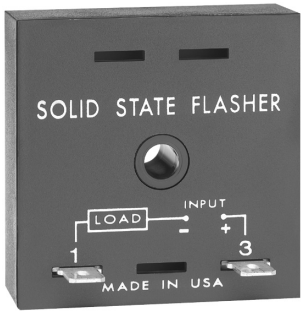


The FS300 Series of solid-state flashers were specifically designed to operate lamp loads. Their two-terminal series connection feature makes installation easy. The high immunity to line noise and transients makes the FS300 Series ideal for moving vehicle applications. All solid-state construction means 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

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

Available Models:

FS312
FS324
FS336
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

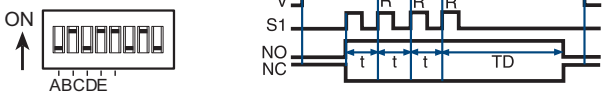
Environmental

Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
Humidity: 95% relative, non-condensing
Weight: ≅ 1.1 oz (31 g)

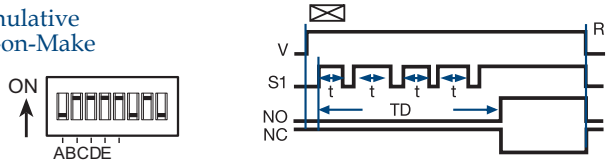
Appendix A - Timer/Flasher Functions

Single Functions

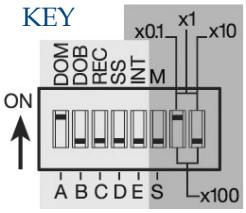
Retriggerable Single Shot



Accumulative Delay-on-Make



KEY



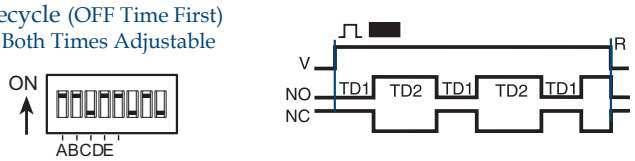
V=Voltage, R=Reset, S1=Initiate Switch, NO=Normally Open Contact, NC=Normally Closed Contact, TD,TD1,TD2=Complete Time Delay, t=Partial Time Delay, DOM=Delay-on-Make, DOB=Delay-on-Break, REC=Recycle, SS=Single Shot, INT=Interval, M=Minutes, S=Seconds, ≡⟨⟩≡ Undefined time

5 Switches for Function Selection
3 Switches for Time Delay Range

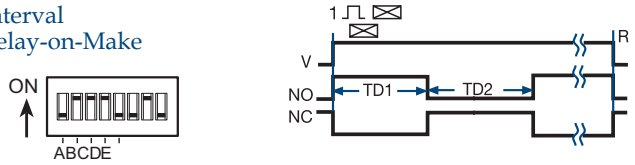
NOTE: The time delay range is the same for both functions when dual functions are selected.

Dual Functions

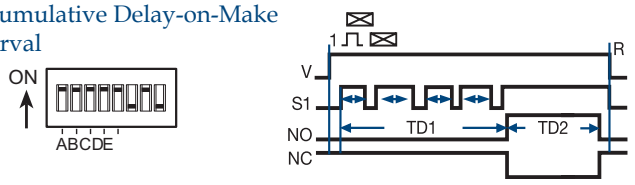
* Recycle (OFF Time First) Both Times Adjustable



* Interval Delay-on-Make



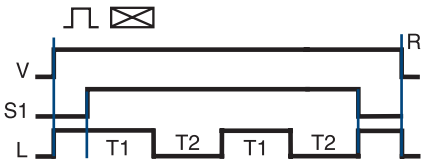
Accumulative Delay-on-Make Interval



* 9 Functions included in the 8 pin DPDT models

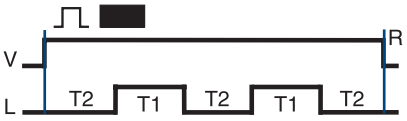
Flasher Function Diagrams

Flasher (NC)



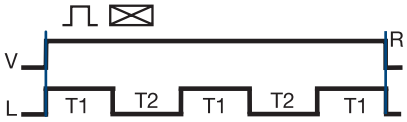
V = Voltage S1 = Initiate Switch L = Load
R = Reset T1 = ON Time T2 = OFF Time
T1 ≅ T2

Flasher (OFF First)



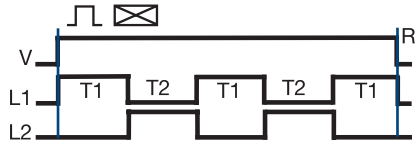
V = Voltage R = Reset L = Load
T1 = ON Time T2 = OFF Time
T1 ≅ T2

Flasher (ON First)



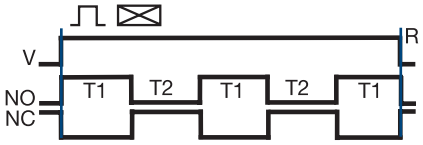
V = Voltage R = Reset L = Load
T1 = ON Time T2 = OFF Time T1 ≅ T2
ON time plus OFF time equals one complete flash.

Flasher (Alternating)



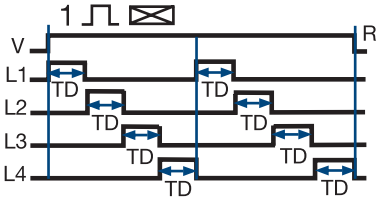
V = Voltage L1 = Load 1 L2 = Load 2
R = Reset T1 = ON Time T2 = OFF Time
T1 ≅ T2

Flasher (ON First-DPDT)



V = Voltage R = Reset
T1 = ON Time T2 = OFF Time
NO = Normally Open NC = Normally Closed

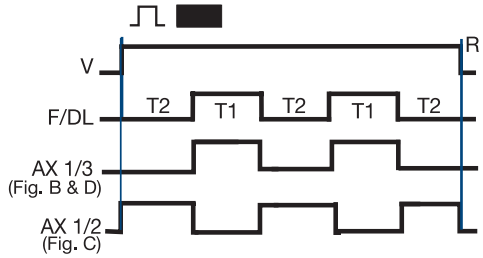
Flasher (Chasing)



SC4 shown; SC3, L4 is eliminated and L1 TD begins as soon as L3 TD is completed.

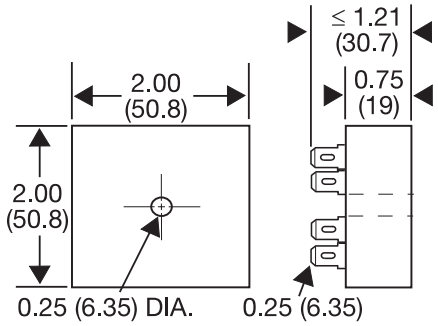
V = Voltage R = Reset L (1...4) = Lamps
TD = Time Delay (all are equal)

Flashers & Aux. Modules



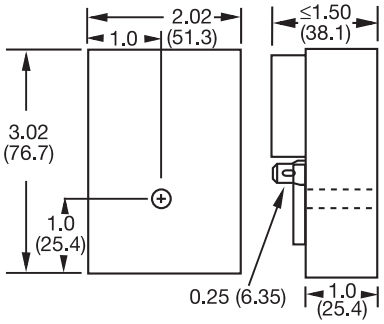
V = Voltage L = Load T1 = ON Time
T2 = OFF Time R = Reset
T1 ≅ T2

FIGURE 1



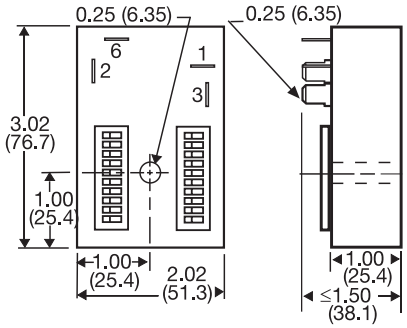
CT; ESD5; ESDR; FS100; FS200; FS300; KRD3; KRD9; KRDB; KRDI; KRDM; KRDR; KRDS; KRPD; KRPS; KSD1; KSD2; KSD3; KSD4; KSDB; KSDR; KSDS; KSDU; KSPD; KSPS; KSPU; KVM; T2D; TA; TAC1; TAC4; TDU; TDUB; TDUI; TDUS; TL; TMV8000; TS1; TS2; TS4; TS6; TSB; TSD1; TSD2; TSD3; TSD4; TSD6; TSD7; TSDB; TSDR; TSDS; TSS; TSU2000

FIGURE 2



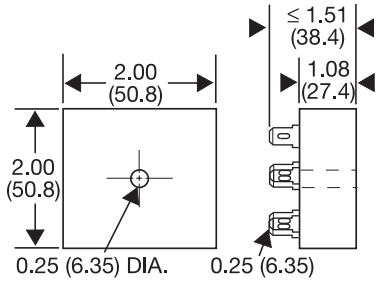
HLV; HRD3; HRD9; HRDB; HRDI; HRDM; HRDR; HRDS; HRID; HRIS; HRIU; HRPD; HRPS; HRPU; HRV; RS

FIGURE 3



HSPZ

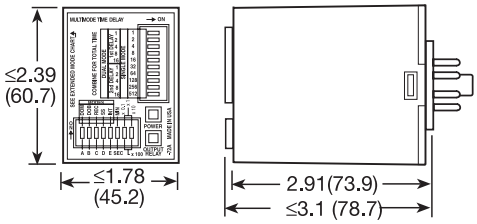
FIGURE 4



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

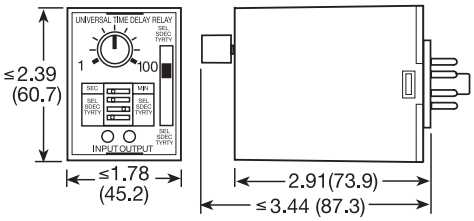
*If unit is rated @ 1A, see Figure 1

FIGURE 5



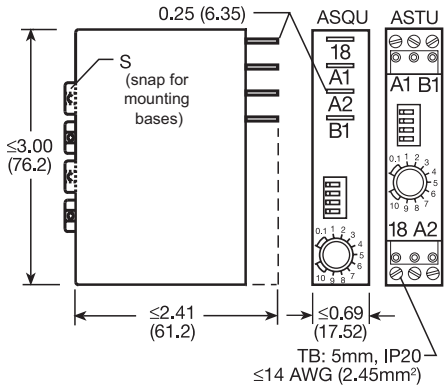
TRDU

FIGURE 6



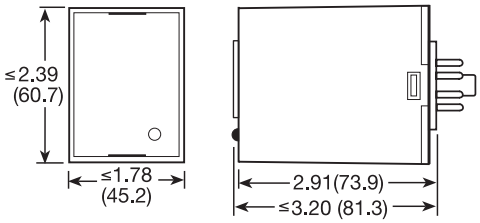
TRU

FIGURE 7



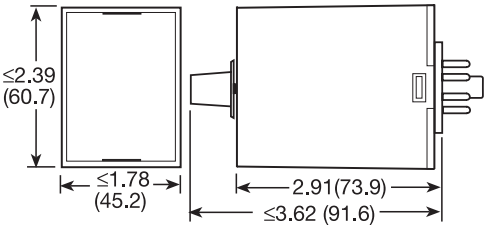
ASQU; ASTU; DSQU; DSTU

FIGURE 8



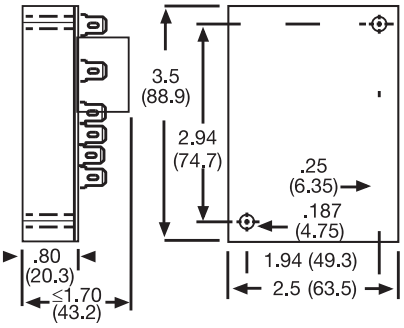
PLM; PLR; TDB; TDBH; TDBL; TDI; TDIH; TDIL; TDM; TDMB; TDMH; TDML; TDR; TDS; TDSH; TDSL

FIGURE 9



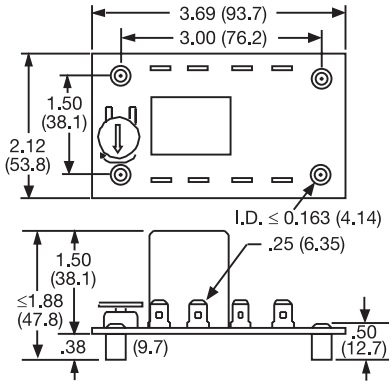
FS500; PRLB; PRLM; PRLS; TRB; TRM; TRS

FIGURE 10



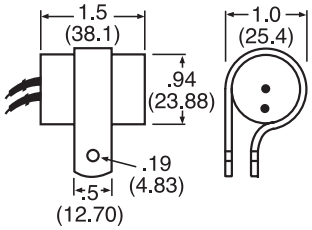
ERD3; ERDI; ERDM

FIGURE 11



ORB; ORM; ORS

FIGURE 12

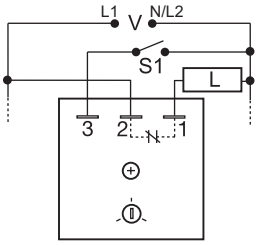


FS100; FS400

inches (millimeters)

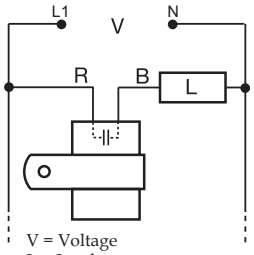
Appendix C - Connection Diagrams

FIGURE 1 - FSU1000 Series



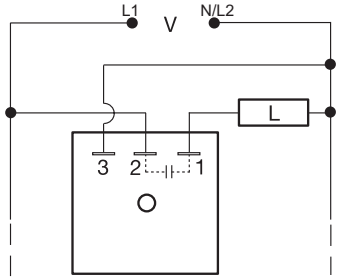
S1 = Optional low current switch
V = Voltage
L = Load

FIGURE 2 - FS100 Series



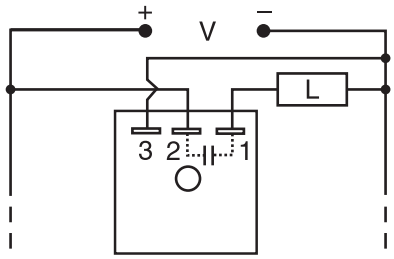
V = Voltage
L = Load
R = Red Wire
B = Black Wire

FIGURE 3 - FS100 Series



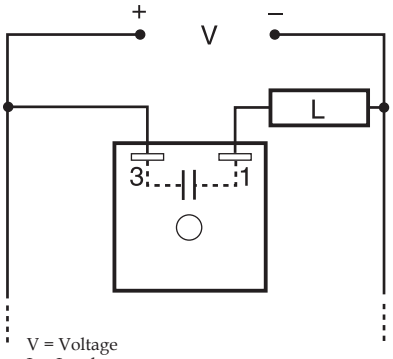
V = Voltage
L = Load

FIGURE 4 - FS200 Series



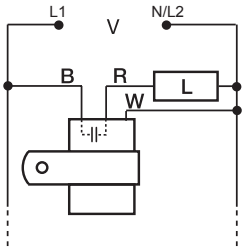
V = Voltage
L = Load

FIGURE 5 - FS300 Series



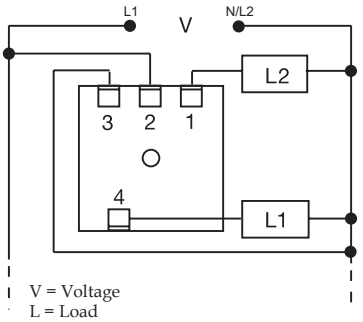
V = Voltage
L = Load
Note: Load may be in positive side.

FIGURE 6 - FS400 Series



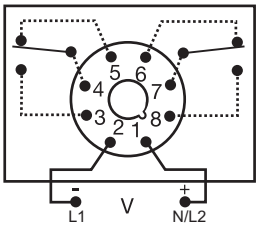
V = Voltage
L = Load
R = Red Wire
B = Black Wire
W= White Wire

FIGURE 7 - AF Series



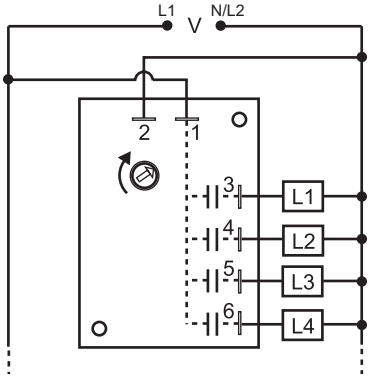
V = Voltage
L = Load

FIGURE 8 - FS500 Series



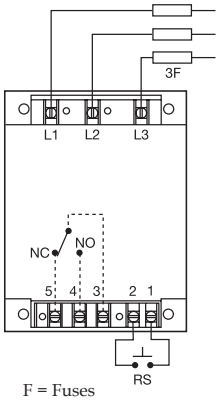
V = Voltage

FIGURE 9 - SC3/SC4 Series



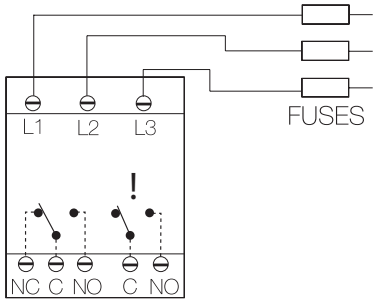
SC4 shown;
for SC3, terminal 6 & load L4 are eliminated.

FIGURE 10 - WVM Series



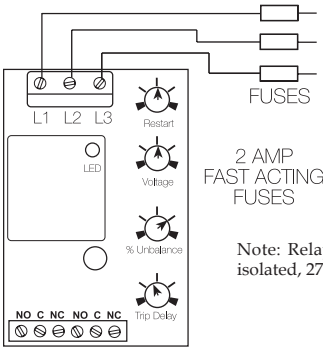
F = Fuses
NO = Normally Open
NC = Normally Closed
RS = Optional Remote Reset Switch
Relay contacts are isolated.
CAUTION:
2 amp max fast acting fuses must be installed externally in series with each input. (3)

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

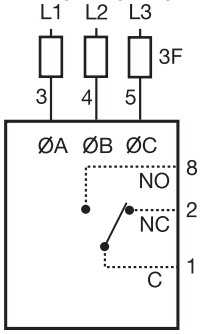


2 AMP
FAST ACTING
FUSES

Note: Relay contacts are isolated, 277VAC max.

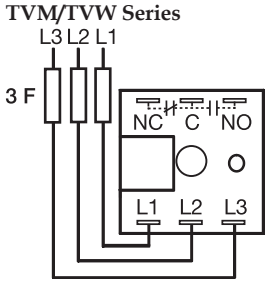
L1, L2, L3 = Line Voltage Input
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment's wiring. They are not required to protect the HLMU.

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

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