PENTAIR

FAIRBANKS NIJHUIS™

MODELS 3412 AND 3417 (4M– 17H)
SUBMERSIBLE TURBINE PUMPS
INSTALLATION, OPERATION AND MAINTENANCE MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

Part #FM-03-533 | © 2013 Pentair Ltd. | 08/22/13

4M thru 17H- 3412 & 3417 Submersible Turbine Installation, Operation and Maintenance

TABLE OF CONTENTS

Loss or Damage in Transit

Immediately upon receipt, a complete inspection and accounting against the packing list should be made of all major components and accompanying boxes or pallets. All material is shipped F.O.B. our factory or our vendor's shipping point unless optional contractual arrangements are made. Under these terms, any claims for loss or damage in transit should be immediately directed to the delivering freight carrier. Fairbanks Nijhuis™ will assist the customer in receiving fair compensation, but assumes no responsibliity to mediate such claims. This policy includes shipments wherein Fairbanks Nijhuis pays freight costs as part of the sales terms.

Pump Identification

Carefully record all of the following data. It will aid in obtaining the correct replacement parts for your pump.

Pump:

Serial Number_____
Model Number_____
Pump Size _____
Number of Stages _____
GPM _____
Head (feet) _____

Motor:

Manufacturer _____
Horsepower _____
Serial Number_____
Motor Size _____
Full Load Speed _____
Full Load Amps _____
Service Factor Amps _____
Phase/Hz/Volts _____/_____/_____
Date Placed in Service _____

Introduction

Congratulations! You are the owner of the finest pump commercially available. If you give it the proper care as outlined and recommended by this manual, it will provide you reliable service and long life.

IMPORTANT

Read this complete manual and manuals for all component equipment before assembly or installation is started. It contains information which is the result of engineering and research efforts. It is designed to supply adequate instructions for the installation, operation and maintenance of your pump. Failure or neglect to properly install, operate or maintain your pump may result in personal injury, property damage or unnecessary damage to the pump.

This manual applies to the pump installation, operation and maintenance. They are intended to be general and not specific. If your operating conditions ever change, always refer to the factory for reapplication. Always refer to the manuals provided by manufacturers of the accessory equipment for their separate instructions.

Variations exist in both the equipment used with these pumps and in the particular installation of the pump and driver. Therefore, specific operating instructions are not within the scope of this manual. The manual contains general rules for installation, operation and maintenance of the pump. If there are questions regarding the pump or its application which are not covered in this manual, please contact the factory as follows:

Fairbanks Nijhuis™
108 Fairbanks Avenue
Thomasville, GA 31792
(800) 422-1551

To obtain additional data on hydraulics and pump selection and operation, we suggest you purchase both of the following reference books:

1. Fairbanks Nijhuis “Hydraulic Handbook”, available from the Kansas City factory.

   Fairbanks Nijhuis
   3601 Fairbanks Avenue
   P.O. Box 6999
   Kansas City, KA 66106-0999

2. Hydraulic Institute Standards

   Hydraulic Institute
   9 Sylvan Way
   Parsippany, NJ 07054-3802

Warranty

DELIVERY: Buyer agrees to inspect all deliveries immediately. Any claim for shortages must be made in writing within ten (10) days after Buyer receives a shipment, and if not made, shall be deemed waived. Any other claim by Buyer, other than claims under the warranty stated in Paragraph 13, shall be made within thirty (30) days after Buyer receives shipment, and if not made, shall be deemed waived. Seller is not responsible for loss or damage in transit after having received an "In Good Order" receipt from the carrier. Buyer will make all claims for loss or damage in transit against the carrier.

Buyer is fully responsible for (including payment of the cost of) installation and start-up of all equipment sold under the Order.

PATENT INFRINGEMENT: Seller will defend Buyer and the user of the equipment against any claim that any equipment and parts of Seller's manufacture furnished under the Order infringe upon any published United States patent, and seller will pay all damages and costs awarded by a court of competent jurisdiction with respect to such claim. The Buyer or user must promptly notify Seller of any such claim, and cooperate fully with Seller in the defense of such claim, or Seller will have no duty under this paragraph. Buyer will defend and indemnify Seller against patent infringement claims relating to equipment and parts that are not manufactured by Seller to the same extent as Seller agrees to defend and indemnify Buyer with respect to patent infringement claims relating to equipment and parts of Seller's manufacture.

WARRANTY: Seller warrants equipment (and its component parts) of its own manufacture against defects in materials and workmanship under normal use and service for one (1) year from date of installation or start-up, or for eighteen (18) months after the date of shipment, whichever occurs first. Seller does not warrant accessories or components that are not manufactured by Seller however, to the extent possible, Seller agrees to assign to Buyer its rights under the original manufacturer's warranty, without recourse to Seller. Buyer must give Seller notice in writing of any alleged defect covered by this warranty (together with all identifying details, including the serial number, the type of equipment, and the date of purchase) within thirty (30) days of the discovery of such defect during the warranty period. No claims made more than 30 days after the expiration of the warranty period shall be valid.

Guarantees of performance and warranties are based on the use of original equipment manufactured (OEM) replacement parts. Fairbanks Nijhuis™ assumes no responsibility or liability if alterations, nonauthorized design modifications and/or non-OEM replacement parts are incorporated.

If requested by Seller, any equipment (or its component parts) must be promptly returned to Seller prior to any attempted repair, or sent to an authorized service station designated by Seller, and Buyer shall prepay all shipping expenses. Seller shall not be liable for any loss or damage to goods in transit, nor will any warranty claim be valid unless the returned goods are received intact and undamaged as a result of shipment. Repaired or replaces material returned to customer will be shipped F.O.B., Seller's factory. Seller will not give Buyer credit for parts or equipment returned to Seller, and will not accept delivery of any such parts or equipment, unless Buyer has obtained Seller's approval in writing.

The warranty extends to repaired or replaced parts of Seller's manufacture for ninety (90) days or for the remainder of the original warranty period applicable to the equipment or parts being repaired or replaced. This warranty applies to the repaired or replaced part and is not extended to the product or any other component of the product being repaired.

Repair parts of its own manufacture sold after the original warranty period are warranted for a period of one (1) year from shipment against defects in materials and workmanship under normal use and service. This

warranty applies to the replacement part only and is not extended to the product or any other component of the product being repaired.

Seller may substitute new equipment or improve part(s) of any equipment judged defective without further liability. All repairs or services performed by Seller, which are not covered by this warranty, will be charged in accordance with Seller's standard prices then in effect.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND SELLER HEREBY EXPRESSLY DISCLAIMS AND BUYER WAIVES ALL OTHER WARRANTIES EXPRESSED, IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Seller's sole obligation under this warranty shall be, at its option, to repair or replace any equipment (or its component parts) which has a defect covered by this warranty, or to refund the purchase prices of such equipment or part. Under the terms of this warranty, Seller shall not be liable for (a) consequential, collateral, special or liquidated losses or damages; (b) equipment conditions caused by normal wear and tear, abnormal conditions of use, accident, neglect, or misuse of said equipment; (c) the expense of, and loss or damage caused by, repairs or alterations made by anyone other than the Seller; (d) damage caused by abrasive materials, chemicals, scale deposits, corrosion, lightning, improper voltage, mishandling, or any other similar conditions; (e) any loss, damage, or expense relating to or resulting from installation, removal or reinstallation of equipment; (f) any labor costs or charges incurred in repairing or replacing defective equipment or parts, including the cost of reinstalling parts that are repaired or replaced by Seller; (g) any expense of shipment of equipment or repaired or replacement parts; or (h) any other loss, damage or expense of any nature.

This section 13 shall not apply to any equipment which may be separately covered by one of the following warranties. KC685 5-Year Prorated warranty, KC885 15-Month Prorated Warranty, KC985 9-Month Warranty. All other provisions of KC585 shall remain effective.

CONDITION TO WARRANTY WORK: If Buyer is in default (including, but not limited to, the failure of Buyer to maintain a current account with Seller) under the Order or any other agreement between Buyer and Seller, Buyer's rights under the warranty shall be suspended and the original warranty period will not be extended.

PERFORMANCE: Equipment performance is not warranted or guaranteed unless separately agreed to by Seller in accordance with it guarantee policy. Performance curves and other information submitted to Buyer are approximate and no warranty or guarantee shall be deemed to arise as a result of such submittal. All testing shall be done in accordance with Seller's standard policy.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability under the Order or otherwise for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, regardless of the cause of such damages or losses. In any event, Seller's aggregate total liability under the Order or otherwise shall not exceed the contract price. Buyer agrees to indemnify and hold harmless Seller from all claims by third parties in excess of the limitations.

COMPLIANCE WITH LAW: Since the compliance with the various Federal, State, and Local laws and regulations concerning occupational health and safety and pollution are affected by the use, installation and operation of the equipment and other matters over which Seller has no control, Seller assumes no responsibility for compliance with those laws and regulations, whether by way of indemnity, warranty, or otherwise.

KC585A (03/93)

Safety

Safety should be of utmost importance when in close proximity of this pumping equipment. Before attempting to operate this equipment, you should read this manual in its entirety, taking special notice of all CAUTIONS, WARNINGS and/or DANGER notifications. These warnings apply to pumps supplied by Fairbanks Nijhuis™. Refer to the manuals supplied by the driver and control manufacturer for additional warnings before operating this equipment.

CALIFORNIA PROPOSITION 65 WARNING:
WARNING:

This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

The words DANGER, WARNING and CAUTION have different connotations and are generally defined as follows:

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, will result in serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which if not avoided, may result in minor or moderate injury or may indicate that improper practices will result in equipment malfunction or failure. It may also be used to alert against unsafe practices.

IMPORTANT

Another indication will appear throughout this manual. IMPORTANT indicates the highlight or accent of specific information.

The installation, use and operation of this type of equipment is affected by various Federal, State and Local Laws and the regulations concerning OSHA. Compliance with such laws relating to the proper installation and safe operation of this type of equipment is the responsibility of the equipment Owner and all necessary steps should be taken by the Owner to assure compliance with such laws before operating the equipment.

⚠ DANGER

Do not attempt to service the pump until the electrical power has been disconnected and it has been verified that the pump cannot start. Because many installations utilize automatic starting equipment, the pump unit may start at any time without warning. Proper precautions should be taken to avoid injury as a result of automatic starting of the equipment.

⚠ DANGER

Do not operate the pump without the protective guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel. Any operation of this machine without a protective guard can result in severe bodily injury. The responsibility for the installation of protective guards is that of the equipment owner.

⚠ DANGER

This pump is designed for the exclusive use of pumping water. It should not be used for pumping other media unless a specific Purchase/Buyer agreement is negotiated.

⚠WARNING

Do not attempt to try to clean the pump with bare hands. The pumped material may contain items that may present health hazards. Always wear heavy puncture resistant gloves.

⚠WARNING

Before attempting to service this pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or lock out the power source to insure the pump will not start. Confirm power source is disconnected with appropriate electrical test equipment.**

3. **Close the discharge valve.**

After the pump has been installed, make certain that the pump and all piping connections are tight and are properly supported prior to start-up and operation.

⚠WARNING

Certain procedures in disassembly and assembly require parts be heated to high temperatures. Heat resistant gloves must be worn when handling heated parts. Heated parts can cause severe personal injury.

⚠ CAUTION

***For pumps used in potable water service, all thread lubrication, grease, cleaning* materials and paint must be suitable for potable water.**

Storage of Pumps

⚠ CAUTION

If the equipment is not to be immediately installed and operated, THE FOLLOWING INSTRUCTIONS SHOULD BE ADHERED TO AS A MINIMUM.

Consider a unit in storage when:

1. **It has been delivered to the jobsite and is awaiting installation.**
2. **It has been installed but operation is delayed pending completion of plant construction.**
3. **There are long (30 days or more) periods between operation cycles.**
4. **The plant (*or facility*) is shut down.**

NOTE: Improper storage could result in product failures or restoration <u>not</u> covered by warranty.

Unassembled Pumps:

1. Store the unassembled components in a clean, dry well-ventilated place free from vibrations, moisture, and temperature variation.

2. Wipe clean all exposed machined surfaces and coat with a heavy layer of grease or other equivalent rust preventative material.

3. Cover the suction and discharge of the pump with cardboard or wood to prevent entry of foreign material or varmints.

Assembled Pumps:

1. When pumps with rubber bearings are stored assembled in horizontal position, it is necessary to rotate the **pump** 90 degrees once per month. This practice will help prevent the weight of the shafts from deforming the rubber bearings.

2. Pumps stored in horizontal positions are to have **shafts** rotated once per month .

3. Refer to the motor manufacturer's owners manual for storage instructions.

General Description

The Fairbanks Nijhuis™ submersible turbine pump consists of two basic components. These components are the pump bowl assembly and a submersible motor specifically designed for sustained operation submerged in water. The rotating elements of the bowl assembly are driven from the bottom where its extended shaft is connected to the motor shaft by a coupling. Power is supplied to the motor through a submersible cable.

The 3412 and 3417 series single stage bowl assembly is made up of a motor bracket, a top intermediate bowl and impeller, and a discharge case. Units of two or more stages include a motor bracket, multiple intermediate bowls and impellers, and a discharge case.

Drop Pipe

The drop pipe conducts water from the pump bowl assembly to the surface plate connection. It supports the pump and driver in the well and also supports the electric cable that carries current from the surface to the motor lead connection. Drop pipe for the pumps covered in this manual is threaded steel pipe. Plastic or flexible pipe may also be used. However, it is not recommended. Flanged pipe may also be used.

Electric Cable

The cable is the conductor that conducts power from the surface to the motor terminal leads. The motor is equipped with an electrical cable. **Under no circumstance should the cable be used to support the weight of the pump.**

Wire Cable Type

The wire cable used between the pump and control box or panel should be approved for submersible pump applications. The cable may consist of individually insulated conductors twisted together, insulated conductors molded side by side in one flat cable or insulated conductors with a round overall jacket. The conductor insulation should be type RW, RUW, TW, TWU or equivalent and must be suitable for use with submersible pumps.

Control Devices

Due to the wide variety of products available, check with the appropriate owners manual.

Surface Plate

The surface plate supports the entire weight of the pump, motor, drop pipe and cable. It

contains provisions for the cable to pass through and may include an elbow that directs the water into a piping system as required.
Shipment Inspection

Pre-Installation

General

Parts are to be thoroughly cleaned and any burrs removed by filing. The pump bowl assembly and motor are normally shipped completely assembled. Both the suction and discharge openings should be inspected for damage and for foreign materials.

⚠WARNING

Under no circumstance should the motor leads or electric cable be used to support the weight of the pump.

Extreme caution is to be exercised when hoisting components with open lifting lugs. Precautions should be taken to prevent hoisting slings from coming out of the lugs.

Well

The condition of the well into which the submersible is placed is of major importance. Comments regarding the well are given to avoid misunderstandings concerning the installation and operation of the unit. The well must be deep enough so that the pump can be set at least 10 feet off the bottom. Otherwise, accumulation of sediment can ultimately "bury" the motor. The capacity of the well must be sufficient to avoid lowering the pumping level to the point where the pump will break suction. The minimum pumping water level should be at least 10 feet above the pump suction. Additional submergence may be required when using pumps with capacities in excess of 250 GPM to satisfy the pump's NPSHR.

Development of the Well

A new pump should not be used to develop the well. Developing, purging and freeing a well of sand should be performed with a test pump since these functions may result in extensive initial damage to a new pump. If the pump is to be used in an existing well, the well must be purged of all sand, oil and other contaminants prior to installation.

IMPORTANT

If the pump is to be installed in a lake, pond, tank or large diameter well, the water velocity

passing over the motor must be sufficient to ensure proper motor cooling. This may require that a flow inducer be installed on the motor. Refer to the motor manufacturer's instructions for proper velocities.

Effects of Gas, Air or Temperature

Guarantees of hydraulic performance are contingent on pumping clean, cold water free from gas and with the pump properly submerged. The presence of air or gas in the water will affect the hydraulic performance by reduction in capacity and head which cannot be predicted with accuracy. Further, the presence of air or gas in the well can cause deterioration of the pump more rapidly than under normal conditions. All guarantees of performance are nullified under such conditions of operation. The maximum water temperature should not exceed 86 degrees F. Water temperatures exceeding 86 degrees F require special adaption to the pump or motor.

Effects of Chemicals

Even though the chemical analysis of the water is known, it is not possible to predict its corrosive action on metals. In addition to chemicals, water may also contain entrained air or gases that have a definite oxidizing or corrosive action of their own, which is accentuated by high velocity within the pump. Such conditions do not appear in the chemical analysis of the water. Conforming with the Hydraulic Institute Standards and the practice of all reliable pump manufacturers, Fairbanks Nijhuis™ does not guarantee its pumps against corrosive action.

Crooked Wells

The submersible will give better results in a crooked well than the conventional lineshaft driven pump because the length of the rotating members is much shorter than in the case of the lineshaft type deepwell turbine. When a well is known to be crooked, a “cage” of the same length and diameter as the combined pump and motor assembly must be lowered in the well to the point at which the motor and pump are to be placed. If the cage can be lowered to this point without binding, a submersible pump can be installed.

⚠WARNING

Never install a pump without caging a well known to be crooked.

Survey of the Well

Always sound the well to make sure it is deep enough to permit installation of the pump. If the exact diameter and depth of the well casing is not known, "cage" the well following the procedure outlined above. Experience indicates that many wells have more than one size of casing installed and frequently the lower sections are smaller in diameter than the surface casing. Be sure the submersible unit will pass into the well freely and hang suspended clear of the well bottom

Derrick and Hoist Equipment

A permanent derrick, temporary tripod, or power driven hoist may be used. This equipment must be of sufficient strength and rigidity to lift the complete unit safely. The derrick or tripod must be of sufficient height to allow the load hook to be raised about twenty-eight feet above the foundation so that 18-22 foot random pipe column sections can be handled with ease. The load hook should have a good, easy working swivel. For heavy pumps and deep setting, the installation equipment must be stronger and heavier in proportion.

Electrical Supply

The motor voltage, phase and frequency indicated on the motor nameplate should be checked against the actual electrical supply.

Tools

Necessary tools that must be provided for installation include:

1-Megger
1-Clamp on Volt-Ammeter
2-Pipe elevators
1-Special banding tool
1-Set of hand tools
1-Ohmmeter

Foundation

A foundation should be supplied consisting of any material that will provide a permanent, rigid support. This support is to be of sufficient size and depth to fully carry the weight of the pump (full of water) and rigid enough to prevent vibration.

Anchor bolts of appropriate size, length and configuration are required to adequately secure the surface plate (elbow) to the foundation.

Flow Inducer

Applications in which proper cooling of the submersible motor cannot be guaranteed, a flow inducer or sleeve should be used to positively direct flow past the motor. Some typical applications would be lakes, ponds, tanks, streams, rivers, top feeding wells, large diameter wells, sumps and in-line boosters. Consult the factory for proper applications.

Check Valve

Pump backspin and hydraulic shock can cause severe damage. Check valves will help prevent this type of damage and should be installed 20' above the pump and every 150' to 200' of drop pipe thereafter. If a surface check valve is employed, an air release valve should be installed at or near the discharge elbow to preclude any hydraulic shock. When check valves are not used, a time delay is required in the control panel to prevent start-up while the motor is back-spinning. Where check valves are used a time delay is recommended.

Erect Derrick

Erect derrick, tripod or power hoist and adjust so that the load hook is directly over the well axis. During erection of the derrick, **WATCH OVERHEAD POWER LINES.** Guy the derrick or tripod securely and inspect hoisting equipment or draw works to be sure that all parts are in good repair. **TAKE NO CHANCES.**

Field Assembly of Pump and Motor

The following applies when shipped as sub-assemblies. While the pump is in the horizontal position:

1. Attach an elevator to the bowl assembly and lift the pump to a vertical position over the motor. Do not allow the unit to swing and strike the motor or foundation.

2. Inspect the pump shaft coupling and the mating flanges to be sure they are free of dirt or burrs.

3. Slowly lower the pump element, guided by hand, until the pump coupling is over the motor shaft.

4. Rotate the entire pump element until the pump coupling slots line up with the key (or splines) on the motor shaft.

5. Slowly lower pump element until very close to contact between the bottom of the pump element and the top of the motor.

6. Secure the pump element to the motor using the capscrews furnished for this purpose.

7. Look through the adaptor side opening and observe alignment of the holes in the pump element coupling for the entry of the setscrews.

8. Tighten setscrews with a hex key socket wrench.

Cable Selection and Splicing

Follow the cable selection chart shown in Table 1. Never exceed the maximum recommended length. Use of smaller than recommended size will void the warranty. Use of the next larger size will improve the pump efficiency. For splicing the cable refer to the motor manufacturers owners manual.

⚠WARNING

This equipment is intended for installation by technically qualified personnel. Failure to install it in compliance with national and local electrical codes, and with the motor manufacturers recommendations, may result in electrical shock or fire hazard, unsatisfactory performance, and equipment failure.

Do not bend the wires back and forth while taping, as the wires may break. Keep ends of power cable clean and dry. Ensure that all splices are watertight. Failure to do so may cause permanent motor damage.

Pump and Motor Installation

Using an appropiate hoisting system, lift the pump/motor assembly into position over the well. Lower the assembly partially into the well. Attach a pipe clamp to the upper most bowl. Lower the assembly, allowing it to be supported on the well casing via the pipe clamp.

Pipe Installation

Steel pipe is recommended on submersible pump installations. If plastic or flexible pipe is used, the pipe manufacturer, or his representative, should be consulted to ensure a proper installation.

While the pipe is in a horizontal position, attach an elevator to the column pipe. Hoist to a vertical position over the pump and properly align. The pipe must be tightened to at least 10 lb.ft. per motor horsepower (i.e. 40 HP x 10 lb.ft. = 400 lb.ft.) to prevent the joint from unscrewing. It is recommended to tack or strap weld each pipe joint, including the pipe joint at the bowl assembly (pump end). After being securely tightened, it is ready to be

lowered into the well casing. Lower until the elevator rests across the top of the well casing. Fasten cable approximately 2 feet above and below each connection. Install the check valve being sure it is installed in the correct location, properly oriented and operating freely. Repeat adding column pipe as described above until the desired setting is reached.

Surface Plate

Secure the top section of column pipe, while in a horizontal position on the ground, to the surface plate. Raise this assembly by means of the lifting eyes in the surface plate, and secure to the column. Lower the entire installation onto the foundation with the cable extended neatly through the surface plate. Take care not to pinch the cable or bend it more sharply than necessary.

After Pump Installation

Before connecting the leads to the starter, refer to the motor manufacturer's owners manual. This work should be done by a qualified electrician familiar with motors and controls.

1. Test, with an ohmmeter, all three pairs of power leads to ensure continuity of the power leads, splice and motor windings, per the motor manufacturers instructions.

2. Test with a megger connected between any power lead and ground. These readings should comply with those recommended by the motor manufacturer.

3. Check the starter to ensure that the wiring, fuses, relays and contactors are of the proper size in compliance with the motor manufacturer's recommendations.

4. Before connecting the surface end of the cable to the starter, make sure the main contacts are in good condition and are working properly.

⚠WARNING

MAKE SURE THE METAL PANEL HOUSING IS GROUNDED.

5. Check the no load voltage at the load terminals LL-1, LL-2 and LL-3 of the starter between all three phases. These should be the same as the motor voltage rating stamped on the motor nameplate.

6. Connect the cable to the starter load terminals. The unit is now ready to start.

Operation

General

Because variations may exist in both the equipment used with these pumps, and in the particular installation of the pump and driver, specific operating instructions are not within the scope of the manual. However, there are general rules and practices that apply to all pump installations and operation.

⚠ CAUTION

Before starting or operating the pump, read this entire manual, especially the following instructions.

Before Starting the Pump:

1. Observe all danger, warning and caution tags attached to this equipment.

2. Ensure water in the well or sump is at the specified level for adequate submergence.

If excessive vibration or noise occurs during operation, shut the pump down and review the TROUBLESHOOTING section. If the problem cannot be corrected, consult a Fairbanks Nijhuis™ representative.

Operating at Reduced Capacity

Although pumps are applicable over a wide range of operating conditions, care should be exercised when doing so, especially when the actual conditions differ from the sold conditions. if a variable speed driver is to be used to adjust pump capacity, Fairbanks Nijhuis and the motor manufacturer must be consulted to verify the pump and motor selection. You should always contact your nearest Fairbanks Nijhuis distributor or factory before opeating the pumps at any condition other than that for which they are sold.

Generally, these pumps can be operated continuously at a capacity equal to 60% of the pump capacity at the best efficiency point, and at higher capacities.

Initial Startup

Inspect the complete installation to ensure that the installation instructions of the manual, and the manuals of all the related equipment, have been followed and that the installation is complete. Use the following "Start-up Check List" as a guide.

Submersible Turbine Pump Start-Up Checklist

Customer_____ Pump Serial Number_____
Project Name_____ Pump Model Number_____
Motor Serial Number_____

Note: Items listed below do not cover all potential problems that may arise during installation and start-up. If you have any questions please consult the manufacturer.

		Ref. Page
1. SHIPMENT INSPECTION		
Was there any damage in shipment?	Yes___No___	2
Were all items received?	Yes___No___	2
2. STORAGE		
Has equipment been protected from inclement weather?	Yes___No___	8
Was equipment subject to flooding?	Yes___No___	9
Has motor been protected against freezing?	Yes___No___	9
3. ROTATION		
Has rotation been checked for correctness?	Yes___No___	19
4. INSTALLATION		
Have you recorded all data from the pump and motor?	Yes___No___	2
Have you selected the correct cable size?	Yes___No___	15
Has the cable been properly supported?	Yes___No___	16
Has the pipe been properly torqued and locked against rotation?	Yes___No___	16
Are all safety guards in place?	Yes___No___	9
Has the pump been shimmed properly? (3417 only)	Yes___No___	27
Has a check valve(s) been installed and in the correct direction?	Yes___No___	16
5. SYSTEM		
Has the system been flushed and checked to insure that it is free of foreign matter which could be damaging to the pump?	Yes___No___	
Is liquid available to the pump?	Yes___No___	
Have assurances been obtained from responsible parties that all piping is secure and that routing of flow has been established and is correct?	Yes___No___	

6. START-UP

Is the discharge valve set properly?	Yes___No___	19
What is the amp draw on each leg at start-up? 1.) 2.) 3.)	Yes___No___	20
What is the amp draw on each leg at condition point? 1.) 2.) 3.)	Yes___No___	20
Has flow been established ? Flow rate:_____GPM		
Have gauge readings been taken? Discharge Pressure:_____PSI		
Is excessive vibration present?	Yes___No___	17

7. SAFETY

Have all safety warning labels been read and understood?	Yes___No___	6

8. MOTOR (Refer to the motor manufacturer's owners manual)

Has the motor been checked to see that it is full of clean water?	Yes___No___
Has the motor manufacturers owners manual been read and understood?	Yes___No___

Important

Ensure the discharge valve is approximately 1/3 open. Do not start pump with valve closed or wide open.

Start the pump according to the following procedure:

⚠ CAUTION

Zero Flow Operation

1. **Shutoff pressures can cause extreme stresses. These values should be investigated prior to operation.**

2. **During prolonged operation at shutoff, heat buildup will become a factor since the energy transmitted from the motor is converted to heat.**

Start the motor and pump to check for proper rotation. If no water or very little water is pumped, the unit may be running backwards. Reverse rotation by interchanging the position of any two power leads at the starter. **MARK THE LEADS SO THAT THEY MAY BE REPLACED IN THE SAME POSITION IF REMOVED.**

1. Open the discharge valve until the desired capacity is obtained.

2. Immediately after the pump has been started, check and record the current draw on each of the three power leads. The current should not exceed the amperes stamped on the nameplate of the motor. Continue to monitor for the first several hours of operation.

3. Check all other necessary equipment for satisfactory operation following their manuals.

4. Be sure to check with the motor manufacturer's owners manual as to the number and frequency of starts.

Normal Operation

Monitor the unit for vibration or noise.

Shutdown

Pump systems are usually designed to have the pumps started and stopped automatically. Since this is a function of system design, the operators should be familiar with the systems operating parameters. The general procedure to shut down the pump is as follows:

A. Disconnect the electrical power source.

B. If the pump is to be removed for repair, close the discharge valve.

⚠WARNING

After removal of pump, ensure pump opening is adequately covered and secured.

Seasonal Operating Instructions

If the pump is located in an area that is subject to below freezing temperatures and will not be operated enough to prevent freezing, it should be protected to prevent damage caused by freezing.

Emergency Procedures

Many installations are equipped with emergency shut off switches near the pump location. These locations should be plainly marked and readily accessible at all times.

The control panel (if used)or starter may be equipped with an emergency start/stop button or switch.

IMPORTANT

The operator or persons working around the equipment should be familiar with locations of emergency start-up & shut-off points.

Troubleshooting

If you have followed the installation and start up procedures outlined in this manual,your pump should provide reliable service and long life. However, if operating problems occur, significant time and expense can be saved if you use the following check list to eliminate the most common causes of those problems.

Insufficient Pressure or Flow

Symptom	Remedy
1. Wrong direction of rotation.	Reverse any two motor lead connections. Check motor O & M.
2. Low water level.	Raise wet well level. Increase pump length.
3. Insufficient submergence.	Raise wet well level. Increase pump length.
4. Speed too low.	Check motor speed and voltage.
5. System head too high	Change system. Raise wet well level. Install larger impeller & motor.
6. Incorrect pressure switch setting.	Check switch setting with pressure gauge.
7. Air in liquid.	Deaerate liquid. Increase submergence to prevent vortexing.
8. Improper sump or well design.	Change sump/well design. Increase submergence to prevent vortexing.
9. Check valve reversed or closed.	Check all valves.
10. Leak in drop pipe.	Tighten joints or replace defective parts.
11. Bowl passage partially blocked.	Refer to factory.
12. Impeller passage partially blocked	Refer to factory.
13. Clogged suction.	Refer to factory.
14. Impeller damaged.	Refer to factory.
15. Loose or broken shaft or coupling.	Repair or replace defective parts

Loss of Suction Operation

Symptom	Remedy
1. Low water level.	Raise well/sump water level. Increase length of pump.
2. Insufficient submergence.	Raise well/sump water level. Increase length of pump.
3. Wrong direction of rotation.	Reverse any two motor lead connections.
4. Air or gases in liquid.	Deaerate liquid. Increase submergence.

Excessive Power Consumption

Symptom	Remedy
1. Speed too high.	Check motor speed and voltage.
2. Improper voltage to driver.	Check motor voltage. Change power source of motor.
3. Specific gravity or viscosity of liquid pumped is too high.	Refer to the factory.
4. System head lower than pump rating; pumps operating over capacity.	Change system. Trim impeller.
5. Incorrect impeller diameter.	Determine correct impeller diameter. Replace or trim impeller.

Vibration or Noise

Symptom	Remedy
1. Foundation loose	Stabilize foundation and/or regrout.
2. Pipe strain - improperly supported or aligned.	Check pipe supports and adjust or realign.
3. System head lower than pump rating, pumps too much liquid.	Increase system head. Trim impeller.
4. Pump running at shut-off condition	Open discharge valve. Check for obstructions.
5. Insufficient submergence.	Increase submergence.
6. Low water level.	Increase submergence.
7. Air in liquid.	Increase submergence.
8. Improper well/sump design.	Change well/sump design. Increase submergence.
9. Impeller passages plugged.	Clean impeller passages.
10. Foreign object in pump.	Remove foreign object. Check for damage.
11. Bad driver bearing.	Replace driver bearing.
12. Worn pump bearings.	Replace bearings.

Pump Won't Run or Fuses Blow

Symptom	Remedy
1. No power or incorrect voltage.	Check power supply. Check connections. Check wire size.
2. Blown fuse.	Check fuses, relays, heater elements, capacitors and all electrical connections.
3. Defective pressure switch.	Repair or replace pressure switch.
4. Incorrect control box.	Check nameplate for horsepower and voltage.
5. Incorrect connections.	Check control box wiring diagrams.

6. Faulty overload protection.	Replace protector.
7. Cable insulation damaged.	Locate and repair or replace.
8. Splice open or grounded.	Check and repair.
9. Pump bound.	Reverse rotation temporarily to free blockage.
10.Defective motor.	Repair or replace.

Pump Starts Too Often

Symptom	Remedy
1. Pressure tank capacity too small.	Replace with larger capacity tank.
2. No air in pressure tank	Check air volume control or snifter valve. Repair (waterlogged) or replace. Drain and recharge tank.
3. Pressure switch out of adjustment.	Readjust or replace.
4. Leak in system.	Locate air leaks and repair or replace defective parts.
5. Check valve leaking.	Replace check valve.

Pump Runs Continuously

Symptom	Remedy
1. Service outlets open.	Check all outlets.
2. Pressure switch out of adjustment.	Readjust or replace.
3. Dirty or inoperative switch	Clean or replace contacts.
4. Low level well.	Throttle pump output. Reset pump to lower level. Do not lower level if sand may clog the pump.
5. Leak in system.	Locate air leaks and repair or replace defective parts.
6. Check valve stuck.	Check and replace if necessary.
7. Pump strainer blocked.	Clean strainer. Clean well if necessary.
8. Loose or broken shaft or coupling.	Check for damaged shafts or coupling. Replace defective parts.
9. Worn Pump.	Replace worn parts or replace pump.

Disassembly Instructions - 3417

Read this entire disassembly procedure and refer to the sectional drawings and technical data on pages 41-53 in this manual before starting.

For disassembly of the pump bowls, proceed in accordance with steps listed below. Select a clean area for work. Refer to assembly drawing and parts list for part identification.

Record the pump model number, serial number, motor model and date of failure. Obtain information directly from nameplate on the pump and motor.

Before disassembly of any pump, make a visual inspection. It should be noted if external appearance indicates improper alignment, dirt or abrasive under the screen, motor lead damage, or evidence of mishandling during shipment, installation or removal.

Before disassembling a pump, it should be determined whether the reason for repair service is not in the motor, control or wiring. When it has been determined that the motor, wire and controls are satisfactory and water quantity is adequate, proceed with pump disassembly and reassembly. Notice that the pump is taken apart starting at the suction end. **CAUTION: DO NOT** disassemble from the discharge end or with the motor attached.

1. Carefully remove banding or screws that hold cable guard (123) and suction strainer(42).

2. Raise the pump and motor unit into a vertical position before loosening nuts or bolts and lockwashers at motor.

3. Loosen nuts (125B) or bolts (125A) and lockwashers (125C). Raise the pump from the motor. CAUTION: Do not raise the pump on long length of pipe.We recommend removing the pump from the motor in a vertical position. Never take the pump apart until the motor is removed.

4. Check the motor shaft height and condition of the spline.

5. Lay the motor in a horizontal position out of the way. Block from rolling.

6. Secure the pump in a horizontal position in a vise, with the brass lockpins (36D) on the top side, and clamp at the discharge cone (101). Support the suction end with blocks or a jack stand. Mark all bowls starting with No.1 on the bottom or suction end so the order of disassembly is known and can be reassembled in the same order.

7. Drill out the one bowl lockpin (36D) only (3/16"), between the motor bracket (135) and the first intermediate bowl (36), and unscrew the motor bracket (135) with chain tongs.

8. Loosen the bottom impeller drive collet (39) using the male end of the collet driver tool No. 40067793 for 3/4" shaft, No. 40067794 for 1" shaft. (Refer to Figure 1).

9. Slide off the bottom impeller (38) and drive collet (39).

10. Continue drilling out pins (36D), one at a time (do not drill out all pins at once), removing drive collets (39) and impellers (38), keeping collets (39), impellers (38) and bowls (36) together for reassembly in the same order.

11. When the last, or top impeller, is removed, the shaft may be pulled out. Visually inspect the shaft and bearings for wear.

12. Drill out the bowl lockpin (36D) between the top bowl (36) and the discharge cone (101) and thread apart.

Reassembly Instructions - 3417

1. Clean all parts and arrange in order. Replace all parts that indicate wear by visual inspection or comparison with new parts. All bearings that have been removed should not be re-used.

2. To replace rubber bearings (36A), clean bearing cavity thoroughly and place a thin film of rubber cement on the cavity and the outside of the bearing. Press the bearing into place and wipe away any excess cement. **CAUTION:** Do not get oil or grease on the rubber bearings. Do not get cement on the inside diameter of the bearings.

3. To replace the bronze bearings (34 & 35A) in the bottom bowl (36) and discharge case (102), it may be necessary to machine out the old bearings and press in the new parts.

4. Straighten the shaft (32) as shown in Figure 2. Make sure the motor coupling (115) and key (115A) slide freely on the pump shaft.

5. Install shaft stud (40088684 for 4" motors or 40088685 for 6" motors) on assembly fixture 40088682. (Refer to Figure 3).

6. Mount the motor bracket, (135), to the assembly fixture. Notice that the 4" motor bracket fits on the raised face of the fixture and is held by four 5/16" - 24 UNF bolts, 1-1/2" long. The 6" bracket fits on the larger outer diameter and is held with four 1/2" - 20 UNF bolts, 2" long.

7. Bolt the pump shaft (32) down tightly on the top of the assembly fixture stud.

8. Place the impeller (38) over the shaft. Slide it down holding it by hand against the face of the bowl. Place the impeller lock collet (39) over the shaft and slide it into the impeller. (The impeller blades must be tight against the bowl face after the collet is installed.) Drive the collet (39) tightly between the impeller and the shaft by using the male end of the collet driver (Fig. 1)(40067793 for 3/4" shaft and 40067794 for 1" shaft) as a hammer.

9. Use a lead-free pipe joint compound on the motor bracket threads. Thread on the bottom bowl (36). The bottom bowl (36) requires a bronze bearing (35A). Assure that the bowl faces are firmly seated and that there is no gap.

10. Install the remaining intermediate bowls (36), impellers (38), rubber bearings (35), and collets (39), as described in steps 5 and 6 above.

11. Install the discharge case (102) (requires bronze bearing (34)).

12. Remove the shaft, hold down bolt and check the lateral end play. (There should be a minimum of 1/8"). If there is no end play disassemble to determine and correct the problem. The pumpshaft must rotate freely.

13. Move the shaft (32) to the maximum upthrust position. Install the thrust plug (102A). Thread into the discharge case (102) until shaft contact is made. Continue threading to move the shaft a minimum of 1/16" or 1 "turn". (This travel distance can be measured from the coupling end). Drill one 3/16" Dia. hole that penetrates the threaded areas of both the discharge case (102) and the thrust plug (102A) so when a lockpin (36D) is driven in, it interlocks the two parts. Install a lockpin (36D) by driving it in until it flares. (This plug keeps the impellers from striking the bowls during momentary upthrust when starting under low head conditions.)

14. Install the discharge cone (101).

15. Drill the bowl pin holes (3/16" by 3/8" deep) between the faces of the bowls. Drive the bowl lock pins (36D) until they flair. Remove the excess pin with a file. CAUTION: Drilling in excess of 3/8" deep may penetrate the bowl wall.

16. Remove the pump from the assembly fixture and hang vertically. Make sure all flanges and fits are clean.

17. With the motor in a vertical position, push down the motor shaft by hand to insure it is seated. Measure the motor shaft extension as shown in Figure 4 to determine "X" dimension, ("X4" for 4" motors or "X6" for 6" and 8" motors) and record.

18. With the bowl assembly in a vertical position (impellers seated down against the bowl seats) and the motor coupling (115) temporarily installed, measure "Z" dimension ("Z4" for 4" motors and "Z6" for 6" and 8" motors) and record.

19. Subtract X from Z and this dimension, plus the additional shimming dimension shown in Table 2, gives the shim thickness required between the pump and motor shafts. Install the motor coupling (115) onto the motor shaft, then install the shims in the coupling. (When the coupling furnished has a slug insert do not install shims between coupling and motor shaft, always between coupling and pump shaft.)

20. Carefully align motor to pump and lower the pump so the splined shaft fits into the coupling. Secure the motor to the pump. 6" motors use lockwashers (125C) and capscrews (125A). 4" motors use lockwashers (125C) and nuts (125B).

21. Make certain pump/motor rotates freely by hand. If not, disassemble and determine cause of rub.

22. Attach the suction strainer (42), with tap-tite screws,(use .290 pilot hole).

23. Carefully cover motor leads with the cable guard (123), and attach with stainless steel bands and seals.

Disassembly Instructions - 3412

Read this entire disassembly procedure and refer to the sectional drawings and technical data on pages 41-53 in this manual before starting.

For disassembly of the pump bowls, proceed in accordance with steps listed below. Select a clean area for work. Mark all bowls starting with No. 1 on the bottom or suction end so the order of disassembly is known and can be reassembled in the same order.

Pumps with Thrust Washer (6M thru 8H)

1. Place the pump/motor unit in a horizontal position, blocked to prevent rolling.

2. Remove the cable guard (123) and suction strainer (42).

3. Loosen all setscrews (115B) on the pump/motor coupling (115). Remove the capscrews (125A) and hex nuts (125B) holding the motor to the motor bracket (135). Remove the motor, the pump/motor coupling (115), pump shaft key (115A) and motor shaft key (115A). (Motor shaft key is not used on motors with a splined shaft).

4. **Threaded Bowls -** Pump models 6M through 8M have bowls which are threaded directly together rather than bolted. All bowl threads are right-hand. To prevent the possibility of bowl threads loosening during operation, all such bowls are drilled and pinned at the parting line with a 3/16" pin. Disassembly of threaded bowls requires that the pins be drilled out, one at a time. (Do not drill out all pins at once). At reassembly the bowls should be re-pinned for security.

   A. Unscrew the discharge cone (101) and remove from the pump shaft (32) and set aside for inspection.

   B. Unscrew and remove the top bowl (36) and set aside for inspection.

   C. Remove the impeller (38) and collet (39) from the pump shaft (32) according to the following procedure:

      1. To remove the collet (39) from the impeller (38) , pull the pumpshaft (32) upwards until the impeller is in its upmost position. Using a collet tool (Figure 1), with the female end towards the impeller, drive the impeller off the collet.

      2. To remove the collet (39), insert a screwdriver in the collet slit and wedge apart. the collet will slide easily off the shaft.

      3. If the impellers are to be reused, they should be marked so that they are re-installed in the same bowl.

   D. Unscrew the next intermediate bowl (36). Remove the intermediate bowl from the pump shaft (32) and set aside for inspection.

   E. Repeat steps C and D until all bowls and impellers have been removed.

5. **Flanged Bowls -** 8H

   A. Remove the capscrews holding the discharge cone (101) and top bowl (36) and remove from the pump shaft (32) and set aside for inspection. It is not necessary to disassemble these two bowls unless bearings are to be replaced.

   B. Remove the impeller (38) and collet (39) from the pump shaft according to the following procedure:

      1. To remove the collet from the impeller, pull the shaft upwards until the impeller is in its upmost position. Using a collet tool (Figure 1), with the female end towards the impeller, drive the impeller off the collet.

2. To remove the collet (39), insert a screwdriver in the collet slit and wedge apart. the collet will slide easily off the shaft.

3. If the impellers are to be reused, they should be marked so that they are re-installed in the same bowl.

C. Remove the capscrews holding the next intermediate bowl (36). Remove the intermediate bowl from the pump shaft and set aside for inspection.

D. Repeat steps B and C until all bowls and impellers have been removed.

6. Mark the location of the sand collar (110) on the pump shaft (32). Loosen the sand collar set screws (110A) and remove the sand collar.

7. Remove the pump shaft (32) from the motor bracket (135).

8. Remove the thrust washer (27A) and snap ring (27).

9. This pump may be fitted with wear rings (36W), (38W) by machining the bowls (or impellers) for a ring seat. Refer to the WEAR RINGS section of this manual for instructions on adding wear rings or replacing existing rings.

Pumps With Thrust Plug (10M and Above)

1. Place the pump/motor unit in a horizontal position, blocked to prevent rolling.

2. Remove the cable guard (123) and suction strainer (42).

3. Loosen all setscrews (115B) on the pump/motor coupling (115). Remove the capscrews (125A) and hex nuts (125B) holding the motor to the motor bracket (135). Remove the motor, the pump/motor coupling, pump shaft key (115A) and motor shaft key (115A). (Motor shaft key is not used on motors with a splined shaft).

4. **Threaded Bowls** - Pump models 10XH and 10XHH have bowls which are threaded directly together rather than bolted. All bowl threads are right-hand. To prevent the possibility of bowl threads loosening during operation, all such bowls are drilled and pinned at the parting line with a 3/16" pin. Disassembly of threaded bowls requires that the pins be drilled out, one at a time (do not drill out all pins at once). At reassembly the bowls should be re-pinned for security.

A. The thrust plug was (102A) also drilled and pinned at assembly. Drill out the thrust plug pin and remove the thrust plug.

B. Unscrew the discharge case (102) and remove from the pump shaft (32). Set aside for inspection.

C. Loosen the sand collar set screws (110A) and remove the sand collar (110).

D. Unscrew and remove the top bowl (36) and set aside for inspection.

E. Remove the impeller (38) and collet (39) from the pump shaft (32) according to the following procedure:

1. To remove the collet (39) from the impeller (38), pull the pump shaft (32) upwards until the impeller is in its upmost position. Using a collet tool (Figure 1), with the female end towards the impeller, drive the impeller off the collet.

2. To remove the collet (39), insert a screwdriver in the collet slit and wedge apart: the collet will slide easily off the shaft.

3. If the impellers are to be reused, they should be marked so that they are re-installed in the same bowl.

F. Unscrew the next intermediate bowl (36), remove from the pump shaft (32) and set aside for inspection.

G. Repeat steps D and E until all bowls and impellers have been removed.

5. **Flanged Bowls -** 10M , 11M and Above

A. The thrust plug (102A) was also drilled and pinned at assembly. Drill out the thrust plug pin and remove the thrust plug.

B. Remove the capscrews holding the discharge case (102). Remove from the pump shaft (32) and set aside for inspection.

C. Remove the capscrews holding the top bowl (36). Remove from the pump shaft (32) and set aside for inspection.

D. Loosen the sand collar set screws (110A) and remove the sand collar (110).

E. Remove the impeller (38) and collet (39) from the pump shaft (32) according to the following procedure:

1. To remove the collet (39) from the impeller (38), pull the pump shaft (32) upwards until the impeller is in its upmost position. Using a collet tool (Figure 1) with the

female end towards the impeller, drive the impeller off the collet.

2. To remove the collet (39), insert a screwdriver in the collet slit and wedge apart. The collet will slide easily off the shaft.

3. If the impellers are to be reused, they should be marked so that they are re-installed in the same bowl.

F. Remove the capscrews holding the next intermediate bowl (36). Remove the intermediate bowl from the pump shaft (32)and set aside for inspection.

G. Repeat steps B and C until all bowls and impellers have been removed.

6. Remove the pump shaft (32) from the motor bracket (135).

7. Measure and record the location of the sand collar (110). Remove the sand collar only if it is damaged and replacement is required.

8. This pump may be fitted with wear rings (36W)(38W) by machining the bowls (or impellers) for a ring seat. Refer to WEAR RINGS section of this manual for instructions on adding wear rings or replacing existing rings.

Inspection for Replacement

After the components are disassembled, each part should be thoroughly cleaned and inspected for wear and physical damage. During cleaning, do not allow any petroleum-based solvents on rubber bearings.

It is not necessary to remove bearings unless inspection indicates replacement is necessary. If it is necessary to remove bearings, they should be pressed from their seats and discarded.

⚠ CAUTION

Use care not to damage bores or hubs during bearing removal.

Any parts showing signs of excessive wear or damage should be replaced with Fairbanks Nijhuis™ parts. Maximum clearances are shown in the technical data section of this manual.

1. Inspect the pump shaft at each bearing location for damage or excessive wear and replace the shaft if not salvageable.

2. Inspect all bearings for wear and excessive clearance. If the diametral bearing clear-

ance exceeds the limits shown in Table 3, the bearings must be replaced.

3. Inspect the bowl and/or impeller wear ring (if so equipped) for wear and excessive clearance. The correct clearance is shown in Table 3. The ring should be replaced with a Fairbanks Nijhuis™ replacement part.

⚠ CAUTION

If it is found that any of the bearings or wear rings have excessive wear, it is recommended that all bearings and/or wear rings be replaced.

Reassembly Instructions - 3412

Shaft Straightness

1. Prior to reassembly, the bowl shafts should be checked for straightness. The maximum allowable total indicated runout must be less than .005".

   Figure 2 outlines the proper positions at which dial indicator readings should be taken. The shaft should be supported in V-blocks or on rollers as shown. Position the dial indicator and zero the dial face. Slowly rotate the shaft and observe the maximum runout.

   If the shafts exceed the .005" maximum limit, straightening will be required. Consult the Fairbanks Nijhuis factory for straightening recommendations, or a local qualified machine shop.

   After straightening, make sure the motor coupling and key slide freely on the pump shaft.

2. Clean all components before starting the assembly. Do not apply any petroleum based solvents to rubber bearings.

3. Install bearings in their respective bowls (if they have been removed) as shown in Figure 5. To insure proper bonding, thoroughly clean all mating parts with to remove all grease, oil, dirt, etc. To install bronze bearings, apply a bead of LOCTITE 290® completely around the middle of the bearing housing and press the bearings in place. If they have not been replaced, they should be thoroughly cleaned and lubricated with a thin film of grease (except rubber bearings).

NOTE: When rubber intermediate bowl bearings are used, do not use any solvents.

5. Install new wear rings (if they are to be replaced) in the bowls or on the impellers. Refer to WEAR RINGS section of this manual for instructions.

6. Mount the shaft locating tool onto the assembly fixture. Refer to drawings 24LYA3537A, M2S281CK and M2S282A.

7. Lay out the parts in the order in which they will be assembled.

Pumps With Thrust Washer (6M thru 8H)

1. Put the motor bracket (135) in a horizontal position using a suitable support.

2. Slide the thrust washer (27A) into position on the pump shaft (32) and install the snap ring (27).

3. Insert the pump shaft into the motor bracket.

4. Mount the motor bracket to the assembly fixture. Lock the pumpshaft to the assembly fixture using a Grade 8 bolt.

5. Install the bracket sand collar (110). Flush against the suction bearing (126) and secure with setscrews (110A).

6. Install the impeller (38) over the pump shaft (32) and into position.

7. Clean all rust and burrs from the collet slot. Open the lock collet slightly using a screw driver and slide over the pump shaft and into the impeller. Using a collet drive tool (Figure 1) with the male end towards the impeller, drive the lock collet into place in the impeller bore. This will require substantial force to make sure the collet is properly seated. You will be able to detect the change in sound when the collet has properly seated.

⚠ CAUTION

Failure to properly seat the impeller drive collet will result in damage to the pump.

8. Install the intermediate bowl as follows:

   A. **Flanged Bowls** - Install capscrews and tighten securely.

   B. **Threaded Bowls** - Apply a lead-free thread sealant to bowl threads and tighten se-- curely. Remove excess sealant. **Note: Bowl threads are right hand.**

9. Repeat steps 6, 7 and 8 to install all additional stages until all pump bowls have been installed.

10. Remove the shaft locating tool and assembly fixture holding the pump shaft in place. Check the bowl end play. It should be the same as shown in Table 3. If it is not, the bowl assembly should be disassembled to determine the reason.

11. Install the discharge case (102).

12. Install the coupling (115) and key (115A) on the pump shaft (32). Lightly secure the setscrews (115B).

13. With the motor in a vertical position, carefully align the pump to the motor and lower the pump until the motor shaft fits into the coupling as follows:

    A. Motors with a splined shaft - Loosen the coupling setscrews on the pump shaft and slide the coupling onto the motor shaft until the coupling butts on the motor shaft. At this point, the pump shaft and motor shaft should be butted together. Tighten all setscrews. Check the first stage impeller to insure it has been lifted off the bracket seat. Note: Couplings for 4" & 6" motors are furnished with a spacer (slug). Couplings for 8" motors and above are furnished without a spacer.

    B. Motors with a keyed shaft - Install the motor key onto the motor shaft. Loosen the coupling setscrews on the pumpshaft and slide the coupling onto the motor shaft until the pump shaft and motor shaft butt together. Position the coupling so it is centered between the pumpshaft and motor shaft. Tighten all setscrews. Check the first stage impeller to insure it has been lifted off the bracket seat.

    With the motor flange fit fully engaged in the bracket fit, install and tighten the motor bolts.

14. If threaded bowls are used, pin the bowls at each connection using a 3/16 x 1/2 pin. Drive in the pins (#36D) until they flair and remove the excess with a file.

15. Attach the suction strainer (42).

16. Carefully cover the motor leads with the cable guard (123) and attach to the pump.

Pumps with Thrust Plugs (10M and Above)

1. Put the motor bracket (135) in a horizontal position and mount to the assembly fixture. Lock the pump shaft (32) to the assembly fixture using a Grade 8 bolt.

2. Install the bracket sand collar (110). If it has been removed, flush against the suction bearing (126) and secure with setscrews (110A).

3. Install the impeller (38) over the pump shaft (32) and into position.

4. Clean all rust and burrs from the collet slot. Open the lock collet slightly using a screw driver and slide over the pump shaft and into the impeller. Using a collet drive tool, (Figure 1) drive the lock collet into place in the impeller bore. This will require substantial force to make sure the collet is properly seated. You will be able to detect the change in sound when the collet has properly seated.

⚠ CAUTION

Failure to properly seat the impeller drive collet will result in damage to the pump.

5. Install the intermediate bowl (36) as follows:

   A. Flanged Bowls - Install capscrews and tighten securely.

   B. Threaded Bowls - Apply a lead-free thread sealant to bowl threads and tighten securely. Remove excess sealant. **Note: Bowl threads are right hand.**

6. Repeat steps 3, 4 and 5 to install all additional stages until all pump bowls have been installed.

7. Remove the shaft locating tool and assembly fixture holding the pump shaft in place. Check the bowl end play. It should be the same as shown in Table 3. If it is not, the bowl assembly should be disassembled to determine the reason.

8. Place V-blocks under the pump to make sure it doesn't roll from the assembly table. Place the discharge case (102) (without the thrust plug (102A) installed) on the last bowl assembled. Push the shaft up and away from the bowl seat to its highest lateral position. Screw the upthrust plug (102A) into the discharge case (102) until it comes in contact with the shaft (32). Continue screwing the plug 1/4". Now the desired upthrust protection is achieved. Note this plug keeps the impellers from striking the bowls during momentary upthrust when starting under low head conditions. The amount of movement can be measured from the coupling end of the pump. With the upthrust plug now set, remove the discharge case (102) and install the discharge sand collar (110) over the pump shaft and lightly secure the setscrews (110A). Assemble the discharge case to the last bowl. With the discharge case in position, again push the shaft to its highest position (it should hit the upthrust plug). Now remove the discharge case and tighten

the sand collar setscrews (110A). With the discharge case removed, drill a 3/16" diam eter hole that penetrates the threaded areas of both the bowl and the plug so when the lockpin is driven, it interlocks the two parts. Install lock pin (36D), driving it in until it flares. Assemble the discharge bowl (102) to bowl the assembly. Check to insure the pump shaft turns freely.

9. Install the coupling (115) and key (115A) on the pump shaft (32). Lightly secure the setscrews (115B).

10. With the motor in a vertical position, carefully align the pump to the motor and lower the pump until the motor shaft fits into the coupling as follows:

    A. Motors with a splined shaft - Loosen the coupling setscrews on the pump shaft and slide the coupling onto the motor shaft until the coupling butts on the motor shaft. At this point, the pump shaft and motor shaft should be butted together. Tighten all setscrews. Check the first stage impeller to insure it has been lifted off the bracket seat. Note: Couplings for 4" & 6" motors are furnished with a spacer (or slug). Couplings for 8" motors and above are furnished without a spacer.

    B. Motors with a keyed shaft - Install the motor key onto the motor shaft. Loosen the coupling setscrews on the pump shaft and slide the coupling onto the motor shaft until the pump shaft and motor shaft butt together. Position the coupling so it is centered between the pumpshaft and motor shaft. Tighten all setscrews. Check the first stage impeller to insure it has been lifted off the bracket seat.

    With the motor flange fit fully engaged in the bracket fit, install and tighten the motor bolts.

11. If threaded bowls are used, drill and pin the bowls at each connection with a 3/16" by 1/2" Drive the bowl pins (36D) until they flair and remove excess pin with a file.

12. Attach the suction strainer (42).

13. Carefully cover the motor leads with the cable guard (123) and attach to the pump.

Wear Rings

If the pump is equipped with wear rings and replacement is required, refer to WEAR RING REMOVAL below.

Wear Ring Removal

1. If the wear ring requires replacement it can be more easily removed by heating it to 250 - 400 degrees F.

⚠WARNING

To prevent possible serious personal injury, heat resistant gloves must be worn when handling heated parts.

2. The ring may also be removed by splitting with a chisel and removed or machined.

⚠ CAUTION

Care should be used to avoid damage to the bowl (or impeller) ring seat.

⚠WARNING

To prevent possible serious personal injury, approved safety glasses must be worn when grinding.

Installing New Wear Ring

IMPORTANT

If this bowl assembly is to be fitted with wear rings, and was not equipped with wear rings at the factory, contact the factory for correct dimensions.

⚠ CAUTION

Machine work should be done by a qualified machinist experienced in similar machining work.

If the wear rings are to be replaced, they should be replaced with Fairbanks Nijhuis™ wear rings. Install the wear rings as follows:

1. To ensure proper bonding, thoroughly clean all mating parts with solvent to remove all grease, oil, dirt, etc.

2. Apply a bead of LOCTITE 290® completely around the middle of the impeller or bowl wear ring fit, and press the wear ring(s) in place.

IMPORTANT

To avoid distortion and ensure proper installation, be careful to press the wear rings evenly and completely in place. They should be firmly butted against the corresponding impeller or bowl shoulder at the bottom of the wear ring fit.

Service

Warranty Service

For Warranty Service contact the facility from which your pump was shipped.

Shipping facilities addresses:

Thomasville, Georgia
Fairbanks Nijhuis™
108 Fairbanks Avenue
Thomasville, GA 31792
(912) 228-4400
Fax: (912) 228-9116

Fresno, California
Fairbanks Nijhuis
2790 South Railroad
Fresno, CA 93725
(209) 266-0516
Fax: (209) 266-5341

Indianola, Mississippi
Fairbanks Nijhuis
1259 Highway 82 East
Indianola, MS 38751
(601) 887-3840
Fax: (601) 887-3500

Kansas City, Kansas
Fairbanks Nijhuis
P.O. Box 6999
3601 Fairbanks Ave.
Kansas City, KS 66106-0999
(913) 371-5000
Fax: (913) 371-2272

Service After Warranty

For service after warranty on this pump or any other pumping equipment contact your local Fairbanks Nijhuis™ Distributor or by contacting:

Pump Services Group, 1-800-648-PUMP

Or Write:

Pump Services Group
Fairbanks Nijhuis
P. O. Box 6999
3601 Fairbanks Ave.
Kansas City, KS 66106-0999
(913) 371-5000
Fax: (913) 371-2272

Repair Parts

Ordering Parts

When ordering parts, give pump serial number, size, model number, a complete description, and item number of each part. Refer to drawing and parts list in the back of this manual. You may order parts from your local Fairbanks Nijhuis Distributor. Consult your telephone yellow pages under “Pumps” for the office nearest you.

You may also contact Fairbanks Nijhuis directly as follows:

Thomasville, Georgia
Fairbanks Nijhuis
108 Fairbanks Ave.
Thomasville, GA 31792
(912) 228-4400
Fax: (912) 228-9116

Fresno, California
Fairbanks Nijhuis
2790 South Railroad
Fresno, CA 93725
(209) 266-0828
Fax: (209) 266-5341

Indianola, Mississippi
Fairbanks Nijhuis™`
1259 Highway 82 East
Indianola, MS 38751
(601) 887-3840
Fax: (601) 887-3500

Returning Parts

All material or parts returned to the factory must have prior approval and a "Returned Goods Tag", listing the material to be returned and the reason for the return. All material to be returned should be carefully packed to avoid damage in route from rough handling or exposer to weather. Contact the factory for shipping instructions. All material is to be returned freight prepaid.

Fairbanks Nijhuis makes improvements on its products from time to time and reserves the right to furnish improved parts for repairs. A part that is received and is not identical in appearance, or has a different symbol from the original part, may be interchangeable. Examine the part carefully before contacting your Fairbanks Nijhuis representative. The parts should never be returned to the factory without first obtaining proper authorization from your Fairbanks Nijhuis representative.

TECHNICAL DATA

Table #1

Cable Selection Chart

MOTOR			COPPER CABLE SIZE FROM CONTROL BOX TO MOTOR (FEET)																			
Phase	HP	Volts	14	12	10	8	6	4	2	0	00	000	0000	250	300	350	400	500	600			
Single	1	230	250	400	630	990	1540	2390	3610	5360	6520											
	1.5	230	190	310	480	770	1200	1870	2850	4280	5240											
	2	230	150	250	390	620	970	1530	2360	3620	4480											
	3	230		190	300	470	750	1190	1850	2890	3610											
	5	230			180	280	450	710	1110	1740	2170	2680										
	7.5	230				200	310	490	750	1140	1410	1720										
	10	230					250	390	600	930	1160	1430	1760									
	15	230						270	430	660	820	1020	1260									
Three	5	230		240	380	620	980	1500	2370													
		460		1000	1590	2600																
	7.5	230		160	260	420	650	1010	1600	2560												
		460		690	1100	1800	2790															
	10	230			190	300	470	730	1160	1850	2320											
		460		510	820	1330	2070															
	15	230				200	300	470	750	1190	1490	1890										
		460		350	550	900	1400	2170														
	20	230				210	330	530	840	1060	1340	1690	2060									
		460			410	670	1050	1600	2370													
	25	230						250	390	630	790	1000	1260	1530	1840							
		460				530	830	1280	2040													
	30	230							350	560	710	900	1130	1380	1650	1920						
		460				450	690	1080	1710	2730												
	40	460					490	760	1210	1930	2430											
	50	460						590	930	1480	1870	2370										
	60	460							810	1290	1620	2060										
	75	460							700	1110	1400	1770	2230									
	100	460								860	1080	1370	1720	2100								
	125	460									710	1060	1330	1620	1940							
	150	460										880	1080	1320	1580	1840						
	175	460											1000	1220	1460	1700	1950					
	200	460												1050	1260	1470	1680	2100				
	250	460															1310	1640	1970			
	300	460																1440	1720			

Table #2
3417 - Additional Shim Thickness

FRANKLIN

Stages	4" and 6" MOTORS						8" MOTORS			
	4L	4M	6XL	6L	6M	6H	6XL	6L	6M	6H
1 to 5	.005"	.005"	.005"	.006"	.006"	.008"	.005"	.005"	.005"	.005"
6	.005"	.005"	.005"	.007"	.008"	.013"	.005"	.005"	.005"	.005"
7	.005"	.005"	.006"	.008"	.013"	.015"	.005"	.005"	.006"	.006"
8	.005"	.005"	.007"	.009"	.013"	.015"	.005"	.005"	.007"	.007"
9	.005"	.005"	.008"	.010"	.015"	.015"	.005"	.006"	.008"	.008"
10	.005"	.005"	.011"	.011"	.018"	N/A	.006"	.007"	.009"	.010"
11	.006"	.006"	.011"	.012"	.021"	N/A	.007"	.008"	.010"	.010"
12	.006"	.006"	.013"	.014"	N/A	N/A	.008"	.009"	.012"	.012"
13	.008"	.006"	.013"	.021"	N/A	N/A	.009"	.010"	.013"	.014"
14	.008"	.008"	.015"	.022"	N/A	N/A	.010"	.011"	.014"	.015"
15	.008"	.008"	.017"	.023"	N/A	N/A	.012"	.012"	.016"	.017"
16	.010"	.008"	.017"	N/A	N/A	N/A	.013"	.013"	.017"	.018"
17	.010"	.010"	.019"	N/A	N/A	N/A	.014"	.014"	.019"	.020"
18	.010"	.010"	.020"	N/A	N/A	N/A	.015"	.015"	.020"	.020"
19	.011"	.011"	.028"	N/A	N/A	N/A	.016"	.016"	.022"	.023"
20	.011"	.011"	.030"	N/A	N/A	N/A	.017"	.017"	.024"	.025"
21	.013"	.011"	.032"	N/A	N/A	N/A	.018"	.018"	.026"	N/A
22	.013"	.013"	N/A	N/A	N/A	N/A	.019"	.019"	.028"	N/A
23	.013"	.013"	N/A	N/A	N/A	N/A	.021"	.021"	.030"	N/A
24	.015"	.013"	N/A	N/A	N/A	N/A	.023"	.022"	.032"	N/A
25	.015"	.013"	N/A	N/A	N/A	N/A	.024"	.024"	N/A	N/A

HITACHI

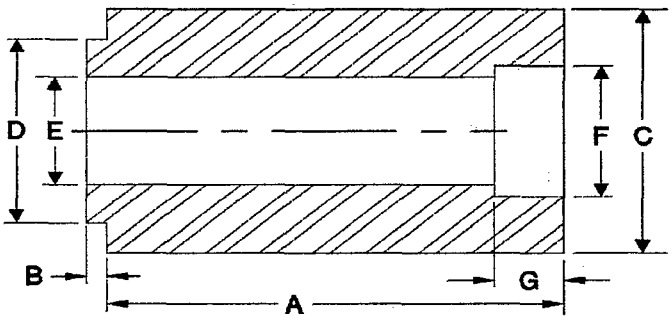
Stages	6" MOTORS						8" MOTORS			
	4L	4M	6XL	6L	6M	6H	6XL	6L	6M	6H
1 to 6	.005"	.005"	.005"	.005"	.005"	.005"	.005"	.005"	.005"	.005"
7	.005"	.005"	.005"	.005"	.007"	.006"	.005"	.005"	.006"	.006"
8	.005"	.005"	.006"	.006"	.008"	.008"	.005"	.005"	.007"	.007"
9	.005"	.005"	.006"	.007"	.010"	.010"	.005"	.006"	.008"	.008"
10	.005"	.005"	.007"	.008"	.010"	.011"	.006"	.007"	.009"	.010"
11	.006"	.006"	.008"	.009"	.012"	.012"	.007"	.008"	.010"	.010"
12	.006"	.006"	.009"	.010"	.014"	.014"	.008"	.009"	.012"	.012"
13	.008"	.006"	.010"	.011"	.015"	.015"	.009"	.010"	.013"	.014"
14	.008"	.008"	.012"	.012"	.016"	.017"	.010"	.011"	.014"	.015"
15	.008"	.008"	.013"	.014"	.018"	.019"	.012"	.012"	.016"	.017"
16	.010"	.008"	.014"	.014"	.020"	N/A	.013"	.013"	.017"	.018"
17	.010"	.010"	.015"	.016"	.021"	N/A	.014"	.014"	.019"	.020"
18	.010"	.010"	.017"	.017"	.023"	N/A	.015"	.015"	.020"	.021"
19	.011"	.011"	.018"	.018"	.026"	N/A	.016"	.016"	.022"	.023"
20	.011"	.011"	.020"	.020"	.027"	N/A	.017"	.017"	.024"	.025"
21	.013"	.011"	N/A	.021"	.029"	N/A	.018"	.018"	.026"	N/A
22	.013"	.013"	N/A	N/A	N/A	N/A	.019"	.019"	.028"	N/A
23	.013"	.013"	N/A	N/A	N/A	N/A	.021"	.021"	.030"	N/A
24	.015"	.015"	N/A	N/A	N/A	N/A	.023"	.022"	.032"	N/A
25	.015"	.015"	N/A	N/A	N/A	N/A	.024"	.024"	N/A	N/A

Table #3

Bowl Size	Shaft End Play (Inches)	
	At Full Diameter	At Minimum Diameter
6M	.34	.80
7M	.46	1.10
8M	.44	.80
8H	.58	.83
10M	.70	.78
10XH	.79	.79
10XHH	.94	1.31
11M	.75	1.07
11H	.87	1.73
12L	1.14	1.14
12M	.99	1.17
12MC	1.29	1.29
12H	1.17	1.24
12XH	1.42	1.96
13H	.87	1.81
14M	1.00	1.30
14MC	.98	.98
14XH	1.12	1.20
15H	.93	1.90
17M	1.13	1.25
17H	1.20	2.20

Bowl Size	Diametral Bowl and/or Impeller Wear Ring Clearance (Inches)		Diametral Bowl Bearing Clearance (Inches)			
	Nominal	Replacement	Bronze		Rubber	
			Nominal	Replacement	Nominal	Replacement
6M	.016	.022	.014	.018	N/A	N/A
7M	.016	.022	.014	.018	N/A	N/A
8M	.016	.022	.014	.018	N/A	N/A
8H	.016	.022	.014	.018	N/A	N/A
10M	.016	.022	.014	.018	.015	.020
10XH	.016	.022	.014	.018	.015	.020
10XHH	.016	.022	.014	.018	.015	.020
11M	.016	.022	.014	.018	.015	.020
11H	.016	.022	.014	.018	.015	.020
12L	.016	.022	.014	.018	.015	.020
12M	.016	.022	.014	.018	.015	.020
12MC	.016	.022	.014	.018	.015	.020
12H	.016	.022	.014	.018	.015	.020
12XH	.016	.022	.014	.018	.015	.020
13H	.016	.022	.014	.018	.015	.020
14M	.016	.022	.014	.018	.015	.020
14MC	.016	.022	.014	.018	.015	.020
14XH	.016	.022	.014	.018	.015	.020
15H	.016	.022	.014	.018	.015	.020
17M	.024	.032	.014	.018	.017	.022
17H	.024	.032	.014	.018	.017	.022

Collet Driver



Part Number	Shaft Size	A	B	C	D	E	F	G
3417								
40067793	3/4	6	1/2	2	61/64	49/64	1-1/16	1/4
40067794	1	6	1/2	2	1-3/16	1-1/64	1-5/16	1/4
3412								
M2S872A	1	2-3/4	1/4	2-1/4	1-5/32	1-1/32	1-11/32	1
M2S872B	1-3/16	2-3/4	1/4	2-1/4	1-11/32	1-7/32	1-17/32	3/4
M2S872C	1-7/16	3	5/16	2-7/8	1-21/32	1-15/32	2-1/32	3/4
M2S872D	1-11/16	3	5/16	3	1-29/32	1-23/32	2-7/32	1
M2S872E	1-15/16	3	5/16	3-1/4	2-1/4	1-31/32	2-31/32	3/4
M2S872F	2-3/16	6	5/16	4	2-1/2	2-7/32	2-13/16	3/4

Fig.#1

Shaft Straightness

Prior to installation or reassembly, bowl shafts should be checked for straightness. The maximum allowable total indicated runout must be less than .005"

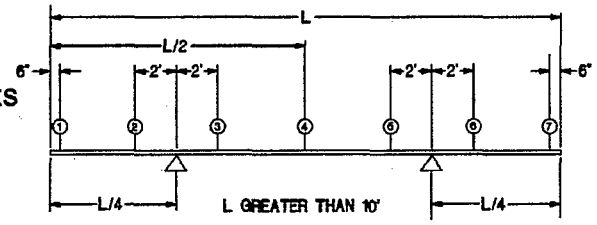


FIGURE A

Figures A&B below outline the proper position at which dial indicator readings should be taken. The shaft should be supported in V-blocks or on rollers as shown. Position the dial indicator and zero the dial face. Slowly rotate the shaft and observe the maximum runout.

△

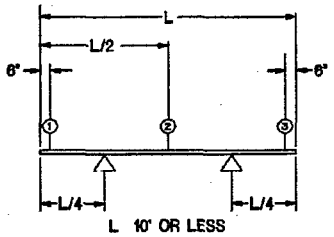


FIGURE B

If the shaft exceeds the .005" maximum limit, straightening will be required. Consult the Fairbanks Nijhuis™ factory for straightening recommendations.

Fig.#2

3417 Assembly Fixture

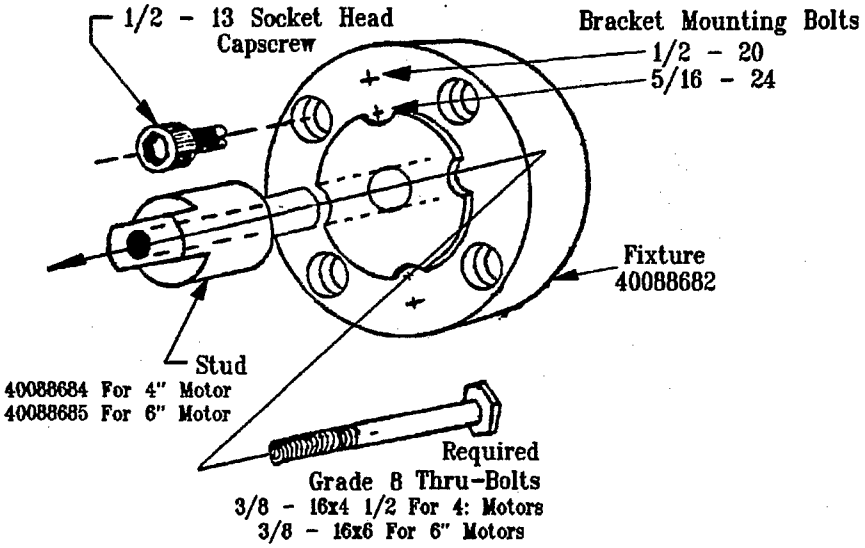


Fig.#3

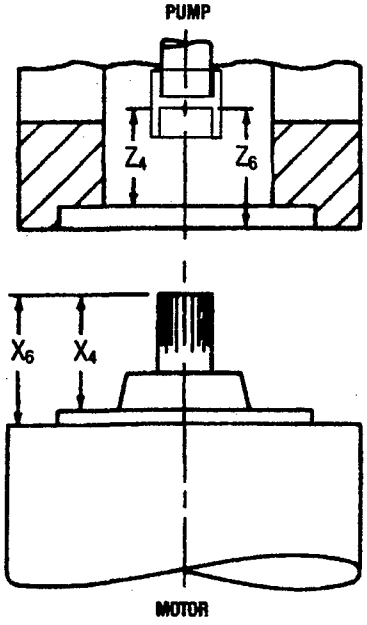
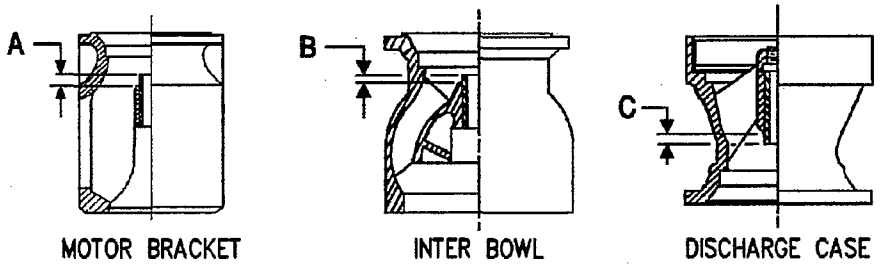


Fig.#4

THREADED OR FLANGED BOWLS



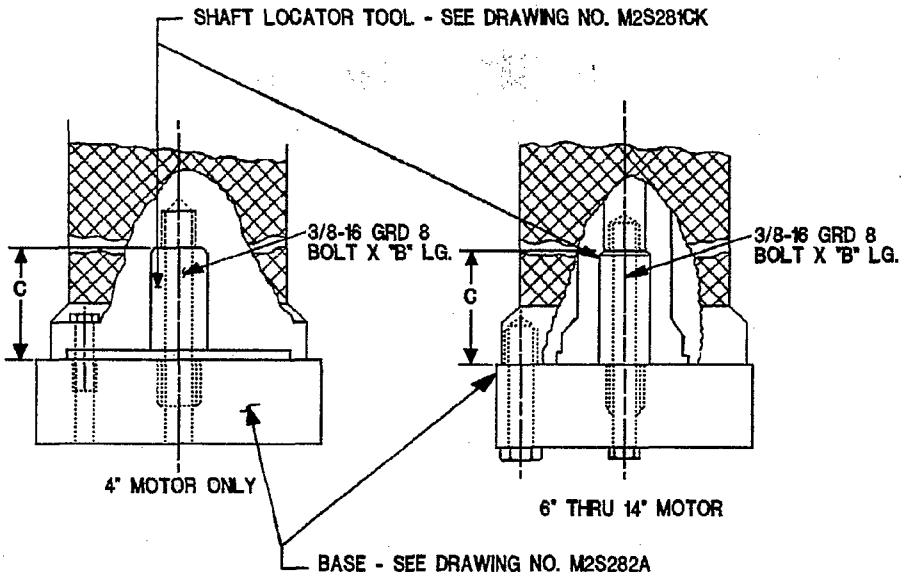
PUMP	A	B	C
6M	.68	.12	.68
7M	.68	.12	.68
8M	.68	.14	.68
8H	.68	.14	.68
10M	1.00	.56	1.00
10XHC	.87	.00	.87
10XHH	1.19	.61	1.19
11M	1.00	.56	1.00
11H	1.00	.56	1.00
12L	1.12	.69	1.12
12M	1.12	.69	1.12
12H	1.00	.00	1.00
12XH	1.12	.00	1.12
13H	1.20	.69	1.20
14M	1.25	.79	1.25
14XH	1.25	.00	1.25
15H	1.08	.79	1.08
17M	1.40	.06	1.40
17H	1.40	.00	1.40

Fig.#5

PENTAIR FAIRBANKS NIJHUIS

BOWL BEARING LOCATION MODEL 3412 PUMPS

SIZE | DWG NO.



PUMP MODEL	IMPELLER LIFT	4" MOTOR	6" MOTOR	8" MOTOR 6" FLG.	8" MOTOR 8" FLG.	10"MOTOR "A" FLG.	10"MOTOR "B" FLG.	12" MOTOR	14" MOTOR	
6M	.200"	M2S281BP M2S282B	M2S281BQ M2S282C	M2S281BQ M2S282C	M2S281BR M2S282D	M2S281BR M2S282E	M2S281BS M2S282E	M2S281BS M2S282E	M2S281BS M2S282F	LOCATOR BASE
7M	.200"	M2S281BP M2S282B	M2S281BQ M2S282C	M2S281BQ M2S282C	M2S281BR M2S282D	M2S281BR M2S282E	M2S281BS M2S282E	M2S281BS M2S282E	M2S281BS M2S282F	LOCATOR BASE
8M	.200"	M2S281BP M2S282B	M2S281BQ M2S282C	M2S281BQ M2S282C	M2S281BR M2S282D	M2S281BR M2S282E	M2S281BS M2S282E	M2S281BS M2S282E	M2S281BS M2S282F	LOCATOR BASE
8H	.200"	M2S281BP M2S282B	M2S281BQ M2S282C	M2S281BQ M2S282C	M2S281BR M2S282D	M2S281BR M2S282E	M2S281BS M2S282E	M2S281BS M2S282E	M2S281BS M2S282F	LOCATOR BASE
10M	.200"		M2S281BT M2S282C	M2S281BT M2S282C	M2S281BU M2S282D	M2S281BU M2S282E	M2S281BV M2S282E	M2S281BV M2S282E	M2S281BV M2S282F	LOCATOR BASE
10XH	.600"		M2S281CF M2S282C	M2S281CF M2S282C	M2S281CH M2S282D	M2S281CH M2S282E	M2S281CJ M2S282E	M2S281CJ M2S282E	M2S281CJ M2S282F	LOCATOR BASE
10XHH	.400"		M2S281BZ M2S282C	M2S281BZ M2S282C	M2S281CA M2S282D	M2S281CA M2S282E	M2S281CB M2S282E	M2S281CB M2S282E	M2S281CB M2S282F	LOCATOR BASE
11M	.200"		M2S281BT M2S282C	M2S281BT M2S282C	M2S281BU M2S282D	M2S281BU M2S282E	M2S281BV M2S282E	M2S281BV M2S282E	M2S281BV M2S282F	LOCATOR BASE
11H	.200"		M2S281BT M2S282C	M2S281BT M2S282C	M2S281BU M2S282D	M2S281BU M2S282E	M2S281BV M2S282E	M2S281BV M2S282E	M2S281BV M2S282F	LOCATOR BASE
12L	.200"		M2S281BT M2S282C	M2S281BT M2S282C	M2S281BU M2S282D	M2S281BU M2S282E	M2S281BV M2S282E	M2S281BV M2S282E	M2S281BV M2S282F	LOCATOR BASE
12M	.200"		M2S281BT M2S282C	M2S281BT M2S282C	M2S281BU M2S282D	M2S281BU M2S282E	M2S281BV M2S282E	M2S281BV M2S282E	M2S281BV M2S282F	LOCATOR BASE
12H	.400"		M2S281BZ M2S282C	M2S281BZ M2S282C	M2S281CA M2S282D	M2S281CA M2S282E	M2S281CB M2S282E	M2S281CB M2S282E	M2S281CB M2S282F	LOCATOR BASE
12XH	.850"		M2S281BJ M2S282C	M2S281BJ M2S282C	M2S281BX M2S282D	M2S281BX M2S282E	M2S281BY M2S282E	M2S281BY M2S282E	M2S281BY M2S282F	LOCATOR BASE
13H	.200"		M2S281BT M2S282C	M2S281BT M2S282C	M2S281BU M2S282D	M2S281BU M2S282E	M2S281BV M2S282E	M2S281BV M2S282E	M2S281BV M2S282F	LOCATOR BASE
14M	.200"		M2S281CC M2S282C	M2S281CC M2S282C	M2S281CD M2S282D	M2S281CD M2S282E	M2S281CE M2S282E	M2S281CE M2S282E	M2S281CE M2S282F	LOCATOR BASE
14XH	.200"		M2S281CC M2S282C	M2S281CC M2S282C	M2S281CD M2S282D	M2S281CD M2S282E	M2S281CE M2S282E	M2S281CE M2S282E	M2S281CE M2S282F	LOCATOR BASE
15H	.200"		M2S281CC M2S282C	M2S281CC M2S282C	M2S281CD M2S282D	M2S281CD M2S282E	M2S281CE M2S282E	M2S281CE M2S282E	M2S281CE M2S282F	LOCATOR BASE
17M	.200"		M2S281CC M2S282C	M2S281CC M2S282C	M2S281CD M2S282D	M2S281CD M2S282E	M2S281CE M2S282E	M2S281CE M2S282E	M2S281CE M2S282F	LOCATOR BASE
17H	.600"		M2S281CF M2S282C	M2S281CF M2S282C	M2S281CH M2S282D	M2S281CH M2S282E	M2S281CJ M2S282E	M2S281CJ M2S282E	M2S281CJ M2S282F	LOCATOR BASE

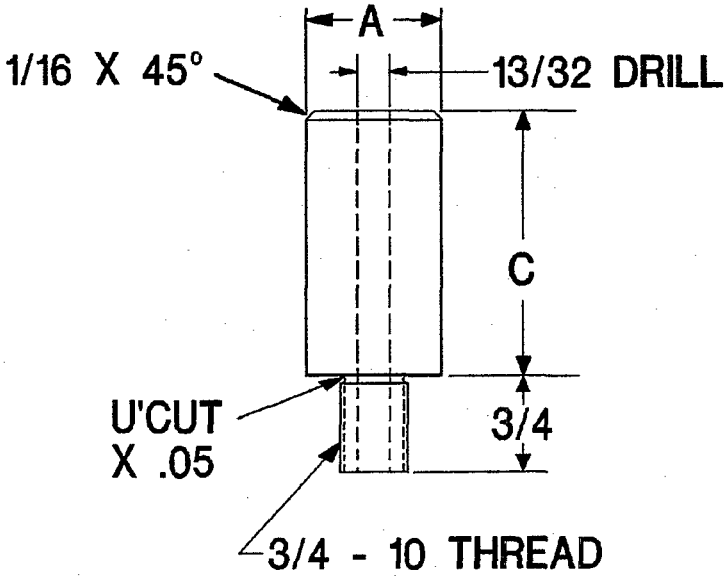
NOTES:

1. FOR "C" DIMENSION SEE M2S281CK
2. "B" LONG "C" 2-3/8"
3. FOR BASE SEE M2S282A

PENTAIR FAIRBANKS NIJHUIS

SHAFT LOCATOR TOOL ASSEMBLY

SIZE A | DWG. NO. 24LYA3537A



PART NUMBER	A	C	IMPELLER LIFT
M2S281BP	1-3/16	1.425	0.200
M2S281BQ	1-3/16	2.925	0.200
M2S281BR	1-3/16	3.800	0.200
M2S281BS	1-3/16	4.800	0.200
M2S281BT	1-11/16	2.925	0.200
M2S281BU	1-11/16	3.800	0.200
M2S281BV	1-11/16	4.800	0.200
M2S281BW	1-11/16	2.275	0.850
M2S281BX	1-11/16	3.150	0.850
M2S281BY	1-11/16	4.150	0.850
M2S281BZ	1-11/16	2.725	0.400
M2S281CA	1-11/16	3.600	0.400
M2S281CB	1-11/16	4.600	0.400
M2S281CC	1-15/16	2.925	0.200
M2S281CD	1-15/16	3.800	0.200
M2S281CE	1-15/16	4.800	0.200
M2S281CF	1-15/16	2.525	0.600
M2S281CH	1-15/16	3.400	0.600
M2S281CJ	1-15/16	4.400	0.600

NOTES:

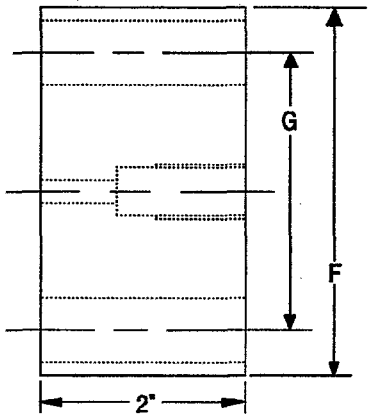
1. FOR ASSEMBLY SEE DRAWING NO. 24LYA3537A
2. 4" MOTOR - USE COUPLING WITH .125" SPACER
3. 6" MOTOR - USE COUPLING WITH .250" SPACER
4. 8" MOTOR WITH 6" FLANGE - USE COUPLING WITH .250" SPACER
5. 8"-14" MOTOR - USE COUPLING WITH NO SPACER
6. HEAT TREAT TO RC 44-476

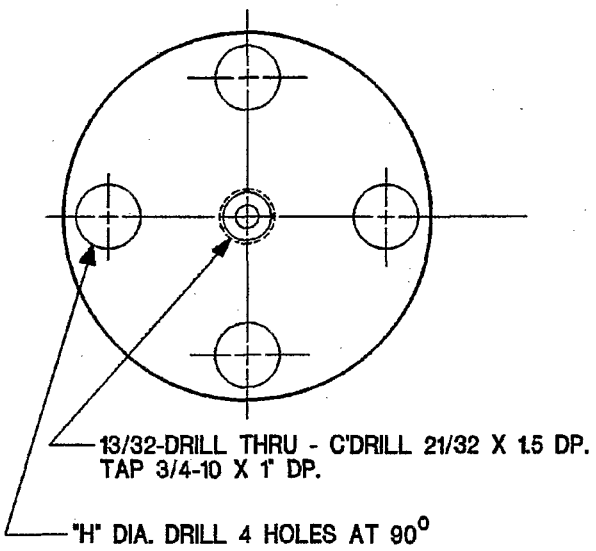
PENTAIR FAIRBANKS NIJHUIS

SHAFT LOCATOR TOOL

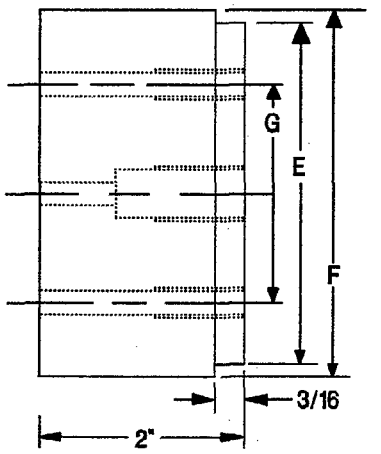
SIZE A | DWG NO M2S281CK

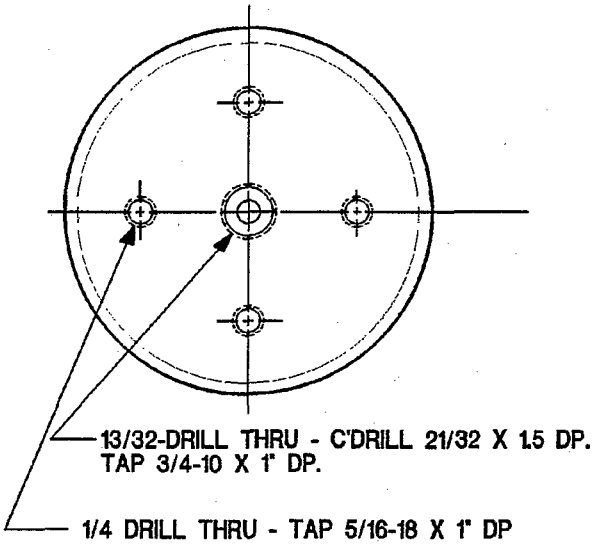
6" THRU 14" MOTOR





4" MOTOR ONLY





PART NUMBER	"E"	"F"	"G"	"H"	MOTOR SIZE
M2S282B	3.425	4.00	3.000		4"
M2S282C		5.50	4.380	.62	6"
M2S282D		7.50	6.000	.95	8"
M2S282E		9.50	7.500	.87	10" & 12"
M2S282F		13.25	11.380	1.31	14"

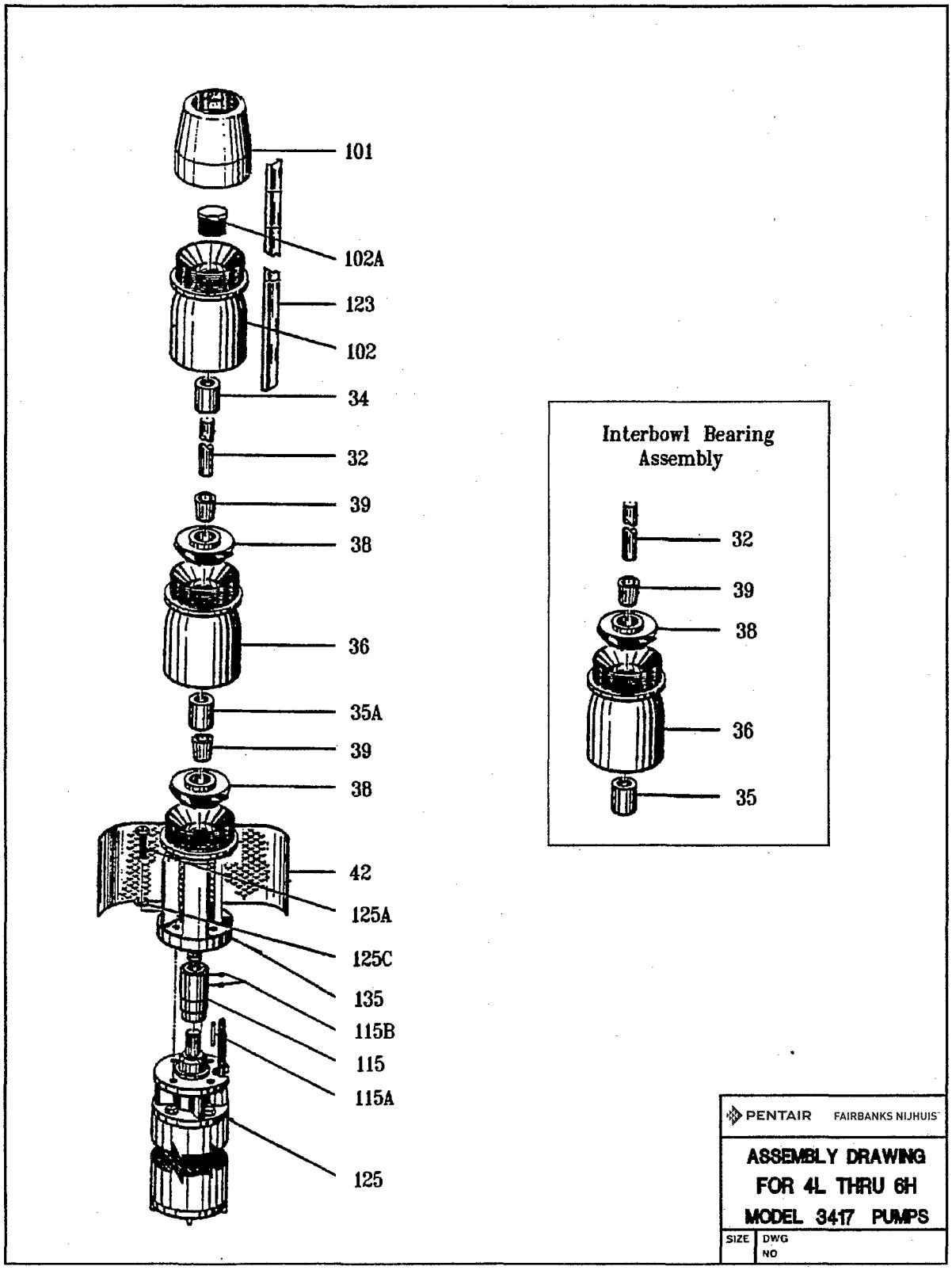
NOTES: 1. FOR ASSEMBLY SEE DRAWING NO. 24LYA3537A
2. HEAT TREAT TO RC 44-46

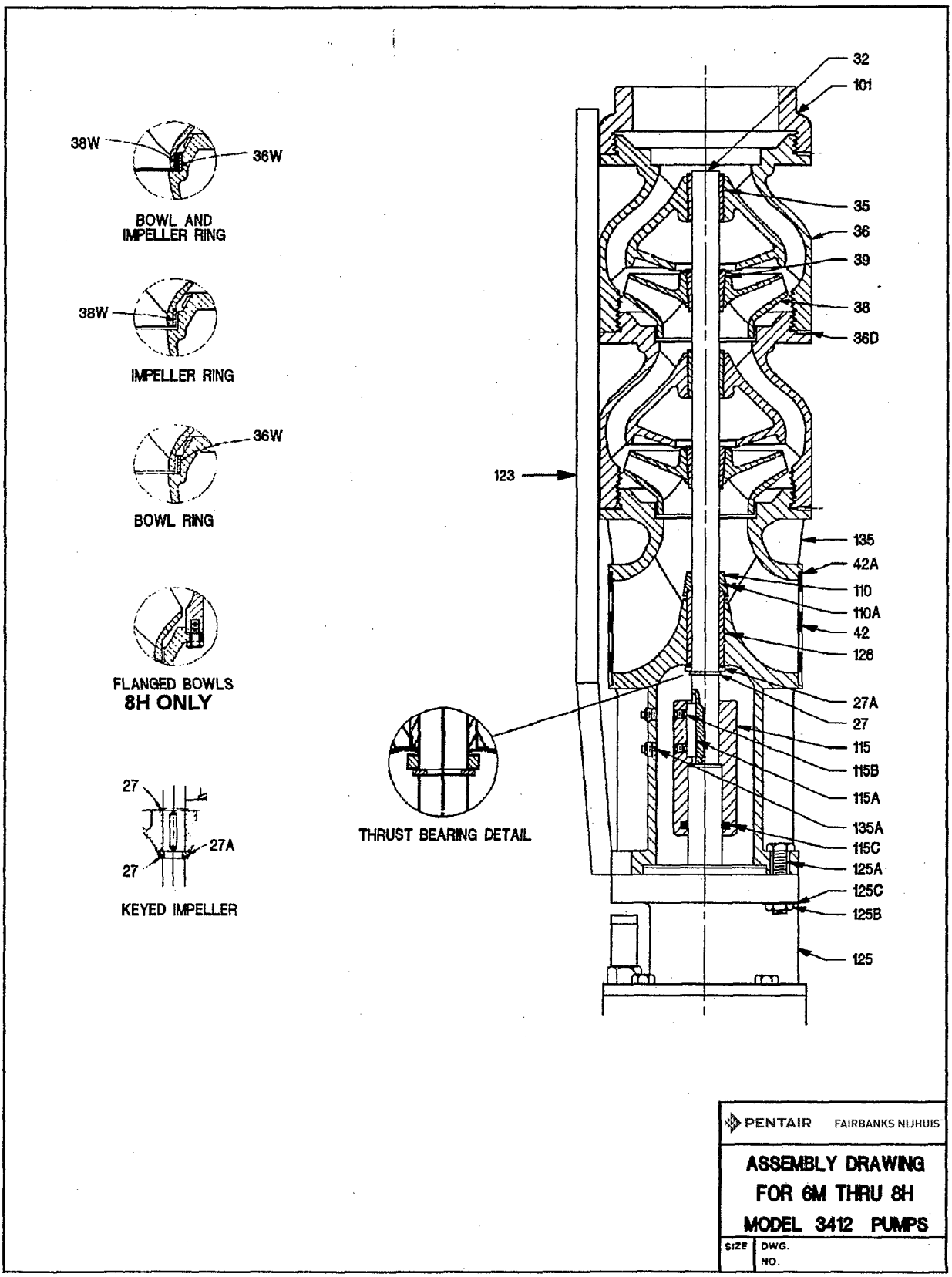
PENTAIR FAIRBANKS NIJHUIS

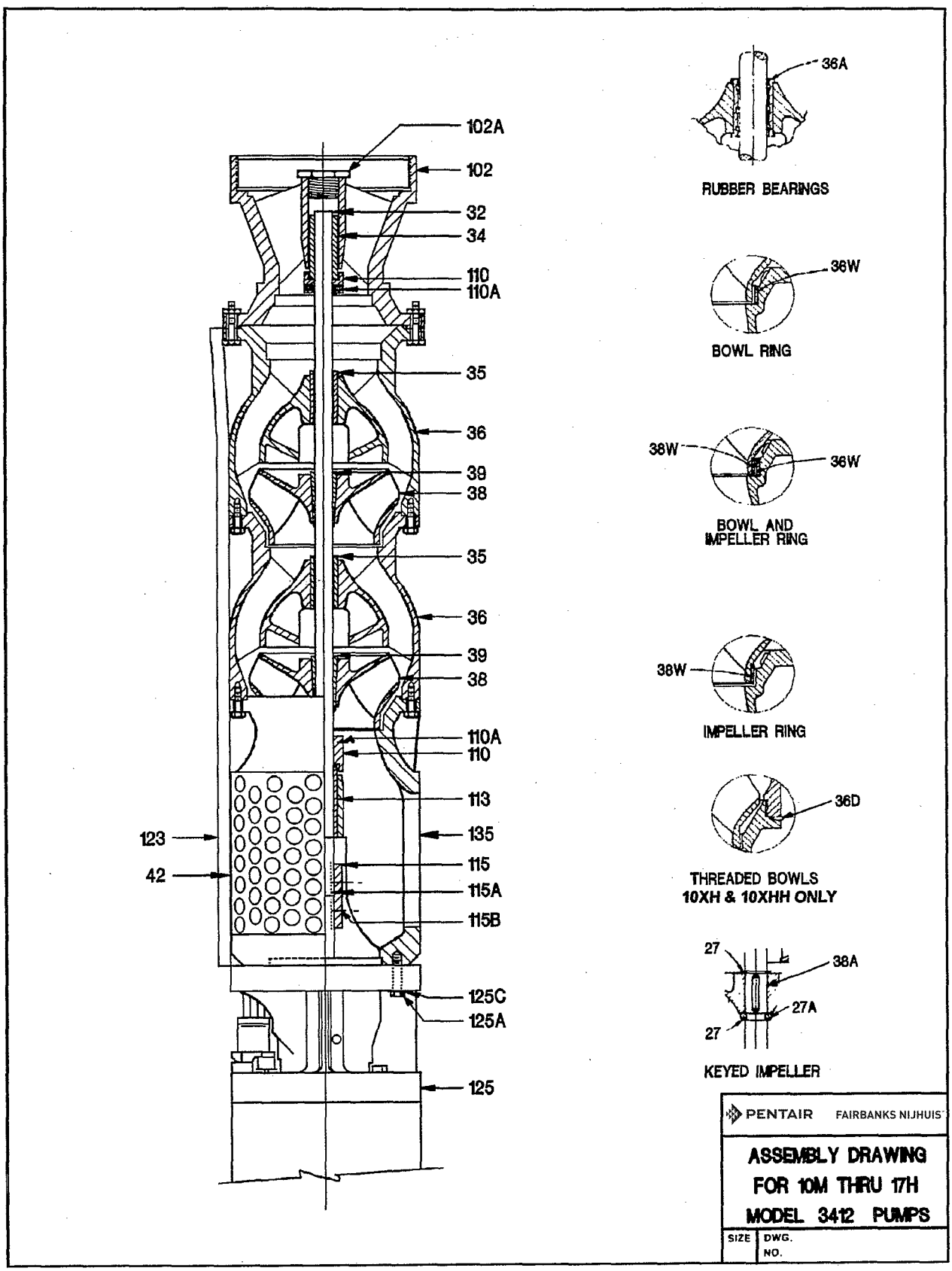
ASSEMBLY
BASE

SIZE A | DWG. NO **M2S282A**

Drawings


101
102A
123
102
34
32
39
38
36
35A
39
38
42
125A
125C
135
115B
115
115A
125
Interbowl Bearing Assembly
32
39
38
36
35
PENTAIR FAIRBANKS NIJHUIS
ASSEMBLY DRAWING
FOR 4L THRU 6H
MODEL 3417 PUMPS
SIZE
DWG NO


38W
36W
BOWL AND IMPELLER RING
38W
IMPELLER RING
36W
BOWL RING
FLANGED BOWLS
8H ONLY
27
27A
27
KEYED IMPELLER
THRUST BEARING DETAIL
32
101
35
36
39
38
36D
123
135
42A
110
110A
42
126
27A
27
115
115B
115A
135A
115C
125A
125C
125B
125
PENTAIR FAIRBANKS NIJHUIS
ASSEMBLY DRAWING
FOR 6M THRU 8H
MODEL 3412 PUMPS
SIZE
DWG. NO.


102A
102
32
34
110
110A
35
36
39
38
35
36
39
38
110A
110
113
135
115
115A
115B
123
42
125C
125A
125
36A
RUBBER BEARINGS
36W
BOWL RING
38W
36W
BOWL AND
IMPELLER RING
38W
IMPELLER RING
36D
THREADED BOWLS
10XH & 10XHH ONLY
27
38A
27A
27
KEYED IMPELLER
PENTAIR FAIRBANKS NIJHUIS
ASSEMBLY DRAWING
FOR 10M THRU 17H
MODEL 3412 PUMPS
SIZE
DWG.
NO.

REF. NO.	DESCRIPTION
27	Snap Ring
27A	Thrust Ring
32	Pump Shaft
34	Top Bowl Bearing
35	Intermediate Bowl Bearing
35A	Bottom Bowl Bearing
36	Intermediate or Top Bowl
36A	Intermediate Bowl Bearing
36D	Bowl Lock Pin
36W	Bowl Wearing Ring
38	Impeller
38A	Impeller Key
38W	Impeller Wearing Ring
39	Impeller Lock Collet
42	Strainer
42A	Strainer Screw
101	Discharge Cone
102	Discharge Case
102A	Thrust Plug
110	Sand Collar
110A	Sand Collar Set Screw
115	Motor Coupling
115A	Coupling Key
115B	Coupling Set Screw
123	Cable Guard
125	Submersible Motor
125A	Capscrew
125B	Hex Nut
125C	Washer
126	Suction Bearing
135	Motor Bracket

THIS PAGE INTENTIONALLY LEFT BLANK