DT-362 LED Stroboscope

Operation Manual

Warning

Use in flammable environments is prohibited. Use in this manner may result in fire or explosive.

Do not look directly into the LED light Source. This may result in eye injury.

Do not use or store in the following environments: Direct sunshine condensation, dust or caustic.

Do not alter, or modify of improperly. Such action may cause damage and void warranty.

Operate with 0-35°C (32-95°F), 35-85% RH. Use outside of this range may alter operation of the unit.

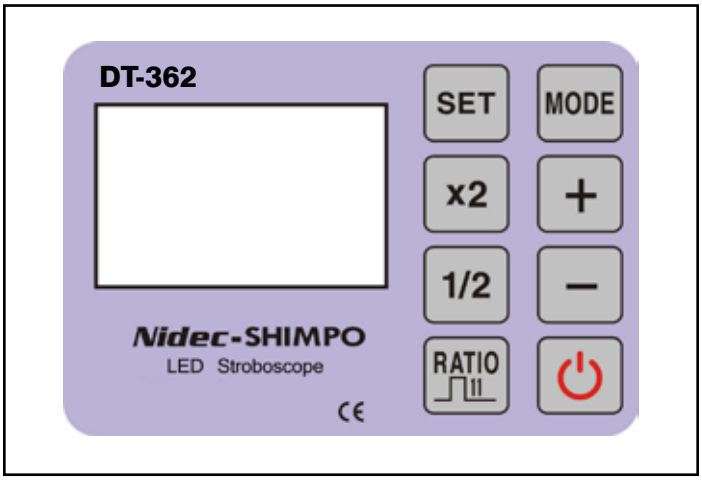
Case may become excessively hot when used continuously for more than 2 hours. Mount unit on a tripod or other fixed device.

The DT-362 is a portable, line-powered stroboscope that utilizes super bright CREE High-Powered LED lamps. The DT-362's LED array provides a bright, stable strobe light over a wide measurement range with a lifetime far exceeding xenon-lit stroboscopes. Combined with a large, backlit LCD display, operation is simple with the 8 button keypad and quick rate-adjustment dial. Phase shift, flash duration, plus flash rate all are easily viewed and adjustable. The universal power range (85-240 VAC) allows one model to be utilized on various power voltages in a multitude of countries. The unit can function by user altered flash frequency or from a remote sensor's signal input which will automatically adjust the stroboscope to the corresponding process fluctuations.

The DT-362 is designed for speed and frequency measurements in motion and vibration analysis. It is ideal for predictive and preventive maintenance applications such as: motors, shafts, roto-gravure printing, extruders, blow molding, wire lettering and striping, engraving, pulse jets, water jets, fans, cams, gear teeth, belt inspections, fuel injectors, vibration analysis, spindle spinning, cutting blade timing and sharpness, plus many more in the printing, packaging, textile, automotive, cable, mining, steel, chemical, optical, medical and shipbuilding industries.

SPECIFICATIONS
Flash Rate Range: 30 to 120,000 FPM ; 1-2000 Hz
Accuracy: 0.01%±1 digit of F.S. @ 77° F (25°C)
Lux Rating (Approx.): 6000 FPM: Distance 8″ (20 cm) 6850 lx with 10″ (254 mm) irradiation dia., Distance 20″ (50 cm) 2325 lx with 14″ (355 mm) irradiation dia. 1500 FPM: Distance 8″ (20 cm) 3395 lx with 10″ (254 mm) irradiation dia., Distance 20″ (50 cm) 1350 lx with 14″ (355 mm) irradiation dia
Lamp Lifetime: Approximately 3~5 years depending on usage.
Display: Backlit LCD
Resolution: 60 ~12,000 FPM = 0.1 FPM; 12,001~120,000 FPM = 1 FPM; 1~200 HZ = 0.01 Hz; 201~2000 = 0.1 Hz
Flash Duration: 0.1°- 2.5°
Power Requirement: 85-240 VAC 50/60Hz
External Sensor Input: Pulse Input; Mini-USB
Sensor Power Supply: 15 V dc up to 50 mA
Input Pulse Width: Over 50 μs
Input Signal Flash Delay: 0-999 ms; 0-359°
Temperature Limits: 32-95°F (0-35°C)
Humidity Limits: 35 to 85% RH
Enclosure: Aluminum & ABS
Product Weight: 1.8 lb (0.82 kg)
Package Weight: 5.3 lb (2.4 kg)
Dimensions: 8 x 4.3 x 7.6" (203 x 110 x 192 mm)
Approvals: CE, RoHS
Warrenty: 1 Year
Included Accessories: Carrying Case, 9.8' (3 m) power cable, Bottom and Top Handle

Operation Panel Located on Control Enclosure
POWER: Power on and off.
MODE: Select mode of operation or Parameter Menu: Internal/External/Parameter Settings
SET: Change Units (FPM to Hz); In Parameter Menu scroll through parameter settings, Store setting values.
x2: Multiplies the flash rate/frequency by a factor of 2.
1/2: Divides the flash rate/frequency by a factor of 2.
RATIO: Adjusts flash duration (flash pulse width) in Internal/External modes.
"+": Advance image forward 3 degrees at a time in internal mode. In parameter setting mode, adjusts setting values.
"-": Retard image backwards 3 degrees at a time in internal mode. In parameter setting mode, adjusts setting values.
Dial: Set flash rate or frequency. CW: Increase flash rate/frequency. CCW: Decrease flash rate/frequency. (Turn dial quickly to drastically change value; Turn dial slowly to change value by 1 digit.) In parameter setting mode, CW or CCW rotation changes the setting value. *Dial located on side of unit.



SEALS USA, Inc.

Instruments Division

LCD Display

Main Data Display

•Flash rate value will be displayed in internal flashing or External trigger mode.

•Display will indicate “P” or “LCD” (in ON/OFF setting of LCD backlight) in *Parameter setting mode.

*For details about Parameter setting mode, please refer to Parameter setting mode.

Sub Data Display

Internal Mode

•Phase Shift will indicate degrees of phase shift in internal flashing mode. To change the degrees of phase shift, press + or - keys. The display will reflect the cumulative angle of phase shift.

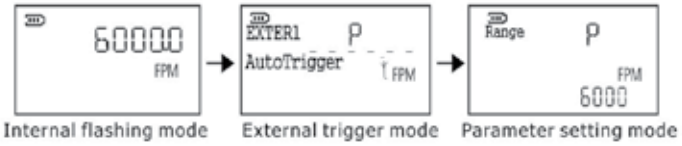
•The flash duration time will be displayed when the RATIO key is pressed. The flash duration time can then be increased or decreased with the dial from 0 to 2.5 (0~2.5°) degrees.

External Mode

• In external trigger mode, the display will show the settings of delay time. For details about changing these settings, please see external trigger mode section.

FUNCTION INSTRUCTIONS

Mode Selection - To switch between INTERNAL, EXTERNAL and PARAMETER menu, press and release the MODE key. For details about Parameter setting mode, please refer to Parameter setting menu section.



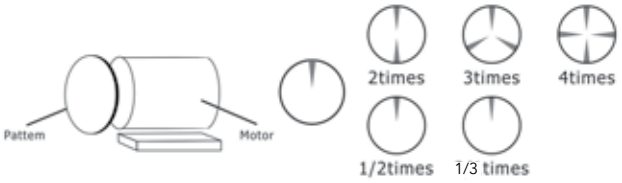
Internal Flashing Mode

Changing Units of Measure in Internal Mode - To change the measuring units from FPM to Hz, press and release the SET key. Units will alternate with each press and release.

Flash Rate (Frequency Setting) in Internal Mode -
You can set the flash rate by turning the dial in the center of the unit. To increase the flash rate, turn the dial in the clockwise direction. To decrease the flash rate, turn the dial in the counter-clockwise direction. For small adjustments, turn the dial slowly. For quick adjustments, rotate the dial quickly. The flash rate range and resolution will be different according to the selected measuring range.

One function of a stroboscope is to provide a “stopped” image of a rotating target when the flash rate of the stroboscope has matched the rotational speed of the target object. The stroboscope will show a single image when the flash rate is set to a lesser multiple of the true RPM (1/2,1/3,etc.) When the flash rate is increased to a higher multiple (2,3,etc.), multiple images will appear. To find the true RPM of the target object, reduce the flash rate to a lower multiple until only one image appears.

Stopped Image:



Example			
True Rotational Speed of Target Object (rpm)	Flash Rate of Stroboscope (fpm)	Multiple of True Rotational Speed	Number of Stopped Images
900 rpm	3600	4 times	4
	2700	3 times	3
	1800	2 times	2
	900	1 time	1
	450	1/2 times	1
	300	1/3 times	1

Multiple/Divide by 2 Function - The flash rate can be doubled or halved by x2 and 1/2 keys on the operation panel.

1. Doubling the flash rate(x2) Press x2 key to multiply the current flash rate by a factor 2.

Note: The use of the x2 key will have no effect when multiplication of the current flash would result in a value that exceeds the maximum flash rate range. After the flash rate changes, it becomes the new value based on the set display resolution. Therefore, the rate may likely not return to the original frequency, even if the "1/2" key is pressed.

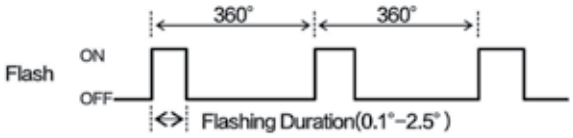
2. Having the flash rate(1/2) Press "1/2" key to divide the current flash rate by a factor of 2. Operation Indication

Note: The use of the 1/2 key will have no effect when the division of the current flash rate would result in a value that goes below the minimum flash rate.

After the flash rate changes, it becomes the value based on the set display resolution. Therefore, the rate may likely not return to the original, even after pressing the x2 key.

Phase Shift (Angle) - First, press 'SET" key, then enter this mode. When the rotation speed of the target object and the flash rate of the DT-362 becomes equal, the phase shift function can be used to delay the flash so that the image will appear to rotate incrementally. The phase shift angle can be increased or decreased 3°, each time the "+" or "-" keys are pressed or the adjustment dial is turned CW or CCW. The sub display will show the cumulative angle of the phase shift.

Flash Duration (Brightness) Settings
The flash duration, RATIO key, can be set within the range of 0.1°-2.5° over a 360° period with a resolution of 0.1°.



When the flash duration is lengthened, the brightness of the flash will be increased, however the image of the target object may appear slightly out of focus. When the flash duration is shortened, the brightness will be decreased, yet the image of the target object will become more focused.

To change the flash duration in either Internal or External modes, first press the "RATIO" key. Once pressed, "Flash Time" will appear with the current flash pulse duration ratio in the sub display. The flash pulse duration can now be modified.

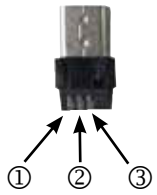
To set the flash pulse duration while in the modifiable mode; press "+" key, or turn the dial in the clockwise direction to increase the flash pulse duration by 0.1° increments.

Press "-" key, or turn the dial in the counter clockwise direction to decrease the flash pulse duration by 0.1° increments.

External Trigger Mode
External trigger mode will allow the flash rate of the DT-362 stroboscope to be controlled by an external signal, such that the flash rate will automatically increase or decrease when the signal is altered, so that it may remain in unison with the speed of a changing target.

Mini-USB External Signal Input:

1. GND
2. External Pulse Signal Input
3. Sensor Power Outlet: +15 V 50 mAh



External Pulse Input: The input signal requires the following characteristics.

Input frequency: 60-120,000 fpm (1-2000Hz)
Pulse width must be greater than 50 μs.

Note: When the external sensor input is utilized on battery-powered models, the AC power supply must be used for proper sensor performance.

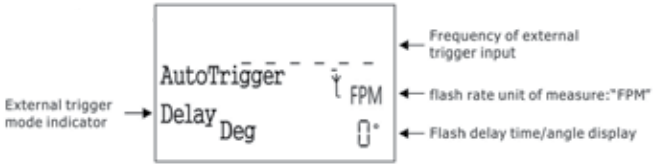
Additionally, there are several settings that can be adjusted in External Trigger mode, including phase shift, delay time, and flash duration.

The flash timing can be set by using the positive or negative edge of an external trigger signal. Also the delay of the flash timing can be set by time in (msec) or degrees (°).

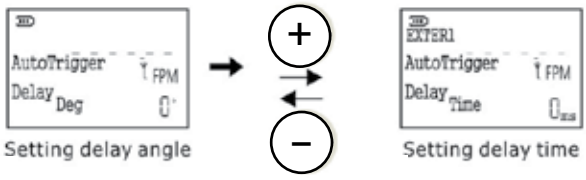
Press "mode" once and the unit enters EXTER 1. In this mode, frequency (HZ) or speed (FPM) automatically flash according to the external trigger signal.

After setting the parameters, generally the detected object has an advanced or lag phenomenon. To adjust, press the "+" or "-" for fine-tuning, change the perimeter parameters, so that detected object achieves a still image. In this setting process, the unit will automatically save the last setting.

External Trigger Mode: LCD Display Information
The frequency of the external signal is measured each period, while the latest external frequency measurement is updated every 50 ms.



External Trigger Flash Delay Setting
A flash angle delay can be programmed into the DT-362 to delay the flash after an external trigger signal is detected. The unit of delay can be set to time (msec) or degree (°). Use "+" or "-"key to alternate between the settings of delay angle or delay time.

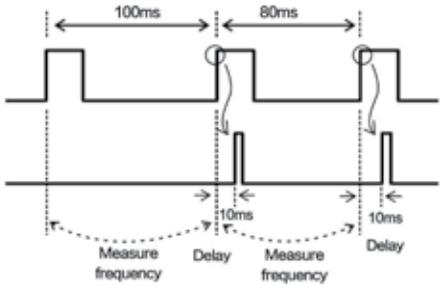


Delay Time Setting
The delay time can be set to incorporate a delay from the external pulse input to the flash output. The delay can be set from 0-999 ms with a resolution of 1 ms.

Note: Because of the existence of a delay in internal calculation, the DT-362 flashes 60 μs after the external signal input. This results in the actual setting delay time having approximately +60 μs added to the delay.

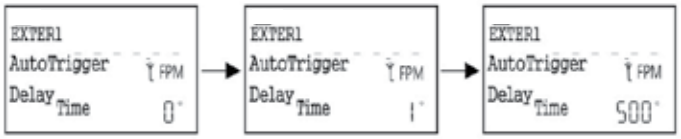
Example
Trigger: positive edge **Delay Time:** 10 ms

The DT-362 does not flash at the 1st trigger pulse as shown below in the diagram, DT-362 flashes from the external trigger after 10 ms.



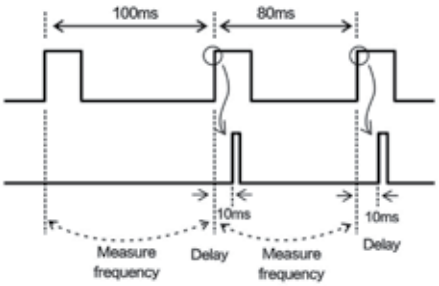
If the period of the external input is less than the setting of the delay time, the delay time is ignored and the DT-362 flashes as if the delayed time equals 0.

To adjust the delay time, press the "+" or "-" key. Or turn the dial to set the delay time. Delay time will increase as the dial is turned clockwise, and decrease as it is turned counter clockwise.



Delay Angle Setting
As the period of the external input is 360, the delay angle can be set from 0°to 360°, by every 3°. Since the internal calculation time is 60 μs, the actual delay time is as follows:

Delay angle setting/360° x period of external input + appox. 60 μs. The DT-362 does not flash at the 1st trigger pulse as shown below in the diagram.
Example: Trigger: positive Delay Angle: 36° 36/360=10



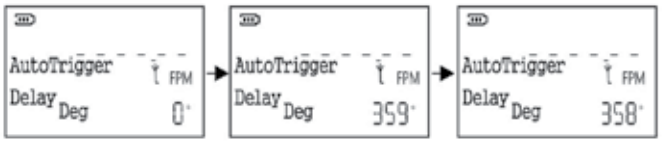
If the current period of external trigger input changes, the time of the flash is not accurate, because the time is calculated based on the previous measurement period.

If the current period of external trigger input is less than the previous period and the next trigger input occurs before the flash time, the delay angle setting is ignored and the DT-362 flashes at the delay angle=0°.

To adjust, press the "+" or "-" key. You may also use the adjustment dial.

The delay angle increases as the dial is rotated to the right. The angle settings will go to 0° as the angle increases past 359°.

Delay angle decreases as the dial is rotated to the left. The settings will eventually go to 0° as the angle decreases past 359°.

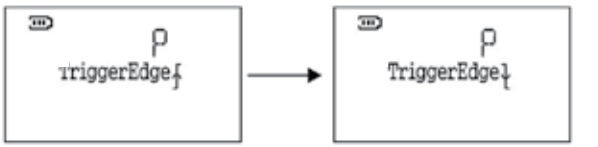


Parameter Settings
To enter parameter setting menu, press "MODE" until the LCD displays "P". When the display shows "P', press the SET key to cycle between the various parameter settings available (range, trigger edge, delay time, LCD backlight, Auto Shut-off, Initial). To store the settings and return to measuring modes, press the MODE key.

Measuring Range Setting
You can adjust the flash setting from the home view and also in parameter mode if desired.

Trigger Edge Setting (External Modes)
In external mode, the trigger edge parameter will allow for selecting either the leading edge or trailing edge of the input pulse to trigger the stroboscope flash.

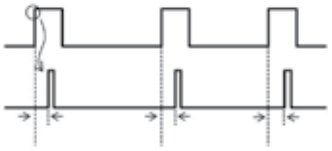
In parameter mode, use the SET key to cycle to the Trigger Edge setting parameter mode. To set the trigger edge as "Down Edge" (trailing), press " -" key or turn the dial clockwise. To set the trigger edge as "Up Edge" (leading), press "+" key or turn the dial clockwise.



Trigger edge set as "up edge" Trigger edge set as "down edge"

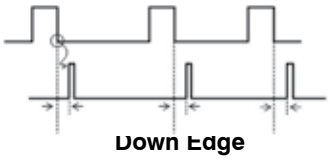
When trigger edge setting is set to "up edge". The flash will occur on the leading edge of the input pulse (when delay setting is zero).

External Pulse Signal from Machine/Sensor vs. Stroboscope Flash



When trigger edge setting is set to "down edge". The flash will occur on the trailing edge of the input pulse (when delay setting is zero).

External Pulse Signal from Machine/Sensor vs. Stroboscope Flash



Down Edge

Back Light Setting
The LCD display of the DT-362 stroboscope has a backlight that can be turned on or off in the parameter settings. Turning off the backlight will conserve battery power. To adjust the backlight setting, enter parameter mode and use the "SET" key to cycle to LCD setting. Press "+" key to turn on the backlight. Press "-" key to turn off the backlight.

Note: If the backlight is set to on, as a power saving feature, it will automatically shut off after the set minutes if no keypad or dial operation has occurred. The LCD backlight will turn back on with keypad or dial operation.

Automatic Power-Saving Settings

LCD Back Light Off: If the backlight is set to on, as a power saving feature, it can be adjusted to automatically shut off from 1 to 1000 seconds, if no keypad or dial operation has occurred. The LCD backlight will turn back on with keypad or dial operation.

Factory Reset (Initial)
To reset unit to factory values choose "Yes" under Initial in the parameter setting mode. Then press "SET".

Mounting
To mount permanently, remove the two screws holding the trigger handle. The threaded adapter will now be visible. Discard screws and handle. With appropriate 1/4-20 UNC male thread connection, attach to stroboscope's female threaded adapter. Hand tighten to secure.