This is a SAFETY ALERT SYMBOL.
When you see this symbol on the product, or in the manual, look for one of the following signal words and be alert to the potential for personal injury, death or major property damage.

WARNING
Hazardous voltage. Can shock, burn or cause death.

WARNING
Hazardous or toxic fluids can cause serious injury.

WARNING
Hazardous pressure can cause personal injury or property damage.

WARNING
Failure to disconnect and lockout electrical power before attempting maintenance can cause shock, burns or death.

WARNING
If pumping hazardous or toxic fluids, system must be flushed and decontaminated, inside and out, prior to performing service or maintenance.

WARNING
Disconnecting fluid or pressure containment components during pump operation can cause serious personal injury, death or major property damage.

WARNING
Failure to disconnect and lockout electrical power or engine drive before attempting maintenance can cause severe personal injury or death.

WARNING
Failure to relieve system pressure prior to performing pump service or maintenance can cause severe personal injury or property damage.

CAUTION
Extreme heat can cause injury or property damage.

CAUTION
Failure to allow gear reducer to cool before attempting maintenance can cause serious personal injury.

NOTICE:
Indicates special instructions which are very important and must be followed.

NOTICE:
Indicates special instructions which are very important and must be followed.

NOTICE:
Blackmer gear reducers MUST only be installed in systems, which have been designed by qualified engineering personnel. The system MUST conform to all applicable local and national regulations and safety standards.

These instructions are intended to assist in the installation of and maintenance of the Blackmer gear reducer, and MUST be kept with the reducer.

Blackmer gear reducer service shall be performed by qualified technicians ONLY. Service shall conform to all applicable local and national regulations and safety standards.

Thoroughly review this manual, all instructions and hazard warnings, BEFORE performing any work on Blackmer gear reducer.

Maintain ALL system and Blackmer pump and reducer operation and hazard warning decals.

NOTE: Numbers in parentheses following individual parts indicate reference numbers on the corresponding Lip Seal Parts Lists.

Pump manuals, parts lists and other needed literature may be obtained from the Blackmer website (www.blackmer.com) or by contacting Blackmer Customer Service.
### Parts List

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Description</th>
<th>Parts per Unit</th>
<th>Part No.</th>
<th>Description</th>
<th>Parts per Unit</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Bearing</td>
<td>1</td>
<td>903142</td>
<td>104</td>
<td>2</td>
<td>331925</td>
</tr>
<tr>
<td>24A</td>
<td>Bearing – Shielded</td>
<td>1</td>
<td>903143</td>
<td>104A</td>
<td>1</td>
<td>331921</td>
</tr>
<tr>
<td>24B</td>
<td>Bearing</td>
<td>1</td>
<td>903116</td>
<td>110</td>
<td>1</td>
<td>894044</td>
</tr>
<tr>
<td>24C</td>
<td>Bearing – Shielded</td>
<td>1</td>
<td>903117</td>
<td>111</td>
<td>1</td>
<td>814040</td>
</tr>
<tr>
<td>29</td>
<td>Pipe Plug</td>
<td>1</td>
<td>908187</td>
<td>112</td>
<td>5</td>
<td>920203</td>
</tr>
<tr>
<td>29A</td>
<td>Drain Plug</td>
<td>1</td>
<td>908105</td>
<td>112A</td>
<td>2</td>
<td>920235</td>
</tr>
<tr>
<td>29B</td>
<td>Pipe Plug</td>
<td>1</td>
<td>908198</td>
<td>114</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>29D</td>
<td>Oil Level Plug</td>
<td>1</td>
<td>908187</td>
<td>115</td>
<td>1</td>
<td>814042</td>
</tr>
<tr>
<td>35</td>
<td>Key – Pinion</td>
<td>1</td>
<td>909166</td>
<td>116</td>
<td>5</td>
<td>920178</td>
</tr>
<tr>
<td>38</td>
<td>Dowel Pin</td>
<td>2</td>
<td>930739</td>
<td>124</td>
<td>1</td>
<td>909164</td>
</tr>
<tr>
<td>76C</td>
<td>Fill &amp; Vent Plug</td>
<td>1</td>
<td>701988</td>
<td>124A</td>
<td>1</td>
<td>909165</td>
</tr>
<tr>
<td>82</td>
<td>Spacer Ring</td>
<td>2</td>
<td>374041</td>
<td>125</td>
<td>1</td>
<td>704051</td>
</tr>
<tr>
<td>82A</td>
<td>Spacer Ring</td>
<td>1</td>
<td>374042</td>
<td>132</td>
<td>1</td>
<td>908603</td>
</tr>
<tr>
<td>83</td>
<td>Retaining Ring</td>
<td>1</td>
<td>903603</td>
<td>132A</td>
<td>1</td>
<td>908302</td>
</tr>
<tr>
<td>101</td>
<td>Gear</td>
<td>1</td>
<td>See Table</td>
<td>132B</td>
<td>1</td>
<td>908573</td>
</tr>
<tr>
<td>102</td>
<td>Pinion &amp; Shaft</td>
<td>1</td>
<td>See Table</td>
<td>154</td>
<td>1</td>
<td>908794</td>
</tr>
</tbody>
</table>

* Non-saleable item – included with Body/Cover Assembly.


### Gear and Pinion Selection Table

<table>
<thead>
<tr>
<th>Ratio</th>
<th>RPM</th>
<th>102 Pinion No.</th>
<th>QTY.</th>
<th>101 Gear No.</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.24</td>
<td>780</td>
<td>915118</td>
<td>1</td>
<td>919918</td>
<td>1</td>
</tr>
<tr>
<td>2.72</td>
<td>640</td>
<td>915116</td>
<td>1</td>
<td>919916</td>
<td>1</td>
</tr>
<tr>
<td>3.32</td>
<td>520</td>
<td>915117</td>
<td>1</td>
<td>919917</td>
<td>1</td>
</tr>
<tr>
<td>4.10</td>
<td>420</td>
<td>915120</td>
<td>1</td>
<td>919920</td>
<td>1</td>
</tr>
<tr>
<td>4.94</td>
<td>350</td>
<td>915121</td>
<td>1</td>
<td>919921</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTE:** Speed is based on 1750 rpm input.
INSTALLATION

NOTICE
This product must only be installed in systems which have been designed by those qualified to engineer such systems. The system must be in accordance with all applicable regulations and safety codes and warn of any hazards unique to the particular system.

ALIGNMENT ADJUSTMENT
To adjust the alignment of the gear reducer to the pump or motor, use shims as needed.

COUPLING ALIGNMENT
Both angular and parallel coupling alignment MUST be maintained between the pump, gear, motor, etc. in accordance with manufacturer's instructions. Verify coupling alignment after installation of new or rebuilt pumps. See fig. 1.

1. Parallel alignment: The use of a laser alignment tool or dial indicator is preferred. If a laser alignment tool or dial indicator is not available, use a straightedge. Turn both shafts by hand, checking the reading through one complete revolution. Maximum offset must be less than .005” (125 microns).

2. Angular alignment: Insert a feeler gauge between the coupling halves. Check the spacing at 90º increments around the coupling (four check points). Maximum variation must not exceed .005” (125 microns). Some laser alignment tools will check angular alignment as well.

3. Replace the coupling guards after setting alignment.

MAINTENANCE

NOTICE:
Maintenance and troubleshooting must be done by an individual experienced with pump and reducer maintenance and the type of system involved.

NOTICE:
To avoid possible entanglement in moving parts do not lubricate pump bearings, gear reducer or any other parts while the pump is running.

CAUTION: The normal full load operating temperature of the gearcase is 180°F (82°C) – too hot to touch with the bare hand.

LUBRICATION
Gear reducers are not lubricated at the factory. Oil MUST be added before starting the pump.

Horsepower calculations for Blackmer reducers are based on 75°F (24°C) ambient air temperature; 200°F (93°C) maximum oil temperature using synthetic oil.

Blackmer recommends using synthetic oil with oxidation inhibitors and is compatible with Buna elastomers. Use synthetic oil AGMA Viscosity Grade 4 or ISO Viscosity Grade 150 such as Mobil SHC 629, Mobil SHC 630, Shell Omala S4 GX 150, Castrol Isolube EP 150 or equivalent.

To add oil to the gear reducer:

1. Remove the oil level plug (29D) and the fill and vent plug (76C). NOTE: The vent fitting in the fill plug (76C) should be kept clean to prevent expansion from forcing oil leaks at the shaft.

2. Add oil through the filler hole until oil runs out of the oil level hole – approximately 0.5 qt. (0.47 l) depending on the orientation of the reducer mounting.

3. Replace the oil level plug and the fill and vent plug.

4. After the first two weeks of operation, the oil should be drained, the gearcase flushed, and new oil added.

5. For normal operation, the oil should be changed every six months or 1000 hours, whichever is shorter. If operation is accompanied by frequent and wide changes in temperature, or if the unit operates in an unusually moist or dusty atmosphere, the oil should be changed every 500 hours or every three months.

REDUCER DISASSEMBLY
The foot mounted gear reducer can usually be removed from its unit assembly without disturbing the motor or pump mounting.

1. Take apart the couplings and remove the capscrews in the foot mount.

2. Once the couplings are apart and the capscrews are removed, the reducer can be lifted away from the pump and motor.

3. Remove the cover capscrews (112 & 112A). NOTE: The gearcase cover is located on the gearcase with two (2) dowel pins (38). These pins remain in the gearcase.

4. After the capscrews have been removed, insert a wedge between the projecting lugs on the gearcase cover and tap lightly until the cover loosens and can be removed from the casing.

5. Remove the cover gasket (111).

6. The pinion & shaft (input shaft) (102) is a one-piece assembly and does not come apart. If necessary, the bearings (24 & 24A) can be removed from the shaft with the use of a bearing puller or arbor press.

7. To remove the gear (101) and bearings (24B & 24C) from the output shaft (125), use a gear puller or arbor press. Support the assembly on the gear and press the shaft out of the gear and bearings.
OIL SEAL REPLACEMENT
1. To replace the oil seal (104A) on the input shaft, it is only necessary to remove the closure plate (114). Once the plate is removed, the old seal can be pressed out and a new one installed. Grease the lip of the oil seal before installing. The oil seal must be inserted such that the lip of the seal will face inward when the closure plate is reattached to the gearcase cover.

2. To replace the two (2) oil seals (104) on the output shaft, it is necessary to disassemble the body and cover assembly and remove the output shaft. (Refer to “Reducer Disassembly.”) Grease the lip of one oil seal and insert it into the bearing bore of the gearcase so that the lip of the seal faces inward. Install the spacer ring (82A) and insert the second oil seal also with the lip facing inward.

REDUCER ASSEMBLY
Before reassembling the gear reducer, clean each part thoroughly. Wash out the bearing bores and remove all burrs or sharp corners with a file.

NOTE: Disregard steps 1 and 2 if the shaft and bearing assemblies have not been dismantled.
1. The output shaft (125) has a stepped shoulder on one end (retaining ring end) to facilitate bearing and gear location.
   a. Before installing the gear and bearings, remove all dirt, burrs, or sharp corners from the shaft to prevent galling or seizing of the gear and shaft.
   b. Apply a coat of graphite, moly sulphide, or white lead to the shaft.
   c. Press the retaining ring end of the shaft squarely into the shielded bearing (24B). The shield of the bearing should be upward, so that the balls of the bearing will face the gear.
   d. Install the spacer ring (82).
   e. Align the gear key (124) with the notch in the gear (101), and press the gear squarely onto the shaft. Install the other spacer ring (82).
   f. Press the second bearing (24C) squarely onto the shaft and add the retaining ring (83).
2. To assemble the input shaft (102) (Pinion & Shaft) a bearing must be pressed onto each end of the shaft.
   a. Prior to installing the bearings, follow steps 1a and 1b.
   b. Press the shielded bearing (24A) onto the driven end of the shaft (longer end) with the shield facing downward so that the balls of the bearing will face the pinion.
   c. Press the second bearing (24) onto the opposite shaft end.
3. After the shafts, gears and bearings have been assembled, apply a light film of oil in the bearing bores of the gearcase to help the bearings slide into position.
4. If the oil seals (104) have been removed from the gearcase, they must be replaced prior to reassembly. Refer to step 2 of “Oil Seal Replacement.”
5. To install the shaft assemblies into the gearcase it is easiest to tip the gearcase so that it is resting on the closed end, with the cavity opening upward.
   a. Start the output shaft (125) into the bearing bore of the gearcase.
   b. Align the bearings and gear teeth of the input shaft (102) with the output shaft and drop the two shaft assemblies together into their respective bearing bores.
   NOTE: It is important to line the bearings up squarely with the bores in order for them to drop smoothly into place. If the bearings are positioned correctly in the gearcase, the shafts should rotate freely when turned by hand.
6. Once the input and output shaft assemblies are properly installed, set the cover gasket (111) on the gearcase.
7. Position the cover on the gearcase using the dowel pins for alignment.
8. Install and tighten the cover capscrews (112).
9. Make sure the oil seal (104) is inserted in the closure plate (114) before reattaching the plate to the gearcase cover. Refer to step 1 of “Oil Seal Replacement.”
10. Set the closure plate gasket (115) and the closure plate (114) on the gearcase cover. Install and tighten the remaining two (2) cover capscrews (112A), and the five (5) closure plate capscrews (116).

TROUBLESHOOTING

NOISE AND VIBRATION

POSSIBLE CAUSES:
1. Worn or damaged bearings.
2. Inadequate lubrication / use of wrong lubricant.
3. Impurities in the lubricant, such as abrasive particles.
4. Excessive overloading.
5. Misalignment to either pump or motor.

REMEDY:
Replace bearings.
Check oil condition. The lubricant may not be getting to the contact areas of the gear teeth, or the viscosity of the oil may be too low for the operating temperature (see “Lubrication”).
Replace with clean oil (see “Lubrication”).
Overloading causes overheating which may lower oil viscosity and thus cause the oil film on gear teeth contact surfaces to break down. The gears will begin to “groan” as the oil loses its effectiveness. If the loading is not decreased, the gear teeth will begin to “bite” into each other and wear out rapidly.
Recheck alignment and adjust as necessary.