



6R MATRIX User Guide

Auxiliary, Trip & Supervision Relays

relay monitoring systems pty ltd

Advanced Protection Devices



User Guide



Test Manual

6R MATRIX User Guide

About This Manual

This User Guide covers all 6R MATRIX relays manufactured from May 2003. 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 6R MATRIX 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/6R_MATRIX_user_guide.pdf

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

How this guide is organised

This guide is divided into five parts:

Part 1 Overview

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Part 5 Maintenance

Mechanical Inspection

Test Intervals

Defect Report Form



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

Due to RMS continuous product improvement policy this information is subject to change without notice. 6R MATRIX_Guide/lss B/10/06/03



Production Testing

This User Guide covers all 6R MATRIX 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, output contact arrangement, relay functionality etc.

The product ordering code described in the Technical Bulletin is used to generate a unique *standard* version of the relay specification & takes the form:

- 2HSMaaa - b - c - d - e High speed tripping relays
- 6RMaaa - b - c - d - e Auxiliary relays
- 1TMaa - b - c - d - e - f - g Supervision relays

where the	aa(a)	is the relay function number
	b	is the element size which helps determine the case size
	c	is the contact duty
	d	is the nominal operate voltage
	e	is the contact arrangement
	f	is the flag operation (If applicable)
	g	is the operating time (If applicable)

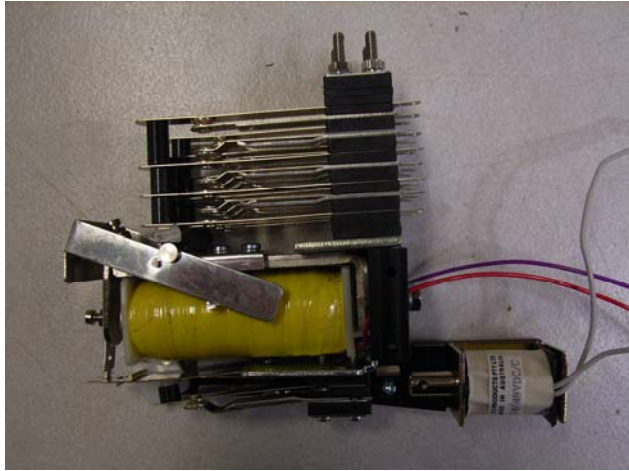
The case is always specified separately to the relay element as this allows multiple & different relay element to be fitted in a single case.

Where a specific relay design is required for repetitive ordering a type number reference code is generated. This ensures that special wiring configurations are maintained across production batches.

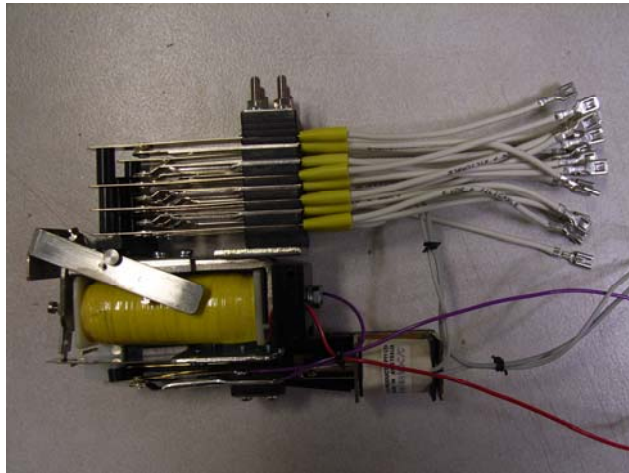
Each 6R MATRIX version is supplied with a wiring diagram affixed to side of the draw out module plus a Test Certificate.

Production testing is carried out at a 100% level of factory production to verify the basic performance of the relay to the published Technical Bulletin. This includes high voltage pressure tests & operating performance.

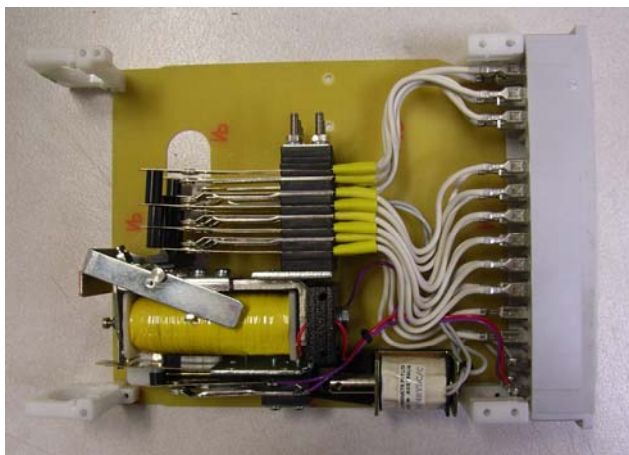




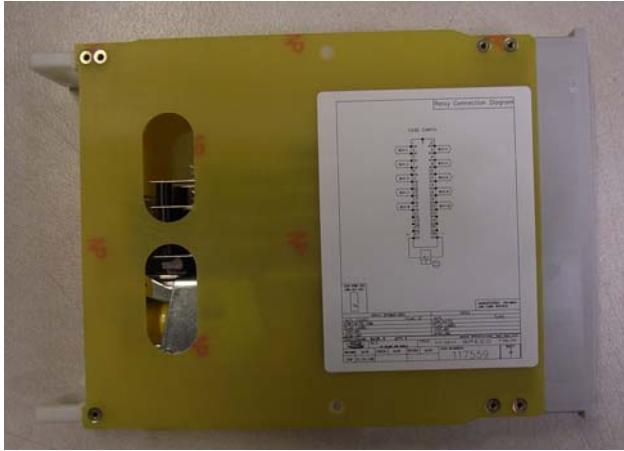
Example of a 2HSM high speed trip relay element before wiring & assembly into draw out relay module.



Contact wiring fitted.



Wiring to rear terminal block plug & module side plate.



Draw out module completed showing wiring diagram position.



Fitting outer case.



Technical Bulletin

The detailed technical attributes, functional description & performance specifications for the 6R MATRIX are described in the attached Technical Bulletin. For the most up to date version go to:

www.rmspl.com.au/handbook/6R MAT.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:

- Technical Bulletin
- User Guide

Features

- Rugged modular construction
- Rack or flush mounting
- Range of function types
- Draw out module
- M4 screw terminals
- Operating & reset coils are available for 24, 32, 48, 110, 125 or 250V DC nominal
- Time delay operate options
- Contacts are of fine silver designed & manufactured to ensure low resistance & high reliability
- Optional gold plated contacts suitable for low currents
- Magnetic blowouts to further enhance contact breaking capability may be specified
- Custom contact configuration
- Custom labeling
- High visibility electro-mechanical flag indication
- Made in Australia

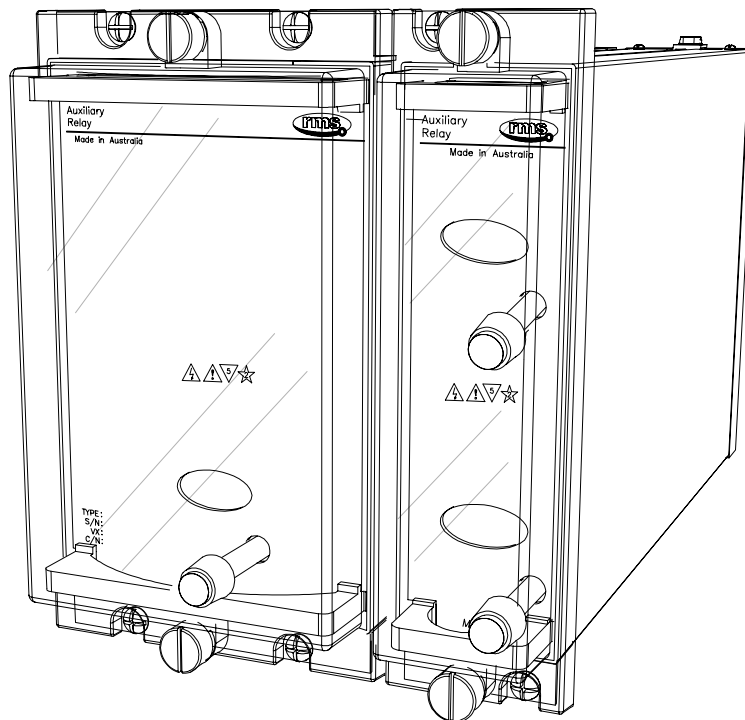
Application

The 6R MATRIX range has been developed to provide design engineers with a modular system of auxiliary relays to meet a wide variety of system configurations. Based on our well proven 6R heavy duty control relay, the 6R MATRIX system offers numerous benefits:

- ▶ Modular configuration to simplify panel layout & circuit design
- ▶ High packing density to reduce panel space requirements
- ▶ Standard component design to reduce delivery lead times
- ▶ Case suitable for both flush panel & 19 inch rack mounting
- ▶ Standard draw out module
- ▶ Heavy duty M4 screw terminals

Refer also to the following RMS data sheets for detailed information on product applications & technical specifications:

- [6R Relay Series](#)
- [6R Technical Data Supplement](#)
- [M Series MATRIX Case System](#)
- [6RM QUAD 4 Element Flag Relays](#)
- [6R MATRIX Pre Defined Relays](#)



Functional Elements

	Series	Page
HIGH SPEED TRIPPING RELAYS	2HSM	4
AUXILIARY RELAYS	6RM	8
TIME DELAY ELEMENTS	2TM649	11
TRIP CIRCUIT SUPERVISION	1TM	12

Cases

	Series	Page
Relay Construction	M	2
Case System Summary	M	3
MATRIX Case Details	M	15

Introduction

Made in Australia

The effect of a fault on a power system is dependent on the speed with which the fault can be detected & isolated. Modern protection schemes incorporate ever increasing functionality through the application of digital techniques to protection relay technology. The requirement for highly reliable tripping & control relay elements does however remain & often constitutes a significant cost & space requirement for protection panel designs. The 6R MATRIX system fulfills this need by providing a compact, flexible & cost effective solution.

6R MATRIX Construction

Specification Process

- ▶ Select the functional elements required to meet system design requirements;
- ▶ Complete the options section for each functional element & complete details;
- ▶ Select case & accessories;
- ▶ Group functional elements to fill cases such that panel space is minimized.

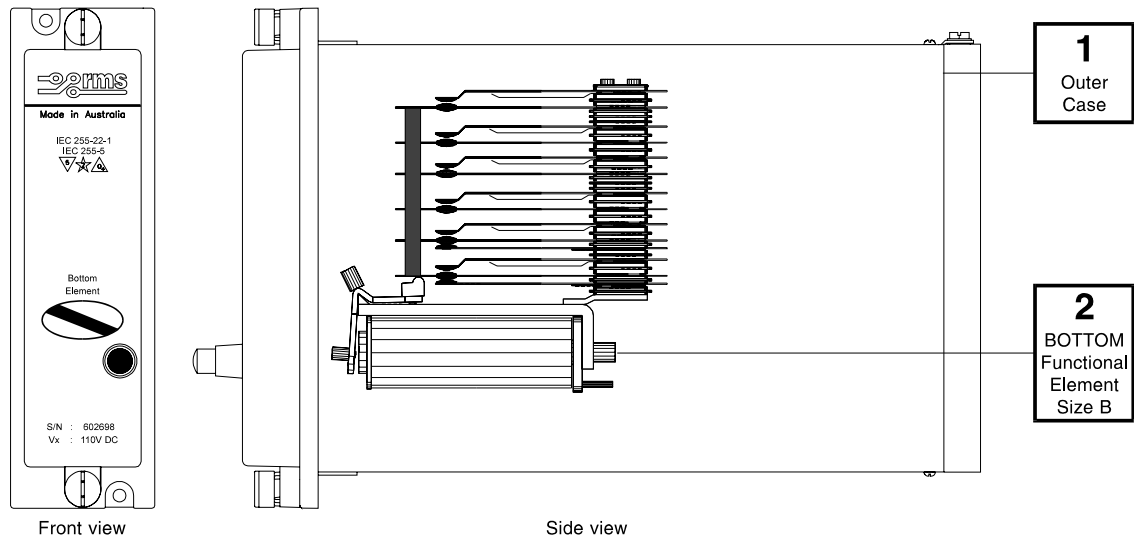
Each 6R MATRIX relay is comprised of two main parts:

1. Outer casing
2. Functional element(s)

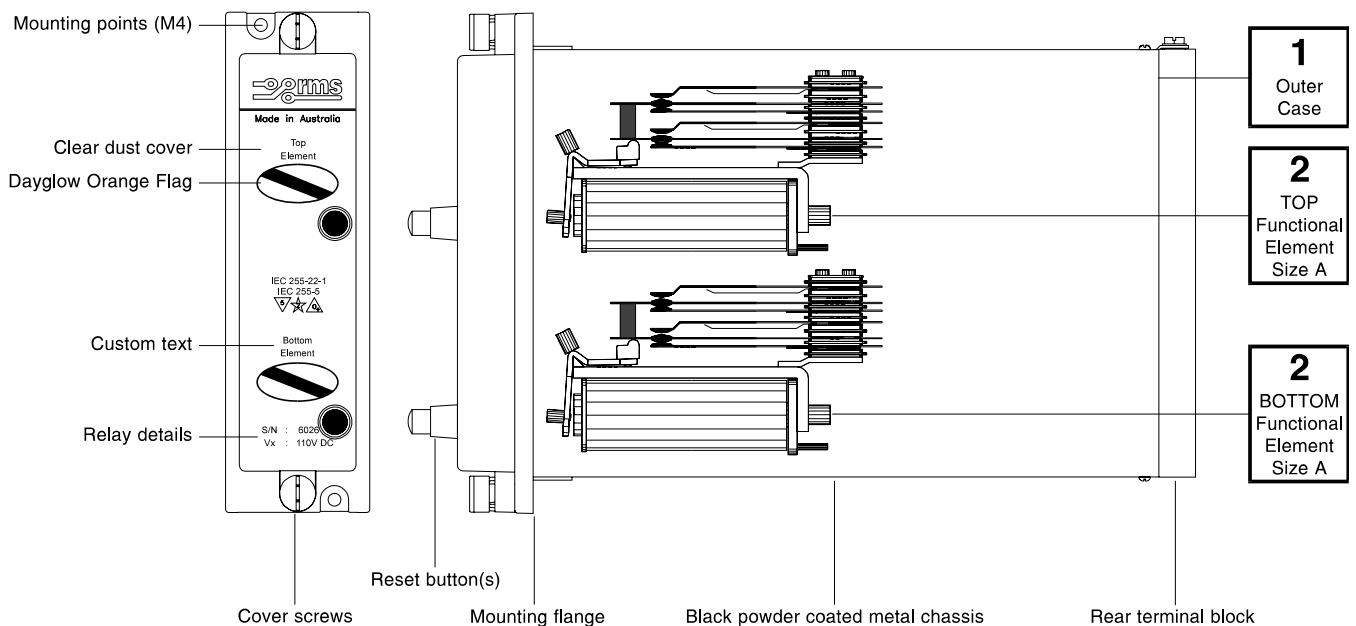
The completed relay is shipped from the factory fully assembled but for flexibility, each part is specified & numbered separately.

The main components & features are depicted below for a single element & a double element both mounted in a size 2 M Series case:

One element per case



Two elements per case



Case Mounting

The following standard features are provided:

- RACK & FLUSH MOUNTING
- DRAW OUT RELAY MODULE
- REAR M4 SCREW TERMINALS

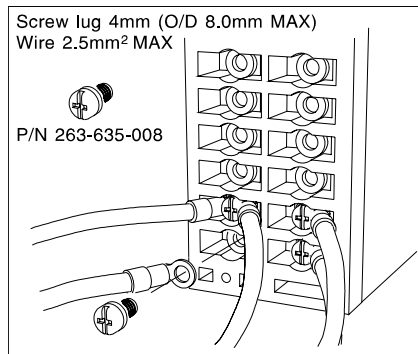
Case Construction

The outer case is manufactured from zinc coated mild steel providing considerable strength & black powder coated surface finish for corrosion protection. Relay elements are mounted on fabricated fibreglass & Acetal components to provide reliable electrical isolation & simple cost effective construction.

Terminal Blocks

High quality moulded terminal block(s) are utilized. The draw out function is made possible through the use of inner & outer terminal blocks, each with silver plated contact fingers to provide high current rating & very low electrical resistance.

M4 screw terminals allow 2x crimp lug connections per point. Space efficient design allows 28 contact points per terminal block.



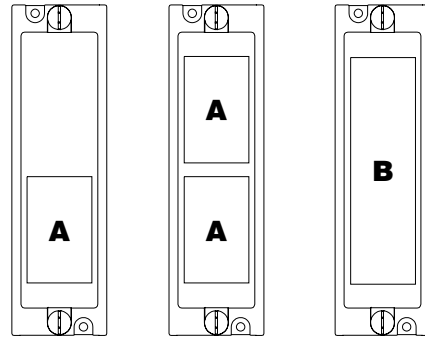
Reset Buttons

Latching relays are provided with front mounted reset buttons.

Flag Indicators

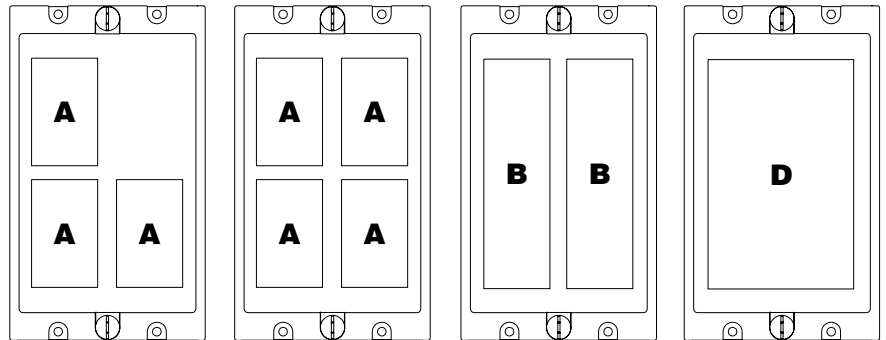
Each relay element is supplied with an operation (target) indicator. The indicator consists of a high visibility solid day glow orange mechanical flag which drops on energisation or de-energisation.

Case System Summary



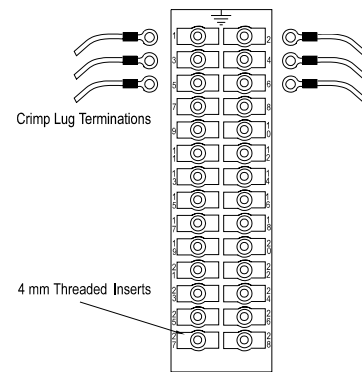
1 X A Element 2M28-S-1 case
2 x A Element 2M28-S-2 case
1 x B Element 2M28-S-1 case

Size 2M Case Element Fit

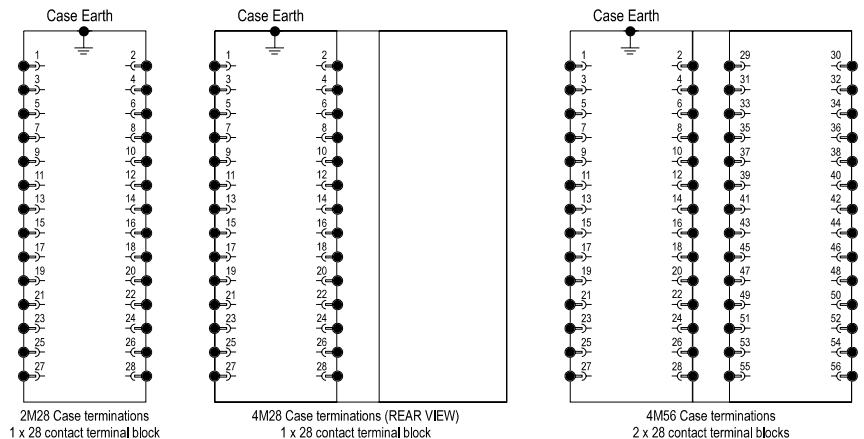


3 x A Element 4M28-S-3 or 4M56-S-3 case
4 x A Element 4M28-S-4 or 4M56-S-4 case
2 x B Element 4M28-S-2 or 4M56-S-2 case
1 x D Element 4M28-S-1 or 4M56-S-1 case

Size 4M Case Element Fit



Case terminations (Rear view)



Application

The effect of a fault on a power system is dependent on the speed with which the fault can be detected & isolated. The 2HS Series multi-contact high-speed trip relays are used for this isolating function providing simultaneous tripping outputs.

The operating element for the 6R MATRIX High Speed Trip functional elements are designated 2HSM. A high speed coil provides fast operation (<10ms at nominal DC operating voltage), with specially constructed anti bounce buffers ensuring effective damping of the contacts to avoid excessive bounce.

The Type 2HSM relays may be broadly divided into two groups:

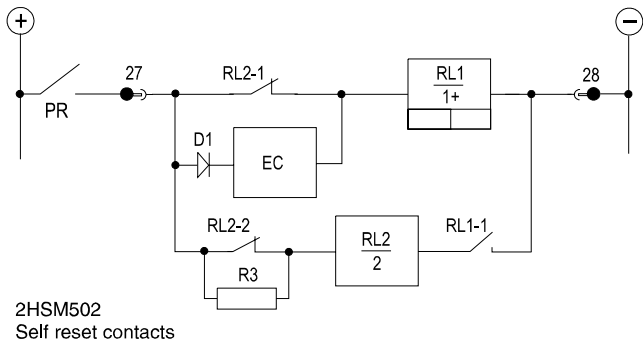
- Low burden tripping relays
- High burden tripping relays

High burden tripping relays are designed to withstand the 10uF capacitor discharge test such that the relay will not operate when a 10uF capacitor charged to 120% of nominal operating voltage is applied across the coil of the relay.

Low Burden Trip Relays

2HSM 502, 503, 504, 506, 507, 508, 509

These are low burden versions of types 2HSM relays respectively & are suitable for applications where immunity to capacitance discharge & high minimum operation currents are not required. Circuit diagrams for types 2HSM504, 506, 508, 509 are as per 2HSM514, 516, 518, 519 without C1, R1 or R2 loaded. Circuit diagrams for types 2HSM503 are as per 2HSM502 without the flag.



High Burden Trip Relays

These relays are suitable for application in high security circuit breaker tripping circuits & in particular where the initiating contact may be remote from the relay. The high burden may also allow the satisfactory operation of external series elements.

These relays have a high burden to provide immunity to capacitance discharge currents & power to the coil is cut off at operation or is economized to a low figure to provide thermal protection.

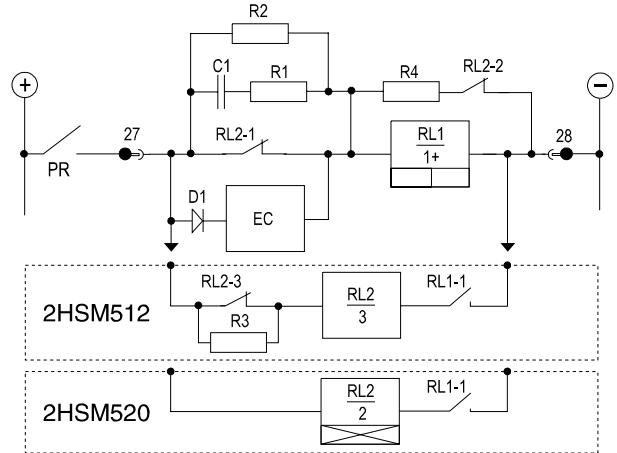
Operation of Series Elements

External relay elements are often employed for additional flagging & alarm functions. These elements are typically much slower than the primary high speed tripping relay so care must be taken to ensure reliable operation of the series element before the series trip signal is cut off or economized. In these circumstances a 2HSM relay with a time delayed (TD) cut off should be employed.

2HSM High Speed Tripping Relay Elements

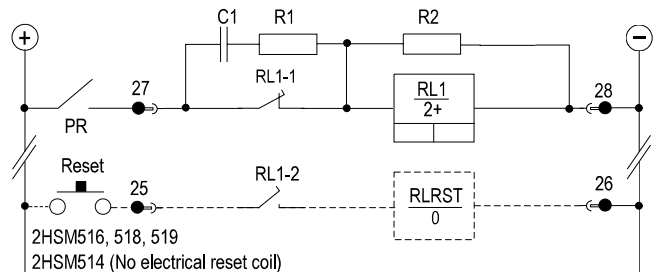
HIGH BURDEN SELF-RESETTING TYPE 2HSM 512, 513, 520

This type uses a contact on the main contact stack (RL1-1), to energize a separate economizing element. After operation this reduces the burden by switching a second coil in series with the main element. The 2HSM520 version has a "slug" delay relay element fitted to provide time for series relays to operate.



HIGH BURDEN LATCHING TYPE WITH INST. CUT OFF 2HSM 514, 516, 517, 518, 519

These relays incorporate a break contact (RL1-b), in series with the operate coil. Located below the main contact stack, it is arranged to break the coil circuit once the relay mechanism has completely operated. This reduces the relay burden to zero when the mechanical latching of the contact has occurred. An arc suppression circuit (R1 & C1), is used to protect RL1-b.



RELAYS WITH TIME DELAYED CUT OFF 2HSM 521, 522, 524, 525, 526 (See also 2HSM520 above)

These relays have time delayed cut off circuits such that the burden is reduced to zero 40 to 100ms, after energisation by the use of a second attracted armature "slug" delay element. This delay allows ample time for any flagging or auxiliary elements in series with the tripping relay to operate before cut off. Contact RL1-1 is fitted to ensure the latching contacts & flag cannot be reset until the initiate voltage has been removed. The 2HSM521 is a special version requiring an auxiliary supply to provide a 2s delay on drop off.

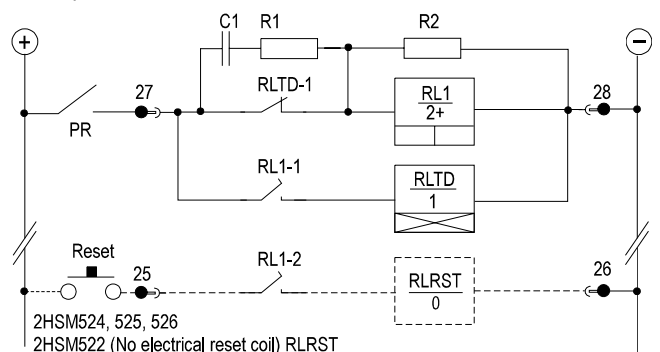


Table 1

Relay Type	Contact Refer note 1	Flag	Cut off	Burden	Element Size	Minimum Case
2HSM502	SR	HR	Econ.	Low	B	2M28-S-1
2HSM503	SR	NF	Econ.	Low	B	2M28-S-1
2HSM504		HR	Inst.	Low	B	2M28-S-1
2HSM506	ER	HR	Inst.	Low	B	2M28-S-1
2HSM507		ER	Inst.	Low	B	2M28-S-1
2HSM508		H/ER	Inst.	Low	B	2M28-S-1
2HSM509	H/ER	HR	Inst.	Low	B	2M28-S-1
2HSM512	SR	HR	Econ.	High	B	2M28-S-1
2HSM513	SR	NF	Econ.	High	B	2M28-S-1
2HSM514		HR	Inst.	High	B D	2M28-S-1 4M56-S-1
2HSM516	ER	HR	Inst.	High	B D	2M28-S-1 4M56-S-1
2HSM517		ER	Inst.	High	B D	2M28-S-1 4M56-S-1
2HSM518		H/ER	Inst.	High	B D	2M28-S-1 4M56-S-1
2HSM519	H/ER	HR	Inst.	High	B D	2M28-S-1 4M56-S-1
2HSM520	SR	HR	TD Econ.	High	B D D	2M28-S-1 4M28-S-1 4M56-S-1
2HSM521	SR	HR	TD Econ.	High	B D D	2M28-S-1 4M28-S-1 4M56-S-1
2s drop out delay Aux. supply required						
2HSM522		HR	TD	High	B D D	2M28-S-1 4M28-S-1 4M56-S-1
2HSM524	ER	HR	TD	High	B D D	2M28-S-1 4M28-S-1 4M56-S-1
2HSM525		H/ER	TD	High	B D D	2M28-S-1 4M28-S-1 4M56-S-1
2HSM526	H/ER	HR	TD	High	B D D	2M28-S-1 4M28-S-1 4M56-S-1

Maximum Contacts	
Magnetic Blowouts M or B*	Heavy Duty M or B*
1	2
9	13
9	13
10	13
9	12
9	12
9	12
9	12
9	13
9	13
10	13
20	20
9	12
19	19
9	12
19	19
9	12
19	19
9	12
19	19
5	8
10	13
-	20
5	8
10	13
-	20
-	5
10	13
-	20
-	3
10	12
-	20
-	3
10	12
-	20
-	3
10	12
-	20

KEY: H/ER - Hand / electrical reset SR - Self reset HR - Hand reset
 TD - Time delay 40 to 100ms ER - Electrical reset Econ. - Economy element
 M - Make (N/O) contacts B - Break (N/C) contacts Inst. - Instantaneous cut off
 Cont. - Continuously rated coil C/F - Consult factory NF - No flag

NOTES: 1. The Contact & Flag code should be read in conjunction with the section on flag & contact reset function on the following page.
 2. C/O - Changeover contacts may be specified but each C/O contact replaces 1.5 M or B contacts.

EXAMPLE: 2HSM512-B2 represents a high burden high speed relay with a self reset flag with a maximum of 9 M or 9 B (without magnetic blowouts), hand reset contacts. As the relay is an element size B, one of these elements may be fitted in a size 2M28-S-1 case.

Contact Stack Arrangement

The number of contacts indicated in Table 1 are the maximums that can be fitted for the element size. Fewer contacts may be specified to save cost. The operate time for relay elements with 14 to 20 contacts is <12ms at nominal operate voltage.

Mixed Contacts Stacks

Mixed M & B contact arrangements may be specified provided the total number does not exceed the maximum indicated in table 1 for the relay element size specified above. Changeover contacts (C/O), are also available but must be counted as 1.5 M or B contacts & the result rounded down to the nearest integer & not exceed the maximum indicated in table 1



Flag & Contact Reset Function

COMBINED OPERATION & COMBINED RESET

Types: 2HSM504, 507, 508, 514, 517, 518, 522, 525

With these types the flag & contacts operate & reset together. I.e.

When the relay is tripped the flag changes state & the contacts latch. Both the flag & contacts are reset if either the reset button is pressed or the electrical reset coil is energized.

COMBINED OPERATION & INDEPENDENT RESET

Types: 2HSM502, 506, 509, 512, 516, 519, 520, 521, 524, 526

With these types the flag & contacts operate together but may be reset independently. I.e. When the relay is tripped the flag changes state & the contacts latch. The contacts only are reset if the electrical reset coil is energized or the contact reset button is pressed. In both cases the flag is not reset. The flag can only be reset if the independent flag reset button is pressed.

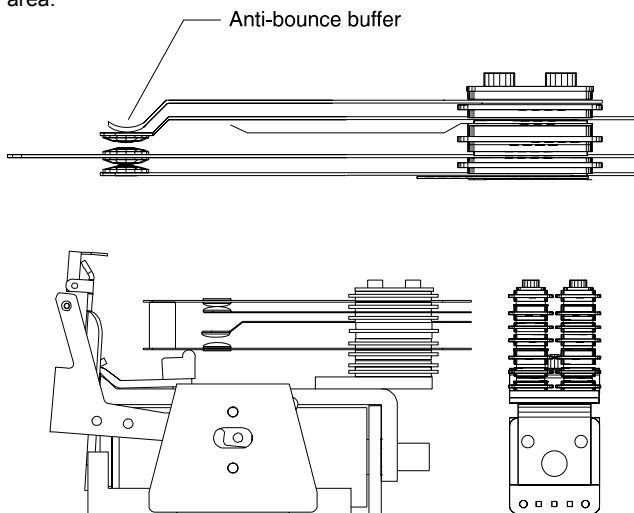
Contact Bounce & Self Cleaning

Contact bounce occurs due to the speed at which the contacts meet. If too much coil power is used then the contacts will come together with too much force causing excessive bounce. It is therefore important to only fit relay coils with adequate power to provide the force required to switch the relay at the minimum operate voltage 65% of nominal.

In addition contact bounce can be greatly reduced through the addition of anti-bounce buffers. These components are added to each contact to provide a damping wiping motion when the contacts meet thus dissipating the force which would otherwise produce bounce.

Contacts are constructed from silver / copper alloy, shaped & positioned to ensure very reliable, low resistance operation. Over travel of the contacts during each operation causes a wiping action ensuring a clean "make".

The design of the contact surface is spherical such that when the contacts are driven to an over travel position they actually wipe. This wiping motion is part of the damping action mentioned above but also provides a wiping action which serves to clean the contact area.



Flag Indicators

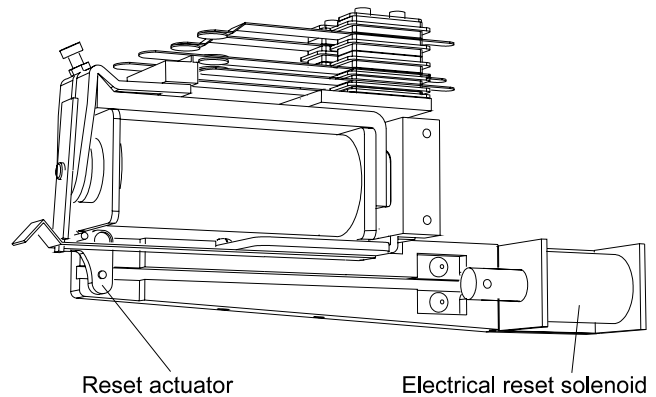
Each relay element is supplied with an operation (target) indicator. The indicator consists of a high visibility solid day glow orange mechanical flag which drops on energisation (Type 2F).

2HSM High Speed Tripping Relay Elements

Magnetic Blowouts

Heavy duty contacts may be optionally fitted with magnetic blowouts to further increase the DC breaking capacity. This feature is particularly useful for breaking highly inductive loads such as that presented by high voltage circuit breaker trip coils. Refer to the 6R Technical Data Supplement for details.

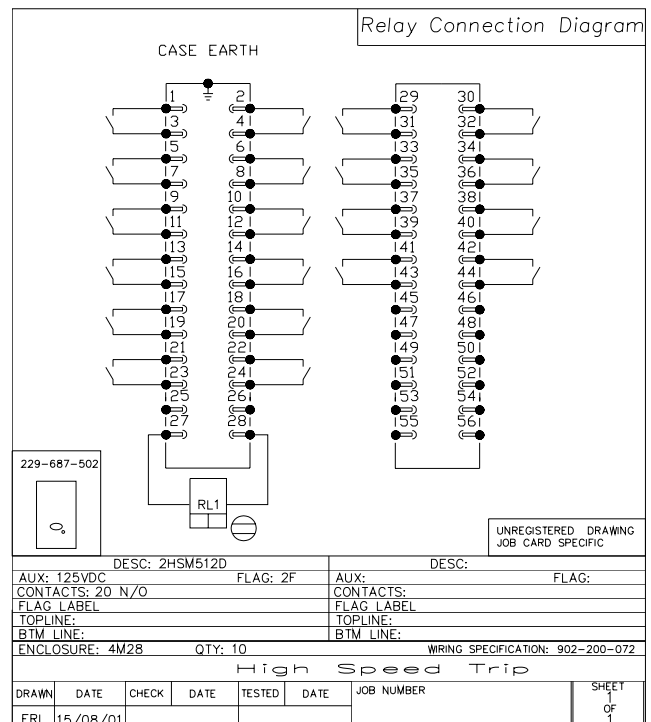
Electrical Reset Mechanism



Where electrical reset mechanisms are fitted the

Wiring Diagram Example

6R MATRIX relays have custom wiring determined by the number & configuration of the contacts. To convey this information a label is attached to the internal side plate depicting the wiring information. As this stays with the product (unlike the paper wiring diagram also supplied), it cannot be lost.





OPERATING BURDEN (Burden during pick up at nominal)
 Low burden relays: 50W Maximum
 High burden relays: 150W Maximum
 Reset coils: 40W Maximum

OPERATED BURDEN (Burden after pick up at nominal)
 Self reset relays: 5W Maximum
 Latching relays: Zero
 Reset coils: Zero

Add 2 Watts for relays fitted with time delayed cut-off contact.

COIL THERMAL RATING

All operate, reset & time delayed circuits are designed to withstand continuous application of 120% of nominal voltage. The high speed operate coil element (150 watt max.) has a thermal rating of 30 seconds, however this is protected by use of the series cut-off contact arrangement (INSTANTANEOUS or TIME DELAYED), or series coil (ECONOMY COIL).

OPERATING TIME

Less than 10ms at nominal rated operating voltage: <14 contacts
 Less than 12ms at nominal rated operating voltage: 14 - 20 contacts

OPERATING VOLTAGE

Guaranteed operation between 65% & 120% of nominal rated DC operating voltage. 2HSM relays are "All or Nothing" devices & continuous application of AC or DC voltages above or below the pick up level is not recommended. Self reset relays will reset at not less than 5% of rated voltage.

AC VOLTAGES

Standard 2HSM relays are not intended for operation with AC voltages. Application of continuous AC voltage below the pick up level will cause excessive power dissipation in the capacitor discharge resistor & likely result in thermal damage to the device.

MINIMUM OPERATING CURRENT

Low burden relays: 50mA
 High burden relays: 100mA

ELECTRICAL RESET

Operate voltage: As per specified operate voltage.
 Reset cut off: Instantaneous with main relay reset.

Continuous application of both the high speed pick up coil & the reset coil (or contact reset button), will defeat the cut throat contact & result in overheating & thermal damage to both coils & associated circuit.

INSULATION WITHSTAND in accordance with IEC 255-5:

2KV RMS & 1.2/50 5KV impulse between:

- ◆ all input terminals & frame
- ◆ all output terminals & frame
- ◆ all input & output terminals
- ◆ each input group
- ◆ each output group

1KV RMS between open contacts.

6R RELAY CONTACT RATINGS

Make & Carry Continuously

3,000 VA AC resistive with maximums of 660V & 12A
 3,000 W DC resistive with maximums of 660V & 12A

Make & Carry for 3 Seconds

7,500 VA AC resistive with maximums of 660V & 30A
 7,500 W DC resistive with maximums of 660V & 30A

AC Break Capacity

3,000 VA AC resistive with maximums of 660V & 12A

DC Break Capacity (Amps)

Voltage			24V	48V	125V	250V
Resistive rating	1	12	12	10	5	
	2	12	2	0.5	0.25	
L/R=40ms	Maximum break	1	30	15	5.5	3.5
		2	12	1	0.25	0.15
	1K operations (N3 Rating)	1	12	12	5	2.5

1 = With magnetic blowouts 2 = Without magnetic blowouts



2HSM Ordering Codes

Also refer to the RMS Relay Builder: www.rmspl.com.au/6rmat.htm

Generate the required ordering code as follows:
 e.g. 2HSM514B1-D-8M2B-2M28S1

General Class	Order Code					
	1	2	3	4	5	6
2HSM	-					

1 RELAY FUNCTION

Specify relay functional number from table 1.

2 ELEMENT SIZE

B Size B Up to 1 element in a 2M case
 D Size D Up to 1 element in a 4M case

3 CONTACT DUTY

1 Heavy duty contacts – magnetic blowouts fitted
 2 Heavy duty contacts

4 NOMINAL OPERATE VOLTAGE

A 24V DC D 110V DC
 B 32V DC E 125V DC
 C 48V DC F 250V DC

5 CONTACT ARRANGEMENT

Specify the number of "MAKES" followed by M; i.e. 10M
 Specify the number of "BREAKS" followed by B; i.e. 2B
 Specify the number of "CHANGEOVER" followed by C; i.e. 3C

6 CASE CONFIGURATION

- Element only – No case
 2M28S1 One element in a 2M28-S case
 4M28S1 One element in a 4M28-S case
 4M56S1 One element in a 4M56-S case
 4M28S2 Two identical elements in a 4M28-S case
 4M56S2 Two identical elements in a 4M56-S case

ELEMENT TEXT (Optional)

Element part number is used as the default

Application

The operating element for the 6R MATRIX Auxiliary Relay functional elements are designated 6RM & are based on our 6R Series relays.

The type 6RM Series elements are low burden auxiliary relays which can be used where a scheme demands several contacts for event recording, alarm initiation, contact logic arrangements, etc.

The relay can be supplied fitted with heavy duty contacts & with heavy duty magnetic blow-outs fitted.

Contacts are constructed from silver / copper alloy, shaped & positioned to ensure very reliable, low resistance operation. Over travel of the contacts during each operation causes a wiping action ensuring a clean "make".

Heavy duty make, break & changeover contacts & heavy duty contacts fitted with magnetic blow-outs are available in various combinations. See table 2 below.

Heavy duty contacts fitted with magnetic blow-out are recommended for breaking heavy or highly inductive DC loads. When these are fitted, the number of contacts available may be reduced.

A 2TM649 adjustable time delay element may also be added to any of the size A 6RM elements.

Flag Indicators

Each relay element is supplied with a flag (target) indicator. The indicator consists of a high visibility solid dayglow orange mechanical flag which drops on energisation or de-energisation.

Resets

Resetting of flags & contacts may be either manual at the relay panel or electrical via a remote signal or both. The provision to separately reset the flag & contacts is also possible.

Electrical Reset Function

COMBINED CONTACT / FLAG OPERATION & RESET 6RM210

With these types the flag & contacts operate & reset together. i.e.

When the relay is operated the flag changes state & the contacts latch. Both the flag & contacts are reset if either the reset button is pressed or the electrical reset coil is energized.

COMBINED CONTACT / FLAG OPERATION & INDEPENDENT RESET 6RM211

With these types the flag & contacts operate together but may be reset independently. i.e.

When the relay is operated the flag changes state & the contacts latch. The contacts only are reset if the electrical reset coil is energized or the contact reset button is pressed. In both cases the flag is not reset.

The flag can only be reset if the independent flag reset button is pressed.

Coil Operating Power

Relay elements may be specified with 1W or 2W operating power for relay elements with up to 9 contacts. 2W coils have the advantage of faster operation for armature operated contacts but obviously generate more heat when continuously energized. A second advantage which is particularly useful in high humidity climate installations is that the thicker gauge copper wire used in 2W coils is less susceptible to corrosion & going open circuit.

Relay elements with 10-20 contacts are fitted with a 5W nominal coil.

6RM Auxiliary Elements

Operating Times

INSTANTANEOUS OPERATING TIMES (6RM2xx Series)

Contact Stack	Pick up* 1W coil	Pick up* 2W coil	Drop out* 1W coil	Drop out* 2W coil
1 N/O	25	22	34	35
2 N/O	32	25	24	25
3 N/O	35	25	18	19
4 N/O	40	30	14	15
6 N/O	50	35	12	13
9 N/O	65	45	10	11
1 N/C	25	22	38	38
2 N/C	40	25	25	26
3 N/C	52	35	20	21
4 N/C	62	40	18	19
6 N/C	70	52	13	14
1 C/O	35	22	26	27
2 C/O	45	25	20	21
3 C/O	60	40	13	14
4 C/O	75	45	12	13
6 C/O	90	50	10	11
7 C/O	110	55	9	10

Table 2

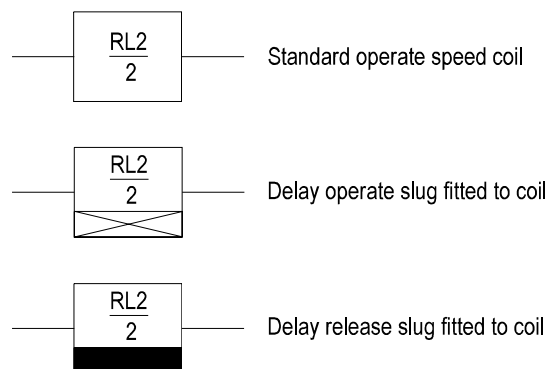
* NOTES ON OPERATING TIMES:

1. Tolerance on stated operate times: +/-10%
2. Operate times are in ms & refer to armature operated contacts at nominal stated coil operating voltage.
3. For flag operated contacts operate time is typically 60ms & is independent of the coil power.
4. 1W nominal coils are used as the default coil specification up to 9 N/O contacts. 5W coils are used for 10 to 20 contacts.

OPERATING TIMES WITH TIME DELAY SLUGS FITTED

DELAY ON DROP OFF Heel end slugs (HES)
Heel end slugs can be specified to provide delayed drop out times of up to 300ms. The more contacts specified the faster the drop out time.

DELAY ON PICK UP Armature end slugs (AES)
Armature end slugs can be specified to provide delayed pick up times of up to 150ms. The more contacts specified the slower the pick up time.



6RM Standard Versions

- ◆ There are 9 basic 6RM versions without a slug time delay.
- ◆ There are 4 versions with a slug delay release function.
- ◆ There are 9 versions with a slug delay operate function.

All versions are defined by the operation of the contact & flag reset mechanism & may be specified with contact configurations as described in table 2.

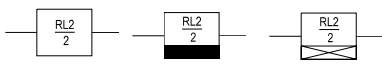
6R Element Part Numbers Timing Function										Maximum Contacts	
No Time Delay	Delay Release	Delay Operate	Contact	Flag	Element Size	Minimum Case	Magnetic Blowouts		Heavy Duty		
							M or B*	M or B*			
							1	2			
											
6RM201	6RM301	6RM401	SR	NF	A	2M28-S-1	4	6			
					B	2M28-S-1	10	13			
					D	4M56-S-1	20	20			
6RM202	6RM302	6RM402	SR	HR	A	2M28-S-1	4	6			
					B	2M28-S-1	10	13			
					D	4M56-S-1	20	20			
6RM203	6RM303	6RM403	SR		A	2M28-S-1	4	6			
					B	2M28-S-1	10	13			
					D	4M56-S-1	20	20			
6RM204	6RM304	6RM404	H/SR	HR	A	2M28-S-1	1SR / 1HR	2SR / 2HR			
					D	4M28-S-1	2SR / 2HR	4SR / 4HR			
6RM206	-	6RM406	HR		A	2M28-S-1	4	6			
					B	2M28-S-1	10	13			
					D	4M56-S-1	20	20			
6RM207	-	6RM407	ER		A	2M28-S-1	1	2			
					B	2M28-S-1	9	12			
					D	4M56-S-1	19	19			
6RM208	-	6RM408	ER	HR	B	2M28-S-1	9	12			
					D	4M56-S-1	19	19			
6RM210	-	6RM410	H/ER		A	4M28-S-1	1	2			
					B	2M28-S-1	9	12			
					D	4M56-S-1	19	19			
6RM211	-	6RM411	H/ER	HR	B	2M28-S-1	9	12			
					D	4M56-S-1	19	19			

Table 3

KEY: H/ER - Hand / electrical reset SR - Self reset HR - Hand reset
H/SR - Hand / self reset ER - Electrical reset C/F - Consult factory
M - Make (N/O) contacts B - Break (N/C) contacts NF - No flag

*C/O - Changeover contacts may be specified but EACH C/O contact replaces 1.5 M or B contacts.

EXAMPLE: 6RM206-A1 represents an auxiliary relay with a maximum of 4 heavy duty M or B (Magnetic blowouts fitted), hand reset contacts.

As the relay element is a size A, two of these elements may be fitted in a size 2M28-S-2 case.



NUMBER OF OUTPUT RELAY CONTACTS

The number of contacts & configuration are specified in table 2. The number of enclosure terminals available is the limiting factor necessitating some contacts to be connected to a common circuit.

OPERATING BURDEN (Burden during pick up at nominal)

Operate coils: 1 or 2W Up to 9 contacts
5W 10-20 contacts
Reset coils: 40W Maximum

OPERATED BURDEN (Burden after pick up at nominal)

Self reset relays: 5W Maximum
Latching relays: Zero
Reset coils: Zero

Add 2 Watts for relays fitted with time delayed cut-off contact.

OPERATING VOLTAGE

75% to 120% of nominal rated DC operating voltage.

THERMAL RATING

All operate & reset circuits are designed to withstand continuous application of 120% of nominal voltage

ELECTRICAL RESET

Operate voltage: As per specified operate voltage.
Reset cut off: Instantaneous with main relay reset.

Continuous application of both the operate coil & the reset coil will & result in overheating & thermal damage to the reset coil.

INSULATION WITHSTAND in accordance with IEC 255-5:

2KV RMS & 1.2/50 5KV impulse between:

- ◆ all input terminals & frame
- ◆ all output terminals & frame
- ◆ all input & output terminals
- ◆ each input group
- ◆ each output group

1KV RMS between open contacts.

6R RELAY CONTACT RATINGS

Make & Carry Continuously

3,000 VA AC resistive with maximums of 660V & 12A
3,000 W DC resistive with maximums of 660V & 12A

Make & Carry for 3 Seconds

7,500 VA AC resistive with maximums of 660V & 30A
7,500 W DC resistive with maximums of 660V & 30A

AC Break Capacity

3,000 VA AC resistive with maximums of 660V & 12A

DC Break Capacity (Amps)

Voltage			24V	48V	125V	250V
Resistive rating		1	12	12	10	5
		2	12	2	0.5	0.25
L/R=40ms	Maximum break	1	30	15	5.5	3.5
		2	12	1	0.25	0.15
	1K operations (N3 Rating)	1	12	12	5	2.5

1 = With magnetic blowouts 2 = Without magnetic blowouts

Refer to the 6R Contact Rating supplementary data sheet for further details on contact specifications & magnetic blowout function.

6RM Ordering Codes

Also refer to the RMS Relay Builder: www.rmspl.com.au/6rmat.htm

Generate the required ordering code as follows:

e.g. 6RM202B1-D-8M2B-AA-4M28S2

General Class	Order Code							
	1	2	3	4	5	6	7	8
6RM	-							

1 RELAY FUNCTION

Specify relay functional number from table 3.

2 ELEMENT SIZE

A Size A Up to 2 elements in a 2M case
B Size B Up to 1 element in a 2M case
D Size D Up to 1 element in a 4M case

3 CONTACT DUTY

1 Heavy duty contacts – magnetic blowouts fitted
2 Heavy duty contacts

4 NOMINAL OPERATE VOLTAGE

A 24V DC H 24V AC
B 32V DC K 60V AC
C 48V DC L 110V AC
D 110V DC P 240V AC
E 125V DC
F 250V DC

5 CONTACT ARRANGEMENT

Specify the number of "MAKES" followed by M; i.e. 10M
Specify the number of "BREAKS" followed by B; i.e. 2B
Specify the number of "CHANGEOVER" followed by C; i.e. 3C

6 FLAG OPERATION

- No flag
A Flag drops on energisation (Factory default)
B Flag drops on de-energisation

7 OPERATING TIME (Refer table 2)

A 1W operating coil (Factory default) (5W for 10-20 contacts)
B 2W operating coil

8 CASE CONFIGURATION

- Element only – No case
2M28S1 One element in a 2M28-S case
2M28S2 Two identical elements in a 2M28-S case
4M28S2 Two identical elements in a 4M28-S case
4M28S3 Three identical elements in a 4M28-S case
4M28S4 Four identical elements in a 4M28-S case
4M56S1 One element in a 4M56-S case
4M56S2 Two identical elements in a 4M56-S case
4M56S3 Three identical elements in a 4M56-S case
4M56S4 Four identical elements in a 4M56-S case

ELEMENT TEXT (Optional)

Element part number is used as the default



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

Due to RMS continuous product improvement policy this information is subject to change without notice. 6RMATRIX/Iss. AU - 09/03/2012/10/17

Application

The Series 2TM649 Time Delay on energisation relays are suitable for utility grade protection & control schemes where accurate & consistent time delays are required.

The 2TM649 version used in the MATRIX Relay system occupies the same space as a size A element & may be used to provide a time delay function when combined with any size A 6RM element. The two A elements when combined consume the space of a size B element.

Minimum case size: 2M28-S-1A

It is possible to combine a 2TM649 size A element with a size B 6RM element but the result must be considered as a size D element.

Minimum case size: 4M28-S-1D

Operation

Combining the 6RM & 2TM649 elements provides the proven rugged reliability of an electro-mechanical relay driven from an electronic ripple count type timer.

Pulses from an on-chip oscillator are fed into a ripple counter which is programmed to give an output after a pre-set (binary) count is reached. Time setting is achieved by a dial mounted potentiometer located on the front panel which adjusts the oscillator frequency. The output of the ripple counter (2TM649) drives the heavy duty electromechanical relay (6RM) via a transistor switch.

This technique gives good repeatability & fast reset characteristics, although delays are provided which prevent spurious resetting for short term supply dips. Power failures of less than 20 milliseconds duration will not affect the operation of the timer which will continue timing out.

Technical Data

ACCURACY

+/-5% of max- setting

REPEATABILITY

+/-2% of setting **Note:** Repeat accuracy in particular is greatly improved when ambient temperature conditions & supply voltages are stable.

SUPPLY VOLTAGE

24, 32, 48, 110, 125, or 250V DC nom. with allowable variation of 75-120% of nominal.

BURDEN (110V AC unit)

3VA (approx.) during timing
5VA (approx.) whilst output relay is energized.

INSULATION WITHSTAND

In accordance with IEC 255-5:
2KV RMS between input & frame, output & frame, & output & input. 1.2/50 5KV impulse between each terminal & earth, between circuits not normally connected together & between terminals of the same circuit.

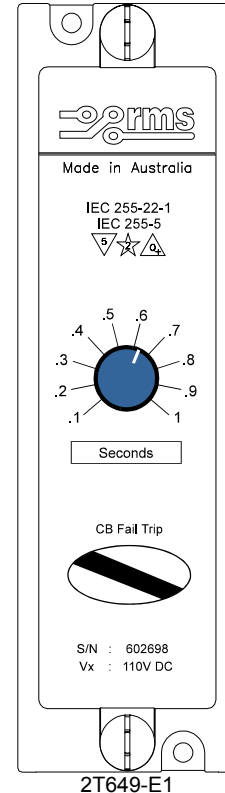
6R RELAY CONTACT RATINGS

Refer 6RM data.

NOISE IMMUNITY

Withstands the high frequency interference test detailed in IEC 255-22-1.

2TM649 Timer Options



Ordering Codes

The 2TM649 is available with five standard time delay ranges & seven standard operating voltages as follows. These must be specified when ordering as follows:

Generate the required ordering code as follows: e.g. 2TM649-D2

2TM649

1 NOMINAL OPERATE VOLTAGE

A	24V DC	D	110V DC
B	32V DC	E	125V DC
C	48V DC	F	250V DC

2 TIME RANGE

1	0.1 to 1s	4	3 to 30s
2	0.3 to 3s	5	10 to 100s
3	1 to 10s		

3 CASE CONFIGURATION

- Element only – No case

ELEMENT TEXT (Optional)

Element part number is used as the default

1TM Trip Circuit Supervision Elements

Application

The 1TM Series Relays provide fail safe supervision of CB trip circuits. Three models are available depending on the degree of supervision required & wiring configuration.

Supervision	Model Number			
	1TM10	1TM11	1TM12	1TM13
CB 52a contact	Yes	No	Yes	No
CB 52b contact	Yes	No	Yes	No
Trip supply	Yes	Yes	Yes	Yes
Trip coil continuity	Yes	No	Yes	No
Trip wiring continuity	Yes	No	Yes	No
Trip relay circuit	No	No	No	Yes

Table 4

The relay can be supplied fitted with heavy duty contacts & with magnetic blow-out fitted.

A significant safety feature is the fitting of internal resistors to limit the trip coil current to well below the circuit breaker trip coil operate current, should the relay be accidentally short circuited.

STANDARD SUPERVISION RELAYS AVAILABLE

Relay Type	Flag	Element Size	Case	Alarm Contacts
1TM10	Hand reset	B	2M28-S1	2 C/O
1TM11	Hand reset	B	2M28-S1	2 C/O
1TM12	Hand reset	D	4M28-S1	2 C/O
1TM13	Hand reset	B	2M28-S1	2 C/O

Table 5

FLAG OPERATION

Each relay element is supplied with a flag (target) indicator. The indicator consists of a high visibility solid dayglow orange mechanical flag.

Operation: Drops on coil de-energisation.
Reset: Hand reset.

THERMAL RATING

All 1TM relay element circuits are designed to withstand continuous application of 120% of nominal voltage.

6R RELAY CONTACT RATINGS

Refer 6RM data.

INSULATION WITHSTAND in accordance with IEC 255-5:

2KV RMS & 1.2/50 5KV impulse between:

- ◆ all input terminals & frame
- ◆ all output terminals & frame
- ◆ all input & output terminals
- ◆ each input group
- ◆ each output group

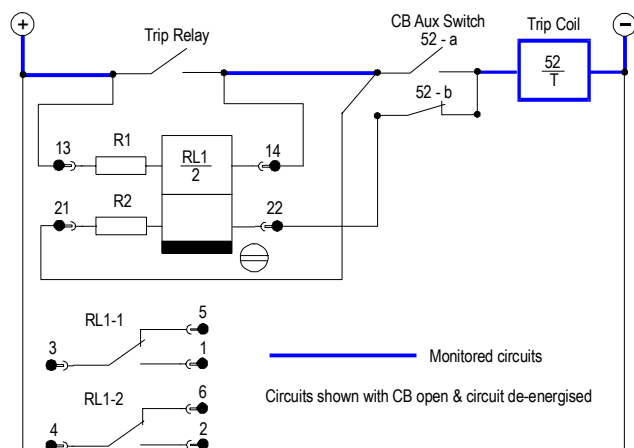
1TM10 Operation Trip Circuit Supervision Relay

The operating element of the 1TM10 comprises a single 6R heavy duty attracted armature control relay with two operating coils wound on a single core.

Supervision is active with the circuit breaker in the open or closed position via the 52a & b auxiliary contacts.

Under healthy conditions, with the CB in the closed position, winding 1 is energized & if the trip coil becomes open circuited or the supply fails, the relay will drop out initiating the local visual indicator & output contacts. Similarly, when the CB is in the open position, both coil windings 1 & 2 are energized enabling the relay to detect failure of the trip circuit coil or supply in the same manner as if closed. Once operated the electro-mechanical alarm flag must be hand reset.

The relay element is fitted with a slug to provide a delay of 300ms (approx.) on de-energisation preventing a false alarm due to voltage dips in the supply rail, or the normal delays in the tripping operation, when the first coil winding is momentarily short circuited by the protection trip contact. If the protection trip contact should fail to reset, due to a failure of the circuit breaker tripping mechanism for example, the relay drops out initiating the local visual alarm indicator & output contacts.



CIRCUIT RESISTANCE & BURDEN

The 1TM10 circuit design is optimized to minimize the supervision current in the CB trip coil to avoid the possibility of nuisance tripping. The total series resistance provided by R1 & RL1 - winding 1 is tabulated below. Resistance of the CB coil must be much less than this figure to ensure adequate supervision current flows through the 1TM10 element under normal conditions.

Nominal supply	~Resistance (ohms)	Current (mA)	Burden* (Watts)
32V DC	2,200	15	<0.5
48V DC	3,100	15	<0.8
110V DC	7,400	15	<1.7
125V DC	7,400	17	<2.2
220V DC	25,000	9	<2.0
240V DC	25,000	10	<2.4
250V DC	25,000	10	<2.5

TRIP SUPPLY BURDEN

* Actual operating burden is dependent on the CB coil resistance.

OPERATING VOLTAGE RANGE

Guaranteed operation between 80% & 120% of nominal rated operating voltage.

1TM Trip Circuit Supervision Elements

FLAG OPERATION

Each relay element is supplied with a flag (target) indicator. The indicator consists of a high visibility solid dayglow orange mechanical flag.

Operation: Drops on coil de-energisation.
Reset: Hand reset.

DROP OUT VOLTAGE

Drop out between 25 & 40% of nominal rated operate voltage.

RESET TIME

Not less than 300ms when supply is switched from 100% of nominal rated operating voltage to off.

NOMINAL OPERATING VOLTAGES

24, 32, 48, 110, 125, 220, 240 & 250V DC available.

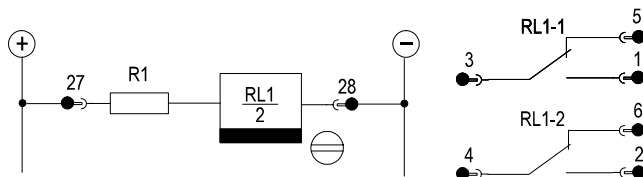
CONTACTS

2 C/O standard

1TM11 Operation Trip Circuit Supply Supervision

The operating element of the 1TM11 comprises a single 6R heavy-duty attracted armature control relay with a single operating coil & delay slug. The relay is normally operated to indicate a healthy trip circuit supply while a slug is fitted to provide a delay on drop out & avoid nuisance tripping due to transients.

Under healthy conditions the coil is energized & if the supply fails, the relay will drop out after a short time delay (200ms approx.), to initiate a supply fail alarm.



Contacts shown with CB Open & circuit de-energised

CIRCUIT RESISTANCE & BURDEN

The 1TM11 circuit design is optimized to minimize the supervision current to minimize the burden on the supervised supply. The total series resistance provided by R1 & RL1 is tabulated below.

Nominal supply	~Resistance (ohms)	Current (mA)	Burden (Watts)
24V DC	1,200	20	<0.6
32V DC	1,600	20	<1.0
48V DC	2,400	20	<1.0
110V DC	11,000	10	<1.2
125V DC	11,000	11	<1.5
220V DC	22,000	10	<2.5
240V DC	24,000	10	<2.5
250V DC	24,000	11	<2.7

DROP OUT VOLTAGE

Drop out between 25 & 40% of nominal rated operate voltage.

RESET TIME

Not less than 200ms when supply is switched from 100% of nominal rated operating voltage to off.

1TM Trip Circuit Supervision Elements

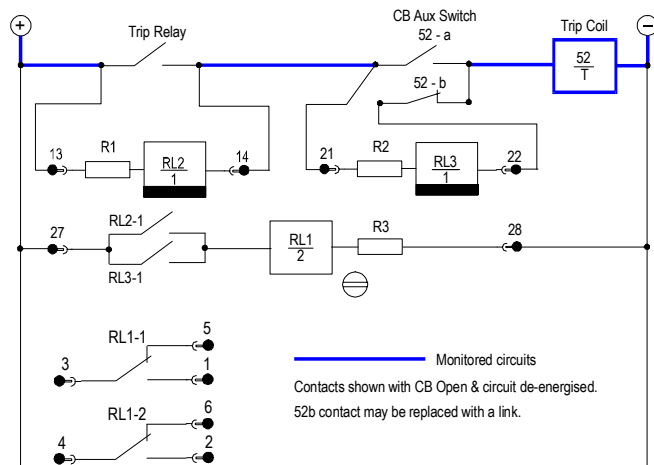
1TM12 Operation Trip Circuit Supervision Relay

The operating element of the 1TM12 comprises three 6R heavy duty attracted armature relays as shown below.

Supervision is active with the circuit breaker in the open or closed position via the "a & b" CB auxiliary contacts.

Under healthy conditions, with the CB in the closed position, relay 1 & 2 are energized & if the trip coil becomes open circuited or the supply fails, relay 2 will drop out causing alarm relay 1 to drop out & initiate the local visual indicator & output contacts. Similarly, when the CB is in the open position, relays 1, 2 & 3 are energized enabling the relay to detect failure of the trip circuit coil or supply in the same manner as if closed. Once set the alarm relay flag must be hand reset. If the protection trip contact operates relay 1 will drop out after a 400ms (approx.) delay. If the CB auxiliary contact has not opened causing relay 2 not to pick up within this time delay then alarm relay 3 will drop out.

Both relay 2 & 3 elements are fitted with slugs to provide a delay of 300ms (approx.) on de-energisation to prevent false alarms due to voltage dips in the supply rail, or the normal delays in the tripping operation. If the protection trip contact should fail to reset, due to a failure of the circuit breaker tripping mechanism for example, the relay drops out initiating the local visual alarm indicator & output contacts.



CIRCUIT RESISTANCE & BURDEN

The 1TM12 circuit design is optimized to minimize the supervision current in the CB trip coil to avoid the possibility of nuisance tripping. The total series resistance provided by R1 & RL2 is tabulated below. Resistance of the CB coil must be much less than this figure to ensure adequate supervision current flows through the 1TM12 element under normal conditions.

Nominal supply	~Resistance (ohms)	Current (mA)	Burden* (Watts)
32V DC	1,090	30	<1.0
48V DC	1,600	20	<1.5
110V DC	8,100	14	<1.5
125V DC	8,100	15	<2.0
220V DC	25,000	9	<2.0
240V DC	25,000	10	<2.4
250V DC	25,000	10	<2.5

TRIP SUPPLY BURDEN

* Actual operating burden is dependent on the CB coil resistance.

ALARM CIRCUIT BURDEN

Allow a nominal 1 Watt for the alarm relay RL1 which is normally energised under healthy trip circuit conditions.

OPERATING VOLTAGE RANGE

Guaranteed operation between 80% & 120% of nominal rated operating voltage.

DROP OUT VOLTAGE

Drop out between 25 & 40% of nominal rated operate voltage.

RESET TIME

Not less than 300ms when supply is switched from 100% of nominal rated operating voltage to off.

NOMINAL OPERATING VOLTAGES

24, 32, 48, 110, 125, 220, 240 & 250V DC available.

CONTACTS

2 C/O standard

1TM13 Operation Trip Relay Circuit Supervision

The 1TM13 relay is designed to supervise trip relay circuits utilizing high burden trip relays such as the 6RJ & 2HSM series available from RMS.

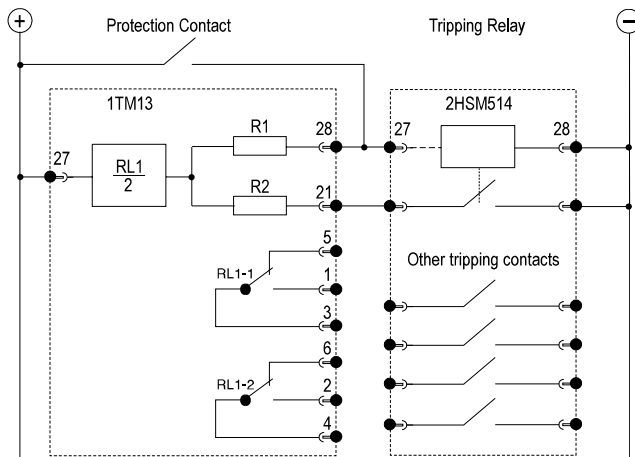
The operating element comprises a single 6R heavy-duty attracted armature control relay with a single operating coil & delay slug. It has two dropping resistors R1 & R2 of equal ohmic value, connected in series with the coil.

If the circuit being supervised becomes open circuited or if the supply fails, the relay will become reenergized and an alarm or visual indication will be given.

Under healthy conditions the relay coil is energized via the dropping resistor R1 as shown below (Tripping relay circuit). If the circuit being supervised becomes open circuit or if the supply fails, the relay will become de-energized & an alarm is given (2 C/O contacts & flag indication).

To prevent the alarm being given when the circuit being supervised is operated the relay coil is maintained via the dropping resistor R2. For this purpose, an additional normally open contact is required from the latching tripping relay as depicted at right. A short time delay (>100ms), is incorporated to hold up the alarm relay during a normal trip relay operation.

Contacts are constructed from silver, shaped & positioned to ensure reliable, low resistance operation. Over travel of the contacts during each operation causes a wiping action ensuring a clean "make".



1TM Ordering Codes

Generate the required ordering code as follows:
e.g. 1TM10-D2-2M28S1

General Class	Order Code			
	1	2	3	4
1TM	-			

1 RELAY FUNCTION

Specify relay functional number from table 5.

2 NOMINAL OPERATE VOLTAGE

A	24V DC	E	125V DC
B	32V DC	F	250V DC
C	48V DC	G	220V DC
D	110V DC	H	240V DC

3 CONTACT DUTY

- 1 Heavy duty contacts – magnetic blowouts fitted
- 2 Heavy duty contacts

4 CASE CONFIGURATION

- Element only – No case
- 2M28S1 One element in a 2M28-S case
- 4M28S2 Two identical elements in a 4M28-S case

ELEMENT TEXT (Optional)

Element part number is used as the default

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

CIRCUIT RESISTANCE & BURDEN

The 1TM13 circuit design is optimized to minimize the supervision current in the tripping relay coil to avoid the possibility of nuisance tripping. The total series resistance provided by the combination of RL1/R1 & RL1/R2 is tabulated below. Resistance of the CB coil must be much less than this figures to ensure adequate supervision current flows through the 1TM13 element under normal conditions.

Nominal supply	~Resistance (ohms)	Burden* (Watts)
32V DC	2,200	<0.6
48V DC	3,100	<0.9
110V DC	8,000	<1.7
125V DC	8,000	<2.2

TRIP SUPPLY BURDEN

* Actual operating burden is dependent on the tripping relay coil resistance.

THERMAL RATING

All operate & reset circuits are designed to withstand continuous application of 120% of nominal voltage

OPERATING VOLTAGE RANGE

Guaranteed operation between 70% & 120% of nominal rated operating voltage.

DROP OUT VOLTAGE

Drop out voltage: >10% of nominal rated operate voltage.

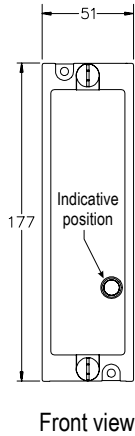
M Series Case System

The M Series case range has been specifically designed to meet the demanding & varied requirements for applications in power utility sub-station environments. The standard 4U high 19 inch rack mounting modular configuration simplifies panel design & installation.

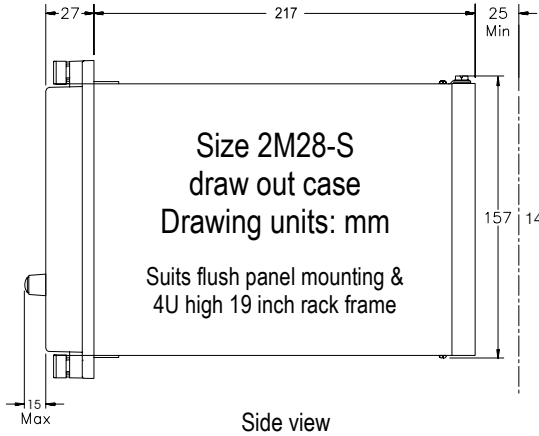
Mounting points & overall panel dimensions meet international standards such that the cases may be interchanged with other similar types available on the market.

The MATRIX-S version was released in mid August 2005 with the length reduced by 18mm to improve compatibility with shallow cubicles.

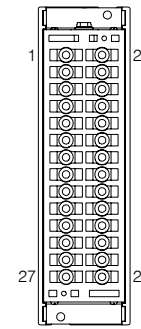
Care should be taken when ordering spare relay modules to ensure compatibility with existing units.



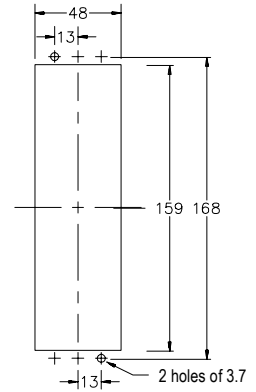
Front view



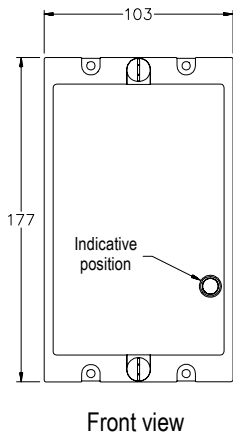
Side view



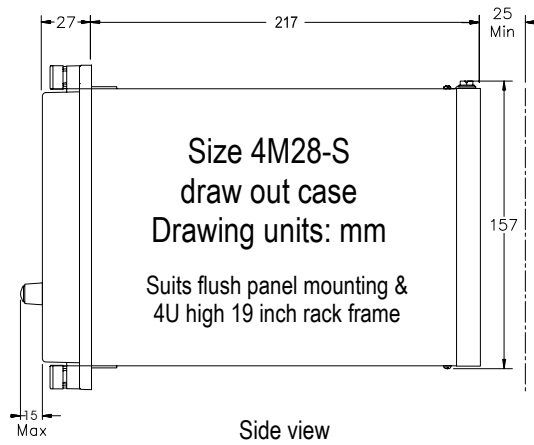
Terminal layout



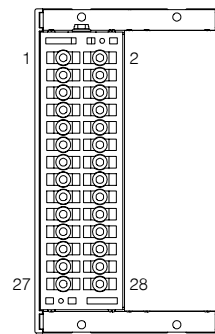
Panel cut out



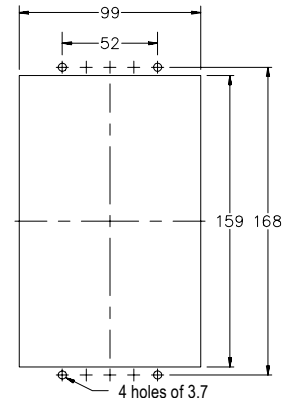
Front view



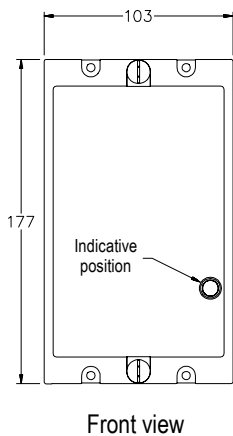
Side view



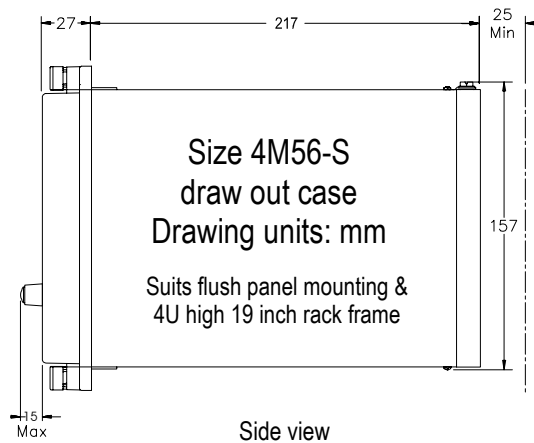
Terminal layout



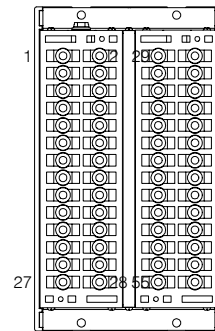
Panel cut out



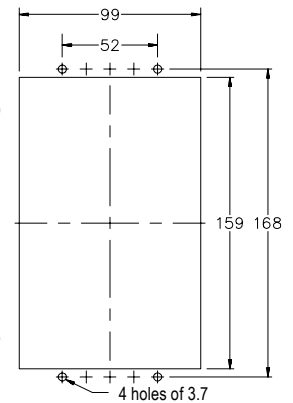
Front view



Side view



Terminal layout



Panel cut out

Technical Data

CURRENT RATINGS

CT terminals:	20A	continuous
	400A	1s
Other terminals:	10A	continuous
	200A	1s

VOLTAGE RATINGS

All circuits & terminals:	600V AC	continuous
	350V DC	continuous

AUXILIARY INSULATION WITHSTAND

In accordance IEC 255-5:
 2KV RMS between all terminals & all terminals & frame.
 1.2/50 5KV impulse between all terminals & all terminals & frame.

IP RATING

IP5X category 2 dust protected and IP4X for solid ingress to IEC60529.

M Series Case Accessories

Refer to the M Series Technical Bulletin:

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

- Sub rack mount frames
- Blanking plates
- Mounting screw kits
- Termination ring lugs
- Stud terminal kits
- Semi projection mount kits
- Earth bars

Case Ordering Codes

Generate the required order code as follows: e.g. 2M28-S-1

Order Code				
1		2		3
	M		- S -	

1 CASE SIZE

- 2 Size 2
- 4 Size 4

M M SERIES CASE

2 NUMBER OF TERMINALS

- 28 28 Terminals
- 56 56 Terminals (Size 4 case only)

S SHORT CASE VERSION

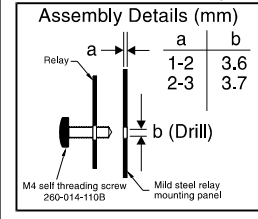
3 RELAY ELEMENTS PER CASE

- 1 One
- 2 Two
- 3 Three
- 4 Four

Case Mounting Screws

RELAY PANEL/RACK MOUNTING SCREWS P/N 290-406-151A

4 X M4 self threading screws
 Use for RMS "D", "E" & "M" Series relay cases



M Series cases may be flush mounted to mild steel panels up to 3mm thick using the M4 self threading screws provided with the case. Panel mounting is simplified due to the location of the fixing screws at the front face of the relay. Alternatively the cases may be 19 inch rack mounted using a 4U high sub rack. The M4 self threading screws are suitable for application with the RMS type 4M800K1 sub

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

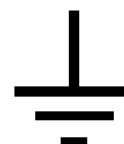


Caution: risk of electric shock



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)



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

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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.

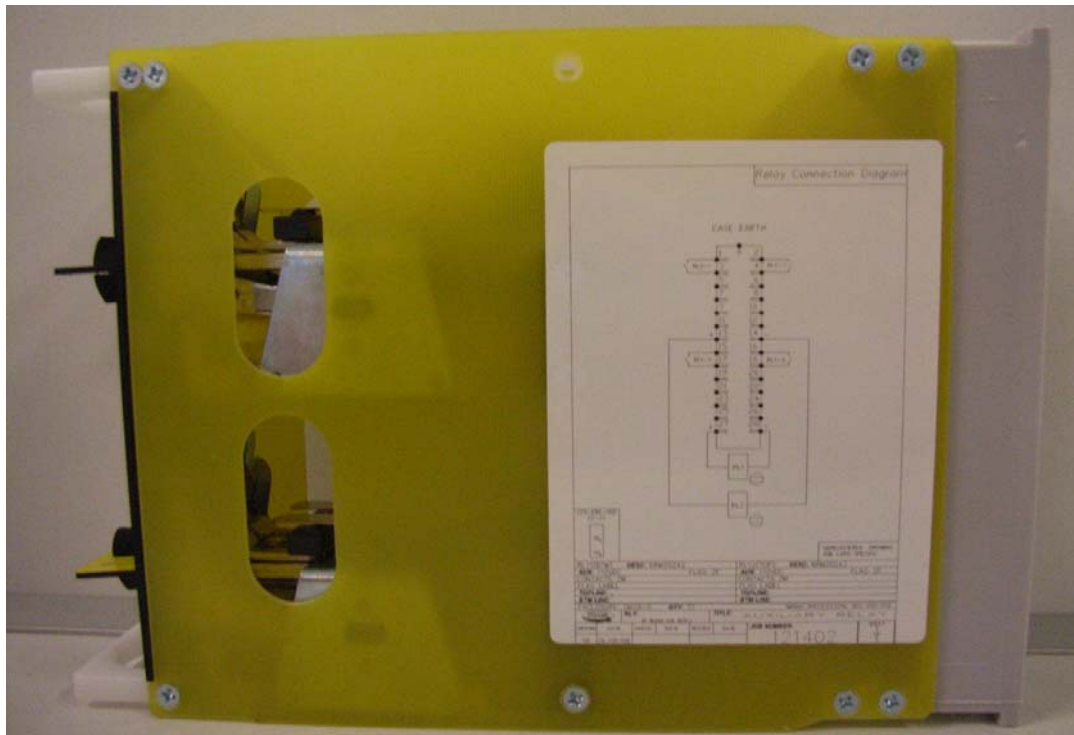


Where mechanical flags are fitted the yellow transit wedge must be removed before operation using a gentle twisting action. The wedge should be stored with the original packaging material.

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.



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.

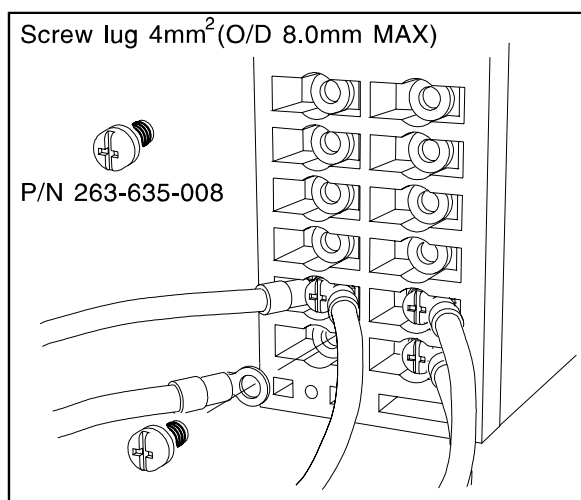
Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

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 2.5mm², 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.

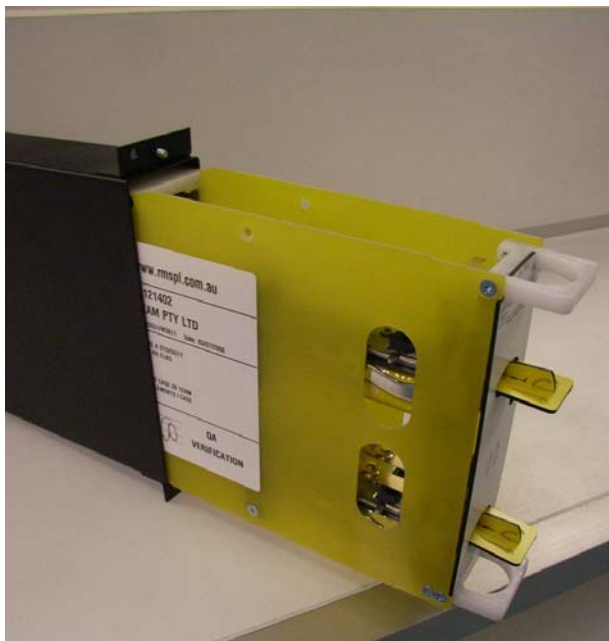
Relay Module

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.



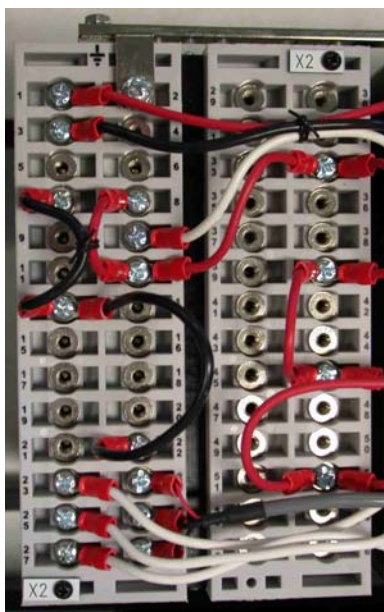
Remove cover by unscrewing black thumb screws & withdraw the relay module from the case.

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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Maintenance

Mechanical Inspection

Relay Assembly

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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.

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 80%. 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, The Middle East & 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.



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