

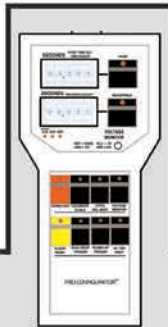
Industrial Supervisory Modules

Watchdog Timer & Power Supply Monitoring Module

P8D-ISM
P8D-ISM5
P8D-ISM12
P8D-ISM24

Applications

- ▶ Fault Detection & Shutdown
- ▶ Industrial Control Systems
- ▶ PLC Applications
- ▶ Safe Permissive Start
- ▶ High Quality Machinery
- ▶ Robotics & Automation
- ▶ OEMs/Systems Integrators



User-Configurable

P8D-ISM types may be factory *pre-configured* or *user-configured* and *reconfigured* with a Brentek hand-held **Configurator™**. All timing values (fixed or adjustable), power supply voltages and configurable parameters are all field or OEM configurable. Selected parameters allows the user to download a new configuration to the P8D-ISM Module in 10 seconds with the press of a button.

Description

The P8D-ISM Industrial Supervision Module is a system component intended for high-end control applications where system integrity is imperative. This series uses new technology combining both a *Digital Watchdog Timer* and continuous power supply voltage supervision.

Standard features include an opto-isolated WDI trigger input (accepting 3-30V DC pulses), a fail-safe 8 Amp rated FORM C Relay Output and 'real-time' status indicators for **Input**, **Output** Relay and **Power** quality status monitor (for all operating conditions). Additionally, the latest *digital Watchdog Timer* technology offers many new configurable options with precision $\pm 2\%$ timing accuracy. Low-profile 8-pin octal packaging, encapsulated circuitry and industrial operating-temperature make this series well suited to robust high-end industrial control applications.

Advanced control system supervision technology can prevent a critical 'loss of control' from occurring. System integrity is ensured by supervising vital system functions which directly affect the health of a control system. When all supervised parameters are OK, such as the power supply voltage operating within $\pm 10\%$ of nominal and a valid WDI input pulse is being received from a system output, the '**SYSTEM OK**' indicator turns ON and the output relay is energized. Changes in the SYSTEM status are indicated and the output relay is de-energized allowing for ALARM or SHUTDOWN, depending on the application.

New Product

I/O Compatibility

8-Pin Octal



Standard Features

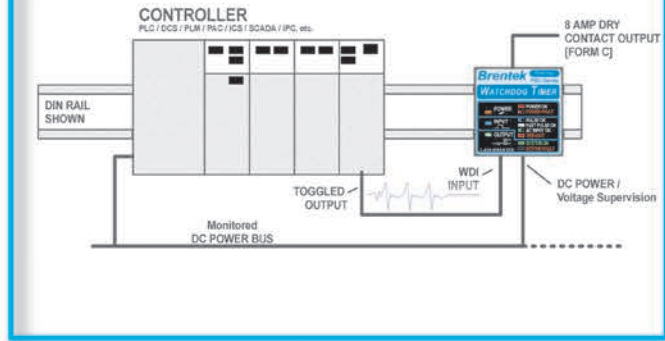
- ▶ Power Supply Voltage Supervision
- ▶ Precision *Digital Watchdog Timer* $\pm 2\%$
- ▶ User-Configurable w/ the Configurator™
- ▶ Fully Encapsulated Circuitry
- ▶ Standard 8 Pin Octal Plug-in
- ▶ -40°C to $+85^{\circ}\text{C}$ Operating Temperature
- ▶ FORM C (8 Amp rated) Output Contacts
- ▶ 3-30V Opto-Isolated Trigger Input
- ▶ 90-132VAC Opto-Isolated Trigger Input**
- ▶ Smart Pulse Detection Technology
- ▶ Power-up Reset
- ▶ Enhanced Inductive Load Feature
- ▶ Edge-triggered WDI Timer Input
- ▶ INPUT, OUTPUT & POWER Indicators
- ▶ Relay Fail-safe (de-energizes on FAULTs)
- ▶ $>2500\text{VAC}$ Input Optical Isolation

Advanced Features

Digital Watchdog Timer (dWDT)

Time-out(s) for the Watchdog Timer function may be specified (or configured); *fixed or adjustable* over a range from 50mS to 60 Seconds with one millisecond resolution and +/-2% timing accuracy. Optional WDI triggering and power-up triggered configurations are available. (If unspecified, default factory configuration is ON-Edge triggered with a 2 second timeout.)

Typical Application



Power Supply Supervision

Power supply supervision insures a clean regulated power source continually operating within +/-10% of nominal. When supervision is configured, over-voltage and under-voltage levels beyond +/-15% limits of nominal are detected within <15mS as a system fault condition. The base part number **P8D-ISM** is the default factory configuration with *no power supply supervision* for full 5-28VDC operation. *Power supply supervision* may be configured or specified when ordering by adding voltage suffix to the base part number specifying the nominal voltage to be supervised. For 5V, the base p/n is P8D-ISM5, for 12V the base p/n is P8D-ISM12 and for 24V, the base p/n is P8D-ISM24.

Operating Parameters for P8D-ISM5 types (5V nominal)

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	TYP	MAX	
V+	Supply Voltage - Operating	4.5	5.0	5.5	VDC
V _{LOTRIP}	Low trip-out voltage		4.25	4.4	VDC
V _{HIGHTRIP}	High trip-out voltage	5.5	5.75		VDC
T _{FTO}	Fault Trip-out time	2	3		mSec
T _{FRT}	Fault Recovery time		3		mSec

Operating Parameters for P8D-ISM12 types (12V nominal)

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	TYP	MAX	
V+	Supply Voltage - Operating	10.9	12.0	13.2	VDC
V _{LOTRIP}	Low trip-out voltage		10.40	10.58	VDC
V _{HIGHTRIP}	High trip-out voltage	13.22	13.56		VDC
T _{FTO}	Fault Trip-out time	3	5		mSec
T _{FRT}	Fault Recovery time		60		mSec

Operating Parameters for P8D-ISM24 types (24V nominal)

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	TYP	MAX	
V+	Supply Voltage - Operating	21.8	24.0	26.4	VDC
V _{LOTRIP}	Low trip-out voltage		20.97	21.58	VDC
V _{HIGHTRIP}	High trip-out voltage	26.77	27.3		VDC
T _{FTO}	Fault Trip-out time	5	10		mSec
T _{FRT}	Fault Recovery time		150		mSec

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P8D-ISM24

Absolute Maximum Ratings (Note 1, 3)

Supply Voltage (Pins 2 & 7) +/-30VDC
 DC RESET (WDI) voltage (Pins 5 & 6).. +/-50VDC
 AC Reset (WDI) voltage (Pins 6 & 8)..... 200Vrms (-AC option)
 Contact Voltage (Pins 1,3 & 4) 200VDC/400VAC (Note 2)
 Contact Switching/Inrush Current 10 A at 250 VAC, 30 VDC
 Operating Temperature -40 to +85°C

Note(s):

1. Exceeding values above those listed may cause permanent device damage. Operation at these ratings for extended periods may affect reliability.
2. If DC switching voltage is greater than 30VDC, switching current must be derated. Please consult factory.
3. Depending on options chosen, other maximum values may apply. See maximum values in specifications for specific options.

Operating Parameters for P8D-ISM types

SYMBOL	PARAMETER	LIMITS			UNIT	CONDITION
		MIN	TYP	MAX		
V+	Supply Voltage (P8D-ISM)	4.5		28	VDC	Pins 2(+) & 7(-)
I _{SUPPLY}	Supply Current		50	60	mA	Output Relay Energized
T _A	Operating Temperature	-40		+85	°C	Ambient Temperature
V _{IL}	Input Logic Low voltage	0		0.8	V	Input Pins 5(+) & 6(-)
V _{IH}	Input Logic High voltage	2.0		30	V	Input Pins 5(+) & 6(-)
R _{IN}	Input Resistance		10		KOHMS	Pins 5 & 6
F _{IN}	Maximum WDI Input rate		1	1.5	KHz	@50% duty. Note 1
V _{ISO}	Input Isolation Voltage		2500		Vrms	1 minute, RH <60%

Contact Specifications

SYMBOL	PARAMETER	LIMITS			UNIT	CONDITION
		MIN	TYP	MAX		
V _{SW}	Switching Voltage AC DC			250 30	VAC VDC	@Rated Load
I _{SW}	Switching Current	0.1		8	Amps	Resistive Load
P _{SW}	Switching Power			2500 240	VA W	1/2 HP @240VAC, 1/3 HP @120VAC
Life	Expected Cycle Life @Rated Load		3x10 ⁷ 1X10 ⁵		Cycles	Mechanical Electrical
R	Contact Resistance	0.1			Ohms	Initial Resistance
V _{ISO}	Isolation Voltage		5000 1000		Vrms	Coil to Contact Between open contacts
T _{DEL}	Pick-up Time (delay)		7		mS	Contact bounce
T _{LAT}	Drop-out Time (latency)		3		mS	Contact bounce

Detailed Timing Specifications

SYMBOL	PARAMETER	LIMITS			UNIT	CONDITION
		MIN	TYP	MAX		
T	Time-out period	1.96	2.0	2.04	Seconds	Notes 1, 2, 3
T _{IN}	Trigger Input pulse-width	500μS		T		Pins 5 & 6, Note 5
T _{PUC}	Power-up clear delay		200	300	mS	Note 4
T _{RET}	Retrigger delay (lockout)		50		mS	Note 4

Note(s):

1. Standard time-out period is 2 Seconds. Nominal time "T" corresponds accordingly for units with optional time-out values, including -Txx.x, -Mxxx, -Axx-xx, etc..
2. Standard Tolerance is +/-2%, optional -FC factory calibration to +/- 1%
3. Standard units time-out from last valid ON-EDGE transition of input Trigger (pins 5 & 6). Units with -DT dual triggered option time-out from last change-of-state of Trigger input.
4. Trigger Input pulses ignored during this period. The Power-up clear delay feature assures that the timer is initialized when powered on. The Retrigger delay lockout prevents inductive or RFI/EMI coincident with time-out from inadvertently triggering the timer.
5. This value applies to both 'ON' and 'OFF' time pulse widths of standard units. 'FAST PULSE' indication occurs when multiple pulses are received within a 15mS period. For units with AC input trigger option -AC, T_{IN} (min) is 25mS.

Operation (Please refer to Options Section for option-specific operations)

When power is first applied to pins 2(+) and 7(-), the timer is cleared, the output relay (pins 1, 3 & 4) remains de-energized and WDI input pulses pins 5(+) & 6(-) are initially ignored for the first 200 milliseconds (T_{PUC}). The INPUT indicator will also remain ON (RED ■) indicating the timer has not yet been triggered/reset. After the power-up clear period, the first ON-EDGE transition of the WDI input triggers and resets the internal Watchdog Timer. The INPUT indicator is never red while the timer is timing. When the Watchdog Timer has been triggered and the supervised power supply voltage is operating within $\pm 10\%$ regulation, the POWER indicator is SOLID ON (RED ■) indicating clean power, the OUTPUT indicator is ON (GREEN ■) indicating 'SYSTEM OK' and the output relay is energized. .

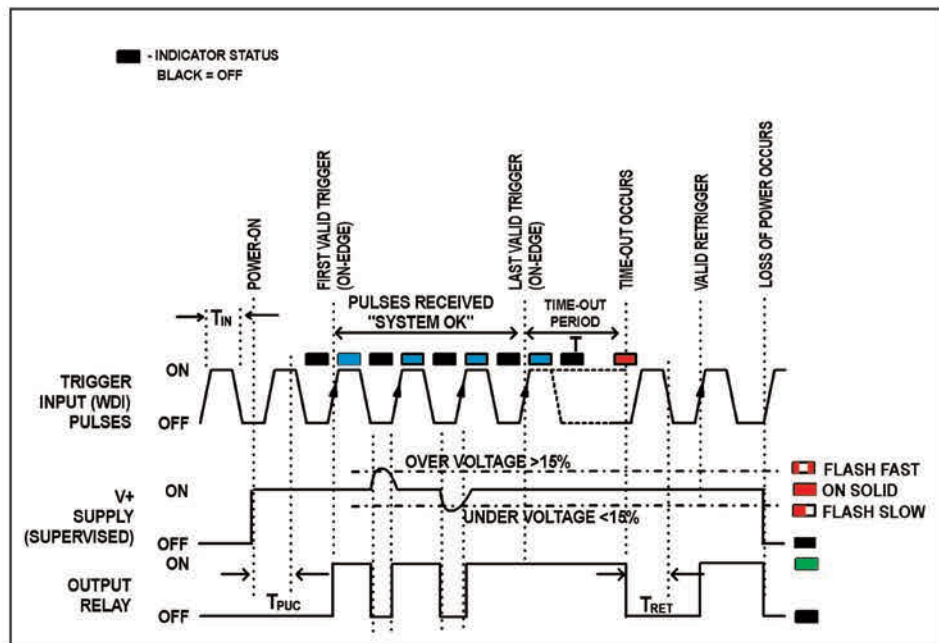


Watchdog Timer operation

Subsequent input pulses reset the timer with each ON-EDGE transition and are indicated by the INPUT indicator. PULSE OK is indicated in 'real time' ON (BLUE ■)-OFF, etc.; FAST PULSE OK is indicated by the INPUT indicator as (SOLID WHITE ■) ON while detecting multiple trigger pulses within a 20mS period. Time-out occurs from the last ON-EDGE transition of the input pulse (WDI). Upon time-out, the output relay de-energizes, turns OFF the OUTPUT indicator and turns the INPUT indicator ON (RED ■) to indicate a time-out 'T' has occurred. 'Loss of Power' also de-energizes the output relay as a fail-safe design feature. The timer will retrigger with the next ON-EDGE of the input pulse, providing real-time system recovery (FREE MODE), unless configured otherwise with the optional -LO lock-out feature. (See options and special configurations for 'configuration-specific' operations and functions.)

Power Supply Supervision

Units can be configured to supervise 5V, 12V or 24V power supply voltages such as models P8D-ISM5, P8D-ISM12 and P8D-ISM24, respectively. (The base model P8D-ISM has this feature disabled). Units configured with this feature continuously monitor for clean, well regulated power supply voltage across pins 2 & 7 for line regulation to within $\pm 10\%$ of nominal. Clean regulated power is indicated by the POWER indicator - SOLID ON (RED ■). If the supervised voltage is out of



regulation by more than $\pm 15\%$, the output relay is de-energized indicating a system fault condition. The POWER indicator will FAST FLASH (RED ■ ■ ■) if the voltage is above the $+15\%$ limit or SLOW FLASH (RED ■ ■ ■), if the voltage is below the -15% limit. (NOTE: if both the POWER and INPUT indicators are Flashing RED, then the Watchdog Timer and supervised Power are both in fault status. The rate of flash indicates whether power supply voltage is over-voltage or under voltage.)

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User-configurable Parameters

(Refer to Optional Configurations Section)

■ Fault Handling

- ✓ First-fault' Lockout (enable / disable)

Watchdog Timer Parameters

■ Timeout (Any value from 50mS to 60.000 Seconds)

- ✓ Fixed Value (1 mS Resolution)
- ✓ Adjustable Range (User defined >100mS range, 25 Turns / 100 Step resolution)

tion)

■ Timer Triggering

- ✓ Power-up Trigger (enable / disable)
- ✓ Dual-Edge Trigger (enable / disable)
- ✓ 120VAC Input Trigger (enable / disable)

Power Supply Supervision Parameters

■ Selectable Voltage

- ✓ Disabled for full 5-28VDC Operation
- ✓ 5V Nominal P/S Voltage
- ✓ 12V Nominal P/S Voltage
- ✓ 24V Nominal P/S Voltage

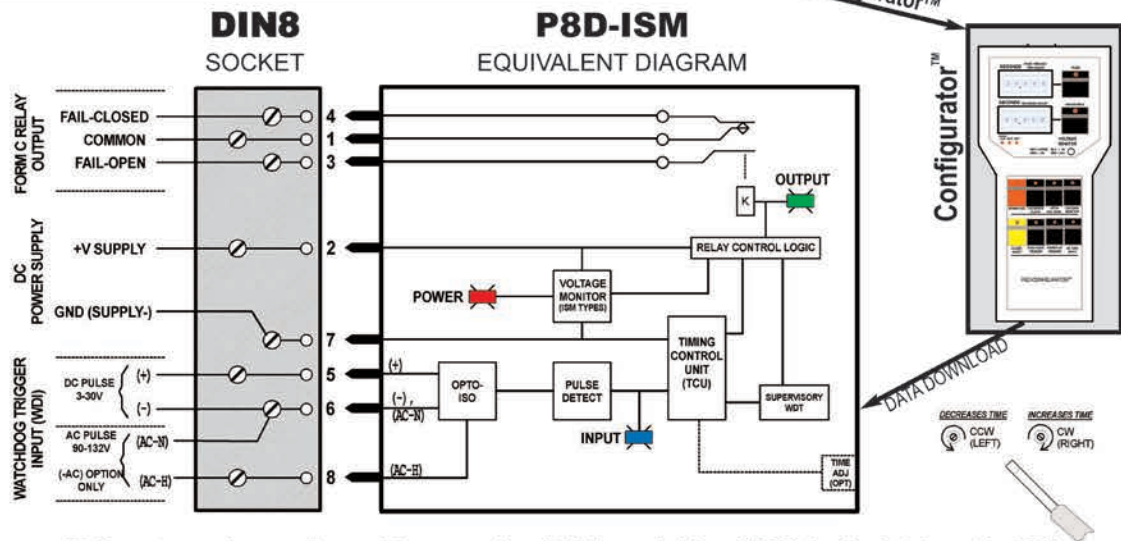
Made to Order or User Configured

Optional configurations may be ordered as 'made to order' from the factory with pre-specified time-out value(s) and any configurable options, or;

The **P8D-ISM** may be configured and reconfigured by the user with the **Brentek** hand-held **Configurator™**. This feature allows OEMs and Systems Integrators to define any configurable parameters anywhere any time. Other benefits include reduced inventory by stocking a single part number with the ability to make changes to pre-configured modules

(Download time is about 10 Seconds).

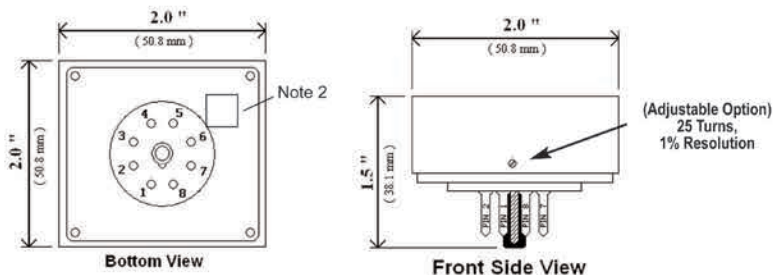
Connection Diagram



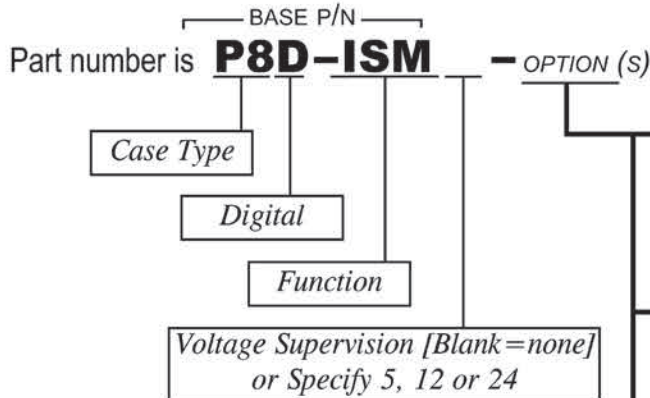
DC Input may be configured for sourcing (PNP) or sinking (NPN) logic. AC input is 60Hz.

Dimensions

- Note(s): 1. Overall height in #DIN8 Socket is 1.9" (max)
 2. Configurator™ Port.



Part Numbering



Base p/n **P8D-ISM** is Fixed 2 second timeout, 5-28VDC operation with 3-30VDC opto-isolated WDI input.
 User-configurable with **Brentek Configurator™**.

Input WDI Trigger Option

[Blank] - Triggers with ON-edge of WDI input pulse

- DT - Dual Edge Trigger. Triggers on ON and OFF edges of WDI input pulse

Input Pulse Trigger Option

[Blank] - Accepts DC pulse; 3 to 30Vpk

- AC - Accepts AC Pulse; 90 to 132V, 60Hz

Fixed Time-out Options

[Blank] - 2 Seconds (fixed)

-Txx.xx - Specify timing value 'xx.xx' in the range of 50 milliseconds to 60 seconds '-T50MS to -T60'

Adjustable Time-out Option

[Blank] - 2 Seconds (fixed)

-Ax.xx - x.xx - Specify any adjustable range with minimum and maximum values in the range of 50 milliseconds to 60 Seconds. (The smallest adjustment span is 100 milliseconds.)

Power-up Trigger Option

[Blank] - Power-up Clear

-PT - Power-up Trigger. Triggers on power-up

Time-out Handling Option

[Blank] - Free mode, retriggerable after time-out

- LO - Not retriggerable after time-out until power is cycled OFF for 2 seconds.

Factory Calibration Option

Timer tolerance is +/-2%, Consult factory for special calibration requirements.

Part numbering examples:

P8D-ISM5-A1-5	[Adjustable time-out 1 to 5 seconds, 5V power supply supervision.]
P8D-ISM-T30	[Fixed 30 Second time-out, 5-28VDC Operation.]
P8D-ISM24-LO	[Fixed 2 Second time-out, 24V p/s supervision, 'First-fault' Lock-out.]
P8D-ISM-T100MS-PT	[Fixed 100 mS time-out; Power-up Triggered, 5-28VDC Operation.]

Note(s):

- Specify any fixed time-out -T period in the range of 50 milliseconds to 60 Seconds (-T50MS to -T60).
 [Example: For a fixed time-out of 15 Seconds, suffix would be: -T15]
- Specify any adjustable time-out range (-TMIN-TMAX). Desired timing values must be in the order of increasing time and within the valid timing range of 50 milliseconds to 60 Seconds. Minimum span: 100mS, Resolution: 1% increments.
 [Example1: For a range of 50 mS to 12 Seconds, suffix would be: -A50MS-12]
 [Example2: For a range of 50 mS to 500 mS, suffix would be: -A50MS-500MS]
 [Example3: For a range of 1 Second to 60 Seconds, suffix would be: -A1-60]
- Please note: units with 'Dual-Trigger' (-DT) option will trigger on at power-up when no input pulse is present. When combining this option with the fault 'lock-out' option (-LO), pulses must be detected within the time-out period at initial power-up to prevent a fault 'lock-out' condition from occurring.

Options Index

- 1 ▶ Fixed Time-out (specified) (-T)
- 2 ▶ Adjustable Time-out 25 TURN (-Axx.xx to xx.xx)
- 3 ▶ Power-up Triggered (-PT)
- 4 ▶ Dual-edge Input Trigger/Reset (-DT)
- 5 ▶ 120VAC/60Hz Trigger Input (-AC)
- 6 ▶ Lock-out 'First Fault' Annunciated (-LO)

Optional Configurations

Configuration options make the P8D-Series very flexible and simple to install and use. Options allow the designer to specify or configure parameters for specific application requirements. Configurations include timing value(s) and modes, triggering modes and type of WDI signal, as well as modes of power-up and fault handling.

Refer to the *Options Compatibility Chart* for which options can be combined together.

Refer to the *Options Index* for the applicable section for each specific option.

Options Compatibility Chart

OPTION(S)	FIXED TIMOUT (T)	ADJUSTABLE (A)	POWER-UP TRIGGER (PT)	DUAL-EDGE TRIG (DT)	AC INPUT (AC)	LOCK-OUT (LO)
FIXED TIMOUT (T)			■	■	■	■
ADJUSTABLE (A)			■	■	■	■
POWER-UP TRIGGER (PT)	■	■		1	■	■
DUAL-EDGE TRIG (DT)	■	■	1			■
AC INPUT (AC)	■	■	■			■
LOCK-OUT (LO)	■	■	■	■	■	

Note(s):

1 The Dual Edge Trigger option includes a power-up trigger feature. If this option is used in conjunction with the Lock-out (LO) option, the input trigger signal must be present at power-up. Otherwise, the timer will time-out from power-up and latch in the 'lock-out' mode requiring an external reset to be applied expecting the WDI input signal presence.

BLANK BOXES indicate options which cannot be combined.

1 ▶ Fixed Time-out (specified) (-T)

P8D-ISM types, without any timing options specified, provide a standard 2 second Fixed Time-out. If a different time-out period is required, other than the standard two (2) seconds, please specify the desired time-out when ordering. Any fixed time-out value may be specified from 50 milliseconds to 60 Seconds.

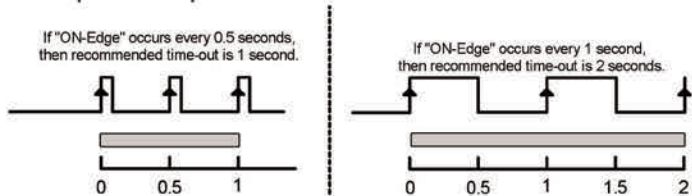
For a time-out of less than 1 second, the value must be specified in milliseconds (i.e. for a 250 millisecond timeout, specify “-T250MS”). For values of 1 second to 60 seconds, the value is specified in seconds (Examples: specify -T2.75 for 2.75 seconds OR -T30 for 30 seconds, etc.).

Timing Precision

Precision Timing values may also be specified to millisecond resolution. Timing values are the value of the internal precision digital timer *dWDT* with +/-2% timing accuracy. Note that for short time-out periods, the pick-up and drop-out times of the output relay need to be considered. Referring to the Contact Specifications section, a seven (7) millisecond pick-up delay of the output relay contact should be expected including contact bounce when energized. Upon time-out, a three (3) millisecond drop-out latency of the output contact should be expected including contact bounce.

Selecting a Time-out

Standard **P8D-ISM** modules are ‘Single-Edge’ or ‘ON-Edge’ triggered resetting the timer and energizing the output relay upon receiving the first pulse. Specified time-out values should assure that at least two ON-Edges triggers occur within the time-out period. For example, if a pulse is received every 500 milliseconds, the recommended time-out value would be at least greater than two times, or 1 second.



Careful consideration must be used when using a “toggle” function to trigger the WDI input. An example would be, where a ‘toggle’ function is performed every 500mS - meaning the state changes OFF for 500mS, then ON for 500mS... In this case, only one “ON-EDGE” will occur every full second making the recommended time-out period 2 seconds so that at least two triggering “ON-Edges” occurs within the time-out period.

Enhanced Inductive Load Feature

It is highly recommended that all inductive loads in any control system be suppressed with sufficient spike suppression to eliminate RFI/EMI from “inductive kick” when a coil de-energizes. The P8D-Series employs a proprietary *Enhanced Inductive Load Feature* which prevents false re-triggers from RFI/EMI spikes which can occur at time-out from the de-energizing of coincident inductive loads. Please refer to (T_{RET}) in the Detailed Timing Specification section.

2 ▶ Adjustable Time-out 25 TURN (-Axx.xx to xx.xx)

The P8D-Series allows the range of time-out period adjustment to be specified. By defining the minimum and maximum time-out values, **a 25 turn adjustment is provided for field timing adjustment in 1% increments (or 100 step resolution)**. (Note: There are no stops in the timing adjustment screw - it will rotate continuously over the specified timing range.)

Any timing value ranges from 50 milliseconds to 60 seconds may be specified, with the minimum range span of 100mS. The time-out value increases with clockwise adjustment.

Specifying Adjustable Time-out Periods

Example(s):

1. For an adjustable range of 50 milliseconds to 2 seconds, specify **-A50MS-2** in the part number.
2. For 100 milliseconds to 500 milliseconds, specify **-A100MS-500MS**.
3. For an adjustable range of 2 to 10 seconds, specify **-A2-10**.
4. For an adjustment range of 1 to 60 Seconds, specify **-A1-60**.

Estimating Time-out by Adjustment Turns

When determining time-outs, it is first recommended to begin at the minimum end of the adjustable timing range using a small screw driver and rotating the 25T adjustment screw 25+ times counter-clockwise (CCW or to the left). The timing range is at the maximum time when the 25T adjustment is rotated 25+ times clockwise (CW or to the right). (Note: There are no stops in the timing adjustment screw - it will rotate continuously.)

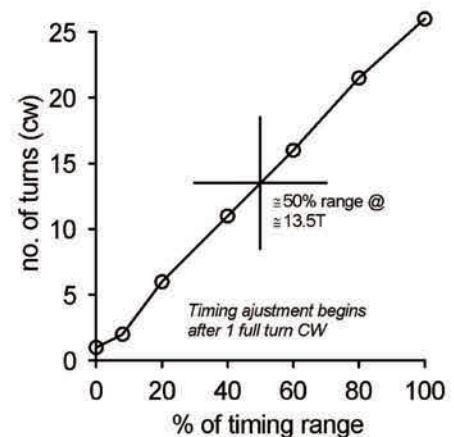
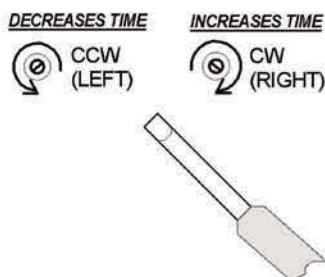
When calculating a time-out, add the minimum time (T_{min}) to the increased time derived from the graph to the right.

$$T = T_{\text{MIN}} + (\% \text{Range} \div 100\% \times (T_{\text{MAX}} - T_{\text{MIN}}))$$

where,

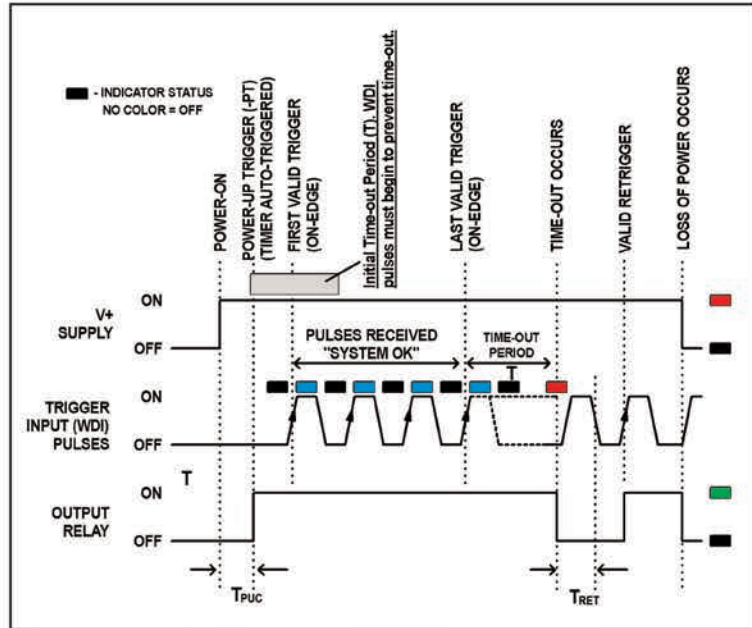
(T) is Timeout,
(T_{MIN}) is the minimum time-out,
(T_{MAX}) is the maximum time-out

%Range is the estimated factor value determined by no. of turns from the adjustment graph.



3 ▶ Power-up Triggered (-PT)

The Power-up Trigger function (-PT) is useful for 'boot-strap' applications requiring time to boot-up a control system intended to continue triggering the Watchdog Timer. After the initial power-up delay (T_{PUC}), the Power-up Trigger function (-PT) automatically triggers the timer when power is applied to pins 2 & 7, which energizes the output relay for the initial time-out period (T). If subsequent WDI trigger pulses are then received during the initial time-out period, the Watchdog timer will remain reset. However, if no pulses are subsequently received during the initial time-out period, the timer will time-out and de-energize the output as a system fault. Other uses include precision power-on, delay-off timer applications.



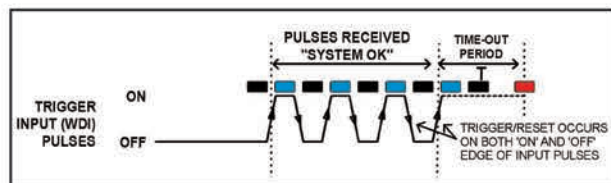
Application Note:

Special Considerations when combining the (-PT) & (-LO) Options together

If the (-PT) option is combined with the Lock-out (-LO) option, trigger pulses need to be received after power-up and during the initial time-out period to prevent a 'time-out / lock-out' from occurring. If a 'time-out / lock-out' does occur, a RESET must be initiated to clear the 'lock-out' state by interrupting power to pin 2 for two (2) seconds. A RESET will allow the power-up trigger sequence to clear and again accept input trigger pulses.

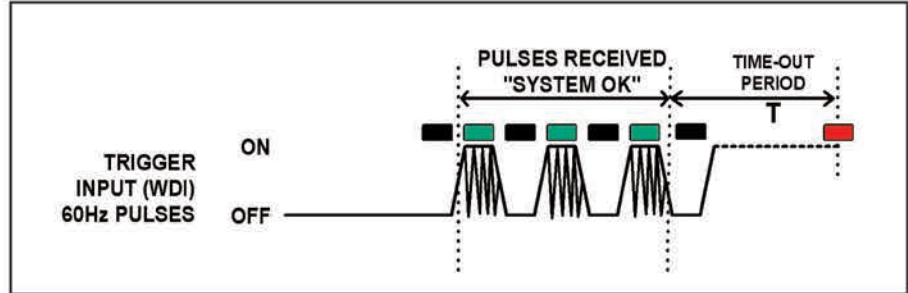
4 ▶ Dual-edge Input Trigger/Reset (-DT)

The standard Watchdog Timer input is 'single-edge' triggered only resetting the Watchdog Timer when an "ON-EDGE" is received (pins 5+ & 6-). The Dual-Edge trigger (-DT) option triggers/resets the timer on both leading (ON) and trailing (OFF) edges of an input pulse. As with the (-PT) option, this feature triggers the timer at power-up. The same special considerations apply when using this feature with the (-LO) lock-out option as mentioned in the previous option section.



5 ▶ 120VAC/60Hz Trigger Input (-AC)

The (-AC) input option features an advanced filter which recognizes 60Hz AC voltages to determine their presence and absence providing dependable ON/OFF AC pulse detection. Without this feature, an AC voltage continuously applied ON to a standard DC pulse input appears as multiple pulses keeping the timer triggered. (Please consult factory for filtering and detection of lower frequencies, such as 50Hz.)



This option provides detection of standard AC line voltages operating within the 90-130VAC limits which can be switched ON and OFF by standard DRY CONTACT outputs, such as mechanical relays, switches, etc.) The input indicator is ON (GREEN) while the AC is present and OFF when it is absent.

Application Note for SSR's:

The input is virtually "non-loading" to the AC signal source and therefore may not meet the minimum loading requirements of SSR's. In such applications, the required load must be applied externally or used in applications with minimum load requirements already met.

Operating Parameters -AC Option (Pin 6 & 8)

SYMBOL	PARAMETER	LIMITS			UNIT	CONDITION
		MIN	TYP	MAX		
F_{IN}	AC Frequency	58	60	480	Hz	
AC_{ON}	Pulse ON-time	2		time-out	mS	
AC_{OFF}	Pulse OFF-time	20		time-out	mS	
R_{in}	Input Resistance	200	250		Kohm	
V_{off}	Input OFF level	0		5	Vrms	
V_{on}	Input ON level	90	115	150	Vrms	

Absolute Maximum RESET (WDI) voltage (Pins 6 & 8) 200Vrms

6 ► Lock-out 'First Fault' Annunciated (-LO)

This feature is very useful in fail-safe applications which cannot allow a system to recover without user intervention (permissive start, E-STOP, machinery, etc.). It is also helpful to determine system faults which may be intermittent.

The Lock-out 'First Fault' option is an advanced feature which detects, retains and indicates the 'first-fault' condition which occurs after initial start-up and 'SYSTEM OK' status. Upon initial power-up (or power to the P8D-ISM Module is interrupted for > 2 seconds), all fault conditions are cleared. When all monitored conditions are satisfied, such as the supervised Power Supply voltage is operating within 10% of nominal (if power supply supervision is active) and upon receiving the first WDI trigger pulse, the output relay is energized and the OUTPUT indicator is SOLID ON (GREEN■) indicating 'SYSTEM OK'. Normal operation will continue indefinitely unless a system fault is detected. The first fault detected will cause the output relay to de-energize and remain 'locked-out', as long as the power supply voltage does not at any time drop below 3.6 volts. The indicators will also retain indication of the 'first-fault' which occurred;

- the Supervised power supply voltage exceeds 15% of nominal (if active)
[The POWER indicator will FAST FLASH (RED■ ■ ■)]
- the Supervised power supply voltage drops below 15% of nominal (if active)
[The POWER indicator will SLOW FLASH (RED■ ■ ■)]
- the Watchdog Timer does not receive a pulse within the time-out period
[The INPUT indicator will also remain SOLID ON (RED■)]

The module will maintain the 'first-fault' in the locked-out state until cleared by interrupting power to pins 2(+) and or 7(-) for at least two seconds.