SPOKANE INDUSTRIES, INC.

SPOKANE METAL PRODUCTS DIVISION

Spokane Washington

300 GALLON JIFFY REFUELER WITH GAS OPERATED PUMP

TECHNICAL MANUAL PARTS, OPERATION AND MAINTENANCE

Spokane Industries, Inc.
Spokane Metal Products Division
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SPOKANE INDUSTRIES, INC.
Spokane Metal Products Division
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1) CAUTION:
PRIOR TO OPERATING PUMP ALWAYS ATTACH THE GROUNDING CLAMP TO A SOLID GROUND TO AVOID ANY CHANCE OF STATIC ELECTRICITY BUILD UP.

2) PRIOR TO OPERATING THE JIFFY UNIT READ THIS MANUAL FIRST
CHECK TO ENSURE THAT MOTOR HAS OIL IN IT.
THE PUMP MUST BE FIRST PRIMED BEFORE IT WILL PUMP PROPERLY.

3) FLOW DIRECTIONAL VALVE NOTES:
NOTE: FLOW INTENT IS TO FLOW OUT OF THE TANKS MECHANICAL EMERGENCY VALVE INTO THE FUEL PUMP THROUGH THE METER THEN FILTER INTO THE HOSE REEL AND OUT TO END DESTINATION.
FLOW CONTROL IS MAINTAINED BY THREE (3) HAND OPERATED FLOW VALVES, ONE MECHANICAL EMERGENCY VALVE, ONE 1" SUCTION SIDE VALVE AND ONE 1 1/2" DRAIN VALVE.

CAUTION:
IN ORDER FOR PROPER OPERATION THE SUCTION SIDE OF THE PUMP MUST BE OPEN AND UNOBSTRUCTED.
THE 1" SUCTION SIDE VALVE MUST BE OPENED.

NEVER OPERATE THE PUMP WHEN THE SUCTION SIDE IS CLOSED, OBSTRUCTED OR IF THE SUCTION LINE IS NOT PRIMED. TO DO SO MAY CAUSE DAMAGE TO THE PUMP AND/ OR HOSES.

NEVER OPERATE A DRY PUMP!

4) MECHANICAL EMERGENCY VALVE NOTES:
LOCATED ON THE END HEAD OF THE TANK JUST IN FRONT OF THE PUMP BOX.
WHEN LEVER IS UP, THE VALVE IS OPEN
WHEN LEVER IS DOWN, THE VALVE IS CLOSED
CAUTION: THIS VALVE MUST BE OPEN WHENEVER THE PUMP IS RUNNING

5) EMERGENCY SHUT OFF:
THERE IS AN EMERGENCY TRIP LEVER LOCATED ON THE DRIVERS SIDE, FRONT LOWER SKID ON THE TANK, TO USE SIMPLY PULL LEVER AND THE EMERGENCY VALVE WILL TRIP SHUT IF OPEN.

6) DOT MANWAY:
THERE IS A DOT TYPE MANWAY INSTALLED IN THE TOP OF THE TANK, IT HAS A 10" FILL TYPE LID WITH A 16" COVER WHICH MAY BE REMOVED FOR ACCESS INTO THE TANK.

7) SURGE BRAKES:
THIS UNIT IS EQUIPPED WITH AUTOMATIC HYDRAULIC SURGE BRAKES ON ALL 4 WHEELS FOR YOUR SAFETY.

8) 2" COUPLER HITCH:
THIS HITCH ACCEPTS A 2" STANDARD BALL TYPE HITCH, & SHOULD ALWAYS BE WIRED TO THE TOWING VEHICLE FOR SAFETY.

SPOKANE INDUSTRIES, INC.

SPOKANE METAL PRODUCTS DIVISION
Spokane Washington

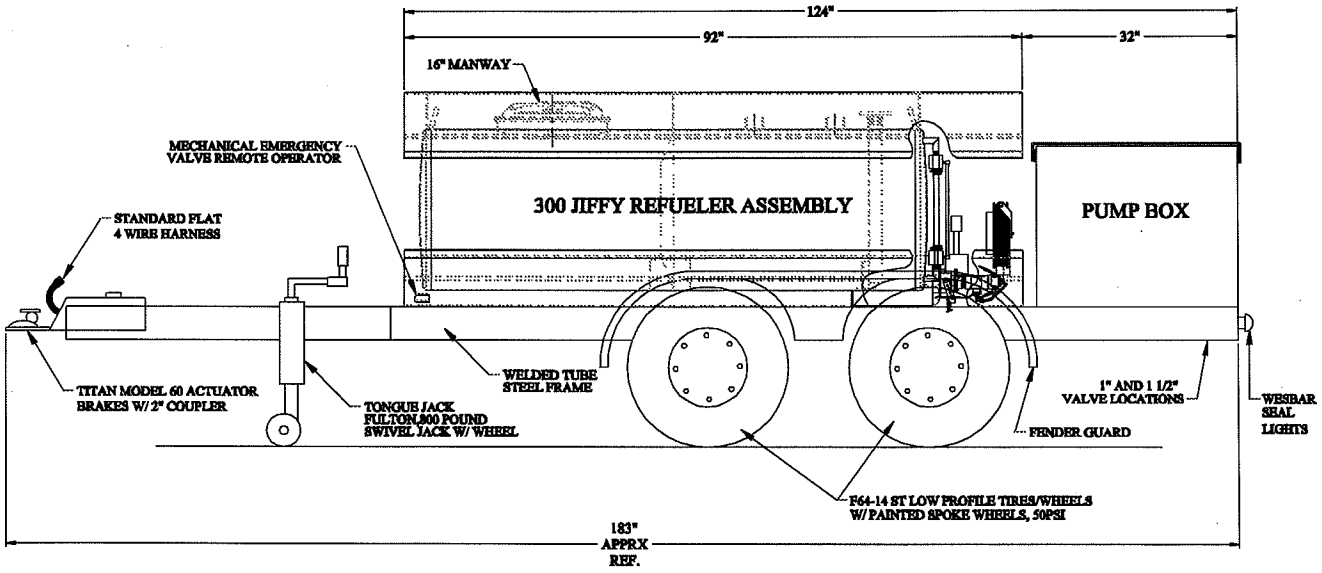
300 GALLON JIFFY REFUELER WITH GAS OPERATED PUMP

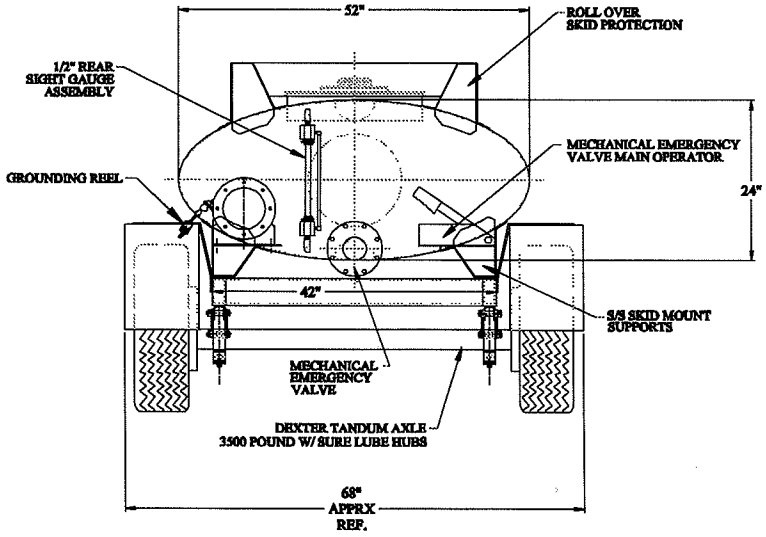
ONE YEAR LIMITED WARRANTY

Seller warrants its "300 Gallon Jiffy Refueler with Gas Operated Pump" to be free from defects in material and workmanship under the normal use and service for which the unit is intended. If, but only if the unit has been properly operated, maintained and stored in accordance with printed directions contained in the product manual. Our obligation under this warranty shall be limited to the repair or exchange of equipment and parts which may prove defective within one year of the date the unit is put into service but shall in no event extend beyond a date two years from the date the unit is shipped from our plant. All transportation charges on parts returned to us for replacement under this warranty must be returned pre-paid.

This warranty does not extend to damages caused by environmental factors varying from normal design conditions, whether natural or man-made, or to units subjected to misuse, negligence or accident. This warranty likewise does not extend to the unit or any parts thereof which have been repaired or altered improperly or in any way so as to effect adversely its stability or reliability. This warranty does not cover parts or labor required to repair or replace parts whose usefulness is exhausted due to normal operation of this unit.

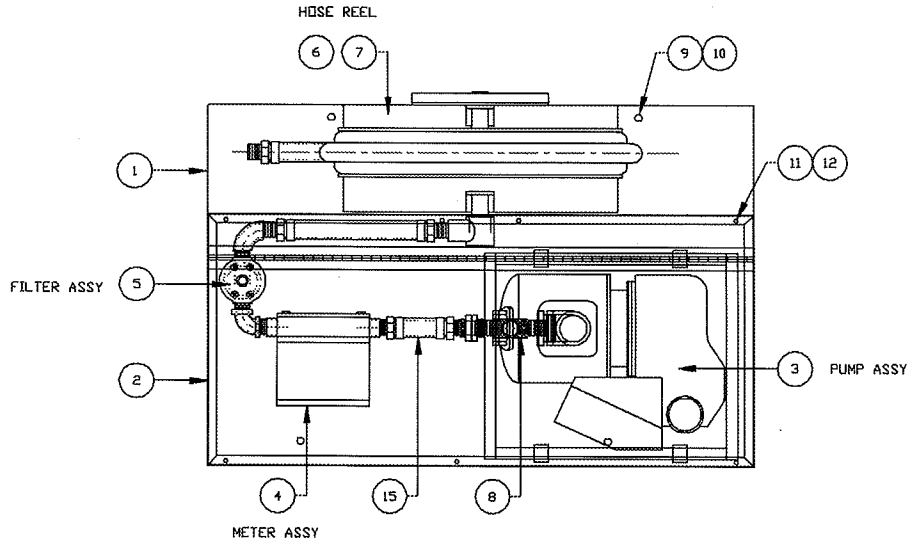
THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE NOT SET FORTH IN A WRITING SIGNED BY AN AUTHORIZED REPRESENTATIVE OR SELLER. SELLER SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL LOSS OR DAMAGE RESULTING FROM THE USE OR LOSS OF USE OF THIS UNIT.

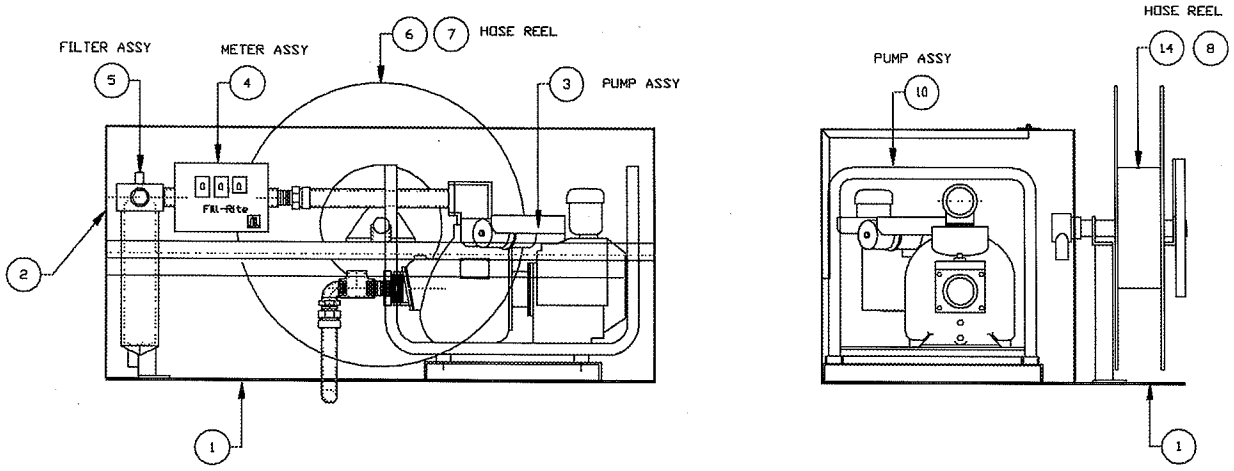




SPOKANE INDUSTRIES, INC.
Spokane Metal Products Division
P.O.Box 3303, Spokane, WA 99220 (509) 928 0720

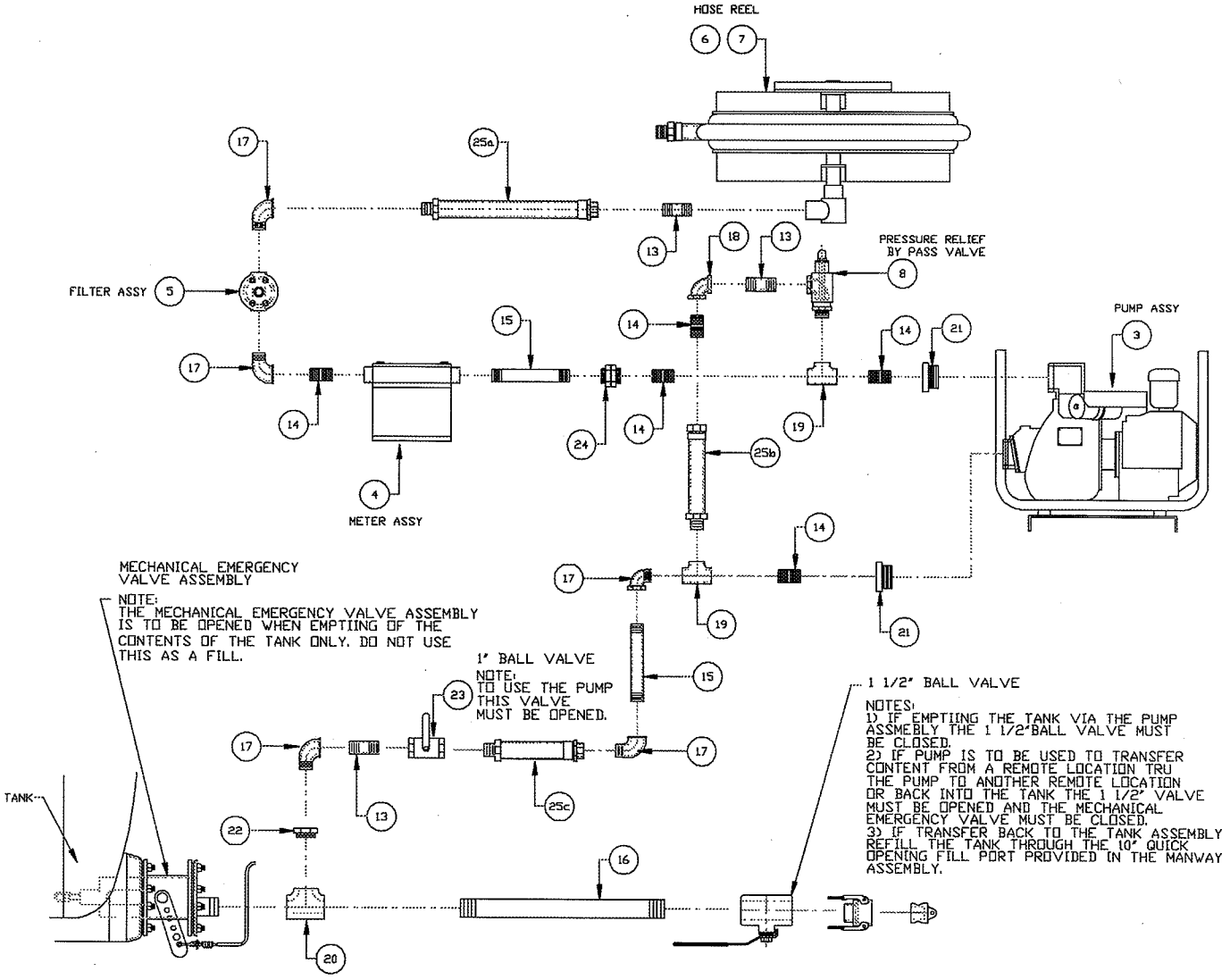
NAME	DATE	TITLE	DWG. NO.
DAN DEMARCO	12-21-99	300 GALLON DOT 406 JIFFY REFUELER ASSEMBLY	SK-817





ASSEMBLY No. SMP–15890A
MAJOR ASSEMBLY– GAS OPERATED REFUELER PACKAGE

Sub Assy.	Item	Part No.	Quantity	Description
SMP–15890A	–	–	1	Refueler Package
	1	01–9025S	1	Platform
	2	01–902S	1	Pump Box
	3	15890–3	1	Pump
	4	15890–4	1	Meter
	5	15890–5	1	Filter
	6	15890–6	1	Reel
	7	15890–7	35ft	Hose
	8	15890–8	1	Pressure Relief Bypass
	9	02–100115	4	Bolt
	10	02–1216	4	Nut
	11	02–10015	7	Bolt
	12	02–12012	7	Nut

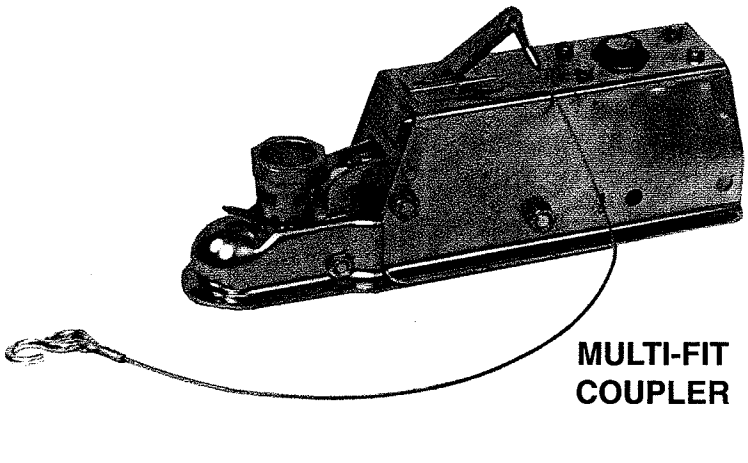


ASSEMBLY No. SMP–15890A (CONTINUED)
MAJOR ASSEMBLY– GAS OPERATED REFUELER PACKAGE

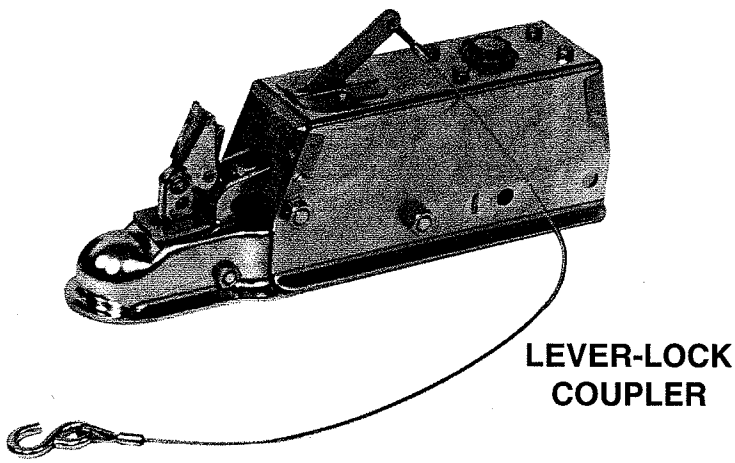
Sub Assy.	Item	Part No.	Quantity	Description	Wt. #'s
SMP–15890A	–	–	1	Refueler Package Continued	–
	13	03–0041S	3	Nipple, 1" NPT x 3"Lg	1.3
	14	03–0252S	5	Nipple, 1" NPT x Short	1.6
	15	15890A–15	2	Nipple, 1 1/2" NPT x 8" Lg	2.2
	16	15890A–16	1	Nipple, 1 1/2" NPT x (Specify Length)	5.5
	17	15890A–17	5	Elbow, 1" 90deg NPT	5.0
	18	03–10651	1	Elbow, 1" 90deg FNPT	1.0
	19	03–10071	2	Tee, 1" FNPT	1.0
	20	15890A–20	1	Tee, 1 1/2" FNPT	1.0
	21	03–10143	2	Bushing, 2" MNPT x 1" FNPT	2.1
	22	03–10145	1	Bushing, 1 1/2" MNPT x 1" FNPT	1.0
	23	15890A–23	1	Valve, 1" Ball	2.0
	24	15890A–24	1	Union, 1" FNPT	1.1
	25	15890A–25	3	Hose Assy, 1" NPT (Specify Length)	10.0

INSTALLATION INSTRUCTION AND SERVICE MANUAL
Actuator/Trailer Dealer - Please provide these instructions to the consumer.
Consumer - Read and follow these instructions. Keep them with the trailer for future reference.

TITAN MODEL 60 SURG-O-MATIC™ ACTUATOR FOR TRAILER BRAKES



MULTI-FIT COUPLER



LEVER-LOCK COUPLER

INTRODUCTION TO SURGE BRAKING

Surge braking is accomplished by replacing a trailer's standard tongue coupler with an actuator and adding hydraulic brake assemblies. The "surge" or "push" of the trailer toward the tow vehicle during deceleration automatically synchronizes these trailer brakes with the tow vehicle brakes. As the trailer pushes against the vehicle, the actuator telescopes together and applies force to its master cylinder, supplying hydraulic pressure to the trailer brakes.

Surge actuators of this type provide a service life of approximately five years with proper installation, usage, and maintenance. However, a well cared-for actuator can often exceed this estimate. To get the most benefit from your TITAN surge actuator, follow the instructions given in this manual and use common sense in caring for the MODEL 60 and your entire trailer brake system.

RATED CAPACITY AND USAGE

⚠ WARNING ⚠
Do not exceed these ratings.

6,000 POUNDS MAXIMUM GROSS LOAD (weight of trailer fully loaded with all cargo and equipment). To find your trailer's Gross Load, use a commercial vehicle scale at a truck weigh station, grain elevator, etc.

600 POUNDS MAXIMUM TONGUE LOAD (weight applied downwards by the fully loaded trailer's coupler onto the tow vehicle's hitch). Measure your trailer's Tongue Load with the tongue in the horizontal towing position, using either a commercial scale or a bathroom scale if the load is small enough. Upwards tongue loads are not permissible.

The MODEL 60 actuator is intended for light occasional use on recreational, marine, and baggage trailers, which are towed by passenger cars or pickups. The actual in-service rating is limited to that of the ball and hitch being used or the trailer manufacturer's G.V.W.R. shown on the certification label, whichever is lower. The actuator will provide enough fluid displacement to supply up to four TITAN free-backing or uni-servo drum style trailer brakes.

TITAN™
Titan Wheel Corporation
2345 East Market Street
Des Moines, IA 50317
800-247-1781
515/265-9200, FAX: 515/265-9301

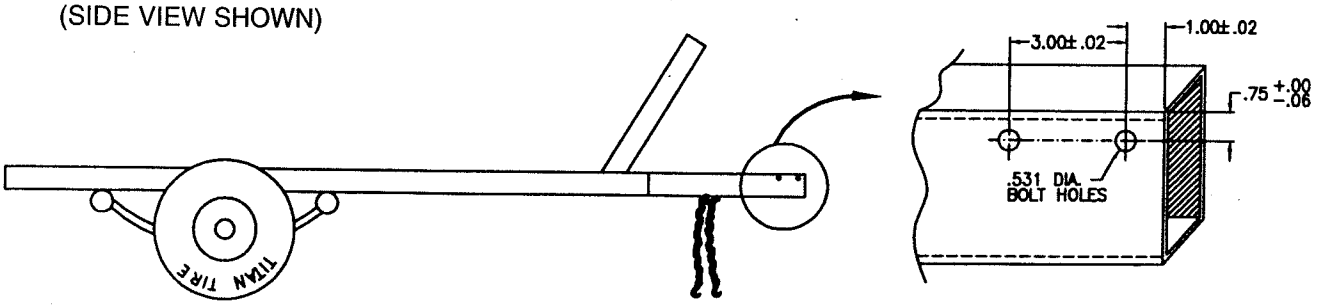
⚠ WARNING ⚠

DO NOT submerge the actuator. Internal corrosion may result and cause brake failure. Salt water, granular fertilizers, and other corrosive materials are destructive to metal. To minimize the damaging effect of corrosion on a braking system used under corrosive conditions, we recommend that the actuator be externally flushed after use with a high pressure water hose. Be sure to lubricate all moving parts after the unit has dried. Whenever the unit will be out of service for an extended period of time, or after hard use, remove the brake drums and clean inside the brakes. Pack wheel bearings with grease before the drum is installed. Failure to properly and adequately grease and maintain the actuator could weaken it and/or cause it to fail and result in serious injury and/or property damage.

INSTALLATION*

1. The MODEL 60 Actuator is completely assembled and ready to bolt into place onto straight three inch wide trailer tongues. **WELDING IS NOT RECOMMENDED** since it will make repair or replacement difficult, destroy the plated or painted surface finish, and could potentially cause internal damage resulting in decreased brake performance. If the actuator must be painted for aesthetic reasons, TITAN recommends painting **ONLY** the outer case, and disassembling the unit prior to painting. Application of heavy coats of paint may interfere with component operation. Confirm the coupler and break-away mechanisms work properly before operation. Store actuators indoors and in their original shipping carton until the time of installation.

FIG.1 - TRAILER AND TRAILER TONGUE BOLT PATTERN
(SIDE VIEW SHOWN)



2. Bolt the actuator to the tongue using 1/2 inch by 4 inch grade 5 bolts, nuts, and lockwashers. The two holes match standard coupler mounting holes on three inch wide trailer tongues, as shown in Figure 1. Light weight tongues require spacer tubes inside for reinforcement such as a 3/4 inch outside diameter by eleven gauge piece of tubing. Using a torque wrench, tighten bolts to eighty (80) foot-pounds torque.

3. Install the hydraulic brakes and brake lines on the trailer as described in the installation manual supplied with the brakes. **DO NOT** crush or kink the tubing as you mount the actuator. TITAN recommends 3/16 inch brazed double wall tubing per S.A.E. J527 for use with all our actuator and brake products. Use forty-five degree (45°) double-flare tube ends per S.A.E. J533. **DO NOT** remove or modify the orifice connector <17> at the rear of your actuator's master cylinder. It connects directly to the brake tubing and ensures proper fluid flow characteristics.

4. After installation of the actuator, brake, and brake lines as described above, proceed immediately to the "BRAKE FLUID FILLING AND BLEEDING" instructions.

⚠ WARNING ⚠

Failure to complete the "BRAKE FLUID FILLING AND BLEEDING" procedures promptly after installation may result in internal master cylinder corrosion and cause brake failure.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

BRAKE FLUID FILLING AND BLEEDING

⚠ WARNING ⚠

Use only fresh brake fluid from a sealed container. DO NOT reuse fluid. After filling and bleeding, remember to refill the actuator. Failure to maintain an adequate fluid level may cause brake failure.

1. After completing the "INSTALLATION" instructions, remove the master cylinder's cap <20> and fill the reservoir to three-quarters full with DOT-3 brake fluid. DO NOT allow brake fluid to contact painted surfaces since it will damage the finish. Wipe up any spills immediately and wash the area with water.

2. Bleed the brake system either manually or with a pressure bleeder. Pressure bleeding equipment simplifies the process, and is available at your local automotive supply store. Use the instructions provided with the pressure bleeder. If you chose to manually bleed the system, an assistant makes the job easier. Use the following steps to manually bleed the brake system:

   A. Fill the master cylinder with fluid as described above. Repeatedly press the tip of the push rod assembly <14>. This can be done by inserting a screwdriver in the round hole on the top of the coupler case <3>. Use the screwdriver as a lever to press the push rod. Apply short strokes until bubbling stops inside the master cylinder.

⚠ WARNING ⚠

DO NOT use the actuator's break-away lever or cable to bleed the brake system.

   B. Install a bleeder hose on the bleeder screw of the farthest wheel cylinder from the actuator. If the trailer has tandem axles, bleed the rear axle first. Submerse the other end of the hose in a glass container of brake fluid, so that air bubbles can be observed.

   C. Open the bleeder screw and have your helper stroke (but not release) the push rod <14>. Brake fluid and/or air bubbles will flow into the jar. Close the bleeder screw. The helper can then allow the push rod to return.

   D. Repeat the process until no more bubbles are released with the stroke. Air trapped in the brake lines will greatly reduce your braking efficiency. Be sure to close the bleeder screw securely when the cylinder is fully bled.

   E. Repeat the bleeding operation at each wheel cylinder. During the bleeding process, replenish the master cylinder reservoir's brake fluid so that the level does not fall below half full. This will ensure that no air is drawn into the system.

3. After all brakes have been bled, again make sure that the master cylinder reservoir is filled to three-quarters full before operating. Check that the filler cap gasket is not torn or damaged. Screw the filler cap and gasket into the master cylinder cover. The filler cap only needs to be finger tight.

TESTING TITAN SURGE BRAKE SYSTEMS

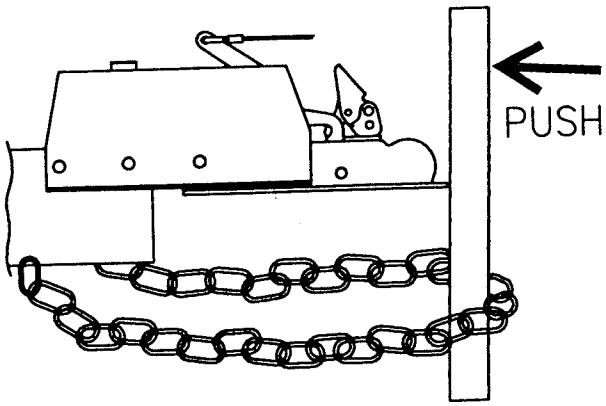
⚠ WARNING ⚠

It should be noted that the field-test procedure indicates only if the trailer brake system is functional, but DOES NOT provide information on how efficiently it will operate. Regular inspection, maintenance, and adjustment of all brake system components (including the surge actuator, tubing, hoses, brake clusters, drums, and associated hardware/support structure) are still required to ensure maximum brake performance and smooth, even brake operation.

1. Hydraulic surge actuator systems provide automatic and smooth trailer braking without special application by the tow vehicle driver. While this is extremely convenient it can sometimes be difficult to determine if the surge setup is functioning properly. The following steps provide a quick field-test to confirm that the trailer brake system is operational.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

2. Move the trailer to flat, level ground, pulling **FORWARD** several feet before parking. This forward motion will ensure trailers equipped with free-backing brakes are in their normal operating mode. Disconnect the trailer from the tow vehicle and jack the trailer's tongue until it is horizontal.



3. Hook the trailer's safety chains (**NOT** the actuator's break-away cable/chain) together to form a loop, which is centered below the actuator's coupler as shown in Figure 2.

4. Place a sturdy board, such as a 2 inch by 4 inch piece of lumber, into the chain loop below the coupler. The board should be 4 feet or longer so it will extend several feet above the actuator. Keep the end of the board a few inches off the ground, and position it to press against the front end of the actuator's coupler.

5. Stand in front of the trailer and face the rear. Apply force to the top end of the board to use it as a lever. Press back towards the rear of the trailer. The board will begin moving the coupler case (inner slide) into the actuator's outer housing.

6. Keep pressing the top of the board to stroke the actuator and its internal master cylinder. If the trailer brake system is operational, the brakes will apply and keep the trailer from rolling away from you. Properly adjusted uni-servo or duo-servo type brakes will prevent you from moving the trailer back more than a few inches. Free-backing type brakes will initially provide rolling resistance, but continued force on the board will switch them into free-backing mode, and you'll be able to move the trailer backwards.

7. If you have uni-servo or duo-servo brakes, and stroking the actuator (as described above) causes the trailer to roll away from you freely or with only minimal resistance, the brakes are **NOT** applying properly. If you have free-backing brakes, and stroking the actuator (as described above) causes the trailer to roll away without initial resistance, the brakes are **NOT** applying properly. The brake system **MUST** be evaluated to determine the cause of the problem, and corrective action **MUST** be taken before the trailer is used.

8. Use this procedure each time you tow your trailer to check your surge brake system operation.

HITCHING TRAILER

⚠ WARNING ⚠

To ensure proper engagement of the actuator's coupler to the tow ball, DO NOT use a multi-piece ball, an incorrectly sized ball, or a worn/damaged ball.

1. Confirm the towing hitch and ball have a rating equal to or greater than the trailer G.V.W.R. and are properly and securely attached to the tow vehicle. The hitch MUST be installed so the trailer tongue is level (horizontal) when coupled to the tow vehicle.

2. To attach the actuator to the tow vehicle, follow the procedure below which corresponds to your actuator's coupler type.

   A. MULTI-FIT COUPLER:
   The multi-fit (hand wheel) coupler will accept 1-7/8 inch, 50 millimeter, and 2 inch diameter tow balls. Open the coupler by depressing the hand wheel lock <27> and turning the hand wheel <28> fully counter-clockwise until its rotation is stopped by the lock ring <29>. Lower the coupler onto the ball, confirming that the ball is fully seated in the coupler socket. Tighten the hand wheel in a clockwise direction to secure the ball. The hand wheel lock should click as you turn the hand wheel, to confirm that the hand wheel will stay tightened. Turn the hand wheel until it can no longer be turned by hand, and then back it off until the lock catches in the nearest notch on the bottom of the hand wheel. Check that the ball latch <25> has been drawn up snugly under the tow ball, trapping it in the coupler socket. **Do not tow the trailer if the coupler is damaged.**

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

B. LEVER-LOCK COUPLER:

The lever-lock coupler is preset at the TITAN factory to fit 2" trailer balls. It can be adjusted to fit 1-7/8 inch or 50 millimeter diameter tow balls by tightening the coupler's locknut <9>, which is underneath the ball latch <25>. After adjustment, make sure that the sides of the locknut is trapped between the flanges of the lock plate <24> so that the locknut can not vibrate loose during trailering. Open the coupler by pressing the handle assembly's <32> lock trigger so it unhooks from the lock plate's loop, and then by swinging the handle forward. Lower the coupler onto the ball, confirming that the ball is fully seated in the coupler socket. Swing the handle upwards until the lock trigger hooks onto the lock plate loop to secure the ball. Check that the ball latch <25> has been drawn up snugly under the tow ball, trapping it in the coupler socket, and that the lock trigger is firmly hooked onto the lock plate loop. A properly adjusted lever-lock coupler will have between 1/64 inch and 1/32 inch of free play between the ball and ball socket. **Do not tow the trailer if the coupler is damaged.**

3. Check that the actuator's coupler is securely latched onto the tow ball by extending the trailer's tongue jack to the ground. Use it to lift the trailer tongue and tow vehicle hitch two to four inches. The coupler and ball should remain engaged. **DO NOT tow the trailer unless the coupler is latched onto the ball securely.** Retract the trailer tongue jack before towing.

4. The coupler mechanism may be further secured by following the procedure below which corresponds to your actuator's coupler type.

   A. MULTI-FIT COUPLER:

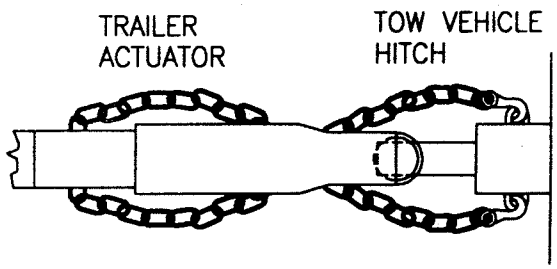
   Confirm that the tow ball is fully secured in the coupler as previously described. Insert a standard padlock through the holes in the side of the hand wheel <28>. The padlock will stop against the bracket on top of the couple case <3> and further prevent the hand wheel from rotating and opening. Do not use padlocks which interfere with the telescoping action of the actuator and thereby compromise braking performance.

   B. LEVER-LOCK COUPLER:

   Confirm that the tow ball is fully secured in the coupler as previously described. With the handle in the locked (up) position, insert either a standard padlock or spring pin through the hole in the side of the handle assembly <32>. This will lock the handle to the handle bolt and further prevent the handle assembly from swinging forward and opening. Do not use padlocks or pins which interfere with the telescoping action of the actuator and thereby compromise braking performance.

5. As shown in Figure 3, your tow vehicle's hitch provides a safety chain hole or ring on each side. Attach your trailer's safety chains securely to these connection points, being sure to cross the chains **UNDER** the trailer tongue. Safety chains **MUST** be used. This will prevent the trailer tongue from dropping to the road if the coupler separates from the tow vehicle's hitch. If your tow vehicle's hitch does not provide safety chain connection points, have appropriate ones added by a reputable hitch installer.

FIG.3 - SAFETY CHAIN ATTACHMENT (TOP VIEW SHOWN)



⚠ WARNING ⚠

The trailer safety chains' length MUST be set short enough so the actuator's break-away cable is NOT pulled if the coupler separates from the tow vehicle's hitch but remains connected by the safety chains. The break-away system should only be activated after BOTH the trailer's coupler AND safety chains have failed and allowed the trailer to completely separate from the tow vehicle. Provide just enough slack in the trailer safety chains to allow tight turns. The chains should not drag on the ground. Safety chains must be used.

6. Attach the actuator's break-away cable S-hook <11> securely to one of the tow vehicle hitch's safety chain connection points. Confirm that the trailer's safety chains are adjusted relative to the actuator's break-away cable as noted previously. **DO NOT** loop the break-away cable around a bracket and hook it back onto itself.

7. Before towing, check that the break-away lever assembly <10> is properly positioned as shown on the cover illustration of this manual.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

⚠ WARNING ⚠

The break-away system is not designed to operate if the trailer does not separate completely from the tow vehicle, or if the trailer tongue "submarines" and goes beneath the tow vehicle. DO NOT use the break-away system as a parking brake.

8. If the break-away lever and cable are not located correctly, due to either the cable being pulled during use or by accident, it **MUST** be reset prior to the trailer being moved.

⚠ WARNING ⚠

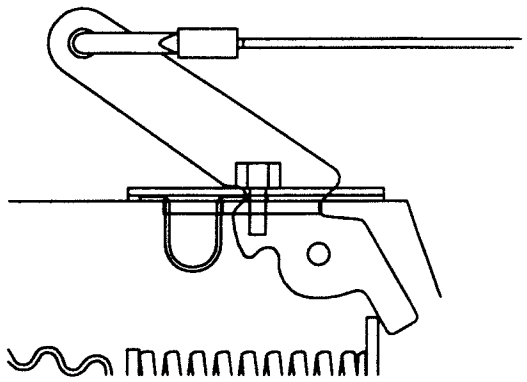
An incorrect lever or cable position may cause the trailer brakes to drag and overheat, or may keep the brakes from being applied in a break-away situation. After any usage of the break-away mechanism, either real or accidental, check all system components (lever, cable, S-hooks, cover, pin, push rod assembly, etc.) for damage. Replace any damaged items with genuine TITAN service parts.

Resetting is accomplished by first removing the two screws <31> which retain the cover over the break-away spring <13>. This will allow the cover to be lifted. By pulling the break-away lever <10> slightly further forward, you'll be able to pry the break-away spring carefully out of the notch in the outer case <1> to release the break-away lever. When removing the break-away spring, be careful not to deform it.

⚠ WARNING ⚠

The hydraulic pressure held in the system may cause the lever and push rod assembly to snap back quickly. Keep hands and fingers clear as you reset the break-away mechanism.

FIG. 4 - BREAK-AWAY LEVER TOWING POSITION



Inspect all break-away system components for damage. Replace any damaged items with genuine TITAN service parts. With the break-away spring removed, the lever can now be returned to its original position. Check that the tip of the break-away lever which is inside the outer case <1>, is in FRONT of the push rod assembly <14>. Also confirm that the roll-pin, which is pressed through the break-away lever, has remained inside the outer case. Following Figure 4, reinsert the break-away spring into the outer case notch, with the spring flange in the lever's upper detent groove. Replace the cover and fasten it securely with the two screws.

If the hydraulic pressure being held in the system is too great to permit the break-away spring to be easily pried out, it can also be released by removing the front roller bolt <8>. This will allow the front of the coupler case <3> to swing down and free the break-away lever. The break-away spring can then be pried out and reset as described above. Be sure to reassemble the rollers <7> with their chamfered ends out against the walls of the coupler case <3>. Tighten the locknuts <9> on the roller bolts <8> just to zero free-play between the outer case <1> and the coupler case <3>, and then back the locknuts off one-half turn. Over-tightening will restrict proper surge operation.

9. Weight distributing (equalizing) hitches have been an important part of trailering for many years. They shift excess tongue weight from the end of the tow vehicle by distributing it across all vehicle and trailer axles. Leveling the tow vehicle and the trailer reduces the stress on the suspension components and increases towing stability.

All TITAN surge brake actuators are fully compatible with equalizing hitches. When using weight distributing hitches with TITAN actuators, observe the following rules:

1) Allow six to eight inches of free chain length,
2) The chains must be vertical (straight up and down) under pulling load, and
3) Tongue weight beyond the specified actuator rating WILL interfere with brake performance.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

The above statement summarizes TITAN's three "rules of thumb" for equalizer/actuator compatibility. Each rule contributes to optimum trailer braking.

RULE #1: Allow six to eight inches of free chain length. This means that the equalizer's chains must be at least six to eight inches long between the spring bars and the hook-up brackets (which attach the chains to the trailer). **Surge brake actuators must be free to compress their internal master cylinder.** Shorter lengths of chain will limit the distance the actuator can move, and this restricts the unit's braking.

RULE #2: The chains must be vertical (straight up and down) under pulling load. During towing, these chains must be aligned straight up and down. This should be confirmed on level ground with the trailer coupled (using the equalizing hitch) to the tow vehicle. After checking that the actuator is in its towing position (not compressed), adjust the position of the hook-up brackets on the trailer until the chains are vertical. If the chains are angled forward or back on the TITAN actuator, they have a tendency to either impede the braking action by limiting the distance the actuator can stroke or prematurely apply the brakes by pulling the trailer forward relative to the tow vehicle.

RULE #3: Tongue weight beyond the specified actuator rating WILL interfere with brake performance. Weight distributing hitches spread tongue weight over the axles of both the tow vehicle and the trailer by applying leverage against the trailer tongue and actuator/coupler. This additional force and torque on the trailer system approximately doubles the load on the actuator, potentially exceeding its load rating.

For example, a fully-loaded trailer with a hitched tongue weight of 250 pounds might be equipped with a TITAN Model 60 actuator. A weight distributing hitch would then cause the actuator to receive the equivalent of a 500 pound tongue load. Since 500 pounds is less than the TITAN Model 60 actuator's 600 pound tongue load rating, this set-up would be acceptable. If a similar trailer has a 350 pound tongue weight, and once again an equalizer is hooked up, the actuator would perceive a 700 pound tongue load. That would put the system above the 600 pound tongue load rating of the actuator. Since the excess tongue load on a surge actuator can cause it to stroke less freely (resulting in less effective braking), this would be an inappropriate set-up.

Two factors in selecting towing equipment are gross trailer weight (GTW) and tongue load (TL). GTW is the weight of the trailer fully loaded in its actual towing condition. This can be measured by placing the fully loaded trailer on a vehicle scale. TL is the downward force exerted on the trailer hitch ball by the trailer coupler. In most cases it is 10% to 15% of the GTW.

With a heavier tongue load, roller kits are available. The roller kit attaches directly to the actuator, and extends back to a roller which rides on the trailer's tongue, allowing a higher tongue weight by shifting the equalizer's added load to the tongue roller instead of the actuator/coupler. Consult your trailer manufacturer, or your equalizer manufacturer for more information on roller kits.

10. Sway control devices that restrict operation of the actuator CANNOT be used. The actuator MUST be free to telescope in response to braking requirements.

> **⚠ WARNING ⚠**
>
> **When towing, AVOID sharp turns which can cause the actuator to bind against the tow vehicle. This can damage the actuator and trailer, causing brake failure. AVOID towing across severe bumps or dips which may cause the tow hitch to lever against the actuator/coupler and compromise the connection between the tow vehicle and the trailer.**

11. The actuator is designed for use with free-backing or uni-servo drum style trailer brakes. Do not block the surge action in order to back up when using other brake types, due to potential system damage. Failure to remove any block will also prevent forward braking.

12. To uncouple the trailer, first block the wheels to keep the trailer from rolling. Unhook the actuator's break-away cable and the trailer's safety chains from the tow vehicle. Then open your coupler as described previously in the section which corresponds to your actuator's coupler type. Finally, lift the trailer tongue off the tow ball, using a tongue jack if necessary.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

MAINTENANCE

⚠ WARNING ⚠

Use only fresh brake fluid from a sealed container. DO NOT reuse fluid. Failure to maintain an adequate fluid level may cause brake failure.

1. Before each towing, perform the following steps:

   • Check that the brake fluid reservoir is three-quarters full of DOT-3 brake fluid. Check for leaks and repair as required.

   • Examine the actuator for wear, bent parts, corroded/seized parts, or other damage. Have the affected components replaced with genuine TITAN service parts. Check to determine that the actuator mounting bolts are tightened to eighty (80) foot-pounds torque using a torque wrench.

   • Test the actuator and brake function as described in the "TESTING TITAN SURGE BRAKE SYSTEMS" section of this manual. Actuator travel over one inch indicates that the brakes need adjustment (or that the actuator has been structurally damaged). Actuator travel is the distance the coupler case assembly <3> moves relative to the outer case <1> during braking. Adjust the brakes following the instructions given in the brake installation manual. In general, back-off adjusters ten clicks from locked drum rotation. Adjust free-backing brakes by rotating in the forward direction only. Failure to adjust brakes will result in loss of braking.

2. The only adjustments on the actuator itself are the self-locking nuts <9> on the two roller bolts <8>. Tighten the locknuts just to zero free-play between the outer case <1> and the coupler case <3>, and then back the locknuts off one-half turn. Over-tightening will restrict proper surge operation.

3. A film of clean grease on the ball will minimize squeaking. Wipe the ball clean and renew film each time the trailer is used.

4. Before storage or after extended use, TITAN recommends applying motor oil to the coupler components and internal rollers to keep them moving freely and to prevent corrosion.

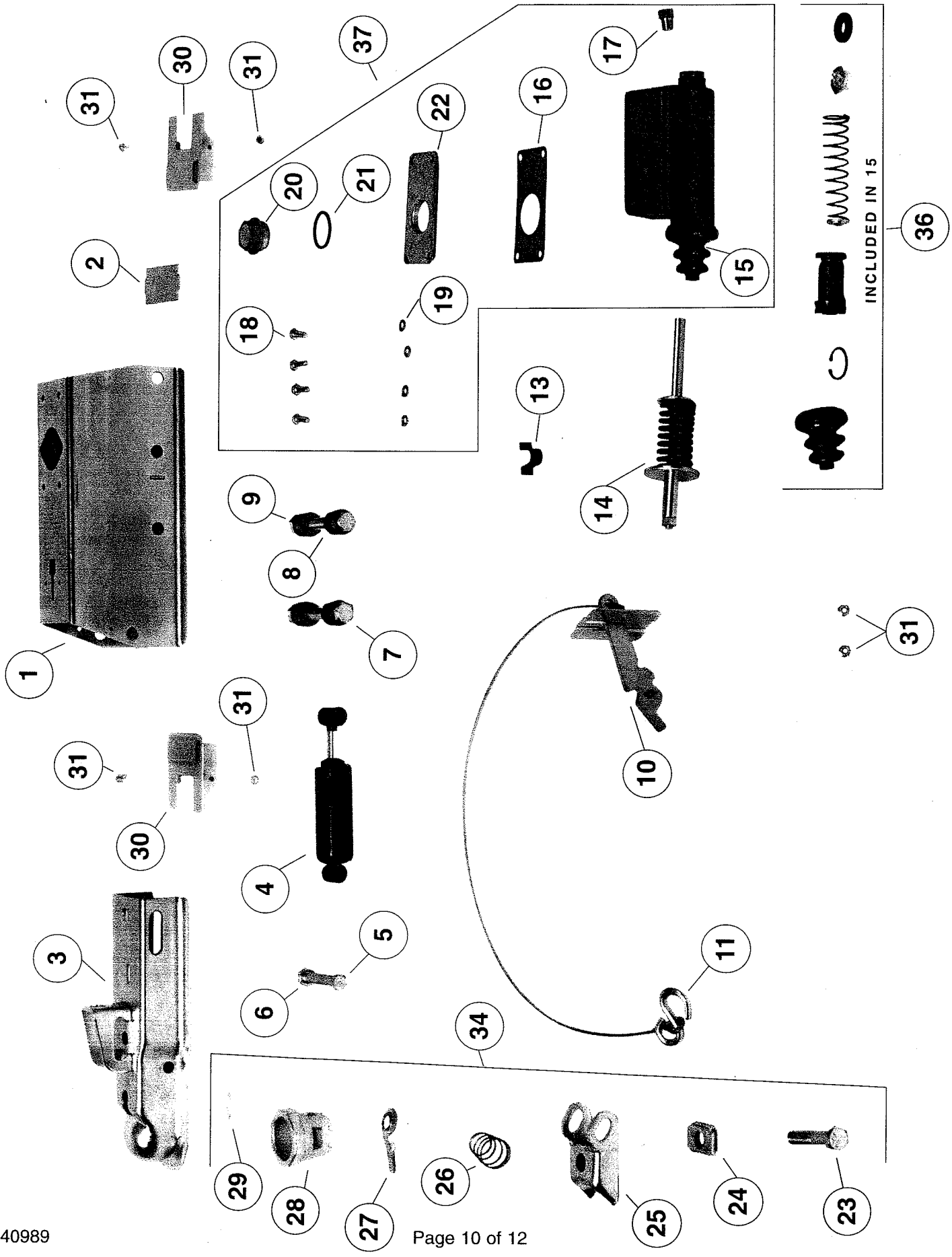
*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

TITAN MODEL 60 ACTUATOR PARTS LIST

REF. NO.	PART NO.	PART DESCRIPTION	MULTI-FIT MARINE 43397	MULTI-FIT PAINTED 43399	LEVER-LOCK MARINE 43329	LEVER-LOCK PAINTED 43386
1	43246	Outer Case	1		1	
1	43387	Outer Case		1		1
2	23377	Strut	1	1	1	1
3	23378	Coupler Case	1			
3	40970	Coupler Case		1		
3	43325	Coupler Case			1	
3	43388	Coupler Case				1
4	23362	Shock Absorber	1	1	1	1
5	23390	Bolt, Hex 7/16 NF x 2-5/8	1	1	1	1
6	23391	Locknut, Hex 7/16 NF Thin	1	1	1	1
7	23278	Roller	4	4	4	4
8	23413	Bolt, Hex 1/2 NF x 3-3/4	2	2	2	2
9	18612	Locknut, Hex 1/2 NF	2	2	3	3
10	46238	Break-Away Assy. w/Pin, Cover, S-Hook	1	1	1	1
11	10555	S-Hook - Included with 46238	1	1	1	1
13	40052	Break-Away Spring	1	1	1	1
14	23463	Push Rod Assembly	1	1	1	1
15	23361	Master Cylinder *	1	1	1	1
16	23414	Gasket *	1	1	1	1
17	12098	Connector, 1/64" Orifice *	1	1	1	1
18	10508	Bolt, Hex 1/4 NC x 3/4 *	4	4	4	4
19	07940	Lockwasher 1/4 *	4	4	4	4
20	44807	Filler Cap, 1-1/4 – 18 NEF *	1	1	1	1
21	23389	Gasket, Filler Cap *	1	1	1	1
22	23566	Cover, Master Cylinder *	1	1	1	1
23	23381	Latch Bolt	1	1		
24	18090	Lock Plate	1	1	1	1
25	43358	Ball Latch	1	1	1	1
26	43368	Spring	1	1	1	1
27	23383	Hand Wheel Lock	1	1		
28	24200	Hand Wheel	1	1		
29	24964	Lock Ring	1	1		
30	24525	Cover, Front	2		2	
30	40972	Cover, Front		2		2
31	10941	Screw, Cover	6	6	6	6
32	43585	Handle Assembly			1	1
33	43345	Spring Plate			1	1
34	40454	Multi-Fit Coupler Repair Kit	1	1		
35	43584	Lever-Lock Coupler Repair Kit			1	1
36	15026	Master Cylinder Repair Kit	1	1	1	1
37	43951	Master Cylinder Kit (includes * parts)	1	1	1	1

RECOMMENDED TOOLS

Socket and wrench sets Nut drivers Torque wrench	Snap ring pliers Flat-blade screw driver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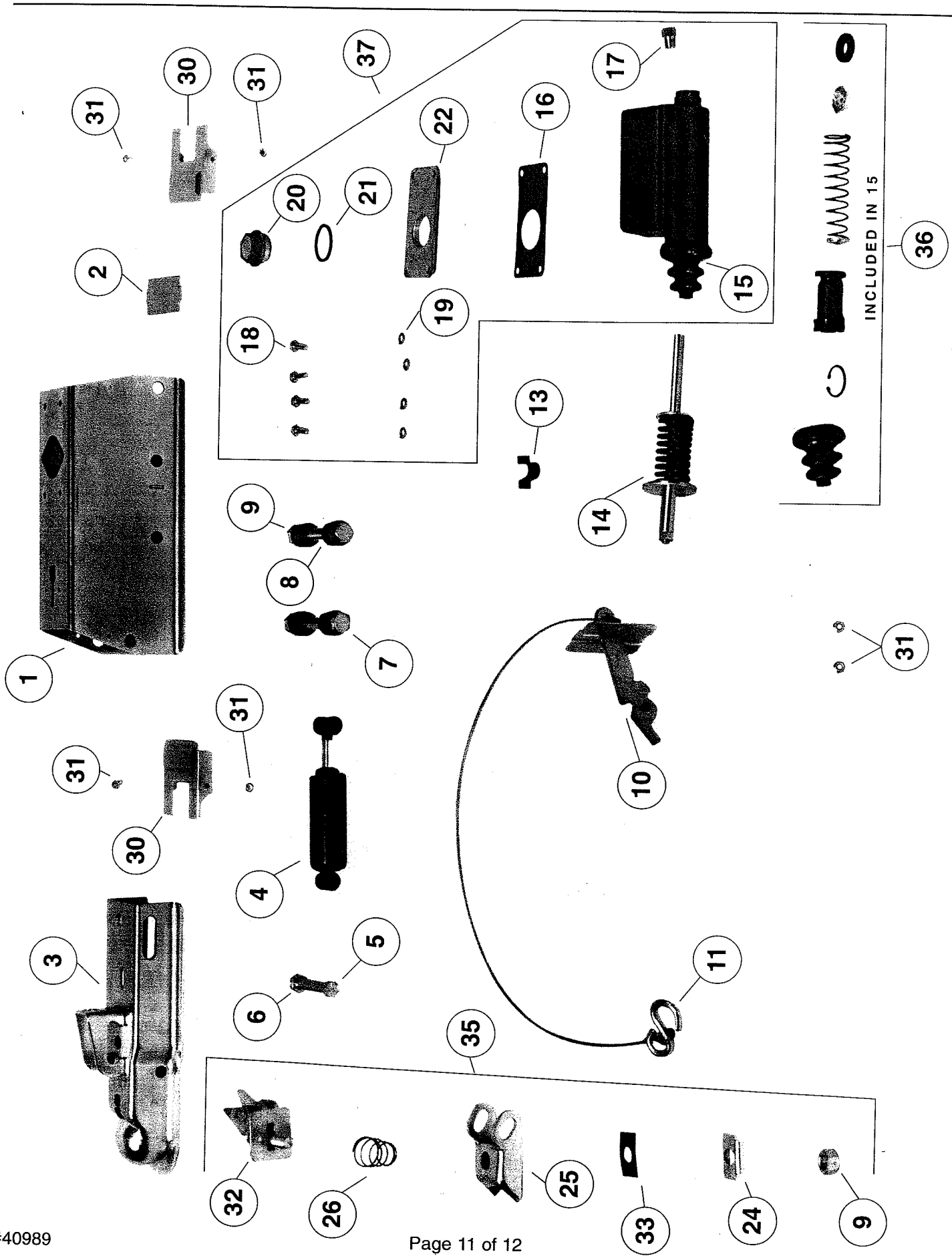
LEVER-LOCK
MODEL 60 ACTUATOR DIAGRAM



TITAN

LIMITED WARRANTY

Limited Warranty Titan Wheel International (Titan) warrants its products to be free from defects in material and workmanship for one year from date of delivery to the original purchaser when properly installed, used and maintained by the purchaser.

This warranty does not apply to damage or loss caused by any or all of the following circumstances or conditions:

- Freight damage.
- Parts, accessories, materials or components not obtained from or approved in writing by TITAN.
- Misapplication, misuse and failure to follow the directions or observe cautions and warnings on installation, operation, application, inspection or maintenance specified in any TITAN quotation, acknowledgement, sales literature, specification sheet or installation instruction and service manual ("applicable literature").

If any TITAN products are found upon TITAN's examination to have been defective when supplied, TITAN will either: credit the purchaser's account for the purchase price of the TITAN product; replace the TITAN product; or repair the product. TITAN has sole discretion in choosing which option to provide. For this LIMITED WARRANTY to apply, TITAN must receive notice of the alleged defect within 30 days of either the discovery of the alleged defect or the expiration of the warranty period, whichever is earlier. Any claim not made within this period shall conclusively be deemed waived.

If requested by TITAN, purchaser shall return the alleged defective product to TITAN for examination at TITAN's direction and expense. TITAN will not pay for expenses incurred in returning a product to TITAN without TITAN's prior written authority. TITAN shall not be liable for any other expenses purchaser incurs to remedy any defect. Purchasers waive subrogation on all claims under any insurance.

Limitation of Liability It is expressly agreed that the liability of TITAN is limited and TITAN does not function as an insurer. THE REMEDIES SET FORTH IN THIS WARRANTY SHALL CONSTITUTE THE EXCLUSIVE REMEDIES AVAILABLE TO THE PURCHASER OR USER AND ARE IN LIEU OF ALL OTHER REMEDIES, EXPRESS OR IMPLIED. THE LIABILITY OF TITAN, WHETHER IN CONTRACT, IN TORT, UNDER ANY WARRANTY OR OTHERWISE, SHALL NOT EXCEED THE PURCHASE PRICE OF THE PARTICULAR PRODUCT MANUFACTURED, SOLD OR SUPPLIED BY TITAN.

To Obtain Technical Assistance To enable TITAN to respond to a request for assistance or evaluation of customer or user operating difficulty, please provide at a minimum the following information by calling **1-800-247-1781** or within Iowa **1-515-265-9200**:

- Model number, serial number and all other data on the specific component which appears to be involved in the difficulty.
- The date and from whom you purchased your TITAN product.
- State your difficulty, being sure to mention at least the following: Application, Nature of load involved, and Weight of the load.

Field Service If field service at the request of the purchaser is rendered and the difficulty is found not to be with TITAN's product, the purchaser shall pay the time and expense (at the prevailing rate at the time of service) of seller's field representative(s). Charges for service, labor and other expenses that have been incurred by the purchaser, its customer or agent without prior written authorization of TITAN will not be accepted.

TITAN EXTENDS NO WARRANTY, EXPRESS OR IMPLIED, ON PRODUCTS NOT MANUFACTURED BY TITAN OR TO TITAN'S DESIGN SPECIFICATION, INCLUDING BUT NOT LIMITED TO SUCH ITEMS AS NON-TITAN TIRES, BRAKES, ACTUATORS, BEARINGS, HOSE AND TUBING. PURCHASER'S RECOURSE SHALL BE LIMITED TO ANY WARRANTY OF THE RESPECTIVE MANUFACTURERS.

THIS WARRANTY EXCLUDES ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY PURPOSE.

THIS WARRANTY DOES NOT COVER NOR EXTEND TO INCIDENTAL OR CONSEQUENTIAL DAMAGE. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

No representative has authority to make any representation, promise or agreement except as stated in this Limited Warranty. TITAN reserves the right to make design and other changes upon its products without any obligation to install the same on any previously sold or delivered products.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THOSE DESCRIBED ABOVE. EFFECTIVE JANUARY 1, 1998 THIS WARRANTY SUPERSEDES ALL PRIOR WARRANTIES, WRITTEN OR IMPLIED.

ENGINEERING BULLETIN

SUBJECT: PROPER ADJUSTMENT OF PRESSURE RELIEF VALVE

The Pressure Relief Valve incorporated in the "PAF" series manholes is designed to provide pressure–actuated emergency venting at their rated capacities when properly adjusted. The correct load on the Pressure Relief Valve cover is provided by a special spring located in the center of the cover. To properly adjust the cover please follow these procedures

(1) Loosen lock nut on underside of cover as shown in Fig. 1.

(2) With the cover held firmily closed, loosen or tighten adjusting bolt in center of strongback until latch just touches the secondary latch on the end of strongback. See Fig. 2.

(3) Tighten lock nut making sure bolt does not turn.

(4) Close cover and recheck clearance of latch and strongback.

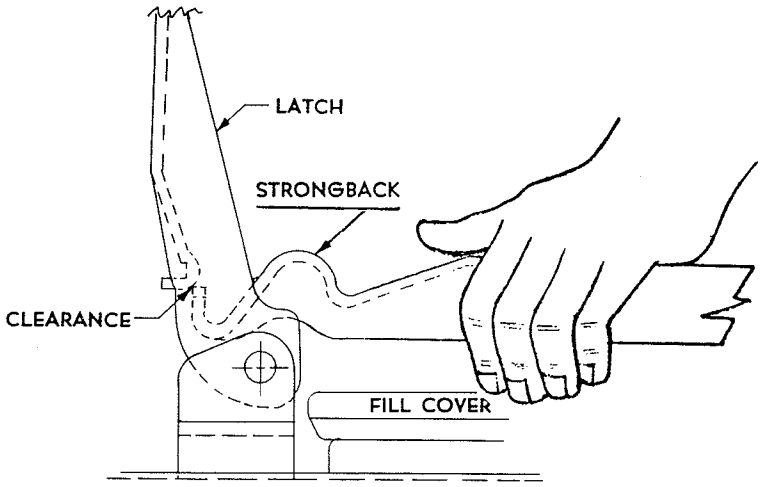


FIG. 2

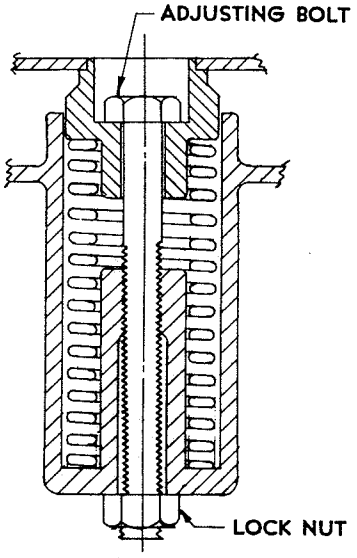
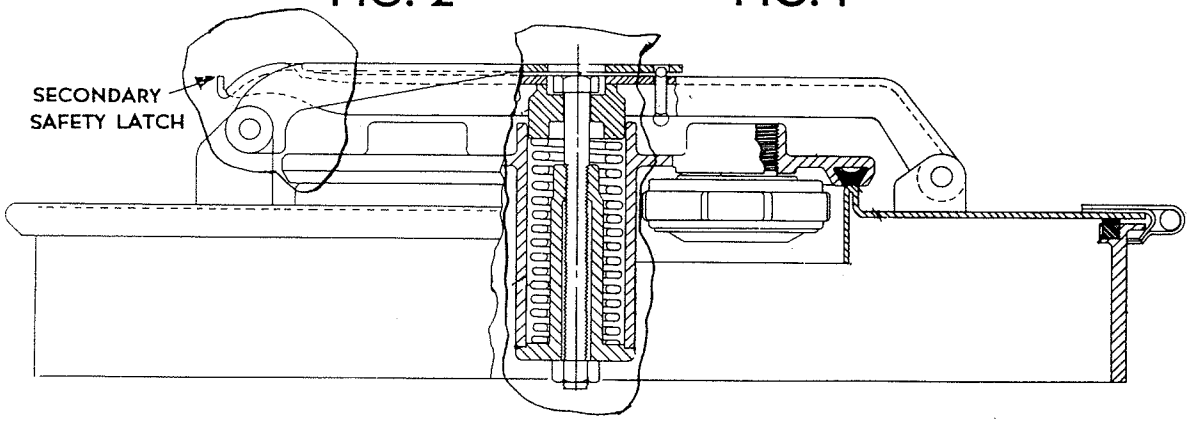


FIG. 1

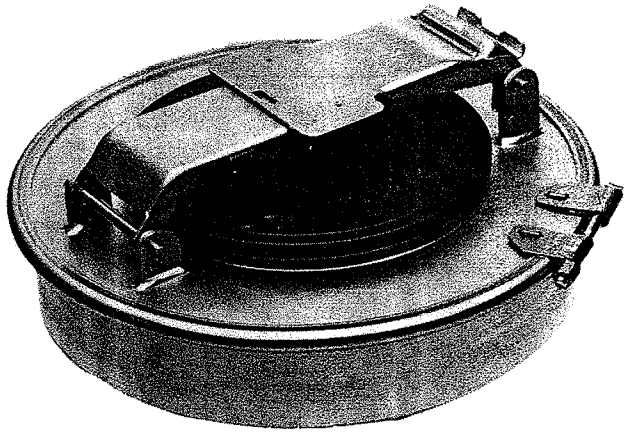


TIONA®

16" PAF 406-98 MANHOLE

WITH INTEGRAL RELIEF VALVE/10" FILL

- INTEGRAL RELIEF VALVE/10"FILL
- LESS THAN 1 LITER LEAKAGE
- SET PRESSURE ADJUSTMENT
- INCREASED FLOW RATE
- SECONDARY SAFETY LATCH



MODEL L716-STANDARD
MODEL L742-SELF LATCHING

Pressure Relief Valve setting 3.63 psig
Rated Pressure Actuated Emergency Venting: 363,820 cu. ft. free air per hour @ 6.25 psig
Rated Liquid Flow Capacity 1150 gpm @ 5.0 psig

PAF manholes with integral latch style surge suppression relief valves are designed for use on DOT406 and replacement on MC306 specification cargo tanks. Manholes are certified and marked in accordance with 49CFR178.345-5 with a test pressure of 36 psig. Manhole covers are 7 gage steel or stainless and are secured to the tank weld collar with a clamp ring and bolt which can be easily removed to provide access into the tank.

The integral 10" relief valve provides emergency pressure relief and meets the 1 liter surge leakage limit imposed by 49CFR178.345-10(b)(3)(ii). The relief valve also serves as a 10" latch style fill which can be easily opened to provide access for filling the tank or for inspection. Relief valves contain an adjustment feature to allow for fine-tuning of set pressure in the field. Other standard features include a heavy duty clamp ring, secondary safety latch and model 6496ALB pressure-vacuum vent mounted in the 10" relief valve cover.

Manholes are available with a self-latching feature that allows the 10" relief valve/fill cover to drop and securely latch upon movement of the tank if the cover is inadvertently left open. For self-latching model substitute L742 for L716 in assembly number.

Cover Plate	Relief Valve	Clamping Ring, Bolt, Washer, Strongback, & Latch	Clamping Ring Nut	Normal Vent	Wt. (lb)	Assembly No.
Steel Zinc Plt.	Alum.	Steel Zinc Plt.	Brass	Alum.	24.2	PPVL716BXB
Stnls 304	Alum.	Stnls 304	Stnls 304	Alum.	24.7	PPVL716CXB
Stnls 316	Alum.	Stnls 304	Stnls 304	Alum.	24.7	PPVL716DXY

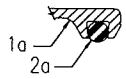
NOTE: Manhole assemblies, as listed above, have Buna-N gaskets (suffix "B"). For variation in gasketing change last letter of assembly number as follows.
Suffix "V" indicates Viton collar gasket
Suffix "W" indicates White Hypalon collar gasket
Suffix "T" indicates Teflon envelope collar gasket

Manhole collars are available in aluminum, steel, and stainless steel. Please see parts page for correct numbers. When welding collars to tank, care should be exercised to insure collar remains flat and round.

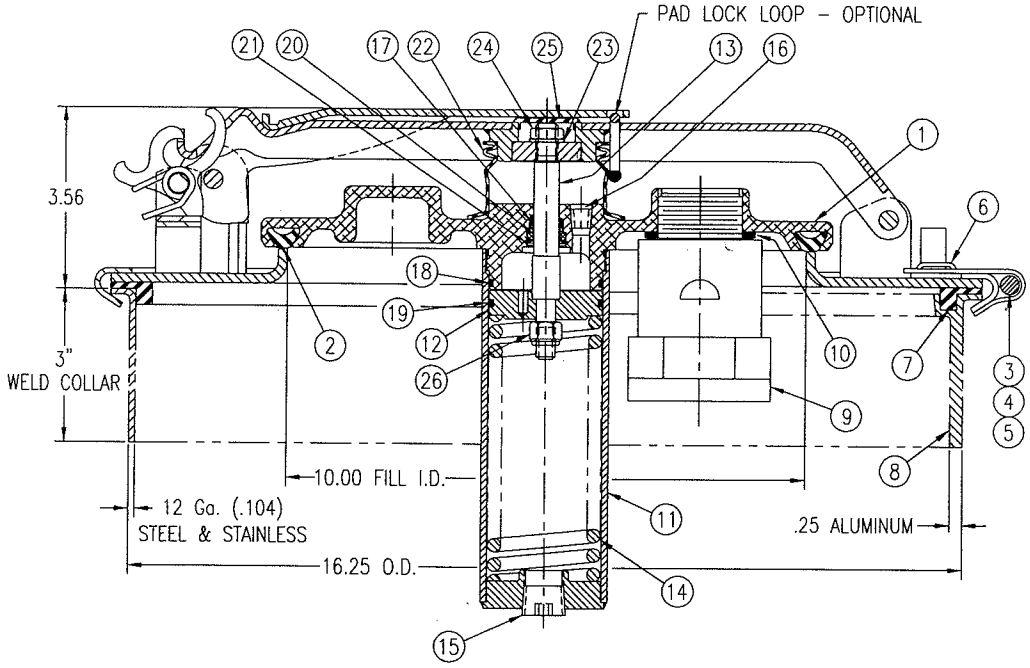
PARTS LIST

16" PAF 406-98 MANHOLE

Self-Latching Model Illustrated



COVER w/O-RING



No.	Description	Material	Part No.
1	Fill Cover	Alum/E-Coated	8297ALEY
1a	Fill Cover (O-Ring Grvd.)	Alum/E-Coated	8297ALEY389
2	Gasket – Integral Relief Valve	Buna-N	3119BN
		Viton	3119VT
		Wh. Hypalon	3119WH
2a	O-Ring	Tef-Sil	3902TS
3	Bolt-Clamp Ring	Steel Zinc Plt.	3029ZC
		Stnls 304	3029SL
4	Nut-Clamp Ring	Brass	3030BR
		Stnls 304	9Q5809
5	Washer-Clamp Ring	Steel Zinc Plt.	3031ZC
		Stnls 304	3031SL
6	Clamping Ring	Steel	3028MS
		Steel Zinc Plt.	3028ZC
		Stnls 304	3028SL
7	Manhole Gasket Channel type	Buna-N	3559BN
		Viton	3559VT
		Wh. Hypalon	3559WH
		Teflon Env. w/Wh. Hypalon	3025TF
8	Manhole Collar Channel type	Steel	3057MS
		Aluminum	3057AE
		Stnls 304	3057SL
		Stnls 316	3057SS

No.	Description	Material	Part No.
9	Vent Assembly	Aluminum	6496ALB
10	Gasket	Buna-N	3716BN
11	Cylinder Assembly	Aluminum	6657AL
12	Piston	Aluminum	6654AL
13	Stem	Stnls 304	6688SL
14	Spring	Steel	4122MS
15	1/2" NPT Plug Zinc Plt.	Steel Zinc Plt.	9V4907
16	1/8" NPT Plug Stnls.	Stnls 304	9V4915
17	Stem O-Ring -112	Buna-N	4118BN
18	Cylinder O-Ring-137	Buna-N	4015BN
19	Piston O-Ring-137	Tef-Sil	4015TS
20	O-Ring Retainer	Alum/E-Coated	4117ALEY
21	Retainer Ring	Stnls 304	9Q4961
22	Bellows	Buna-Urethane	4020BU
23	Lockwasher Ext. Tooth 7/16"	Stnls 304	9Q5961
24	Nut Hex 7/16x20	Stnls 304	9Q5960
25	Plastic Plug	Polyethylene	9Z6163
26	3/8-16 Hex Nut W/ Insert	Steel Zinc Plt.	9Q5896

Gasket Maximum Temperature

Buna N (Nitrile)	250°F
Viton	400°F
White Hypalon	250°F
Teflon-Silicone	400°F
Teflon Envelope w/ White Hypalon Insert	250°F

Replace oil in cylinder using Kendall Hyken Glacial Blu Hydraulic Fluid, or if unavailable, a high quality SAE 5W-10W oil with viscosity of 90 SUS at 100°F and a pour point of no greater than -50°F.

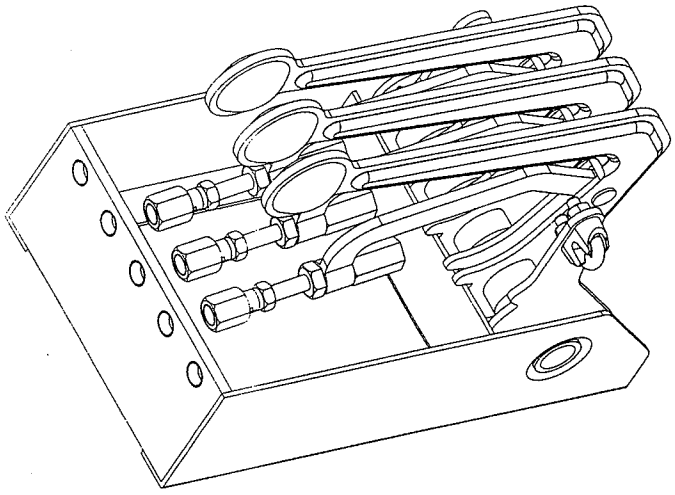
MAINTENANCE: Manhole assemblies should be inspected with sufficient frequency to insure 10" Integral Relief Valve functions properly. Any worn, damaged or missing parts must be replaced. Gaskets should be replaced if their effectiveness to insure a liquid tight seal is impaired in any way. Replacement gaskets must be compatible with products carried.

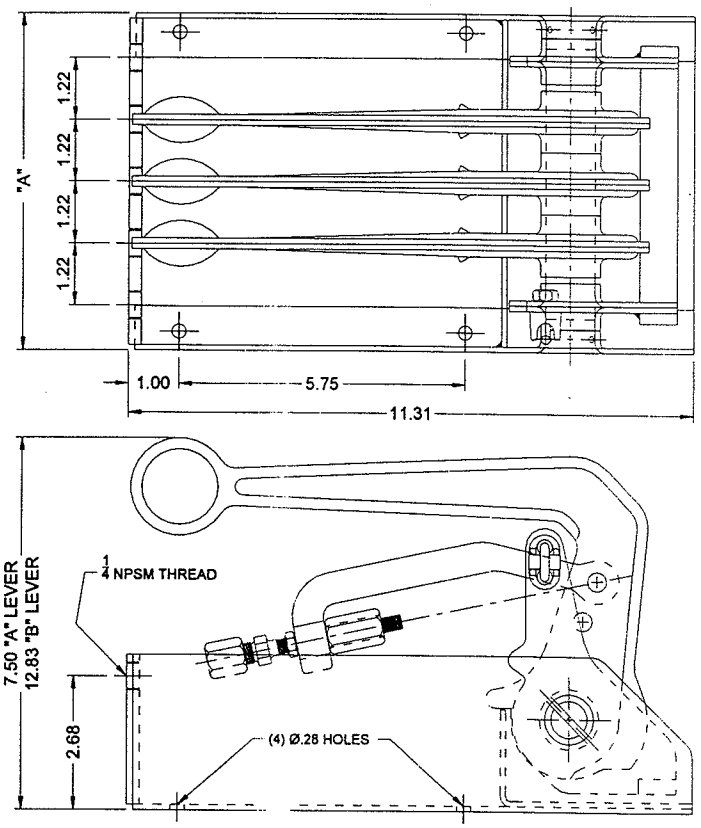
WARNING **Consult PAF406-98 maintenance manual prior to disassembly of this relief valve.**
Use only genuine BETTS INDUSTRIES, INC. replacement parts. Use of substitue parts can impair the proper functioning of this product.

Mechanical Operator

UNIVERSAL

- **Fusible Joint on Each Compartment**
- **Non-slip Cable Connectors**
- **1-1/2" or 2-1/8" Cable Travel**
- **Choice of 2 Lever Styles**





Betts universal mechanical operators function cable operated emergency valves from a central location on a cargo tank. Operators are available in any number of compartments from 1 up to 7. Each compartment is supplied with a fusible joint designed to melt at not more than 250° F. Non-slip cable connectors for each compartment allow cables to be cut to length after installation.

Emergency valves are held open by the over-center action of the lever assembly, thereby eliminating the need for springs and latches. Trip levers close all open valves when the remote control is tripped. Two trip levers allow for flexibility in locating remote control or for attaching two remote controls, if required.

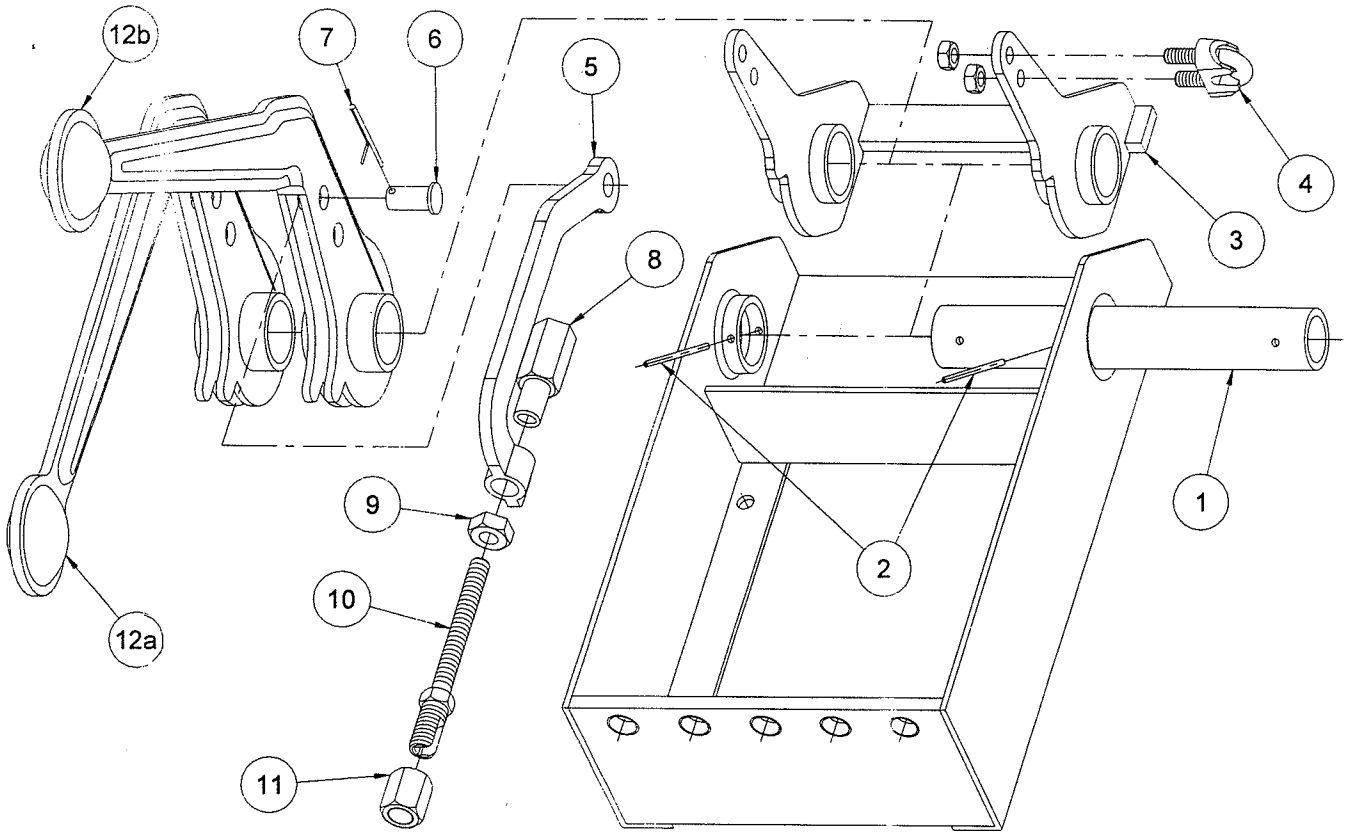
Fabricated steel construction provides strength while keeping weight to a minimum. Tubular brass shaft provides an excellent bearing surface for levers. Levers are available in two styles. Style "A" is furnished as standard, but style "B" is available at no added cost (see notes). Operators are also available with an optional black "E" coating which provides an attractive finish with excellent corrosion resistance.

No. of Compts.	Finish	Weight (lb)	Part Number	Dimension "A"
1	Plain	8.0	40397A	4-7/32
	E-coated	8.0	40397AEY	
2	Plain	10.3	40397B	5-7/16
	E-coated	10.3	40397BEY	
3	Plain	12.5	40397C	6-21/32
	E-coated	12.5	40397CEY	
4	Plain	14.8	40397D	7-7/8
	E-coated	14.8	40397DEY	
5	Plain	17.0	40397E	9-3/32
	E-coated	17.0	40397EEY	
6	Plain	19.3	40397F	10-5/16
	E-coated	19.3	40397FEY	
7	Plain	21.5	40397G	11-17/32
	E-coated	21.5	40397GEY	

Notes: 1. Add suffix –01 to specify "B" style levers, i.e. 40397A01 or 40397A01EY.

PARTS LIST

Universal Mechanical Operator



No.	Description	Material	Part No.						
			1 Compt.	2 Compt.	3 Compt.	4 Compt.	5 Compt.	6 Compt.	7 Compt.
1	Shaft	Brass	20298A	20298B	20298C	20298D	20298E	20298F	20298G
2	Roll Pin	Steel	9Q5816						
3	Trip Lever Assy	Steel	20301A	20301B	20301C	20301D	20301E	20301F	20301G
4	Cable Clamp	Steel	9Q1660						
5	Offset Link	Steel	10083A						
6	Offset Link Clevis	Steel	15757MS						
7	Offset Link Cotter Pin	Steel	9Q5865						
8	Fusible Bushing Nut	Brass	10865A						
9	Lock Nut	Steel	9Q5808A						
10	Adjusting Bolt	Steel	20040A						
11	Clamping Nut	Steel	10268A						
12a	Lever (Style - A)	Steel	20258A						
12b	Lever (Style - B)	Steel	20269A						

WARNING Use only genuine BETTS INDUSTRIES INC. replacement parts. Use of substitute parts can impair the proper function of this product.

Note: Adjusting Bolt assembly 20040A001 includes items 8, 9, 10, 11.

Suggestions for Installing, Operating, and Maintaining

Installation

1. **Mechanical Emergency Valve** should be located and orientated in order to provide the shortest and most direct piping.
2. Three sixteenths inch (3/16") diameter, or smaller, flexible cable should be inserted in the valve's lever arm as shown on catalog page 117 . Tightening of the clamping bolt assures positive cable anchorage which should not require further attention.

Operation

1. **Mechanical Emergency Valve** is operated by a flexible cable which in turn is attached to the mechanical emergency valve operator.

Maintenance

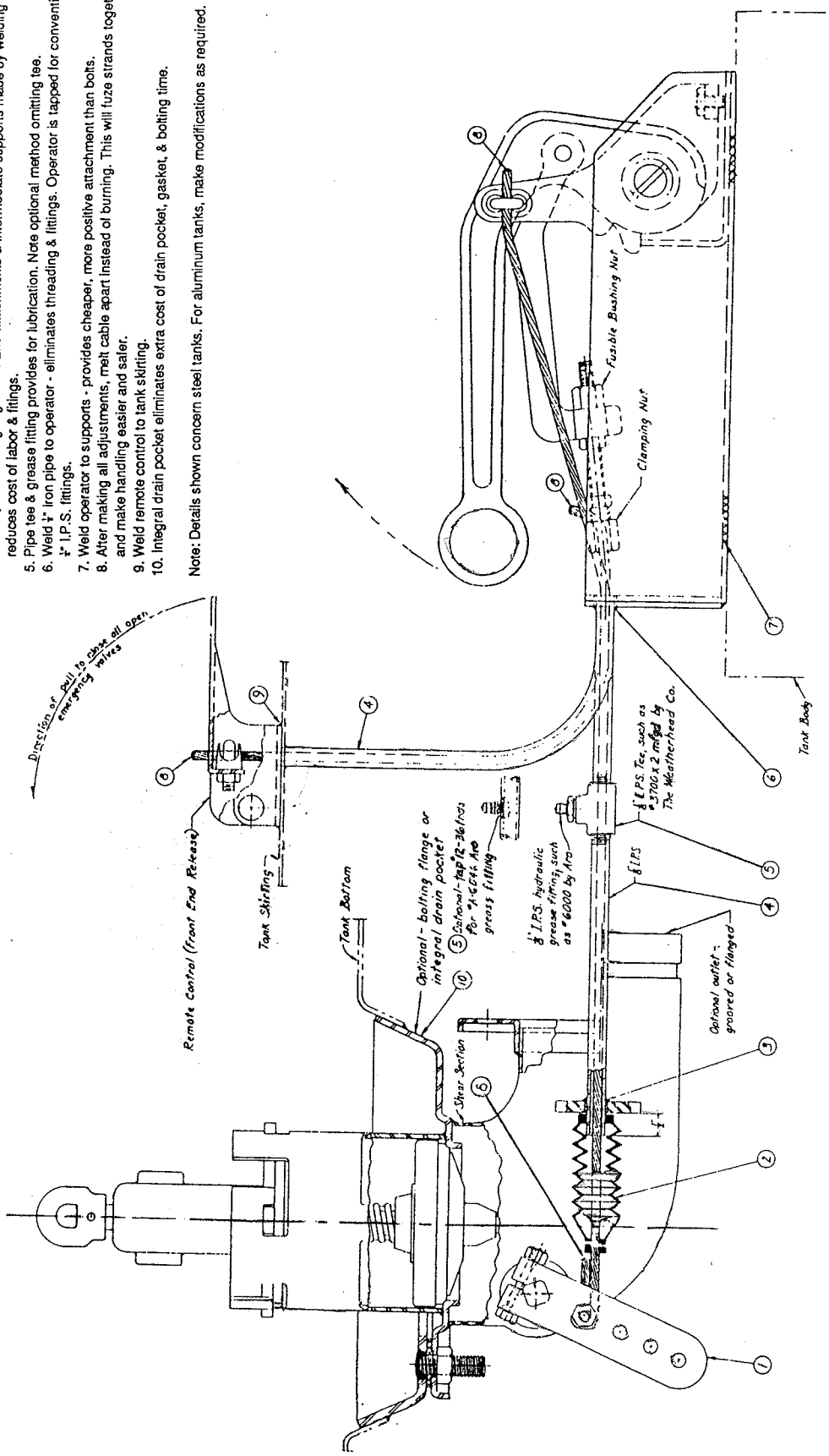
1. **Mechanical Emergency Valves** are equipped with a conventional spring-loaded stuffing box which should maintain a perfect seal for many years. If repacking is required, remove the lever arm, gland nut, and gland. After insertion of a packing ring, the stuffing box is reassembled.

MECHANICAL EMERGENCY VALVES

SUGGESTIONS FOR IMPROVED, LOW COST INSTALLATIONS

1. Clamping Arm (included in the base price of valve) elirninates the need of separate clevis & pin - Furnished for use with cable 3/16" diameter or smaller.
2. Bellows protects against road wash, fits tightly over ¾" pipe projection. No fittings required.
3. Stitch weld ¾" iron pipe to emergency valve outrigger- elirninates threading & fittings. Outrigger is tapped for conventional ¾" I.P.S. fitting.
4. ¾" iron pipe is inexpensive, may be easily bent without collapsing walls, insures maximum cable travel by maintaining alignment. End attachments & intermediate supports made by welding which reduces cost of labor & fittings.
5. Pipe tee & grease fitting provides for lubrication. Note optional method omitting tee.
6. Weld ¾" iron pipe to operator - elirninates threading & fittings. Operator is tapped for conventional ¾" I.P.S. fittings.
7. Weld operator to supports - provides cheaper, more positive attachment than bolts.
8. After making all adjustments, melt cable apart instead of burning. This will fuze strands together and make handling easier and safer.
9. Weld remote control to tank skirting.
10. Integral drain pocket elirninates extra cost of drain pocket, gasket, & bolting time.

Note: Details shown concern steel tanks. For aluminum tanks, make modifications as required.



Emergency Valve

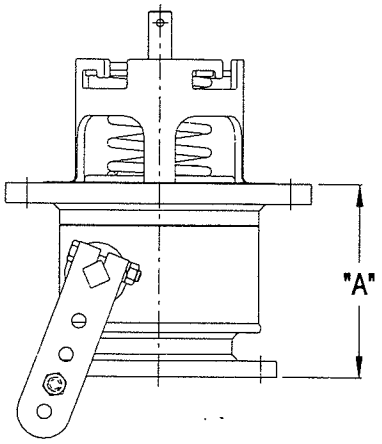
Stainless Steel

STRAIGHT

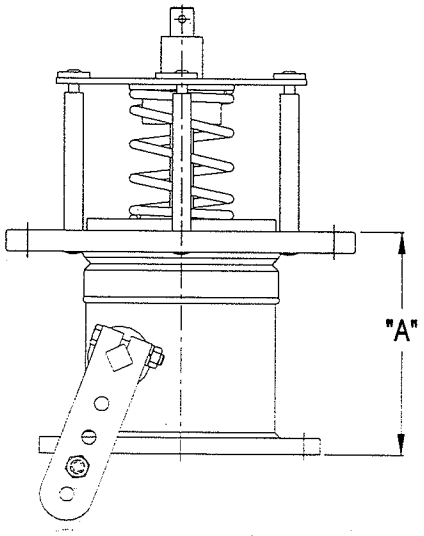
- Cable Operated
- Tapered Seat
- Teflon Encapsulated Seals

Betts Stainless Steel Emergency Valves are equipped with Teflon encapsulated O-ring seals which are compatible with a wide range of products. The tapered seat is self-cleaning to lessen the possibility of seat damage due to foreign objects. The stuffing box features two O-ring seals to provide positive sealing.

Left-hand valves are available with the cable lever arm on opposite side of valve as shown at right. Add suffix –005 for left-hand option. Add suffix –004 for optional screen.



3in. CABLE / FLANGED



4in. CABLE / FLANGED

See Section 30 Page 9B for parts list.

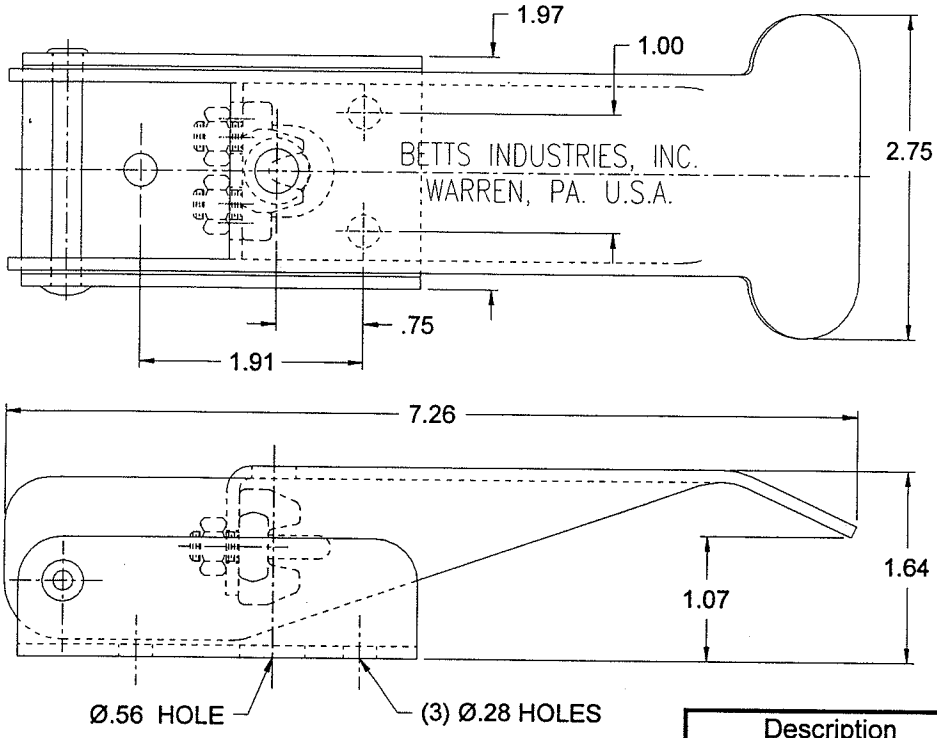
Size	Assembly No.	Air/Cable	Outlet	Wt.	Dimensions	Inlet Flange		Outlet Flange	
					A	B.C.	Holes	B.C.	Holes
3"	Not Available	Air	3" Flg	N.A.	4.50"	6.25"	6-9/16	4.88"	8-7/16
	EV46326SSTS	Cable	3" Flg	13.0					
4"	Not Available	Air	4" Flg	N.A.	5.25"	7.25"	8-9/16	5.88"	8-7/16
	EV46629SSTS	Cable	4" Flg	15.7					

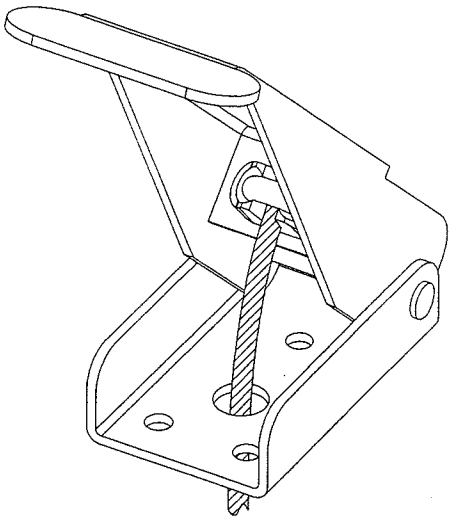
Force rating from TTMA RP86: 3" Valves: $F_{b\text{-}max}$=21,000 lb. 4" Valves: $F_{b\text{-}max}$=8,500 lb.

CAUTION: Never bottom load through emergency valves without first opening valve. Failure to do so may result in damage to the tank and/or valve.

Operator Accessories

Cable Remote Control

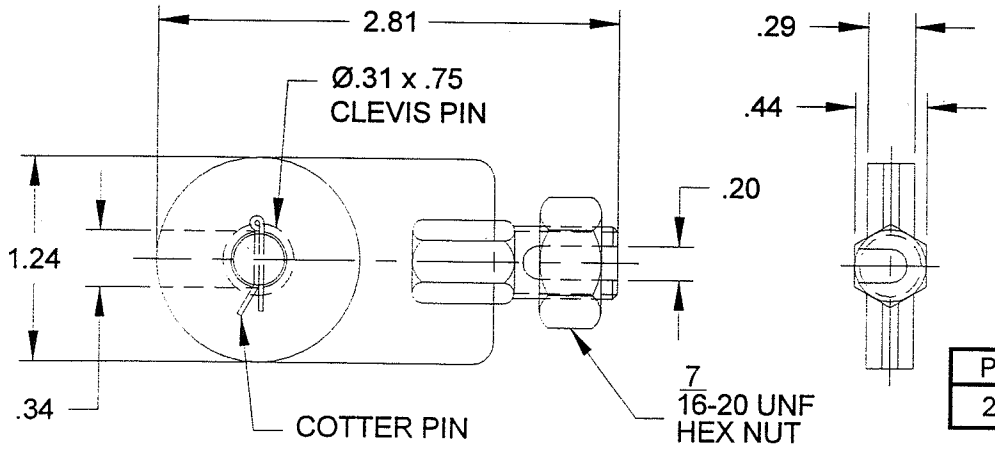




Description	Part No.	Material	Weight (lb)
Remote Control Assy.	35603SL	Stainless	1.10
Cable Clamp only	9Q1659		.10

New design provides greater stroke (2-1/8") and leverage. Stainless steel to resist corrosion. Remote attaches to trip lever on operator using cable. Pulling remote lever rotates operator trip lever and bar assembly, causing all open emergency valves to close. Per 49CFR178.345-11, remote must be located at least 10 feet away from loading/unloading outlet (where vehicle length allows) or on the end of the cargo tank farthest from the loading/unloading outlet. Test cable remote controls and operators at least once a day to insure proper functioning.

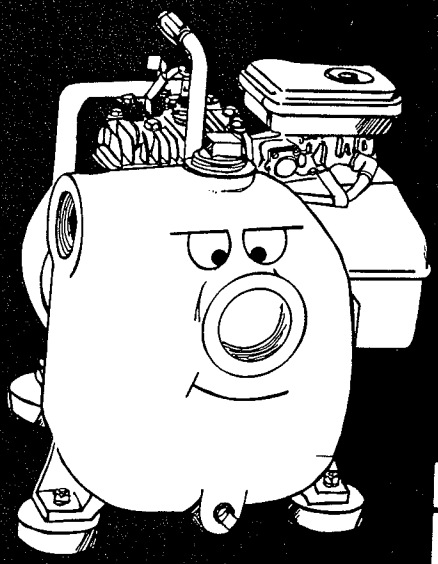
Fusible Link



Part No.	Material	Weight (lb)
21050A	Steel	.17

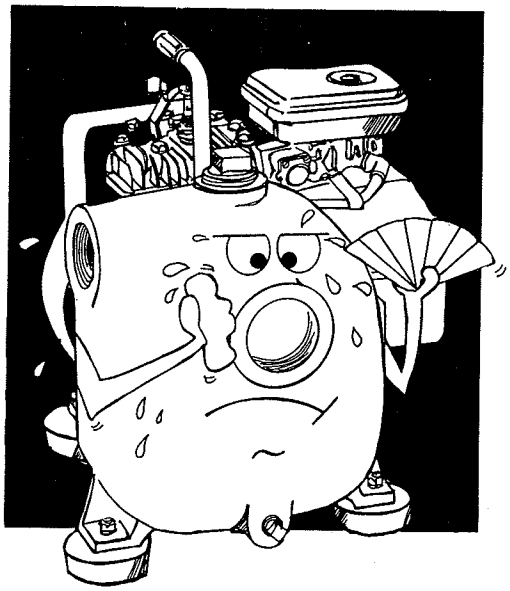
Heavy duty fusible cable links are designed to attach the cable to the emergency valve cable lever arm and to provide thermal activation at the emergency valve. Fusible element melts at not more than 250°F, releasing the cable tension and allowing the emergency valve to close. Uses same non-slip, adjustable cable attachment as on Betts operators.

GORMAN-RUPP



PUMP SAFETY HANDBOOK

PUMPS IN GENERAL



[1] Overheated pumps can cause severe burns and injury. If overheating of pump casing occurs:

A. stop pump immediately
B. allow to cool completely
C. slowly and cautiously vent pump
D. refer to instruction manual before restart.

[2] Do not operate pump without guards and shields in place.

[3] Approach cautiously any pump that has been in operation.

[4] Pump only liquids designed for operation of pump.

[5] Do not pump flammable or corrosive liquids unless pump and piping are designed for such.

[6] Operating pump with suction and discharge closed is one cause of severe overheating.

[7] Note direction of rotation — operating pump in wrong direction can cause impeller to unscrew and damage volute casing.

[8] Locate the pump in an accessible location, as close to the liquid as possible.

[9] Check all lubricants before installation and in accordance with maintenance programs.

[10] When lifting pumps, use only lifting equipment in good repair and with adequate capacity.

[11] Never operate a self-priming pump unless the volute is filled with liquid. The pump will not prime when dry.

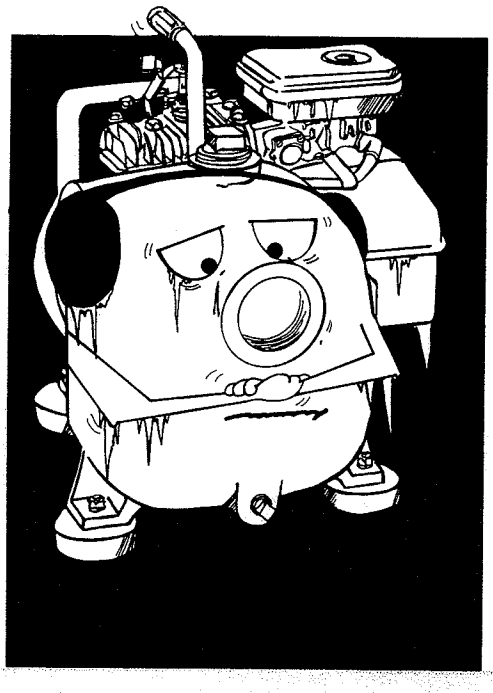
[12] Do not remove the cover plate or drain plugs from any overheated pump. Allow pump to cool. Check pump temperature before opening fill port or drain plug.

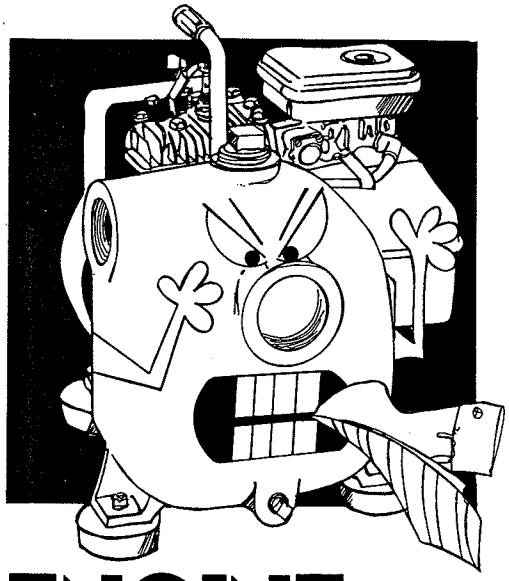
[13] A pump should not be operated against a closed valve for any period of time.

[14] Check the suction strainer regularly.

[15] Secure the pump after it is in its operating position.

16. Check the pump thoroughly at delivery for any shipping damage.
17. Don't work in underground pump systems by yourself.
18. Never wear loose clothing around machinery.
19. Always read and keep Pump Maintenance and Parts Manual.
20. When overhauling pumps, never delete warning tags.
21. Experienced personnel only should operate machinery.
22. When working on pumps with electric motors and panels, LOCK control handle in OFF position:
    A. if control cannot be locked pull main fuse.
    B. take V-belts off.
23. Drain pump completely of water before freezing weather.

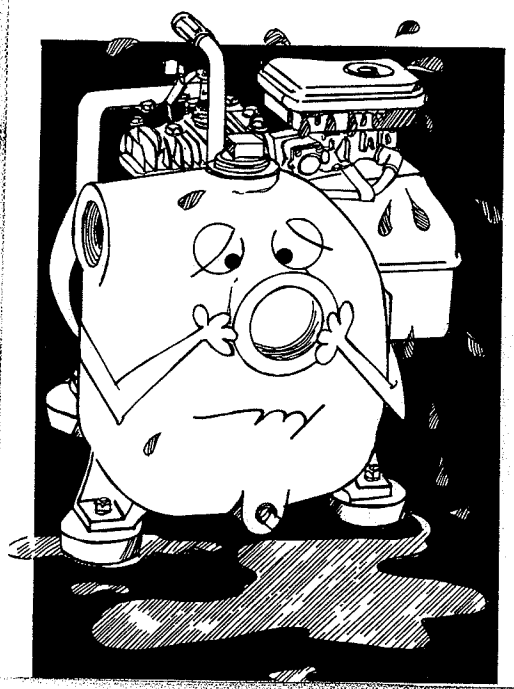


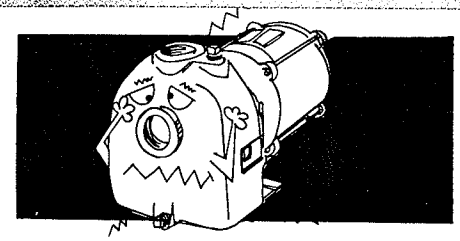


ENGINE DRIVEN PUMPS

1. When operating internal combustion engines in an enclosed area, always make provisions to pipe exhaust fumes to outside.
2. Overfilling of fuel tank should be avoided.
3. Disconnect spark plug during repair.
4. Never refuel a hot or running engine.
5. Experienced personnel only should operate machinery.
6. Never tamper with the governor setting to gain more power. The governor establishes safe operating limits.

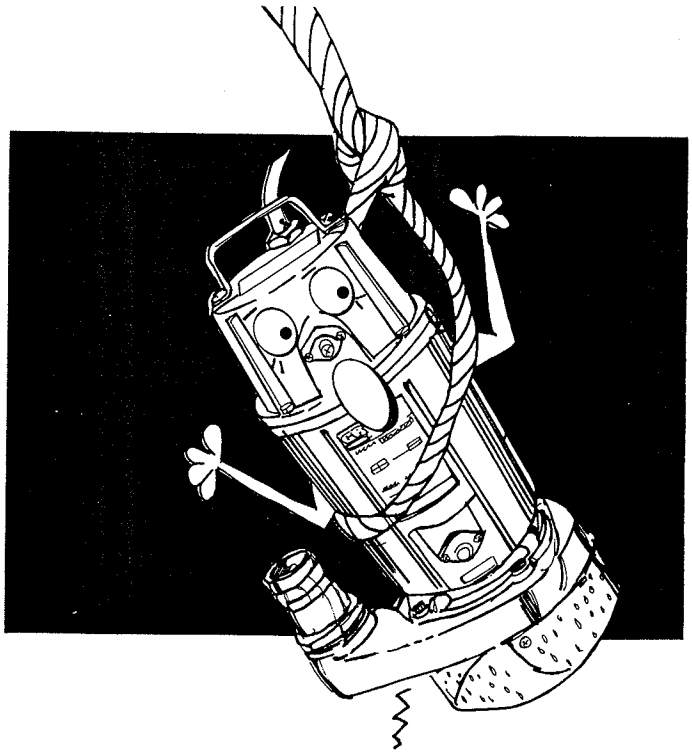
7. Always store gasoline in an approved safe container and location.
8. Make sure all fuel lines are secure.
9. Follow engine manufacturer recommended maintenance and operations.
10. Always use correct type of fuel for engine.
11. Normal heat from an exhaust can be a hazard.
12. Do not jump-start engine battery.
13. Do not shut down high head pumps quickly:
    A. throttle back slowly
    B. by-pass line should be opened
    C. should have check valve
    D. slowly close gate valve on discharge if it has one.





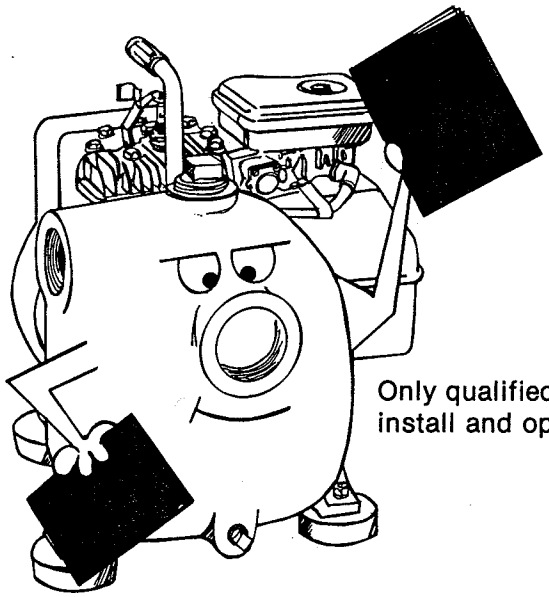
ELECTRIC MOTOR DRIVEN

1. Whenever electricity is present there is a possibility of electrocution.
2. Allow only qualified personnel to install, wire and operate pump and motor.
3. Always ground electrical units.
4. Never use gas piping as an electrical ground.
5. Be sure to connect motor to right phase and voltage.
6. If circuit breaker or fuse is tripped, examine problem before restarting pump.
7. Do not run pump if voltage is not within limits.
8. Make all electrical installation in accordance with national electrical code and local codes.
9. Make sure the related electrical circuits are dead and locked out before performing any maintenance.
10. Follow motor manufacturer recommended maintenance and operations.



SUBMERSIBLES

1. Never attempt to raise pump by electrical cord.
2. Always use proper Gorman-Rupp control box.
3. Always check rotation on 3 phase pumps.
4. Make sure the related electrical circuits are dead and locked out before performing any maintenance.
5. Do not hold reset button if overload control trips off. Do not reset until 10 minutes have elapsed.
6. Never put pump directly on soft, loose bottom.
7. Do not run pump if voltage is not within limits.
8. Check oil level only when pump is cool.
9. Use only recommended transformer oil.
10. Control box must be mounted in vertical position.



Only qualified personnel should install and operate pumps.

Be sure you have read all of Installation, Operation and Maintenance Manual as well as these safety instructions before you begin to operate your new pump. Once you have read them all, you should only have to apply some ordinary common sense to avoid any mishaps. We, at Gorman-Rupp, have gone to considerable expense to insure the safety and reliability of all our pumps. But your safety ultimately rests in your hands, so do your part and you will enjoy trouble-free pumping for years to come. Thank you.

GORMAN-RUPP®

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

SM-00593

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THE GORMAN-RUPP CO.
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GORMAN-RUPP PUMPS

Thank you for purchasing a Gorman-Rupp pump. So that we may serve you better, please take a few moments to fill out and return this card. At Gorman-Rupp, quality and customer satisfaction are our primary concerns. If your new pump doesn't meet your expectations in any way, we want to know about it.

Thank you,

Jeff Gorman
President/CEO

Pump Model _____ Serial No. _____
Pump purchased from: _____
How is your pump being used? _____
_____
What type of liquid are you pumping? _____
Comments: _____
_____
_____
_____
_____
_____

How did you hear about our pumps?
❑ Advertising ❑ Trade Show ❑ Local Distributor ❑ Other _____

****

Name _____
Phone # _____ FAX# _____
Company _____
Address _____
City _____ State _____ Zip _____

Date _____

PLEASE FOLD AND SECURE WITH TAPE

ADV 00174-2/00

July 18, 1979

WARRANTY

Pumping units manufactured by The Gorman-Rupp Company, Mansfield, Ohio are guaranteed to be free from defects in material and workmanship for one year from date of shipment from factory in Mansfield, Ohio. The obligation under this Warranty, statutory or otherwise, is limited to replacement or repair at Mansfield, Ohio factory or at a point designated by Gorman-Rupp, of such part as shall appear to us upon inspection at such point, to have been defective in material or workmanship.

This Warranty does not obligate The Gorman-Rupp Company to bear the cost of labor or transportation charges in connection with replacement or repair of defective parts; nor shall it apply to a pump upon which repairs or alterations have been made unless authorized by Gorman-Rupp.

No warranty is made in respect to engines, motors, or trade accessories, such being subject to warranties of their respective manufacturers.

In Submersible Pumps, pump and motor are integral and Submersibles are warranted as a unit. Since motor is subject to an important degree upon quality and performance of electrical controls, unit warranty is valid only when controls have been specified and provided by Gorman-Rupp.

No express implied or statutory warranty, other than herein set forth is made or authorized to be made by Gorman-Rupp.

In no event shall The Gorman-Rupp Company be liable for consequential damages or contingent liabilities arising out of the failure of any Gorman-Rupp pump or parts thereof to operate properly.

THE GORMAN-RUPP COMPANY
Mansfield, Ohio

NOTE: In Canada, all above references to "The Gorman-Rupp Company, Mansfield, Ohio" is understood to mean "Gorman-Rupp of Canada Limited, St. Thomas, Ontario."

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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ABCEG

OM-03873-OE01
January 14, 1993
Rev. A: 10/09/98

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

SHIELD-A-SPARK™

UL LISTED

80 SERIES PUMP

MODEL
82D1-9-X

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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WARNING!

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

INTRODUCTION

This Installation, Operation, and Maintenance manual is designed to help you achieve the best performance and longest life from your Gorman-Rupp pump.

This pump is a 80 Series, "Shield-A-Spark®", semi-open impeller, self-priming centrifugal model with a suction check valve. It is close-coupled to a four cycle air cooled single cylinder Briggs and Stratton engine incorporating such safety features as splash guards, grounding wire and spark arresting muffler. The pump is specially designed for pumping gasoline and other petroleum products in a non-flammable atmosphere. The basic material of construction for wetted parts is aluminum, with an aluminum impeller and steel wearing parts.

If there are any questions regarding the pump or its application which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor, or write:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901-1217

or

Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.

WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY - SECTION A

This information applies to 80 Series engine driven pumps. Refer to the manual accompanying the engine before attempting to begin operation.

The engine used in this pump is not standard. It has been modified for use in handling gasoline and other petroleum products in a well-ventilated, non-flammable atmosphere free of combustible hazards. It cannot be further modified without affecting performance and safety factors. The shield and spark arresting modifications must be inspected and maintained regularly while the unit is in use. Refer to the manual accompanying the engine before attempting to start the engine.

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Shut down the engine and disconnect the spark plug wire to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.

This pump is designed to handle gasoline and other petroleum products in a non-flammable atmosphere. Do not attempt to pump corrosive materials, or any liquids which may damage the pump or endanger personnel as a result of pump failure.

After the pump has been installed, make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.

Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

WARNING!

Overheated pumps can cause severe burns and injuries. If overheating of the pump occurs:

1. **Stop the pump immediately.**
2. **Ventilate the area.**
3. **Allow the pump to completely cool.**
4. **Check the temperature before opening any covers, plates, gauges, or plugs.**
5. **Vent the pump slowly and cautiously.**
6. **Refer to instructions in this manual before restarting the pump.**

WARNING!

Do not operate an internal combustion engine in an explosive atmosphere. When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless, and odorless.

WARNING!

Fuel used by internal combustion engines presents an extreme explosion and fire hazard. Make certain that all fuel lines are securely connected and free of leaks. Never refuel a hot or running engine. Avoid overfilling the fuel tank. Always use the correct type of fuel.

WARNING!

If this pump is used with volatile and/or flammable liquids, be certain proper safety practices are followed before operating or servicing the pump. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately after occurrence.

WARNING!

Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for this pump is 3600 RPM.

INSTALLATION - SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

Most of the information pertains to a standard **static lift** application where the pump is positioned above the free level of liquid to be pumped.

If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line configuration, and priming must be tailored to the specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve.

For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Pump Dimensions

See Figure 1 for the approximate physical dimensions of this pump.

OUTLINE DRAWING

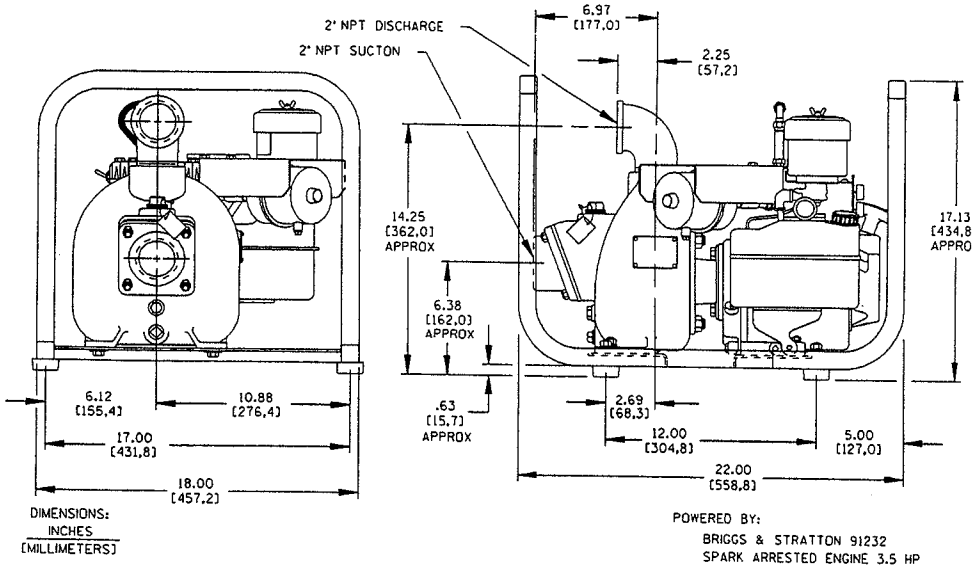


Figure 1. Pump Model 82D1-9-X

PREINSTALLATION INSPECTION

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

a. Inspect the pump and engine for cracks, dents, damaged threads, and other obvious damage.

b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.

d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.

e. If the pump and engine have been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

f. Check all special engine modifications such as spark arresting muffler, fuel guard and handle assembly for loose mounting hardware.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

POSITIONING PUMP

Lifting

This pump is designed to be light-weight and portable with a two-man carry handle provided. The total pump weight is approximately **132 pounds (59,9 kg)**, not including accessories or engine fuel. Customer installed equipment such as suction and discharge hoses **must** be removed before attempting to lift.

CAUTION

The pump assembly can be seriously damaged if the cables or chains used to lift and move the unit are improperly wrapped around the pump.

Mounting

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation.

The pump may have to be supported or shimmed to provide for level operation or to eliminate vibration.

If the pump has been mounted on a moveable base, make certain the base is stationary by setting the brake and blocking the wheels before attempting to operate the pump.

To ensure sufficient lubrication and fuel supply to the engine, **do not** position the pump and engine more than 15° off horizontal for continuous operation. The pump and engine may be positioned up to 30° off horizontal for **intermittent operation only**; however, the engine manufacturer should be consulted for continuous operation at angles greater than 15°.

SUCTION AND DISCHARGE PIPING

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve and notes on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

Materials

Either pipe or hose maybe used for suction and discharge lines; however, the materials must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use

of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches (457,2 mm) from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

Strainers

If a strainer is furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 5/8 inch (15,9 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1-1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance 1-1/2 times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance

equal to at least 3 times the diameter of the suction pipe.

Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure 2 shows recommended minimum submergence vs. velocity.

NOTE

The pipe submergence required may be reduced by installing a standard pipe increaser fitting at the end of the suction line. The larger opening size will reduce the inlet velocity. Calculate the required submergence using the following formula based on the increased opening size (area or diameter).

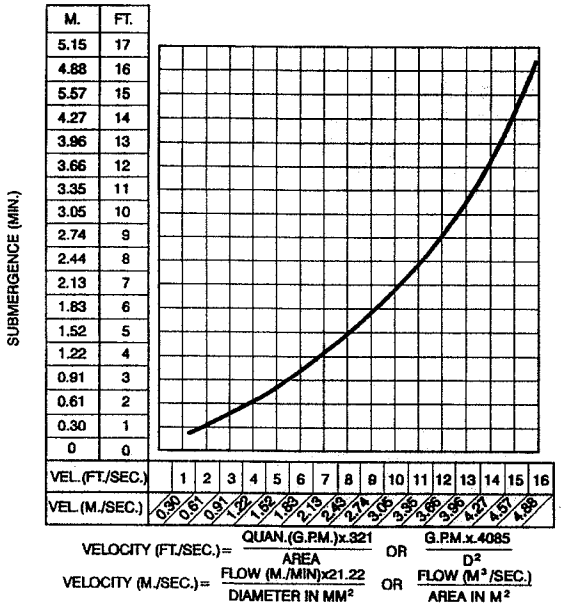


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

DISCHARGE LINES

Siphoning

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action causing damage to the pump could result.

Valves

If a throttling valve is desired in the discharge line, use a valve as large as the largest pipe to minimize friction losses. Never install a throttling valve in a suction line.

A check valve in the discharge line is normally recommended, but it is not necessary in low discharge head applications.

With high discharge heads, it is recommended that a throttling valve and a system check valve be installed in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

Bypass Lines

If a system check valve is used due to high discharge head, it may be necessary to vent trapped air from the top of the pump during the priming process. This may be accomplished by installing a bypass line from the top of the pump, back to the source of liquid. The end of the bypass line must be submerged. The line must be large enough to prevent clogging, but not so large as to affect pump discharge capacity.

GROUNDING

To eliminate electrostatic build-up by the liquid being pumped, the unit must be grounded by attaching the ground wire assembly to a ground rod. Install the ground rod in accordance with the National Electrical Codes and all local codes. Be sure the clamp or fastener has made a tight electrical connection with the rod.

CAUTION

Inspect and test the ground wire assembly for conductivity. Replace broken or frayed wire before resuming operation.

OPERATION - SECTION C

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.

WARNING!

This pump is designed to handle gasoline and other petroleum products in a non-flammable atmosphere. Do not attempt to pump corrosive materials, or any liquids which may damage the pump or endanger personnel as a result of pump failure.

WARNING!

If this pump is used with volatile and/or flammable liquids, be certain proper safety practices are followed before operating or servicing the pump. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately after occurrence.

PRIMING

Install the pump and piping as described in **INSTALLATION**. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.

CAUTION

Never operate this pump unless there is liquid in the pump casing. The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly.

Add liquid to the pump casing when:

1. The pump is being put into service for the first time.
2. The pump has not been used for a considerable length of time.
3. The liquid in the pump casing has evaporated.

Once the pump casing has been filled, the pump will prime and reprime as necessary.

WARNING!

After filling the pump casing, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed. Otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

To fill the pump, remove the pump casing fill cover or fill plug in the top of the casing, and add clean liquid until the casing is filled. Replace the fill cover or fill plug before operating the pump.

STARTING

Consult the operations manual furnished with the engine.

Be sure the pump unit is properly grounded before operation. See **GROUNDING**, Section B.

OPERATION

Lines With a Bypass

Close the discharge throttling valve (if so equipped) so that the pump will not have to prime against the weight of the liquid in the discharge line. Air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. When the pump is fully primed and liquid is flowing steadily from the bypass line, open the discharge throttling valve. Liquid will then continue to circulate through the bypass line while the pump is in operation.

Lines Without a Bypass

Open all valves in the discharge line and start the engine. Priming is indicated by a positive reading on the discharge pressure gauge or by a quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

After the pump has been primed, partially close the discharge line throttling valve in order to fill the line slowly and guard against excessive shock pressure which could damage pipe ends, gaskets, sprinkler heads, and any other fixtures connected to the line. When the discharge line is completely filled, adjust the throttling valve to the required flow rate.

Leakage

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160° F (71°C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the pump casing with cool liquid.

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

Pump Vacuum Check

NOTE

Petroleum products are very sensitive to changes in temperature. Warmer temperatures elevate the product vapor pressure resulting in low vacuum readings. Do not mistake temperature problems for faulty pump installation or performance.

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches (508,0 mm) or more of mercury. If it does not, check for air leaks in the seal, gasket, or discharge valve.

Open the suction line, and read the vacuum gauge with the pump primed and at operation speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum gauge.

STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

After stopping the pump, remove the spark plug wire to ensure that the pump will remain inoperative.

Cold Weather Preservation

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts. If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from completely draining, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

TROUBLESHOOTING - SECTION D

Review all SAFETY information in Section A.

Before attempting to open or service the pump:

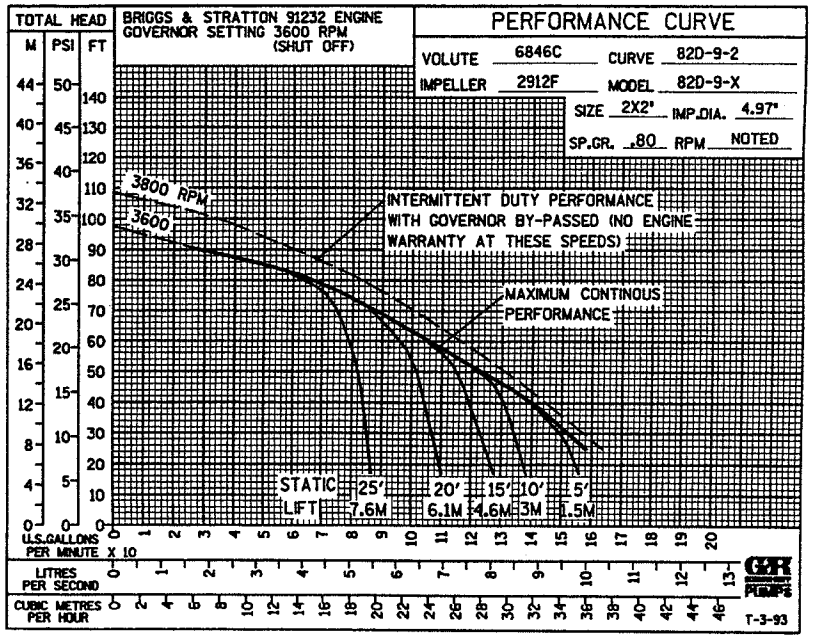
1. **Familiarize yourself with this manual.**
2. **Shut down the engine and disconnect the spark plug wire to ensure that the pump will remain inoperative.**
3. **Allow the pump to cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See **PRIMING**.
	Suction check valve contaminated or damaged.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Product vapor pressure too high.	Cool pump and product suction line.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction check valve or foot valve clogged or binding.	Clean valve.
	Pump speed too slow.	Check engine output; consult engine operation manual.
	Discharge head too high.	Install bypass line.
	Suction lift too high.	Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.
	Strainer clogged.	Check strainer and clean if necessary.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.
	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Impeller clogged.	Free impeller of debris.
	Pump speed too slow.	Check engine output; consult engine operation manual.
	Discharge head too high.	Install bypass line.
	Suction lift too high.	Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check driver output; check that sheaves or couplings are correctly sized.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.

PUMP MAINTENANCE AND REPAIR - SECTION E

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



*** STANDARD PERFORMANCE FOR PUMP MODEL 82D1-9-X**

* Based on 70° F (21° C) clear water (or corrected to .80 specific gravity) at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify performance or part numbers.

WARNING!

Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for this pump is 3600 RPM.

SECTION DRAWING

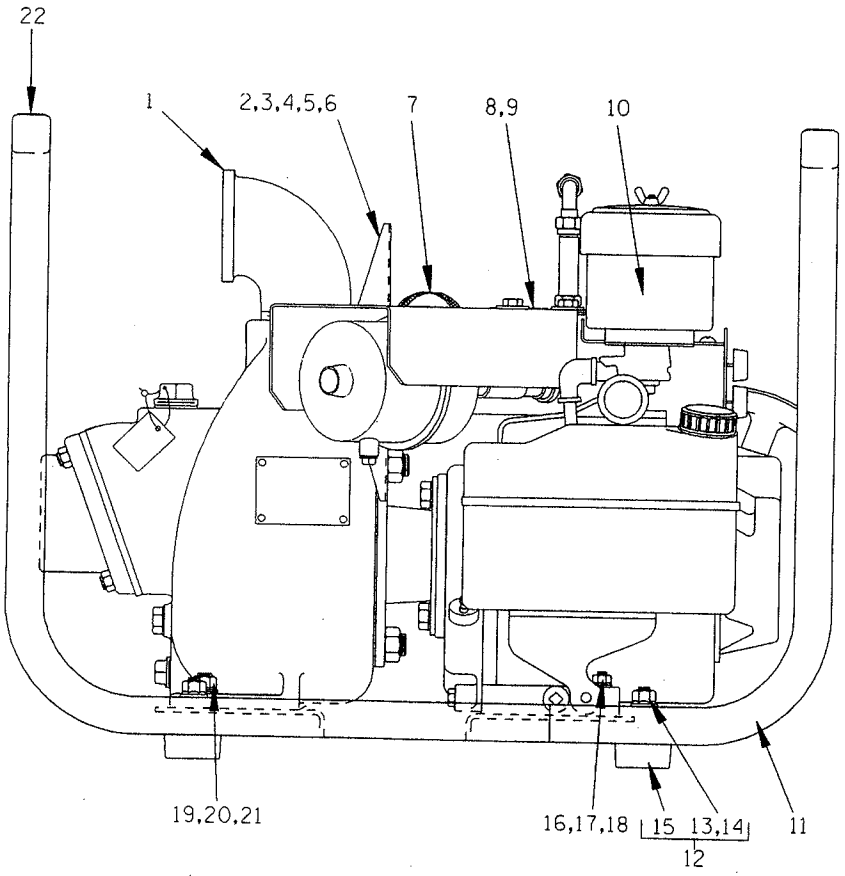


Figure 1. Pump Model 82D1-9-X

PARTS LIST
Pump Model 82D1-9-X
(From S/N 1010740 up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PUMP END ASSY	82D1-(9-X)	-----	1
2		ENGINE SHIELD	34165-002	15120	1
3		HEX HD CAPSCREW	B0402 1/2	15991	1
4		FLAT WASHER	K04	15991	2
5		LOCKWASHER	J04	15991	1
6		HEX NUT	D04	15991	1
7	*	GROUND WIRE ASSEMBLY	13830	-----	1
8		SHIELD-A-SPARK PLATE	38816-106	13990	REF
9		POP RIVET	11703D	13990	REF
10		ENGINE MODIFICATION ASSEMBLY	GRP41-17	-----	1
11		ROLLOVER BASE	41583-316	24150	1
12		RUBBER FOOT MOUNTING KIT	48152-607	-----	1
13		-FLANGED HEX NUT	21765-312	-----	4
14		-HEX HD CAPSCREW	B0506	15991	4
15		-MOUNTING FOOT	24631-401	-----	4
16		HEX HD CAPSCREW	B0506	15991	2
17		FLAT WASHER	KE05	15991	2
18		FLANGED HEX NUT	21765-312	-----	2
19		HEX HD CAPSCREW	B0604	15991	2
20		FLAT WASHER	KE06	15991	2
21		FLANGED HEX NUT	21765-314	-----	2
22		HAND CARRY DECAL	2613FT	-----	2
OPTIONAL:					
		WHEEL KIT	GRP30-52	-----	1

* INDICATES PARTS RECOMMENDED FOR STOCK

Above Serial Numbers Do Not Apply To Pumps Made In Canada.
CANADIAN SERIAL NO. ..... AND UP

SECTION DRAWING

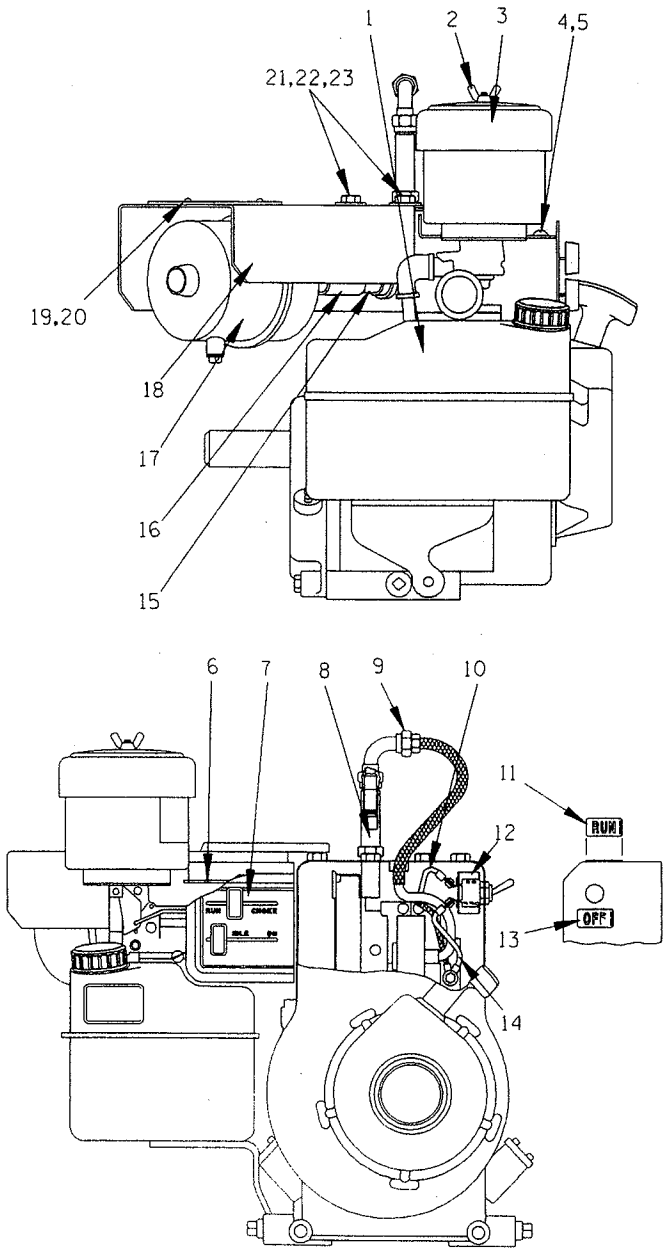


Figure 2. GRP41-17 Engine Modification Assembly

PARTS LIST
GRP41-17 Engine Modification Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	BRIGGS & STRATTON 91232 ENGNE	29112-501	-----	1
2	AIR CLEANER MOUNTING ASSEMBLY	29334-031	-----	1
3	AIR CLEANER	29334-084	-----	1
4	RD HD MACHINE SCREW	X#10-01 1/2S	15991	2
5	T-TYPE LOCKWASHER	AK#10	15991	2
6	SUPPORT SHIELD	34851-169	15120	1
7	OPERATION STICKER	38811-202	-----	1
8	SPARK PLUG	S1809	-----	1
9	SPARK PLUG SHIELD KIT	S1810	-----	1
10	TERMINAL	S2067	-----	1
11	RUN DECAL	38816-034	-----	1
12	TOGGLE SWITCH	S1961	-----	1
13	OFF DECAL	38815-009	-----	1
14	GROUND WIRE ASSEMBLY	47311-052	-----	1
15	PIPE NIPPLE	T08	15079	1
16	PIPE COUPLING	AE08	15079	1
17	MUFFLER	29334-202	-----	1
18	MUFFLER SHIELD	34851-162	15120	1
19	SHIELD-A-SPARK PLATE	38816-106	13990	1
20	POP RIVET	11703D	13990	4
21	SPACER	31411-252	15001	2
22	HEX HD CAPSCREW	21632-565	-----	2
23	FLAT WASHER	K05	15991	2

SECTION DRAWING

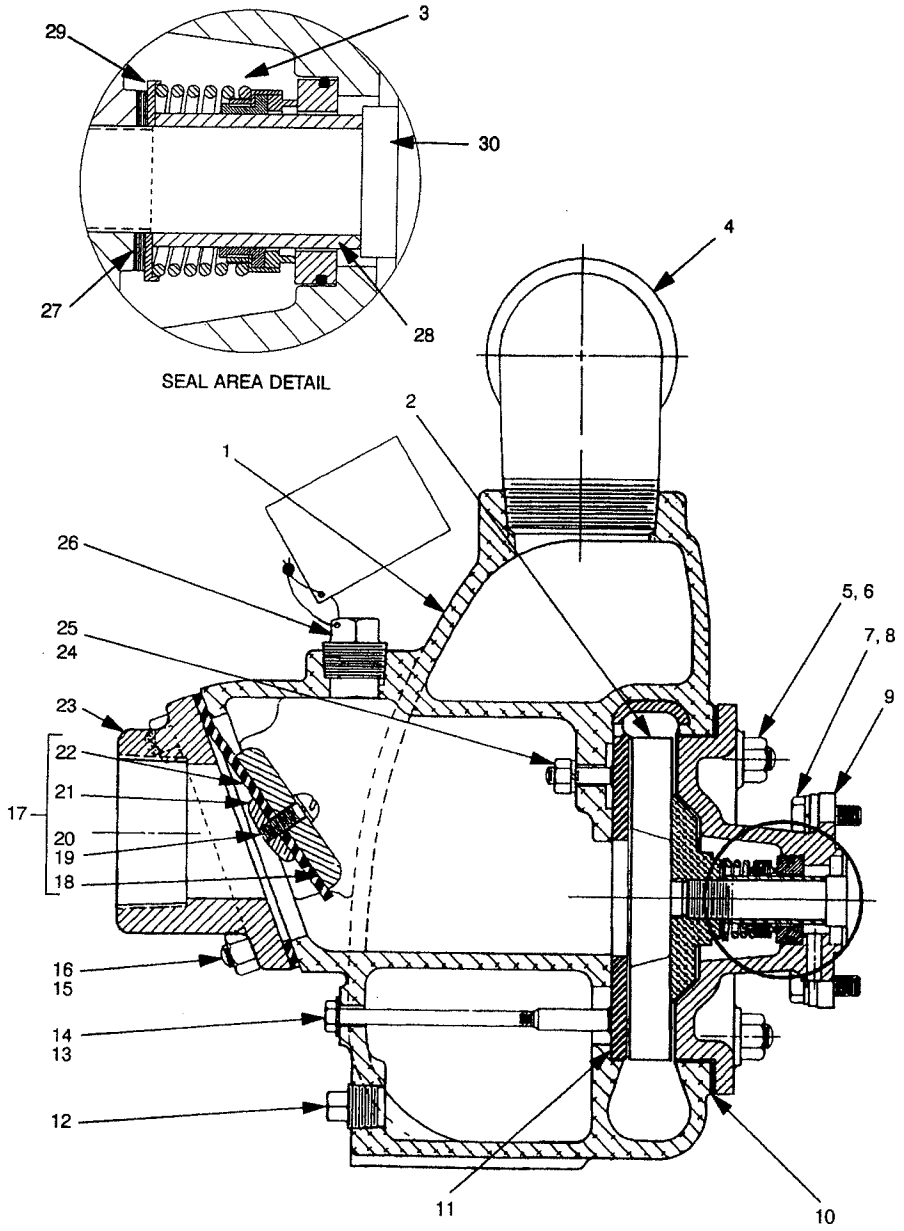


Figure 3. Pump End Assembly 82D1-(9-X)

PARTS LIST
Pump End Assembly 82D1-(9-X)

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP CASING	6846C	13040	1
2 *	IMPELLER	2912F	13040	1
3 *	SEAL ASSY	25271-841	-----	1
4	STREET ELBOW	RS32	11999	1
5	STUD	C0606	15991	4
6	HEX NUT	D06	15991	4
7	HEX HD CAPSCREW	B0503 1/2S	15991	4
8	LOCKWASHER	J05	15991	4
9	INTERMEDIATE	6732A	10010	1
10 *	CASING GASKET SET	504GA	20000	1
11 *	WEAR PLATE ASSY	2643A	15990	1
12	CASING DRAIN PLUG	P08	15079	1
13	HEX HD CAPSCREW	B0414	15991	1
14 *	FIBER WASHER	KF04	18040	1
15	STUD	C0606	15991	4
16	HEX NUT	D06	15991	4
17	CHECK VALVE ASSY	1361E	-----	1
18	-VALVE WEIGHT	19B	10010	1
19	-RD HD MACH SCREW	X0403	17090	1
20	-LOCKWASHER	J04	17090	1
21	-VALVE WEIGHT	1354	10010	1
22 *	-CHECK VALVE	1361GC	19550	1
23	SUCTION FLANGE	1361	10010	1
24	LOCKWASHER	J04	15991	1
25	HEX NUT	D04	15991	1
26	FILL PLUG ASSY	48271-062	-----	1
27 *	IMP ADJ SHIM SET	513-A	17090	1
28 *	SHAFT SLEEVE	2353	17020	1
29 *	SPRING CTR WASHER	12658	17100	1
30	ENGINE CRANKSHAFT	(W/ENGINE)		REF
NOT SHOWN:				
	NAME PLATE	38812-040	13990	1
	DRIVE SCREW	BM#04-03	15990	4
	SUCTION STICKER	6588-AG	-----	1
	DISCHARGE STICKER	6588-BJ	-----	1

* INDICATES PARTS RECOMMENDED FOR STOCK

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional views (Figures 1, 2 and 3) and the accompanying parts lists.

Before attempting to service the pump, disconnect the spark plug wire to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.

For engine disassembly and repair, consult the literature supplied with the engine, or contact your local Briggs and Stratton engine representative.

WARNING!

The engine used in this pump is not standard. It has been modified for use in handling gasoline and other petroleum products in a well-ventilated, non-flammable atmosphere free of combustible hazards. It cannot be further modified without affecting performance and safety factors. The shield and spark arresting modifications must be inspected and maintained regularly while the unit is in use. Refer to the manual accompanying the engine before attempting to start the engine.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Shut down the engine and disconnect the spark plug wire to ensure that the pump will remain inoperative.**
3. **Allow the pump to cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

If this pump is used with volatile and/or flammable liquids, be certain proper safety practices are followed before operating or servicing the pump. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately after occurrence.

Suction Check Valve Disassembly

(Figure 3)

Before attempting to service the pump, remove the pump casing drain plug (12) and drain the pump. Clean and reinstall the drain plug.

To service the suction check valve, remove the suction piping. Remove the nuts (16) securing the suction flange (23) to the pump casing (1). Pull the check valve assembly (17) from the suction port.

Remove the hardware (19 and 20) securing the check valve weights (18 and 21) to the check valve (22).

If no further disassembly is required, see **Suction Check Valve Installation**.

Pump Casing Removal

(Figure 1)

To service the impeller or seal assembly, disconnect the discharge piping. Remove the hardware (19, 20 and 21) securing the pump casing to the base (11).

(Figure 3)

Remove the hardware (6) securing the pump casing to the intermediate. Separate the parts by pulling the casing straight away from the intermediate. Tie and tag any leveling shims used under the pump casing mounting feet.

Remove the casing gasket set (10). Tie and tag the gaskets, or measure and record their thickness for ease of reassembly. Clean the mating surfaces of the intermediate and pump casing.

Inspect the wear plate (11) and replace it if badly scored or worn. To remove the wear plate, disengage the hardware (13, 14, 24 and 25) and pull the wear plate from the pump casing.

Impeller Removal

(Figure 3)

To loosen the impeller (2), tap the vanes of the impeller in a counterclockwise direction (when facing the impeller) with a block of wood or a soft-faced mallet. Unscrew the impeller and replace it if cracked or badly worn. Use caution when removing the impeller; tension on the seal spring will be released as the impeller is unscrewed.

Slide the impeller adjusting shims (27) off the impeller shaft. Tie and tag the shims, or measure and record their thickness for ease of reassembly.

Seal Removal and Disassembly

(Figure 3 and 4)

Carefully remove the spring centering washer (29) and seal spring. Slide the shaft sleeve (28) and rotating portion of the seal off the engine shaft (30) as a unit. Lubricate the sleeve, and press the rotating portion of the seal off the sleeve.

Use a pair of stiff wires with hooked ends to remove the stationary seat from the intermediate bore.

NOTE

An alternate method of removing the stationary seat is to remove the hardware (7 and 8) and separate the intermediate (9) from the engine. Use a wooden dowel or other suitable tool to press the stationary seat from the intermediate bore.

If no further disassembly is required, see **Seal Reassembly and Installation**.

Seal Reassembly and Installation

(Figures 3 and 4)

Inspect the engine crankshaft (30) for damage. Small scratches or nicks may be removed with a fine file or emery cloth. If excessive wear exists, the shaft will have to be replaced in the engine (refer to the engine service manual).

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well-ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

The seal is not normally reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. If any components are worn, replace the complete seal; **never mix old and new seal parts.**

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

To ease installation of the seal, lubricate the bellows and O-rings with water or a very **small** amount of light lubricating oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 4).

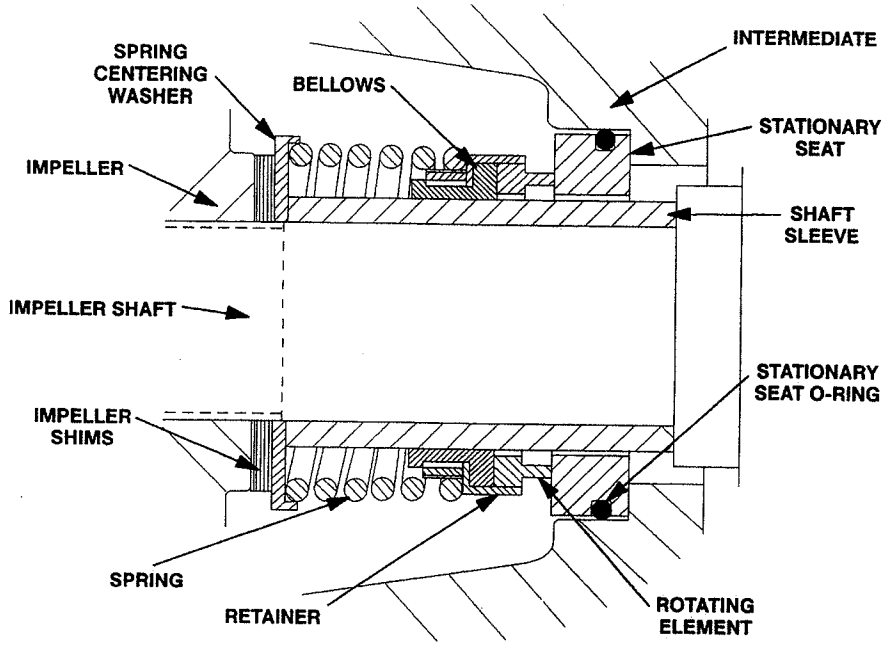


Figure 4. 25271-841 Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 160°F (71°C) However, most petroleum products such as gasoline are more efficiently handled at ambient temperatures. Do not use at higher operating temperatures.

If the intermediate was removed, lay it on a flat surface with the impeller side facing up.

Subassemble the O-ring onto the stationary seat and press this subassembly into the intermediate bore until it seats squarely against the shoulder. Slide the assembled intermediate and stationary seat over the shaft, and secure the intermediate to the engine with the hardware (7 and 8). When installing the intermediate, use caution not to damage the stationary seat on the shaft threads.

NOTE

If the intermediate was not separated from the engine during disassembly, subassemble the O-ring into the stationary seat, and use a piece of plastic pipe to press the seat into the intermediate bore until fully seated. The O.D. of the pipe should be approximately the same as the O.D. of the seal spring.

Subassemble the rotating element into the retainer and bellows, then slide this subassembly onto the shaft sleeve until the face of the rotating element is **just flush** with the chamfered end of the sleeve.

Slide the sleeve and rotating portion of the seal onto the shaft until the seal faces contact. Continue to push the sleeve through the seal until the chamfered end seats firmly against the shaft shoulder.

Install the seal spring and spring centering washer (29).

Impeller Installation And Adjustment

(Figure 3)

Inspect the impeller, and replace it if cracked or badly worn. Install the same thickness of impeller adjusting shims (27) as previously removed, and screw the impeller onto the shaft until tight.

A clearance of .010 to .020 inch (0,25 to 0,51 mm) between the impeller and the intermediate is necessary for maximum pump efficiency. Measure this clearance, and add or remove impeller shims until this clearance is reached.

Pump Casing Installation

(Figure 3)

If the wear plate assembly (11) was removed for replacement, secure it to the pump casing using the attaching hardware (13, 14, 24 and 25) at this time. Replace the fiber washer (14) if badly worn or compressed.

Install the same thickness of pump casing gaskets (10) as previously removed, and secure the pump casing to the intermediate with the nuts (16). **Do not** fully tighten the nuts at this time.

A clearance of .008 to .015 inch (0,20 to 0,38 mm) between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance can be obtained by adding or removing gaskets in the pump casing gasket set until the impeller scrapes against the wear plate when the shaft is turned. After the impeller scrapes, add approximately .008 inch (0,20 mm) of gaskets.

After the face clearance has been set, tighten the nuts (6) securing the pump casing to the intermediate.

See Figure 1, and secure the pump casing to the base (11) with the hardware (19, 20 and 21). Be sure to reinstall any leveling shims used under the pump casing mounting feet.

Suction Check Valve Installation

(Figure 3)

Inspect the check valve components, and replace as required. Subassemble the check valve weights (18 and 21) and check valve (22) with the hardware (19 and 20).

Position the check valve assembly (17) in the suction port with the large valve toward the inside of the pump. Install the suction flange (23), and secure with the nuts (16). Check the operation of the check valve to ensure proper seating and free movement.

Final Pump Assembly

(Figure 1)

Be sure the pump and engine are securely mounted to the base.

Install the suction and discharge lines, and open all valves. Make certain that all piping connections are tight, properly supported and secure.

Be sure the engine has been properly lubricated. See the literature supplied with the engine.

Fill the pump casing with clean liquid. Reinstall the fill plug and tighten it.

Refer to **OPERATION**, Section C, before putting the pump back into service.

LUBRICATION

Seal Assembly

The seal is lubricated by the medium being pumped. No additional lubrication is required.

Engine

Consult the literature supplied with the engine, or contact your local Briggs and Stratton engine representative.

ENGINE MODIFICATIONS

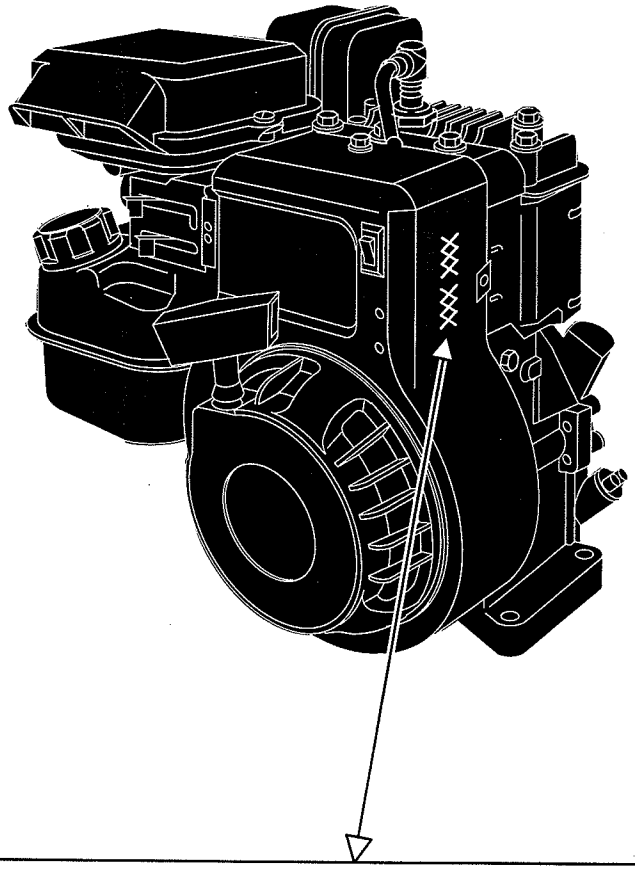
The engine used on this pump is not a standard commercial model. It has been specially modified by Gorman-Rupp for pumping gasoline and other petroleum products in a well-ventilated, non-flammable atmosphere, free of combustible hazards. Further modifications may not be made without jeopardizing the integrity of the safety features.


BRIGGS & STRATTON
®

Operating & Maintenance Instructions

Model Series Covered in This Manual

91200
92200
94200



Model	Type	Code

Note: General Model Series numbers noted above include many specific numbers like the ones on your engine. To get replacement parts or technical assistance in the future, write your engine Model, Type, Code and date of purchase here.

Month	Day	Year

TABLE OF CONTENTS

⚠ WARNING

Briggs & Stratton does not approve or authorize the use of these engines on 3-wheel All Terrain Vehicles (ATVs), motor bikes, aircraft products or vehicles intended for use in competitive events. Use of these engines in such applications could result in property damage, serious injury (including paralysis), or even death.

In the USA and Canada our 24 hour hotline is
1-800-233-3723
Briggs & Stratton Corporation
Milwaukee, Wisconsin 53201
www.briggsandstratton.com

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FORM NO. 274260-10/99

THE POWER IN POWER EQUIPMENT™

Thank you for selecting a Briggs & Stratton engine to power your equipment.

Briggs & Stratton is committed to producing a line of engines which will make your life's chores easier to perform. We have, at the same time, improved the design of our engines so they are environmentally friendly. Since 1995, we have succeeded in reducing smog-forming exhaust emissions from our engines by 70%. Briggs & Stratton's efforts have not stopped there. We are also committed to designing and introducing even cleaner engines in the future, while maintaining our reputation for excellent utility and value.

Briggs & Stratton's environmental awareness has resulted in the engineering of the "Smart-Fill®" gas can, featuring a spill resistant nozzle which opens only when fully inserted into the gas tank, and which shuts off automatically when the tank is full. Because refueling spills can harm the environment, the Smart-Fill® container helps preserve a stronger ecosystem by reducing this source of pollution.

We hope you will enjoy your new engine and equipment. We welcome you to our worldwide family of Briggs & Stratton engine users.

Best Wishes Always,

The Employees of Briggs & Stratton Corporation

BEFORE OPERATING ENGINE

- Read entire Operating & Maintenance Instructions AND the instructions for the equipment this engine powers.*
- Failure to follow instructions could result in serious injury or death.

THE OPERATING & MAINTENANCE INSTRUCTIONS CONTAIN SAFETY INFORMATION TO

- Make you aware of hazards associated with engines
- Inform you of the risk of injury associated with those hazards, and
- Tell you how to avoid or reduce the risk of injury.

The safety alert symbol (⚠) is used to identify safety information about hazards that can result in personal injury.

A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard.

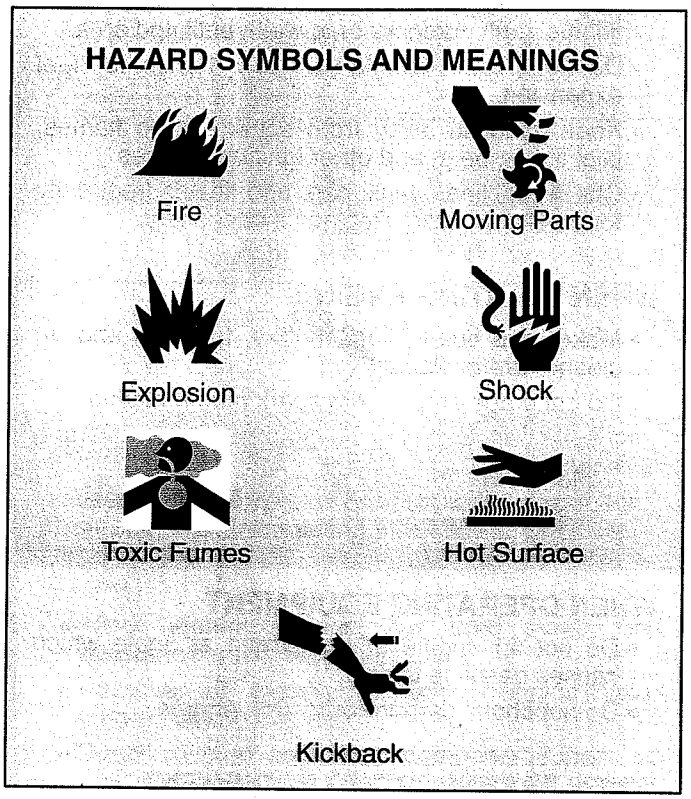
⚠ **DANGER** indicates a hazard which, if not avoided, **will result in death or serious injury.**

⚠ **WARNING** indicates a hazard which, if not avoided, **could result in death or serious injury.**

⚠ **CAUTION** indicates a hazard which, if not avoided, **might result in minor or moderate injury.**

CAUTION, when used **without** the alert symbol, indicates a situation that **could result in damage to the engine.**

HAZARD SYMBOLS AND MEANINGS



⚠ WARNING ⚠

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

* Briggs & Stratton does not necessarily know what equipment this engine will power. For that reason, you should carefully read and understand the operating instructions for the equipment on which your engine is placed.

SAFETY

⚠ WARNING

Gasoline and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

WHEN ADDING FUEL

- Turn engine OFF and let engine cool at least 2 minutes before removing gas cap.
- Fill fuel tank outdoors or in well-ventilated area.
- Do not overfill fuel tank. Allow 1 inch for fuel expansion.
- Keep gasoline away from sparks, open flames, pilot lights, heat, and other ignition sources.
- Check fuel lines, tank, cap, and fittings frequently for cracks or leaks. Replace if necessary.

WHEN STARTING ENGINE

- Make sure spark plug, muffler, fuel cap and air cleaner are in place.
- Do not crank engine with spark plug removed.
- If fuel spills, wait until it evaporates before starting engine.
- If engine floods, set choke to OPEN/RUN position, place throttle in FAST and crank until engine starts.

WHEN OPERATING EQUIPMENT

- Do not tip engine or equipment at angle which causes gasoline to spill.
- Do not choke carburetor to stop engine.

WHEN TRANSPORTING EQUIPMENT

- Transport with fuel tank EMPTY or with fuel shut-off valve OFF.

WHEN STORING GASOLINE OR EQUIPMENT WITH FUEL IN TANK

- Store away from furnaces, stoves, water heaters or other appliances that have pilot light or other ignition source because they can ignite gasoline vapors.

⚠ WARNING

Unintentional sparking can result in fire or electric shock.

Unintentional start-up can result in entanglement, traumatic amputation, or laceration.

BEFORE PERFORMING ADJUSTMENTS OR REPAIRS

- Disconnect spark plug wire and keep it away from spark plug.
- Disconnect battery at negative terminal (only engines with electric start).

WHEN TESTING FOR SPARK

- Use approved spark plug tester.
- Do not check for spark with spark plug removed.

⚠ WARNING

Starting engine creates sparking.

Sparking can ignite nearby flammable gases.

Explosion and fire could result.

- If there is natural or LP gas leakage in area, do not start engine.
- Do not use pressurized starting fluids because vapors are flammable.

⚠ WARNING

Engines give off carbon monoxide, an odorless, colorless, poison gas.

Breathing carbon monoxide can cause nausea, fainting or death.

- Start and run engine outdoors.
- Do not start or run engine in enclosed area, even if doors or windows are open.

⚠ WARNING

Running engines produce heat. Engine parts, especially muffler, become extremely hot.

Severe thermal burns can occur on contact.

Combustible debris, such as leaves, grass, brush, etc. can catch fire.

- Allow muffler, engine cylinder and fins to cool before touching.
- Remove accumulated combustibles from muffler area and cylinder area.
- Install and maintain in working order a spark arrester before using equipment on forest-covered, grass-covered, brush-covered unimproved land. The state of California requires this (Section 4442 of the California Public Resources Code). Other states may have similar laws. Federal laws apply on federal land.

⚠ WARNING

Rotating parts can contact or entangle hands, feet, hair, clothing, or accessories.

Traumatic amputation or severe laceration can result.

- Operate equipment with guards in place.
- Keep hands and feet away from rotating parts.
- Tie up long hair and remove jewelry.
- Do not wear loose-fitting clothing, dangling drawstrings or items that could become caught.

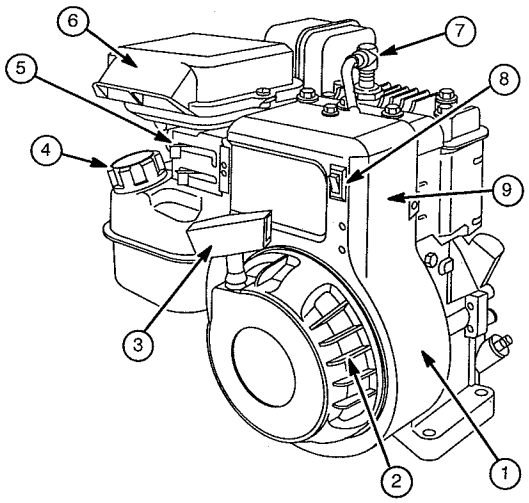
⚠ WARNING

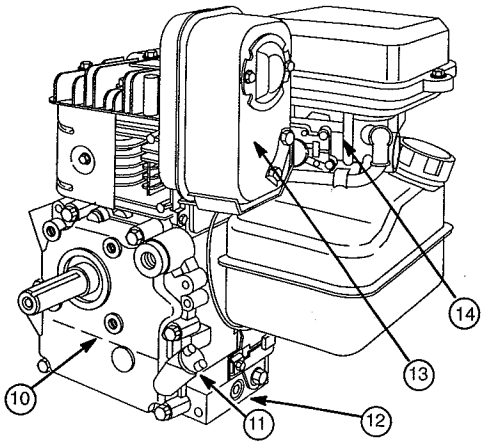
Rapid retraction of starter cord (kickback) will pull hand and arm toward engine faster than you can let go.

Broken bones, fractures, bruises or sprains could result.

- When starting engine, pull cord slowly until resistance is felt, then pull rapidly.
- Remove all external equipment/engine loads before starting engine.
- Direct coupled equipment components such as, but not limited to, blades, impellors, pulleys, sprockets, etc., must be securely attached.

ENGINE PARTS





1. Blower housing
2. Finger guard/ Rotating screen
3. Rope handle
4. Fuel fill
5. Control levers
6. Air cleaner
7. Spark plug wire
8. Stop switch (if equipped)
9. Engine Model Type Code
   xxxxx xxxx xx xxxxxxxx
10. Oil level
11. Oil fill cap
12. Oil drain plug
13. Muffler/(Muffler guard, if equipped)/ (Spark arrester, if equipped)
14. Carburetor

GENERAL INFORMATION

ENGINE MODEL

This is a single cylinder, L-head, air-cooled engine. It is a low emissions engine.

MODEL SERIES 90000

Bore ..... 2-9/16 in. (65.09 mm)

Stroke ..... 1-3/4 in. (44.45 mm)

Displacement ..... 9.02 cu. in. (148.0 cc)

Note: For practical operation, the horsepower loading should not exceed 85% of rated horsepower. Engine power will decrease 3-1/2% for each 1,000 feet (300 meters) above sea level and 1% for each 10° F (5.6° C) above 77° F (25° C). Engine will operate satisfactorily at an angle up to 15°.

TUNE-UP SPECIFICATIONS

Armature air gap .... 0.006 – 0.010 in. (0.15 – 0.25 mm)

Spark plug gap ..... 0.030 in. (0.76 mm)

Valve clearance with valve springs installed and piston 1/4 in. (6 mm) past top dead center (check when engine is cold). See Repair Manual P/N 270962.

Intake ..... 0.005 – 0.007 in. (0.13 – 0.18 mm)

Exhaust ..... 0.007 – 0.009 in. (0.18 – 0.23 mm)

THE INTERNATIONAL SYMBOLS USED ON THE ENGINE OR IN THIS MANUAL INCLUDE:


Safety Alert


Read Owner's Manual


On Off

Stop


Fuel Shutoff


Oil


Fuel


Choke

BRIGGS & STRATTON OIL

CAUTION: This engine is shipped from Briggs & Stratton **without oil**. Check oil level before starting engine. If you start the engine without oil, the engine will be damaged beyond repair and will not be covered under warranty.

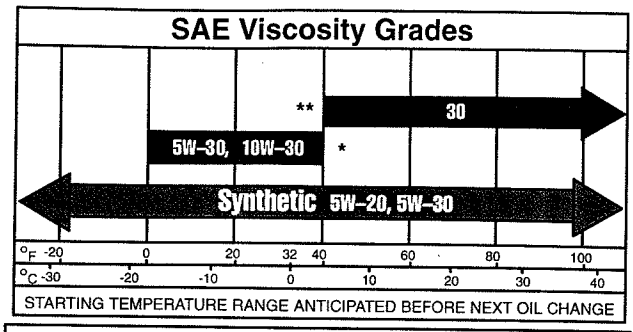
OIL CAPACITY

The engine holds approximately 2/3 qt (21 ozs; 0.6 liter).

TYPE OF OIL TO USE

- Use a high quality detergent oil classified "For Service SF, SG, SH, SJ" or higher, such as Briggs & Stratton 30W, Part Number 100005 (20 oz) or 100028 (48 oz).
- Do not use special additives.
- Choose a viscosity according to the table opposite.

Note: Synthetic oil meeting ILSAC GF-2, API certification mark and API service symbol (shown at left) with "SJ/CF ENERGY CONSERVING" or higher, is an acceptable oil at all temperatures. **Use of synthetic oil does not alter required oil change intervals.**



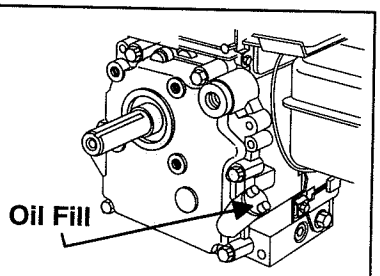
* **CAUTION:** Air cooled engines run hotter than automotive engines. The use of non-synthetic multi-viscosity oils (5W-30, 10W-30, etc.) in temperatures above 40° F (4° C) will result in higher than normal oil consumption. When using a multi-viscosity oil, check oil level more frequently.

** **CAUTION:** SAE 30 oil, if used below 40° F (4° C), will result in hard starting and possible engine bore damage due to inadequate lubrication.

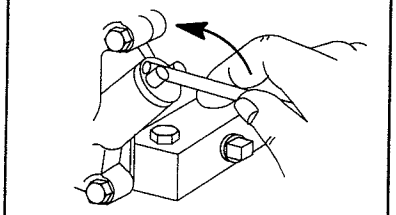
CHECKING AND ADDING OIL

- Check oil level *before* starting the engine.
- Check level daily, or after every eight (8) hours.
- Keep oil level at FULL.
- Do not overfill.

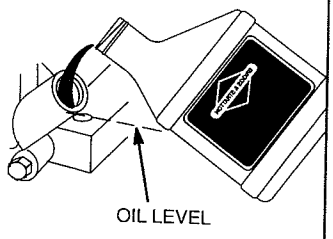
Note: If this engine is equipped with gear reduction, see gear reduction oil filling instructions on page 11.



[1] Place engine level and clean around oil fill area.

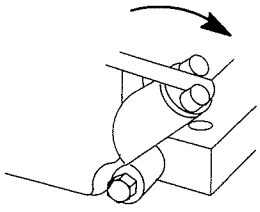


[2] Remove oil fill cap.



[3] Add oil, if needed.

[4] Pour slowly. Fill to point of overflowing.



[5] Replace and tighten oil fill cap.

FUEL

TYPE OF FUEL TO USE

- Use clean, fresh, regular unleaded gasoline with a minimum of 77 octane. Fresh fuel prevents gum from forming in the fuel system or on essential carburetor parts. Purchase fuel in quantity that can be used within 30 days.
- Do not use gasoline which contains Methanol.
- Do not mix oil with gasoline.
- For engine protection use Briggs & Stratton Gasoline Additive available from your Authorized Briggs & Stratton Dealer (P/N 5041 or single use pouch).
- This engine is certified to operate on gasoline. Exhaust Emission Control System: EM (Engine Modifications).

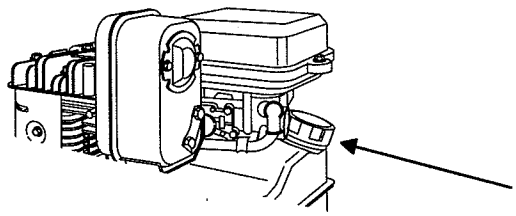
CAUTION: Some fuels, called oxygenated or reformulated gasoline, are gasoline blended with alcohols or ethers. Excessive amounts of these blends can damage the fuel system or cause performance problems. If any undesirable operating symptoms occur, use gasoline with a lower percentage of alcohol or ether.

ADDING FUEL

WARNING

[1] Fill fuel tank outdoors or in well-ventilated area, away from sparks, open flames, pilot lights, heat, and other ignition sources.

[2] If fuel spills, wait until it evaporates before starting engine.



[3] Turn engine OFF and let engine cool at least 2 minutes before removing gas cap.

[4] Remove cap. Add fuel until level is approximately 1 inch from top of fuel fill to allow for fuel expansion. Do not top off tank.

[5] Replace cap before starting.

STARTING

WARNING

- Do not use pressurized starting fluids.
- Vapors are flammable.

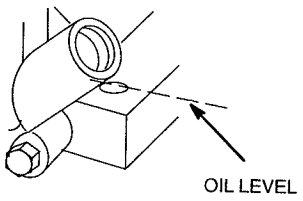
STARTING AND OPERATING TIPS

- Store and fuel equipment in level position.
- Use fresh fuel. (See Fuel.)
- Use correct type of oil for expected starting temperature. (See Oil.)
- Remove external equipment/engine loads. (See equipment operating instructions.)
- Periodically remove any debris buildup from the machine (See Maintenance.)
- After engine has started, let it warm up several seconds to several minutes, depending on outside temperature.
- For maximum performance and life, operate engine with choke in RUN and throttle in FAST.

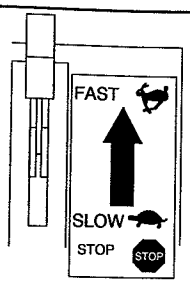
STARTING AND STOPPING

REWIND (MANUAL) STARTER

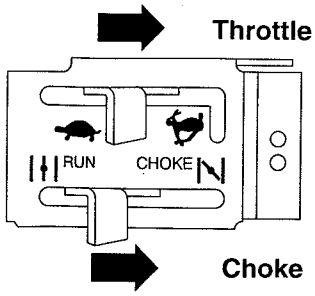
TO START ENGINE



[1] Check oil level (see p. 8).

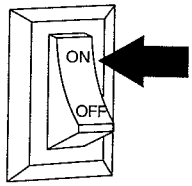


Throttle



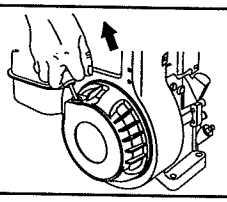
[2] Move throttle (if equipped) to FAST. Operate engine with throttle in FAST.

[3] Move choke control lever to CHOKE.

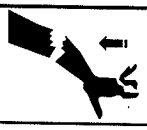


Stop Switch

[4] Move stop switch (if equipped) to ON.



⚠ WARNING

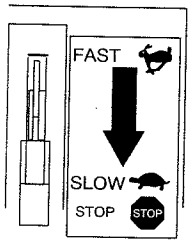


[5] Grasp rope handle. Pull slowly until resistance is felt, then pull rapidly to start engine and avoid kickback.

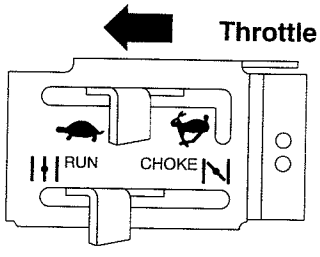
[6] Let engine warm up. **Choke Equipped:** Move choke control lever toward RUN a short distance at a time over several seconds in warm weather or minutes in cold weather. Let engine run smoothly before each change. Operate with choke in RUN.

TO STOP ENGINE

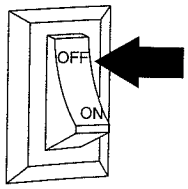
CAUTION: Do not stop engine by moving choke control to CHOKE. Backfire, fire or engine damage could occur.



Throttle



[1] Move throttle control to SLOW, then to STOP (if equipped).



Stop Switch

[2] Push stop switch (if equipped) to OFF.

MAINTENANCE

Regular maintenance will improve the performance and extend the life of the engine. See any Authorized Briggs & Stratton Dealer for service. **Use only genuine Briggs & Stratton parts. Other parts may not perform as well, may damage the engine, and may result in injury.** In addition, use of other parts may void your warranty.

EMISSION CONTROL

Maintenance, replacement or repair of the emission control devices and systems may be performed by any nonroad engine repair establishment or individual. However, to obtain no charge repairs under the terms and provisions of the Briggs & Stratton warranty statement, any service or emission control part repair or replacement must be performed by a factory authorized dealer.

Follow the instructions and schedules indicated below.

Task *Perform task at hourly or calendar interval, whichever comes first.*	Every 8 Hours or Daily	25 Hours or Every Season	50 Hours or Every Season	100 Hours or Every Season	100-300 Hours
Check Oil Level	✔				
Change Oil			✔*		
Change oil in gear reduction (if equipped)				✔	
Service air cleaner pre-cleaner (if equipped)		✔**			
Service air cleaner cartridge (if not equipped with pre-cleaner)		✔**			
Service air cleaner cartridge (if equipped with pre-cleaner)				✔**	
Inspect spark arrester (if equipped)			✔		
Replace spark plug				✔	
Clean cooling system				✔**	
Clean combustion chamber					✔

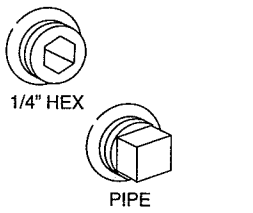
* **Change oil after first 5 to 8 hours of use**, then every 50 hours or every season. Change oil every 25 hours when operating the engine under heavy load or in high temperatures.

** Clean more often under dusty conditions or when airborne debris is present. Replace air cleaner parts, if very dirty.

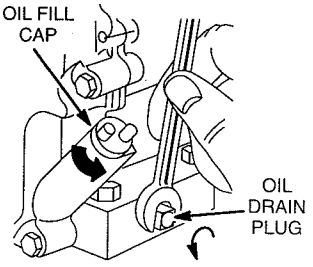
CAUTION: Used oil is a hazardous waste product. Dispose of used oil properly. Do not discard with household waste. Check with your local authorities, service center, or dealer for safe disposal/recycling facilities.

CHANGING OIL

Change oil after first 5 hours of use.



Typical drain plugs

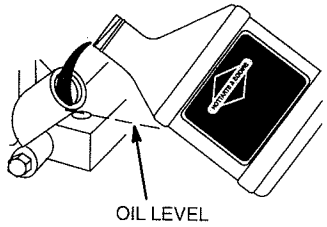


WARNING

[1] Place engine level.

[2] Place engine level. Disconnect spark plug wire and keep it away from spark plug.

[3] With engine OFF but still warm remove oil drain plug and drain oil into appropriate receptacle.



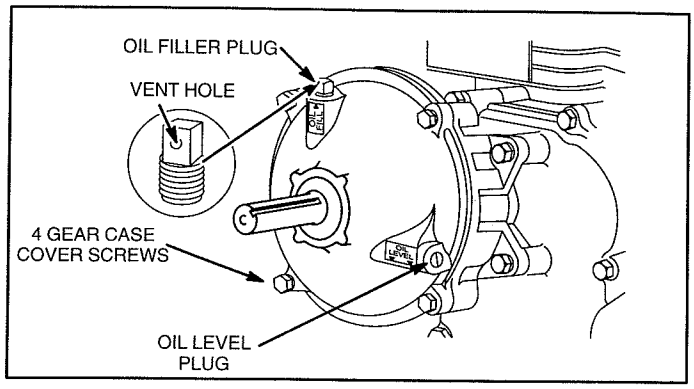
[4] Reinstall oil drain plug. Remove oil fill cap.

[5] Add about 2/3 quart (21 ounces; 0.6 liter) new oil. Fill to point of overflowing.

[6] Replace oil fill cap.

CHANGING OIL IN GEAR REDUCTION (if equipped)

Change oil in gear reduction after every 100 hours of operation.



[1] To drain oil, loosen 4 gear case cover screws and drain oil into appropriate receptacle.

[2] After draining, torque 4 screws to 85 in-lbs.

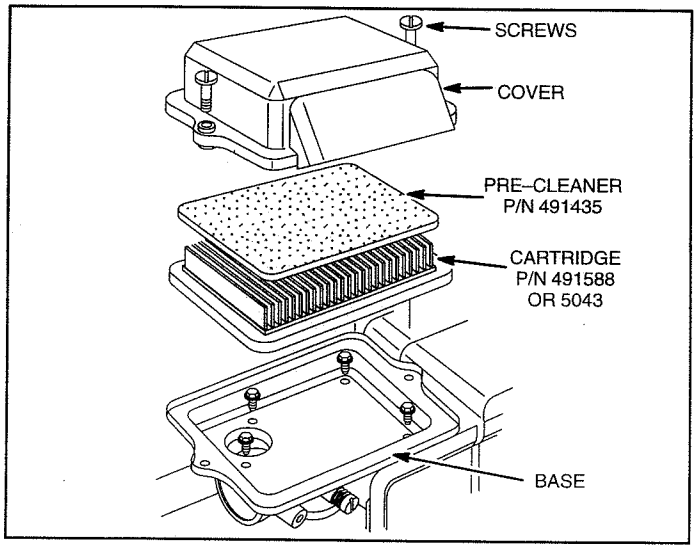
[3] To refill, pour SAE 30 oil into oil fill hole until it runs out level check hole.

[4] Replace both oil plugs.

Note: Oil filler plug has a vent hole and must be installed on top of gear case cover.

AIR CLEANER

All engines have an air cleaner cartridge. In addition, some engines have a pre-cleaner.



REMOVING AND RE-INSTALLING AIR CLEANER

[1] Loosen screws and remove cover.

[2] Remove pre-cleaner (if equipped) and cartridge carefully to prevent debris from entering carburetor.

[3] Re-install clean (or new) air cleaner assembly in base.

[4] Replace cover and tighten screws.

CLEANING PRE-CLEANER AND CARTRIDGE

CAUTION: Do not use pressurized air or solvents to clean cartridge. Pressurized air can damage cartridge; solvents will dissolve cartridge.

Pre-cleaner

To clean pre-cleaner (if equipped), separate it from cartridge and wash in liquid detergent and water. Air dry thoroughly. Do not oil. Re-install dry pre-cleaner on clean cartridge.

Cartridge

To clean cartridge, gently tap pleated paper side on a flat surface.

ENGINE AND ENGINE PARTS

We recommend that you see an authorized Briggs & Stratton Service Dealer for all maintenance and service of the engine and engine parts. Use only genuine Briggs & Stratton parts.

⚠ WARNING

If you perform any maintenance on the engine, first disconnect the spark plug wire from the spark plug, and disconnect the battery at the negative terminal (electric starter engines only) to prevent unintentional sparking. Unintentional sparking can result in fire or electric shock. Unintentional start-up can result in entanglement, traumatic amputation or laceration. Use only correct tools.

⚠ WARNING

- Do not strike the flywheel with a hammer or hard object because the flywheel may later shatter during operation.
- Do not tamper with governor spring, links or other parts to increase engine speed.

MUFFLER

⚠ WARNING

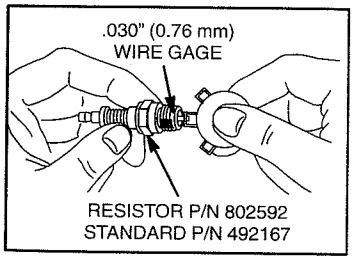
Replacement parts for the muffler must be the same and installed in the same position as the original parts, otherwise fire can occur.

If muffler is equipped with spark arrestor screen, remove screen for inspection. Replace screen if damaged or plugged.

SPARK PLUG

Use only Briggs & Stratton Spark Tester (part number 19368) to check for spark.

Note: In some areas, local law requires using resistor spark plug to suppress ignition signals. If this engine was originally equipped with resistor spark plug, use same type for replacement.



COMBUSTION DEPOSITS

We recommend that after every 100-300 hours you have an authorized Briggs & Stratton Service Dealer remove combustion deposits from the cylinder, cylinder head, top of piston, and around valves.

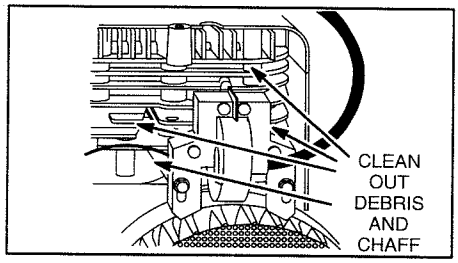
FUEL SYSTEM

⚠ WARNING

Replacement parts for fuel system (cap, hoses, tanks, filters, etc.) must be the same as original parts, otherwise fire can occur.

AIR COOLING SYSTEM

We recommend cleaning the air cooling system every 100 hours.



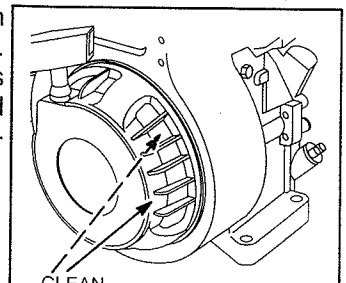
CLEANING DEBRIS

CAUTION: Do not use water to clean engine parts. Water could contaminate fuel system. Use a brush or dry cloth.

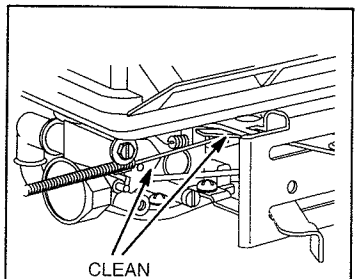
⚠ WARNING

Engine parts should be kept clean to reduce the risk of overheating and ignition of accumulated debris.

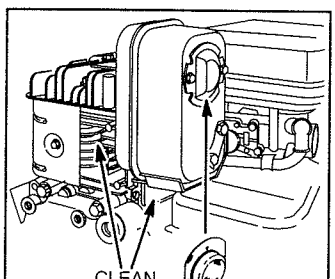
Daily or before every use, clean accumulated debris from engine. Keep linkage, spring and controls clean. Keep area around and behind muffler free of any combustible debris.



Finger Guard



Linkage, Springs, Controls



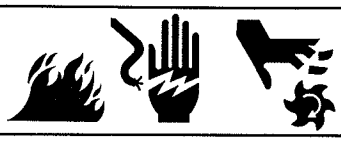
Muffler, Spark Arrester

ADJUSTMENTS

THROTTLE ADJUSTMENT

If the engine does not start or if it runs roughly, the remote throttle control may need adjustment. See your authorized Briggs & Stratton dealer or follow the instructions below.

WARNING

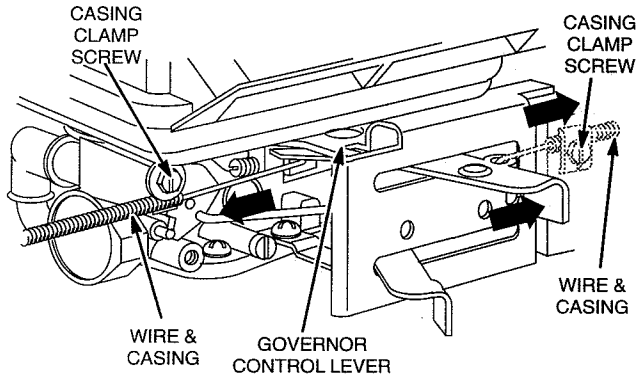


Prevent unintentional starting.

Before performing adjustments:

- Remove spark plug wire from spark plug.
- Disconnect battery at negative terminal (only engines with electric start).

TO ADJUST REMOTE THROTTLE*



[1] Loosen casing clamp screw on carburetor or on control lever bracket.

[2] Move governor control lever, wire, and casing as far as possible in direction shown.

[3] Move remote throttle control to FAST.

[4] Tighten casing clamp screw.

* Manual choke or manual throttle control needs no adjustment.

TO ADJUST REMOTE STOP SWITCH

[1] Governor control lever should make good contact with remote stop switch (if equipped). Readjust if necessary.

[2] Check operation of throttle control.

CARBURETOR ADJUSTMENT

WARNING

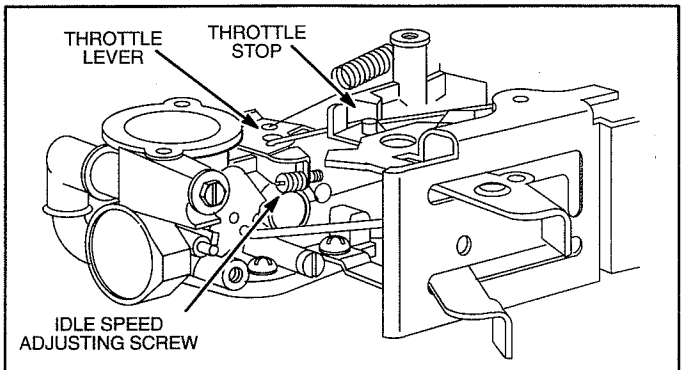
The manufacturer of the equipment on which this engine is installed specifies top speed at which the engine will be operated. DO NOT EXCEED this speed.

Air cleaner and air cleaner cover must be assembled to carburetor before starting engine. (Air cleaner is shown removed in illustration below for clarity ONLY.)

The carburetor on this engine is equipped with an idle speed adjustment screw.

TO ADJUST CARBURETOR*

Governed idle has been set to 1750 at the factory.



[1] To adjust idle speed, start engine and warm up about 5 minutes.

[2] Then with engine running, place equipment throttle control in SLOW position.

[3] Rotate carburetor throttle lever against the throttle stop and hold it while adjusting the idle speed screw to obtain 1500 rpm (use a tachometer).

* The idle mixture valve on this engine is not adjustable.

Note: Engines operated at approximately 3000 to 5000 feet (900 to 1500 meters) above sea level may require a high altitude carburetor pilot jet. If erratic performance is observed, contact a Briggs & Stratton Authorized Service Dealer for cost to install/purchase a high altitude carburetor pilot jet.

PARTIAL LIST OF GENUINE BRIGGS & STRATTON PARTS

PART	BRIGGS & STRATTON PART NO. (or equivalent)
Flat air cleaner cartridge	491588 (5043)
Flat air cleaner pre-cleaner	491435
Oil	100005 or 100028
Fuel Filter	298090 (5018)
Gas additive	5041
Resistor spark plug	802592
Standard spark plug	492167
Long life platinum spark plug (used on most L-head engines)	5062
Spark plug wrench	89838 (5023)
Spark tester	19368
Oil pump kit (uses standard electric drill to remove oil from engine quickly)	5056

SERVICE

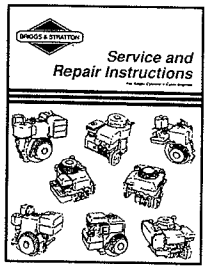
See an Authorized Briggs & Stratton Service Dealer. Each one carries a stock of Genuine Briggs & Stratton Parts and is equipped with special service tools. Trained mechanics assure expert repair service on all Briggs & Stratton engines. Only dealers advertising as "Authorized Briggs & Stratton" are required to meet Briggs & Stratton standards.

When you purchase equipment powered by a Briggs & Stratton engine, you are assured of highly skilled, reliable service at more than 30,000 Authorized Service Dealers worldwide, including more than 3,200 Master Service Technicians. Look for these signs wherever Briggs & Stratton service is offered.

You may locate your nearest Authorized Briggs & Stratton Service Dealer in our dealer locator map on our web site **www.briggsandstratton.com** or in the "Yellow Pages™" directory under "Engines, Gasoline" or "Gasoline Engines," or "Lawn Mowers" or similar category.

Note: Walking fingers logo and "Yellow Pages" are registered trademarks in various jurisdictions.

An illustrated shop manual includes common specifications and detailed information covering adjustment, tune-up and repair of Briggs & Stratton single cylinder, L-head, 4 cycle engines. It is available for purchase from an Authorized Briggs & Stratton Service Dealer or you can order it from the factory. Write:
Briggs & Stratton Corporation
Attn: Service Division
P. O. Box 1144
Milwaukee, WI 53201



Part No. 270962

To purchase a complete list of Genuine Briggs & Stratton Parts for your engine, fill in both sides of this order form carefully. We cannot fill your order without the correct Engine Model/Type/Code. Allow 3 to 4 weeks for delivery.

Payment Method: Fill in both sides of this order form carefully

☐ Check or money order enclosed payable to **Briggs & Stratton Corporation** in the amount of $_____ (U.S. Dollars, please)

☐ Please charge my ☐ MasterCard ☐ VISA

_____ CREDIT CARD NUMBER _____ EXPIRATION DATE

_____ SIGNATURE (REQUIRED FOR CREDIT CARD ORDERS)

Parts List	$2.00
Shipping & Handling	$1.50
****Add State Sales Tax**	_____
Total	_____

Add sales tax if you live in any of the following states: **AL 5%, CT 6%, FL 6.5%, GA 4%, KY 6%, MI 6%, MN 6%, MO 4.225%, NY 8.5%, OH 5%, TN 6%, TX 6.25%, WA 6.5%, WI 5%

SERVICE & STORAGE

BRIGGS & STRATTON®

STORAGE

Engines stored over 30 days need special attention.

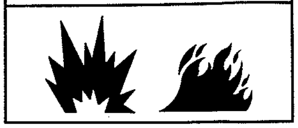
[1] To prevent gum from forming in fuel system or on essential carburetor parts:
a) if fuel tank contains oxygenated or reformulated gasoline (gasoline blended with an alcohol or an ether), run engine until it stops from lack of fuel, **or** b) if fuel tank contains gasoline, either run engine until it stops from lack of fuel, or add a gasoline additive to the gas in the tank. (See parts list. Single – use pouches of gas additive are available from your service dealer.) If you use a gas additive, run the engine for several minutes to circulate the additive through the carburetor. Then, engine and fuel can be stored up to 24 months.

[2] While engine is still warm, change oil.

[3] Remove spark plug and pour about 1/2 oz. (15 ml) of engine oil into cylinder. Replace spark plug and crank slowly to distribute oil.

[4] Clean engine of surface debris, chaff or grass.

[5] **WARNING**



Store in a clean, dry area. Do not store in same area as a stove, furnace, water heater, or other appliance that uses a pilot light or has a device that can create a spark.

Fill in both sides, clip and return to:
Briggs & Stratton Corporation
P.O. Box 1144
Milwaukee, WI 53201–1144 U.S.A.

Name ______________________

Address ______________________

City ________ **State** ________ **Zip** ________ **Country** ________

Your Engine Model ☐☐☐☐☐ **Type** ☐☐☐☐☐☐ **Code** ☐☐☐☐☐☐☐☐

To purchase a complete list of Genuine Briggs & Stratton Parts for your engine, fill in both sides of this order form carefully. We cannot fill your order without the correct Engine Model/Type/Code. Allow 3 to 4 weeks for delivery.

Briggs & Stratton Corporation (B&S), the California Air Resources Board (CARB) and the United States Environmental Protection Agency (U.S. EPA) Emission Control System Warranty Statement (Owner's Defect Warranty Rights and Obligations)

EMISSION CONTROL WARRANTY COVERAGE IS APPLICABLE TO CERTIFIED ENGINES PURCHASED IN CALIFORNIA IN 1995 AND THEREAFTER, WHICH ARE USED IN CALIFORNIA, AND TO CERTIFIED MODEL YEAR 1997 AND LATER ENGINES WHICH ARE PURCHASED AND USED ELSEWHERE IN THE UNITED STATES.

California and United States Emission Control Defects Warranty Statement

The California Air Resources Board (CARB), U.S. EPA and B&S are pleased to explain the Emission Control System Warranty on your model year 2000 and later small off-road engine (SORE). In California, new small off-road engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Elsewhere in the United States, new non-road, spark-ignition engines certified for model year 1997 and later, must meet similar standards set forth by the U.S. EPA. B&S must warrant the emission control system on your engine for the periods of time listed below, provided there has been no abuse, neglect or improper maintenance of your small off-road engine.

Your emission control system includes parts such as the carburetor, air cleaner, ignition system, muffler and catalytic converter. Also included may be connectors and other emission related assemblies.

Where a warrantable condition exists, B&S will repair your small off-road engine at no cost to you including diagnosis, parts and labor.

Briggs & Stratton Emission Control Defects Warranty Coverage

Small off-road engines are warranted relative to emission control parts defects for a period of two years, subject to provisions set forth below. If any covered part on your engine is defective, the part will be repaired or replaced by B&S.

Owner's Warranty Responsibilities

As the small off-road engine owner, you are responsible for the performance of the required maintenance listed in your Operating and Maintenance Instructions. B&S recommends that you retain all your receipts covering maintenance on your small off-road engine, but B&S cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

As the small off-road engine owner, you should however be aware that B&S may deny you warranty coverage if your small off-road engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your small off-road engine to an Authorized B&S Service Dealer as soon as a problem exists. The undisputed warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities, you should contact a B&S Service Representative at 1-414-259-5262.

The emission warranty is a defects warranty. Defects are judged on normal engine performance. The warranty is not related to an in-use emission test.

Briggs & Stratton Emission Control Defects Warranty Provisions

The following are specific provisions relative to your Emission Control Defects Warranty Coverage. It is in addition to the B&S engine warranty for non-regulated engines found in the Operating and Maintenance Instructions.

1. Warranted Parts

   Coverage under this warranty extends only to the parts listed below (the emission control systems parts) to the extent these parts were present on the engine purchased.

   a. Fuel Metering System
      - Cold start enrichment system
      - Carburetor and internal parts
      - Fuel Pump

   b. Air Induction System
      - Air cleaner
      - Intake manifold

   c. Ignition System
      - Spark plug(s)
      - Magneto ignition system

   d. Catalyst System
      - Catalytic converter
      - Exhaust manifold
      - Air injection system or pulse valve

   e. Miscellaneous Items Used in Above Systems
      - Vacuum, temperature, position, time sensitive valves and switches
      - Connectors and assemblies

2. Length of Coverage

   B&S warrants to the initial owner and each subsequent purchaser that the Warranted Parts shall be free from defects in materials and workmanship which caused the failure of the Warranted Parts for a period of two years from the date the engine is delivered to a retail purchaser.

3. No Charge

   Repair or replacement of any Warranted Part will be performed at no charge to the owner, including diagnostic labor which leads to the determination that a Warranted Part is defective, if the diagnostic work is performed at an Authorized B&S Service Dealer. For emissions warranty service contact your nearest Authorized B&S Service Dealer as listed in the "Yellow Pages" under "Engines, Gasoline," "Gasoline Engines," "Lawn Mowers," or similar category.

4. Claims and Coverage Exclusions

   Warranty claims shall be filed in accordance with the provisions of the B&S Engine Warranty Policy. Warranty coverage shall be excluded for failures of Warranted Parts which are not original B&S parts or because of abuse, neglect or improper maintenance as set forth in the B&S Engine Warranty Policy. B&S is not liable to cover failures of Warranted Parts caused by the use of add-on, non-original, or modified parts.

5. Maintenance

   Any Warranted Part which is not scheduled for replacement as required maintenance or which is scheduled only for regular inspection to the effect of "repair or replace as necessary" shall be warranted as to defects for the warranty period. Any Warranted Part which is scheduled for replacement as required maintenance shall be warranted as to defects only for the period of time up to the first scheduled replacement for that part. Any replacement part that is equivalent in performance and durability may be used in the performance of any maintenance or repairs. The owner is responsible for the performance of all required maintenance, as defined in the B&S Operating and Maintenance Instructions.

6. Consequential Coverage

   Coverage hereunder shall extend to the failure of any engine components caused by the failure of any Warranted Part still under warranty.

In the USA and Canada, a 24 hour hot line, **1-800-233-3723,** has a menu of pre-recorded messages offering you engine maintenance information.

About your engine warranty: (see next page for statement of LIMITED WARRANTY).

Briggs & Stratton welcomes warranty repair and apologizes to you for being inconvenienced. Any Authorized Service Dealer may perform warranty repairs. Most warranty repairs are handled routinely, but sometimes requests for warranty service may not be appropriate. For example, warranty would not apply if engine damage occurred because of misuse, lack of routine maintenance, shipping, handling, warehousing or improper installation. Similarly, warranty is void if the serial number of the engine has been removed or the engine has been altered or modified.

If a customer differs with the decision of the Service Dealer, an investigation will be made to determine whether the warranty applies. Ask the Service Dealer to submit all supporting facts to his Distributor or the Factory for review. If the Distributor or the Factory decides that the claim is justified, the customer will be fully reimbursed for those items that are defective. To avoid misunderstanding which might occur between the customer and the Dealer, listed below are some of the causes of engine failure that the warranty does not cover.

Normal wear:

Engines, like all mechanical devices, need periodic parts service and replacement to perform well. Warranty will not cover repair when normal use has exhausted the life of a part or an engine.

Improper maintenance:

The life of an engine depends upon the conditions under which it operates, and the care it receives. Some applications, such as tillers, pumps and rotary mowers, are very often used in dusty or dirty conditions, which can cause what appears to be premature wear. Such wear, when caused by dirt, dust, spark plug cleaning grit, or other abrasive material that has entered the engine because of improper maintenance, is not covered by warranty.

This warranty covers engine related defective material and/or workmanship only, and not replacement or refund of the equipment to which the engine may be mounted. Nor does the warranty extend to repairs required because of:

1. PROBLEMS CAUSED BY PARTS THAT ARE NOT ORIGINAL BRIGGS & STRATTON PARTS.
2. Equipment controls or installations that prevent starting, cause unsatisfactory engine performance, or shorten engine life. (Contact equipment manufacturer.)
3. Leaking carburetors, clogged fuel pipes, sticking valves, or other damage, caused by using contaminated or stale fuel. (Use clean, fresh, lead-free gasoline and Briggs & Stratton gasoline stabilizer, Part No. 5041.)
4. Parts which are scored or broken because an engine was operated with insufficient or contaminated lubricating oil, or an incorrect grade of lubricating oil (check oil level daily or after every 8 hours of operation. Refill when necessary and change at recommended intervals.) Read Operating & Maintenance Instructions.
5. Repair or adjustment of associated parts or assemblies such as clutches, transmissions, remote controls, etc., which are not manufactured by Briggs & Stratton.
6. Damage or wear to parts caused by dirt, which entered the engine because of improper air cleaner maintenance, re-assembly, or use of a non-original air cleaner element or cartridge. (At recommended intervals, clean and re-oil the Oil-Foam® element or the foam pre-cleaner, and replace the cartridge.) Read Operating & Maintenance Instructions.
7. Parts damaged by overspeeding, or overheating caused by grass, debris, or dirt, which plugs or clogs the cooling fins, or flywheel area, or damage caused by operating the engine in a confined area without sufficient ventilation. (Clean fins on the cylinder, cylinder head and flywheel at recommended intervals.) Read Operating & Maintenance Instructions.
8. Engine or equipment parts broken by excessive vibration caused by a loose engine mounting, loose cutter blades, unbalanced blades or loose or unbalanced impellers, improper attachment of equipment to engine crankshaft, overspeeding or other abuse in operation.
9. A bent or broken crankshaft, caused by striking a solid object with the cutter blade of a rotary lawn mower, or excessive v-belt tightness.
10. Routine tune-up or adjustment of the engine.
11. Engine or engine component failure, i.e., combustion chamber, valves, valve seats, valve guides, or burned starter motor windings, caused by the use of alternate fuels such as, liquified petroleum, natural gas, altered gasolines, etc.

Warranty is available only through service dealers which have been authorized by Briggs & Stratton Corporation. Your nearest Authorized Service Dealer is listed in the "Yellow Pages™" of your telephone directory under "Engines, Gasoline" or "Gasoline Engines," "Lawn Mowers," or similar category.

Briggs & Stratton Engines Are Made Under One Or More Of The Following Patents: Design D-247,177 (Other Patents Pending)

5,852,951	5,548,955	5,269,713	5,188,069	5,040,644	4,895,119	4,630,498	DES. 309,458
5,823,153	5,546,901	5,265,700	5,186,142	5,040,503	4,875,448	4,522,080	DES. 309,457
5,819,513	5,503,125	5,243,878	5,138,996	5,009,208	4,819,593	4,520,288	DES. 308,872
5,765,713	5,501,203	5,235,943	5,105,331	4,996,956	4,719,682	4,453,507	DES. 308,871
5,645,025	5,497,679	5,197,425	5,086,890	4,995,357	4,694,792	4,430,984	
5,642,701	5,320,795	5,197,422	5,070,829	4,977,879	4,684,917	4,355,253	
5,606,948	5,271,363	5,191,864	5,058,544	4,971,219	4,633,556		

In the USA and Canada, a 24 hour hot line, **1-800-233-3723,** has a menu of pre-recorded messages offering you engine maintenance information.

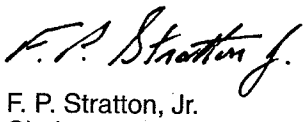
BRIGGS & STRATTON ENGINE OWNER WARRANTY POLICY
effective July 1, 1999

Replaces all undated Warranties and all Warranties dated before July 1, 1999

LIMITED WARRANTY

"Briggs & Stratton Corporation will repair or replace, free of charge, any part, or parts of the engine that are defective in material or workmanship or both. Transportation charges on parts submitted for repair or replacement under this Warranty must be borne by purchaser. This warranty is effective for the time periods and subject to the conditions provided for in this policy. For warranty service contact your nearest Authorized Service Dealer as listed in the 'Yellow Pages™' under 'Engines, Gasoline,' 'Gasoline Engines,' 'Lawn Mowers' or similar category. THERE IS NO OTHER EXPRESS WARRANTY. IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED TO ONE YEAR FROM PURCHASE, OR TO THE EXTENT PERMITTED BY LAW ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED. LIABILITY FOR CONSEQUENTIAL DAMAGES UNDER ANY AND ALL WARRANTIES ARE EXCLUDED TO THE EXTENT EXCLUSION IS PERMITTED BY LAW. Some states do not allow limitations on how long an implied warranty lasts, and some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation and exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state."

Briggs & Stratton Corporation



F. P. Stratton, Jr.
Chairman and Chief Executive Officer

WARRANTY PERIOD

ENGINES	WITHIN U.S.A. AND CANADA		OUTSIDE U.S.A. AND CANADA	
	CONSUMER USE*	COMMERCIAL USE*	CONSUMER USE*	COMMERCIAL USE*
All Vanguard™ engines.	2 year – engine ‡			
All Diamond Plus®, Industrial Plus™, I/C® engines and sleeve bore Intek series.	2 year	1 year	2 year ‡	1 year
Quantum® and Diamond Power®.	2 year	90 days	2 year † ‡	90 days
All standard engines and Kool Bore™ Intek series installed on lawn mowers, riders, edgers, chippers, shredders, tillers, and all Sno/Gard engines.	2 year	90 days	1 year	90 days
All other standard engines and Classic™ series.	1 year	90 days	1 year	90 days

* For purposes of this warranty policy, "consumer use" means personal residential household use by the original retail consumer. "Commercial use" means all other uses, including use for commercial, income producing or rental purposes. Once an engine has experienced commercial use, it shall thereafter be considered as a commercial use engine for purposes of this warranty. ***Engines used in competitive racing or on commercial or rental tracks are not warrantied.***

† One (1) year in Australia, New Zealand, Middle East and Africa.

‡ One (1) year in India.

NO WARRANTY REGISTRATION CARD IS NECESSARY TO OBTAIN WARRANTY ON BRIGGS & STRATTON ENGINES. YOU MUST SAVE THE PURCHASE RECEIPT. A PROOF OF PURCHASE DATE WILL BE REQUIRED TO OBTAIN WARRANTY.

In the USA and Canada, a 24 hour hot line, **1-800-233-3723,** has a menu of pre-recorded messages offering you engine maintenance information.

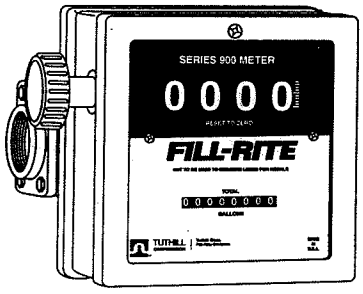
Pump System Technology

FILL-RITE

Owner's Operation & Safety Manual

SERIES 900 METER

For models 901, 901N & 901T



Model 901

OUTSTANDING FEATURES

- 6 to 40 GPM / 23 to 151 LPM flow rate
- Accurate to within ±2%
- 1" or 1-1/2" NPT inlet/outlet ports
- Large, easy to read numbers
- Quick reset knob
- Accumulative totalizer
- UL listed

TUTHILL CORPORATION | Fill-Rite Division
8825 Aviation Drive
Fort Wayne, Indiana USA 46809
Tel 219 747-7524 Fax 219 747-3159

Dear Fill-Rite Customer,

Thank you for buying a Fill-Rite product. We believe that you have bought the best. This piece of literature contains information about your new equipment and its operating and service requirements. Please take a few minutes to read it carefully.

Fill-Rite's products are distributed around the world and are the result of people at Fill-Rite working together to design, manufacture, sell, ship and service products which meet the needs of each and every customer.

If, for any reason, any of our products do not meet your performance expectations, we would like to hear from you. Our best sales force is you, our customer, and we want you to be satisfied. We appreciate your purchase of a Fill-Rite product and look forward to providing your future equipment needs.

Sincerely,

George P. Jenkins
President

SAFETY INSTRUCTIONS

To ensure safe and efficient operation, it is essential to read each of these warnings and precautions, and to carefully follow all instructions listed in this manual.

1. **Improper use or installation of this product can cause serious bodily injury or death.**
2. DO NOT smoke near meter or use meter near an open flame when measuring flammable fluids. Fire could result.
3. Do not exceed 50 PSI / 3.5 BARS line pressure.
4. CAUTION: DO NOT INSTALL ADDITIONAL FOOT VALVE OR CHECK VALVE DURING INSTALLATION WITHOUT PRESSURE RELIEF VALVE. CRACKING MAY RESULT.

GENERAL DESCRIPTION

The Fill-Rite Series 900 Meter is a nutating disc flow meter. The meter uses wheel counters for registering either U.S. gallons or liters. The U.S. gallon meter has three unit wheels and a tenth wheel which can be reset to zero. It's totalizer has seven unit wheels and a tenth wheel. The liter counter has four unit wheels which can be reset to zero. It's totalizer has eight unit wheels.

SAFETY

The safety of Fill-Rite Series 900 meters is proven by their listing with:

Underwriters Laboratories Inc., a nationally recognized independent organization for testing of products to ensure public safety.

Canadian Standards Association, a Canadian organization for testing of products to ensure public safety.

OPTIONS

- Liter registers
- 1-1/2" NPT inlet/outlet ports
- Teflon or nickel coatings for pumping a variety of fluids
- BSP threads

TECHNICAL INFORMATION

Design Features:

- 1" NPT female inlet and outlet ports
- 6 to 40 GPM / 23 to 151 LPM flow rate
- ±2% accuracy
- 50 PSI maximum pressure
- Measures fluids with temperatures from -15°F (-26°C) to 150°F (66°C)
- Weatherproof, corrosion resistant
- Large 11/16" figures with zero reset
- Measures flow to 1,000 gallons in 1/10 increments
- Easy to read totalizer registers to 1,000,000 gallons
- Compact design: 8 1/2" x 6 1/2" x 5 1/2"
- Large reset knob
- Self-lubricating
- Not for resale use
- Maximum viscosity of fluid: diesel fuel

Fluid Compatibility

The 900 is compatible with the following fluids:

- Diesel Fuel, Gasoline, Kerosene, Mineral Spirits, Heptane, and Hexane

The 900 is NOT compatible with the following fluids:

- Bleach, Hydrochloric Acid, Ink, Sulfuric Acid, and Salt Water

If in doubt about compatibility of a specific fluid, contact supplier of fluid to check for any adverse reactions to the following wetted materials.

All Series 900 Meters		
Nylon	Polyester	Fluorocarbon
300, 400 Series Stainless Steel		
In Addition		
901 Aluminum, Buna-N		
901N Nickel Plated Aluminum		
901T Teflon Coated Aluminum		

INSTALLATION

Meters are furnished for horizontal piping; left to right flow unless otherwise specified. Flow parts can be changed to any of four positions for horizontal or vertical piping and for either direction of flow.

1. Determine direction for fluid to flow.
2. Install meter observing directional arrow on casting.
3. Remove four screws (item 28).
4. Rotate meter cover assembly (item 37) to desired orientation.
5. Replace four screws.

ASSEMBLY & DISASSEMBLY

Meter consists of a chamber housing, measuring chamber, gear train, counter assembly and cover. Meter can be completely disassembled without disturbing piping, or meter can be partially disassembled as required.

Counter Assembly

For access to counter assembly, remove reset knob (item 15) by grasping edges and pulling firmly. Knob is held in place by a spring clip. Loosen two screws (item 14) and lift bezel (item 11) off. Remove two screws (item 12) to detach counter face (item 13). Remove two screws (item 9) to extract counter (item 10). Reassemble by reversing procedure.

Meter Chamber Assembly

To expose meter chamber assembly, gear train and seal, remove four screws (item 28). Meter chamber assembly consists of upper and lower chambers, a nutating disc and four screws. Meter chamber assembly (item 3) can be dislodged by removing four screws (item 5). Reassemble by reversing procedure.

If replacement of any components of the meter chamber assembly is required, the complete assembly must be replaced due to the precise method of its construction. This assures a proper fit and a correctly operating chamber.

Gear Train and Seal

To disassemble gear train and seal, remove two screws (item 8) and gear frame (item 6). Remove cluster gear (item 18), washer (item 19), and shaft (item 17). Remove drive gear (item 24) and washers (item 23) by rotating and pulling drive gear. Remove O-ring seal (item 25).

When reassembling seal, lubricate O-ring with oil or petroleum jelly and replace in cover. Place washer on drive gear shaft. Rotate and push shaft through O-ring and cover carefully to prevent damage to O-ring. Shaft must then be guided into pinion bevel (item 27) if counter has not been removed. Replace remaining parts to complete assembly by reversing disassembly procedure.

CALIBRATION

The Fill-Rite Series 900 meters can be calibrated for either U.S. gallons or liters. Calibration is required upon installation, after disassembly, after significant wear or when metering a different viscosity fluid. Depending on the model, Series 900 meters are calibrated at the factory metering gasoline in either U.S. gallons or liters. Calibration must be done between 6 and 40 GPM.

Meter calibration can be easily changed by following the calibration procedure listed below. A proving container or a container of KNOWN volume will be needed for the calibration procedure. It is recommended that the container's volume be at least five times larger than the unit of calibration. For example, a five gallon container should be used when calibrating for gallons.

Procedure for Calibration:

1. Fill container to a known volume.
2. If meter amount is incorrect, turn calibration screw (item 31) counterclockwise for more liquid, or clockwise for less liquid.
3. Repeat step 2 until calibration is acceptable.

OPERATING INSTRUCTIONS

For accurate measurement and to prevent meter damage, meter and piping must always be filled with liquid and free of air. Meter should be calibrated per instructions in this manual prior to its use.

1. Reset meter to "0".
2. Meter is ready for use.

MAINTENANCE

Meter should operate maintenance free. However, certain liquids can dry out while in meter housing, causing the meter to stop. If this happens, meter should be thoroughly cleaned (see instructions below).

Cleaning Instructions:

Run a flushing fluid through meter. For a more thorough cleaning, disassemble meter per "ASSEMBLY/ DISASSEMBLY" section, "Meter Chamber Assembly" subsection. Rinse all meter components. Recalibrate meter following calibration instructions above.

Storage:

If meter is to be stored for a period of time, clean thoroughly. This will help protect meter from damage.

REPAIR

Meters needing repair should be taken to an authorized repair shop or returned to factory for service. Meters must be thoroughly triple-rinsed before being taken in for repair.

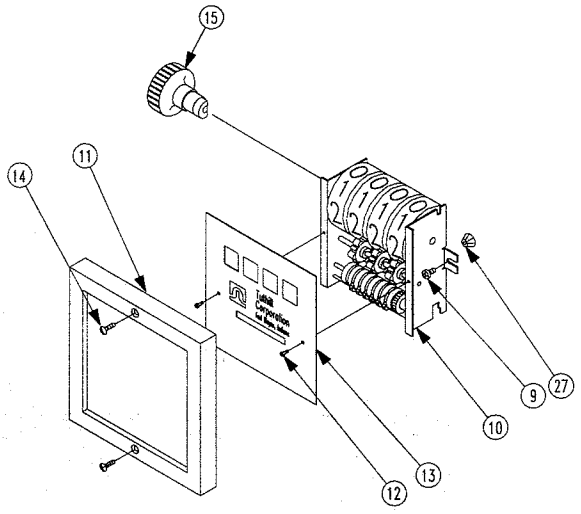
900 SERIES METER PARTS LIST

ITM. NO.	PART NO.	PROC. NO.	DESCRIPTION	QTY
1	900-5	F8051	Meter Housing	1
	900-5N	F8102	Meter Housing - Nickel Plated	Opt.
	900-5T	F8101	Meter Housing - Teflon Coated	Opt.
2	300-28	F7744	Gasket - Buna-N	2
	300-28V	F7788	Gasket - Fluorocarbon	Opt.
3	300-25	F8087	Meter Chamber Assembly	1
4	900-15	F8067	Cover Gasket - Buna-N	1
	900-15V	F8068	Cover Gasket - Fluorocarbon	Opt.
5	F4017	F4017	#10-32 x 1/2 PHMS, ACR II, T	4
6	900-14	F8066	Gear Frame	1
7	900-6	F8053	Meter Cover (Includes Item 20)	1
	900-6N	F8104	Meter Cover - Nickel Plated	Opt.
	900-6T	F8103	Meter Cover - Teflon Coated	Opt.
8	F8132	F8132	#12-1/2 PHMS, Type AB	2
9	F4007	F4007	#8-32 x 5/16 PHMS, ACR II, TT	2
10	900-17	F8070	Counter Assembly - U.S. Gallon (Includes Item 15)	1
	900-17L	F8071	Counter Assembly - Liter (Includes Item 15)	Opt.
11	900-16	F8069	Bezel	1
12	800-66	F4020	#4-40 x 1/4 PHMS	2
13	900-18A	F8073	Counter Face	1
	900-27A	F8099	Counter Face - Litre	Opt.
14	702-26	F3410	#8 x 1/2 OHMS - Type B	2
15	800-105A	F4261	Knob	1
17	800-16	F3820	Shaft - Cluster Gear	1
18	800-159	F3841	Cluster Gear - U.S. Gallon	1
	800-161	F3843	Cluster Gear - Liter	Opt.
19	800-18	F3830	Washer	1
20	900-11	F8063	Driver Pinion Shaft (Included with Item 7)	1
21	900-13	F8065	Retaining Ring	1
22	900-12	F8064	Driver Pinion	1
23	800-55	F3980	Washer	3
24	800-160A	F3845	Drive Gear - U.S. Gallon	1
	800-162A	F3846	Drive Gear - Liter	Opt.
25	800-97V	F4191	O-Ring (5-106) - Fluorocarbon	1
27	800-172	F3959	Pinion Bevel	1
28	700-16	F2810	5/16-18 x 7/8 HHCS	4
29	900-39	F8158	Seal Screw	1
30	800-125V	F4449	O-Ring (-012) - Fluorocarbon	1
31	900-38A	F8160	Adjustment Screw (Includes Item 32)	1
32	900-40V	F8159	O-Ring (-010) - Fluorocarbon	1
33	1200-66	F6721	1/4-20 x 3/4 HHCS (1" meters)	8
34	900-20	F8076	1" Meter Flange	2
	900-20N	F8106	1" Meter Flange - Nickel Plated	Opt.
	900-20T	F8105	1" Meter Flange - Teflon Coated	Opt.
35	900-30	F8092	1-1/2" Meter Flange	Opt.
	900-30N	F8110	1-1/2" Meter Flange - Nickel Plated	Opt.
	900-30T	F8109	1-1/2" Meter Flange - Teflon Coated	Opt.
36	900-29	F8091	1/4-20 x 1-1/2 HHCS (1-1/2" meters)	Opt.
37	900-6U	F8045	Meter Cover Assembly - U.S. Gallon	
	900-6UN	F8047	Meter Cover Assy-U.S. Gallon - Nickel Pltd	
	900-6UT	F8046	Meter Cover Assy-U.S. Gallon - Teflon Coatd	
	900-6L	F8048	Meter Cover Assembly - Liter	
	900-6LN	F8050	Meter Cover Assy - Liter - Nickel Plated	
	900-6LT	F8049	Meter Cover Assy - Liter - Teflon Coated	

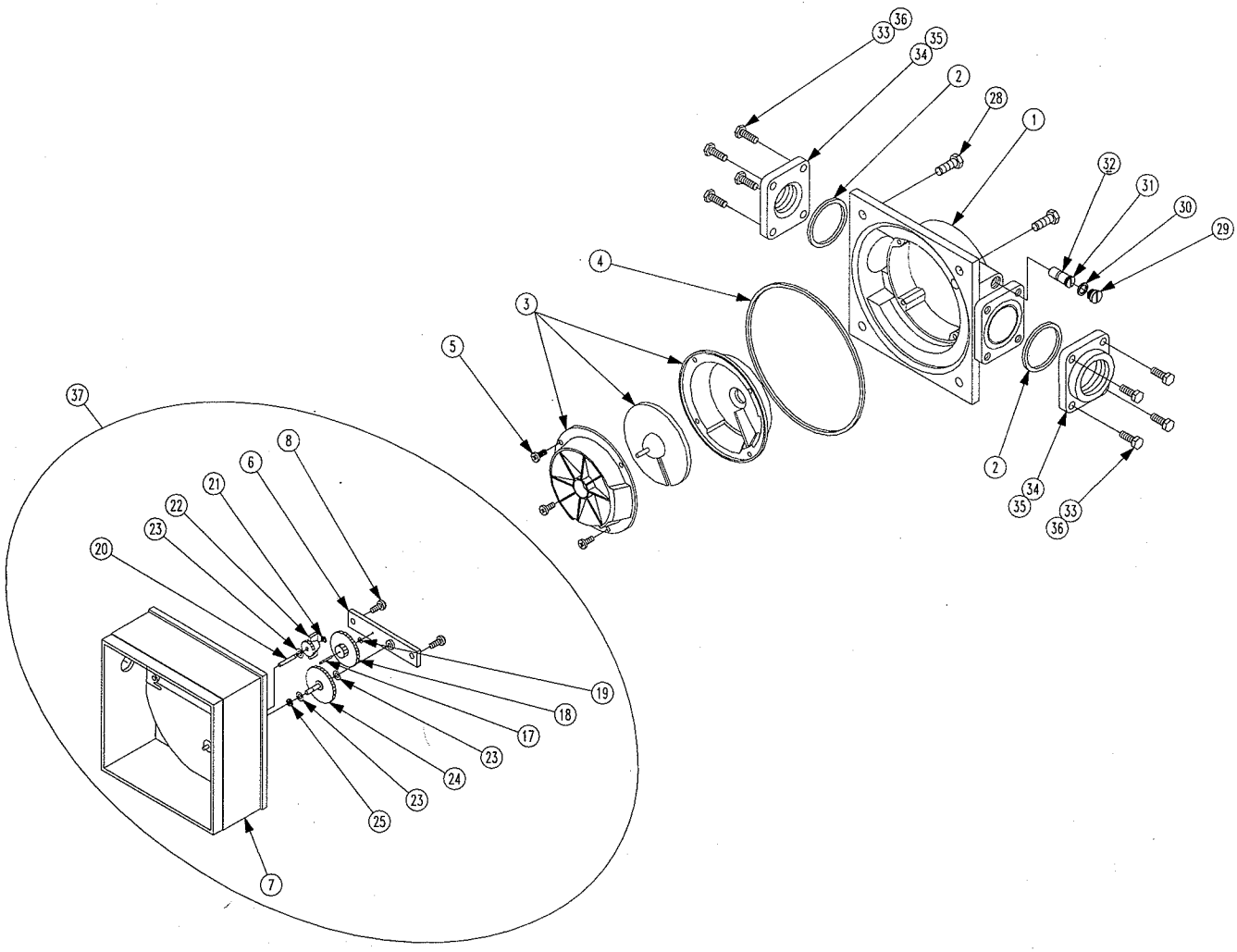
900 SERIES REPAIR PARTS KITS

900-48	F8119	Meter Repair Kit, U.S. Gallon (Standard Seals) (Includes items 2-4, 6, 17-19, 21-25, 27, 30, 32)
900-48V	F8120	Meter Repair Kit, U.S. Gallon (Fluorocarbon Seals) (Includes items 2-4, 6, 17-19, 21-25, 27, 30, 32)
900-48L	F8121	Meter Repair Kit, Liter (Standard Seals) (Includes items 2-4, 6, 17-19, 21-25, 27, 30, 32)
900-48LV	F8123	Meter Repair Kit, Liter (Fluorocarbon Seals) (Includes items 2-4, 6, 17-19, 21-25, 27, 30, 32)

PRIOR TO SERVICE, ADHERE TO FOLLOWING INSTRUCTIONS:
If meter was used for a fluid other than a petroleum product, it must be triple-rinsed and accompanied by a note indicating the chemicals which have been pumped through the unit. Meters not adhering to these specifications may be refused service at either the repair shop or at the factory.



WHEN ORDERING REPAIR PARTS, BE SURE TO GIVE REPLACEMENT PART NUMBER AND DATE OF MANUFACTURE AND METER SERIES NUMBER. THIS WILL ENSURE THAT THE CORRECT REPLACEMENT PART IS SUPPLIED.



PROBLEM	POSSIBLE CAUSE	SOLUTION
Counter reading high or low	•Calibration off •Air in product •Measuring chamber or gears sticking	•Recalibrate meter. •Find and repair air leaks in system. •Clean or replace internal metering components.
Shaft seal leakage	•Dirty seal •Bad seal	•Clean O-ring seal and seat area. •Replace seal.
Gasket leakage	•Loose joints •Dirty gasket •Bad gasket	•Tighten joints. •Clean gasket and seat area. •Replace gasket.
Low flow capacity	•Clogged meter chamber	•Clean meter chamber.

Fill-Rite: A Worldwide Reputation for Reliability.

For over 40 years, people all over the world who have needed tough, dependable pumps have insisted on Fill-Rite products. For them, Fill-Rite has been "the reliable pump" that keeps on working even under the toughest of conditions. We're proud of the reputation our hand pumps, DC and AC pumps and meters have earned. Today they're only a part of the rapidly expanding Fill-Rite line.

Applying the Science of Fluid Transfer.

An active research and development program is the centerpiece of our ongoing commitment to respond to new fluid transfer opportunities. This has led to new products and to new technologies and new facilities to produce these products.

To bring this advanced technology to market, we have invested in precision engineering and testing equipment. This improves our ability to produce fluid handling equipment that meets market demands for quality, performance and price.

A Hard Working Support Network.

Just as important as these capabilities are the people behind them - our design and production personnel. They give you the ability to specify systems that meet the most challenging of applications. With them, you can be assured of prompt, intelligent answers to your fluid transfer questions.

To service customers in the field, we've put together a select, well-monitored team of distributors. Throughout the world, they are ready to help you with technical advice, ordering and delivery.

Fill-Rite will always stand for reliable pumps and fluid handling equipment. We'll continue to develop new products and production techniques to keep pace with ever changing technologies. Each of our products will always be made with the same care and quality that made our pumps famous.

PRODUCT WARRANTY

Fill-Rite Division of Tuthill Corporation ("Manufacturer") warrants to each buyer of its products (the "Buyer") for a period of 12 months from date of installation but in no event more than 18 months from date of manufacture that goods of its manufacture ("Goods") will be free from defects of material and workmanship. Specific to Series 10, 12, 20, and 22, Warranty is understood not to exceed 6 months and is specific to all related items. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. If Manufacturer so requests the return of the Goods, the Goods will be redelivered to Manufacturer in accordance with Manufacturer's instructions F.O.B. Factory. IN NO EVENT SHALL MANUFACTURER BE LIABLE FOR CONSEQUENTIAL DAMAGES, NOR SHALL MANUFACTURER'S LIABILITY ON ANY CLAIM FOR DAMAGES ARISING OUT OF THE MANUFACTURE, SALE, DELIVERY OR USE OF THE GOODS EXCEED THE PURCHASE PRICE OF THE GOODS.

The foregoing warranties will not extend to Goods subjected to misuse, neglect, accident or improper installation or maintenance, or which have been altered or repaired by anyone other than Manufacturer or its authorized representative. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED.

No person may vary the foregoing warranties and remedies except in writing signed by a duly authorized officer of Manufacturer. Warranties or remedies that differ from the foregoing shall not otherwise be binding on Manufacturer. The Buyer's acceptance of delivery of the Goods constitutes acceptance of the foregoing warranties and remedies, and all conditions and limitations thereof.

FILL-RITE

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FILL-RITE

F9096

Thank you for purchasing this product from Fill-Rite. Please register your warranty within 10 days by filling out this card and mailing it to us.

Date of Purchase_____ Meter Model Number_____
Pump Model Number_____

Name_____
☐ Owner ☐ Employee
Company_____
Address_____
City/State/Zip_____

In a continuous effort to improve our products, we would like to hear what you think about Fill-Rite products.

Where was this product purchased?
Supplier Company Name_____
Supplier City/State_____
Price paid_____

Where will this product be used?
☐ Farm/Ranch ☐ Construction ☐ Mining & Logging
☐ Industrial ☐ Home or Hobby

What type of fluid will this product be used with?
☐ Fuel ☐ Lubricant ☐ Other (please specify) _____

What was the main reason you chose this Fill-Rite pump/meter?
☐ Price ☐ Design ☐ Performance ☐ Supplier Recommendation
☐ Other reason _____

Which of these applies to your purchase?
☐ This is my first pump/meter
☐ This is a replacement pump/meter
☐ This is an additional pump/meter

Would you like to receive additional Fill-Rite product information or information about future new products? ☐ Yes ☐ No

May we contact you in the future to ask about your satisfaction with this purchase?
☐ Yes ☐ No
Phone number_____

PRODUCT WARRANTY

Fill-Rite Division of Tuthill Corporation ("Manufacturer") warrants to each buyer of its products (the "Buyer") for a period of 12 months from date of installation, but in no event more than 18 months from date of manufacture that goods of its manufacture ("Goods") will be free from defects of material and workmanship. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. If Manufacturer so requests the return of the Goods, the Goods will be redelivered to Manufacturer in accordance with Manufacturer's instructions F.O.B. Factory. If Manufacturer elects to repair defective Goods and written notice of defects is given to Manufacturer during the warranty period specified above and within 90 days from date of installation, then Manufacturer will provide at its cost the services of an authorized representative for on-site repair of defective Goods. If such notice is given after 90 days, all service costs incurred in the repair or replacement of defective Goods shall be the responsibility of the Buyer. The remedies contained herein shall constitute the sole recourse of the Buyer against Manufacturer for breach of warranty. IN NO EVENT SHALL MANUFACTURER BE LIABLE FOR CONSEQUENTIAL DAMAGES, NOR SHALL MANUFACTURER'S LIABILITY ON ANY CLAIM FOR DAMAGES ARISING OUT OF THE MANUFACTURE, SALE, DELIVERY OR USE OF THE GOODS EXCEED THE PURCHASE PRICE OF THE GOODS. The foregoing warranties will not extend to Goods subjected to misuse, neglect, accident or improper installation or maintenance, or Goods which have been altered or repaired by anyone other than Manufacturer or its authorized representative. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESSED OR IMPLIED. No person may vary the foregoing warranties and remedies except in writing signed by a duly authorized officer of Manufacturer. Warranties or remedies that differ from the foregoing shall not otherwise be binding on Manufacturer. The Buyer's acceptance of delivery of the Goods constitutes acceptance of the foregoing warranties and remedies, and all conditions and limitations thereof.

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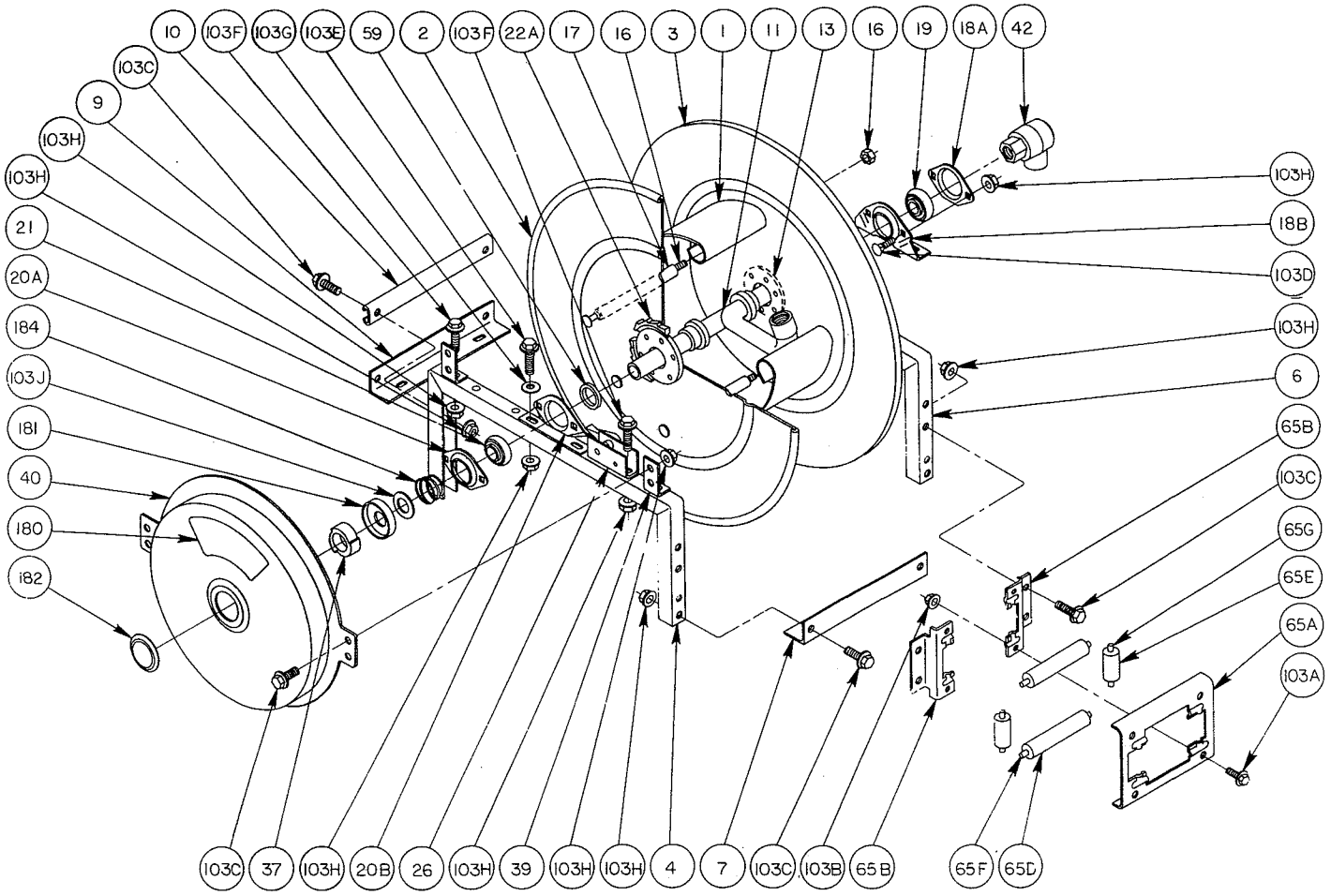
ISO 42
PARTS LIST
SERIES 800



PARTS LIST
ISO-42
SERIES 800

When ordering parts

BE SURE TO SPECIFY COMPLETE MODEL NUMBER and SERIAL NUMBER OF REEL.

USE PART NUMBER!

Item No.	Description	PART NUMBER	Quantity
1	Drum, 10-1/2" Dia. - Wrap Around (Specify Model)	9905.0138	1
1	Drum, 15-1/2" Dia. - Wrap Around (Specify Model)	9905.0178	1
2	Front Disc, 19-20, 18-3/4" Dia. (Specify Model)	9903.0821	1
2	Front Disc, 23-24, 21-3/4" Dia. (Specify Model)	9903.1121	1
2	Front Disc, 25-26, 24-3/4" Dia. (Specify Model)	9903.1321	1
2	Front Disc, 28-29, 26-3/4" Dia. (Specify Model)	9903.1521	1
2	Front Disc, 30-31, 28-3/4" Dia. (Specify Model)	9903.1621	1
3	Back Disc, 19-20, 18-3/4" Dia. (Specify Model)	9903.0821	1
3	Back Disc, 23-24, 21-3/4" Dia. (Specify Model)	9903.1121	1

PARTS LIST
ISO-42
SERIES 800

When ordering parts

BE SURE TO SPECIFY COMPLETE MODEL NUMBER and SERIAL NUMBER OF REEL.

USE PART NUMBER!

Item No.	Description	PART NUMBER	Quantity
3	Back Disc, 25-26, 24-3/4" Dia. (Specify Model)	9903.1321	1
3	Back Disc, 28-29, 26-3/4" Dia. (Specify Model)	9903.1521	1
3	Back Disc, 30-31, 28-3/4" Dia. (Specify Model)	9903.1621	1
4	Front Frame, 19-20, 1-1/2" Rollform Channel	9906.0081	1
4	Front Frame, 23-24, 1-1/2" Rollform Channel	9906.0111	1
4	Front Frame, 25-26, 1-1/2" Rollform Channel	9906.0121	1
4	Front Frame, 28-29, 1-1/2" Rollform Channel	9906.0141	1
4	Front Frame, 30-31, 1-1/2" Rollform Channel	9906.0151	1
6	Back Frame, 19-20, 1-1/2" Rollform Channel	9906.0081	1
6	Back Frame, 23-24, 1-1/2" Rollform Channel	9906.0111	1
6	Back Frame, 25-26, 1-1/2" Rollform Channel	9906.0121	1
6	Back Frame, 28-29, 1-1/2" Rollform Channel	9906.0141	1
6	Back Frame, 30-31, 1-1/2" Rollform Channel	9906.0151	1
7	Front Foot	Specify Model	1
9	Back Foot	Specify Model	1
10	Back Brace - C Channel	Specify Model	1
11	1" Hub Assembly, Welded Iron Pipe w/1" FNPT Riser (Specify Model)	9901.1600	1
13	Disc Washer w/Rivets, EH-936	9965.0015	1
16	3/8" - 16 Carriage Bolt w/Nut (10-1/2" Drum)	Specify Model	6
16	3/8" - 16 Carriage Bolt w/Nut (15-1/2" Drum)	Specify Model	10
17	Spacer Pipe (10-1/2" Drum)	Specify Model	6
17	Spacer Pipe (15-1/2" Drum)	Specify Model	10
18A	Self Aligning Bearing Holder (Back)	9902.2800	1
18B	Self-Aligning Bearing Pillow Block (Back)	9902.2900	1
19	Self-Aligning Bearing Insert (Back)	9902.1500	1
20A	Self-Aligning Bearing Holder (Front)	9902.2800	1
20B	Self-Aligning Bearing Pillow Block (Front)	9902.2900	1
21	Self-Aligning Bearing Insert (Front)	9902.1500	1
22A	Ratchet Wheel	9922.0003	1
26	Ratchet Locking Assembly, GH-784	9922.0005	1
37	Spring Arbor For A & D Spring	9922.0001	1
37	Spring Arbor For B, G, & J Spring	9922.0002	1
39	Spring Mounting Bracket	9922.0009	2
40	Spring Motor, A	9921.0010	1
40	Spring Motor, B	9921.0015	1
40	Spring Motor, D	9921.0020	1
40	Spring Motor, G	9921.0021	1
40	Spring Motor, J	9921.0030	1
42	1" 90 Deg. FxF Swivel Joint	9929.2588	1
59	Hub Spacer	9954.0021	2
65A	Roller Bracket Frame, GH-895	Specify Model	1
65B	Roller Mounting Bracket, GH-896	9940.0170	1
65D	1" Dia Roller for Stamped Housing, GH-1012	Specify Model	2
65E	1" Dia. Roller for Stamped Housing, 2" Long, GH-1012A	9940.0180	2
65F	1/4" Dia. Stainless Steel Rod	Specify Model	2
65G	1/4" Dia. Stainless Steel Rod, 2-3/4" Long	9940.0190	2
66	EH-678D Roller Assembly (Not Shown)	9939.0009	1
103A	5/16" - 18 x 3/4" Spinlock Bolt	9904.2101	4
103B	5/16" - 18 Spinlock Nut	9904.6100	4
103C	3/8" - 16 x 3/4" Spinlock Bolt	9904.2201	14
103D	3/8" - 16 x 3/4" Carriage Bolt	9904.0201	4
103E	3/8" - 16 x 1-1/4" Spinlock Bolt	9904.2203	4
103F	3/8" - 16 x 1-1/2" Spinlock Bolt	9904.2204	4
103G	3/8" Flat Washer	9954.0007	4
103H	3/8" - 16 Spinlock Nut	9904.6200	22
103J	1-7/8" O.D. x 1-5/16" I.D. x .049 Washer	9954.0055	1
180	Caution Decal, "Spring Under Tension"	9922.0010	1
181	Cap-Plug for Spring (Inner Side)	9922.0036	1
182	Cap-Plug for Spring (Outer Side)	9922.0037	1
184	Dust Cap Spring	9922.0038	1

IMPORTANT INSTRUCTIONS

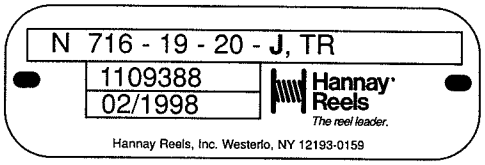
INSTALLING HOSE OR CABLE ON A HANNAY SPRING RETRACTABLE REEL

Note: Instructions must be followed or warranty is void.

1) *CHECK SPRING TYPE*

The spring type is indicated by the first letter at the end of the model number on the metal nameplate. It is also stamped on the mounting ear of the spring housing on most models. The maximum number of usable turns for which each spring is designed, is shown at right (listed in descending order of pull force ability):

Spring Type	Usable Turns
"SA"	17
"A"	23
"K"	13
"B"	18
"D"	30
"G"	25
"J"	17
"C"	14
"F"	32
"SCR"	26
"LC"	18
"B5" (HGR-100)	42
"B6" (HGR-50)	30

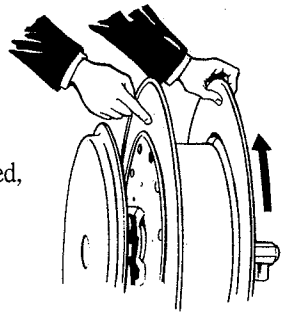


2) *RELEASE SPRING (if needed)*

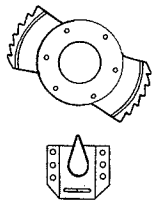
To release the spring, disengage the pawl from the ratchet wheel and allow the spring to unwind completely and slowly. (If the reel is shipped from the factory without hose installed, the spring is normally discharged and this step would be unnecessary.)

2) *SET SPRING TENSION*

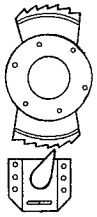
Carefully turn the discs by hand in the direction that the outlet is facing (you will begin feeling resistance after the first couple of turns). The number of revolutions you need to turn is determined by the type of spring you have (see the chart in step 1 above). When the last turn is completed, lock the reel by engaging the pawl in the ratchet wheel.



CAUTION: Do not wind more than the number of turns listed in the table above for the spring that you have. Never wind the spring in reverse or free wheel past the start of the spring load.



(Figure A)



(Figure B)

4) *ATTACH HOSE OR CABLE*

HOSE: After setting the spring tension, insert the hose between the rollers and attach the hose fitting to the reel outlet. (If you have a 1-1/2" spring reel, also known as the 900 series, the outlet riser can be temporarily removed to aid in attaching the hose.)

CABLE: After setting the spring tension, feed the cable through the drum and hub with the aid of the pull wire supplied. Then connect the cable to the collector ring terminals. You will need to remove the collector cover to expose the collector rings if you have an SCR-700 series cable reel. CAUTION: Always use a cable clamp connected to the drum in order to keep pressure off the wire connections.

5) *WIND HOSE OR CABLE TO REEL*

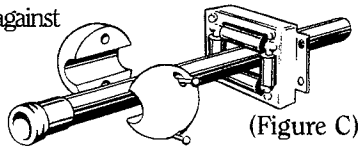
Pull gently on the hose until the pawl is clear of the ratchet teeth (Figure A). Retract the hose slowly until it is completely on the reel. Then pull the hose out until the pawl drops into one of the ratchet wheel teeth. This will lock the reel (Figure B).

6) *REDUCE TENSION*

If the spring tension is greater than that required to adequately retract the hose, you can decrease this tension. Just let the end of the hose (after it is completely rewound on the reel) pass back through the roller assembly and carefully allow the reel to unwind by another revolution (or possibly more) until the proper tension is reached. Relock the reel and pass the end of the hose back through the rollers.

7) *ATTACH BALL STOP TO HOSE*

Draw the hose through the rollers to the point where the ball stop should be attached. *NOTE:* After ball stop is positioned, make sure that when the stop is resting against the rollers the brass pawl is *disengaged* from the ratchet wheel. (See figure C.)



(Figure C)

Now take the two halves of the ball stop and join them together over the hose. Fasten ball stop with provided fasteners.

8) *MAKE FINAL CONNECTIONS*

You should now be ready to make your hose connection to the inlet swivel joint on the side of the reel. A flexible connector must be used between the inlet pipe and the inlet swivel joint on the reel or the warranty will be void.

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E-mail: reels@hannay.com

CHANGING THE ROLLER ARM POSITION ON "N" SERIES SPRING REELS

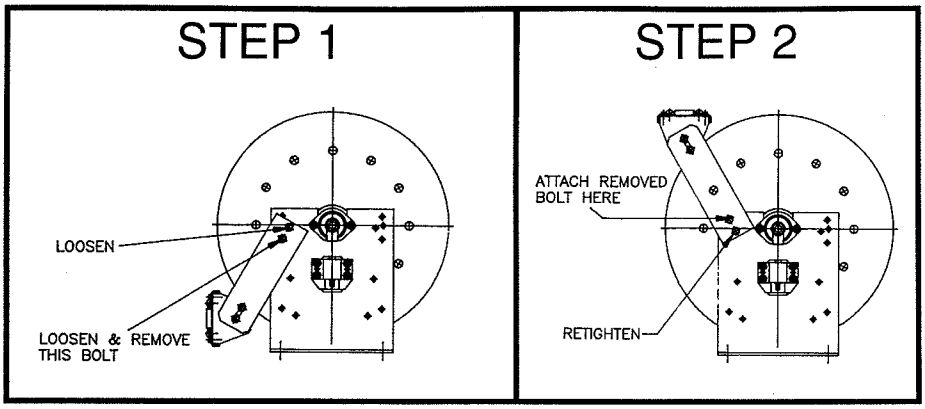
From "SR" position to "VR" position (and vice versa):

All "N" series reels that have the suffix "SR" or "VR" and have a serial tag date of 4-94 or later are interchangeable between those two roller positions. For safety reasons, **NEVER** work on a spring reel unless the tension is first removed from the spring (i.e., fully retract the hose onto the reel before starting).

1. Loosen and remove the two bolts with a 9/16″ wrench as shown in the diagram below and swing the arm up into the VR position.

2. Retighten both bolts in the new position.

3. If you have a spring reel with a DOUBLE roller arm (which became standard in 1999 on all reels), you will have to repeat steps 1 & 2 above on the 2nd roller arm. However, this requires first removing the spring motor itself. A separate sheet is available for help with this additional task.

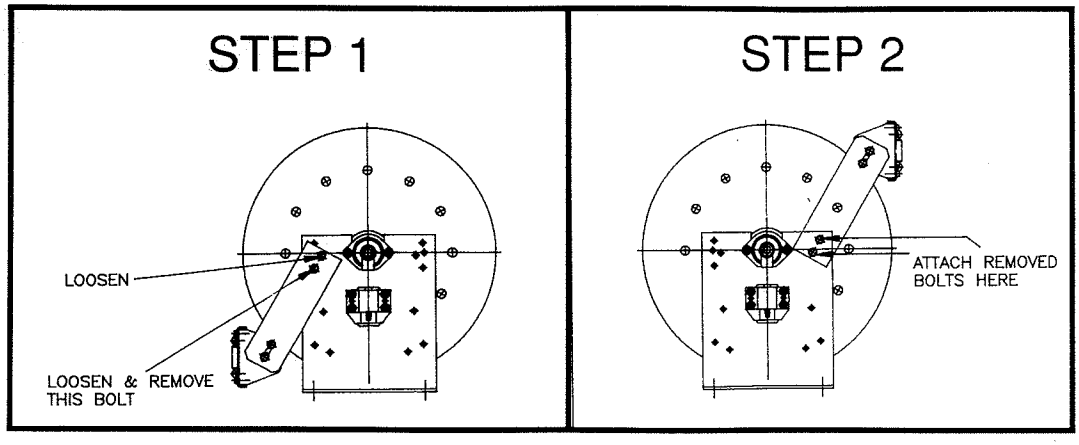


From "SR" (or "VR") position to "TR" position (and vice versa):

1. Loosen and remove the two bolts with a 9/16″ wrench as shown in the diagram below and move the arm to the TR position, which is on the opposite side of the frame as shown in the diagram.

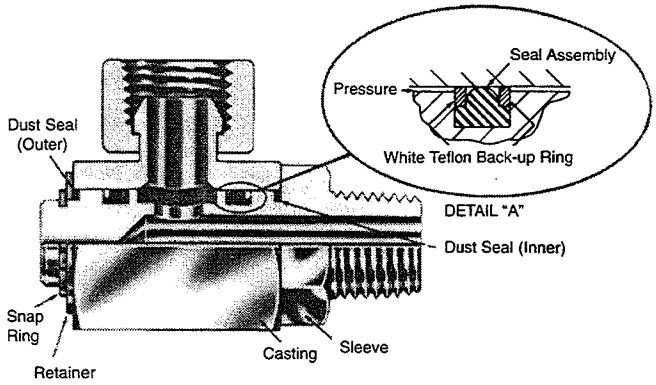
2. Retighten both bolts in the new position.

3. If you have a spring reel with a DOUBLE roller arm (which became standard in 1999 on all reels), you will have to repeat steps 1 & 2 above on the 2nd roller arm. However, this requires first removing the spring motor itself. A separate sheet is available for help with this additional task.

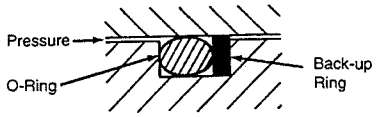


Bulletin JB14A
Supersedes Bulletin JB14

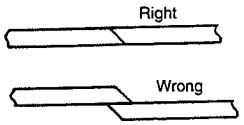
5500 Series Balanced Pressure Swivel Joints



DETAIL "B" O-Ring Assembly



DETAIL "C" Back-up Ring



Seal Replacement Instructions

Disassembly

1. Remove snap ring, retainer and outer dust seal.
2. Remove sleeve from casing by hand or by gently tapping solid end of sleeve.
3. Remove the inner dust seal and seal assemblies (take care not to scratch groove).
4. Clean thoroughly and inspect bearing surfaces of sleeve and casing and seal grooves of sleeve. If these surfaces appear to be galled, scratched, or worn in any way, the sleeve, casing or entire swivel joint should be replaced.

Assembly

1. Assemble the seals to the sleeve as follows:
   - A. Lubricate sleeve and rubber portion of seal with any petroleum or silicone base lubricant.* The seal nearest the fitting end of the sleeve is to be assembled first.
   - B. Assemble the rubber portion of the seal into groove in sleeve (care must be taken so that the rubber portion is not damaged during assembly).
   - C. Assemble back-up ring portions of seal into groove in sleeve (see Details "A" and "B").

     CAUTION – Back-up rings must be expanded carefully or they are likely to be damaged. Visually examine seal assembly to assure that it is properly and completely seated in the seal grooves. When in the groove the skive cut back-up rings must be completely closed (see Detail "C").
2. Assemble the inner dust seal to the sleeve by stuffing it into its sleeve groove so that when assembled the dust seal contacts the chamfer in the casing and forms a seal (the outer dust seal slides over the sleeve end and the above technique does not apply).
3. Reassemble sleeve into casing after lubricating casing bearing surfaces with any petroleum or silicone base lubricant.*
4. Assemble outer dust seal, dust seal retainer and snap ring. Use snap ring pliers to prevent deformation of the snap ring.

* Use **only** silicone base lubricant with EPR seals (all kits with the last two digits of the kit part number, "-04" have EPR seals).

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SAFETY GUIDELINES

READ THIS FIRST.

These guidelines provide general safety recommendations for using hose and cable reels. However, the employer should assess and determine if any additional safety measures are required for its particular application and operation, and fully instruct employees on those safety measures.

Additionally, the employer should make a copy of this safety manual available to all employees working with reels. Additional copies of this safety manual may be obtained upon request. No warranty of the correctness or sufficiency of the information in this manual is made by Hannay Reels.

Read all relevant manuals and safety instructions prior to unpackaging reels. If there is ANYTHING you do not understand about the safe installation and use of your Hannay reel, please contact Hannay Reels (Attn: Customer Safety). We are always glad to help.

NOTICE

Hannay Reels will not assume any liability for any alterations and/or modifications to Hannay Reels or products supplied by Hannay Reels nor for uses other than for which these products are intended. All warranties expressed or implied will become null and void.

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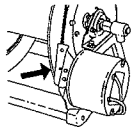
WARNING: PINCH POINT AREAS

USE CAUTION WHEN OPERATING NEAR CHAIN AND SPROCKETS.

Where chain guards are furnished, the reels should not be operated with them removed.

NOTE:

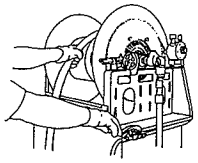
OSHA indicates the appropriate guarding of chains and sprockets is at least partly the responsibility of the final installer of equipment, based on the fact that equipment can be installed in so many different positions and so many different degrees of accessibility to the operator.



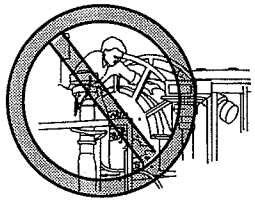
Please make sure that you have thoroughly reviewed this issue when making the installation of the reel.

USE CAUTION WHEN GUIDING HOSE OR CABLE BACK ONTO POWER REELS.

Keep the hand guiding the hose back onto the reel several inches away from the drum so that there is no possibility of trapped or pinched fingers.



KEEP HANDS AWAY FROM SPOKED DISCS WHEN TURNING.

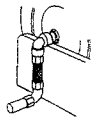


INSTRUCTIONS FOR SAFE FLUID HANDLING

USE A HOSE REEL AND HOSE PROPERLY RATED FOR THE JOB.

Never exceed the pressure rating (psi) specified for a particular reel and hose. Also, make sure that the size and material of both the reel and hose are designed for the intended use.

USE A FLEXIBLE CONNECTOR BETWEEN A SWIVEL JOINT AND INLET PIPING.



CHECK FOR POSSIBLE LEAKS AT FLUID CONNECTIONS PRIOR TO USE.

RELEASE PRESSURE IN HOSE BEFORE REMOVING FITTINGS OR PERFORMING ANY MAINTENANCE.

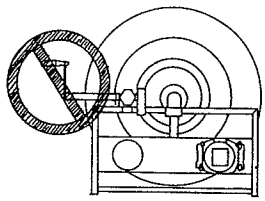
BEFORE WINDING COLLAPSIBLE HOSE ONTO A LIVE REEL, HOSE MUST BE EVACUATED OF ALL FLUID.

POWER REWIND REELS

USE CIRCUIT BREAKERS FOR ELECTRIC REWIND MOTORS.

Make sure that the circuit breaker is properly sized for the motor. Also, check all electrical connections for proper installation prior to use.

REMOVE AUXILIARY CRANK REWIND HANDLE WHEN USING POWER REWIND.



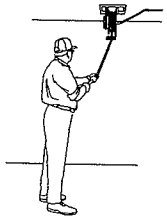
DISCONNECT POWER SOURCE BEFORE PERFORMING MAINTENANCE.

This applies to both electric and air-powered reels. Also, disconnect electrical power before removing junction box covers or collector ring housings.

SPRING REWIND REELS

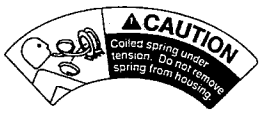
USE CAUTION WHEN SPRING REEL RATCHET ASSEMBLY LOCK IS DISENGAGED.

When the lock is disengaged, always hold onto the hose and guide it onto the reel as it rewinds.



ON SPRING REELS, NEVER REMOVE THE COVER CONTAINING THE SPRING.

Coiled springs are under tension and removal of cover can result in severe personal injury.



Bronze Adjustable Liquid Relief Valves

- Set Pressure: varies by range
- Maximum Temperature:
  Low Pressure: 400° F
  Medium Pressure: 450° F

Set pressure is adjustable within the range you select. Valve bodies are bronze. Choose from low-pressure and medium-pressure models.

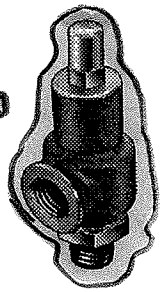
Low-pressure valves have a cadmium-plated steel spring. **Connections:** NPT male inlet and NPT female outlet.

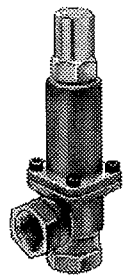
To Order: Please specify pressure range in psi: 0-14, 15-25, 26-40, 41-75, 76-110, 111-130, 131-150, 151-200, or 201-400.

Medium-pressure valves have a stainless steel spring. **Connections:** NPT female inlet and outlet.

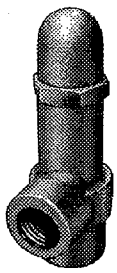
To Order: Please specify pressure range in psi: 15-75, 50-150, 100-300, or 200-600.

Pipe Size	Pipe OD		Each
Low-Pressure Valves			
1/2"	0.840"	**4703K54**	$93.93
3/4"	1.050"	**4703K55**	95.89
1"	1.315"	**4703K56**	111.16
1 1/4"	1.660"	**4703K57**	145.85
1 1/2"	1.900"	**4703K58**	175.09
2"	2.375"	**4703K59**	259.58
2 1/2"	2.875"	**4703K61**	407.13
3"	3.500"	**4703K62**	658.85
Medium-Pressure Valves			
1/4"	0.540"	**4662K46**	110.42
3/8"	0.675"	**4662K48**	110.42
1/2"	0.840"	**4662K32**	166.45
3/4"	1.050"	**4662K34**	166.45
1"	1.315"	**4662K36**	330.37
1 1/4"	1.660"	**4662K38**	330.37


Low Pressure


Medium Pressure

Cast Iron Adjustable Liquid Relief Valves



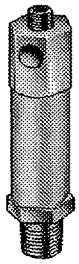
- Set Pressure: varies by range
- Maximum Temperature: 437° F

Set pressure is adjustable within the range you choose. Valve is cast iron with Type 416 stainless steel piston and spring and a Viton seal. **Connections:** NPT female inlet and outlet.

To Order: Please specify pressure range in psi: 3-15, 7-35, 30-100, 60-175, 150-350, or 300-500. The 1/2" size is also available with 400-600 psi and 550-750 psi ranges.

Pipe Size	Pipe OD		Each	Pipe Size	Pipe OD		Each
1/2"	0.840"	**4704K11**	$73.92	1 1/4"	1.660"	**4704K14**	$144.84
3/4"	1.050"	**4704K12**	88.44	1 1/2"	1.900"	**4704K25**	188.52
1"	1.315"	**4704K13**	114.72	2"	2.375"	**4704K26**	299.72

Steel Adjustable Liquid Relief Valves



- Set Pressure: varies by range
- Maximum Temperature: 300° F

Adjust the set pressure within a range you choose; a nylon adjustment lock helps prevent accidental changes to your setting. Valves are leak-tight below set pressure. Body is cold-rolled steel with an alloy steel poppet and spring, Teflon seal, and zinc-plated internal parts. Valves have an inlet bottom and top and side outlets. Side and top outlets are the same size. **Connections:** Choose from NPT male × NPT female outlet and NPT female inlet × NPT female outlet.

To Order: Please specify pressure range in psi: 50-400, 300-1000, or 900-2000.

Pipe Size, Inlet × Outlet	Pipe OD, Inlet × Outlet	*Male × Female*	Each	*Female × Female*	Each
1/4" × 1/4"	0.540" × 0.540"	**5026K51**	$53.94	**5026K61**	$53.94
3/8" × 1/4"	0.675" × 0.540"	**5026K52**	53.94	**5026K73**	53.94
1/2" × 1/4"	0.840" × 0.540"	**5026K53**	53.94	**5026K72**	53.94

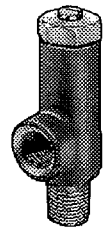
Adjustable Calibrated Bronze Liquid Relief Valves

- Set Pressure: 100 psi
- Maximum Temperature: 250° F

Change pressures without gauges or guesswork. These calibrated, adjustable valves for cold water service let you adjust pressure from 50 to 175 psi in 25 psi increments. Body is bronze with brass trim, spring is Type 302 stainless steel, seat is silicone rubber, and seal is EPDM rubber. **Connections:** NPT male inlet and NPT female outlet.

Pipe Size, Inlet × Outlet	Pipe OD, Inlet × Outlet		Each
1/2" × 1/2"	0.840" × 0.840"	**4612K12**	$16.89
3/4" × 1/2"	1.050" × 0.840"	**4612K14**	18.26

316 Stainless Steel Medium-Pressure Adjustable Liquid Relief Valves



- Set Pressure: varies by range
- Maximum Temperature: 250° F

Set pressure is adjustable within the ranges shown below. Valves have all metal-to-metal construction. Body and internal parts are Type 316 stainless steel. **Connections:** 1/2" NPT male bottom inlet and 1/2" NPT female side outlet (both have 0.840" pipe OD).

Pressure Range, psi		Each	Pressure Range, psi		Each
30-100	**5027K51**	$183.44	401-1000	**5027K53**	$183.44
101-400	**5027K52**	183.44	1001-2000	**5027K54**	183.44

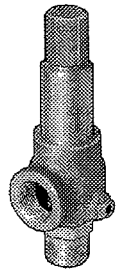
316 Stainless Steel High-Pressure Liquid Relief Valves

- Maximum Set Pressure: see table
- Maximum Temperature: 450° F

Body is Type 316 stainless steel; ball is cobalt alloy. Seal is Viton. **Connections:** see table. **To Order:** Please specify set pressure, type of liquid, and temperature.

Pipe Size, Inlet × Outlet	Pipe OD, Inlet × Outlet	Max. Set Press., psi		Each
NPT Male Inlet × NPT Female Outlet				
3/4" × 3/4"	1.050" × 1.050"	3500	**6871K32**	$298.46
1" × 1"	1.315" × 1.315"	3500	**6871K33**	298.46
NPT Female Inlet × NPT Female Outlet				
1/4" × 3/4"	0.540" × 1.050"	6000	**6871K28**	299.46
3/8" × 3/4"	0.675" × 1.050"	6000	**6871K29**	299.46
1/2" × 3/4"	0.840" × 1.050"	3500	**6871K31**	298.46

High-Pressure Bronze Liquid Relief Valves



- Set Pressure: varies by range
- Maximum Temperature:
  Metal seat and soft seat Viton: 406° F
  Soft seat Buna-N: 200° F

The valve body is heavy duty casting, so it handles pressures up to 900 psi. Use for liquid service only. Set pressure is adjustable within the range you select. Body and bonnets are bronze/brass. Internal parts and spring are Type 316 stainless steel. Choose *metal seat* (Type 316 stainless steel) or *soft seat* (Viton or Buna-N). **Connections:** NPT male inlet, NPT female outlet.

To Order: Please specify pressure range in psi: 15-75, 50-150, 100-300, 200-600, or 600-900. *Note:* 1 1/2" pipe size is not available in 600-900 psi pressure range.

Pipe Size	Pipe OD		Each
Metal Seat			
1/2"	0.840"	**4460K12**	$224.37
3/4"	1.050"	**4460K14**	237.85
1"	1.315"	**4460K16**	262.89
1 1/4"	1.660"	**4460K24**	320.67
1 1/2"	1.900"	**4460K28**	388.07
Soft Seat Viton			
1/2"	0.840"	**4460K32**	256.02
3/4"	1.050"	**4460K34**	269.50
Soft Seat Viton (Cont.)			
1"	1.315"	**4460K36**	$294.54
1 1/4"	1.660"	**4460K44**	357.74
1 1/2"	1.900"	**4460K48**	425.15
Soft Seat Buna-N			
1/2"	0.840"	**4460K62**	256.02
3/4"	1.050"	**4460K64**	269.50
1"	1.315"	**4460K66**	294.54
1 1/4"	1.660"	**4460K74**	357.74
1 1/2"	1.900"	**4460K78**	425.15