

Features

- Four time ranges 0-0.99s, 0-9.9s, 0-99s, 0-990s
- High accuracy & repeatability timing compensated for output relay delay
- Time settings easily selected by digital thumb wheel switches
- Selectable delay operate or delay release
- Optional reset functions Instantaneous (Fast), definite time, count down
- 4 C/O output contacts
- Wide auxiliary supply range with fail alarm contact
- Timing in progress LED
- Non-volatile trip indication
- Multi voltage timer initiate input
- Multi voltage flag reset input
- Size 2M draw out case

Application

The 2T105 time delay relay is particularly suitable for use in protection & control schemes where precision time delays are required.

CB FAIL

A typical use is for providing a definite time delay in circuit breaker failure protection. For example: The transformer multi-trip relays energize the 2T105 timer & if the circuit breaker (CB) fails to clear the fault within the pre-set (0.6s) the timer times out & operates a multi-trip relay. This in turn trips all CB's on the section of the busbar connected to the CB, which has failed to trip.

INDUCTION DISC RESET EMULATION

Replacement of induction disc timing elements with solid-state relays can result in a loss of grading & reduced functionality due to the different reset characteristics. For example, the inherent slow reset time of induction disc relays provide an advantage in sensitive overcurrent schemes where pecking faults could go undetected due to the timer being instantaneously reset each time the current momentarily falls bellow the start setting. The 2T105 may be specified with a number of reset functions to avoid this problem & to suit specific protection applications.



Technical Bulletin

Multi Range Digital Setting Time Delay Relay



2T105 depicted in a 2M28 case.

Operation

Made in Australia

A crystal oscillator & embedded micro controller based timing circuit are employed to provide accurate timing & flexible functionality. When a control signal is applied to the timer initiate input, a counter begins counting down from the thumb wheel switch setting. When the zero is detected, the output relay contacts & flag operate.

Three time ranges are selected via a front panel switch. An internal configuration switch can be used to select a x10 range multiplier to provide up to 990s of precision time delay. Two timing modes are available:

Time delay **ON** mode (Relay starts timing after the initiate control signal is applied & output contact picks up after the pre-set time delay has elapsed) or;

Time delay **OFF** mode (Relay output contact picks up instantaneously when the initiate control signal is applied, starts timing after the initiate control signal is removed & drops out after the pre-set time delay has elapsed).

An amber LED on the front panel indicates when the relay has been initiated & flashes during timing.

The 2T105 timer may be specified with a number of different reset functions to provide instantaneous reset, definite time reset or induction dist reset emulation. These functions are specified at time of order.

A switchmode power supply provides a very wide auxiliary operating range. A relay fail alarm is provided in the form of a C/O contact which is picked up when the auxiliary supply rail & CPU watchdog status is healthy.



TIMING FUNCTION / INITIATE SIGNAL INPUT (Status input) For accurate timing functions the 2T105 detects application or removal of an external voltage control signal. This mode is set using internal configuration switch 2 (Refer order code details). Refer to Table 2 for timing initiate P/U & D/O times.

DELAY OPERATE TIMING FUNCTION

This timing mode is selected using internal configuration switch 3.

The relay is permanently connected to the auxiliary supply & is initiated by the application of a control signal. Application of the initiate signal starts the pre set timing cycle. During timing the front panel initiate LED will flash & then go on solid once the thumbwheel time setting has elapsed, this sets the output relay & visual indicator. The initiate LED is extinguished & the output contacts reset when the initiate signal is removed. After system reset the visual indicator may be reset locally using the front panel push button or remotely via the flag reset input.

To achieve a simple but less accurate delay ON function, the initiate signal may be connected directly to the auxiliary supply. Timing will then commence when power is applied to the relay while removal of power will reset the time delay & output relay. This mode is only suitable for longer time delay settings as the switch mode power supply takes 100 - 500ms (Depending on Vx), to start which adds to the inherent time delay.



Removal of the initiate signal during timing will reset the time delay (Refer timing reset options). After time out the contacts are reset to the D/O condition upon removal of the initiate signal. The flag can be reset provided the timer initiate signal is removed.

RESET FUNCTION DIAGRAM

Timing Functions

DELAY RELEASE TIMING FUNCTION

This timing mode is selected using internal configuration switch 3.

The relay is permanently connected to the auxiliary supply. Application of the initiate control signal, causes the output relay to set instantaneously (Rset). It will remain in this state until the control signal is removed; this starts the timing cycle & resets the output relay when the preset time delay is reached.



Re-application of the initiate signal during timing will reset the time delay (Refer timing reset options). After time out the contacts are reset to the P/U condition. The flag can be reset at any time, except during timing.

TIMING RESET OPTIONS

Instantaneous

If reset before the preset time delay is reached the timing element will reset (D/O) as per Table 2.

Definite Time Reset (Treset)

If reset before the preset time delay is reached the delay timer will pause until the reset time has elapsed before resetting. If the timer is re-initiated before the reset time has elapsed, the delay timer will restart the timing sequence from the paused timing point.

Count Down Reset

If reset before the preset time delay is reached, the timer will count down toward reset. If the timer is re-initiated before reset is reached the timer will start counting back up towards the time delay pre set.





Due to RMS continuous product improvement policy this information is subject to change without notice. 2T105/Iss K/12/10/09 - 2/5



AUXILIARY SUPPLY

40-300V DC & 40-275V AC or 20-70V DC switchmode supply.

BURDEN (110V DC nominal supply) Less than 2 watts during idle & timing. Less than 4 watts when output relays are energized.

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 & if necessary performs a soft restart.

TIME SETTING RANGES

The 2T105 relay allows for precision time settings of between zero (Minimum operate time) & 990 seconds. This is achieved by the use of two decimal thumb wheel switches & a range multiplication switch on the front panel. A 10x setting multiplier is activated when configuration switch 5 is set to OFF to extend timer range 3 up to 990s.

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	
Range setting x10	Zero to 990 Sec	10 Sec	

TIME DELAY SETTING CHANGES

Table 1

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

TIMER INITIATE STATUS INPUT DELAY

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

Table 2

MINIMUM OUTPUT CONTACT OPERATE TIME



Minimum Time delay

The minimum output contact operate time is equal to the timer initiate status input delays in Table 2 + 6ms. Time delay settings ≤ to this figure will result in a relay contact operate time equal to the minimum.

TIMING ACCURACY

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

		AC Rejection Filter		
ſ	Initiate input	ON	OFF	
	DC	-0.19% <u>+</u> 0.2ms		
	AC	N/A	-0.19% <u>+</u> 10ms	

Table 3

Technical Data

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 2T105 is powered up:





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 to1.5mA 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.

FRONT PANEL INDICATORS

Four LED indicators are provided on the front panel:						
Power	On solid when auxiliary supply healthy	Green				
Timing	Flashing during timing	Amber				
Trip	On solid when output relay operated	Red				
Range x10	On when the x10 time range selected	Green				

The trip LED status is stored in non volatile memory & will be restored when the 2T105 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) indicator may be specified as an option. Note that an auxiliary supply is required to reset the flag circuits.

TRANSIENT OVERVOLTAGE

Between all terminals & earth Between independent circuits without damage or flashover

INSULATION COORDINATION Between all terminals & earth Between independent circuits Across normally open contacts

AUXILIARY SUPPLY Allowable breaks / dips in supply Collapse to zero from nominal voltage

HIGH FREQUENCY DISTURBANCE 2.5kV 1MHz common mode

ELECTROSTATIC DISCHARGE 6kV contact discharge

1.0kV 1MHz differential mode

FAST TRANSIENT 4kV, 5/50ns, 100KHz repetitive

TEMPERATURE RANGE Operating:

Storage: HUMIDITY

40 °C & 95% RH non condensing

IEC60255-5 CLASS III 2.0kV RMS for 1 minute 2.0kV RMS for 1 minute 1.0kV RMS for 1 minute

IEC60255-5 CLASS III

5kV 1.2/50us 0.5J

5kV 1.2/50us 0.5J

IEC60255-11

≤ 20ms

IEC60255-22-1 CLASS III

≤ 3% variation

IEC60255-22-2 CLASS III ≤ 5% variation

IEC60255-22-4 ≤ 3% variation

IEC68-2-1/2 -10 to +55°C

-25 to +75°C

IEC68-2-78





MANAGEMENT SYSTEM 1 5 0 9 0 0 1-

Wiring Diagram

OUTPUT RELAY CONTACT CONFIGURATION 4 C/O contacts

OUTPUT CONTACT DWELL TIME

Once operated all time delayed output contacts have a minimum dwell time of 100ms.

OUTPUT CONTACT RATINGS

Minimum number of operations

Minimum recommended load

Carry continuously Make & carry L/R ≤ 40ms & V ≤ 300V

Break capacity I ≤ 5A & V ≤ 300V

5A AC or DC 0.5s 20A AC or DC 0.2s 30A AC or DC AC resistive 1,250VA AC inductive 250VA @ PF ≤ 0.4 DC resistive 75W 30W @ L/R ≤ 40ms DC inductive 50W @ L/R ≤ 10ms 10⁶ at maximum load 0.5W limit 10mA / 5V

IEC60255-0-2





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CASE

Size 2M28-S draw out case 28 M4 screw terminals Flush panel mount or 4U high 1/8 width 19 inch rack mount

ACCESSORIES SUPPLIED WITH EACH RELAY

- P/N 290-406-151 1 x M4 self threading mounting screw kit P/N 290-407-153
- 1 x M4 terminal screw kit
- 1 x Product Test Manual



2M28 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. 2T105-BAA



1 AUXILIARY SUPPLY RANGE

20-70V DC

A В

40-275V AC & 40-300V DC

2 TIMING RESET FUNCTION

- A Instantaneous reset
- В Definite time reset – Treset s
- Specify a Treset delay in the range 0.1 to 255s in 0.1s steps С Count down reset

3 **TRIP FLAG**

Red LED non volatile trip indication А В Magnetic disc trip flag

(Standard)

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



STATUS INPUT OPERATION 1 ON DC operation only - AC rejection ON OFF AC / DC operation - AC rejection OFF (Default) 0 TIMER INITIATE INPUT 2 ON Apply volts to initiate (Default) 0 OFF Remove volts to initiate TIME DELAY FUNCTION 3 ON Time delay OPERATE (Default) OFF Time delay RELEASE 0 4 **OUTPUT RELAY FUNCTION** ON All outputs contacts are time delayed (Default) OFF Output contact 4 will operate instantaneously 0 irrespective of the front panel time delay settings. 5 TIME RANGE MULTIPLIER

ON Selected time range x1 (Default) 1 0 OFF Selected time range x10



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.



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