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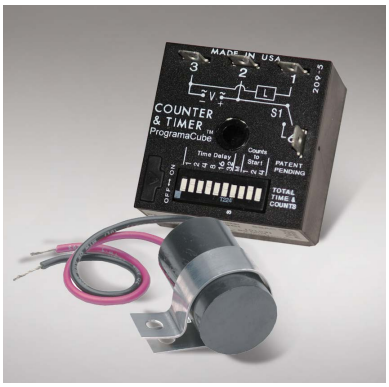
TIMERS, FLASHERS & EQUIPMENT CONTROLS CATALOG



For information, call 800-221-0487 ☐ Switches Unlimited ☐ Fax 718-672-6370 ☐ www.switchesunlimited.com
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TIMERS, FLASHERS & EQUIPMENT CONTROLS

Timers • Flashers • Liquid Level Controls • Alternating Relays
Current Sensors/Transducers • Voltage/Phase Monitors • Indicators

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Timers (ProgramCube)

Series Included

Relay Output - Single

Power Relay Output

Solid-State Output - Dual

Solid-State Output

Power Solid-State Output

Switches Unlimited
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The KRPD Series is a factory programmed time delay relay available with 1 of 12 standard dual functions. The time delays can be factory fixed, onboard or externally adjustable or a combination of fixed and adjustable. The SPDT output relay contacts offer a full 10A rating with complete isolation. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRPD Series is a cost effective approach for OEM applications that require small size, isolation, accuracy and long life.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

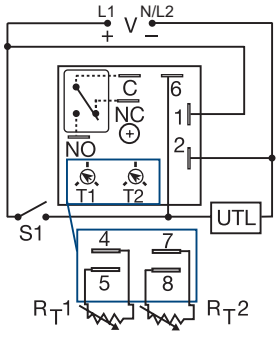
- Choose 1 of 12 standard dual functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Input voltage from 12 to 240V in 2 ranges
- Delays from 100ms - 1000h in 9 ranges

Approvals:

Auxiliary Products:

- **External adjust potentiometer:** P/N: P1004-95
- P/N: P1004-95-X
- **Versa-knob:** P/N: P0700-7
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

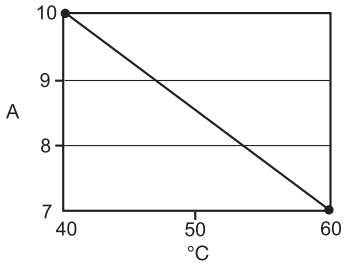
Connection:



V = Voltage
C = Common, Transfer Contact
NC = Normally Closed
NO = Normally Open
S1 = Initiate Switch
UTL = Untimed Load

A knob is supplied for adjustable units or R_T terminals for external adjust. The untimed load is optional. S1 is not used for some functions.

Output Current/Ambient Temperature:



Available Models:

KRPD12121MB	KRPDA2825AMI
KRPD215S190SMB	KRPDA3232MB
KRPD417M113MRXD	KRPDA3434MB
KRPDA11M14MRXE	KRPDD2121MB
KRPDA175S130SMI	KRPDD3232RXE
KRPDA2222RXE	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

KRPD **X** **Input**
- A - 24 to 240VAC/DC
- D - 12 to 48VDC
- 1 - 12VDC
- 2 - 24VAC
- 4 - 120VAC
- 9 - 230VAC

X **First Adjustment (T1 or R_T1)**
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X **First Time Delay***
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X **Second Adjustment (T2 or R_T2)**
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X **Second Time Delay***
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X **Function**
- Specify function

Functions:
MB, MRE, MI, MS, IRE, BRE, SRE, RXE, RXD, IM, AMI, SL

*If fixed delay is selected, insert delay (**0.1-999**) followed by (**S**) secs., or (**M**) mins., or (**H**) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay
Type . . . . . Microcontroller circuitry
Range . . . . . 0.1s - 1000h in 9 adjustable ranges or fixed (to 999)
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±2%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 40ms; 750 operations per minute
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 12 to 48VDC; 24 to 240VAC/DC
Tolerance 12 to 48VDC . . . . . -15% - 20%
24 to 240VAC/DC . . . . . -20% - 10%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Isolated relay contacts
Form . . . . . SPDT
Rating (at 40°C) . . . . . 10A resistive @ 125VAC
5A resistive @ 230VAC & 28VDC
1/4 hp @ 125VAC
Max. Switching Voltage 250VAC
Life (Operations) . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connects
Environmental
Operating / Storage Temperature . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.6 oz (74 g)

The KRPS Series is a factory programmed time delay relay available with 1 of 15 functions and measures only 2 inches square. The KRPS offers a wide range of fixed, onboard, or externally adjustable time delays. The output relay contacts offer a full 10A rating with complete isolation. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRPS Series is a cost effective approach for OEM applications that require small size, isolation, accuracy, and long life. Special time ranges and functions are available.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

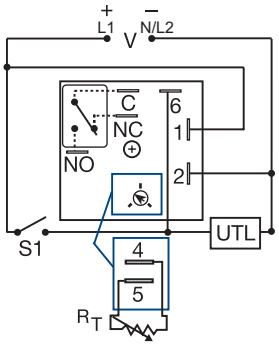
- Choose 1 of 15 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Input voltage from 12 to 240V in 2 ranges
- Delays from 0.1s - 1000h in 9 ranges

Approvals:

Auxiliary Products:

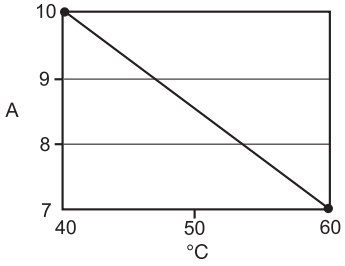
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Versa-knob:** P/N: P0700-7
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



V = Voltage
C = Common, Transfer Contact
NC = Normally Closed
NO = Normally Open
S1 = Initiate Switch
UTL = Untimed Load
A knob is supplied for adjustable units, or R_t terminals 4 & 5 for external adjust. See external adjustment vs. time delay chart. The untimed load is optional. S1 is not used for some functions.

Output Current/Ambient Temperature:



Available Models:

KRPS1110SM	KRPSD10.1SF
KRPS4160MM	KRPSD10.1SM
KRPS425M	KRPSD10.5SS
KRPS913MB	KRPSD12STS
KRPSA10.1SFT	KRPSD13SB
KRPSA10.5SFT	KRPSD21B
KRPSA110SM	KRPSD21M
KRPSA12MM	KRPSD22M
KRPSA12SM	KRPSD22PSD
KRPSA15SM	KRPSD22S
KRPSA21RE	KRPSD24B
KRPSA22B	KRPSD24M
KRPSA22PSD	KRPSD25B
KRPSA24M	KRPSD25S
KRPSA28PSE	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

KRPS **X** **Input**
- A - 24 to 240VAC/DC
- D - 12 to 48VDC
- 1 - 12VDC
- 4 - 120VAC
- 9 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

*If fixed delay is selected, insert delay (**0.1-1000**) followed by (**S**) secs., (**M**) mins., or (**H**) hrs.

X **Delay***
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X **Function**
Specify function

Functions:
M, B, RE, RD, S, SD, I, TS, US, UB, AM, PSD, FT, F, SF

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay	
Type	Microcontroller circuitry
Range	0.1s - 1000h in 9 adjustable ranges or fixed
Repeat Accuracy	±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration)	≤ ±2%
Reset Time	≤ 150ms
Initiate Time	≤ 40ms; ≤ 750 operations per minute
Time Delay vs Temp. & Voltage	≤ ±2%
Input	
Voltage	12 to 48VDC; 24 to 240VAC/DC
Tolerance 12 to 48VDC	-15% - 20%
24 to 240VAC/DC	-20% - 10%
AC Line Frequency / DC Ripple	50/60Hz / ≤ 10%
Power Consumption	AC ≤ 2VA; DC ≤ 2W
Output	
Type	Isolated relay contacts
Form	SPDT
Rating (at 40°C)	10A resistive @ 125VAC 5A resistive @ 230VAC & 28VDC 1/4 hp @ 125VAC
Max. Switching Voltage	250VAC
Life (Operations)	Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection	
Circuitry	Encapsulated
Isolation Voltage	≥ 1500V RMS input to output
Insulation Resistance	≥ 100 MΩ
Polarity	DC units are reverse polarity protected
Mechanical	
Mounting	Surface mt. with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
Termination	0.25 in. (6.35 mm) male quick connects
Environmental	
Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.6 oz (74 g)

The HRID/HRPD Series combines an electromechanical relay with microcontroller timing circuitry. It is a factory programmed module available in any 1 of 12 standard functions. It offers 12 to 240V operation in two universal ranges and factory fixed, onboard or externally adjustable time delays with a repeat accuracy of ±0.5%. The high switching capacity of the output contacts allow for direct control of heavy loads like compressors, pumps, motors, heaters, and lighting. HRPD has non-isolated SPDT relay contacts, and the HRID has isolated SPDT relay contacts. An excellent choice for OEM applications where cost is a factor. Both offer dual functions in one convenient package.

See Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

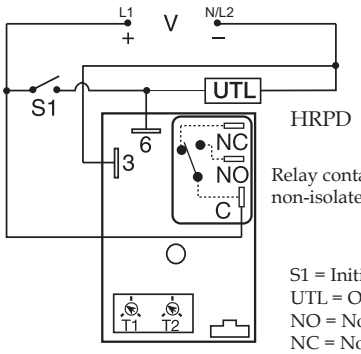
- Special time ranges & functions available
- Factory programmed
- 30A, SPDT, NO output contacts
- 12 to 240V operation in 2 ranges
- Delays from 0.1s - 1000h in 9 ranges
- ±0.5% repeat accuracy

Approvals:

Auxiliary Products:

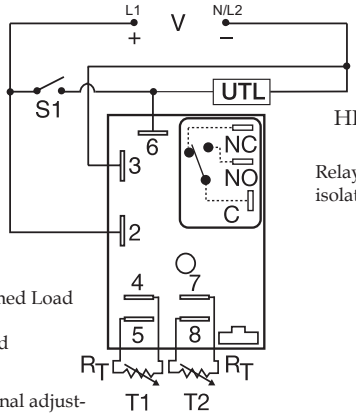
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Versa-knob:** P/N: P0700-7
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



HRPD

Relay contacts are non-isolated.



HRID

Relay contacts are isolated.

S1 = Initiate Switch
UTL = Optional Untimed Load
NO = Normally Open
NC = Normally Closed
C = Common

R_1 is used when external adjustment is ordered.

Available Models:

HRPDD2225RXE

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

HRID / HRPD

X — Input
- W - 24 to 240VAC
- 24 to 110VDC
- D - 12 to 48VDC

X — First Adjustment (T1 or $R_1$1)
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X — First Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X — Second Adjustment (T2 or $R_1$2)
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X — Second Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X — Function
- Specify function

Functions:
MB, MRE, MI, MS, IRE, BRE, SRE, RXE, RXD, IM, AMI, SL

*If fixed delay is selected, insert delay (**0.1-999**) followed by (**S**) secs., or (**M**) mins., or (**H**) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay

Range	0.1s - 1000h in 9 adjustable ranges or fixed
Repeat Accuracy	±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration)	±2%
Reset Time	≤ 150ms
Initiate Time	≤ 20ms; ≤ 1500 operations per minute
Time Delay vs. Temp. & Voltage	≤ ±2%

Input

Voltage	12 to 48VDC; 24 to 240VAC/24 to 110VDC
Tolerance 2 to 48VDC	-15% - 20%
24 to 110VDC/24 to 240VAC	-20% - 10%
AC Line Frequency	50/60Hz
Power Consumption	AC ≤ 4VA; DC ≤ 2W

Output

Type	Electromechanical relay		
Form	SPDT		
Ratings:		SPDT-N.O	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**
Life (Operations)	Mechanical - 1 x 10^6		
	Electrical - 1 x 10^5, *3 x10^4, **6,000		

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Isolation Voltage	≥1500V RMS input to output; isolated units
Insulation Resistance	≥100 MΩ
Polarity	DC units are reverse polarity protected

Mechanical

Mounting	Surface mt. with one #10 (M5 x 0.8) screw
Dimensions	3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)
Termination	0.25 in. (6.35 mm) male quick connects

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)

The HRPS/HRIS Series combines an electromechanical relay output with microcontroller timing circuitry. It is a factory programmed module available in any 1 of 13 standard functions. It offers 12 to 240V operation in two universal ranges and factory fixed, onboard, or external adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. This series is ideal for OEM applications where cost is a factor. The HRPS has non-isolated SPDT relay contacts, and the HRIS has isolated SPDT relay contacts. Both offer the most popular timer functions in the industry.

See Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

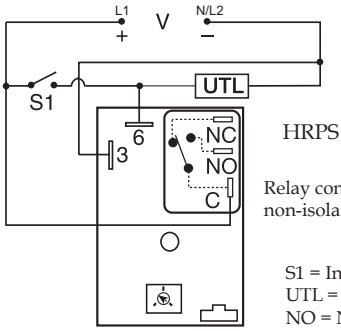
- 30A, SPDT, NO output contacts
- Factory programmed
- 12 to 240V operation in 2 ranges
- Special time ranges & functions available
- Delays from 0.1s - 1000h in 9 ranges
- ±0.5% repeat accuracy
- ±2% factory calibration
- Fixed, external, or onboard adjustment

Approvals:

Auxiliary Products:

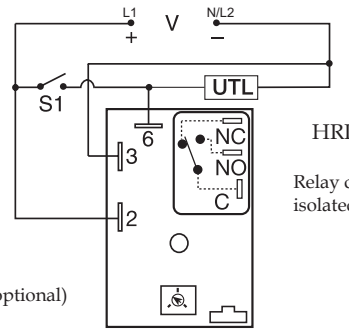
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



HRPS

Relay contacts are non-isolated.



HRIS

Relay contacts are isolated.

S1 = Initiate Switch
UTL = Untimed Load (optional)
NO = Normally Open
NC = Normally Closed
C = Common

A knob, or terminals 4 & 5 are only included on adjustable units. R_T is used when external adjustment is ordered.

Available Models:

HRISW21FT
HRISW27I
HRPSD12HI

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

HRPS / HRIS

X — Input
- W - 24 to 240VAC
  24 to 110VDC
- D - 12 to 48VDC

X — Adjustment
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

*If fixed delay is selected, insert delay (**0.1-1000**) followed by (**S**) secs., (**M**) mins., or (**H**) hrs.

X — Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X — Function
Specify function

Functions:
M, B, RE, RD, S, SD,
I, TS, US, UB, AM,
PSD, FT

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay

Type	Microcontroller circuitry
Range	0.1s - 1000h in 9 adjustable ranges or fixed
Repeat Accuracy	±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration)	±2%
Reset Time	≤ 150ms
Initiate Time	≤ 20ms
Time Delay vs Temp. & Voltage	±2%

Input

Voltage	12 to 48VDC; 24 to 240VAC/24 to 110VDC
Tolerance 12 to 48VDC	-15% - 20%
24 to 110VDC/240VAC	-20% - 10%
AC Line Frequency	50/60Hz
Power Consumption	AC ≤ 4VA; DC ≤ 2W

Output

Type	Electromechanical relay
Form	SPDT

Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**

Life	Mechanical - 1 x 10^6
	Electrical - 1 x 10^5, *3 x 10^4, **6,000

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Isolation Voltage	≥ 1500V RMS input to output; isolated units
Insulation Resistance	≥ 100 MΩ
Polarity	DC units are reverse polarity protected

Mechanical

Mounting	Surface mt. with one #10 (M5 x 0.8) screw
Dimensions	3 x 2 x 1.5 in (76.7 x 51.3 x 38.1 mm)
Termination	0.25 in. (6.35 mm) male quick connects

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)

The HRPU/HRIU Series combines an electromechanical relay output with microcontroller timing circuitry. Its switching capacity allows direct control of loads like compressors, pumps, motors, heaters, and lighting. It is a factory programmed module available in any 1 of 14 standard functions. The HRPU/HRIU offers a single adjustable timer or counter function. Switch adjustment allows accurate selection of the time delay or number of counts. The HRPU has non-isolated relay contacts, the HRIU has isolated relay contacts. Encapsulation protects against shock, vibration, and humidity. The HRPU/HRIU Series is a cost effective approach for OEM applications that require small size, reliability and accurate switch adjustment.

See Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.1% repeat accuracy
- 30A, SPDT, NO output contacts
- Accurate switch adjustment
- 12 to 240V operations in 2 ranges
- Delays from 0.1s - 1023h

Approvals:

Auxiliary Products:

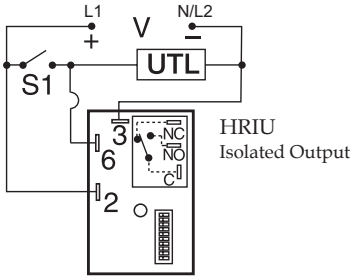
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

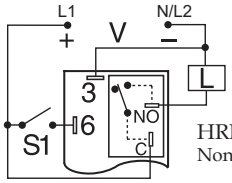
HRIUW2I
HRIUW2M

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



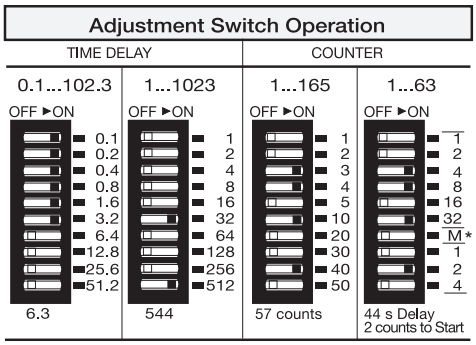
HRIU
Isolated Output



HRPU
Non-isolated Output

S1 = Initiate Switch
UTL = Optional Untimed Load
L = Load
V = Voltage

Switch Adjustment:



Order Table:

HRPU/ HRIU | **X** | **Input**
- W - 24 to 240VAC 24 to 110VDC
- D - 12 to 48VDC

X | **Time Delay/Counts**
- 1 - 0.1 - 102.3s
- 2 - 1 - 1023s
- 3 - 0.1 - 102.3m
- 4 - 1 - 1023m
- 5 - 0.1 - 102.3h
- 6 - 1 - 1023h
- 7 - 1 - 165 counts (straight) w/ pulsed output
- 8 - 1 - 1023 counts (binary) w/ pulsed output
- 9 - 1 - 7 counts to start 1 - 63s or m interval time

X | **Function**
Specify function

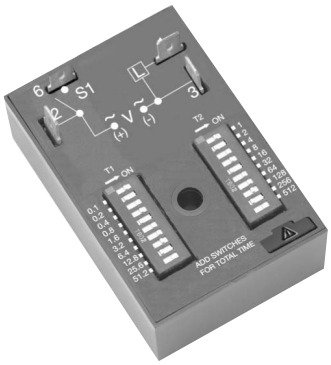
Functions:
M, B, RE, RD, S, SD, I, TS, PSD, US, AM, UB, C, CI

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Count Functions/Switch Type	Mechanical switch (counts on switch closure)		
Count Range	1 - 1023 counts		
Counter Output (Variable 7 & 8)	Pulse widths 300ms ±20%		
Initiate Time	≤ 20ms, ≤ 1500 operations per minute		
Time Delay/Range ***	Adjustable 0.1s - 1023h		
Setting Accuracy	±1%, or 50ms, whichever is greater		
Repeat Accuracy	0.1% or 20ms, whichever is greater		
Reset Time	≤ 150ms		
Time Delay vs Temp. & Voltage	±2%		
Input			
Voltage	12 to 48VDC; 24 to 240VAC/24 to 110VDC		
AC Line Frequency / DC Ripple	50/60Hz / ≤ 10%		
Tolerance 12 to 48VDC	-15% - 20%		
24 to 240VAC/24 to 110VDC	-20% - 10%		
Power Consumption	AC ≤ 4VA; DC ≤ 2W		
Output			
Type	Electromechanical relay		
Form	SPDT		
Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**
Life	Mechanical - 1 x 10^6		
	Electrical - 1 x 10^5, *3 x 10^4, ** 6,000		
Protection			
Surge	IEEE C62.41-1991 Level A		
Circuitry	Encapsulated		
Isolation Voltage	≥ 1500V RMS input to output; isolated units		
Insulation Resistance	≥ 100 MΩ		
Mechanical			
Mounting	Surface mt. with one #10 (M5 x 0.8) screw		
Dimensions	3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)		
Termination	0.25 in. (6.35 mm) male quick connects		
Environmental			
Operating / Storage Temperature	-40° to 60°C / -40° to 85°C		
Humidity	95% relative, non-condensing		
Weight	≅ 3.9 oz (111 g)		

***For CE approved applications, power must be removed from the unit when a switch position is changed.



The HSPZ Series is a factory programmed module available in any 1 of 13 standard functions. The HSPZ offers dual switch adjustable timer or counter functions. Switch adjustment allows accurate selection of the time delay or number of counts the first time and every time. The 1A steady, 10A inrush rated solid-state output provides 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The HSPZ Series is a cost effective approach for OEM applications that require small size, solid state reliability, and accurate switch adjustment.

See Appendix B, page 165, Figure 3 for dimensional drawing.

Features:

- Choose 1 of 13 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.1% repeat accuracy
- 1A, solid-state output
- Accurate switch adjustment
- 12 to 240V in 3 options
- Delays from 0.1s - 1023h
- Counts to 1023

Approvals:

Auxiliary Products:

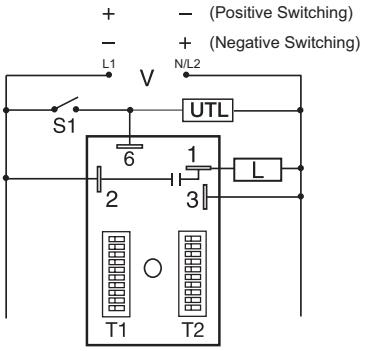
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

HSPZA13MS
HSPZA22SL

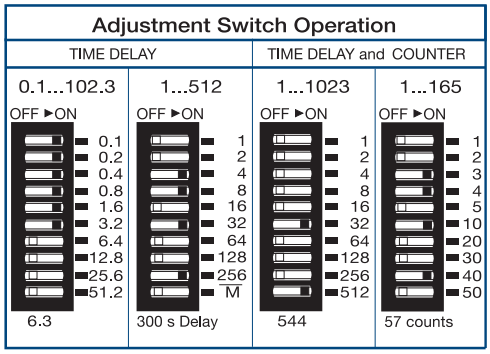
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



S1 = Initiate Switch
UTL = Optional Untimed Load
L = Load
V = Voltage

Switch Adjustment:



Order Table:

HSPZ **X**

Input
- A - 24 to 240VAC
- P - 12 to 120VDC positive switching
- N - 12 to 120VDC negative switching

X

T1 Time Delay/Counts
- 1 - 0.1 - 102.3s
- 2 - 1 - 1023s
- 3 - 0.1 - 102.3m
- 4 - 1 - 1023m
- 5 - 0.1 - 102.3h
- 6 - 1 - 1023h
- 7 - 1 - 165 counts (straight)
- 8 - 1 -1023 counts (binary)
- 9 - 1 - 512m or s

X

T2 Time Delay/Counts
- 1 - 0.1 - 102.3s
- 2 - 1 - 1023s
- 3 - 0.1 - 102.3m
- 4 - 1 - 1023m
- 5 - 0.1 - 102.3h
- 6 - 1 - 1023h
- 7 - for future expansion
- 8 - for future expansion
- 9 - 1 - 512m or s

X

Function
Specify function

Functions:
MB, MRE, MI, MS,
IRE, BRE, SRE, RXE,
RXD, IM, AMI, SL, CI

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay
Type ..... Microcontroller circuitry
Range ..... 0.1 - 102.3s, m or h in 0.1s, m or h increments
1 - 1023s, m or h in 1s, m or h increments
1 - 512s or m in 1s or m increments
Repeat Accuracy ..... ±0.1% or 20ms, whichever is greater
Setting Accuracy ..... ≤ ±1% or 20ms, whichever is greater
Reset Time ..... ≤ 150ms
Initiate Time ..... ≤ 20ms
Time Delay vs Temp. & Voltage ..... ≤ ±2%
Count Range ..... 1 - 1023 in 2 ranges
Count Rate ..... ≤ 25 counts per second

Input
Voltage ..... 12 to 120VDC; 24 to 240VAC
Tolerance ..... ≤ ±15%
AC Line Frequency / DC Ripple ..... 50/60Hz / ≤ 10%
Power Consumption ..... AC ≤ 2VA; DC ≤ 1W

Output
Type ..... Solid-state output
Rating ..... 1A steady, 10A inrush for 16ms
Voltage Drop ..... AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
OFF State Leakage Current ..... AC ≅ 5mA @ 240VAC; DC ≅ 1mA
Counter Output ..... Output pulse width: 300ms ±20%

Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Surface mt. with one #10 (M5 x 0.8) screw
Dimensions ..... 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connects

Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 3.9 oz (111 g)

For information, call 800-221-0487 ☐ Switches Unlimited ☐ Fax 718-672-6370 ☐ www.switchesunlimited.com
tech@switchesunlimited.com ☐ sales@switchesunlimited.com

The KSPD Series is a factory programmed module available with 1 of 12 standard dual functions. The time delays can be factory fixed, externally or onboard adjustable, or a combination of fixed and adjustable. The 1A steady, 10A inrush rated solid-state output provides 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KSPD Series is a cost effective approach for OEM applications that require small size and long life.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

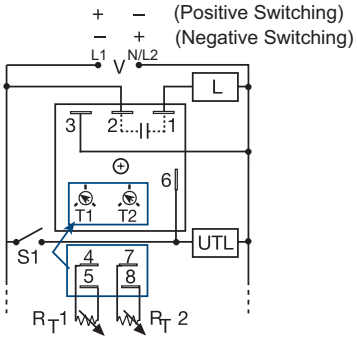
- Choose 1 of 12 standard dual functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- 1A steady, solid-state output , 10A inrush
- 12 to 240V in 3 options
- Delays from 0.1s - 1000h in 9 ranges

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Versa-knob:** P/N: P0700-7
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



Terminal Location for External Adjustment.

V = Voltage
L = Load
S1 = Initiate Switch
UTL = Untimed Load
T1 & R_T1 = First Adjustment
T2 & R_T2 = Second Adjustment

Available Models:

KSPD32221RXD	KSPDA2222RXE
KSPD4175S130SMS	KSPDP10.1S31RXE
KSPD42121MB	KSPDP110M18SRXD
KSPDA110ST00127	KSPDP110M18SRXE
KSPDA114ST00173	KSPDP3131MI
KSPDA2121RXE	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

KSPD **X**

Input
- A - 24 to 240VAC
- P - 12 to 120VDC positive switching
- N - 12 to 120VDC negative switching
- 1 - 120VDC positive switching
- 3 - 24VDC
- 4 - 120VAC

X

First Adjustment (T1 or R_T1)
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X

First Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X

Second Adjustment (T2 or R_T2)
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X

Second Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X

Function
- Specify function

Functions:
MB, MRE, MI, MS, IRE, BRE, SRE, RXE, RXD, IM, AMI, SL

*If fixed delay is selected, insert delay (**0.1-999**) followed by (**S**) secs., or (**M**) mins., or (**H**) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay
Type . . . . . Microcontroller circuitry
Range . . . . . 0.1s - 1000h in 9 adjustable ranges or fixed (to 999)
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±2%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms; ≤ 1500 operations per minute
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%

Input
Voltage . . . . . 12 to 120VDC; 24 to 240VAC
Tolerance . . . . . ≤ ±15%
AC Line Frequency / DC Ripple . . . . . 50/60Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 1W

Output
Type . . . . . Solid-state output
Rating . . . . . 1A steady, 10A inrush for 16ms
Voltage Drop . . . . . AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
OFF State Leakage Current . . . . . AC ≅ 5mA @ 230VAC; DC ≅ 1mA

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Surface mt. with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connects

Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)

The KSPS Series is a factory programmed module available in any 1 of 14 standard functions. The KSPS offers a single, fixed, externally or onboard adjustable time delay. The 1A steady, 10A inrush rated solid-state output provides 100 million operations typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KSPS Series is a cost effective approach for OEM applications that require small size and solid state reliability.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

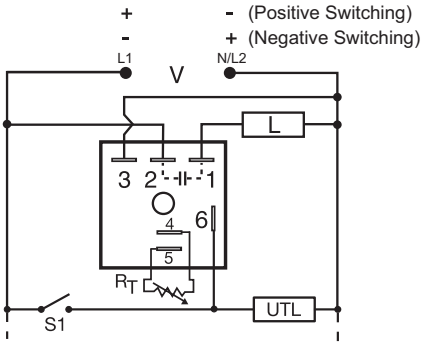
- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- Solid-state output 1A steady, 10A inrush
- Fixed, external, or onboard adjustment
- 12 to 240V in 3 options
- Delays from 0.1s - 1000h in 9 ranges

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Versa-knob:** P/N: P0700-7
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



L = Load
UTL = Untimed Load
V = Voltage
S1 = Initiate Switch

Available Models:

KSPS121TS	KSPSA24US
KSPS124PS	KSPSN110SI
KSPS2180SB	KSPSN21B
KSPS3115SRE	KSPSP110SI
KSPSA21FT	KSPSP145SM
KSPSA23SD	KSPSP160MB
KSPSA24B	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

KSPS **X**

Input
- A - 24 to 240VAC
- P - 12 to 120VDC positive switching
- N - 12 to 120VDC negative switching
- 1 - 12VDC positive switching
- 2 - 24VAC
- 3 - 24VDC positive switching

X

Adjustment
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X

Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X

Function
Specify function

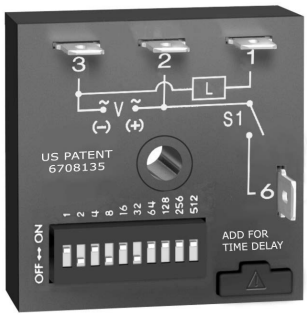
Functions:
M, B, RE, RD, S, SD, FT I, TS, US, UB, AM, PS, PSD

*If fixed delay is selected, insert delay (**0.1-1000**) followed by (**S**) secs., or (**M**) mins., or (**H**) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay	
Type	Microcontroller circuitry
Range	0.1s - 1000h in 9 adjustable ranges or fixed
Repeat Accuracy	±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration)	≤ ±2%
Reset Time	≤ 150ms
Initiate Time	≤ 20ms; ≤ 1500 operations per minute
Time Delay vs Temp. & Voltage	≤ ±2%
Input	
Voltage	12 to 120VDC; 24 to 240VAC
Tolerance	≤ ±15%
AC Line Frequency / DC Ripple	50/60Hz / ≤ 10%
Power Consumption	AC ≤ 2VA; DC ≤ 1W
Output	
Type	Solid-state output
Rating	1A steady, 10A inrush for 16ms
Voltage Drop	AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
OFF State Leakage Current	AC ≅ 5mA @ 240VAC, DC ≅ 1mA
Protection	
Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ
Polarity	DC units are reverse polarity protected
Mechanical	
Mounting	Surface mt. with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination	0.25 in. (6.35 mm) male quick connects
Environmental	
Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.4 oz (68 g)



The KSPU Series is a factory programmed module available in any 1 of 14 standard functions. The KSPU offers a single adjustable timer or counter function. Switch adjustment allows accurate selection of the time delay or number of counts the first time and every time. The 1A steady, 10A inrush rated solid-state output provides 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KSPU Series is a cost effective approach for OEM applications that require small size, solid state reliability, and accurate switch adjustment.

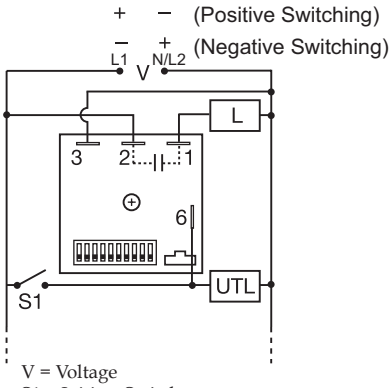
See Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.1% repeat accuracy
- 1A steady, solid-state output, 10A inrush
- Accurate switch adjustment
- 12 to 240V in 3 options
- Delays from 0.1s - 1023h
- Counts 1 to 1023

Approvals:

Connection:



V = Voltage
S1 = Initiate Switch
L = Load
UTL = Untimed Load

Switch Adjustment:

Adjustment Switch Operation

TIME DELAY		COUNTER	
0.1...102.3	1...1023	1...165	1...63
OFF ►ON	OFF ►ON	OFF ►ON	OFF ►ON
0.1 0.2 0.4 0.8 1.6 3.2 6.4 12.8 25.6 51.2	1 2 4 8 16 32 64 128 256 512	1 2 3 4 5 10 20 30 40 50	1 2 4 8 16 32 M* 1 2 4
6.3	544	57 counts	44 s Delay 2 counts to Start

* for selecting time in minutes or seconds

Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

KSPU11M
KSPUA2I
KSPUA8C

If desired part number is not listed, please call us to see if it is technically possible to build

Order Table:

KSPU **X** **X** **X**

Input
- A - 24 to 240VAC
- P - 12 to 120VDC positive switching
- N - 12 to 120VDC negative switching
- 1 - 12VDC positive switching
- 4 - 120VAC
- 9 - 120/240VAC

Time Delay/Counts
- 1 - 0.1 - 102.3s
- 2 - 1 - 1023s
- 3 - 0.1 - 102.3m
- 4 - 1 - 1023m
- 5 - 0.1 - 102.3h
- 6 - 1 - 1023h
- 7 - 1 - 165 counts (straight) w/ pulsed output
- 8 - 1 - 1023 counts (binary) w/ pulsed output
- 9 - 1 - 7 counts to start 1 - 63s or m interval time

Function
- Specify function

Functions:
M, B, RE, RD, S, SD, I, TS, US, UB, AM, PSD, C, CI

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay

Type	Microcontroller circuitry
Range	0.1 - 102.3s, m or h in 0.1s, m or h increments 1 - 1023s, m or h in 1s, m or h increments 1 - 63s or m in 1s or m increments
Repeat Accuracy	±0.1% or 20ms, whichever is greater
Setting Accuracy	≤ ±1% or 20ms, whichever is greater
Reset Time	≤ 150ms
Initiate Time	≤ 20ms
Time Delay vs Temp. & Voltage	≤ ±2%
Count Range	1 - 1023 in 3 ranges
Count Rate	≤ 25 counts per second

Input

Voltage	12 to 120VDC; 24 to 240VAC
Tolerance	≤ ±15%
AC Line Frequency / DC Ripple	50/60 Hz / ≤ 10%
Power Consumption	AC ≤ 2VA; DC ≤ 1W

Output

Type	Solid-state output
Rating	1A steady, 10A inrush for 16ms
Voltage Drop	AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
OFF State Leakage Current	AC ≅ 5mA @ 240VAC; DC ≅ 1mA
Counter Output	Output pulse width: 300ms ±20% Time Delay/Counts Variable 7 & 8

Protection

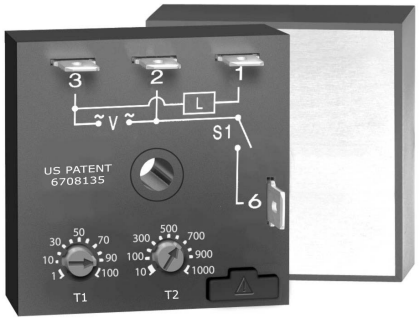
Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ
Polarity	DC units are reverse polarity protected

Mechanical

Mounting	Surface mt. with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination	0.25 in. (6.35 mm) male quick connects

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.4 oz (68 g)



The NHPD Series is a factory programmed module available in any 1 of 12 standard dual functions. The time delays can be factory fixed, externally or onboard adjustable, or a combination of fixed and adjustable. The NHPD includes a high current solid-state output. It can switch motors, lamps and heaters directly without the addition of a contactor. It can switch up to 20A with up to 100 million operations typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The NHPD Series is a cost effective approach for OEM applications that require small size and long life.

See Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- High load currents up to 20A, 200A inrush
- Factory programmed
- Choose 1 of 12 standard dual functions
- Special time ranges & functions available
- Microcontroller circuitry, ±0.5% repeat accuracy
- Fixed, external, or onboard adjustment
- 24 to 240VAC
- Delays from 0.1s - 1000h in 9 ranges

Approvals:

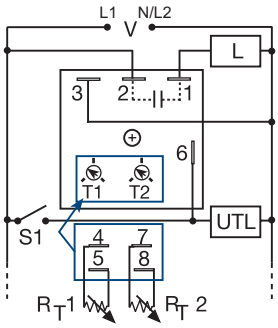
Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Versa-knob:** P/N: P0700-7
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18

Available Models:

There are no part numbers currently active. Please call Technical Support with your requirements.

Connection:



Terminal Location for External Adjustment

V = Voltage
L = Load
S1 = Initiate Switch
UTL = Untimed Load
T1 & R_T1 = First Adjustment
T2 & R_T2 = Second Adjustment

Order Table:

NHPD **X**

Output Rating
- A - 6A
- B - 10A
- C - 20A

X

Input Voltage
- A - 24 to 240VAC

X

First Adjustment (T1 or R_T1)
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X

First Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X

Second Adjustment (T2 or R_T2)
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X

Second Time Delay*
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X

Function
Specify function

Functions:
MB, MRE, MI, MS, IRE, BRE, SRE, RXE, RXD, IM, AMI, SL

*If fixed delay is selected, insert delay (**0.1-999**) followed by (**S**) secs., or (**M**) mins., or (**H**) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay
Type . . . . . Microcontroller circuitry
Range . . . . . 0.1s - 1000h in 9 adjustable ranges or fixed (to 999)
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±2%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms; ≤ 1500 operations per minute
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%

Input
Voltage . . . . . 24 to 240VAC
Tolerance . . . . . ≤ ±15%
AC Line Frequency 50/60Hz

Output
Type . . . . . Solid state

Rating	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

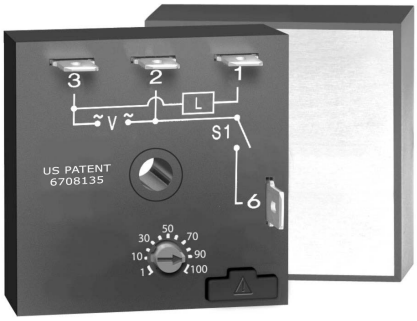
Minimum Load Current 100mA
Voltage Drop . . . . . ≅ 2.5V @ rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ

Mechanical
Mounting ** . . . . . Surface mt with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connects

Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The NHPS Series is a factory programmed module available in any 1 of 13 standard functions. The NHPS offers a single, fixed, onboard adjustment or an externally adjustable time delay. The NHPS includes a high current solid-state output. It can switch motors, lamps and heaters directly without the addition of a contactor. It can switch up to 20A with up to 100 million operations typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The NHPS Series is a cost effective approach for OEM applications that require small size and solid state reliability.

See Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- High load currents up to 20A, 200A inrush
- Factory programmed
- Choose 1 of 13 standard functions
- Special time ranges & functions available
- Microcontroller circuitry, ±0.5% repeat accuracy
- Fixed, external, or onboard adjustment
- 24 to 240VAC
- Delays from 0.1s - 1000h in 9 ranges

Approvals:

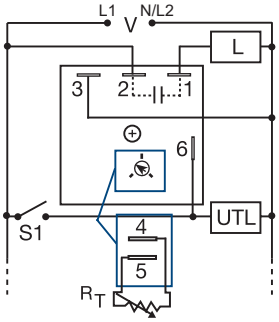
Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Versa-knob:** P/N: P0700-7
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18

Available Models:

There are no part numbers currently active. Please call Technical Support with your requirements.

Connection:



Terminal Location for External Adjustment

V = Voltage
S1 = Initiate Switch
UTL = Untimed Load
L = Load

Order Table:

NHPS **X** **Output Rating**
- A - 6A
- B - 10A
- C - 20A

X **Input**
- A - 24 to 240VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

X **Time Delay***
- 1 - 0.1 - 10s
- 2 - 1 - 100s
- 3 - 10 - 1000s
- 4 - 0.1 - 10m
- 5 - 1 - 100m
- 6 - 10 - 1000m
- 7 - 0.1 - 10h
- 8 - 1 - 100h
- 9 - 10 - 1000h

X **Function**
- Specify function

Functions:
M, B, RE, RD, S, SD, I, TS, US, UB, AM, FT, PSD

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

*If fixed delay is selected, insert delay (**0.1-1000**) followed by (**S**) secs., or (**M**) mins., or (**H**) hrs.

Specifications

Time Delay

Type	Microcontroller circuitry
Range	0.1s - 1000h in 9 adjustable ranges or fixed
Repeat Accuracy	±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration)	≤ ±2%
Reset Time	≤ 150ms
Initiate Time	≤ 20ms; ≤ 1500 operations per minute
Time Delay vs Temp. & Voltage	≤ ±2%

Input

Voltage	24 to 240VAC
Tolerance	≤ ±15%
AC Line Frequency	50/60Hz

Output

Type	Solid state

Rating	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current	100mA
Voltage Drop	≅ 2.5V @ rated current
OFF State Leakage Current	≅ 5mA @ 230VAC

Protection

Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000 V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ

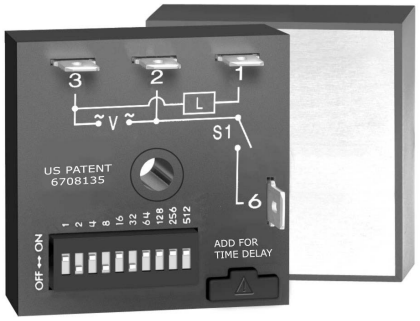
Mechanical

Mounting **	Surface mt. with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination	0.25 in. (6.35 mm) male quick connects

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The NHPU Series is a factory programmed module available in any 1 of 14 standard functions. The NHPU offers a single adjustable timer or counter function. Switch adjustment allows accurate selection of the time delay or number of counts, the first time and every time. The NHPU includes a high current solid-state output. It can switch motors, lamps and heaters directly without the addition of a contactor. It can switch up to 20A with up to 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The NHPU Series is a cost effective approach for OEM applications that require small size, solid state reliability, and accurate switch adjustment.

See Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- High load currents up to 20A, 200A inrush
- Factory programmed
- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Microcontroller circuitry, ±0.1% repeat accuracy
- Accurate switch adjustment
- 24 to 240VAC
- Delays from 0.1s - 1023h
- Counts to 1023

Approvals:

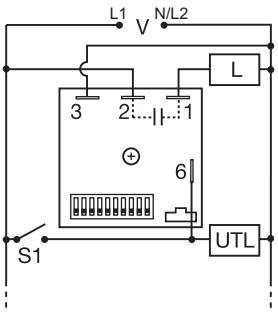
Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18

Available Models:

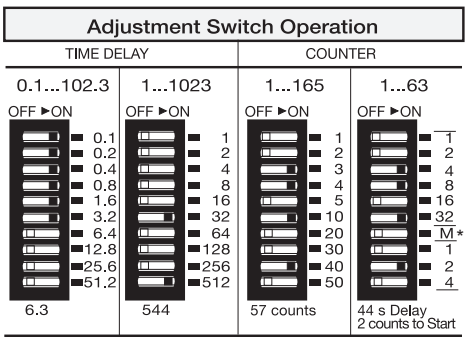
There are no part numbers currently active. Please call Technical Support with your requirements.

Connection:



V = Voltage
L = Load
UTL = Untimed Load
S1 = Initiate Switch

Switch Adjustment:



Order Table:

NHPU **X** **Output Rating**
- A - 6A
- B - 10A
- C - 20A

X **Input Voltage**
- A - 24 to 240VAC

X **Time Delay/Counts**
- 1 - 0.1 - 102.3s
- 2 - 1 - 1023s
- 3 - 0.1 - 102.3m
- 4 - 1 - 1023m
- 5 - 0.1 - 102.3h
- 6 - 1 - 1023h
- 7 - 1 - 165 counts (straight) w/ pulsed output
- 8 - 1 - 1023 counts (binary) w/ pulsed output
- 9 - 1 - 7 counts to start 1 - 63s or m interval time

X **Function**
Specify function

Functions:
M, B, RE, RD, S, SD, I, TS, US, UB, AM, PSD, C, CI

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

Time Delay
Type ..... Microcontroller circuitry
Range ..... 0.1 - 102.3s, m or h in 0.1s, m or h increments
1 - 1023s, m or h in 1s, m or h increments
1 - 63s or m in 1s or m increments
Repeat Accuracy ..... ±0.1% or 20ms, whichever is greater
Setting Accuracy ..... ≤ ±1% or 20ms, whichever is greater
Reset Time ..... ≤ 150ms
Initiate Time ..... ≤ 20ms
Time Delay vs Temp. & Voltage ..... ≤ ±2%
Count Range ..... 1 - 1023 in 3 ranges
Count Rate ..... ≤ 25 counts per second

Input
Voltage ..... 24 to 240VAC
Tolerance ..... ≤ ±15%
AC Line Frequency 50/60Hz

Output
Type ..... Solid state

Rating	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop ..... ≅ 2.5V @ 1A
OFF State Leakage Current ..... ≅ 5mA @ 230VAC
Counter Output
Time Delay/CountsVariable 7 & 8) ..... Pulse width: 300ms ±20%
Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ

Mechanical
Mounting ** ..... Surface mt. with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connects

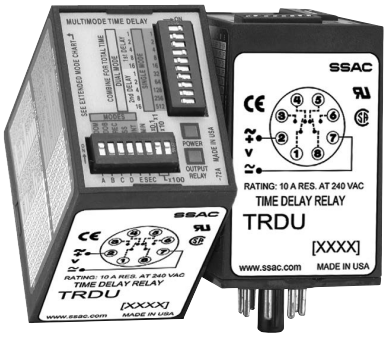
Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

Series Included

Relay Output

Solid-State Output



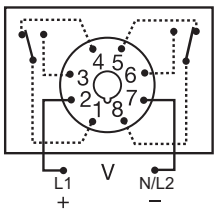
The TRDU Series is a versatile universal time delay relay with 21 selectable single and dual functions. The dual functions replace up to three timers required to accomplish the same function. Both the function and the timing range are selectable with switches located on the face of the unit. Two LED's indicate input voltage and output status. This device offers full 10A isolated relay output contacts in either SPDT or DPDT. The TRDU replaces hundreds of part numbers, thereby, reducing your stock inventory requirements.

Features:

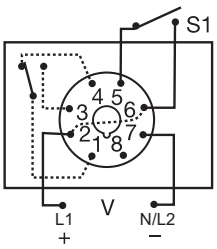
- Microcontroller ±0.1% repeat accuracy
- Multifunction – 21 timing functions
- Multirange – 0.1s - 1,705h in 8 ranges
- Switch selectable modes, time delay, & ranges
- AC & DC input voltages are available
- Isolated, 10A, SPDT or DPDT output contacts

Approvals:

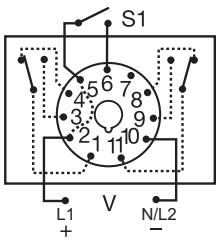
Connection:



8-pin DPDT



8-pin SPDT



11-pin DPDT

V = Voltage
S1 = Initiate Switch

21 Functions:

Five switches are provided to set one of 10 single or 11 dual modes of operation.

Single Functions-
- * Delay-on-Make
- Delay-on-Break
- * Recycle (ON time first, equal recycle delays)
- Single Shot
- * Interval
- Trailing Edge Single Shot
- Inverted Single Shot
- Inverted Delay-on-Break
- Accumulative Delay-on-Make
- Retriggerable Single Shot (motion detector)

Dual Functions -
- Delay-on-Make/Delay-on-Break
- * Delay-on-Make/Recycle (ON time first, equal recycle delays)
- * Delay-on-Make/Interval
- Delay-on-Make/Single Shot
- * Interval/Recycle (ON time first, equal recycle delays)
- Delay-on-Break/Recycle (ON time first, equal recycle delays)
- Single Shot/Recycle (ON time first, equal recycle delays)
- * Recycle - both times adjust. (ON time first)
- * Recycle - both times adjust. (OFF time first)
- * Interval/Delay-on-Make
- Accumulative Delay-on-Make/Interval

For more information see:
Appendix A, page 163-164 for function diagrams.
Appendix B, page 165, Figure 5 for dimensional drawing.

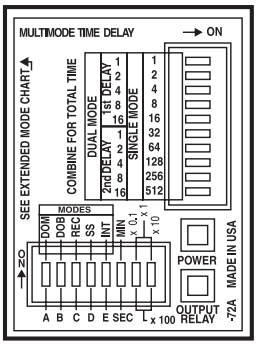
Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **11-pin socket:** P/N: NDS-11
- **Octal 8-pin socket:** P/N: NDS-8
- **DIN rail:**
  P/N: C103PM (Al)

Available Models:

TRDU120A1	TRDU230A2
TRDU120A2	TRDU24A1
TRDU120A3	TRDU24A2
TRDU12D1	TRDU24A3
TRDU12D3	

If desired part number is not listed, please call us to see if it is technically possible to build.



Order Table:

TRDU **X** **X**

Input Voltage
- 12D - 12VDC
- 24A - 24VAC/DC
- 120A - 120VAC
- 230A - 230VAC

Base Connection
- 1 - 8-pin DPDT*
- 2 - 8-pin SPDT
- 3 - 11-pin DPDT

*Limited to 9 operating functions in 8-pin DPDT units

Specifications

Time Delay
Type ..... Microcontroller
Range: Switch Selectable** ..... Single Functions: 0.1s - 1,705h in 8 ranges
Dual Functions: 0.1s - 3,100m each in 8 ranges
Adjustments ..... Multiplier: 3 position DIP switches select 0.1, 1, 10, or 100 in s or m
Setting Accuracy ..... ±1% or 50ms, whichever is greater
Repeat Accuracy ..... ±0.1% or 20ms, whichever is greater
Timing Functions ..... Five switches are provided to set one of twenty-one single or dual functions
Reset Time ..... ≤ 50ms
Initiate Time 120VAC: 75ms
Time Delay vs Temp. & Voltage ..... ±1%

Indication
Two LEDs indicate ..... 1) Input voltage applied 2) Output relay status

Input
Voltage ..... 12VDC, 24VAC/DC, 120VAC, or 230VAC
Tolerance 12VDC & 24VAC/DC ..... -15% - 20%
120 & 230VAC ..... -20% - 10%
AC Line Frequency 50/60Hz
Power Consumption ..... 24 to 230V ≤ 3W; 12VDC ≤ 2W

Output
Type ..... Electromechanical relay
Form ..... SPDT or DPDT
Rating ..... 10A resistive @ 120/240VAC & 28 VDC; 1/3 hp @ 120/240VAC
Life ..... Mechanical – 1 x 10^7; Electrical – 1 x 10^6

Protection
Isolation Voltage ..... ≥ 1500V RMS input to output
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Plug-in socket
Dimensions ..... 3.1 x 2.39 x 1.78 in. (78.7 x 60.7 x 45.2 mm)
Termination ..... Octal 8-pin plug-in or magnal 11-pin plug-in

Environmental
Operating / Storage Temperature ..... -20° to 65°C / -40° to 85°C
Weight ..... ≅ 5.8 oz (164 g)

**For CE approved applications, power must be removed from the unit when a switch position is changed.

The TRU Series is a multifunction, knob adjustable, Universal Time Delay Relay. It includes six of the most popular timing functions selected by a slide switch. The time delay is knob adjustable and the time delay range is switch selectable. The repeat accuracy is ± 0.1%. Both function and time range can be selected on the top face of the unit. In addition to multifunctioning and multiple time ranges, the TRU Series features universal input voltage; 19 to 264VAC and 19 to 30VDC and full 10A output relay. The TRU Series can directly replace up to 1000 competitive time delay relay models.

Operation

A six position slide switch selects delay-on-make, interval, single shot, recycling (ON time first, Equal Recycle Delays), delay-on-break, and retriggerable single shot. 8-pin DPDT base wiring is limited to delay-on-make, interval, and recycling functions. All six functions are available in the 8-pin SPDT and 11-pin DPDT versions.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 6 for dimensional drawing.

Features:

- Microcontroller ±0.1% repeat accuracy
- Six timing functions are switch selectable
- 0.1s - 1000m in six ranges
- Knob adjustable time delay
- Universal input voltage 19 to 264VAC & 19 to 30VDC
- 10A, SPDT or DPDT output contacts

Approvals:

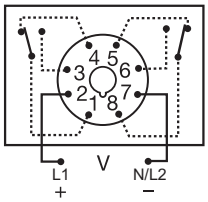
Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **11-pin socket:** P/N: NDS-11
- **Octal 8-pin socket:** P/N: NDS-8

Available Models:

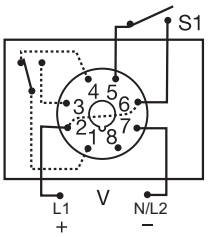
TRU1
TRU2
TRU3

Connection:



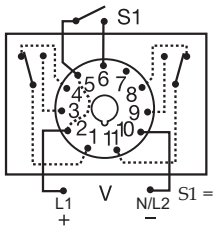
8-pin DPDT

Delay-on-Make
Interval
Recycling



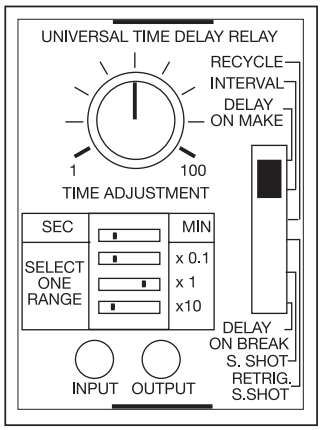
8-pin SPDT

Delay-on-Make
Interval
Single Shot
Recycling (ON Time First, Equal Recycle Delays)
Delay-on-Break
Retriggerable Single Shot



11-pin DPDT

S1 = Initiate Switch



Order Table:

Input Voltage	Base Wiring	Functions	Part Number
19 to 264VAC; 19 to 30VDC	8-pin DPDT	3	TRU1
19 to 264VAC; 19 to 30VDC	8-pin SPDT	6	TRU2
19 to 264VAC; 19 to 30VDC	11-pin DPDT	6	TRU3

Specifications

Time Delay
Type ..... Digital integrated circuitry
Range: Switch Selectable* ..... 0.1s - 1000m in 6 ranges - 0.1 - 10, 1 - 100 or 10 - 1000s; 0.1 - 10, 1 - 100 or 10 - 1000m
Adjustments ..... Multiplier: 4 position DIP switch selects x0.1, x1, x10, and s or m
Time Setting: Onboard knob adjustment with 1 - 100 reference dial
Two LEDs indicate ..... 1) Input voltage applied 2) Output relay status
Repeat Accuracy ..... ±0.1% or ±20ms, whichever is greater
Reset Time ..... ≤ 300ms
Time Delay vs Temp. & Voltage ..... ±2%

Input
Voltage - Universal Input Range ..... 19 to 264VAC and 19 to 30VDC
AC Line Frequency 50/60Hz

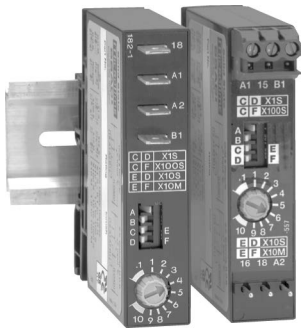
Output
Type ..... Electromechanical relay
Form ..... SPDT & DPDT, isolated
Rating ..... 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life ..... Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection
Transient ..... 38 joules
Isolation Voltage ..... ≥ 1500V RMS input to output
Polarity ..... DC units are reversed polarity protected

Mechanical
Mounting ..... Plug-in socket
Dimensions ..... 3.44 x 2.39 x 1.78 in. (87.3 x 60.7 x 45.2 mm)
Termination ..... Octal 8-pin plug-in or magnal 11-pin plug-in

Environmental
Operating / Storage Temperature ..... -20° to 65°C / -30° to 85°C
Weight ..... ≅ 6 oz (170 g)

* For CE approved applications, power must be removed when a switch position is changed.



The ASQU/ASTU Series of 17.5 mm, knob adjustable, universal solid-state timers offer multiple functions, voltages, and time delay ranges. Choose one of 5 functions and 4 time delay ranges via 4 selection switches located on face of the unit. Adjustment through the time range is accomplished by an onboard knob.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 7 for dimensional drawing.

Features:

- 17.5 mm package for high rail density
- Microprocessor controlled with ±1% repeat accuracy
- Multimode: 5 selectable functions
- Multirange: knob adjustable from 0.1s - 100m
- Multivoltage: 24 to 240VAC or 9 to 110VDC
- 0.7A steady, 10A inrush rated solid-state output

Approvals:

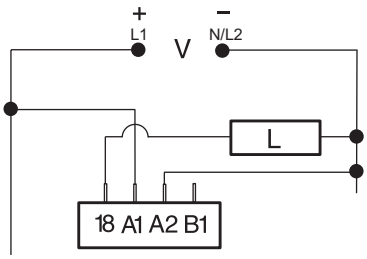
Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

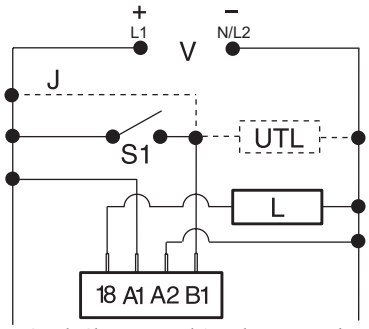
Available Models:

ASQUA3
ASQUD3
ASTUA3
ASTUD3

Connection:



Delay-on-Make & Recycling



Single Shot, Interval & Delay-on-Break

V = Voltage
L = Load
J= Wire Required for Interval Operation
S1= Initiate Switch
UTL = Optional Untimed Load

Adjustment:

DOM	A / B
SS	A / B
R	A / B
DOB	A / B

R	M	S
0.1-10s	X1s	C E / D F
1-100s	X10s	C E / D F
10-1000s	X100s	C E / D F
1-100m	X10m	C E / D F

DOM = Delay-on-Make
SS = Single Shot/Interval
R = Recycling
DOB = Delay-on-Break

R = Range
M = Multiplier
S = Setting

Order Table:

ASQU - Quick Connects
ASTU - Terminal Blocks

X
Input Voltage
- A - Universal AC Voltage (24 to 240VAC)
- D - Universal DC Voltage (9 to 110VDC)

X
Base Adaptors
- 3 - Both - Surface & DIN rail adaptors with quick mount fasteners

Specifications

Time Delay

Type	Microcontroller based with ceramic resonator and watchdog circuitry
Adjustment	Knob with dial; 2 switches select 1 of 4 multipliers
Range*	0.1 - 10s, 1 - 100s, 10 - 1000s, 1 - 100m
Repeat Accuracy	±1% or ±50ms, whichever is greater
Tolerance (Factory Calibration)	±2% or ±50ms, whichever is greater
Reset Time	≤ 300ms
Initiate Time	Single Shot & Delay-on-Break: ≤ 32ms
Time Delay vs Temp. & Voltage	±2%, or ±50ms, whichever is greater

Input

Voltage	AC: 24 to 240VAC; -20% - 10% DC: 9 to 110VDC; -0% - 20% @ -25°C 9.4 to 110VDC; -0% - 20% @ -40°C
AC Line Frequency / DC Ripple	50/60Hz / ≤ 10%

Output

Type	Solid state
Form	NO
Rating	0.7A steady state, 10A inrush
Voltage Drop	AC ≅ 2.5V @ 0.7A; DC ≅ 1.5V @ 0.7A

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Polarity	DC units are reverse polarity protected

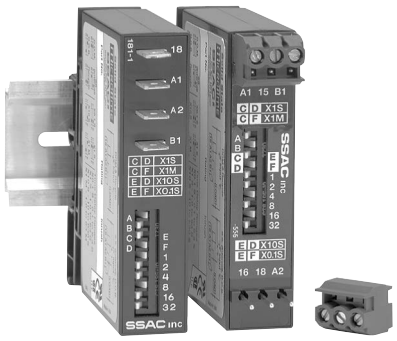
Mechanical

Mounting	Two base adaptors are available
DIN Rail	Snap on to 32 mm DIN 1 & 35 mm DIN 3 rail
Surface	Two #6 (M3.5 x 0.6) screws or quick mount fasteners
Termination	
ASQU	0.25 in. (6.35 mm) male quick connect terminals
ASTU	0.197 in. (5 mm) push-on terminal blocks for up to #14 AWG (2.5 mm²) wire

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 4 oz (113 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.



The DSQU/DSTU Series of 17.5 mm, switch adjustable, universal solid-state timers offer multiple functions, voltages, and time delay ranges. Choose one of 5 functions and 4 time delay ranges via 4 selection switches located on face of the unit. Six switches adjust the time delay through the selected range.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 7 for dimensional drawing.

Features:

- 17.5 mm package for high rail density
- Microprocessor controlled with ±0.1% timing accuracy
- Multimode: 5 selectable functions
- Multirange: switch adjust from 0.1s - 63m
- Multivoltage: 24 to 240VAC or 9 to 110VDC
- 0.7A steady, 10A inrush rated solid-state output

Approvals:

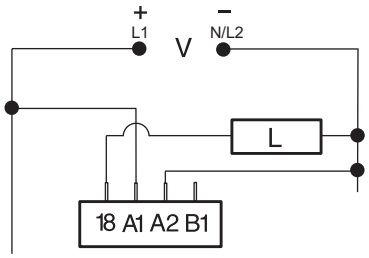
Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

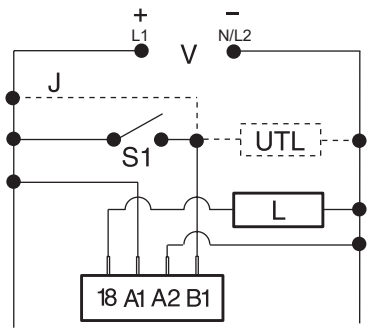
Available Models:

DSQUA3
DSQUD3
DSTUA3
DSTUD3

Connection:



Delay-on-Make & Recycling



Single Shot, Interval & Delay-on-Break

V = Voltage
L = Load
J= Wire Required for Interval Operation
S1= Initiate Switch (for Single Shot or Delay-on-Break)
UTL = Optional Untimed Load

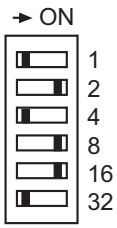
Adjustment:

DOM	A / B
SS	A / B
R	A / B
DOB	A / B

R	M	S	I
0.1-6.3s	X0.1s	C E / D F	0.1s
1-63s	X1s	C E / D F	1s
10-630s	X10s	C E / D F	10s
1-63m	X1m	C E / D F	1m

DOM = Delay-on-Make
SS = Single Shot/Interval
R = Recycling
DOB = Delay-on-Break

R = Range
M = Multiplier
S = Setting
I = Increments of time



Add switches in ON position
TD = 2+8+16=26

Order Table:

DSQU - Quick Connects
DSTU - Terminal Blocks

X **Input Voltage**
- A - Universal AC Voltage (24 to 240VAC)
- D - Universal DC Voltage (9 to 110VDC)

X **Base Adaptors**
- 3 - Both - Surface & DIN rail adaptors with quick mount fasteners

Specifications

Time Delay
Type ..... Microcontroller based with ceramic resonator and watchdog circuitry
Adjustment ..... 6 switches adjust the time delay; 2 switches select 1 of 4 multipliers
Range* ..... x0.1s = 0.1 - 6.3s in 0.1s increments
x1s = 1 - 63s in 1s increments
x10s = 10 - 630s in 10s increments
x1m = 1 - 63m in 1m increments
Repeat Accuracy ..... ±0.1% or ±20ms, whichever is greater
Setting Accuracy ..... ±2% or ±50ms, whichever is greater
Reset Time ..... ≤ 300ms
Initiate Time ..... Single Shot & Delay-on-Break: ≤ 32ms
Time Delay vs Temp. & Voltage ..... ±2% or ±50ms, whichever is greater

Input
Voltage ..... AC: 24 to 240VAC; -20% - 10%
DC: 9 to 110VDC; -0% - 20% @ -25°C
9.4 to 110VDC; -0% - 20% @ -40°C
AC Line Frequency / DC Ripple ..... 50/60Hz / ≤ 10%

Output
Type ..... Solid state
Form ..... NO
Rating ..... 0.7A steady state, 10A inrush
Voltage Drop ..... AC ≅ 2.5V @ 0.7A; DC ≅ 1.5V @ 0.7A

Protection
Surge ..... IEEE C62.41-1991 Level A
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Two base adaptors are available
DIN Rail ..... Snap on to 32 mm DIN 1 & 35 mm DIN 3 rail
Surface ..... Two #6 (M3.5 x 0.6) screws or quick mount fasteners
Termination
DSQU ..... 0.25 in. (6.35 mm) male quick connect terminals
DSTU ..... 0.197 in. (5 mm) push-on terminal blocks for up to #14 AWG (2.5 mm²) wire

Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 4.2 oz (119 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.

Timers - Dedicated

Series Included

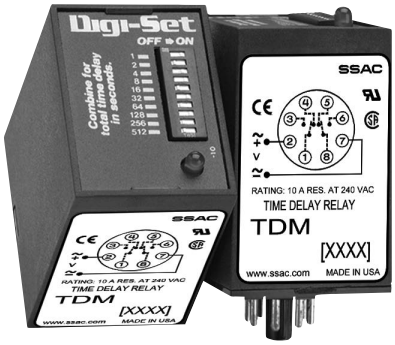
Single Function

Sequencer

Dual Function

HVAC Timers

Vending Timers



The TDM Series is a delay-on-make timer that combines accurate digital circuitry with isolated, DPDT relay contacts in an industry standard 8-pin plug-in package. DIP switch adjustment allows precise selection of the time delay over the full time delay range. The TDM Series is the product of choice for custom control panel and OEM designers.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Features:

- Switch settable time delay
- Three time ranges from 0.1s - 10,230s
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 10A, DPDT output contacts
- LED indication

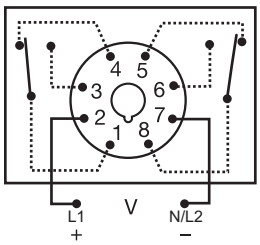
Approvals:

8-pin models UL listed when used in combination with P1011-6 socket only.

Auxiliary Products:

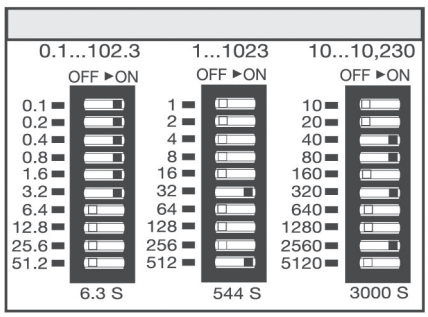
- **Panel mount kit:** P/N: BZ1
- **8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **Octal socket for UL listing:** P/N: P1011-6
- **DIN rail:** P/N: C103PM (Al)

Connection:



Relay contacts are isolated.

Digi-Set Binary Switch Operation:



Available Models:

TDM120AL	TDMH24DL
TDM12DL	TDML110DL
TDM230AL	TDML120AL
TDM24AL	TDML12DL
TDM24DL	TDML230AL
TDMH120AL	TDML24DL
TDMH24AL	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TDM - 1 - 1023s in 1s increments
TDMH - 10 - 10,230s in 10s increments
TDML - 0.1 - 102.3s in 0.1s increments

X — **Input Voltage**
- 12D - 12VDC
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

X — **LED Indication**
- L

Specifications

Time Delay
Type ..... Digital integrated circuitry
Range* ..... 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
10 - 10,230s in 10s increments
Repeat Accuracy ..... ±0.1% or 20ms, whichever is greater
Setting Accuracy ..... ±2% or 50ms, whichever is greater
Reset Time ..... ≤ 50ms
Recycle Time ..... During Timing - TDMH: ≤ 500ms
TDM, TDML: ≤ 300ms
Time Delay vs Temp. & Voltage ..... ±2%
Indicator ..... LED glows during timing; relay is de-energized

Input
Voltage ..... 12, 24, or 110 VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC ..... -15% - 20%
110VAC/DC to 230VAC ..... -20% - 10%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... ≤ 2.25W

Output
Type ..... Electromechanical relay
Form ..... DPDT
Rating ..... 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life ..... Mechanical - 1 x10^7; Electrical - 1 x 10^6

Protection
Polarity ..... DC units are reverse polarity protected
Isolation Voltage ..... ≥ 1500V RMS input to output

Mechanical
Mounting ..... Plug-in socket
Dimensions ..... 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
Termination ..... Octal 8-pin plug-in

Environmental
Operating / Storage Temperature ..... -20° to 65°C / -30° to 85°C
Weight ..... ≈ 6 oz (170 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.

The TRM Series is a combination of analog electronic circuitry and electromechanical relay output. It provides input to output isolation with a wide variety of input voltages and time ranges. Standard plug-in base wiring, fast reset, rugged enclosure, and good repeat accuracy make the TRM a select choice in any OEM application.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Features:

- 10A, DPDT or SPDT output contacts
- 24 to 230V operation in ranges
- 8-pin or 11-pin plug-in
- Fixed or adjustable delays from 0.05 - 600s in multiple ranges
- ±2% repeat accuracy

Approvals:

8-pin models UL listed when used in combination with P1011-6 socket only.

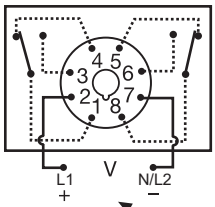
Auxiliary Products:

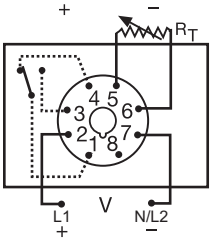
- **Octal socket for UL listing:** P/N: P1011-6
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **8-pin socket:** P/N: NDS-8
- **11-pin socket:** P/N: NDS-11
- **Panel mount kit:** P/N: BZ1
- **Versa-knob:** P/N: P0700-7
- **External adjust potentiometer:**
  P/N: P1004-XX
  P/N: P1004-XX-X

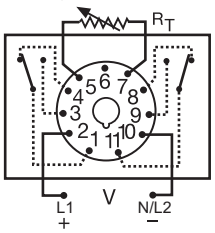
External R_T P/N Selection Table

Value	Part Number
1M ohm	P1004-16
1.5M ohm	P1004-15
2M ohm	P1004-14
3M ohm	P1004-12
5M ohm	P1004-13
1M ohm	P1004-16-X
1.5M ohm	P1004-15-X
2M ohm	P1004-14-X
3M ohm	P1004-12-X
5M ohm	P1004-13-X

Connection:







R_T is used when external adjustment is ordered.
Relay contacts are isolated.

R_T Selection Chart

Time Delay*	
Range	R_T
Seconds	Megohm
0.05...1	1.0
0.05...2	2.0
0.05...3	3.0
0.1...5	5.0
0.1...10	3.0
1...30	1.5
1...60	3.0
2...120	2.0
2...180	3.0
7...240	1.5
7...300	2.0
7...360	2.0
7...420	3.0
7...480	3.0
7...600	5.0

* When selecting an external R_T add at least 15...30% for tolerance of unit and the R_T.

Available Models:

TRM110D1Z30	TRM120A2Y60
TRM120A2X1	TRM120A2Y600
TRM120A2X30	TRM24A8Y5
TRM120A2Y180	TRM24D1Y1

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TRM **X** **Input Voltage**
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

X **Adjustment and Output Form**
- 1 - Fixed, Octal, DPDT
- 2 - Knob Adjust, Octal, DPDT
- 3 - Lock Shaft Adjust, Octal, DPDT
- 5 - Ext. Adjust, 11-pin, DPDT without potentiometer
- 6 - Ext. Adjust, 11-pin, DPDT supplied with potentiometer
- 8 - Ext. Adjust, Octal, SPDT, without potentiometer
- 9 - Ext. Adjust, Octal, SPDT, with potentiometer

X **Time Tolerance**
- X - ±20%
- Y - ±10%
- Z - ±5%

X **Time Delay* (seconds)**
- 1 - 0.05 - 1
- 2 - 0.05 - 2
- 3 - 0.05 - 3
- 5 - 0.1 - 5
- 10 - 0.1 - 10
- 30 - 1 - 30
- 60 - 1 - 60
- 120 - 2 - 120
- 180 - 2 - 180
- 240 - 7 - 240
- 300 - 7 - 300
- 360 - 7 - 360
- 420 - 7 - 420
- 480 - 7 - 480
- 600 - 7 - 600

*If fixed delay is selected, insert delay (0.05 - 600) in seconds.

Specifications

Time Delay
Type ..... Analog circuitry
Range ..... 50ms - 10m in 15 adjustable ranges or fixed
Repeat Accuracy ..... ±2% or 20 ms, whichever is greater
Fixed Time Tolerance & Setting Accuracy ... ±5, 10, or 20%
Reset Time ..... ≤ 50ms
Recycle Time ..... After timing: ≤ 20ms
During timing: 0.1% of max. time delay or 75ms, whichever is greater
Time Delay vs Temp. & Voltage ..... ≤±10%

Input
Voltage ..... 24 or 110VDC; 24, 120, or 230VAC
Tolerance 24VDC/AC ..... -15% - 20%
110 to 230VAC/DC ..... -20% - 10%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... ≤ 2.25W

Output
Type ..... Electromechanical relay
Form ..... Isolated DPDT or SPDT
Rating ..... 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life ..... Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection
Isolation Voltage ..... ≥ 1500V RMS between input & output terminals
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Plug-in socket
Dimensions ..... 3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)
Termination ..... Octal 8-pin or 11-pin plug-In

Environmental
Operating / Storage Temperature ..... -20° to 65°C / -30° to 85°C
Weight ..... ≅ 6 oz (170 g)

The PRLM Series is designed for use in non-critical timing applications. It offers low cost, knob adjustable timing control, full 10A relay output, and onboard LED indication. The knob adjustment provides a guaranteed time range of up to 10 minutes in 6 ranges. The onboard LED indicates whether or not the unit is timing (flashing LED) as well as the status of the output.

Operation (Delay-on-Make):
The time delay is initiated when input voltage is applied. LED flashes during timing. At the end of the delay period, the output contacts energize. LED is on steady after the unit times out.
Reset: Reset is accomplished by removal of input voltage. There is no false output when reset during timing.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Features:

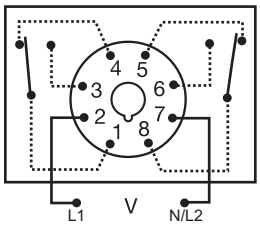
- Knob adjustable time delay relay
- Electronic circuit with electromechanical relay
- Popular AC & DC operating voltages
- Industry standard octal plug-in connection
- Fixed or adjustable delays from 0.05 - 600s in multiple ranges
- ±2% repeat accuracy
- ±10% factory calibration
- LED indication
- 10A, DPDT output contacts
- Isolated relay contacts

Approvals:

Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **DIN rail:** P/N: C103PM (Al)

Connection:



8-pin octal
DPDT

Available Models:

PRLM41180
PRLM423

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

PRLM	X	X	X
	Input Voltage	**Adjustment**	**Time Delay***
	1 - 12VDC	1 - Factory Fixed	1 - 0.05 - 3s
	2 - 24VAC	2 - Adjustable	2 - 0.1 - 10s
	3 - 24VDC		3 - 1 - 60s
	4 - 120VAC		4 - 2 - 180s
	5 - 110VDC		5 - 7 - 480s
	6 - 230VAC		6 - 7 - 600s

*If fixed delay is selected, insert delay (0.05 - 600) in seconds.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 600s in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance . . . . . Knob adjust: guaranteed range
Fixed: ±10%
Reset Time . . . . . ≤ 50ms
Recycle Time . . . . . After timing: ≤ 20ms
During timing: 0.1% of max. time delay or 75ms, whichever is greater
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 12, 24, or 110VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110 to 240VAC/DC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2.25W
Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated, DPDT
Rating . . . . . 10A resistive @ 28VDC;
10A resistive @ 240VAC;
1/3 hp @ 120/240VAC
Life . . . . . Mechanical - $1x10^7$; Electrical - $1x10^6$
Protection
Surge . . . . . IEEE C62.41-1991 Level A
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Indication
Type . . . . . LED
Operation . . . . . During timing - flashing
Output energized - on steady
Mechanical
Mounting . . . . . Plug-in socket
Dimensions . . . . . 3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)
Termination . . . . . Octal 8-pin plug-in
Environmental
Operating / Storage Temperature . . . . . -20° to 65°C / -30° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

The HRDM Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, onboard, or external adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

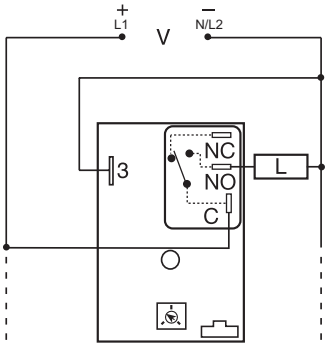
- 30A, SPDT, NO output contact
- 12 to 230V operation in 5 ranges
- Encapsulated circuitry
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

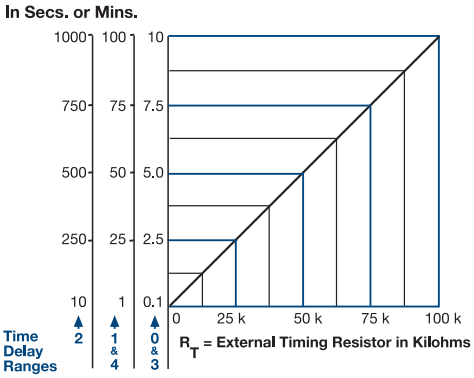
Connection:



NO = Normally Open
L = Load
C = Common, Transfer Contact

NOTE: A knob, or terminals 4 & 5 are only included on adjustable units. R_T is used when external adjustment is ordered. Relay contacts are not isolated.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the R_T terminals; as the resistance increases the time delay increases.
When selecting an external R_T, add the tolerances of the timer and the R_T for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm R_T. For 1 to 100 S use a 100 K ohm R_T.

Available Models:

HRDM114S	HRDM322
HRDM120	HRDM323
HRDM220	HRDM324
HRDM221	HRDM4130S
HRDM222	HRDM413M
HRDM223	HRDM415M
HRDM224	HRDM420
HRDM3112S	HRDM421
HRDM320	HRDM422
HRDM321	HRDM423

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

HRDM **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X

Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

X

Time Tolerance
- Blank - ±5%
- A - ±1%

X

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay
Type . . . . . Microcontroller circuitry
Range . . . . . 0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20 ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ±1%, ±5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ±2%

Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC . . . . . -15% - 20%
24 to 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . AC ≤ 4VA; DC ≤ 2W

Output
Type . . . . . Electromechanical relay
Form . . . . . Non-isolated, SPDT

Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**

Life . . . . . Mechanical - 1 x 10^6 ; Electrical - 1 x 10^5, *3 x 10^4, **6,000

Protection
Surge . . . . . IEEE C62.41-1991 Level A
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

Econo-Timers are a combination of digital electronics and a reliable electromechanical relay. These devices offer a DPDT relay output for relay logic circuits, and isolation of input to output voltages. Cost effective for OEM applications, such as random starting, sequencing ON, switch de-bouncing, anti-short cycling, and other common delay-on-make applications.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 10 for dimensional drawing.

Features:

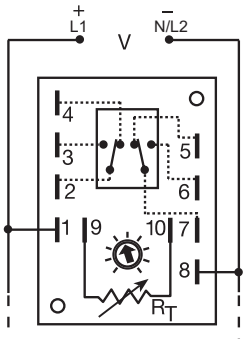
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- Encapsulated, digital circuitry
- Isolated, 10A, DPDT output contacts

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-16
  P/N: P1004-16-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Connection:



A knob, or terminals 9 & 10 are only included on adjustable units. Relay contacts are isolated.

R_T is used when external adjustment is ordered.

R_T Selection Chart						
Desired Time Delay* Seconds						R_T
1	2	3	4	5	6	Megohm
0.1	0.1	0.1	0.2	0.3	0.6	0.0
0.19	0.6	1	1.7	3	6	0.1
0.28	1.1	2	3.2	6	12	0.2
0.37	1.6	3	4.7	9	18	0.3
0.46	2.1	4	6.2	12	24	0.4
0.55	2.6	5	7.7	15	30	0.5
0.64	3.0	6	9.2	18	36	0.6
0.73	3.5	7	10.7	21	42	0.7
0.82	4.0	8	12.2	24	48	0.8
0.91	4.5	9	13.7	27	54	0.9
1.0	5.0	10	15	30	60	1.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

R_T Selection Chart					
Desired Time Delay* Minutes					R_T
7	8	9	10	11	Megohm
0.1	0.1	0.2	1	10	0.0
0.6	1	1.7	10	50	0.1
1.1	2	3.2	20	100	0.2
1.6	3	4.7	30	150	0.3
2.1	4	6.2	40	200	0.4
2.6	5	7.7	50	250	0.5
3.0	6	9.2	60	300	0.6
3.5	7	10.7	70	350	0.7
4.0	8	12.2	80	400	0.8
4.5	9	13.7	90	450	0.9
5.0	10	15	100	500	1.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Available Models:

ERDM1110S	ERDM4210
ERDM123	ERDM422
ERDM126	ERDM423
ERDM128	ERDM425
ERDM222	ERDM427
ERDM310.5S	ERDM429
ERDM324	ERDM6210
ERDM326	ERDM628
ERDM4110S	ERDM629
ERDM4130S	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

ERDM **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 120VDC
- 6 - 230VAC

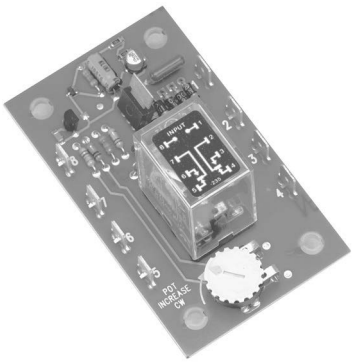
Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

Time Delay*
- 1 - 0.1 - 1s
- 2 - 0.1 - 5s
- 3 - 0.1 - 10s
- 4 - 0.2 - 15s
- 5 - 0.3 - 30s
- 6 - 0.6 - 60s
- 7 - 0.1 - 5m
- 8 - 0.1 - 10m
- 9 - 0.2 - 15m
- 10 - 1 - 100m
- 11 - 10 - 500m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec or (**M**) min.

Specifications

Time Delay
Type . . . . . Digital integrated circuitry
Range . . . . . 0.1s - 500m in 11 adjustable ranges or 0.1s - 1000m fixed
Adjustment . . . . . Fixed, onboard or external adjust
Repeat Accuracy . . . . . ±0.5%
Tolerance (Factory Calibration) . . . . . ≤ ±10%
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 12, 24, or 120VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
120VAC/DC & 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Isolated relay contacts
Form . . . . . DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life . . . . . Mechanical - 1 x 10^7; Full Load - 1 x 10^6
Protection
Isolation Voltage . . . . . ≥1500V RMS input to output
Insulation Resistance . . . . . ≥100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions . . . . . 3.5 x 2.5 x 1.7 in. (88.9 x 63.5 x 43.2 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 65°C / -40° to 85°C
Weight . . . . . ≅ 5.7 oz (162 g)



The ORM Series features open PC board construction for reduced cost. It has isolated, 10A, DPDT relay contacts and all connections are 0.25 in (6.35 mm) male quick connect terminals. The time delay may be ordered as factory fixed, onboard knob, or external adjustment. Time delays from 0.05 - 300 seconds.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 11 for dimensional drawing.

Features:

- Time delays from 0.05s - 300s in 5 ranges or fixed
- Low cost open PCB construction
- 10A, DPDT output contacts
- ±2% repeat accuracy
- ±10% factory calibration
- Factory fixed, onboard or external adjust

Approvals:

Auxiliary Products:

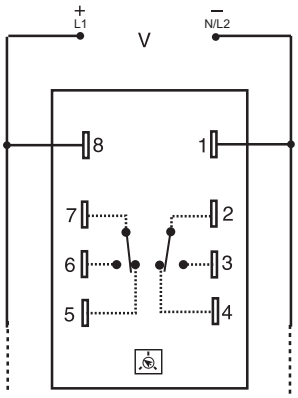
- **External adjust potentiometer:**
  P/N: P1004-12
  P/N: P1004-12-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

ORM120A110
ORM120A115
ORM120A145
ORM120A17
ORM120A25
ORM230A17
ORM24D13.5

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T is used when external adjustment is ordered.
Relay contacts are isolated.

R_T Selection Chart					
Desired Time Delay*					R_T
Seconds					
1	2	3	4	5	Megohm
0.05	0.5	0.6	1.2	3.0	0.0
0.5	5.0	10	20	50	0.5
1.0	10	20	40	100	1.0
1.5	15	30	60	150	1.5
2.0	20	40	80	200	2.0
2.5	25	50	100	250	2.5
3.0	30	60	120	300	3.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Order Table:

ORM **X** **X** **X**

Input Voltage
- 24A - 24VAC
- 24D - 24VAC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.5 - 30s
- 3 - 0.6 - 60s
- 4 - 1.2 - 120s
- 5 - 3 - 300s

*If fixed delay is selected, insert delay (**0.05 - 300**) in seconds.

Specifications

Time Delay
Type ..... Analog circuitry
Range ..... 0.05 - 300s in 5 adjustable ranges or fixed
Repeat Accuracy ..... ±2% or 20ms, whichever is greater
Tolerance ..... Adjustable: guaranteed range
Fixed: ±10%
Recycle Time ..... After timing - ≤ 16ms;
During timing - 0.1% of max. time delay or 75ms, whichever is greater
Time Delay vs Temp. & Voltage ..... ≤ ±10%

Input
Voltage ..... 24 or 110VDC; 24, 120, or 230VAC
Tolerance 24VDC/AC ..... -15% - 20%
110 to 230VAC/DC ..... -20% - 10%
AC Line Frequency ..... 50/60 Hz
Power Consumption 2.25W

Output
Type ..... Electromechanical relay
Form ..... DPDT, Isolated
Rating ..... 10A resistive @ 120/240VAC & 28VDC;
1/3 hp @ 120/240VAC
Life ..... Mechanical - $1x10^7$; Electrical - $1x10^6$

Protection
Polarity ..... DC units are reverse polarity protected
Isolation Voltage ..... ≥1500V RMS input to output

Mechanical
Mounting ..... Surface mount with four #6 (M3.5 x 0.6) screws
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating/Storage Temperature ..... -20° to 65°C / -30° to 85°C
Weight ..... ≅ 2.7 oz (77 g)

The KRDM Series is a compact time delay relay measuring only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDM Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

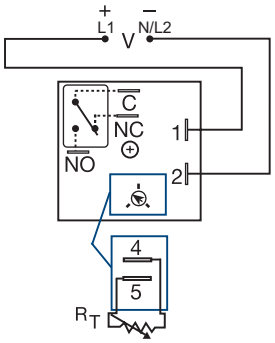
For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Compact time delay relay
- 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 100m in 5 ranges or fixed
- ±0.5% repeat accuracy
- ±5% factory calibration
- Input voltages from 12 to 230V in 6 ranges

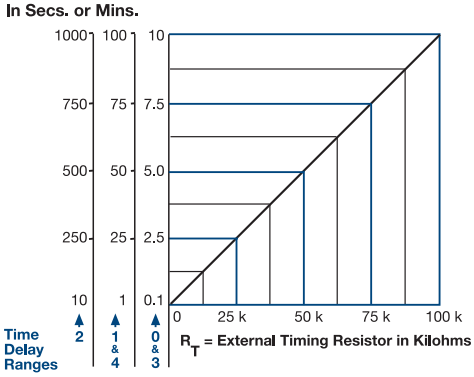
Approvals:

Connection:



V = Voltage
C = Common, Transfer Contact
NO = Normally Open
NC = Normally Closed
A knob is supplied for adjustable units, or R_T terminals 4 & 5 for external adjust. See external adjustment vs time delay chart. Relay contacts are isolated.

External Resistance vs Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the R_T terminals; as the resistance increases the time delay increases.
When selecting an external R_T, add the tolerances of the timer and the R_T for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm R_T. For 1 to 100 S use a 100 K ohm R_T.

Auxiliary Products:

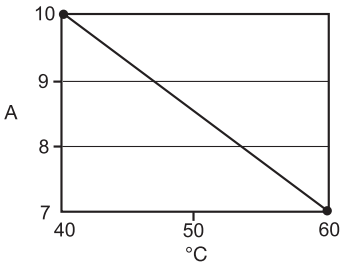
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
-

Available Models:

KRDM110.4S	KRDM223
KRDM110.5S	KRDM224
KRDM111.5S	KRDM234
KRDM1110S	KRDM310.2S
KRDM111S	KRDM320
KRDM1130S	KRDM4110S
KRDM120	KRDM4145S
KRDM121	KRDM4160S
KRDM2110M	KRDM421
KRDM215M	KRDM430
KRDM220	KRDM433
KRDM221	KRDM623
KRDM222	

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature:



Order Table:

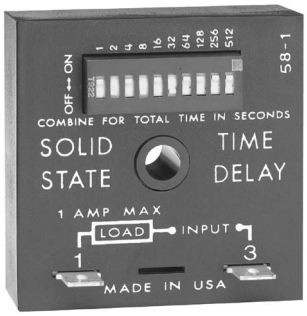
KRDM **X** **X** **X**

Input Voltage	Adjustment	Time Delay*
1 - 12VDC	1 - Fixed	0 - 0.1 - 10s
2 - 24VAC/DC	2 - Onboard knob	1 - 1 - 100s
3 - 24VDC	3 - External adjust	2 - 10 - 1000s
4 - 120VAC		3 - 0.1 - 10m
5 - 110VDC		4 - 1 - 100m
6 - 230VAC		

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±5%
Input
Voltage . . . . . 12, 24 or 110VDC; 24, 120 or 230VAC
Tolerance 12VDC & 24VAC/DC . . . . -15% - 20%
110VDC 120 & 230VAC . . . . -20% - 10%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Isolated relay contacts
Form . . . . . SPDT
Rating (at 40°C) . . . . . 10A resistive @ 125VAC;
5A resistive @ 230VAC & 28VDC;
1/4 hp @ 125VAC
Max. Switching Voltage 250VAC
Life (Operations) . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.6 oz (74 g)



The TDU and KSDU Series are encapsulated solid-state, delay-on-make timers that combine digital timing circuitry with universal voltage operation. The TDU offers DIP switch adjustment allowing accurate selection of the time delay over the full time delay range. The KSDU is factory fixed from 0.1s to 10,230s and does not include the DIP switch. These series are excellent choices for process control systems and OEM equipment.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

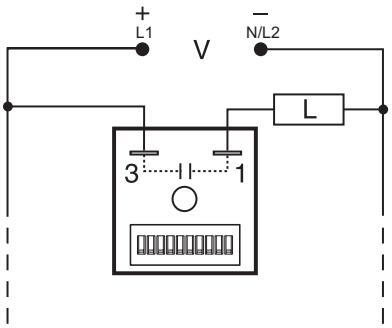
- 2 universal voltage ranges from 24 to 240VAC/DC
- Digital integrated circuitry
- Switch selectable delays from 0.1s - 2.8h in 3 ranges or factory fixed
- ±0.5% repeat accuracy
- 1A steady, 10A inrush
- Totally solid state & encapsulated

Approvals:

Auxiliary Products:

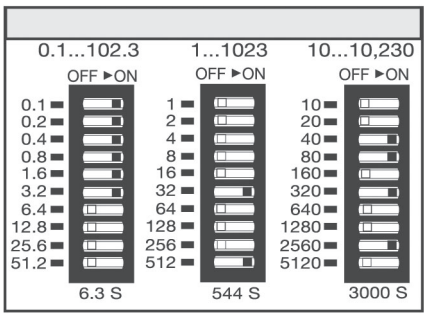
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



Load may be connected to terminal 3 or 1.
TDU has DIP switch adjustment; KSDU is fixed.

Digi-Set Binary Switch Operation:



Available Models:

KSDU8110	TDUH3000A
KSDU811200	TDUH3001A
TDU3000A	TDUL3000A
TDU3001A	TDUL3001A
TDU3003A	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Tables:

KSDU **X** **Input Voltage Range**
- 8 - 24 to 120VAC/DC
- 9 - 100 to 240VAC/DC

X **Type**
- 1 - Fixed

X **Time Delay (Seconds)**
- Specify fixed delay in seconds **0.1 - 10230**

TDU	Input Voltage Range	Time Range - Seconds	Part Number
	24 to 120VAC/DC	0.1 - 102.3	TDUL3000A
	100 to 240VAC/DC	0.1 - 102.3	TDUL3001A
	24 to 120VAC/DC	1 - 1023	TDU3000A
	100 to 240VAC/DC	1 - 1023	TDU3001A
	120 to 277VAC	1 - 1023	TDU3003A
	24 to 120VAC/DC	10 - 10230	TDUH3000A
	100 to 240VAC/DC	10 - 10230	TDUH3001A

Specifications

Time Delay
Type . . . . . Digital integrated circuitry
Range* Adjustable (TDU) . . . . . 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
10 - 10230s in 10s increments
Fixed (KSDU) . . . . . Fixed from 0.1s - 10230s
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ±10%
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ±5%
Input
Voltage . . . . . 24 to 120VAC/DC; 100 to 240VAC/DC
AC Line Frequency . . . . . 50/60 Hz
Tolerance . . . . . ±20%
Output
Type . . . . . Solid state
Form . . . . . NO, open during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Minimum Holding Current 40mA
Voltage Drop . . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)

* For CE approved applications, power must be removed from the unit when a switch position is changed.

The TMV and TSU Series are universal voltage delay-on-make timers. Two models cover all the popular voltages and time delays. Available with knob or external adjust time delay. Its simple two terminals can easily be connected in series with a relay coil, contactor coil, solenoid, lamps, small motor, etc., to delay their energization, prevent short cycling or to sequence on various loads.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Operates from 24 to 240VAC/DC
- Onboard or external adjust time delays
- Delays from 5s - 8m
- Totally solid state & encapsulated
- 1A steady, 10A inrush
- Two terminal series connection with load

Approvals:

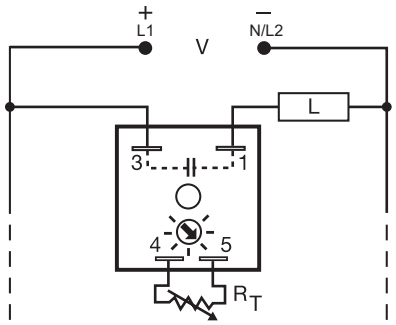
Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-12
  P/N: P1004-12-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

TMV8000
TSU2000

Connection:



Load may be connected to terminal 3 or 1.
TMV has knob adjustment.
TSU has external adjustment terminals 4 & 5.

R_T Selection Chart	
Time Delay*	
Seconds	R_T Megohm
5	0.0
85	0.5
163	1.0
240	1.5
320	2.0
400	2.5
480	3.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

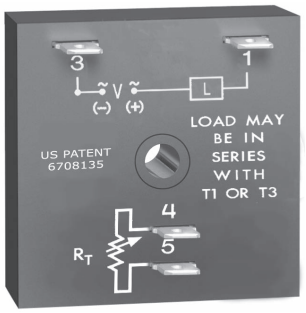
Order Table:

Input Voltage Range	Time Delay	Adjustment	Part Number
24 to 240VAC/DC	5 - 480s	External	TSU2000
24 to 240VAC/DC	0.1 - 8m	Onboard	TMV8000

Specifications

Time Delay
Type ..... Analog circuitry
Range ..... 5 - 480s (TSU2000)
0.1 - 8m (TMV8000)
Repeat Accuracy ..... ±2%
Tolerance (Factory Calibration) ..... ≤ ±10%
Reset Time ..... ≤ 100ms
Input
Voltage ..... 24 to 240VAC/DC ±20%
AC Line Frequency ..... 50/60 Hz
Output
Type ..... Solid State
Form ..... NO, open during timing
Maximum Load Current ..... 1A steady state, 10A inrush at 55°C
Minimum Holding Current ..... ≤ 40mA
Voltage Drop ..... ≅ 2.5V @ 1A

Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature ..... -20° to 70°C / -30° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)



The TSD1 Series is designed for more demanding commercial and industrial applications where small size and accurate performance is required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD1 Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

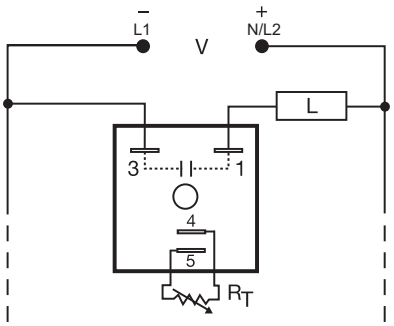
- Fixed or adjustable delays from 0.1s - 100h
- ±0.1% repeat accuracy
- ±1% factory calibration
- 12 to 230V in 6 ranges
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

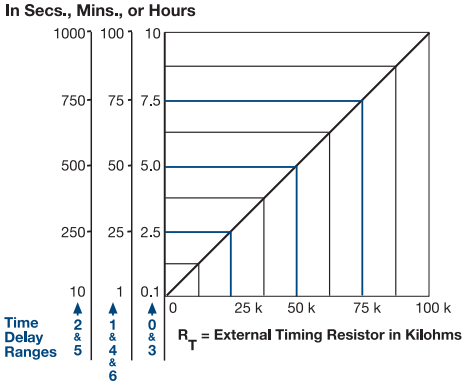
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



Load may be connected to terminal 3 or 1.
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

TSD11110S
TSD1311.2S
TSD1315S
TSD1320
TSD1321
TSD1424

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TSD1	X	X	X
	Input Voltage	**Adjustment**	**Time Delay***
	1 - 12VDC	1 - Fixed	0 - 0.1 - 10s
	2 - 24VAC	2 - External adjust	1 - 1 - 100s
	3 - 24VDC	3 - Onboard adjust	2 - 10 - 1000s
	4 - 120VAC		3 - 0.1 - 10m
	5 - 120VDC		4 - 1 - 100m
	6 - 230VAC		5 - 10 - 1000m
			6 - 1 - 100h

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. (**M**) min. or (**1 - 100**) (**H**) hours.

Specifications

Time Delay
Range . . . . . 0.1s - 100h in 7 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±1%

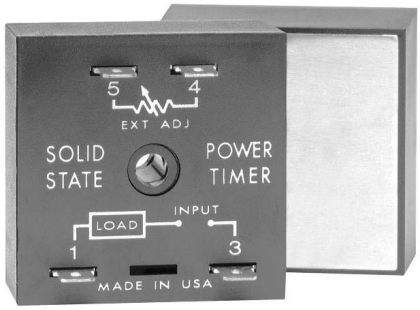
Input
Voltage 12, 24, 120VDC; 24, 120, 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz

Output
Type . . . . . Solid state
Form . . . . . NO, open during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Minimum Holding Current . . . . . ≤ 40mA
Off State Leakage Current . . . . . ≅ 7mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The THDM Series is a high power solid-state delay-on-make timer that is connected in series with the load. The THDM eliminates the need for a timer and a separate solid-state relay. A cost effective approach for controlling larger loads, such as motors, electric heating elements, and lamps. When mounted on a metal surface, it can switch loads up to 20A steady, 200A inrush.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output is energized and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

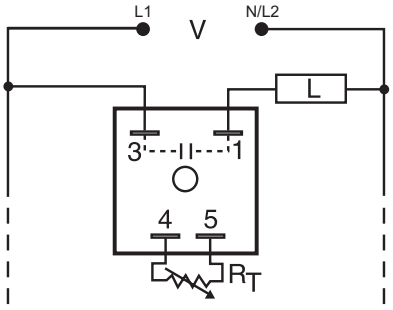
For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- High load currents up to 20A, 200A inrush
- Simple-to-use two terminal series connection
- ± 0.5% repeat accuracy
- Fixed or adjustable delays from 1s - 1000m
- ± 10% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Solid state & encapsulated

Approvals:

Connection:



Load may be connected to terminal 3 or 1.
R_T is used when external adjustment is ordered.

R_T Selection Chart					
Desired Time Delay*					R_T
Seconds		Minutes			
1	2	3	4	5	Megohm
1	10	0.1	1	10	0.0
10	100	1	10	100	0.5
20	200	2	20	200	1.0
30	300	3	30	300	1.5
40	400	4	40	400	2.0
50	500	5	50	500	2.5
60	600	6	60	600	3.0
70	700	7	70	700	3.5
80	800	8	80	800	4.0
90	900	9	90	900	4.5
100	1000	10	100	1000	5.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-13
  P/N: P1004-13-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

Time Delay	VTP P/N
1 - 1-100s	VTP5G
2 - 10-1000s	VTP5K
3 - 0.1-10m	VTP5N
4 - 1-100m	VTP5P
5 - 10-1000m	VTP5R

Selection Table for VTP Plug-on Adjustment Accessory.

Available Models:

There are no part numbers currently active. Please call Technical Support with your requirements.

Order Table:

THDM **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust

X **Time Delay***
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Output Rating**
- A - 6A
- B - 10A
- C - 20A

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**1 - 100**) (**M**) min.

Specifications

Time Delay
Type . . . . . Digital intergrated circuitry
Range . . . . . 1s - 1000m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ± 10%
Recycle Time . . . . . After timing - ≤ 350ms;
During timing - ≤150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form . . . . . NO, open during timing

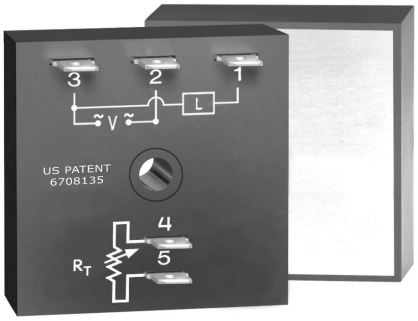
Maximum Load Currents	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Effective Voltage Drop (V Line - V Load)

Input	Effective Drop
24VAC	≤ 3V
120VAC	≤ 3V
230VAC	≤ 5V

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating/Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The THD1 Series combines accurate timing circuitry with high power solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

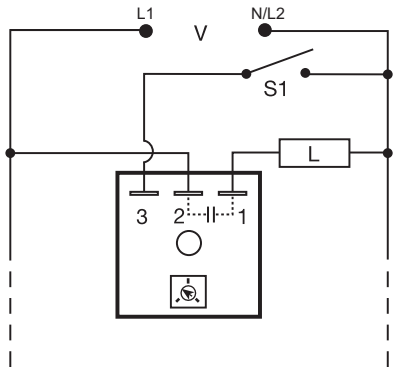
- High load currents up to 20A, 200A inrush
- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid state & encapsulated

Approvals:

Auxiliary Products:

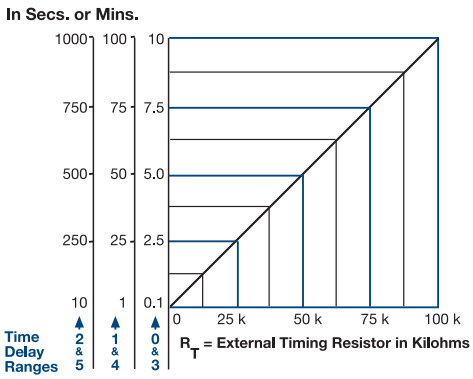
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Connection:



S1 = Optional Low Current Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the R_T terminals; as the resistance increases the time delay increases.
When selecting an external R_T, add the tolerances of the timer and the R_T for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm R_T. For 1 to 100 S use a 100 K ohm R_T.

Available Models:

THD1B410.5S	THD1C431
THD1C231	THD1C432
THD1C232	THD1C433
THD1C233	THD1C434
THD1C234	THD1C435
THD1C235	THD1C6110S
THD1C415M	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

THD1 **X** **X** **X** **X**

Output Rating
- A - 6A
- B - 10A
- C - 20A

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

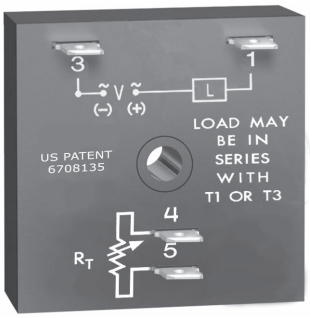
Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, open during timing

Maximum Load Current	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop . . . . . ≅ 2.5V @ rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The KSD1 Series features two-terminal, series-connection with the load. The KSD1 Series is an ideal choice for delay-on-make timing applications. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for popular AC and DC voltages. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

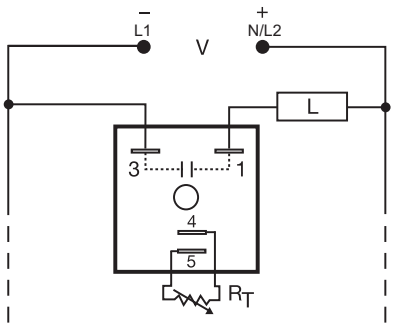
- Fixed or adjustable delays from 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ±5% factory calibration
- 12 to 230V in 5 options
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

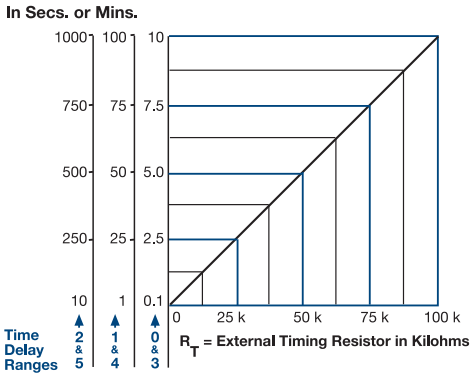
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



Load may be connected to terminal 3 or 1.
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

KSD11120S	KSD1320
KSD1122	KSD1412S
KSD1123	KSD14130S
KSD1133	KSD1420
KSD1230	KSD1431
KSD13110M	KSD16130S

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

KSD1 **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

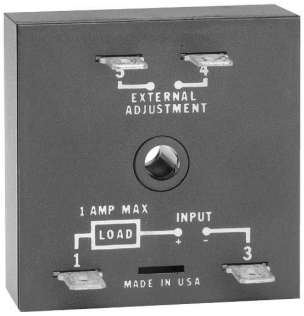
Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 24, 120, or 230VAC; 12 or 24VDC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form . . . . . NO, open during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Minimum Holding Current . . . . . ≤ 40mA
OFF State Leakage Current . . . . . ≅ 7mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



Versa-Timer offers proven reliability and performance with years of use in OEM equipment and commercial applications. This encapsulated general use timing module is capable of controlling load currents ranging from 5mA to 1A. May be connected in series with contactors, relays, valves, solenoids, small motors, and lamps.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

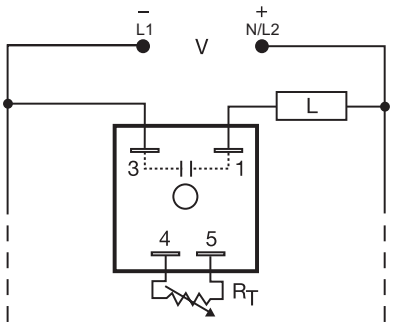
For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Two terminal series connection with load
- 5mA - 1A load currents
- Totally solid state & encapsulated
- ±2% repeat accuracy
- Fixed or adjustable delays from 0.05s - 10m in 8 ranges

Approvals:

Connection:



Load may be connected to terminal 3 or 1.
R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay*				R_T
Seconds				
1	2	3	4	Megohm
0.05	0.5	2	5	0.0
0.5	10	30	60	0.5
1.0	20	60	120	1.0
▼	24VDC or AC ONLY†		▼	
1.5	30	90	180	1.5
2.0	40	120	240	2.0
2.5	50	150	300	2.5
3.0	60	180	360	3.0
			420	3.5
			480	4.0
			540	4.5
			600	5.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.
† 1 Megohm max for 12 VDC Units

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-XX
  P/N: P1004-XX-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

All Other Voltages	
Time Delay	VTP P/N
1 - 0.05-3s	VTP4B
2 - 0.5-60s	VTP4F
3 - 2-180s	VTP4J
4 - 5-600s	VTP5N

12VDC	
Time Delay	VTP P/N
1 - 0.05-1s	VTP2A
2 - 0.5-20s	VTP2E
3 - 2-60s	VTP2F
4 - 5-120s	VTP2H

Selection Table for VTP Plug-on Adjustment Accessory.

Available Models:

TS1111	TS1411
TS12110	TS14110
TS121150	TS141180
TS12120	TS1412
TS12130	TS14120
TS121360	TS14130
TS1214	TS1415
TS121420	TS1416
TS12160	TS1418
TS12190	TS1421
TS1221	TS1422
TS1222	TS1423
TS1224	TS1424
TS13115	TS1612
TS1321	TS1615
TS1410.1	TS1621
TS1410.25	TS1622

Order Table:

TS1

X — **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 120VDC
- 6 - 230VAC

X — **Adjustment**
- 1 - Fixed
- 2 - External adjust

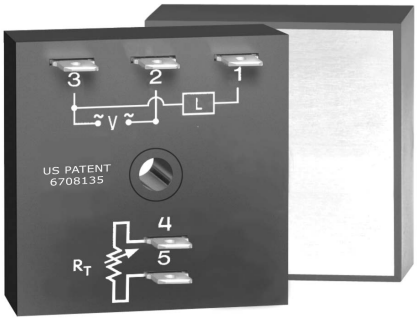
X — **Time Delay* (12VDC)**
- 1 - 0.05 - 1s
- 2 - 0.5 - 20s
- 3 - 2 - 60s
- 4 - 5 - 120s

X — **Time Delay* (ALL other voltages)**
- 1 - 0.05 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.05 - 120**) (12VDC) or (**0.05 - 600**) (other voltages) in secs.

Specifications

Time Delay
Type ..... Analog circuitry
Range 12VDC ..... 0.05 - 120s in 4 adjustable ranges or fixed (1 MΩ max. R_T)
Other Voltages ..... 0.05 - 600s in 4 adjustable ranges or fixed
Repeat Accuracy ..... ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) ..... ≤ ±10%
Recycle Time ..... After timing – ≤ 16ms
During timing – 0.1% of time delay or 75ms, whichever is greater
Time Delay vs Temp. & Voltage ..... ≤ ±10%
Input
Voltage ..... 12, 24 or 120VDC; 24, 120, or 230VAC
Tolerance ..... ±20%
AC Line Frequency ..... 50/60 Hz
Output
Type ..... Solid state
Form ..... NO, open during timing
Maximum Load Current ..... 1A steady state, 10A inrush at 60°C
Minimum Holding Current 5mA
Voltage Drop ..... ≅ 2.5V @ 1A
Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected
Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature ..... -40° to 80°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)



The TH1 Series is a solid-state relay and timer combined into one compact, easy-to-use control. This highly reliable device eliminates the need for a separate solid-state relay. When mounted to a metal surface, it can switch load currents up to 20A steady state, and 200A inrush.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- High current load capacity up to 20A with 200A inrush
- Solid-state switching - no contact wear or arcing
- Encapsulated
- Fixed or adjustable time delays from 0.1 - 600s
- ± 2% repeat accuracy
- ± 5% factory calibration
- Metallized mounting surface for heat transfer

Approvals:

Auxiliary Products:

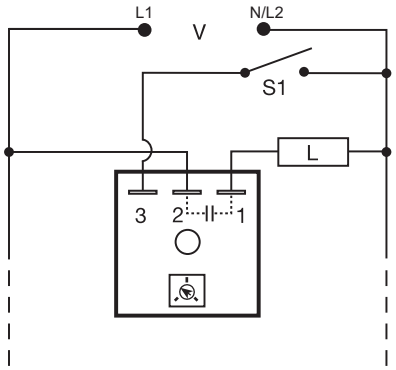
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

TH1A421
TH1B633
TH1C415
TH1C621

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



S1 = Optional Low Current Initiate Switch
R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Kohms
0.1	0.5	2	5	0
0.3	6	20	60	10
0.6	12	38	120	20
0.9	18	55	180	30
1.2	24	73	240	40
1.5	30	90	300	50
1.8	36	108	360	60
2.1	42	126	420	70
2.4	48	144	480	80
2.7	54	162	540	90
3.0	60	180	600	100

* When selecting an external R_T add at least 15% for tolerance of unit and the R_T.

Order Table:

TH1 **X** **X** **X** **X**

Output Rating	Input Voltage	Adjustment	Time Delay*
A - 6A	2 - 24VAC	1 - Fixed	1 - 0.1 - 3s
B - 10A	4 - 120VAC	2 - External adjust	2 - 0.5 - 60s
C - 20A	6 - 230VAC	3 - Onboard adjust	3 - 2 - 180s
			4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.1 - 600**) in secs.

Specifications

Time Delay
Range . . . . . 0.1 - 600s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ± 5%
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Recycle Time . . . . . ≤ 150ms
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±15%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, open during timing

Maximum Load Currents	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop . . . . . ≅ 2.5V at rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

The MSM replaces bi-metal type timing with reliable solid-state circuitry. There are no moving parts to arc or wear. It is a cost effective solution for OEM designers. It is available for printed circuit board mounting or surface mounting with a removable bracket and wire leads. The MSM offers immediate reset on removal of power.

Operation (Delay-on-Make):
The time delay begins upon application of input voltage. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 167, Figure 25 for dimensional drawing.

Features:

- Printed circuit mount or wire leads
- Fixed delays from 0.05 - 180s
- ± 5% repeat accuracy
- ± 15% factory calibration
- Two-wire series connection with the load
- Fast reset

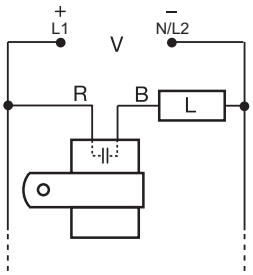
Approvals:

Available Models:

MSM10.2W7	MSM21W9
MSM10.5W6	MSM22W6
MSM10.7W6	MSM25W9
MSM11W6	MSM30.7W6
MSM110W6	MSM33W9
MSM130W9	MSM360P1
MSM16W9	MSM40.2W6
MSM190W6	MSM420W6
MSM20.15W9	MSM42W6
MSM210P3	MSM610W9

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



V = Voltage
L = Load
R = Red Wire
B = Black Wire

Order Table:

MSM — **X** — **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X — **Fixed Time Delay**
- 0.05 - 180s

Specify fixed time in seconds.

X — **Wire Type**
- P - PC Mount
- W - Stranded Wire Leads

X — **Wire Length Inches (mm)**

For P - PC Mount:
- 1 - 0.250 (6.35)
- 2 - 0.375 (9.53)
- 3 - 0.5 (12.70)
- 4 - 0.625 (15.88)
- 5 - 0.75 (19.05)

For W - Stranded Wire Leads:
- 6 - 6.0 (152.4)
- 7 - 7.0 (177.8)
- 8 - 8.0 (203.2)
- 9 - 9.0 (228.6)

Specifications

Time Delay
Type . . . . . Analog Circuitry
Range . . . . . 0.05 - 180s fixed
Repeat Accuracy . . . . . ±5%
Tolerance (Factory Calibration) . . . . . ±15%
Recycle Time . . . . . ≤ 75ms
Time Delay vs Temp. & Voltage . . . . . ±15%

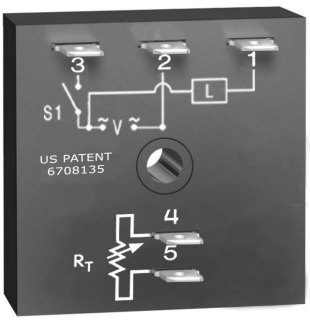
Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance . . . . . ±10%
AC Line Frequency . . . . . 50/60 Hz

Output
Type . . . . . Solid State
Form . . . . . NO, open during timing
Maximum Load Current . . . . . 0.5A steady state 25°C; 0.25A steady state 60°C
Minimum Holding Current 40mA
Voltage Drop . . . . . ≅ 2.5V @ 0.5A

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS input to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . a. PC mount 14 AWG (2.087mm²) wires (Can be inserted in AMP Miniature Spring Socket #645980-1)
b. Stranded 18 AWG wire leads (0.933 mm²) with mounting bracket

Environmental
Operation / Storage Temperature . . . . . -20° to 60°C / -30° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . P: ≅ 1.1 oz (31.2 g) W: ≅ 1.2 oz (34 g)



The TSD4 Digi-Timer is a delay-on-make timer with a normally closed solid-state output. The load is energized prior to and during the delay period. The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Make NC):
Upon application of input voltage, the load energizes immediately. When the initiate switch is closed, the time delay begins. At the end of the time delay, the load de-energizes.
Reset: When the initiate switch is reopened, the load energizes again and the time delay is reset. Removing input voltage resets the time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Fixed or adjustable delays from 0.1s - 100h
- 24, 120, or 230VAC
- ±0.1% repeat accuracy
- ±1% factory calibration
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

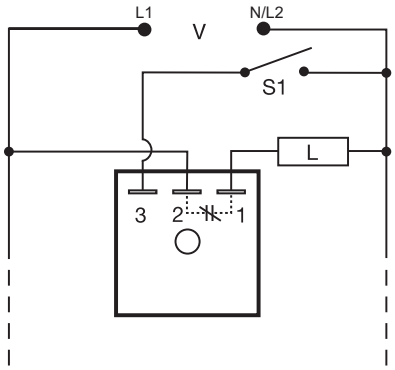
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

TSD44115S

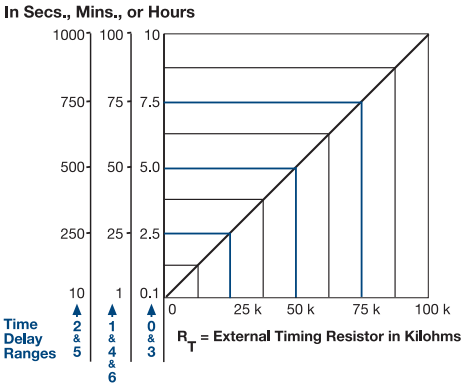
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



S1 = Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

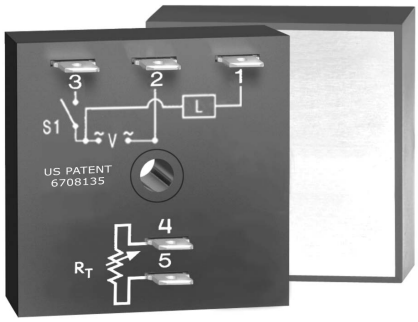
TSD4 **X** **X** **X**

Input Voltage	Adjustment	Time Delay*
2 - 24VAC	1 - Fixed	0 - 0.1 - 10s
4 - 120VAC	2 - External adjust	1 - 1 - 100s
6 - 230VAC	3 - Onboard adjust	2 - 10 - 1000s
		3 - 0.1 - 10m
		4 - 1 - 100m
		5 - 10 - 1000m
		6 - 1 - 100h

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. (**M**) min. or (**1 - 100**) (**H**) hours.

Specifications

Time Delay
Range . . . . . 0.1s - 100h in 7 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±1%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NC, closed before & during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The THD4 utilizes solid-state circuitry and a solid-state relay in one easy to use control. The metallized mounting surface allows a metal panel to dissipate heat rather than adding an expensive heat sink. The solid-state output is rated 6, 10, or 20 amps steady and up to 200 amps inrush. Motors, heaters and valves can be switched directly, eliminating the expense of a separate contactor. The THD4 offers substantial performance, reliability, and cost advantages for OEM designers.

Operation (Delay-on-Make NC):
Upon application of input voltage, the load is energized immediately. When the initiate switch closes, the time delay begins. At the end of the time delay, the load de-energizes.
Reset: When the initiate switch is reopened, the load is again energized and the time delay is reset. Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- High load current capacity up to 20A, 200A inrush
- Load energized prior to & during timing
- ±0.5% repeat accuracy
- ±1% factory calibration
- Totally solid state & encapsulated
- Fixed or adjustable delays from 0.1s - 1000m in 6 ranges

Approvals:

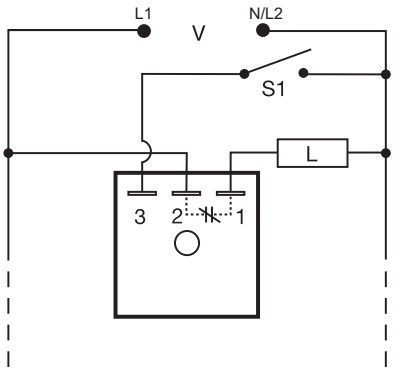
Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

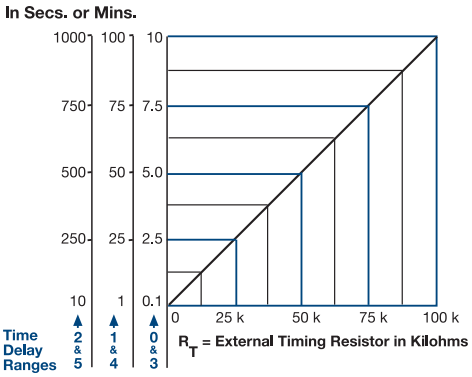
There are no part numbers currently active. Please call Technical Support with your requirements.

Connection:



S1 = Low Current Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

THD4 **X** **X** **X** **X**

Output Rating	Input Voltage	Adjustment	Time Delay*
A - 6A	2 - 24VAC	1 - Fixed	0 - 0.1 - 10s
B - 10A	4 - 120VAC	2 - External adjust	1 - 1 - 100s
C - 20A	6 - 230VAC	3 - Onboard adjust	2 - 10 - 1000s
			3 - 0.1 - 10m
			4 - 1 - 100m
			5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

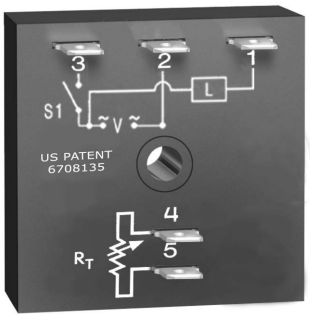
Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NC

Rating	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop . . . . . ≅ 2.5V at rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The KSD4 Digi-Timer offers a delay-on-make function with normally closed solid-state output. The load is energized prior to and during the time delay. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for input voltages of 24, 120 or 230VAC. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Make NC):
Upon application of input voltage, the load energizes immediately. When the initiate switch is closed, the time delay begins. At the end of the time delay, the load de-energizes.
Reset: When the initiate switch is reopened, the load energizes and the time delay is reset. Removing input voltage resets the time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ±5% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

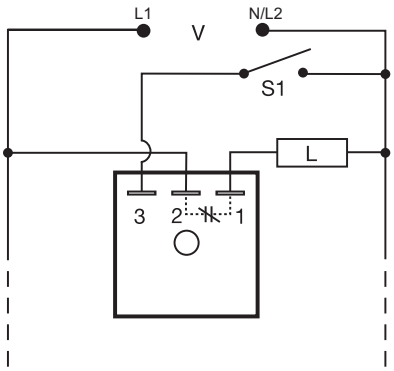
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

KSD4433

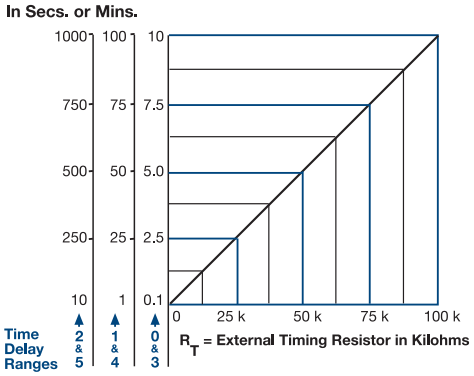
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



S1 = Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

KSD4 **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

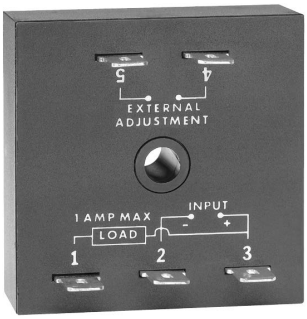
Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration. . . . . ≤ ± 5%
Reset Time. . . . . ≤ 150ms
Time Delay vs Temp. & Voltage. . . . . ≤ ±10%
Input
Voltage. . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form. . . . . NC, closed before & during timing
Maximum Load Current. . . . . 1A steady state, 10A inrush at 60°C
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop. . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance. . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions. . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination. . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature. . . . . -40° to 60°C / -40° to 85°C
Humidity. . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TS4 Versa-Timer is an analog delay-on-make timer with a normally closed solid-state output. Unlike an interval timer, the load is energized prior to and during the time delay period. It can be used as a faster starting interval time delay when S1 is closed upon application of input voltage.

Operation (Delay-on-Make NC):
Upon application of input voltage, the load is energized immediately. When the initiate switch is closed, the time delay begins. At the end of the time delay, the load de-energizes.
Reset: When the initiate switch is reopened, the load again energizes and the time delay is reset. Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Fixed or adjustable delay
- Load energized prior to & during time delay
- 0.05 - 600s in 4 ranges
- ±2% repeat accuracy
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Approvals:

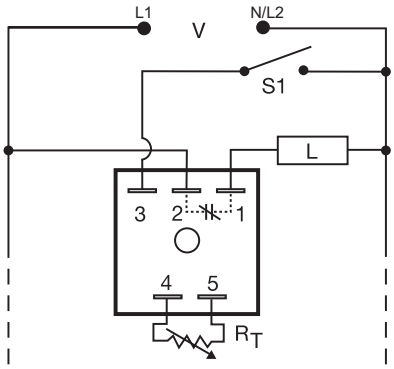
Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-XX
  P/N: P1004-XX-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

Time Delay	VTP P/N
1 - 0.05-3s	VTP4B
2 - 0.5-60s	VTP4F
3 - 2-180s	VTP4J
4 - 5-600s	VTP5N

Selection Table for VTP Plug-on Adjustment Accessory.

Connection:



S1 = Initiate Switch
R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Megohm
0.05	0.5	2	5	0.0
0.5	10	30	60	0.5
1.0	20	60	120	1.0
1.5	30	90	180	1.5
2.0	40	120	240	2.0
2.5	50	150	300	2.5
3.0	60	180	360	3.0
			420	3.5
			480	4.0
			540	4.5
			600	5.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Available Models:

TS441180
TS4422
TS4611

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TS4 **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

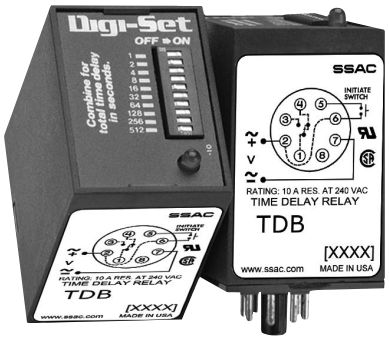
Adjustment
- 1 - Fixed
- 2 - External adjust

Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.05 - 600**) in secs.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 600s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater; under fixed conditions
Tolerance (Factory Calibration) . . . . . ≤ ±10%
Time Delay vs Temp. & Voltage. . . . . ≤ ±10%
Recycle Time. . . . . ≤ 150ms
Input
Voltage. . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form. . . . . NC, closed during timing
Maximum Load Current. . . . . 1A steady state, 10A inrush at 60°C
Voltage Drop. . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance. . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions. . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination. . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature. . . . -40° to 75°C / -40° to 85°C
Humidity. . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TDB Series combines accurate digital circuitry with isolated, 10A, DPDT or SPDT contacts in an 8 or 11-pin plug-in package. The TDB Series features DIP switch selectable time delays ranging from 0.1-10,230 seconds in three ranges. The TDB Series is the product of choice for custom control panel and OEM designers.

Operation (Delay-on-Break):
Input voltage must be applied to the input before and during timing. Upon closure of the initiate switch, the output relay is energized. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Features:

- Switch settable time delay
- Three time ranges from 0.1s - 10,230s
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 10A, SPDT or DPDT output contacts
- LED indication

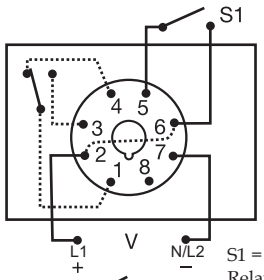
Approvals:

8-pin models UL listed when used in combination with P1011-6 socket only.

Auxiliary Products:

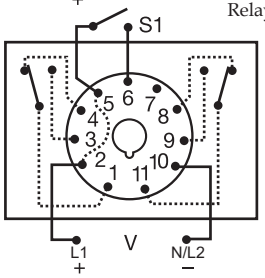
- **Panel mount kit:** P/N: BZ1
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **11-pin socket:** P/N: NDS-11
- **Octal 8-pin socket:** P/N: NDS-8
- **Octal socket for UL listing:** P/N: P1011-6

Connection:



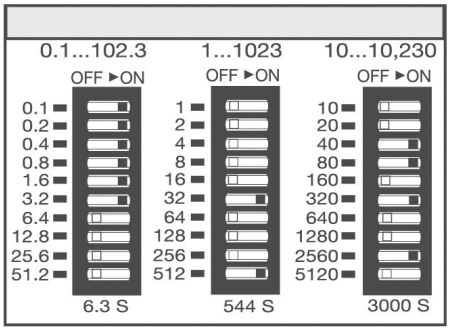
8-pin octal
SPDT

S1 = Initiate Switch
Relay contacts are isolated.



11-pin
DPDT

Digi-Set Binary Switch Operation:



Available Models:

TDB120AL	TDBH120AL
TDB120ALD	TDBH120ALD
TDB12D	TDBH24AL
TDB230AL	TDBL120AL
TDB24AL	TDBL120ALD
TDB24DL	TDBL24DL

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TDB - 1 - 1023s in 1s increments
TDBH - 10 - 10,230s in 10s increments
TDBL - 0.1 - 102.3s in 0.1s increments

X **Input Voltage**
- 12D - 12VDC
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

X **LED***
- L

X **Type Plug / Output Form**
- D - 11-pin plug, DPDT
- Blank - Octal (8-pin) plug, SPDT

*Note: LED not available on 12VDC units.

Time Delay
Type ..... Digital integrated circuitry
Range** ..... 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
10 - 10,230s in 10s increments
Repeat Accuracy ..... ±0.1% or 20ms, whichever is greater
Setting Accuracy ..... ±2% or 50ms, whichever is greater
Reset Time ..... ≤ 50ms
Recycle Time ..... ≤ 150ms
Time Delay vs Temp. & Voltage ..... ±5%
Indicator ..... LED indicates relay is energized
Initiate Time ..... ≤ 60ms

Input
Voltage ..... 12, 24/28, or 110VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC ..... -15% - 20%
110 to 230VAC/DC ..... -20% - 10%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... ≤ 3.25W

Output
Type ..... Electromechanical relay
Form ..... SPDT or DPDT
Rating ..... 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life ..... Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection
Isolation Voltage ..... ≥ 1500V RMS input to output
Polarity ..... DC units reverse polarity protected

Mechanical
Mounting ..... Plug-in socket
Dimensions ..... 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm)
Termination ..... Octal 8-pin plug-in or 11-pin plug-in

Environmental
Operating / Storage Temperature ..... -20° to 65°C / -30° to 85°C
Weight ..... ≅ 6 oz (170 g)

** For CE approved applications, power must be removed from the unit when a switch position is changed.

The TRB Series combines an isolated, 10A electromechanical relay output with analog timing circuitry. False trigger of the TRB by a transient is unlikely because of the complete isolation of the circuit from the line prior to initiation. The initiate contact is common to one side of the line and may be utilized to operate other loads. Installation is easy due to the TRB's industry standard 8 or 11-pin plug-in base wiring.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Features:

- Onboard adjustable time delays
- Fixed or adjustable delays from 0.05 - 600s in multiple ranges
- ±2% repeat accuracy
- AC and DC operating voltages are available
- Isolated, 10A, SPDT or DPDT output contacts

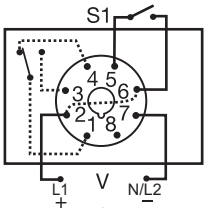
Approvals:

8-pin models UL listed when used in combination with P1011-6 socket only.

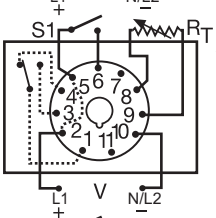
Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **Octal 8-pin socket:** P/N: NDS-8
- **11-pin socket:** P/N: NDS-11
- **Octal socket for UL listing:** P/N: P1011-6
- **External adjust potentiometers:**
  P/N: P1004-XX
  P/N: P1004-XX-X
- **Versa-knob:** P/N: P0700-7

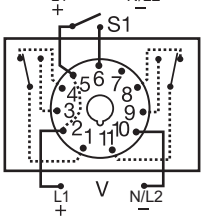
Connection:



8-pin octal SPDT



11-pin SPDT



11-pin DPDT

S1 = Initiate Switch
Relay contacts are isolated.
R_T is used when external adjustment is ordered.

External R_T P/N Selection Table

Value	Part Number
1M ohm	P1004-16
1.5M ohm	P1004-15
2M ohm	P1004-14
3M ohm	P1004-12
5M ohm	P1004-13
1M ohm	P1004-16-X
1.5M ohm	P1004-15-X
2M ohm	P1004-14-X
3M ohm	P1004-12-X
5M ohm	P1004-13-X

Available Models:

TRB120A1Y240	TRB120A3X600
TRB120A2Y1	TRB24A1Y0.2
TRB120A2Y3	TRB24A4Y60
TRB120A2Y30	TRB24D10Y10

If desired part number is not listed, please call us to see if it is technically possible to build.

R_T Selection Chart

Time Delay* Range Seconds	R_T Megohm
0.05...1	1.0
0.05...2	2.0
0.05...3	3.0
0.1...5	5.0
0.1...10	3.0
1...30	1.5
1...60	3.0
2...120	2.0
2...180	3.0
7...240	1.5
7...300	2.0
7...360	2.0
7...420	3.0
7...480	3.0
7...600	5.0

* When selecting an external R_T add at least 15...30% for tolerance of unit and the R_T.

Order Table:

TRB **X**

Input Voltage
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

X

Adjustment and Output Form
- 1 - Fixed, Octal, SPDT (AC Volts only)
- 2 - Onboard Adjust, Octal, SPDT (AC Volts only)
- 3 - Lock Shaft Adjust, Octal, SPDT (AC Volts only)
- 4 - Onboard adjust, 11-pin, DPDT
- 7 - Ext. Adjust, 11-pin, SPDT without potentiometer
- 10 - Fixed, 11-pin, DPDT

X

Time Tolerance
- X - ±20%
- Y - ±10%
- Z - ±5%

X

Time Delay* (seconds)
- 1 - 0.05 - 1
- 2 - 0.05 - 2
- 3 - 0.05 - 3
- 5 - 0.1 - 5
- 10 - 0.1 - 10
- 30 - 1 - 30
- 60 - 1 - 60
- 120 - 2 - 120
- 180 - 2 - 180
- 240 - 7 - 240
- 300 - 7 - 300
- 360 - 7 - 360
- 420 - 7 - 420
- 480 - 7 - 480
- 600 - 7 - 600

*If fixed delay is selected, insert delay (0.05 - 600) in seconds.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 50ms - 10m in 15 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Fixed Time Tolerance & Setting Accuracy . . ±5, 10, or 20%
Initiate Time . . . . . ≤ 70ms
Reset Time . . . . . ≤ 75ms
Recycle Time . . . . . ≤ 250ms
Time Delay vs Temp. & Voltage . . . . . ≤±10%

Input
Voltage . . . . . 24/28 or 110VDC; 24, 120, or 230VAC (DC voltages on DPDT output models only)
Tolerance 24VDC/AC . . . . . -15% - 20%
110 to 230VAC/DC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 3.25W

Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated SPDT or DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection
Insulation Resistance . . . . . ≥ 100 MΩ
Isolation Voltage . . . . . ≥ 1500V RMS between input to output
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Plug-in socket
Dimensions . . . . . 3.62 x 2.39 x 1.78 in (91.6 x 60.7 x 45.2 mm)
Termination . . . . . Octal 8-pin plug-in or 11-pin plug-in

Environmental
Operating / Storage Temperature . . . . . -20° to 65°C / -30° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

The PRLB Series is designed for use on non-critical timing applications. It offers low cost, knob adjustable timing control, full 10A relay output, and onboard LED indication. The knob adjustment provides a guaranteed time range of up to 10 minutes in 6 ranges. The onboard LED indicates whether or not the unit is timing (flashing LED) as well as the status of the output.

Operation (Delay-on-Break):
Input voltage must be applied at all times prior to and during timing. Upon closure of the initiate switch, the output contacts transfer and remain transferred if no further action is taken. The LED is on steady. When the initiate switch is opened, the time delay is started. The LED flashes during timing. At the conclusion of the delay, the output contacts revert to their original unenergized position. Applying input voltage with the initiate switch closed will energize the load.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Features:

- Onboard adjustable time delay relay
- Electronic circuit with electromechanical relay
- Popular AC & DC operating voltages
- Industry standard octal plug-in connection
- Time delays 0.05 - 600s in 6 ranges
- ±2% repeat accuracy
- ±10% factory calibration
- LED indication
- 10A, SPDT output contacts

Approvals:

Auxiliary Products:

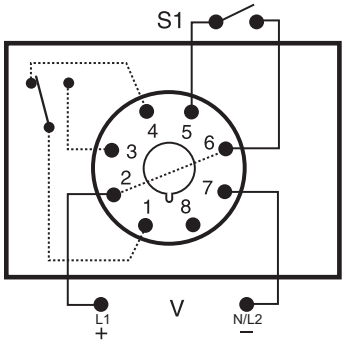
- **Panel mount kit:** P/N: BZ1
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **Octal 8-pin socket:** P/N: NDS-8
- **DIN rail:** P/N: C103PM (Al)

Available Models:

PRLB422
PRLB425

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



S1 = Initiate Switch
Relay contacts are isolated.

Order Table:

PRLB **X** **X** **X**

Input Voltage	Adjustment	Time Delay*
1 - 12VDC	1 - Factory Fixed	1 - 0.05 - 3s
2 - 24VAC	2 - Adjustable	2 - 0.1 - 10s
3 - 24VDC		3 - 1 - 60s
4 - 120VAC		4 - 2 - 180s
5 - 110VDC		5 - 7 - 480s
6 - 230VAC		6 - 7 - 600s

*If fixed delay is selected, insert delay (0.05 - 600) in seconds.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 600s in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance . . . . . Knob adjust: guaranteed range
Fixed: ±10%
Reset Time . . . . . ≤ 75ms
Recycle Time . . . . . ≤ 250ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%

Input
Voltage . . . . . 12, 24, or 110VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . -15% - 20%
110 to 230VAC/DC . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2.25W

Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated, SPDT
Rating . . . . . 10A resistive @ 28VDC; 10A resistive @ 240VAC; 1/3 hp @ 120 & 240VAC
Life . . . . . Mechanical - $1x10^7$; Electrical - $1x10^6$

Protection
Surge . . . . . IEEE C62.41-1991 Level A
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Indication
Type . . . . . LED
Operation . . . . . Output energized - on steady
Output energized & timing - flashing

Mechanical
Mounting . . . . . Plug-in socket
Dimensions . . . . . 3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)
Termination . . . . . Octal 8-pin plug-in

Environmental
Operating / Storage Temperature . . . . . -20° to 65°C / -30° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

The HRDB Series combines an electromechanical, relay output with microcontroller timing circuitry. The HRDB offers 12 to 230V operation in five options and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The isolated output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. The HRDB is ideal for OEM applications where cost is a factor.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

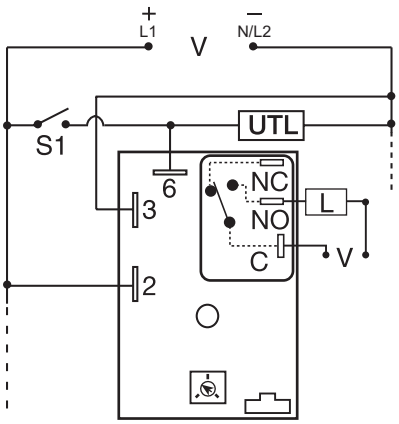
- Isolated, 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

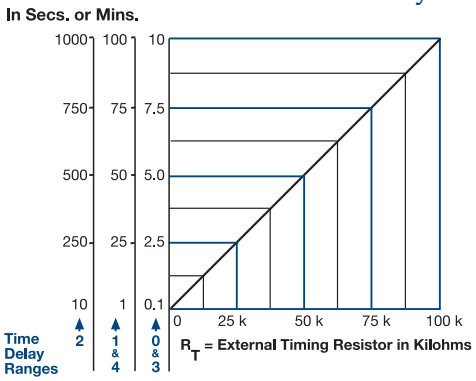
Connection:



S1 = Initiate Switch
L = Timed Load
UTL = Untimed Load (optional)
NO = Normally Open
C = Common, Transfer Contact

NOTE: A knob, or terminals 4 & 5 are only included on adjustable units. R_T is used when external adjustment is ordered. Relay contacts are isolated. Dashed lines are internal connections. The untimed load is optional.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

HRDB1110M	HRDB320
HRDB113S	HRDB321
HRDB117S	HRDB322
HRDB120	HRDB323
HRDB121	HRDB324
HRDB124	HRDB4130S
HRDB21A65M	HRDB420
HRDB220	HRDB421
HRDB221	HRDB422
HRDB222	HRDB423
HRDB223	HRDB424
HRDB224	HRDB615M
HRDB315M	HRDB621
HRDB3160M	HRDB623

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

HRDB **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

X **Time Tolerance**
- Blank - ±5%
- A - ±1%

X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay
Type ..... Microcontroller circuitry
Range ..... 0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy ..... ±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration) ..... ±1%, ±5%
Reset Time ..... ≤ 150ms
Initiate Time ..... ≤ 20ms
Time Delay vs Temp. & Voltage ..... ±2%

Input
Voltage ..... 12 or 24VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC ..... -15% - 20%
24 to 230VAC ..... -20% - 10%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... AC ≤ 4VA; DC ≤ 2W

Output
Type ..... Electromechanical relay
Form ..... Isolated, SPDT

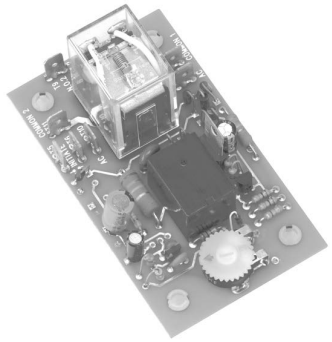
Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**

Life ..... Mechanical - 1 x 10^6;
Electrical - 1 x 10^5, *3 x 10^4, **6,000

Protection
Surge ..... IEEE C62.41-1991 Level A
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 3.9 oz (111 g)



The ORB Series' open PCB construction offers the user good economy without sacrificing performance and reliability. The output relay is available in isolated, 10A, DPDT or SPDT forms. The time delay may be ordered as factory fixed, onboard knob, or external adjustment. All connections are 0.25 in. (6.35 mm) male quick connect terminals.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 11 for dimensional drawing.

Features:

- Low cost open PCB construction
- 10A, DPDT or SPDT output contacts
- Line voltage initiation
- Delays from 0.05s - 300s in 5 ranges
- ±2% repeat accuracy
- ±10% factory calibration

Approvals:

Auxiliary Products:

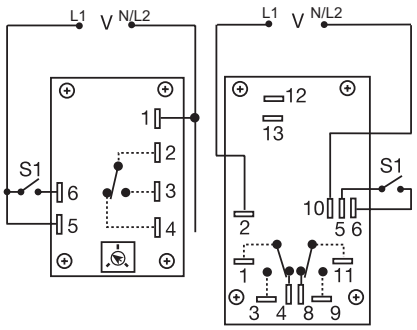
- **External adjust potentiometer:**
  P/N: P1004-12
  P/N: P1004-12-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

ORB120A160
ORB120A25
ORB24A15D
ORB24A21D
ORB24A25

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



SPDT DPDT

Relay contacts are isolated.
R_T is used when external adjustment is ordered.

R_T Selection Chart					
Desired Time Delay*					R_T
Seconds					
1	2	3	4	5	Megohm
0.05	0.5	0.6	1.2	3.0	0.0
0.5	5.0	10	20	50	0.5
1.0	10	20	40	100	1.0
1.5	15	30	60	150	1.5
2.0	20	40	80	200	2.0
2.5	25	50	100	250	2.5
3.0	30	60	120	300	3.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Order Table:

ORB **X** **X** **X** **X**

Input Voltage
- 24A - 24VAC
- 120A - 120VAC
- 230A - 230VAC

Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.5 - 30s
- 3 - 0.6 - 60s
- 4 - 1.2 - 120s
- 5 - 3 - 300s

*If fixed delay is selected, insert delay (**0.05 - 300**) in seconds.

Output Form
- Blank - SPDT
- D - DPDT

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 300s in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . Adjustable: guaranteed range
Fixed: ±10%
Reset Time . . . . . ≤ 50ms
Initiate Time . . . . . ≤ 70ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%

Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance 24VAC . . . . . -15% - 20%
120 & 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption 2.25W

Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated, SPDT or DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC;
1/3 hp @ 120/240VAC
Life . . . . . Mechanical - $1x10^7$; Electrical - $1x10^6$

Protection
Isolation Voltage . . . . . ≥1500V RMS input to output

Mechanical
Mounting . . . . . Surface mount with four #6 (M3.5 x 0.6) screws
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -20° to 65°C / -30°to 85°C
Weight . . . . . ≅ 2.7 oz (77 g)

The KRDB Series is a compact time delay relay measuring only 2 in. (50.8 mm) square. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDB Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

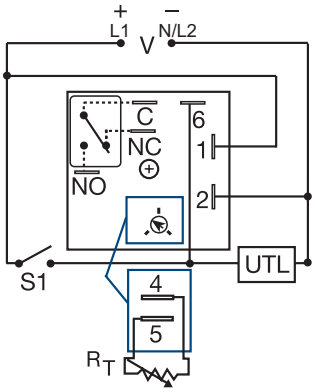
- Compact time delay relay
- Microcontroller circuitry
- ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m in 6 ranges
- Input voltages from 12 to 230V in 6 options
- ±5% factory calibration

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

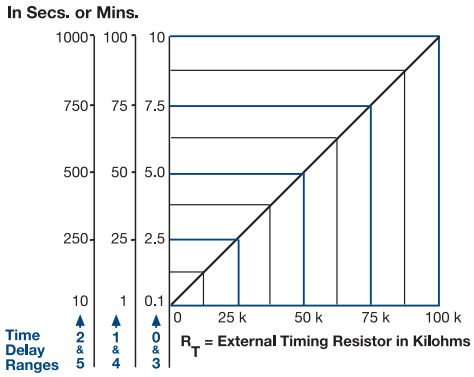
Connection:



V = Voltage
S1 = Initiate Switch
C = Common, Transfer Contact
NO = Normally Open
NC = Normally Closed
UTL = Untimed Load (optional)

A knob is supplied for adjustable units. The untimed load is optional. Relay contacts are isolated.

External Resistance vs. Time Delay:



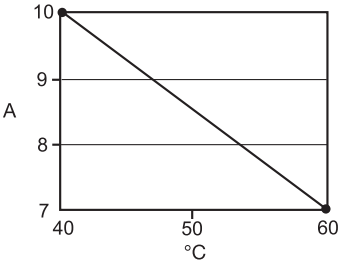
This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

KRDB1110S	KRDB217S
KRDB112.5S	KRDB222
KRDB1120M	KRDB31120S
KRDB115M	KRDB415S
KRDB1160M	KRDB420
KRDB120	KRDB421
KRDB121	KRDB422
KRDB124	KRDB424
KRDB125	KRDB425

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature



Order Table:

KRDB **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC/DC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**M**) min.

Specifications

Time Delay
Type ..... Microcontroller with watchdog circuitry
Range ..... 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy ..... ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) ..... ≤ ±5%
Recycle Time ..... ≤ 150ms
Initiate Time ..... ≤ 40ms
Time Delay vs Temp. & Voltage ..... ≤ ±5%

Input
Voltage ..... 12, 24, 110VDC; 24, 120 or 230VAC
Tolerance 12VDC & 24VDC/AC .... -15% - 20%
110VDC, 120 or 230VAC .... -20% - 10%
AC Line Frequency / DC Ripple ..... 50/60 Hz / ≤ 10%
Power Consumption ..... AC ≤ 2VA; DC ≤ 2W

Output
Type ..... Isolated relay contacts
Form ..... SPDT
Rating (at 40°C) ..... 10A resistive @ 125VAC;
5A resistive @ 230VAC & 28VDC;
1/4 hp @ 125VAC
Max. Switching Voltage 250VAC
Life (Operations) ..... Mechanical - 1 x 10^7; Electrical - 1 x 10^5

Protection
Circuitry ..... Encapsulated
Isolation Voltage ..... ≥ 1500V RMS input to output
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≈ 2.6 oz (74 g)

The TDUB Series combines digital timing circuitry with universal voltage operation. Voltages of 24 to 240VAC and 12 to 24VDC are available in three ranges. The TDUB Series offers DIP switch selectable time delays ranging from 0.1 seconds to 102.3 minutes in three ranges. Its 1A rated output, ability to operate on multiple voltages, and wide range of switch selectable time delays make the TDUB Series an excellent choice for process control systems and OEM equipment.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Switch selectable time setting
- 0.1s - 102.3m in 3 ranges
- ± 0.5% repeat accuracy
- ± 2% setting accuracy
- 1A, solid-state output
- Wide voltage ranges

Approvals:

Auxiliary Products:

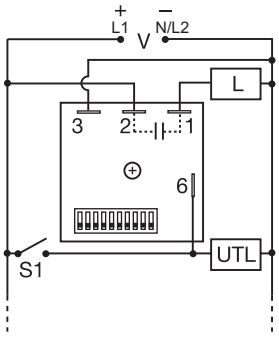
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM
- **DIN rail adaptor:** P/N: 1023-20

Available Models:

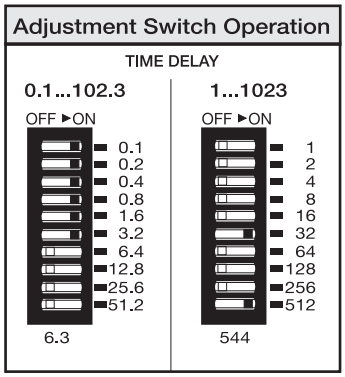
TDUB3000A	TDUBH3002A
TDUB3002A	TDUBL3002A

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



UTL = Optional Untimed Load
S1 = Initiate Switch
L = Timed Load



Add the value of switches in the ON position for the total time delay.

Order Table:

Input Voltage Range	Time Range	Part Number
24 to 120VAC	0.1 - 102.3s	TDUBL3000A
100 to 240VAC	0.1 - 102.3s	TDUBL3001A
12 to 24VDC	0.1 - 102.3s	TDUBL3002A
24 to 120VAC	1 - 1023s	TDUB3000A
100 to 240VAC	1 - 1023s	TDUB3001A
12 to 24VDC	1 - 1023s	TDUB3002A
24 to 120VAC	0.1 - 102.3m	TDUBH3000A
100 to 240VAC	0.1 - 102.3m	TDUBH3001A
12 to 24VDC	0.1 - 102.3m	TDUBH3002A

Specifications

Time Delay
Range* ..... 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
0.1 - 102.3m in 0.1m increments
Repeat Accuracy ..... ±0.5% or 20ms, whichever is greater
Setting Accuracy ..... ≤ ±2% or 20ms, whichever is greater
Reset Time ..... ≤ 150ms
Initiate Time ..... ≤ 20ms
Time Delay vs Temp. & Voltage ..... ≤ ±5%

Input
Voltage / Tolerance ..... 24 to 240VAC, 12 to 24VDC /±20%
AC Line Frequency / DC Ripple ..... 50/60 Hz / ≤ 10%
Power Consumption ..... AC ≤ 2VA; DC ≤ 1W

Output
Type ..... Solid state
Form ..... NO, closed before and during timing
Rating ..... 1A steady state, 10A inrush at 60°C
Voltage Drop ..... AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
Off State Leakage Current ..... AC ≅ 5mA @ 230VAC; DC ≅ 1mA

Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.

The TSDB Series is designed for more demanding commercial and industrial applications where small size, and accurate performance are required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 1000 minutes are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

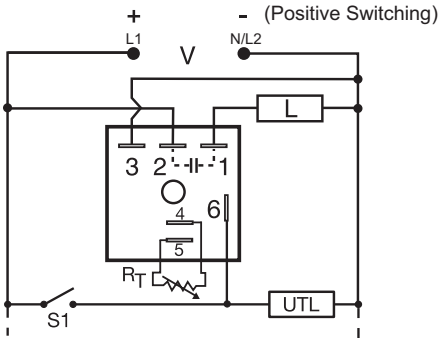
- Fixed or adjustable delays 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ± 1% factory calibration
- 12VDC to 230VAC in 5 options
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

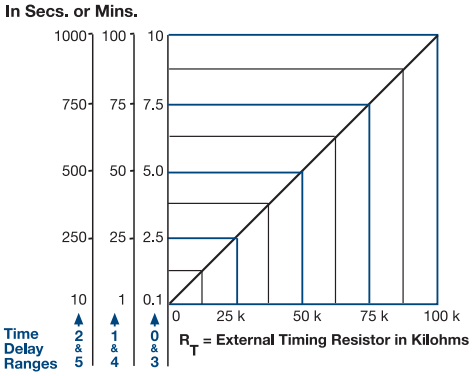
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



UTL = Optional Untimed Load
L = Timed Load
S1 = Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

TSDB120P	TSDB431
TSDB320P	TSDB434
TSDB420	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TSDB **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

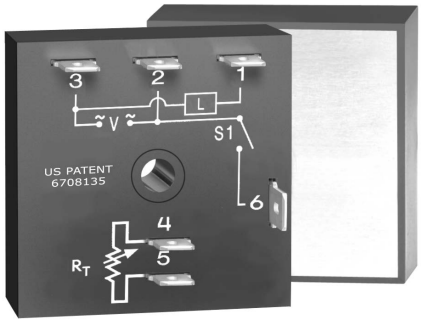
X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Switching Mode (VDC only)**
- P - Positive
- N - Negative

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance . . . . . ±15%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 1W
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10 %
Output
Type . . . . . Solid state
Form . . . . . NO, closed before & during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Off State Leakage Current . . . . . ≅ 5mA @ 230VAC; DC ≅ 1mA
Voltage Drop . . . . . AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
DC Operation . . . . . Positive or negative switching
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The THDB Series combines accurate timing circuitry with high power, solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output energizes if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

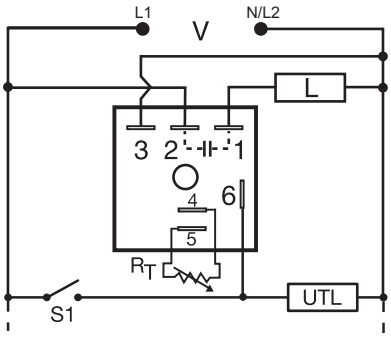
- High load currents up to 20A, 200A inrush
- Fixed or adjustable 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid-state & encapsulated

Approvals:

Auxiliary Products:

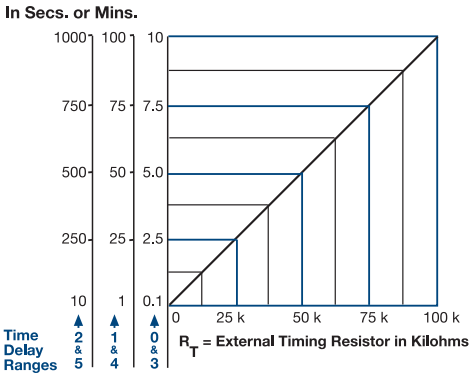
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Connection:



UTL = Optional Untimed Load
L = Timed Load
S1 = Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

THDB231C	THDB430C
THDB232C	THDB431C
THDB233C	THDB432C
THDB234C	THDB433C
THDB235C	THDB434C
THDB4110MC	THDB435C
THDB421A	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

THDB **X** **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

Output Rating
- A - 6A
- B - 10A
- C - 20A

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%

Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA

Output
Type . . . . . Solid state
Form . . . . . NO, closed before & during timing

Maximum Load Current	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Voltage Drop . . . . . ≅ 2.5V @ rated current
Off State Leakage Current . . . . . ≅ 5mA @t 230VAC
Minimum Load Current 100mA

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ

Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

The KSDB is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for popular AC and DC voltages. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output energizes if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

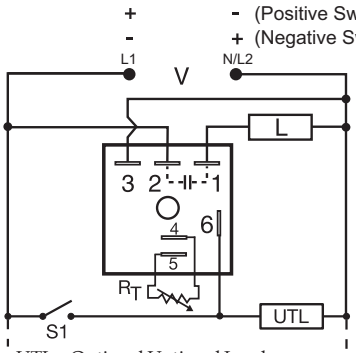
- Fixed or adjustable 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 12VDC to 230VAC in 6 ranges
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

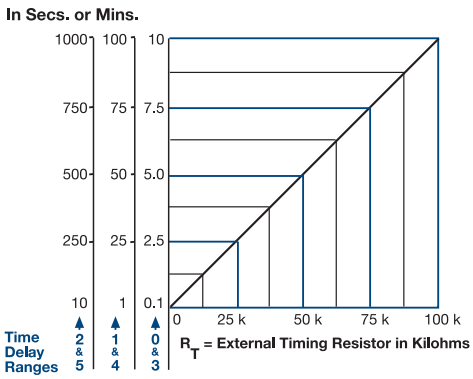
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



UTL = Optional Untimed Load
L = Load
S1 = Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

KSDB1110MP	KSDB320P
KSDB1115SP	KSDB324N
KSDB1120SP	KSDB330N
KSDB113MP	KSDB330P
KSDB113SP	KSDB334P
KSDB1160SP	KSDB4110S
KSDB120P	KSDB41150S
KSDB134P	KSDB4120M
KSDB2115S	KSDB4160S
KSDB220	KSDB4190M
KSDB231	KSDB431
KSDB312SN	KSDB61150S
KSDB314SP	KSDB631
KSDB315SP	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

KSDB **X** **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 120VDC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

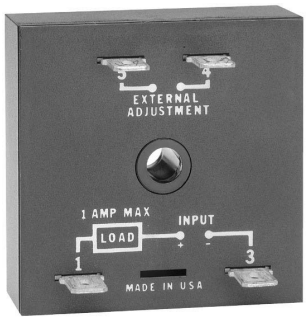
Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

Switching Mode (VDC only)
- P - Positive
- N - Negative

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 12, 24, or 120VDC; 24, 120, or 230VAC
Tolerance . . . . . ±20%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10 %
Output
Type . . . . . Solid state
Form . . . . . NO, closed before & during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
OFF State Leakage Current . . . . . AC ≅ 5mA @ 230VAC; DC ≅ 1mA
Voltage Drop . . . . . AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
DC Operation . . . . . Positive or negative switching
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 80°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TSD7 utilizes only two terminals connected in series with the load. Interval timing mode period is achieved by using a small portion of the AC sine wave allowing sufficient voltage for circuit operation. It can be used as an interval timer to control or pulse shape the operation of contactors, solenoids, relays, and lamp loads. The TSD7 can be wired to delay on the break of a switch for energy saving fan delays.

Operation (Interval):
Upon application of input voltage, the output energizes and the time delay begins. The output remains energized throughout the time delay. At the end of the time delay, the output de-energizes and remains de-energized until power is removed.
Reset: Removing input voltage resets the time delay and the output.
Operation (Delay-on-Break):
Upon closure of SW1, the load is energized and the timer is reset (zero volts across its input terminals). Opening SW1 re-applies input voltage to the timer, the load remains energized and the time delay begins. At the end of the time delay, the output de-energizes. If SW1 is open when power is applied, the load will energize for the time delay then de-energize.
Reset: Reclosing SW1 resets the timer.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Two terminal series connection to load
- Fixed or adjustable 1s - 1000m in 5 ranges
- Digital integrated circuitry
- ±0.5% repeat accuracy

Approvals:

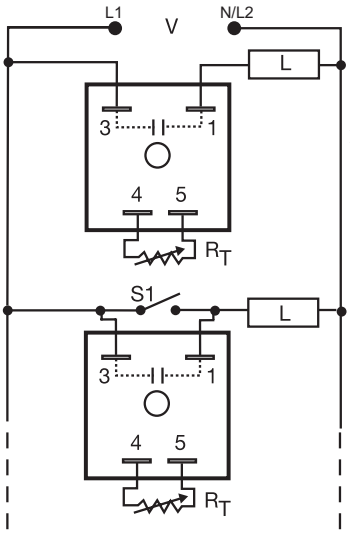
Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-13
  P/N: P1004-13-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Mounting bracket:** P/N: P1023-6
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

Time Delay	VTP P/N
1 - 1-100s	VTP5G
2 - 10-1000s	VTP5K
3 - 0.1-10m	VTP5N
4 - 1-100m	VTP5P
5 - 10-1000m	VTP5R

Selection Table for VTP Plug-on Adjustment Accessory.

Connection:



V = Voltage
L = Load
S1 = Initiate Switch
R_T is used when external adjustment is ordered.

R_T Selection Chart					
Desired Time Delay*					R_T
Seconds		Minutes			
1	2	3	4	5	Megohm
1	10	0.1	1	10	0.0
10	100	1	10	100	0.5
20	200	2	20	200	1.0
30	300	3	30	300	1.5
40	400	4	40	400	2.0
50	500	5	50	500	2.5
60	600	6	60	600	3.0
70	700	7	70	700	3.5
80	800	8	80	800	4.0
90	900	9	90	900	4.5
100	1000	10	100	1000	5.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Available Models:

TSD72130S
TSD7222
TSD74110M
TSD7412S
TSD7413S
TSD7414M
TSD7421
TSD7423
TSD7424
TSD761120S
TSD761180S
TSD7611S
TSD7621

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TSD7 **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - External adjust

Time Delay*
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**1 - 1000**) (**M**) min.

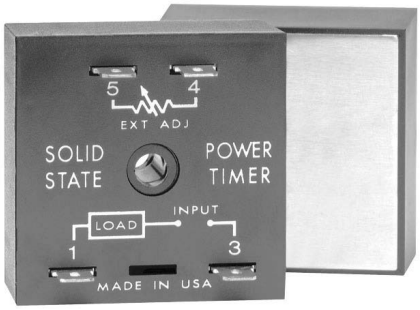
Specifications

Time Delay
Type ..... Digital integrated circuitry
Range ..... 1s - 1000m in 5 adjustable ranges or fixed
Repeat Accuracy ..... ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) ..... ≤ ±10%
Recycle Time ..... ≤ 400ms
Time Delay vs Temp. & Voltage ..... ≤ ±2%
Input
Voltage ..... 24, 120, or 230VAC
Tolerance ..... ±20%
AC Line Frequency ..... 50/60 Hz
Output
Type ..... Solid state
Form ..... NO, closed during timing
Maximum Load Current ..... 1A steady state, 10A inrush at 45°C
Minimum Load Current 40mA

Effective Voltage Drop (VLine-VLoad)

Input	Effective Drop
24VAC	3V
120VAC	4V
230VAC	6V

Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature ..... -40° to 75°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)



The THD7 utilizes only two terminals connected in series with the load. Interval timing mode is achieved by using a small portion of the AC sine wave allowing sufficient voltage for circuit operation. The THD7 can be used for interval or delay-on-break timing. It is designed to operate large loads directly, such as motors, heater elements, and motor starters.

Operation (Interval):
Upon application of input voltage, the output energizes and the time delay begins. The output remains energized throughout the time delay. At the end of the time delay the output de-energizes and remains de-energized until power is removed.
Reset: Removing input voltage resets the time delay and the output.
Operation (Delay-on-Break):
Upon closure of SW1, the load energizes and the timer is reset (zero voltage across its input terminals). Opening SW1 re-applies input voltage to the timer, the load remains energized and the time delay begins. At the end of the time delay the output de-energizes. If SW1 is open when power is applied, the load will energize for the time delay then de-energize.
Reset: Reclosing SW1 resets the timer.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- Solid-state relay and timer combined
- Two terminal series connection to load
- Up to 20A steady state, 200A inrush
- Fixed or adjustable delays from 1s - 1000m
- ±0.5% repeat accuracy

Approvals:

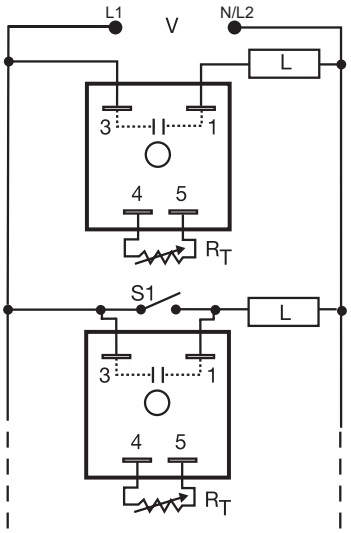
Auxiliary Products:

- **External adjust potentiometer:** P/N: P1004-13 P/N: P1004-13-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:** P/N: P1015-13 (AWG 10/12) P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Versa-knob:** P/N: P0700-7
- **Plug-on adjustment module:** P/N: VTP(X)(X)

Time Delay	VTP P/N
1 - 1-100s	VTP5G
2 - 10-1000s	VTP5K
3 - 0.1-10m	VTP5N
4 - 1-100m	VTP5P
5 - 10-1000m	VTP5R

Selection Table for VTP Plug-on Adjustment Accessory.

Connection:



V = Voltage
L = Load
S1 = Initiate Switch
R_T is used when external adjustment is ordered.

R_T Selection Chart					
Desired Time Delay*					R_T
Seconds		Minutes			
1	2	3	4	5	Megohm
1	10	0.1	1	10	0.0
10	100	1	10	100	0.5
20	200	2	20	200	1.0
30	300	3	30	300	1.5
40	400	4	40	400	2.0
50	500	5	50	500	2.5
60	600	6	60	600	3.0
70	700	7	70	700	3.5
80	800	8	80	800	4.0
90	900	9	90	900	4.5
100	1000	10	100	1000	5.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Available Models:

THD72110SA
THD7415SB
THD7421C
THD7612MA
THD7621C

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

THD7 **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust

X **Time Delay***
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Output Rating**
- A - 6A
- B - 10A
- C - 20A

*If fixed delay is selected, insert delay (**1 - 1000**) followed by (**S**) sec. or (**0.1 - 1000**)(**M**) min.

Specifications

Time Delay
Type . . . . . Digital integrated circuitry
Range . . . . . 1s - 1000m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±10%
Recycle Time . . . . . After timing: ≤150ms; During timing: ≤ 350ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing

Rating	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Effective Voltage Drop (VLine-VLoad)	Input	Effective Drop
	24VAC	≤ 3V
	120VAC	≤ 3V
	230VAC	≤ 5V

Minimum Load Current 100mA
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

The TSB Series is a totally solid-state, delay-on-break timing module. The TSB is available with a fixed, external, or onboard adjustable time delay. Time Delays from 0.05 to 600 seconds, in 4 standard ranges, cover over 90% of all OEM and commercial appliance timing applications. The repeat accuracy is ±2%. Operating voltages of 24, 120, or 230VAC are available. The TSB's 1A steady state, 10A rated, solid-state output is perfect for direct control of solenoids, contactors, relays, lamps, buzzers, and small heaters. The TSB can be surface mounted with a single screw, or snapped on a 35 mm DIN rail using the P1023-20 adaptor.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch opens. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the output and the time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

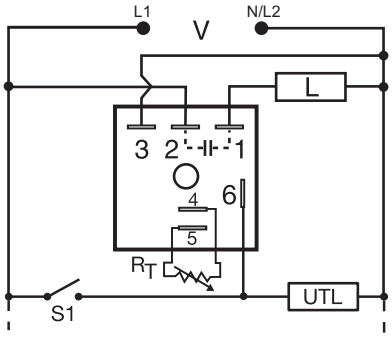
- Fixed or adjustable 0.05 - 600s in 4 ranges
- Totally solid state & encapsulated
- ± 2% repeat accuracy
- ±5% factory calibration

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



S1 = Initiate Switch
UTL = Optional Untimed Load
L = Load
R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Kohms
0.05	0.5	2	5	0
0.3	6	20	60	10
0.6	12	38	120	20
0.9	18	55	180	30
1.2	24	73	240	40
1.5	30	90	300	50
1.8	36	108	360	60
2.1	42	126	420	70
2.4	48	144	480	80
2.7	54	162	540	90
3.0	60	180	600	100

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Available Models:

TSB2130	TSB4190
TSB2190	TSB422
TSB222	TSB423
TSB232	TSB424
TSB4110	TSB432
TSB41300	TSB434
TSB414	TSB632
TSB4170	TSB634
TSB418	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TSB **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

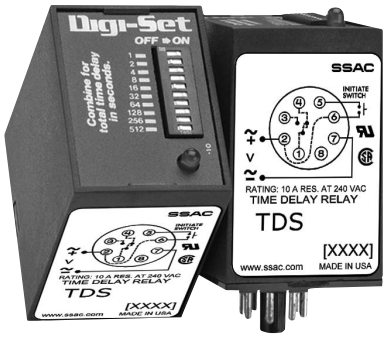
Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.05 - 600**) in seconds.

Specifications

Time Delay
Range . . . . . 0.05s - 600s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Reset Time . . . . . ≤ 150ms
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, closed before & during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Off State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TDS Series combines accurate digital circuitry with isolated, 10A rated, DPDT or SPDT relay contacts in an 8 or 11-pin plug-in package. The TDS Series features DIP switch selectable time delays ranging from 0.1s to 10,230s in three ranges. The TDS Series is the product of choice for custom control panel and OEM designers.

Operation (Single Shot):
Input voltage must be applied to the input before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output relay energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Features:

- Switch selectable time delay
- Three time ranges from 0.1s - 10,230s
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 10A, SPDT or DPDT output contacts
- LED indication

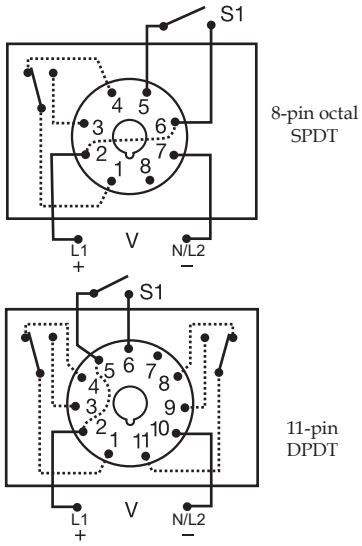
Approvals:

8-pin models UL listed when used in combination with P1011-6 socket only.

Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **11-pin socket:** P/N: NDS-11
- **Octal 8-pin socket:** P/N: NDS-8
- **Octal socket for UL listing:** P/N: P1011-6

Connection:

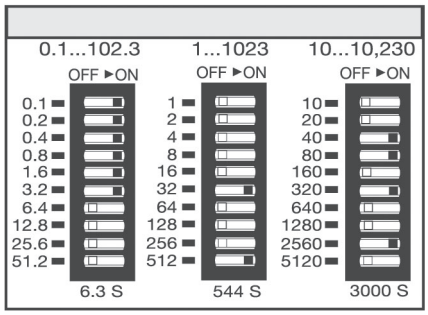


8-pin octal SPDT

11-pin DPDT

S1 = Initiate Switch
Relay contacts are isolated.

Digi-Set Binary Switch Operation:



Available Models:

TDS120AL	TDSH120AL
TDS120ALD	TDSH120ALD
TDS12D	TDSH24ALD
TDS230AL	TDSL120AL
TDS24AL	TDSL12D
TDS24DL	TDSL24D

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TDS - 1 - 1023s in 1s increments
TDSH - 10 - 10,230s in 10s increments
TDSL - 0.1 - 102.3s in 0.1s increments

X — **Input Voltage**
- 12D - 12VDC
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

X — **LED***
- L

X — **Type of Plug /Output Form**
- Blank - Octal (8-pin) plug, SPDT
- D - 11-pin Plug, DPDT

* Note: LED not available in 12VDC

Specifications

Time Delay
Type . . . . . Digital integrated circuitry
Range** . . . . . 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
10 - 10,230s in 10s increments
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Setting Accuracy . . . . . ±2% or 50ms, whichever is greater
Reset Time . . . . . ≤ 50ms
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ±5%
Indicator . . . . . LED glows during timing; relay is energized
Initiate Time . . . . . ≤ 60ms

Input
Voltage . . . . . 12, 24/28, or 110VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110 to 230VAC/DC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 3.25W

Output
Type . . . . . Electromechanical relay
Form . . . . . SPDT & DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28 VDC;
1/3 hp @ 120/240VAC
Life . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Plug-in socket
Dimensions . . . . . 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm)
Termination . . . . . Octal 8-pin plug-in or 11-pin plug-in

Environmental
Operating / Storage Temperature . . . . . -20° to 65°C / -30° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

**For CE approved applications, power must be removed from the unit when a switch position is changed.

The TRS Series combines an isolated, 10A electromechanical, relay output with analog timing circuitry. False trigger of the TRS by a transient is unlikely because of the complete isolation of the circuit from the line prior to initiation. The initiate contact is common to one side of the line and may be utilized to operate other loads. Installation is easy due to the TRS's industry standard 8 or 11-pin plug-in base wiring.

Operation (Single Shot):
Input voltage must be applied to the input before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. Applying input voltage with the initiate switch closed will energize the load and begin the time delay.
Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Features:

- Knob adjustable time delays
- Fixed or adjustable 0.05 - 600s in 15 ranges
- Analog circuitry
- ±2% repeat accuracy
- AC & DC operating voltages are available
- Isolated, 10A, SPDT & DPDT output contacts

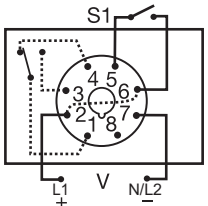
Approvals:

8-pin models UL listed when used in combination with P1011-6 socket only.

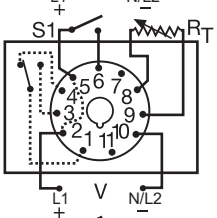
Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-XX
  P/N: P1004-XX-X
- **Octal socket for UL listing:** P/N: P1011-6
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **Octal 8-pin socket:** P/N: NDS-8
- **11-pin socket:** P/N: NDS-11
- **Panel mount kit:** P/N: BZ1
- **Versa-knob:** P/N: P0700-7

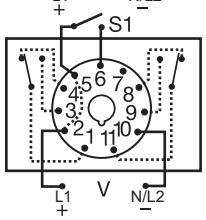
Connection:



8-pin octal SPDT



11-pin SPDT



11-pin DPDT

S1 = Initiate Switch
Relay contacts are isolated.
R_T is used when external adjustment is ordered.

External R_T P/N Selection Table	
Value	Part Number
1M ohm	P1004-16
1.5M ohm	P1004-15
2M ohm	P1004-14
3M ohm	P1004-12
5M ohm	P1004-13
1M ohm	P1004-16-X
1.5M ohm	P1004-15-X
2M ohm	P1004-14-X
3M ohm	P1004-12-X
5M ohm	P1004-13-X

Available Models:

TRS120A1X300
TRS120A2X300
TRS120A4Z3
TRS24D7Z10
TRS24D7Z3

If desired part number is not listed, please call us to see if it is technically possible to build.

R_T Selection Chart	
Time Delay*	
Range	R_T
Seconds	Megohm
0.05...1	1.0
0.05...2	2.0
0.05...3	3.0
0.1...5	5.0
0.1...10	3.0
1...30	1.5
1...60	3.0
2...120	2.0
2...180	3.0
7...240	1.5
7...300	2.0
7...360	2.0
7...420	3.0
7...480	3.0
7...600	5.0

* When selecting an external R_T add at least 15...30% for tolerance of unit and the R_T.

Order Table:

TRS **X** **X** **X** **X**

Input Voltage
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

Adjustment and Output Form
- 1 - Fixed, Octal, SPDT (AC Volts only)
- 2 - Knob Adjust, Octal, SPDT (AC Volts only)
- 3 - Lock Shaft Adjust, Octal, SPDT (AC Volts only)
- 4 - Knob adjust, 11-pin, DPDT
- 7 - Ext. Adjust, 11-pin, SPDT without potentiometer
- 10 - Fixed, 11-pin, DPDT

Time Tolerance
- X - ±20%
- Y - ±10%
- Z - ±5%

Time Delay* (seconds)
- 1 - 0.05 - 1
- 2 - 0.05 - 2
- 3 - 0.05 - 3
- 5 - 0.1 - 5
- 10 - 0.1 - 10
- 30 - 1 - 30
- 60 - 1 - 60
- 120 - 2 - 120
- 180 - 2 - 180
- 240 - 7 - 240
- 300 - 7 - 300
- 360 - 7 - 360
- 420 - 7 - 420
- 480 - 7 - 480
- 600 - 7 - 600

*If fixed delay is selected, insert delay (0.05 - 600) in seconds.

Specifications

Time Delay
Type ..... Analog circuitry
Range ..... 0.05s - 10m in 15 adjustable ranges or fixed
Repeat Accuracy ..... ±2% or 20ms, whichever is greater
Fixed Time Tolerance & Setting Accuracy ..... ±5, 10, or 20%
Initiate Time ..... ≤ 70ms
Reset Time ..... ≤ 75ms
Recycle Time ..... ≤ 250ms
Time Delay vs Temp. & Voltage ..... ≤±10%

Input
Voltage ..... 24/28 or 110VDC; 24, 120, or 230VAC (DC voltages on DPDT output models only)
Tolerance 24VDC/AC ..... -15% - 20%
110 to 230VAC/DC ..... -20% - 10%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... ≤ 3.25W

Output
Type ..... Electromechanical relay
Form ..... Isolated SPDT or DPDT
Rating ..... 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life ..... Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection
Insulation Resistance ..... ≥ 100 MΩ
Isolation Voltage ..... ≥ 1500V RMS between input & output terminals
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Plug-in socket
Termination ..... Octal 8-pin plug-in or 11-pin plug-in
Dimensions ..... 3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)

Environmental
Operating / Storage Temperature ..... -20° to 65°C / -30° to 85°C
Weight ..... ≅ 6 oz (170 g)

The PRLS Series is designed for use on non-critical timing applications. It offers low cost, knob adjustable timing control; full 10A relay output; and onboard LED indication. The knob adjustment provides a guaranteed time range of up to 10 minutes in 6 ranges. The onboard LED indicates whether or not the unit is timing (flashing LED) as well as the status of the output.

Operation (Single Shot):
Input voltage must be applied to the input at all times prior to and during timing. Upon closure of the initiate switch (momentary or maintained) the output contacts transfer and the time delay is initiated. The LED flashes during timing. At the end of the delay, the output contacts revert to their original position. If the initiate switch is reclosed during timing, the time delay will not be affected. Applying input voltage with the intiate switch closed will energize the load and begin the time delay.
Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Features:

- Knob adjustable time delay relay
- Electronic circuit with electromechanical relay
- AC & DC operating voltages
- Standard, octal plug-in connection
- Fixed or adjustable 0.05 - 600s in 6 ranges
- ±2% repeat accuracy
- ±10% factory calibration
- LED indication
- 10A, SPDT output contacts

Approvals:

Auxiliary Products:

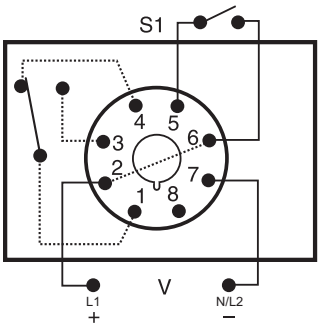
- **Panel mount kit:** P/N: BZ1
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **Octal 8-pin socket:** P/N: NDS-8
- **DIN rail:** P/N: C103PM (Al)

Available Models:

PRLS625

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



S1 = Initiate Switch
V = Voltage
Relay contacts are isolated.

Order Table:

PRLS **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

Adjustment
- 1 - Factory Fixed
- 2 - Adjustable

Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.1 - 10s
- 3 - 1 - 60s
- 4 - 2 - 180s
- 5 - 7 - 480s
- 6 - 7 - 600s

*If fixed delay is selected, insert delay (0.05 - 600) in seconds.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 600s in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance . . . . . Knob adjust: guaranteed range
Fixed: ±10%
Reset Time . . . . . ≤ 75ms
Recycle Time . . . . . ≤ 250ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 24, 120, or 230VAC; 12, 24, or 110VDC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110 to 230VAC/DC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2.25W
Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated SPDT
Rating . . . . . 10A resistive @ 28VDC;
10A resistive @ 240VAC;
1/3 hp @ 120 & 240VAC
Life . . . . . Mechanical - $1x10^7$; Electrical - $1x10^6$
Protection
Surge . . . . . IEEE C62.41-1991 Level A
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Indication
Type . . . . . LED
Operation . . . . . Output energized & timing - flashing
Mechanical
Mounting . . . . . Plug-in socket
Dimensions . . . . . 3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)
Termination . . . . . Octal 8-pin, plug-in
Environmental
Operating / Storage Temperature . . . . . -20° to 65°C / -30° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

The HRDS Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five options and factory fixed, onboard or external adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output relay energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

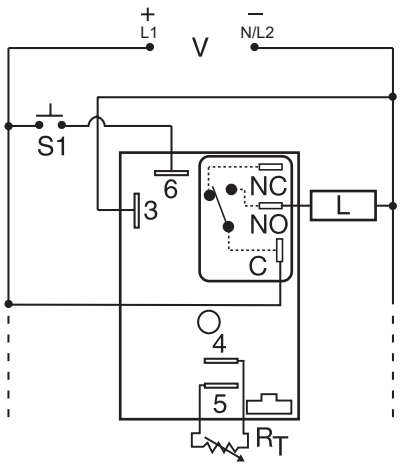
- 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Encapsulated circuitry
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Approvals:

Auxiliary Products:

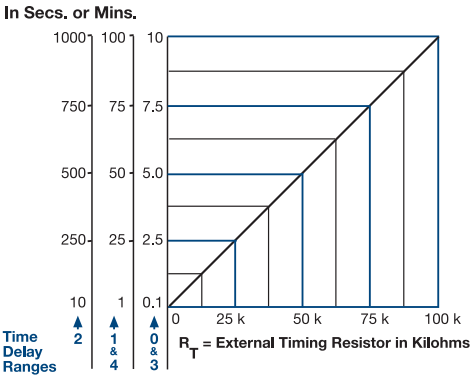
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



NO = Normally Open
S1 = Initiate Switch
L = Load
C = Common, Transfer Contact
NOTE: A knob, or terminals 4 & 5 are only included on adjustable units. R_T is used when external adjustment is ordered. Relay contacts are not isolated.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

HRDS120	HRDS322
HRDS124	HRDS323
HRDS21120S	HRDS324
HRDS220	HRDS420
HRDS221	HRDS421
HRDS222	HRDS422
HRDS223	HRDS423
HRDS313M	HRDS424
HRDS320	HRDS430
HRDS321	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

HRDS **X** **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

Time Tolerance
- Blank - ±5%
- A - ±1%

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay

Type	Microcontroller circuitry
Range	0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy	±0.5% or 20 ms, whichever is greater
Tolerance (Factory Calibration)	±1%, ±5%
Reset Time	≤ 150ms
Initiate Time	≤ 20ms
Time Delay vs Temp. & Voltage	±2%

Input

Voltage		12 or 24VDC; 24, 120, or 230VAC
Tolerance	12VDC & 24VDC	-15% - 20%
	24 to 230VAC	-20% - 10%
AC Line Frequency		50/60 Hz
Power Consumption		AC ≤ 4VA; DC ≤ 2W

Output

Type		Electromechanical relay	
Form		Non-isolated, SPDT	
Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**
Life		Mechanical - 1 x 10^6; Electrical - 1 x 10^5, *3 x 10^4, **6,000	

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ
Polarity	DC units are reverse polarity protected

Mechanical

Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	3 x 2 x 1.5 in (76.7 x 51.3 x 38.1mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-40° to 60°C/-40° to 85°C
Humidity	95% relative, non-condensing
Weight	≈ 3.9 oz (111 g)

Econo-Timers are a combination of digital electronics and an electromechanical relay. DPDT relay output for relay logic circuits, and isolation of input to output voltages. For applications, such as interval on, pulse shaping, minimum run time, etc. The ERD Series is encapsulated to protect the circuitry from shock, vibration and humidity.

Operation (Interval):
Upon application of input voltage, time delay begins, and output relay energizes. At the end of time delay, output de-energizes until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

Operation (Single Shot):
Input voltage must be applied before & during timing. Upon momentary or maintained closure of initiate switch, output relay energizes for time delay. At the end of the delay, output de-energizes. Opening or reclosing initiate switch during timing has no affect on time delay. Output will energize if initiate switch is closed when input voltage is applied.
Reset: Reset occurs when time delay is complete & initiate switch is opened. Loss of input voltage resets time delay & output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 10 for dimensional drawing.

Features:

- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m in 11 ranges
- ±0.5% repeat accuracy
- ± 10% factory calibration
- Encapsulated digital circuitry
- Isolated 10A, DPDT output contacts

Approvals: CE cULus

Auxiliary Products:

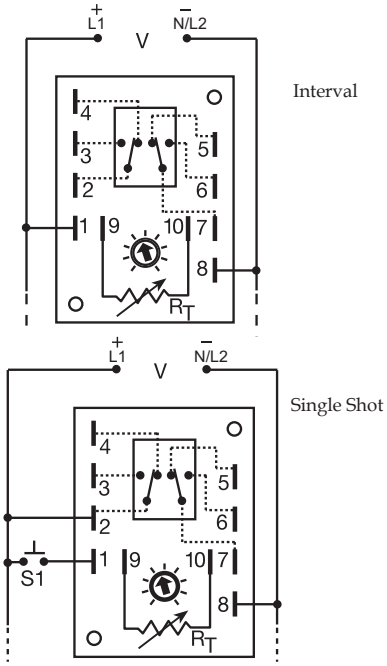
- **External adjust potentiometer:**
  P/N: P1004-16
  P/N: P1004-16-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

ERDI1210
ERDI123
ERDI323
ERDI326
ERDI4311
ERDI436
ERDI628

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



2-3 & 7-6 are Normally Open Contacts (NO)
2-4 & 7-5 are Normally Closed Contacts (NC)

A knob, or terminals 9 & 10 are included on adjustable units. Relay contacts are isolated. R_T is used when external adjustment is ordered.

R_T Selection Chart						
Desired Time Delay* Seconds						R_T
1	2	3	4	5	6	Megohm
0.1	0.1	0.1	0.2	0.3	0.6	0.0
0.19	0.6	1	1.7	3	6	0.1
0.28	1.1	2	3.2	6	12	0.2
0.37	1.6	3	4.7	9	18	0.3
0.46	2.1	4	6.2	12	24	0.4
0.55	2.6	5	7.7	15	30	0.5
0.64	3.0	6	9.2	18	36	0.6
0.73	3.5	7	10.7	21	42	0.7
0.82	4.0	8	12.2	24	48	0.8
0.91	4.5	9	13.7	27	54	0.9
1.0	5.0	10	15	30	60	1.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

R_T Selection Chart					
Desired Time Delay* Minutes					R_T
7	8	9	10	11	Megohm
0.1	0.1	0.2	1	10	0.0
0.6	1	1.7	10	50	0.1
1.1	2	3.2	20	100	0.2
1.6	3	4.7	30	150	0.3
2.1	4	6.2	40	200	0.4
2.6	5	7.7	50	250	0.5
3.0	6	9.2	60	300	0.6
3.5	7	10.7	70	350	0.7
4.0	8	12.2	80	400	0.8
4.5	9	13.7	90	450	0.9
5.0	10	15	100	500	1.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Order Table:

ERDI **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 120VDC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

X **Time Delay***
- 1 - 0.1 - 1s
- 2 - 0.1 - 5s
- 3 - 0.1 - 10s
- 4 - 0.2 - 15s
- 5 - 0.3 - 30s
- 6 - 0.6 - 60s
- 7 - 0.1 - 5m
- 8 - 0.1 - 10m
- 9 - 0.2 - 15m
- 10 - 1 - 100m
- 11 - 10 - 500m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**M**) min.

Specifications

Time Delay
Type . . . . . Digital integrated circuitry
Range . . . . . 0.1s - 500m in 11 adjustable ranges, 0.1s - 1000m fixed
Adjustment . . . . . Knob, external adjust, or fixed
Repeat Accuracy . . . . . ±0.5%
Tolerance (Factory Calibration) . . . . . ≤ ±10%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%

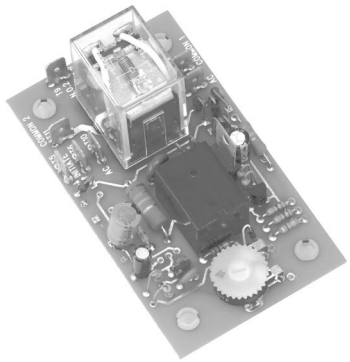
Input
Voltage . . . . . 12, 24, or 120VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
120VDC/AC & 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz

Output
Type . . . . . Isolated relay contacts
Form . . . . . DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions . . . . . 3.5 x 2.5 x 1.7 in. (88.9 x 63.5 x 43.2 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . -40° to 65°C / -40° to 85°C
Weight . . . . . ≅ 5.7 oz (162 g)



The ORS Series' open PCB construction offers the user good economy without sacrificing performance and reliability. The output relay is available in isolated, 10A, DPDT or SPDT forms. The time delay may be ordered as factory fixed, onboard knob, or external adjustment. All connections are 0.25 in. (6.35 mm) male quick connect terminals.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output relay energizes for a measured interval of time. At the end of the time delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 11 for dimensional drawing.

Features:

- Low cost open PCB construction
- Momentary or maintained initiation
- 10A, DPDT or SPDT output contacts
- Delays from 0.05s - 300s in 5 ranges
- ±2% repeat accuracy
- ±10% factory calibration

Approvals:

Auxiliary Products:

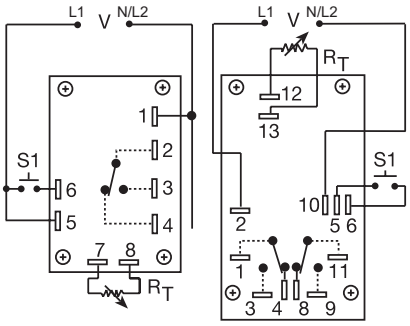
- **External adjust potentiometer:**
  P/N: P1004-12
  P/N: P1004-12-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

ORS120A1180
ORS120A33
ORS230A150SD

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



SPDT DPDT

Relay contacts are isolated.
R_T is used when external adjustment is ordered.

R_T Selection Chart					
Desired Time Delay*					R_T
Seconds					
1	2	3	4	5	Megohm
0.05	0.5	0.6	1.2	3.0	0.0
0.5	5.0	10	20	50	0.5
1.0	10	20	40	100	1.0
1.5	15	30	60	150	1.5
2.0	20	40	80	200	2.0
2.5	25	50	100	250	2.5
3.0	30	60	120	300	3.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Order Table:

ORS **X** **X** **X** **X**

Input Voltage	Adjustment	Time Delay*	Output Form
24A - 24VAC	1 - Fixed	1 - 0.05 - 3s	Blank - SPDT
120A - 120VAC	2 - Onboard knob	2 - 0.5 - 30s	D - DPDT
230A - 230VAC	3 - External adjust	3 - 0.6 - 60s	
		4 - 1.2 - 120s	
		5 - 3 - 300s	

*If fixed delay is selected, insert delay (**0.05 - 300**) in seconds.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 300s in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . Adjustable: guaranteed range
Fixed: ±10%
Reset Time . . . . . ≤ 50ms
Initiate Time . . . . . ≤ 70ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%

Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance 24VAC . . . . . -15% - 20%
120 & 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption 2.25W

Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated, SPDT or DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC;
1/3 hp @ 120/240VAC
Life . . . . . Mechanical - $1x10^7$; Electrical - $1x10^6$

Protection
Isolation Voltage . . . . . ≥1500V RMS input to output

Mechanical
Mounting . . . . . Surface mount with four #6 (M3.5 x 0.6) screws
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -20° to 65°C / -30° to 85°C
Weight . . . . . ≅ 2.7 oz (77 g)

The KRDS Series is a compact time delay relay measuring only 2 in. (50.8 mm) square. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDS Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output relay energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

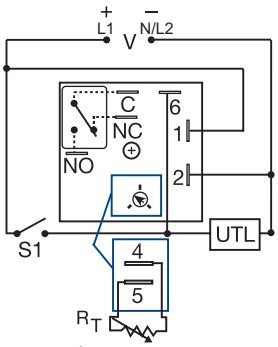
- Compact time delay relay
- ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m in 6 ranges
- ±5% factory calibration
- Input voltages from 12 to 230V in 5 options

Approvals:

Auxiliary Products:

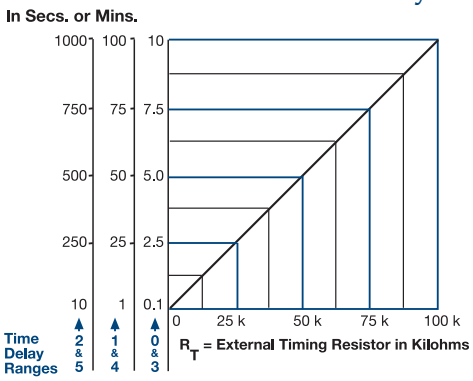
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



V = Voltage
S1 = Initiate Switch
C = Common, Transfer Contact
NO = Normally Open
NC = Normally Closed
UTL = Untimed Load
R_T is used when external adjustment is ordered. A knob is supplied for adjustable units. The untimed load is optional. Relay contacts are isolated.

External Resistance vs. Time Delay:



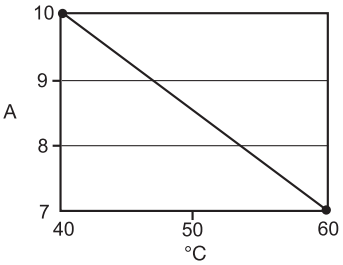
This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

KRDS120	KRDS424
KRDS221	KRDS430
KRDS225	

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature:



Order Table:

KRDS **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC/DC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**M**) min.

Specifications

Time Delay
Type . . . . . Microcontroller with watchdog circuitry
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 40ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±5%
Input
Voltage . . . . . 12, 24 or 110VDC; 24, 120 or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110VDC, 120VAC or 230VAC . . . . . -20%- 10%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Isolated relay contacts
Form . . . . . SPDT
Rating (at 40°C) . . . . . 10A resistive @ 125VAC;
5A resistive @ 230VAC & 28VDC;
1/4 hp @ 125VAC
Life (Operations) . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating/Storage Temperature . . . . . -40° to 60°C/-40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.6 oz (74 g)

The TDUS Series combines digital timing circuitry with universal voltage operation. Voltages of 24 to 240VAC and 12 to 24VDC are available in three ranges. The TDUS Series offers DIP switch selectable time delays ranging from 0.1 seconds to 102.3 minutes in three ranges. Its 1A rated output, ability to operate on multiple voltages, and wide range of switch selectable time delays make the TDUS Series an excellent choice for process control systems and OEM equipment.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Switch selectable time setting
- 0.1s - 102.3m in 3 ranges
- ± 0.5% repeat accuracy
- ± 2% setting accuracy
- 1A, solid-state output
- Encapsulated
- Wide voltage ranges

Approvals:

Auxiliary Products:

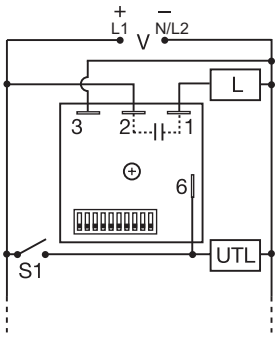
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

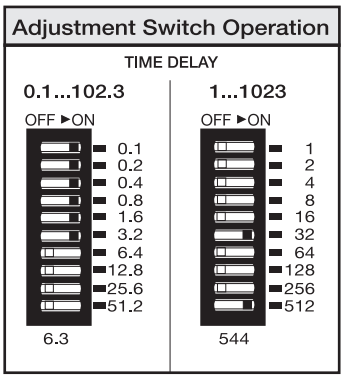
TDUS3000A
TDUS3002A
TDUSL3000A

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



UTL = Optional Untimed Load
S1 = Initiate Switch
L = Timed Load



Order Table:

Input Voltage Range	Time Range	Part Number
24 to 120VAC	0.1 - 102.3s	TDUSL3000A
100 to 240VAC	0.1 - 102.3s	TDUSL3001A
12 to 24VDC	0.1 - 102.3s	TDUSL3002A
24 to 120VAC	1 - 1023s	TDUS3000A
100 to 240VAC	1 - 1023s	TDUS3001A
12 to 24VDC	1 - 1023s	TDUS3002A
24 to 120VAC	0.1 - 102.3m	TDUSH3000A
100 to 240VAC	0.1 - 102.3m	TDUSH3001A
12 to 24VDC	0.1 - 102.3m	TDUSH3002A

Specifications

Time Delay
Range* ..... 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
0.1 - 102.3m in 0.1m increments
Repeat Accuracy ..... ±0.5% or 20 ms, whichever is greater
Setting Accuracy ..... ≤ ±2% or 20 ms, whichever is greater
Reset Time ..... ≤ 150ms
Initiate Time ..... ≤ 20ms
Time Delay vs Temp. & Voltage ..... ≤ ±5%
Input
Voltage/Tolerance ..... 24 to 240VAC, 12 to 24VDC /±20%
AC Line Frequency / DC Ripple ..... 50/60 Hz / ≤ 10%
Power Consumption ..... AC ≤ 2VA; DC ≤ 1W
Output
Type ..... Solid state
Form ..... NO, closed during timing
Rating ..... 1A steady state, 10A inrush at 60°C
Voltage Drop ..... AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
Off State Leakage Current ..... AC ≅ 5mA @ 230VAC; DC ≅ 1 mA
Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected
Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.

The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 1000 minutes are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry. This product is suitable for many applications, including dispensing, welding, and exposure timing.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will not energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

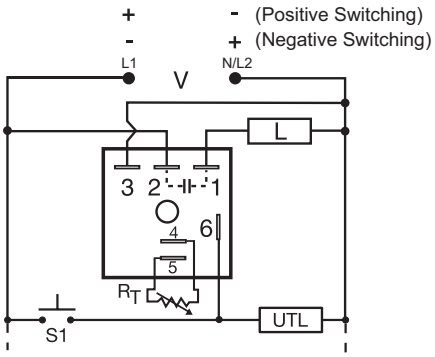
- Fixed or adjustable delays 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ±1% factory calibration
- 12VDC to 230VAC in 5 options
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

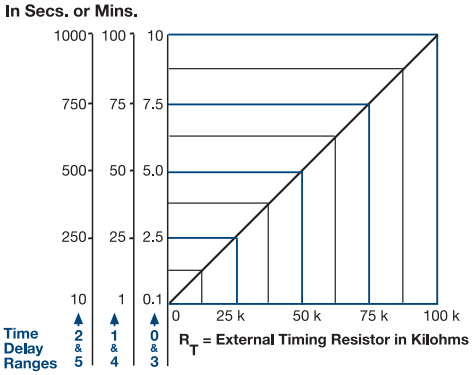
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



L = Timed Load
UTL = Optional Untimed Load
S1 = Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

TSDS11390SP
TSDS2110S
TSDS320N
TSDS321P
TSDS421

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TSDS — **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

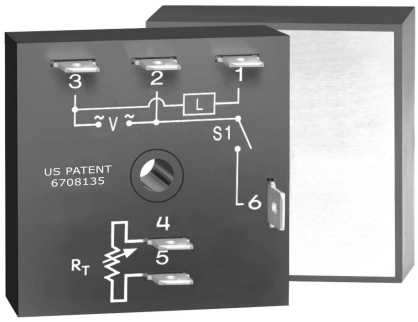
X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Switching Mode (VDC only)**
- P - Positive
- N - Negative

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance . . . . . ±15%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 1W
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Voltage Drop . . . . . AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
Off State Leakage Current . . . . . AC ≅ 5mA @ 230VAC; DC ≅ 1mA
DC Operation . . . . . Positive or negative switching
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The THDS Series combines accurate timing circuitry with high power solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output energizes if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

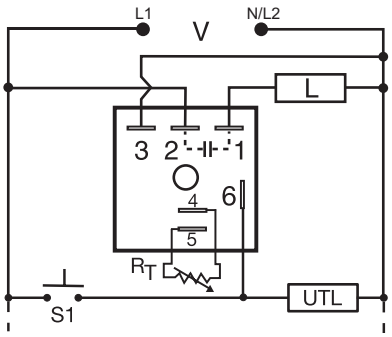
- High load currents up to 20A, 200A inrush
- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid state and encapsulated

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

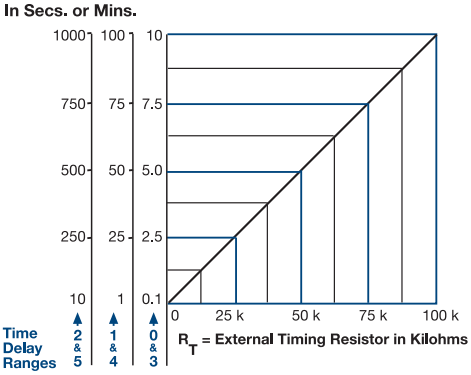
Connection:



UTL = Optional Untimed Load
L = Timed Load
S1 = Initiate Switch

R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

THDS230C	THDS420B
THDS231C	THDS430C
THDS232C	THDS432C
THDS233C	THDS433C
THDS234C	THDS434C
THDS235C	THDS435C
THDS410.25SA	THDS610.25SA
THDS411.5SA	THDS611.5SA
THDS414MC	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

THDS **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Output Rating**
- A - 6A
- B - 10A
- C - 20A

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing

Maximum Load Current	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Voltage Drop . . . . . ≅ 2.5V @ rated current
Off State Leakage Current . . . . . ≅ 5mA @ 230VAC
Minimum Load Current 100mA
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

The KSDS Series is ideal for applications that require momentary start interval timing including dispensing, exposure timing, or pulse shaping. This series is available for both AC and DC voltages. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Features:

- Fixed or adjustable delays 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 12 to 230V in 5 ranges
- 1A, solid-state output

Approvals:

Auxiliary Products:

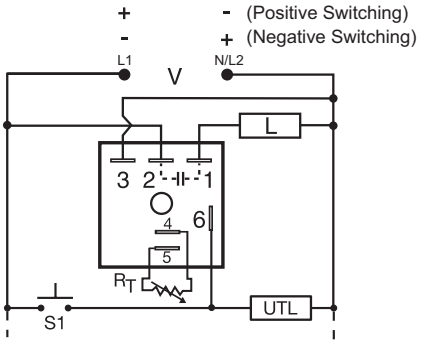
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

KSDS1115SP
KSDS121P
KSDS130P
KSDS310.1SP
KSDS330P
KSDS415M
KSDS420

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



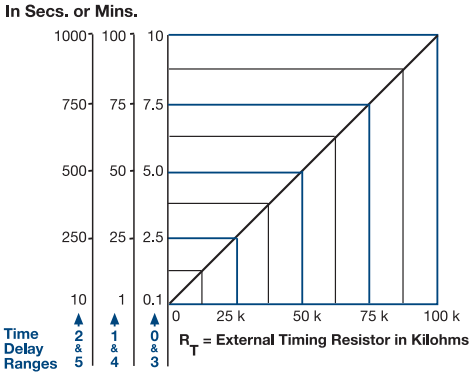
UTL = Optional Untimed Load
L = Timed Load
S1 = Initiate Switch

R_T is used when external adjustment is ordered.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will not energize if the initiate switch is closed when input voltage is applied.
Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

KSDS **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Switching Mode (VDC only)**
- P - Positive
- N - Negative

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10 %
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 1W
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
OFF State Leakage Current . . . . . AC ≅ 5mA @ 230VAC; DC ≅ 1mA
Voltage Drop . . . . . AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
DC Operation . . . . . Positive or negative switching
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)

The TSS is a totally solid-state timing module. Its 1A rated, solid-state output provides an excellent method of time control for exposures, dispensing, or for increasing or decreasing a switch closure. Time delays from 0.05 to 600 seconds, in 4 ranges, cover 90% of all OEM applications. Factory calibration of fixed delays is ±5% and the repeat accuracy is ±2%. The TSS can be surface mounted with a single screw, or snapped on a 35mm DIN rail using the P1023-20 accessory adaptor.

Operation (Single Shot):
Voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reset occurs when the time delay is complete and the initiate switch opens. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

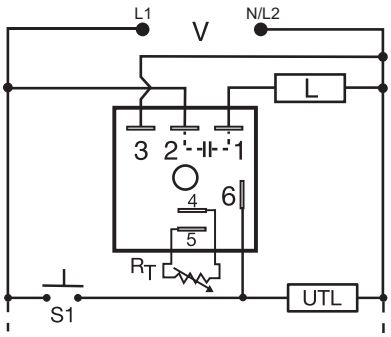
- Expands or decreases switch closures
- Momentary or maintained initiate switch
- Totally solid state
- Encapsulated to protect against shock & vibration
- Fixed or adjustable delays from 0.05 - 600s in 4 ranges
- ±2% repeat accuracy
- ±5% factory calibration

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



S1 = Initiate Switch
L = Timed Load
UTL = Optional Untimed Load

R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay*				R_T
Seconds				
1	2	3	4	Kohms
0.05	0.5	2	5	0
0.3	6	20	60	10
0.6	12	38	120	20
0.9	18	55	180	30
1.2	24	73	240	40
1.5	30	90	300	50
1.8	36	108	360	60
2.1	42	126	420	70
2.4	48	144	480	80
2.7	54	162	540	90
3.0	60	180	600	100

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Available Models:

TSS223	TSS424
TSS410.5	TSS432
TSS421	TSS622
TSS422	TSS624

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TSS **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

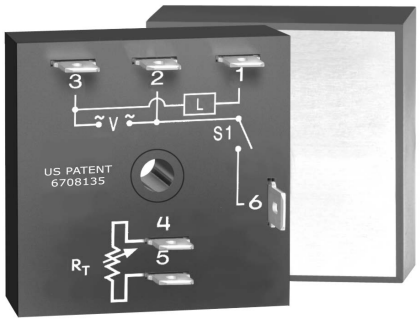
Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.05 - 600**) in seconds.

Specifications

Time Delay
Range . . . . . 0.05s - 600s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Off State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . - 40° to 75°C / - 40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TH series is a solid-state relay and timer combined into one compact, easy-to-use control. When mounted to a metal surface, the TH Series may be used to directly control lamp or heater loads of up to 20A steady, 200A inrush. Its single shot function can perform dispensing and pulse shaping operations. The initiate switch can be a momentary or maintained type of switch. Time delays can be selected from 0.1 - 600 seconds in 4 ranges. The THC Series is used for coin vending applications where fast initiate response is required.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied.
Reset: Reset occurs when the time delay is complete and the initiate switch opens. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

- High load current capacity, up to 20A, 200A inrush
- Momentary or maintained initiate switch
- ±2% repeat accuracy
- ±5% factory calibration
- Fixed or adjustable 0.1 - 600s in 4 ranges
- Metallized mounting surface for heat transfer

Approvals:

Auxiliary Products:

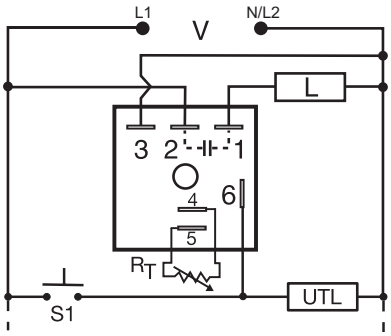
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

THC41180B
THC421C
THS422B

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



S1 = Initiate Switch
L = Timed Load
UTL = Optional Untimed Load
R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Kohms
0.1	0.5	2	5	0
0.3	6	20	60	10
0.6	12	38	120	20
0.9	18	55	180	30
1.2	24	73	240	40
1.5	30	90	300	50
1.8	36	108	360	60
2.1	42	126	420	70
2.4	48	144	480	80
2.7	54	162	540	90
3.0	60	180	600	100

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Order Table:

THC / THS — **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X

Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

X

Time Delay*
- 1 - 0.1 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 600s

X

Output Rating
- A - 6A
- B - 10A
- C - 20A

*If fixed delay is selected, insert delay (**0.1 - 600**) in seconds.

Specifications

Time Delay
Range . . . . . 0.1 - 600s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ± 5%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 20ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%

Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±15%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA

Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing

Maximum Load Currents	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop . . . . . ≅ 2.5V at rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥100 MΩ

Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

The HRD9 Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The isolated output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. The HRD9 is ideal for OEM applications where cost is a factor.

Operation (Motion Detector/Retriggerable Single Shot):
Input voltage must be applied prior to and during timing. The output is de-energized. Upon closure of the initiate switch (momentary or maintained) the output energizes and the time delay starts. On completion of the delay period, the output de-energizes.
Reset: Reclosing the initiate switch during or after timing will reset the time delay and restart timing. Reset is also accomplished by removing and reapplying input voltage.
Note: Powering up the unit with the initiate switch closed will not energize the output relay or start timing.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

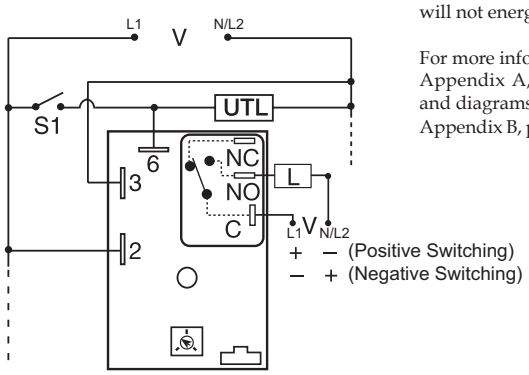
- Isolated, 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Delays from 0.1s - 100m in 5 ranges
- 0.5% repeat timing accuracy
- Factory fixed, onboard or external adjust
- Encapsulated circuitry

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



S1 = Initiate Switch
L = Timed Load
UTL = Untimed Load (optional)
NO = Normally Open
C = Common, Transfer Contact

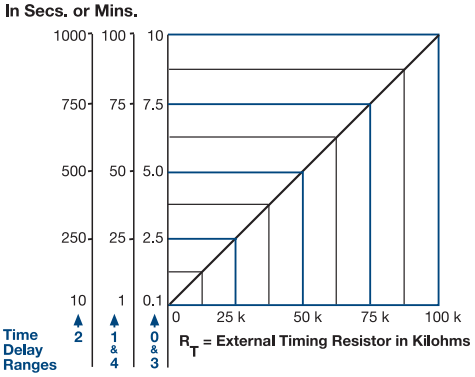
NOTE: A knob, or terminals 4 & 5 are only included on adjustable units. R_T is used when external adjustment is ordered. Relay contacts are isolated. The untimed load is optional.

Available Models:

HRD93110S
HRD9320

If desired part number is not listed, please call us to see if it is technically possible to build.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

HRD9 **X** **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

Time Tolerance
- Blank - ±5%
- A - ±1%

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay

Type	Microcontroller circuitry
Range	0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy	±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration)	±1%, ±5%
Reset Time	≤ 150ms
Time Delay vs Temp. & Voltage	±2%
Initiate Time	≤ 20ms (≤ 1500 operations per min.)

Input

Voltage	12 or 24VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC	-15% - 20%
24 to 230VAC	-20% - 10%
AC Line Frequency	50/60 Hz
Power Consumption	AC ≤ 4VA; DC ≤ 2W

Output

Type	Electromechanical relay
Form	Isolated, SPDT

Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**

Life	Mechanical - 1 x 10^6; Electrical - 1 x 10^5, *3 x 10^4, **6,000

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ
Polarity	DC units are reverse polarity protected

Mechanical

Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-40° to 60°C/-40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)

The KRD9 Series microcontroller timing circuit provides excellent repeat accuracy and stability. Cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Retriggerable Single Shot):
Function Type A (Output Initially De-energized): Input voltage must be applied prior to and during timing. When the initiate switch is closed, (momentary or maintained) the output energizes and the time delay starts. On completion of the delay, the output de-energizes. The unit will time out if S1 remains in the open or closed position for the full time delay. Reclosing the initiate switch resets the time delay and restarts timing; the output remains energized. The output will not energize if the initiate switch is closed when input voltage is applied.
Function Type B (Output Initially Energized): Upon application of input voltage, the output energizes and the time delay starts. At the end of the time delay, the load de-energizes. The unit will time out if S1 remains in the open or closed position for the full time delay. Closing (re-closing) the initiate switch resets the time delay and restarts timing; the output remains energized.
Reset: The time delay and the output are reset when input voltage is removed.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

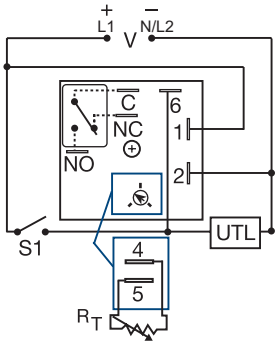
- Compact time delay relay
- Microcontroller circuitry
- ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m in 6 ranges
- Input voltages from 12 to 230V in 6 options

Approvals:

Auxiliary Products:

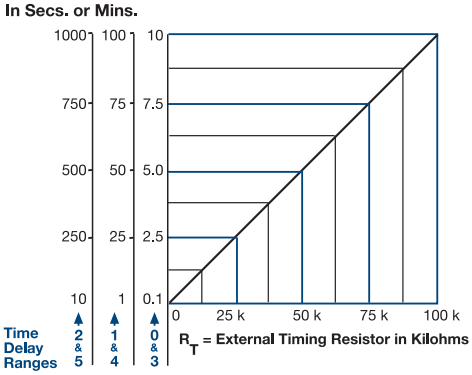
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



C = Common, Transfer Contact
UTL = Untimed Load (optional)
A knob is supplied for adjustable units, or R_T terminals 4 & 5 for external adjust. See external adjustment vs time delay chart. The untimed load is optional. Relay contacts are isolated.

External Resistance vs. Time Delay:



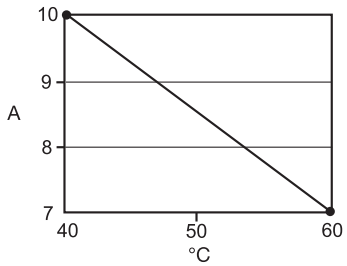
This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

KRD9120B	KRD93115MA
KRD92115MA	KRD94115SB
KRD92115MB	KRD9423B
KRD9220B	

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature:



Order Table:

KRD9 **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC/DC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

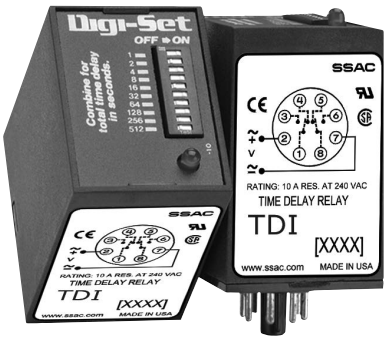
X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Function Type**
- A - De-energized
- B - Energized

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**M**) min.

Specifications

Time Delay
Type . . . . . Microcontroller based with watchdog circuitry
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Initiate Time . . . . . ≤ 40ms; ≤ 750 operations per minute
Time Delay vs Temp. & Voltage . . . . . ≤ ±5%
Input
Voltage . . . . . 12, 24 or 110VDC; 24, 120 or 230VAC
Tolerance 12VDC & 24VDC/AC . . -15% - 20%
110VDC, 120 or 230VAC . . -20% - 10%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Isolated relay contacts
Form . . . . . SPDT
Rating (at 40°C) . . . . . 10A resistive @ 125VAC; 5A resistive @ 230VAC & 28VDC; 1/4 hp @ 125VAC
Max. Switching Voltage 250VAC
Life (Operations) . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reversed polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . -40°to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.6 oz (74 g)



The TDI Series is an interval timer that combines accurate digital circuitry with isolated, 10A rated, DPDT relay contacts in an 8-pin plug-in package. The TDI Series features DIP switch selectable time delays ranging from 0.1 to 10,230 seconds in three ranges. The TDI Series is the product of choice for custom control panel and OEM designers.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output relay is energized during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Features:

- Switch settable time delay
- Three time ranges from 0.1s - 10,230s
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 10A, DPDT output contacts
- LED indication

Approvals:

Auxiliary Products:

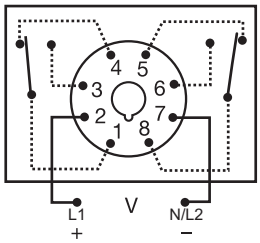
- **Panel mount kit:** P/N: BZ1
- **Octal 8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **DIN rail:** P/N: C103PM (Al)

Available Models:

TDI120AL	TDI24DL
TDI12D	TDIH24AL
TDI230AL	TDIL120AL
TDI24AL	TDIL24DL

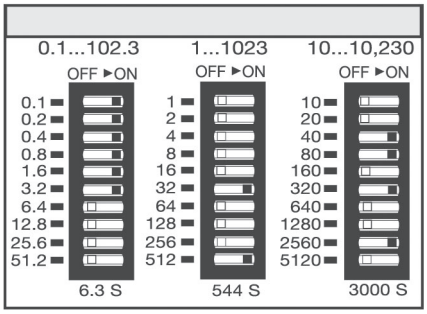
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



Relay contacts are isolated.

Digi-Set Binary Switch Operation:



Order Table:

TDI - 1 - 1023s in 1s increments
TDIH - 10 - 10,230s in 10s increments
TDIL - 0.1 - 102.3s in 0.1s increments

X
Input Voltage
- 12D - 12VDC
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 230A - 230VAC

X
LED Indication*
- L

* Note: LED not available in 12VDC

Specifications

Time Delay
Type ..... Digital integrated circuitry
Range** ..... 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
10 - 10,230s in 10s increments
Repeat Accuracy ..... ±0.1% or 20ms, whichever is greater
Setting Accuracy ..... ±2% or 50ms, whichever is greater
Reset Time ..... ≤ 50ms
Recycle Time ..... ≤ 150ms
Time Delay vs Temp. & Voltage ..... ±2%
Indicator ..... LED glows during timing; relay is energized
Input
Voltage ..... 12, 24, or 110VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC ..... -15% - 20%
110 to 230VAC/DC ..... -20% - 10%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... ≤ 3.25W
Output
Type ..... Electromechanical relay
Form ..... DPDT
Rating ..... 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life ..... Mechanical - 1 x 10^7; Electrical - 1 x 10^6
Protection
Polarity ..... DC units are reverse polarity protected
Isolation Voltage ..... ≥ 1500V RMS input to output
Mechanical
Mounting ..... Plug-in socket
Dimensions ..... 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm)
Termination ..... Octal 8-pin plug-in
Environmental
Operating / Storage Temperature ..... -20° to 65°C / -30° to 85°C
Weight ..... ≅ 6 oz (170 g)

** For CE approved applications, power must be removed from the unit when a switch position is changed.

The HRDI Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output relay is energized during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

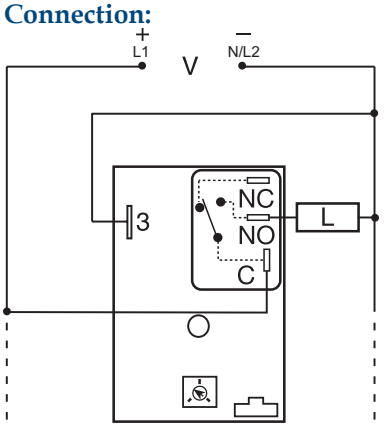
- 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Encapsulated circuitry
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat timing accuracy
- Factory fixed, onboard or external adjust

Approvals:

Auxiliary Products:

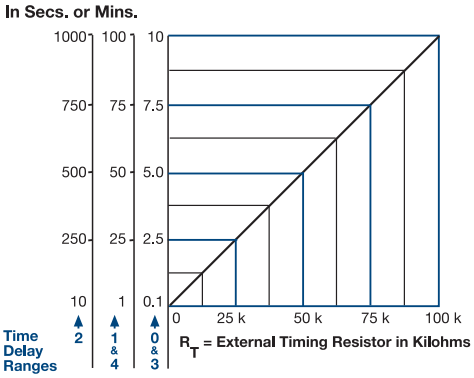
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



C = Common, Transfer Contact
NO = Normally Open
L = Load
NOTE: A knob, or terminals 4 & 5 are only included on adjustable units. R_T is used when external adjustment is ordered. Relay contacts are not isolated.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

HRDI117S	HRDI323
HRDI220	HRDI324
HRDI221	HRDI4130M
HRDI222	HRDI421
HRDI223	HRDI422
HRDI224	HRDI423
HRDI320	HRDI424
HRDI321	HRDI431
HRDI322	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

HRDI **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

X **Time Tolerance**
- Blank - ±5%
- A - ±1%

X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay
Type . . . . . Microcontroller circuitry
Range . . . . . 0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ±1%, ±5%
Recycle Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ±2%

Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC . . . . . -15% - 20%
24 to 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . AC ≤ 4VA; DC ≤ 2W

Output
Type . . . . . Electromechanical relay
Form . . . . . SPDT, non-isolated

Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**

Life . . . . . Mechanical - 1 x 10^6;
Electrical - 1 x 10^5, *3 x 10^4, **6,000

Protection
Surge . . . . . IEEE C62.41-1991 Level A
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

The KRDI Series is a compact time-delay relay measuring only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDI Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output relay energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

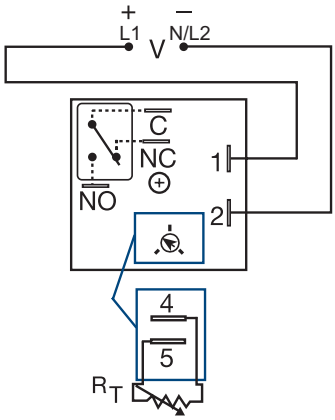
For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Compact time delay relay
- 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- ±5% factory calibration
- Input voltages from 12 to 230V in 6 options

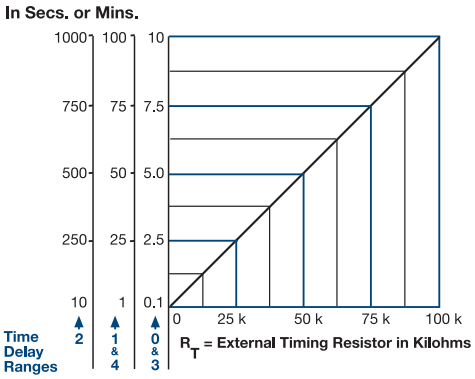
Approvals:

Connection:



V = Voltage
C = Common, Transfer Contact
NO = Normally Open
NC = Normally Closed
A knob is supplied for adjustable units, or R_T terminals 4 & 5 for external adjust. See external adjustment vs time delay chart. Relay contacts are isolated.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Auxiliary Products:

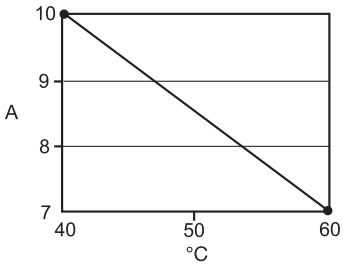
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Versa-knob:** P/N: P0700-7

Available Models:

KRDI1132S	KRDI2110S
KRDI120	KRDI21120S
KRDI121	KRDI320
KRDI122	KRDI420
KRDI210.1S	KRDI423

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature:



Order Table:

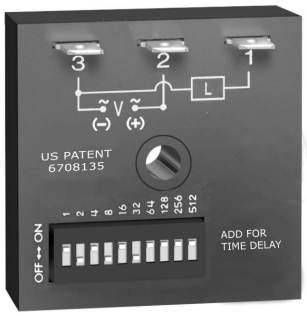
KRDI **X** **X** **X**

Input Voltage	Adjustment	Time Delay*
1 - 12VDC	1 - Fixed	0 - 0.1 - 10s
2 - 24VAC	2 - Onboard knob	1 - 1 - 100s
3 - 24VDC	3 - External adjust	2 - 10 - 1000s
4 - 120VAC		3 - 0.1 - 10m
5 - 110VDC		4 - 1 - 100m
6 - 230VAC		

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ± 5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±5%
Input
Voltage . . . . . 12, 24 or 110VDC; 24, 120 or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . -15% - 20%
110VDC, 120VAC or 230VAC . . . . . -20% - 10%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Isolated relay contacts
Form . . . . . SPDT
Rating (at 40°C) . . . . . 10A resistive @ 125VAC;
5A resistive @ 230VAC & 28VDC;
1/4 hp @ 125VAC
Max. Switching Voltage 250VAC
Life (Operations) . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.6 oz (74 g)



The TDUI Series combines digital timing circuitry with universal voltage operation. Voltages of 24 to 240VAC and 12 to 24VDC are available in three ranges. The TDUI Series offers DIP switch selectable time delays ranging from 0.1 seconds to 102.3 minutes in three ranges. Its 1A rated output, ability to operate on multiple voltages, and wide range of switch selectable time delays make the TDUI Series an excellent choice for process control systems and OEM equipment.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

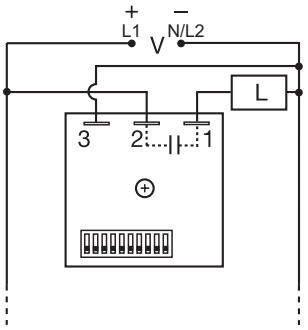
- Switch selectable time setting
- 0.1s - 102.3m in 3 ranges
- ±0.5% repeat accuracy
- ±2% setting accuracy
- 1A, solid-state output
- Encapsulated
- Wide voltage ranges

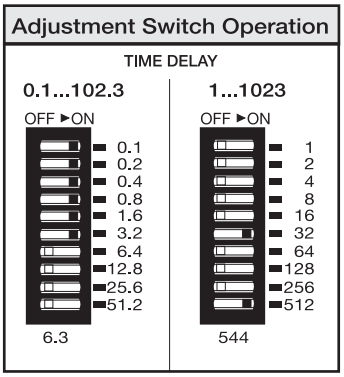
Approvals:

Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:





Available Models:

TDUI3000A
TDUIH3001A
TDUIH3002A
TDUIL3002A

Order Table:

Input Voltage Range	Time Range	Part Number
24 to 120VAC	0.1 - 102.3s	TDUIL3000A
100 to 240VAC	0.1 - 102.3s	TDUIL3001A
12 to 24VDC	0.1 - 102.3s	TDUIL3002A
24 to 120VAC	1 - 1023s	TDUI3000A
100 to 240VAC	1 - 1023s	TDUI3001A
12 to 24VDC	1 - 1023s	TDUI3002A
24 to 120VAC	0.1 - 102.3m	TDUIH3000A
100 to 240VAC	0.1 - 102.3m	TDUIH3001A
12 to 24VDC	0.1 - 102.3m	TDUIH3002A

Specifications

Time Delay
Range* ..... 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
0.1 - 102.3m in 0.1m increments
Repeat Accuracy ..... ±0.5% or 20ms, whichever is greater
Setting Accuracy ..... ≤ ±2% or 20ms, whichever is greater
Reset Time ..... ≤ 150ms
Time Delay vs Temp. & Voltage ..... ≤ ±5%

Input
Voltage ..... 24 to 240VAC, 12 to 24VDC ±20%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... AC ≤ 2VA; DC ≤ 1W
DC Ripple ..... ≤ 10%

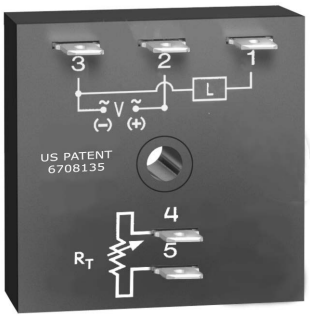
Output
Type ..... Solid state
Form ..... NO, closed during timing
Rating ..... 1A steady state, 10A inrush at 60°C
Voltage Drop ..... ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
OFF State Leakage Current ..... AC ≅ 5mA @ 230VAC; DC ≅ 1mA

Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected

Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.



The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output is energized during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

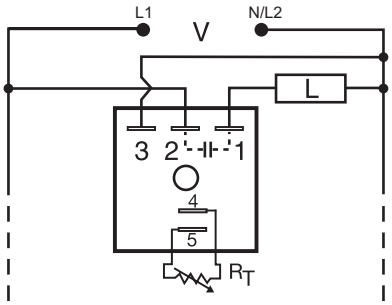
- Fixed or adjustable delays from 0.1s - 100h
- ±0.1% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

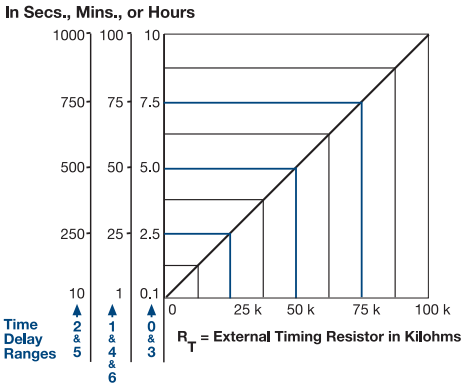
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Versa-knob:** P/N: P0700-7

Connection:



R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

TSD2221
TSD2411S
TSD24145S
TSD241600S
TSD2434

If desired part number is not listed, please call us to see if it is technically possible to build.

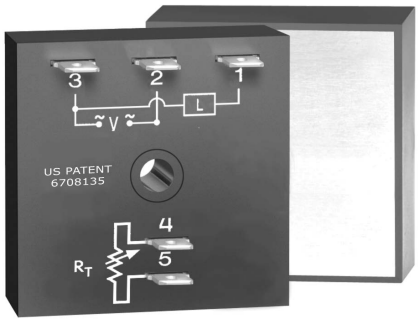
Order Table:

TSD2	X	X	X
	Input Voltage	**Adjustment**	**Time Delay***
	2 - 24VAC	1 - Fixed	0 - 0.1 - 10s
	4 - 120VAC	2 - External adjust	1 - 1 - 100s
	6 - 230VAC	3 - Onboard adjust	2 - 10 - 1000s
			3 - 0.1 - 10m
			4 - 1 - 100m
			5 - 10 - 1000m
			6 - 1 - 100h

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min. or (**1 - 100**) (**H**) hours

Specifications

Time Delay
Range . . . . . 0.1s - 100h in 7 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±1%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Off State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weightv . . . . . ≅ 2.4 oz (68 g)



The THD2 Series combines accurate timing circuitry with high power solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

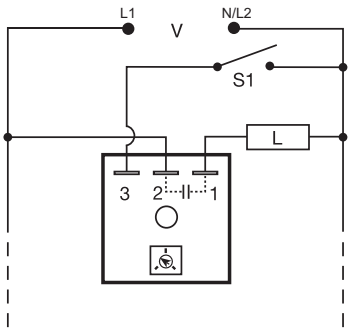
- High load currents up to 20A, 200A inrush
- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid state and encapsulated

Approvals:

Auxiliary Products:

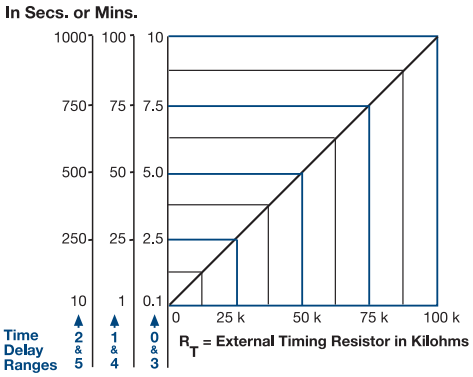
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Connection:



S1 = Optional Low Current Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

THD2B4110M	THD2C423
THD2B41600S	THD2C430
THD2B6110M	THD2C431
THD2C231	THD2C432
THD2C232	THD2C433
THD2C233	THD2C434
THD2C234	THD2C435
THD2C235	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

THD2 **X** **X** **X** **X**

Output Rating	Input Voltage	Adjustment	Time Delay*
A - 6A	2 - 24VAC	1 - Fixed	0 - 0.1 - 10s
B - 10A	4 - 120VAC	2 - External adjust	1 - 1 - 100s
C - 20A	6 - 230VAC	3 - Onboard adjust	2 - 10 - 1000s
			3 - 0.1 - 10m
			4 - 1 - 100m
			5 - 10 - 1000m

*If fixed delay is selected, insert delay (**1 - 1000**) followed by (**S**) secs. or (**M**) mins.

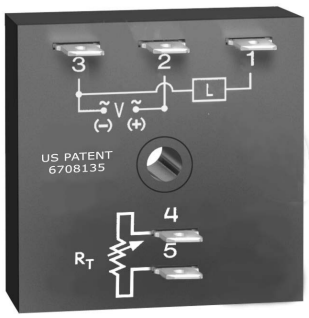
Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing

Maximum Load Current	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop . . . . . ≅ 2.5V at rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The TSD6 offers total solid-state, interval timing for 12 or 24VDC applications. This series provides either negative or positive switching. The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance is required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

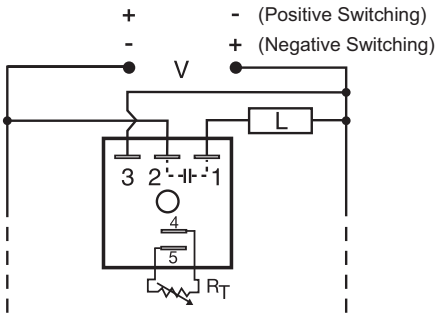
- Fixed or adjustable delays from 0.1s - 100h
- ±0.1% repeat accuracy
- ±1% factory calibration
- 12 or 24VDC interval timing
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

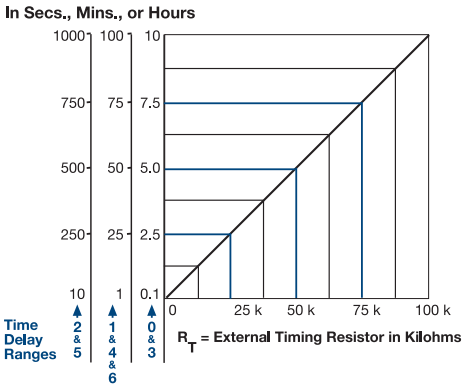
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Versa-knob:** P/N: P0700-7

Connection:



R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

TSD6113SN	TSD6310.8SN
TSD6121N	TSD631180SP
TSD6121P	TSD631380SP
TSD6123N	TSD6320P
TSD6124P	TSD6334P

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TSD6 **X** **Input Voltage**
- 1 - 12VDC
- 3 - 24VDC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

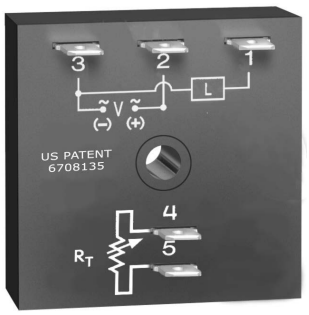
X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m
- 6 - 1 - 100h

X **Switching Mode**
- P - Positive
- N - Negative

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min. or (**1 - 100**) (**H**) hours

Specifications

Time Delay
Range . . . . . 0.1s - 100h 7 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±1%
Input
Voltage . . . . . 12 or 24VDC
Tolerance . . . . . ±15%
DC Ripple . . . . . ±10%
Power Consumption . . . . . ≤ 1W
Output
Type . . . . . Solid state, positive or negative switching
Form . . . . . NO, closed during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Off State Leakage Current . . . . . ≅ 1mA
Voltage Drop . . . . . ≅ 1.0V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . Units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The KSD2 Series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for input voltages of 24, 120 or 230VAC. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry. An excellent choice for most OEM pulse shaping, maximum run time, and other process control applications.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

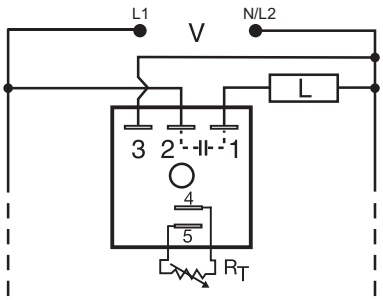
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Mounting bracket:** P/N: P1023-6
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

KSD2211M
KSD2221
KSD2413M
KSD2420

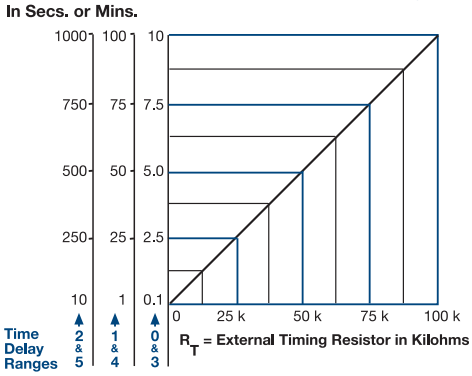
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

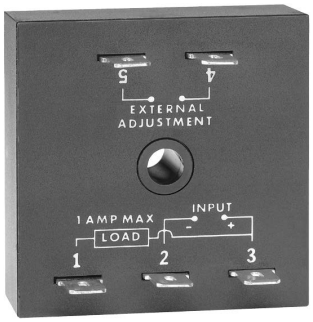
Order Table:

KSD2	X	X	X
	Input Voltage	**Adjustment**	**Time Delay***
	2 - 24VAC	1 - Fixed	0 - 0.1 - 10s
	4 - 120VAC	2 - External adjust	1 - 1 - 100s
	6 - 230VAC	3 - Onboard adjust	2 - 10 - 1000s
			3 - 0.1 - 10m
			4 - 1 - 100m
			5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) secs. or (**M**) mins.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TS2 Series is designed for 24, 120 or 230VAC and the TS6 Series is designed for 12 or 24VDC. These series are capable of controlling load currents of up to 1A steady state, 10A inrush. Encapsulated circuitry and the reliability of a ±2% repeat accuracy make the TS2 and TS6 ideal for cost sensitive applications.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- 12 or 24VDC; 24,120, or 230VAC input voltages
- Fixed or adjustable delays from 0.05s - 10m in 8 ranges
- Repeat accuracy ±2%
- Load currents to 1A, 10A inrush
- Totally solid state & encapsulated

Approvals:

Auxiliary Products:

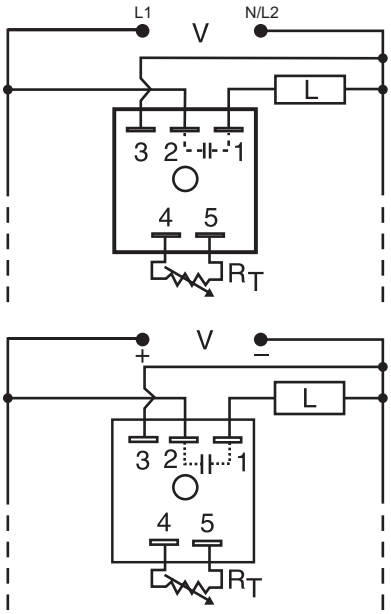
- **External adjust potentiometer:**
  P/N: P1004-XX
  P/N: P1004-XX-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Versa-knob:** P/N: P0700-7
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

TS6 12VDC	
Time Delay	VTP P/N
1 - 0.05-1s	VTP2A
2 - 0.5-20s	VTP2E
3 - 2-60s	VTP2F
4 - 5-120s	VTP2H

TS2 & TS6 All Other Voltages	
Time Delay	VTP P/N
1 - 0.05-3s	VTP4B
2 - 0.5-60s	VTP4F
3 - 2-180s	VTP4J
4 - 5-600s	VTP5N

Selection Table for VTP Plug-on Adjustment Accessory.

Connection:



R_T is used when external adjustment is ordered.
Note: TS6 is not reverse polarity protected.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Megohm
0.05	0.5	2	5	0.0
0.5	10	30	60	0.5
1.0	20	60	120	1.0
▼	24VDC or AC ONLY†			▼
1.5	30	90	180	1.5
2.0	40	120	240	2.0
2.5	50	150	300	2.5
3.0	60	180	360	3.0
			420	3.5
			480	4.0
			540	4.5
			600	5.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.
† 1 Megohm max for 12 VDC Units

Order Tables:

TS2

X — Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X — Adjustment
- 1 - Fixed
- 2 - External adjust

X — Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.05 - 600**) in seconds.

TS6

X — Input Voltage
- 1 - 12VDC
- 3 - 24VDC

X — Adjustment
- 1 - Fixed
- 2 - External adjust

X — Time Delay*

12VDC	24VDC
1 - 0.05 - 1s	0.05 - 3s
2 - 0.5 - 20s	0.5 - 60s
3 - 2 - 60s	2 - 180s
4 - 5 - 120s	5 - 600s

X — Switching Mode
- P - Positive

*If fixed delay is selected, insert delay (**0.05 - 120** 12VDC) or (**0.05 - 600** 24VDC) in secs.

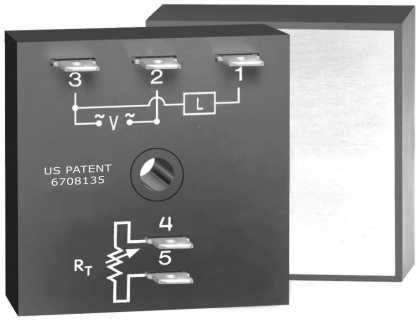
Available Models:

TS22120	TS2421	TS6116P
TS2213	TS2422	TS6122P
TS2223	TS2423	TS6123P
TS2411.5	TS2424	TS6311P
TS24110	TS2611.5	TS63110P
TS2412	TS26130	TS6321P
TS2413	TS26190	
TS24130	TS2621	

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range
12VDC . . . . . 0.05 - 120s in 4 adjustable ranges or fixed (1 MΩ max. R_T)
Other Voltages . . . . . 0.05 - 600s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±10%
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Reset Time . . . . . ≤ 150ms
Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance . . . . . ±15%
DC Ripple 10%
Power Consumption . . . . . DC ≤ 1W; AC ≤ 2VA
Output
Type . . . . . Solid state
Form . . . . . NO, closed during timing
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Voltage Drop . . . . . DC ≅ 1.0V @ 1A; AC ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Polarity . . . . . TS6 is not reverse polarity protected
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TH2 is the combination of a timer and a solid-state relay into one easy-to-use solid-state molded module. When mounted to a metal surface, the TH2 Series can switch load currents up to 20A steady state with 200A inrush. The TH2 replaces a timer and relay at a competitive price.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features

- High load current capacity up to 20A, 200A inrush
- Fixed or adjustable time delays from 0.1 - 600s in 4 ranges
- ±2% repeat accuracy
- ±5% factory calibration
- Metallized mounting surface for heat transfer
- Solid state & encapsulated

Approvals:

Auxiliary Products:

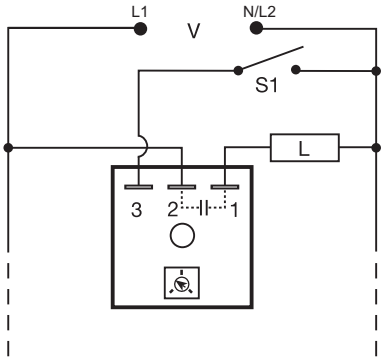
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

TH2A421

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Kohms
0.1	0.5	2	5	0
0.3	6	20	60	10
0.6	12	38	120	20
0.9	18	55	180	30
1.2	24	73	240	40
1.5	30	90	300	50
1.8	36	108	360	60
2.1	42	126	420	70
2.4	48	144	480	80
2.7	54	162	540	90
3.0	60	180	600	100

* When selecting an external R_T add at least 15% for tolerance of unit and the R_T.

Order Table:

TH2 **X** **X** **X** **X**

Output Rating	Input Voltage	Adjustment	Time Delay*
A - 6A	2 - 24VAC	1 - Fixed	1 - 0.1 - 3s
B - 10A	4 - 120VAC	2 - External adjust	2 - 0.5 - 60s
C - 20A	6 - 230VAC	3 - Onboard adjust	3 - 2 - 180s
			4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.1 - 600**) in seconds.

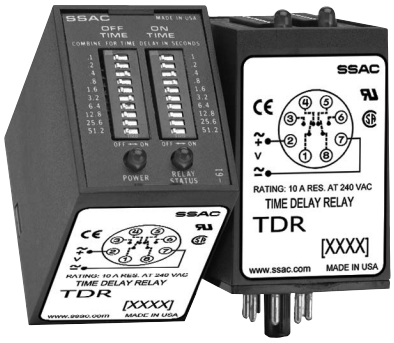
Specifications

Time Delay
Range . . . . . 0.1s - 600s in 4 adjustable ranges, or fixed
Repeat Accuracy . . . . . ±2% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Time Delay vs Temp. & Voltage. . . . . ≤ ±10%
Reset Time. . . . . ≤ 150ms
Input
Voltage. . . . . 24, 120, or 230VAC
Tolerance . . . . . ±15%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Form. . . . . NO, closed during timing

Maximum Load Currents	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop. . . . . ≅ 2.5V at rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance. . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions. . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination. . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature. . . . . -20° to 60°C / -40° to 85°C
Humidity. . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The TDR Series of time-delay relays are comprised of digital circuitry and an isolated, 10A relay output. The on and off delays are selected by means of two, ten position binary switches, which allow the setting of the desired delay to be precise every time.

Operation (Recycling - ON Time First):
Upon application of input voltage, the green LED glows, the output relay is energized, the red LED glows, and the T1 ON time begins. At the end of the ON time, the output de-energizes, the red LED turns OFF and the T2, OFF time begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.
Operation (Recycling - OFF Time First):
Upon application of input voltage, the green LED glows, the T1 OFF time begins, the load is OFF. At the end of the OFF time, the T2 ON time begins, the load energizes, and the red LED glows. At the end of the ON time the load de-energizes and the red LED turns OFF. The cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Features:

- Switch settable time delays - both times adjustable
- 0.1s - 2.84h in 3 ranges
- ±0.1% repeat accuracy
- ±2% setting accuracy
- Isolated, 10A, DPDT output contacts
- Octal plug-in base connection

Approvals:

Auxiliary Products:

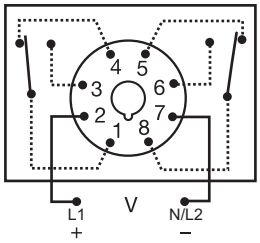
- **Panel mount kit:** P/N: BZ1
- **Octal 8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **DIN rail:** P/N: C103PM (Al)

Available Models:

TDR1A22	TDR4A22
TDR2A22	TDR4A23
TDR2A23	TDR4A33
TDR4A11	TDR4B22
TDR4A12	TDR4B23
TDR4A13	TDR6A22

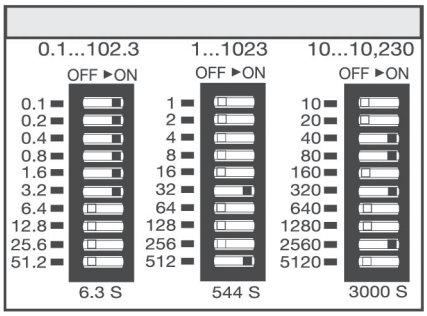
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



Relay contacts are isolated.

Digi-Set Binary Switch Operation:



Order Table:

TDR **X** **X** **X** **X**

Input Voltage
- A - 24 to 240VAC/DC
- D - 12* to 48VDC
- 1 - 12VDC*
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

Sequence
- A - ON Time First
- B - OFF Time First

ON Time
- 1 - 0.1 - 102.3s in 0.1s increments
- 2 - 1 - 1023s in 1s increments
- 3 - 10 - 10,230s in 10s increments

OFF Time
- 1 - 0.1 - 102.3s in 0.1s increments
- 2 - 1 - 1023s in 1s increments
- 3 - 10 - 10,230s in 10s increments

*Control status LED not available on 12VDC units.

Specifications

Time Delay
Type . . . . . Microcontroller circuitry
Range** . . . . . 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
10 - 10,230s in 10s increments
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Setting Accuracy . . . . . ±2% or 50ms, whichever is greater
Reset Time. . . . . ≤ 150ms
Recycle Time. . . . . ≤ 500ms
Time Delay vs Temp. & Voltage. . . . . ±2%
Input
Voltage. . . . . 12 to 24VDC, 110VDC, 24, 120, or 230VAC; 24 to 240VAC/DC; 12 to 48VDC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110 to 230VAC/DC . . . . . -20% - 10%
AC Line Frequency / DC Ripple. . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Input LED Indicator . . . . . Green; On when input voltage is applied
Output
Type . . . . . Electromechanical relay
Form. . . . . DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 30VDC; 1/3 hp @ 230VAC
Life . . . . . Mechanical - 1 x10^7; Electrical - 1 x 10^5
Max. Switching Voltage 250VAC
Relay LED Indicator . . . . . Red; ON when output relay energizes
Protection
Isolation Voltage. . . . . ≥ 1500V RMS input to output
Insulation Resistance. . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Plug-in socket
Dimensions. . . . . 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
Termination. . . . . Octal 8-pin plug-in
Environmental
Operating / Storage Temperature. . . . . -20° to 60°C / -30° to 85°C
Weight . . . . . ≈ 6 oz (170 g)

**For CE approved applications, power must be removed from the unit when a switch position is changed.

The HRDR Series combines an electromechanical relay and microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, onboard or externally adjustable time delays with a repeat accuracy of ±0.5%. The high switching capacity of the output contacts allow for direct control of heavy loads like compressors, pumps, motors, heaters and lighting. A bypass/reset switch option allows operator to interrupt normal recycling sequence and energize output relay. An excellent choice for OEM applications.

Operation (Recycling with Reset Switch):
Upon application of input voltage, the ON time T1 begins and output relay energizes. At the end of the ON time, the output relay de-energizes and the OFF time T2 begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied. Some recycling timers have the OFF time as the first delay.
Reset: Removing input voltage resets output and time delays, and returns sequence to the first delay.
Bypass/Reset Switch: Closing the normally open bypass/reset switch energizes the output relay and resets the time delays. Opening the switch restarts recycling operation with the first delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features

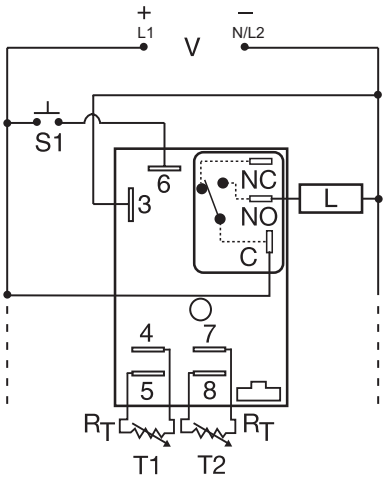
- 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Encapsulated circuitry
- Delays from 0.1s - 1000m in 6 ranges
- Independent adjustment of on and off delays
- ±0.5% repeat accuracy
- ±5% factory calibration
- Factory fixed, onboard or external adjust

Approvals:

Auxiliary Products:

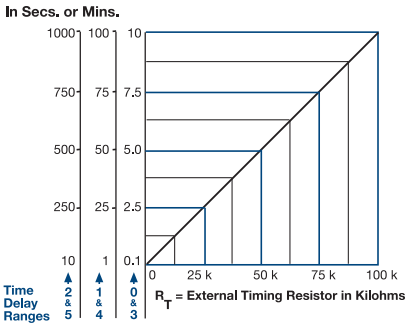
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



NO = Normally Open
S1 = Reset Switch
C = Common, Transfer Contact
L = Load
Terminals 4 & 5 and/or 7 & 8 are only included on externally adjustable units.
Relay contacts are non-isolated. R_T is included when external adjustment is ordered. Terminal 6 is included when Bypass/Reset is selected.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

HRDR11720MB60S	HRDR330A0R
HRDR120A1R	HRDR331A1
HRDR121A4R	HRDR4110MB20M
HRDR130A0R	HRDR431A1R
HRDR321A4R	
HRDR322B2R	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

HRDR — **X** — **X** — **X** — **X** — **X** — **X** — **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

External Adjust
- 1 - Both Times Fixed
- 2 - Both Times Onboard Adj.
- 3 - Both Times External Adj.
- 4 - ON Time External Adj. OFF Time Fixed
- 5 - ON Time Fixed OFF Time External Adj.
- 6 - ON Time Onboard Adj. OFF Time Fixed
- 7 - ON Time Fixed OFF Time Onboard Adj.
- 8 - ON Time Onboard Adj. OFF Time External Adj.
- 9 - ON Time External Adj. OFF Time Onboard Adj.

T1 ON Time*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

Operating Sequence
- A - ON time first
- B - OFF time first

T2 OFF Time*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

Operation
- Blank - NoBypass/Reset Option
- R - Bypass/Reset Option

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**0.1 - 1000**) (**M**) min.

Specifications

Time Delay
Range . . . . . 100ms - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ±5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%

Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC . . . . . -15% - 20%
24 to 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . AC ≤ 4VA; DC ≤ 2W

Output
Type . . . . . Electromechanical relay
Form . . . . . SPDT, non-isolated

Ratings:		SPDT- NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**

Life . . . . . Mechanical - 1 x 10^6;
Electrical - 1 x 10^5 *3 x 10^4, **6,000

Protection
Surge . . . . . IEEE C62.41-1991 Level A
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected

Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

The HRD3 Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five options and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output relay energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.
Operation (Recycling - OFF Time First):
Upon application of input voltage, the T2, OFF time begins. At the end of the OFF time, the T1, ON time begins and the load energizes. At the end of the ON time the load de-energizes, and the cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

- Equal on and off delays
- 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Encapsulated
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Approvals:

Auxiliary Products:

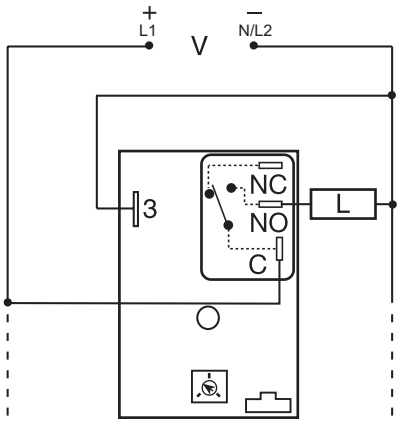
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

HRD3220A	HRD3323A
HRD3221A	HRD3324A
HRD3222A	HRD3420A
HRD3223A	HRD3421A
HRD3224A	HRD3422A
HRD3320A	HRD3423A
HRD3321A	HRD342A0A
HRD3322A	

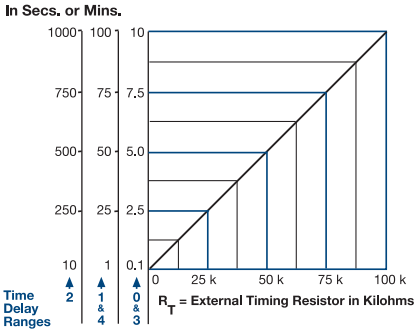
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



C = Common, Transfer Contact
NO = Normally Open
L = Load
NOTE: A knob, or terminals 4 & 5 are only included on adjustable units. R_T is used when external adjustment is ordered. Relay contacts are not isolated.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the R_T terminals; as the resistance increases the time delay increases.
When selecting an external R_T, add the tolerances of the timer and the R_T for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm R_T. For 1 to 100 S use a 100 K ohm R_T.

Order Table:

HRD3 **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

X **Time Tolerance**
- Blank - ±5%
- A - ±1%

X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

X **Operating Sequence**
- A - ON Time First
- B - OFF Time First

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay

Type	Microcontroller circuitry
Range	0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy	±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration)	±1%, ±5%
Reset Time	≤ 150ms
Time Delay vs Temp. & Voltage	±2%

Input

Voltage		12 or 24VDC; 24, 120, or 230VAC
Tolerance	12VDC & 24VDC	-15% - 20%
	24 to 230VAC	-20% - 10%
Line Frequency		50/60 Hz
Power Consumption		AC ≤ 4VA; DC ≤ 2W

Output

Type		Electromechanical relay	
Form		Non-isolated, SPDT	
Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**
Life		Mechanical - 1 x 10^6;	
		Electrical - 1 x 10^5, *3 x 10^4, **6,000	

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ
Polarity	DC units are reverse polarity protected

Mechanical

Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)

Econo-Timers are a combination of digital electronics and a reliable electromechanical relay. DPDT relay output for relay logic circuits, and isolation of input to output voltages. Cost effective for OEM applications, such as duty cycling, drying, washing, signaling, and flashing.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output relay energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.
Operation (Recycling - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of the ON time the load de-energizes, and the cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 10 for dimensional drawing.

Features

- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- Encapsulated digital circuitry
- Isolated, 10A, DPDT output contacts

Approvals:

Auxiliary Products:

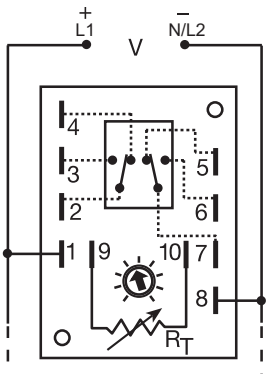
- **External adjust potentiometer:**
  P/N: P1004-16
  P/N: P1004-16-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

ERD3425A

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



A knob, or terminals 9 & 10 are only included on adjustable units. Relay contacts are isolated. RT is used when external adjustment is ordered.

R_T Selection Chart						
Desired Time Delay* Seconds						R_T
1	2	3	4	5	6	Megohm
0.1	0.1	0.1	0.2	0.3	0.6	0.0
0.19	0.6	1	1.7	3	6	0.1
0.28	1.1	2	3.2	6	12	0.2
0.37	1.6	3	4.7	9	18	0.3
0.46	2.1	4	6.2	12	24	0.4
0.55	2.6	5	7.7	15	30	0.5
0.64	3.0	6	9.2	18	36	0.6
0.73	3.5	7	10.7	21	42	0.7
0.82	4.0	8	12.2	24	48	0.8
0.91	4.5	9	13.7	27	54	0.9
1.0	5.0	10	15	30	60	1.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

R_T Selection Chart					
Desired Time Delay* Minutes					R_T
7	8	9	10	11	Megohm
0.1	0.1	0.2	1	10	0.0
0.6	1	1.7	10	50	0.1
1.1	2	3.2	20	100	0.2
1.6	3	4.7	30	150	0.3
2.1	4	6.2	40	200	0.4
2.6	5	7.7	50	250	0.5
3.0	6	9.2	60	300	0.6
3.5	7	10.7	70	350	0.7
4.0	8	12.2	80	400	0.8
4.5	9	13.7	90	450	0.9
5.0	10	15	100	500	1.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Order Table:

ERD3 **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 120VDC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

X **Time Delay***
- 1 - 0.1 - 1s
- 2 - 0.1 - 5s
- 3 - 0.1 - 10s
- 4 - 0.2 - 15s
- 5 - 0.3 - 30s
- 6 - 0.6 - 60s
- 7 - 0.1 - 5m
- 8 - 0.1 - 10m
- 9 - 0.2 - 15m
- 10 - 0.3 - 30s
- 11 - 10 - 500m

X **Operating Sequence**
- A - ON Time First
- B - OFF Time First

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**M**) min.

Specifications

Time Delay
Type . . . . . Digital integrated circuitry
Range . . . . . 0.1s - 500m in 11 adjustable ranges
0.1s - 1000m fixed
Adjustment . . . . . Knob, external adjust, or fixed
Repeat Accuracy . . . . . ±0.5%
Tolerance (Factory Calibration) . . . . . ≤ ±10%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 12, 24, or 120VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
120VAC/DC & 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Isolated relay contacts
Form . . . . . DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC;
1/3 hp @ 120/240VAC
Life . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^6
Protection
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions . . . . . 3.5 x 2.5 x 1.7 in. (88.9 x 63.5 x 43.2 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating/Storage Temperature . . . . . -40° to 65°C / -40° to 85°C
Weight . . . . . ≅ 5.7 oz (162 g)

The KRDR Series is a compact time-delay relay measuring only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDR Series is a cost effective recycling timer for OEM applications that require small size, isolation, reliability, and long life.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output relay energizes and the T2 ON time begins. At the end of the ON time, the output de-energizes and the T1 OFF time begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied
Reset: Removing input voltage resets the output and the time delays, and returns the sequence to the ON time.
Operation (Recycling - OFF Time First):
Upon application of input voltage, the T1 OFF time begins. At the end of the OFF time, the T2 ON time begins and the load energizes. At the end of the ON time the load de-energizes, and the cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

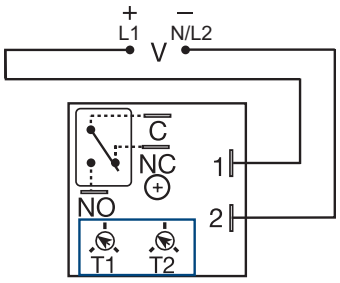
- Compact time delay relay
- 10A, SPDT output contacts
- Factory fixed or onboard adjust
- Delays from 0.1s - 1000m in 6 ranges
- Input voltages from 120 to 230V in 6 options
- ±0.5% repeat accuracy
- ±5% factory calibration

Approvals:

Auxiliary Products:

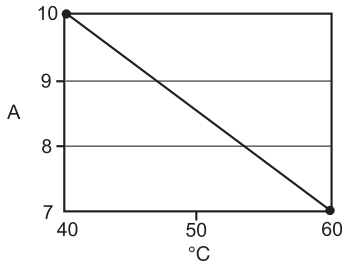
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



T1 = OFF Time
T2 = ON Time
NO = Normally Open
NC = Normally Closed
C = Common
A knob is supplied for adjustable units.

Output Current/Ambient Temperature:



Available Models:

KRDR115MB25M	KRDR321A4
KRDR120A0	KRDR321B4
KRDR123A4	KRDR421A4
KRDR124A4	KRDR424A0
KRDR320A1	KRDR440.5SA0
KRDR320B0	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

KRDR — **X** — **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

X — **Adjustments**
- 1 - Both Times Fixed
- 2 - Both Times Adj.
- 3 - ON Time Adj. OFF Time Fixed
- 4 - ON Time Fixed OFF Time Adj.

X — **T2 ON Time***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X — **Operating Sequence**
- A - ON time first
- B - OFF time first

X — **T1 OFF Time***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 999**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5 % or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±5%
Input
Voltage . . . . . 12, 24 or 110VDC; 24, 120 or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110VDC & 120 or 230VAC . . . -20% - 10%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Isolated relay contacts
Form . . . . . SPDT
Rating (at 40°C) . . . . . 10A resistive @ 125VAC;
5A resistive @ 230VAC & 28VDC;
1/4 hp @ 125VAC
Max. Switching Voltage 250VAC
Life (Operations) . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.6 oz (74 g)

The KRD3 Series measures only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRD3 Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Recycling Flasher - ON Time First):
Upon application of input voltage, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to T1 ON time.
Operation (Recycling Flasher - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2 OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features

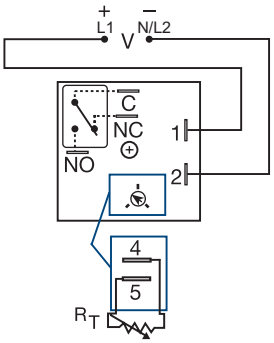
- Compact time-delay relay
- 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- ±5% factory calibration
- Input voltages from 12 to 230V in 5 options

Approvals:

Auxiliary Products:

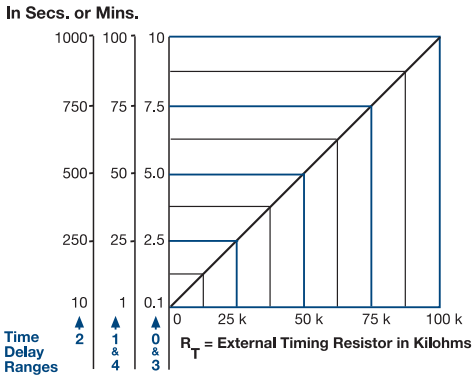
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



V = Voltage
C = Common, Transfer Contact
NO = Normally Open
NC = Normally Closed
A knob is supplied for adjustable units, or RT terminals 4 & 5 for external adjust. See external adjustment vs time delay chart. Relay contacts are isolated.

External Resistance vs. Time Delay:



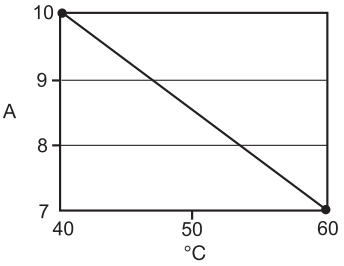
This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

KRD3110.4SA	KRD3420A
KRD31160SA	KRD3434A

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature:



Order Table:

KRD3 **X** **X** **X** **X**

Input Voltage
- 1 - 12VDC
- 2 - 24VAC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - Onboard knob
- 3 - External adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

Operating Sequence
- A - ON Time First
- B - OFF Time First

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec, or (**0.1 - 100**) (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ± 5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±5%
Input
Voltage . . . . . 12, 24 or 110VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110VDC, 120 or 230VAC . . . -20% - 10%
AC Line Frequency/DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Isolated relay contacts
Form . . . . . SPDT
Rating (at 40°C) . . . . . 10A resistive @ 125VAC;
5A resistive @ 230VAC & 28VDC;
1/4 hp @ 125VAC
Max. Switching voltage 250VAC
Life (Operations) . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5
Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . DC units are reverse polarity protected
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental . . . . . .
Operating/Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.6 oz (74 g)

The RS Series is a solid-state, encapsulated, recycling timer designed for tough industrial environments. It is used by many testing labs as a life cycle tester; by others as a cycle controller. The RS Series has separate DIP switch adjustments for the on delay and the off delay. These make accurate adjustment possible the first time, every time. Time delays of 0.1 seconds to 1023 hours are available in 4 ranges.

Operation (Recycling - ON Time First)
Upon application of input voltage, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the ON time.
Operation (Recycling - OFF Time First)
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Features:

- Accurate, reliable, recycling timer
- Switch settable time delays - both times adjustable
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 0.1s - 1023h in 4 ranges
- 12 to 230V in 5 options
- 1A, solid-state output
- Totally solid state and encapsulated

Approvals:

Auxiliary Products:

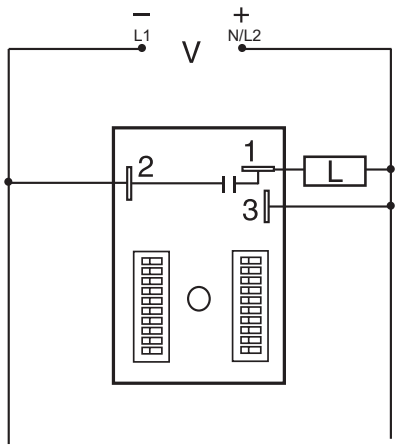
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

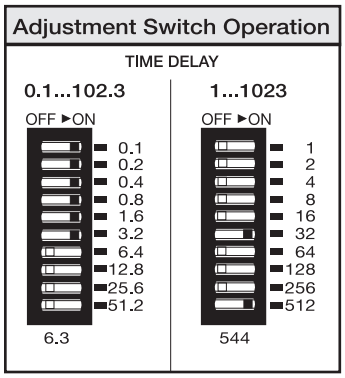
RS1A11	RS4A13
RS1A12	RS4A22
RS1B12	RS4A24
RS2A12	RS4A31
RS2A24	RS4A33
RS2B44	RS4B23
RS4A11	RS6A13
RS4A12	RS6A24

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



L = Load



Order Table:

RS **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Operating Sequence**
- A - ON time first
- B - OFF time first

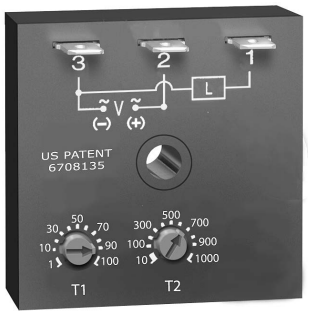
X **T1 ON Time**
- 1 - 0.1 - 102.3s in 0.1s increments
- 2 - 0.1 - 102.3m in 0.1m increments
- 3 - 1 - 1023m in 1m increments
- 4 - 1 - 1023h in 1h increments

X **T2 OFF Time**
- 1 - 0.1 - 102.3s in 0.1s increments
- 2 - 0.1 - 102.3m in 0.1m increments
- 3 - 1 - 1023m in 1m increments
- 4 - 1 - 1023h in 1h increments

Specifications

Time Delay
Range* ..... 0.1 - 102.3s in 0.1s increments
0.1 - 102.3m in 0.1m increments
1 - 1023m in 1m increments
1 - 1023h in 1h increments
Repeat Accuracy ..... ±0.1% or 20ms, whichever is greater
Setting Accuracy ..... ≤ ±2% or 20ms, whichever is greater
Reset Time ..... ≤ 150ms
Time Delay vs Temp. & Voltage ..... ≤ ± 2%
Input
Voltage ..... 12, or 24VDC; 24, 120, or 230VAC
Tolerance ..... ±20%
AC Line Frequency / DC Ripple ..... 50/60 Hz / ≤ ±10%
Power Consumption ..... AC ≤ 2VA; DC ≤ 1W
Output
Type ..... Solid state
Maximum Load Current ..... 1A steady state, 10A inrush at 60°C
OFF State Leakage Current ..... AC ≅ 5mA @ 230VAC; DC ≅ 1mA
Voltage Drop ..... AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected
Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 3 x 2 x 1.5 in (76.7 x 51.3 x 38.1 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature ..... -40° to 75°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 3.9 oz (111 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.



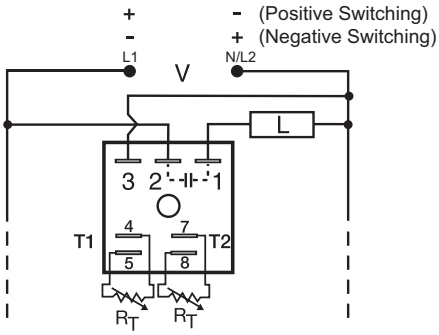
The ESDR Series offers independent time adjustment of both delay periods. Adjustment options include fixed, onboard or external adjust. The ESDR is recommended for air drying, automatic oiling, life testing, chemical metering and automatic duty cycling. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is ≤±5%. The repeat accuracy, under stable conditions, is 0.1% of the selected time delay. This series is designed for input voltages of 12VDC to 230VAC in five ranges. Time delays of 0.1 seconds to 1000 minutes are available in six ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Features

- ON/OFF recycling with independent adjustment of both the on and off periods
- Factory fixed, onboard or external adjust
- 0.1s to 1000m in 6 ranges
- ±0.1% repeat accuracy
- ± 5% factory calibration
- Available in AC or DC voltages

Approvals:

Connection:

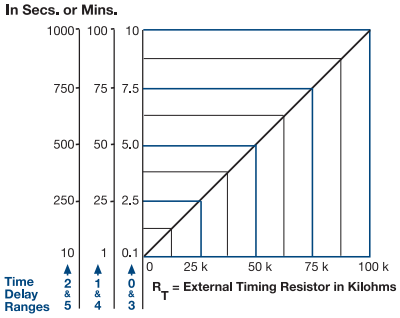


V = Voltage
L = Load
T1 = ON Time
T2 = OFF Time
R_T is used when external adjustment is ordered. A knob is supplied for adjustment on the unit; terminals for external adjustment.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2, OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.

Operation (Recycling - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the Rt terminals; as the resistance increases the time delay increases.
When selecting an external Rt, add the tolerances of the timer and the Rt for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm Rt. For 1 to 100 S use a 100 K ohm Rt.

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

ESDR120A0P	ESDR420A1
ESDR120A1P	ESDR420A4
ESDR120A4P	ESDR420B1
ESDR120B3P	ESDR420B4
ESDR121A2P	ESDR421A1
ESDR121A3P	ESDR421A4
ESDR123A0P	ESDR421B1
ESDR123B4P	ESDR423A4
ESDR124A0P	ESDR423B1
ESDR125A5P	ESDR424A0
ESDR152B1P	ESDR424A4
ESDR221A2	ESDR450A1
ESDR221B5	ESDR452B1
ESDR224B4	ESDR620B3
ESDR310.7SA10SP	ESDR621A1
ESDR320A0P	ESDR650A1
ESDR320A3P	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

ESDR **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **External Adjust**
- 1 - Both Times Fixed
- 2 - Both Times Onboard Adj.
- 3 - ON Time Onboard Adj. OFF Time Fixed
- 4 - ON Time Fixed OFF Time Onboard Adj.
- 5 - Both Times External Adj.
- 6 - ON Time External Adj. OFF Time Fixed
- 7 - ON Time Fixed OFF Time External Adj.
- 8 - ON Time Onboard Adj. OFF Time External Adj.
- 9 - ON Time External Adj. OFF Time Onboard Adj.

X **T1 ON Time***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Operating Sequence**
- A - ON time first
- B - OFF time first

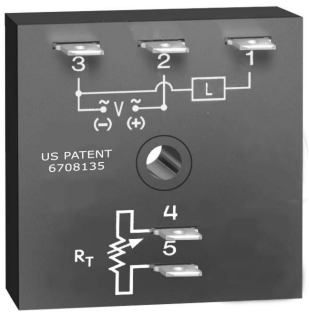
X **T2 OFF Time***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Switching Mode (VDC Only)**
- P - Positive
- N - Negative

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . .0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . .±0.1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . .≤ ± 5%
Time Delay vs Temp. & Voltage. . . . . .≤ ±2%
Reset Time. . . . . .≤ 150ms
Input
Voltage. . . . . .12 or 24VDC; 24, 120, or 230VAC
Tolerance . . . . . .±20%
Power Consumption . . . . . .AC ≤ 2VA; DC ≤ 1W
AC Line Frequency / DC Ripple. . . . . .50/60 Hz / ≤ 10%
Output
Type . . . . . .Solid state
Maximum Load Current. . . . . .1A steady state , 10A inrush at 60°C
OFF State Leakage Current . . . . . .AC ≅ 5mA @ 230VAC; DC ≅ 1mA
Voltage Drop. . . . . .AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
Protection
Circuitry . . . . . .Encapsulated
Dielectric Breakdown . . . . . .≥ 2000V RMS terminals to mounting surface
Insulation Resistance. . . . . .≥ 100 MΩ
Polarity . . . . . .DC units are reverse polarity protected
Mechanical
Mounting . . . . . .Surface mount with one #10 (M5 x 0.8) screw
Dimensions. . . . . .2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination. . . . . .0.25 in. (6.35 mm) male quick connect terminals
Operating / Storage Temperature. . . . . .-40° to 75°C / -40° to 85°C
Humidity. . . . . .95% relative, non-condensing
Weight . . . . . .≅ 2.4 oz (68 g)



The TSDR Digi-Timer is an on/off or off/on recycling timing module designed to control metering pumps, chemical valves, flash lamps, or use in energy saving or duty cycling applications. It may be ordered with both time delays factory fixed, or one delay fixed and the other delay external or onboard adjustable. The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required. The factory calibration for fixed time delays is ≤±5%. The repeat accuracy, under stable conditions, is 0.5% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 1000 minutes are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2, OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the T1 ON time.
Operation (Recycling - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of the T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2 OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Fixed or adjustable 0.1s - 1000m in 6 ranges
- ± 0.5% repeat accuracy
- ± 5% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

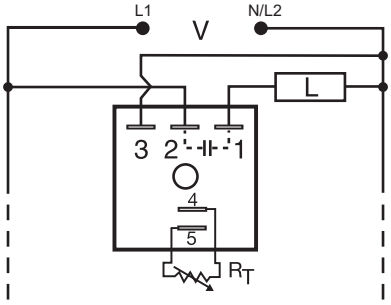
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

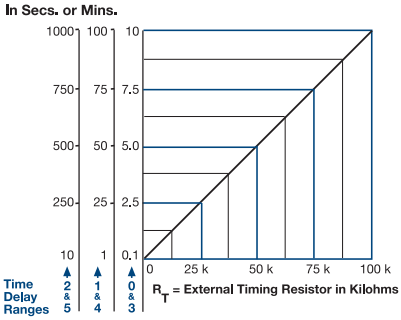
TSDR2150MA5M	TSDR440.25SA1
TSDR215SB18M	TSDR4412SA1
TSDR410.1SA0.3S	TSDR442MA2
TSDR410.4SB4S	TSDR4430SA2
TSDR412.5SA0.5S	TSDR450.3SA1
TSDR412.5SA4.5S	TSDR6110SA30S
TSDR4140MA20M	TSDR612.5SA4.5S
TSDR415SB18M	TSDR615SB18M

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T is used when external adjustment is ordered. An onboard adjustment, or terminals 4 & 5 are only included on adjustable units.



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

TSDR **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Both Times Fixed
- 2 - ON Time Onboard Adj. OFF Time Fixed
- 3 - ON Time External Adj. OFF Time Fixed
- 4 - ON Time Fixed OFF Time External Adj.
- 5 - ON Time Fixed OFF Time Onboard Adj.

X **T1 ON Time***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

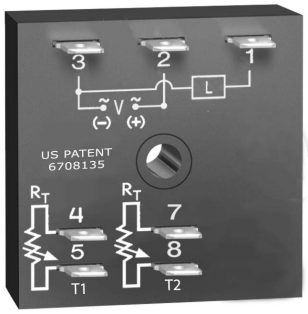
X **First Delay**
- A - ON time
- B - OFF time

X **T2 OFF Time***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range ..... 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy ..... ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) ..... ≤ ±5%
Reset Time ..... ≤ 150ms
Time Delay vs Temp. & Voltage ..... ≤ ±5%
Input
Voltage ..... 24, 120, or 230VAC
Tolerance ..... ±20%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... ≤ 2VA
Output
Type ..... Solid state
Maximum Load Current ..... 1A steady state, 10A inrush at 60°C
Off State Leakage Current ..... ≅ 5mA @ 230VAC
Voltage Drop ..... ≅ 2.5V @ 1A
Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... 100 MΩ
Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature ..... -40° to 75°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)



The KSDR Series offers independent time adjustment of both delay periods. The KSDR is recommended for air drying, automatic oiling, life testing, chemical metering, and automatic duty cycling. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is within ± 5% of the target delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for input voltages of 24, 120 or 230VAC. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling - ON Time First)
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2, OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to T1 ON time.
Operation (Recycling - OFF Time First)
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2 OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features

- Adjustable 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

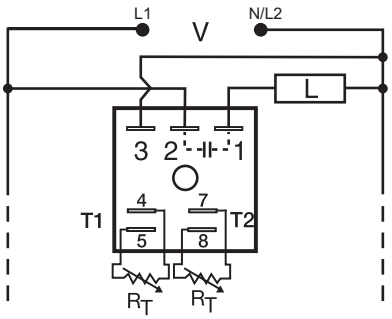
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

KSDR21A1
KSDR24A4
KSDR40A0
KSDR42A4
KSDR61A4
KSDR64A4

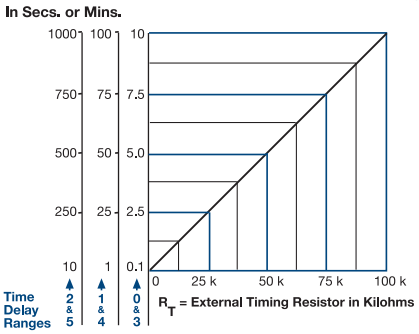
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

KSDR **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

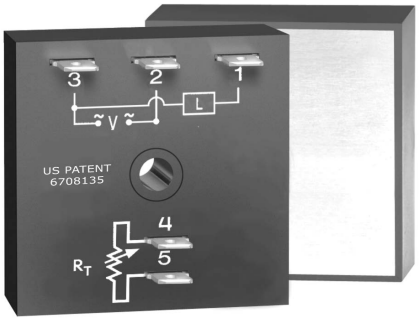
X **T1 ON Time**
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Operating Sequence**
- A - ON time first
- B - OFF time first

X **T2 OFF Time**
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 ranges
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Rating . . . . . 1A steady state, 10A inrush at 60°C
Voltage Drop . . . . . ≅ 2.5V @ 1A
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The THD Series combines accurate timing circuitry with high power, solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. The THD3 has equal on and off time delays. A single R_T sets both time delays. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

Operation (Recycling Flasher - ON Time First):
Upon application of input voltage, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to T1 ON time.
Operation (Recycling Flasher - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2 OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features:

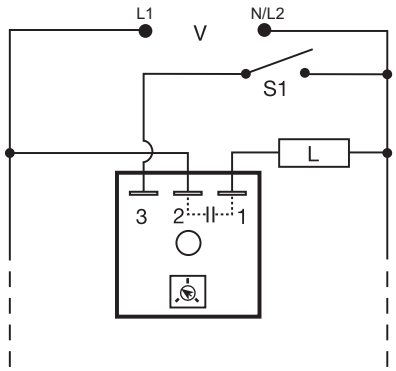
- High load currents up to 20A, 200A inrush
- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid state & encapsulated

Approvals:

Auxiliary Products:

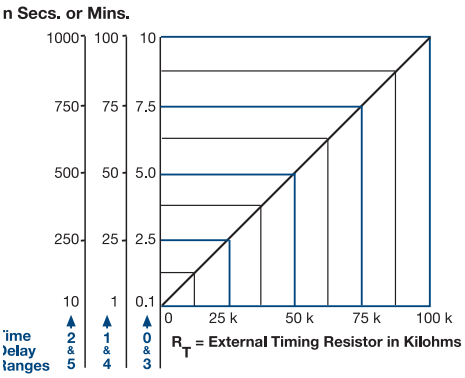
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Connection:



S1 = Optional Low Current Initiate Switch
R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



his chart applies to externally adjustable part numbers.
he time delay is adjustable over the time delay range selected by varying
he resistance across the RT terminals; as the resistance increases the
me delay increases.
When selecting an external RT, add the tolerances of the timer and the RT
or the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and
50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

THD3C23A0	THD3C43A1
THD3C23A1	THD3C43A2
THD3C23A2	THD3C43A3
THD3C23A3	THD3C43A4
THD3C23A4	THD3C43A5
THD3C23A5	
THD3C42A0	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

THD3 **X** **Output Rating**
- A - 6A
- B - 10A
- C - 20A

X **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

X **Operating Sequence**
- A - ON time first
- B - OFF time first

X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.5 - 1000**) followed by (**S**) secs. or (**M**) mins.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Adjustment . . . . . Single variable resistor changes both the on & off times equally
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state

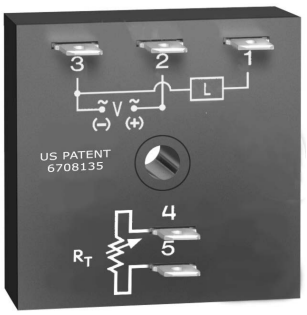
Maximum Load Current	Output	Steady State	Inrush**
	A	6A	60A
	B	10A	100A
	C	20A	200A

Minimum Load Current 100mA
Voltage Drop . . . . . ≅ 2.5V at rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting ** . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

Timer - Recycling Flasher

TSD3 Series



The TSD3 is a solid-state ON/OFF recycling timer with the on time always equal to the off time. When time delay is changed by the RT, both the ON and the OFF periods are changed. The TSD Series is designed for more demanding commercial and industrial applications where small size, and accurate performance is required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling Falsher - ON Time First):
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the T1 ON time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features

- Equal on and off delays
- Fixed or adjustable delays from 0.1s - 100h
- ±0.1% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

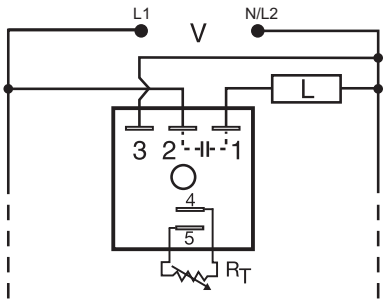
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

TSD3411S
TSD34150S
TSD36130M

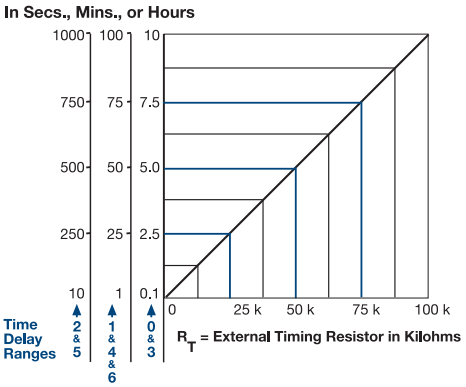
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

TSD3 **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

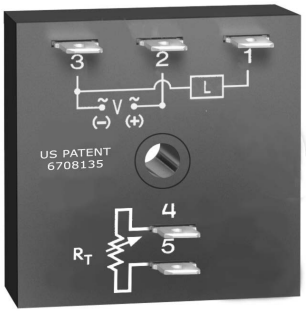
Adjustment
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m
- 6 - 1 - 100h

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min. or (**1 - 100**) (**H**) hours

Specifications

Time Delay
Range . . . . . 0.1s - 100h in 7 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±1%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±1%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA
Output
Type . . . . . Solid state
Maximum Load Current . . . . . 1A steady state, 10A inrush at 60°C
Off State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating/Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The KSD3 Digi-Timer is a cost effective approach for ON/OFF recycling applications. The on time is equal to the off time. An adjustment of the R_T will change the time delays of both on and off times. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for popular AC and DC voltages. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling Flasher - ON Time First):
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the ON time.
Operation (Recycling Flasher - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of the ON time the load de-energizes, and the cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and time delays and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Fixed or adjustable delays from 0.1s -1000m
- Equal on and off delays
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 12 to 120V in 4 ranges
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:

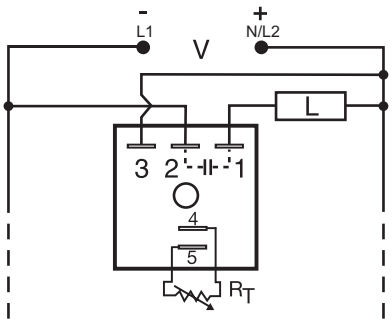
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

KSD3120A
KSD3310.1SA
KSD3410.5SA
KSD3432A

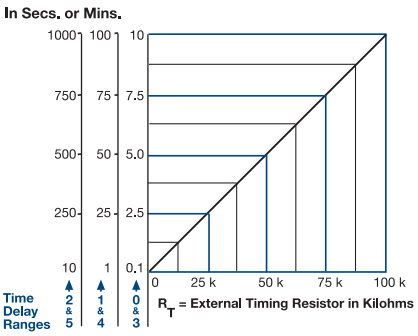
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T is used when external adjustment is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Order Table:

KSD3 **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC

Note: DC voltages available in negative switching only

X **Adjustment**
- 1 - Fixed
- 2 - External adjust
- 3 - Onboard adjust

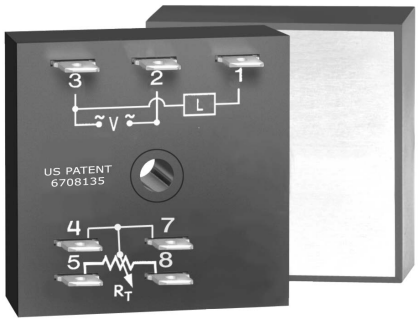
X **Time Delay***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **Operating Sequence**
- A - ON time first
- B - OFF time first

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range ..... 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy ..... ±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration) ..... ≤ ± 5%
Reset Time ..... ≤ 150ms
Time Delay vs Temp. & Voltage ..... ≤ ±10%
Input
Voltage ..... 24 or 120VAC; 12 or 24VDC
Tolerance ..... ±20%
AC Line Frequency ..... 50/60 Hz
Power Consumption ..... AC ≤ 2VA; DC ≤ 1W
Output
Type ..... Solid state
Maximum Load Current ..... 1A steady state, 10A inrush at 60°C
OFF State Leakage Current ..... AC ≅ 5mA @ 230VAC; DC ≅ 1mA
Voltage Drop ..... AC ≅ 2.5V @ 1A; DC ≅ 1V @ 1A
DC Operation ..... Negative switching only
Protection
Circuitry ..... Encapsulated
Dielectric Breakdown ..... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance ..... ≥ 100 MΩ
Polarity ..... DC units are reverse polarity protected
Mechanical
Mounting ..... Surface mount with one #10 (M5 x 0.8) screw
Dimensions ..... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination ..... 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating/Storage Temperature ..... -40° to 60°C / -40° to 85°C
Humidity ..... 95% relative, non-condensing
Weight ..... ≅ 2.4 oz (68 g)



The PTHF Series can be used for a variety of applications from chemical metering, to temperature regulating, to energy management. The infinite adjustability from 1 to 99% provides accurate percentage on control over a wide factory fixed cycle period. When mounted on a metal surface, it can be used to drive solenoids, contactors, relays, or lamps, up to 20A steady, 200A inrush. PTHF is the suggested replacement for the PT Series.

Operation (Percentage):
Upon application of input voltage, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Increasing the ON time decreases the OFF time. The total cycle period is equal to the ON time plus the OFF time. The total cycle period is factory fixed. ON time range is 1 to 99 percent of cycle period.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the T1 ON time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Features

- ON/OFF recycling percentage control
- Controls loads up to 20A, 200A inrush
- Fixed cycle period 10s - 1000m
- ±0.5% repeat accuracy
- ±5% factory calibration
- Totally solid state & encapsulated
- Onboard or external adjustment
  1 - 99% ON

Approvals:

Auxiliary Products:

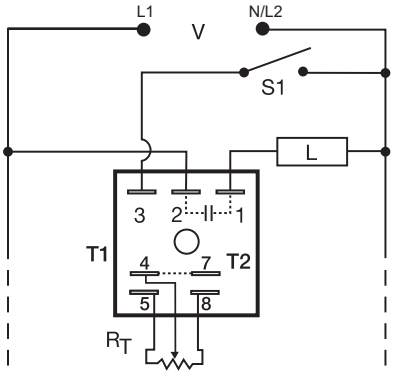
- **External adjust potentiometer:**
  P/N: P1004-95
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

Available Models:

PTHF410C
PTHF410CK
PTHF4120D
PTHF615A

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



R_T = 100 KΩ
S1 = Optional Low Current Initiate Switch
T1 = ON Time
T2 = OFF Time
R_T is used when external adjustment is ordered.

Order Table:

PTHF **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Fixed Cycle Period**
Specify 10 - 1000 as the total fixed cycle period in seconds. If cycle period is in minutes insert (M) suffix.

X **Output Rating**
- A - 6A
- B - 10A
- C - 20A
- D - 1A

X **Adjustment**
- Blank - External adjust
- K - Onboard adjust

Specifications

Time Delay
Type . . . . . External or onboard knob
Range/External Adjustment Resistance. . . Adjustable from 1 - 99% / R_T = 100 KΩ
Cycle Period . . . . . Fixed from 10s - 1000m
Repeat Accuracy . . . . . ±0.5% or 20ms, whichever is greater
Cycle Period Tolerance
(Factory Calibration) . . . . . ≤ ± 5%
Reset Time. . . . . ≤ 150ms
Time Delay vs Temp. & Voltage. . . . . ≤ ±10%

Input
Voltage. . . . . 24, 120, or 230VAC
Tolerance. . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA

Output
Type . . . . . Solid state

Maximum Load Currents	Output	Steady State	Inrush*	Minimum
	A	6A	60A	100mA
	B	10A	100A	100mA
	C	20A	200A	100mA
	D	1A	10A	- -

Voltage Drop. . . . . ≅ 2.5V at rated current
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance. . . . . ≥ 100 MΩ

Mechanical
Mounting * . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions. . . . . 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination. . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating/Storage Temperature. . . . -40° to 60°C / -40° to 85°C
Humidity. . . . . 95% relative, non-condensing
Weight . . . . . 1A unit: ≅ 2.4 oz (68 g);
6, 10, 20A units: ≅ 3.9 oz (111 g)

*Units rated ≥ 6A must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.
Inrush: Non-repetitive for 16ms.

The SQ Series is available with either three (SQ3) or four (SQ4) outputs and an adjustable or fixed time delay. The time delay period is the same for each output. This makes the SQ ideal for applications like dust collection, automatic lubrication, air drying, lighting displays, merchandising displays, duty cycling, and energy management.

Operation (Sequencing):
Upon application of input voltage, Load 1 energizes for the selected ON time delay. At the end of this ON time delay, Load 1 de-energizes and Load 2 immediately energizes starting another ON time delay. At the end of this ON time delay, Load 2 de-energizes and Load 3 immediately energizes. At the end of the ON time delay for Load 3 (Load 4 for 4 output devices), Load 1 re-energizes and the cycle repeats. The sequential operation continues as long as input voltage is applied.
Reset: Removing and re-applying input voltage resets the sequence to the Load 1 ON time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 166, Figure 14 for dimensional drawing.

Features:

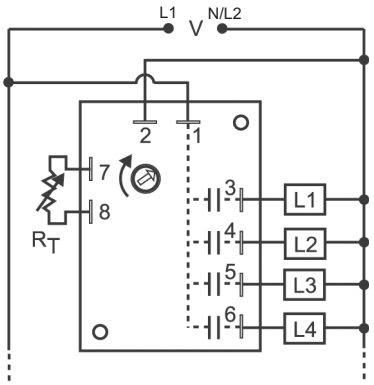
- Three or four outputs
- Variable delays from 0.1s - 100m in 5 ranges
- Totally solid state for a long, reliable life
- Encapsulated to protect against the environment
- Digital circuitry for accuracy and stability
- 1A, solid-state outputs

Approvals: CE cULus

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-12
  P/N: P1004-12-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

Connection:



R_T is 3 megohms, when external adjustment is ordered. SQ4 shown; for SQ3, terminal 6 & load L4 are eliminated.

R_T Selection Chart					
Desired Time Delay*					
Seconds			Minutes		R_T
0	1	2	3	4	Megohm
0.1	1	10	0.1	1	0.0
1	10	100	1	10	0.3
2	20	200	2	20	0.6
3	30	300	3	30	0.9
4	40	400	4	40	1.2
5	50	500	5	50	1.5
6	60	600	6	60	1.8
7	70	700	7	70	2.1
8	80	800	8	80	2.4
9	90	900	9	90	2.7
10	100	1000	10	100	3.0

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Time Delay	VTP P/N
0 - 0.1-10s	VTP4C
1 - 1-100s	VTP4G
2 - 10-1000s	VTP4K
3 - 0.1-10m	VTP45N
4 - 1-100m	VTP4P

Selection Table for VTP Plug-on Adjustment Accessory.

Available Models:

SQ3221
SQ4424
SQ4434

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

SQ **X** **X** **X** **X**

# of Outputs
- 3 - Three
- 4 - Four

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - Onboard adjust
- 3 - External adjust

Time Delay*
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**1 - 100**) (**M**) min

Specifications

Time Delay
Type . . . . . Digital integrated circuitry
Range . . . . . 0.1s - 100m in 5 adjustable ranges or fixed
Repeat Accuracy . . . . . ±1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±10%
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%

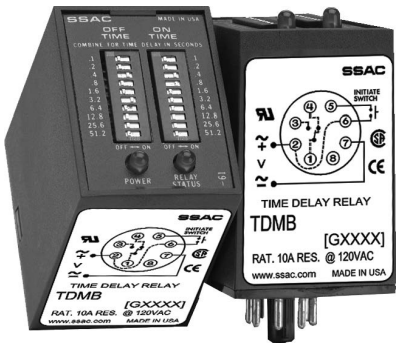
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz

Output
Type . . . . . Solid state
Form . . . . . SPST NO (three or four)
Rating . . . . . 1A steady state, 10A inrush per output
Voltage Drop (Each Output) . . . . . ≅ 1.5V @ 1A

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ

Mechanical
Mounting . . . . . Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions . . . . . 3.5 x 2.5 x 1.22 in. (88.9 x 63.5 x 31 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 5.4 oz (153 g)



The TDMB combines both delay-on-make and delay-on-break functions into one plug-in package. Selection of the time period is accomplished with dual switches, one for the on delay and the other for the off delay. SPDT or DPDT output options provide isolated, 10A switching capability.

Operation (Delay-on-Make/Delay-on-Break):
Input voltage must be applied at all times. The output relay is de-energized. Upon closure of the initiate switch, the green LED glows and the delay-on-make time delay (T1) begins. At the end of T1, the output relay energizes and the red LED glows. When the initiate switch opens, the green LED turns OFF and the delay-on-break time delay (T2) begins. At the end of T2, the output relay de-energizes and the red LED turns OFF.
Reset: Removing input voltage resets time delay and output. Opening the initiate switch during the delay-on-make delay, resets T1. Closing the initiate switch during the delay-on-break delay, resets T2.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Features

- Switch settable time delays from 0.1s - 10,230s in 3 ranges
- ±2% setting accuracy
- ±0.1% repeat accuracy
- 10A, SPDT or DPDT output contacts

Approvals:

Auxiliary Products:

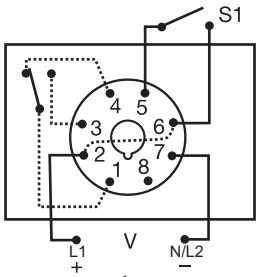
- **Panel mount kit:** P/N: BZ1
- **11-pin socket:** P/N: NDS-11
- **Octal 8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)

Available Models:

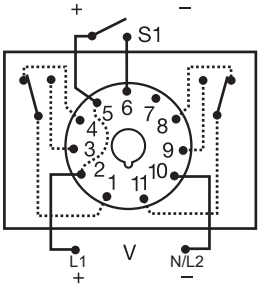
TDMB411	TDMB422
TDMB411D	TDMB422D
TDMB413D	TDMB622

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



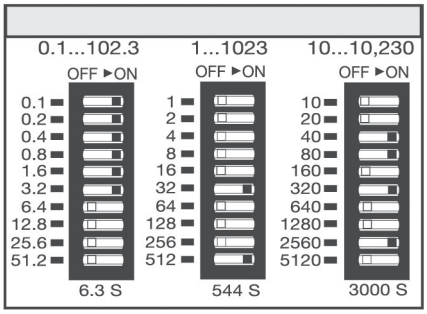
8-pin octal SPDT



11-pin DPDT
(P/N ends with D)

Relay contacts are isolated.

Digi-Set Binary Switch Operation:



Order Table:

TDMB **X** **X** **X** **X**

Input Voltage
- A - 24 to 240VAC/DC
- D - 12 to 48VDC
- 1 - 12VDC*
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 5 - 110VDC
- 6 - 230VAC

Delay-on-Make
- 1 - 0.1 - 102.3s in 0.1s increments
- 2 - 1 - 1023s in 1s increments
- 3 - 10 - 10230s in 10s increments

Delay-on-Break
- 1 - 0.1 - 102.3s in 0.1s increments
- 2 - 1 - 1023s in 1s increments
- 3 - 10 - 10230s in 10s increments

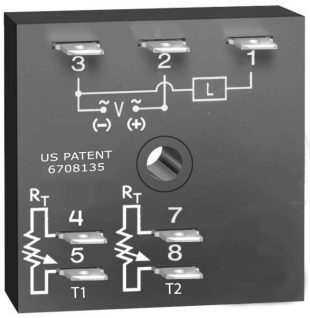
Type Plug/Output Form
- Blank - Octal plug (8-pin) SPDT
- D - 11-pin plug DPDT

*No control status LED for 12VDC

Specifications

Time Delay
Type . . . . . Microcontroller circuitry
Range** . . . . . 0.1 - 102.3s in 0.1s increments
1 - 1023s in 1s increments
10 - 10,230s in 10s increments
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Setting Accuracy . . . . . ≤ ±2% or 50ms, whichever is greater
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%
Control LED Indicator . . . . . Green; on when the initiate switch is closed
Input
Voltage . . . . . 12 or 24VDC; 24, 120, or 230VAC;
24 to 240VAC/DC; 12 to 48VDC
Tolerance 12VDC & 24VDC/AC . . . . . -15% - 20%
110 to 230VAC/DC . . . . . -20% - 10%
AC Line Frequency / DC Ripple . . . . . 50/60 Hz / ≤ 10%
Power Consumption . . . . . AC ≤ 2VA; DC ≤ 2W
Output
Type . . . . . Electromechanical relay
Form . . . . . SPDT or DPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC;
1/3 hp @ 230VAC
Life . . . . . Mechanical - 1 x10^7; Electrical - 1 x 10^5
Max. Switching Voltage 250VAC
Relay LED Indicator . . . . . Red; on when output relay energizes
(not included on 12VDC units)
Protection
Insulation Resistance . . . . . ≥ 100M
Polarity . . . . . DC units are reverse polarity protected
Isolation Voltage . . . . . ≥ 1500V RMS input to output
Mechanical
Mounting . . . . . Plug-in socket
Dimensions . . . . . 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm)
Termination . . . . . Octal 8-pin plug-in, magnal 11-pin plug-in
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -30° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

** For CE approved applications, power must be removed from the unit when a switch position is changed.



The ESD5 Series is an accurate, solid-state, delayed interval timer. It offers a 1A steady, 10A inrush output and is available with adjustable or fixed time delays of 0.1 seconds to 1000 minutes in six ranges. Input voltages of 24, 120, or 230VAC are available. Encapsulation offers protection against shock and vibration. Adjustment options are factory fixed, onboard or externally adjustable. The repeat accuracy, under stable conditions, is 0.1%. The factory calibration of the time delay is ± 5%.

Operation (Delayed Interval):
Upon application of input voltage, the T1 delay-on-make time delay begins and the output remains de-energized. At the end of this delay, the output energizes and the T2 interval delay begins. At the end of the interval delay period, the output de-energizes.
Reset: Removing input voltage resets the output and the time delays, and returns the sequence to the first delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

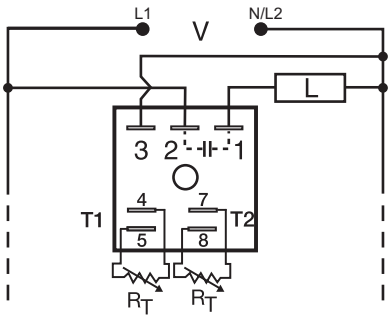
- Delay-on-Make with interval output
- 0.1s - 1000m in 6 ranges
- ±0.1% repeat accuracy
- ±5% factory calibration
- Factory fixed, onboard or external adjust
- Totally solid state & encapsulated
- 24, 120 or 230VAC
- 1A, solid-state output

Approvals:

Auxiliary Products:

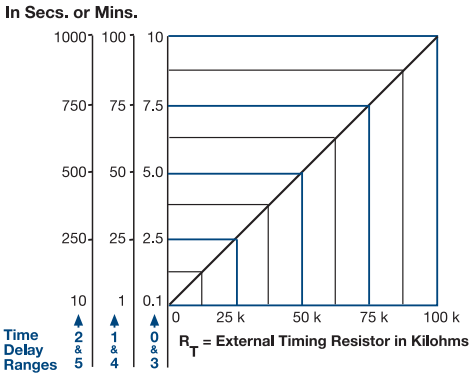
- **External adjust potentiometer:**
  P/N: P1004-95
  P/N: P1004-95-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



R_T is the external adjustment component.
Note: Terminals 4, 5 and/or 7, 8 are included when external adjustment is ordered. A knob is included when onboard adjust is ordered.

External Resistance vs. Time Delay:



This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals; as the resistance increases the time delay increases.
When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 S use a 100 K ohm RT.

Available Models:

ESD52233
ESD54160S2S
ESD54233
ESD54500

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

ESD5 **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Adjustment**
- 1 - Both Times Fixed
- 2 - Both Times External Adj.
- 3 - T1 Fixed, T2 External Adj.
- 4 - T1 External Adj., T2 Fixed
- 5 - Both Times Onboard Adj.
- 6 - T1 Fixed, T2 Onboard Adj.
- 7 - T1 External Adj., T2 Onboard Adj.
- 8 - T1 Onboard Adj., T2 Fixed
- 9 - T1 Onboard Adj., T2 External Adj.

X **T1 Delay-on-Make***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

X **T2 Interval***
- 0 - 0.1 - 10s
- 1 - 1 - 100s
- 2 - 10 - 1000s
- 3 - 0.1 - 10m
- 4 - 1 - 100m
- 5 - 10 - 1000m

*If fixed delay is selected, insert delay (**0.1 - 1000**) followed by (**S**) sec. or (**M**) min.

Specifications

Time Delay
Range . . . . . 0.1s - 1000m in 6 adjustable ranges or fixed
Repeat Accuracy . . . . . ±0.1% or 20ms, whichever is greater
Tolerance (Factory Calibration) . . . . . ≤ ±5%
Reset Time . . . . . ≤ 150ms
Time Delay vs Temp. & Voltage . . . . . ≤ ±2%

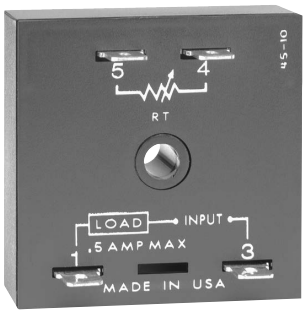
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Power Consumption . . . . . ≤ 2VA

Output
Type . . . . . Solid state
Rating . . . . . 1A steady state, 10A inrush at 60°C
OFF State Leakage Current . . . . . ≅ 5mA @ 230VAC
Voltage Drop . . . . . ≅ 2.5V @ 1A

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ

Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68g)



The TAC1 Series was designed to delay the operation of a compressor relay. It eliminates the possibility of relay chatter due to half-wave failure of the output. It connects in series with the load relay coil and provides a delay-on-make time delay each time input voltage is applied. It can be used for random start, anti-short cycling, sequencing, and many other applications. It is an excellent choice for all air conditioning and refrigeration equipment.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
Reset: Removing input voltage resets the time delay and output.

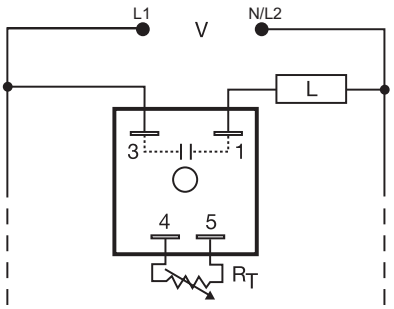
For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features

- UL approved for air conditioning & refrigeration equipment
- Fixed or adjustable delays from 0.05 - 600s
- 24 to 230VAC
- Fail-safe design eliminates contactor chatter problems
- ±2% repeat accuracy

Approvals:

Connection:



Load may be connected to terminals 3 or 1.
R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Megohm
0.05	0.5	2	5	0.0
0.5	10	30	60	0.5
1.0	20	60	120	1.0
1.5	30	90	180	1.5
2.0	40	120	240	2.0
2.5	50	150	300	2.5
3.0	60	180	360	3.0
			420	3.5
			480	4.0
			540	4.5
			600	5.0

* When selecting an external R_T add at least 30% for tolerance of unit and the R_T.

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-XX
  P/N: P1004-XX-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

Time Delay	VTP P/N
1 - 0.05-3s	VTP4B
2 - 0.5-60s	VTP4F
3 - 2-180s	VTP4J
4 - 5-600s	VTP5N

Selection Table for VTP Plug-on Adjustment Accessory.

Available Models:

TAC1223
TAC1411
TAC141150
TAC1412
TAC1413
TAC14164

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TAC1 **X** **X** **X**

Input Voltage
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

Adjustment
- 1 - Fixed
- 2 - External adjust

Time Delay*
- 1 - 0.05 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 600s

*If fixed delay is selected, insert delay (**0.05 - 600**) in seconds.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 600s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2%
Tolerance (Factory Calibration) . . . . . ±20%
Recycle Time . . . . . ≤ 20ms after timing, during timing - 0.1% of time delay or 75ms, whichever is greater
Time Delay vs Temp. & Voltage . . . . . ≤ ±10%
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form . . . . . NO, open during timing
Rating . . . . . 0.5A steady state, 10A inrush at 60°C
Voltage Drop . . . . . 120 & 230VAC: ≅ 4.2V @ 0.5A
24VAC: ≅ 2.5V @ 0.5A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating/Storage Temperature . . . . . -40° to 80°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)

The T2D Series provides protection against short cycling of compressors and other motors. At the end of each operation, a lockout delay prevents restarting the compressor or motor until the delay is completed. 24VAC models can be used with thermostats that include a cooling anticipator resistor. It can be connected in series with the load for delay-on-make operation.

Operation (Lockout with Random Start):
Connection #1: Upon application of input voltage, a random start time delay begins. At the end of this time delay, the output is energized. Lockout Delay: Input voltage must be applied prior to and during timing. When the thermostat or initiate switch opens, the output de-energizes and the lockout time delay begins. At the end of the lockout delay, the output is energized allowing the load to immediately energize when the initiate switch or thermostat closes.
Connection #2: Upon application of input voltage and closure of initiate switch, the time delay begins. At the end of the time delay, the output is energized and remains energized until power is removed.
Reset: Removing power resets the output and the time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Lockout delay prevents rapid recycling of compressor
- Random start delay helps prevent low voltage starting
- Delay-on-make timer optional two terminal series connection
- Totally solid-state 1A output
- 24VAC to 230VAC in 2 ranges

Approvals:

Auxiliary Products:

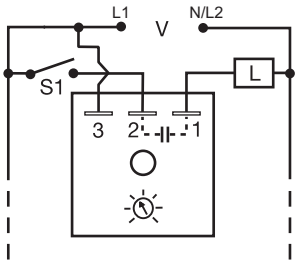
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

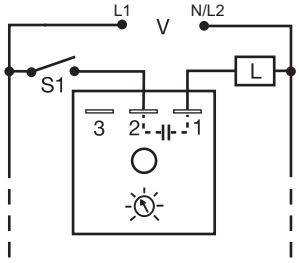
T2D120A1150S
T2D120A15M

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



1
Random Start
Plus Lockout



2
Delay-on-Make

V = Voltage
L = Load
S1 = Initiate Switch or Thermostat

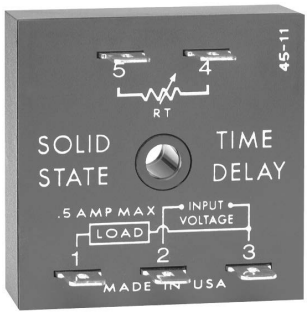
Order Table:

T2D	X	X	X
	Input Voltage	**Adjustment**	**Time Delay***
	24A - 24VAC	1 - Fixed	1 - 1 - 100s
	120A - 120/230VAC	2 - External adjust	2 - 10 - 1000s
			3 - 0.1 - 10m
			4 - 1 - 100m

*If fixed delay is selected, insert delay (**1 - 1000**) followed by (**S**) sec. or (**0.1 - 100**) (**M**) min.

Specifications

Input
Voltage . . . . . 24VAC, or 120/230VAC in 2 ranges
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Minimum Load Current . . . . . 24VAC - 100mA; 120/230VAC - 40mA
Rating . . . . . 1A steady state, 10A inrush at 60°C
Voltage Drop . . . . . ≅ 2.5V @ 1A
Time Delay
Initiate Time . . . . . After timing - 16ms
Type . . . . . Analog circuitry
Lockout & Random Start Delays . . . . . 1s - 100m in 4 adjustable ranges or fixed
Note: The lockout & random start delays are the same length.
Tolerance . . . . . Adjustable: ±30%; factory fixed: ±30%
Repeat Accuracy . . . . . ±1% or 20ms, whichever is greater
Reset Time . . . . . After timing - ≤ 16ms;
During timing - ≤ 200ms
Protection
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)
Cooling Anticipator (24VAC Units Only)
Minimum Cooling Anticipator . . . . . ≥ 3,000 Ω



The TAC4 is a bypass timer that provides a closure across the low-pressure switch during compressor startup. Its time-delay circuit is totally solid state including the normally closed output. The molded housing with encapsulation, the single hole mounting, and 0.25 in. (6.35 mm) termination makes the TAC4 easy to use, rugged, and reliable.

Operation (Bypass Timer):
(As shown in the connection & function diagrams) Upon application of input voltage and closure of controller contact, CC, the load, CR, energizes and the time delay begins. During the time delay, the TAC4's solid-state output bypasses the LPC, low pressure cutout switch. This allows the compressor controlled by CR to start and establish acceptable pressure. At the end of the time delay, TAC4's output de-energizes and remains de-energized until reset. The TAC4 may be used in other applications where a controlling contact must be bypassed for a specified period of time.
Reset: Removing input voltage or opening CC resets the output and time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features

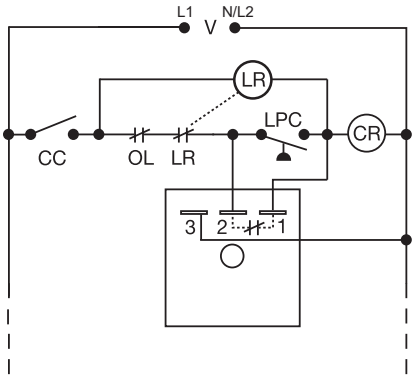
- UL approved for air conditioning & refrigeration equipment
- Fixed or adjustable delays from 0.05 - 600s
- 24, 120 or 230VAC
- Fail-safe design eliminates contactor chatter problems
- ±2% repeat accuracy

Approvals:

Auxiliary Products:

- **External adjust potentiometer:**
  P/N: P1004-12
  P/N: P1004-12-X
- **Female quick connect:**
  P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20
- **Plug-on adjustment module:**
  P/N: VTP(X)(X)

Connection:



V = Voltage
LR = Lockout Relay
OL = Overload or High Pressure Switch
LPC = Low Pressure Cutout
CR = Compressor Control Relay
CC = Controller Contact
R_T is used when external adjustment is ordered.

R_T Selection Chart				
Desired Time Delay* Seconds				R_T
1	2	3	4	Megohm
0.05	0.5	2	5	0.0
0.5	10	30	30	0.5
1.0	20	60	60	1.0
1.5	30	90	90	1.5
2.0	40	120	120	2.0
2.5	50	150	150	2.5
3.0	60	180	180	3.0
			210	3.5
			240	4.0
			270	4.5
			300	5.0

* When selecting an external R_T add at least 30% for tolerance of unit and the R_T.

Time Delay	VTP P/N
1 - 0.05-3s	VTP4B
2 - 0.5-60s	VTP4F
3 - 2-180s	VTP4J
4 - 5-300s	VTP5T

Selection Table for VTP Plug-on Adjustment Accessory.

Available Models:

TAC42110
TAC441120
TAC4415

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TAC4 **X** **Input Voltage**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

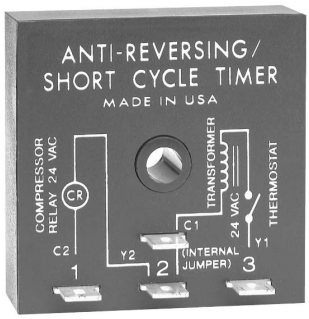
X **Adjustment**
- 1 - Fixed
- 2 - External adjust

X **Time Delay***
- 1 - 0.05 - 3s
- 2 - 0.5 - 60s
- 3 - 2 - 180s
- 4 - 5 - 300s

*If fixed delay is selected, insert delay (**0.05 - 300**) in seconds.

Specifications

Time Delay
Type . . . . . Analog circuitry
Range . . . . . 0.05 - 300s in 4 adjustable ranges or fixed
Repeat Accuracy . . . . . ±2%
Tolerance (Factory Calibration) . . . . . ±20%
Time Delay vs Temp. & Voltage . . . . . ≤±10%
Reset Time . . . . . ≤ 150ms
Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance . . . . . ±20%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form . . . . . NC, closed during timing
Rating . . . . . 0.5A steady state, 10A inrush at 60°C
Voltage Drop . . . . . 120 & 230VAC ≅ 4.2V @ 0.5A
24VAC ≅ 2.5V @ 0.5A
Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Environmental
Operating/Storage Temperature . . . . . -40° to 75°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)



The TA Series prevents rapid recycling of a compressor. A lockout delay is started when the thermostat opens, or input voltage is lost. Eliminates tripped circuit breakers or blown fuses caused by a locked rotor during short cycling. The TA will not allow the compressor to start when the line voltage is low. Chatter of the compressor relay is eliminated. Because of the fast initiate time, bounce of the thermostat will not be transmitted to the compressor relay coil. A 30 second delay provides anti-reversing protection for scroll compressors.

Operation (Lockout):
On initial closure of the S1, the compressor relay energizes immediately. When S1 opens or input voltage is interrupted, a lockout time delay is initiated. During this lockout time delay, the compressor relay cannot be energized. The low voltage (brownout) protection prevents energization of the compressor when the line voltage is low.
Reset: The lockout time delay cannot be reset. After the time delay is completed, the unit automatically resets.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Ideal for HVAC/R applications
- Lockout delay prevents rapid recycling of a compressor
- Low voltage brownout protection
- Circuitry to activate the cooling anticipator (24VAC models)
- Eliminates nuisance service calls due to blown fuse or tripped breakers

Approvals:

Auxiliary Products:

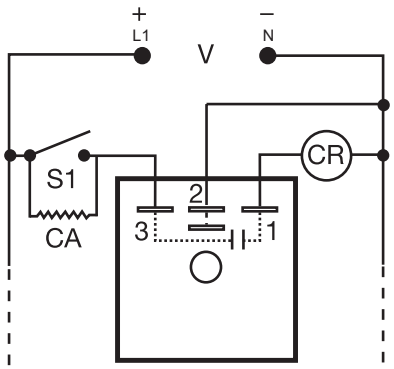
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

TA12D2	TA24A5
TA24A0.5	TA24D0.5
TA24A3	TA24D2

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



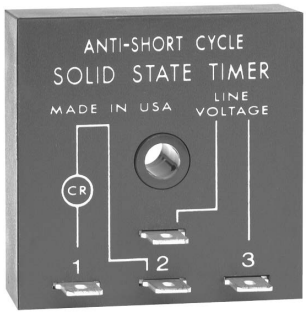
S1 = Initiate Switch, Contact, or Thermostat
CR = Compressor Relay (Load)
CA = Optional Cooling Anticipator
V = Voltage

Order Table:

Input Voltage	Time Delay	Part Number
24VAC	30s	TA24A0.5
24VAC	2m	TA24A2
24VAC	3m	TA24A3
24VAC	5m	TA24A5
12VDC	1m	TA12D1
12VDC	2m	TA12D2
24VDC	30s	TA24D0.5
24VDC	2m	TA24D2
24VDC	3m	TA24D3
24VDC	5m	TA24D5

Specifications

Input
Voltage . . . . . 12 or 24VDC; 24VAC
AC Line Frequency . . . . . 50/60 Hz
Impedance . . . . . 450 Ω (anticipator by-pass)
Output
Minimum Load Current 75mA
Maximum Load Current . . . . . 1A at 60°C
Voltage Drop . . . . . ≤ 1.25V
Time Delay
Initiate Time . . . . . ≅ 16ms
Lockout Time . . . . . Fixed 0.5, 1, 2, 3, or 5m
Tolerance . . . . . -15% - 35%
Protection
Circuitry . . . . . Encapsulated
Low Voltage Protection . . . . . ≅ 20V: 24VAC/DC; ≅ 9V: 12VDC
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature . . . . . -40° to 70°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)
Thermostat
Cooling Anticipator Resistor . . . . . ≥ 1800 Ω



The TL Series provides protection against short cycling of a compressor. At the end of each operation, or whenever power is lost, a lockout delay is initiated. This lockout delay prevents restarting of the compressor until the head pressure has equalized. Compressor relay chatter due to thermostat bounce is eliminated by use of optional one second delay-on-make. The TL Series should not be used with cooling anticipator resistors or solid-state switches. (See the TA Series).

Operation (Lockout):
Lockout: On initial closure of S1, the compressor relay energizes immediately (or after an optional 1 s delay). When the S1 opens or input voltage is interrupted, the output opens and remains open for the lockout time delay. During this lockout time delay period, the compressor relay cannot be re-energized.
Reset: The lockout time delay cannot be reset. After the time delay is completed, the unit automatically resets.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features

- Ideal for HVAC/R applications
- Lockout delay prevents short cycling of a compressor
- Optional 1s delay-on-make prevents contactor chatter
- Totally solid state and encapsulated
- 24VAC to 230VAC in 3 ranges
- Eliminates nuisance service calls due to blown fuse or tripped breakers

Approvals:

Auxiliary Products:

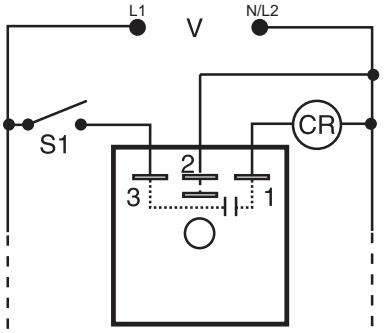
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

TL120A5T
TL230A5
TL230A5T
TL24A5

If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



V = Voltage
S1 = Initiate Switch
CR = Compressor or Control Relay

Order Table:

TL	X	X	X
	Input Voltage	**Lockout Time**	**Delay-on-Make**
	24A - 24VAC	2 - 2m	Blank - No delay
	120A - 120VAC	3 - 3m	T - 1s
	230A - 230VAC	5 - 5m	

Specifications

Input
Voltage . . . . . 24, 120, or 230VAC
AC Line Frequency . . . . . 50/60 Hz
Tolerance . . . . . ±20%

Output
Minimum Load Current . . . . . ≤ 40mA
Maximum Load Current . . . . . 1A @ 24VAC; 0.5A @ 120 & 230VAC at 60°C
Inrush Current . . . . . 10A at 60°C
Voltage Drop . . . . . 24VAC - 2.5V @ 1A
120 & 230VAC - 4.2V @ 0.5A

Time Delay
Initiate Time . . . . . ≅ 8ms
Lockout Time* . . . . . Fixed 2, 3, or 5m
Tolerance . . . . . -15% - 35%
Option . . . . . 1s delay-on-make eliminates contactor chatter due to thermostat bounce

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ

Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature . . . . -40° to 70°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)

*Power must be applied for at least 15 s to achieve a full lockout delay. Less than 15s will result in proportionally shorter delay periods.
NOTE: Cooling anticipator resistor or leakage may cause erratic operation. See TA Series for use with 24VAC systems that include anticipator resistors or use solid-state switches.

The CT Series combines a delay-on-make and delay-on-break time delay into one unit and may be used to control fan delays in heating and/or cooling equipment. The CT includes bypass circuitry to allow it to operate with cooling anticipators ≥ 3000 ohms. It is designed to operate in 24VAC control circuits. Several CT modules may be combined to provide sequencing on of any number of loads and sequencing off of the same loads, such as electric heating elements.

Operation (Delay-on-Make/Delay-on-Break):
Forced Air Heating or Air Conditioning (as shown): When the thermostat closes, the compressor relay is immediately energized. At the end of a fixed delay-on-make delay (T1), the fan relay is energized. When the thermostat opens, the compressor relay is de-energized and the delay-on-break delay is initiated. On completion of the fixed delay-on- break delay (T2) the fan relay is de-energized. If the thermostat is reclosed during the delay-on-break delay, the delay-on-break delay is reset and the fan relay remains energized. If the thermostat is closed when input voltage is applied, the delay-on-make delay (T1) begins as normal.
Reset: Removing input voltage resets the output and time delays.

For more information see:
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:

- Delay-on-make and delay-on-break in one unit
- Use for fan delays in heating or cooling equipment
- Use for multiple load sequencing
- 24VAC operation
- Factory fixed delays from 1 - 600s in 1s increments

Approvals:

Auxiliary Products:

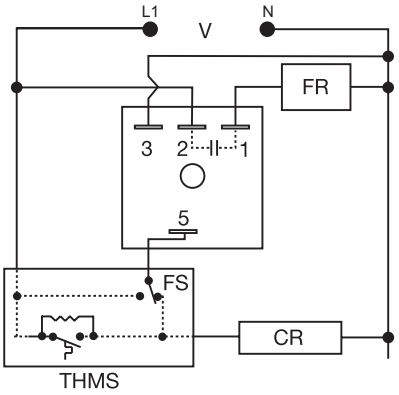
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

CT1S12
CT1S30
CT1S300
CT1S45
CT1S8
CT1S90
CT30S1
CT45S45
CT5S300

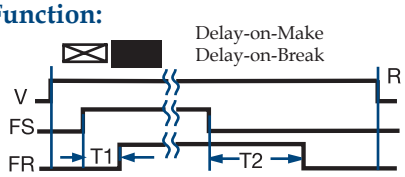
If desired part number is not listed, please call us to see if it is technically possible to build.

Connection:



CR = Compressor Relay
THMS = Wall Thermostat

Function:



V = Voltage
R = Reset
FS = Fan Switch
FR = Fan Relay
T1 = Delay-on-Make
T2 = Delay-on-Break

Order Table:

CT **X** **X**

Delay-on-Make (fixed)
Specify time in seconds from **1 - 600**s followed by (S)

Delay-on-Break (fixed)
Specify time in seconds from **1 - 600**s

Specifications

Time Delay
Type . . . . . Microcontroller
Range . . . . . 1 - 600s
Repeat Accuracy . . . . . ±5%
Tolerance (Factory Calibration) . . . . . ±20%
Recycle Time . . . . . ≤ 300ms
Input
Voltage 24VAC
Tolerance . . . . . ±15%
AC Line Frequency . . . . . 50/60 Hz
Output
Type . . . . . Solid state
Form . . . . . NO
Rating . . . . . 0.75A steady state, 5A inrush at 55°C
Voltage Drop . . . . . ≅ 1.25V

Protection
Circuitry . . . . . Encapsulated
Dielectric Breakdown . . . . . ≥ 2000V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Mechanical
Mounting . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating/Storage Temperature . . . . . -40° to 70°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.4 oz (68 g)
Thermostat . . . . . Anticipator Resistor: ≥ 3000 Ω

The HRV combines the accuracy of microcontroller based circuitry with an electromechanical relay output. The HRV's switching capacity allows direct control of loads like compressors, pumps, motors, heaters, and lighting. The HRV "S" version provides a vend time after the selected number of initiate switch closures to start is reached. The HRV "A" version includes all of the "S" features and allows the total vend time to be extended for each additional initiate switch closure. The HRV is ideal for cost sensitive single coin or token vending machines. The electronic circuitry is encapsulated to protect against humidity and vibration.

Features

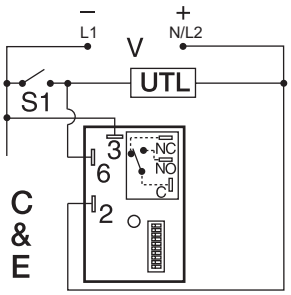
- Accumulates 1 - 256 coins
- Switch selectable 1 - 7 coins to start
- Vend time from 1s - 31.75m
- Coin switch can be connected to a counter
- Up to 30A, 1 Hp at 125VAC, NO contacts
- Encapsulated circuitry

Approvals:

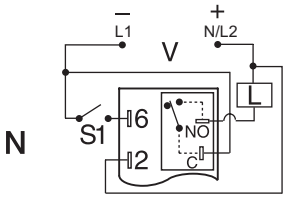
Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Connection:



Isolated Output



Non-Isolated Output

V = Voltage
S1 = Initiate Switch
L = Load
UTL = Optional Untimed Load

Operation

Coin Totalizer & Vending Timer ("S" Version):
Input voltage must be applied prior to & during operation. When the total number of S1 initiate switch closures equals the number to start set on the lower 3 DIP switches, the load energizes and the vending time set on the upper 7 DIP switches begins. At the end of the vending time, the load de-energizes and the vending time is reset. Closing the initiate switch during vend timing will have no affect on vend time delay.
Accumulating Vending Timer ("A" Version):
Input voltage must be applied prior to & during operation. When the total number of S1 initiate switch closures equals the number to start set on the lower 3 DIP switches, the load energizes and the vending time starts. For every initiate switch closure, the HRV unit adds one time per coin period, as set on the upper 7 DIP switches, to the total vending time.
Operation Note: If S1 is closed when input voltage is applied, the output remains de-energized and the S1 counter remains at zero closures. At least one "vend time" and one "closures to start" DIP switch must be in the "ON" position for proper operation.
Reset: Removing input voltage resets the vend time delay, the S1 closure counter, and de-energizes the output relay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Available Models:

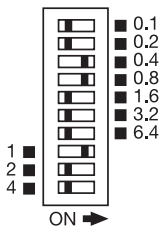
HRV11SC	HRV41SC
HRV24AC	HRV41SE
HRV31AC	HRV42SE
HRV31SC	HRV43AE
HRV41AE	HRV43AN

If desired part number is not listed, please call us to see if it is technically possible to build.

Switch Adjustment

Combine upper seven switches in "ON" position for vend time in minutes.

Combine lower three switches in "ON" position for number of closures to start.



Order Table:

HRV **X** **Input Voltage**
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X **Vend Time**
- 1 - 1 - 127s
- 2 - 5 - 635s
- 3 - 0.1 - 12.7m
- 4 - 0.25 - 31.75m

X **Mode of Operation**
- S - Coin totalizer vending timer
- A - Accumulating vending timer

X **Output Form & Rating**
- C - 30A SPDT - NO (Isolated)
- E - 30A SPDT - NO (Isolated)
- N - 30A SPDT - NO (Non-Isolated)

Specifications

Count Functions/Switch Type	Mechanical (counts on switch closure)
Minimum Switch Closure Time	≥ 20ms
Min. Switch Open (between closures) Time	≥ 20ms
Count Range to start	1 - 7 counts
Maximum Counts ("A" Version)	250
Time Delay/Range ***	Adjustable 1s - 31.75m in 4 ranges
Adjustment	7 of a 10 position DIP switch
Setting Accuracy	0% to +2% or 50ms, whichever is greater
Repeat Accuracy	±0.1% or 20ms, whichever is greater
Reset Time	≤ 150ms
Time Delay vs Temp. & Voltage	≤ ±2%
Input	
Voltage	12 or 24VDC; 24, 120, or 230VAC
Tolerance 12VDC & 24VDC/AC	-15% - 20%
Tolerance 120 & 230 VAC	-20% - 10%
AC Line Frequency / DC Ripple	50/60 Hz / ≤ 10%
Power Consumption	AC ≤ 4VA; DC ≤ 2W
Output	
Type	Electromechanical relay
Form	Isolated, SPDT or non-isolated, SPDT

Ratings:		SPDT-NO	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**

Life	Mechanical - 1 x 10^6; Electrical - 1 x 10^5, *3 x 10^4, ** 6,000
Protection	
Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Dielectric Breakdown	≥ 1500V RMS input to output on isolated units
Insulation Resistance	≥ 100 MΩ
Mechanical	
Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	3 x 2 x 1.5 in (76.7 x 51.3 x 38.1 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals
Environmental	
Operating/Storage Temperature	-40° to 70°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≈ 3.9 oz (111 g)

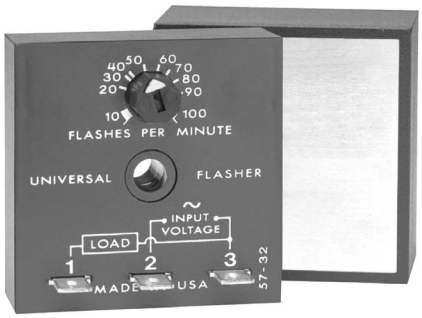
***For CE approved applications, voltage must be removed when a switch position is changed.

Series Included

Solid State

Relay

Chasers



The FSU1000 incorporates an onboard adjustable flash rate of 10 to 100 FPM and a universal input voltage in one device. Its circuitry is encapsulated and is capable of controlling loads of up to 20A. The versatility of the FSU1000 makes it ideal for applications where various flash rates and operating voltages are required.

Operation
When input voltage is applied to terminal 2 and the load (lamp), the load energizes steadily. When input voltage is applied to terminal 3, the output flashes.
Optional Low Current Switch (S1)
This low current switch could be a limit switch or contact. While open, the operator sees the load (lamp) ON and operating. When the limit switch closes, the load (lamp) flashes to attract attention.

For more information see:
Appendix A, page 164 for Flasher (NC) function.
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 168, Figure 1 for connection diagram.

Features:

- All solid state – no moving parts or contacts
- Onboard adjustable flash rate
- Loads up to 20A
- High inrush up to 200A
- Universal voltage 24 to 240VAC

Approvals:

Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18

Order Table:

Rating	Inrush Rating	Part Number
1A	10A	FSU1000
6A	60A	FSU1003
10A	100A	FSU1004
20A	200A	FSU1005

Available Models:

FSU1000
FSU1003
FSU1004

Specifications

Technical Data
Operation . . . . . ON/OFF recycling solid-state flasher (continuous duty)
Flash Rate . . . . . Adjustable 10 - 100 FPM
ON/OFF Ratio . . . . . ≅ 50%
Input
Range/Frequency . . . . . 24 to 240VAC/50/60Hz
Output
Load Type . . . . . Inductive, resistive, or incandescent
Maximum Load Rating. . . . . 1, 6, 10, or 20A steady state
Inrush. . . . . 10 times steady state current

Mechanical
Mounting* . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination. . . . . 0.25 in. (6.35 mm) male quick connect terminals
Protection
Circuitry . . . . . Encapsulated
Environmental
Operating / Storage Temperature. . . -20° to 60°C (240VAC +50°C) / -40° to 85°C
Weight . . . . . 1A units: ≅ 2.4 oz (68 g)
≥ 6A units: ≅ 3.9 oz (111 g)

*Units rated ≥ 6A must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.

The FS100 Series (low amp) may be used to control inductive, incandescent or resistive loads. This series offers a 1A (fullwave) or a 2A (halfwave) steady state, 10A inrush solid-state output and may be ordered with an input voltage of 24 or 120VAC. The FS100 Series offers a factory fixed flash rate of 75 FPM or may be ordered with a fixed, custom flash rate ranging from 45 to 150 FPM. Ideal for OEM applications where cost is a factor.

Operation
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2.

For more information see:
Appendix A, page 164 for Flasher (OFF First) function.
Appendix B, page 165, Figure 12 for dimensional drawing.
Appendix C, page 168, Figure 2 for connection diagram.

Features:

- Fixed flash rate 75 FPM
- Custom flash rate 45 - 150 FPM
- 1 or 2A output
- 24 or 120VAC
- Small size: 1.5 x 0.94 in. (38 x 23.9 mm)

Approvals:

Available Models:

FS126
FS126-45
FS126-60
FS126RC
FS126RC-90
FS127
FS146
FS146RC

Order Table:

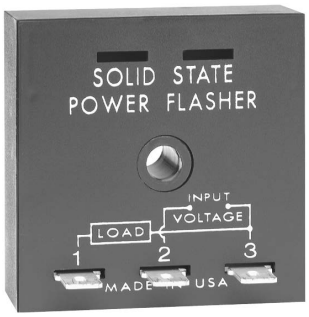
Input	Output Rating	Output Type	Load Type*	Part Number
120VAC	1A	AC, Fullwave	A	FS126
120VAC	1A	AC, Fullwave	B	FS126RC
120VAC	2A	AC, Halfwave	A	FS127
24VAC	1A	AC, Fullwave	A	FS146
24VAC	1A	AC, Fullwave	B	FS146RC
24VAC	2A	AC, Halfwave	A	FS147

*Load Type:
A-Incandescent & Resistive
B-Incandescent, Resistive & Inductive

Add the suffix "-##" to any part number to indicate the custom flash rate.

Specifications

Technical Data
Operation . . . . . OFF/ON solid-state flasher (continuous duty)
Flash Rate . . . . . Factory fixed at 75 FPM ±20%
Custom Flash Rates Available . . . From 45 - 150 FPM ±20%
ON/OFF Ratio . . . . . ≅ 50%
Input
Voltage. . . . . 24, 120VAC, ±15%
AC Line Frequency 50/60Hz
Output
Output . . . . . Fullwave AC or Halfwave rectified AC
Load Type . . . . . Incandescent, resistive, or inductive
(Choose RC suffix for inductive loads)
Maximum Load Rating. . . . . Fullwave: 1A steady state
Halfwave: 2A steady state
Inrush. 10A
Mechanical
Mounting . . . . . Removable mounting bracket, use one #8 (M4 x 0.7) screw
Connection/Wires . . . . . 18 AWG (0.82mm^2) wires 6 in. (15.2cm)
Dimensions. . . . . 1.5 x 0.94 in. (38.1 x 23.9 mm)
Protection
Circuitry . . . . . Encapsulated
Environmental
Operating / Storage Temperature -20° to 60°C / -40° to 85°C
Humidity. . . . . 95% relative, non-condensing
Weight . . . . . ≅ 1.1 oz (31 g)



The FS100 Series (medium amp) may be used to control inductive, incandescent, or resistive loads. Input voltages of 24, 120, or 230VAC are available. Factory fixed flash rate of 90 FPM or may be ordered with a fixed, custom flash rate ranging from 10 to 300 FPM. Encapsulation provides protection against shock, vibration, and humidity. This group of solid-state flashers has proven reliability with years of use throughout the world.

Operation
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2.

For more information see:
Appendix A, page 164 for Flasher (OFF First) function.
Appendix B, page, 165, Figure 1 for dimensional drawing.
Appendix C, page168, Figure 3 for connection diagram.

Features:

- Fixed at 90 FPM
- Custom flash rate 10 - 300 FPM
- Switches inrush currents up to 30A
- 24, 120, or 230VAC input voltages
- Totally solid state & encapsulated

Approvals:

Auxiliary Products:

- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Order Table:

Input Voltage	Rating	Part Number
24VAC	3A	FS143
120VAC	3A	FS152
230VAC	3A	FS162

Add the suffix "-##" to any part number to indicate the custom flash rate.

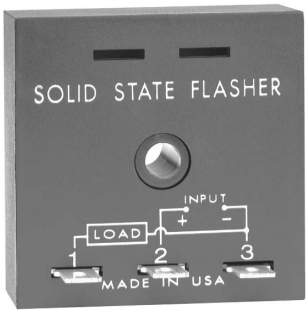
Available Models:

FS143, FS152, FS152-30, FS152-50, FS152-60, FS162, FS162-30

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

Technical Data
Operation. . . . . OFF/ON solid-state flasher (continuous duty)
Flash Rate . . . . . Fixed at 90 FPM ±10%
Custom Flash Rates . . . . . 10 - 300 FPM ±10%
ON/OFF Ratio . . . . . ≅ 50%
Input
Voltage/Frequency . . . . . 24, 120, or 230VAC ±15%/50/60 Hz
Output
Load Type . . . . . Inductive, resistive, or incandescent
Output . . . . . Fullwave AC, solid state, SPST
Maximum Load Rating . . . . . 3A steady state
Inrush. . . . . 10 times steady state current
Mechanical
Mounting. . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination. . . . . 0.25 in. (6 .35 mm) male quick connect terminals
Protection
Circuitry. . . . . Encapsulated
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Weight . . . . . ≅ 2.2 oz (62 g)



The FS200 Series may be used to control inductive, incandescent, or resistive loads. Input voltages of 12, 24, 36, 48, or 110VDC are available. Factory fixed flash rate of 90 FPM or may be ordered with a fixed custom flash rate ranging from 10 to 180 FPM. Encapsulation provides protection against shock, vibration, and humidity. Uniform performance, high inrush current capability, and low RFI, make this series ideal for general industrial applications.

Operation
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2.

For more information see:
Appendix A, page 164 for Flasher (OFF First) function.
Appendix B, page, 165, Figure 1 for dimensional drawing.
Appendix C, page 168, Figure 4 for connection diagram.

Features:

- Fixed at 90 FPM
- Custom flash rate 10 - 180 FPM
- 3A, SPST output contact
- 12 to 110VDC input voltages in 5 ranges
- Totally solid state & encapsulated
- 0.25 in. (6.35 mm) male quick connects

Auxiliary Products:

- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Order Table:

Input Voltage	Rating	Part Number
12VDC ±20%	3A	FS219
24VDC ±20%	3A	FS224
36VDC ±20%	1A	FS236
48VDC ±15%	0.75A	FS248
110VDC ±15%	0.25A	FS290

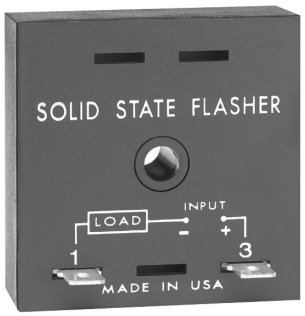
Available Models:

FS224

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

Technical Data
Operation. . . . . OFF/ON solid-state flasher (continuous duty)
Flash Rate . . . . . Fixed at 90 FPM ±10%
Custom Flash Rate . . . . . 10 - 180 FPM
ON/OFF Ratio . . . . . ≅ 50%
Input
Voltage . . . . . 12, 24, 36, 48, or 110VDC
Output
Load Type . . . . . Inductive, resistive, or incandescent
Maximum Load Rating . . . . . 0.25 - 3A steady state
OFF State Leakage Current
12 & 24VDC. . . . . ≤ 250 µA
Inrush. . . . . 10 times steady state current
Mechanical
Mounting. . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination. . . . . 0.25 in. (6.35 mm) male quick connect terminals
Protection
Circuitry. . . . . Encapsulated
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -40° to 85°C
Weight . . . . . ≅ 2.2 oz (62 g)



The FS300 Series of solid-state flashers were specifically designed to operate lamp loads. Their two-terminal series connection feature makes installation easy. The high immunity to line noise and transients makes the FS300 Series ideal for moving vehicle applications. All solid-state construction means reliability and long life. The FS300 Series offers a factory fixed flash rate of 75 FPM or may be ordered with a fixed, custom flash rate ranging from 60 to 150 FPM.

Operation

Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to T2.

For more information see:
Appendix A, page 164 for Flasher (OFF First) function.
Appendix B, page 165, Figure 1 for dimensional drawing.
Appendix C, page 168, Figure 5 for connection diagram.

Features:

- All solid state – no moving parts or contacts
- High surge capability – designed to operate incandescent lamp loads
- High noise & transient protection
- Two-terminal series connection
- Encapsulated – protects against shock, vibration, & humidity

Auxiliary Products:

- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

FS312
FS324
FS336
FS390

Order Table:

Input	Maximum Current Load	Part Number
12VDC ±20%	2.5A	FS312
24VDC ±20%	1.5A	FS324
36VDC ±20%	1A	FS336
48VDC ±15%	0.75A	FS348
72VDC ±15%	0.5A	FS372
110VDC ±15%	0.25A	FS390

Specifications

Technical Data
Operation. . . . . OFF/ON recycling solid-state flasher (continuous duty)
Flash Rate . . . . . Fixed at 75 FPM ±10%
Custom Flash Rates . . . . . 60 - 150 FPM
ON/OFF Ratio . . . . . ≅ 50%
Input
Voltage . . . . . 12, 24, 36, 48, 72, & 110VDC
Output
Load Type . . . . . Incandescent or resistive
Maximum Load Rating . . . . . 0.25 - 2.5A steady state
Inrush. . . . . 10 times steady state current

Mechanical
Mounting. . . . . .Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . .2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination. . . . . .0.25 in. (6.35 mm) male quick connect terminals
Protection
Circuitry. . . . . .Encapsulated
Environmental
Operating/Storage Temperature . . . .-20° to 60°C / -40° to 85°C
Humidity. . . . . .95% relative, non-condensing
Weight . . . . . .≅ 2.2 oz (62 g)

The FS400 Series is a low leakage AC flasher designed to control LED, or resistive loads. This series offers a solid-state output and may be ordered with an input voltage of 24V to 240VAC, in two ranges. It offers a factory fixed flash rate of 75 FPM or may be ordered with a fixed, custom flash rate ranging from 45 to 150 FPM. The FS400 is the perfect solution for LED lamp flashing.

Operation

Upon application of input voltage, the output energizes and the ON time begins. At the end of the ON time, the output de-energizes and the OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and the flash sequence.

For more information see:
Appendix A, page 164 for Flasher (ON First) function.
Appendix B, page 165, Figure 12 for dimensional drawing.
Appendix C, page 168, Figure 6 for connection diagram.

Features:

- Low leakage for LED lamps
- Fixed flash rate at 75 FPM
- Custom flash rate 45 - 150 FPM
- 0.5 or 1A, solid-state output
- 24V to 240VAC in 2 ranges
- Small size: 1.5 x 0.94 in. (38 x 23.9 mm)

Approvals:

Available Models:

FS491

Order Table:

Input Voltage	Output Rating	Part Number
120 to 240VAC	0.5A	FS491
24VAC	1A	FS421

Specifications

Technical Data
Operation. . . . . .ON/OFF solid-state flasher (continuous duty)
Flash Rate . . . . . .Fixed at 75 FPM ±20%
Custom Flash Rates . . . . . .45 - 150 FPM ±20%
ON/OFF Ratio . . . . . .≅ 50%
Input
Voltage . . . . . .24, or 120 - 240VAC
Tolerance . . . . . .± 15%
AC Line Frequency 50/60Hz
Output
Load Type . . . . . .LED or resistive
Output . . . . . .Bridge Rectifier & FET
Maximum Load Rating
120VAC to 240VAC. . . . . .0.5A steady state; 5A inrush
24VAC. . . . . .1A steady state; 10A inrush

Max. Load Leakage Current. 250µA
Voltage Drop. . . . . .2V typical
Mechanical
Mounting. . . . . .Surface mount with one #8 (M4 x 0.7) screw
Dimensions . . . . . .1.5 x 0.94 in. (38.1 x 23.9 mm)
Protection
Surge . . . . . .IEEE C62.41 - 1991 Level A
Circuitry. . . . . .Encapsulated
Environmental
Operating/Storage Temperature. . . . . .-20° to 60°C / -40° to 85°C
Humidity. . . . . .95% relative, non-condensing
Weight . . . . . .≅ 1.1 oz (31 g)

The FS500 Series flash rate is adjustable from 10 to 100 FPM. A locknut is provided to hold selected flash rate. The long-life electronic circuit combined with a quality electromechanical relay provides flexibility and reliability in most applications.

Operation
Upon application of input voltage, the output relay is energized and the ON time begins. At the end of the ON time, the output relay de-energizes and the OFF time begins. At the end of the OFF time, the output is energized and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and the sequence.

For more information see:
Appendix A, page 164 for Flasher (ON First-DPDT) function.
Appendix B, page 165, Figure 9 for dimensional drawing.
Appendix C, page 168, Figure 8 for connection diagram.

Features:

- Solid-state circuitry - relay output
- Industrial standard octal plug-in
- Adjustable flash rate 10 - 100 FPM
- 10A, DPDT output contacts

Approvals: (some models)

Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **Octal 8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **DIN rail:** P/N: C103PM (Al)

Order Table:

Input Voltage	Part Number
12VDC	FS512
24VAC/DC	FS524
120VAC/DC	FS590
230VAC	FS599

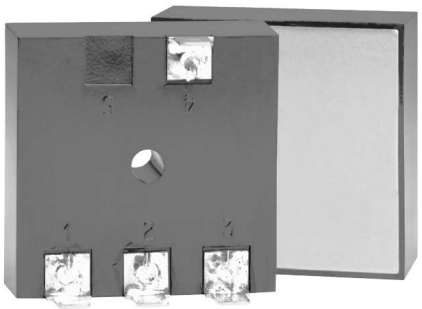
Available Models:

FS512
FS524
FS590

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

Technical Data
Operation . . . . . ON/OFF recycling flasher with adjustable flash rate
Flash Rate . . . . . Adjustable from 10 - 100 operations per minute (guaranteed range)
ON/OFF Ratio . . . . . ≅ 50%
Input
Input Voltage. 12VDC, 24VAC/DC, 120VAC/DC, 230VAC
Tolerance 12VDC & 24VDC/AC . . . . -15% - 20%
120 - 230VAC/DC . . . . -20% - 10%
AC Line Frequency 50/60Hz
Output
Load Type . . . . . Electromechanical relay
Form . . . . . DPDT
Rating. . . . . 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/ 240VAC
Mechanical
Mounting. . . . . Plug-in socket
Dimensions . . . . . 3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)
Termination. . . . . Octal 8-pin plug-in
Protection
Isolation Voltage. . . . . ≥ 1500V RMS input to output
Polarity. . . . . DC units are reverse polarity protected
Environmental
Operating / Storage Temperature . . . . . -20° to 60°C / -30° to 85°C
Weight . . . . . ≅ 5.8 oz (164 g)



The AF Series offers a high inrush capacity of up to 200A. These devices exceed mechanical type relays in both performance and lifespan. The AF Series is constructed with no moving parts to arc, wear, and eventually fail; 100 million operations are typical. Circuitry is encapsulated to provide protection against vibration and moisture, making the AF Series ideal for outdoor applications.

Operation
Upon application of input voltage T1 begins, Load 1 is ON and Load 2 is OFF. At the end of T1, T2 begins and Load 2 is now ON and Load 1 is OFF. At the end of T2, T1 repeats and this sequence continues until input voltage is removed. The duration of T1 and T2 is approximately equal.
Reset: Removing input voltage resets the flasher.

For more information see:
Appendix A, page 164 for Flasher (Alternating) function.
Appendix B, page 166, Figure 13 for dimensional drawing.
Appendix C, page 168, Figure 7 for connection diagram.

Features:

- Alternately flashes two high current loads
- High surge capacity - up to 200A
- Small size - 2 x 2 x 1.30 in. (50.8 x 50.8 x 33 mm)
- Totally solid state & encapsulated

Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Quick connect to screw adaptor:**
  P/N: P1015-18

Order Table:

AF **X** **X** **X**

X — Input Voltage
- 1 - 24VAC
- 2 - 120VAC
- 3 - 230VAC

X — Output Rating
- 1 - 6A
- 2 - 10A
- 3 - 20A

X — Flash Rate (flashes per min.)
- 1 - 10
- 2 - 30
- 3 - 60
- 4 - 90
- 5 - 120
- 6 - 140
- Blank - Custom Flash Rate

Available Models:

AF213
AF223
AF232
AF233

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

Technical Data
Operation. . . . . Alternating solid-state flasher rated (continuous duty)
Flash Rate . . . . . Factory fixed at 10, 30, 60, 90, 120, or 140 flashes per min. ±10%.
Custom Flash Rate . . . . . 10 - 140 FPM
Ratio . . . . . ≅ 50%
Input
Input Voltage/Frequency . . . . . 24, 120, or 230VAC ±15% / 50/60Hz
Output
Load Type . . . . . Incandescent or resistive
Maximum Load Rating . . . . . 6, 10, & 20A steady state
Inrush. . . . . 10 times steady state current
Mechanical
Mounting * . . . . . Surface mount with one #10 (M5 x 0.8) screw
Dimensions . . . . . 2 x 2 x 1.30 in. (50.8 x 50.8 x 33 mm)
Protection
Circuitry. . . . . Encapsulated
Environmental
Operating/Storage Temperature . . . -20° to 60°C / -40° to 85°C
Humidity. . . . . 95% relative, non-condensing
Weight . . . . . ≅ 2.9 oz (82 g)
*Must be bolted to metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.

The SC3/SC4 Series are solid-state 3 or 4 channel, chasers designed for sequential three or four circuit flashing of incandescent lamp loads. Unlike electromechanical chasers, there are no contacts to arc, wear, and eventually fail. Fixed or adjustable rates of 30 to 300 operations per minute.

Operation

Sequential 3 or 4 circuit flashing of incandescent loads with equal time delays for each load. Upon application of input voltage, Load 1 is energized. At the end of the time delay, Load 1 de-energizes and Load 2 energizes. At the end of the time delay, Load 2 de-energizes and Load 3 energizes. This cycle continues until input voltage is removed.
Reset: Removing input voltage resets the unit and cycle.

For more information see:
Appendix A, page 164 for Flasher (Chasing) function.
Appendix B, page 166, Figure 14 for dimensional drawing.
Appendix C, page 168, Figure 9 for connection diagram.

Features:

- Sequential 3 or 4 circuit flashing of incandescent loads
- Fixed or adjustable at 30 - 300FPM
- 1A steady state output
- 24, 120, or 230VAC input voltage
- Totally solid state - encapsulated

Approvals: CE cULus

Auxiliary Products:

- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

SC3120F30

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

SC3 (3 outputs) **SC4** (4 outputs)	**X** **Input Voltage** 24 - 24VAC 120 - 120VAC 230 - 230VAC	**X** **Rate** A - Adjustable (30 - 300) F - Fixed*

*If Fixed is selected, insert (30 - 300) operations per minute.

Specifications

Technical Data

Operation	Sequential 3 or 4 circuit flashing of incandescent lamp loads. Fixed or adjustable rates.
Rate	Adjustable: 30 - 300 operations per minute Fixed: 30 - 300 operations per minute (±10%)

Input

Voltage	24, 120, or 230VAC ±15%
AC Line Frequency	50/60 Hz

Output

Type	Solid state
Rating	1A steady state per output

Mechanical

Mounting	Surface mount with two #6 (M3.5 x 0.6) screws
Termination	0.25 in. (6.35 mm) male quick connect terminals
Dimensions	3.5 x 2.5 x 1.22 in. (88.9 x 63.5 x 31 mm)

Protection

Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ

Environmental

Operating / Storage Temperature	-20° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 5.4 oz (153 g)

Series Included

3-Phase Voltage Monitors

Low Volts, Phase Reversal

Phase Reversal

1-Phase Voltage Monitors

The WVM Series provides protection against premature equipment (motor) failure caused by voltage faults on the 3-phase line. The WVM's microcontroller design provides reliable protection even if regenerated voltages are present. It combines dependable fault sensing with a 10 fault memory and a 6 LED status display. Part instrument, part control, the WVM protects your equipment when you're not there and displays what happened when you return. The WVM is fully adjustable and includes time delays to prevent nuisance tripping and improve system operation. Time delays include a 0.25 to 30s adjustable trip delay, an adjustable 0.25 to 64m (in 3 ranges) restart delay, plus a unique 3 to 15s true random start delay. The random start delay prevents voltage sags caused by simultaneous restarting of numerous motor loads after a power outage.

Features:

- Protects against phase loss & reversal; over, under & unbalanced voltages; & short cycling
- 10 fault memory & status displayed on 6 LED readout
- Switch selectable automatic restart, delayed automatic restart, & manual reset
- Isolated, 10A, SPDT output contacts
- ASME A17.1 Rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Auxiliary Products:

- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)

Available Models:

WVM011AL	WVM911AL
WVM611AH	WVM911AL-60
WVM611AL	WVM911RL
WVM811AH	WVM911RN-60
WVM911AH	

If desired part number is not listed, please call us to see if it is technically possible to build.

For more information see:
Appendix B, page 166, Figure 15 for dimensional drawing.
Appendix C, page, 168, Figure 10 for connection diagram.

Operation

The output relay is energized when all conditions are acceptable and the WVM is reset. A restart and/or random start delay may occur before the output relay is energized.

Field Adjustment: Select the line voltage listed on the motor's name plate. This automatically sets the over and undervoltage trip points. No further adjustment should be required to achieve maximum equipment protection.

Read Memory: Fault(s) stored in the memory are indicated when the yellow LED is flashing, up to 10 faults are noted.

Memory Reset: To clear the memory of all faults stored, rotate selector to Clear Memory for 5 seconds. The yellow LED will turn off.

Memory Overload: Only the 10 most recent faults are retained.

Random Start Delay: A new 3 to 15s random start delay is selected by the microcontroller when a fault is corrected and when the operating voltage (L1, L2, L3) is applied to the WVM. A random start delay does not occur when the reset is manual.

Automatic Restart: Upon fault correction, the output will re-energize after a random start delay.

Automatic Restart Upon Fault Trip: When a fault is sensed for the full trip delay, the output de- energizes and a restart delay is initiated. This delay locks out the output for the delay period. Should the fault be corrected by the end of the restart delay, the output will re-energize after a random start delay. A restart delay will also occur when operating voltage (L1, L2, L3) is applied to the WVM.

Manual Reset: After a fault condition is corrected, the WVM can be manually reset. There are two methods; a customer supplied remote switch, or the onboard selector switch.

Manual Reset (Onboard): Rotate selector switch from the Manual Reset position to Auto Restart w/ Delay then back again to Manual Reset within 3 seconds. The output will immediately energize.

Remote Reset: Reset (Restart) is accomplished by a momentary contact closure across terminals 1 & 2. The output will immediately energize. Remote switch requirements are ≥10mA @ 20VDC and the reset terminals are not isolated from line voltage. A resistance of ≤20KΩ across terminals 1 & 2 will cause immediate automatic restart.

Automatic Restart Upon Fault Correction: (P/N includes an R)

When a fault is sensed for the full trip delay, the output relay de-energizes. Upon correction of the fault, a restart delay begins. At the end of this delay, the output will re-energize after a random start delay. If a fault occurs during restart timing, the restart time delay will be reset to zero, and the output will not energize until the restart delay is completed.

Order Table:

WVM **X** **X** **X** **X** **X**

3-Phase Line Voltage
- 6 - 200-240VAC
- 8 - 355-425VAC
- 9 - 400-480VAC
- 0 - 500-600VAC

Unbalance
- 1 - 2-10%

Trip Delay
- 1 - 0.25-30s

Reset Method
- A - Switch Selectable: Automatic restart upon fault trip
- R - Swith Selectable: Automatic restart upon fault correction

Restart Delay
- L - 0.25-64s
- N - 6-300s
- H - 0.25-64m

-60 Option: Add the suffix -60 to any automatic restart part number to remove the random start delay feature.

Specifications

Line Voltage

Type . . . . . 3-phase delta or wye with no connection to neutral

Operating Voltage	Model	Adj. Line Voltage Range
	240	200-240VAC
	380	355-425VAC
	480	400-480VAC
	600	500-600VAC

AC Line Frequency . . . . . 50/60 Hz

Overvoltage, Undervoltage, & Voltage Unbalance

Overvoltage Trip Point . . . . . 109-113% of adjusted voltage
Reset Voltage . . . . . -2% of trip point
Undervoltage Trip Point . . . . . 88-92% of adjusted voltage
Reset Voltage . . . . . +2% of trip point
Voltage Unbalance . . . . . Adjustable from 2-10%*
Trip Delay . . . . . Adjustable from 0.25 - 30s ±15%
Phase Loss . . . . . ≥ 15% unbalance
Response Time . . . . . ≤ 200 ms
Random Start Delay Range . . . . . 3 - 15s

Reset (Restart) Delay

Low Range . . . . . 0.25-64s ±15%
Normal Range . . . . . 6-300s ±15%
High Range . . . . . 0.25-64m ±15%

Fault Memory

Type . . . . . Nonvolatile RAM
Capacity . . . . . Stores last 10 faults
Status Indicators . . . . . 6 LEDs provide existing status & memory readout
Note: 50% of operating line voltage must be applied to L1 & L2 for operation of status indicators

Output

Type . . . . . Electromechanical relay
Form . . . . . Isolated, SPDT
Rating . . . . . 10A resistive @ 250VAC; 6A inductive (0.4 PF) @ 250VAC
Life . . . . . Mechanical - 1 x 10^7

Protection

Surge . . . . . IEEE 62.41-1991 Level B
Isolation Voltage . . . . . ≥ 2500V RMS input to output

Mechanical

Mounting . . . . . Surface with 2 or 4 #8 (M4 x 0.7) screws
Dimensions . . . . . 6.9 x 4.4 x 2.4 in. (175.3 x 111.8 x 61.0 mm)
Termination . . . . . Screw terminals with captive wire clamps for up to #12 AWG (3.2 mm^2) wire

Environmental

Operating / Storage Temperature . . . . . -40° to 65°C / -40° to 85°C
Weight . . . . . ≅25 oz (709 g)

* Unbalance reset is 90% of the unbalance setting (i.e. VUB at 5% reset is 4.5%)

The DLMU Series is a universal voltage, 3-phase voltage monitor. It continuously measures the voltage of each of the three phases with microcontroller accuracy and compares the value to preset trip points. It separately senses phase reversal and loss; over, under and unbalanced voltages; and over or under frequency. Protection is assured during periods of large average voltage fluctuations or when regenerated voltages are present. The unit trips within 200ms when phase loss is detected. Adjustable time delays are included to prevent nuisance tripping and short cycling of sensitive equipment. The isolated, 10A, SPDT and 2A alarm output relay contacts trip when a phase voltage exceeds the trip limits for the trip delay. Nominal line voltage, voltage unbalance, and time delays are knob adjustable. The phase loss setpoint and the acceptable frequency range are fixed. Both delta and wye systems can be monitored; no connection to neutral is required.

For more information see:
Appendix B, page 166, Figure 16 for dimensional drawing.
Appendix C, page 168, Figure 11 for connection diagram.

Features:

- Protects against phase & reversal; over, under & unbalanced voltages; & over & under frequency
- 35mm DIN rail or surface mounting
- Isolated, 10A, relay contacts
- Isolated, 2A, NO or NC, SPST relay contact
- LED indicates relay, faults, & time delays
- Universal line voltage 240 to 480VAC
- 600VAC version available
- 3-wire connection for delta or wye systems
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Auxiliary Products:

- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)

Available Models:

DLMHBRAAA
DLMUBNAAN
DLMUBRAAA

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Upon application of line voltage, the output is de-energized and the restart delay begins. If all the 3-phase voltages are within the acceptable range, the output energizes at the end of the restart delay. The microcontroller circuitry automatically senses the voltage range, and selects the correct operating frequency (50 or 60Hz). The over and undervoltage trip points are set automatically. When the measured value of any phase voltage exceeds the acceptable range limits (lower or upper) the trip delay begins. At the end of the trip delay the output relay de-energizes. If the phase voltage returns to an acceptable value before the trip delay expires, the trip delay is reset and the output remains energized. Under, over, and unbalanced voltages plus over or under frequency must be sensed for the complete trip delay before the unit trips. The unit trips in 200ms when phase loss or reversal are sensed. The unit will not energize if a fault is sensed as the line voltage is applied.
Reset: Reset is automatic upon correction of the voltage or frequency fault or phase sequence.

Restart Delay Options:

L= Lockout or minimum OFF time. The restart delay begins when the output trips. The unit cannot be re-energized until the restart delay is complete. This provides a minimum off time or lockout time to allow equipment sensitive to short cycling, time to reset. If the fault is corrected after the restart delay is complete the output energizes immediately. The restart delay also occurs when line voltage is applied/reapplied.
R= Restart Delay on fault correction. The restart delay begins when line voltage is reapplied or when a voltage fault is corrected. This option is normally selected when staggered restarting of multiple motors on a power system is required.
N= No Restart Delay. 0.6 second initialization delay on application of line voltage applies.
Restart Notes:
All restart options remain reset when the following conditions are detected:
1.) Phase loss (phase unbalance greater than 25%) 2.) Average line voltage less than 120VAC 3.) Phase reversal
The restart delay begins when the condition is corrected.

LED Operation

The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay then glows red when the output de-energizes. It flashes red/green if phase reversal is sensed If a fault is sensed during the restart delay, the LED will glow red during that portion or the full restart delay.

Order Table:

DLM **X**

Line Voltage
- U - 200-480VAC
- H - 500-600VAC

X

Output
- B - SPDT & NO
- C - SPDT & NC

X

Restart Function
- L - Lockout, min off time
- R - Staggered restarting
- N - No Restart Delay

X

Voltage Unbalance
- A - Adjustable 2-10%
- Fixed - Specify unbalance 2-10% in 1% increments using two digits [04]

X

Trip Delay
- A - Adjustable 1-30s
- Fixed - Specify delay 1-30s in 1s increments, using two digits [20]

X

Restart Delay
- A* - Adjustable 0.6-300s
- N - No Restart Delay

* Selection "A" is only available for L or R Restart Functions

Specifications

Line Voltage

Type . . . . . 3-phase delta or wye with no connection to neutral
Operating Voltage

200-480VAC	Range	Voltage Adj.Range	Line Frequency	Line Voltage Max.
	240	200-240VAC	50/60Hz	
	380	340-420VAC	50Hz	
	480	400-480VAC	60Hz	550VAC
600VAC	600	500-600VAC	50/60Hz	600VAC

AC Line Frequency . . . . . 50/60 Hz automatically detected
Phase Loss. . . . . ≥ 25% unbalance
Response Time. . . . . ≤200ms

Undervoltage & Voltage Unbalance

Type . . . . . Voltage detection with delayed trip & automatic reset
Overvoltage Trip Voltage . . . . . 109 - 113% of the adjusted line voltage
Reset Voltage . . . . ≅ -3% of the trip voltage
Undervoltage Trip Voltage . . . . . 88 - 92% of the adjusted line voltage
Reset Voltage . . . . ≅ +3% of the trip voltage
Voltage Unbalance . . . . . Adjustable 2 - 10% or specify fixed unbalance of 2 - 10% in 1% increments
Reset on balance . . . ≅ -0.7% unbalance
Trip Delay Active On. . . . . Over/undervoltage, voltage unbalance, over/under frequency
Range . . . . . Adjustable from 1 - 30s or specify fixed delay 1 - 30s in 1s increments
Tolerance . . . . . ± 15%
Restart Delay Range . . . . . Adjustable from 0.6 - 300s; if no restart delay is selected a 0.6s initialization delay applies
Tolerance . . . . . ± 15%
Over/Under Frequency . . . . . ±4%; Reset ±3%; 50/60 Hz
Phase Sequence . . . . . A, B, C, L1, L2, L3
Response Time -Phase Reversal & Phase Loss. . . . ≤200 ms
Reset. . . . . Automatic

Output

Type . . . . . Isolated Electromechanical Relay
Rating . . . . . 10A resistive @ 240VAC; 8A resistive @ 277VAC; NO-1/4 hp @ 120VAC; 1/3 hp @ 240VAC
Life . . . . . Mechanical - 1 x 10^6; Electrical - 1 x 30^3

Protection

Surge . . . . . IEEE C62.41-1991 Level B
Isolation Voltage. . . . . ≥ 2500V RMS input to output

Mechanical

Mounting . . . . . Surface mount with 2 #8 (M4 x 0.7) screw or snapon 35mm DIN Rail
Note: 0.25 in.(6.35 mm) spacing between units or other devices is required
Dimensions . . . . . 4.33 x 2.95 x 1.97 in. (110 x 75 x 50 mm)
Termination. . . . . Screw terminals with captive wire clamps for up to #14 AWG (2.5 mm^2) wire

Environmental

Operating / Storage Temperature. . -40° to 60°C / -40° to 85°C
Humidity. . . . . 95% relative, non-condensing
Weight . . . . . ≅ 8.6 oz (244 g)

The HLMU Series is a universal voltage, encapsulated, 3-phase voltage monitor. It continuously measures the voltage of each of the three phases with microcontroller accuracy and compares the value to preset trip points. It separately senses phase reversal and loss; over, under and unbalanced voltages; and over or under frequency. Protection is assured during periods of large average voltage fluctuations, or when regenerated voltages are present. The unit trips within 200ms when phase loss is detected. Adjustable time delays are included to prevent nuisance tripping and short cycling of sensitive equipment. The isolated, 10A, DPDT relay contacts trip when a phase voltage exceeds the trip limits for the trip delay. Nominal line voltage, voltage unbalance, and time delays are knob adjustable. The phase loss setpoint and the acceptable frequency range are fixed. Both delta and wye systems can be monitored; no connection to neutral is required.

Features:

- Protects against phase loss & reversal; over, under & unbalanced voltages; & over & under frequency
- Encapsulated circuitry
- Isolated, 10A, DPDT output contacts
- LED indicates relay status, faults, & time delays
- Universal line voltage 200 to 480VAC in one unit
- Compact design
- Finger-safe terminal blocks, up to 12 AWG
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Auxiliary Products:

- **3-Phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

HLMUDLAAA	HLMUDRAAA
HLMUDN0405N	HLMUSR0604A
HLMUDNAAN	

If desired part number is not listed, please call us to see if it is technically possible to build.

For more information see:
Appendix B, page 166, Figure 17 for dimensional drawing.
Appendix C, page 168, Figure 12 for connection diagram.

Operation

Upon application of line voltage, the output is de-energized and the restart delay begins. If all the three-phase voltages are within the acceptable range, the output energizes at the end of the restart delay. The microcontroller circuitry automatically senses the voltage range, and selects the correct operating frequency (50 or 60Hz). The over and under voltage trip points are set at ± 10% of the adjusted line voltage. When the measured value of any phase voltage exceeds the acceptable range limits (lower or upper) the trip delay begins. At the end of the trip delay the output relay de-energizes. If the phase voltage returns to an acceptable value before the trip delay expires, the trip delay is reset and the output remains energized. Under, over, and unbalanced voltages plus over or under frequency must be sensed for the complete trip delay before the unit trips. The unit trips in 200ms when phase loss or reversal are sensed. The unit will not energize if a fault is sensed as the line voltage is applied.

Reset: Reset is automatic upon correction of the voltage or frequency fault or phase sequence.

Restart Delay Options:

L= Lockout or minimum OFF time. The restart delay begins when the output trips. The unit cannot be re-energized until the restart delay is complete. This provides a minimum off time or lockout time to allow equipment sensitive to short cycling, time to reset. If the fault is corrected after the restart delay is complete, the output energizes immediately. The restart delay also occurs when line voltage is applied/reapplied.

R= Restart Delay on fault correction. The restart delay begins when line voltage is reapplied or when a voltage fault is corrected. This option is normally selected when staggered restarting of multiple motors on a power system is required.

N= No Restart Delay. 0.6 second initialization delay on application of line voltage applies.

Restart Notes:

All restart options remain reset when the following conditions are detected:

1.) Phase loss (phase unbalance greater than 25%) 2.) Average line voltage less than 120VAC 3.) Phase reversal

The restart delay begins when the condition is corrected.

LED Operation

The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay then glows red when the output de-energizes. It flashes red/green if phase reversal is sensed. If a fault is sensed during the restart delay, the LED will glow red during that portion or the full restart delay.

Order Table:

HLMU **X** **X** **X** **X** **X**

Output
- D - DPDT
- S - SPST

Restart Function
- L - Lockout, Min Off Time
- R - Staggered Restarting
- N - No Restart Delay

Voltage Unbalance
- A - Adjustable 2-10%
- Fixed - Specify Unbalance 2-10% in 1% increments, using two digits [04]

Trip Delay
- A - Adjustable 1-30s
- Fixed - Specify delay 1-30s in 1s increments, using two digits [05]

Restart Delay
- A* - Adjustable 0.6-300s
- N - No Restart Delay

*Selection "A" is only available for Restart Functions "L" and "R"

Specifications

Line Voltage

Type	3-phase delta or wye with no connection to neutral			
Operating Voltage	200 - 480VAC	Range	Voltage Adj. Range	Frequency
		240	200-240VAC	50 or 60Hz
		380	340-420VAC	50Hz
		480	400-480VAC	60Hz
Line Voltage Max.	550VAC			
AC Line Frequency	50/60 Hz automatically detected			
Phase Loss	≥ 25% unbalance			
Response Time	≤200ms			

Undervoltage & Voltage Unbalance

Type	Voltage detection with delayed trip & automatic reset	
Overvoltage	Trip Voltage	109 - 113% of the adjusted line voltage
	Reset Voltage	≅ -3% of the trip voltage
Undervoltage	Trip Voltage	88 - 92% of the adjusted line voltage
	Reset Voltage	≅ +3% of the trip voltage
Voltage Unbalance	Trip Setpoint	Adjustable 2 - 10% or specify fixed unbalance of 2 - 10% in 1% increments
	Reset on Balance	≅ -0.7% unbalance
Trip Delay	Active On	Over/undervoltage, voltage unbalance, over/under frequency
	Range	Adjustable from 1 - 30s or specify fixed delay 1 - 30s in 1s increments
	Tolerance	± 15%
Restart Delay	Range	Adjustable from 0.6 - 300s; if no restart delay is selected a 0.6s initialization delay applies
	Tolerance	± 15%

Over/Under Frequency	±4%; Reset ±3%; 50/60 Hz
Phase Sequence	A, B, C, L1, L2, L3
Response Time-Phase Reversal & Phase Loss.	≤200 ms
Reset	Automatic

Output

Type	Isolated Electromechanical Relay
Form	DPDT
Rating	10A resistive @ 240VAC; 8A resistive @ 277VAC; NO-1/4 hp @ 120VAC; 1/3 hp @ 240VAC
Life	Mechanical - 1 x 10^6 Electrical (at 10A) - DPDT - 1 x 30^3

Protection

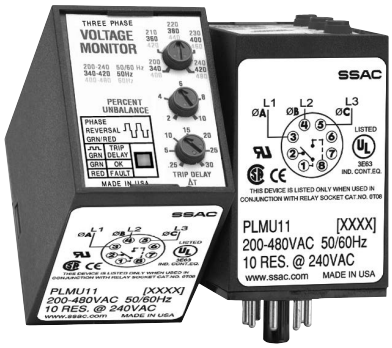
Surge	IEEE C62.41-1991 Level B
Isolation Voltage	≥ 2500V RMS input to output
Circuitry	Encapsulated

Mechanical

Mounting	Surface mount with one #10 (M5 x 0.7) screw
Note: 0.25 in.(6.35 mm) spacing between units or other devices is required	
Dimensions	3 x 2 x 1.64 in. (76.7 x 51.3 x 41.7 mm)
Termination	Screw terminal connection up to 12 AWG (3.3 mm^2) wire

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)



The PLMU Series continuously measures the voltage of each of the three phases to provide protection for 3-phase motors and sensitive loads. Its microcontroller senses under and overvoltage, voltage unbalance, phase loss, and phase reversal. Protection is provided even when regenerated voltages are present. Universal voltage operation and standard base connection allows the PLMU to replace hundreds of competitive part numbers.

For more information see:
Appendix B, page 166, Figure 18 for dimensional drawing.
Appendix C, page 168, Figure 13 for connection diagram.

Features:

- Protects against phase & reversal; & over, under & unbalanced voltages
- Octal plug-in
- Isolated, 10A, SPDT output contacts
- Operates from 200 to 480VAC
- LED indicator glows green when voltages are acceptable, red for faults
- Indicates reverse-phase wiring
- Simple 3-wire connection for delta or wye systems
- ASME A17.1 Rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Operation

Upon application of power, a 0.6s random start delay begins and the PLMU measures the voltage levels and line frequency and selects the voltage range. The output relay is energized and the LED glows green when all voltages are acceptable and the phase sequence is correct. LED flashes green during trip delay, glows red when output de-energizes. Undervoltage, overvoltage, and voltage unbalance must be sensed for continuous trip delay before the relay de-energizes. Re-energization is automatic upon fault correction. The output relay will not energize if a fault condition is sensed as 3-phase input voltage is applied. The LED alternately flashes red/green when phase reversal is sensed. Line voltage is selected with the knob, setting the over and under voltage trip points. Voltage range is automatically selected by the microcontroller.

Auxilary Products:

- **Panel mount kit:** P/N: BZ1
- **8-pin octal socket**: P/N: OT08PC
- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)

Available Models:

PLMU11

Order Table:

Voltage Unbalance	Trip Delay	Part Number
Adjustable 2-10%	Adjustable 0.25-30s	PLMU11

LED Indicator	
Steady Green	Energized
Steady Red	De-engergized (tripped on fault)
Flashing Green	Trip Delay
Alternate Flashing Red/Green	Phase Reversal

Specifications

Line Voltage

Type . . . . . 3-phase delta or wye with no connection to neutral
Line Voltage . . . . . 200 to 480VAC ±15%, 50/60 Hz ±2 Hz
Adjustable Voltage Ranges
(Automatic Range Selection) . . . . . 200 to 240VAC, 50/60 Hz
340 to 420VAC, 50 Hz
400 to 480VAC, 60 Hz
Maximum Voltage 552VAC
Phase Sequence . . . . . ABC

Overvoltage, Undervoltage, & Voltage Unbalance

Type . . . . . Voltage detection with delayed trip & automatic reset

Overvoltage & Undervoltage
Undervoltage Trip Point . . . . . 88 - 92% of adjusted line voltage
Reset Voltage . . . . . +2% of trip voltage
Overvoltage Trip Point. . . . . 109 - 113% of adjusted line voltage
Reset Voltage . . . . . -2% of trip voltage
Voltage Unbalance Trip Point . . . . . Adjustable from 2 - 10%
Factory fixed from 4 - 10% (a minimum order quantity applies)

Reset on Balance (%):

Selected Unbalance	2	3	4	5	6	7	8	9	10
Reset	1.5	2.5	3.5	4.5	5.4	6.3	7.2	8.1	9

Trip Delay Range . . . . . Adjustable from 0.25 - 30s
Factory fixed from 2 - 30s ±15%
(a minimum order quantity applies)
Severe Unbalance - 2X Selected Unbalance . 0.25 - 2s; disabled when the trip delay is less than 2s
Random Start Delay . . . . . ≅ 0.6s
Phase Reversal & Phase Loss Trip Time. . . . . ≤ 150ms
Phase Loss Setpoint . . . . . ≥ 15% unbalance
Reset Type . . . . . Automatic
Output Type . . . . . Energized when voltages are acceptable
Rating . . . . . 10A resistive @ 240VAC; 1/4 hp @ 125VAC; 1/3 hp @ 250VAC; max. 277VAC
Life . . . . . Mechanical - 1 x 10^6 ; Electrical - 1 x 10^5

Protection

Surge . . . . . IEEE C62.41-1991 Level B
Isolation Voltage. . . . . ≥ 2500V RMS input to output

Mechanical

Mounting* . . . . . Plug-in socket rated 600VAC
Termination. . . . . Octal 8-pin plug-in
Dimensions . . . . . 3.03 x 2.39 x 1.78 in. (77.0 x 60.7 x 45.2 mm)

Environmental

Operating / Storage Temperature. . . . . -40° to 60°C / -40° to 85°C
Weight . . . . . ≅ 8.6 oz (244 g)

*CAUTION: Select an octal socket rated for 600VAC operation.

The PLM Series continuously measures the voltage of each of the three phases. The PLM Series uses a microcontroller circuit design that senses undervoltage, voltage unbalance, phase loss, and phase reversal. Protection is assured when regenerated voltages are present. Both delta and wye systems can be monitored; no connection to neutral is required.

For more information see:
Appendix B, page 165, Figure 8 for dimensional drawing.
Appendix C, page 168, Figure 13 for connection diagram.

Features:

- Protects against phase loss & reversal; & under & unbalanced voltages
- 8-pin plug-in base
- Adjustable low voltage trip point
- Factory fixed unbalance & trip delay
- Line voltages 200 to 480VAC in 3 ranges
- Isolated, 10A, SPDT output contacts
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **Octal 8-pin socket:** P/N: OT08PC
- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)

Available Models:

PLM6405	PLM9405
PLM6502	PLM9502
PLM6805	PLM9805
PLM8405	PLM9820
PLM8805	

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

The output relay is energized and the LED glows green when all voltages are acceptable and the phase sequence is correct. Under and unbalanced voltages must be sensed for a continuous trip delay period before the relay de-energizes. Reset is automatic upon correction of the fault condition. The output relay will not energize if a fault condition is sensed as power is applied. The LED flashes red during the trip delay, then glows red when the output de-energizes. The LED flashes green/red if phase reversal is sensed.

Field Adjustment:

Set voltage adjustment knob at the desired operating line voltage for the equipment. This adjustment automatically sets the undervoltage trip point. Apply power. If the PLM fails to energize, (LED glows red) check wiring of all 3 phases, voltage, and phase sequence. If phase sequence is incorrect, the LED flashes green/red. To correct this, swap any two line voltage connections at the mounting socket. No further adjustment should be required.

Order Table:

PLM **X** **X** **X**

- **Line Voltage**
  - 6 - 240VAC
  - 8 - 380VAC
  - 9 - 480VAC
- **Voltage Unbalanced**
  - Fixed - Specify - 4-8% in 1% increments
- **Trip Delay**
  - Fixed - Specify from 2-20s in 1s increments using two digits

Specifications

Line Voltage

Type . . . . . 3-phase delta or wye with no connection to neutral

Operating Voltage:	Model	Adj. Line Voltage Range	Line Voltage Max.
	240	200-240VAC	270VAC
	380	360-430VAC	480VAC
	480	400-480VAC	530VAC

AC Line Frequency . . . . . 50/100 Hz
Phase Sequence . . . . . ABC
Power Consumption . . . . . ≅ 2W for 240V units
≅ 3W for 380 - 480V units

Low Voltage & Voltage Unbalance

Type . . . . . Voltage detection with delayed trip & automatic reset

Low Voltage	Trip Voltage	88 - 92% of adjusted line voltage
	Reset Voltage	Plus 3% of trip voltage
Voltage Unbalance	Trip Unbalance	Factory fixed from 4 - 8%
	Reset on Balance	-0.7% unbalance typical
Trip Delay	Range	Factory fixed from 2 - 20s
	Tolerance	±15%

Phase Reversal & Phase Loss
Response Time: Phase Reversal . . . . . ≤ 200ms
Phase Loss. . . . . ≤ 200ms
Phase Loss. . . . . ≥ 35% unbalance
Reset. . . . . Automatic

Output

Type . . . . . Electromechanical relay
Form. . . . . Isolated, SPDT
Rating . . . . . 10A resistive @ 240VAC, 277VAC max; 1/2 Hp @ 240VAC; 1/4 Hp @ 120VAC
Life . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5

Protection

Surge . . . . . IEEE C62.41-1991 Level B
Isolation Voltage. . . . . ≥ 2500V RMS input to output

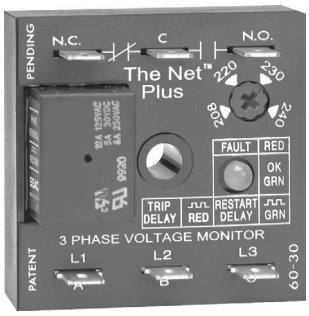
Mechanical

Mounting*. . . . . 8-pin plug-in socket rated 600VAC
Dimensions. . . . . 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)

Environmental

Operating/Storage Temperature. . . . . -40° to 60°C / -40° to 85°C
Weight . . . . . ≅ 4.4 oz (125 g)

*CAUTION: Select an octal socket rated for 600VAC operation.



Provides protection for motors and other sensitive loads. Continuously measures the voltage of each of the three phases using a microcontroller circuit design that senses under and overvoltage, voltage unbalance, phase loss, and phase reversal. Protection is provided even when regenerated voltages are present. Includes a trip delay to prevent nuisance tripping and a restart delay to prevent short cycling after a momentary power outage.

For more information see:
Appendix B, page 167, Figure 30 for dimensional drawing.
Appendix C, page 168, Figure 14 for connection diagram.

Features:

- Protects against phase loss & reversal; over, under & unbalanced voltages; short cycling
- Fixed trip points & delays
- Adjustable voltages from 208 to 480VAC in 4 ranges
- Monitor 600VAC lines by connecting VRM accessory
- Isolated, 10A, SPDT output contacts
- Bi-color LED indicates: output status, faults, time delays, phase reversal & setpoint
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Operation

Upon application of line voltage, the restart delay begins. The output is de-energized during restart delay. Under normal conditions, the output energizes after the restart delay. Undervoltage, overvoltage, and voltage unbalance must be sensed for the complete trip delay period before the output de-energizes. The restart delay begins as soon as the output de-energizes. If the restart delay is completed when a fault is corrected, the output energizes immediately. The output will not energize if a fault is sensed as the input voltage is applied. If the voltage selector is set between two voltage marks (i.e. between 220 and 230V), the LED will flash red rapidly. The TVW provides fault protection at the lower of the two line voltages (i.e. 220V).
Reset: Reset is automatic upon correction of a fault.

LED Operation

The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay then glows red when the output de-energizes. It flashes red/green if phase reversal is sensed. If the voltage selector knob is between settings, it rapidly flashes red.

Auxilary Products:

- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Voltage reduction module:** P/N: VRM6048

Available Models:

TVW575S1M
TVW6510S0.4S
TVW9510S0.4S

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TVW **X**

Line Voltage Wide Range
- 5 - 208-240VAC Selectable
- 6 - 208, 220, 230 & 240VAC
- 8 - 380, 400 & 415VAC
- 9 - 430, 440, 460 & 480VAC

X

Voltage Unbalance
- Fixed - Specify 4-10% in 1% increments

X

Trip Delay*
- Fixed - Specify from 0.2-1s in 0.1s increments
- Fixed - Specify from 1-100s in 1s increments

*Must indicate (S) for secs. or (M) for mins.

X

Restart Delay*
- Fixed - Specify from 0.4-1s in 0.1s increments
- Fixed - Specify from 1-100s in 1s increments
- Fixed - Specify from 1-999min in 1min increments

Specifications

Line Voltage

Type	3-phase delta or wye with no connection to neutral
Input Voltage/Tolerance	208 to 480VAC in 4 ranges/-30% - 20%
AC Line Frequency	50 - 100 Hz
Phase Sequence	ABC
Power Consumption	Approx. 2W for 240V units Approx. 3W for 480V units

Overvoltage, Undervoltage, & Voltage Unbalance

Overvoltage & Undervoltage	Voltage detection with delay trip & automatic reset
Undervoltage Trip Point	88 - 92% of the selected line voltage
Reset Voltage	≅ +3% of trip voltage
Overvoltage Trip Point	109 - 113% of the selected line voltage
Reset Voltage	≅ -3% of trip voltage
Trip Variation vs Temperature	≤ ±2%
Voltage Unbalance	Factory fixed, from 4 - 10%
Reset On Balance	≅ -0.7% unbalance
Trip Delay Range	Fixed from 0.2 - 100s ±15% or ±0.1s, whichever is greater
Restart Delay Range	Fixed from 0.4s - 999m ±15% or ±0.2s, whichever is greater
Phase Reversal & Phase Loss Response	≤ 200ms; automatic reset
Phase Loss	≥ 25% unbalance

Output

Type		Isolated, SPDT
Rating	208 to 240VAC (55°C)	10A resistive @ 125VAC, 5A @ 250VAC, 1/4 hp @ 125VAC
	380 to 480VAC	10A resistive @ 240VAC, 1/4 hp @ 125VAC, 1/3 hp @ 250VAC, max. voltage 277VAC
Life		Mechanical - 1 x 10^6; Electrical - 1 x 10^5

Protection

Surge		IEEE C62.41-1991 Level B
Dielectric Breakdown	208 to 240VAC	≥ 1500V RMS input to output terminals
	380 to 480VAC	≥ 2500V RMS input to output terminals

Mechanical

Mounting	Surface mount with one #8 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.25 in. (50.8 x 50.8 x 31.8 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-40° to 55°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.8 oz (79 g)

Provides protection for motors and other sensitive loads. Continuously measures the voltage of each of the three phases using a microcomputer circuit design that senses under and overvoltage, voltage unbalance, phase loss, and phase reversal. Protection is provided even when regenerated voltages are present. Includes a trip delay to prevent nuisance tripping and a restart delay to prevent short cycling after a momentary power outage.

For more information see:
Appendix B, page 167, Figure 30 for dimensional drawing.
Appendix C, page 168, Figure 14 for connection diagram.

Features:

- Protects against phase loss & reversal; over, under & unbalanced voltages; short cycling
- Fixed trip points & delays
- Fixed voltages from 208 to 480VAC
- Isolated, 10A, SPDT ouput contacts
- Bi-color LED indicator shows: output status, faults, time delays & phase reversal
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **3-phase fuse block/disconnect:**
  P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **Voltage reduction module:**
  P/N: VRM6048

Operation

Upon application of line voltage, the restart delay begins. The output relay is de-energized during restart delay. Under normal conditions, the output energizes after restart delay. Undervoltage, overvoltage, and voltage unbalance must be sensed for continuous trip delay period before the output is de-energized. The output will not de-energize if a fault is corrected during the trip delay. The restart delay begins as soon as the output relay de-energizes. If the restart delay is completed when the fault is corrected, the output relay will energize immediately. The output relay will not energize if a fault or phase reversal is sensed as 3-phase input voltage is applied.
Reset: Reset is automatic upon correction of a fault.

LED Operation

The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay then glows red when the output de-energizes. It flashes red/green if phase reversal is sensed.

Available Models:

TVM208A100.5S3S	TVM460A510S5S
TVM230A101S1S	TVM460A75S2M
TVM400A101S1S	TVM480A100.5S3S
TVM460A101S1S	TVM480A50.5S2S
TVM460A41S5M	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TVM **X** **Line Voltage**
- 208A - 208VAC
- 220A - 220VAC
- 230A - 230VAC
- 240A - 240VAC
- 380A - 380VAC
- 400A - 400VAC
- 415A - 415VAC
- 440A - 440VAC
- 460A - 460VAC
- 480A - 480VAC

X **Voltage Unbalance**
- Fixed - Specify 4-10% in 1% increments

X **Trip Delay***
- Fixed - Specify from 0.2-1s in 0.1s increments
- Fixed - Specify from 1-100s in 1s increments

*Must indicate (S) for secs. or (M) for mins.

X **Restart Delay***
- Fixed - Specify from 0.5-1s in 0.1s increments
- Fixed - Specify from 1-100s in 1s increments
- Fixed - Specify from 1-999 min in 1min increments

Specifications

Line Voltage

Type	3-phase delta or wye with no connection to neutral
Input Voltage	208 to 480VAC
AC Line Frequency	50 - 100 Hz
Phase Sequence	ABC
Power Consumption	Approx. 2W for 240V units Approx. 3W for 480V units

Overvoltage, Undervoltage, & Voltage Unbalance

Overvoltage & Undervoltage	Voltage detection with delay trip & automatic reset
Undervoltage Trip Point	88 - 92% of the selected line voltage
Reset Voltage	≅ +3% of trip voltage
Overvoltage Trip Point	109 - 113% of the selected line voltage
Reset Voltage	≅ -3% of trip voltage
Trip Variation vs Temperature	≤ ±2%
Voltage Unbalance	Factory fixed from 4 - 10%
Reset On Balance	≅ -0.7% unbalance
Trip Delay Range	Fixed from 0.2 - 100s ±15% or ±0.1s, whichever is greater
Restart Delay Range	Fixed from 0.5s - 999m ±15% or ±0.2s, whichever is greater
Phase Reversal & Phase Loss Response	≤ 200ms; automatic reset
Phase Loss	≥ 25% unbalance

Output

Type		Isolated SPDT relay contacts
Rating	208 to 240VAC (55°C)	10A resistive @ 125VAC, 5A @ 250VAC, 1/4 hp @ 125VAC
	380 to 480VAC	10A resistive @ 240VAC, 1/4 hp @ 125VAC, 1/3 hp @ 250VAC, max. voltage 277VAC
Life		Mechanical - 1 x 10^6; Electrical - 1 x 10^5

Protection

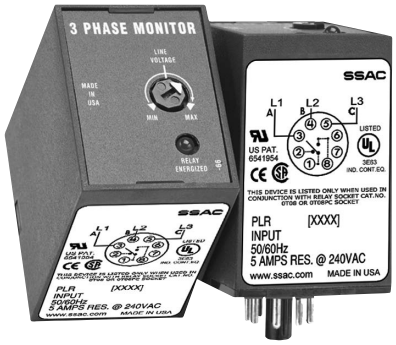
Surge		IEEE C62.41-1991 Level B
Dielectric Breakdown	208 to 240VAC	≥ 1500V RMS input to output terminals
	380 to 480VAC	≥ 2500V RMS input to output terminals

Mechanical

Mounting	Surface mount with one #8 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.25 in. (50.8 x 50.8 x 31.8 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-40° to 55°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.8 oz (79 g)



The PLR Series provides a cost effective means of preventing 3-phase motor startup during adverse voltage conditions. Proper A-B-C sequence must occur in order for the PLR's output contacts to energize. In addition, the relay will not energize when an undervoltage or phase loss condition is present. The PLR protects a motor against undervoltage operation. The adjustment knob sets the undervoltage trip point.

For more information see:
Appendix B, page 165, Figure 8 for dimensional drawing.
Appendix C, page 168, Figure 13 for connection diagram.

Features:

- Protects against phase loss (on startup), phase reversal & undervoltage
- Used where moderate voltage unbalance protection is not required
- Direct replacement for most popular 3-phase monitors
- 8-pin octal base connection
- Isolated, 5A, SPDT output contacts
- AMSE A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Auxilary Products:

- **Panel mount kit:** P/N: BZ1
- **Octal 8-pin socket:** P/N: OT08PC
- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)

Available Models:

PLR120A
PLR240A
PLR380A
PLR480A

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

The output relay is energized and the LED glows when all voltages are acceptable and the phase sequence is correct. Undervoltage must be sensed for a continuous dropout delay period before the relay de-energizes. Reset is automatic upon correction of the fault condition. The output relay will not energize if a fault condition is sensed as power is applied.

Field Adjustment: Turn the adjustment knob fully counterclockwise and apply three-phase power. The LED should be ON. Increase adjustment until the LED goes OFF. Decrease adjustment until LED glows again. If nuisance tripping occurs, decrease the adjustment slightly.

NOTE: When properly adjusted and operating in an average system, a voltage unbalance of 10% or more is required for phase loss detection. When a phase is lost while the motor is running, a voltage will be induced into the open phase nearly equal in magnitude to the normal phase-to-phase voltage. This condition is known as regeneration. When regenerated voltages are present, the voltage unbalance during single phasing may not exceed 10% for some motors. The PLR Series may not provide protection under this condition. For systems that require superior phase loss protection, select the PLMU Series.

Order Table:

Voltage	Part Number
95-140VAC	PLR120A
190-270VAC	PLR240A
340-450VAC	PLR380A
380-500VAC	PLR480A

Specifications

Line Voltage

Type . . . . . 3-phase delta or wye with no connection to neutral

Nominal Voltage	Undervoltage Dropout Adj Range	Line Voltage Max.
120VAC	85 to 130VAC	143VAC
240VAC	170 to 240VAC	270VAC
380VAC	310 to 410VAC	480VAC
480VAC	350 to 480VAC	530VAC

AC Line Frequency 50/60Hz
Phase Sequence . . . . . ABC

Response Times

Pull-in . . . . . ≤ 400ms
Drop-out . . . . . ≤ 100ms
Hysterisis Pull-in/Drop-out . . . . ≅ 2%

Output

Type . . . . . Electromechanical relay, energized when all voltages are acceptable
Form. . . . . SPDT
Rating . . . . . 5A resistive @ 240VAC, 1/4 Hp @ 120VAC
Maximum Voltage 250VAC

Protection

Surge . . . . . IEEE C62.41-1991 Level B
Isolation Voltage 120 & 240VAC ≥ 1500V RMS input to output
380 & 480VAC ≥ 2500V RMS input to output

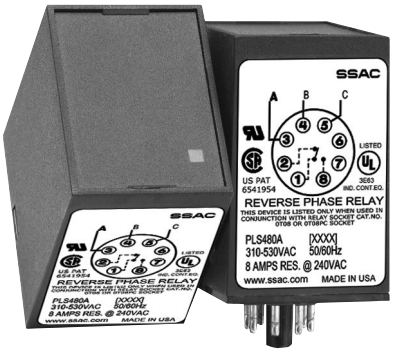
Mechanical

Dimensions . . . . . 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
Mounting* . . . . . Plug-in socket
Termination. . . . . Octal 8-pin, plug-in

Environmental

Operating/ Storage Temperature . . . . 0° to 55°C / -40° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

*CAUTION: Select an octal socket rated for 600VAC operation.



The PLS Series is a low cost phase sensitive control that provides an isolated contact closure when the proper A-B-C phase sequence is applied. Protects sensitive 3-phase equipment and equipment operators from reverse rotation. Designed to be compatible with motor overloads or other 3-phase equipment protection devices. Protection for equipment control centers where frequent reconnection or electrical code makes reverse rotation protection essential. Examples include: mobile refrigerated containers, construction equipment, hoists, pumps, conveyors, elevators and escalators.

For more information see:
Appendix B, page 166, Figure 19 for dimensional drawing.
Appendix C, page 168, Figure 13 for connection diagram.

Operation

The internal relay and LED are energized when the phase sequence is correct. The output relay will not energize if the phases are reversed. Reset is automatic upon correction of the fault.

Features:

- Protects against phase reversal
- Low cost protection, one unit for all sized motors
- 3-wire connection for dela or wye systems
- Octal base connect - industry standard wiring
- Isolated, SPDT output contacts
- Factory calibrated - no adjustments required

Approvals:

Auxilary Products:

- **Panel mount kit:** P/N: BZ1
- **Octal 8-pin socket:** P/N: OT08PC
- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **Din rail:** P/N: C103PM (Al)

Available Models:

PLS120A
PLS240A
PLS480A

Order Table:

Voltage	Part Number
120VAC	PLS120A
208/240VAC	PLS240A
380/415VAC	PLS380A
440/480VAC	PLS480A

Specifications

Line Voltage

Type . . . . . 3-phase delta or wye with no connection to neutral

Nominal Voltage	Minimum Voltage	Maximum Voltage
120VAC	95VAC	135VAC
208/240VAC	175VAC	255VAC
380/415VAC	310VAC	430VAC
440/480VAC	380VAC	500VAC

AC Line Frequency . . . . . 50/60 Hz
Phase Sequence . . . . . ABC

Response Times

Pull-in . . . . . ≤ 300ms
Drop-out . . . . . ≤ 50ms

Output

Type . . . . . Electromechanical relay, energized when the phase sequence is correct
Form. . . . . Isolated SPDT
Rating 120 & 240VAC . . . . . 10A resistive @ 240VAC
380 & 480VAC . . . . . 8A resistive @ 240VAC
Maximum Voltage 250VAC

Protection

Isolation Voltage 120 & 240VAC . . . ≥ 1500V RMS input to output
380 & 480VAC . . . ≥ 2500V RMS input to output

Mechanical

Mounting* . . . . . Plug-in socket
Dimensions . . . . . 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
Termination. . . . . Octal 8-pin plug-in

Environmental

Operating/Storage Temperature. . . . . -40°to 55°C / -40° to 85°C
Weight . . . . . ≅ 6 oz (170 g)

*CAUTION: Select an octal socket rated for 600VAC operation.

The HLV Series is a single-phase undervoltage monitor designed to protect sensitive equipment from brownout or undervoltage conditions. Time delays are included to prevent nuisance tripping and short cycling. The 30A, 1hp rated, SPDT relay contacts allow direct control of motors, solenoids and valves. The output relay can be ordered with isolated SPDT contact to allow monitoring of one voltage and switching a separate voltage. Two undervoltage trip point ranges allow monitoring of 110 to 120VAC or 208 to 240VAC systems.

For more information see:
Appendix B, page 165, Figure 2 for dimensional drawing.
Appendix C, page 169, Figure 15 for connection diagram.

Features:

- Protects against undervoltage in single-phase systems
- 30A, SPDT, NO output contacts
- 100 to 240VAC input voltage
- 70 to 220VAC adjustable undervoltage trip point in 2 ranges
- Restart delays from 3 - 300s
- Trip delay 1 - 20s fixed
- Isolated or non-isolated relay contacts

Approvals:

Auxiliary Products:

- **Quick connect to screw adaptor:** P/N: P1015-18
- **Female quick connect:** P/N: P1015-13 (AWG 10/12) P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

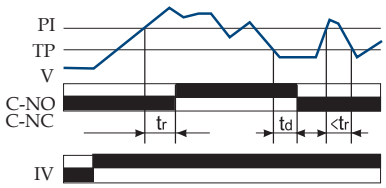
Available Models:

HLVA6I23

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Upon application of input voltage the output relay remains de-energized. When the input voltage value is above the pull-in voltage, the restart delay begins. At the end of the restart delay, the output relay energizes. When the input voltage falls below the trip point, the trip delay begins. If the input voltage remains below the pull-in voltage for the entire trip delay the relay de-energizes. If the input voltage returns to a value above the pull-in voltage, during the trip delay, the trip delay is reset and the relay remains energized. If the input voltage falls below the trip point voltage during the restart delay, the delay is reset and the relay remains de-energized. Reset is automatic upon correction of an undervoltage fault.
Reset: Removing input voltage resets the output relay and the time delays.



tr = Restart Delay
td = Trip Delay
PI = Pull-in 105% or trip point
TP = Trip Point
V = Monitored Voltage
IV = Input voltage
C-NO = Normally Open Contacts
C-NC = Normally Closed Contacts

Order Table:

HLVA **X** **Undervoltage Range**
- 4 - 70 to 120VAC
- 6 - 170 to 220VAC

X **Output Connection**
- I - Isolated SPDT
- N - Non-Isolated SPDT

X **Restart Delay**
- 2 - Onboard adjustment 3-300s

X **Trip Delay**
- Fixed - Specify from 1-20s in 1s increments

Specifications

Input

Min & Max RMS Voltage		70 to 264VAC
AC Line Frequency		50/60 Hz
Power Consumption		AC ≤ 4VA

Undervoltage Sensing

Type		Peak voltage sensing
Ranges	(4)	70 to 120VAC
	(6)	170 to 220VAC
Pull-In Voltage		105% or trip point voltage
Trip Point Accuracy		± 3% of trip point

Time Delay

Restart Delays	3 - 300s adjustable
Trip Delay	1 - 20s fixed in 1s increments
Repeat Accuracy	±0.5% or 20ms, whichever is greater
Tolerance (Factory Calibration)	±5%
Reset Time	≤ 150ms
Time Delay vs. Temp. & Voltage	≤ ±10%

Output

Type	Electromechanical relay
Form	SPDT

Ratings		SPDT-N.O	SPDT-NC
General Purpose	125/240VAC	30A	15A
Resistive	125/240VAC	30A	15A
	28VDC	20A	10A
Motor Load	125VAC	1 hp*	1/4 hp**
	240VAC	2 hp**	1 hp**
Life		Mechanical - 1 x 10^6	
		Electrical - 1 x 10^5, *3 x10^4, **6,000	

Protection

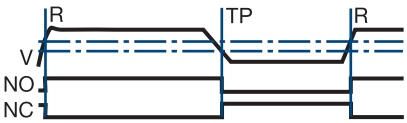
Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Isolation Voltage	≥ 1500V RMS input to output; isolated units
Insulation Resistance	≥ 100 MΩ

Mechanical

Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)
Termination	0.25 in. (6.35 mm) male quick connects

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)



TP = Undervoltage Setpoint
R = Reset Point

The KVM Series is a single-phase undervoltage monitor designed to protect sensitive equipment against brownout undervoltage conditions. The compact design and encapsulated construction make the KVM an excellent choice for OEM equipment.

For more information see:
Appendix B, page 165, Figure 1 for dimensional drawing.
Appendix C, page 169, Figure 16 for connection diagram.

Operation

The output relay is energized and the LED glows green when the input voltage is above the reset voltage threshold. If the input voltage drops below the undervoltage setpoint, the output relay and LED will de-energize. The output relay will remain de-energized as long as the input voltage is below the reset voltage. Reset is automatic when the input voltage returns to a normal range.

Features:

- Economical single-phase brownout/ undervoltage protection
- Isolated, 8A, SPDT output contacts
- Protects sensitive 110 to 120VAC or 220 to 240VAC loads
- Adjustable low voltage trip point
- LED Indicator

Approvals:

Auxilary Products:

- **Quick connect to screw adaptor:** P/N: P1015-18
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

KVM4
KVM6

Order Table:

Undervoltage Setpoint	Maximum Line Voltage	Part Number
78 to 99VAC	132VAC	KVM4
156 to 199VAC	264VAC	KVM6

Specifications

Line Voltage

Type	Single phase
Input Voltage	110 to 120VAC or 220 to 240VAC
AC Line Frequency	50/60 Hz
Power Consumption	2.5W @ 132VAC; 4.5W @ 264VAC
Power Off Reset Time	≤ 150ms

Undervoltage Detection

Undervoltage Setpoint	KVM4	78 to 99VAC
	KVM6	156 to 199VAC
Undervoltage Reset Point	KVM4	Fixed at 104VAC
	KVM6	Fixed at 209VAC
Repeatability		± 0.5% under fixed conditions ±1% over temperature range
Voltage Sensing Accuracy		±2% at 25°C

Output

Type	Electromechanical relay
Form	SPDT
Rating	8A resistive @ 120VAC, 1/3 hp @ 120/240VAC
Life	Mechanical - 1 x 10^6; Electrical - 1x10^5
LED Indicator	Glows green when output is energized

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Isolation Voltage	≥ 1500V RMS input to output
Insulation Resistance	≥ 100 MΩ minimum

Mechanical

Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-25 to 55°C / -40 to 85°C
Humidity	95% relative, non-condensing
Weight	2.6 oz (74 g)

Series Included

Over or Undercurrent

Over or Undercurrent Monitor

Current Transducer

Current Indicator

The ECS Series of single-phase AC current sensors is a universal, overcurrent or undercurrent sensing control. Its built-in toroidal sensor eliminates the inconvenience of installing a stand-alone current transformer. Includes onboard adjustments for current sensing mode, trip point, and trip delay. Detects over or undercurrent events like; locked rotor, loss of load, an open heater or lamp load, or proves an operation is taking place or has ended.

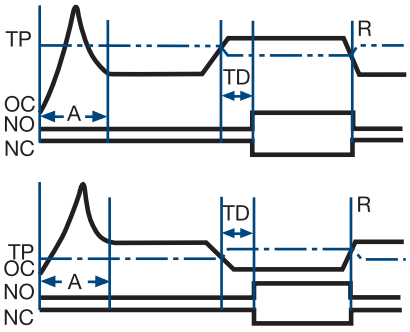
For more information see:
Appendix B, page 166, Figure 20 for dimensional drawing.
Appendix C, page 169, Figure 17 for connection diagram.

Operation

Input voltage must be supplied at all times for proper operation. When a fault is sensed throughout the trip delay, the output relay is energized. When the current returns to the normal run condition or zero, the output and the delay are reset. If a fault is sensed and then corrected before the trip delay is completed, the relay will not energize and the trip delay is reset to zero.

Adjustment

Select the desired function, over or under current sensing. Set the trip point and trip delay to approximate settings. Apply power to the ECS and the monitored load. Turn adjustment and watch the LED. LED will light; turn slightly in opposite direction until LED is off. Adjustment can be done while connected to the control circuitry if the trip delay is set at maximum. To increase sensitivity, multiple turns may be made through the ECS's toroidal sensor. The trip point range is divided by the number of turns through the toroidal sensor to create a new range. When using an external CT, select a 2VA, 0-5A output CT rated for the current to be monitored. Select ECS adjustment range 0. Pass one secondary wire lead through the ECS toroid and connect the secondary leads together.



NO = Normally Open Contact
NC = Normally Closed Contact
A = Sensing Delay On Start Up
TD = Trip Delay
TP = Trip Point
R = Reset
OC = Monitored Current

Features:

- Toroidal through hole wiring
- 0.5 - 50A trip points
- Adjustable or factory fixed trip delays
- Isolated, 10A, SPDT output contacts
- 5% trip point hysteresis (dead band)

Approvals:

Auxiliary Products:

- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

ECS20BC	ECSH21F.08C
ECS21BC	ECSH30AC
ECS21BH	ECSH3HF0.08D
ECS2HBC	ECSH40AC
ECS30AC	ECSH40AD
ECS40A	ECSH41AD
ECS40AC	ECSH41BC
ECS40BC	ECSH41F.08D
ECS40BD	ECSH4HF.08D
ECS41A	ECSH61AD
ECS41AC	ECSL31A
ECS41BC	ECSL40AC
ECS41BD	ECSL40B
ECS41BH	ECSL40BH
ECS41F.08	ECSL41A
ECS4HBC	ECSL41AD
ECS4HBH	ECSL45F7
ECS60AH	ECSL4HBH
ECS60BC	ECSL61AH
ECS61BC	ECSL6HAC
ECS6HAH	

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

X Series
- ECS - Selectable over or undercurrent sensing
- ECSH - Overcurrent sensing
- ECSL - Undercurrent sensing

X Input
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X Trip Point
- Fixed - Specify 2-50A in 1A increments
- 0 - 0.5-5A adjustable
- 1 - 2-20A adjustable
- H - 5-50A adjustable

X Trip Delay
- F - Specify: 0.08-50s factory fixed
- A - 0.150-7s adjustable
- B - 0.5-50s adjustable

X Sensing Delay on Start Up
- Blank - 0s
- C - 1s
- D - 2s
- E - 3s
- F - 4s
- G - 5s
- H - 6s

Specifications

Sensor
Type . . . . . Toroidal through hole wiring
Mode . . . . . Over or undercurrent, switch selectable on the unit or factory fixed
Trip Point Range . . . . . 0.5 - 50A in 3 adjustable ranges or fixed
Tolerance Adjustable . . . . . Guaranteed range
Fixed . . . . . 0.5 - 25A: 0.5A or ±5% whichever is less; 26 - 50A: ±2.5%
Maximum Allowable Current . . . . . Steady – 50A turns; Inrush – 300A turns for 10s
Trip Point Hysteresis . . . . . ≅ ±5%
Trip Point vs. Temperature . . . . . ±5%
Response Time . . . . . ≤ 75ms
Frequency . . . . . 45/500 Hz
Type of Detection . . . . . Peak detection

Trip Delay
Type . . . . . Analog
Range Adjustable . . . . . 0.150 - 7s; 0.5 - 50s (guaranteed ranges)
Factory Fixed . . . . 0.08 - 50s (±20ms, whichever is greater)
Delay vs. Temperature . . . . . ±15%
Sensing Delay on Startup . . . . . Factory fixed 0 - 6s: +40%, -0%

Input
Voltage . . . . . 24 , 120, or 230VAC; 12 or 24VDC
Tolerance 12VDC & 24VDC/AC . . . -15 - 20%
120 & 230VAC . . . . . -20 - 10%
AC Line Frequency . . . . . 50/60 Hz

Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated, SPDT
Rating . . . . . 10A resistive @ 240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Life . . . . . Mechanical – 1 x 10^6; Electrical – 1 x 10^5

Protection
Circuitry . . . . . Encapsulated
Isolation Voltage . . . . . ≥ 2500V RMS input to output
Insulation Resistance . . . . . ≥ 100 MΩ

Mechanical
Mounting . . . . . Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions . . . . . 3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
Termination . . . . . 0.25 in. (6.35 mm) male quick connect terminals (5)

Environmental
Operating/Storage Temperature . . . . . -40° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 6.4 oz (181 g)

The ECSW Series of single-phase, AC window, current sensors includes adjustable overcurrent and undercurrent trip points. Detects locked rotor, jam, loss of load, an open heater or lamp load, a broken belt, or loss of suction. LED's aid in trip point adjustment and provide fault indication. The built-in toroidal sensor eliminates the need for an external current transformer. The output can be electrically latched after a fault, or automatically reset. Remote resetting of a latched output by removing input voltage. The unit includes switch selectable zero current detection and normally de-energized or energized output operation. Time delays are included to improve operation and eliminate nuisance tripping.

For more information see:
Appendix B, page 166, Figure 20 for dimensional drawing.
Appendix C, page 169, Figure 18 for connection diagram.

Features:

- Overcurrent & undercurrent (window current) sensing
- Adjustable overcurrent & undercurrent trip points
- Current sensor is included
- Isolated, 10A, SPDT output contacts
- LED indicators

Approvals:

Available Models:

ECSW3LABT	ECSW4LBHT
ECSW4HBHT	ECSW4MBHT
ECSW4LABT	

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

When the input voltage is applied, sensing delay on startup begins and the output transfers (if normally energized is selected). Upon completion of the startup delay, sensing of the monitored current begins. As long as current is above undercurrent trip point and below the overcurrent trip point (inside the window), the output relay remains in its normal operating condition and both red LED's are OFF. The green LED glows when the output is energized. If current varies outside the window, the associated red LED glows, and the trip delay begins. If the current remains outside the window for the full trip delay, the relay transfers to fault condition state. If the current returns to normal levels (inside the window) during the trip delay, the red LED goes OFF, the trip delay is reset, and the output remains in the normal condition.
Reset: Remove input voltage or open latch switch. If zero current detection is selected, the unit will reset as soon as zero current is detected.
Operation With Zero Current Detection Enabled: If the current decreases to zero within the trip delay period, then zero current is viewed as an acceptable current level. The unit's output remains in its normal operating state. This allows the monitored load to cycle ON and OFF without nuisance tripping the ECSW. Zero current is defined as current flow of less than 250 milliamp-turns. Note: When zero current detect is selected, the latching operation of switch SW2 is canceled; the output will not latch after a fault trip.

Notes on Operation:

1) There is no hysteresis on the trip points. The overcurrent and undercurrent trip points should be adjusted to provide adequate protection against short cycling.
2) If the upper setpoint is set below the lower setpoint, both red LED's will glow indicating a setting error.
3) If zero current detection is selected (SW2 ON), and the system is wired to disconnect the monitored load, the system may short cycle. After the unit trips, the load de-energizes, and zero current is detected. The ECSW resets, and the load energizes again immediately and may be short cycled.
4) The sensing delay on start up only occurs when input voltage is applied. When zero current detection is selected, the trip delay must be longer than the duration of the inrush current or the unit will trip on the inrush current.

Typical Pump or Fan Protection Circuit Operation

Window Current Sensing: With the ECSW connected as shown in the diagram, a load may be monitored and controlled for over and undercurrent. The ECSW Series' on board CT (CS) may be placed on the line or load side of the contactor. The ECSW selection switches are set for zero current sensing (see Selector Switch SW2) and the output selection is normally de-energized (see Selector Switch SW3). The input voltage (V) is applied to the ECSW continually. As the control switch (FSW) is closed, the input voltage (V) is applied to the motor contactor coil (MCC), and the motor (M) energizes. As long as the current remains below the overcurrent and above the undercurrent trip points, the ECSW's output contacts remain de-energized. If the load current should rise above or fall below a trip point, for the full trip delay, the normally open (NO) contact will close, energizing the control relay (CR) coil. The CR normally closed contact (CR1) opens and the MCC de-energizes and CR latches on through its normally open contacts (CR2). Reset is accomplished by momentarily opening the normally closed reset switch (RSW).
Note: If the current falls to zero within the trip delay, the ECSW remains de-energized. The sensing delay on startup occurs when input voltage is applied therefore trip delay must be longer than the duration of the motor's inrush current. The external latching relay CR2 is required in this system to prevent rapid cycling. A timer can be added to provide an automatic reset.

Selector Switch

ON ↔ OFF

SW1	Not Used
SW2	Latched
SW3	Zero I
	Output - Normally Energized

Mode Selection Switches
SW1 = Latched or Auto reset selector
OFF - Automatic reset after a fault
ON - Output relay latches after a fault trips the unit
SW2 = Zero current detection (below 250 mA)
OFF- Zero current detection disabled
ON- Zero current detection enabled
SW3 = Output during normal operation
OFF- Output relay de-energized
ON - Output relay energized

Order Table:

ECSW **X**

Input
- 1 - 12VDC
- 2 - 24VAC
- 3 - 24VDC
- 4 - 120VAC
- 6 - 230VAC

X

Trip Point
- L - 0.5-5A adjustable
- M - 2-20A adjustable
- H - 5-50A adjustable

X

Trip Delay
- F - Specify: 0.1-50s factory fixed*
- A - 0.150-7s adjustable
- B - 0.5-50s adjustable

*If fixed delay is selected, insert delay (**0.1-50**) in seconds. 0.1-1.9s in 0.1s increments; 2-50s in 1s increments.

X

SensingDelay on Start up
- B - 0.1s
- C - 1s
- D - 2s
- E - 3s
- F - 4s
- G - 5s
- H - 6s

X

Connection
- T - Terminal Blocks

Specifications

Sensor

Type	Toroid, through hole wiring for up to #4 AWG (21.1 mm²) THHN wire
Mode	Over & undercurrent trip points (window current sensing)
Trip Point Range	0.5 - 50A in 3 adjustable ranges
Tolerance	Guaranteed range
Maximum Allowable Current	Steady - 50A turns; Inrush - 300A turns for 10s
Time Point vs Temp. & Voltage	±5%
Response Time	≤ 75ms
Frequency	45/500 Hz
Type of Detection	Peak detection
Zero Current Detection	< 250mA turns typical

Time Delay

Range	0.15 - 50s in 2 adjustable ranges or 0.1 - 50s fixed
Tolerance	Adjustable: guaranteed range; Fixed: ±10%
Sensing Delay On Start Up	Fixed ≅ 0.1 - 6s in 1s increments
Tolerance	+40% -0%
Delay vs. Temperature & Voltage	±15%

Input

Voltage	24, 120, or 230VAC; 12 or 24VDC
Tolerance 12VDC & 24VDC/AC	-15% - 20%
120 & 230VAC	-20% - 10%
AC Line Frequency	50/60 Hz

Output

Type		Electromechanical relay
Mode: Switch selectable	ON	Energized during normal operation, de-energized after a fault
	OFF	De-energized during normal operation, energizes during a fault
Form		Isolated, SPDT
Rating		10A resistive @ 240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Life		Mechanical - 1 x 10⁶; Electrical - 1 x 10⁵
Latch	Type	Electrical
	Reset	Remove input voltage
	Function	Switch selectable latching function

Protection

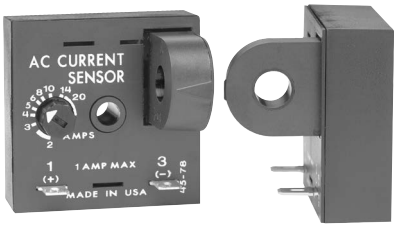
Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Isolation Voltage	≥ 2500V RMS input to output
Insulation Resistance	≥ 100 MΩ

Mechanical

Mounting	Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions	3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
Termination	0.197 in. (5 mm) terminal blocks for up to #12 (3.2 mm²) AWG wire

Environmental

Operating / Storage Temperature	-40° to 60° C/-40° to 85° C
Humidity	95% relative, non-condensing
Weight	≅ 6.4 oz (181 g)



The TCS Series is a low cost method of go/no go current detection. It includes a solid-state output to sink or source current when connected directly to a standard PLC digital input module. Its normally open or normally closed output can also be used to control relays, lamps, valves, and small heaters rated up to 1A steady, 10A inrush. The TCS is self-powered (no external power required to operate the unit) and available with an adjustable actuation range of 2 - 20A or factory fixed actuation points from 2 - 45A.

For more information see:
Appendix B, page 166, Figure 21 for dimensional drawing.
Appendix C, page 169, Figure 19 for connection diagram.

Features:

- Direct connection to a PLC digital input module
- 3 to 50VDC, 24 to 240VAC
- 1A steady - 10A inrush
- Actuation Points –
  2 - 45A (fixed units)
  2 - 20A (adjustable units)
- NO or NC solid-state output
- Complete isolation between sensed current & control circuit

Approvals:

Auxiliary Products:

- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

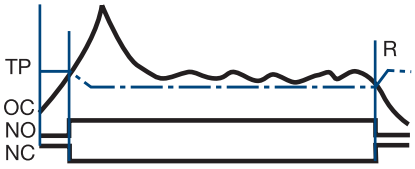
Available Models:

TCSG2A	TCSH3A
TCSGAA	TCSH4A
TCSGAB	TCSHAA
TCSH2A	TCSHAB
TCSH2B	

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Normally Open: When a current equal to or greater than the actuate current is passed through the toroidal sensor, the output closes. When the current is reduced to 95% of the actuate current or less, the output opens.
Normally Closed: When the current through the toroid is equal to or greater than the actuate current, the output opens. When the current is reduced below 95% of the actuate current, the output closes. To increase sensitivity, multiple turns may be made through the TCS's toroidal sensor. The trip point range is divided by the number of turns through the toroidal sensor to create a new range. When using an external CT, select a 2VA, 0-20A output CT rated for the current to be monitored. Select TCS adjustment range 0. Pass one secondary wire lead through the TCS' toroid and connect the secondary leads together.



L = Load
V = Voltage
PS = Power Supply
PLC = PLC Digital Input Module
R = Reset
TP = Trip Point
OC = Monitored Current
NO = Normally Open Output
NC = Normally Closed Output

Order Table:

TCS **X** **X** **X**

Output Voltage
- G - 3-50VDC
- H - 24-240VAC

Actuate Current
- A - 2-20A adjustable
- Fixed - Specify from 2-45A in 1A increments

Output Form
- A - Normally Open
- B - Normally Closed

Specifications

Sensor

Type	Toroid, through hole wiring, alternating current, monitored wire must be properly insulated
Current to Actuate	Adjustable: - 2 - 20A, guaranteed range Fixed: - 2 - 45A, +0/-20%
Reset Current	≅ 95% of the actuate current
Maximum Allowable Current	Steady - 50A turns Inrush - 300A turns for 10s
Actuate Current vs. Temp. & Voltage	≤ ±5%
Response Times	Overcurrent - ≤ 200ms Undercurrent - ≤ 1s
Burden	< 0.5VA

Output

Type	Solid state
Form	NO or NC
Rating	1A steady, 10A inrush
Voltage	AC - 24 to 240VAC +10/-20% DC - 3 to 50VDC
Voltage Drop	AC NO & NC - ≅ 2.5V DC NO & NC - ≅ 1.2V

Protection

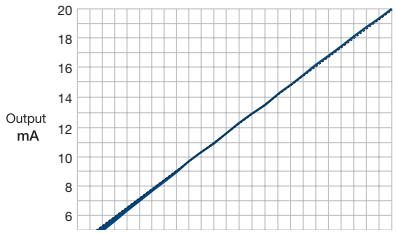
Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ

Mechanical

Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.75 in. (50.8 x 50.8 x 44.5 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals (2)
Sensor Hole	0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm^2) THHN wire

Environmental

Operating/Storage Temperature	-20° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.6 oz (74 g)



The TCSA Series is a loop-powered, linear output current transducer that provides an output that is directly proportional to the RMS AC current passing through the onboard toroid. The TCSA provides a 4 - 20mA output over a power supply range of 10 - 30VDC. Each unit is factory calibrated for monitoring in one of four ranges; 0-5, 0-10, 0-20, or 0-50A. The 0 - 5A range allows the use of external current transformers so loads up to 1200AC amps can be monitored.

For more information see:
Appendix B, page 166, Figure 21 for dimensional drawing.
Appendix C, page 169, Figure 20 for connection diagram.

Features:

- Monitors 0 - 50A in 4 ranges
- Loop powered from 10 to 30VDC
- Linear output from 4 - 20mA
- Zero & span adjustments
- Complete isolation between sensed current & control circuit

Approvals:

Auxilary Products:

- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM
- **DIN rail adaptor:** P/N: P1023-20

Available Models:

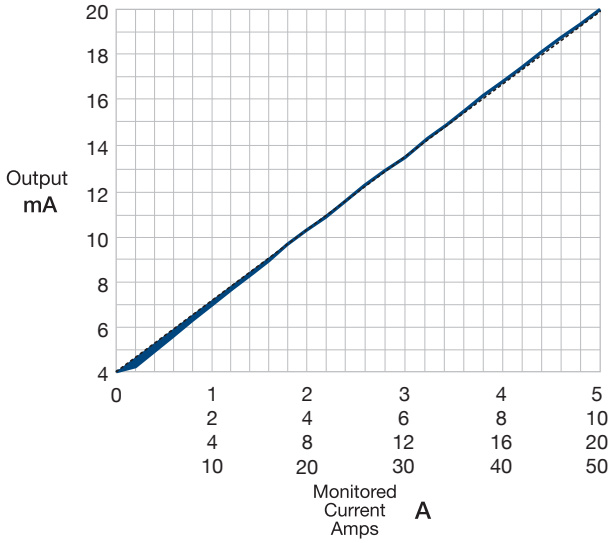
TCSA5
TCSA10
TCSA20
TCSA50

Operation

The TCSA varies the effective resistance of its output in direct proportion to the current flowing in the monitored conductor. The unit is factory calibrated so that 0 amps provides a 4mA output and full span provides a 20mA output. Zero and span adjustments are provided for minor calibration adjustments in the field (if required).

Using an External Current Transformer (CT)

Select a 2VA, 0 to 5A output CT, rated for the current to be monitored. Select TCSA5. Pass one of the CT's secondary wire leads through the TCSA's toroid. Connect the CT's secondary leads together.



Order Table:

Current Range	Part Number
0-5A	TCSA5
0-10A	TCSA10
0-20A	TCSA20
0-50A	TCSA50

Specifications

Sensor

Type	Toroid, through hole wiring, alternating current, monitored conductor must be properly insulated
Monitored AC Current	0 - 50A
Ranges	
4 factory calibrated ranges	0 - 5A, 0 - 10A, 0 - 20A, or 0 - 50A
Factory calibration	≤±2% of full scale
Maximum Allowable Current	Steady – 50A turns; Inrush – 300A turns for 10s
Repeat Accuracy	≤±0.25% of full scale under fixed conditions
Response Time	≅ 300ms
Burden	≤ 0.5VA
AC Line Frequency 0 - 20A / 21 - 50A	20 - 100Hz / 30 - 100Hz
Temperature Coefficient	±0.05%/°C

Output

Type: Series Connection	Current directly proportional to monitored current
Range	4 - 20mA
Sensor Supply Voltage*	10 to 30VDC
Momentary Voltage	40VDC for 1m
Zero Adjust	≅ 3.75 - 4.25mA
Span Adjust	18mA - 22mA
Adjustment	Mini-screw, 25-turn potentiometer

Protection

Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ
Polarity	Units are reverse polarity protected

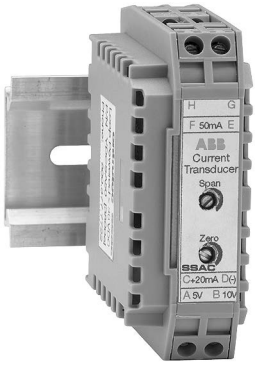
Mechanical

Mounting	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.75 in. (50.8 x 50.8 x 44.5 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals
Sensor Hole	0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm²) THHN wire

Environmental

Operating / Storage Temperature	-30° to 60°C/-40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.4 oz (68 g)

*Minimum loop-power supply voltage equals the minimum sensor voltage 10VDC plus the voltage drop developed across all the other loop devices at 20mA.



The DCSA Series is a loop-powered, linear output current transducer that provides an output that is directly proportional to the RMS AC current passing through the LCSC10T12 sensor. The DCSA provides either an analog current or voltage: 4 - 20 mA, 1 to 5VDC, or 2 to 10VDC. Each unit is factory calibrated for monitoring (with the LCSC10T12 connected) in one of four ranges; 0 - 5, 0 - 10, 0 - 20, or 0 - 50A. Zero and span adjustments allow field calibration if needed. The DCSA mounts on both DIN 1 and DIN 3 rails.

For more information see:
Appendix B, page 166, Figure 22 for dimensional drawing.
Appendix C, page 169, Figure 21 for connection diagram.

Features:

- Mounts on DIN 1 or DIN 3 rail
- 0 - 50A in 4 ranges using LCSC10T12 sensor
- Loop powered from 10 to 30VDC
- Linear output from 4 - 20mA, 1 - 10VD
- Zero & span adjustments
- Separate sensor & control unit

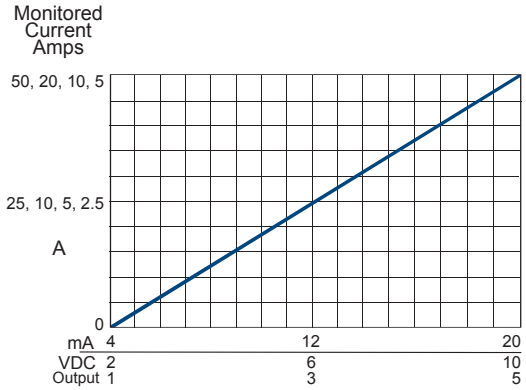
Approvals:

Auxiliary Products:

- **Current sensor:**
  P/N: LCSC10T12

Operation

The DCSA varies the effective resistance of its output in direct proportion to the current flowing in the conductor monitored by the LCSC10T12. Connecting the power supply to terminals C & D provides a 4 to 20mA DC current. Connect the power supply to terminals C & A to get 1 to 5VDC at terminal D. Connect the power supply to terminals C & B to get 2 to 10VDC at terminal D.



Available Models:

DCSA50
LCSC10T12

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

Current Range with LCSC10T12	DCSA Input Range (F to E)	Part Number
0-5A	0-5mA AC	DCSA5
0-10A	0-10mA AC	DCSA10
0-20A	0-20mA AC	DCSA20
0-50A	0-50mA AC	DCSA50
	Toroidal Current Sensor	LCSC10T12

Specifications

Input

Ranges (without LCSC10T12 connected)
4 factory calibrated ranges in mA AC . . . . . 0 - 5mA, 0 - 10mA, 0 - 20mA, or 0 - 50mA AC
Factory calibration . . . . . ±0.5% of full scale
Repeat Accuracy . . . . . ±0.25% of full scale under fixed conditions
Response Time . . . . . ≅ 300ms
Temperature Coefficient . . . . . ±0.05%/°C
Input To Output . . . . . Not isolated

Output

Type Analog . . . . . Current directly proportional to input current
Range . . . . . 4 - 20mA, or 1 to 5VDC or 2 to 10VDC
Supply Voltage* . . . . . 10 to 30VDC
Momentary Voltage . . . . . 40VDC for 1m
Zero Adjust . . . . . ≅ 3.75 - 4.25mA
Span Adjust . . . . . 18mA - 22mA
Adjustment . . . . . Mini-screw, multi-turn potentiometer

Protection

Dielectric Breakdown . . . . . ≥ 2500V RMS terminals to mounting surface
Insulation Resistance . . . . . ≥ 100 MΩ
Polarity . . . . . Units are reverse polarity protected

Mechanical

Mounting . . . . . DIN 1 & DIN 3 rail mounting
Termination Wire clamp . . . . . For 22 - 14AWG (.336 mm² ... 2.5 mm²)

Environmental

Operating / Storage Temperature . . . . . -30° to 60°C / -40° to 85°C
Humidity . . . . . 95% relative, non-condensing
Weight . . . . . ≅ 1.6 oz (45.4 g)

Accessory - LCSC10T12 Toroidal Sensor

Number of Turns 1000
Nominal Output Current Full Range . . . . . 0 - 50 mA
Maximum Allowable Current . . . . . Steady 50A turns
Inrush 300A turns for 10s
Burden . . . . . ≤ 0.5 VA
Frequency 0 - 20A / 21 - 50A . . . . . 20/100 Hz / 30/100 Hz
Sensor Hole . . . . . 0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm²) THHN wire
Weight . . . . . ≅ 1 oz (28.3 g)

*Minimum loop-power supply voltage equals the minimum sensor voltage 10VDC plus the voltage drop developed across all the other loop devices at 20mA.

The LCS10T12 connected to the LPM12 or LPMG12 indicator is a low cost, easy to use, go/no-go indication system for the remote monitoring of current flow. The LCS10T12 is installed on an adequately insulated wire of the monitored load. Its 12in. (30.4cm) leads are connected to the LPM12 or LPMG12 panel mount indicator directly or via customer supplied wires up to 500 feet (152.4m) long.

For more information see:
Appendix B, pages 166 & 167, Figures 23 & 24 for dimensional drawings.
Appendix C, page 170, Figure 22 for connection diagram.

Features:

- Low cost go/no go indication
- May be connected to wires up to 500 feet (152.4 m) long
- Remote monitoring of currents up to 50A
- Green or red LED indicator available

Approvals:

Available Models:

LCS10T12
LPM12
LPMG12

Operation

When the monitored current is 5A turns, the panel mount LPM indicator will glow. The LCS10T12 is designed to maximize the light output of the panel mount indicator. It can be used to monitor current flow of less than 5A by passing the monitored conductor 2 or more times through the sensor.
CAUTION: The LCS10T12 must be connected to the LPM12 or LPMG12 before current flows to prevent damage or a shock hazard. Monitored wires must be properly insulated.

Panel mount indicator designed to match the output of the LCS10T12. The LPM12 and LPMG12 come with 12 in. (30.4 cm) wires and a one piece mounting clip. Both devices install quickly in a 0.25 in. (6.35 mm) hole in panels from 0.031 - 0.062 in. (0.79 - 1.6 mm) thick.

Order Table:

Description	Part Number
AC Current Sensor	LCS10T12
Red LED Indicator	LPM12
Green LED Indicator	LPMG12

Specifications

Monitored Current

Current Range . . . . . 2 - 50A AC

Wire Passes	Min. Current	Max Current	Max. Inrush	Max. Wire Dia.
1	5A	50A	120A	0.355 in. (9.0 mm)
2	2.5A	25A	60A	0.187 in. (4.7 mm)
3	1.7A	16.6A	40A	0.15 in. (3.8 mm)
4	1.3A	12.5A	30A	0.125 in. (3.2 mm)
5	5/X	50/X	120/X	

Maximum Current. . . . . 50A turns continuous
AC Line Frequency 50/60Hz
DC Resistance of Current Limiter . . . . . 65 Ω

Mechanical

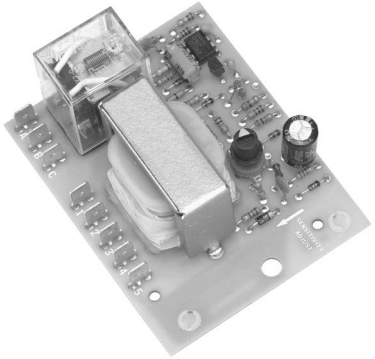
Sensor Hole. . . . . 0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm^2) THHN wire
Termination. . . . . 12 in. (30.4 cm) wire leads

Environmental

Operating / Storage Temperature. . . . . -40° to 60°C/-40° to 85°C
Weight . . . . . LCS: ≅ 0.8 oz (23 g)
LPM: ≅ 0.2 oz (6 g)

Liquid Level Controls & Alternating Relays

Series Included



The LLC1 Series is a single probe conductive liquid level control designed for OEM equipment and commercial appliances. This unit may be ordered with selectable or fixed fill or drain operation. A time delay (1-60s) prevents rapid cycling of the output relay. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. Isolated AC voltage is provided at the probe to prevent electrolysis. A trickle current of less than 1mA determines the presence or absence of liquid between the probe and common. The LLC1 Series printed circuit board is conformal coated to resist moisture and corrosion.

For more information see:
Appendix B, page 167, Figure 26 for dimensional drawing.
Appendix C, page 170, Figure 23 for connection diagram.

Operation

Drain (Pump-Down Mode): When the liquid level rises and touches the probe, a fixed time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay energizes and remains energized until the liquid level falls below the probe. The output relay then de-energizes and remains de-energized until the liquid again touches the probe.

Fill (Pump-Up Mode): When the liquid level falls below the probe, a fixed time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay energizes and remains energized until the liquid level rises and touches the probe. The output relay then de-energizes and remains de-energized until the liquid level again falls below the probe.

Features:

- Single probe level control for conductive liquids
- Isolated AC voltage on the probes
- Adjustable or fixed sensing up to 250KΩ
- Fill or drain operation available
- 24, 120, or 230VAC models are available
- Isolated, 10A, SPDT & non-isolated, SPST output contacts

Approvals:

Auxiliary Products:

- **Quick connect to screw adaptor:** P/N: P1015-18
- **Electrode:** P/N: PHST-38QTN
- **Threaded probe (24"):** P/N: LLP-24
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

LLC14A1AX
LLC14A5AX
LLC14A7AX
LLC14B15AX
LLC14B1AX
LLC14B60AX
LLC16A25AX
LLC16A3AX
LLC16B60A

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

LLC1 **X** **X** **X** **X** **X**

- **Input**
  - 2 - 24VAC
  - 4 - 120VAC
  - 6 - 230VAC
- **Operation**
  - A - Drain
  - B - Fill
- **Time Delay**
  - Fixed: Specify 1-60s in **1s increments**
- **Sense Resistance**
  - A - Adjustable
  - F - Fixed (Specify fixed resistance (1-250) in 1KΩ increments.)
- **Mounting**
  - Blank - Surface mount
  - X - 0.5 in. nylon standoffs (three)

Specifications

Control

Type	ON/OFF (single level) resistance sensor with built-in time delay to prevent rapid cycling
Sense Voltage	Low voltage AC between probe & common. Isolated from input & output.
Sense Resistance	Fixed or adjustable to 250KΩ
Sense Resistance Tolerance	Adjustable - guaranteed range Factory fixed ±10%

Time Delay

Range	Fixed 1 - 60s in 1s increments

Input

Voltage	24, 120, or 230VAC
Tolerance 24VAC	-15% - 20%
120 & 230VAC	-20% - 10%
AC Line Frequency	50/60 Hz

Output

Type	Electromechanical relay
Form	Non-isolated, SPST & Isolated, SPDT contacts
Rating	10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life	Mechanical - 1 x 10^7; Electrical - 1 x 10^5

Protection

Surge	IEEE C62.41-1991 Level A
Isolation Voltage	≥ 1500V RMS between input, output & probe

Mechanical

Mounting	Surface mount to probe common with two #6 (M3.5 x 0.6) screws or 0.50 in. (12.7 mm) nylon standoffs with three #6 (M3.5 x 0.6) screws (use Terminal 5 for probe common)
Termination	0.25 in. (6.35 mm) male quick connect terminals
Dimensions (Open Board)	3.5 x 2.75 x 2 in. (88.9 x 69.9 x 50.8 mm)

Environmental

Operating/Storage Temperature	-20° to 55°C/-40° to 80°C
Coating	Printed circuit board is conformal coated to resist moisture and corrosion
Weight	≅ 8.7 oz (247 g)

The LLC2 Series is a dual-probe conductive liquid level control designed for OEM equipment and commercial appliance applications. Models are available for fill or drain operation. Transformer isolated 12VAC is provided at the probes to prevent electrolysis. A trickle current of less than 1mA determines the presence or absence of liquid between the probes and common. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. The LLC2 Series printed circuit board is conformal coated to resist moisture and corrosion.

For more information see:
Appendix B, page 167, Figure 27 for dimensional drawing.
Appendix C, page 170, Figure 27 for connection diagram.

Features:

- Dual probe level control for conductive liquids
- Isolated AC voltage on the probes
- Adjustable or fixed sensing up to 100KΩ
- Terminal block or quick connect terminals
- Fill or drain operation available
- 24, 120, or 230VAC models are available
- Isolated, 10A, SPDT output contacts

Approvals:

Auxiliary Products:

- **Quick connect to screw adaptor:** P/N: P1015-18
- **Electrode:** P/N: PHST-38QTN
- **Threaded probe (24"):** P/N: LLP-24
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

LLC24A2AN
LLC24A2F50N
LLC24B2F50N
LLC26A1F25C

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Drain (Pump-Down Mode): When the liquid level rises and touches the high probe, the output relay energizes and remains energized until the liquid level falls below the low probe. The output relay then de-energizes and remains de-energized until the liquid again touches the high probe.

Fill (Pump-Up Mode): When the liquid level falls below the low probe, the output relay energizes and remains energized until the liquid level rises and touches the high probe. The output relay then de-energizes and remains de-energized until the liquid level again falls below the low probe.

Order Table:

LLC2 **X** **Input**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Operation**
- A - Drain
- B - Fill

X **Termination**
- 1 - 0.25 Quick Connect
- 2 - Terminal Block

X **Sense Resistance**
- A - Adjustable to 100kΩ
- F - Fixed (Specify fixed resistance **1-100** in 1KΩ increments.)

X **Mounting Dimension**
- N
- C

	N	C
W	0.44 (11.35)	0.25 (6.35)
X	3.62 (11.35)	3.5 (88.9)
Y	2.12 (53.8)	2.5 (63.5)
Z	0.19 (4.83)	0.25 (6.35)

Mounting dimensions as indicated in Appendix B, page 167.

Specifications

Control
Type . . . . . Resistance sensing for high & low level detection of conductive liquids
Sense Voltage . . . . . 12VAC at probe terminals
Sense Resistance . . . . . Fixed or adjustable to 100KΩ
Sense Resistance Tolerance . . . . . Adjustable: guaranteed range Fixed: ±10%

Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance 24VAC . . . . . -15% - 20%
120 & 230VAC . . . . . -20% - 10%
AC Line Frequency . . . . . 50/60 Hz

Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated, SPDT
Rating . . . . . 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life . . . . . Mechanical - 1 x 10^7; Electrical - 1 x 10^5

Protection
Isolation Voltage . . . . . ≥ 1500V RMS between input, output, & probe

Mechanical
Mounting . . . . . Surface mount with two or four #6 (M3.5 x 0.6) screws
Termination . . . . . 0.25 in. (6.35 mm) duplex male quick connect terminals
Terminal blocks for up to #14 AWG (2.5 mm^2) wire
Dimensions (Open Board) . . . . . 4 x 3 x 2 in. (101.6 x 76.2 x 50.8 mm)

Environmental
Operating / Storage Temperature . . . . . -20° to 55°C / -40° to 80°C
Coating . . . . . Printed circuit board is conformal coated to resist moisture and corrosion
Weight . . . . . ≅ 9 oz (255 g)

The LLC4 combines resistance sensing circuitry with solid-state timing to provide single probe level maintenance. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. Isolated pulsed DC is provided at the probe to prevent electrolysis. A trickle current of less than 1mA determines the presence or absence of conductive liquid between the probe and common. The LLC4 Series can be used with many types of low voltage (resistance changing) transducers to perform other control functions like temperature limit control, photo limit control, condensation sensing, and ice sensing.

For more information see:
Appendix B, page 166, Figure 19 for dimensional drawing.
Appendix C, page 170, Figure 24 for connection diagram.

Features:

- Single probe level control for conductive liquids
- Adjustable or fixed sensing up to 250 KΩ
- Selectable or fixed fill or drain operation available
- 24, 120, or 230VAC models are available
- Isolated pulsed DC on the probes
- Isolated, 4A, SPDT output contacts

Approvals:

Auxiliary Products:

- **Electrode:** P/N: PHST-38QTN
- **Threaded probe (24"):** P/N: LLP-24
- **Panel mount kit:** P/N: BZ1
- **8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)

Available Models:

LLC42A10A	LLC44A60A
LLC42A1A	LLC44B1F250
LLC42B15A	LLC44B20A
LLC44A10A	LLC44B2A
LLC44A1A	LLC44B30A
LLC44A2A	LLC44B4A
LLC44A4A	LLC44B5A
LLC44A5A	LLC44B5F100

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Drain (Pump-Down Mode): When the liquid level rises and touches the probe, the time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay and LED energize and remain energized until the liquid level falls below the probe level. The output relay and LED de-energize and remain de-energized until the liquid rises and touches the probe.

Fill (Pump-Up Mode): When the liquid level falls below the probe, the time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay and LED energize and remain energized until the liquid level rises and touches the probe. The output relay and LED then de-energize and remain de-energized until the liquid level again falls below the probe level.

Order Table:

LLC4 **X** **X** **X** **X**

Input
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

Operation
- A - Drain
- B - Fill

Time Delay
- Specify fixed delay **1-60**s in 1s increments

Sense Resistance
- A - Adjustable (1-250k)
- F - Fixed (Specify fixed resistance (**1-250**) in 1KΩ increments.)

Specifications

Control
Type . . . . . ON/OFF (single level) resistance sensor with built-in time delay to prevent rapid cycling
Sensing Voltage . . . . . Pulsed DC at probe terminals
Sensing Resistance . . . . . Fixed or adjustable to 250KΩ
Sensing Resistance Tolerance . . . . . Adjustable: 1K ±500Ω at low end; 250K ±25% at high end
Factory fixed: ±10% or 500Ω, whichever is greater

Input
Voltage . . . . . 24, 120, or 230VAC
Tolerance 24VAC . . . . . -15%, +20%
120 & 230VAC . . . . . -20%, +10%
AC Line Frequency . . . . . 50/60 Hz

Output
Type . . . . . Electromechanical relay
Form . . . . . Isolated, SPDT
Rating . . . . . 4A resistive @ 240VAC; 1/10 hp @ 240VAC

Protection
Surge . . . . . IEEE C62.41-1991 Level A
Isolation Voltage . . . . . ≥ 1500V RMS between input, output & probe

Mechanical
Mounting . . . . . Plug-in socket
Termination . . . . . Octal 8-pin plug-in
Dimensions . . . . . 2.91 x 2.39 x 1.78 in. (73.9 x 60.7 x 45.2 mm)

Environmental
Operating/Storage Temperature . . . . . -20° to 60°C/-40° to 80°C
Weight . . . . . ≅ 6 oz (170 g)

The LLC5 provides dual probe conductive liquid level control in a convenient octal plug-in package. Models are available for fixed fill or drain operation. Isolated, pulsed DC voltage on the probes prevents electrolytic plating. Less than 1 mA of current is used to sense the presence of conductive liquid between the probes and common. On adjustable units, the sensitivity adjustment eliminates false tripping caused by floating debris and foaming agents.

For more information see:
Appendix B, page 167, Figure 29 for dimensional drawing.
Appendix C, page 170, Figure 28 for connection diagram.

Features:

- Dual probe level control for conductive liquids
- Onboard knob or fixed sensing up to 100KΩ
- Fill or drain operation available
- Select standard or diagnostic LED operation
- Diagnostic LED operation reduces adjustment & troubleshooting time
- 24, 120, or 230VAC models are available
- Isolated, 5A, SPDT ouput contacts

Approvals:

Auxiliary Products:

- **Panel mount kit:** P/N: BZ1
- **Octal 8-pin socket:** P/N: NDS-8
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **Electrode:** P/N: PHST-38QTN
- **Threaded probe (24"):** P/N: LLP-24

Available Models:

LLC52AA	LLC54AF10
LLC52BA	LLC54BA
LLC54AA	LLC54BAS
LLC54AAS	LLC56AA

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Drain (Pump-Down Mode): When the liquid level rises and touches the high level probe, the output relay and LED energize and remain energized until the liquid level falls below the low level probe. The output relay and LED de-energize and remain de-energized until the liquid rises and touches the high level probe.

Fill (Pump-Up Mode): When the liquid level falls below the low level probe, the output relay and LED energize and remain energized until the liquid level rises and touches the high level probe. The output relay and LED de-energize and remain de-energized until the liquid level again falls below the low level probe.

Order Table:

LLC5 **X** **Input**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X **Operation**
- A - Drain
- B - Fill

X **Sense Resistance**
- A - Adjustable
- F - Fixed (Specify fixed resistance **1-100** in 1KΩ increments.)

X **Connection**
- Blank - Standard (#6 Low, #8 High)
- S - Reverse (#8 Low, #6 High)

X **LED Operation**
- Blank - Standard LED operation
- D - LED operation with diagnostics

Specifications

Control

Type	Resistance sensing for high & low level detection of conductive liquids
Sensing Voltage	Pulsed DC at probe terminals
Sensing Resistance	Factory fixed or adjustable to 100KΩ
Sensing Resistance Tolerance	Adjustable: 1K ±500Ω at low end; 100KΩ ±25%, 0% at high end Factory fixed: ±10% or 500Ω whichever is greater
Response Time	Debounce time delay <1s

Input

Voltage	24, 120, or 230VAC
Tolerance 24VAC	-15%, +20%
120 & 230VAC	-20%, +10%
AC Line Frequency	50/60 Hz

Output

Type	Electromechanical relay
Form	Isolated, SPDT
Rating	5A resistive @ 240VAC 1/10 hp @ 240VAC

Protection

Isolation Voltage	≥ 1500V RMS between input, output, & probe

Mechanical

Mounting	Plug-in socket
Dimensions	3.01 x 2.39 x 1.78 in. (76.5 x 60.7 x 45.2 mm)
Termination	Octal 8-pin plug-in

Environmental

Operating/Storage Temperature	-20° to 60°C / -40° to 80°C
Weight	≅ 6 oz (170 g)

The LLC6 Series is a plug-in, single-probe conductive liquid level control designed for low liquid level cutoff protection. It offers a factory fixed time delay of 1 - 60s and is available in input voltages of 24, 120, or 230VAC. LED indicator illuminates whenever the LLC6's 10A, SPDT output relay is energized. Available with automatic/manual reset or a special manual reset with power outage feature, which auto resets the unit when power is restored and the water level is acceptable. 24VAC and 120VAC units are recognized as limit switches under UL353 (230VAC units are UL508) and CSA certified under Standard 14.

For more information see:
Appendix B, page 166, Figure 19 for dimensional drawing.
Appendix C, page 170, Figure 26 for connection diagram.

Features:

- Designed for low level cutoff protection
- Energized on wet probe
- Fixed time delay of 1 - 60s
- Fixed sense resistance of 5K - 250KΩ
- 24, 120, or 230VAC input voltage available
- Non-isolated, 10A, SPDT output contacts

Approvals:

Auxiliary Products:

- **Electrode:** P/N: PHST-38QTN
- **Threaded probe (24"):** P/N: LLP-24
- **Panel mount kit:** P/N: BZ1
- **11-pin socket:** P/N: NDS-11
- **Hold-down clips (sold in pairs):** P/N: PSC11 (NDS-11)

Available Models:

LLC6210F10M
LLC622F10P
LLC6410F10M
LLC642F10M
LLC643F250M
LLC645F250M
LLC6610F5P

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Automatic Reset (Reset terminals not connected): When liquid rises to the low level cutoff probe, the output relay and the LED indicator energize. When the liquid falls below low level cutoff probe, the output relay and the LED indicator de-energize after a fixed time delay.

Manual Reset (Reset switch connected): When the liquid level falls below the low level probe, the output relay and LED de-energize after a fixed time delay. When the liquid level rises to the low level probe, the output relay and LED indicator remain de-energized until the manual reset switch is opened; then they energize immediately.

Power Outage Manual Reset (Reset switch connected): A power outage causes the output relay and LED indicator to de-energize. Upon restoration of power, if the liquid level is above the low level probe, the output relay and LED indicator will re-energize. If the liquid level is below the low level probe, the output relay and LED indicator remain de-energized until the Normally Closed (NC) reset switch is opened.

Order Table:

LLC6 **X** **X** **X** **X**

- **Input**
  - 2 - 24VAC
  - 4 - 120VAC
  - 6 - 230VAC
- **Time Delay (fixed)**
  - Specify fixed delay in seconds (**1-60**) in 1s increments
- **Sense Resistance**
  - F - Fixed (Specify fixed resistance in kilohms (**5-250**) in 1K increments.)
- **Reset**
  - M - Manual/Automatic Reset
  - P - Power outage manual reset

Specifications

Control

Type	ON/OFF (single level) resistance sensor with built-in time delay to prevent rapid cycling
Sense Voltage	12VAC nominal at probe terminals
Sense Resistance	Fixed 5K - 250KΩ
Sense Resistance Tolerance	Fixed ±10%

Time Delay

Range	1 - 60s in 1s increments
Tolerance	±20%
Repeat Accuracy	±10%
Time Delay vs Temp. & Voltage	±10%
Power Outage Reset Delay	≤ 1s

Input

Voltage	24, 120, or 230VAC
Tolerance 24VAC	+20% to -15%
120 or 230VAC	+10% to -20%
AC Line Frequency	50/60 Hz

Output

Type	Electromechanical relay
Form	Non-isolated, SPDT
Rating	10A resistive @ 240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC

Protection

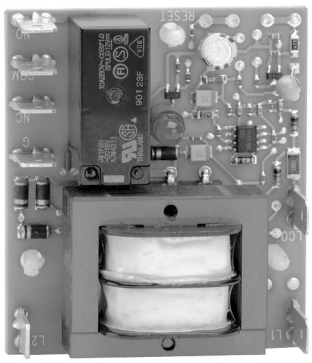
Surge	IEEE C62.41-1991 Level A
Isolation Voltage	≥ 2500V RMS between input & output terminals

Mechanical

Mounting	Plug-in socket
Termination	11-pin relay type
Dimensions	2.91 x 2.39 x 1.78 in. (73.9 x 60.7 x 45.2 mm)

Environmental

Operating / Storage Temperature	-40° to 60°C / -40° to 80°C
Humidity	95% relative, non-condensing
Weight	≅ 7.3 oz (207 g)



The LLC8 Series is a low cost, single-probe conductive liquid level control designed for low liquid level cutoff protection. It offers a factory fixed time delay of 1 - 60s and is available for input voltages of 24, 120, or 230VAC. LED indicator illuminates whenever the LLC8's isolated, 10A, SPDT output relay is energized. Sense resistance is fixed from 5K - 250KΩ. Available with manual/automatic reset or a special manual reset with a power outage feature that auto resets the unit when power is restored and the water level is acceptable. 24 and 120VAC units are UL recognized as limit switches under UL353 (230VAC units are UL 508) and CSA certified under Standard 14.

For more information see:
Appendix B, page 167, Figure 28 for dimensional drawing.
Appendix C, page 170, Figure 25 for connection diagram.

Features:

- Designed for low level cutoff protection
- Energized on wet probe
- Fixed time delay 1 - 60s
- Fixed sense resistance of 5K - 250KΩ
- 24, 120, or 230VAC input voltages available
- Isolated, 10A, SPDT output contacts

Approvals:

Auxiliary Products:

- **Quick connect to screw adaptor:** P/N: P1015-18
- **Electrode:** P/N: PHST-38QTN
- **Threaded probe (24"):** P/N: LLP-24
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

LLC825F5M
LLC843F10M
LLC843F10P
LLC843F26M
LLC843F26P
LLC845F25P
LLC8610F12M

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Automatic Reset (Reset switch not connected): When liquid rises to low level cutoff probe, output relay and LED indicator energize. When liquid falls below the low level cutoff probe, the output relay and LED indicator de-energize after a fixed time delay.

Manual Reset (Reset switch connected): When the liquid level falls below low level probe, the output relay and LED de-energize after a fixed time delay. When the liquid level rises to low level probe, the output relay and LED indicator remain de-energized until the NC manual reset switch is opened; then they energize immediately.

Power Outage Manual Reset (Reset switch connected): A power outage causes the output relay and LED indicator to de-energize. Upon restoration of power, if the liquid is touching the low level probe, the output relay and LED indicator will re-energize. If the liquid level is below the low level probe, the output relay and LED indicator remain de-energized until the NC reset switch is opened.

Order Table:

LLC8

X — **Input**
- 2 - 24VAC
- 4 - 120VAC
- 6 - 230VAC

X — **Time Delay (fixed)**
- Specify fixed delay in seconds (**1-60**) in 1s increments

X — **Sense Resistance**
- F - Fixed (Specify fixed resistance in kilohms (**5-250**) in 1K increments.)

X — **Reset**
- M - Manual/Automatic Reset
- P - Power outage manual reset

Specifications

Control

Type	Resistance sensing for conductive liquids with time delay
Sense Voltage	12VAC nominal at probe terminals
Sense Resistance	Fixed 5K - 250KΩ
Sense Resistance Tolerance	±10%

Time Delay

Tolerance	±20%
Repeat Accuracy	±10%
Time Delay vs Temp. & Voltage	±10%
Power Outage Reset Delay	≤1s

Input

Voltage	24, 120, or 230VAC
Tolerance 24VAC	-15% - 20%
120 or 230VAC	-20% - 10%
AC Line Frequency	50/60 Hz

Output

Type	Electromechanical relay
Form	Isolated SPDT
Rating	10A resistive @ 120/240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC

Protection

Surge	IEEE C62.41-1991 Level A
Isolation Voltage	≥ 2500V RMS input to output terminals

Mechanical

Mounting		0.5 in. (12.7 mm) x .187 (4.76 mm) dia. nylon standoffs (3)
Termination	Electrical	0.25 in. (6.35 mm) male quick connect terminals
	Reset Switch & Probe(s)	0.187 x 0.03 in. (4.75 x 0.76 mm) male quick connect terminals

Environmental

Operating/Storage Temperature	-40° to 60°C / -40° to 80°C
Coating	Printed circuit board is conformal coated to resist moisture & corrosion
Humidity	95% relative, non-condensing
Weight	≈ 5 oz (141.7 g)

The ARP Series is used in systems where equal run time for two motors is desirable. The selector switch allows selection of alternation of either load for continuous operation. LED's indicate the status of the output relay. This versatile series may be front panel mounted (BZ1 accessory required) or 35 mm DIN rail mounted with an accessory socket.

For more information see:
Appendix B, page 167, Figure 31 for dimensional drawing.
Appendix C, 170, Figure 29 for connection diagram.

Features:

- Provides equal run time for two motors
- Alternating or electrically locked operation
- Low profile selection switch
- 10A output contacts
- LED status indication
- Industry standard base connection

Approvals:

Auxiliary Products:

- **Hold-down clips (sold in pairs):**
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- **Panel mount kit:** P/N: BZ1
- **11-pin socket:** P/N: NDS-11
- **8-pin socket:** P/N: NDS-8
- **DIN rail:** P/N: C103PM

Available Models:

ARP23S
ARP41
ARP41S
ARP42S
ARP43
ARP43S
ARP61S
ARP63
ARP63S

If desired part number is not listed, please call us to see if it is technically possible to build.

Operation

Alternating: When the rotary switch is in the "alternate" position, alternating operation of Load A and Load B occurs upon the opening of the control switch S1. To terminate alternating operation and cause only the selected load to operate, rotate the switch to position "A" to lock Load A or position "B" to lock Load B. The LEDs indicate the status of the internal relay and which load is selected to operate.

Note: Input voltage must be applied at all times for proper alternation. The use of a solid-state control switch for S1 may not initiate alternation correctly. S1 voltage must be from the same supply as the unit's input voltage (see connection diagrams). Loss of input voltage resets the unit; Load A becomes the lead load for the next operation.

Duplexing (Cross Wired): Duplexing models operate the same as alternating relays and when both the Control (S1) and Lag Load (S2) Switches are closed, Load A and Load B energize simultaneously.

The DPDT 8-pin, cross-wired option, allows extra system load capacity through simultaneous operation of both motors when needed. Relay contacts are not isolated.

Order Table:

ARP	X	X	X
	Input	**Output Form**	**Switch Operation**
	2 - 24VAC	1 - SPDT, 8-pin	Blank - No Switch
	4 - 120VAC	2 - DPDT, 11-pin	S - Rotary Switch
	6 - 230VAC	3 - DPDT, 8-pin cross wired	

Specifications

Input

Voltage	24, 120, or 230VAC
Tolerance 24VAC	-15% - 20%
120 & 230VAC	-20% - 10%
AC Line Frequency	50/60Hz

Output

Type	Electromechanical relay
Form	SPDT, DPDT, or cross wired DPDT
Rating	10A resistive @ 120/240VAC & 28 VDC; 1/3 hp @ 120/240VAC
Maximum Voltage	250VAC
Life	Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection

Isolation Voltage	≥ 1500V RMS input to output

Mechanical

Mounting	Plug-in socket
Dimensions	3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
Termination	Octal 8-pin or magnal 11-pin

Environmental

Operating / Storage Temperature	-20° to 60°C / -30° to 85°C
Weight	≅ 5.6 oz (159 g)

NOTE: Unit does not have debounce time delay.

Tower & Obstruction Lighting Controls

Series Included

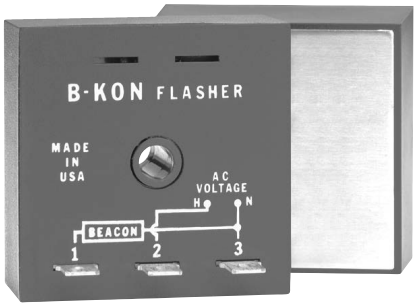
Beacon Flasher

Lamp Monitors

Incandescent Lamps

LED Lamps

Photo Controls



B-KON Flashers have proven their reliability through years of use on communication towers, smoke stacks, cooling towers, tall buildings, bridges and utility towers. The highest quality components are encapsulated in a rugged plastic housing with a molded-in heat transfer plate. The flash rate, ratio, and fail-safe design meet FAA regulations. Zero voltage switching can increase lamp life up to ten times. The FS155-30RF & FS165-30RF include superior RF filtering circuitry for use in high RF installations; including AM hot towers.

For more information see:
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 171, Figure 30 for connection diagram.

Operation
FS Series - Flasher (OFF First)
FA Series - Flashers & Aux. Modules
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until voltage is removed. Reset: Removing input voltage resets the output and the sequence to T2.

Features:

- Zero voltage switching - up to 10 times longer lamp life
- No RFI caused by contacts closing
- High inrush capability - up to 200A
- RF model for AM hot towers & other high RF installations
- Auxiliary units for synchronous flashing or constant line loading

Approvals: (FS155 & FA155 models only)

Auxiliary Products:

- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

FA155
FA155-2
FA165
FA165-2
FS155-30RF
FS155-30T
FS165-30T

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

Input	Wattage	Inrush	Description	Part Number
120VAC	2500W	200A	For High RF Radiation locations including AM Hot Towers	FS155-30RF
120VAC	2500W	200A	Standard Flasher	FS155-30T
230VAC	5000W	200A	For High RF Radiation locations including AM Hot Towers	FS165-30RF
230VAC	5000W	200A	Standard Flasher	FS165-30T
120VAC	2500W	200A	Auxiliary unit for synchronous operating of additional beacons	FA155-2
120VAC	3000W	300A	Auxiliary unit with optical isolation between input and load contacts	FA155-3
230VAC	5000W	200A	Auxiliary unit for sychronous operating of additional beacons	FA165-2
120VAC	2500W	200A	Auxiliary unit to provide constant line loading	FA155
230VAC	5000W	200A	Auxiliary unit to provide constant line loading	FA165

Specifications

Operation	Single & multiple beacon flashing with auxiliary modules
Flash Rate (FS Series Only)	30 ±10 FPM
ON/OFF Ratio (FS Series Only)	50 - 67% ON time; 33 - 50% OFF time
Voltage	120 or 230VAC ±20%
AC Line Frequency	50/60Hz
Output Rating (Zero Voltage Switching)	2500W @ 120VAC; 5000W @ 230VAC
Inrush Current	200A peak for 1 cycle of AC line
Mounting*	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals
Circuitry	Encapsulated
Operating / Storage Temperature	-55° to 65°C / -55° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)

* Note: Must be mounted to metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.

Flasher & Incandescent Beacon Alarm Relay FB120A/FB230A

The FB120A and FB230A are used to monitor the operation of one two-lamp incandescent beacon and one beacon flasher (or auxiliary module). The flasher and lamps are monitored by sensing the flow of current in the circuit. If the lamp(s) or the flasher fail to operate properly, a solid-state output and an isolated SPDT relay energize. When connected to a site monitoring system, this unit provides the remote beacon monitoring protection required by the FAA/FCC. On a multiple beacon structure, one unit is required for each two-lamp incandescent beacon (one unit per beacon for LED beacons).

For more information see:
Appendix B, page 167, Figure 32 for dimensional drawing.
Appendix C, page 171, Figure 31 for connection diagram.

Operation

If one lamp in an incandescent beacon fails, the relay and solid-state lamp failure outputs energize after 10s. If the flasher fails in the ON or OFF condition, the relay and the solid-state flasher failure output energizes after 6s. If both failures occur, all three outputs energize after their trip delays.
Note: If both incandescent lamps fail, all three outputs will energize. The relay and solid-state flasher failure output energizes after 6s, and the solid-state lamp failure output energizes after 10s.

Features:

- Senses failed flashing incandescent beacon lamps & beacon flashers
- Toroidal current sensing
- One isolated, 5A, SPDT alarm output
- Two 1A, solid-state line voltage alarm outputs
- Trip delays prevent nuisance alarms

Available Models:

FB120A
FB230A

Order Table:

Input	Lamp Type	Part Number
120VAC	Incandescent Beacon	FB120A
230VAC	Incandescent Beacon	FB230A

Specifications

Input Voltage
FB120A. . . . . 120VAC ±15%
FB230A. . . . . 230VAC ±15%
AC Line Frequency 50/60Hz
Lamp Socket Voltage . . . . . ±10%; 50/60Hz

Alarm Outputs
Type . . . . . 3 total - 1 relay, 2 solid state;
One isolated SPDT relay rated 5A resistive
Two solid-state line voltage outputs
rated 0.5A steady, 5A inrush

Lamp Failure Detection
FB120A. . . . . For two 620W or 700W lamps
FB230A. . . . . For two 500W or 700W lamps

Trip Delays
Flasher Failure . . . . . Fixed at 6s; -0/+40%
Lamp Failure . . . . . Fixed at 10s; -0/+40%

LEDs
Lamp Failure (Red) . . . . . Glows when one or both lamps fail
Flasher Failure (Red) . . . . . Glows when the flasher fails

Protection
Circuitry . . . . . Encapsulated
Mounting . . . . . Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions . . . . . 3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
Termination. . . . . 7 position barrier block for 20 AWG (0.5 mm²)
to 14 AWG (2.5 mm²) wire

Environmental
Operating / Storage Temperature. . . . . -55° to 60°C / -55° to 85°C
Weight . . . . . ≅ 7 oz (198 g)

Obstruction Lamp Alarm Relay

SCR490D

The SCR490D Series is used to provide remote monitoring of steady burning incandescent marker and obstruction lighting. Four onboard switches allow operator programming for lighting systems with two through nine lamps on a single AC circuit. The SCR490D uses a toroidal sensor and electronic circuitry to sense the failure of one or more lamps.

For more information see:
Appendix B, page 167, Figure 32 for dimensional drawing.
Appendix C, page 171, Figure 32 for connection diagram.

Operation

When a lamp fails, the SCR490D senses a decrease in current flow. Then, after a fixed time delay, it transfers to its alarm mode. In alarm mode, the LED indicator, the output relay (SPDT isolated contacts), and a non-isolated solid-state output are energized. Replacement of the failed lamps resets the alarm outputs and the LED indicator. To prevent false alarm signals, power must be applied to the SCR490D at the same time that lamps are energized.

Features:

- Senses failed obstruction lamps
- 2 - 9 steadily burning lamps can be monitored
- Toroidal current sensing
- Isolated, 10A, SPDT alarm output contacts
- 1A, solid-state line voltage alarm output
- 6 second trip delay prevents nuisance alarms

Approvals:

Available Models:

SCR490D

Order Table:

Input	Part Number
120VAC	SCR490D

Specifications

Operation	
Number of Lamps	2 - 9 (selectable)
Lamp Wattage	116W, incandescent lamps
Rated Lamp Voltage	120 or 130VAC (selectable)
Monitored Voltage	120VAC ±3%
Trip Delay	≅ 6s fixed
Voltage	120VAC
AC Line Frequency	50/60Hz
Tolerance 120VAC	- 20% - 10%
Line Voltage Output (Solid State Rated)	≤ 125W to operate a spare lamp or alarm
Isolated Alarm Output	10A @ 120VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Mounting	Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions	3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
Termination	Screws with captive clamps for up to 14 AWG (2.45 mm²) wire
Circuitry	Encapsulated
Operating/Storage Temperature	-55° to 65°C / -55° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 6.8 oz (193 g)

The SCR series is a universal lamp alarm relay designed to sense the failure of flashing or steady incandescent beacon lamps or steady side lights. The toroidal current sensor provides isolation and allows monitoring of more than one line at a time. The SCR Series energizes when one or more lamps fail. It will monitor the operation of one to four side lights and up to four beacon lamps.

For more information see:
Appendix B, page 167, Figure 32 for dimensional drawing.
Appendix C, page 171, Figure 33 for connection diagram.

Operation

When a lamp fails, the SCR Series senses a decrease in current flow. After a fixed time delay, the LED glows and the two alarm outputs energize. The outputs and the LED are reset when the failed lamps are replaced and the current returns to the nominal setting, or when the input voltage is removed. The SCR will sense an open flasher, it will not sense a continuously ON flasher (see FB Series).

Features:

- Monitors incandescent lamps for failure
- Senses failed flashing beacon or obstruction lamps
- Switch selectable number, voltage, & wattage of lamps
- Isolated, 10A, SPDT alarm output contacts
- 1A, solid-state line voltage alarm output
- Toroidal current sensing

Approvals: CE SP (SCR430T only)

Available Models:

SCR430T
SCR630T

Order Table:

Input	Lamp Type	Part Number
120VAC	Incandescent	SCR430T
230VAC	Incandescent	SCR630T

Specifications

Lamp Monitoring

Capacity (in lamps)		100W	116W	620W	700W
SCR430T	120VAC Lamps	4	4	4	n/a
SCR630T	230VAC Lamps	n/a	4	n/a	4

Time Delay
Trip Delay . . . . . Factory fixed ≅ 6s

Input
Input Voltage/Tolerance. . . . . SCR430T - 120VAC ±10%
SCR630T - 230VAC ±10%
AC Line Frequency 50/60Hz

Output . . . . . To operate a spare lamp or alarm
Line Voltage Output (Solid-state Rated). . . . . ≤ 125W @ 120VAC
≤ 250W @ 240VAC
Isolated Alarm Output (SPDT) . . . . . 10A @ 240VAC or 30VDC resistive;
1/4 hp @ 125VAC; 1/2 hp @ 250VAC

Mechanical
Mounting . . . . . Two #6 (M3.5 x 0.6) screws
Dimensions. . . . . 3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
Termination. . . . . Screws with captive clamps for up to 14 AWG (2.45 mm^2) wire

Protection
Circuitry . . . . . Encapsulated

Environmental
Operating Temperature. . . . . -55° to 65°C
Weight . . . . . ≅ 6.8 oz (193 g)

The FB series is a universal lamp alarm relay designed to sense the failure of flashing LED beacon lamps. It will monitor the operation of one to eight beacons connected to a single flasher and/or auxiliary modules and the operation of the flasher. The FB Series output relay energizes when one or more lamps fail. All monitored lamps must be the same wattage and voltage. The 0.5A solid-state output energizes when a flasher failure is sensed.

For more information see:
Appendix B, page 167, Figure 32 for dimensional drawing.
Appendix C, page 171, Figure 31 for connection diagram.

Features:

- Senses failed flashing beacon lamps
- Switch selectable number of beacons
- Senses flasher failure
- Isolated, 10A, SPDT alarm output contacts
- 10A, NO line voltage alarm output
- 0.5A, solid-state flasher failure output "F"
- Self calibrating; no fine adjustment required
- Meets FAA-AC No: 150/5345-43E

Approvals: CE

Auxiliary Products:

- **DIN mount adaptor:** P/N: P1023-20
- **DIN rail:** P/N: C103PM (Al)

Available Models:

FB9L

Operation

When a LED beacon lamp fails, the FB senses a decrease in current flow. After a 10s lamp failure trip delay, the isolated SPDT (4-5-6) and non-isolated SPNO (3-1) relay contacts energize. These contacts are used to indicate a beacon failure has occurred. The "L" onboard LED indicator flashes green during the trip delay and glows red after the output relay energizes. Connected to a site monitoring system, it provides remote beacon monitoring required by FAA-AC No: 150/5345-43E.

The FB also monitors the operation of the flasher. If the flasher remains in the ON or OFF condition for more than 6s the solid-state output energizes and the "F" flasher failure, onboard LED glows red. This output is normally used to energize an external flasher bypass relay. The contacts of the bypass relay are used to route voltage around the failed flasher and to indicate an alarm condition.

Note: In a single flasher, single beacon system, if the beacon lamp fails, zero current flow is detected. This will cause the flasher failure output to energize after 6s and then the beacon failure outputs after 10s. This is normal operation and can be expected anytime zero current is flowing through the monitored conductor.

Calibration

The alarm relays must be calibrated after initial installation and each time the LED lamps are replaced. In order to calibrate or re-calibrate the alarm relay, the internal memory must be cleared.

Clearing Memory:

Remove input voltage, transfer the calibration switch to the off position, re-apply input voltage. The LED will flash Red to indicate the memory is clear and the relay is ready for calibration.

Calibration:

1) Perform visual inspection of the structure's lighting to assure all lamps and flashers are operating properly.

2) Remove input voltage, and check to ensure the calibrate switch is in the OFF position. Adjust the lamp selector switches for the correct number of similar (see note a) lamps to be monitored.

3) Reapply input voltage, the LED should flash Red. After confirming the LED is flashing Red and the lamp selector switches are properly adjusted, transfer the calibrate switch from OFF to ON. The LED will alternately flash Red & Green. Within 30 seconds the LED will glow Green indicating input power is applied and the unit is calibrated. Leave the calibrate switch in the ON position. Reapplying input voltage when this switch is in the ON position does not affect the calibration settings.

Calibration Failed:

4) If the relay is unable to establish trip points for the setup conditions within 60 seconds, the LED will double blink Red. Remove input voltage and repeat steps 2 and 3.

Notes:

a. Monitoring a mixture of LED beacons and LED obstruction lamps is not possible with the SCR9L.
b. This alarm relay is not designed to monitor incandescent lamps.
c. This alarm relay must be recalibrated each time an LED lamp is replaced.
d. Due to LED lamp aging, recalibration every 12 months is recommended.
e. Applying input voltage when the calibrate switch is in the OFF position, erases the previous calibration settings. The LED will flash Red. The output relays are OFF and the unit will not sense lamp failures.
f. Only one (1) temperature compensated LED Beacon can be monitored with this product. A combination of temperature compensated and standard LED Beacons cannot be monitored.

Indicator Table:

L	Green	Input ON & Calibrated
L	Green Flashing	Trip Delay
L	Red	Lamp Failure
L	Red/Green Flashing	Calibrating
L	Red Flashing	Not Calibrated
F	Red	Flasher Failure

Order Table:

Input	Beacon Type	Part Number
120 - 230VAC	LED	FB9L

Specifications

Sensors
Calibration Range (total all Lamps) ..... 150mA - 8.0A
Absolute Max Current (total all Lamps) .... 15A max. (may not calibrate above 8A)
Single Lamp Current ..... 150mA - 8.0A (total all lamps ≤ 8.0A)

Trip Delay
Flasher Failure ..... Fixed at 6s; -0/+40%
Lamp Failure ..... Fixed at 10s; -0/+40%

Input
Input Voltage/Tolerance..... 120 to 230VAC / ±15%
AC Line Frequency 50/60Hz

Output..... To operate a spare lamp or alarm
Line Voltage Output (SPNO) ..... 5A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Isolated Alarm Output (SPDT) ..... 10A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Solid-state Line Voltage Output (F)..... 0.5A steady; 5A inrush

Mechanical
Mounting ..... One #10 (M5 x 0.8) screw
Dimensions..... 3 x 2 x 1.64 in (76.7 x 51.3 x 41.7 mm)
Termination..... IP20 screw terminals for up to 14 AWG (2.45 mm²) wire or two 16 AWG (1.3 mm²) wires

LEDs
Power/Timing/Lamp Failure (Bi color) .... Glows red when one or more lamps fail
Flasher Failure (Red)..... Glows red when the flasher fails

Protection
Circuitry ..... Encapsulated

Environmental
Operating / Storage Temperature..... -40° to 60°C / -40° to 85°C
Weight ..... ≅ 3.9 oz (111 g)

Universal Lamp Alarm Relay

SCR9L

The SCR series is a universal lamp alarm relay designed to sense the failure of flashing or steady LED beacon lamps or obstruction lamps. The SCR Series energizes when one or more lamps fail. It will monitor the operation of one to eight beacon or obstruction lamps. All monitored lamps must be the same wattage and voltage When connected to a site monitoring system, it provides the remote lamp monitoring protection required by the FAA-AC No: 150/5345-43E.

For more information see:
Appendix B, page 167, Figure 32 for dimensional drawing.
Appendix C, page 172, Figure 35 for connection diagram.

Features:

- Monitors LED lamps for failure
- Senses failed flashing or steady beacon or obstruction lamps
- Switch selectable number of lamps
- Isolated, 10A, SPDT alarm output contacts
- 5A, NO line voltage alarm output
- Self calibrating; no fine adjustment required
- Meets FA-AC No: 150/5345-43E

Approvals: CE

Available Models:

SCR9L

Operation

When a lamp fails, the SCR Series senses a decrease in current flow. After a 10s trip delay, the onboard LED glows and the two alarm outputs energize. The outputs and the LED are reset when the failed lamps are replaced and the unit is recalibrated. The SCR will sense an open flasher, it will not sense a continuously ON flasher (see FB Series). Removing input voltage de-energizes the output and the LED's. It does not change the calibration.

Calibration

The alarm relays must be calibrated after initial installation and each time the LED lamps are replaced. In order to calibrate or re-calibrate the alarm relay, the internal memory must be cleared.

Clearing Memory:

Remove input voltage, transfer the calibration switch to the off position, re-apply input voltage. The LED will flash Red to indicate the memory is clear and the relay is ready for calibration.

Calibration:

1) Perform visual inspection of the structure's lighting to assure all lamps and flashers (if used) are operating properly.

2) Remove input voltage, and check to ensure the calibrate switch is in the OFF position. Adjust the lamp selector switches for the correct number of similar (see note a) lamps to be monitored.

3) Reapply input voltage, the LED should flash Red. After confirming the LED is flashing Red and the lamp selector switches are properly adjusted, transfer the calibrate switch from OFF to ON. The LED will alternately flash Red & Green. Within 30 seconds the LED will glow Green indicating input power is applied and the unit is calibrated. Leave the calibrate switch in the ON position. Reapplying input voltage when this switch is in the ON position does not affect the calibration settings.

Calibration Failed:

4) If the relay is unable to establish trip points for the setup conditions within 60 seconds, the LED will double blink Red. Remove input voltage and repeat steps 2 and 3.

Notes:

a. Monitoring a mixture of LED beacons and LED obstruction lamps is not possible with the SCR9L.
b. This alarm relay is not designed to monitor incandescent lamps.
c. This alarm relay must be recalibrated each time an LED lamp is replaced.
d. Due to LED lamp aging, recalibration every 12 months is recommended.
e. Applying input voltage when the calibrate switch is in the OFF position, erases the previous calibration settings. The LED will flash Red. The output relays are OFF and the unit will not sense lamp failures.
f. Only one temperature compensated LED Beacon can be monitored with this product. A combination of temperature compensated and standard LED Beacons cannot be monitored.

Indicator Table:

L	Green	Input ON & Calibrated
L	Green Flashing	Trip Delay
L	Red	Lamp Failure
L	Red/Green Flashing	Calibrating
L	Red Flashing	Not Calibrated

Order Table:

Input	Lamp Type	Part Number
120 - 230VAC	LED	SCR9L

Specifications

Sensors
Calibration Range (total all Lamps) . . . . . 150mA - 8.0A
Absolute Max Current (total all Lamps) . . . 15A max. (may not calibrate above 8A)
Single Lamp Current . . . . . 150mA - 8.0A (total all lamps ≤ 8.0A)

Time Delay
Trip Delay . . . . . Factory fixed ≅10s

Input
Input Voltage/Tolerance . . . . . 120 to 230VAC ±15%
AC Line Frequency 50/60Hz

Output . . . . . To operate a spare lamp or alarm
Line Voltage Output (SPNO) . . . . . 5A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Isolated Alarm Output (SPDT) . . . . . 10A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Auxilliary Input Voltage (H) . . . . . ≤ 2A @ 230VAC

Mechanical
Mounting . . . . . One #10 (M5 x 0.8) screw
Dimensions . . . . . 3 x 2 x 1.64 in (76.7 x 51.3 x 41.7 mm)
Termination . . . . . IP20 screw terminals for up to 14 AWG (2.45 mm²) wire or two 16 AWG (1.3 mm²) wires

Protection
Circuitry . . . . . Encapsulated

Environmental
Operating / Storage Temperature . . . . . -40° to 60°C / - 40° to 85°C
Weight . . . . . ≅ 3.9 oz (111 g)

The PCR Series of photo control is a combination of precision electronic circuitry, electromechanical output, and unique molded plastic housing. Designed and built to meet the demands of the most rigorous requirement of tower and obstruction lighting control, each unit is factory calibrated to meet FAA and FCC specifications. Electronic circuit, output contactor, and terminal block are all contained within front plastic housing. Edge support molded into the bottom edge of housing allows easy wiring of new and existing installations. Available with or without cast aluminum junction box.

For more information see:
Appendix B, page 167, Figure 33 for dimensional drawing.
Appendix C, page 172, Figure 36 for connection diagram.

Operation

When the amount of light sensed falls below the actuation level for energization, the output relay energizes. Conversely, when the amount rises above the actuation level for de-energization, the output relay de-energizes.

Features:

- Automatic lighting circuit operation: dusk to dawn
- Meets FAA/FCC requirements for obstruction lighting
- Two 20A load contacts
- Direct replacement of popular photo controls
- Time delay eliminates contact chatter

Available Models:

PCR10
PCR11
PCR12
PCR13

Order Table:

Input	Description	Part Number
120VAC	Photo Control without aluminum box	PCR10
230VAC	Photo Control without aluminum box	PCR12
120VAC	Photo Control with aluminum box	PCR11
230VAC	Photo Control with aluminum box	PCR13

Conversion Chart		
Part Number	REPLACES	
	Hughey & Phillips	Crouse Hinds
PCR11	PC800 120V	PEC52010
PCR13	PC800 240V	PEC52010-1

Specifications

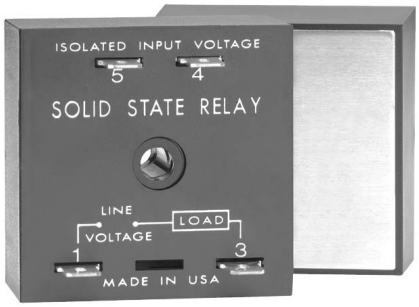
Indication	LED indicates power is applied
Light Actuation Levels (Factory Calibrated)	Energized: ≥ 35 fc De-energized: ≤ 60 fc
Voltage	120VAC or 230VAC
AC Line Frequency	50/60Hz
Tolerance 120 & 230VAC	-20% - 10%
Output Rating	Two SPST NO 20A contacts 1 hp @ 120VAC 2.5 hp @ 240VAC
Termination	Screw terminals for up to #8 (M4 x 0.7) AWG wire
Dimensions	ABS plastic housing with gasket seal. Multiple knockout holes for optional mounting to Crouse Hinds or Hughey & Phillips cast aluminum electrical boxes.
Operating / Storage Temperature	-40° to 60°C / -55° to 85°C

Solid-State Relays

Series Included

Solid-State Relays

PHS Series



Designed for industrial applications requiring rugged reliable operation. Provides an optically isolated, high capacity, solid-state output, with power switching capability up to 20A steady state, 200A inrush. Zero voltage switching SIR2 extends the life of an incandescent lamp up to 10 times. Random switching SIR1 is ideal for inductive loads. When fully insulated female terminals are used on the connection wires, the system meets the requirements for touch-proof connections.

For more information see:
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 172, Figure 37 for connection diagram.

Operation

The solid-state output is located between terminals 1 and 3, and is normally open or normally closed without control voltage applied to terminals 4 and 5. When control voltage is applied to terminals 4 and 5, the solid-state output opens or closes respectively.
Reset: Removing control voltage resets the output. The unit is also reset if output voltage is removed.

Features:

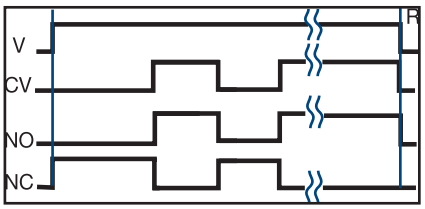
- SIR1 - Random switching for inductive loads
- SIR2 - Zero voltage switching for resistive & incandescent loads
- Normally open or normally closed output
- 3 - 20A with up to 200A inrush
- Encapsulated circuitry
- Optically isolated output
- 0.25 in. (6.35 mm) terminals with single hole mounting

Approvals:

Auxiliary Products:

- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Function:



V = Voltage
CV = Control Voltage
R = Reset
NC = Normally Closed Output
NO = Normally Open Output
—⌇— = Undefined time

Available Models:

SIR1A10A6	SIR1B6B4
SIR1A6A2	SIR1C20B6
SIR1B10A4	SIR2A20A4
SIR1B10B4	SIR2B20A4
SIR1B20A4	SIR2B20B4

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

Solid-state Output Contact

X	X	X	X	X
Series	**Control Voltage**	**Rating**	**Form**	**Voltage**
SIR1 - Random Switching	A - 9 - 30VAC or DC	1 - 3A	A - Normally Open	2 - 24VAC
SIR2 - Zero Voltage Switching	B - 90 - 150VAC or DC	6 - 6A	B - Normally Closed	4 - 120VAC
	C - 190 - 290VAC or DC	10 - 10A		6 - 230VAC
		20 - 20A		

Specifications

Output

Type	Optical isolation, totally solid state		
Form	SPST, NO or NC		
Voltage	24, 120, or 230VAC		
Tolerance	±20%		
Ratings	Steady State	Inrush*	Output Device
	3A	30A	Triac
	6A	60A	Triac
	10A	100A	Triac
	20A	200A	Triac
Minimum Load Current	≅ 50mA		
Voltage Drop	≅ 2.0V at rated current		
Leakage Current (Open State)	≅ 6mA		

Input

Type	Optical isolation LED/photo transistor
Control Voltage	9 to 290VAC/DC in 3 ranges
Power Consumption	≤ 0.5W

Protection

Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100 MΩ

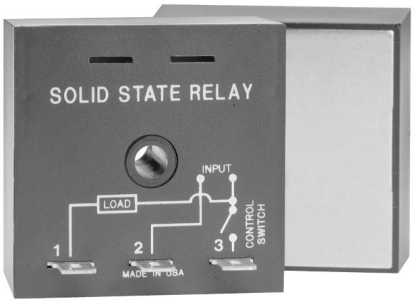
Mechanical

Mounting*	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-40° to 60°C / -55° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 3.9 oz (111 g)

*Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The SLR Series has no isolation between the control switch input and the solid-state output. Select the SLR for applications where the control switch is the same voltage source as the load. Provides the noiseless, reliability and long life of a solid-state relay, without the cost of isolation circuitry. Zero voltage switching SLR2 can extend the life of an incandescent lamp up to 10 times its normal life. Random switching SLR1 is normally used for inductive loads. When fully insulated female terminals are used on the connection wires, the system meets the requirements for touch-proof connections.

For more information see:
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 172, Figure 38 for connection diagram.

Features:

- SLR1 - Random switching for inductive loads
- SLR2 - Zero voltage switching for resistive & incandescent loads
- Normally open or normally closed output
- 1 - 20A with up to 200A inrush
- 0.25 in. (6.35 mm) termination with single hole mounting
- Noiseless switching, reliability, and long life

Approvals:

Auxiliary Products:

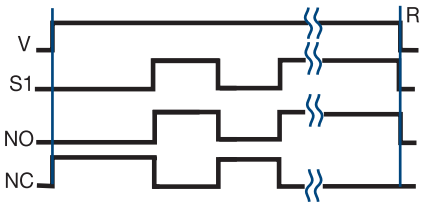
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

SLR1410B
SLR1420A
SLR1610A

If desired part number is not listed, please call us to see if it is technically possible to build.

Function:



V = Voltage
S1 = Initiate Switch
R = Reset
NO = Normally Open Output
NC = Normally Closed Output
⫽ = Undefined time

Operation

The solid-state output is located between terminals 1 and 2 and can be ordered as either normally open or normally closed, when voltage is applied and S1 is open. When S1 is closed, the solid-state output between terminals 1 and 2 closes (or opens). If S1 is opened, the solid-state output will open (or close).
Reset: Opening S1 resets the output to its original state. Reset is also accomplished by removing input voltage.

Order Table:

X	X	X	X
Series	**Voltage**	**Output Rating**	**Output Form**
SLR1 - Random Switching	2 - 24VAC	1 - 1A	A - Normally Open
SLR2 - Zero Voltage Switching	4 - 120VAC	6 - 6A	B - Normally Closed
	6 - 230VAC	10 - 10A	
		20 - 20A	

Specifications

Output (Contact)

Type	Non-isolated solid state		
Form	SPST, NO or NC		
Voltage	24, 120, or 230VAC		
Tolerance	±20%		
Ratings	Steady State	Inrush*	Output Device
	1A	10A	SCR & Bridge Rectifier
	6 A	60A	Triac
	10A	100A	Triac
	20A	200A	Triac
Minimum Load Current	≅ 50mA		
Voltage Drop (at Rated Current)	≅ 2.0V - 6, 10, & 20A units; ≅ 2.5V - 1A units		
Leakage Current (Open State)	≤ 5mA		
Initiate Switch Voltage	Same as the output voltage		
Power Consumption	≤ 0.5W		

Protection

Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100MΩ

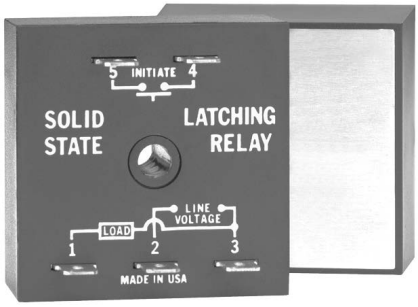
Mechanical

Mounting*	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-20° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	1A units: ≅ 2.4 oz (68 g); 6, 10, 20A units: ≅ 3.9 oz (111 g)

*Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.



The NLF1 and NLF2 Series provide a flip-flop latching function. Each time the control switch is closed, the solid-state output changes state and latches. The NLF Series has no isolation between the control switch and the solid-state output, which lowers cost and reduces the number of connections required. For use where the control switch is the same voltage source as the load. Zero voltage switching NLF2 extends the life of an incandescent lamp by up to 10 times. Random switching NLF1 is ideal for inductive loads. When accessory fully insulated female terminals are used on the connection wires, the system meets the requirements for touch-proof connections.

For more information see:
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 172, Figure 39 for connection diagram.

Features:

- Totally solid-state latching relay - encapsulated
- Non-isolated to reduce cost
- 1 - 20A with 200A inrush
- 24, 120, or 230VAC input voltages
- NLF1 - Random switching for inductive loads
- NLF2 - Zero voltage switching for lamp & resistive loads

Auxiliary Products:

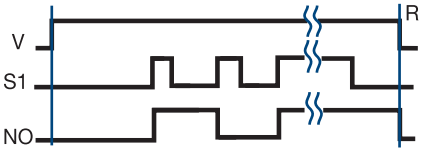
- **Quick connect to screw adaptor:**
  P/N: P1015-18
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

Available Models:

NLF126A
NLF141A
NLF1620A

If desired part number is not listed, please call us to see if it is technically possible to build.

Function:



V = Voltage
S1 = Initiate Switch
R = Reset
NO = Normally Open Output
NC = Normally Closed Output
⟋⟍ = Undefined time

Operation

The solid-state output is located between terminals 1 and 2, and can be ordered as either normally open or normally closed, when voltage is applied. When S1 is closed, the solid-state output between terminals 1 and 2 closes (or opens). If S1 is opened and reclosed, the solid-state output will open (or close).
Reset: Open and reclose S1. Reset is also accomplished by removing and reapplying input voltage.

Order Table:

X	X	X	X
Series	**Input**	**Output Rating**	**Output Form**
NLF1 - Random Switching	2 - 24VAC	1 - 1A	A - Normally Open
NLF2 - Zero Voltage Switching	4 - 120VAC	6 - 6A	B - Normally Closed
	6 - 230VAC	10 - 10A	
		20 - 20A	

Specifications

Output

Type	Non-isolated solid state		
Form	SPST, NO or NC		
Ratings	Steady State	Inrush*	Output Device
	1A	10A	SCR & Bridge Rectifier
	6A	60A	Triac
	10A	100A	Triac
	20A	200A	Triac
Minimum Load Current	50mA		
Voltage Drop (at Rated Current)	≅ 2.0V – 6, 10, & 20A units; ≅ 2.5V – 1A units		
Leakage Current (Open State)	≤ 5mA		

Input

Type	Non-isolated, switch contact (customer supplied)
Voltage	24, 120, or 230VAC ±20%
Power Consumption	≤ 0.5W
Operations Per Second	≤ 5

Protection

Circuitry	Encapsulated
Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥ 100MΩ

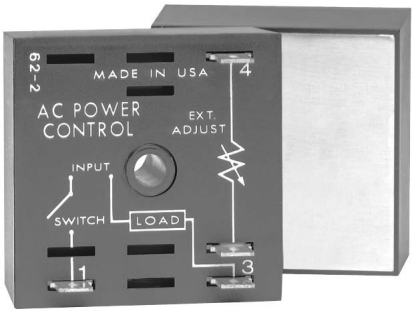
Mechanical

Mounting *	Surface mount with one #10 (M5 x 0.8) screw
Dimensions 6, 10, 20A units	2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
1A units	2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-20° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	1A units: ≅ 2.4 oz (68 g);
	6, 10, 20A units: ≅ 3.9 oz (111 g)

*Units rated ≥ 6A must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.
Inrush: Non-repetitive for 16ms.



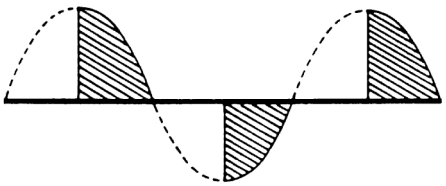
The PHS Series is an ideal method of changing lamp intensity, varying the speed of a fan/motor, or controlling the temperature of a heater. The effective output voltage is adjusted with an accessory external potentiometer suitable for line voltage applications.

For more information see:
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 172, Figure 40 for connection diagram.

Operation

Upon application of input voltage, effective output voltage can be varied by changing the external resistance value. As the external resistance increases, the effective output voltage decreases. The inverse is also true.

Typical Output Waveform



Features:

- External adjustment - 230VAC rated potentiometer
- 120 or 230VAC input voltages available
- Up to 20A steady state - 200A inrush
- Single hole surface mounting

Approvals:

Auxiliary Products:

- **Versa-knob:** P/N: P0700-7
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Potentiometers:**
  P/N: P1004-174 (100kΩ 1W)
  P/N: P1004-175 (200kΩ 2W)

Available Models:

PHS120A10
PHS120A20
PHS120A6
PHS230A1
PHS230A10
PHS230A20
PHS230A6

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

PHS **X** **X**

Input Voltage
- 120A - 120VAC
- 230A - 230VAC

Rating
- **1** - 1A
- **6** - 6A
- 10 - 10A
- 20 - 20A

Specifications

Output

Type	Variable voltage phase angle control

Rating	Steady State (at 100% On)	Inrush*
	1A	10A
	6A	60A
	10A	100A
	20A	200A

Minimum Load Current	100mA
Voltage Drop	≅ 2.0V at rated current

Input

Voltage	120 or 230VAC
Tolerance	±20%
AC Line Frequency	50/60Hz

Protection

Dielectric Breakdown	≥ 2000V RMS terminals to mounting surface
Insulation Resistance	≥100MΩ

Mechanical

Mounting *	Surface mount with one #10 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

Operating / Storage Temperature	-20° to 60°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	1A: ≅ 2.4 oz (68 g) 6, 10, & 20A: ≅ 3.9 oz (111 g)

External Adjustment Potentiometer

120VAC	100KΩ rated at 1W
230VAC	200KΩ rated at 2W Must have insulation resistance suitable for line voltage applications.

*Units rated ≥ 6A must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

Series Included

DIN Rail/Surface Mount Sockets

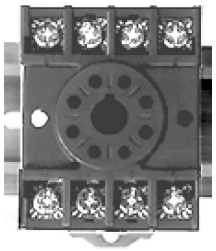
Mounting Methods, Terminals, Varistors, Cover and Marker

Timer Adjustment Options & Dials

Motor Protectors

Liquid Level Probes & Probe Holders

Octal Sockets:



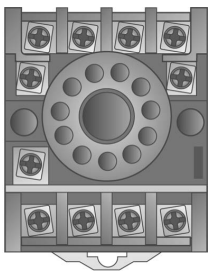
8-pin

P/N: OT08PC
8-pin 35mm DIN rail or surface mount octal socket. OT08PC is rated at 10A @ 600VAC and has pressure clamp terminals. For use with AWG 12 to 22 (3.2 to 0.33 mm²) wire sizes.

P/N: NDS-8
8-pin 35mm DIN rail or surface mount octal socket. NDS-8 is rated at 10A @ 300VAC. Surface mounted with two #6 (M 3.5 x 0.6) screws or snaps onto a 35 mm DIN rail. A spring mechanism allows easy removal. Screw terminals with captive wire clamps accept up to two #14 AWG (2.45 mm²) wires. Uses PSC8 hold-down clips.

P/N: P1011-6
8-pin surface mount socket with binder head screw terminals. Rated 10A @ 600VAC. When used with TDM, TDB, TDS Series timers the combination is UL Listed. Uses PSCRB8 hold-down brackets.

Magnal Sockets:



11-pin

P/N: OT11PC
11 pin 35 mm DIN rail or surface mount socket. OT11PC is rated at 10A @ 300VAC and has pressure clamp terminals. For use with AWG 12 to 22 (3.2 to 0.33 mm2) wire sizes.

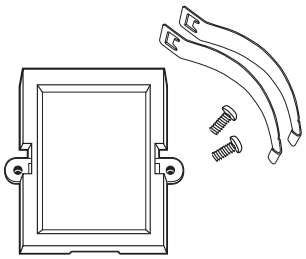
P/N: NDS-11
11 pin 35 mm DIN rail or surface mount socket. OT11PC is rated at 10A @ 300VAC. Surface mounted with two #6 (M 3.5 x 0.6) screws or snaps onto a 35 mm DIN rail. A spring mechanism allows easy removal. Screw terminals with captive wire clamps accept up to two #14 AWG (2.45 mm²) wires. Uses PSC11 hold-down clips.

Hold-down Clips:

P/N: PSC8 or PSC11
Securely mounts plug in controls in any position. Also provides protection against vibration. Select the PSC8 for use with NDS-8, or the PSC11 for use with NDS-11 sockets. Comes in sets of two.

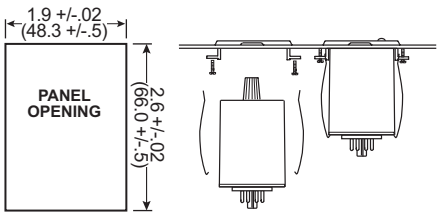
Hold-down Brackets:

P/N: PSCRB8
Designed for use with P1011-6 socket. Securely mounts 8-pin plug-in controls in any position, and provides protection against vibration. Sold in pairs.

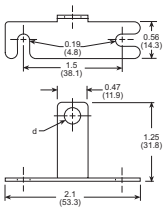


Front Panel Mount Kit:

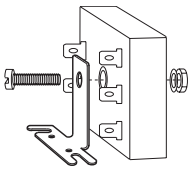
P/N: BZ1
Provides an easy method of through-the-panel mounting of 8 or 11-pin plug-in timers, flashers, and other controls. May be mounted in panels up to 0.125 in. (3.2 mm) thick. Includes two clamps and two screws.



Inches (Millimeters)
Illustrates panel opening size required to mount BZ1.



Inches (Millimeters)



D = 0.25(6.35)
(P1023-7)

D = 0.19(4.8)
(P1023-6)

Mount Brackets:

P/N: P1023-6 / P1023-7

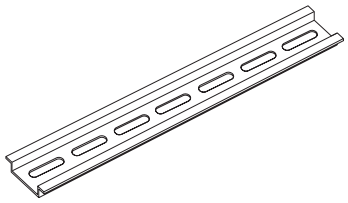
Provides a convenient method of mounting 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm) or 2 x 3 x 1.5 in. (50.8 x 76.2 x 38.1 mm) modules. The 90° orientation of mounting slots makes installation/removal of modules quick and easy. The P1023-6 secures to module with a #8 (M4 x 0.7) screw. The P1023-7 secures to 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm) module with Mini-Pot for local adjustment. Made from steel with a cadmium surface finish.

Mounting Method	Mounting Hole Size	P/N
#8 (M4 x 0.7) screw	0.19 in. (4.8 mm)	P1023-6
Mini-Pot	0.25 in (6.35 mm)	P1023-7

DIN Rail:

P/N: C103PM (Al)

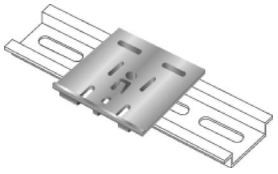
Industry standard 35 mm aluminum or steel DIN rail. C103PM aluminum rail is available in a 36 in. (91.4 cm) length.



DIN Rail Mount Adaptor:

P/N: P1023-20

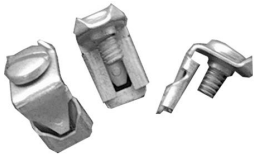
Allows any 2 x 2 in. (50.8 x 50.8 mm) or 2 x 3 in. (50.8 x 76.2 mm) module to be mounted on a 35 mm DIN type rail. Comes complete with mounting hardware for 0.75 in. (19 mm) and 1 in. (25.4 mm) thick modules.



Heat Sink Compound:

P/N: P0200-19

Single package of heat sink compound sufficient to mount one high current, plated 2" x 2" (50.8 x 50.8 mm) timer or flasher. Contains approximately 2 grams.



Quick Connect Screw Adaptor:

P/N: P1015-18

Screw adaptor terminal designed for use with all modules with 0.25 in. (6.35 mm) male quick connect terminals. Screw terminal accepts ring or spade terminals.

Part Number	Wire Size
P1015-13	AWG 10/12 (5.3/3.2 mm^2)
P1015-64	AWG 14/16 (2.5/1.3 mm^2)
P1015-14	AWG 18/22 (0.93/0.33 mm^2)

Female Quick Connect Terminals:

These 0.25 in. (6.35 mm) female terminals are constructed with an insulator barrel to provide strain relief.

Metal Oxide Varistor:

P/N	Max. Operating Voltage DC (V)	Max. Operating Voltage AC (V)	Max Impulse Current 80.20 us current wave (A)	Varistor Voltage at 1mA DC Test Current Min. (V)	Varistor Voltage at 1mA DC Test Current Max. (V)	Peak Clamping Voltage with 80 us wave Vc (V)	Peak Clamping Voltage with 80 us wave 1p (A)	Capacitance	Size (mm)
P1012-25	200	150	4500	212	268	395	50	800	14

Versa-Pot:

Panel mountable, industrial potentiometer recommended for remote time delay adjustment. The shaft is slotted for screwdriver adjustment and serrated for slip-proof finger adjustment. Accepts Versa-Knob or Lock Shaft. May be ordered with two 8 in. (20.3 cm) wires soldered to pot (clockwise increase) and female quick connect terminals on other ends by adding suffix -X to end of part number.

P/N	With Wire Leads	Value
P1004-198		25kΩ
P1004-199		50kΩ
P1004-95	P1004-95-X	100kΩ
P1004-17		500kΩ
P1004-16	P1004-16-X	1MΩ
P1004-15		1.5MΩ
P1004-12	P1004-12-X	3MΩ
P1004-13		5MΩ

Specifications	
Rating	0.25W at 55°C
Taper	Linear
Shaft Rotation	300° ±5°
Tolerance	±10%

Versa-Knob:

P/N: 0700-7

Versa-Knob is designed for 0.25 in (6.35 mm) shaft of Versa-Pot. Semi-gloss industrial black finish.

Lock Shaft:

P/N: P0700-8

Fits 0.25 in. (6.35 mm) potentiometer shafts. Locks by tightening nut onto four tapered/slotted fingers. Pressure on the shaft locks control against mis-adjustment. Nickel plated brass finish.

Mini-Pot:

P/N: P1004-10 & P1004-31

A high quality, industrial potentiometer for remote time delay adjustment. The shaft extends through the timer's center hole for easy panel mounting. Use mini-mount bracket for standup mounting of timer. Adjustment by screwdriver or mini-knob. May be ordered with two 3 in. (7.6 cm) wires soldered to pot (clockwise increase) and female quick connect terminals on other ends by adding suffix -X to end of part number.

P/N	With Wire Leads	Value
P1004-9	P1004-9-X	500kΩ
P1004-10	P1004-10-X	1MΩ
P1004-31	P1004-31-X	3MΩ

Specifications	
Rating	0.25W at 55°C
Taper	Linear
Shaft Rotation	300° ±5°
Tolerance	±10%

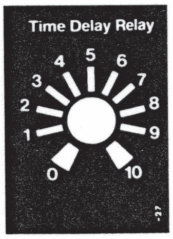
Mini-Knob:

P/N: 0700-21

Black plastic control knob with fluted body and white index/dot for setting accuracy. Mounts on 0.125 in. (3.2 mm) shaft of Mini-Pot.

Time Adjustment Dials:

Dials for use with remote Versa-Pot and panel mounted Mini-Pot. Reverse screen printed on clear plastic to avoid damage to printed image.



P/N	Range	Increments
P0400-82	0.1 - 10s	1s
P0400-17	1 - 30s	5s
P0400-83	1 - 60s	10s
P0400-27	0 - 10	MRD*

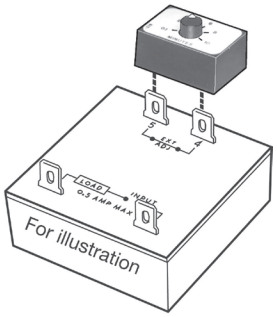
*Multiplier Reference Dial

VTP:

The VTP Series mounts on modules with in-line adjustment terminals. Rated at 0.25W at 55°C. Available in resistance values from 5KΩ to 5MΩ.

Ordering Table (select one from each column)

Series	R_T Value	Range
VTP	A – 5KΩ	A – 0.05 - 1s
	B – 10KΩ	B – 0.05 - 3s
	C – 20KΩ	C – 0.1 - 10s
	D – 50KΩ	D – 0.5 - 10s
	0 – 250KΩ	E – 0.5 - 20s
	1 – 0.5MΩ	F – 0.5 - 60s
	2 – 1MΩ	G – 1 - 100s
	3 – 2 MΩ	H – 2 - 120s
	4 – 3MΩ	J – 2 - 180s
	5 – 5 MΩ	K – 10 - 1000s
		L – 0.1 - 4m
		M – 0.1 - 6m
		N – 0.1 - 10m
		P – 1 - 100m
		R – 0 - 10MRD*
		S – 0.1 - 8m
		T – 0.1 - 5m
		X – All time range labels



Approvals:

Available Models:

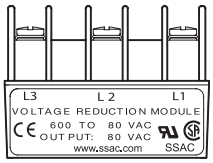
VTP1B
VTP1C
VTP1D
VTP2E
VTP2F
VTP2J
VTP2P
VTP3B
VTP3L
VTP4B
VTP4F
VTP4J
VTP4P
VTP5G
VTP5K
VTP5N
VTPDF

Three-Phase Fuse Block/Disconnect:

P/N: FH3P
3-phase fuse block disconnect designed for use with HRC midget fuses [1.5 x .41 in. (38.1 x 10.4 mm)] rated up to 30A @ 600VAC. DIN3 rail mounting. 3.9 x 2.09 x 2.2 in. (99 x 53.1 x 55.9 mm)
Replaced P/N: P0700-241

P/N: P0600-11 (Midget Fuse)
Fast acting fuse for use with voltage monitors. Rated 2A @ 500VAC. 1.5 x .41 in. (38.1 x 10.4 mm)

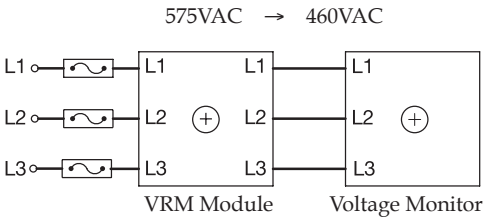
Voltage Monitor Accessory Module:



P/N: VRM6048

The VRM6048 accessory module allows the voltage monitor to monitor a 3-phase 550 to 600VAC Line. The VRM can be used with voltage monitor series: TVM, TVW, PLM, PLR, and PLS manufactured after December 2003.

*The VRM6048 must be connected as shown. If the voltage monitor is disconnected, the VRM output voltage equals the input voltage.



Adjustment: If the measured line voltage is 575VAC, connect as shown and adjust/select the voltage monitor for 460VAC operation.

Package: Molded housing with encapsulated circuitry
Mounting: Surface mount with one #10 (M5 x 0.8) plastic screw. May be DIN Rail mounted using P1023-20 Adaptor.
Termination: Screw terminals with captive wire clamps for up to No.12 AWG wire.
Operating: -40° to 70°C
Storage: -40° to 85°C
Humidity: 95% relative, non-condensing

Voltage:

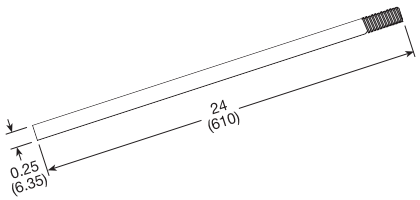
INPUT	*OUTPUT
600VAC	480VAC
575VAC	460VAC
550VAC	440VAC

Liquid Level Control Electrodes:

P/N: PHST-38QTN (Probe Holder) & P0700-409 (Protective Boot)

Designed for use with all conductive liquid level controls. Composed of insulators and metal parts made of number 300 series stainless steel. These internally conductive probe holders are designed for a maximum steam pressure of 240 PSI; 400° F maximum. Maximum voltage from electrode to ground. PHST-38QTN is UL353 Recognized.

Liquid Level Probe:



P/N: LLP-24

Threaded stainless steel probe measuring 24 in. (61 cm) long. Designed for use with PHST-38QTN liquid level control electrodes.

Appendix A

Appendix B

Appendix C

Appendix

Appendix A - Timer Functions

Selecting a Timer's Function

Selecting one of the five most common timing functions can be as easy as answering three questions on the chart below. If you have trouble answering these questions, try drawing a connection diagram that shows how the timer and load are connected. Time diagrams and written descriptions of the five most popular functions, plus other common functions. Instantaneous contacts, accumulation, pause timing functions, and flashing LED's are included in some units to expand the versatility of the timer. These expanded operations are explained on the product's catalog page. Time diagrams are used on these pages along with text and international symbols for functions.

Function Selection Guide

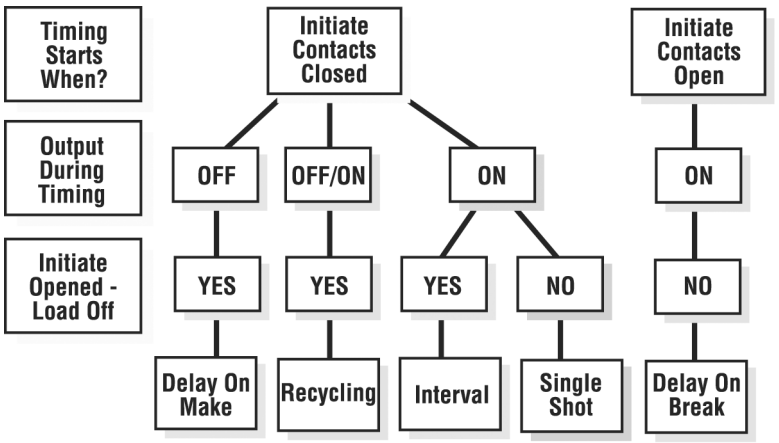
Selection Questions

1) The timing starts when the initiate (starting) contacts are:
   A) Closed B) Opened

2) What is the status of the output (or load) during timing:
   A) On B) Off C) On/Off

3) Will the load de-energize (or remain de-energized) if the initiate (starting) contacts are opened during timing:
   A) Yes B) No

THE FIVE MOST USED FUNCTIONS



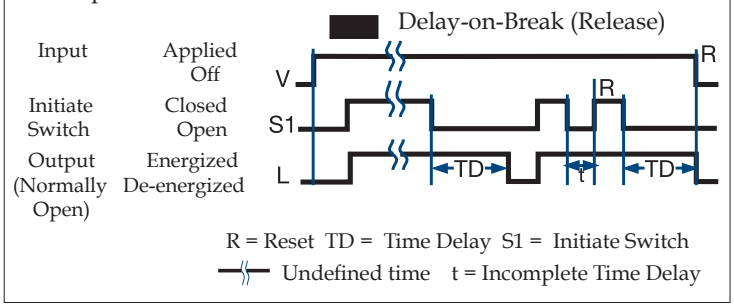
Understanding Time Diagrams

Time diagrams are used to show the relative operation of switches, controls, and loads as time progresses. Time begins at the first vertical boundary. There may be a line indicating the start of the operation or it may just begin with the transition of the device that starts the operation. Each row in the time diagram represents a separate component. These rows will be labeled with the name of the device or its terminal connection numbers. In a bistable or digital system, the switches, controls, or loads can only be ON or OFF. The time lines are drawn to represent these two possible conditions. Vertical lines are used to define important starting or ending points in the operation.

The example to the right is the most common type of time diagram in use in North America. It shows the energizing of loads, and the closing of switches and contacts by an ascending vertical transition of the time line. Opening switches or contacts or de-energizing loads are represented by descending vertical transitions.

TIME DIAGRAM

Example:

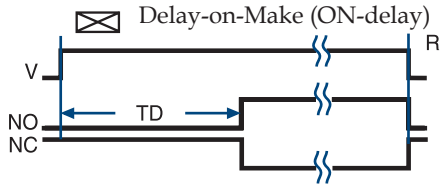


INTERNATIONAL TIMING FUNCTION SYMBOLS

= Delay-on-Make; ON-delay
= Delay-on-Break; OFF-delay
= Delay-on-Make & Break; ON and OFF-delay
= Interval; Impulse-ON
= Trailing Edge Interval; Impulse-OFF
= Single Shot; Pulse Former
= Flasher - ON Time First; Recycling Equal Times - ON First
= Flasher - OFF Time First; Recycling Equal Times - OFF First
= Recycling - Unequal Times; Pulse Generator
= Recycling - Unequal Times Starting with ON or OFF
= Delay-on-Make & Interval; Single Pulse Generator

Delay-on-Make: (ProgramaCube® Function M)

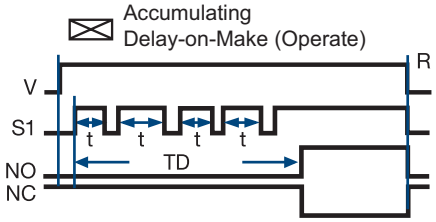
(ON-delay, Delay on Operate, On Delay, Operate Delay, Delay On, Prepurge Delay)
OPERATION: Upon application of input voltage, the time delay begins. The output (relay or solid state) is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.
RESET: Removing input voltage resets the time delay and output.
See: HRPS, KRPS, KSPS, KSPU, NHPS, NHPU, TDM, TRDU



Extra Functions Included in Some Delay-on-Make (DOM) Timers:

Accumulating Time Delay Feature: (ProgramaCube® Function AM)

Some DOM timers allow the time delay to be stopped and held and then resumed by opening and closing an external switch. The total time delay, TD is the sum of the accumulated partial time delays, "t".
See: KRPD, KRPS, HRPS, NHPS, KSPD, KSPS, TRDU

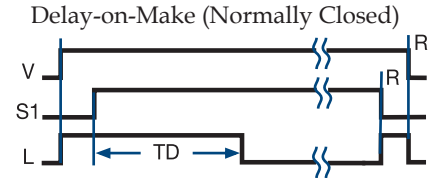


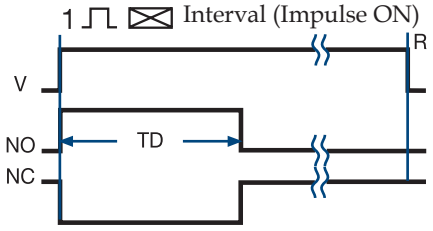
Instantaneous Contacts:

Some DOM timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

Delay-on-Make, Normally Closed Output:

All relay output delay-on-make timers with normally closed contacts include this function. (See Delay-on-Make NC Contacts) This function is also available in solid-state output timers. The solid-state output energizes when input voltage is applied. The time delay begins when an optional initiate switch S1 is closed (timing starts when voltage is applied if S1 is not used). The output de-energizes at the end of the time delay.
Reset: Opening S1 resets the time delay and the output immediately energizes (or remains energized). Removing input voltage resets the time delay and de-energizes the output.
See: KSD4, THD4, TS4, TSD4





Interval: (ProgramaCube® Function I)

(Impulse-ON, Single Pulse on Operate, On Interval, Interval On, Pulse Shaping, Bypass Timing)
OPERATION: Upon application of input voltage, the time delay begins. The output (relay or solid state) energizes during the time delay. At the end of time delay the output de-energizes and remains de-energized until input voltage is removed.
RESET: Removing input voltage resets the time delay and output.
See: HRPS, KRPS, KSPS, KSPU, NHPS, NHPU, TDI, TSD2

Extra Functions Included on Some Interval Timers:

Instantaneous Contacts:

Some Interval timers have a set of intantaneous contacts in addition to the delayed contacts. Intantaneous contacts energize when input voltage is applied and remain until voltage is removed.

Legend

V = Voltage
R = Reset
TD = Time Delay
S1 = Initiate Switch
NO = Normally Open Contact
NC = Normally Closed Contact
t = Incomplete (Partial) Time Delay
L = Load
= Undefined time

Timer Functions
Popular Functions

Recycling: (ProgramaCube® Functions RE, RD, RXE, RXD)

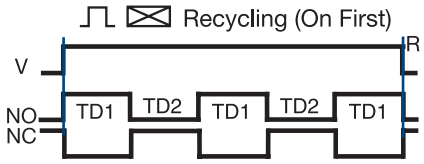
(Flasher, Pulse Generator, Recycle Timing, Repeat Cycle, Duty Cycling)

OPERATION: Upon application of input voltage, the output (relay or solid state) energizes and the ON time begins. At the end of the ON time, the output de-energizes and the OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. The OFF time may be the first delay in some recycling timers.

RESET: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.

The time delays in some recycling timers are equal TD1=TD2. Flashers are an example of this type of recycling timer. Others have separately selectable time delays.

See: HRPD, HRPS, KRPD, KRPS, KSPD, KSPS, KSPU, NHPD, NHPS, NHPU, TDR



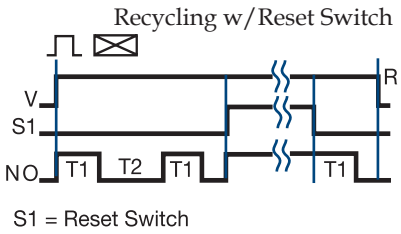
Extra Functions Included in Some Recycling Timers:

Instantaneous Contacts:

Some Recycling timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

RESET SWITCH: Closing an external switch transfers the output and resets the sequence to the first delay.

See: HRDR



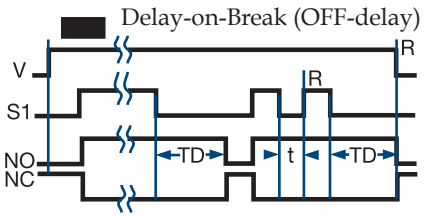
Delay-on-Break: (ProgramaCube® Function B)

(Delay on Release, OFF-delay, Release Delay, Postpurge Delay)

OPERATION: Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output (relay or solid state) energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.

RESET: Reclosing the initiate switch during timing resets the time delay. Removing input voltage resets the time delay and output.

See: HRPS, HRPU, KRPS, KSPS, KSPU, NHPS, NHPU, TRDU, TDB



Extra Functions Included in Some Delay-on-Break (DOB) Timers:

Instantaneous Contacts:

Some DOB timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

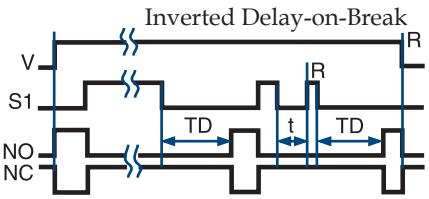
Related Functions:

Inverted Delay-on-Break: (ProgramaCube® Function UB)

OPERATION: Input voltage must be applied before and during timing. Upon closure of the initiate switch S1, the output (relay or solid state) de-energizes. The time delay begins when S1 is opened. The output remains de-energized during timing. At the end of the time delay, the output energizes. The output remains de-energized if S1 is closed when input voltage is applied

RESET: Reclosing S1 during timing resets the time delay. Removing input voltage resets the time delay and output.

See: HRPS, HRPU, KRPS, KSPS, KSPU, NHPS, NHPU, TRDU



Legend

V = Voltage	NO = Normally Open Contact
R = Reset	NC = Normally Closed Contact
T1 = ON Time	t = Incomplete Time Delay
T2 = OFF Time	TD, TD1, TD2 = Time Delay
S1 =Initiate Switch	= Undefined Time

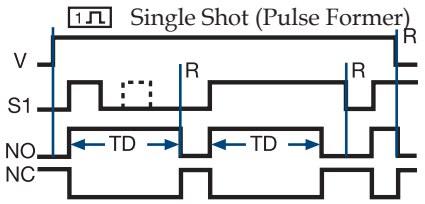
Single Shot: (ProgramaCube® Functions S or SD)

(Pulse Former, One Shot Relay, Single Shot Interval, Pulse Shaping)

OPERATION: Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output (relay or solid state) energizes and the time delay begins. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no effect on the time delay. Note (for most single shot timers): If the initiate switch is closed when input voltage is applied, the output energizes and the time delay begins.

RESET: Reset occurs when the time delay is complete and the initiate switch is opened. Removing input voltage resets the time delay and output.

See: HRPS, HRPU, KRPS, KSPS, KSPU, NHPS, NHPU, TDS, TSDS, TRDU



Extra Functions Included in Some Single Shot Timers:

Instantaneous Contacts:

Some Single Shot timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

Related Functions:

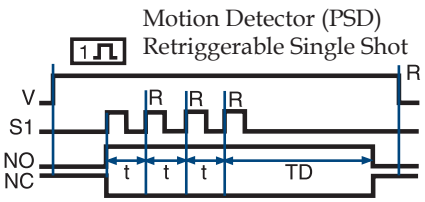
Retriggerable Single Shot (Motion Detector): (ProgramaCube® Function PSD)

(Motion Detector, Zero Speed Switch, Watchdog Timer, Missing Pulse Timer)

OPERATION: Input voltage must be applied prior to and during timing. The output (relay or solid state) is de-energized. When the initiate switch S1 closes momentarily or maintained, the output energizes and the time delay begins. Upon completion of the delay, the output de-energizes.

RESET: Reclosing S1 resets the time delay and restarts timing. Removing input voltage resets the time delay and output.

See: HRD9, HRPS, HRPU, KRD9, KRPS, KSPS, KSPU, NHPS, NHPU, TRDU, TRU

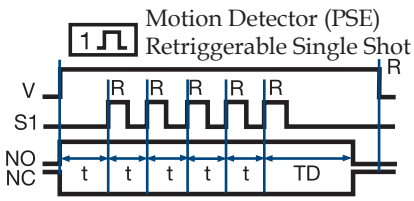


Retriggerable Single Shot (Motion Detector): (ProgramaCube® Function PSE)

OPERATION: Similar to retriggerable single shot function PSD above except, when input voltage is applied, the output (relay or solid state) immediately energizes and timing begins. At the end of the time delay, the output de-energizes. The unit will timeout as long as S1 remains open or closed for a full time delay period.

RESET: During timing, reclosing S1 resets and restarts the time delay and the output remains energized. After timeout, reclosing S1 starts a new operation. Removing input voltage resets the time delay and the output.

See: KRD9

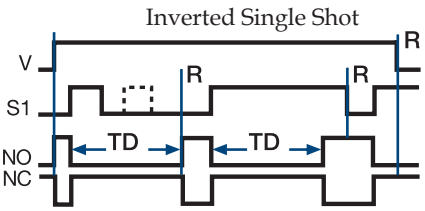


Inverted Single Shot: (ProgramaCube® Function US)

OPERATION: Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch S1, the output (relay or solid state) de-energizes. At the end of the time delay, the output energizes. Opening or reclosing S1 during timing has no affect on the time delay. The output will remain de-energized if S1 is closed when input voltage is applied.

RESET: Reset occurs when the time delay is complete and S1 is open. Removing input voltage resets the time delay and output.

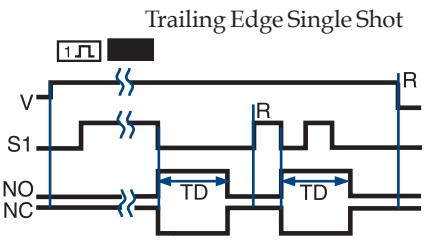
See: HRPS, HRPU, KRPS, KSPS, KSPU, NHPS, NHPU, TRDU



Trailing Edge Single Shot (Impulse-OFF): (ProgramaCube® Function TS)

OPERATION: Input voltage must be applied before and during timing. When the initiate switch S1 opens, the output (relay or solid state) energizes. At the end of the time delay, the output de-energizes. Reclosing and opening S1 during timing has no affect on the time delay. The output will not energize if S1 is open when input voltage is applied.

RESET: Reset occurs when the time delay is complete and S1 is closed. Removing input voltage resets the time delay and output.See: HRPS, KRPS, KSPS, KSPU, NHPU, TRDU



Timer Functions
Two Functions in One Timer

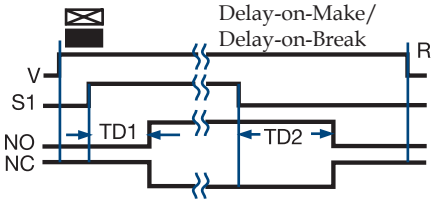
Delay-on-Make/Delay-on-Break: (ProgramaCube® Function MB)

(ON-delay/OFF-delay, Delay on Operate/Delay on Release, Sequencing ON & OFF, Fan Delay, Prepurge & Postpurge)

OPERATION: Input voltage must be applied at all times. The output (relay or solid state) is de-energized. Upon closure of the S1 initiate switch, the delay-on-make time delay (TD1) begins. At the end of TD1, the output (relay or solid state) energizes. Opening S1 starts the delay-on-break time delay (TD2). At the end of TD2, the output de-energizes.

RESET: Removing input voltage resets time delays and the output.If S1 is a) opened during TD1, then TD1 is reset and the output remains de-energized. b) reclosed during TD2, then TD2 is reset and the output remains energized.

See: HRPD, KRPD, KSPD, NHPD



Extra Functions Included in Some Delay-on-Make/Delay-on-Break Timers:

Instantaneous Contacts:

Some DOM/DOB timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

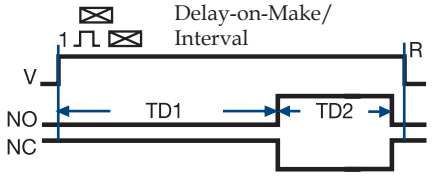
Delay-on-Make/Interval: (ProgramaCube® Function MI)

(Single Pulse Generator, Delayed Interval, Delay on Operate/Single Pulse on Operate)

OPERATION: Upon application of input voltage, the delay-on-make time delay (TD1) begins, the output remains de-energized. At the end of this delay, the output (relay or solid state) energizes and the interval delay (TD2) begins. At the end of the interval delay (TD2), the output de-energizes.

RESET: Removing input voltage resets the output, the time delays and returns the sequence to the first delay.

See: ESD5, HRPD, KRPD, KSPD, NHPD, TRDU

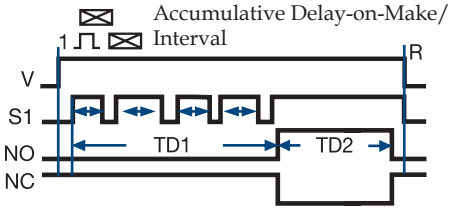


Accumulative Delay-on-Make/Interval: (ProgramaCube® Function AMI)

OPERATION: Input voltage must be applied before and during timing. The output is de-energized before and during the TD1 time delay. Each time S1 closes, the time delay progresses; when it opens, timing stops. When the amount of time S1 is closed equals the full TD1 delay, the output (relay or solid state) energizes for TD2. Upon completion of TD2, the output relay de-energizes. Opening S1 during TD2 has no affect.

RESET: Removing input voltage resets the time delay, output relay, and the sequence to the first delay.

See: HRPD, KRPD, KSPD, NHPD



Legend

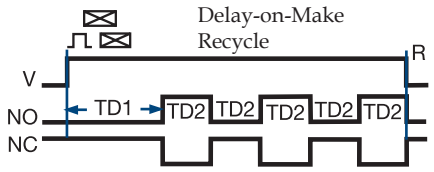
V = Voltage	TD1, TD2 = Time Delay
S1 = Initiate Switch	NO = Normally Open
R = Reset	NC = Normally Closed

⟆ = Undefined Time

Timer Functions
Two Functions in One Timer

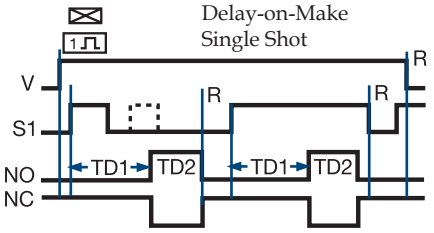
Delay-on-Make/Recycle: (ProgramaCube® Function MRE)

OPERATION: Upon application of input voltage, TD1 begins and the output (relay or solid state) remains de-energized. At the end of TD1, the TD2 recycle function begins and the output (relay or solid state) cycles ON and OFF for equal delays. This cycle continues until input voltage is removed.
RESET: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.
See: KSPD, KRPD, NHPD, HRPD, TRDU



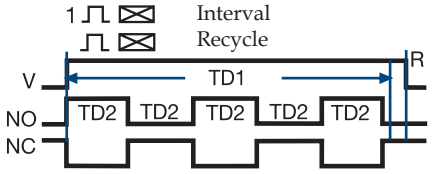
Delay-on-Make/Single Shot: (ProgramaCube® Function MS)

OPERATION: Upon application of input voltage and the closure of S1, TD1 begins and the output (relay or solid state) remains de-energized. The output (relay or solid state) energizes at the end of TD1, and TD2 begins. At the end of TD2, the output (relay or solid state) de-energizes. Opening or reclosing S1 during timing has no affect on the time delays.
RESET: Reset occurs when the time delay is complete and S1 is open. Removing input voltage resets the time delay, output, and the sequence to the first delay.
See: KSPD, KRPD, NHPD, HRPD, TRDU



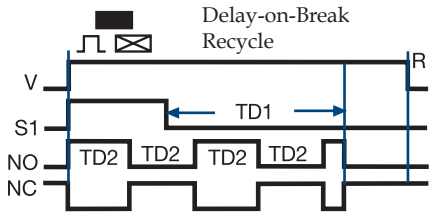
Interval/Recycle: (ProgramaCube® Function IRE)

OPERATION: Upon application of input voltage TD1 begins. At the same time, the TD2 ON time begins and the output (relay or solid state) energizes. At the end of the ON time, the TD2 OFF time begins and the output de-energizes. The equal ON time OFF time cycle continues until TD1 is completed at which time the output de-energizes.
RESET: Removing input voltage resets the time delays, output, and the sequence to the Interval function. See: KSPD, KRPD, NHPD, HRPD, TRDU



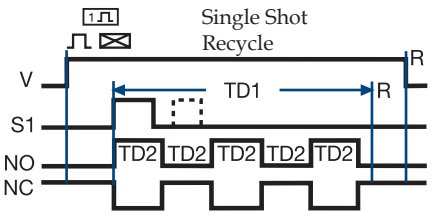
Delay-on-Break/Recycle: (ProgramaCube® Function BRE)

OPERATION: Upon application of input voltage and the closure of S1, the TD2 ON time begins and the output (relay or solid state) energizes. Upon completion of the ON time, the output de-energizes for the TD2 OFF time. At the end of the OFF time, the equal ON/OFF cycle repeats. When S1 opens, the TD1 delay begins. TD1 and TD2 run concurrently until the completion of TD1 at which time, the TD2 ON/OFF cycle terminates and the output de-energizes. The output energizes if S1 is closed when input voltage is applied.
RESET: Reclosing S1 during timing resets the TD1 time delay. Removing input voltage resets the time delay, output, and the sequence to the Delay-on-Break function.
See: KSPD, KRPD, NHPD, HRPD, TRDU



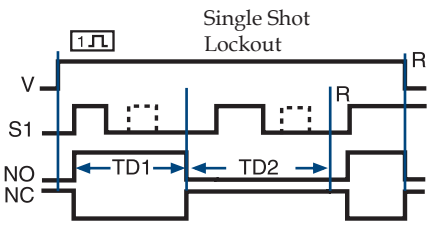
Single Shot/Recycle: (ProgramaCube® Function SRE)

OPERATION: Upon application of input voltage and the closure of S1, TD1 begins. At the same time, the TD2 ON time begins and the output (relay or solid state) energizes. Upon completion of the ON time, the output de-energizes for the TD2 OFF time. At the end of the OFF time, the equal ON/OFF cycle repeats. TD1 and TD2 run concurrently until the completion of TD1 at which time, the TD2 ON/OFF cycle terminates and the output de-energizes. Opening or reclosing S1 during timing has no affect on the time delays. The output will energize if S1 is closed when input voltage is applied.
RESET: Removing input voltage resets the time delay, output, and the sequence to the first delay.
See: HRPD, KRPD, KSPD, NHPD, TRDU



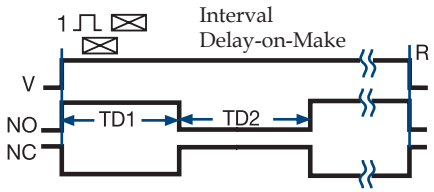
Single Shot/Lockout: (ProgramaCube® Function SL)

OPERATION: Upon application of input voltage and momentary or maintained closure of S1, the output (relay or solid state) energizes and TD1 single shot time delay begins. The output relay de-energizes at the end of TD1 and the TD2 lockout time delay begins. During TD2 (and TD1) closing switch S1 has no effect on the operation. After TD2 is complete, closing S1 starts another operation. If S1 is closed when input voltage is applied, the output energizes and the TD1 time delay begins.
RESET: Removing input voltage resets the time delays and the output and returns the cycle to the first delay.



Interval/Delay-on-Make: (ProgramaCube® Function IM)

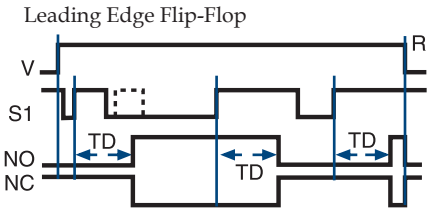
OPERATION: Upon application of input voltage, the output (relay or solid state) energizes and TD1 begins. At the end of TD1, the output de-energizes and TD2 begins. At the end of TD2, the output energizes.
RESET: Removing input voltage resets the time delays, output, and the sequence to the first delay.
See: HRPD, KRPD, KSPD, NHPD, TRDU



Timer Functions
Counting and Switching Functions

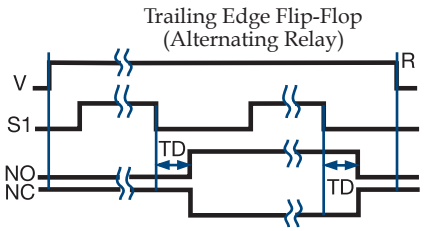
Leading edge flip-flop: (ProgramaCube® Function F)

OPERATION: Input voltage must be applied before and during operation. The operation begins with the output (relay or solid state) de-energized. Upon momentary or maintained closure (leading edge triggered) of the initiate switch S1, the time delay begins. At the end of the time delay, the output energizes and remains energized. Opening or re-closing S1 during timing has no affect. After the output transfers, the next closure of S1 starts a new operation. Each time an S1 closure is recognized, the time delay occurs and then the output transfers, ON to OFF, OFF to ON, ON to OFF. The first operation will occur if S1 is closed when input voltage is applied.
RESET: Removing input voltage resets the time delay and the output to the de-energized state.
Function can be applied to ProgramaCube Series: HRPS, KRPS, KSPS



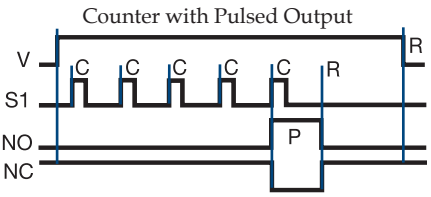
Alternating Relay (Trailing edge flip-flop): (ProgramaCube® Function FT)

OPERATION: Input voltage must be applied at all times for proper operation. The operation begins with the output (relay or solid state) de-energized. Closing S1 enables the next alternating operation. When S1 opens (trailing edge triggered), the time delay begins. At the end of the time delay, the output energizes and remains energized until S1 is (re-closed and) re-opened. Then the output relay de-energizes and remains until S1 opens again. Each time S1 opens the time delay occurs and the output transfers.
RESET: Removing input voltage resets the output and the time delay.
See: ARP, HRPS, KRPS



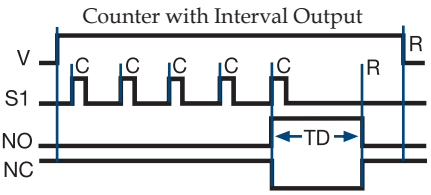
Counter with Pulsed Output: (ProgramaCube® Function C)

Function Limited to Switch Adjustable ProgramaCubes®
OPERATION: Input voltage must be applied before and during operation. Each time S1 is closed, a count is added. When the total number of S1 closures equals the total count selected on the unit, the output energizes. The output remains energized for the pulse duration specified for the product, and then de-energizes. If S1 is closed while the output is energized, a count is not added. If S1 is closed when input voltage is applied, a count is not added.
RESET: The unit automatically resets at the end of each operation. Removing input voltage resets the output, counter, and pulse delay.
See: HRPU, KSPU, NHPU



Counter with Interval Output: (ProgramaCube® Function CI)

Function Limited to Switch Adjustable ProgramaCubes®
OPERATION: Input voltage must be applied before and during operation. Each time S1 is closed, a count is added. When the total number of S1 closures equals the total count selected on the unit, the output energizes and the interval time delay begins. The output de-energizes at the end of the time delay. If S1 is closed during the time delay, a count is not added. If S1 is closed when input voltage is applied, a count is not added.
RESET: The counter is reset during the time delay, the unit automatically resets at the end of the interval time delay. Removing input voltage resets the output, counter, and time delay.
See: HRPU, HRV, HSPZ, KSPU, NHPU

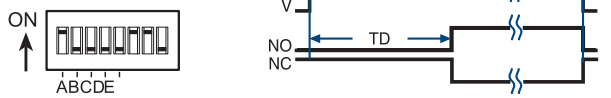


Legend
V = Voltage
R = Reset
S1 = Initiate Switch
Td, TD1, TD2 = Time Delay
NO = Normally Open Contact
NC = Normally Closed Contact
C = Count
P = Pulse Duration
⊣⫽⊢ = Undefined Time

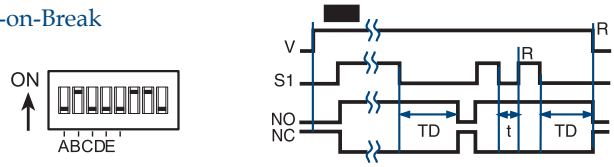
TRDU Function Diagrams

Single Functions

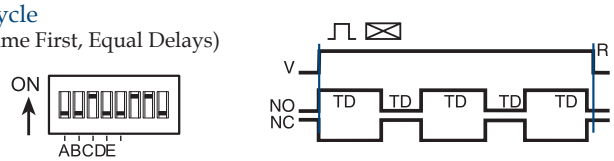
* Delay-on-Make



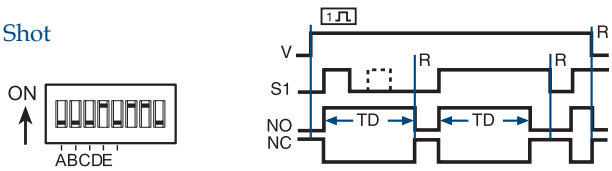
Delay-on-Break



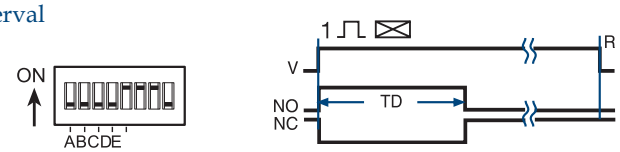
* Recycle
(ON Time First, Equal Delays)



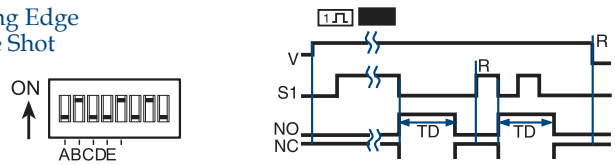
Single Shot



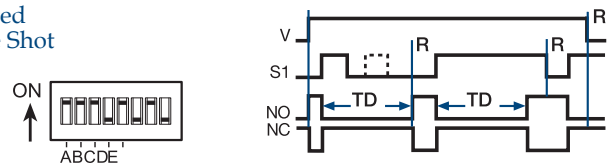
* Interval



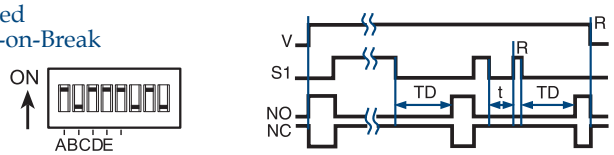
Trailing Edge
Single Shot



Inverted
Single Shot

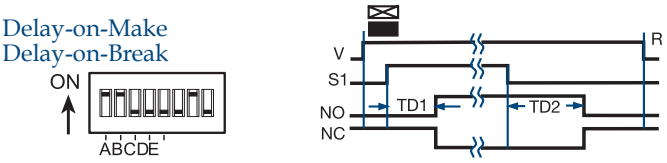


Inverted
Delay-on-Break

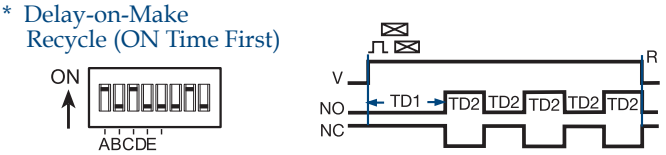


Dual Functions

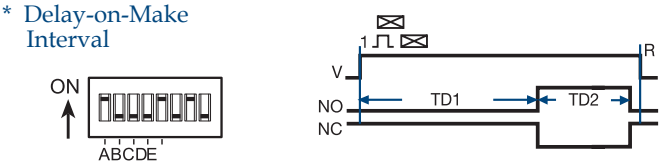
Delay-on-Make
Delay-on-Break



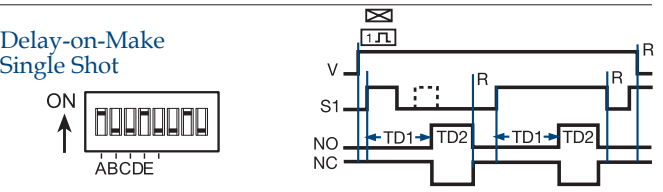
* Delay-on-Make
Recycle (ON Time First)



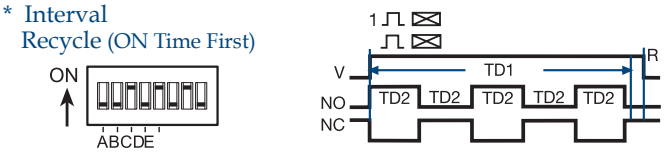
* Delay-on-Make
Interval



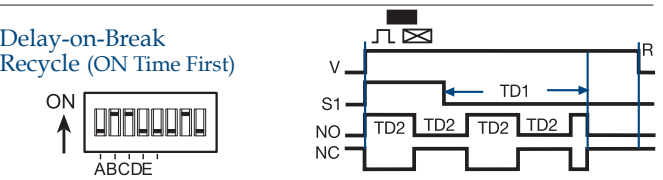
Delay-on-Make
Single Shot



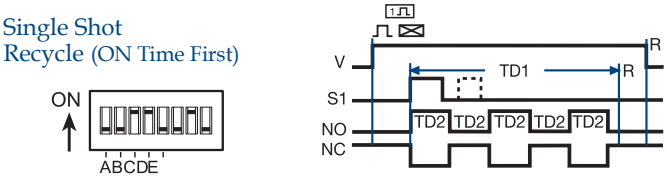
* Interval
Recycle (ON Time First)



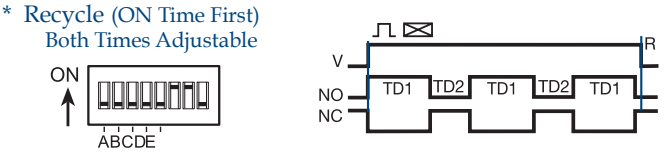
Delay-on-Break
Recycle (ON Time First)



Single Shot
Recycle (ON Time First)



* Recycle (ON Time First)
Both Times Adjustable



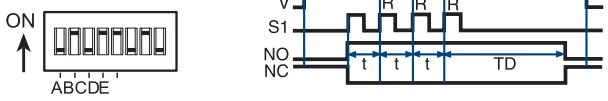
* 9 Functions included in the 8 pin DPDT models

Continued on next page...

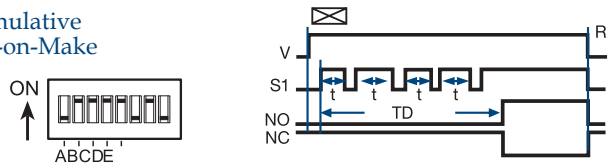
Appendix A - Timer/Flasher Functions

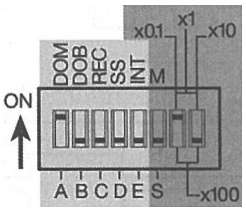
Single Functions

Retriggerable Single Shot



Accumulative Delay-on-Make





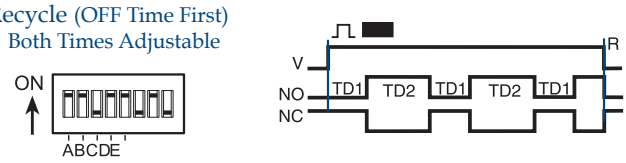
V=Voltage, R=Reset, S1=Initiate Switch, NO=Normally Open Contact, NC=Normally Closed Contact, TD,TD1,TD2=Complete Time Delay, t=Partial Time Delay, DOM=Delay-on-Make, DOB=Delay-on-Break, REC=Recycle, SS=Single Shot, INT=Interval, M=Minutes, S=Seconds, ⟋⟋ = Undefined time

5 Switches for Function Selection
3 Switches for Time Delay Range

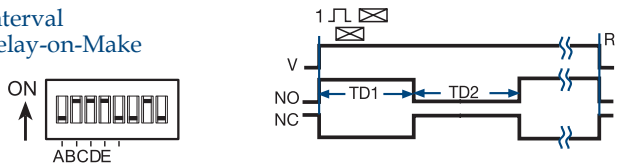
NOTE: The time delay range is the same for both functions when dual functions are selected.

Dual Functions

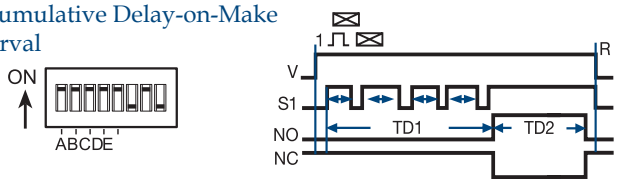
* Recycle (OFF Time First) Both Times Adjustable



* Interval Delay-on-Make



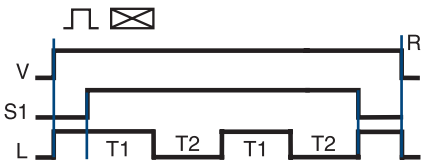
Accumulative Delay-on-Make Interval



* 9 Functions included in the 8 pin DPDT models

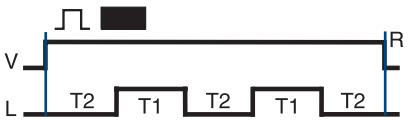
Flasher Function Diagrams

Flasher (NC)



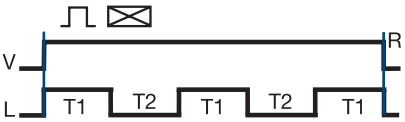
V = Voltage S1 = Initiate Switch L = Load
R = Reset T1 = ON Time T2 = OFF Time
T1 ≅ T2

Flasher (OFF First)



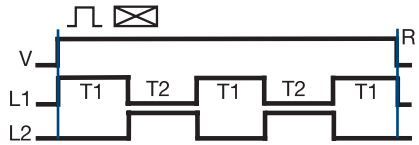
V = Voltage R = Reset L = Load
T1 = ON Time T2 = OFF Time
T1 ≅ T2

Flasher (ON First)



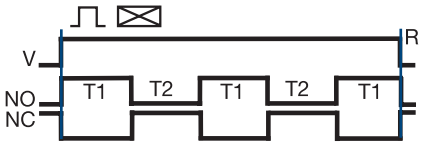
V = Voltage R = Reset L = Load
T1 = ON Time T2 = OFF Time T1 ≅ T2
ON time plus OFF time equals one complete flash.

Flasher (Alternating)



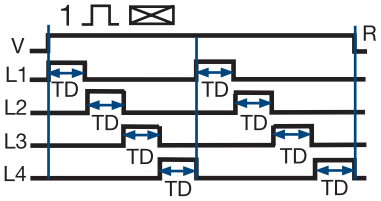
V = Voltage L1 = Load 1 L2 = Load 2
R = Reset T1 = ON Time T2 = OFF Time
T1 ≅ T2

Flasher (ON First-DPDT)



V = Voltage R = Reset
T1 = ON Time T2 = OFF Time
NO = Normally Open NC = Normally Closed

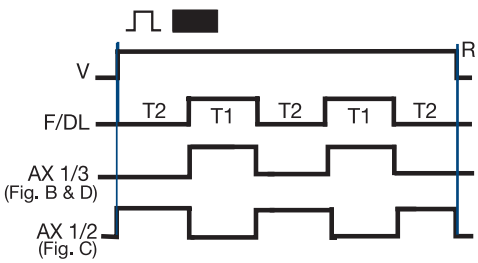
Flasher (Chasing)



SC4 shown; SC3, L4 is eliminated and L1 TD begins as soon as L3 TD is completed.

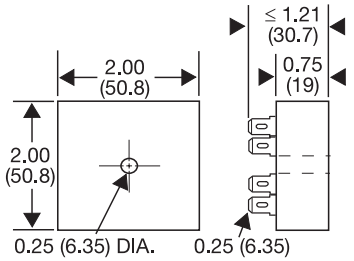
V = Voltage R = Reset L (1...4) = Lamps
TD = Time Delay (all are equal)

Flashers & Aux. Modules



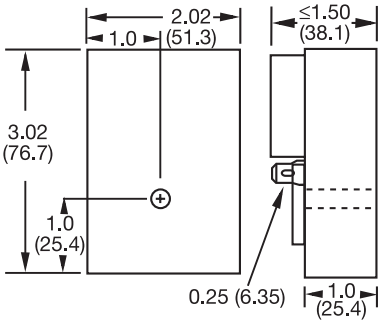
V = Voltage L = Load T1 = ON Time
T2 = OFF Time R = Reset
T1 ≅ T2

FIGURE 1



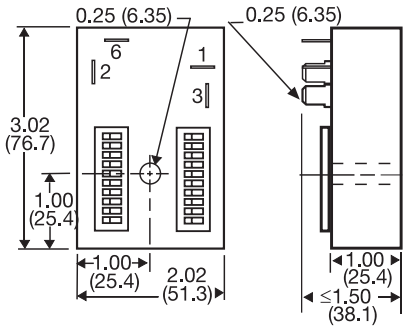
CT; ESD5; ESDR; FS100; FS200; FS300; KRD3; KRD9; KRDB; KRDI; KRDM; KRDR; KRDS; KRPD; KRPS; KSD1; KSD2; KSD3; KSD4; KSDB; KSDR; KSDS; KSDU; KSPD; KSPS; KSPU; KVM; T2D; TA; TAC1; TAC4; TDU; TDUB; TDUI; TDUS; TL; TMV8000; TS1; TS2; TS4; TS6; TSB; TSD1; TSD2; TSD3; TSD4; TSD6; TSD7; TSDB; TSDR; TSDS; TSS; TSU2000

FIGURE 2



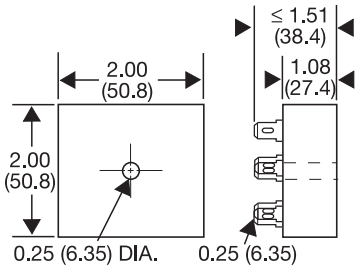
HLV; HRD3; HRD9; HRDB; HRDI; HRDM; HRDR; HRDS; HRID; HRIS; HRIU; HRPD; HRPS; HRPU; HRV; RS

FIGURE 3



HSPZ

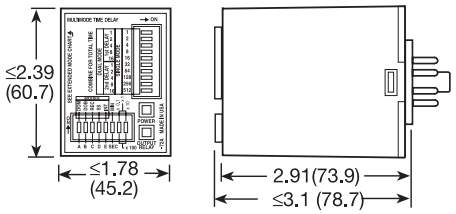
FIGURE 4



FA; FS; FSU1000*; NHPD; NHPS; NHPU; NLF1*; NLF2*; PHS*; PTHF*; SIR1; SIR2; SLR1*; SLR2*; TH1; TH2; THC; THD1; THD2; THD3; THD4; THD7; THDB; THDM; THDS; THS

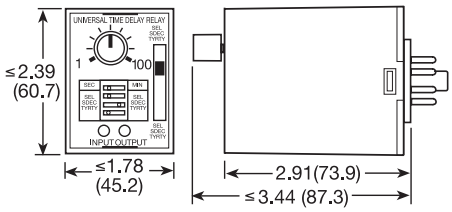
*If unit is rated @ 1A, see Figure 1

FIGURE 5



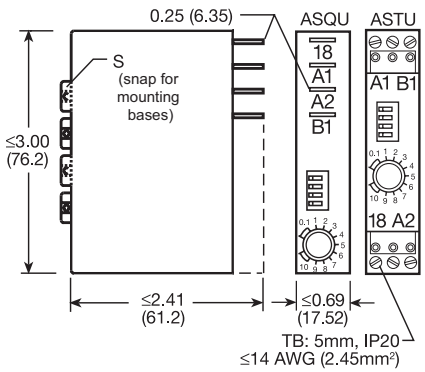
TRDU

FIGURE 6



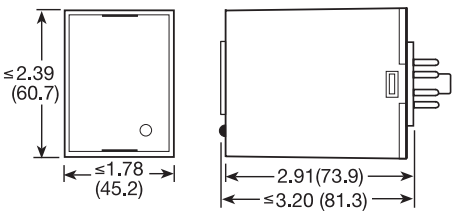
TRU

FIGURE 7



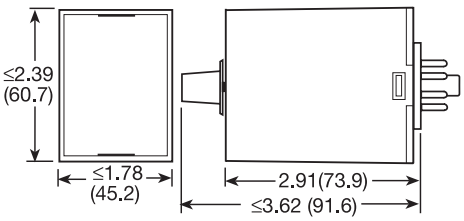
ASQU; ASTU; DSQU; DSTU

FIGURE 8



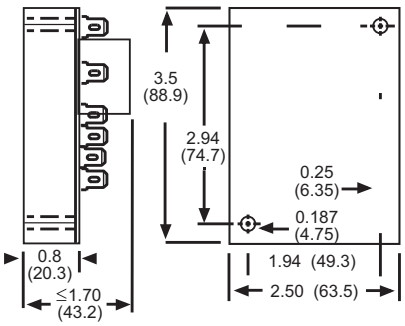
PLM; PLR; TDB; TDBH; TDBL; TDI; TDIH; TDIL; TDM; TDMB; TDMH; TDML; TDR; TDS; TDSH; TDSL

FIGURE 9



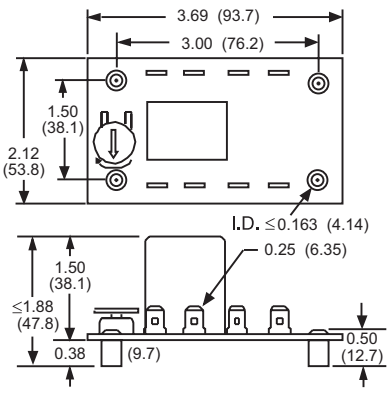
FS500; PRLB; PRLM; PRLS; TRB; TRM; TRS

FIGURE 10



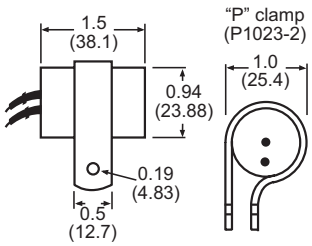
ERD3; ERDI; ERDM

FIGURE 11



ORB; ORM; ORS

FIGURE 12

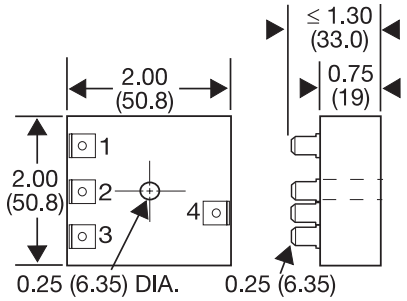


FS100; FS400

inches (millimeters)

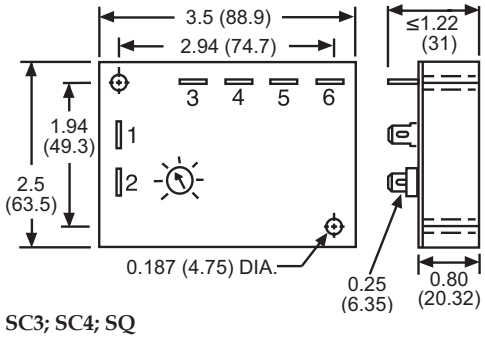
Appendix B - Dimensional Drawings

FIGURE 13



AF

FIGURE 14



SC3; SC4; SQ

FIGURE 15

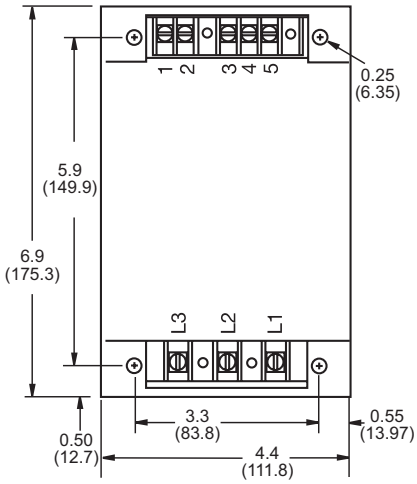
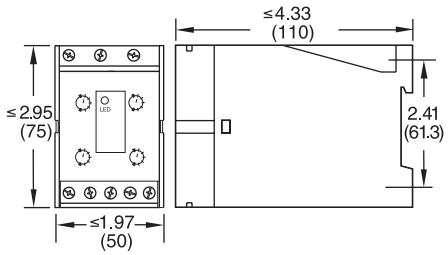
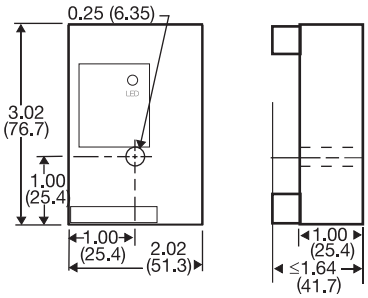


FIGURE 16

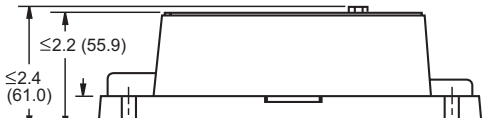


DLMU

FIGURE 17

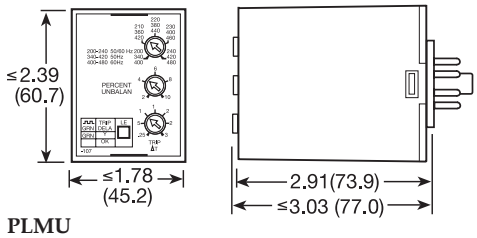


FB9L; HLMU; SCR9L



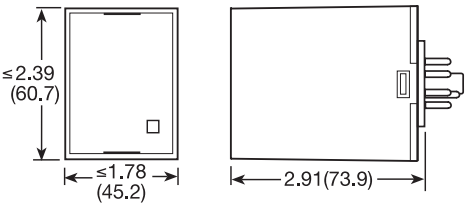
WVM

FIGURE 18



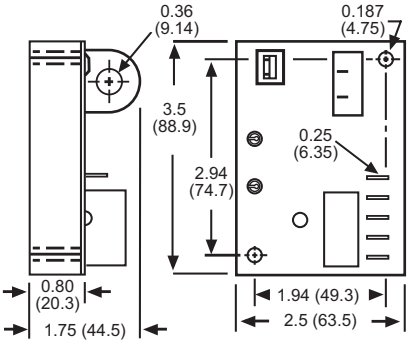
PLMU

FIGURE 19



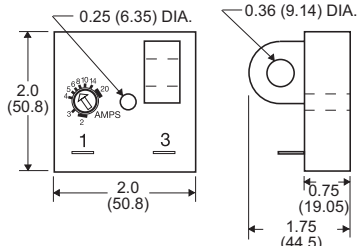
LLC4; LLC6; PLS

FIGURE 20



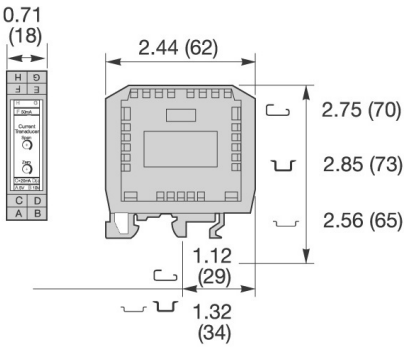
ECS; ECSW (ECS has spade connectors and ECSW has terminal board)

FIGURE 21



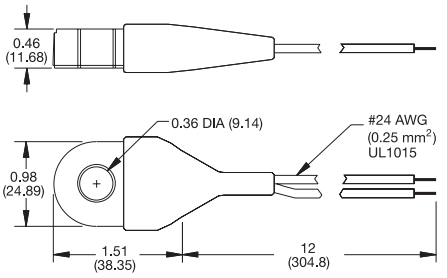
TCS; TCSA

FIGURE 22



DCSA

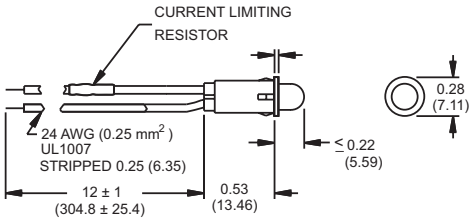
FIGURE 23



LCS

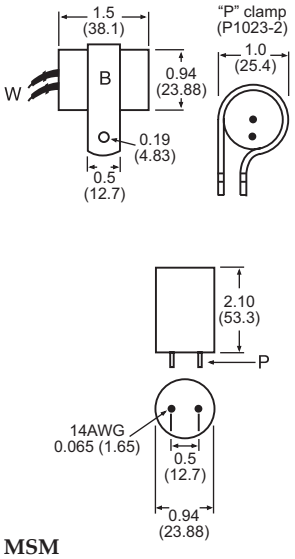
inches (millimeters)

FIGURE 24



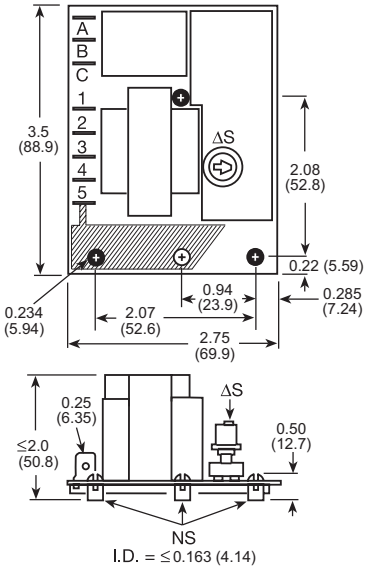
LPM

FIGURE 25



MSM

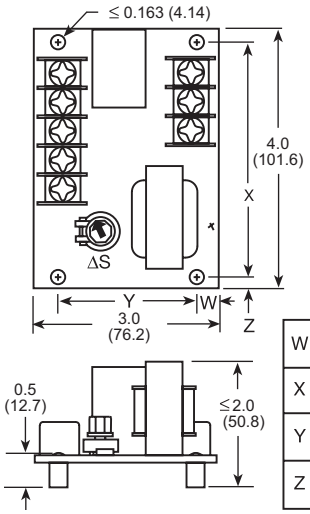
FIGURE 26



NS = Nylon Standoffs

LLC1

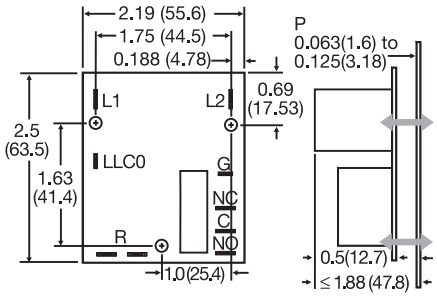
FIGURE 27



	N	C
W	0.44 (11.35)	0.25 (6.35)
X	3.62 (91.9)	3.5 (88.9)
Y	2.12 (53.8)	2.5 (63.5)
Z	0.19 (4.83)	0.25 (6.35)

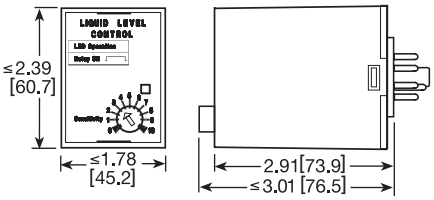
LLC2

FIGURE 28



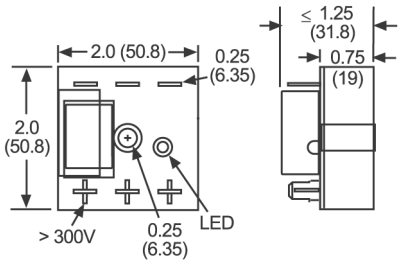
LLC8

FIGURE 29



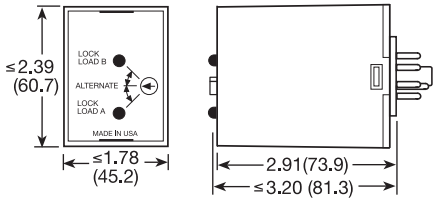
LLC5

FIGURE 30



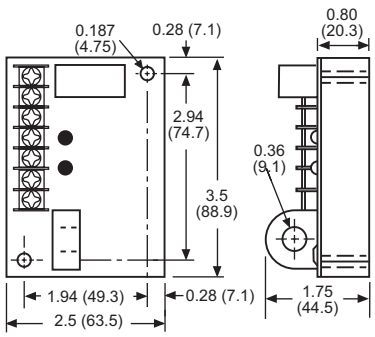
TVM; TVW

FIGURE 31



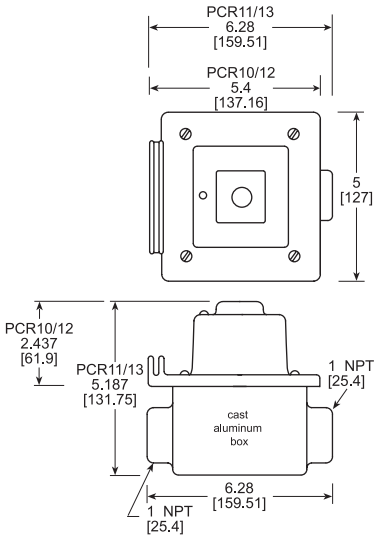
ARP

FIGURE 32



FB; SCR

FIGURE 33

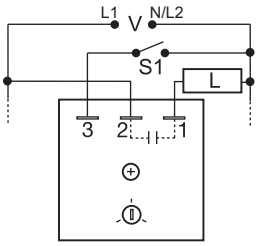


PCR

inches (millimeters)

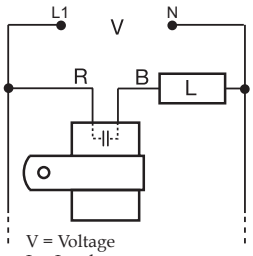
Appendix C - Connection Diagrams

FIGURE 1 - FSU1000 Series



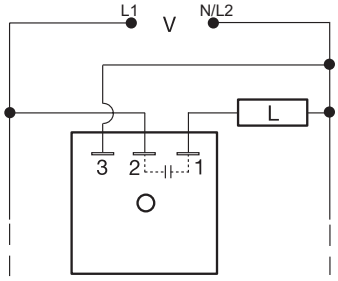
S1 = Optional low current switch
V = Voltage
L = Load

FIGURE 2 - FS100 Series



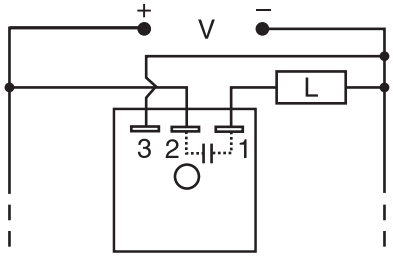
V = Voltage
L = Load
R = Red Wire
B = Black Wire

FIGURE 3 - FS100 Series



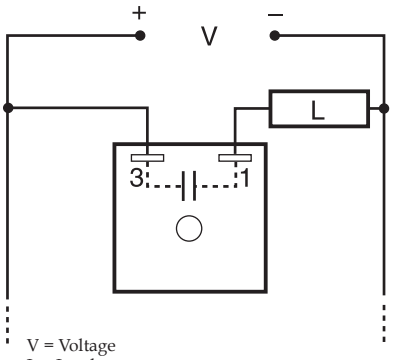
V = Voltage
L = Load

FIGURE 4 - FS200 Series



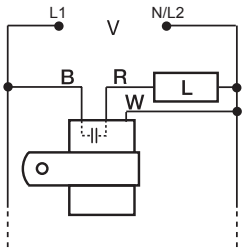
V = Voltage
L = Load

FIGURE 5 - FS300 Series



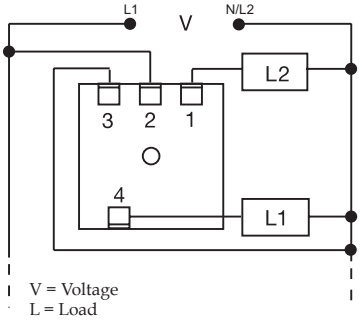
V = Voltage
L = Load
Note: Load may be in positive side.

FIGURE 6 - FS400 Series



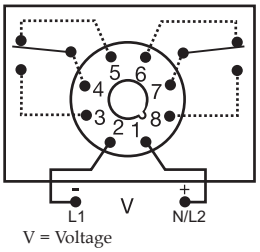
V = Voltage
L = Load
R = Red Wire
B = Black Wire
W= White Wire

FIGURE 7 - AF Series



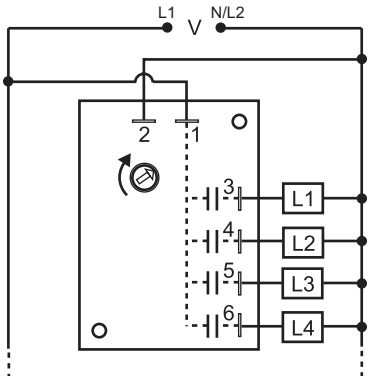
V = Voltage
L = Load

FIGURE 8 - FS500 Series



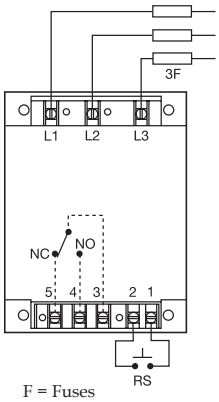
V = Voltage

FIGURE 9 - SC3/SC4 Series



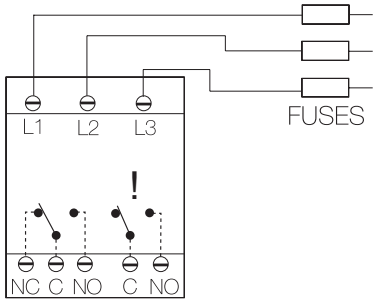
SC4 shown;
for SC3, terminal 6 & load L4 are eliminated.

FIGURE 10 - WVM Series



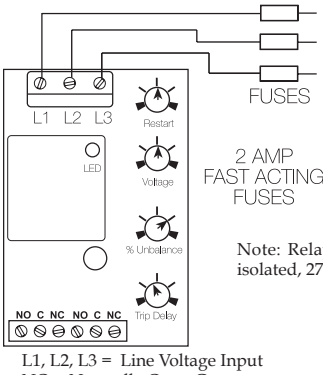
F = Fuses
NO = Normally Open
NC = Normally Closed
RS = Optional Remote Reset Switch
Relay contacts are isolated.
CAUTION:
2 amp max fast acting fuses must be installed externally in series with each input. (3)

FIGURE 11 - DLMU Series



L1, L2, L3 = Line Voltage Input
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment's wiring. They are not required to protect the DLMU.
! = Select alarm contact connection as N.O. or N.C. when ordering; N.O. Shown.

FIGURE 12 - HLMU Series

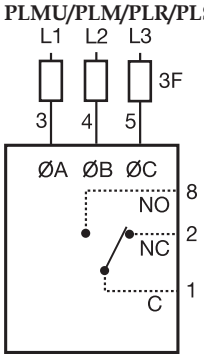


2 AMP
FAST ACTING
FUSES

Note: Relay contacts are isolated, 277VAC max.

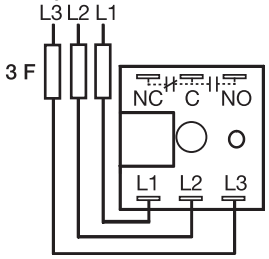
L1, L2, L3 = Line Voltage Input
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment's wiring. They are not required to protect the HLMU.

FIGURE 13 - PLMU/PLM/PLR/PLS Series



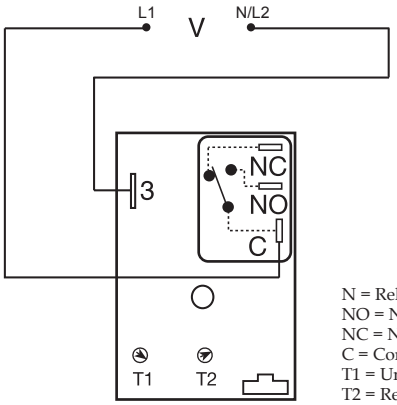
F = Fuses
ØA = Phase A = L1
ØB = Phase B = L2
ØC = Phase C = L3
NO = Normally Open
NC = Normally Closed
2A fast acting fuses recommended for safety (not required)
Relay contacts are isolated.

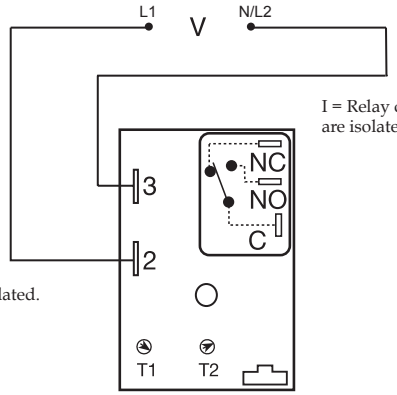
FIGURE 14 - TVM/TVW Series



L1 = Phase A
L2 = Phase B
L3 = Phase C
NO = Normally Open
NC = Normally Closed
C = Common, Transfer Contact
Relay contacts are isolated.
F = 2A Fast acting fuses are recommended, but not required

FIGURE 15 - HLV Series

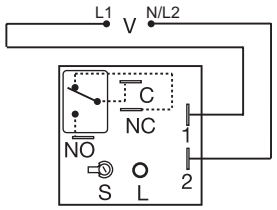




I = Relay contacts are isolated.

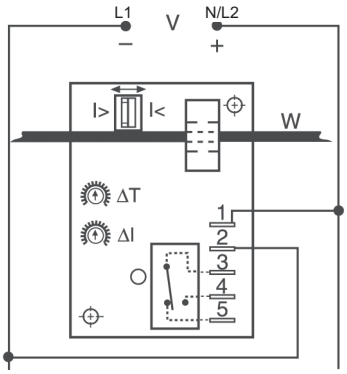
N = Relay contacts are non-isolated.
NO = Normally Open
NC = Normally Closed
C = Common
T1 = Undervoltage Trip Point
T2 = Restart Delay

FIGURE 16 - KVM Series



V = Voltage
L = LED
S = Undervoltage Setpoint
NO = Normally Open
NC = Normally Closed
C = Common, Transfer Contact

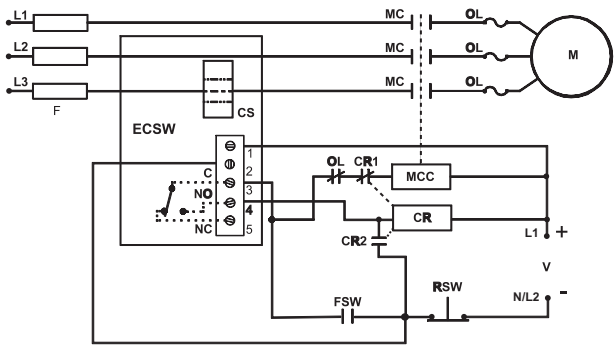
FIGURE 17 - ECS Series



V = Voltage
I> = Overcurrent
I< = Undercurrent

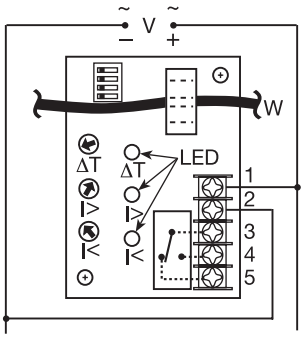
W = Insulated Wire Carrying Monitored Current
Relay contacts are isolated.

FIGURE 18 - ECSW Series



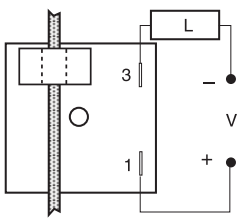
MC = Motor Contactor
M = Motor
F = Fuses
OL = Overload
RSW = Reset Switch

FSW = Fan or Float Contacts
CR = Control Relay
CS = Current Sensor
MCC = Motor Contactor Coil

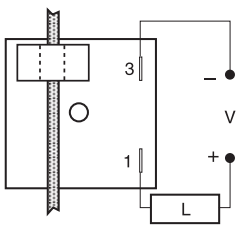


V = Voltage
I> = Adjustable Overcurrent
I< = Adjustable Undercurrent
W = Monitored Wire
ΔT - Adjustable Trip Delay

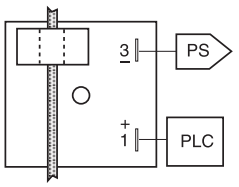
FIGURE 19 - TCS Series



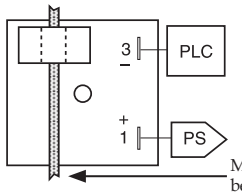
Positive Switching



Negative Switching



Sinking

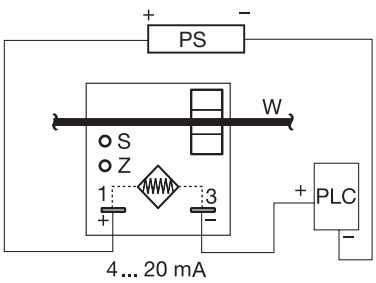


Sourcing

L = Load
V = Voltage
PS = Power Supply
PLC = PLC Digital Input Module

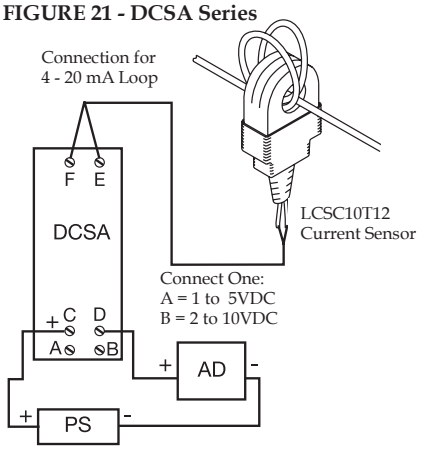
Monitored AC conductor must be insulated.

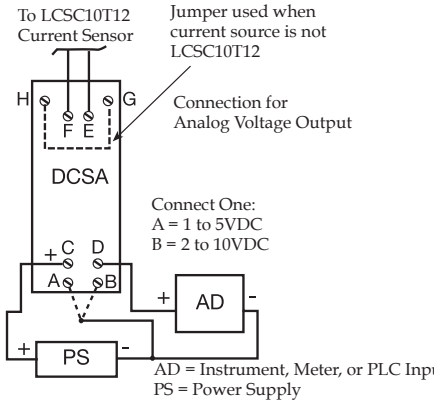
FIGURE 20 - TCSA Series



PS = Power Supply
Z = Zero Adjust
S = Span Adjust
W = Insulated Wire Carrying Monitored Current
PLC = PLC Analog Input or Meter Input

FIGURE 21 - DCSA Series

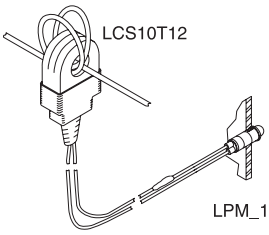




AD = Instrument, Meter, or PLC Input
PS = Power Supply

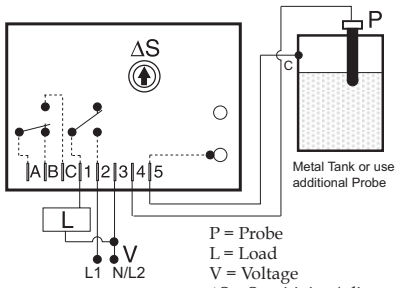
Appendix C - Connection Diagrams

FIGURE 22 - LCS10T12



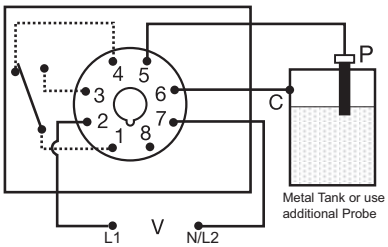
Wire Length: 500 ft. (152.4m) max. (Customer Supplied)
CAUTION: The LCS10T12 must be connected to the LPM12 or LPMG12 before current flows to prevent damage or shock hazard. Monitored wires must be properly insulated.

FIGURE 23 - LLC1 Series



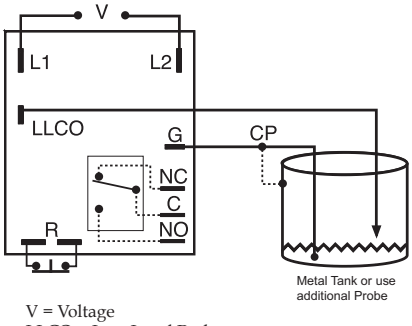
P = Probe
L = Load
V = Voltage
ΔS = Sensitivity Adjustment
Connect common to conductive tank or an additional probe as required.
Contacts A, B & C are isolated.

FIGURE 24 - LLC4 Series



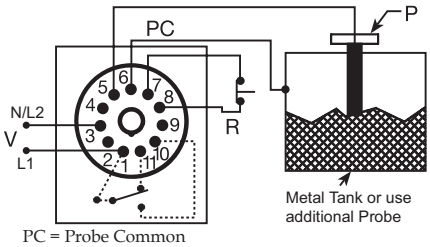
P = Probe
C = Probe Common
V = Voltage
Relay contacts are isolated.
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 25 - LLC8 Series



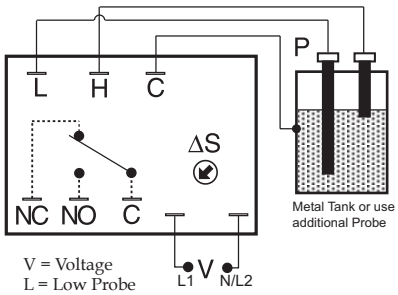
V = Voltage
LLCO = Low Level Probe
G or CP = Ground or Common (Reference) Probe
R = Optional NC Reset Switch (not included)
NO = Normally Open
NC = Normally Closed
C = Common or Transfer Contact
Relay contacts are isolated.
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 26 - LLC6 Series



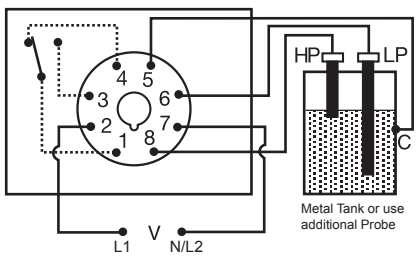
PC = Probe Common
P = Probe
V = Voltage
R = Optional NC Reset Switch
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 27 - LLC2 Series



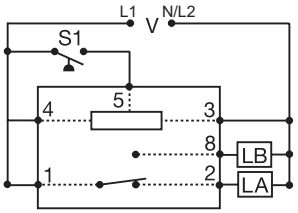
V = Voltage
L = Low Probe
H = High Probe
C = Probe Common
ΔS = Sensitivity Adjustment
NC = Normally Closed
NO = Normally Open
Connect common to conductive tank.
Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 28 - LLC5 Series

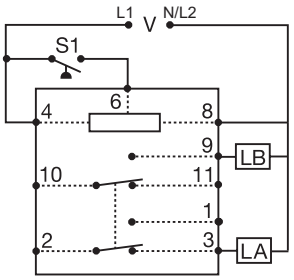


HP = High Level Probe
LP = Low Level Probe
C = Probe Common
V = Voltage
Relay contacts are isolated.
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 29 - ARP Series

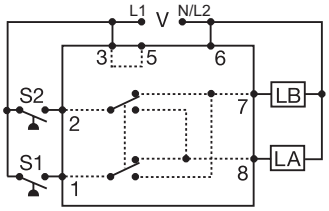


SPDT 8-pin



DPDT 11-pin

Relay contacts in above are isolated.



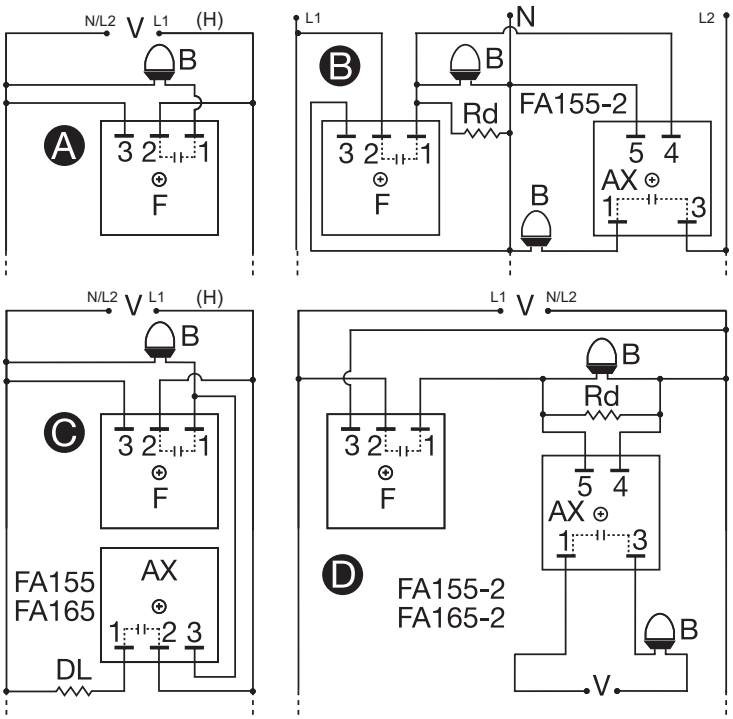
DPDT 8-pin cross wired

V = Voltage
LA = Load A
LB = Load B
S1 = Primary Control Switch
S2 = Lag Load Switch

Duplexing (Cross Wired): Duplexing models operate the same as alternating relays and when both the Control (S1) and Lag Load (S2) Switches are closed, Load A and Load B energize simultaneously.

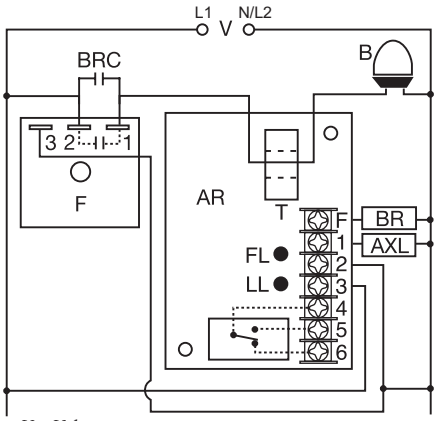
The DPDT 8-pin, cross wired option, allows extra system load capacity through simultaneous operation of both motors when needed. Relay contacts are not isolated.

FIGURE 30 - FS155 & FS165 & FA Series



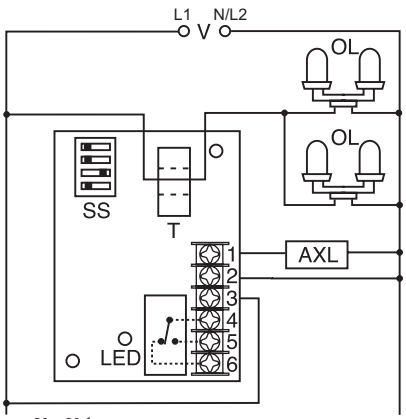
F = Flasher (FS155-30T, FS155-30RF, FS165-30T, FS165-30RF)
AX = Auxiliary Unit
B = Beacon
DL = Dummy Load for Constant Line Loading
Rd = 3.3 KΩ @ 5W for 120VAC
8.5 KΩ @ 5W for 230VAC

FIGURE 31 - FB Series



V = Voltage
B = Beacon
F = Flasher
BRC = Flasher Bypass Relay Contacts
T = Toroid
AR = FB Alarm Relay
BR = Bypass Relay Coil
FL = Flasher Failure LED
LL = Lamp Failure LED
AXL = Lamp Alarm Relay Coil
NOTE: Flasher module may be located on either the line or load side of the toroidal sensor.

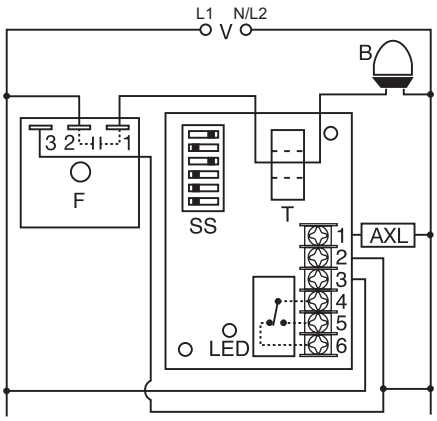
FIGURE 32 - SCR490D



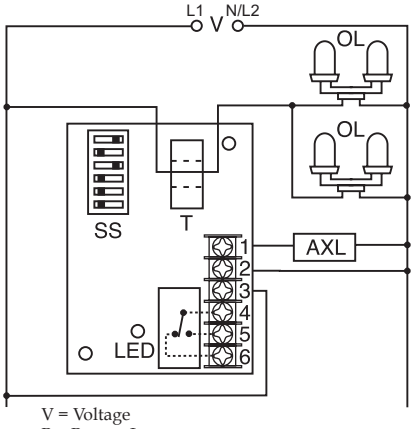
V = Voltage
OL = Obstruction Lamps
T = Toroid
SS = Selector Switch
AXL = Auxiliary Load/Alarm
Relay contacts are isolated.

FIGURE 33 - SCR Series

Beacon Connection Diagram



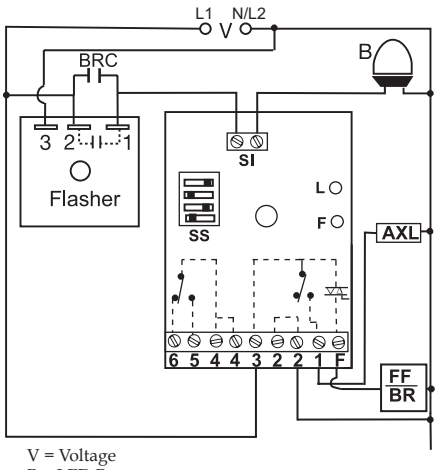
Obstruction Lamp Connection Diagram



V = Voltage
B = Beacon Lamps
SS = Selector Switch
T = Toroid
F = Flasher
AXL = Auxiliary Load/Alarm
OL = Obstruction Lamps
Relay contacts are isolated.

Appendix C - Connection Diagrams

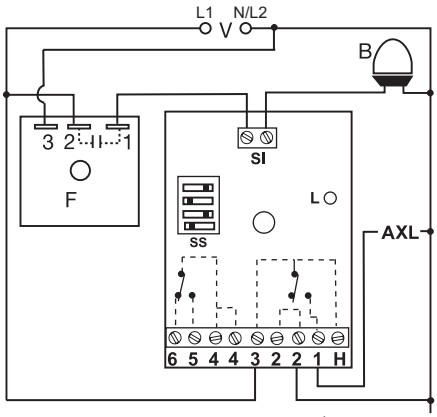
FIGURE 34 - FB9L



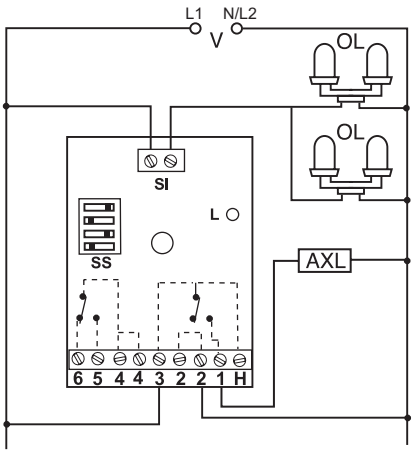
V = Voltage
B = LED Beacon
SS = Selector Switch
SI = Sensor Input
L = Indicator
F = Flasher Failure LED
AXL = Auxiliary Load/Alarm
FF = Flasher Failure/Bypass Relay
BRC = Bypass Relay Contacts

FIGURE 35 - SCR9L

Beacon Connection Diagram

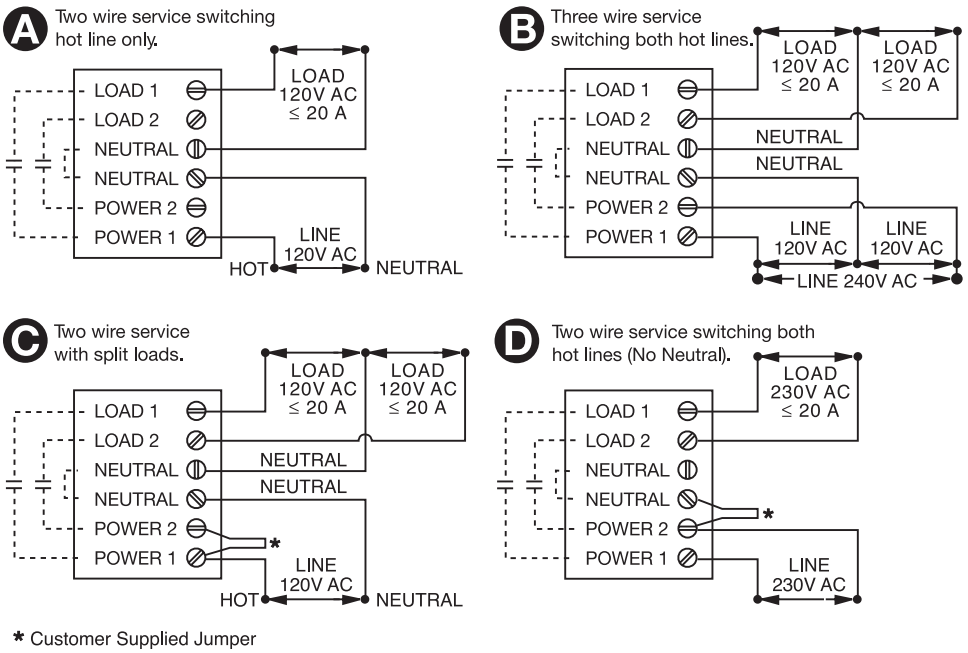


Obstruction Lamp Connection Diagram



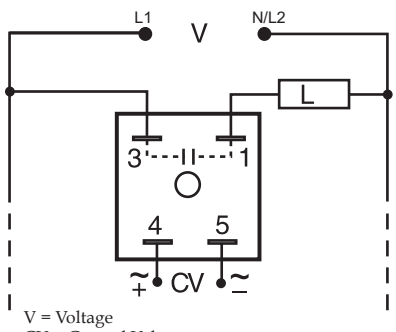
V = Voltage
B = Beacon Lamps
SS = Selector Switch
L = LED Indicator
F = Flasher
AXL = Auxiliary Load/Alarm
OL = Obstruction Lamps
SI = Sensor Input
H = "3" Spare AC Hot Connection (2A max.)

FIGURE 36 - PCR Series



* Customer Supplied Jumper

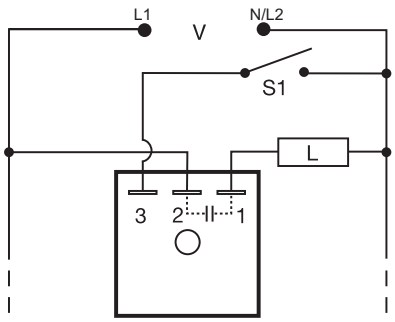
FIGURE 37 - SIR1/SIR2 Series



V = Voltage
CV = Control Voltage
R = Reset
NC = Normally Closed Output
NO = Normally Open Output
= Undefined time

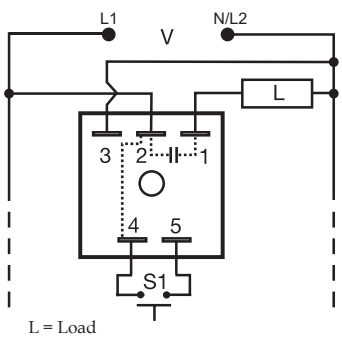
Load may be connected to terminal 3 or 1.
Note: Normally open output is shown.
Normally closed output is also available.

FIGURE 38- SLR Series



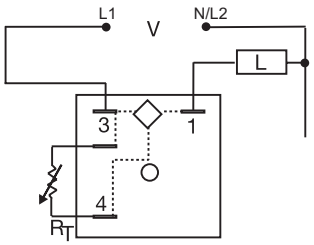
L = Load
S1 = Initiate Switch
Note: Normally open output is shown. Normally closed output is also available.

FIGURE 39 - NLF1/NLF2 Series



L = Load
S1 = Control Switch
Internal connections between terminals 2 & 4.

FIGURE 40 - PHS Series



Triac Output Device
V = Voltage
L = Load
R_T = External Adjustment