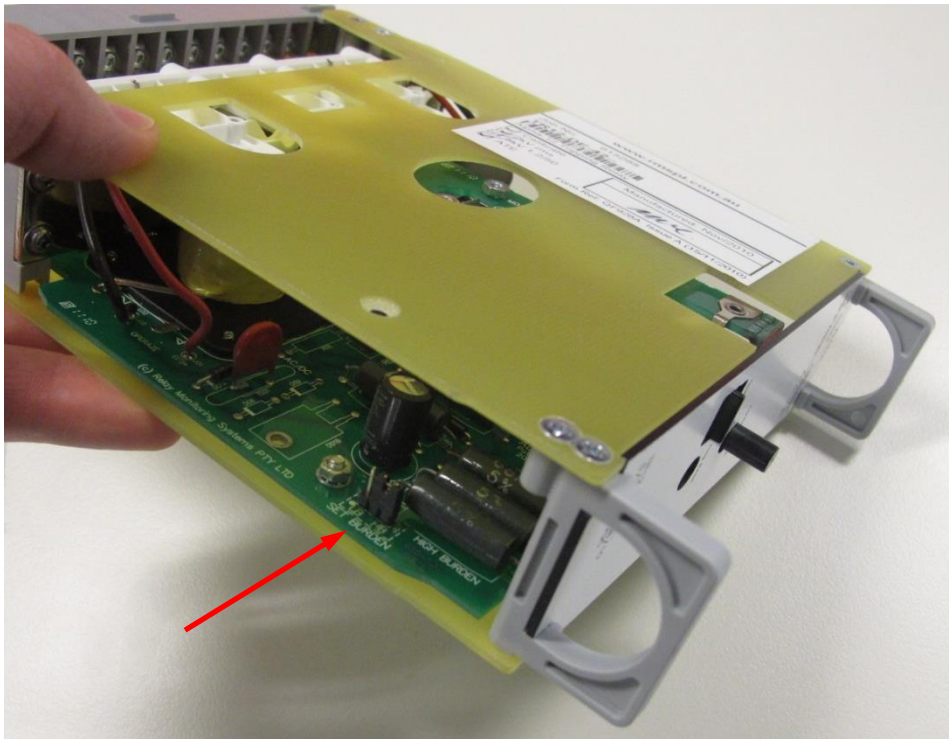
Relay Configuration

Prior to application of the Alpha TR the following configuration settings must be set to ensure correct relay application.

Operating Burden Configuration

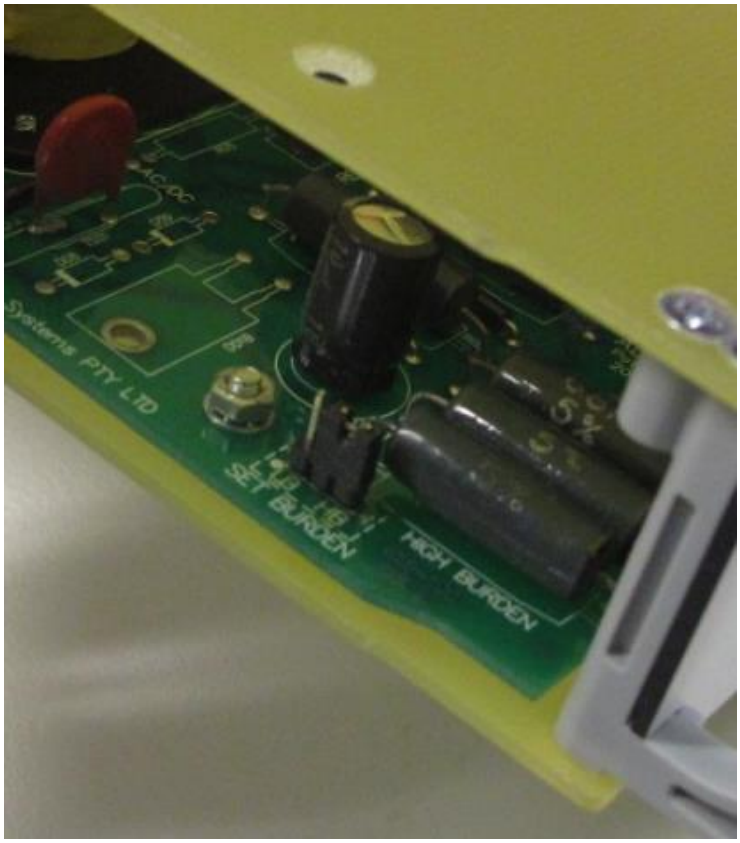
The Alpha TR high speed tripping relays may be set by the user for low burden or high burden operation.

This is achieved by withdrawing the relay module from the case and changing the position of a PCB link, as depicted in figure below.



The burden setting link is located at the bottom front of the draw out module and is readily accessible to the user for checking and changing to meet specific system requirements.

Unless otherwise specified all TR model relays are factory set and shipped in high burden configuration.



The link is shown fitted in the high burden (HB), position.

LB = Low burden operation.

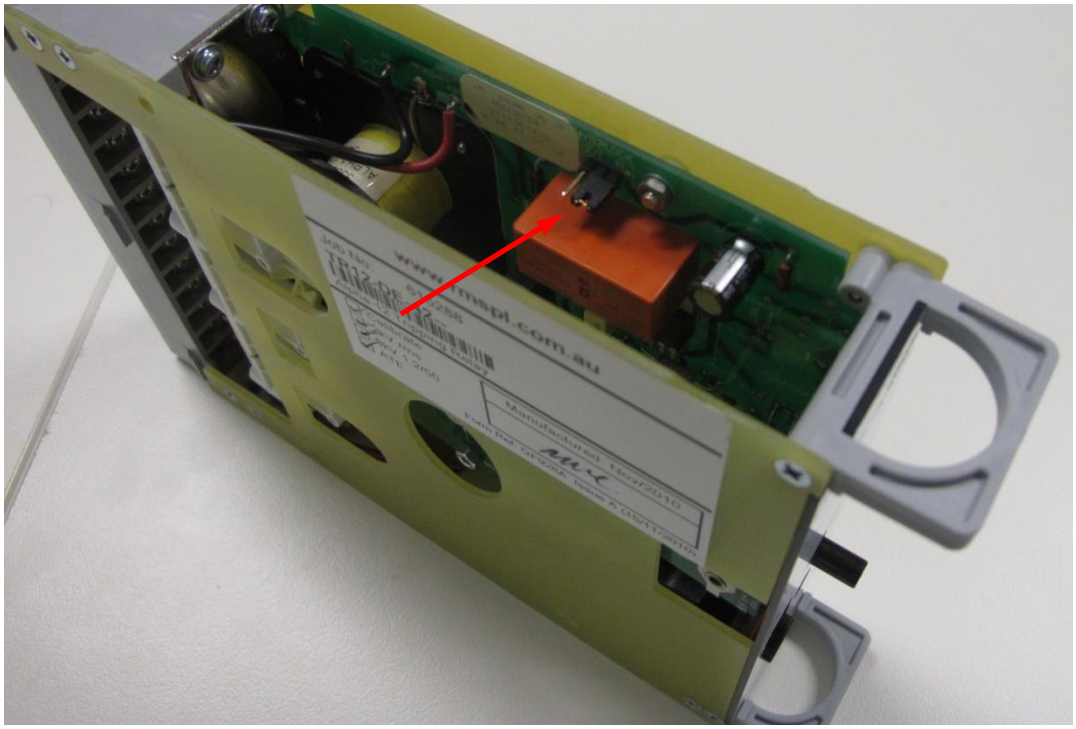
HB = High burden operation – default factory position.

Electrical Reset Interlock Configuration

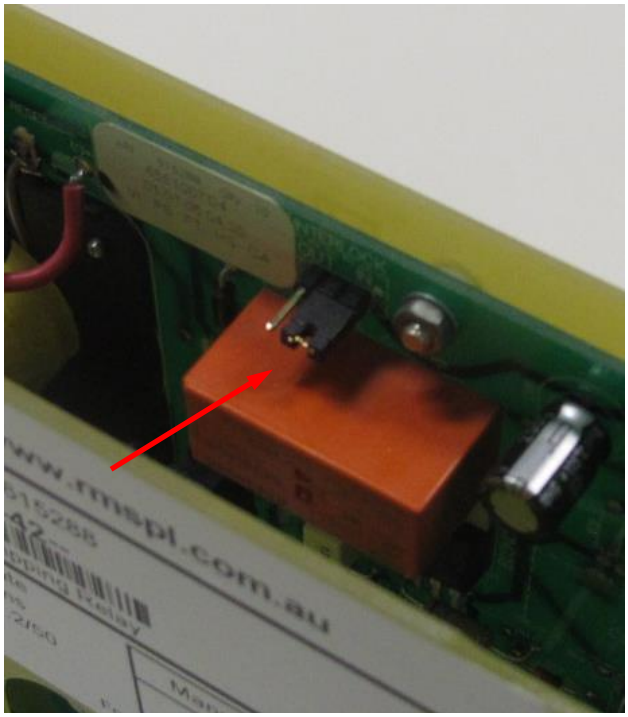
On Alpha TR relays fitted with an electrical reset, a selectable Electrical Reset Interlock feature is provided. If selected this feature locks out the reset command while voltage is applied to the operate coil and prevents damage to the relay.

Unless otherwise specified all electrical reset Alpha TR model relays are factory set and shipped with the interlock set to the 'IN' position.

The selection of the Electrical Reset Interlock is achieved by withdrawing the relay module from the case and changing the position of a PCB link, as depicted in figure below.



The Electrical Reset Interlock link is located at the top front of the draw out module and is readily accessible to the user for checking and changing to meet specific system requirements.



Alpha TR Indications

Front Layout

The figure below depicts the indications, controls and the reset push buttons on the front of the relay of a fully optioned model.

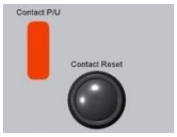
Optional Coil P/U LED

The P/U Led illuminates when a pickup voltage is applied to the relay coil.

Optional Operation Counter

The operation counter increments each time the relay contacts operate.

Armature Flag and Latched Contact Reset Push Button



The Armature flag follows the position of the contacts. Latched contacts and associated Armature flag are reset using the contact reset push button.

Independent Hand Reset Flag and Flag Reset Push Button

The Independent hand reset flag operates when the contacts first operate and remains visible until it is hand reset using the Flag Reset Push Button.

Optional Electrical Reset Interlock

An optional front panel switch that allows a local operator to isolate the electrical reset coil and disable the remote reset function.

Commissioning

Commissioning Preliminaries

Carefully examine the module to ensure that no damage has occurred during transit. Check that the model number and rating information are correct.

Insulation

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

- all electrically isolated circuits
- 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.

Injection Testing

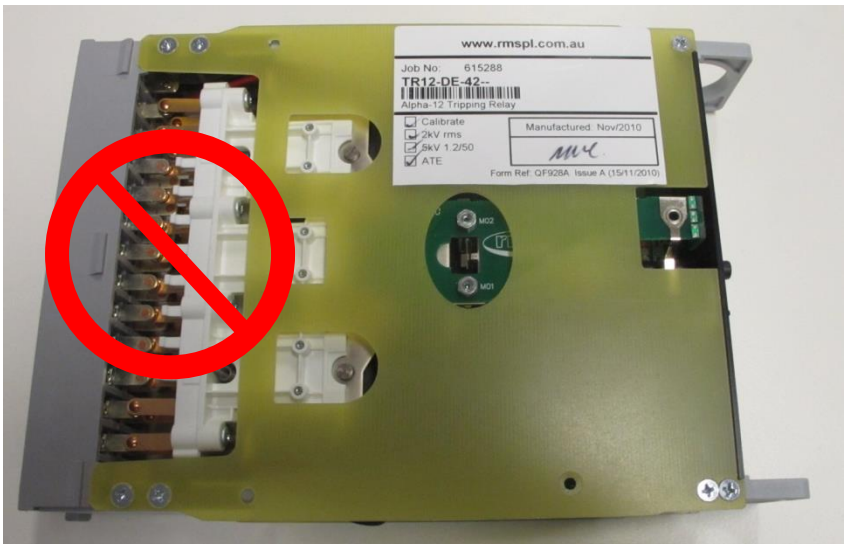
Testing of relay function may be undertaken using a secondary test set injecting directly into the relay operate coil or alternatively as part of a complete protection scheme tested in conjunction with the main protection relays.

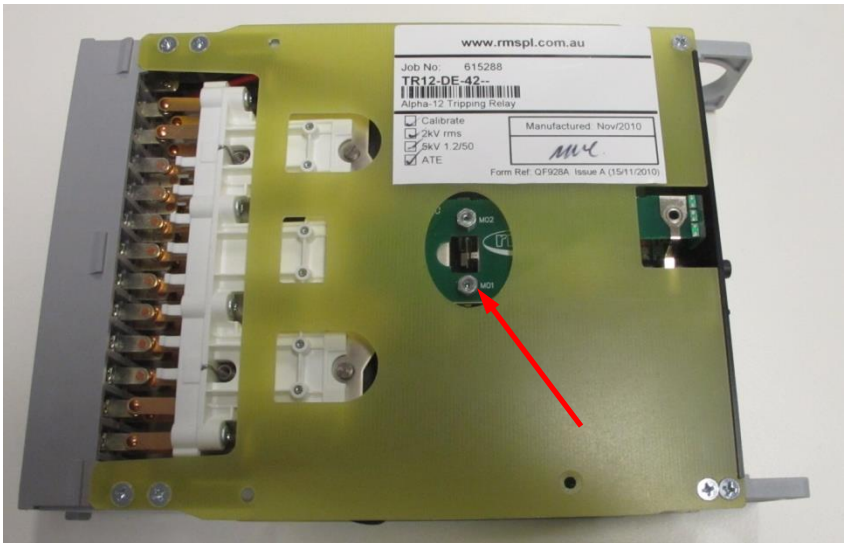
Site Commissioning Verification Checklist

Observe all site specific standard safety procedures.

The following tests are undertaken following the completion of all Alpha TR relay wiring.

Preliminary Checks

Item	Description	Complete
1	Confirm all necessary primary equipment isolations	
2	Confirm all necessary secondary equipment isolations (including trip outputs)	
3	Check panel installation of the Alpha TR relay	
4	Check the Alpha TR is wired to the protection design schematic	
5	With the relay element withdrawn from the case check for any evidence of transit damage and confirm free and easy movement of the armature assembly. Note care should be taken to avoid touching the adjusted contacts. 	

Item	Description	Complete
6	The armature assembly may be manually operated using the grub screw adjustment window as depicted.   Confirm that fitted mechanical flags drop when the armature assembly is manually operated. On latched contact models confirm that the armature mechanism latches when manually operated.	

Item	Description	Complete
7	On latched contact models confirm that the latched contacts are able to be reset using the contact reset push button. Confirm that the fitted mechanical flags are able to be reset.	
8	In the non operate state confirm the normally open and normally closed contact states against the relevant relay connection diagram using a suitable continuity tester	
9	Manually operate the relay contacts and confirm the contact state change against the relevant relay connection diagram using a suitable continuity tester	

Operate/Reset Operation

Item	Description	Complete
1	Insert the relay module into the case and ensure contacts are reset and the mechanical flags are in the reset position	
2	The operate circuit is terminated to case terminals 27(+) and 28(-)	
3	Where fitted the electrical reset circuit is terminated to case terminals 15(+) and 16(-) on TR5 models or 1(+) and 2(-) on TR12 models	
4	Disconnect external wiring from these terminals to allow application of the test supply	
5	Check for operation of the operate circuit by energising the relay with 100% of the nominal supply voltage The test voltage is to be applied as a step The relays should switch cleanly with one movement On relays fitted with a mechanical flag, confirm that the flag drops to provide a visual indication of relay operation Confirm the operate time of the contacts is in accordance with the individual relay test report supplied with the relay	
6	With the relay in the operate state check the continuity of the closed contacts. The contact continuity test should be undertaken by applying 5A current & measuring the voltage across the closed output contact terminals and confirming the contact impedance per the individual relay test report supplied with the relay	

Item	Description	Complete
7	Remove the operate circuit test supply	
8	On latching relays perform a manual contact reset and confirm the contact state change with a suitable continuity tester On relays fitted with a mechanical flag reset the flag	
9	On relays fitted with an electrical reset circuit, repeat step 5 through to 7 Ensure that the operate circuit test supply is removed Check for operation of the reset circuit by energising the reset input with 100% of the nominal supply voltage The test voltage is to be applied as a step and the relays should reset cleanly with one movement Confirm the contact state change with a suitable continuity tester On relays fitted with a mechanical flag reset the flag	
10	Restore any external wiring connections that may have been disturbed during the above tests	

Protection Scheme Confirmation

Item	Description	Complete
1	With the tripping relay connected in the tripping scheme perform a trip check of the main protection relay	
2	Confirm intended operation of the tripping relay upon operation of the main protection relay	
3	On latching relays perform a manual contact reset and confirm the contact state change with a suitable continuity tester On relays fitted with a mechanical flag reset the flag	
4	On relays fitted with an electrical reset circuit, repeat steps 1 through to 2 Ensure that the operate circuit test supply is removed Check operation of the reset circuit by performing an electrical reset Confirm the contact state change with a suitable continuity tester On relays fitted with a mechanical flag reset the flag	

Part 4

Installation

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 electronic 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 Relay Monitoring Systems Pty Ltd products are immune to the relevant levels of electrostatic discharge when housed in the case. 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 at the 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.
3. Avoid touching the electronic components, printed circuit track or connectors.
4. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
5. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as you.
6. Store or transport the module in a conductive bag.

If you are making measurements on the internal electronic circuitry of 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.

Safety Section

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

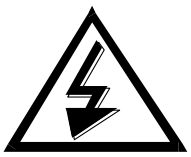
The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety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

Explanation of Symbols & Labels

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

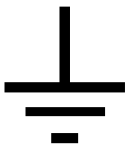
Caution: refer to product information

Caution: risk of electric shock



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 eg. power supply.



Unpacking

Upon receipt inspect the outer shipping carton or pallet for obvious damage.

Remove the individually packaged relays and inspect the cartons for obvious damage.

To prevent the possible ingress of dirt the carton should not be opened until the relay is to be used. Refer to the following images for unpacking the relay:

Outer packing carton showing the shipping documentation pouch.
Address label on top of carton.

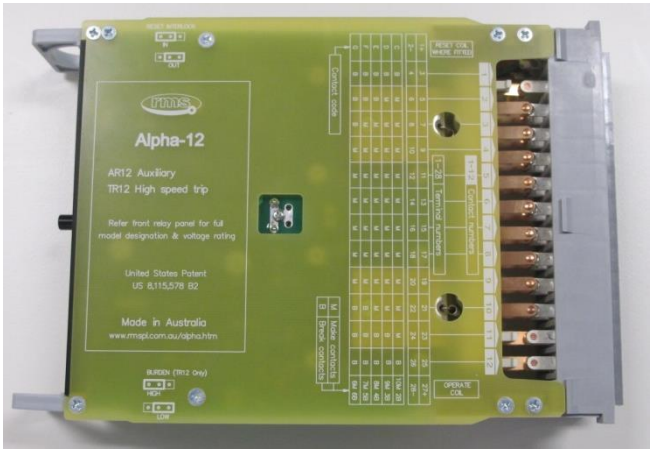
Example of the Inner packing carton showing front label detailing the relay job number, the relay part number & description and the packing date.

(Size 2 inner packing carton depicted)

Inner packing carton with lid open showing protective foam insert, relay mounting and terminating screw kit.

Inner packing carton with protective foam insert removed showing packed relay.

Withdrawn relay module showing side label depicting product details.



Withdrawn relay module showing termination table.

Accessories Supplied With Each Relay

Self threading M4 mounting screws and
M4 terminal screws with captured lock washers

Storage & Handling

If damage has been sustained a claim should immediately be made against the carrier, also inform Relay Monitoring Systems Pty Ltd and the nearest RMS agent

When not required for immediate use, the relay should be returned to its original carton and stored in a clean, dry place.

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.

If relays are not installed immediately upon receipt they should be stored in a place free from dust and moisture in their original cartons.

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 is efficiency.

Equipment Operating Conditions

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

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

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.

The relay should be mounted on the circuit breaker or panel to allow the operator the best access to the relay functions.

Relay Dimensions & Other Mounting Accessories

Refer drawing in Technical Bulletin. Relevant Auto Cad files & details on other accessories such as 19 inch sub rack frames, semi projection mount kits & stud terminal kits may be down loaded from:

http://www.rmspl.com.au/mseries.htm

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 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 electric shock or energy hazards.

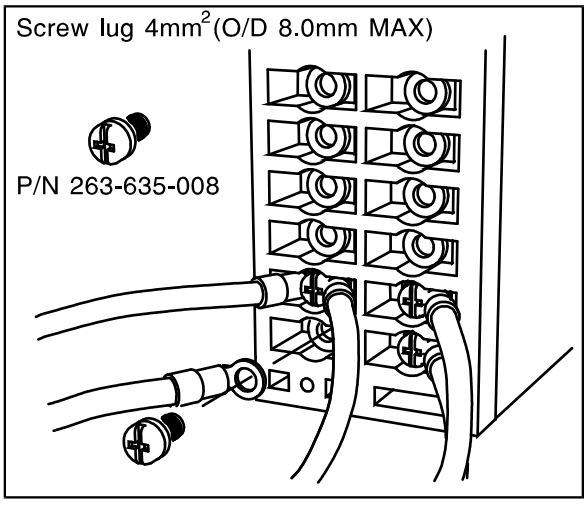
Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

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:

1. Voltage rating and polarity;
2. CT circuit rating and integrity of connections;
3. Protective fuse rating;
4. Integrity of earth connection (where applicable)



Current Transformer Circuits

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

External Resistors

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

Insulation & 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.

Insertion of Modules

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

Electrical Adjustments

Pieces of equipment 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 electric 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 & 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.

Commissioning Preliminaries

Carefully examine the module and case to see that no damage has occurred during transit. Check that the relay serial number on the module, case and cover are identical, and that the model number and rating information are correct.

Check that the external wiring is correct to the relevant relay diagram or scheme diagram. The relay diagram number appears inside the case.

Note that shorting switches shown on the relay diagram are fitted internally across the relevant case terminals and close when the module is withdrawn. It is essential that such switches are fitted across all CT circuits.

Earthing

Ensure that the case earthing connection above the rear terminal block is used to connect the relay to a local earth bar.

Insulation

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

- all electrically isolated circuits
- 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.

Commissioning Tests

If the relay is wired through a test block it is recommended that all secondary injection tests should be carried out using this block.

Ensure that the main system current transformers are shorted before isolating the relay from the current transformers in preparation for secondary injection tests.

DANGER

DO NOT OPEN CIRCUIT THE SECONDAY CIRCUIT OF A CURRENT TRANSFORMER SINCE THE HIGH VOLTAGE PRODUCED MAY BE LETHAL AND COULD DAMAGE INSULATION.

It is assumed that the initial preliminary checks have been carried out.

Relay CT shorting

Check electrically that the CT is shorted before isolating CT secondaries.

Primary injection testings

It is essential that primary injection testing is carried out to prove the correct polarity of current transformers.

Before commencing any primary injection testing it is essential to ensure that the circuit is dead, isolated from the remainder of the system and that only those earth connections associated with the primary test equipment are in position.

Decommissioning & 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.

Part 5

Maintenance

Mechanical Inspection

Relay Assembly

Inspect the relay for obvious signs of damage or ingress of moisture or other contamination.

Relay Module

Isolate the relay, remove the front cover & carefully withdraw the relay module from the case.

Care must be taken to avoid subjecting the relay element to static discharge which may damage or degrade sensitive electronic components.

Inspect the relay module for signs of any overheating or burn marks which may have been caused by overvoltage surge or transient conditions on the power supply or digital status inputs.

Inspect the VT & CT stages for degradation of insulation on the terminal wiring & transformer windings.

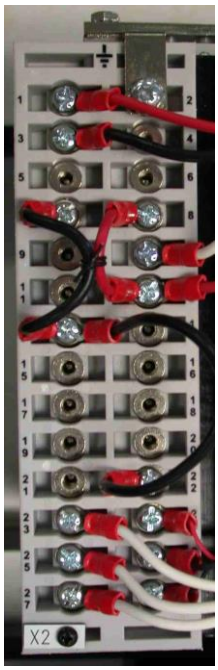
Remove cover by unscrewing black thumb screws & withdraw the relay module from the case.

Relay Case

Inspect the outer terminals checking insulation integrity & tightness.

Inspect inside the case and use a blower to remove dust.

Inspect the inner terminals for worn, distorted or tarnished contacts and if necessary clean the contacts using a brush dipped in a suitable substance.



Case outer terminal

Case inner terminals

Module plug in terminals

Test Intervals

The maintenance tests required will largely depend upon experience and site conditions, but as a general rule it is recommended that the following inspection and tests are performed every twelve months.

- Mechanical Inspection
- Check of Connections
- Insulation Resistance Test

Defect Report Form

Please copy this sheet and use it to report any defect which may occur.

Customers Name & Address:	Contact Name:
	Telephone No:
	Fax No:
Supplied by:	Date when installed:
Site:	Circuit:

When Defect Found

Date:	Commissioning?	Maintenance?	Systems Fault?	Other, Please State:
Product Part No:				Serial Number:
Copy any message displayed by the relay:				
Describe Defect:				
Describe any other action taken:				
Signature:		Please Print Name:		Date:

For RMS use only

Date Received:	Contact Name:	Reference No:	Date Acknowledged:	Date of Reply:	Date Cleared:

www.rmspl.com.au

Relay Monitoring Systems Pty Ltd design, manufacture and market a wide range of electrical protection and control products for application on high voltage power systems. The company's depth of manufacturing and engineering expertise is backed up by many years of experience since the formation of its predecessor, Relays Pty Ltd (RPL), in 1955. This experience combined with a broad base of field proven product types enables RMS to service specific customer needs by producing relays on demand and with typically short lead times.

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ISO9001 Quality Accreditation

RMS holds NCSI (NCS International Pty Limited) registration number 6869 for the certification of a quality system to AS/NZS ISO9001:2008.