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# WARNING:

**THE DURA TANK YOU HAVE PURCHASED MUST BE PROPERLY INSTALLED AND GROUNDED BY YOUR ELECTRICIAN TO PROTECT THE TANK FROM LIGHTNING STRIKES.**

**LIGHTNING DAMAGE TO THE ELECTRICAL COMPONENTS IS NOT COVERED BY WARRANTY.**

# *** WARNING ***

**EMULSIONS CONTAIN SOME MILD CORROSIVE ELEMENTS THAT CAN GROW IN CONCENTRATION AT THE BOTTOM OF THE DURATANK.**

**FAILURE TO EMPTY ALL CONTENTS OF TANK AND COMPLETELY CLEAN THE INSIDE EVERY TWO YEARS COULD RESULT IN PERMANENT DAMAGE TO THE STRUCTURE OF THE TANK.**

## PRE-HEATING THE TANK

If the DuraTank is equipped with blanket heating elements, it is recommended that the tank be pre-heated for 1-2 days before emulsion delivery. To do this, merely turn the tank on and adjust thermostat to desired temperature.

## SETTING THE TANK TEMPERATURE

The control module is pre-set at the factory for a <u>maximum</u> temperature of 200 or 400 degrees Fahrenheit, dependent upon customer specifications.

The control module on the DuraTank works just like a household thermostat. To set the temperature at the level you want to store emulsion, use only the up and down arrows on the control display until desired temperature shows on the display. The “PV” is the present temperature in the tank, where “SV” is the set, or desired, temperature in the tank.

All other functions are locked.


If you encounter problems with your tank or control system, contact us at 601-932-2100

The control module installed in this panel is factory pre-set at 50$^{o}$ Fahrenheit low temperature limit. If your tank temperature drops to or below this temperature level, the agitator motor will not operate until temperature increases above 50$^{o}$ Fahrenheit. When your tank temperature increases above 50$^{o}$ power to the agitator will be restored and you will have to reset the clock time on your timer. This is done to protect the agitation system from attempting to mix thick emulsion.

The control module installed in this panel is factory preset at 200$^{o}$ or 400$^{o}$ Fahrenheit high temperature limit dependent upon customer specifications for limits. If the tank should heat past customer set temperature, the control module will cut power to the heaters and they will remain off until temperature drops back below set level.

If the quantity level in the tank drops below 250 gallons the control module will cut power to the heaters.

Heating blankets are standard on DuraTanks. They are rated at 1000 watts and are attached to the tank with adhesive. The tank may come with four, six, eight, or ten blankets, depending upon size and location.

## HEATING ELEMENT PART NUMBERS:

130701 STORAGE TANK HEATING BLANKET (1 kW)

122861 240V PROBE TUBE HEATER (4 kW)

*** OTHER PROBE VOLTAGES AND WATTAGES AVAILABLE ON REQUEST

# DuraTank
# Operating Instructions

**WARNING!!**
**ALL SURFACES, MATERIAL AND EQUIPMENT SHOULD BE CONSIDERED TO BE HOT. WEAR PROTECTIVE GLOVES AND CLOTHING TO PREVENT BURNS**

## FILLING THE DURATANK FROM THE TRANSPORT TANKER

1. **CONNECT HOSE FROM TRANSPORT TANKER TO QUICK DISCONNECT OF VALVE #1 ON SIDE OF DURATANK.**
2. **OPEN FILL VALVE #1 ON DURATANK AND VALVE ON TRANSPORT TANKER.**
3. **START PUMP ON TRANSPORT TANKER.**
4. **WATCH TANK LEVEL GAUGE ON THE DURATANK TO PROTECT AGAINST OVERFILLING.**
5. **WHEN FILL IS ACHIEVED, CLOSE VALVE ON TRANSPORT TANKER.**
6. **TURN OFF PUMP.**
7. **CLOSE FILL VALVE #1 ON DURATANK.**
8. **OPEN VALVE #2 (RELIEF VALVE) ON DURATANK**
9. **OPEN VALVE ON TRANSPORT TANKER.**
10. **REVERSE PUMP ON TRANSPORT TANKER MOMENTARILY TO DRAW EMULSION OUT OF HOSE.**
11. **CLOSE VALVE #2 ON DURATANK AND TRANSPORT TANKER VALVE.**
12. **DISCONNECT HOSE FROM DURATANK AND REPLACE CAP.**

## OFFLOADING EMULSION FROM DISCHARGE VALVE

1. **REMOVE CAP AND ATTACH 3” LOADER HOSE TO DISCHARGE VALVE #3 QUICK DISCONNECT.**
2. **PLACE OPPOSITE END IN TANK BEING FILLED.**
3. **OPEN 3” DISCHARGE VALVE #3.**
4. **WHEN COMPLETED FILLING, SHUT VALVE #3 OFF.**
5. **OPEN 1” BLEEDER VALVE #4 ON DISCHARGE SIDE TO HELP DRAIN 3” HOSE.**
6. **CLOSE 1” BLEEDER VALVE #4.**
7. **REMOVE LOADER HOSE.**
8. **REPLACE CAP ON QUICK DISCONNECT.**
9. **CLEAN AND STORE LOADER HOSE.**

# ATTENTION:

## Turning the Pump Switch to the Forward position will offload product out of the DURATANK.

## Turning the Pump Switch to the Reverse position will load product into the DURATANK.


# CAUTION:

**IF YOUR DURATANK IS EQUIPPED WITH A PUMP:**

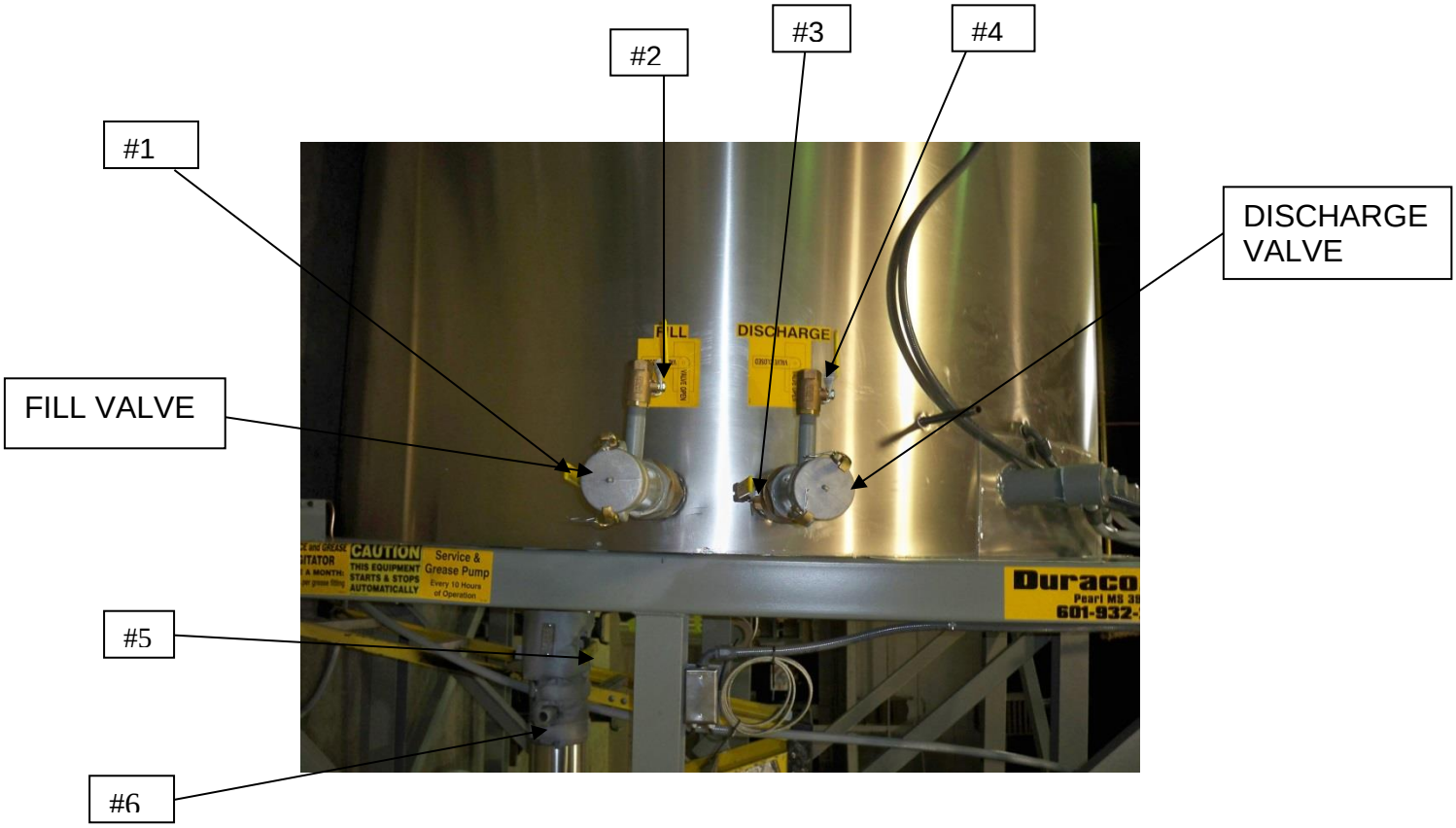
**UPON COMPLETION OF LOADING OR**

**OFFLOADING EMULSION USING THE PUMP**

**ALLOW MOTOR TO COME TO A <u>COMPLETE</u> <u>STOP</u>**

***BEFORE* REVERSING MOTOR.**

**FAILURE TO DO SO WILL SEVERELY DAMAGE CONTROLS !**




## FILLING THE DURATANK WITH THE STORAGE TANK PUMP

1. **CONNECT THE LOADER HOSE FROM THE DURATANK PUMP TO TRANSPORT TANKER.** *MAKE SURE ALL OTHER VALVES ARE CLOSED AND CAPPED!*
2. **OPEN VALVE ON TRANSPORT TANKER AND 3" VALVE #5 UNDER STORAGE TANK.**
3. **START PUMP ON DURATANK (REVERSE DIRECTION).**
4. **WATCH THE TANK LEVEL GAUGE ON THE STORAGE TANK TO PROTECT AGAINST OVERFILLING.**
5. **TURN OFF PUMP WHEN FILL IS COMPLETE**
6. **CLOSE VALVE ON TRANSPORT TANKER.**
7. **CLOSE 3" VALVE #5 UNDER STORAGE TANK.**
8. **DISCONNECT HOSE FROM TRANSPORT TANKER AND PLACE END IN APPROPRIATE CONTAINER TO CATCH EMULSION THAT IS IN THE HOSE.**
9. **PROCEED TO CLEAN OUT INSTRUCTIONS.**

## OFFLOADING EMULSION WITH PUMP

1. **MAKE SURE ALL VALVES ARE OFF.**
2. **CONNECT LOADER HOSE TO QUICK DISCONNECT OF THE PUMP ON THE STORAGE TANK.**
3. **PLACE OPPOSITE END INTO TANK YOU ARE LOADING.**
4. **OPEN 3" VALVE #5 UNDER TANK.**
5. **TURN PUMP SWITCH TO FORWARD POSITION.**
6. **BEFORE RECEIVING TANK IS COMPLETELY FULL, TURN MOTOR SWITCH OFF.**
7. **TURN OFF 3" VALVE #5 UNDER TANK.**
8. **PLACE END OF LOADER HOSE IN WASTE CONTAINER AND PROCEED TO PUMP CLEAN OUT INSTRUCTIONS.**

## DURATANK PUMP CLEAN OUT INSTRUCTIONS

1. **ATTACH 3" LOADER/UNLOADER HOSE TO QUICK DISCONNECT ON PUMP IF NOT ALREADY ATTACHED.**
2. ***IF USING A FLAMMABLE LIQUID FOR CLEANOUT SOLVENT, CHECK THE AREA FOR ALL SOURCES OF OPEN FLAME, LIT CIGERATTES, TORCHES OR LIGHTERS. . EXTINGUISH ALL SOURCES BEFORE PROCEEDING.***
3. **PLACE OPPOSITE END OF HOSE INTO DRUM OF SOLVENT.**
4. **PLACE 1" CLEANOUT HOSE INTO WASTE BUCKET OR DRUM.**
5. **OPEN THE 1" CLEANOUT VALVE #6 APPROXIMATELY ¼ TURN.**
6. **HOLD BOTH HOSES IN PLACE TO AVOID BEING SPLASHED.**
7. **WHILE HOLDING BOTH HOSES IN PLACE TURN THE PUMP SWITCH TO "REVERSE" MOMENTAIRLY. THIS WILL DRAW SOLVENT THROUGH THE HOSE AND PUMP OUT INTO WASTE BUCKET.**
8. **SHUT OFF PUMP.**
9. **DRAIN THE REMAINING SOLVENT FROM THE 3" HOSE INTO THE WASTE BUCKET.**
10. **RETURN HOSE TO STORAGE AND PLACE CAP ON PUMP DISCONNECT**
11. **TURN VALVE ON 1" CLEANOUT VALVE #6 OFF AND DRAIN HOSE.**
12. **RETURN HOSE TO STORAGE POSITION.**

# DURATANK MAINTENANCE INSTRUCTIONS

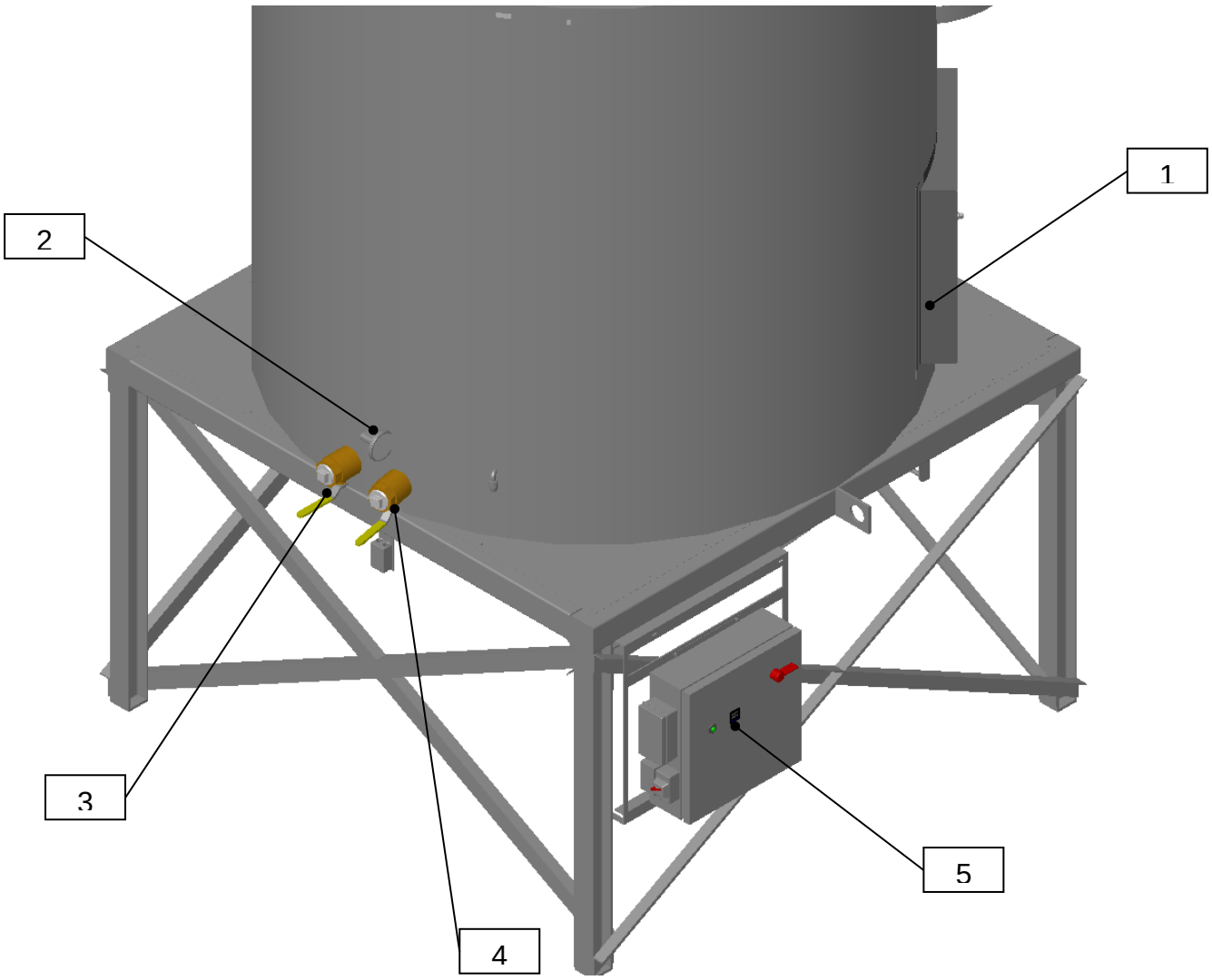
1. **Agitator motor and pulley assembly shaft.**
   Once a month, give 10 pumps of high temp grease in each grease zerk. All zerks are located together on ground level. Check on top of tank for grease on gear and shaft. Check belt tension and wear on agitator gears.

2. **Pump (if installed on tank) - Lubrication:**
   Bowie pumps require lubrication only where grease fittings are provided. **Attn: USE HIGH TEMP GREASE!** All bearing and bushing type pumps require a good grade of grease to insure longer life of the pumps. No lubrication is required on bushing or bearing type pumps if oil is pumped exclusively. This is the only exception. Periodic lubrication is of the utmost importance in care of the Bowie pumps. This point cannot be emphasized enough, and depending on use, this greasing should be done every 4 hours of continuous operation.

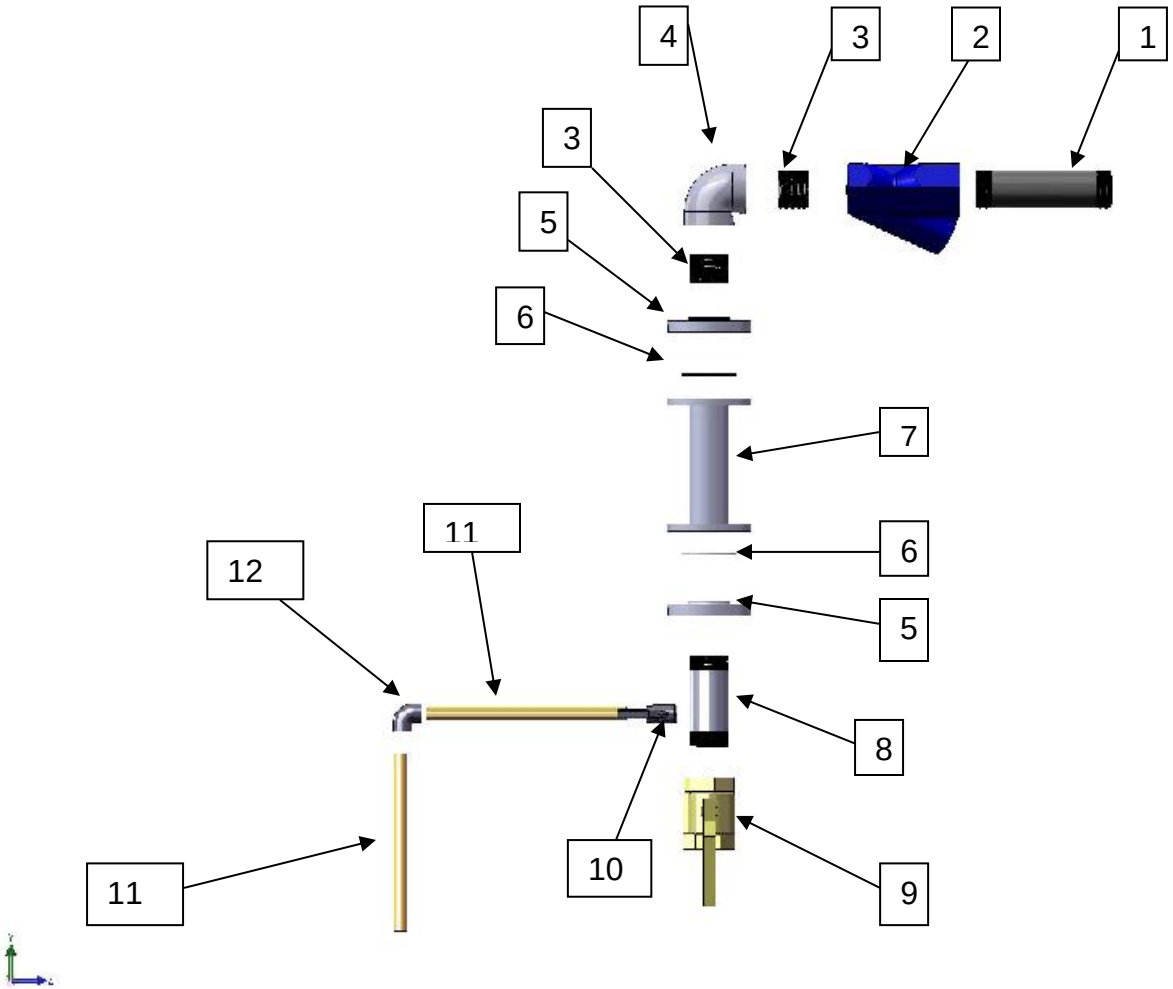
3. **Tank Clean Out.**
   Clean out the bottom of the tank at minimum every 2 years. Drain through bottom valve. Failure to do this can result in permanent damage to tank.

4. **Ladder and safety railing:**
   Inspect ladder and safety railing annually for rust or broken parts. Paint/repair as needed.

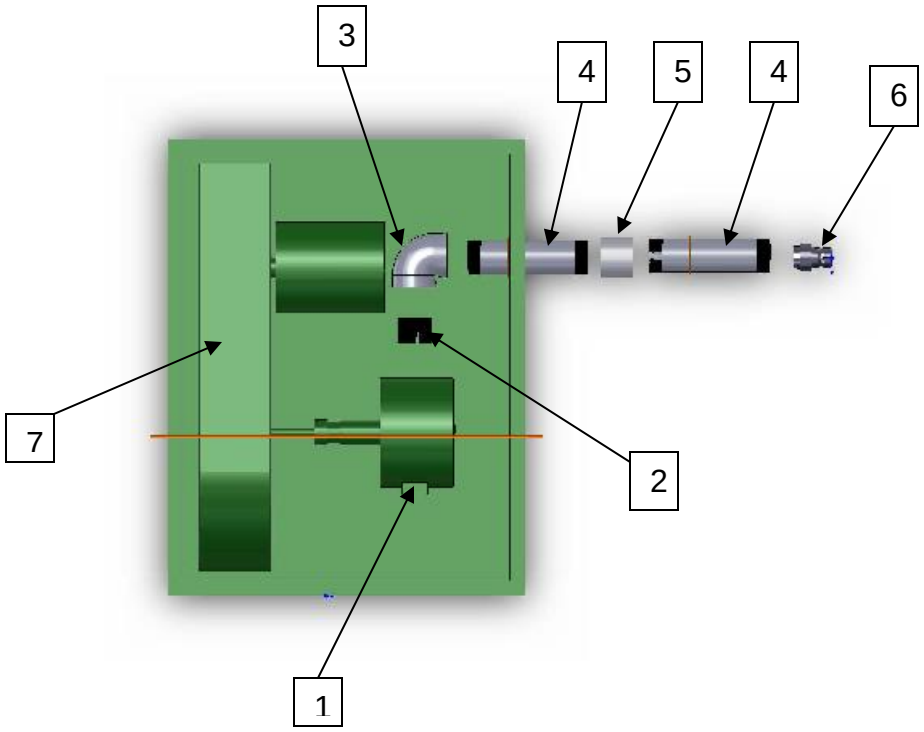
5. **Aluminum Cover:**
   Examine aluminum cover for damage and repair as needed.



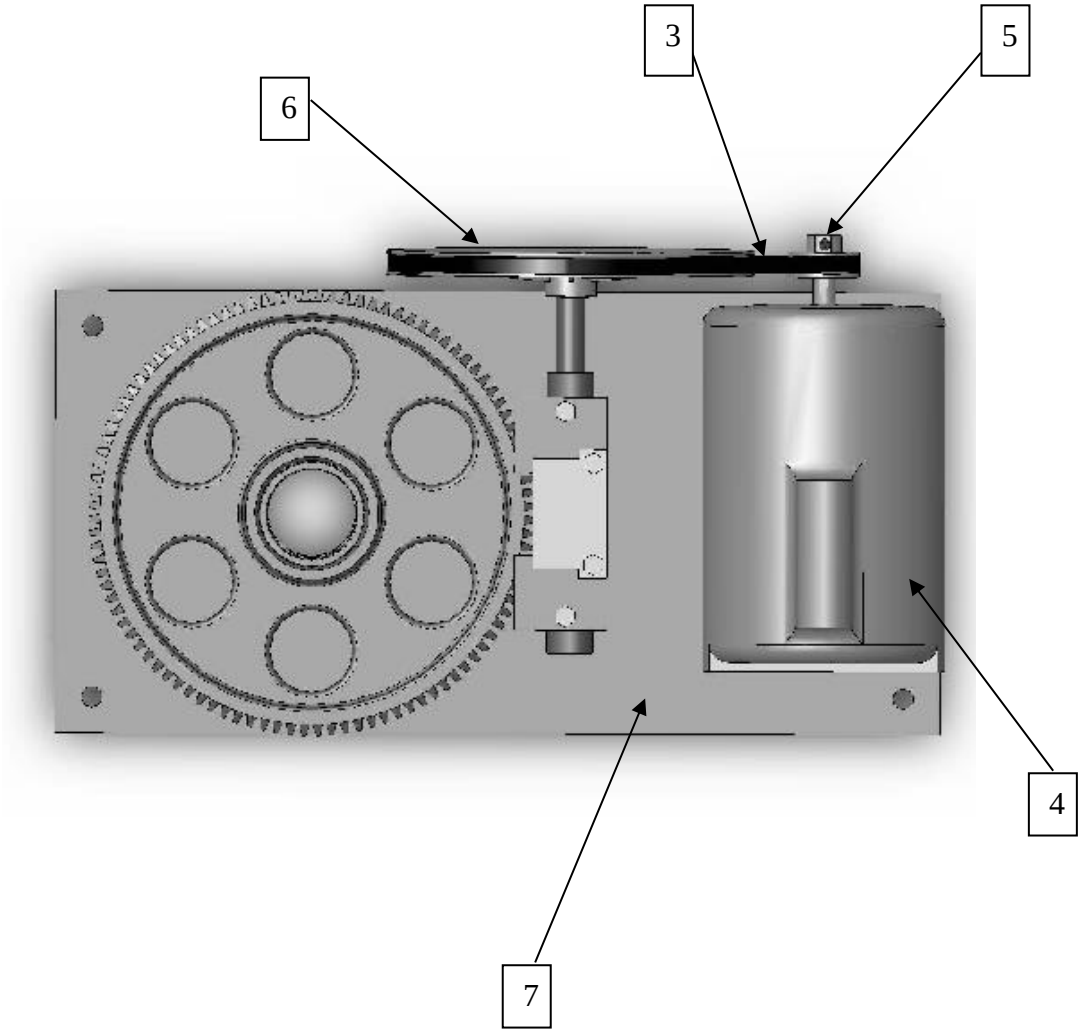

| ITEM | PART NO. | DESCRIPTION |
|---|---|---|
| 1 | 121079 | MANHOLE COVER GASKET |
| 2 | 130592 | TEMPERATURE GAUGE |
| 3 | 121015 | APPOLO HIGH PRESSURE 3" BALL VALVE |
| 4 | 408319 | TANK BLEEDER ASSEMBLY |
| | 130712 | HEAT TAPE (NOT SHOWN) |
| | 155585 | REMOVABLE VALVE COVER CVR-1 (NOT SHOWN) |
| | 155586 | REMOVABLE VALVE COVER 10" X 8" LONG (NOT SHOWN) |
| | 155587 | REMOVABLE VALVE COVER 8" X 9" LONG (NOT SHOWN) |
| 5 | 130728 | CONTROL MODULE (NEW) |
| 5 | 130729 | CONTROL MODULE (REFURBISHED) |




| ITEM # | PART # | DESCRIPTION |
|---|---|---|
| 1 | 121046 | 3” X 12” NIPPLE |
| 2 | 121080 | Y STRAINER |
| 3 | 120924 | 3” CLOSE NIPPLE |
| 4 | 120861 | 3” 90 DEG ELBOW |
| 5 | 121075 | FLANGE |
| 6 | 121074 | GASKET SET W/ BOLT |
| 7 | 121073 | FLEX COUPLING |
| 8 | 408319 | TANK BLEEDER |
| 9 | 121015 | 3” BALL VALVE |
| 10 | 121059 | 1” BALL VALVE |
| 11 | 121040 | 1” X 16” NIPPLE |
| 12 | 121041 | 1” X 18” NIPPLE |
| 13 | 130712 | HEAT TAPE (PER FT) |




| Item # | Part # | Description |
|---|---|---|
| 1 | 408163 | PUMP |
| 2 | 120924 | 3” CLOSE NIPPLE |
| 3 | 120861 | 3” 90 DEG ELBOW |
| 4 | 121046 | 3” X 12” NIPPLE |
| 5 | 427181 | 3” COUPLING |
| 6 | 121032 | 3” MALE CAMLOCK |
| 7 | 111750 | PUMP BELT |
| 8 | 130712 | HEAT TAPE (PER FT) |




| Item # | Part # | Description |
|---|---|---|
| 3 | 111757 | AGITATOR BELT |
| 4 | 130705 | ELECTRIC MOTOR 240V 1PH ¾ HP |
| 4 | 130706 | ELECTRIC MOTOR 240V/480V 3PH ¾ HP |
| 4 | 130703 | ELECTRIC MOTOR 240V 1PH 1 HP |
| 4 | 130704 | ELECTRIC MOTOR 240V/480V 3PH 1 HP |
| 5 | 111754 | AGITATOR MOTOR PULLEY |
| 6 | 111753 | 10” PULLEY |
| 7 | 111758 | AGITATOR GEAR ASSEMBLY |

# Manual Timer Instructions

INTERMATIC T1975 - 125 VOLT 60 HZ CLOCK MOTOR
INTERMATIC T1976 - 208-277 VOLT 60 HZ CLOCK MOTOR

PROGRAM TIME SWITCH WITH "SKIPPER"
FOR UP TO 48 TIMING OPERATIONS ON 24 HOUR SCHEDULE
SINGLE POLE DOUBLE THROW

SWITCH RATING: 20 AMP, 125-480 VOLTS A.C. ½ HP-125V 1HP-250V

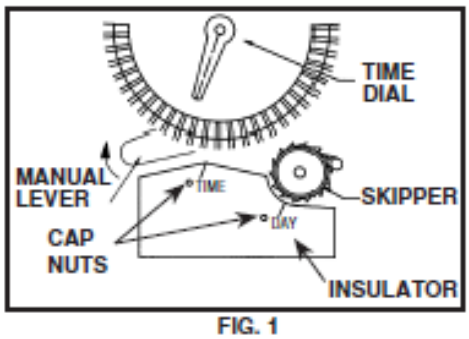
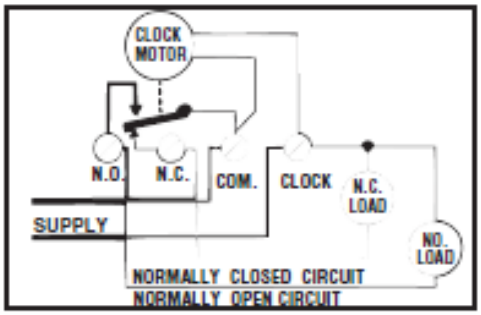



FIG. 1




WIRING DIAGRAM

**WIRING INSTRUCTIONS**

This Time Switch can be wired to control two circuits as Single Pole Double throw, or to control one circuit as Single Pole Single Throw. Either normally open (NO) or normally closed (NC). To wire switch see wiring diagram above.

**PROGRAMMING INSTRUCTIONS**

1. **TO PROGRAM TIME SWITCH,** Depress tripper(s) into dial at desired time(s) operation(s) is/are required.
   • **ON TIME:** First tripper turns on the load for 16-20 minutes. Each additional tripper will lengthen the on time by 15 minutes. If skipping of selected days is desired, the skipper tripper (silver color) should be used to initiate the first operation of the daily program, provided that there is at least 3 hours between the last operation of the previous day and the first operation of the present day.
   • **OFF TIME:** First tripper in raised position turns off the load for 10-14 minutes. Each additional space will lengthen the off time by 15 minutes.
2. **SET TIME-OF-DAY:** Turn dial in clockwise direction only and align the exact time-of-day (the time now when switch is being put into operation) to the "TIME" arrow on insulator.
3. **CHECK SKIPPER WHEEL** If switch is to function seven days a week, pull all pins, in skipper wheel up to "OUT" position. Otherwise depress pin(s) in skipper wheel for day(s) automatic operation is not required.
   • If, after the dial is set to the correct time of day, and the skipper tripper (silver color) has not yet passed the skipper wheel, turn wheel counter clockwise so that the previous day is opposite the "DAY" arrow.
   • If the skipper tripper has already passed the skipper wheel, set the correct day opposite the "DAY" arrow.

**OPERATING INSTRUCTIONS**

**TO CONTROL LOADS MANUALLY,** Move manual lever (See Figure 1) up. This lever will close normally open circuit and open the normally closed circuit. To return, to automatic control, move lever back to its original position .

**IN CASE OF POWER FAILURE,** reset dial. See step (2) of programming instructions.

**TO REMOVE MECHANISM FROM CASE,** Disconnect electricity and all wiring. Depress retainer spring at upper left, then grasp dial and pull mechanism out.

**INTERMATIC INCORPORATED**
SPRING GROVE, ILLINOIS 60081-9698

# DURATANK WARRANTY

Duraco, Inc. warrants its DuraTank to be free from defects in material and workmanship for a period of one (1) year from the date of original purchase. The warranty is in lieu of all other warranties expressed or implied.

This warranty does not apply to any part of the goods which has been subjected to improper or abnormal use, negligence, alterations, accident, or damage due to lack of maintenance.

Duraco, Inc. will replace for the Purchaser any part or parts found upon examination to be defective under normal use and service due to defects in material or workmanship.

# Asphalt Emulsion Information

Asphalt emulsions are classified into-three categories: anionic, cationic, and nonionic. In practice, the first two types are more widely used in roadway construction and maintenance. Nonionics may become more important as emulsion technology advances. The anionic and cationic classes refer to the electrical charges surrounding the asphalt particles. This identification system stems from a basic law of electricity -like charges repel one another and unlike charges attract.

When two poles (an anode and a cathode) are immersed in a liquid and an electric current is passed through, the anode becomes positively charged and the cathode becomes negatively charged. If a current is passed through an emulsion containing negatively charged particles of asphalt, they will migrate to the anode. Hence, the emulsion is referred to as anionic. Conversely, positively charged asphalt particles will move to the cathode and the emulsion is known as cationic. With nonionic emulsions, the asphalt particles are neutral and do not migrate to either pole.

Emulsions are further classified on the basis of how quickly the asphalt droplets will coalesce; (i.e., revert to asphalt cement). The terms RS, MS, SS and QS have been adopted to simplify and standardize this classification They are relative terms only and mean rapid-setting, medium-setting, slow-setting and quick-setting. The tendency to coalesce is closely related to the speed with which an emulsion will become unstable and break after contacting the· surface of an aggregate. An RS emulsion has little or no ability to mix with an aggregate, an NIS emulsion is expected to mix with coarse but not fine aggregate, and SS and QS emulsions are designed to mix with fine aggregate, with the QS expected to break more quickly than the SS.

Emulsions are further identified by a series of numbers and letters related to viscosity of the emulsions and harness of the base asphalt cements. The letter "C" in front of the emulsion type denotes cationic. The absence of the "C" denotes-anionic in American Society for Testing and Materials (ASTM) and American Association of State Highway and Transportation Officials (AASHTO) specification. For example, RS-1 is anionic and CRS-1 is cationic.

The numbers in the classification indicate the relative viscosity of the emulsion. For example, an MS-2 is more viscous than an MS-1. The "h" that follows certain grades simply means that harder base asphalt is used. An "s" means that softer base asphalt is used.

The "HF" preceding some of the anionic grades indicates high-float, as measured by the float test. High-float emulsions have a gel quality, imparted by the addition of certain chemicals that permits a thicker asphalt film on the aggregate particles and prevents

drain off of asphalt from the aggregate. These grades are used primarily for cold and hot plants mixes, seal coats and road mixes.

ASTM and AASHTO have developed standard specifications for these grades of emulsion:

| **Asphalt Emulsion** (ASTM D977, AASHTO M140) | **Cationic Asphalt Emulsion** (ASTM D2397, AASHTO M208) |
|---|---|
| RS-1 | CRS-1 |
| RS-2 | CRS-1 |
| HFRS-2 | - |
| MS-1 | - |
| MS-2 | CMS-2 |
| MS-2h | CMS-2h |
| HFMS-1 | - |
| HFMS-2 | - |
| HFMS-2h | - |
| HFMS-2s | - |
| SS-1 | CSS-1 |
| SS-1h | CSS-1h |

Most producers may not stock all grades of emulsion. As well, many states have their own specifications that do not follow ASTM or AASHTO guidelines for naming emulsions. Communication and planning between user and producer helps facilitate service and supply of a given grade.

Quick setting emulsions have been developed for slurry seals. Cationic quick set (CQS) emulsions are widely used for their versatility with a wide range of aggregates and rapid setting characteristics. Several states use CQS and QS emulsion specifications for slurry seal applications. These specifications are similar to ASTM and AASHTO CSS-lh and SS-lh requirements except that the cement mixing requirement is waived.

Micro-surfacing uses an emulsion often referred to as CSS-lh-p. As with quick set emulsions, micro-surfacing emulsions are required to meet ASTM and AASHTO CSS-lh requirements with the exception of the cement mixing test In addition, a minimum polymer content normally is specified as 3% of solids based on the weight of the asphalt in the emulsion. This addition enhances the high temperature performance of the asphalt and permits application of micro-surfacing in wheel ruts and other areas where multiple stone depths are required.

The expanding use of polymer modified asphalts has contributed a whole new family of emulsion grades. Adding one letter (usually P, S or L) to the end of the grade (e.g., HFRS-2P) normally designates modified emulsions.

Cationic emulsion specifications (ASTM D 2397, AASHTO M 208) permit solvent in some grades but restrict the amount. Some user agencies specify an additional cationic sand-mixing grade designated CMS-2s that contains more solvent than other cationic grades.

**STORAGE TEMPERATURES FOR ASPHALT EMULSIONS**

| **GRADE** | **TEMPERATURE,** °0C (°0F) | |
|---|---|---|
| | MINIMUM | MAXIMUM |
| RS-1 | 20° (70°) | 60° (140°) |
| RS-2, CRS-1, CRS-2, HFRS-2 | 50° (125°) | 85° (185°) |
| SS-1, SS-1h, CSS-1, CSS-1h, MS-1, HFMS-1 | 10° (50°) | 60° (140°) |
| CMS-2, CMS-2h, MS-2, MS-2h, HFMS-2, HFMS-2h, HFMS-2s | 50° (125°) | 85° (185°) |

**RAPID-SETTING EMULSIONS**
The rapid-setting grades are designed to react quickly with aggregate and revert from the emulsion to the asphalt. They are used primarily for spray applications, such as aggregate (chip) seals, sand seals, and surface treatments. The RS-2, HFRS-2 and CRS-2 grades have high viscosity to prevent runoff. Polymer modified versions of these emulsions are routinely used where rapid adhesion is necessary; such as in high traffic areas, when there is minimal traffic control, or where there is heavy truck traffic.

**MEDIUM-SETTING EMULSIONS**
Medium-setting grades are designed for mixing with graded aggregate. Because these grades are formulated not to break immediately upon· contact with aggregate, they can coat a wide variety of graded aggregates. Mixes using medium setting emulsions can remain workable from a few minutes to several months depending upon the formulation. Mixes are produced in pugmills and travel plants or can be road mixed. In recent years, they have been used in cold recycling applications.

Examples of medium-setting emulsions are MS-2, CMS-2 and HFMS-2. Nomenclature for medium-setting emulsions varies from state to state. Consultation with your local emulsion manufacturer is suggested for recommendations.

High-float is a special class of anionic MS emulsion. The major difference between these emulsions and the conventional medium-setting is the existence of a gel structure

in the asphalt residue that is measured by the float test. The float characteristic increases film thickness. While regular asphalt may have a tendency to flow or migrate, the high-float residues are designed to stay in place up to 70°C (160°F). Therefore, high-float residues are less susceptible to changes in temperature and very resistant to flow at high temperatures during the summer.

Polymer modified versions of medium-setting emulsions may be used where additional stability or improved durability is needed to where improved water resistance is important.

**SPRAY INJECTION PROCESS REPAIR OF POTHOLES**

The methods typically used for the repair of potholes using asphalt emulsions are throw and-roll, semi-permanent and full-depth removal and replacement. All of these methods involve placing cold mix in the pothole with a shovel and compacting with a truck tire, vibratory plate compactor or steel-wheeled roller. Maintenance mixes for these repair methods and other patching are covered in Chapter 9 Asphalt Pavement Recycling of this manual. For information on pavement repair procedures, refer to Asphalt in Pavement Maintenance, Manual Series No. 16 (MS016), asphalt Institute.

Another method for repairing potholes is by spray-injection. A special piece of equipment, either trailer or truck-mounted, combines together and blows asphalt emulsion and coarse crushed aggregate into the pothole. The spray-injection procedure consists of these steps:

- Blowing or water and debris from the pothole.
- Spraying a tack coat of asphalt emulsion on the sides and bottom of the pothole.
- Blowing of emulsion and aggregate into the pothole.
- Covering the repaired area with a thin layer of aggregate.
- Opening the repair to traffic as soon as workers and equipment are clear. This method of repair requires no, compacting after the cover aggregate has been placed.

Experience has shown that the asphalt emulsion to use for spray injection varies between summer and winter application. Summer application, for temperature above 1 0°C (50°F), works best with CRS-2, RS-2 or HFRS-2 grades. Limiting the penetration of the residue to a maximum of 135 within the range allowed in the emulsion specification has also shown beneficial in the performance of spray injected patches placed in warm weather.

Winter applications [colder than l0°C (50°F)] call for a CMS-2, MS-2 or HFMS-2 emulsion. Requiring the penetration of the residue to be a minimum of 135 within the range allowed in the emulsion specification has also shown beneficial in the performance of spray-injected patches placed in cool weather.

For good aggregate coating under either temperature condition, experience has shown the emulsion temperature should be about 65°C (150°F), and the emulsion's Saybolt Furol viscosity at *50°C* (122°F) should be limited to 250 seconds.

Aggregate sizes that work best for spray injection are AASHTO or ASTM size No. 9 [4-75 to 1. 18 mm (No. 4 to No. 16)] with no more than 3 percent passing the 75 um (No. 200) sieve. Crushed aggregate material is recommended for spray injection. Using the emulsions described above, an asphalt emulsion content of approximately seven percent by weight of aggregate works best for warm weather conditions, while spray injection patched placed in winter conditions perform well at an asphalt emulsion content of about five percent by weight of aggregate.

**SOURCE: Asphalt Institute, A Basic Asphalt Emulsion Manual No. 19**

# Handling Asphalt Emulsions

**DON'T** use tight clearance pumps; they may seize

**DON'T** leave emulsion in pumps, valves, or lines during freezing weather.

**DON'T** hold emulsions in lines and pumps for extended periods.

**DON'T** apply severe heat to pump casings or packing glands. The pump may be damaged and the emulsion may break.

**DON'T** store emulsions in horizontal tanks.

**DON'T** circulate emulsions excessively. Emulsions tend to loose viscosity when pumped.

**DON'T** dilute rapid-setting emulsions with water. Never add emulsion to water.

**DON'T** dilute emulsions with unpotable or cold water.

**DON'T** pump emulsions into open air or have inlet lines near top of tank.

**DON'T** place outlet lines in mid tank.

**DON'T** mix emulsions of different chemical types or designations. Anionic and cationic emulsions may coagulate when mixed.

**DON'T** subject emulsion or the air above it to open flame or strong oxidants. Never heat the emulsion over 190°F (88°C).

**DON'T** **proceed if you have questions.**

**DO** set the clearance on pumps for emulsions to prevent binding and to prevent breaking of the emulsion.

**DO** clear lines, valves, and pumps of emulsion. Drain pumps and remove plugs during freezing weather.

**DO** drain pumps and remove plugs when not in service. No. 1 or No. 2 fuel oil may be used to keep pumps free.

**DO** warm the pump casings and packing glands to about 150°F (65°C) to ease start up.

**DO** store emulsions in vertical tanks to prevent excessive skin formation

**DO** gently circulate emulsions when heating or after prolonged storage.

**DO** dilute medium and slow-setting emulsions by adding warm water to the emulsion.

**DO** check compatibility of water and emulsions in a flask prior to use on larger volume.

**DO** place inlet and return lines near the bottom of the tank to prevent foaming.

**DO** pump emulsions from the bottom of the tank to reduce skin formation.

**DO** drain tanks to no measureable quantity before adding an emulsion of different type. Emulsions with the same designation may be very different in performance.

**DO** provide adequate ventilation. Heat only to reasonable temperatures.

**DO** **consult your AEMA Member Company for additional emulsion information.**

# TX DOT FILTER AND BELT IDENTIFICATION FORM

## FILTERS

| FILTER TYPE (Air, Oil, Hydraulic) | LOCATION (Engine, Trans.) | EQUIPMENT (Manufacturer's Part No.) | FILTER (Manufacturer's Name) | FILTER (Manufacturer's Part No.) |
|---|---|---|---|---|
| | | | | |
| N/A | N/A | N/A | N/A | N/A |

## BELTS

| BELTS TYPE (Alt., Power Steering) | EQUIPMENT (Manufacturer's Part No.) | BELT (Manufacturer's Name) | BELT (Manufacturer's Part No.) |
|---|---|---|---|
| | | | |
| AGITATOR | 4L-360 | DURAFLEX GL | 4L-360 |
| PUMP MOTOR | R3VX560 | THERMOID | 3VX560 |

# 300 Series
# Bowie Rotary Gear Pumps

Standard Bushing Type
2” - 3” - 4”

## Construction Features:

Rugged Housing
- Ductile Cast Iron Housing for General and Heavy-Duty Applications

Gears or Impellers
- Buna/Nitrile for Most Hydrocarbons, Fats, Oils, Greases, Hydraulic Fluids, Water, Chemicals
- Polyurethane for Moderate Chemicals, Oils, Fats, Greases and Many Hydrocarbons
- Ductile Iron for Certain Chemicals and Solvents, High-Temperature Oils and Greases

Bushings
- Brass for Oils, Fats, Greases, Corrosive Fluids & Water

Shafts
- Fatigue Proof for General Purpose, Heavy Duty Use
- Stainless Steel for Extra Corrosive Resistance & Durability

BOWIE INDUSTRIES, INC

Designed for trouble free operation under a varied range of temperature conditions. The general purpose 300 Series pump is widely used in the transfer of fluids, oil tank trucks, and transfer. The 300 Series -2”, -3”, -4” can be used with clockwise or counter clockwise rotation.

# TROUBLESHOOTING TIPS FOR A PUMPING SYSTEM

| Problem | Probable Cause | Solution |
|---|---|---|
| **Fluid vaporization ('starved' pump inlet)** | Strainers, foot valves, inlet fittings or clogged lines | Clear lines. If problem persists, inlet system may require change |
| | Inlet line too small or length too long. Too many fittings or valves. Foot valves or strainers too small | Increase inlet line size or reduce length |
| | NIPA too low | Raise liquid level in source tank or increase by raising or pressurizing source tank or select larger pump size with smaller NIPR |
| | Fluid viscosity greater than expected | Reduce pump speed and accept lower flow or change system to reduce line losses |
| | Fluid temperature higher than expected (vapor pressure higher) | Reduce temperature, reduce speed and accept lower flow or change system to increase NIPA |
| **Noisy operation** | *Cavitation:* High fluid viscosity. High vapor pressure fluids. High temperature | Slow down pump, reduce temperature, change system |
| | *Air or Gas in Fluid:* Leaks in pump or piping | Correct leaks |
| | Disolve gas or naturally aerated products | Minimize discharge pressure. (also see *cavitation*) |
| | *Mechanical noises gear to body contact:* Improper assembly | Check clearances with pump gasket |
| | *Rotor to body contact:* Distortion of pump due to improper piping installation | Reassemble pump or reinstall piping to assure free running |
| | Pressure higher than rated | Reduce pressure if possible |
| | Worn bushings or bearings | Rebuild with new bearings or bushings, lubricate regularly |
| | Worn gears | Rebuild with new gears, lubricate regularly |
| | Relief valve chattering | Re-adjust, repair or replace |
| **Pump requires excessive power (Overheating, stalls, high current draw, breaker trip)** | Higher than expected viscous losses than expected | If within pump rating , increase drive size |
| | Fluid sets-up in line and pump during shut down | Insulate or heat trace line. Install 'soft start' drive. Install re-circulating bypass system. Flush with other fluid |
| | Fluid colder than expected | Heat fluid, insulate or heat trace lines. Use pump with more pump clearances |
| | Higher than expected pressure | Reduce pump speed, increase line sizes |

| Problem | Probable Cause | Solution |
|---|---|---|
| **Insufficient flow, fluid being bypassed somewhere** | Relief valve not properly adjusted or is jammed | Adjust or clear valve |
| | Flow diverted in branch line, open valve, etc. | Check system and controls |
| **Insufficient flow, high slip** | Hot (HC) or extra clearance on cold fluid, and/or low viscosity fluid | Replace with standard clearance gears |
| **Insufficient flow** | Low speed | Check flow speed chart |
| | Air leak, bad seals | Replace seals, check inlet fitting |
| **No flow** | Relief valve not properly adjusted or held off seat by foreign matter (flow re-circulated to inlet) | Adjust or clear valve |
| **No flow, pump turning** | Wrong pump rotation direction | Reverse flow direction |
| **Now flow, pump not turning** | Keys sheared or missing on pump drive shaft or pump gears | Replace |
| **No flow, pump not priming** | Air leaks, bad seals or pipe connections | Replace seals, check for line leaks |
| | Liquid drains/siphons during off periods | Use foot valves or check valves |
| | Inlet Valve closed | Open valve |
| | Inlet line restricted or clogged | Clear line, remove obstructions |
| **'Short' pump service life** | High corrosion rate | Upgrade material of pump |
| | Pumping abrasives | Larger pumps at slower speed |
| | Speeds and pressures higher than rated | Reduce speeds and pressures by changes in system |
| | Worn bearings and gears due to lack of lubrication | Set-up and follow regular lubrication schedule |
| | Misalignment of drive and/or piping. Excessive overhung load or misaligned couplings | Check alignment and loads |

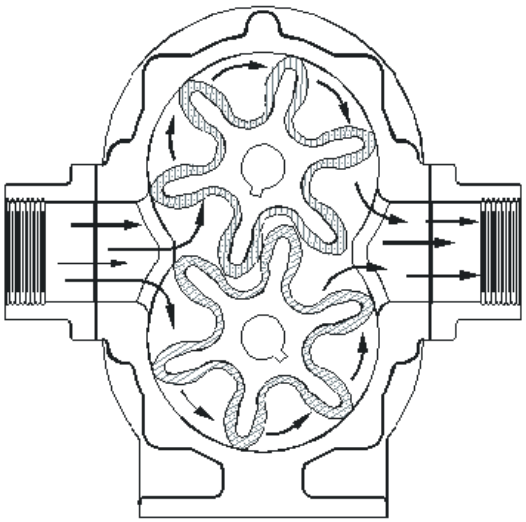
BOWIE INDUSTRIES, INC

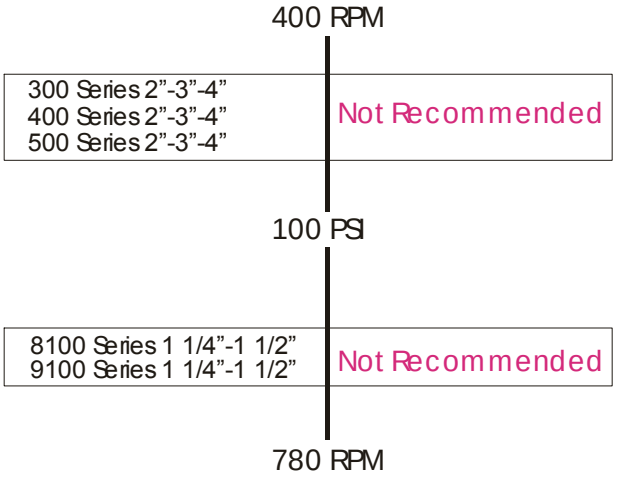
BOWIE PUMPS

1004 E. Wise St PO Box 931 Bowie, TX 76230
(800) 433-0934 FAX (940) 872-4792 www.bowiepump.com

## PUMPING PRINCIPLE:

**The meshing of the gears cause a slight depression, with the resulting enmeshing of the gears causing a vacuum drawing the fluid being pumped into the space between the teeth of the gear. The liquid is carried between the teeth and the case to the opposite side of the pump. The fluid is also forced into the discharge line by the meshing of the gears. *Bowie Pumps* are positive displacement pumps. The pumping gears are of equal size and are the only two moving parts in the pump, which promotes longer life**



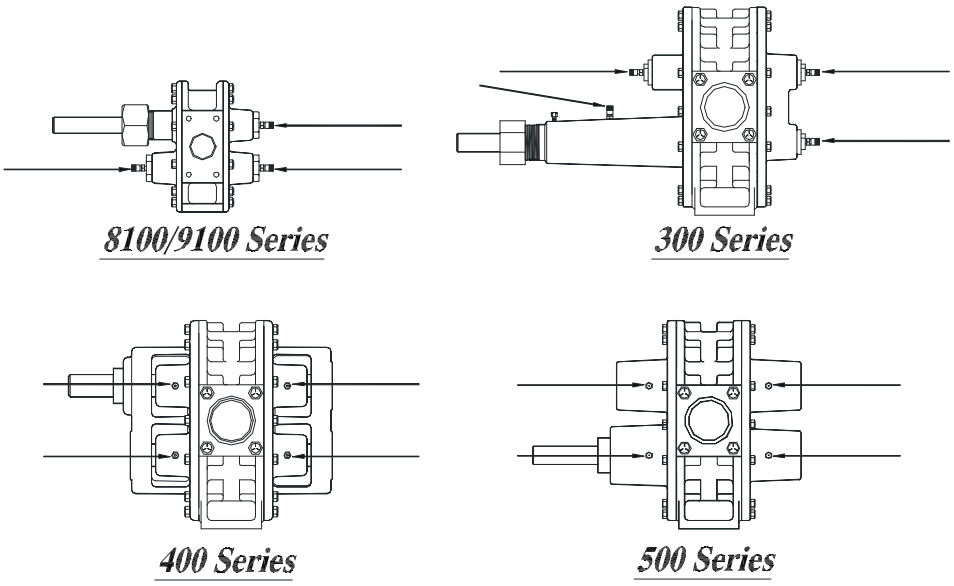



## LUBRICATION:

*Bowie Pumps* require lubrication only where grease fittings are provided. All bearings and bushing type pumps require a good grade of gun grease to insure longer life of the pumps.

No lubrication is required on bushing or bearing type pumps if oil is pumped exclusively. This is the only exception.

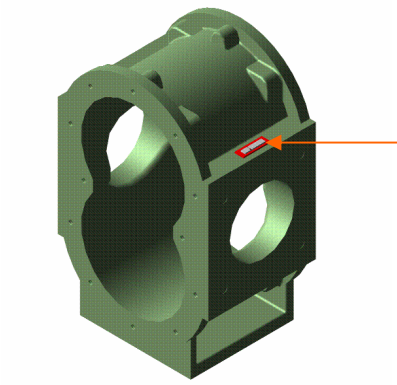
Periodic lubrication is of utmost importance in the care of the *Bowie Pumps.* This point cannot be over emphasized. Depending upon use this lubricating should be done every four (4) hours of continuous operation.

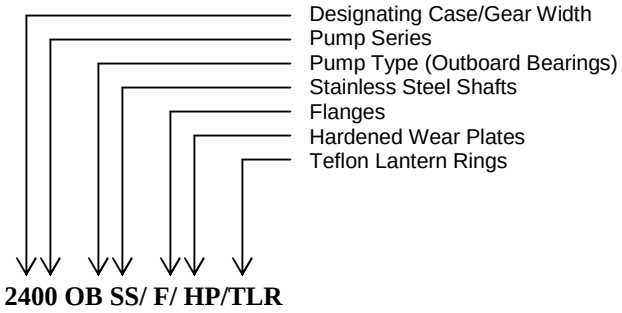



Typical Lubrication Locations

## PUMP IDENTIFICATION:

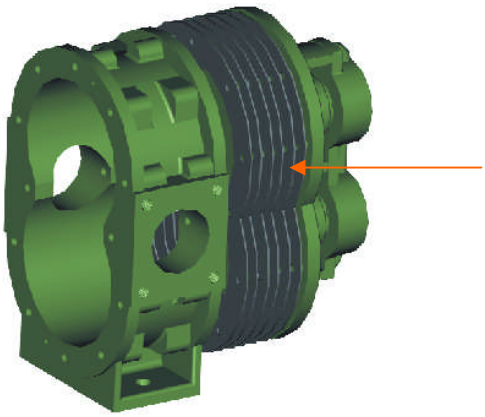
Pump identification codes i.e.:




## ADJUSTMENT FOR CLEARANCE: All Series *Bowie Pumps*

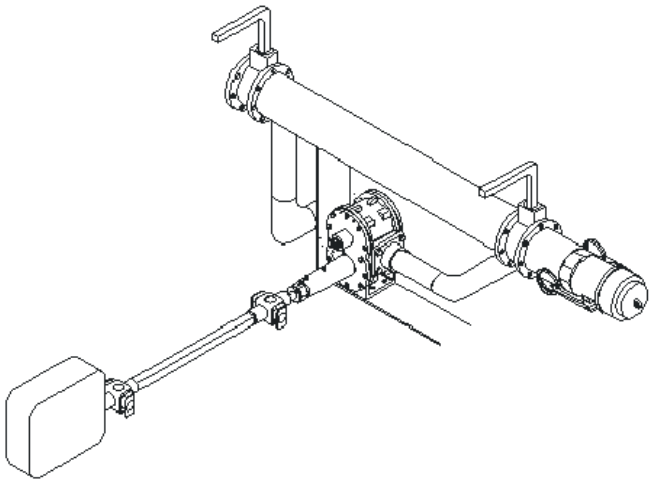
Should it be necessary to adjust the pumps due to excessive clearance from normal wear of the impellers between the front and back plate housing. Remove the back plate and remove one, two or three pump gaskets as may be required to take up the slack. Replace back plate being careful that the remaining gaskets are not damaged. Tighten the bolts diametrically opposed to each other. Tighten bolts evenly.

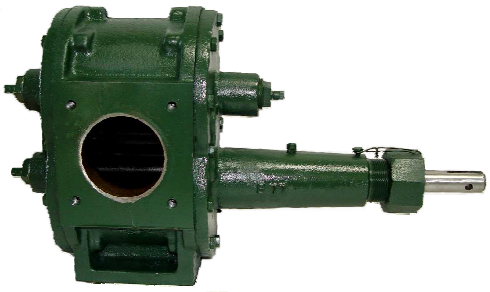


## INSTALLATION:

Bowie Pumps are ideally adapted to truck mount power take-offs. The most popular method of tank truck installation is 'direct-drive', with two U-joints being used (one on each end of the drive shaft). A sleeve joint is recommended at the pump to compensate for any play caused by road conditions. The alignment is most important in mounting pumps on tank trucks. Misalignment will cause excessive wear on U-joints and many breakdowns due to U-joint failure. The alignment should be held to not less than 3 degrees and not more than 15 degrees. Line connection if possible never should be allowed a deviation in excess of 20 degrees between the two joints.

Chain and V-belt drives are the most popular and economical method for installing the Bowie pump on drive equipment other than tank trucks. It is recommended to use a pillow block bearing on all series Bowie pumps when using V-belt or chain drives due to the side pull and weight on the drive shaft.





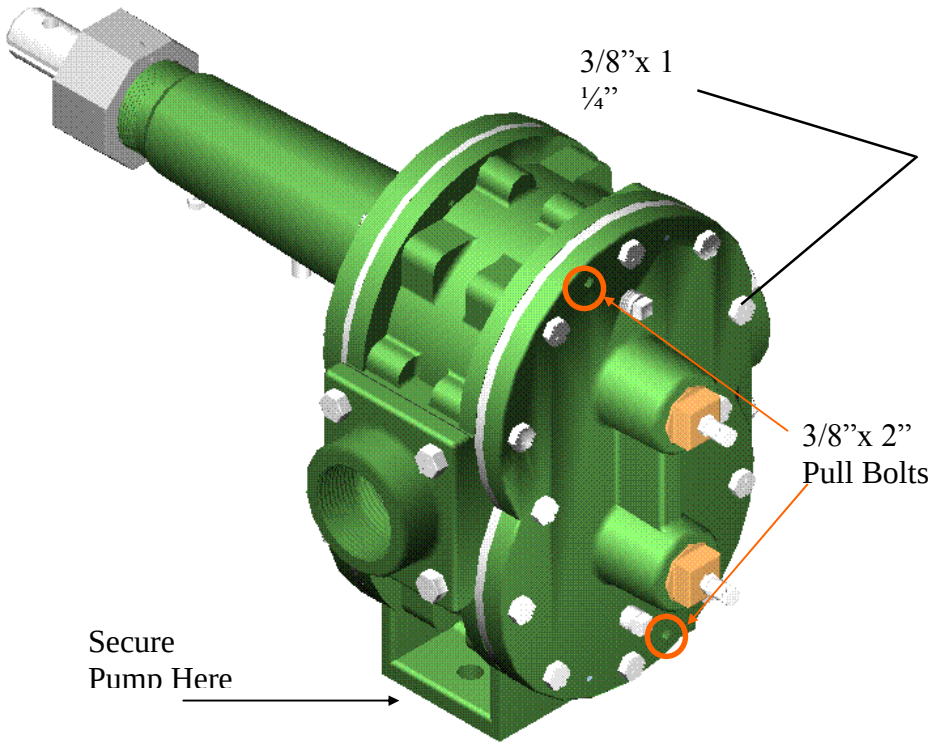
# 300 Series Bowie Pump

| BOWIE PUMP RATINGS FOR 2" PUMP SIZES - -FLUID KEROSENE | | | | |
|---|---|---|---|---|
| **Pump RPM** | **Temperature Of Fluid °F** | **Discharge Pressure** | **Capacity GPM** | **Brake Horsepower** |
| 190 | 147 | 6 | 68.5 | .83 |
| 190 | 147 | 10 | 67.0 | 1.0 |
| 190 | 147 | 30 | 60.0 | 1.9 |
| 190 | 147 | 50 | 55.8 | 2.7 |
| 190 | 146 | 70 | 53.0 | 3.6 |
| 190 | 146 | 100 | 50.0 | 4.7 |
| 280 | 146 | 10 | 99.0 | 1.8 |
| 280 | 146 | 30 | 95.0 | 3.1 |
| 280 | 146 | 50 | 89.0 | 4.3 |
| 280 | 146 | 70 | 86.0 | 5.6 |
| 280 | 146 | 100 | 83.0 | 7.5 |
| 420 | 146 | 20 | 147.0 | 4.3 |
| 420 | 146 | 40 | 144.0 | 3.9 |
| 420 | 147 | 60 | 139.0 | 8.4 |
| 420 | 147 | 80 | 136.0 | 10.3 |
| 420 | 147 | 100 | 133.0 | 12.2 |

| BOWIE PUMP RATINGS FOR 3" PUMP SIZES - -FLUID KEROSENE | | | |
|---|---|---|---|
| **Pump RPM** | **Discharge Pressure** | **Capacity GPM** | **Brake Horsepower** |
| 190 | 6 | 101 | 1.1 |
| 190 | 10 | 99 | 1.3 |
| 190 | 30 | 89 | 2.5 |
| 190 | 50 | 83 | 3.6 |
| 190 | 70 | 78 | 4.8 |
| 190 | 100 | 74 | 6.3 |
| 280 | 10 | 147 | 2.4 |
| 280 | 30 | 141 | 4.1 |
| 280 | 50 | 132 | 5.7 |
| 280 | 70 | 127 | 7.5 |
| 280 | 100 | 123 | 9.9 |
| 400 | 10 | 233 | 5.2 |
| 400 | 20 | 218 | 5.7 |
| 400 | 40 | 213 | 8.6 |
| 400 | 60 | 206 | 11.2 |
| 400 | 80 | 201 | 13.7 |
| 400 | 100 | 197 | 16.2 |

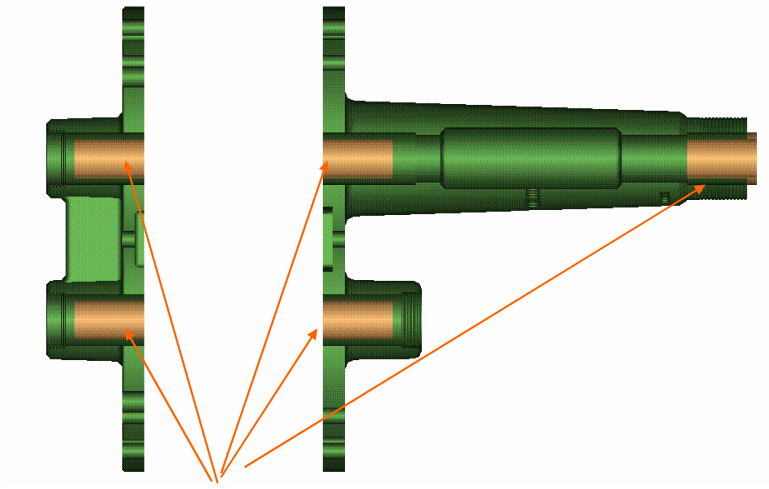
## DISASSEMBLY OF 300 SERIES PUMPS

1. Secure base of pump to table or workbench.
2. Remove twelve (12) 3/8” x 1 ¼” back plate bolts that attaches back plate to center case.




Insert two (2) 3/8”x 2” pull bolts into threaded holes. Remover end plate by sequentially turning the pull bolt so that the plate move evenly on top and bottom to avoid binding on the bushings and shafts.

1. Remove tie wire securing the packing nut. Remove packing nut and packing on drive shaft.
2. Carefully remove drive and idler gears.
3. To remove front plate, remove twelve (12) 3/8”x 1 ¼” front plate bolt that attached the front plate to the center case. Follow steps of line 3 to remove front plate.
4. Remove the two end plugs from the back plate and the one end plug from the front plate.
5. There is access now for removal of the bushings (part #309B), three in the front plate and two in the back plate.

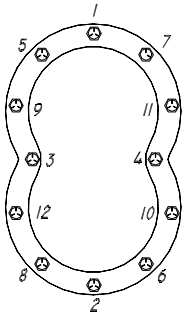


Part #309B

## ASSEMBLY OF 300 SERIES BOWIE PUMPS

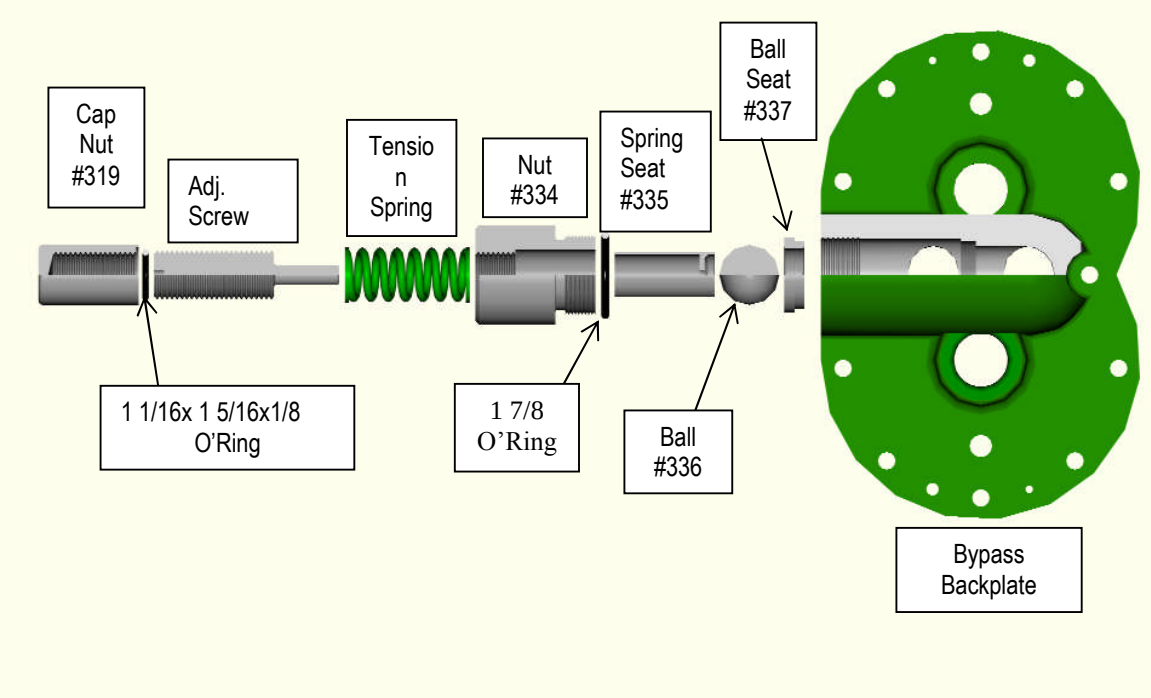
Prior to assembly of pump make sure all parts are clean and free from foreign objects.

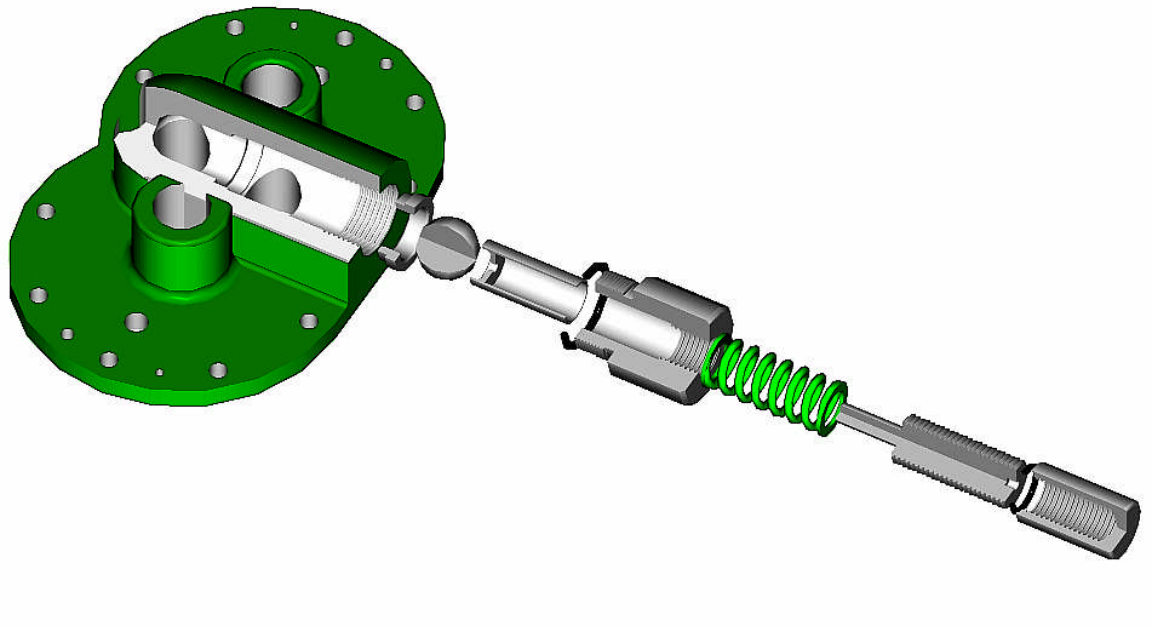
1. Install end plugs and drain plugs into both the front [part no. 302] and back plates [part no. 307].
2. Attach front plate [part no. 302] to center case using one [part no. 306] gasket between plate and center case. Affix bolts finger tight.
1. Solidly secure center case. Lightly oil both the idler and drive gears prior to installation into the center case.
2. Insert idler and drive gears into center case and front plate.
3. Use seven [part no. 306] gaskets between back plate [part no. 307] and center case. Attach back plate to center case with bolts finger tight.
4. Tighten bolt numbers 1 & 2 on both the front and back plates.




5. Oil gears through the input/discharge port
6. Turn the gears several turns with the drive shaft to seat the gears in place. When the gears are turning smoothly tighten bolt numbers 3 & 4 on both the front and back plates. Turn the gears several turns with the drive shaft to assure smooth operation. If the gears turn smoothly then continue to tighten the bolts in the sequence as shown in diagram to 22-25 ft. lbs. Otherwise loosen the bolts and repeat steps 5 & 7.
7. Install taper pins on both plates, top and bottom.
8. Install graphite packing [part no. 313G] into packing nut [part no. 301].
9. Install packing nut over drive shaft and turn until firm, not tight. Note: over tightening can cause damage
10. Use tie wire to secure packing nut in place.
11. Lubricate at all grease fittings. Three are located on end plugs, and one on over front plate drive shaft gland. Grease front plate drive shaft gland until grease starts to come out the packing.

## Bypass Assembly



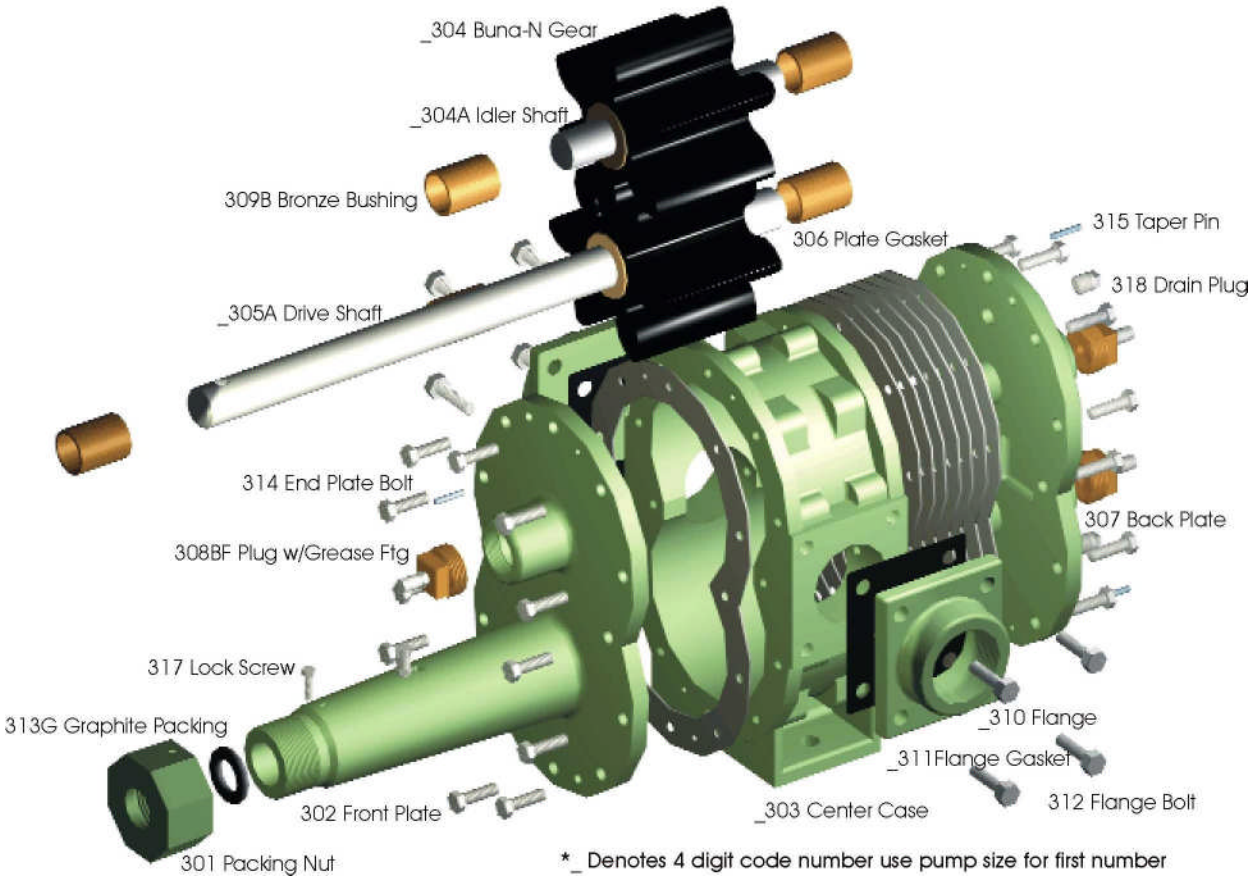



The bypass is easily adjusted and is set for approximately 30 lbs. pressure when leaving the factory. The pressure is easily adjusted with the adjusting screw (#330). Seven turns equals approximately 30 lbs. pressure. The stainless steel ball and seat assures longer life of the bypass. Make sure that the adjusting valve points to the outlet port.
Note: this is a pump option. Not on all Bowie 300 Series pumps.

# 300 Series Parts

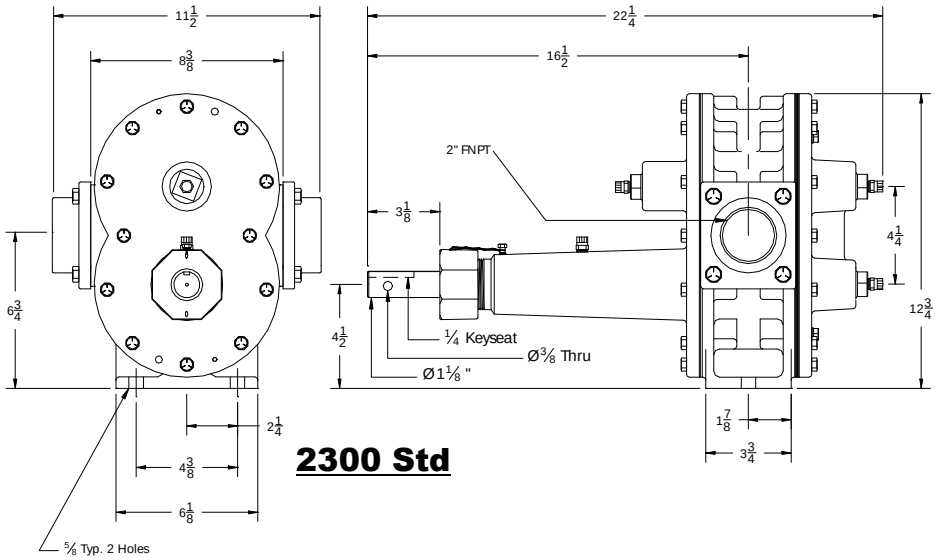
| No | Stock No. | Description | Qty | No | Stock No. | Description | Qty | | No | Stock No. | Description | Qty |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 301 | Nut, Packing | 1 | 8 | 313G | Packing, Graphite | 1 | * | 14 | _303 | Case, Center | 1 |
| 2 | 302 | Plate, front | 1 | 9 | 314 | Bolt, End Plate | 24 | * | 15 | _304G | Gear, Buna-N | 1 |
| 3 | 304K | Key, Gear | 2 | 10 | 315 | Pin, Tape | 4 | * | 16 | _304A | Shaft, Idler | 1 |
| 4 | 306 | Gasket, Plate | 8 | 11 | 316 | Fitting, Grease | 1 | * | 17 | _305A | Shaft, Drive | 1 |
| 5 | 307 | Plate, Back | 1 | 12 | 317 | Screw, Lock | 1 | * | 18 | _310 | Flange, Adapter | 2 |
| 6 | 308BF | Plug, Bronze W/Grease Ftg | 3 | 13 | 318 | Plug, Drain | 2 | * | 19 | _311 | Gasket, Flange | 2 |
| 7 | 309B | Bushing, Bronze | 5 | | | | | * | 20 | _312 | Flange, Bolt | 8 |

*** Denotes 4 digit code number use pump size for first number**

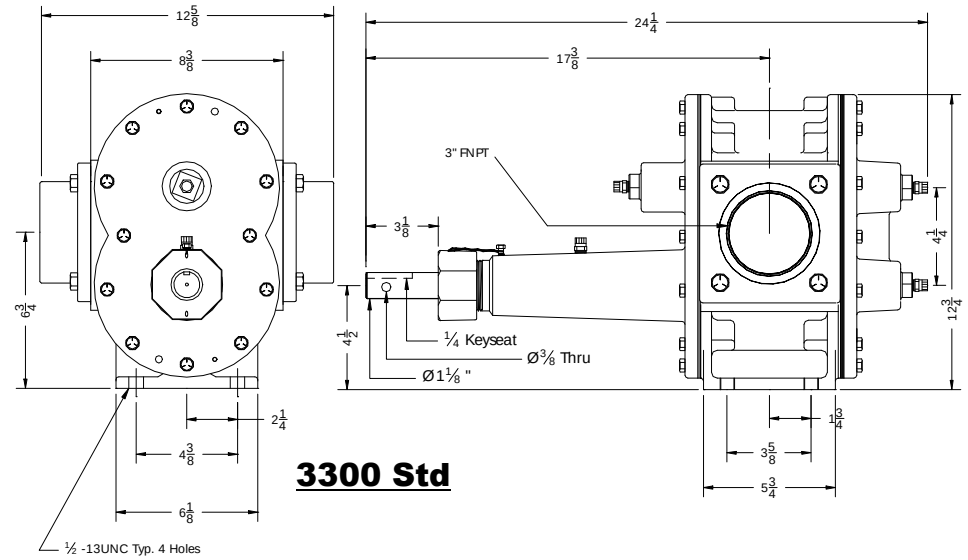



## Options:

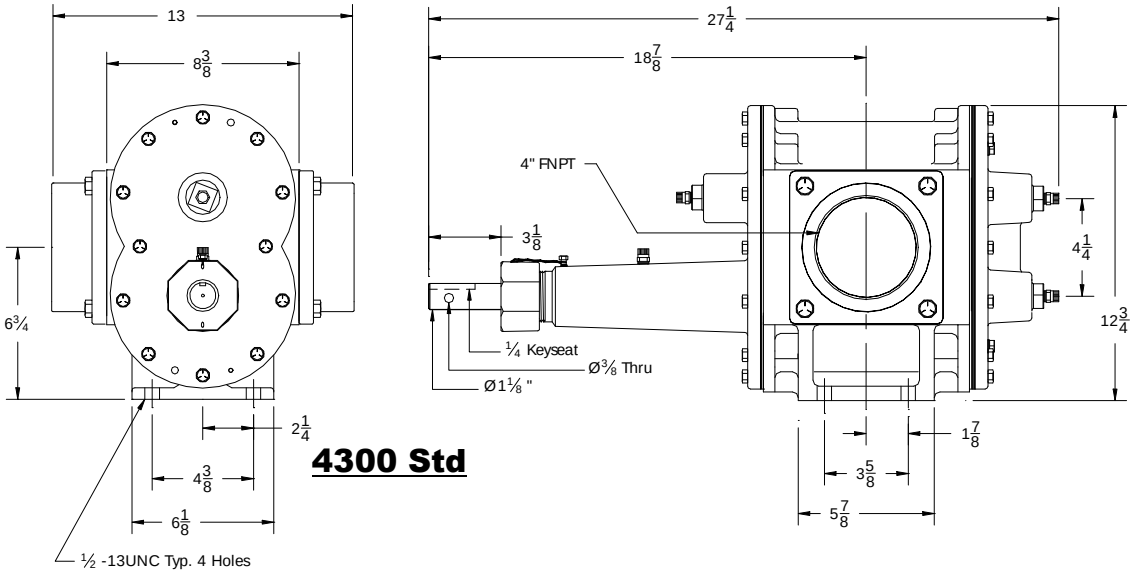
| Stock No. | Description | Stock No. | Description | | Stock No. | Description |
|---|---|---|---|---|---|---|
| 309 BG | Bushing, Brz Grooved | 334 | Nut, Bypass | * | _3 SS | Stainless Steel Shafts |
| 309 T | Bushing, Teflon | 23/33 BP | Plate, Bypass | * | _304 BG | Bronze Gear |
| 313 T | Packing, Teflon | 23/33 EXT | Shaft, Extension | * | _304 CG | Steel Gear |
| 319 | Nut, Bypass Valve | 23/33 SS EXT | Shaft, SS Extension | * | _304 UG | Urethane Gear |
| 330 | Screw, Adj. Bypass | 23/33 HP | Plate, Hard Wear | * | _304 V | Viton Gear |
| 331 | Spring, Bypass | 23/33 RK | Repair Kit | * | _310A | Flange, Adapter Mounting |
| 335 | Seat, Spring | 23/33 RKT | Repair Kit Teflon | * | _310 HM | Flange, Adapter for Hydro-Mulcher |
| 336 | Ball, Bypass | 23/33 TB | Bushings, Teflon | * | **Denotes** | **4 Digit Number 1st digit pump size** |
| 337 | Seat, Ball | | | | | |




## 2300 Std




## 3300 Std




## 4300 Std