Alpha XR User Guide

Supervision Relay

relay monitoring systems pty ltd

Advanced Protection Devices

User Guide

Alpha XR User Guide

About This Manual

This User Guide covers all Alpha XR relays manufactured from December 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 XR 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 XR 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 XR are described in the product Technical Bulletin. For the most up to date version go to:

www.rmspl.com.au/handbook/Alpha XR.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 XR 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 XRKxx 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 XR 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 XR relay series are low burden electro-mechanical supervision relays for application on high security tripping and auxiliary supply circuits.

The Alpha XR models comprise of :

- XR5-xx-1 Trip relay coil supervision
- XR5-xx-4 Trip supply supervision
- XR5-xx-6 Single pole trip circuit supervision

Failure of the circuit or supply being supervised will cause the main relay element to drop out, the flag to fall and the alarm contacts to change state.

XR5-XX-1 Trip Relay Coil Supervision

The XR5-XX-1 relay is designed to supervise trip relay circuits utilising high burden trip relays.

Under healthy conditions supervision current flows through a voltage monitor and the supervising relay coil is energised. If the circuit being supervised becomes open circuit or if the supply fails, the relay will become de-energised and an alarm is given (5 alarm contacts and flag indication).

To prevent the alarm being given when the circuit being supervised is operated, supervision current flows through an alternate voltage monitor to energize the relay coil. For this purpose, an additional normally open contact is required from the latching trip relay as depicted in example application schematic. A short time delay of approximately 100ms, is incorporated to hold up the alarm relay during a normal trip relay operation.

XR5-XX-4 Trip Supply Supervision

The XR5-XX-4 is designed to supervise DC auxiliary supplies utilised in protection and tripping circuits.

Under healthy conditions, the coil is energised and if the supply fails, the relay will drop out to initiate a supply fail alarm. An alarm is reported through the change in state of the five (5) alarm contacts and the front panel hand reset flag indicator.

A short time delay of 100ms is incorporated to avoid nuisance tripping due to switching transients.

XR5-XX-6 Trip Circuit Supervision

The XR5-XX-6 is designed to supervise Protection Tripping Circuits of Protection and Control schemes.

The XR5-XX-6 is comprised of 2 inputs that combine to hold in the contacts of an attracted armature relay.

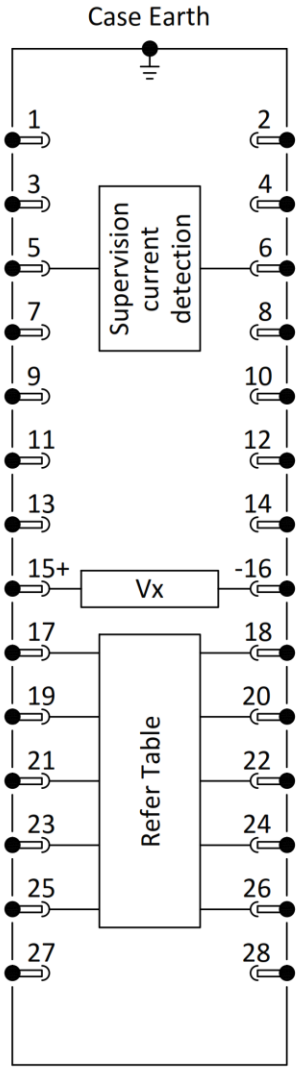
Supervision is active with the circuit breaker in the open or closed position via the “A and B” CB auxiliary contacts.

Supervision also remains active during tripping operations irrespective of the status of the tripping relay contact.

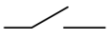
A 400ms relay operate delay caters for trip contact and circuit breaker transitions as well as nuisance alarms due to supply voltage transients.

Scheme Wiring

Alpha XR5-XX-1 Trip Relay Coil Supervision Connection diagram

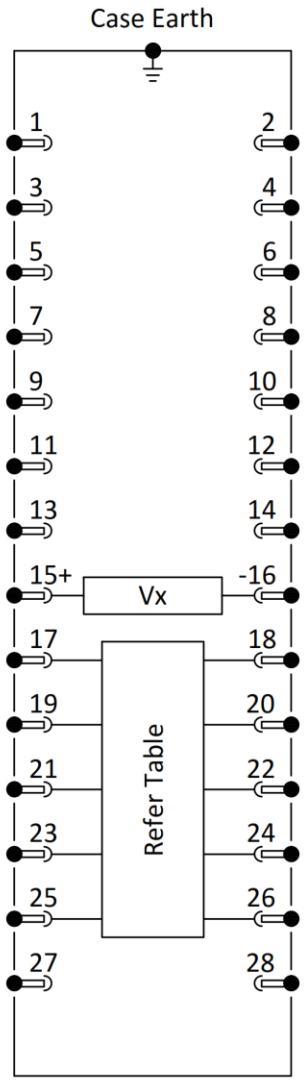


XR5-XX-1 Terminal Number Pairs						
Code	Contacts	17-18	19-20	21-22	23-24	25-26
N	5M 0B	M	M	M	M	M
P	4M 1B	M	M	M	M	B
Q	3M 2B	B	M	M	M	B
R	2M 3B	B	M	M	B	B
S	1M 4B	B	B	M	B	B

M: Make 

B: Break 

Alpha XR5-XX-4 Trip supply Supervision Connection diagram

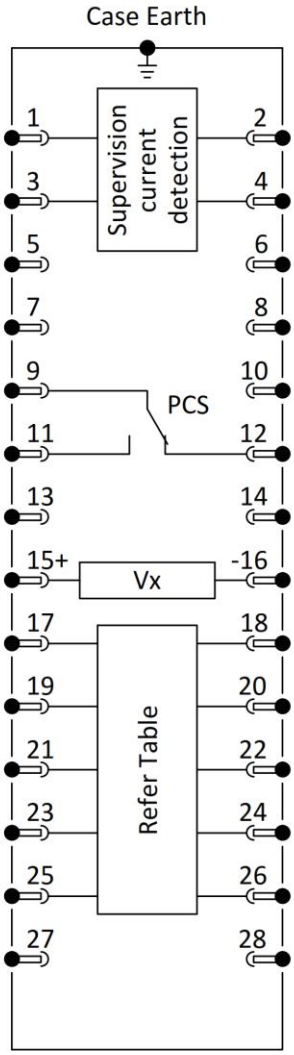


XR5-XX-4 Terminal Number Pairs						
Code	Contacts	17-18	19-20	21-22	23-24	25-26
N	5M 0B	M	M	M	M	M
P	4M 1B	M	M	M	M	B
Q	3M 2B	B	M	M	M	B
R	2M 3B	B	M	M	B	B
S	1M 4B	B	B	M	B	B

M: Make

B: Break

Alpha XR5-XX-6 Trip Circuit Supervision Connection diagram

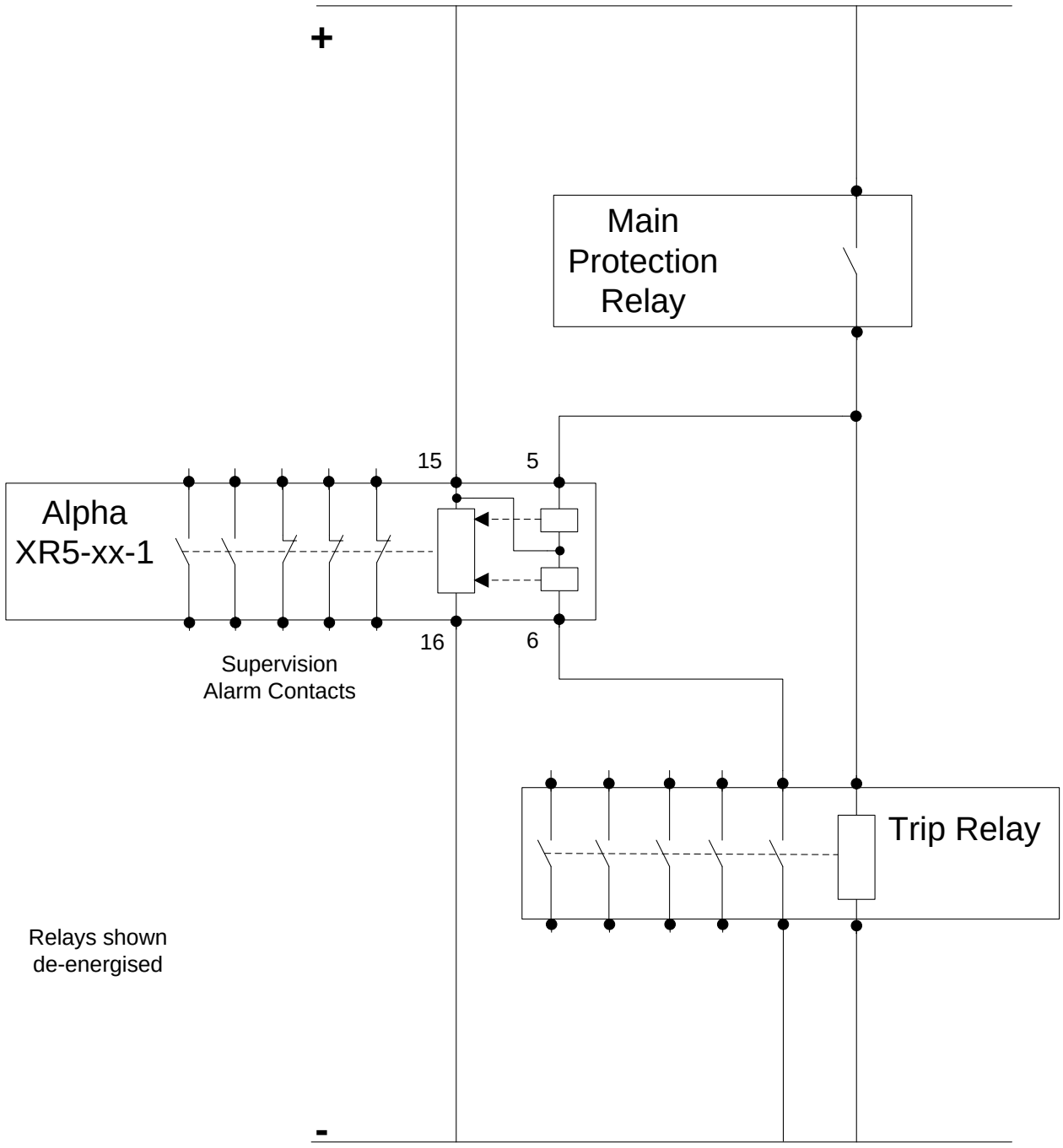


XR5-XX-6 Terminal Number Pairs						
Code	Contacts	17-18	19-20	21-22	23-24	25-26
N	5M 0B	M	M	M	M	M
P	4M 1B	M	M	M	M	B
Q	3M 2B	B	M	M	M	B
R	2M 3B	B	M	M	B	B
S	1M 4B	B	B	M	B	B

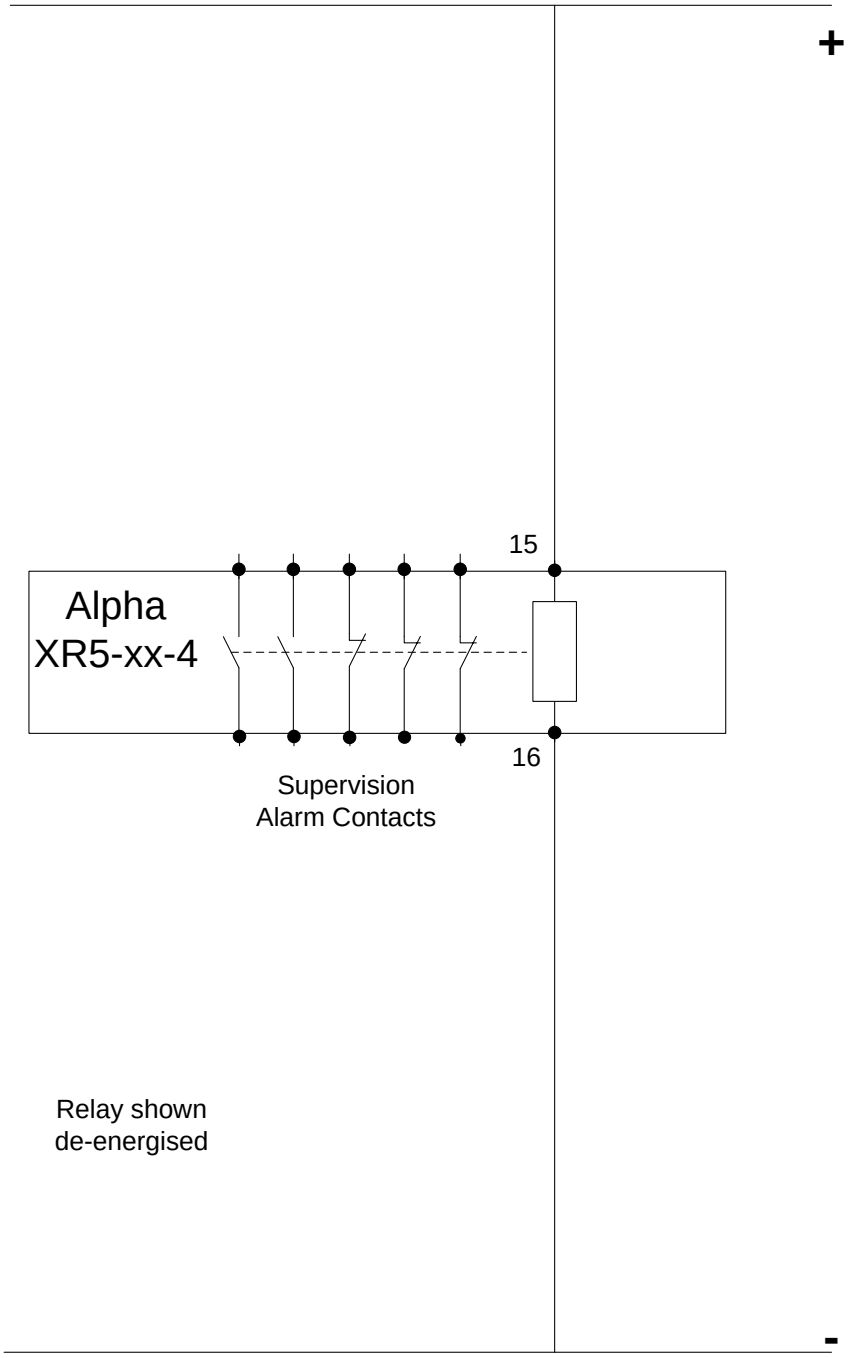
M: Make

B: Break

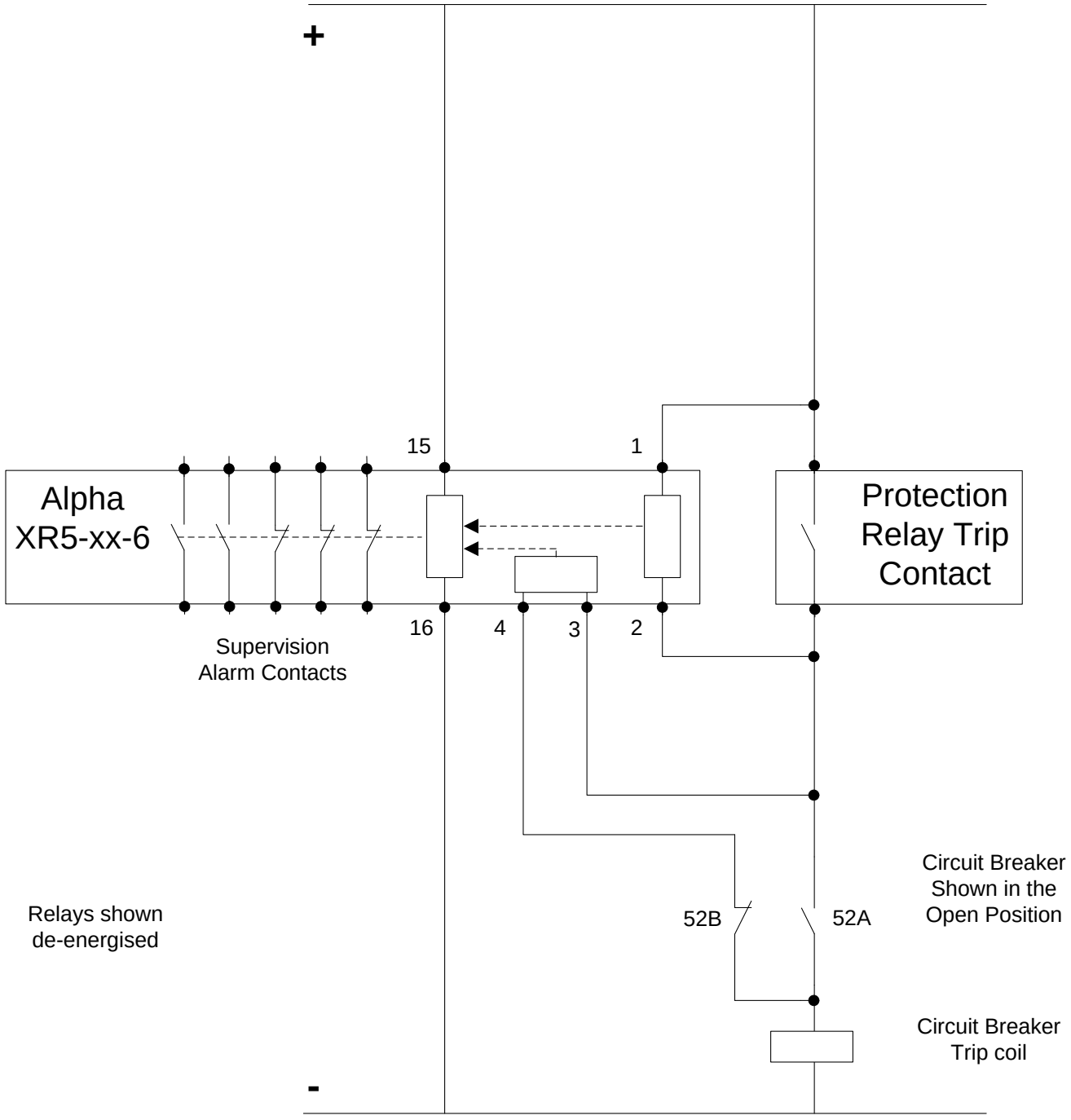
Example Schematic – XR5-xx-1 Trip Relay Coil Supervision Application



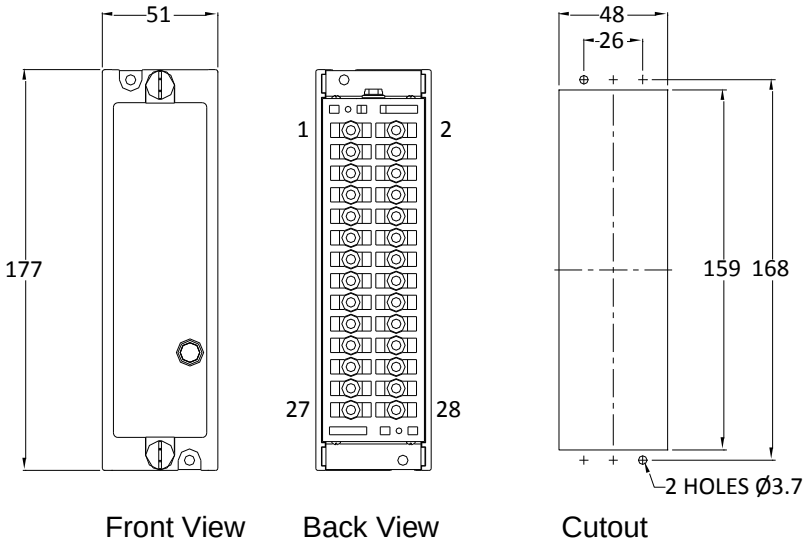
Example Schematic – XR5-xx-4 Trip Supply Supervision Application



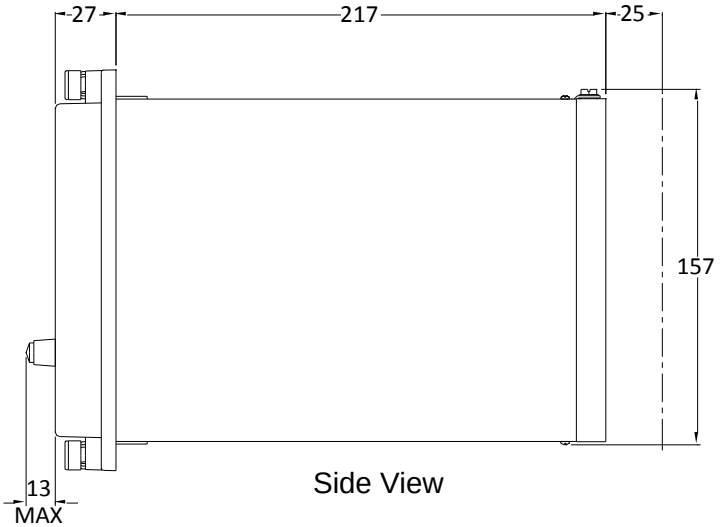
Example Schematic – XR5-xx-6 Trip Circuit Supervision Application



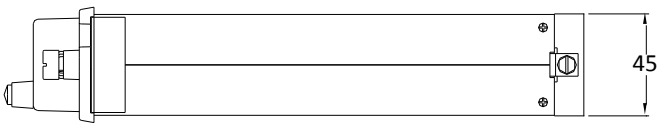
Terminal Layout and Relay Dimensions



Front View Back View Cutout



Side View



Top View

The relay module is designed for rack or panel mounting.

Alpha XR 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 Supervision Healthy P/U LED

The Supervision Healthy Led illuminates when the supply voltage and the supervised circuit are healthy.

Hand Reset Flag and Flag Reset Push Button

The hand reset flag operates if the circuit being supervised becomes open circuited or if the supply fails. The hand reset flag may only be reset when the supervised circuit is returned to the normal condition.

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.

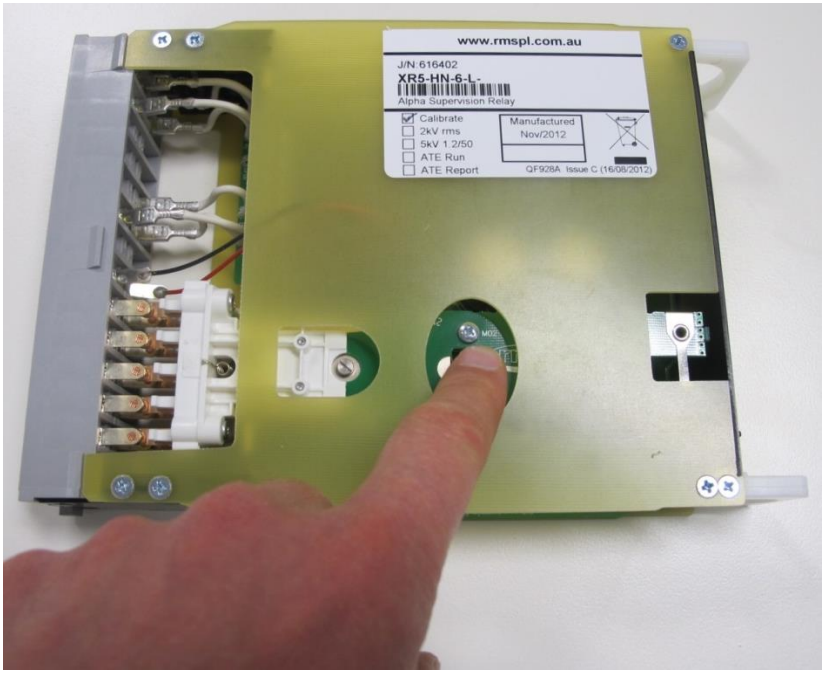
Site Commissioning Verification Checklist

Observe all site specific standard safety procedures.

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

Preliminary Checks (All Variants)

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 XR relay	
4	Check the Alpha XR 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 flag drops when the armature is manually released.	

Item	Description	Complete
7	In the de-energised state confirm the normally open and normally closed contact states against the relevant relay connection diagram using a suitable continuity tester	
8	Manually operate the relay contacts and confirm the contact state change against the relevant relay connection diagram using a suitable continuity tester	

Operational Checks (XR5-xx-1 Trip Relay Coil Supervision Relay)

Item	Description	Complete
1	Insert the relay module into the case and ensure the XR5 relay is picked up in the healthy supervision circuit and following a hand reset that the mechanical flag is in the reset position	
2	Simulate a DC supply failure by removing isolating links or disconnecting the positive supply to terminal 15 of the XR5, confirm that the Alarm contacts change state and the indicating flag drops	
3	Restore the DC supply connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
4	Simulate a DC supply failure by removing isolating links or disconnecting the negative supply to terminal 16, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
5	Restore the DC supply connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
6	Simulate the operation of the supervised tripping relay and confirm that the XR5 relay remains picked up and there is no change in the Alarm contact state and the mechanical flag remains in the reset position	
7	Simulate the failure of the supervised tripping relay coil by removing the positive isolating link to the tripping relay coil or disconnecting the positive terminal to the tripping relay, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
8	Restore the relay connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
9	Simulate the failure of the supervised tripping relay coil by removing the negative isolating link to the tripping relay coil or disconnecting the negative terminal to the tripping relay, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
10	Restore the relay connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	

Operational Checks (XR5-xx-4 Trip Supply Supervision Relay)

Item	Description	Complete
1	Insert the relay module into the case and ensure the XR5 relay is picked up in the healthy supervision circuit and following a hand reset that the mechanical flag is in the reset position	
2	Simulate a DC supply failure by removing isolating links or disconnecting the positive supply to terminal 15 of the XR5, confirm that the Alarm contacts change state and the indicating flag drops	
3	Restore the DC supply connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
4	Simulate a DC supply failure by removing isolating links or disconnecting the negative supply to terminal 16, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
5	Restore the DC supply connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	

Operational Checks (XR5-xx-6 Trip Circuit Supervision Relay)

Item	Description	Complete
1	Insert the relay module into the case and ensure the XR5 relay is picked up in the healthy supervision circuit and following a hand reset that the mechanical flag is in the reset position	
2	Simulate a DC supply failure by removing isolating links or disconnecting the positive supply to terminal 15 of the XR5, confirm that the Alarm contacts change state and the indicating flag drops	
3	Restore the DC supply connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
4	Simulate a DC supply failure by removing isolating links or disconnecting the negative supply to terminal 16, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
5	Restore the DC supply connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
6	Simulate the operation of the protection trip contacts and confirm that the XR5 relay remains picked up and there is no change in the Alarm contact state and the mechanical flag remains in the reset position	
7	Open and Close the Circuit Breaker a number of times and confirm that the supervision relay remains picked up and there is no change in the Alarm contact state and the mechanical flag remains in the reset position	

Item	Description	Complete
8	Simulate the failure of the trip circuit by removing the positive isolating link of the trip circuit, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
9	Restore the trip circuit and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
10	Simulate the failure of the trip circuit by removing the negative isolating link of the trip circuit, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
11	Restore the trip circuit connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	
12	Simulate the failure of the trip circuit wiring between the protection trip contact to the circuit breaker trip coil by disconnecting the wiring at the trip contact, confirm that the XR5 Alarm contacts change state and the indicating flag drops	
13	Restore the trip circuit connections and ensure the XR5 relay is picked up and following a hand reset that the mechanical flag is in the reset position	

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.

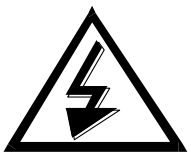
The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety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

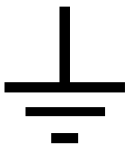
Caution: refer to product information

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.

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.

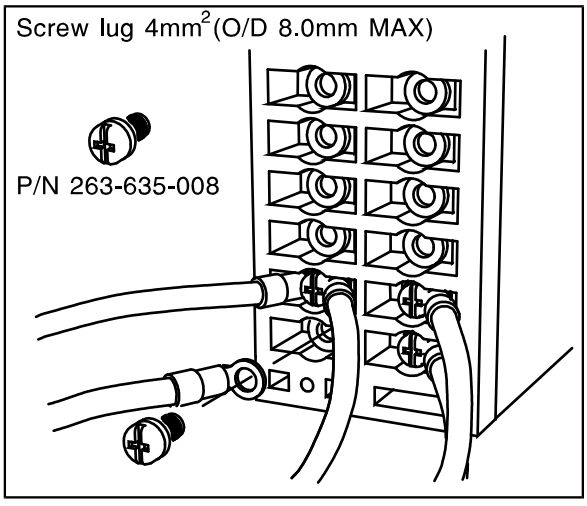
Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

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.

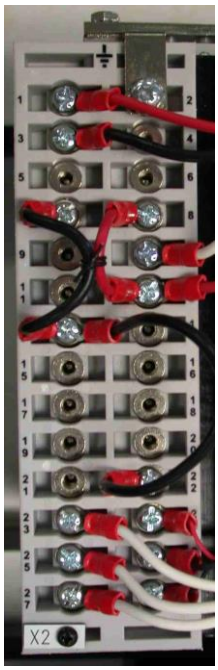
Remove cover by unscrewing black thumb screws & withdraw the relay module from the case.

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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