



Instruction Manual

**Nova-Strobe™ bax and Nova-Strobe™ bbx
Portable 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. DANGER: Hazardous voltage is present inside this product. Do NOT open. Except for the replaceable lamp and fuse (AC Strobe only), no user-serviceable parts inside. Service is to be performed only by authorized personnel. **Prior to any service, make sure the unit is turned off and all power is disconnected.** For technical assistance, contact the sales organization from which you purchased the product or Monarch Instrument directly.

4. AC Stroboscopes that have three-wire mains cable must have the earth wire connected to a suitable Earth point.
5. Certain strobe frequencies can trigger epileptic seizures in those prone to that type of attack.



CAUTION

**BRIGHT LIGHT.
AVOID EXPOSURE.**
Do not stare into light.
Brightness of light may
cause eye injury.

6. Intense light sources can have a high secondary blinding effect. A temporary reduction in visual acuity and afterimages can occur, leading to irritation, annoyance, visual impairment, and even accidents – depending on the situation. Do not aim light at yourself or others.

7. Exposure to flickering light or visual patterns may cause eye strain, headaches, nausea, dizziness, and other afflictions.
8. 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 not touch the target.
9. 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.
10. 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.



To comply with worldwide regulations such as the U.S. Environmental Protection Agency Resource Conservation and Recovery Act (RCRA) and EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), you must not discard this electrical/electronic product in domestic household waste. The electronic components in this device may contain environmentally harmful substances. **DO NOT DISPOSE** of this product as unsorted municipal waste. This product needs to be **RECYCLED** and disposed of in accordance with environmental regulations in the country of use; contact your local authorities for more information. This product may be returnable to your distributor for recycling; contact your distributor for details.



The Nova-Strobe bbx contains a nickel metal hydride battery pack which must be recycled and disposed of in accordance with Federal, State, & Local Regulations. Do not incinerate. The battery pack should be shipped to a reclamation facility for recovery of the metal and plastic components as the proper method of waste management. Contact your local authorities for appropriate product return procedures.

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

Warranty Registration and Extended Warranty Coverage information is available online at www.monarchinstrument.com.

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1.0 OVERVIEW

All descriptions in this manual apply to both the basic battery-powered bbx and basic AC mains-powered bax digital stroboscopes except where noted.

1.1 Display Panel/Definition of Buttons

The display panel consists of a 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).

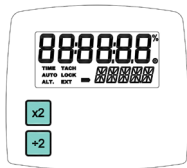


Figure 1 Display Panel

Additional information displayed include:

----- Indicates input frequency exceeds the limit of the stroboscope



Battery indication, (see [6.0 Battery-Powered Models Only](#))

Below the display are two membrane buttons:



Multiplies flash rate by 2 times

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

2.0 PREPARATION FOR USE

The strobe may be handheld 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 (115 Vac or 230 Vac).

The battery-powered strobe has an internal rechargeable battery pack. The unit should be charged before use (see [6.0 Battery-Powered Models Only](#)). 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.

3.0 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.

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 1 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.

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 display panel marked $\times 2$ and $\div 2$. 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.

3.1 Power Up Features

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

Press and hold the $\times 2$ 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.

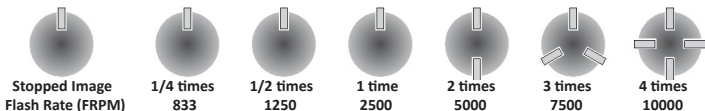
Press and hold the $\div 2$ button, then turn on the strobe by depressing the trigger switch. This will restore the factory programmed presets.

4.0 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, keyway 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 $\div 2$ 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 keyway you will see one stationary image of the keyway at the actual speed and at $1/2$, $1/3$, $1/4$, etc., of the actual speed. You will see 2 images of the keyway at 2 times the actual speed, 3 keyway at 3 times, etc. **The Flashes Per Minute (FPM) equals the shaft's Revolutions Per Minute (RPM) at the highest flash rate that gives only one stationary image of the keyway.**



EXAMPLE: Object rotating at 2500 RPM

If the speed is outside the full scale range of the stroboscope (10,000 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:

$$\text{RPM} = \text{AB}/(\text{A}-\text{B})$$

For a three-point calculation:

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

$$\text{X} = (\text{A}-\text{B}) \text{ and}$$

$$\text{Y} = (\text{B}-\text{C})$$

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 cannot 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.

5.0 LAMP AND FUSE REPLACEMENT

5.1 Lamp Replacement



WARNING: Before attempting to replace the lamp, make sure the stroboscope is turned off and any mains cord is removed from the AC outlet. Wait at least 5 minutes for the lamp to cool and the unit to fully discharge.

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. Using a lint-free cloth, insert the new lamp by gently rocking the lamp while pushing it into place (see figure 2). Make sure the lamp is in straight and centered in the reflector hole.

Note: Older Nova-Strobes and flashtubes may have a red dot (•) on the flashtube and connector to indicate polarity. If present, match red to red.

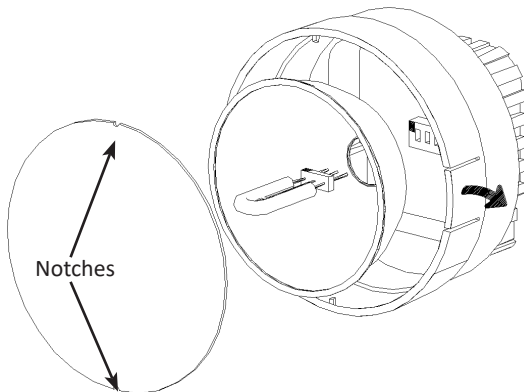


Figure 2 Lamp Replacement



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

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 2). Push the tabs on the front rim outward and press the lens into place.

5.2 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 battery-powered stroboscope has a resettable fuse, which will reset once conditions are normal again.

The AC-powered stroboscope has a replaceable fuse inside the unit which may be accessed by removing the lens and reflector (Figure 2).

If the fuse needs to be replaced, replace only with a fuse of the same type and value: Fast Blow - 750 mA, 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. Wait at least 5 minutes for the lamp to cool and the unit to fully discharge.

6.0 BATTERY-POWERED MODELS ONLY


The Nova-Strobe bbx is fitted with a 5-cell rechargeable NiMH (nickel metal hydride) battery pack. **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 battery pack just prior to use.** Allow 3-5 cycles of charging and discharging for battery pack to reach full capacity.

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

The enclosure contains control electronics to properly and safely charge the battery pack. Never remove the battery pack from the enclosure and attempt to charge externally. **Always use the recharger supplied (PSC-2U or PSC-3U).**

6.1 Low Battery Indication

When the battery pack is charged, there will be no battery indication. When the battery pack is low, the Low Battery icon will blink in the display. The strobe may still be used for a short time.

Low Battery Icon =  (outline blinking means very little time left)

The strobe has a protection feature that prevents operation if the battery voltage is too low. This condition is indicated by no flash and

the display shows **LO BAT**. At this time, the battery pack must be recharged. Remember to release the trigger switch.

6.2 Charging the Battery Pack

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 supplied recharger:

1. Release the trigger so the strobe is off.
2. Make sure the appropriate adapter plug is inserted into the recharger (see section [6.3 Recharger](#)).
3. Plug the barrel plug of the recharger into the recharger socket of the strobe (located below the display panel behind the handle).
4. Plug the recharger into an AC mains outlet (115/230 Vac).



CAUTION: Use of rechargers other than the one supplied (PSC-2U or PSC-3U) will damage the stroboscope and void the warranty.

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

When charging, the strobe will indicate **CHRG** in the bottom right of the display. The recharger will fast charge the battery pack for about 4-5 hours and then trickle charge the battery pack.

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

6.3 Recharger



CAUTION

RISK OF ELECTRIC SHOCK

- Do not insert the adapter plugs into an AC outlet without the recharger attached
- Avoid touching the plug blades when inserting or removing the recharger from the AC outlet
- Indoor use only

The recharger provided with the battery-powered stroboscope has interchangeable adapter plugs allowing it to be used with AC outlets in different countries.



To change the adapter plugs, depress the button on the installed plug and slide the plug up and out of the recharger. Select the correct adapter plug and slide it back into the recharger until the plug seats firmly. Make sure the plug cannot slide out.

6.4 Battery Disposal



Prior to disposing of the battery-powered strobe, the unit must be disassembled to properly dispose of the electronic components in the device. In particular, the nickel metal hydride (NiMH) battery pack must be removed and RECYCLED in accordance with environmental regulations in the country of use.



To remove the NiMH battery pack, make sure the strobe is turned off and then remove the lens, reflector, and lamp as detailed in [5.1 Lamp Replacement](#). This will expose four (4) screws that must be removed so the reflector housing can be detached from the case halves. There are four (4) additional screws in the right case half (opposite the knob) that must be removed. The case halves can now be separated, exposing the battery pack. Unplug the battery pack from the circuit board. The battery pack should be sent to a recycling center or returned to the factory.

7.0 SPECIFICATIONS


Specifications*	Nova-Strobe bax and Nova-Strobe bbx
Flash Range	30 - 10,000 FPM (Flashes Per Minute)
Flash Rate Accuracy	±1 FPM
Flash Rate Resolution	1 FPM
Display Update Rate	Instantaneous
Time Base	Ultra-stable crystal oscillator
Display	LCD with 6 numeric 0.506 in. [12.85 mm] high digits and 5 alphanumeric 0.282 in. [7.17 mm] high digits
Indicators	Battery level (battery-powered units only)
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
Flash Duration	10-25 microseconds (auto adjust with flash rate)
Flash Tube (Lamp) Life	100 million flashes
<i>This product is designed to be safe for indoor use under the following conditions (per IEC61010-1):</i>	
Operating Temperature	32-104 °F (0-40 °C) May be operated for short time periods, slightly beyond stated temperature range.
NOTE: Safety thermal feature will set unit into TACH Mode (stops flashing) in the event of internal overheating. Unit must then be power cycled.	
Humidity	Maximum relative humidity 80% for temperature up to 88 °F (31 °C) decreasing linearly to 50% relative humidity at 104 °F (40 °C)

*Specifications are subject to change without notice.

Specifications*	Nova-Strobe bax (only)
Input Power	AC powered: 115 Vac or 230 Vac, 35 VA (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 and unit must be horizontal
Weight	1.55 lbs. (0.70 kg)

*Specifications are subject to change without notice.



Specifications*	Nova-Strobe bbx (only)
Input Power	Battery powered: internal rechargeable battery pack, 6 Vdc External AC recharger – 100 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	Two (2) hours typical at 1800 FPM and over 1 hour at 6000 FPM with fully charged battery pack
Charge Time	Four to five (4-5) hours typical with provided recharger
Weight	1.875 lbs. (0.8505 kg) including batteries
Energy Efficiency 	Nova-Strobe bbx units with Firmware Revision 1.43 and higher are compliant with U.S. Department of Energy's energy conservation standards specified in the Code of Federal Regulations 10 CFR 430.32(z) and are registered in the DoE CCMS database.

*Specifications are subject to change without notice.



7.1 Compliance

CE Compliant

Please visit our website, www.monarchinstrument.com, to download our Declaration of Conformity for this product.

8.0 ACCESSORIES

[See Accessories webpage for details.](#)

PN	Model	Description
6280-040	CC-7	Standard Latching Carrying Case with provision for accessories
6280-041	SPC-1	Splash-proof Protective Cover (for battery-powered Strobe ONLY)
6280-048	Protective Rubber Cover	Protective Rubber Cover fits over reflector housing to protect against accidental drops and infiltration of contaminants
6206-xxx-CAL 6207-xxx-CAL	CAL-NIST	NIST Traceable Certificate of Calibration (include with order or obtain RMA#)



*Standard Carry Case
(CC-7)*



*Splash-proof Protective
Cover (SPC-1)*



*Protective Rubber
Cover*

Measure • Monitor • Maintain

Monarch Instrument is committed to excellence and quality in manufacturing, sales, and service.



Portable
Tachometers



Track-It™ Data Loggers



Panel Tachometers



Fixed Mounted
Strobes



Portable Strobes



Frequency
Converters



Speed Sensors



DataChart™ Paperless
Recorders



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