



# 2C65 User Guide

## Current Check Relay

relay monitoring systems Pty Ltd

### **Advanced Protection Devices**



User Guide



Test Manual

# 2C65 User Guide

## About This Manual

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This User Guide covers all 2C65 relays manufactured from May 2006. Earlier relays do not necessarily incorporate all the features described. Our policy of continuous may means that extra features & functionality may have been added.

The 2C65 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/2c65\\_user\\_guide.pdf](http://www.rmspl.com.au/userguide/2c65_user_guide.pdf)

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

## How this guide is organised

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*This guide is divided into five parts:*

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Defect Report Form



Visit [www.rmspl.com.au](http://www.rmspl.com.au) for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice. 2C65\_Guide/lss A/29/10/08



## Test Manual

This User Guide covers all 2C65 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. The type number takes the form 2C65Kxx where the Kxx is the "K" or version number.

Refer to: [www.rmspl.com.au/handbook/parta3.pdf](http://www.rmspl.com.au/handbook/parta3.pdf)  
for a complete description of the RMS "K" number system.

Each 2C65 version has a specific Test Manual which provides details on the unique attributes of the relay. Each Test Manual includes the following information:

- Test Certificate
- Specific technical variations from the standard model if applicable
- Test & calibration record
- Wiring diagram

A Test Manual is provided with each relay shipped.

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

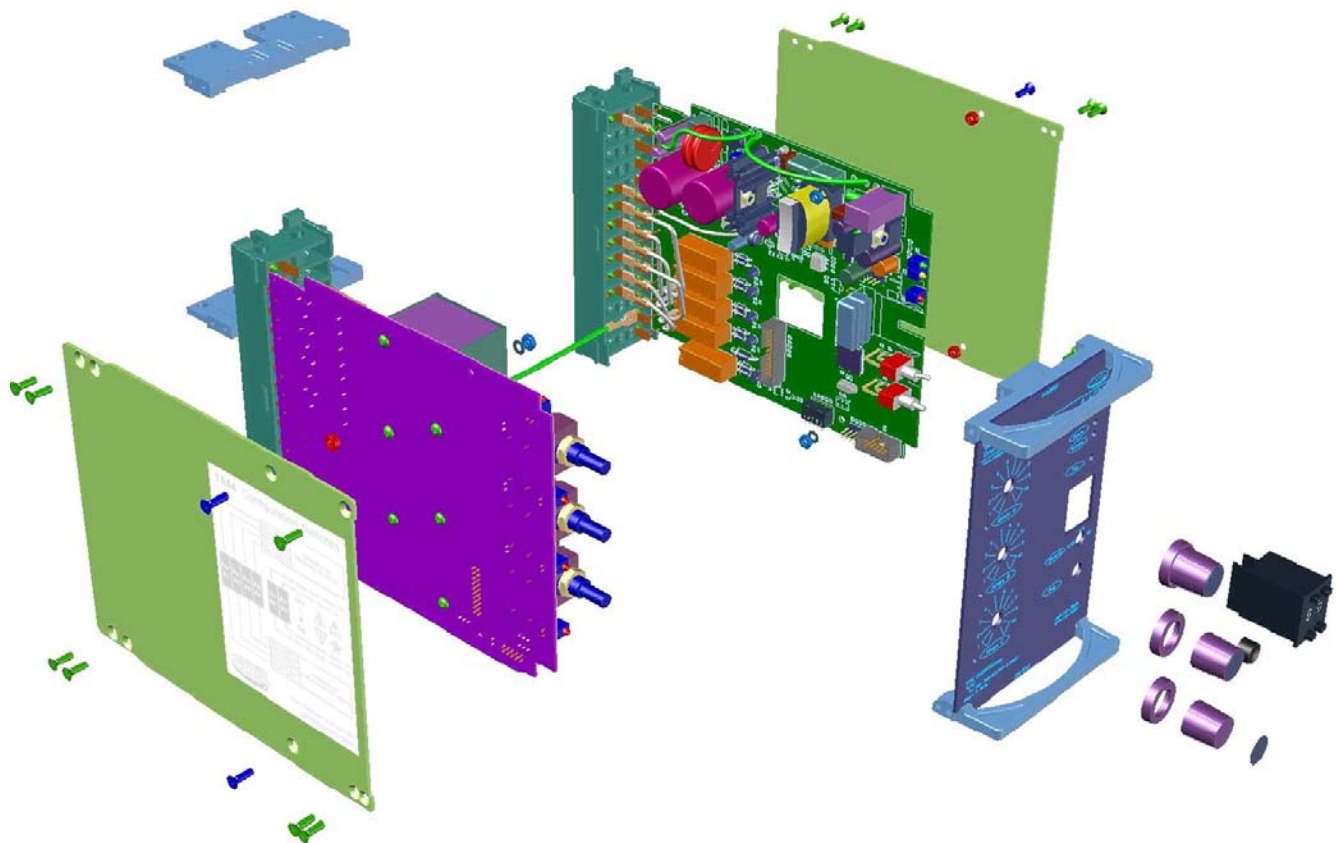
- Check the RMS web site at: [www.rmspl.com.au/search.asp](http://www.rmspl.com.au/search.asp)
- RMS CD catalogue select: [List all Product/Test Manuals](#) under [Technical Library](#)
- Contact RMS or a representative & request a hard copy or PDF by email.



Visit [www.rmspl.com.au](http://www.rmspl.com.au) for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice. 2C65\_Guide/lss A/29/10/08





2C65 relay assembly depicted in a 4M56 case



## Technical Bulletin

The detailed technical attributes, functional description & performance specifications for the 2C65 are described in the attached Technical Bulletin. For the most up to date version go to:

[www.rmspl.com.au/handbook/2c65.htm](http://www.rmspl.com.au/handbook/2c65.htm)

For any specific attributes of a particular version refer to the Test Manual for that type (K) number.

The order of precedence for technical information is as follows:

- Test Manual
- Technical Bulletin
- User Guide

**Current Check Relay**

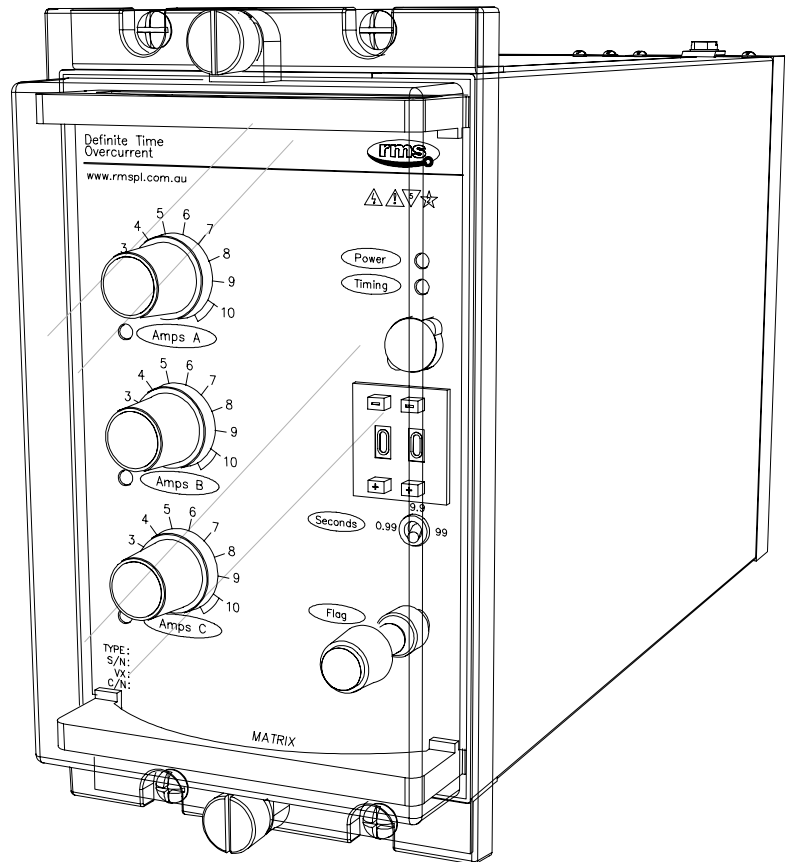
**Features**

- 10:1 PU setting ranges  
Select from two options:
- 5-50% or 20-200% of nominal input current
- 1A or 5A nominal CT's
- Fast O/C pick up time <15ms
- Fast O/C reset time <15ms
- <5% transient over-reach
- Phase segregated initiate input
- 3 phase initiate input
- Internal timer initiate input
- Non volatile trip flag
- Remote flag reset input
- Current pick up LED per phase
- 8 C/O output contacts
- Three time delay ranges  
0-0.99s, 0-9.9s, 0-99s
- High accuracy & repeatability –  
timing compensated for output  
relay delay
- Time settings easily selected  
by digital thumb wheel switches
- Timing in progress LED
- 40-300V DC auxiliary supply  
Power supply fail relay drops  
out if the auxiliary supply fails.
- Optional 20-70V DC supply
- Size 4M draw out case

**Application**

The 2C65 Series relays are adjustable AC current sensing relays designed for high or low voltage power systems where they can be used in a large number of overcurrent applications.

Definite time overcurrent relays offer advantages over inverse time protection in power systems which have a wide variation in source impedance. Faults can be cleared in relatively short times irrespective of the magnitude of the fault current, & coordination of several relays in a system can be obtained at all times regardless of fault current variation.



2C65 in a 4M56 case

**Operation**

Made in Australia

The 2C65 Series relay is a three pole current detector with independently adjustable sensing circuits driving a common adjustable digital setting timing element.

Five (5) status inputs & eight (8) relay outputs are provided as standard to allow the 2C65 to be operated in a number of different configurations:

- ◆ Time delayed or instantaneous output contacts;
- ◆ Phase segregated or 3 phase output contacts;
- ◆ Single phase or 3 phase current initiation inputs;
- ◆ Timer initiate input logic;

After pick up & time out the latching target indicator (LED or magnetic flag), is set. The flag may be reset at the front panel or remotely reset via a status input.

Fully solid state sensing & measuring circuitry is employed with each phase current setting continuously adjustable on a front panel control. Air core CT's are employed to provide a very fast reset characteristic.

The wide range switchmode power supply, input current transformer, output relays & status inputs form the essential barriers against high voltage line transients.

Instantaneous Operation Version

The 2C65 may be specified without the integrated delay timer for instantaneous current check function.

Zero Stand by Burden Relay

The 2C80 current check relay may be specified where a zero stand by burden is required. Initiation of the relay is achieved through application of the auxiliary supply on a single or three phase basis. The linear power supply provides high speed start up but results in higher operating burden & non continuous rating. The 2C80 may be specified with or without an integrated time delay element.



### OPERATING LOGIC CONFIGURATION

The 2C65 may be configured & wired to operate in phase segregated & three phase modes as depicted in logic diagram figures 1 to 4. Where the 2C65 is specified without the integrated time delay element all output contacts operate as instantaneous & the Timer Initiate input does not function.

In each logic example output contacts 1-4 have been set for instantaneous operation - Configuration switch 5 set to ON.

Where configuration switch 5 is set to OFF output contacts 1-4 will operate as time delayed contacts.

For figures 1 to 4 the operating logic is repeated for phase B & C.

### TIMER INITIATE INPUT

#### CB auxiliary contact or palette switch check scheme

This form of circuit breaker failure protection is typically applied to transformer protection to provide supplementary coverage for faults that are low in current magnitude that would otherwise not be protected by a current check circuit breaker failure protection scheme. For example, Buchholz (gas) protection & reflected faults through transformers.

It should be noted that initiating the timer via the timer initiate status input will cause all delayed output contacts to pick up once the preset time delay has expired. In all circumstances the timer initiate status input must be reset before any time delayed contacts are reset.

# Operating Logic

### PHASE SEGREGATED OPERATING LOGIC

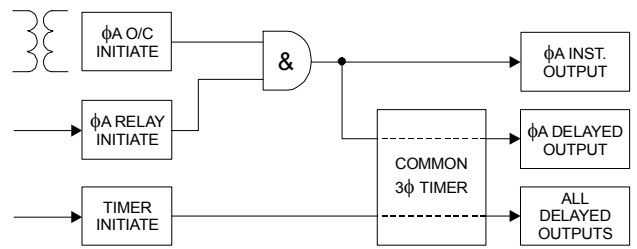


Figure 1:  
Phase segregated inputs & phase segregated output contacts  
Configuration switch 4 set to OFF  
Configuration switch 5 set to ON

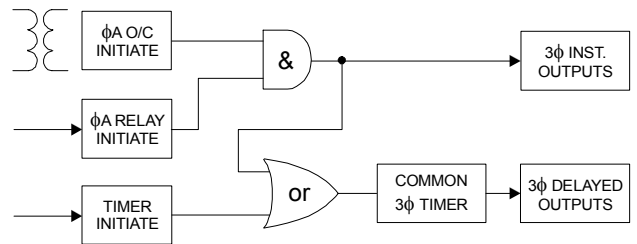


Figure 2:  
Phase segregated inputs & 3 phase output contacts  
Configuration switch 4 set to OFF  
Configuration switch 5 set to ON

### THREE PHASE OPERATING LOGIC

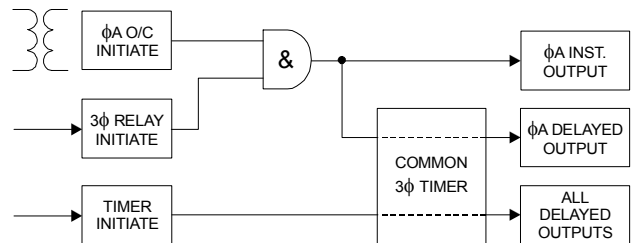


Figure 3:  
Three phase input & phase segregated output contacts  
Configuration switch 4 set to OFF  
Configuration switch 5 set to ON

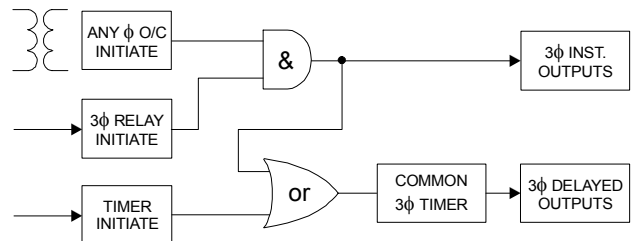
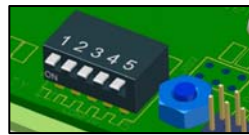
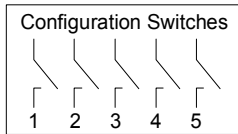


Figure 4:  
Three phase input & 3 phase output contacts  
Configuration switch 4 set to ON  
Configuration switch 5 set to ON

### CONFIGURATION SWITCHES

Configuration switches are accessible to the user & can be set by withdrawing the relay module & following the instructions on the side plate label. A bank of 5 switches are provided as depicted below & are read each time the 2C65 is powered up:



While the function of the configuration switches may vary for special custom models, the standard functions & default settings are described below:

#### Switch 1 - Status input operation

ON DC operation only - AC rejection ON (Default)  
 OFF AC / DC operation - AC rejection OFF

#### Switch 2 - Current initiate inputs

ON Apply volts to enable (Default)  
 OFF Remove volts to enable

#### Switch 3 - Timer initiate input

ON Apply volts to enable (Default)  
 OFF Remove volts to enable

#### Switch 4 - Output relay function

ON Three phase outputs (Default)  
 OFF Phase segregated outputs

#### Switch 5 - Output relay timing function

ON Output relays 1-4 instantaneous (Default)  
 OFF Output relays 1-4 time delayed

### FRONT PANEL INDICATORS

LED indicators are provided on the front panel:

|         |                                        |         |
|---------|----------------------------------------|---------|
| Power   | On solid when auxiliary supply healthy | Green   |
| Current | On when phase current picked up        | Red x 3 |
| Timing  | Flashing during timing                 | Amber   |
| Trip    | Latches on when trip relay operates    | Red     |

The trip LED status is stored in non volatile memory & is restored when the 2C65 is powered up after loss of the auxiliary supply. The preserved trip LED state is reset using the front panel flag reset button or status input.

A hand & remote reset magnetic disc flag (permanent memory) trip indicator may be specified as an option. Note that an auxiliary supply is required to reset the flag circuits.

### CURRENT SETTINGS

5-50% or 20-200% of nominal CT rating  
 Repeatability:  $\pm 2\%$  of setting  
 Setting:  $\pm 5\%$  of maximum setting

### DROPOUT PICKUP RATIO

85% setting: PCB jumper J103 fitted left – Factory default  
 75% setting: PCB jumper J103 fitted right as per figure 5.

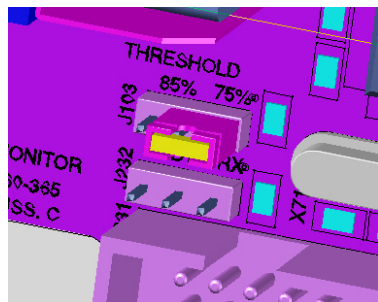


Figure 5:

To change the dropout / pickup ration remove the relay module from the case, locate the three pin jumper header position J103 & fit jumper for 75% or 85% dropout pickup ratio.

# Configuration & Setting

### OPERATING TIME OF CURRENT ELEMENT

At 2 X O/C setting: Logic pick up time <10ms

#### Time delayed contact reset

Logic drop out time is less than 15ms when the current drops from 2 X O/C setting to zero. This means that if current is removed >15ms before the preset time delay expires the trip output contacts will not operate.

#### Instantaneous contact reset

Output contacts set for instantaneous operation will reset in less than 15ms when current drops from 2 X O/C setting to zero.

### OUTPUT CONTACT DWELL TIME

Once operated all time delayed output contacts have a minimum dwell time of 100ms to allow adequate time for CB pallet switches to operate.

### TIME SETTING RANGES

The 2C65 relay allows for precision time settings of between zero (Minimum operate time) & 99 seconds. This is achieved by the use of two decimal thumb wheel switches & a range multiplication switch on the front panel.

| Range Selector Setting | Achievable Time Setting Range | Resolution of Time Setting |
|------------------------|-------------------------------|----------------------------|
| Range 1                | Zero to 0.99 Sec              | 0.01 Sec                   |
| Range 2                | Zero to 9.9 Sec               | 0.1 Sec                    |
| Range 3                | Zero to 99 Sec                | 1 Sec                      |

Table 1

### TIME SETTING CHANGES

The time delay & function settings should only be changed when the timing initiate LED is extinguished. Time settings are read at the beginning of each timing sequence.

### TIMER INITIATE STATUS INPUT DELAY

| Initiate input | Minimum | AC Rejection Filter |       |
|----------------|---------|---------------------|-------|
|                |         | ON                  | OFF   |
| DC             | P/U     | <16ms               | <4ms  |
|                | D/O     | <4ms                | <16ms |
| AC             | P/U     | N/A                 | <23ms |
|                | D/O     |                     | <33ms |

Table 2

### MINIMUM OUTPUT CONTACT PICK UP TIME

For an output contact to pick up, both the O/C & relay initiate logic conditions must be met as per figures 1 to 4. The minimum pick up time of a contact is therefore determined by the last logic element to pick up.

Where a status input initiate is the last element to pick up the minimum contact pick up time is equal to the status input delays in Table 2 + 6ms.

Where an O/C initiate is the last element to pick up the minimum contact pick up time is less than 15ms.

Time delay settings  $\leq$  to the above minimums will result in a relay contact operate time equal to the minimum as per figure 6.

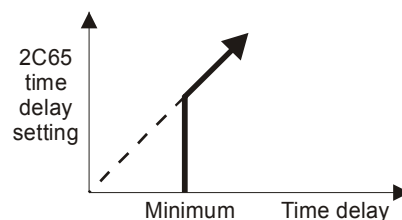


Figure 6

### TIMING ACCURACY

Maximum timing error as a % of setting + uncertainty in ms.

| Initiate input | AC Rejection Filter |               |
|----------------|---------------------|---------------|
|                | ON                  | OFF           |
| DC             | -0.19% + 0.25ms     |               |
| AC             | N/A                 | -0.19% + 19ms |

Table 3

## BURDENS

Auxiliary supply: (at 110V DC nominal supply)  
Less than 3 watts during timing.  
Less than 6 watts with output relays energized.

Sensing circuits: VA per phase all settings at 50Hz.

| I amps | 1A CT input | 5A CT input |
|--------|-------------|-------------|
| 1      | 0.25        | <0.01       |
| 5      | 6.3         | 0.18        |
| 10     | 25          | 0.72        |
| 20     | 100         | 2.9         |
| 25     | -           | 4.5         |
| 30     | -           | 6.5         |

## CT INPUT THERMAL WITHSTAND (Per phase)

|            | 1A CT | 5A CT * |
|------------|-------|---------|
| Continuous | 3.5   | 25      |
| 4.5s       | 39    | 250     |
| 3s         | 75    | 450     |
| 2s         | 90    | 550     |
| 1s         | 120   | 800     |
| 0.5s       | 180   | 1,000   |

\* M Series case terminals are limited to 400A for 1s.

## AUXILIARY SUPPLY

40 – 275V AC & 40-300V DC switchmode supply with power on LED  
20 – 70V DC switchmode supply with power on LED.

## REMOTE FLAG RESET FUNCTION

Application of a control voltage to the optional remote flag reset input will cause the bistable flag to be reset.

## STATUS INPUT OPERATING VOLTAGE (AC rejection filter)

The operating range of the status inputs are set using internal configuration switch 1. This setting may be pre defined when ordering.

18 - 300V DC Set Configuration Switch to **ON**  
In this mode the universal status input will reject AC signals that may be induced on the control wiring. Suitable for high security applications where a DC battery supply is available.

18 - 300V DC & 18 – 275V AC Set Configuration Switch to **OFF**  
In this mode the universal status input is designed to operate on both AC & DC input voltages. Suitable for applications where an AC auxiliary voltage is available such as transformer or generator control panels.

## STATUS INPUT MINIMUM OPERATING CURRENT

10mA P/U for 1ms then reducing to 1.5mA after 4ms.

While the function of the configuration switches may vary for special custom models, the standard functions & default settings are described in the Ordering Information section.

# Technical Data

## OUTPUT CONTACTS

Eight (8) C/O self reset contacts.  
Function as described in the wiring diagram.

## RELAY FAIL ALARM

A C/O alarm contact is maintained in the energized state when all of the following conditions are met:

- The auxiliary supply is applied
- The internal 24V DC rail is within acceptable limits
- The CPU hardware watchdog maintains a pulsing output

A CPU software watchdog records "suspect" events to an assert register and if necessary performs a soft restart.

## OUTPUT CONTACT RATINGS

IEC60255-0-2

|                              |                                 |
|------------------------------|---------------------------------|
| Carry continuously           | 5A AC or DC                     |
| Make & carry                 | 0.5s 20A AC or DC               |
| L/R ≤ 40ms & V ≤ 300V        | 0.2s 30A AC or DC               |
|                              | AC resistive 1,250VA            |
| Break capacity               | AC inductive 250VA @ PF ≤ 0.4   |
| I ≤ 5A & V ≤ 300V            | DC resistive 75W                |
|                              | DC inductive 30W @ L/R ≤ 40ms   |
|                              | 50W @ L/R ≤ 10ms                |
| Minimum number of operations | 10 <sup>6</sup> at maximum load |
| Minimum recommended load     | 0.5W limit 10mA / 5V            |

## TRANSIENT OVERVOLTAGE

IEC60255-5 CLASS III

Between all terminals & earth 5kV 1.2/50us 0.5J  
Between independent circuits without damage or flashover 5kV 1.2/50us 0.5J

## INSULATION COORDINATION

IEC60255-5 CLASS III

Between all terminals & earth 2.0kV RMS for 1 minute  
Between independent circuits 2.0kV RMS for 1 minute  
Across normally open contacts 1.0kV RMS for 1 minute

## AUXILIARY SUPPLY

IEC60255-11

Allowable breaks / dips in supply ≤ 20ms  
Collapse to zero from nominal voltage

## HIGH FREQUENCY DISTURBANCE

IEC60255-22-1 CLASS III

2.5kV 1MHz common mode ≤ 5% variation  
1.0kV 1MHz differential mode

## ELECTROSTATIC DISCHARGE

IEC60255-22-2 CLASS III

6kV contact discharge ≤ 5% variation

## FAST TRANSIENT

IEC60255-22-4

4kV, 5/50ns, 100KHz repetitive ≤ 5% variation

## TEMPERATURE RANGE

IEC68-2-1/2

Operating: -5 to +55°C  
Storage: -25 to +75°C

## HUMIDITY

IEC68-2-78

40°C & 95% RH non condensing

## CASE

Size 4M56-S draw out  
56 M4 screw terminals  
Flush panel mount or 4U high 1/4 width 19 inch rack mount

## SHIPPING DETAILS

Each relay is supplied individually packed in pre formed cardboard cartons with internal moulded polystyrene former.

Weight: 3.3Kg

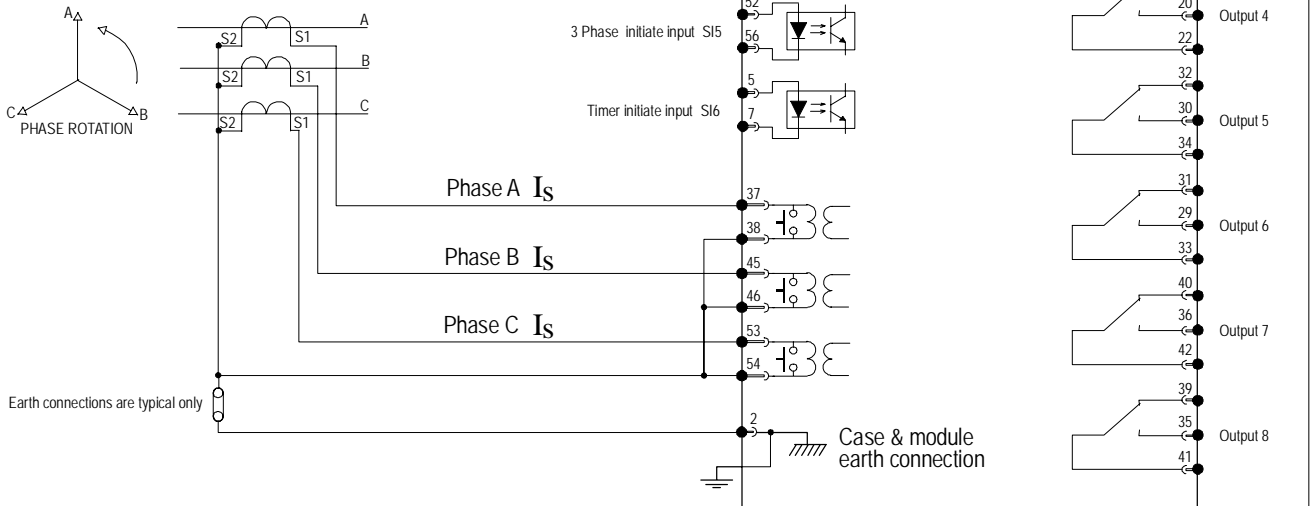
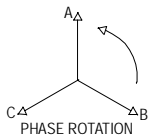
Size: 370(L) x 240(W) x 145(D)mm - Size 4 case

## ACCESSORIES SUPPLIED WITH EACH RELAY

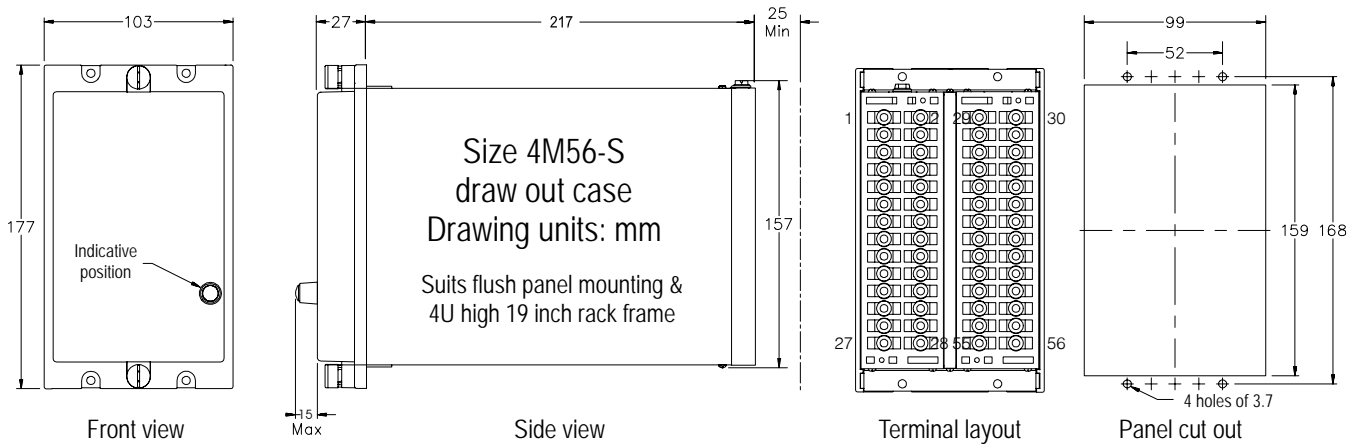
1 x M4 self threading mounting screw kit P/N 290-406-151  
2 x M4 terminal screw kit (28 per kit) P/N 290-407-153

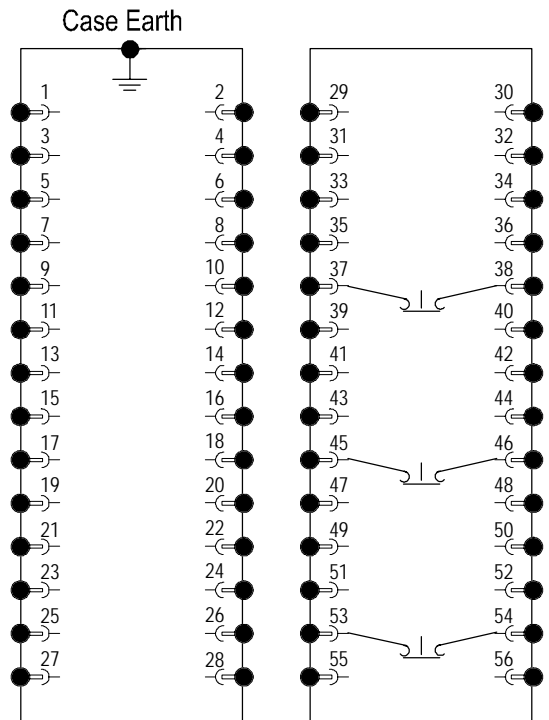
| Output Relay Configuration |                                   |                                  |
|----------------------------|-----------------------------------|----------------------------------|
|                            | Configuration switch 4 set to OFF | Configuration switch 4 set to ON |
| 1                          | φA Inst/Timed                     | 3φ Inst/Timed                    |
| 2                          | φB Inst/Timed                     | 3φ Inst/Timed                    |
| 3                          | φC Inst/Timed                     | 3φ Inst/Timed                    |
| 4                          | 3φ Inst/Timed                     | 3φ Inst/Timed                    |
| 5                          | φA Timed                          | 3φ Timed                         |
| 6                          | φB Timed                          | 3φ Timed                         |
| 7                          | φC Timed                          | 3φ Timed                         |
| 8                          | 3φ Timed                          | 3φ Timed                         |

Time delay outputs only available with timer option  
Relays 1-4 are marked 'Inst/Timed' as the timing function is controlled by the position of configuration switch 5.  
ON = Instantaneous  
OFF = Time delayed



2C65 wiring diagram





4M56 Case terminations (REAR VIEW)

# Ordering Information

### ORDER CODE

The order code determines the production build in the factory & cannot be changed in the field.

Generate the required order code as follows: e.g. 2C65-BBAB

|                     |                   |          |          |          |
|---------------------|-------------------|----------|----------|----------|
| <b>General Type</b> | <b>Order Code</b> |          |          |          |
| <b>2C65</b>         | <b>1</b>          | <b>2</b> | <b>3</b> | <b>4</b> |
|                     |                   |          |          |          |

#### 1 AUXILIARY SUPPLY RANGE

- A 20-70V DC
- B 40-275V AC & 40-300V DC

#### 2 CURRENT SETTING (% of nominal)

- A 5-50% All phases
- B 20-200% All phases
- C 20-200% Phase A & C + 5-50% E/F (In place of phase B)

#### 3 CT RATING (Nominal)

- A 1A
- B 5A

#### 4 TIMING FUNCTION

- A No time delay setting - Instantaneous overcurrent
- B Definite time delay - LED trip indication (Standard)
- C Definite time delay - Magnetic disc trip flag

### CONFIGURATION CODE (Optional specification)

The configuration code can be set in the field by withdrawing the relay module & following the instructions on the side plate label.

The configuration code may be specified at time of order so that the relay will be shipped from the factory pre-set to meet customer requirements. e.g. CONFIG-01011

If a configuration code is not specified the factory default will be set as indicated below. i.e. CONFIG-11111

|                                      |                               |          |          |          |          |
|--------------------------------------|-------------------------------|----------|----------|----------|----------|
| <b>Specify factory Configuration</b> | <b>Configuration Switches</b> |          |          |          |          |
| <b>CONFIG</b>                        | <b>1</b>                      | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
|                                      |                               |          |          |          |          |

#### 1 STATUS INPUT OPERATION

- 1 ON DC operation only - AC rejection ON (Default)
- 0 OFF AC / DC operation - AC rejection OFF

#### 2 CURRENT INITIATE INPUTS

- 1 ON Apply volts to enable (Default)
- 0 OFF Remove volts to enable

#### 3 TIMER INITIATE INPUT

- 1 ON Apply volts to enable (Default)
- 0 OFF Remove volts to enable

#### 4 OUTPUT RELAY FUNCTION

- 1 ON Three phase outputs (Default)
- 0 OFF Phase segregated outputs

#### 5 OUTPUT RELAY TIMING FUNCTION - Where timer fitted

- 1 ON Output relays 1-4 instantaneous (Default)
- 0 OFF Output relays 1-4 time delayed

## 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 yourself.
6. Store or transport the module in a conductive bag.

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.





## 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.

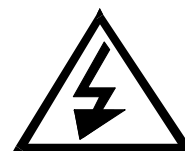
### Explanation of Symbols & Labels

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

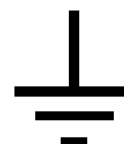


**Caution:** risk of electric shock



### 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 shipping documentation pouch.  
Address label on top of carton.



Inner packing carton showing front label detailing the customer name, order number, relay part number & description, the relay job number & packing date. (Size 2 inner packing carton depicted)



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## Unpacking (Continued)



Inner packing carton with lid open showing protective foam insert.

CD depicted supplied with digital relay models or upon request at time of order.

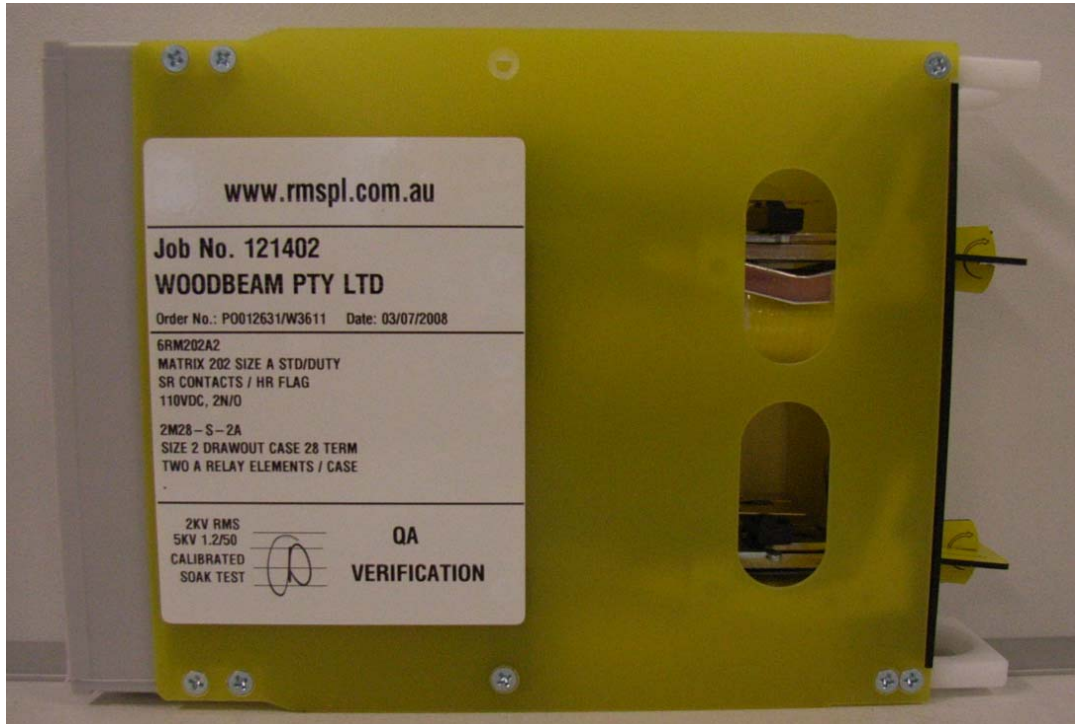


Inner packing carton with protective foam insert removed showing relay location.

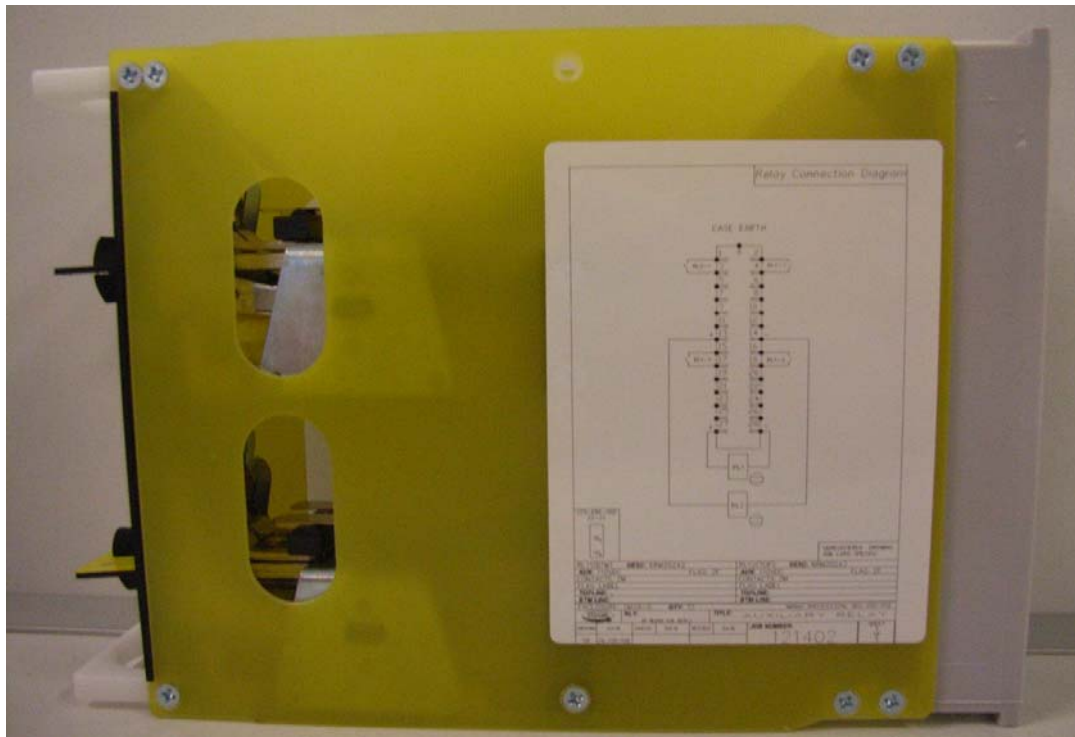


Where mechanical flags are fitted the yellow transit wedge must be removed before operation using a gentle twisting action. The wedge should be stored with the original packaging material.

**Relay Module Side Label Depicting Product Details**



**Relay Module Side Label Depicting Wiring Diagram (6R MATRIX relays only)**





## Accessories Supplied With Each Relay



Self threading M4 mounting screws



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 its efficiency.



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### **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>



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## 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.

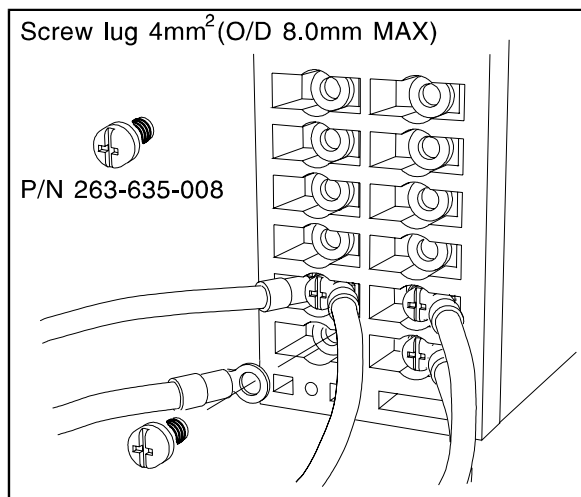
Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

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<sup>2</sup>, 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.



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### **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.

Carefully remove any elastic bands/packing fitting for transportation purposes.

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

Particular attention should be paid to the correct wiring and value of any external resistors indicated on the wiring diagram/relay rating information.

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.

If a test block system is to be employed, the connections should be checked to the scheme diagram, particularly that the supply connections are to the 'live' side of the test block.

### **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.



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## 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 SECONDARY 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 switches

With the relay removed from its case, check electrically that the CT shorting switch is closed.

### 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.



## 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.



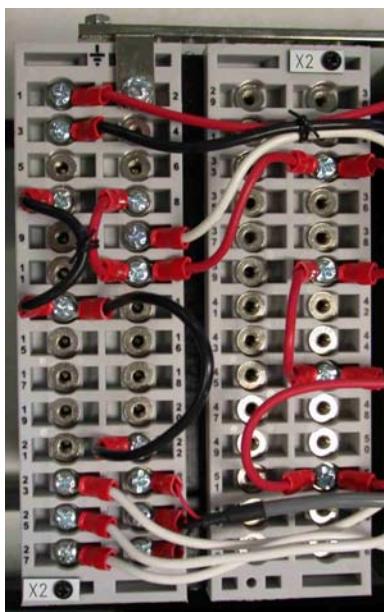
Remove cover by unscrewing black thumb screws & withdraw the relay module from the case.

### 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 terminals



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
- ◆ Fault Setting Tests by Secondary Injection
- ◆ Tests using Load Current
- ◆ Check the continuity of the neutral CT loop with a bell test set or an ohmmeter



## 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: |
|----------------|---------------|---------------|--------------------|----------------|---------------|



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## **Australian Content**

Unless otherwise stated the product(s) quoted are manufactured by RMS at our production facility in Melbourne Australia. Approximately 60% of our sales volume is derived from equipment manufactured in house with a local content close to 90%. Imported components such as semi-conductors are sourced from local suppliers & preference is given for reasonable stock holding to support our build requirements.

## **Quality Assurance**

RMS holds NCSI (NATA Certification Services International), registration number 6869 for the certification of a quality assurance system to AS/NZS ISO9001-2008. Quality plans for all products involve 100% inspection and testing carried out before despatch. Further details on specific test plans, quality policy & procedures may be found in section A4 of the RMS product catalogue.

## **Product Packaging**

Protection relays are supplied in secure individual packing cardboard boxes with moulded styrene inserts suitable for recycling. Each product & packing box is labeled with the product part number, customer name & order details.

## **Design References**

The products & components produced by RMS are based on many years of field experience since Relays Pty Ltd was formed in 1955. A large population of equipment is in service throughout Australia, New Zealand, South Africa & South East Asia attesting to this fact. Specific product & customer reference sites may be provided on application.

## **Product Warranty**

All utility grade protection & auxiliary relay products, unless otherwise stated, are warranted for a period of 24 months from shipment for materials & labour on a return to factory basis. Repair of products damaged through poor application or circumstances outside the product ratings will be carried out at the customer's expense.

## **Standard Conditions of Sale**

Unless otherwise agreed RMS Standard Terms & Conditions (QF 907) shall apply to all sales. These are available on request or from our web site.



## **Relay Monitoring Systems Pty Ltd**

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