

# NAVCO<sup>®</sup> BIN HOPPER VIBRATOR (BH SERIES)

## OPERATION MANUAL



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## COMPANY OVERVIEW



NAVCO<sup>®</sup>, The National Air Vibrator Company, was founded in 1955 as a manufacturer of pneumatic piston vibrators used to facilitate flow of bulk materials out of hoppers, bins, bunkers, and bulk material processing vessels. Since that time, NAVCO has become a leading expert in material flow solutions. Our high quality, industrial grade, pneumatic piston vibrator line still remains at the core of our business today.

At NAVCO, we strive to add value to our customers' processes using our thorough knowledge of bulk material characteristics and the application of vibration technology. Through a network of specialized representatives and distributors, we are able to maintain close relationships with our customers and provide customized vibration systems and vibratory equipment solutions. From our facility in Houston, Texas, we provide engineering, testing, manufacturing, sales and service capabilities to customers around the globe.

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# SAFETY INFORMATION

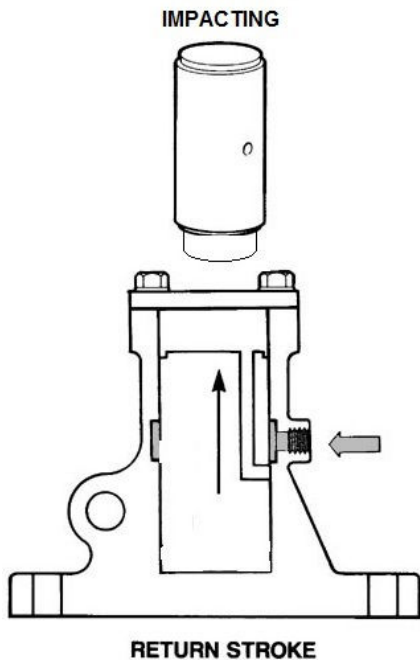
NAVCO Bin Hopper (BH) series vibrators are intended to promote flow of dry bulk solid materials. BH vibrator models are available in air cushioned (SG0), repetitive impacting (IG0) and single impact (IGT).

## Repetitive Impact BH Vibrator

IG0: vibrator operates by alternately directing air pressure from one end of the housing to the other through a ported piston. An air cushion is formed in the top of the housing but not at the bottom of the housing. This allows the piston to impact the housing base. Variable frequency and amplitude is obtained by regulating the air pressure from 20 to 60 psi.

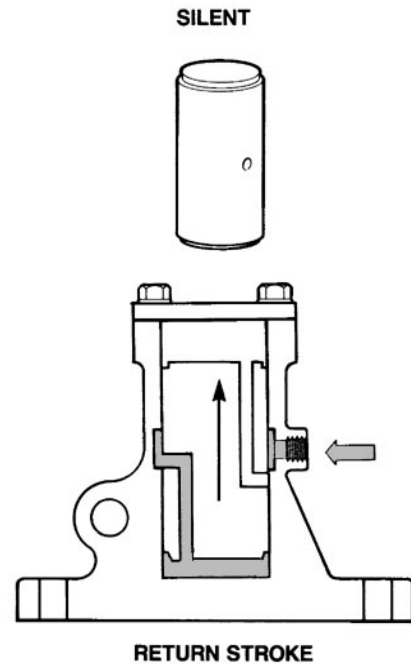
## Single Impact BH Vibrator

IGT: vibrator operates by using air pressure to create a single impact of the piston into the housing base.



## Silent BH Vibrator

SG0: vibrator operates by alternately directing air pressure from one end of the housing to the other through a ported piston. An air cushion is trapped at each end of the piston stroke, preventing the piston from impacting the housing. The repetitive linear motion of the piston creates vibration energy. Variable frequency and amplitude is obtained by regulating the air pressure from 20 to 60 psi.



**NOTE:** Operating BH vibrators over 60 psi is not recommended. Force output peaks at 60 psi. Overpressure reduces vibrator life. Vibrators must have adequate lubrication at all times. See the lubrication section for recommendations.

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## Symbols to Know



### Work Safety

The symbol to the left signifies safety instructions which deal with danger to the health and life of a person. These instructions must be strictly observed. The guidelines within this document must be understood prior to operation of the equipment. General local safety and accident prevention regulations must be observed in addition to the work safety instructions in this operating manual.

### ATTENTION

### Attention

The symbol above signifies notes, regulations and guidelines which deal with damage to or destruction of the equipment as a result of improper operation.

## General Work Safety and Attention Instructions

It must be ensured that every person charged with the installation, operation and maintenance of the equipment has read and understood this operating manual prior to commencing work.

If equipment is improperly operated by untrained persons, it may cause grave injury and damage.

1. The BH vibrator is intended exclusively for the application agreed with the manufacturer.
2. The BH vibrator must only be operated in its original condition.
3. All maintenance work on the BH vibrator must only be carried out while the equipment is off. Before starting work, ensure that the equipment cannot be switched on accidentally or by unauthorized persons.
4. A safety cable or chain must always secure the vibrator to a supporting structure to prevent injury in case of mounting failure.

### ATTENTION

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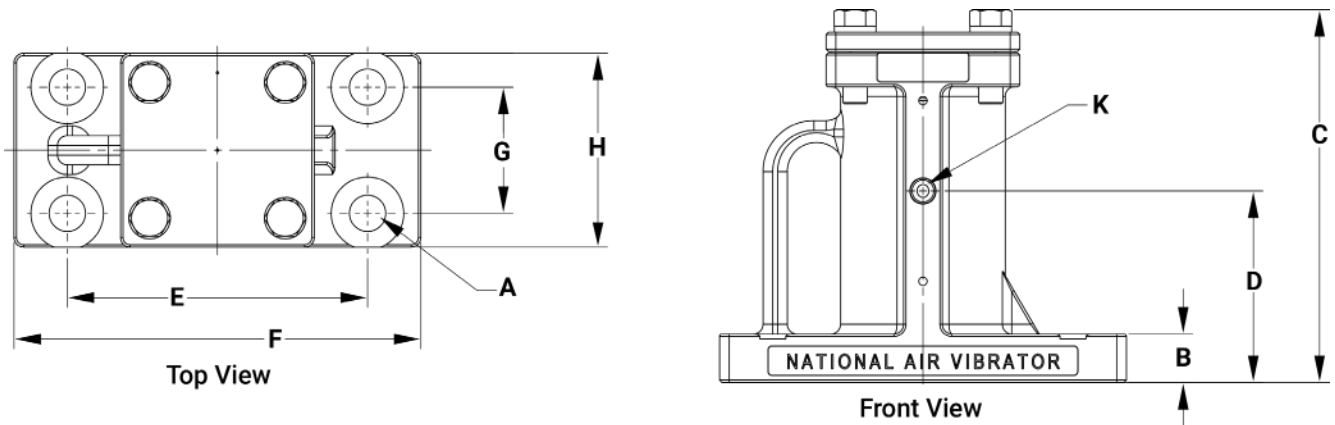


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# TECHNICAL DATA

## BH Vibrator Dimensions



| Model   | A <sup>1</sup><br>(in.) | B<br>(in.) | C<br>(in.) | D<br>(in.) | E<br>(in.) | F<br>(in.) | G <sup>2</sup><br>(in.) | H<br>(in.) | J<br>(in.) | K - NPT <sup>3</sup><br>(in.) | Wt.<br>(lbs) |
|---------|-------------------------|------------|------------|------------|------------|------------|-------------------------|------------|------------|-------------------------------|--------------|
| BH 1.00 | 1/2                     | 1/2        | 3-3/4      | 1-3/4      | 3-1/2      | 4-1/2      | *                       | 2          | 1/4        | 1/4                           | 3            |
| BH 1.25 | 1/2                     | 3/4        | 5-5/8      | 3          | 4-1/2      | 6          | *                       | 2-1/2      | 1/4        | 1/4                           | 8            |
| BH 1.62 | 5/8                     | 1          | 7-1/4      | 3-3/4      | 7-1/2      | 9          | *                       | 3-1/4      | 1/4        | 1/4                           | 18           |
| BH 2.00 | 5/8                     | 1          | 7-1/4      | 3-3/4      | 7-1/2      | 9          | *                       | 3-1/4      | 1/4        | 1/4                           | 20           |
| BH 3.00 | 7/8                     | 1-1/4      | 9-1/2      | 5          | 7-3/4      | 10-1/2     | 3-1/4                   | 5          | 3/8        | 3/8                           | 50           |
| BH 3L   | 7/8                     | 1-1/2      | 12         | 6-1/4      | 7-3/4      | 10-1/2     | 3-1/4                   | 5          | 3/8        | 3/8                           | 64           |
| BH 4.00 | 1                       | 1-1/4      | 11-3/4     | 5-7/8      | 12         | 14-1/2     | 4                       | 6-1/2      | 1/2        | 1/2                           | 105          |
| BH 5.00 | 1                       | 2          | 16-1/2     | 8-1/2      | 12         | 14-1/2     | 4                       | 7-1/4      | 1/2        | 1/2                           | 180          |
| BH 6.00 | 1-1/2                   | 2          | 19-1/2     | 9-7/8      | 11         | 14-1/2     | 7                       | 10-1/8     | 1/2        | 1/2                           | 350          |
| BH 8.00 | 2                       | 2-1/2      | 22-1/2     | 11-1/2     | 13         | 16-1/2     | 8-1/2                   | 12-1/4     | 3/4        | 3/4                           | 650          |

1. Mounting bolt diameter
2. \* Asterisk indicates two bolt mount
3. Single Impact Model See individual PDF

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## Performance

| Sound Pressure Levels  |          |          |          |          |          |          |
|--|----------|----------|----------|----------|----------|----------|
| Models   | @ 10 PSI | @ 20 PSI | @ 30 PSI | @ 40 PSI | @ 50 PSI | @ 60 PSI |
| <b>Silent</b>  |          |          |          |          |          |          |
| BH 1.00  | 58       | 64       | 71       | 72       | 73       | 75       |
| BH 1.25  | 57       | 61       | 63       | 66       | 67       | 71       |
| BH 1.62  | 60       | 65       | 68       | 73       | 74       | 76       |
| BH 2.00  | 60       | 63       | 68       | 71       | 73       | 74       |
| BH 3.00  | 60       | 67       | 72       | 74       | 76       | 77       |
| BH 3L  | 69       | 74       | 78       | 79       | 82       | 83       |
| BH 4.00  | -        | 73       | 76       | 82       | 83       | 84       |
| BH 5.00  | -        | 72       | 76       | 81       | 83       | 85       |
| BH 6.00  | -        | -        | 70       | 75       | 78       | 79       |
| BH 8.00  | -        | -        | -        | -        | 79       | 82       |
| <b>Impacting</b>   |          |          |          |          |          |          |
| BH 1.00  | 60       | 66       | 73       | 84       | 86       | 87       |
| BH 1.25  | 59       | 64       | 79       | 86       | 87       | 91       |
| BH 1.62  | 94       | 95       | 97       | 99       | 102      | 102      |
| BH 2.00  | 87       | 97       | 102      | 104      | 106      | 107      |
| BH 3.00  | 69       | 77       | 86       | 92       | 96       | 98       |
| BH 3L  | 70       | 73       | 78       | 91       | 94       | 96       |
| BH 4.00  | 73       | 80       | 105      | 106      | 110      | 111      |
| BH 5.00  | -        | 93       | 97       | 103      | 105      | 106      |
| BH 6.00  | 81       | 86       | 88       | 94       | 95       | 97       |
| Readings are dBA (slow response). All measurements are 10' – 12' from vibrator, inside concrete tile building. |          |          |          |          |          |          |

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## Performance

| Model   | Frequency Cycles/Minute @ 50 psi |        | Air Consumption SCFM, Operating @ 50 psi |        |
|---------|----------------------------------|--------|--|--------|
|         | Impacting                        | Silent | Impacting                                | Silent |
| BH 1.00 | 7250                             | 3600   | 3.3                                      | 3      |
| BH 1.25 | 5250                             | 3150   | 4.2                                      | 4      |
| BH 1.62 | 5100                             | 2200   | 7.5                                      | 7.2    |
| BH 2.00 | 4750                             | 2100   | 8.3                                      | 8      |
| BH 3.00 | 3400                             | 1800   | 11.6                                     | 11.6   |
| BH 3L   | 3000                             | 1450   | 14                                       | 14     |
| BH 4.00 | 2750                             | 1400   | 18.2                                     | 18.2   |
| BH 5.00 | 1750                             | 1175   | 28                                       | 28     |
| BH 6.00 | 1250                             | 900    | 35                                       | 35     |
| BH 8.00 | 875                              | 850    | 41                                       | 39     |

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# INSTALLATION

| Bolt Torque Specification              |                    |
|--|--------------------|
| Size (in.)                             | Torque* (lbs.-ft.) |
| 1/4                                    | 8                  |
| 5/16                                   | 18                 |
| 3/8                                    | 30                 |
| 1/2                                    | 75                 |
| 5/8                                    | 150                |
| 3/4                                    | 260                |
| 7/8                                    | 430                |
| 1                                      | 640                |
| 1-1/8                                  | 790                |
| 1-1/4                                  | 1120               |
| * Valid for grade 5 coarse thread only |                    |

## Mounting Considerations

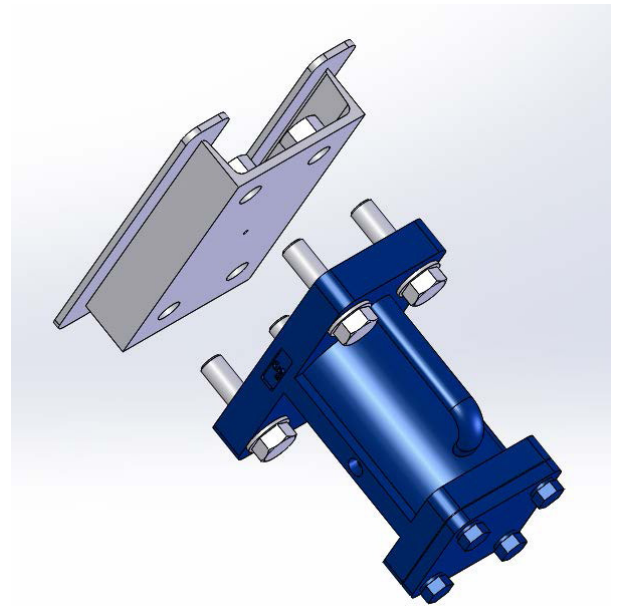
Reinforcement plates are always recommended. The reinforcement plate should match bin wall thickness up to 1/2". A reinforcement plate of 1/2" thickness should be used on bin walls exceeding 1/2" thickness. Refer to NAVCO installation drawings for reinforcement plate dimensions.

If the hopper slope angle is greater than 70° from the horizontal, a piston return spring is recommended to ensure positive starting action (BH 1.62 through BH 6.00 only).

Vibrator(s) should be located according to NAVCO bin map or installation drawing.

## Mounting Instructions: Channel Mount

1. Determine proper mounting location. Assure a mounting angle greater than 20°, unless 'SP' type.
2. Skip weld reinforcing bars to hopper. Do not weld corners. NAVCO can recommend weld specifications if required.
3. Skip weld both channel legs to reinforcing bars. Do not weld corners. NAVCO can recommend weld specifications if required.
4. Install vibrator and mounting bolts.
5. Install lock washer (if included) and nut. Torque mounting hardware to recommended specification (see torque table at beginning of Section 3).
6. Re-torque mounting hardware after 24 hours of equipment operation.

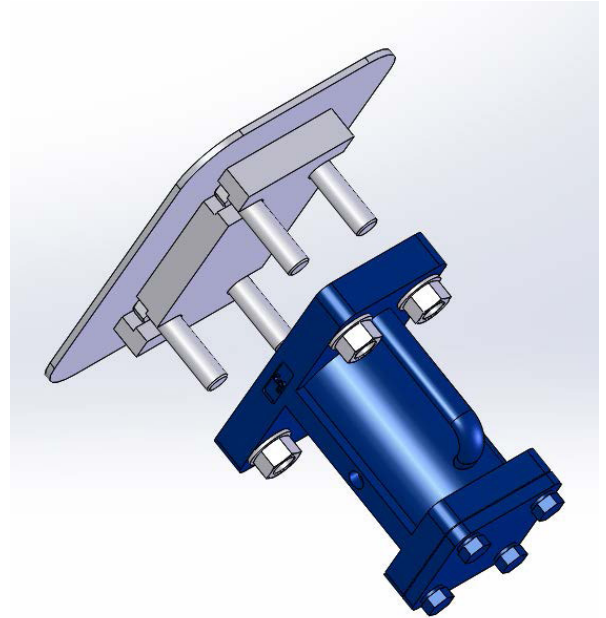


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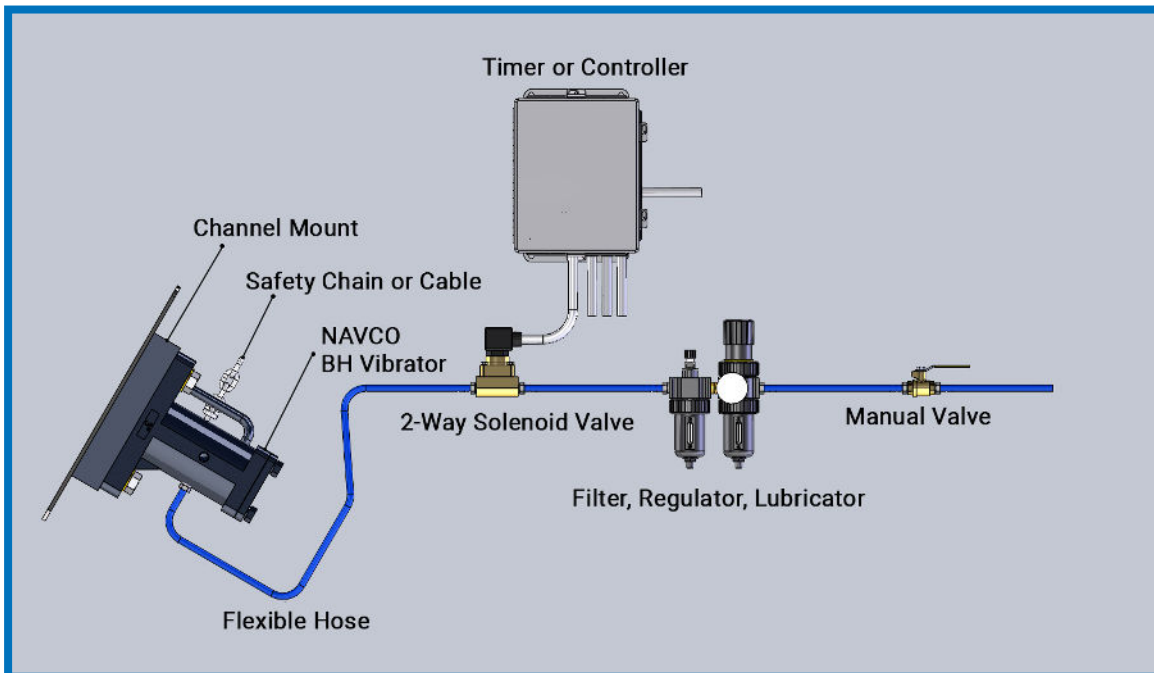
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### Mounting Instructions: T-Slot Mount

1. Determine proper mounting location. Assure a mounting angle greater than 20°, unless 'SP' type.
2. Skip weld reinforcing plate to hopper. Do not weld corners. NAVCO can recommend weld specifications if required.
3. Skip weld t-slot to reinforcing plate. Do not weld corners. NAVCO can recommend weld specifications if required.
4. Insert bolts in slots and position vibrator onto t-slot.
5. Install lock washer (if included) and nut. Torque mounting hardware to recommended specification (see torque table at beginning of Section 3).
6. Re-torque mounting hardware after 24 hours of equipment operation.



## Typical Air Control Package Arrangement



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# OPERATION & MAINTENANCE

## Operations Instructions:

1. Install air control package (See Installation Section).
2. Fill the lubricator with recommended lubricant (See Lubrication Section).
3. Set the pressure regulator to 50 psi.
4. Open Valve.
5. Adjust the lubricator to approximately 10 drops of oil per minute.
6. Allow vibrator to operate for five minutes.
7. Inspect and re-torque ALL mounting fasteners and air line connections.
8. Adjust air regulator for the lowest pressure that will give the desired material flow performance, NOT to exceed 60 psi.

## Maintenance Instructions:

1. Check automatic lubricator and fill with recommended oil type if level is low (See Installation Section).
2. Check to see that air pressure is correctly set for most efficient operation. If filter is installed in system, drain to remove contaminants (water, scale, etc.).
3. Check all air connections and tighten if necessary.
4. Torque any bolts that may have been loosened over a period of time (maintenance/plant-shutdown).
5. Be certain that vibrator is well lubricated at all times. One way to check this is to place hand over exhaust while running. A thin film of oil on the palm of the hand will confirm that the vibrator is being lubricated properly.

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# LUBRICATION

NAVCO recommends the use of an oil mist type lubricator with NAVCO Pneumatic Piston Vibrators. It is important that the lubricator be properly selected for the operating conditions of the vibrator. Contact your NAVCO sales representative for help with selecting the proper lubricator.

The oil mist lubricator, when used with the vibrator, should be installed using an air hose of approximately 5 ½ feet connected directly to the vibrator. The hose connection prevents excessive vibration from being transmitted to the lubricator.

**NOTE:** The lubricator should not be mounted on the structure or device to which the vibrator is mounted. The lubricator should be installed at the same height as the vibrator or higher to ensure that the oil remains atomized in the air stream and is delivered completely to the vibrator.

Before initial start-up of the vibrator, it is recommended to disconnect the hose from the lubricator and directly insert lubrication fluid into the hose. This will 'prime' the vibrator with oil at start-up.

The oil mist lubricator should be set to 5 drops of lube per minute for every 8 SCFM (with a minimum of 5 drips per minute). After the vibrator has run for roughly five minutes, a simple check will help determine if the level of lubrication is sufficient. Place your hand about 1 inch from any exhaust port on the vibrator for 8 to 10 seconds. A fine film of oil should be deposited on your hand. If not, increase the 'drops per minute' on the lubricator until this condition occurs.

A sight glass is normally provided on the lubricator to indicate the level of lubrication fluid in the lubricator reservoir. This sight glass should be checked periodically and refilled as required.

**\*THE VIBRATOR SHOULD NEVER OPERATE WITHOUT LUBRICATION\***

A high-duty, low viscosity, low sludge residue, air percussion tool ISO 32 lubricant or 5 to 10W oil is the preferred lubrication for NAVCO Pneumatic Vibrators.

**We highly recommend Royal Purple Synfilm 32 or equivalent 10W oil.**

All NAVCO vibrators are pre-lubed using Royal Purple Synfilm 32 during factory testing. Royal Purple Synfilm 32 lubricant is suitable for operating temperatures from -75° to 500°F.

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# HANDLING

1. To avoid danger to persons and damage of the vibrator, the vibrator must be handled with proper care. Apart from the instructions below, as well as local safety and accident prevention regulations must be observed.
2. If the unit is packaged, the handling gear must only be attached at the points marked.
3. The unit itself must only be lifted by the lifting eye or handle.
4. No additional pickup points should be attached to the vibrator by welding, flame cutting or drilling.
5. Transit damage must always be reported immediately to the manufacturer.
6. BH models ranging from 1" to 2" diameter may be lifted by hand by using appropriate lifting methods.
7. BH models ranging from 3" or higher must be lifted using appropriate lifting equipment such as hoists or cranes.

**ATTENTION**

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# TROUBLESHOOTING

| Problems                                | Causes / Solutions   |
|---|--|
| Vibrator will not start:                | Vibrator should be within 10-12 feet of operating valve.               |
|   | Be sure vibrator has adequate air pressure and volume available.       |
|   | Check to see that quick opening operating valve is properly installed. |
| Vibrator is sluggish and slow to start: | Check for adequate lubrication.  |
|   | Check for leaking airline or defective operating valve.                |
|   | Check air supply for pressure and volume.                              |
|   | Scale or other contaminants may need to be removed from interior.      |
| Large erratic vibrations observed:      | Faulty mounting.   |
|   | Check all bolt connections for proper torque. Tighten as necessary.    |

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## STORAGE

1. Until its final installation, the vibrator should be stored in closed, dry rooms.
2. In the case of seaworthy packing of the vibrator, this packing must not be damaged or opened during transit and storage.
3. The vibrator must be left in the state it was supplied during storage. The manufacturer does not accept liability for damage resulting from improper storage of the vibrator.

**ATTENTION**

## LIMITED WARRANTY

Seller warrants that the equipment will be of the kind and quality described in the order or contract and will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within one year seller shall, upon notification from buyer, correct such non-conformity, including non-conformance with the specifications, at its option, either by repairing any defective part or parts, or by making available f.o.b. the seller's plant, a repaired or replacement part.

This warranty is in lieu of all warranties of merchantability, fitness for purpose or other warranties, express or implied, except of title and against patent infringement. Correction of non-conformities, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of seller to buyer, whether based on contract, negligence or otherwise with respect to, or arising out of such equipment.

Neither party shall be liable for special, indirect or consequential damages. The remedies set forth herein are exclusive, and the liability of seller with respect to any contract or sale, or anything done in connection therewith, whether in contract, in tort, under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the equipment or part on which such liability is based.

### The following conditions will determine warranty credit:

1. All vibrators must be installed with an inline lubricator.
2. All vibrators must be used with an inline filter and regulator.
3. All vibrators must be properly installed according to instructions, which could differ from those found in this manual.
4. All vibrators must be free of signs of abuse, misuse, or contamination of chamber by foreign material.
5. Vibrators must NOT be disassembled by customer.
6. To obtain credit, vibrators must be returned to NAVCO freight "prepaid." NAVCO will prepay return freight on warranty vibrators. Non-warranted repairs will be returned "collect." NAVCO will provide a list of repairs and an estimate of repair cost. Repairs are made on acceptance of this cost.

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