1071-4800-121

MONARCH INSTRUMENT

Instruction Manual

CE

Vibration Strobe

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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.**
6. **The ventilation holes must remain unrestricted (well exposed) when the unit is in operation to allow heat to escape.**
7. **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.**
8. **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.**
9. **Do not direct strobe flash toward certain data collectors, as it may temporarily interrupt data collector operation, and could result in loss of stored data.**
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.**
11. **Do not attempt to operate the unit while charging. To do so may cause permanent damage to the charger and the strobe light.**
12. **This product contains sealed lead acid 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.**
13. **This instrument is not user serviceable. For technical assistance, contact the sales organization from which you purchased the product or Monarch Instrument directly.**

PRODUCT WARRANTY POLICY

SELLER warrants the Vibration Strobe to be free from defects in workmanship on all parts except as noted below, for a period not to exceed 12 months from date of shipment to BUYER. The warranty period for battery defects and flash tube defects shall be 6 months from date of shipment to BUYER. SELLER's entire liability and BUYER's sole and exclusive remedy resulting from any defect in workmanship or material in the hardware product covered by this limited warranty shall be limited to and fully discharged by the SELLER's option of replacement or repair of such item without charge. The limited warranty provided in this clause is in lieu of all other warranties, expressed or implied, arising by law or otherwise. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. This limited warranty shall not be modified except by an arrangement signed by both parties specifically referencing this clause.

Product failure or damage caused by misuse or abnormal operating conditions are not covered by this warranty. If the malfunction, or a portion thereof, is determined by SELLER to have been caused by misuse or abnormal conditions of operation, or otherwise is not a warranty item, an estimate of cost to repair will be submitted to the BUYER for approval before any such repairs are performed.

NO OTHER WARRANTY IS HEREBY EXPRESSED OR IMPLIED. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE LOSSES OR DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSSES OR DAMAGES FOR ANY LOST PROFITS OR LOST DATA) AS THE RESULT OF ANY BREACH OR DEFAULT BY SELLER WITH RESPECT TO THE HARDWARE OR SOFTWARE, EVEN IF SELLER HAS BEEN ADVISED OR MADE AWARE OF THE POSSIBILITY OF ANY SUCH LOSSES OR DAMAGES AND REGARDLESS OF WHETHER THE CLAIM IS BASED ON CONTRACT, TORT, STRICT LIABILITY, OR OTHER THEORY OF LIABILITY.

Liability under this warranty is limited to servicing and adjusting the instrument returned to Monarch Instrument factory, with transportation charges prepaid by the BUYER. THE USER SHOULD NOT UNDERTAKE ANY STROBE REPAIRS. OPENING THE CASING WILL CAUSE THE WARRANTY TO BE NULL AND VOID.

If a malfunction develops, notify the Customer Support Department of Monarch Instrument, or its representative in your area, giving details of the problem, and the name, model and serial number of the unit. Upon receipt of this information, service data or shipping instructions will be provided. Please do not ship product prior to contacting Monarch Instrument, or its local representative, for a Return Material Authorization (RMA) Number, to insure proper handling.

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: **Vibration Stroboscope**
Model: **VB 115/230**

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

EMC:
EN50082-2:1995
EN55011:1991 Group 1, Class A
EN61000-4-2
ENV50140
EN61000-4-4
ENV50142
ENV50141

and therefore conforms with the requirements of Council Directive 89/336/EEC relating to electromagnetic compatibility. Retlif Testing Laboratories performed the testing of this product. (Report No R-2700N).

27th March 1996
Manufacturer (Amherst, NH)

Alan Woolfson, VP Engineering (Authorized Signature)

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SPECIFICATIONS

Flash Rate Range:	100-12,000 FPM (Flashes Per Minute)
Locking Range:	Wide Mode: 600 to 10,000 RPM Narrow Mode: 200 to 8,000 RPM
Accuracy:	± 1 FPM (RPM)
Resolution:	1 FPM
Display:	5-Digit Liquid Crystal Display, Low Battery Indication
Input:	Connector: 3.5 mm Stereo Plug 2.5 to 12 volt pulse in External (EXT) mode 100mV/g accelerometer in Tracking (LOCK/TRACK) mode, externally powered
Output:	Connector: 3.5 mm Mono Plug Approx 6 Volt positive pulse
Power:	6.0 Vdc, Internal Rechargeable Sealed Lead Acid Battery
Charger:	115 Vac (Optional 230 Vac)
Operating Time:	In excess of 60 minutes at 1800 FPM (on full charge)
Flash Duration:	30 microseconds
Flash Tube (Lamp) Life:	100 million flashes
Operating Temperature:	0-40° C (May be operated for short time periods, slightly beyond stated temperature range.)
Weight:	2.5 lbs.

INTRODUCTION

The Vibration Strobe is a truly portable, battery-operated stroboscope that is suited for a wide range of industrial, institutional, and educational applications, and is able to interface with several of the Vibration Data Collectors that are currently available. Several interface cables are available. Sturdy and compact, the strobe can be operated anywhere in the plant or field to permit visual inspection (freeze motion), and digital measurement of rotary, reciprocating, or linear motions of various equipment while it is in operation.

The Vibration Strobe has a special "tuning" circuit that allows it to track vibration transducer (accelerometer) signals. This capability makes it different from general-purpose strobe lights. It also has a Narrow and Wide Bandwidth filter selection to discriminate fundamentals from harmonics. The Narrow Bandwidth filter limits the influence of harmonics around the selected frequency, providing a more stable phase reading.

The Vibration Strobe requires an input signal to synchronize the flash rate with an external source, typically a vibration transducer in the tracking mode or optical pickup in the external mode. This signal is applied, using a special cable, to the Input (▲ pointing into socket) jack connector on the side of the strobe light. The Vibration Strobe generates a tachometer signal that is on the Output (▼ pointing away from socket) jack. Information about the use of these signals is given in other sections of this manual. Special adapter cables are available to suit several commercially available Vibration Analyzers.

The Vibration Strobe is ideally suited for:

1. Balancing
2. Inspection of High Speed Rotating Parts
3. Motion Analyses, or Phase Measurement
4. Over speed Trip Tests
5. Online coupling Inspections

The Vibration Strobe can also be used as a highly accurate, remote electronic digital tachometer for direct measurement of RPM (speed) without special reflective tape or markings. RPM results are updated and displayed approximately every 1 second on a 5-digit LCD display.

The display panel consists of a backlit liquid crystal display with five alphanumeric digits (see Figure 1). Below the display is a knob that controls the phase shifting, the Mode Selector Switch and the Bandwidth Switch.

Figure 1 Display Panel

REPAIR/SERVICE/PARTS

Repair:

In accordance with the warranty and replacement provisions, the user ordinarily would undertake no strobe repairs. Possible exceptions involve minor malfunctions, i.e., cables, plugs, and attachment items.

Assembling the Vibration Strobe is a critical procedure. It should NOT be dismantled. However, the reflector lens is removable for lamp replacement. Refer to the section on Lamp Replacement for instructions.

Service:

Notes should be kept regarding field troubles, whether or not any of the equipment is returned at that time. A brief history or record of symptoms, or of pre-fault behavior is of substantial aid to the factory. This is especially true of intermittent malfunctions that might call for a schedule of extended scrutiny at the repair site.

Disposal:

Prior to disposing of this product, the user must remove the sealed lead acid batteries. To do this, remove the lens as detailed above in lamp replacement, remove the reflector and lamp. This will expose 4 screws that must be removed so the reflector housing can be dismantled. There are four 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.

Parts:

The following parts are available for field replacement, and can be ordered directly from Monarch Instrument.

Model	Description
CC-7	Latching Carrying Case for Strobe with provision for accessories
FR-3CE	Fast Charger, 115Vac, 50/60Hz (3 hour)
FR-4CE	Fast Charger, 230Vac, 50/60Hz (3 hour)
L-1903	Vibration Strobe replacement lamp (flash tube)
50192	Cable, BNC to miniature phone jack, External trigger input

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 back and forth while pushing it into place (see Figure 5). Make sure the lamp is in straight and centered in the reflector hole.

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

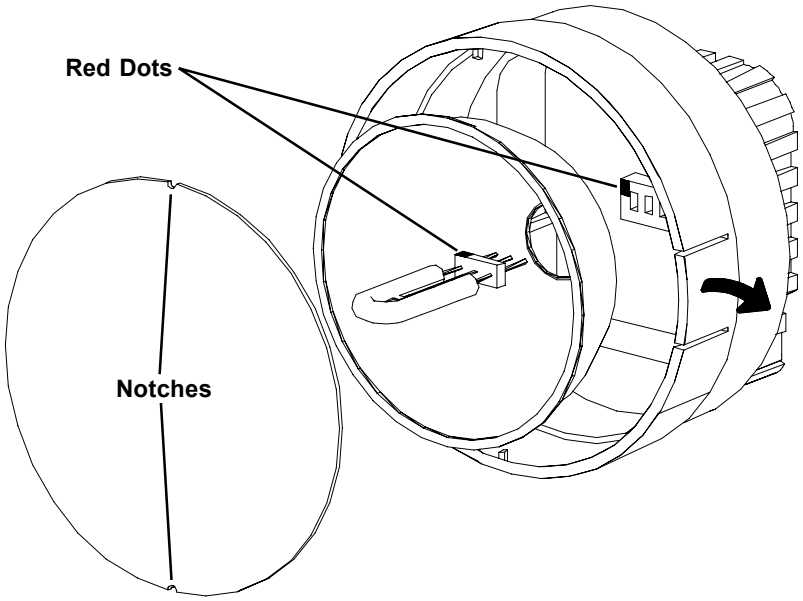

Figure 5 Lamp Replacement

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

PREPARATION FOR USE

The Vibration Strobe is a portable lightweight strobe flash unit with internal battery that will flash for more than 1 hour at 1800 FPM (Flashes Per Minute) before recharging is required. The unit should be fully charged prior to each use. See the Power Requirements and Battery Charging section later in this manual for details.

The unit may be either hand-held, or mounted to a tripod or other user-supplied bracket using the 1/4" - 20 UNC bushing at the base of the handle.

The strobe has input and output jacks on the left side of the stroboscope (see Figure 2). These jacks accept 3.5 mm plugs (input – stereo, output – mono).

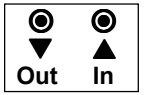

Figure 2 Input/Output Jacks

Input

The input ring is for the accelerometer input. The accelerometer must be powered externally and this input is decoupled internally, so that the positive or signal from the transducer can be applied directly. The unit is optimized for 100mV/g accelerometers, but any signal above 5mVac will activate the unit.

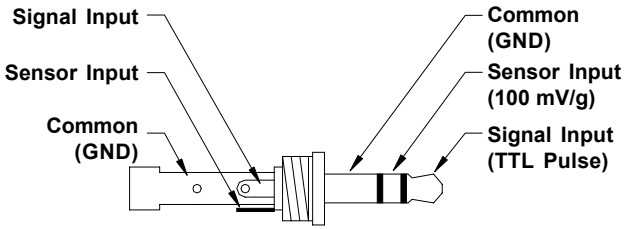

Figure 3 Input Connector Connection Detail

The input tip is for an external digital signal from a remote sensor or another strobe. The range for triggering is from 0 flashes per second to 200 flashes per second (12,000 flashes per minute). There is typically a 5 µsec delay from trigger input to flash. The trigger source should provide a pulse with a minimum duration (width) of 20 µsec in the range 2.5 to 12 volts dc.

Output

In the Internal (INT) mode, the output provides a TTL compatible pulse from the strobe's internal oscillator in synch with the flash. In the External (EXT) mode, the output pulse mimics the input pulse. This output pulse may be used to trigger a second stroboscope synchronously to illuminate larger areas. In the Tracking (LOCK/TRACK) mode, this output is a pulse at the tracking or lock frequency, at the strobe flash rate, and may be phase shifted ±180° from the reference point.

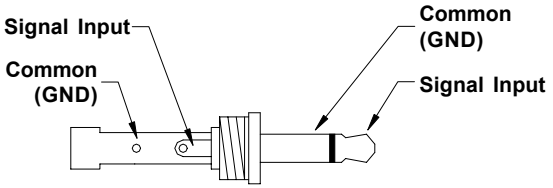

Figure 4 Output Connector Connection Detail

OPERATION

To turn on the stroboscope, depress and hold the trigger. When the strobe is powered up in the Internal (INT) mode, it will begin flashing immediately. The trigger may be locked in position using the side-locking button. To lock the trigger on, hold the unit in the right hand, depress the trigger as far as it will go, and then use your thumb to press the locking button. You may release the trigger and the trigger will be held in place. To release the trigger lock, simply depress the trigger and then release.

There are three Operating Modes that are controlled by the Mode Selector Switch at the front of the unit. The Operating Modes are:

EXT:	External - an external tachometer signal (TTL level pulse) controls the flash rate, i.e. an optical sensor or second strobe.
INT:	Internal - the internal oscillator controls the flash rate
LOCK/TRACK:	Locking - when properly set, the vibration transducer (accelerometer) controls the flash rate

Internal Mode – Standard Strobe Operation

In the **Internal Mode** the stroboscope generates its own signals and functions like an adjustable stroboscope. The strobe is in the **Internal Mode** when the Mode Selector Switch is set to **INT**.

To operate in the **Internal Mode**:

1. Push the Mode Selector Switch to the **INT** (Internal Mode) position.
2. Depress and hold the trigger. The unit will begin to flash at the rate displayed on the LCD display until the trigger is released.
3. Turn the control knob, located on the left side of the strobe to adjust the flash rate.
4. For continuous operation, squeeze the trigger once again, then depress the small "trigger lock" button (just above the trigger, on the side of the unit) and the unit will continue to flash with finger-free operation until the trigger is depressed again, which releases the lock.

External Mode

In the **External Mode** the flash rate is a function of the input signal, and the user cannot make flash rate adjustments. 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 edge of the external input pulse. The strobe is in the **External Mode** when the Mode Selector Switch is set to **EXT**. The LCD will display the current Flash Rate.

Locking Mode

In the **Locking Mode** the vibration transducer (accelerometer) controls the flash rate. The strobe is in the **Locking Mode** when the Mode Selector Switch is set to **LOCK/TRACK**.

Prior to setting the LOCK/TRACK mode, the strobe MUST be operated in the Internal mode. The accelerometer must be properly connected and powered, usually by the external Vibration Analyzer, and must be mounted in place. Special cable assemblies are available for several commercially available Vibration Analyzers, or you may "steal" the accelerometer signal and feed it into the strobe input as detailed above.

Once set up, you have to tune the strobe to set the center frequency of the filters to work with the accelerometer. Using the Internal mode, adjust the flash rate of the strobe to stop motion of the target of interest. Switch the Mode Selector Switch to LOCK/TRACK, and the strobe will now use the signal from the accelerometer to control the flash rate.

POWER REQUIREMENTS AND BATTERY CHARGING

The Vibration Strobe has internal rechargeable batteries and can operate continuously in excess of 60 minutes at 1800 flashes per minute. The strobe has a protection feature to prevent it from operating if the battery charge becomes too low. All decimal points on in the LCD display indicate this condition. When this occurs, the battery is in need of recharging. The actual operating time of the battery depends on the flash rate and duty cycle of operation.

NOTE: Do not attempt to operate the unit while charging. To do so may incur permanent damage to the charger and the stroboscope.

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:

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 a mains wall outlet.

CAUTION: Use of rechargers other than the one supplied (FR-3A for 115 Vac or FR-4 for 230 Vac) may damage the stroboscope and void the warranty.

4. Press the black button on the front panel of the supplied recharger to begin a charge cycle. The red LED "charge light" on the panel will illuminate.

The recharger will fast charge the batteries for up to 5 hours (typically 3½ - 4 hours). Once the fast charge is completed, the recharger will trickle charge the batteries (as indicated by the red LED light turning off). The unit may be left on charge overnight, and it requires 14 hours to reach a full charge, from a low battery condition. The unit may be left on charge indefinitely.

The battery voltage can be measured at the charger socked on the strobe using a high impedance voltmeter. A fully charged set of batteries should measure around 6.6 Vdc.

LAMP REPLACEMENT

WARNING: Before attempting to remove the lamp, make sure the stroboscope is turned off and that the battery recharger and all other cabling are disconnected from the unit. Allow the lamp to cool waiting at least 1 minute.

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.** A new spare lamp is supplied with each new Vibration Strobe Kit.

To change the lamp:

1. Push apart the two tabs on the side of the reflector housing and remove the front 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 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.

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

Checking for unbalance:

1. If the vibration transducer is moved from the vertical position on the bearing to another radial position, the reference mark will move to the new position if there is a significant amount of unbalance. The reference mark will follow the vibration transducer around the clock only if the once per turn vibration is caused by unbalance.

Checking for alignment:

1. Alignment checks can be made by moving the vibration transducer to each end of the machines in a train. The vibration transducer is positioned axially at these locations for these measurements. Keep track of the phase for each measurement location.
2. As the vibration transducer is moved to each location, it's direction keeps changing from North to South, for example. When it changes direction, phase will shift from 12:00 o'clock to 6:00 o'clock.
3. If you move across a coupling and phase does not change as expected, a misalignment condition can be the cause.

MOTION STUDIES

The Vibration Strobe can be a useful tool to determine how a mechanical support or a piping system is moving. It allows the user to find points of maximum motion as well as minimum motion. This is important if a new pipe hanger is to be installed or if a brace is going to be added to dampen a vibration condition.

For these tests the strobe light should be set on a tripod. A long cable will be needed for the sensor. The sensor should be mounted on a magnetic base.

Follow the same 5 steps outlined in the previous section for General Preparation for phase analysis, and then follow these steps:

1. Mark the piping system off in given intervals and note the location of supports or hangers. For example, use 6-foot intervals. Draw a simple diagram on paper.
2. Start at the machine end, adjust the strobe light to running speed, and note the phase reading using the clock face method. (For reference, adjust the phase marker to the 12:00 o'clock). Move the vibration transducer to each location, noting the phase reading at each.

NOTE: Do not move the strobe light, just the vibration sensor. Do not change the Phase Angle control knob after the initial reference has been set.

3. The phase markings should "walk" around the clock face as the sensor is moved to each location. Each time the marking is at or near 12:00 o'clock, the motion is at or near maximum and is in phase with the reference point. Each time the marking is at or near 6:00 o'clock, the motion is at or near maximum in the opposite direction and is out of phase with the reference point.

The Narrow and Wide Bandwidth selector on the strobe's front panel can be used to optimize its' ability to lock onto the vibration signal at any speed. The Wide bandwidth will allow the strobe to track the signal over a fairly wide range of speed change and should be used when tracking the fundamental frequency (in simple systems).

On machines such as a gear drives, reciprocating engines, or any drive with multiple fundamental frequency excitation, the strobe could encounter difficulty tracking the designated signal, due to the tracking filter's normal bandwidth. If substantial levels of multiple fundamental frequencies, or fundamentals with harmonics occur within a selected bandwidth, the shaft reference may appear to oscillate, or drift substantially, when viewed with the Vibration Strobe. Also, if the accelerometer cannot be positioned on the primary point of interest, a fundamental frequency of something other than that of the primary point of interest may be predominant. In these cases, use the Internal (INT) mode and flash rate adjust to stop the motion of the primary point of interest, switch the Bandwidth switch to Narrow, and then switch to the Locking (LOCK/TRACK) mode. The filter is far more sensitive and will better be able to discriminate the required signal. However, it will not be able to track over widely varying speed changes, which will require retuning in the Internal (INT) mode.

After the image has been locked and the Narrow or Wide Bandwidth has been optimized for the speed and/or background noise on the sensor signal, the Phase knob can be used to adjust the phase of the output pulse (and image) - refer to the Phase Analysis section later in this manual for adjusting the Phase Angle control.

MEASURING RPM WITH THE Vibration Strobe

To read and measure RPM (speed) with the Vibration Strobe, select a permanent or semi-permanent object or mark on the shaft to use as a visual reference. Most technicians choose to select an unopposed shaft keyway, or other marking on the shaft, that is not duplicated on the opposite side (180 degrees) of the shaft. If it is possible to stop the machine, mark the shaft with a center punch, paint or permanent marker, liquid correction fluid, etc. When marking, it is a good idea to use marks on the shaft 180 degrees apart, such as a horizontal line (-) at one point, and a vertical line (I) 180 degrees away. This will give an indication of a "+" when the flash rate (and LCD display) is at two times actual running speed. This serves as a useful indicator.

It is suggested that the shaft mark/object should be observed at as much of a 360 degree rotation as possible, however, normally a range of 180-200 degrees is sufficient. After placing the Mode Selector Switch to INT, direct the flash toward the mark/object on the shaft. If the speed of rotation is within the range of the strobe, start at the highest flash rate and adjust the flash rate slower until a single image of the dedicated reference is observed. Note that at a flash rate twice the speed of the image, that two images may be observed 180 degrees apart from each other. As you near the correct speed you will see 3, 4 or more images at harmonics of the running speed. The first *single* image you observe should be the true running speed. To verify this, simply slow the flash rate to half of what was noted at one times speed. A single image should again appear. Readjust the flash rate again, as closely as possible back to running speed, the next higher single image. As the mark is locked-in, the LCD display will read out the true RPM (speed) of the machine part being observed.

BALANCING AND PHASE MEASUREMENT

The Vibration Strobe contains an internally tuned filter that is incorporated in a phase shifting network, which allows the shaft reference mark to be directed at any convenient location on the machine while balancing or performing motion studies (phase measurement) along a machine's casing or along a machine train. Examples of a convenient location are the machine's horizontal split line, top or bottom dead center, or the plane of the reference transducer.

NOTE: It is advisable to "LOG" this reference location, so that it may be utilized in future studies or balancing procedures.

To set-up for balancing or phase measurement, a data collector or vibration analyzer must be used that is capable of interfacing with the Vibration Strobe. The instrument must then be set up to obtain and record the phase information supplied to it from the strobe and the reference transducer.

As a general set-up guideline for the data collector or analyzer, in order to be triggered properly and to read phase properly, check the following:

1. Set the instrument to accept an external tachometer trigger signal. The strobe light will provide this signal.
2. Set the frequency range for order analysis (10 orders full scale works best). This insures the 1X frequency will be centered in the 1X (first order) filter which is a must for repeatable phase measurements.
3. Set the instrument to display averaged spectrum and phase data (4 or 8 averages).
4. Set transducer power to On.

NOTE: Application Notes are available for some data collectors that describe their particular set-up configurations. Check the Owners Manual for your data collector for proper setup configurations.

Connect the proper interconnect cable between the strobe and the data collector or analyzer. See wiring diagram to build the cable. The Input (Up Arrow) and Output (Down Arrow) jacks are located on the left side of the strobe. Connect the vibration transducer (this may be a separate cable or an integral cable) to the strobe cable.

NOTE: The vibration transducer provides the signal the strobe uses as a phase trigger source and therefore is the input to the strobe. The vibration transducer also provides the vibration signal to the data collector or analyzer. The interconnect cable provides a "TEE" connection to both. The strobe provides the phase referenced tachometer signal (output) which is used as an input to the data collector or analyzer for triggering.

Now you are ready to go to work!

Follow the operating instructions outlined at the beginning of this section for tuning the strobe to 1X running speed. After the reference mark has been "frozen" (as nearly as possible, but slight rotation is acceptable), place the Mode Selector Switch in the LOCK/TRACK position. The flash rate is now derived from the vibration transducer. **Phase information is only valid when operating in the Locking (LOCK/TRACK) mode.**

Select the Phase Angle orientation that is desired (0-360 or ±180 degrees) by pulling or pushing the Phase Angle control knob. Using the Phase Angle control knob, position the reference mark to a "convenient viewing location". The data collector can now be employed to receive and process the phase information as supplied to it by the strobe and the transducer. After the information is received, simply release the trigger on the strobe, proceed to the next point, and then repeat the process.

NOTE: The trigger must stay depressed until the data collector or analyzer is through processing the data.

For certain data collectors that do not provide constant power out to transducers that so require, it may be necessary to command the analyzer to begin taking the data before the phase image becomes stable enough to allow it to be placed at a reference location. It may also be noted that slight adjustment of the Phase Angle control knob may be required before each measurement, to assure that the reference location is repeated.

If the data collector you are using does not respond to the phase reference signal supplied to it by the strobe, it is possible that the Trigger Set-up in the data collector may be reversed. If so, change the set-up from "positive" trigger slope to "negative", or vice versa, and try again.

When the strobe is tuned in the Internal (INT) mode, and then switched to LOCK/TRACK, the filter in the strobe will track slight changes in speed. If the speed changes too much or too fast, the strobe will lose LOCK/TRACK and stop flashing. It will be necessary to switch back to Internal (INT) mode and repeat the adjustments. Also, try switching the Narrow and Wide Bandwidth switch to optimize results. Generally, the Wide Bandwidth will give best tracking results but the Narrow Bandwidth will give better stabilization.

NOTE: When it is necessary to have repeatable phase measurements, it is necessary to write down the transducer locations used. Also, the transducer mounting method should be the written down. Stud mounting or magnetic base mounting is preferred since data taken with hand-held transducers may lead to significant phase differences.

PHASE ANALYSIS

The Vibration Strobe can be used to measure movement of parts of a machine, couplings and machine cases in a machine train. The direction of movement (Phase) reveals important information about looseness, unbalance and alignment.

This section is not intended to be a comprehensive review of these measurements. Refer to one of the many training notes and application notes written over the years on these techniques.

This section outlines the preparations and use of the strobe light in order to be assured the measurements you are making are correct.

NOTE: A data collector or vibration analyzer is not needed in order to do phase analysis. You do need a method of powering the vibration transducer, or you can use a self-generating velocity transducer to "drive" the strobe light.

General preparation for phase analysis is as follows:

1. It is important to use a magnetic mounting base on the vibration transducer.
2. Use a transducer cable that is long enough to allow you to get some distance away from the strobe light.
3. Mount the strobe light on a tripod so it can be left standing.
4. Connect the vibration transducer to the strobe light (using a power source or a data collector).
5. Start all measurements with the vibration transducer mounted on a bearing housing in the vertical direction. (This is a good habit to get into). Aim the strobe light at the selected reference mark and turn it on. Adjust the flash rate to running speed and then set it to the Locking (LOCK/TRACK) mode. Using the Phase Angle control, position the reference mark to the 12:00 o'clock position.

   Do not move the strobe between measurements.

Checking for looseness:

1. Keeping the vibration transducer in the vertical direction, move the vibration transducer from the foundation, to the base plate, to a foot, to an area above any split line, to the bearing cap. Note the phase at each of these locations.
2. The reference mark should stay at the 12:00 o'clock position for each of these measurements. If phase changes (probably to 6:00 o'clock) at any of these measurement points, there is looseness at the mechanical joint.