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1071-4203-111R

MONARCH INSTRUMENT

Instruction Manual



(Nova-Strobe dbx shown)

Nova-Strobe dax
and
Nova-Strobe dbx

Portable Deluxe Stroboscopes

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Safeguards and Precautions

1. **Read and follow all instructions in this manual carefully, and retain this manual for future reference.**
2. **Do not use this instrument in any manner inconsistent with these operating instructions or under any conditions that exceed the environmental specifications stated.**
3. **Use of this product may induce an epileptic seizure in persons prone to this type of attack.**
4. **Objects viewed with this product may appear to be stationary when in fact they are moving at high speeds. Always keep a safe distance from moving machinery and do no touch the target.**
5. **There are lethal voltages present inside this product. Refer to the section on Lamp Replacement before attempting to open this product.**

AC Stroboscopes that have three wire mains cable must have the earth wire connected to a suitable Earth point.

6. **Do not allow liquids or metallic objects to enter the ventilation holes on the stroboscope as this may cause permanent damage and void the warranty.**
7. **Do not allow cables extending from unit to come into contact with rotating machinery, as serious damage to the equipment, or severe personal injury or death may occur as a result.**
8. **This instrument may not be safe for use in certain hazardous environments, and serious personal injury or death could occur as a result of improper use. Please refer to your facility's safety program for proper precautions.**

CE DECLARATION OF CONFORMITY

As Manufacturer:

Monarch Instrument

Division of Monarch International Inc.

15 Columbia Drive, Amherst NH 03031 USA

declares under Monarch's sole responsibility that the product:

Name: **Nova-Strobe X Series**
Models: **pbx, dbx, bbx**

to which this declaration relates is in conformity with the following standards:

EN61326:1997 EMC /A1:1998/A2:2001/A3:2003 Class A
Specifically CISPR 16-1:2003/CISPR 16-2:2003
EN55011:1998/A1:1999/A2:2002 EN61000-4-2 EN61000-4-3

EN61010-1:2001-2 Safety Regulation

and therefore conforms with the requirements of Council Directive 89/336/EEC relating to electromagnetic compatibility and 93/68/EEC relating to the low voltage directive with amendments, when operated in accordance with the user guide. EMC testing of this product was performed by Retlif Testing Laboratories, NH, in February of 2007 (File R-4702N-5). Safety testing per Technical Construction File NSXPB-0207.

14th February, 2007
Manufacturer (Amherst,NH)

Alan Woolfson, VP Engineering (Authorized Signature)

CE DECLARATION OF CONFORMITY

As Manufacturer:

Monarch Instrument

Division of Monarch International Inc.

15 Columbia Drive, Amherst NH 03031 USA

declares under Monarch's sole responsibility that the product:

Name: Nova-Strobe X Series
Models: dax, bax

to which this declaration relates is in conformity with the following standards:

EN61326:1997 EMC /A1:1998/A2:2001/A3:2003 Class A
Specifically CISPR 16-1:2003/CISPR 16-2:2003
EN55011:1998/A1:1999/A2:2002 EN61000-4-2 EN61000-4-3
EN61000-4-4 EN61000-4-5 EN6100-4-6 EN6100-4-3

EN61010-1:2001-2 Safety Regulation

and therefore conforms with the requirements of Council Directive 89/336/EEC relating to electromagnetic compatibility and 93/68/EEC relating to the low voltage directive with amendments, when operated in accordance with the user guide. EMC testing of this product was performed by Retlif Testing Laboratories, NH (File R-4702N-4). Safety testing per Technical Construction File NSXDA-0207.

1st July, 2007
Manufacturer (Amherst,NH)

Alan Woolfson, VP Engineering (Authorized Signature)

9. **The Nova-Strobe dbx contains Nickel Metal Hydride batteries which must be disposed of in accordance with Federal, State, & Local Regulations. Do not incinerate. Batteries should be shipped to a reclamation facility for recovery of the metal and plastic components as the proper method of waste management. Contact distributor for appropriate product return procedures.**
10. **This instrument is not user serviceable. For technical assistance, contact the sales organization from which you purchased the product or Monarch Instrument directly.**



In order to comply with EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE): This product may contain material which could be hazardous to human health and the environment. DO NOT DISPOSE of this product as unsorted municipal waste. This product needs to be RECYCLED in accordance with local regulations, contact your local authorities for more information. This product may be returnable to your distributor for recycling - contact the distributor for details.

Monarch Instrument's Limited Warranty applies. See www.monarchinstrument.com for details.

Warranty Registration and Extended Warranty coverage available online at www.monarchinstrument.com.

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9.0 OPTIONS AND ACCESSORIES

C-4027	Set of mating 1/8 inch [3.5 mm] stereo phone plugs (to provide TTL signal and sensor power)
CA-4044-6	6 foot [1.8 m] Input / Output cable, 1/8 inch [3.5 mm] male phone plug to male BNC connector
CA-4045-6	6 foot [1.8 m] Input / Output cable, 1/8 inch [3.5 mm] male phone plug to 1/8 inch [3.5 mm] male phone plug for daisy chaining strobes together
CC-7	Latching carrying case for Strobe with provision for accessories
L-1903	Digital Stroboscope replacement lamp
PSC-2	Recharger, 115 Vac - 50/60 Hz for battery operated Nova-Strobes
PSC-2U	Universal Recharger, 115/230 Vac with USA, U.K., AUS, Euro Adapter Plugs for battery operated Nova-Strobes
ROS-P	Remote Optical Sensor with 8 foot [2.5 m] cable for triggering strobe
T-5	Reflective tape - 5 foot [1.5 m] roll, 0.5 inch [12.7 mm] wide
MT-190P	Magnetic Trigger Sensor/Amplifier with 8 foot [2.5 m] cable for triggering strobe
IRS-P	Infrared Sensor for use without reflective target at 0.5 inch [12 mm] gap with 8 foot [2.5 m] cable for triggering strobe
SPC-1	Splash proof Protective Cover for Battery Powered Strobe ONLY

dbx Specific:

Trigger to Flash Delay	13 µsec typical
Input Power	**Battery powered:** Internal Rechargeable Batteries 6 Vdc, External AC recharger (100 Vac to 240 Vac, 50/60 Hz)
Light Output	**Average:** 13 Watts typical > 4000 FPM **Instantaneous** (per flash): 230 mJoule typical to 4000 FPM
Run Time	2 hours typical at 1800 FPM, and over 1 hour at 6000 FPM with fully charged batteries
Charge Time	4-5 hours typical with PSC-2U
Weight	1.875 lbs [0.8505 kg] including batteries

dax Specific:

Trigger to Flash Delay	16 µsec typical
Input Power	**AC powered:** 115 Vac OR 230 Vac, 35VA (as ordered)
Light Output	**Average Power:** 15.5 Watts typical > 4000 FPM **Instantaneous** (per flash): 230 mJoule typical to 4000 FPM
Run Time	Continuous within temperature limitations. Vents must not be restricted. Unit must be horizontal.
Weight	1.55 lbs [0.70 kg]

1.0 OVERVIEW

All descriptions in this manual apply to both the battery powered (dbx) and AC mains powered (dax) digital stroboscopes except where noted.

1.1 Display Panel / Definition of Buttons

The display panel consists of a backlighted liquid crystal display with six numeric digits on top and five alphanumeric digits on the bottom, which indicate modes, flash rates, etc. (see Figure 1).

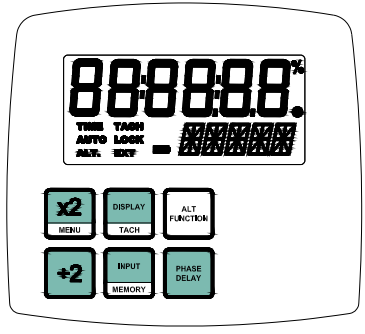


Figure 1 Display Panel

Additional information displayed include:

TIME	Unused
AUTO	Unused
ALT.	Indicates alternate function of each button (lower section) and knob will be used
TACH	Tachometer Mode active (strobe won't flash)
LOCK	Unused
EXT	External Input Mode active
◎	On Target Indicator for Tachometer Mode and Remote Sensor in External Mode
- - - - -	Indicates input frequency exceeds the limit of the stroboscope
▭	**(Battery Powered Model Only)** Battery indication, see section 7.0

Below the display are six membrane buttons which control the operation of the Stroboscope. They are:



Multiplies flash rate by 2 times
ALT Function - Starts Menu (See section 3.0)
Hold when powering up to show all segments, then Rev # and display test



Divides flash rate by 2
Hold when powering up to reset factory defaults



Toggles display between RPM and RPS
ALT Function - Toggles Tach Mode (flashing) on/off



Manually toggles between Internal and External Modes
ALT Function - Reads and Stores 9 preset flash rates



Activates Alternate Function for buttons (lower section) and knob



In Internal Mode, toggles between normal flash rate adjust and "phase" delay adjust

The **ALT FUNCTION** button toggles **ALT.** in the display. When **ALT.** is displayed, the buttons will perform their secondary function listed in the lower section of each button. It also changes how the tuning knob works.

External Input	TTL Compatible (24V pk max), 500 nanosec min pulse width, Positive or Negative edge triggered (menu selectable)
Output Pulse	40 µsec positive/negative pulse (menu selectable), 3.3 Vdc typical **Note:** dax – Input/Output connectors isolated from AC power
Time Base	Ultra Stable Crystal Oscillator
Display	LCD display with 6 numeric 0.506 inch [12.85 mm] high digits and 5 alphanumeric 0.282 inch [7.17 mm] high digits
Indicators	Battery level, On Target, ALT, TACH, and EXT icons
Knob Adjustment	Digital Rotary switch with 36 detents per revolution; velocity sensitive
Memory	Last setting before power down is remembered and restored on next power up. 9 user settable flash rates.
Flash Duration	10-25 microseconds (auto adjust with flash rate)
Flash Tube (Lamp) Life	100 million flashes

This product is designed to be safe for indoor use under the following conditions (per IEC61010-1).

Operating Temperature 32-104 ºF [0-40 °C]
NOTE: Safety thermal feature will set unit into TACH Mode (stops flashing) in the event of internal overheating.

Humidity Maximum relative humidity 80% for temperature up to 88 °F [31 °C] decreasing linearly to 50% relative humidity at 104 °F [40 °C]

7.3 Battery Disposal

Prior to disposing of the battery-powered strobe, the user must remove the Nickel Metal Hydride batteries. To do this, remove the lens, reflector and lamp as detailed in the Lamp Replacement section. This will expose four (4) screws that must be removed so the reflector housing can be dismantled. There are four (4) additional screws in the case half opposite the input and output jacks that must be removed. The case halves can now be separated, exposing the batteries. Remove the cables from the batteries and place tape over the battery terminals to prevent them from shorting. The batteries should be sent to a recycling center or returned to the factory. The rest of the parts may now be disposed of.

8.0 SPECIFICATIONS

Internal Mode:	
Flash Range	30 - 20,000 FPM (Flashes Per Minute)
Flash Rate Accuracy	0.002% of setting or ± last digit
Flash Rate Resolution	0.01 to 1 FPM (menu selectable), 0.1 FPM max resolution above 9,999.99 FPM
Display Update Rate	Instantaneous
External Modes:	
Flash Range and Display	same as internal mode - External flash rates to 0 are acceptable
Tachometer Measurements	5 to 250,000 RPM Accuracy ±0.001% of reading or ± last digit
Display Update Rate	0.5 second typical

2.0 PREPARATION FOR USE

The Strobe may be hand held or mounted on a tripod or other user supplied bracket using the ¼-20 UNC bushing at the base of the handle.

2.1 Power

The AC powered strobe must have its power cord plugged into an AC outlet (115Vac or 230Vac).

The battery powered strobe has internal rechargeable batteries. The unit should be charged before use (see section 7.0). The actual operating time of the stroboscope depends on the flash rate and duty cycle of operation. Slower flash rates (below 4,000 FPM) increase the operating time. Note that the strobe will not operate from the recharger supplied with the unit.

2.2 Input / Output Connections

The strobe has input and output jacks on the left side of the stroboscope. These can be used for external triggering or synchronization (daisy chaining two or more strobes). These jacks accept 1/8" (3.5mm) phone plugs (input - stereo, output - mono). The input and output are TTL compatible. See Figures 2 and 3 for connector connection detail.

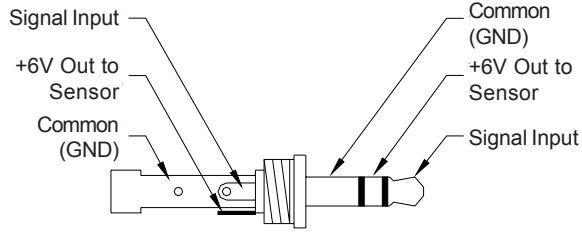


Figure 2 Input Connector Detail (Stereo plug)

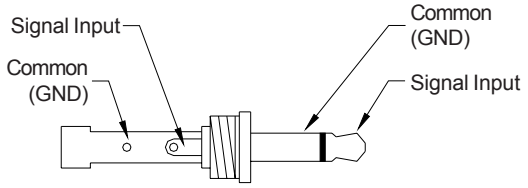


Figure 3 Output Connector Detail (Mono plug)

The input jack (▲ pointing into socket) enables an external signal to trigger the strobe. Inserting a plug into the input jack will automatically put the strobe into the External Input Mode. When the plug is removed, the strobe will be put back into the Internal Mode. The Internal Mode can be forced by pressing the INPUT button. The polarity of the input pulse can be set in the MENU options.

With no external input, the output jack (▼ pointing away from socket) provides a TTL compatible pulse from the strobe's internal oscillator. If an external input is applied, the output pulse is in sync with the input pulse. This output pulse may be used to trigger a second stroboscope synchronously to illuminate larger areas. Many strobes can be "daisy chained". The output jack of one strobe is connected to the input jack of the next strobe causing all the strobes to flash together and be controlled by the first strobe in the chain. The polarity of the output pulse can be set in the MENU options.

The strobe has a protection feature that prevents the strobe from operating if the battery voltage is too low. **This condition is indicated by no flash and the display shows "LO BAT".** At this time the batteries must be recharged. Remember to release the trigger switch.

7.2 Charging the Batteries

The unit may be recharged at any time. You do not need to wait until the low battery condition is indicated.

To charge the battery powered strobe with the recharger:

1. Release the trigger so the strobe is off.
2. Plug the recharger cable into the recharger socket (located below the display panel behind the handle).
3. Plug the recharger into an AC mains wall outlet.

CAUTION: Use of rechargers other than the one supplied (PSC-2 or PSC-2U) will damage the stroboscope and void the warranty.

The strobe will display the current battery charge percent and the recharger will fast charge the batteries for about 4-5 hours. Once the fast charge is completed, the recharger will trickle charge the batteries.

Allow the recharger to charge the batteries until the display shows DONE for peak battery life performance. If the batteries are not charged to 100% regularly, the batteries will lose capacity.

When the recharger plug is inserted into the recharger jack, the strobe will go into the Charging Mode. Make sure the trigger switch is not depressed. The strobe will not do anything else when charging (e.g. it will not flash and the buttons have no function).

7.0 BATTERY POWERED MODELS ONLY

The Nova-Strobe dbx is fitted with rechargeable NiMH (Nickel Metal Hydride) batteries. These batteries contain fewer toxic metals than NiCd (Nickel Cadmium) and are currently classified "environmentally friendly". They also have 30% more capacity than NiCd batteries of the same size.

Like NiCds, NiMH **batteries are prone to self-discharge** - 10 to 15% of charge is lost in the first 24 hours then continues at a rate of 0.5 to 1% per day. For maximum performance, charge the batteries just prior to use.

When not in use, the batteries should be charged at least every three months, otherwise the battery capacity will be reduced or the batteries may become unusable.

Charge the batteries before use and allow 3-5 cycles of charging and discharging for batteries to reach full capacity.

The enclosure contains control electronics to properly and safely charge the batteries. Never remove the batteries from the enclosure and attempt to charge externally. **Always use the charger supplied (PSC-2 or PSC-2U)**.

7.1 Low Battery Indication

The Low Battery icon will be displayed differently depending on the battery voltage. If the Low Battery icon is not displayed, the batteries are full. Otherwise, the Low Battery icon will indicate that the battery voltage is decreasing as follows:

Half solid	¾ Full
Half with block blinking	½ Full
Outline only solid	¼ Full
Outline blinking	Low battery (very little time left)

3.0 MENU

The strobe has a Menu which allows the user to select settings such as number of decimal places, backlight on or off, and positive or negative edge for input and output signal.

To enter the MENU:

1. Press the ALT FUNCTION button and then the MENU button.
2. SetUP and the menu option will be displayed.
3. Turn the tuning knob to cycle through the main menu selections.
4. Once the desired menu option is displayed, press the MENU button to select/save it. Press any other button to cancel.
5. Turn the tuning knob to edit the menu option.
6. Press the MENU button to save your changes. Press any other button to cancel.
7. Press any button other than MENU to exit the Main Menu.
8. *DONE* will be displayed.

Below is a list of the menu items:

DECPT - Decimal Point (none, 1 or 2)
BLITE - Backlight (Yes=On or No=Off)
INPUT - Positive (pos) or Negative (neg) Edge for Input Signal
OUTPT - Positive (pos) or Negative (neg) Edge for Output Signal

4.0 OPERATION

To turn on the stroboscope, depress and hold the trigger. The trigger may be locked in position using the side locking button. To lock the stroboscope on, depress the trigger as far as it will go and then press the locking button. Once the locking button is set you may release the trigger and the trigger will be held in place. To unlock the stroboscope, simply depress the trigger and then release.

There are three major operating modes for the Strobe. These are **Internal**, **External Input** and **Charging** (Battery powered model only). In the **Internal Mode**, the knob adjusts the flash rate. In the **External Input Mode,** an external signal is used to trigger the flash and the knob has no effect. The **Charging Mode** (Battery powered model only) is when the strobe has the battery recharger plugged into it. The strobe will continuously display the state of the battery charge while being recharged.

4.1 Internal Mode - Standard Strobe Operation

In the **Internal Mode** the stroboscope generates it's own signals and functions like a tunable stroboscope. The strobe is in the Internal Mode when nothing is plugged into the input jack or when manually set using the INPUT button.

To change the flash rate:
With the power on, turn the knob counter clockwise to increase the flash rate and clockwise to decrease it. The knob is velocity sensitive. Turn the knob slowly to have each "click" is equal to 0.01 FPM. Turning the knob more quickly will adjust the FPM by larger steps. When adjusting flash rate, quickly turn the knob (or use the **x2** or **÷2** buttons) to coarsely change the FPM. Then slowly turn the knob for fine adjustments.

6.2 Fuse Replacement

Under normal operating conditions, the fuse within the stroboscope should never blow. Examples of abnormal operating conditions would be foreign materials entering the strobe, such as water, pulp, ink, etc.

The AC Powered stroboscope has a replaceable fuse inside the unit, which may be accessed by removing the lens and reflector - refer to Figure 4. If the fuse needs to be replaced, replace only with a fuse of the same type and value: Fast Blow - 750mA, 2AG.

WARNING: Before attempting to replace the fuse, make sure the stroboscope is turned off and any mains cord is removed from the AC outlet. Allow the lamp to cool waiting at least 5 minutes.

The Battery Powered stroboscope has a resettable fuse, which will reset once conditions are normal again.

while pushing it into place (see Figure 4). Make sure the lamp is in straight and centered in the reflector hole.

CAUTION: Do NOT allow the reflector to contact the lamp.

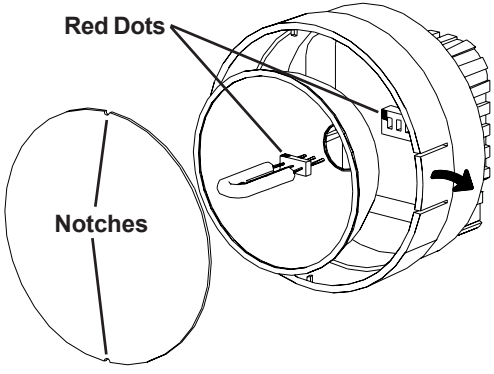


Figure 4 Lamp Replacement

4. Reinstall the reflector and then position the front lens in place matching up the notches on the lens with the two small tabs on the housing to prevent lens rotation (see Figure 4). Push the tabs on the front rim outward and press the lens into place.

NOTE: There are maximum and minimum values in each mode beyond which you cannot adjust. If you are adjusting the rate and you reach a value which on the next increment would exceed the maximum flash rate, the display will not increment. The same is true if you try to adjust the flash rate below the minimum flash rate.

To multiply or divide the current flash rate by 2:
In addition to the knob, there are two buttons on the back panel marked **x2** and **÷2**. This enables the user to instantly double or halve the reading on the display to the maximum or minimum values allowed. This feature is useful for checking harmonics in the internal flashing mode.

Alternate Knob Function (multiple by 2, 3, 4, 5, etc.)
The tuning knob functions differently when **ALT.** is displayed. The current flash rate is used as an adder. The knob will add (counter clockwise) or subtract (clockwise) that initial flash rate for each "click" the knob is turned. This in effect allows the user to multiply the initial flash rate by 2, 3, 4, 5, etc up to the maximum flash rate. This is very helpful on fan blades. Using this feature, one can superimpose the blades on top of each other and check for blade tracking, bent blades, lead and lag tests, etc.

For example: A 3 bladed fan is spinning at 3600 RPM. The strobe is flashing at 3600 FPM. Press the ALT FUNCTION button to display **ALT**. Then turn the knob counter clockwise 2 clicks. The strobe will now flash at 10,800 FPM (effectively 3600 times 3). The fans blades will be all superimposed on each other. One can now see if the blades are out of alignment, bent, etc. by viewing the blades from the front or viewing from the side edge of the blades.

To select a flash rate from a Preset (memory) location:

1. Press the ALT FUNCTION button and then the MEMORY button.
2. *READ* will be displayed.
3. Turn the tuning knob to cycle through the preset flash rates.
4. Once the desired flash rate is displayed, press the MEMORY button to select it. Press any other button to cancel.
5. *DONE* will be displayed.

To store the current flash rate in a Preset (memory) location:

1. Press the ALT FUNCTION button and then the MEMORY button.
2. *READ* will be displayed.
3. Do NOT turn the knob and press the MEMORY button again.
4. *STORE* will be displayed.
5. Turn the tuning knob to cycle through the memory locations.
6. Once the desired memory location is displayed, press the MEMORY button to store the current flash rate in that location. Press any other button to cancel.
7. *DONE* will be displayed.

Internal "Phase" Delay

Once the flash rate has been adjusted to give a stopped motion image, the PHASE DELAY button may be used with the knob to increase or decrease the phase of the reference mark location. Use the PHASE DELAY button and knob to bring a reference mark, such as a key way, into your line of sight.

To adjust the "Phase" Delay:

1. Press the PHASE DELAY button.
2. *PHASE* will be displayed on the bottom line and the current flash rate will be displayed on the top line.

6.0 LAMP AND FUSE REPLACEMENT

6.1 Lamp Replacement

WARNING: Before attempting to remove the lamp, make sure the stroboscope is turned off and any mains cord is removed from the AC outlet. Allow the lamp to cool waiting at least 5 minutes.

The stroboscope is designed to discharge the internal high voltages within 30 seconds. However, caution should be exercised when replacing the lamp.

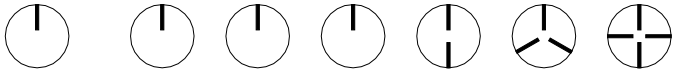
The lamp can be replaced by using just a pocket screwdriver. **It is not necessary to remove any screws to replace the lamp.**

To change the lamp:

1. Push apart the two tabs on the side of the reflector housing and remove the lens using a small screwdriver to help pry one tab and lift the lens. Take care not to pry the tab any more than is necessary to free the lens. The reflector is held in place by the front lens and will come loose, but it is not necessary to remove the reflector.
2. Hold the lamp with a cloth between your forefinger and thumb and rock it back and forth gently while pulling out. Do not attempt to rotate the lamp. The lamp is socketed and will come out easily when pulled straight out.

WARNING: Do NOT touch the new lamp with bare fingers.

3. The lamps are polarized and must be put into the socket matching polarity. **Using a lint free cloth, match up the red dot on the plug with the red dot on the socket** and gently rock the lamp



Stopped Image	1/4 times	1/2 times	1 time	2 times	3 times	4 times
Flash Rate (FPM)	1250	2500	5000	10000	15000	20000

Example: object rotating at 5000 RPM

If the speed is outside the full scale range of the stroboscope (20,000 FPM), it can be measured using the method of harmonics and multipoint calculation. Start at the highest flash rate and adjust the flash rate down. You will encounter multiple images so be aware of these. Note the flash rate of the first SINGLE image you encounter, call this speed "A". Continue decreasing the flash rate until you encounter a second SINGLE image. Note this speed as "B". Continue decreasing the speed until you reach a third SINGLE image at speed "C".

For a two point calculation the actual speed is given by:

$$RPM = AB/(A-B)$$

For a three point calculation:

$$RPM = 2XY(X+Y)/(X-Y)^2 \text{ where}$$
$$X = (A-B) \text{ and}$$
$$Y = (B-C)$$

If a Remote Optical Sensor or Magnetic Sensor is used to sense one pulse per revolution (External mode), the readout will display directly in RPM (FPM) without any adjustment required.

In instances when you can shut down the device and install a piece of reflective tape, then an optical tachometer is easier to use for RPM measurement. **Stroboscopes must be used when you can't shut down the device.** The human eye is not easily tricked into seeing a stopped image by a stroboscope when the flash rate is slower than 300 FPM. Therefore, stroboscopes are just about impossible to use below 300 FPM for inspection or to measure RPM.

3. Turn the tuning knob to adjust the location (phase) of the reference mark.
4. Press the PHASE DELAY button again to turn the "Phase" Delay mode off.

4.2 Internal Mode - TACH Frequency Generator

In the Internal Mode, the strobe can be used as a frequency generator (outputting TTL pulses) without having the strobe flash. The pulse output will still occur at the flash rate; the strobe is just not flashing.

To stop flashing:

1. Press the ALT FUNCTION button and then the TACH button.
2. The TACH icon will be displayed.

To start flashing again:

3. Press the ALT FUNCTION button and then the TACH button.
4. The TACH icon will go away and the strobe will start flashing again.

4.3 External Input Mode

The strobe is in the External Input Mode whenever there is a plug in the input jack. When the strobe is in the External Input Mode, **EXT** will be displayed.

In the External Input Mode the user can't make any flash rate adjustments. The flash rate is a function of the input trigger signal. This mode is used to synchronize the flash to an external event (for example, from an optical sensor) to stop or freeze motion. The flash will be triggered on the rising or falling edge (menu selectable) of the external input pulse.

4.4 Tachometer Mode - External Input Required

When an external input is supplied to the unit and the strobe is put in the Tachometer Mode, the unit will read the signal from the external input (sensor) and display the reading on the LCD display without flashing the lamp. **The strobe will not flash in the Tachometer Mode.**

To enter the Tachometer Mode:

1. Press the ALT FUNCTION button and then the TACH button.
2. The TACH icon will be displayed.

NOTE: If the external input signal exceeds the maximum flash rate, the strobe will go into the Tachometer Mode automatically.

To exit the Tachometer Mode:

1. Press the ALT FUNCTION button and then the TACH button.
2. The TACH icon will go away.

4.5 Power Up Features

When the strobe is powered up it will remember the last settings.

Press and hold the **x2/MENU** button, then turn on the strobe by depressing the trigger switch. This will turn on all the display segments for two seconds or until you release the button. It will then show the software revision, "REV x.x" and then go through a display diagnostic.

Press and hold the **÷2** button, then turn on the strobe by depressing the trigger switch. This will restore the factory programmed presets.

5.0 USING THE STROBOSCOPE TO MEASURE RPM

The primary use for a stroboscope is to stop motion for diagnostic inspection purposes. However the stroboscope can be used to measure speed (in RPM / RPS). In order to do this several factors need to be considered. First, the object being measured should be visible for all 360° of rotation (e.g. The end of a shaft). Second, the object should have some unique part on it, like a bolt, key way or imperfection to use as a reference point. If the object being viewed is perfectly symmetrical, then the user needs to mark the object with a piece of tape or paint in a single location to be used as a reference point. **Look only at the reference point.**

If the speed of rotation is within the range of the stroboscope, start at the highest flash rate and adjust the flash rate down. At some point you will stop the motion with only a single reference point of the object in view. Note that at a flash rate twice the actual speed of the image you will see two images (reference points). As you approach the correct speed you may see three, four or more images at harmonics of the actual speed. The first SINGLE image you see is the true speed. To confirm the true speed, note the reading and adjust the stroboscope to exactly half this reading, or just press the ÷2 button. You should again see a single image (which may be phase shifted with respect to the first image seen).

For example, when viewing a shaft with a single key way you will see one stationary image of the key way at the actual speed and at 1/2,1/3,1/4, etc, of the actual speed. You will see 2 images of the key way at 2 times the actual speed, 3 key way at 3 times, etc. **The FPM equals the shafts Revolutions Per Minute (RPM) at the highest flash rate that gives only one stationary image of the key way.**