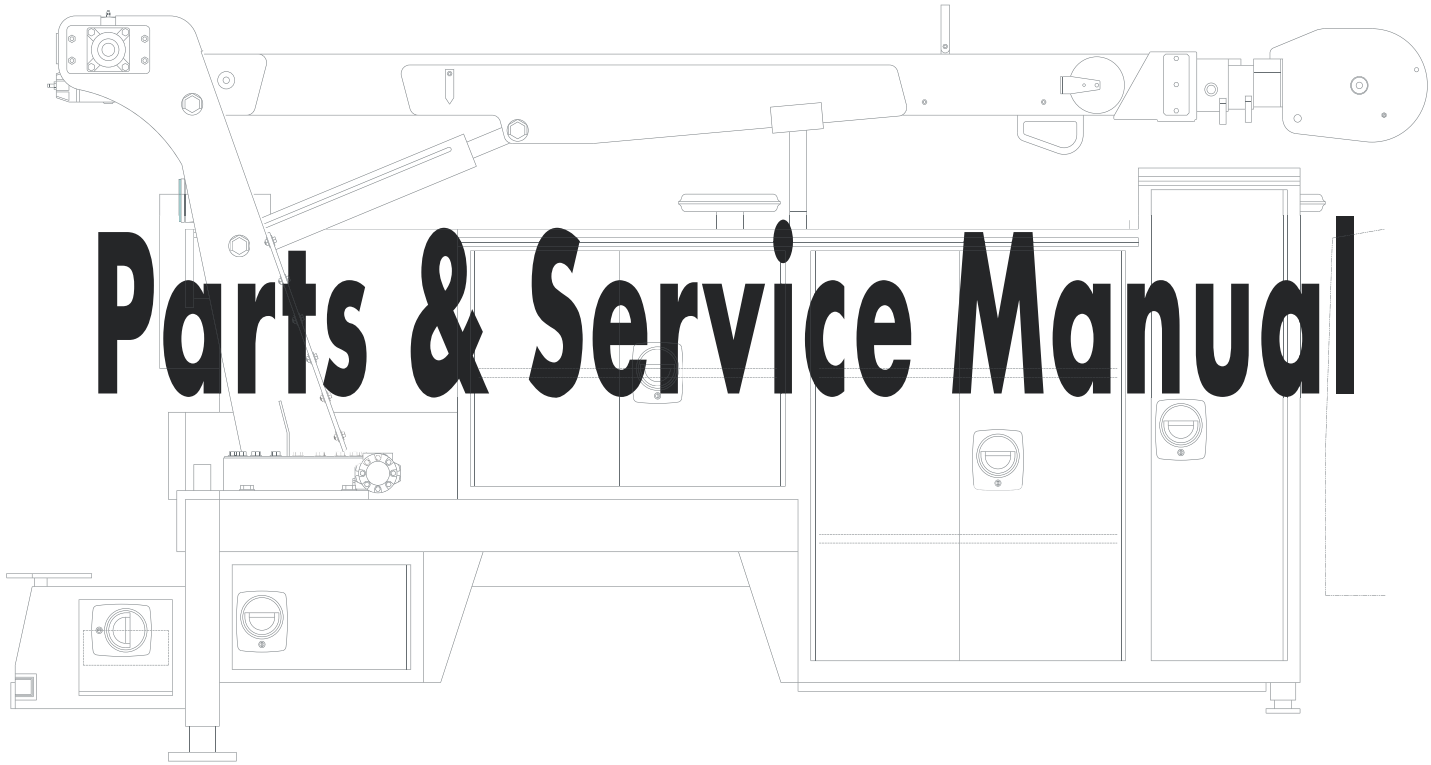
FF306

HEWS
TRUCK BODIES & EQUIPMENT

Hews Company LLC
190 Rumery Street
So. Portland, ME 04106

Hews Company LLC
2 Ryan Road
Bow, NH 03304

www.hewsco.com



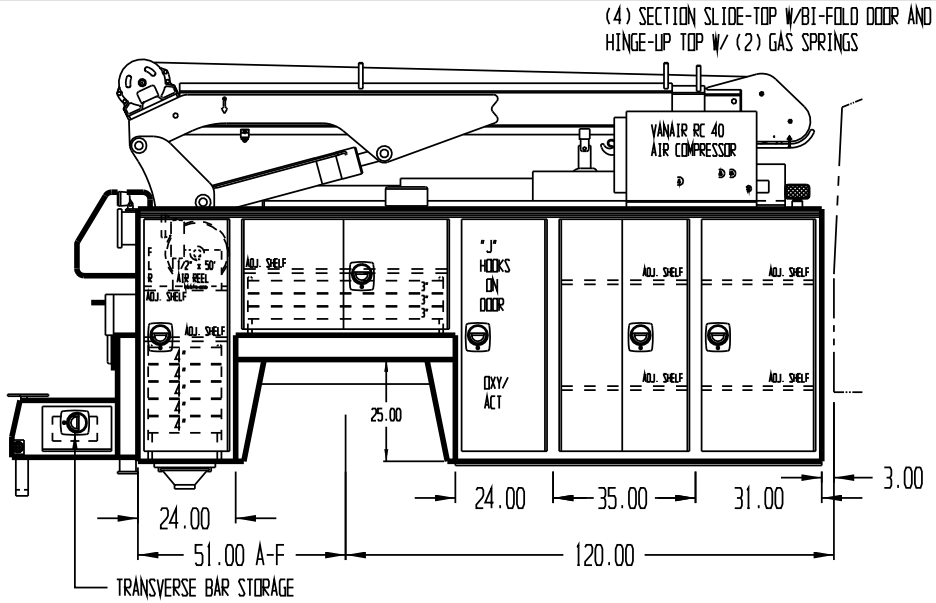
Parts & Service Manual

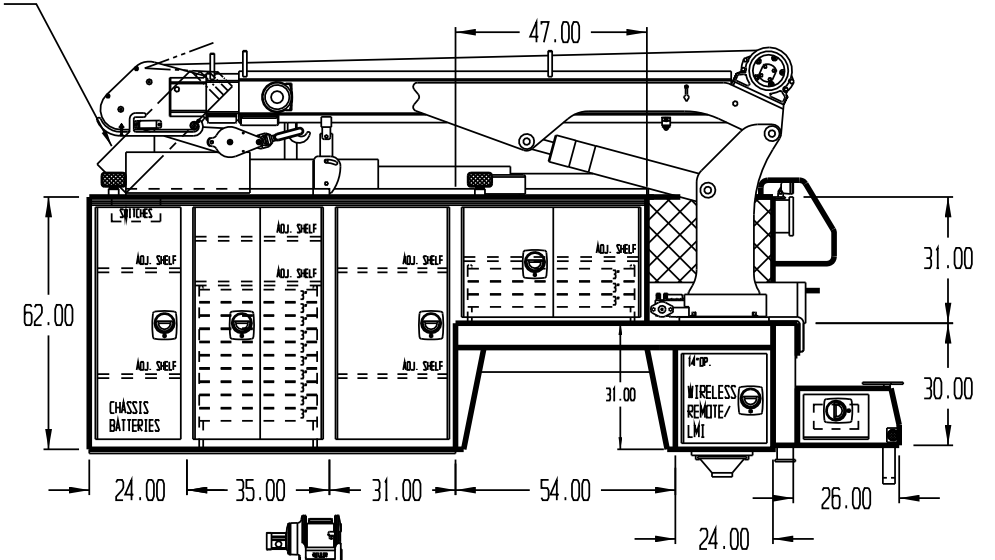
Service Bodies
Lube Bodies
Service/Lube Combo Bodies
Lube Skids
Cranes
Drawers
Accessories

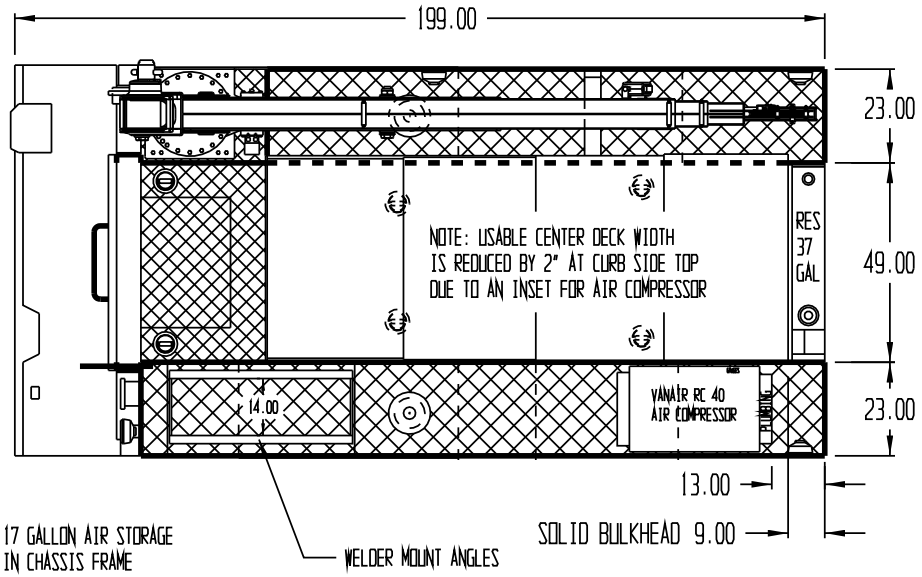
Parts & Service 800-234-4397

APPROVED BY: _____ DATE: _____ PAINT CODE: L6526EB BLUE

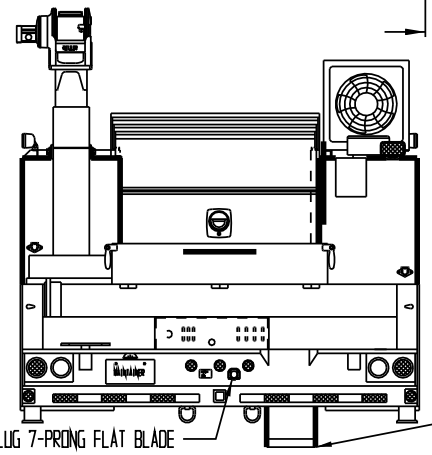
INDICATE WELDER TYPE / MODEL FOR MOUNTING ANGLES: MILLER: _____ LINCOLN: _____ OTHER: _____







NOTE: 17 GALLON AIR STORAGE IN CHASSIS FRAME



NOTE: INTERIOR STRIP LIGHTING SS 1, 2, 3, 4 & CS 1, 2, 3, 4, 5

NOTE: PROTECTIVE SPRAY COVERING ON: CARGO CENTER DECK, COMPARTMENT TOPS, & SIDES, FRONT BULKHEAD, TAIL GATE, & TAIL GATE EXTENSION, REAR WORK BENCH BUMPER AND STEP, OUTSIDE AREA AROUND WHEEL WELLS BOTH SIDES AND SLIDE-IN PANEL

NOTE: USABLE CENTER DECK CARGO WIDTH 48.50"

NOTE: 8" MAINSILL & 4" X-MEMBERS

PLEASE REPORT ANY ERRORS FOUND ON THIS PRINT

UOS DIMENSIONS ARE IN INCHES GENERAL TOLERANCES	MATERIAL:	Maintainer Corporation of Iowa, Inc. P.O. Box 349 1701 S. 2nd Avenue Sheldon, Iowa 51201	
BREAK ALL EDGES .01 X 45°	ANGULAR ± 1° .XX ± .03 .XXX ± .005	SCALE: 1:32	SIZE: B
UOS RADII	UOS ANGLES	DRAWING NUMBER: FF306-2	DFTM. LAG / DATE: 6/04/14
MADE IN THE USA		H10025TT-2-120	HEWS/COMPREHENSIVE LAND

Maintainer

Corporation of Iowa, Inc.

MAINTAINER (5-3-1) LIMITED WARRANTY

FIVE (5) YEAR:	MAINTAINER CRANES STRUCTURE MAINTAINER BODY SUB-STRUCTURES RUST THROUGH ON MAINTAINER SERVICE BODIES
THREE (3) YEAR:	MAINTAINER MANUFACTURED COMPONENTS MAINTAINER MANUFACTURED REPLACEMENT COMPONENTS PAINT COVERAGE ON MAINTAINER MANUFACTURED ITEMS
ONE (1) YEAR:	LABOR ON MAINTAINER WORKMANSHIP PURCHASED COMPONENTS SUPPLIED & INSTALLED BY MAINTAINER

LIMITED WARRANTY COVERAGE: The new products manufactured by Maintainer Corporation of Iowa, Inc. (hereinafter "Maintainer"), are warranted to be free from defects in material and workmanship under normal use, application and maintenance in accordance with Maintainers recommendations, instructions and specifications. The Warranty begins on date of in service as documented by return of the Warranty Registration card and continues for the time identified above. Note: the Warranty Registration card must be filled out and returned to Maintainer within 30 days after purchase. Maintainer's obligation under this warranty is limited to the repair or replacement (at its option) of warranted parts that are determined by Maintainer, after review and inspection, to be defective, which are returned to Maintainer freight prepaid within 30 days of receipt of shipping instructions. (Failure must be reported within thirty (30) days of failure occurrence to qualify).

CONSEQUENTIAL DAMAGES: In no event will Maintainer be liable for business interruptions, loss of sales and/or profits, cost of delays or for any other special, indirect, contingent, incidental or consequential losses, costs or damages or legal fees.

CHANGES IN DESIGN: Maintainer reserves the right to make changes in the design or to make improvements to its products without obligation upon itself to install the same upon products already manufactured.

WARRANTY DOES NOT INCLUDE OR COVER THE: Chassis (whether supplied by Maintainer or Customer) on which the body and/or crane is mounted or any modifications or accessories added by purchaser. Rust through warranty does not apply: 1) where products were used to carry corrosive materials where such materials result in rust through conditions; 2) products are purchased after priming only; 3) product is used outside United States or Canada; 4) product is used in excessive heat.

IMPLIED WARRANTY EXCLUDED: This is the only authorized Maintainer warranty and is in lieu of all other expressed or implied warranties or representations, including any implied warranties of merchantability or fitness for a particular purpose or of any other obligations on the part of Maintainer. There are no other warranties given by Maintainer other than those set forth in this Limited Warranty. Effective: October 2004.

SEE NEXT PAGES FOR ADDITIONAL PROVISIONS.

LABOR CHARGE: Maintainer will warrant labor charges on warranty failures for a period of (1) year from date of in service as documented by return of the Warranty Registration card. All warranty labor charges must be pre-authorized for the time allowed at the Maintainer pre-authorized hourly rate charge.

WARRANTY CLAIMS: Warranty claims must be submitted and shall be processed in accordance with Maintainer's warranty claims procedure, as established from time to time. Contact Maintainer for details.

FREIGHT: Maintainer will pay the regular freight charge on all warranty parts sent to the dealer or end user. The dealer/end user is responsible for payment of any additional special freight charges.

WARRANTY VOIDED: This warranty will be null and void if the product is not maintained in accordance with Maintainer's recommended maintenance procedures. The warranty will be voided if the product is modified or altered in any way without the prior written approval of Maintainer or if abused, neglected, repaired, and not used for its intended purposes.

PURCHASER'S RESPONSIBILITY: The purchaser is responsible for the cost of normal maintenance and replacement of expendable items, such as filters, belts, lubricants, and normal wear items.

PURCHASED COMPONENTS: Maintainer will warrant purchased components supplied & installed by Maintainer for a period of (1) year from date of in service as documented by return of the Warranty Registration card. Maintainer's obligation under this warranty is limited to the repair or replacement (at its option) of warranted parts that are determined by Maintainer, after review and inspection, to be defective, which are returned to Maintainer freight prepaid within 30 days of receipt of shipping instructions. (Failure must be reported within thirty (30) days of failure occurrence to qualify). These components may be returned to the Vendor for evaluation. Maintainer will determine its disposition in a timely manner as the Vendor completes their evaluation.

NO ASSIGNMENT: This Limited Warranty is granted to the first owner/user of record and may not be assigned.

NO SET OFF: No deduction may be made for the value of a warranty claim from outstanding balances due and payable to Maintainer.

LENGTH OF LIMITED WARRANTY:

Five (5) year:

1. Maintainer crane structure from the date the unit is put into service as documented on the Warranty Registration card. The structural items are exclusively specified as the crane base plate, crane tower (mast) and crane booms sections.
2. Maintainer body sub-structure from the date the unit is put into service as documented on the Warranty Registration card. The structural items are exclusively specified as the cross members and main sills.
3. Rust through on Maintainer service bodies from the date the unit is put into service as documented on the Warranty Registration card. This applies to body panels, doors and wheel wells. Rust through damage as a result of surface and /or paint damage, product neglect or abuse or structural modification is not covered under this warranty.

See next page for additional lengths on limited warranty.

Three (3) year:

1. Maintainer manufactured components from the date the unit is put into service as documented on the Warranty Registration card.
2. Maintainer manufactured replacement components from the date of invoice.
3. Paint coverage on Maintainer manufactured items from the date the unit is put into service as documented on the Warranty Registration card. This applies to coverage on structural components such as crane bases, tower, booms, truck body door and body panels to be free from defects such as corrosion, blisters, unreasonable color or gloss loss, or delaminating determined to result form paint film failure. Damage such as chips, scratches, corrosion due to dirt build-up that occurs through usage of the product is not covered under this warranty. Rust bleed out from inaccessible structural features as a result of prolonged moisture exposure does not constitute a failure in paint coverage or adhesion and is not covered under this warranty. Protective spray coverings are not covered by this warranty.

One (1) year:

1. Labor on Maintainer workmanship from the date the unit is put into service as documented on the Warranty Registration card.
2. Purchased components supplied and installed by Maintainer from the date the unit is put into service as documented on the Warranty Registration card.

Maintainer Corporation of Iowa

Maintainer Corporation of Iowa, Inc.
1701 South Second Avenue
P.O. Box 349
Sheldon, IA 51201
Ph (712) 831-8588
Fx (712) 324-3526

Warranty Claim Procedures

The warranty procedures outlined here are detailed to provide the Dealer/Customer with the information necessary when filing a warranty claim. The correct and complete filing of a claim will assist Maintainer in processing of the claim in a timely manner.

All claims, policies and procedures are governed by the terms of the Maintainer Corporation of Iowa, Inc. (Maintainer) Limited Warranty. It is necessary to outline some of the more important provisions for handling claims.

Maintainer authorized Dealers will handle parts replacement and/or correction of defective workmanship.

The failure to file a detailed Warranty Claim Service Report for each occurrence of material or workmanship defect will cause the warranty claim to be rejected.

The defective material must be returned following the guidelines in the Return Parts Procedure. The failure to follow the procedure will result in forfeiture of the claim.

The Dealer/Customer is responsible for the write up of the warranty claim.

The Dealer/Customer shall be allowed no more than 30 days from the date of repair to file a Warranty Claim Service Report.

The Maintainer warranty does not cover diagnostic calls, travel or lodging.

Maintainer will deduct from allowable credits for excessive freight charges caused by sender failing to follow the Return Parts Procedure.

Dealers/Customers deducting the value of a warranty claim from outstanding balances due and payable to Maintainer without receiving prior written approval from Maintainer may be subject to forfeiture of the entire claim.

See next pages for additional warranty claim info.

Warranty Claims – General

The approval of a submitted claim depends on the following provisions:

1. Maintainer must issue a Warranty Claim Authorization Number.
2. The defective material must be returned following the Return Parts Procedure.
3. The material must be determined defective by authorized Maintainer representative.
4. The workmanship must be determined defective by authorized Maintainer representative.
5. The unit must be within the warranty period.
6. The unit has been operated within design conditions in an application for which it was intended to function.

Warranty Claims – Filing procedure

It is necessary to have the serial number of the unit when requesting Warranty and Technical Support.

1. Initiate the claim process through a Purchase Order for parts and/or Authorization Number for labor repair. A Warranty Claim Authorization Number will be issued for all warranty claims.
2. A Warranty Claim Service Report will be sent with the part or will be faxed for completion. The Warranty Claim Service Report must be filled out and returned with the defective part or faxed per address listed in item #7 below.
3. The defective part must be returned freight prepaid if requested by Maintainer Warranty Department within 30 days or claim will be forfeit.
4. The Service Claim Service Report must be returned for processing. The disposition will be completed within 30 days. A credit, check or a letter of explanation/denial will be issued.
5. Maintainer will consider each claim on its own merit and reserves the right to accept or reject the claim request.
6. There are cases where components are purchased and used by Maintainer. These components may be returned to the Vendor for evaluation. Maintainer will determine its disposition in a timely manner as the Vendor completes their evaluation.
7. Send the Warranty Claim Service Report to:

   Maintainer Corporation of Iowa, Inc.
   Attn: Warranty Department
   P.O. Box 349
   Sheldon, IA 51201
   Fx (712) 324-3526

Warranty Claims – Preparation of Material Return

Maintainer may request the return of the defective material for evaluation. Credit will not be given until the material is evaluated and the warranty claim is approved. The material being returned to Maintainer for evaluation must be returned within 30 days freight prepaid.

The material returned to Maintainer must be properly packaged to prevent damage during shipment. Any damage to the material as a result of improper handling or packaging could be cause for claim denial.

The package must be marked with the Return Material Authorization.

Our warranty requires that all defective material must be returned to Maintainer freight prepaid. The credit will be delayed if packages are returned without a Return Material Authorization number.

Maintainer "Warranty Claim Service Report"

Company completing repair		
Owner of Maintainer unit		
Contact name		
Owner's mailing address, city, state, zip code		
Owner's shipping address city, state, zip code		
Owner's phone number	Owner's fax number	Owner's Email address
Serial number or Work Order number of unit		
Date of repair		
Description of repair		
Repair authorization number		
All requested parts returned	YES	NO
Invoice attached	YES	NO
Claim submitted by (PRINT)		(SIGN)
Phone number		Fax number

Maintainer

Crafting a Legacy of Premium Truck Bodies

Get A Free Hat!
FEEDBACK FORM

Thank you for your recent purchase! We appreciate the feedback on your Maintainer Experience and invite you to explore the MyMaintainer.com website

At **www.mymaintainer.com**, you can register your warranty online, stay up to date on product alerts, view instructional videos, locate service manuals, and find warranty information. You can also share your Maintainer story and show off your new truck by uploading pictures that we can share! Please take a moment to answer the following questions that will help us serve you better - **AND RECEIVE A FREE MAINTAINER HAT!**

1. ORDERING PROCESS

Please rate how HELPFUL the person was that took your order: (circle one)

1 Poor **2** **3** **4** **5** Good

Please rate how FRIENDLY & PROFESSIONAL the person was that took your order: (circle one)

1 Poor **2** **3** **4** **5** Good

Name of the selling dealer: _____

2. QUALITY

How was the finished OVERALL APPEARANCE of your unit: (circle one)

1 Poor **2** **3** **4** **5** Good

Did everything FUNCTION properly?: (circle one)

1 Poor **2** **3** **4** **5** Good

Comments regarding product quality: _____

3. SHIPPING / DELIVERY

Please rate the TIMELINESS with which you received your order: (circle one)

1 Poor **2** **3** **4** **5** Good

Please rate the ACCURACY of how your order arrived: (circle one)

1 Poor **2** **3** **4** **5** Good

Comments regarding delivery: _____

If you experienced any problem(s) with your new unit, please describe the situation below or call us at 800-831-8588. Our goal is 100% customer satisfaction! _____

Please complete the form below to receive your FREE Maintainer Cap!

Serial # FF306

Name: _____

Company: _____

Address: _____

City _____ State: _____ Zip Code: _____

Phone: _____ Fax: _____

E-mail: _____

You can complete this form online at www.mymaintainer.com, e-mail to: marketing@maintainer.com, or fax to: 712-324-3526

Thaintainer

General Information

Hitch Ratings and Capacities

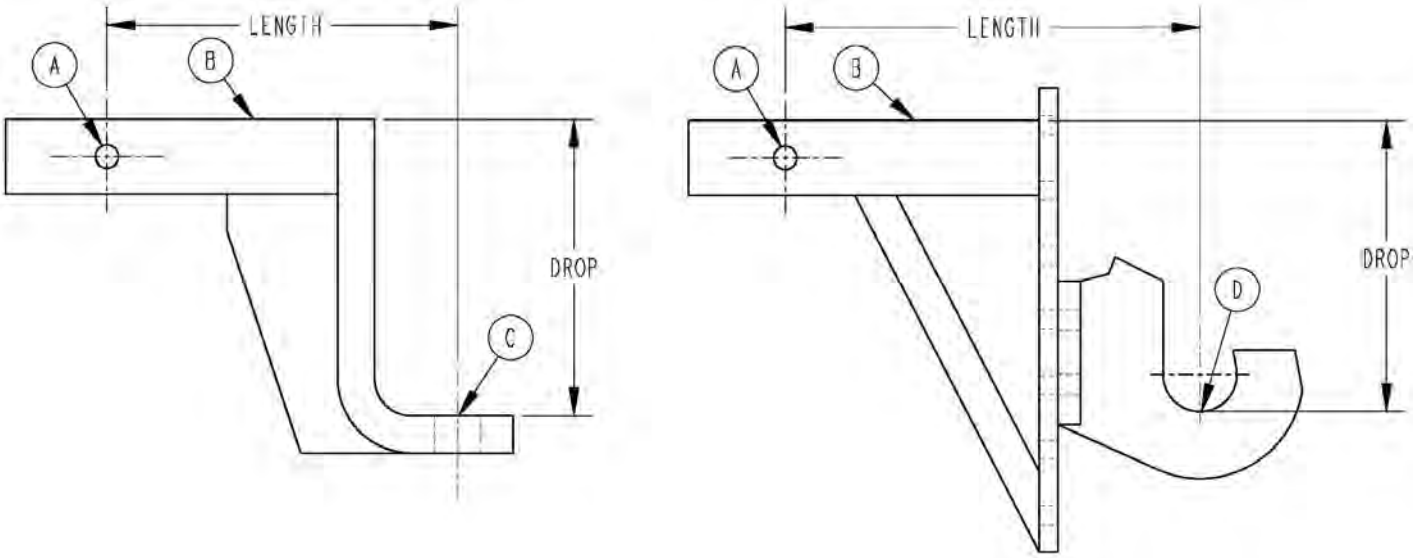
Class IV rating:

10,000lb Max Gross Towed Trailer Weight
1,500lb Max Tongue Weight

For Pintle hitch, custom hitches, and other types of devices consult manufacture for weight ratings.

NOTICE: Maximum weights are determined by the lowest rated component in the towing system.

Maintainer Class IV Hitch Ball / Pintle Hook Mount Specification



***Length is the distance from center of ball mount (letter C) or pintle eye (letter D) to center of hitch pin (letter A)
***Drop is distance from the top of shank (letter B) to the top of ball platform (letter C) or pintle hook cradle (letter D)

Use chart below to determine Gross Trailer Weight Rating (GTWR) based on Length and Drop measurements. The tongue weight is not to exceed 15% of the GTWR.

Drop \ Length	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50	17.00	17.50	18.00
2.00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550
2.50	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304
3.00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071
3.50	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850
4.00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638
4.50	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437
5.00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245
5.50	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061
6.00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885
6.50	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717
7.00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556
7.50	10,000	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401
8.00	10,000	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253
8.50	10,000	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110
9.00	10,000	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973
9.50	10,000	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841
10.00	10,000	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714
10.50	9,676	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714	5,591
11.00	9,370	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714	5,591	5,473
11.50	9,082	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714	5,591	5,473	5,359
12.00	8,809	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714	5,591	5,473	5,359	5,249
12.50	8,550	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714	5,591	5,473	5,359	5,249	5,143
13.00	8,304	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714	5,591	5,473	5,359	5,249	5,143	5,040
13.50	8,071	7,850	7,638	7,437	7,245	7,061	6,885	6,717	6,556	6,401	6,253	6,110	5,973	5,841	5,714	5,591	5,473	5,359	5,249	5,143	5,040	4,941

Maintainer Corporation of Iowa, Inc.
P.O. Box 349, 1701 South 2nd Ave., Sheldon, IA. 51201 • 800-831-8588 • Fax: 712-324-3526

FINISH CARE RECOMENDATIONS

Maintainer recommends the following precautions that must be followed to insure proper care of the finish on your new vehicle. If these recommendations are not followed your paint warranty may be null and void.

The first 30 days…

- Never let gasoline, antifreeze, transmission fluid, or windshield solvent stand on the painted surface. (Rinse off as soon as possible)
- Driving on gravel roads may cause rock chips on the finish. Clean up the area and dab in with a brush.
- The finish can be damaged by tree sap and bird droppings. (Rinse them off as soon as possible)

The first 90 days…

- Do not wax or polish the vehicle – this will allow the finish to dry and harden completely. (Do not use any silicone-containing waxes or polishes)
- After 90 days the vehicle should be polished with a premium quality product.
    - Consult the following manufacturer for their recommendations.
        - 3M
        - Meguiars

Long term care…

- Never use abrasive cleaner, chemicals, steel wool, or scuff pads directly on the finish - this will cause damage to the finish.
- Remove road salt within 1 week by washing or rinsing vehicle with clean water.

Proper washing recommendations…

- Wash vehicle by hand with cold water and a very mild dish wash soap. Be sure to use a soft cloth or sponge.
- Do not "dry wipe" the vehicle – dry wiping could scratch the finish.
- If vehicle is washed indoors, vehicle ***MUST BE*** thoroughly air-dried. Use fans directed at the vehicle until completely dry. If this process is not followed the finish may show signs of blistering cause by moisture trapping.

Proper add-ons recommendations…

- If any mounting of additional equipment (lights, handles, etc.) is needed use the following steps.
    - Mount equipment with adhesive compounds or VHB tape (consult your local 3M distributor) when at all possible – this will keep the finish intact and not damage it.
    - If drilling is required, mark holes to be drilled using a marker. Drill holes using a sharp drill bit. After drilling remove ***ALL*** metal shavings. Prior to mounting equipment, apply ECK® (Electrolysis Corrosion Control) or LOCTITE C5-A compound to all screws. This will prevent corrosion of any metal and helps keep paint from blistering from electrolysis.

Proper recommendations for rock chips and scratches…

-If any scratches or chips occur at anytime during the life of your unit, we recommend cleaning up the area and dabbing with a brush to protect the metal from rusting.

-Consult your local PPG manufacturer or representative for their recommendations on proper topcoat.

DEF Instructions

DEF freezes at 22°F. This freezing can damage the pump, y-strainer, fittings, hoses, etc. This truck is equipped with an air purging system to reduce the likelihood that freezing in the lines will occur. If the DEF in the tank drops below 22°F it will also freeze. Take precaution against this by draining the tank, heating the tank, or placing the truck in a heated shop.

DEF purge system

1. Place DEF dispenser (and open) in container or back into product tank
2. Rotate 3-way handle on top of DEF tank to vertical position
    - This shuts off the tank suction, and begins blowing air through the hoses, pump, and reel.
    - The air regulator must be limited to 100psi
3. Run air through system until no DEF is coming out dispenser
    - The pump can be activated to speed up the process, but for no longer than 45 seconds (or the pump seals could fail)
4. Rotate 3-way handle on top of DEF tank to horizontal
5. Pump may also be drained with the plug on the pump housing.

Handle horizontal for dispensing
Handle vertical for DEF purge

Thaintainer

Operation

and

Maintenance

Maintainer Corporation of Iowa

P.T.O. and Auxiliary Drive Shaft Inspection

P.T.O. and auxiliary drive shaft inspection should be a part of a daily walk around inspection and include the following checks:

- Oil Spills – they are a sign that further investigation is necessary. **Check that all mounting bolts and cap screws are properly torqued and set up a routine inspection.**

- Transmission fluid level – Should be checked on a regular basis. If low, inspect for leaks.

- Universal joints – Should be checked for tightness and serviced on a regular basis.

Routine inspections and maintenance is the responsibility of the Owner / Operator and will keep your unit performing properly.

Recommended filter and oil changes

It is recommended to change the filters and oils annually.
Primary filters for replacement:

- Hydraulic in-line High pressure filter
- In tank Return filter (change after first 50 hours, annually thereafter)

Oils for replacement:

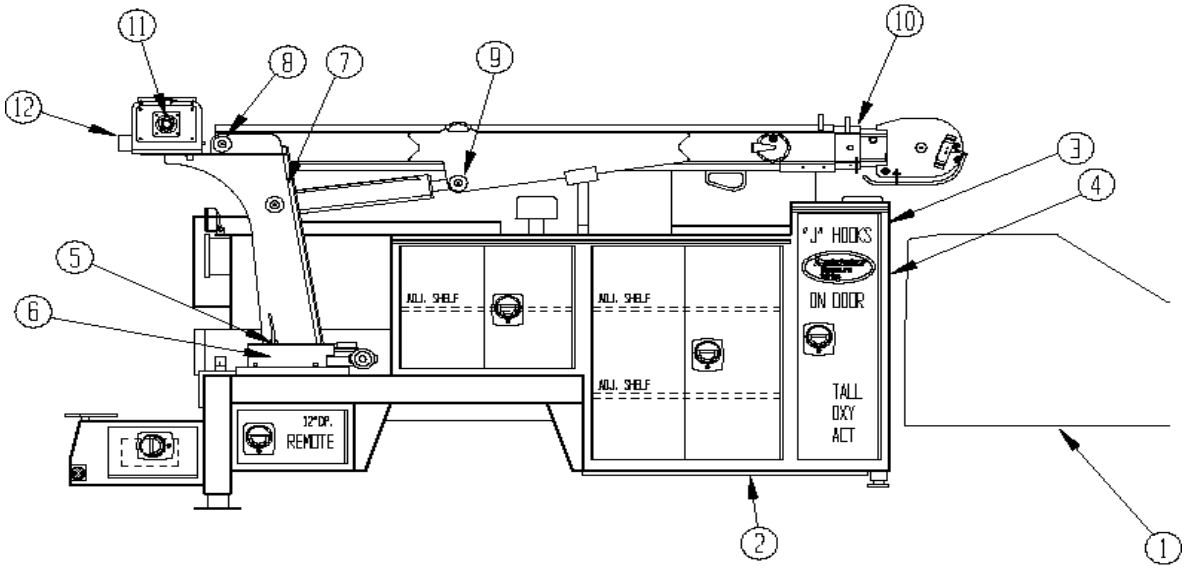
- Main hydraulic reservoir oil
- Crane winch oil
- Planetary winch drive oil (if applicable)

Use the recommended oils and filters found in the parts and service manual.

Change the Air compressor oil and filters per manufacturer's instructions.
See Air compressor section for information on parts and specifications.

The Crane rotate and swing bearing should be greased weekly. As well as all pivot points.

Maintainer Service Truck Maintenance



1. Power Take Off (PTO) & PTO driveline if equipped. Check daily for leaks and loose nuts & bolts.

2. High pressure filter. Change annually

3. Return filter in hydraulic reservoir. Change after 1st 50 hours, after that change annually or when filter indicator deems necessary.

4. Hydraulic Reservoir. Check level weekly, change oil annually

5. Grease weekly or accordingly with usage, the main rotate bearing of the crane

6. Grease weekly or accordingly with usage, the worm drive of the crane using an open bearing grease

7. Grease weekly or accordingly with usage, the zerk at the base of the lift cylinder.

8. Grease weekly or accordingly with usage, the tower and the main boom pivot. (The lift cylinder may need to be fully extended to grease the main boom pivot.)

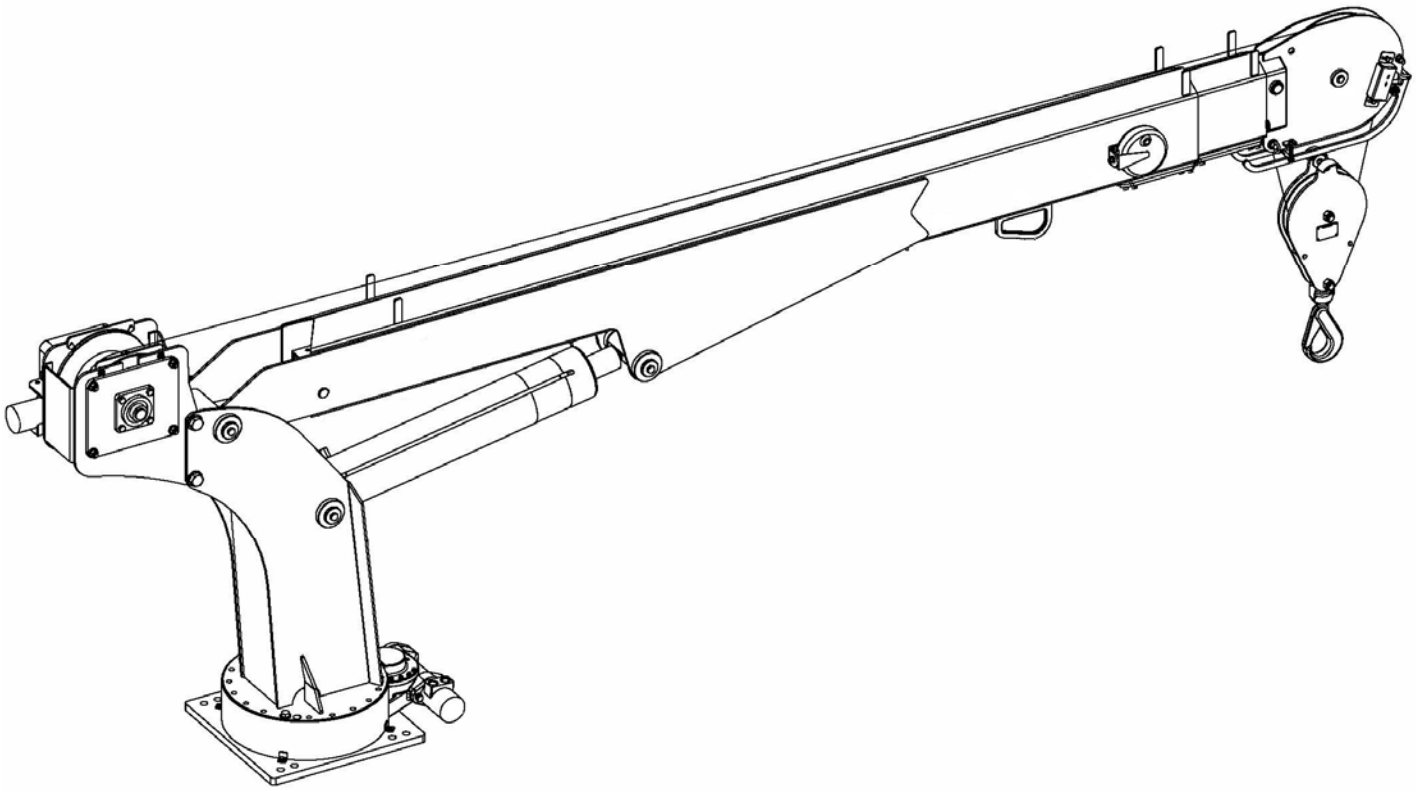
9. Grease weekly or accordingly with usage, the zerk at the rod-end of the lift cylinder.

10. Grease weekly or accordingly with usage, the zerks for the manual boom (if available).

11. Grease weekly or accordingly with usage, the winch pillow block bearing.

12. Winch. Check level weekly, change annually

Maintainer



MAINTAINER CRANES: OPERATION, PARTS, & SERVICE

INTRODUCTION - PLEASE READ CAREFULLY

This manual contains information that is related to all cranes manufactured by Maintainer Corporation. This manual is provided to acquaint you with the operation and proper maintenance of your Maintainer crane. It is the user's responsibility to maintain and operate this unit in a manner that will result in the safest working conditions possible. It is also the user's responsibility to be aware of any existing Federal, State, or Local codes and regulations governing the use and maintenance of this crane.
OSHA requires the crane operator to fully understand ALL applicable regulations, including: OSHA 29 CFR Subpart CC, OSHA 1910.180, PCSA #2, ANSI B30.5 (2007). Maintainer also recommends ANSI B30.5 (2011)

ANSI/ASME B30.5 - 2007
MOBILE AND LOCOMOTIVE CRANES
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Warranty of this unit will be void if any component of this unit is subjected to misuse due to overloading, abuse, lack of maintenance, unauthorized modifications, or operator error. No warranty verbal, written, or implied other than the enclosed written warranty will be valid with this unit.

TABLE OF CONTENTS:

PARTS LISTING:

WORK SAFELY: FOLLOW THESE RULES:

A careful operator is the best insurance against an accident

Important safety points to remember and follow while operating this unit:

- **NEVER** operate the crane too close to a power line. (see OSHA CFR 1926.1407-1411)
- **ALWAYS** have a clear view of the work area.
- **NEVER** lubricate, adjust or service truck while the engine is running, except when necessary. After servicing, be sure all tools, parts or servicing equipment are removed.
- **NEVER** when servicing, allow anyone in the operator's position to accidentally start the engine.
- **ALWAYS** use the proper tools with safety glasses when working with and/or around the truck
- **ALWAYS** make sure no one is around or on the truck before starting it.
- **ALWAYS** depress the clutch pedal before engaging or disengaging the PTO.
- **NEVER** swing a load so it passes over people.
- **ALWAYS** stabilize the unit before attempting any lifting operation.
- **NEVER** rotate the crane too fast with a load.
- **NEVER** exceed the rated lifting capacity.
- **ALWAYS** repair any defects before placing the unit in service.
- **NEVER** leave the operator's station with a load suspended in the air.
- **ALWAYS** disengage the PTO before moving the vehicle.
- **NEVER** use the winch to drag a load into position before lifting.
- **NEVER** side load the boom by dragging a load from the side.
- **ALWAYS** make sure to extend the wire rope before extending the inner boom when using the winch.
- **NEVER** use the crane for lifting people.
- **NEVER** use quick, jerky movements when operating the crane.
- **ALWAYS** keep the load as close to the ground as possible.
- **NEVER** operate the crane during an electrical storm or when high wind conditions exist.
- **ALWAYS** deduct the weight of the load handling equipment from the rated capacity of the crane.

- **NEVER** perform any work on the crane unless authorized to do so.
- **ALWAYS** stand clear when positioning outriggers.
- **NEVER** attempt to service or repair the crane while the crane is operating.
- **ALWAYS** keep the crane operating area clear of unauthorized personnel.
- **NEVER** pick and carry with any crane.
- **ALWAYS** stow crane prior to moving the vehicle
- **ALWAYS** have a minimum cable wraps on the drum of 3
- **NEVER** lift load over the cab of truck

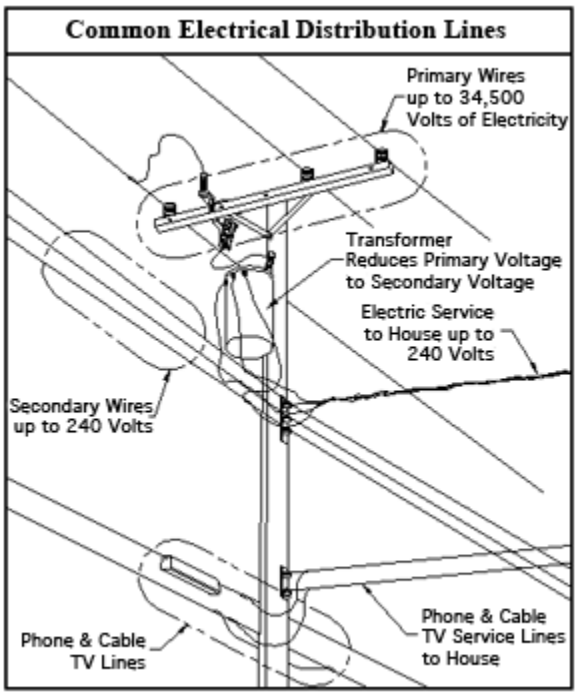
*** The most important factors in the safe operation of the crane are a competent operator, mechanical soundness of the crane, and absolute assurance that the crane is not loaded to exceed its maximum rated capacity***

Power Line Safety OSHA 29 CFR 1926.1407-1411

More information on OSHA: Safety and Health Regulations for Cranes & Derricks in Construction, Standard Number 1926.1407, Power line safety (up to 350 kV)--assembly and disassembly.

Before assembly or disassembly of a crane, the employer must determine if it could come within 20 feet of a power line (up to 350 kV). If so, the employer must take one of the following actions:

(a) Confirm with the power company that the line is de-energized and visibly grounded at the worksite.
(b) Make sure no part gets within 20 feet of the power line



(c) Follow **Table A**, which has minimum clearance distances based on voltage.
If the line is not de-energized, the employer must take the following actions:

Conduct a meeting with the assembly/disassembly crew to review measures to prevent encroachment.

Use only nonconductive tag lines

Use a dedicated spotter, a proximity alarm, a range control warning device, an automatic limit device or an elevated warning line/barrier placed in view of the crane operator.

Cranes cannot be assembled/disassembled below an energized power line or within the **Table A**clearances from a power line.
If **Table A** is used, the owner/utility must provide the power line voltage to the employer within two days of a request.
Power lines must be assumed to be energized until they are confirmed to be de-energized and visibly grounded. Warnings about electrocution hazards must be posted conspicuously in the crane cab and outside the cab in view of the operator (except for overhead gantry and tower cranes).
The work zones must be demarcated 360 degrees around the

equipment to prevent encroachments within 20 feet of a power line. If the line is not de-energized, a meeting must also be held with the crew before operations begin to review the location of the lines and procedures to prevent encroachment. Measures similar to those required during assembly/disassembly must be taken to prevent encroachment, but in this case an insulating link between the load line and the load is also an option.

Operators and crew members must be trained:

- On the procedures to follow in the event of power line contact
- To presume that power lines are energized until confirmed and visibly grounded
- To presume that power lines are not insulated until otherwise confirmed by the owner or a qualified person
- On the limits of insulating links and other devices (e.g. proximity alarms)
- On proper grounding procedures and their limitations.

Spotters must also get applicable training.

Table A: Minimum clearance distances:

Voltage (kV)	Minimum clearance distance (ft)
Up to 50	10
>50 to 200	15
> 200 to 350	20
>350 to 500	25*
>500 to 750	35*
>750 to 1,000	45*
> 1,000	Determined by the utility/owner

*According to 1926.1409, for power lines over 350 to 1,000 kV, the minimum distance is presumed to be 50 feet. Over 1,000 kV, the utility/owner or a registered engineer must establish it.

If work must operate closer than the **Table A** values, then the following precautions must be taken at a minimum:

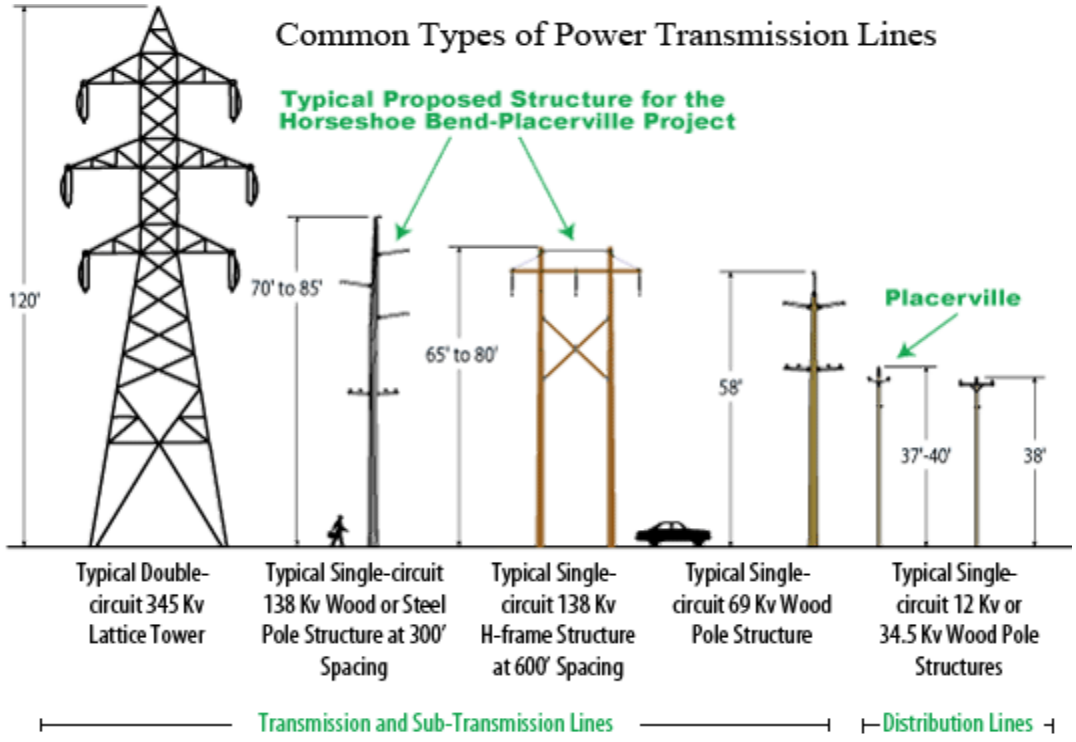
- The employer must show that **Table A** is infeasible and that it is infeasible to de-energize and ground or relocate the line.
- Safe distances must be determined by the owner/operator of the line or a registered professional engineer who is a qualified person.
- A planning meeting must be held and procedures developed must be implemented (if procedures are inadequate, work must be stopped and new procedures established or the line must be de-energized).
- Automatic re-energizing devices must be inoperative.
- A dedicated spotter must be assigned.
- An elevated warning line/barricade or an insulating link must be installed between the line and the load, except for work on electrical transmission/distribution lines covered by Subpart V (additional provisions take effect one to three years after the effective date).
- Non-conductive rigging must be used.
- A range-of-motion limiting device must be used.
- Non-conductive tag lines must be used.
- Barricades at least 10 feet from the equipment (where feasible) must be established.
- Equipment must be properly grounded.
- Workers must be kept from touching the line above the insulating link.
- Only essential personnel are allowed in the area.
- Insulating line hose or cover up must be installed by the owner/operator unless unavailable.
- The owner and user must meet with the equipment operator and other workers to review procedures.
- One person must be identified who will implement the plan and can stop work if necessary.
- Documentation of these procedures must be immediately available on site.
- Safety devices and aids must comply with manufacturers' specifications.
- All employees must be trained in power line safety per 1926.1408 (g).

Equipment traveling under or near a power line must:

(a) Have a lowered boom/mast and support system
(b) Obey minimum clearance distances set in **Table T**
(c) Reduce speeds to minimize breaching
(d) Use a dedicated spotter if closer than 20 feet
(e) Illuminate or identify the power lines at night
(f) Identify and use a safe path of travel.

Table T – Minimum clearance distances while traveling with no load	
Voltage	**Clearance**
Up to 0.75 kV	4 ft
>0.75 to 50 kV	6 ft
>50 to 345 kV	10 ft
>345 to 750 kV	16 ft
>750 to 1,000 kV	20 ft
> 1,000 kV	*

*Established by owner or registered professional engineer/qualified person



OPERATING INSTRUCTIONS

The crane is relatively simple to operate, however, prior to any work at job sites, the operator should be thoroughly familiar with the controls, load limits, safety factors and proper operating procedures and practices for the unit. In addition, practice job operation should be performed by the operator before putting the unit to a task. The operator's understanding of emergency measure execution is essential, the operator should be prepared to take emergency action at any time.

POWER TAKE-OFF:

Transmission driven PTO's are either switch or mechanically activated.

Mechanically activated:

The pull-type shifter control knob is located in the vehicle's cab, normally through the floor. To engage the PTO, place the emergency brake on and depress the clutch with the transmission in neutral, then pull out the control knob and release the clutch. To disengage, depress the clutch and push the control knob in, then release the clutch.

Switch activated (either electrically or air switched):

The switch is located in the vehicle's cab, normally on the dash.

If the transmission is a manual:

-To engage the PTO, place the emergency brake on and depress the clutch with the transmission in neutral, then activate the PTO switch, and release the clutch. To disengage, depress the clutch and de-activate the PTO switch, then release the clutch.

If the transmission is an automatic:

-To engage the PTO, place the emergency brake on, place the transmission in park or neutral, then activate the PTO switch. To disengage, de-activate the PTO switch.

(**NOTE:** for ship-out cranes be sure to follow the instructions for that particular PTO)

ENGINE SPEED CONTROL:

Recommended engine speed for PTO operations is 1200-1300 RPM'S. (Special circumstances may require some variance on this.) The electric speed control can be operated by the crane remote control and is adjusted at the factory for the proper RPM.

HYDRAULIC PRESSURE GAUGE:

A hydraulic pressure gauge is located in the valve compartment at the rear of the truck. This gauge is used to measure standby pressure and the maximum operating pressure. The typical standby pressure is set between 300-450 PSI, the maximum operating pressure is set at 3000 PSI..

HYDRAULIC CONTROLS:

An electric remote control for crane functions is standard on Maintainer Cranes. Manual operation is achieved by operating the manual levers on the valve body, or by pressing the red manual override buttons on the Parker open-center valve body. Decals provided on the backside of the valve compartment cover and on the cover of the open-center valve indicate the function and the direction of the movement.

HYDRAULIC VALVE:

The hydraulic functions of the closed center load sensing valve are preset to give the best performance. However, adjustments can be made to increase or decrease the hydraulic oil flow through a selected valve section, thus increasing or decreasing the function speed. Refer to the section of the valve found in the manual for the location of adjusters and adjustment information.

TRUCK INSPECTION: (ANSI B30.5-2.1)

Before putting the truck into operation always give the equipment a proper inspection and follow any safety and inspection rules that are required by your company. The check list below can be used as a general guide for the inspection.

1. **Structural Soundness:** Examine the truck for soundness and/or damaged or weak members

2. **Hydraulic Oil Supply:** Make sure that there is an adequate oil supply for proper hydraulic function

3. **Hydraulic Oil Leakage:** With the hydraulic system engaged, give the hose and the hydraulic equipment an examination for leaks, blisters, cracks in the hoses that might lead to future leaks

4. **Equipment Controls:** Give all the controls a quick test to confirm proper operation

This equipment should be checked before each operation to ensure your safety and that of those around you. If the inspection proves to be unsatisfactory the necessary repairs must be made before the equipment is used.

OUTRIGGER OPERATION:

When setting up a crane for operation the best location is a sturdy hard foundation that will not fail under working conditions. You should also avoid operating the crane with low overhead obstructions and be extra cautious where you have to be around overhead power lines. When lowering the outriggers make sure that everyone is standing clear and that nothing will get pinched between outrigger pad and the ground. For maximum stability, fully extend the crane side outrigger(s) and lower all outriggers on a firm foundation. OSHA requires the truck be level within 1% of grade before performing any lift. (see “Crane level indicator” insert)

ALWAYS HAVE OUTRIGGERS IN PLACE FOR ANY LIFTING OPERATION!

TRUCK/CRANE STABILITY: (ANSI B30.5-3.4.2)

Included in the operator’s manual is Maintainer’s BALLAST / COUNTERWEIGHT sheet. The specified ballast needs to be added to the truck to achieve stability in all lifting points and crane positions, as designated on the load chart. The ballast that is added must be applied to the truck so the cumulative center of gravity of the ballast is centered between the rear axle, and the back of the chassis cab. If the full required ballast can not be added to the truck, due to being limited by chassis GVW, the truck may not be stable in all lifting areas. After the ballast is loaded onto the truck, the stability of the unit must be verified in all lifting areas prior to jobsite use.

CRANE OPERATION:

Before removing the crane from the saddle and rotating the boom it is important that all the outriggers are extended and on a firm foundation. Before performing any lifting operation, be sure to study and understand the capacity chart. The capacity chart is located on the crane tower, and an additional chart can be found in the operator's manual. The distances measured on the capacity chart are from the cable to the centerline of the rotation.

Maintainer Cranes are equipped with an anti-2 Block safety device. When activated, the device will shut down the winch-up, extend-out, and lift-down functions. These functions will return to normal operation when the winch is lowered, or the boom is retracted. Maintainer cranes are also equipped with an internal hydraulic overstress system, which will protect the crane from overload conditions. These safety features are not intended to relieve the operator of any responsibility with the use of the crane. The main deterrent against accidents is an informed and competent operator. (OSHA & ANSI require qualified and competent individuals to operate cranes)

<u>WARNING</u>: ATTEMPTING TO LIFT MORE THAN THE INDICATED CAPACITY COULD RESULT IN CRANE COMPONENT DAMAGE, IN-STABILITY, OR STRUCTURAL FAILURE LEADING TO SERIOUS INJURY OR DEATH!

CRANE SHUTDOWN:

After the operation and the crane is ready to be shutdown, inspect the crane and its components to be sure it has not been damaged during use.

1. Retract the boom and cable before swinging the crane over the saddle.
2. Raise and retract all outriggers and make sure they are properly secured.
3. Disengage the throttle and the PTO controls and make sure all toggle switches are in the OFF position.
4. Before moving the vehicle make sure all compartments are closed and that any items on the truck bed have been secured.

SERVICE AND MAINTENANCE:

Proper maintenance on a regular schedule is essential to keeping the crane operating at peak efficiency. This section outlines required servicing and maintenance information. Personnel responsible for the care of the crane should familiarize themselves with the service intervals and types of maintenance to be performed.

HYDRAULIC OIL:

Maintainer recommends the using high quality oil: such as Mobil DTE, or Exxon Univis.

Change the hydraulic filter after the first 50 HOURS of operation. Change hydraulic oil filter & hydraulic oil annually there after. The oil level in the reservoir tank should reach the screen in the filler neck.

HYDRAULIC CYLINDER: (Disassembly and assembly of cylinders with turn-in wire)

Pull the piston rod to the fully extended position. Insert the spanner wrench into the holes in the cylinder gland and turn the gland so that the square wire comes out of the slot that is on the side of the cylinder tube. Remove the square wire from the tube. Pull on the piston rod and remove the piston from the cylinder tube. Make the necessary repairs and reassemble using a light film of oil on the piston gland and on the inside of the tube end. To get the square retainer into place, first line up the hole in the gland, with the slot in the tube. Then insert the square wire into the hole and turn the gland with the spanner wrench until the wire is completely around the inside of the tube. In repairing of any cylinder be careful not to contaminate the inside of the cylinder tube and also do not scratch or mark the rod.

GREASE AND LUBE: [reference points are shown on the next page]

1. **Ref. A:** Grease weekly or accordingly with usage, the main rotate bearing of the crane

2. **Ref. B:** Grease weekly or accordingly with usage, the worm drive of the crane using an open bearing grease.

3. **Ref. C:** Grease weekly or accordingly with usage, the zerk at the base of the lift cylinder.

4. **Ref. D:** Grease weekly or accordingly with usage, the tower and the main boom pivot. (**Note**: The lift cylinder may need to be fully extended to grease the main boom pivot.)

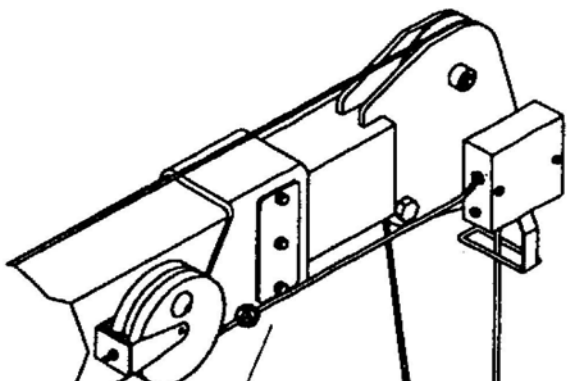
5. **Ref. E:** Grease weekly or accordingly with usage, the zerk at the rod-end of the lift cylinder.

6. **Ref. F:** Grease weekly or accordingly with usage, the zerks for the manual boom (if available).

7. **Ref. G:** Grease weekly or accordingly with usage, the winch pillow block bearing.

8. **Ref. H:** Check weekly the gear lube in the winch.

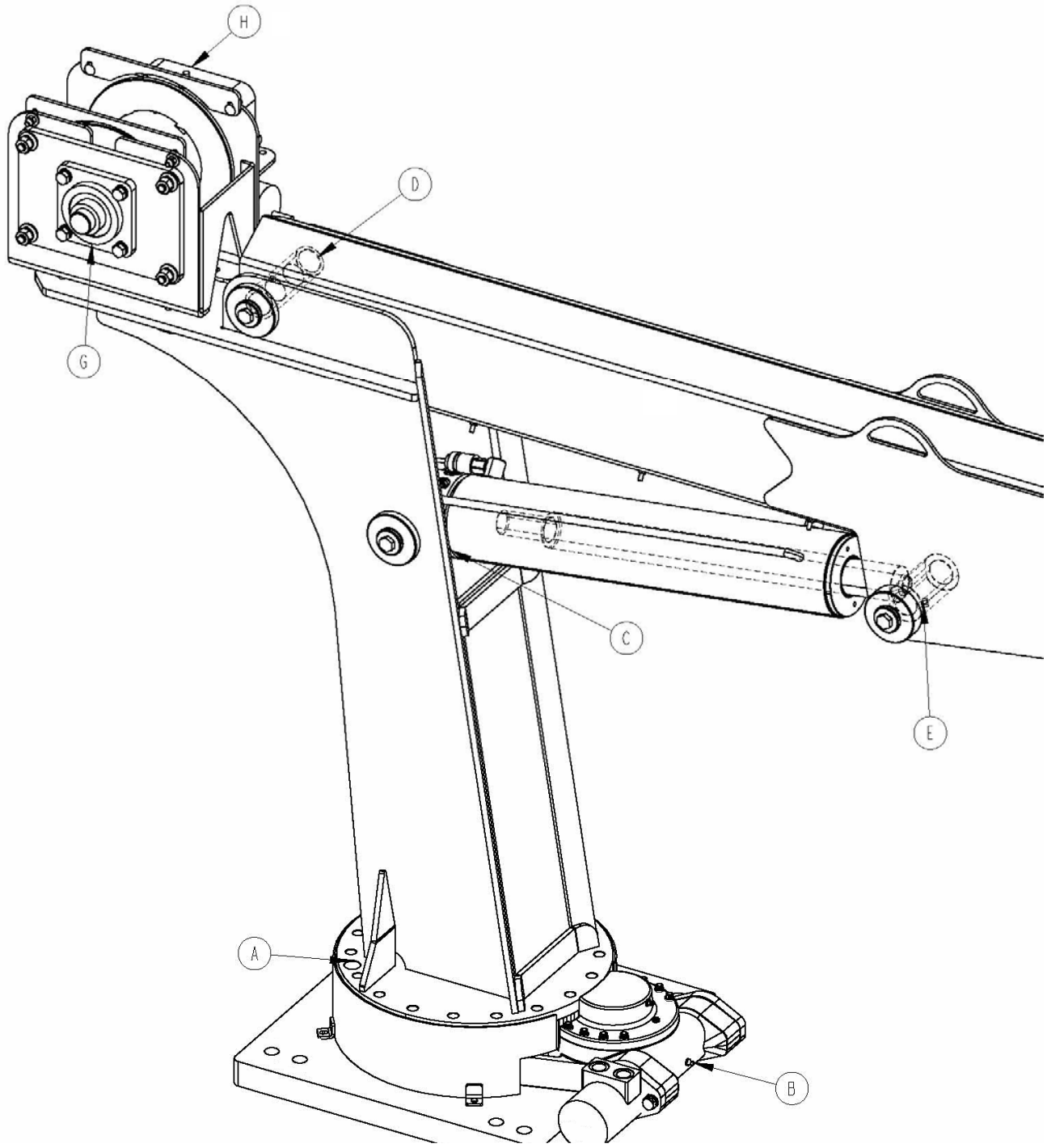
CRANE GREASE & OIL



Thaintainer PARTS LIST

Part #	Description	List Price
	000263 003006 007241	HP Filter Assy Includes Filter High Pressure Filter O-ring	Change Every 12 Months
	003004 051582	Small Return Filter 2.5”x5” O-ring for Housing 013340	Change After 1st 50 Hours of Use then every 12 Months
	007364 050291	Large Return Filter 4”x9” O-ring	Change After 1st 50 Hours of Use then every 12 Months
	012052	Current Production PSS Fan Element	Change Periodically according to working environment.
	007086	Quincy Compressor Air Filter	Change every 12 Months
	051241	Vanair RC40 Air Filter	Change every 12 Months
	014695	Donaldson Filler Breather	Change every 6 Months on Average

SERVICE POINTS



SHIP-OUT CRANES

HYDRAULIC SYSTEM:

The Maintainer Ship-Out crane normally operates on an open center full pressure system through either a Parker BV-4-UL valve, or a Sauer-Danfoss valve.

Parker:
This is valve is a 4-spool stack type, operated with either: an electric remote control and 33 ft. of cable, a wireless remote (optional), or manually by the manual override buttons on the side of the valve. A proportional control system allows the user to adjust the speed of the crane function by adjusting the "trigger" on the remote.

Sauer-Danfoss:
This is valve is a 4-spool stack type, operated with either: an electric remote control and 33 ft. of cable, a wireless remote (optional), or manually by using the handles on the side of the valve. A proportional control system allows the user to adjust the speed of the crane function by adjusting the "trigger" on the remote.

SYSTEM REQUIREMENTS:

For proper operation this crane requires a hydraulic pump system capable of supplying 8-10 GPM at maximum pressure of 3000 PSI, and an in line pressure relief valve set to open at 3000 PSI is also necessary to prevent damage to the hydraulic components. Contact Maintainer with any specific questions regarding hydraulic system pump requirements.

CRANE MOUNTING BOLT SPECIFICATIONS

Crane Model	Bolt size	Number Req'd	Torque Spec (lubed)	Torque Spec (dry)
1115	3/4-10 UNC x 3 GR. 8	4	280 ft*lbs	380 ft*lbs
3216/20	7/8-9 UNC x 4 GR. 8	4	450 ft*lbs	600 ft*lbs
6000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
8000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
10000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
11000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
12000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
14000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs

WARNING: The crane must be mounted on a properly reinforced substructure that is capable of handling the forces/moment generated by any lifting operation or severe damage to the equipment, personal injury, or death may result.

PARTS LISTING

SERIAL NUMBER:

When ordering service parts or optional equipment, be sure to specify the work order number (quick reference number), located on the front side of the street side compartment along with the crane serial number, located at the rear of the crane winch.

Record your service body work order here for future reference _____

Record you crane serial number here for future reference _____

MAINTAINER: Oil Data Sheet (wide-temperature, shear-stable hydraulic oil)

Exxon Univis N 46

This oil is the highest quality oil with controlled low temperature flow properties and higher anti-wear protection for high pressure vane and piston pumps. This provides keep-clean performance for electro-hydraulic control systems, and is super stabilized to provide improved filterability, demulsibility, and multi-metal compatibility in the presence of water. It was selected for its optimum flow characteristics at cold temperatures. This oil is the primary recommendation for hydraulic applications where low circulating or rapid changes from low to high temperatures are encountered. It meets the requirements for all types of gear, vane, and piston pumps where shear stable anti-wear hydraulic oil is recommended.

Advantages:

- Suitable for wide temperature range conditions
- Superior low temperature flow properties
- Outstanding keep-clean performance
- Stay-in-grade viscosity under high-shear conditions
- Super stabilized anti-wear and water tolerance
- Good demulsibility, filterability, and foam resistance
- Excellent multi-metal compatibility and corrosion resistance

It is recommended that the hydraulic oil & filter be changed at least once (1) a year or every 1,000 hours.

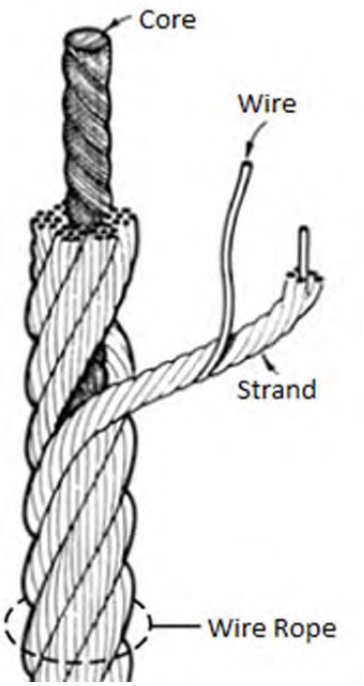
Wire Rope Inspection

References: *OSHA 1926.1413 / ANSI B30.5-2.4 / ANSI B30.5-1.7*

Inspection of wire rope is to be completed by a qualified and competent person. If the wire rope is in a condition that presents the possibility for failure, or the rate of deterioration is determined to put the crane in an unsafe condition prior to the next inspection, the wire rope must be replaced immediately.

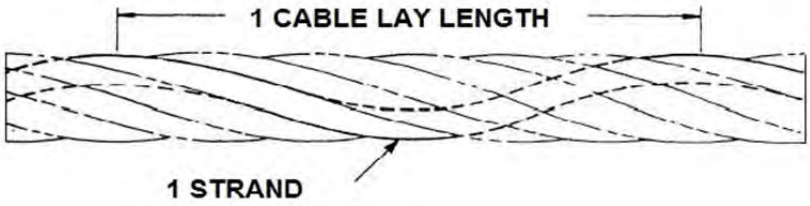
Categories of interest:

- Distortion (kinking, crushing, unstranding, birdcaging)
- Corrosion
- Heat or electric arc damage
- End connections
- Broken wires
- Wear and abrasion



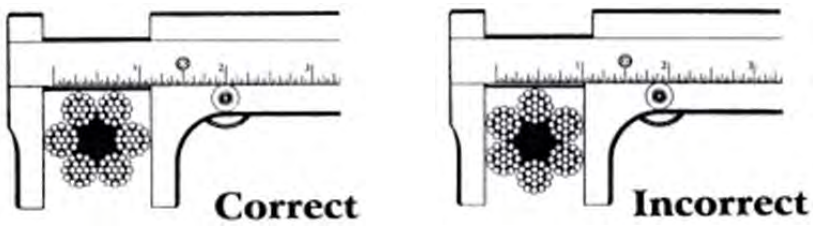
ANSI B30.5 calls for the wire rope to be replaced if any of the following conditions exist.

- 3 Broken wires in one strand
- 6 Broken wires in one lay / any strand
  (Lay = 1 complete revolution of the strand)
- 2 Broken wires at the end connection



Measuring wire rope diameter:

Rope diameter must be measured with calipers during inspections. This measurement must be compared with previous inspection measurements to check for excess wear.



- 1/64” maximum reduction for wire rope diameter up to 5/16”
- 1/32” maximum reduction for wire rope diameter from 3/8” to 1/2”

Lubrication:

Wire rope is lubricated from the OEM. However, with use and exposure to the elements, lubrication needs to be applied periodically. Maintainer recommends using a lubricant specifically designed for wire rope. (many lubricants are available in an aerosol type container). Rope lubricants that hinder inspection must not be used!

Wire ropes must have an operating design factor of no less than 3.5

Maintainer Wire Rope Specifications:

Crane	Maintainer Cable #	Cable Size
1115	011376	1/4" x 70'
3216/20	005069	5/16" x 85'
H6520	014294	3/8" x 105'
6000	007360	3/8" x 120'
H7024	007360	3/8" x 120'
8000	007360	3/8" x 120'
10000	008073	3/8" x 120'
11000	003200	1/2" x 125'
12000Planetary	013052	7/16" x 120'
12000	003200	1/2" x 125'
14000	003200	1/2" x 125'

Thaintainer

Hydraulics

Hydraulic system overview

Maintainer Corp. of Iowa **uses two hydraulic systems. The system used is determined by many variables. They may include chassis limitations, customer preference and component requirements.**

The closed center hydraulic system is the preferred system of *Maintainer Corp. of Iowa*. The closed center system uses a variable displacement piston pump. The pump is capable of "sensing" the required G.P.M. and pressure requirements of the operating component. This allows multiple functions to operate at maximum efficiency. When the system is "deadheaded", the pump reduces its output and retains its pressure. The pump has minimal output if there is not a requirement. This lessens the requirement for cooling of the hydraulic oil.

The open center hydraulic system uses a fixed displacement gear pump. The G.P.M. output is determined by the engine R.P.M., P.T.O. ratio to engine R.P.M., and pump displacement. The pump output will not change unless one of the previous factors changes. The G.P.M. must be determined by component requirements.

The G.P.M. output of most pumps will not meet the requirements of more than one component. The oil flow is only diverted to the component that is required. In most cases this does not allow multiple operations of components. The excess output must be relieved through a valve if "deadheaded". This is done through a relief valve. The relief valve is set to a predetermined pressure setting. This setting must be above component operating requirements. Prolonged relieving can cause excessive heat buildup.

The hydraulic component configuration is not interchangeable between the two systems.

The hydraulic system must be properly adjusted for system components to operate correctly. The first step in troubleshooting any hydraulic problem begins with the hydraulic pump output and pressure settings.

Read, understand and follow all safety warnings before beginning.

Maintainer Corp. of Iowa **installs a pressure gauge on all units for ease of hydraulic testing and setting. The gauge will be located in the pressure line of the hydraulic system. It is necessary to locate the gauge before beginning. The pressure gauge is located on the crane valve on most service trucks. The pressure gauge is located on the lube manifold or the evac control valve on lube trucks.**

Closed center pressure settings

The initial setting is called the stand-by pressure. This pressure is used to signal the pump for flow and pressure.

Standby pressure:

Standby pressure is a static pressure present with the P.T.O. engaged and no functions operating.

The recommended pressure is 400-450 P.S.I.

It may be necessary to adjust the setting. The pressure compensator is bolted to the hydraulic pump. There will be two adjusting screws on the compensator. The adjusting screw that is closest to the pump housing is the standby pressure adjusting screw. Turning the screw clockwise will increase pressure, and turning counterclockwise will decrease the pressure.

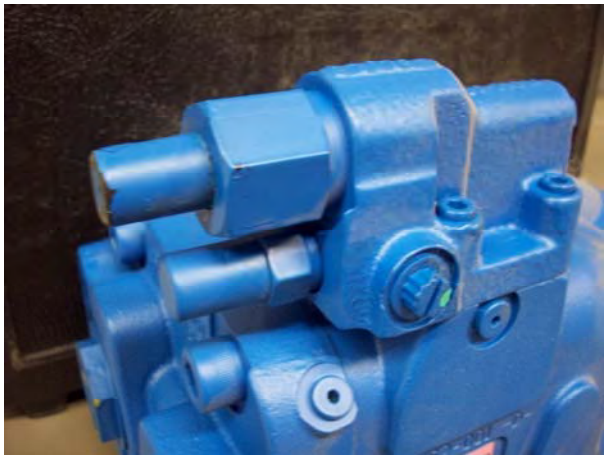
High pressure:

High pressure is the maximum pressure setting the pump will achieve. The system must be “deadheaded”. The outrigger or extension cylinders are the two components on a service truck that will achieve an accurate pressure. It will be necessary to create a “deadhead” on a lube truck. That can be achieved by blocking the oil flow to a component.

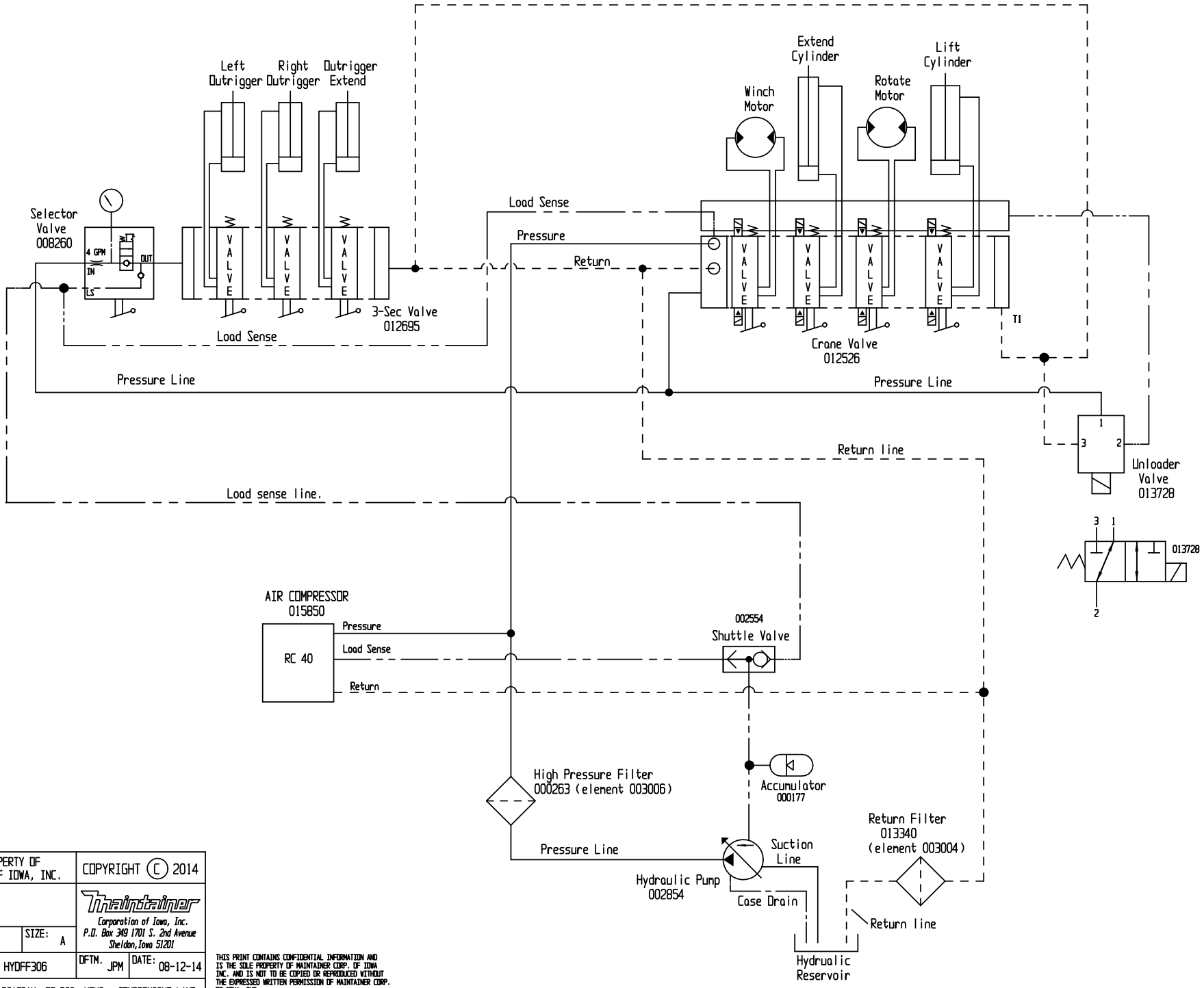
The recommended pressure is 2750 - 3000 P.S.I

It may be necessary to adjust the setting. The pressure compensator is bolted to the hydraulic pump. There will be two adjusting screws on the compensator. The adjusting screw that is farthest from the pump housing is the high pressure adjusting screw. Turning the screw clockwise will increase pressure, and turning counter clockwise will decrease the pressure. The pressure should return to the standby pressure setting after each test. It is recommended that the pressure be tested enough to achieve a consistent reading after each test.

The pressure should return to the standby pressure as quickly as it rose when testing the high-pressure setting. This test may be an indication of a plugged bleed down orifice. It will be necessary to contact the factory for assistance in cleaning of the orifice.



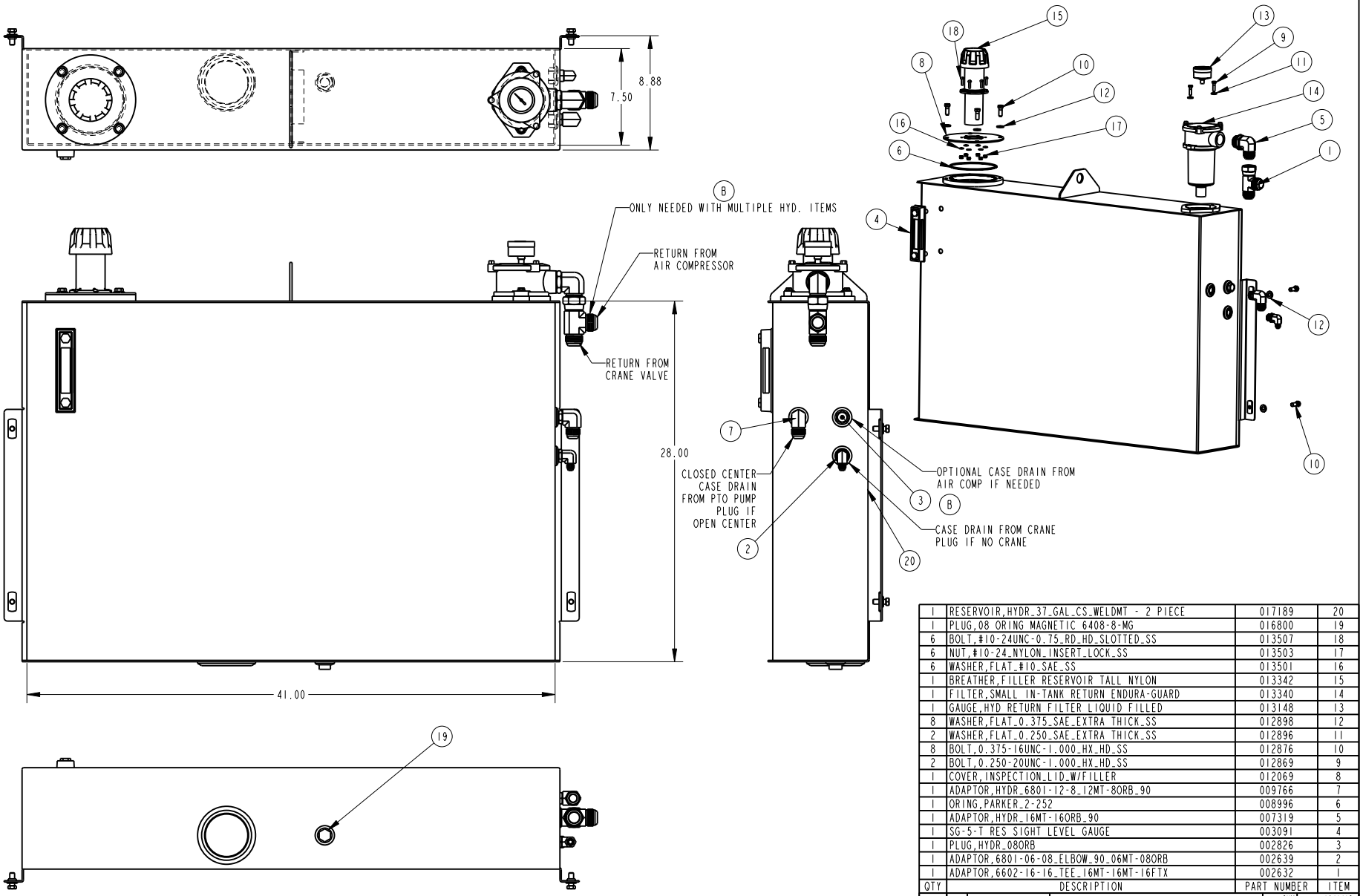
REVISIONS			
REV.	DESCRIPTION	DATE	APRVD



PROPRIETARY DATA PROPERTY OF MAINTAINER CORPORATION OF IOWA, INC.			COPYRIGHT © 2014
UOS DIMENSIONS ARE IN INCHES GENERAL TOLERANCES	MATERIAL:		Maintainer Corporation of Iowa, Inc. P.O. Box 349 1701 S. 2nd Avenue Sheldon, Iowa 51201
BREAK ALL EDGES .01 X 45°	ANGULAR ± 1° .XX ± .03 .XXX ± .005	SCALE: SIZE: A	
UOS RADII	UOS ANGLES	DRAWING NUMBER: HYDFF306	DFTM. JPM DATE: 08-12-14
MADE IN THE USA		HYDRAULIC DIAGRAM FF-306 HEWS - COMPRENSIVE LAND	

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
10/1/13	A	DRAWING RELEASED	-	SVM	KLV
4/21/14	B	ADDED NOTE; REPLACED 002639 WITH 002826	-	WAR	KLV

REPLACEMENT PARTS:
ELEMENT: 003004
ORING: 050290



QTY	DESCRIPTION	PART NUMBER	ITEM
1	RESERVOIR,HYDR_37_GAL_CS_WELDMT - 2 PIECE	017189	20
1	PLUG,08 ORING MAGNETIC 6408-8-MG	016800	19
6	BOLT,#10-24UNC-0.75_RD_HD_SLOTTED_SS	013507	18
6	NUT,#10-24_NYLON_INSERT_LOCK_SS	013503	17
6	WASHER,FLAT_#10_SAE_SS	013501	16
1	BREATHER,FILLER RESERVOIR TALL NYLON	013342	15
1	FILTER,SMALL IN-TANK RETURN ENDURA-GUARD	013340	14
1	GAUGE,HYD RETURN FILTER LIQUID FILLED	013148	13
8	WASHER,FLAT_0.375_SAE_EXTRA THICK_SS	012898	12
2	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	11
8	BOLT,0.375-16UNC-1.000_HX_HD_SS	012876	10
2	BOLT,0.250-20UNC-1.000_HX_HD_SS	012869	9
1	COVER,INSPECTION_LID_W/FILLER	012069	8
1	ADAPTOR,HYDR_6801-12-8_12MT-8ORB_90	009766	7
1	ORING,PARKER_2-252	008996	6
1	ADAPTOR,HYDR_16MT-16ORB_90	007319	5
1	SG-5-T RES SIGHT LEVEL GAUGE	003091	4
1	PLUG,HYDR_08ORB	002826	3
1	ADAPTOR,6801-06-08_ELBOW_90_06MT-08ORB	002639	2
1	ADAPTOR,6602-16-16_TEE_16MT-16MT-16FTX	002632	1

PART NUMBER 017188

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±1° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: SVM DATE: 10/1/13
CHK: KLV DATE: 10/1/13
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: MASTER,RESERVOIR_HYDR_OIL_37_GAL_CS MNT

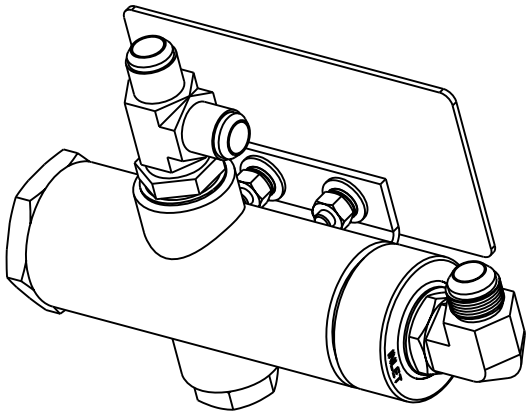
SCALE: 3:16 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 017188 REV. LEVEL: B

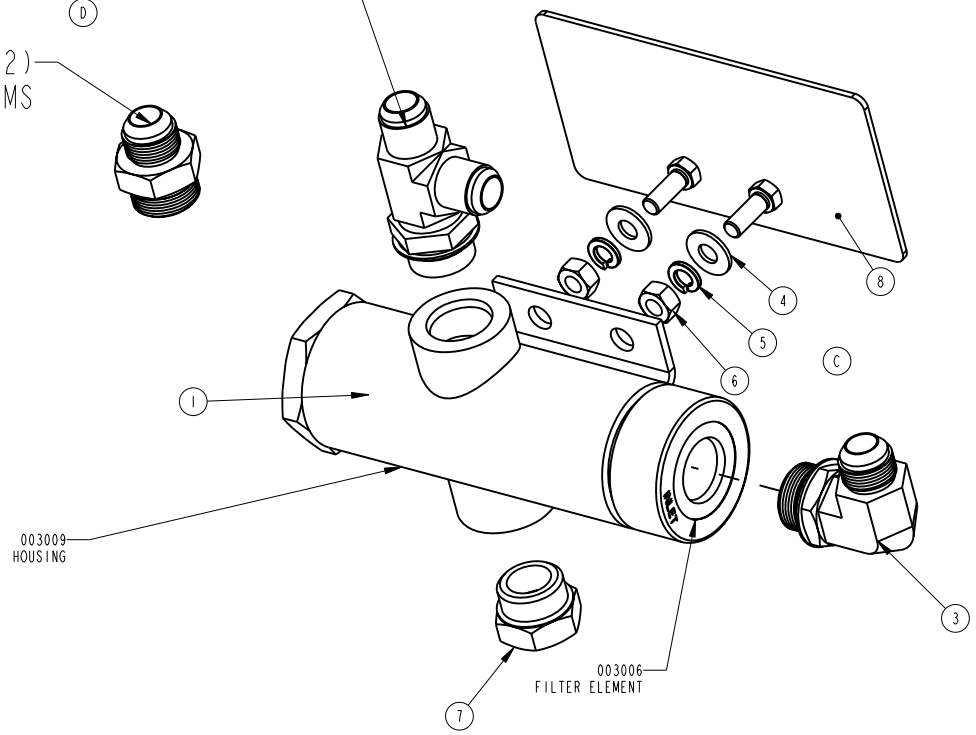
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
1/17/07	A	DRAWING RELEASED	-	MCL	KLV
2/24/10	B	ADDED NUTS,BOLTS & 001432	-	RJW	KLV
9/27/13	C	REPLACE BRKT FROM 001432 TO NEW 017080	-	KJH	KLV
11/4/13	D	CHANGED ADAPTER 002642 TO TEE 017253	-	KJH	KLV

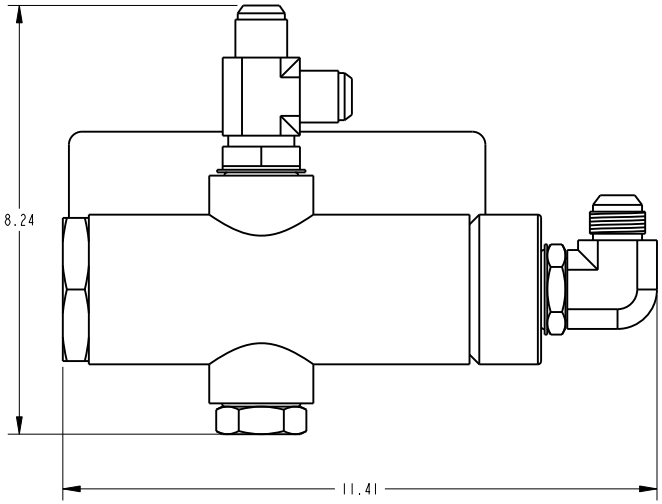
TEE (017253) USED WITH CLOSED CENTER AND MULTI-FUNCTION SYSTEMS

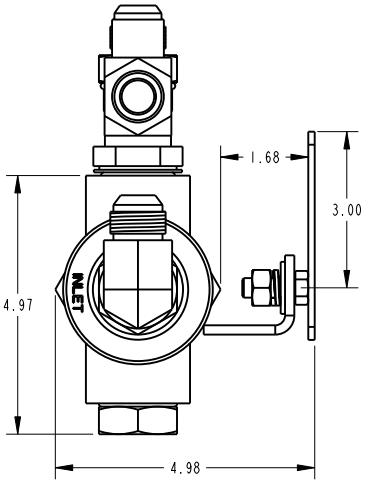
(D)

REPLACE TEE (017253) WITH (002642) ONLY ON OPEN CENTER SYSTEMS









QTY	DESCRIPTION	PART NUMBER	ITEM
1	ADAPTOR,6804-12-16-12_TEE_12MT-16ORB-12MT	017253	9
1	BRKT,HIGH PRESSURE FILTER WELD ON REF. MNT ASY	017080	8
1	PLUG,ORING_1.000	005108	7
2	NUT,0.375-16_GR5	003394	6
2	WASHER,LOCK_0.375_GR2	003359	5
2	WASHER,FLAT_0.375	003358	4
1	ADAPTOR,6801-12-16_ELBOW_90_12MT-16ORB	002661	3
1	ADAPTER,6400-12-16_12MT-16ORB	002642	2
1	FILTER,HIGH_PRESSURE	000263	1

PART NUMBER 010020

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MCL DATE: 1/17/07
CHK: KLV DATE: 1/17/07
APPR:KRV DATE: 1/17/07

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: MASTER,STD_HIGH_PRESS_FILTER

SCALE: 9:16 | SIZE: C | SHEET: 1 OF 1 | DRAWING NUMBER: 010020 | REV. LEVEL: D

REF. | SPECIFICATION

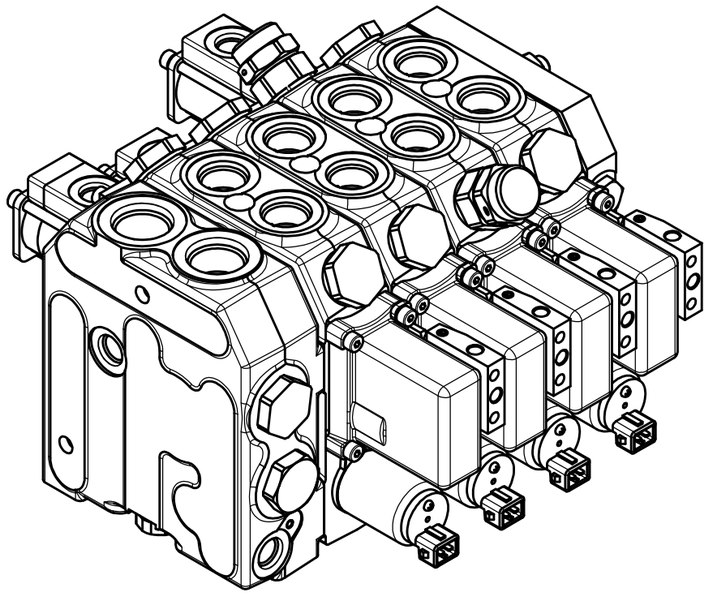
Subject: Hydraulic system oil and filter specifications and recommended maintenance

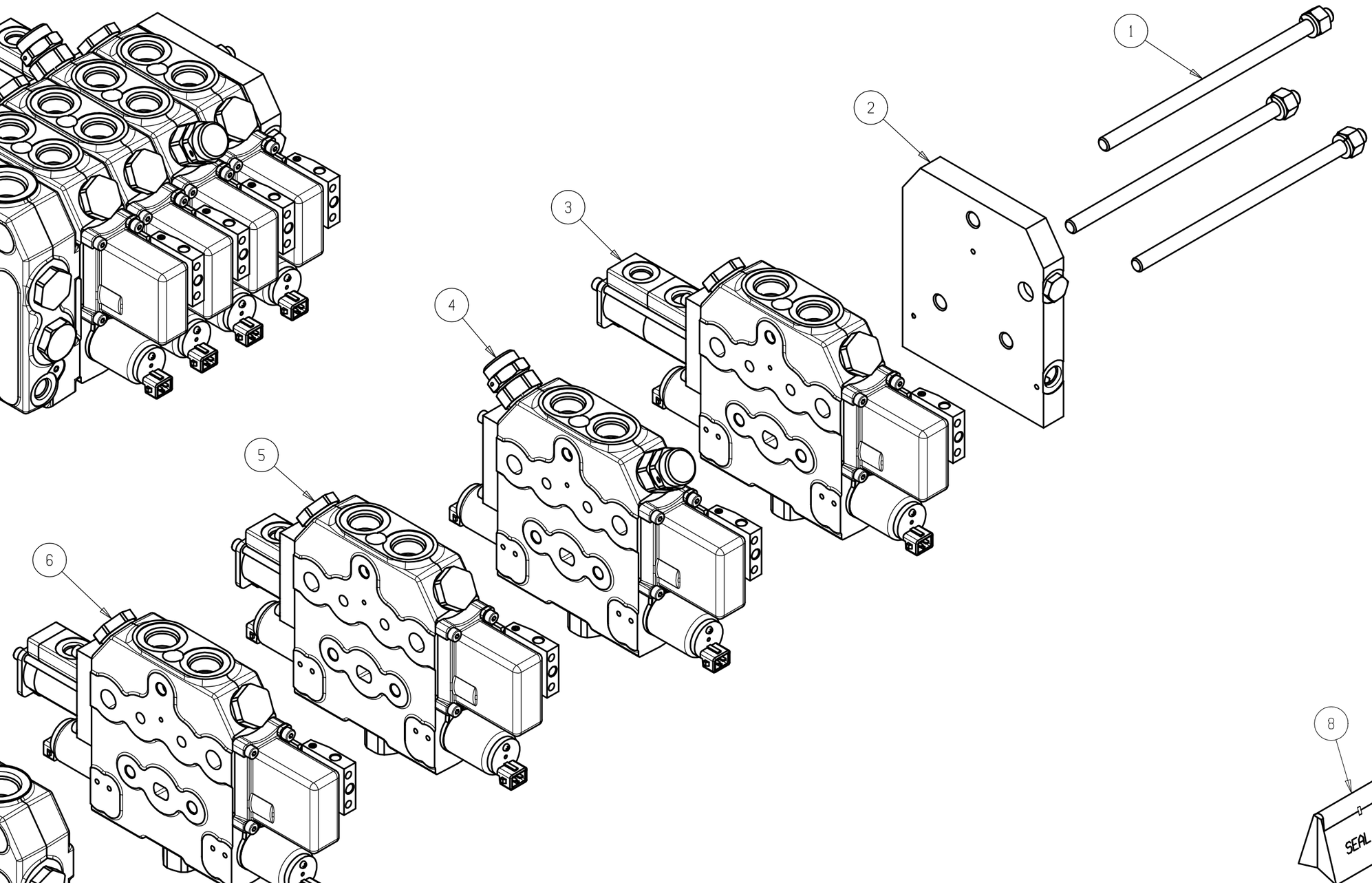
- **Oil provided with your unit is Hydrex MV60 Petro Canada (013153)**
  - This oil was selected to best meet the cross section of climates throughout North America.
    - cSt @ 100 degrees C = 9.0
    - Pour Point = -44° F
    - Flash Point = 417° F
    - Start Up = -15° F
    - Operating Temp = 23° to 196° F
  - Maintainer Corp. Of Iowa recommends the hydraulic system oil be changed annually.
  - The chart below and a decal (applied to the oil reservoir) also identify other grades of oil that may be changed or blended to the existing oil depending on your climate.

HYDRAULIC OIL FILL RECOMMENDATIONS		
Ambient Temperature	Hydraulic Oil	Bulk Hydraulic Oil
-15°F to 75°F	Mobil DTE® 13M	Exxon UNIVIS® N 32
0°F to 95°F	Mobil DTE® 15M	Exxon UNIVIS® N 46
15°F to 105°F	Mobil DTE® 26	Exxon UNIVIS® N 68
For extreme high or low temperature recommendations or for product availability, call Mobil at 1-800-662-4525		

- **On units with a hydraulic system there will typically be a return oil filter that is most commonly located on top of oil reservoir.**
  - Maintainer Corp. Of Iowa recommends the filter element be changed after the first 50 hours of operation (this first replacement element is provided with your unit by Maintainer Corp. Of Iowa) and annually after the first change.
  - Periodically check oil filter gauge on top of oil reservoir for condition.
  - See oil reservoir parts breakdown for part number.

- **On crane service units there will typically be a high pressure filter located near the front of the body on the pressure line coming off of the system pump.**
  - This filter is not equipped with an indicator. Maintainer Corp. Of Iowa recommend that the filter element be changed annually.





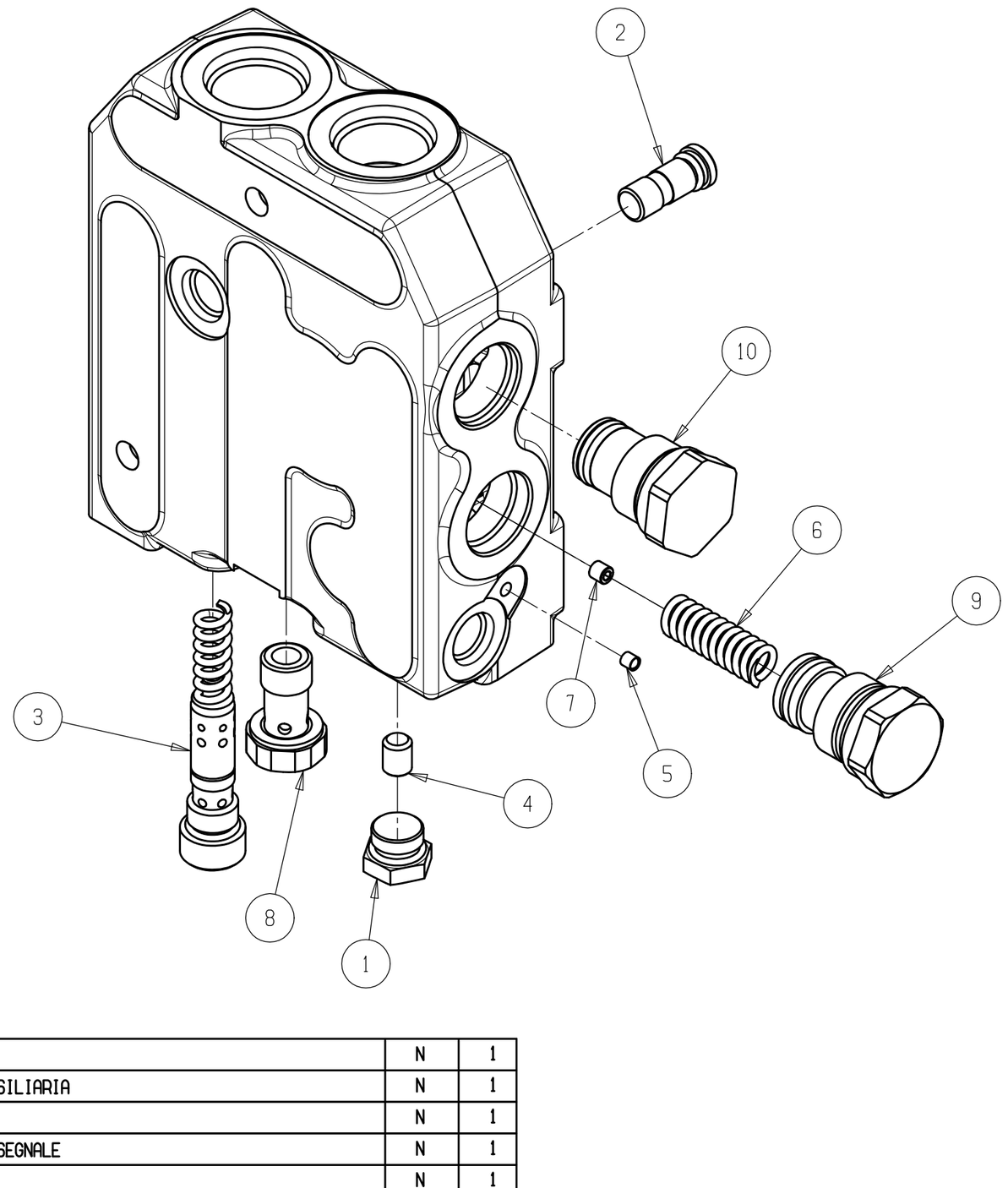
Pos	Codice	Descrizione	UM	Q.ta
8	JSP15500116	KIT GUARNIZIONI	N	1
7	RS_75577	DISEGNO RICAMBIO	N	1
6	RS_75578	DISEGNO RICAMBIO	N	1
5	RS_75579	DISEGNO RICAMBIO	N	1
4	RS_75580	DISEGNO RICAMBIO	N	1
3	RS_75581	DISEGNO RICAMBIO	N	1
2	RS_20957	DISEGNO RICAMBIO	N	1
1	300155004	MV99/4 TIRAN.STD	N	3

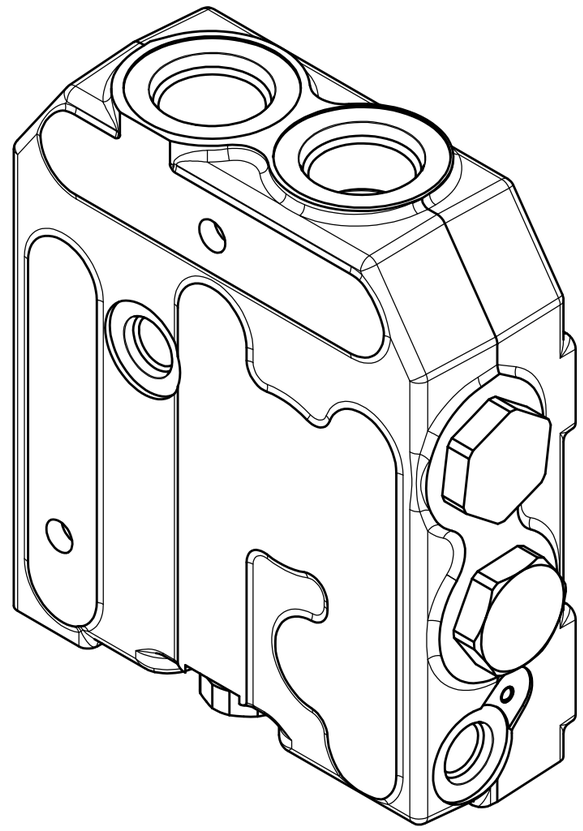
Description: DISEGNO RICAMBIO

hydro control
Bologna Italy

Group: MV99		Scale	
Approv.	Date	Schema Code: 75576	
Designer: IN	Date: 25/10/2011	CODE: RS_75576	Mod.: 0

0 | 25/10/2011 | IN





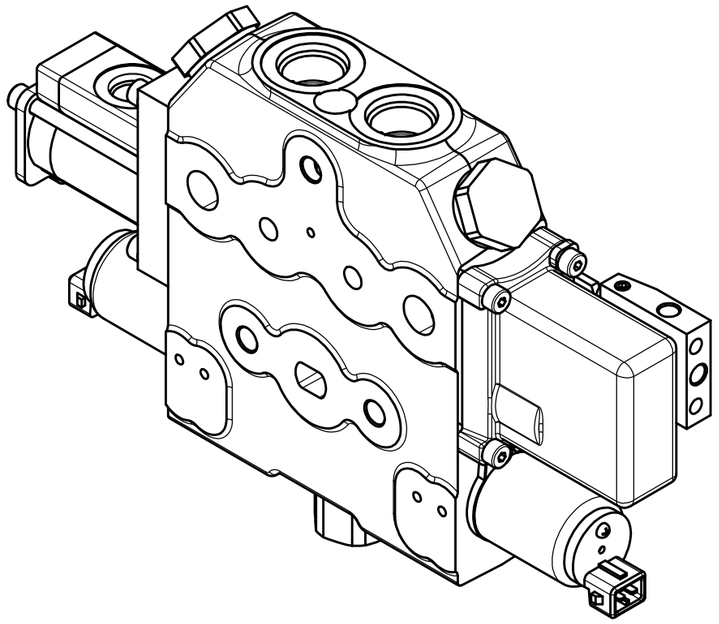
Pos	Codice	Descrizione	UM	Q.ta
11	JSP15500113	KIT GUARNIZIONI	N	1
10	430455001	KIT TAPPO SOSTITUISCE VALVOLA AUSILIARIA	N	1
9	430155001	ASS. TAPPO SOST. V. MAX.	N	1
8	430055002	KIT TAPPO SOSTITUISCE CONTROLLO SEGNALE	N	1
7	423411009	GRANO DIVISORE D.O.6	N	1
6	421803150	MOLLA COMPEN. E.D.2 (9.5-13.5 BAR)	N	1
5	413180005	TAPPO X CHIUS. FORI MB 700-040	N	1
4	411110807	GRANI PPCE UNI 5923 8X10	N	1
3	320255001	KIT V. RDP	N	1
2	320055001	KIT LIMITATORE DI PORTATA	N	1
1	300037001	KIT TAPPO 9/16"-18 UNF	N	1

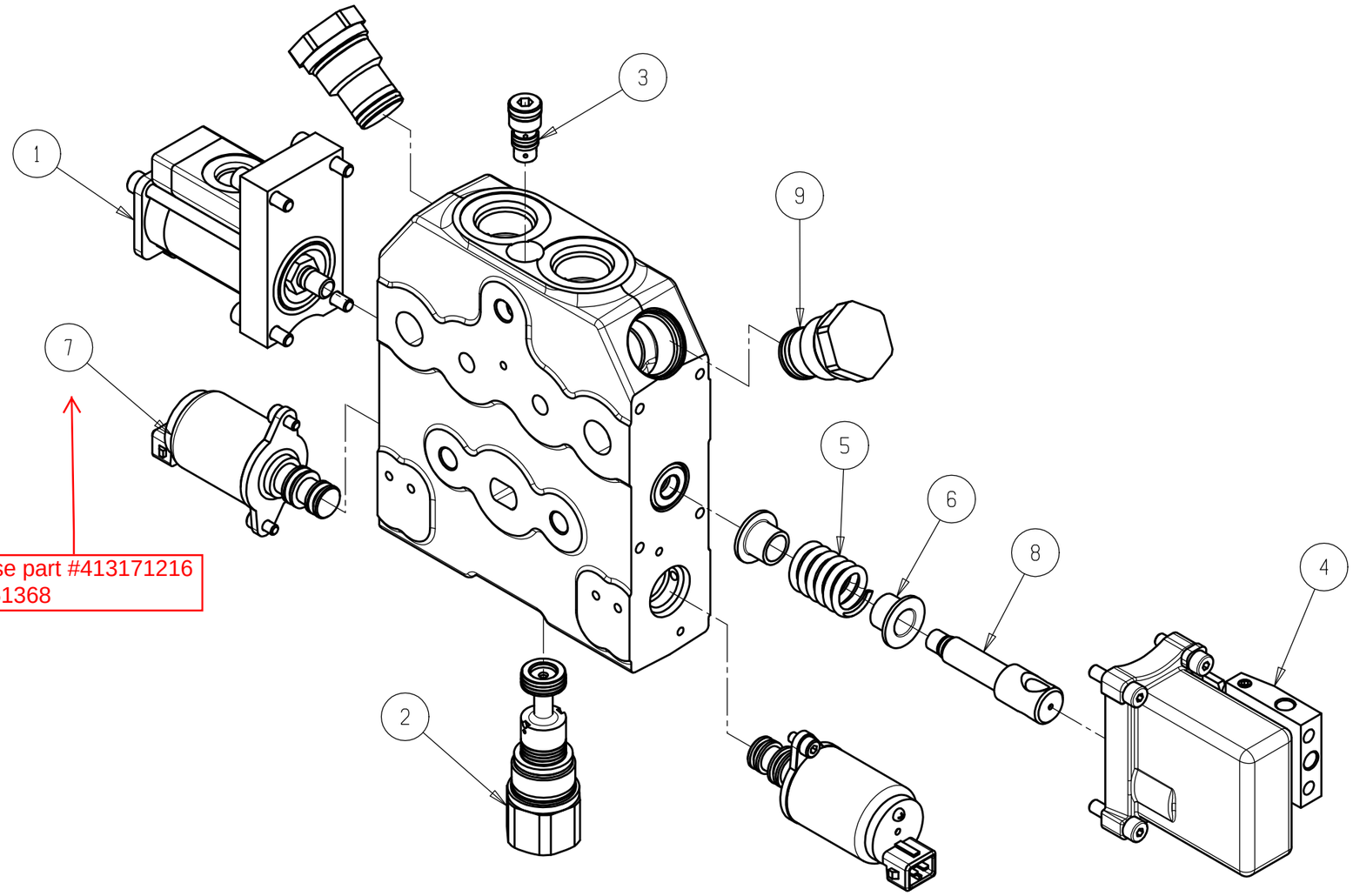
Description: DISEGNO RICAMBIO

hydro control
Bologna Italy

Group:		Scale	
MV99			
Approv.	Date	Schema Code	
		75577	
Designer:	Date	CODE	Mod.
IN	24/10/2011	RS_75577	0

0 | 24/10/2011 | IN





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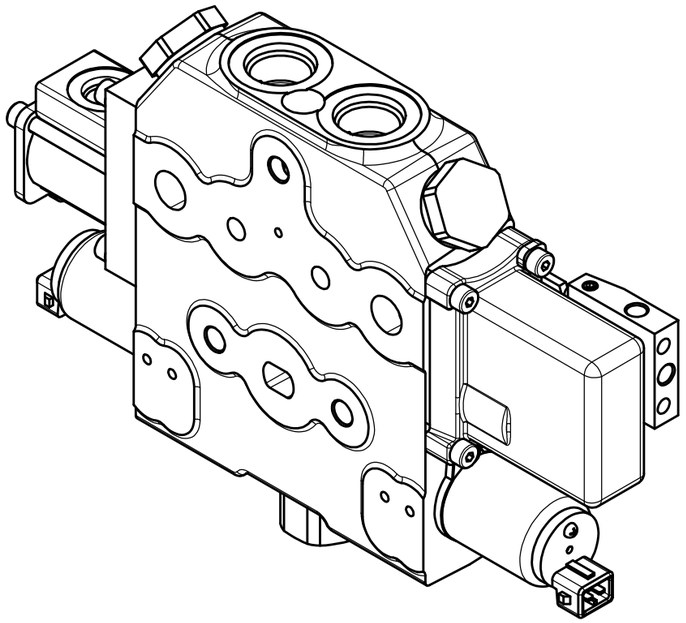
10	JSP15500114	KIT GUARNIZIONI	N	1
9	430455001	KIT TAPPO SOSTITUISCE VALVOLA AUSILIARIA	N	2
8	430055016	MV99 ASS. TAPPO E GUARN.	N	1
7	~~430055004~~	KIT ELETTROVALVOLA PROPORZIONALE 12 VDC	N	2
6	421901117	DISTANZIALE APPOGGIO MOLLA	N	2
5	421801127	MOLLA R.S. COM.E.I.PROP. D.2.9	N	1
4	320355001	MV99 COM.L	N	1
3	320255004	KIT VALVOLA SELEZIONE SEGNALE	N	1
2	320255003	KIT VALVOLA COMPENSATORE IN SEZIONE	N	1
1	320055026	MV99: F028 KIT BLOCCO MOM. IDR. IN B 9/16"-18 UNF SAE6	N	1

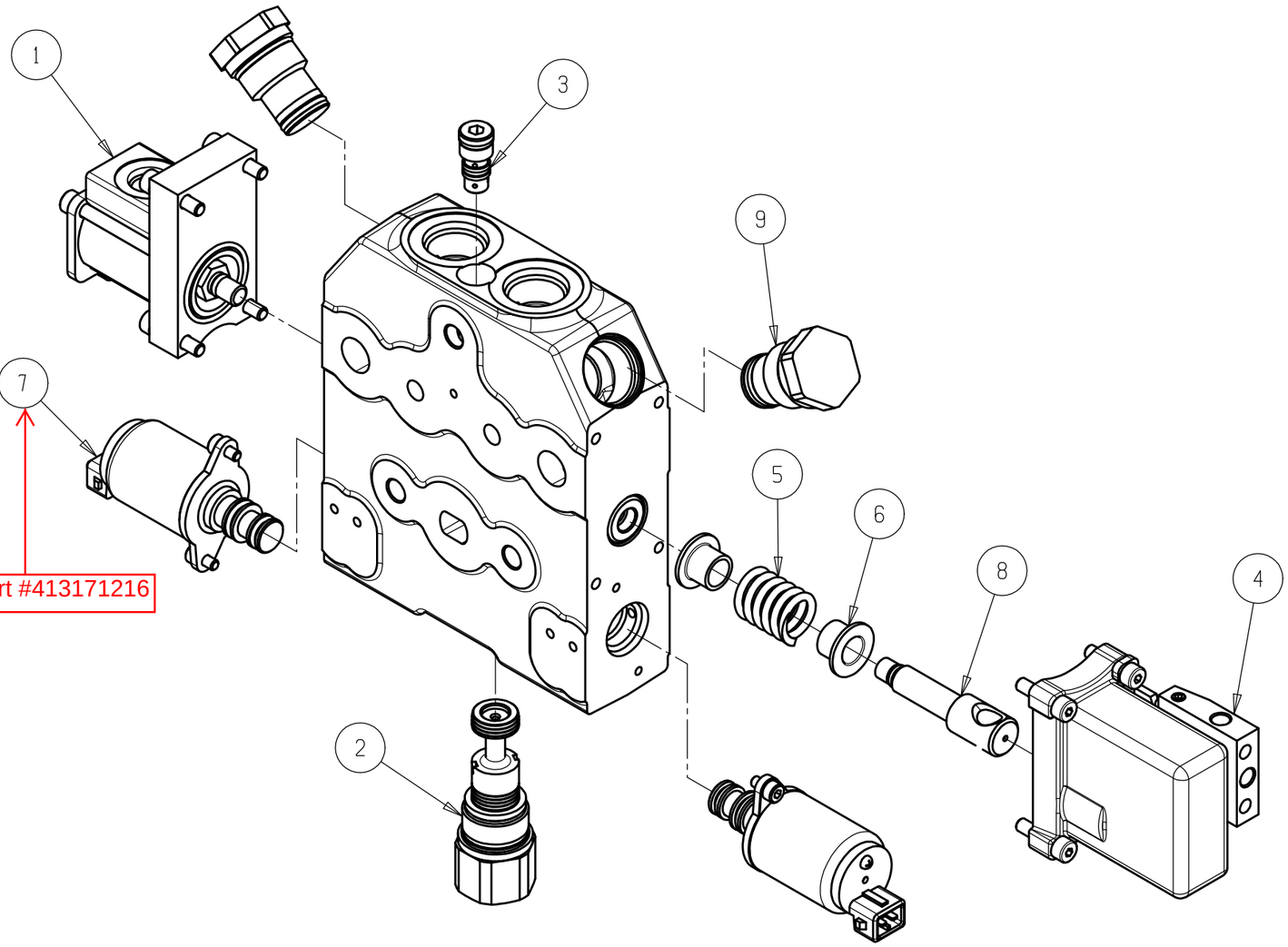
Description: DISEGNO RICAMBIO

hydro control
Bologna Italy

Group: MV99		Scale	
Approv.	Date	Schema Code 75578	
Designer: IN	Date 24/10/2011	CODE RS_75578	Mod. 0

0 | 24/10/2011 | IN





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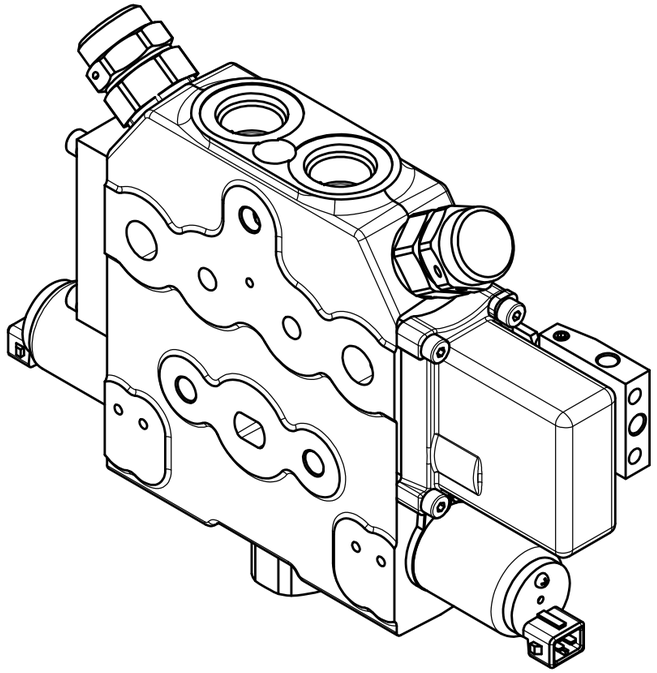
9	430455001	KIT TAPPO SOSTITUISCE VALVOLA AUSILIARIA	N	2
8	430055016	MV99 ASS. TAPPO E GUARN.	N	1
7	~~430055004~~	KIT ELETTROVALVOLA PROPORZIONALE 12 VDC	N	2
6	421901117	DISTANZIALE APPOGGIO MOLLA	N	2
5	421801127	MOLLA R.S. COM.E.I.PROP. D.2.9	N	1
4	320355001	MV99 COM.L	N	1
3	320255004	KIT VALVOLA SELEZIONE SEGNALE	N	1
2	320255003	KIT VALVOLA COMPENSATORE IN SEZIONE	N	1
1	320055027	MV99: F026 KIT BL. MOM. IDR. IN A 9/16"-18 UNF SAE6	N	1

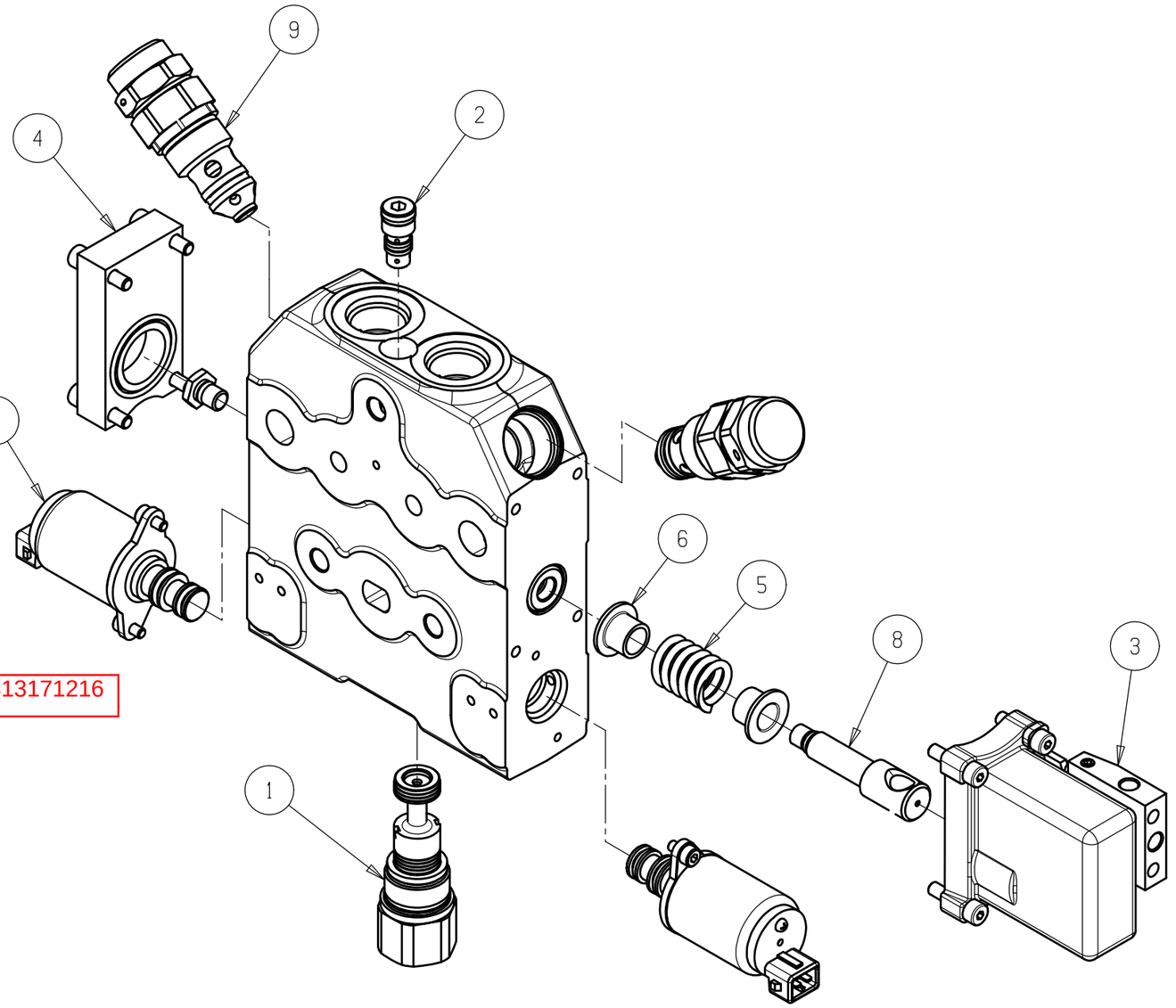
Description: DISEGNO RICAMBIO

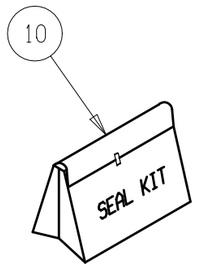
hydro control
Bologna Italy

Group:	Scale	
MV99		
Approv.	Date	Schema Code
		75579
Designer:	Date	CODE / Mod.
IN	24/10/2011	RS_75579 / 0

0 | 24/10/2011 | IN







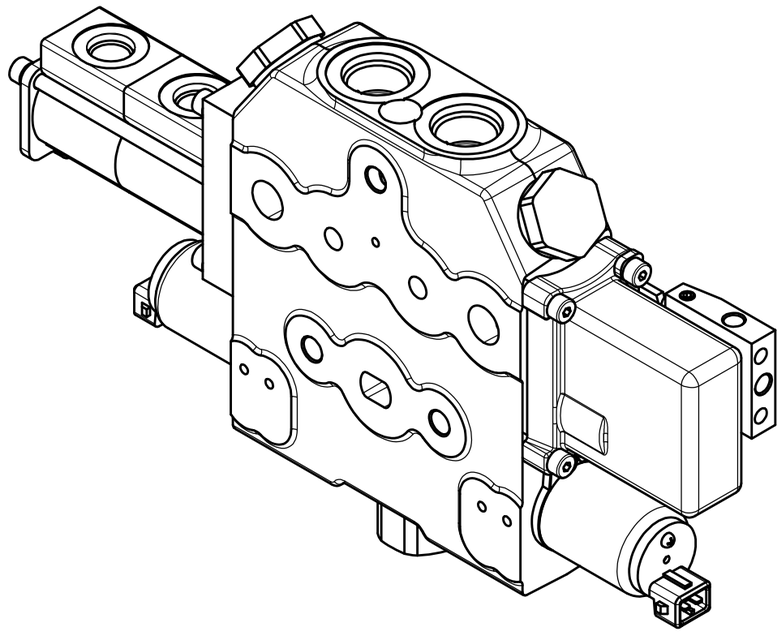
Pos	Codice	Descrizione	UM	Q.ta
10	JSP15500112	KIT GUARNIZIONI	N	1
9	73243	V.AUX (105 BAR)	N	2
8	430055016	MV99 ASS.TAPPO E GUARN.	N	1
7	~~430055004~~	KIT ELETTROVALVOLA PROPORZIONALE 12 VDC	N	2
6	421901117	DISTANZIALE APPOGGIO MOLLA	N	2
5	421801127	MOLLA R.S. COM.E.I.PROP. D.2,9	N	1
4	320755001	MV99 :F001 KIT R.S. STD	N	1
3	320355001	MV99 COM.L	N	1
2	320255004	KIT VALVOLA SELEZIONE SEGNALE	N	1
1	320255003	KIT VALVOLA COMPENSATORE IN SEZIONE	N	1

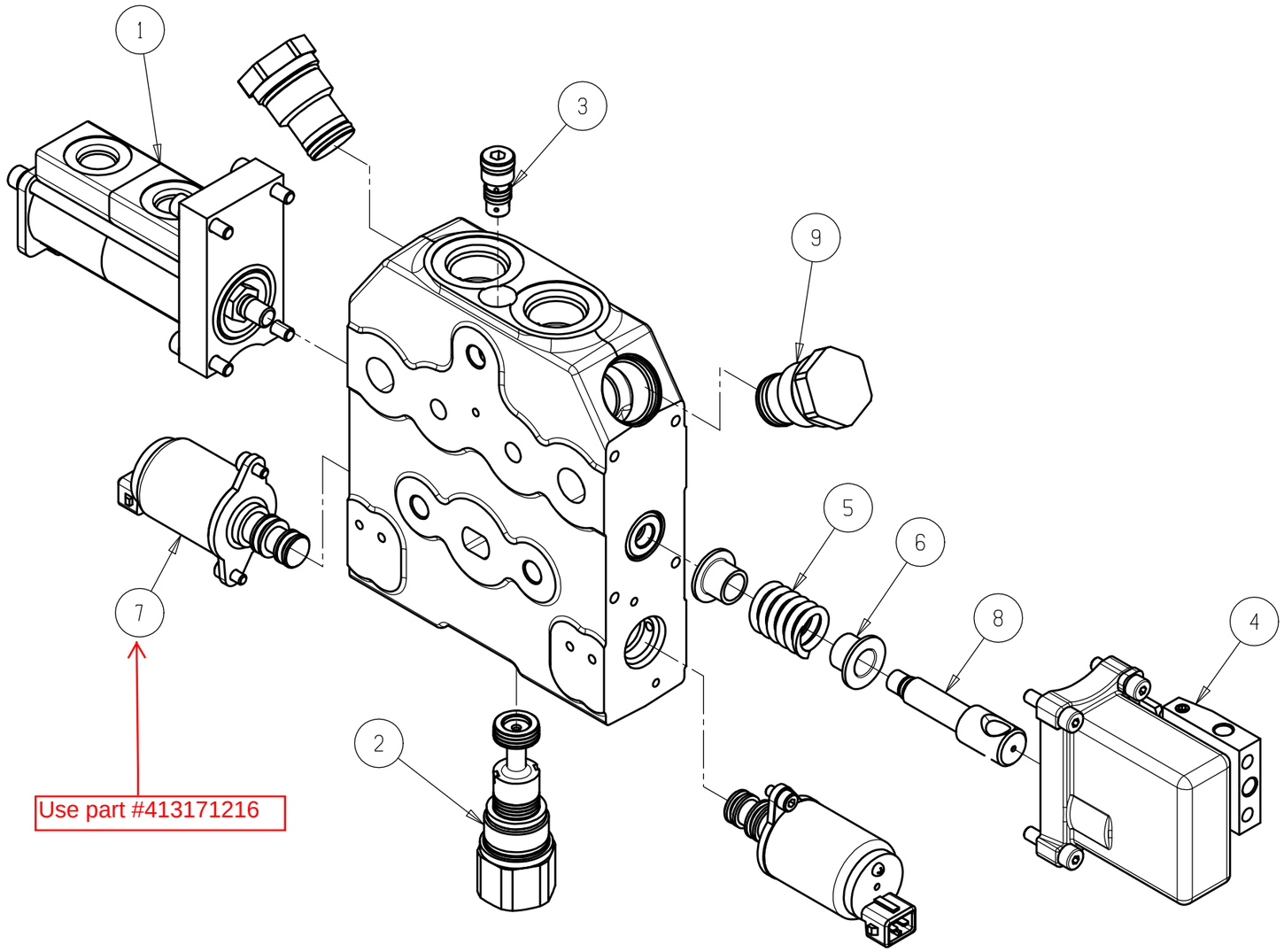
Description: DISEGNO RICAMBIO

hydro control
Bologna Italy

Group: MV99		Scale	
Approv.	Date	Schema Code 75580	
Designer: IN	Date 24/10/2011	CODE RS_75580	Mod. 0

0 | 24/10/2011 | IN





Pos	Codice	Descrizione	UM	Q.ta
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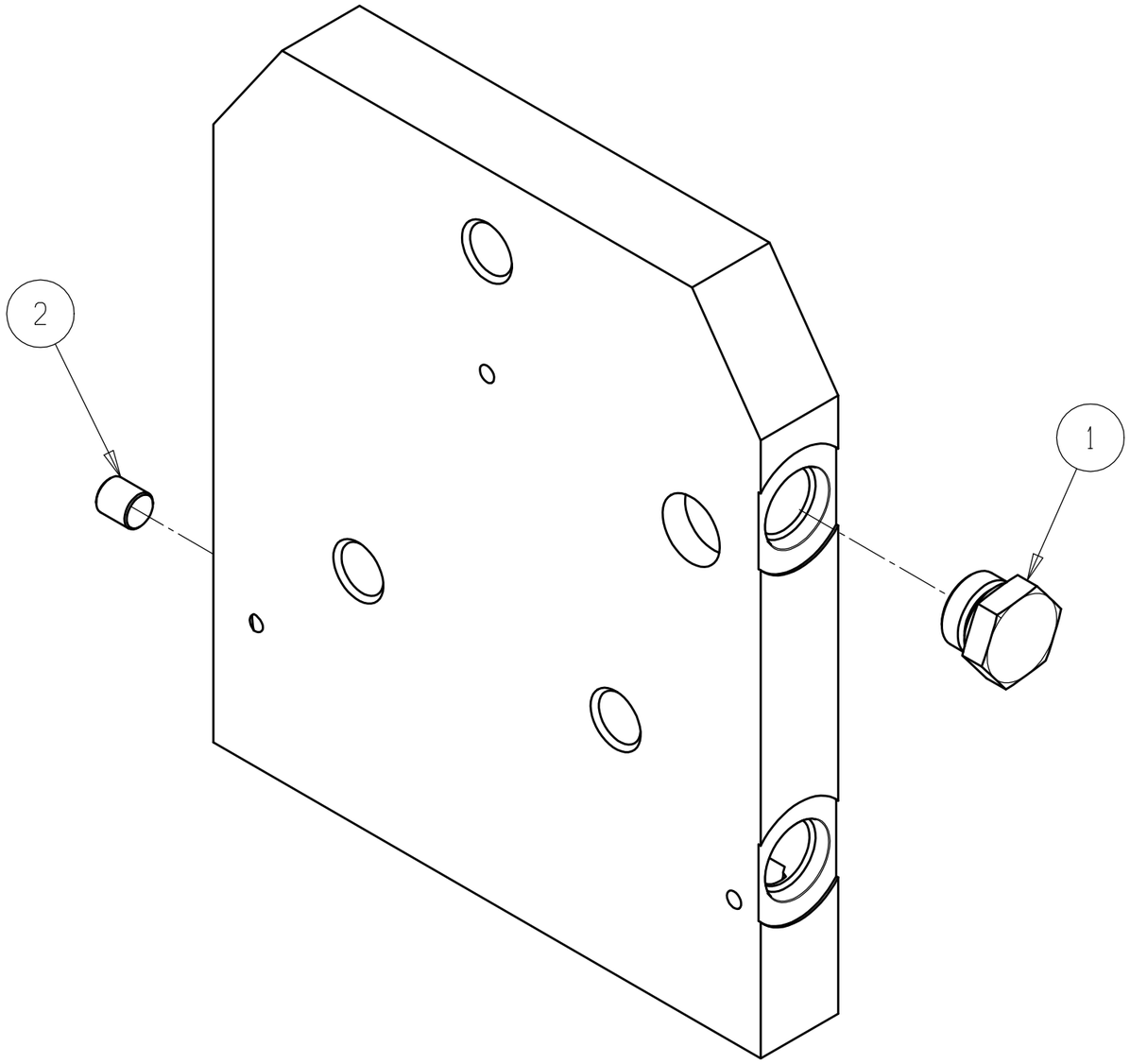
9	430455001	KIT TAPPO SOSTITUISCE VALVOLA AUSILIARIA	N	2
8	430055016	MV99 ASS. TAPPO E GUARN.	N	1
7	~~430055004~~	KIT ELETTROVALVOLA PROPORZIONALE 12 VDC	N	2
6	421901117	DISTANZIALE APPOGGIO MOLLA	N	2
5	421801127	MOLLA R.S. COM.E.I.PROP. D.2,9	N	1
4	320355001	MV99 COM.L	N	1
3	320255004	KIT VALVOLA SELEZIONE SEGNALE	N	1
2	320255003	KIT VALVOLA COMPENSATORE IN SEZIONE	N	1
1	320055025	MV99: F024 KIT BL. MOM. IDR. IN A E B 9/16"-18 UNF SAE6	N	1

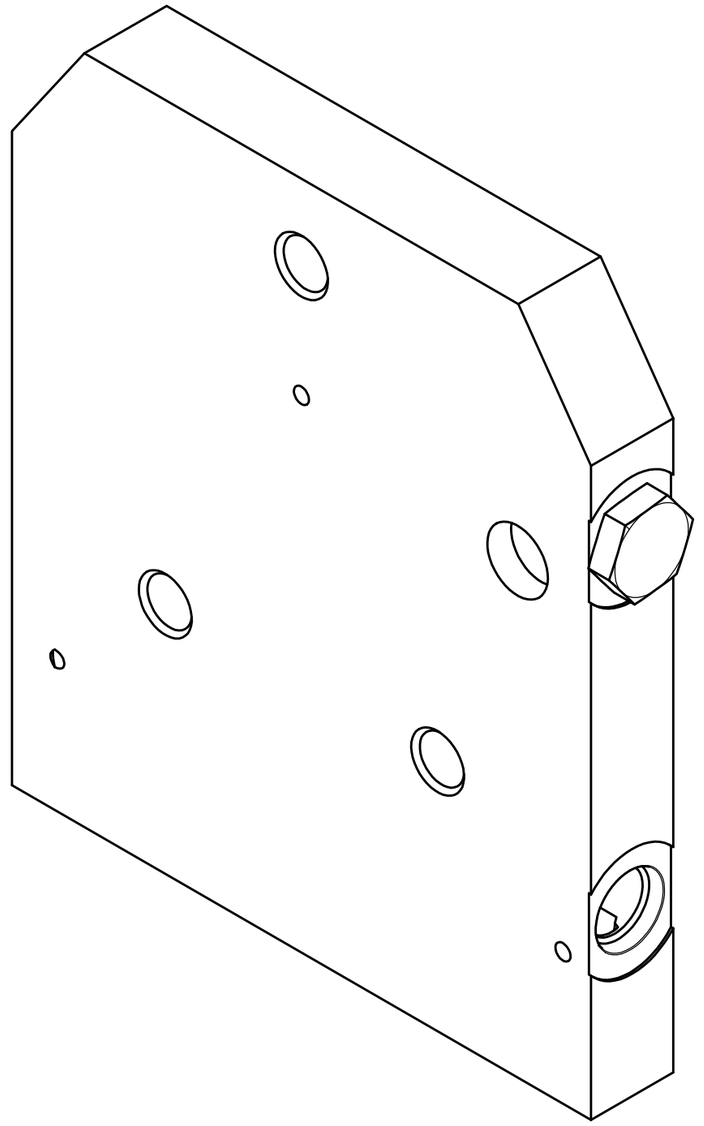
Description: DISEGNO RICAMBIO

hydro control
Bologna Italy

Group: MV99		Scale	
Approv.	Date	Schema Code 75581	
Designer: IN	Date 25/10/2011	CODE RS_75581	Mod. 0

0 | 25/10/2011 | IN





Pos	Codice	Descrizione	UM	Q.ta
2	413180002	TAPPO X CHIUS.FORI MB 800-070	N	1
1	300037001	KIT TAPPO 9/16"-18 UNF	N	1

Description: DISEGNO RICAMBIO

hydro control
Bologna Italy

Group: MV99		Scale	
Approv.	Date	Schema Code 20957	
Designer: IN	Date 25/10/2011	CODE RS_20957	Mod. 0

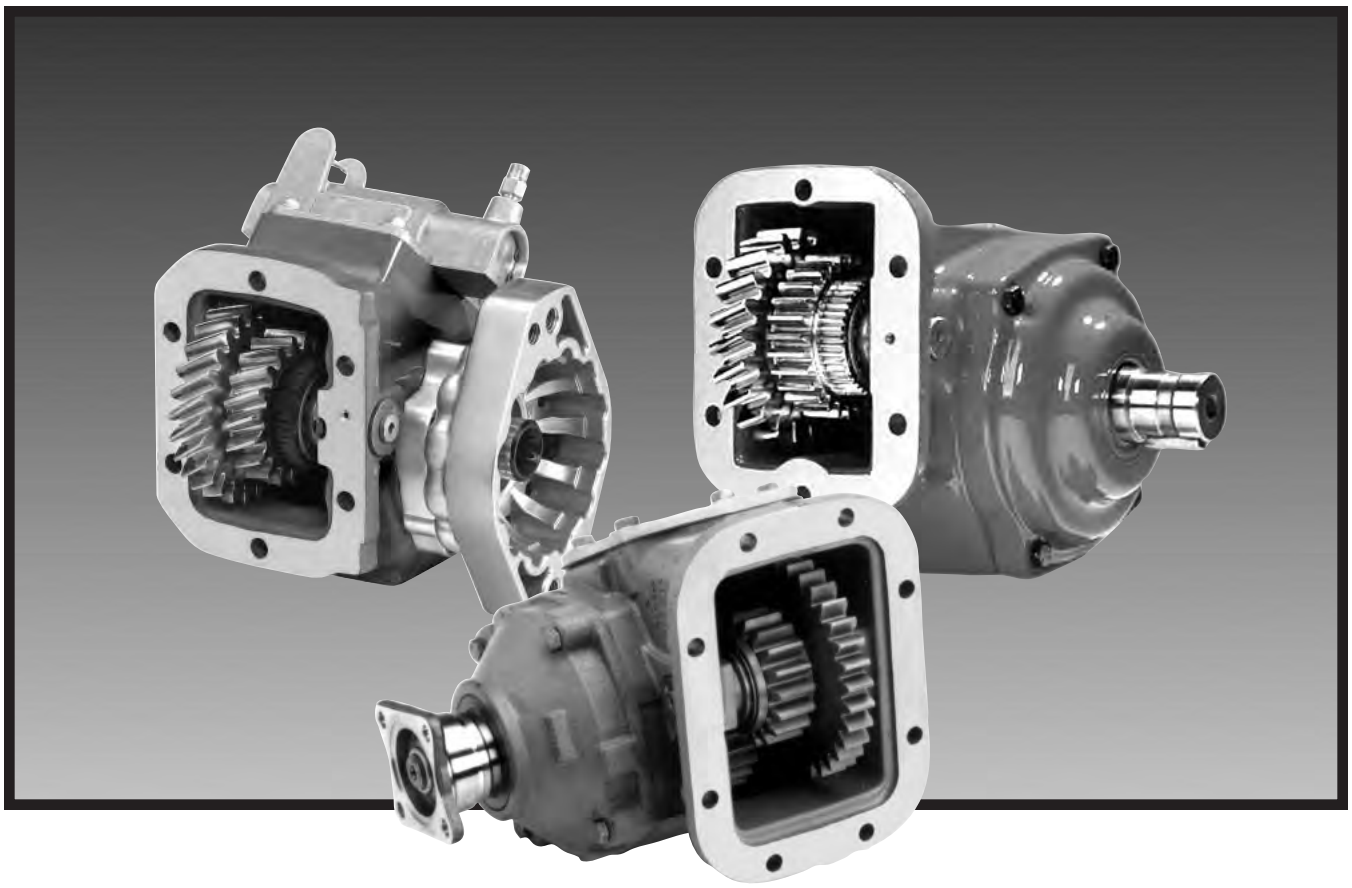
0 | 25/10/2011 | IN

CHELSEA®

Bulletin HY25-1380-M1/US

Owner's Manual
Power Take-Offs

Effective: February 2010
Supersedes: HY25-1380-M1/US December 2009



267 Series
269 Series
277 Series
278 Series
859 Series
867 Series

Parker

⚠ WARNING — User Responsibility

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

Patent Information

The Chelsea® Power Take-Off or its components shipped with this owner's manual may be manufactured under one or more of the following U.S. patents:
4610175 5228355 4597301 5645363 6151975 6142274 6260682 7159701 B2 7,510,064
Other patents pending.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

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Safety Information

These instructions are for your safety and the safety of the end user. Read them carefully until you understand them.

General Safety Information

To prevent injury to yourself and/or damage to the equipment:

- Read carefully all owner's manuals, service manuals, and/or other instructions.
- Always follow proper procedures, and use proper tools and safety equipment.
- Be sure to receive proper training.
- Never work alone while under a vehicle or while repairing or maintaining equipment.
- Always use proper components in applications for which they are approved.
- Be sure to assemble components properly.
- Never use wornout or damaged components.
- Always block any raised or moving device that may injure a person working on or under a vehicle.
- Never operate the controls of the Power Take-Off or other driven equipment from any position that could result in getting caught in the moving machinery.

Proper Matching of P.T.O.

WARNING: A Power Take-Off must be properly matched to the vehicle transmission and to the auxiliary equipment being powered. An improperly matched Power Take-Off could cause severe damage to the vehicle transmission, the auxiliary driveshaft, and/or to the auxiliary equipment being powered. **Damaged components or equipment could malfunction causing serious personal injury to the vehicle operator or to others nearby.**

To avoid personal injury and/or equipment damage:

- Always refer to Chelsea catalogs, literature, and owner's manuals. Follow Chelsea recommendations when selecting, installing, repairing, or operating a Power Take-Off.
- Never attempt to use a Power Take-Off not specifically recommended by Chelsea for the vehicle transmission.
- Always match the Power Take-Off's specified output capabilities to the requirements of the equipment to be powered.
- Never use a Power Take-Off whose range of speed could exceed the maximum.

Cold Weather Operation of Powershift P.T.O.

WARNING: During extreme cold weather operation [32°F (0°C) and lower], a disengaged Powershift Power Take-Off can momentarily transmit high torque that will cause unexpected output shaft rotation. This is caused by the high viscosity of the transmission oil when it is extremely cold. As slippage occurs between the Power Take-Off clutch plates, the oil will rapidly heat up and the viscous drag will quickly decrease.

The Power Take-Off output shaft rotation could cause unexpected movement of the driven equipment resulting in serious personal injury, death, or equipment damage.

To avoid personal injury or equipment damage:

- Driven equipment must have separate controls.
- The driven equipment must be left in the disengaged position when not in operation.
- Do not operate the driven equipment until the vehicle is allowed to warm up.

This symbol warns of possible personal injury.

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Safety Information (Continued)

Rotating Auxiliary Driveshafts

WARNING: 

- Rotating auxiliary driveshafts are dangerous. You can snag clothes, skin, hair, hands, etc. This can cause serious injury or death.
- Do not go under the vehicle when the engine is running.
- Do not work on or near an exposed shaft when the engine is running.
- Shut off the engine before working on the Power Take-Off or driven equipment.
- Exposed rotating driveshafts must be guarded.

Guarding Auxiliary Driveshafts

WARNING: We strongly recommend that a Power Take-Off and a directly mounted pump be used to eliminate the auxiliary driveshaft whenever possible. If an auxiliary driveshaft is used and remains exposed after installation, it is the responsibility of the vehicle designer and P.T.O. installer to install a guard.

Using Set Screws

WARNING: Auxiliary driveshafts may be installed with either recessed or protruding set screws. If you choose a square head set screw, you should be aware that it will protrude above the hub of the yoke and may be a point where clothes, skin, hair, hands, etc. could be snagged. A socket head set screw, which may not protrude above the hub of the yoke, does not permit the same amount of torquing as does a square head set screw. Also, a square head set screw, if used with a lock wire, will prevent loosening of the screw caused by vibration. Regardless of the choice made with respect to a set screw, an exposed rotating auxiliary driveshaft must be guarded.

Important: Safety Information and Owner's Manual

Chelsea Power Take-Offs are packaged with safety information decals, instructions, and an owner's manual. These items are located in the envelope with the P.T.O. mounting gaskets. Also, safety information and installation instructions are packaged with some individual parts and kits. **Be sure to read the owner's manual before installing or operating the P.T.O.** Always install the safety information decals according to the instructions provided. Place the owner's manual in the vehicle glove compartment.

WARNING: Operating the P.T.O. with the Vehicle in Motion

Some Power Take-Offs may be operated when the vehicle is in motion. To do so, the P.T.O. must have been properly selected to operate at highway speeds and correctly matched to the vehicle transmission and the requirements of the driven equipment.

If in doubt about the P.T.O. specifications and capabilities, avoid operating the P.T.O. when the vehicle is in motion. Improper application and/or operation can cause serious personal injury or premature failure of the vehicle, the driven equipment, and/or the P.T.O.

Always remember to disengage the P.T.O. when the driven equipment is not in operation.

Pump Installation Precautions

Use a bracket to support the pump to the transmission if:

- The pump weighs **40 pounds [18.4 kg]** or more.
- The combined length of the P.T.O. and pump is **18 inches [45.72 cm]** or more from the P.T.O. centerline to the end of the pump.

This symbol warns of possible personal injury.

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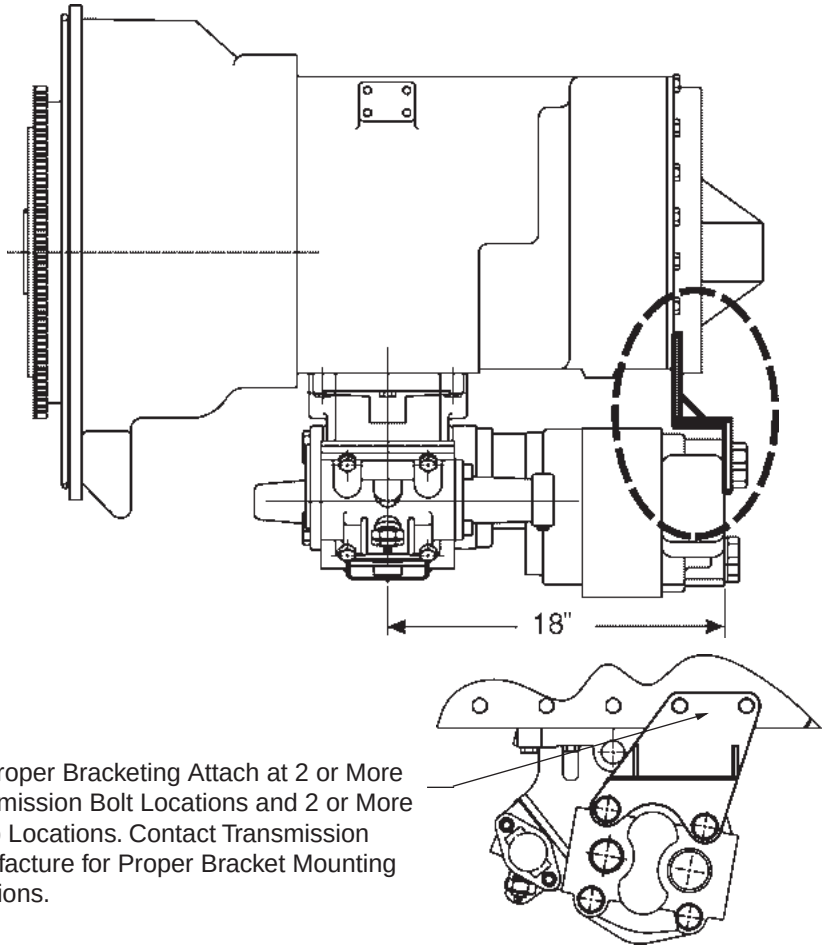
Direct Mount Pump Support Recommendations



NOTE: For Proper Bracketing Attach at 2 or More Transmission Bolt Locations and 2 or More Pump Locations. Contact Transmission Manufacture for Proper Bracket Mounting Locations.

Use caution to ensure that bracket does not pre-load pump/P.T.O. mounting

Chelsea strongly recommends the use of pump supports (Support Brackets) in all applications. P.T.O. warranty will be void if a pump bracket is not used when:

1) The combined weight of pump, fittings and hose exceed **40 pounds [18.14 kg]**.
2) The combined length of the P.T.O. and pump is **18 inches [45.72 cm]** or more from the P.T.O. centerline to the end of the pump.

ALSO: Remember to pack the female pilot of the P.T.O. pump shaft with grease before installing the pump on the P.T.O. (reference Chelsea grease pack 379688)

This symbol warns of possible personal injury.

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Olive Branch, MS 38654 USA

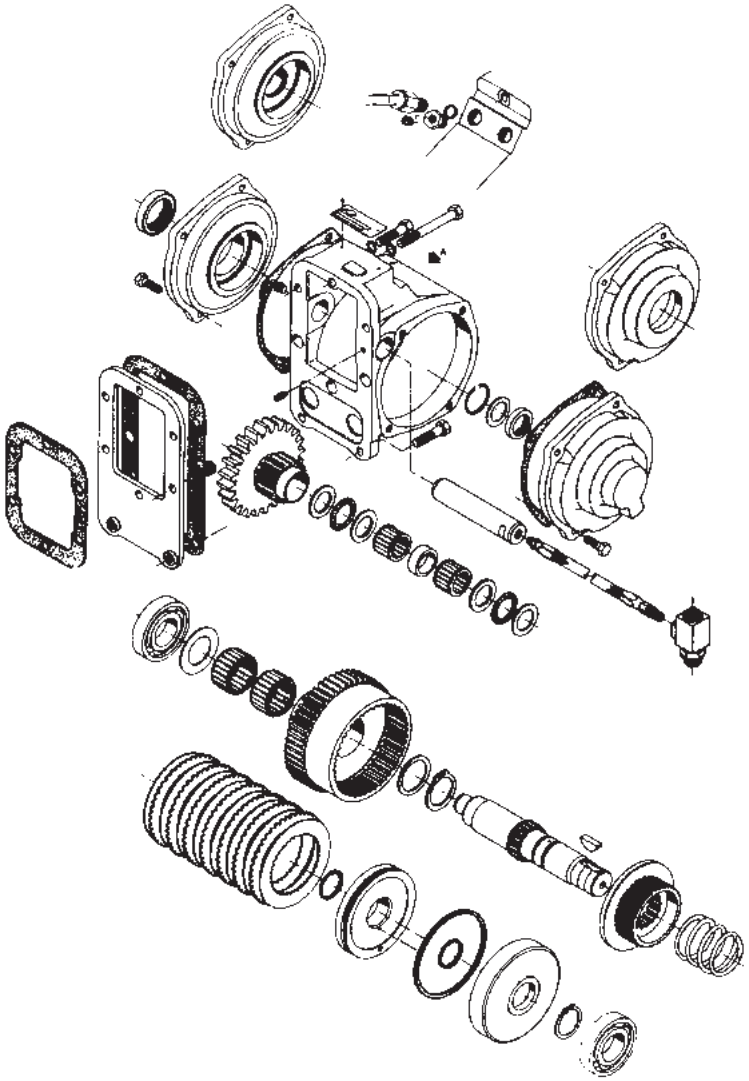
Foreword

Since our major objective is to show you how to get additional and more profitable miles from truck, tractor and trailer components, we want to provide you with information on the installation of Chelsea Power Take-Offs.

We all realize that an inadequate transmission will overwork any Power Take-Off in a very short period of time. In addition, a mismatched transmission/P.T.O. combination can result in unsatisfactory performance of the equipment right from the start.

Before you order new trucks, be sure you're getting the right transmission/P.T.O. combination. It is of vital importance for efficient performance to have adequate power. To help you select the proper type, size and design of P.T.O. it is advisable to discuss your specific requirements with Chelsea P.T.O. specialists. They know their products and have easy access to manufacturers of equipment, transmissions and Power Take-Offs. They can inform you about everything you need to know about power, at the right time, before you specify components.

Exploded View of a Typical Powershift P.T.O.



Chelsea P.T.O. Safety Label Instructions

1. The two black and orange on white 5" x 7" pressure sensitive vinyl labels, part number 379274; must be placed on the vehicle frame rails (one (1) on each side), in a position that would be **HIGHLY** visible to anyone that would go under the truck near the P.T.O. rotating shaft. If the vehicle is to be painted after these labels are installed, cover them with two (2) blank masking covers. Remove the masking covers after painting.

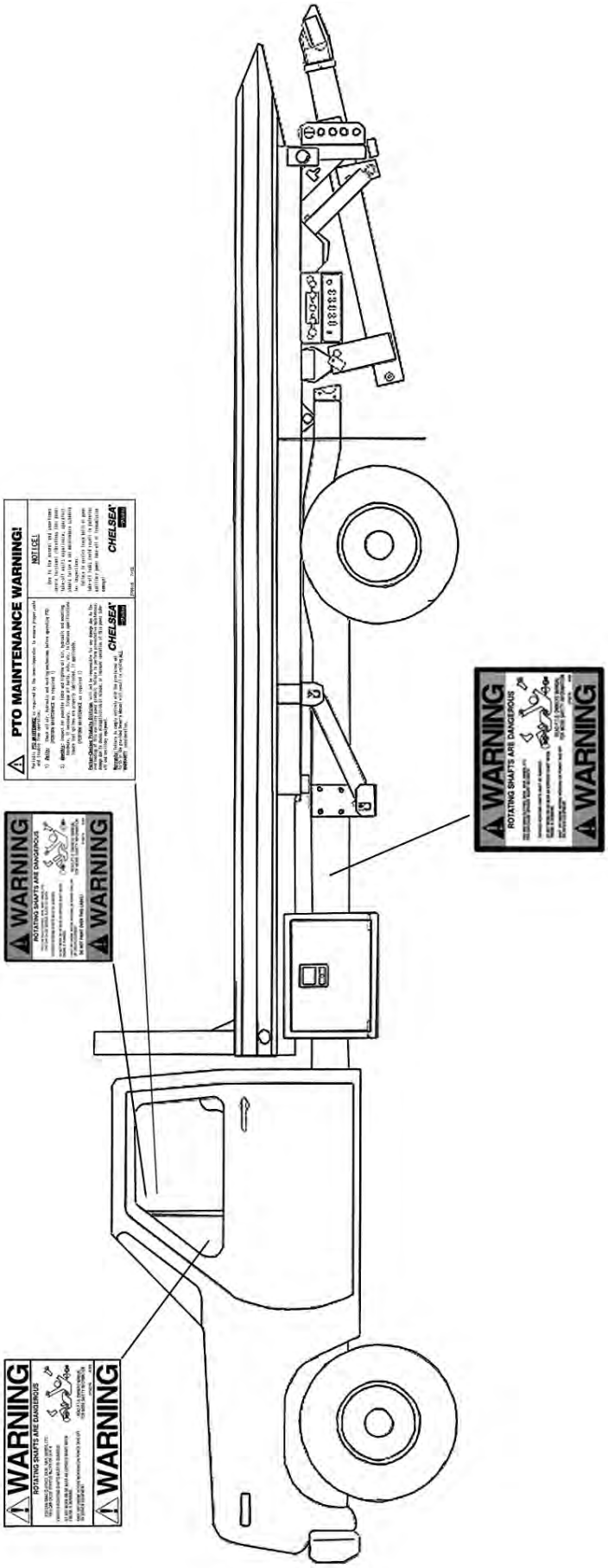
2. Place the one (1) black and orange on white 3.5" x 5" pressure sensitive vinyl label, part number 379275, on the visor nearest the operator of the vehicle, this must be placed near the P.T.O. visor label.

3. Place the one (1) red and white with black lettering 3.5" x 7.5" pressure sensitive vinyl label, part number 379915, on the opposite side of the visor from the above label # 379275.

4. Place the one (1) white and black heavy duty card, part number 379276, in the vehicle glove box. Again in a position highly visible to the operator, for example: try to place this card on top of whatever may be in the glove box.

If you require labels, please order part number 328946X at no charge from your local Chelsea Warehouse or send request direct to:

Parker Hannifin Corporation
Chelsea Products Division
8225 Hacks Cross Road
Olive Branch, MS 38654
Customer Service: (662) 895-1011



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Function of Auxiliary Power Shafts

An auxiliary power shaft transmits torque from the power source to the driven accessory. The shaft must be capable of transmitting the maximum torque and R.P.M. required of the accessory, plus any shock loads that develop.

An auxiliary power shaft operates through constantly relative angles between the power source and the driven accessory, therefore, the length of the auxiliary power shaft must be capable of changing while transmitting torque. This length change, commonly called "slip movement", is caused by movement of the power train due to torque reactions and chassis deflections.

Joint operating angles are very important in an auxiliary power joint application. In many cases, the longevity of a joint is dependent on the operating angles. (See chart below)

This information is limited to 1000 through 1310 series applications. For applications requiring a series larger than 1310, contact your local Chelsea distributor**.**

Determining Shaft Type

1) Solid or tubular?
   a) In applications requiring more than 1000 R.P.M. or where the application necessitates a highly balanced auxiliary power shaft, a tubular shaft should be used.
   b) Spicer's solid shafting auxiliary power joints are designed for 1000 or less R.P.M. intermittent service such as:

      Driving small hydraulic pumps

      Driving winches

      Driving low speed product pumps
2) Joint Series should be determined using the chart on the following page.

Spicer® Universal Joint Operating Angles			
Prop. Shaft R.P.M.	**Max. Normal Operating Angle**	**Prop. Shaft R.P.M.**	**Max. Normal Operating Angle**
3000	5° 50'	1500	11° 30'
2500	7° 00'	1000	11° 30'
2000	8° 40'	500	11° 30'

Above based on angular acceleration of 100 RAD/SEC^2

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Spicer® Universal Joint Engineering Data

Joint Series	1000	1100	1280	1310
Torque Rating				
Automotive (Gas or Diesel Engine) Lbs. ft.				
Continuous	50	54	95	130
Tubing				
Diameter	1.750	1.250	2.500	3.00
Wall Thickness	.065	.095	.083	.083
W = Welded S = Seamless	W	S	W	W
Flange Diameter (Swing Diameter)				
Rectangular Type	3.500	3.500	3.875	3.875
Bolt Holes - Flange Yoke				
Circle	2.750	2.750	3.125	3.125
Diameter	.312	.312	.375	.375
Number	4	4	4	4
Male Pilot Dia.	2.250	2.250	2.375	2.375
Distance Across Lugs				
Snap Ring	2.188	2.656	3.469	3.469
Construction				
Bearing Diameter	.938	.938	1.062	1.062

Maximum Operating Speed * By Tube Size, Solid Shaft Size, and Length
***(For speed below 500 R.P.M. or over 2500 R.P.M., contact your Chelsea Distributor)**

Tubing Dia. & Wall Thickness Joint & Shaft (W=Welded S=Seamless)	Max. Installed Length in Inches for Given R.P.M. Centerline to Centerline of Joints for a Two Joint Assembly or Centerline of Joint to Centerline of Center Bearing for a Joint & Shaft R.P.M. - Revolutions per Minute				
	500	**1000**	**1500**	**2000**	**2500**
1.750" X .065" W	117"	82"	67"	58"	52"
1.250" X .095" S	91"	64"	52"	45"	40"
2.500" X .083" W	122"	87"	70"	62"	55"
3.000" X .083" W	-	-	-	85"	76"
Solid Shaft Diameter					
.750"	60"	42"	35"	30"	27"
.812"	62"	44"	36"	31"	28"
.875"	65"	46"	37"	32"	29"
1.000"	69"	49"	40"	35"	31"
1.250"	77"	55"	45"	39"	35"

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Mounting the P.T.O. on the Transmission

When installing a P.T.O., always wear protective clothing and safety glasses.

1. Begin by draining the oil from the transmission. Use caution, since the oil may be hot (**Fig. 1**).

Fig. 1

NOTE: Installation shown is for Right Side (Street Side) of Transmission.

2. Remove the P.T.O. aperture plate with a 15mm socket (**Fig. 2**).


Fig. 2

3. Remove the gasket and clean the aperture surface (**Fig. 3**)**.**

NOTE: Do not reuse the gasket that comes with the transmission.

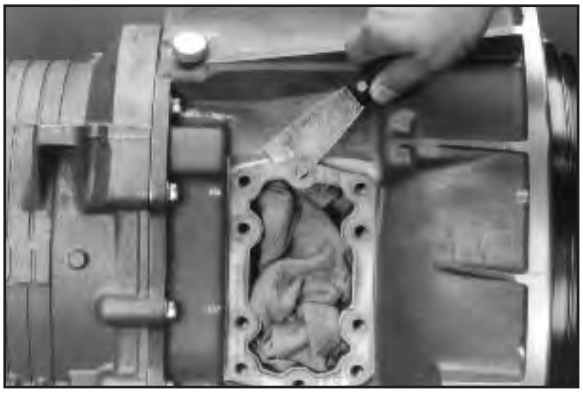
Fig. 3

4. Using a screwdriver, install the guide pins until they bottom out (**Fig. 4**) (Refer to Page 34 for correct location and use).

NOTE: Do not use sealing compounds because they are generally incompatible with automatic transmission fluid.


Fig. 4

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Mounting the P.T.O. on the Transmission (Continued)

5. Install the special gasket over the guide pins. The ribbed surface should face outward, toward the installer (**Fig. 5**).

NOTE: To ensure proper backlash and sealing of P.T.O. to transmission only use gasket furnished with the P.T.O.

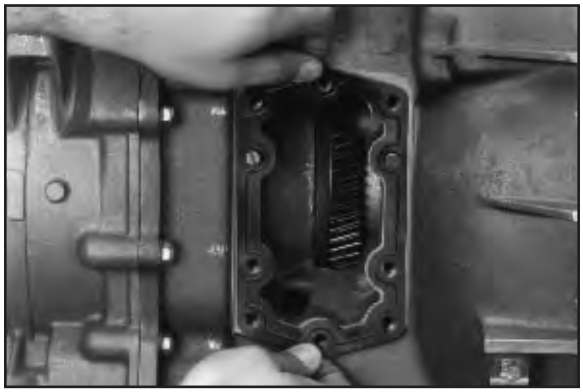

Fig. 5

6. Position the P.T.O. and secure it with the top capscrew (**Fig. 6**).

NOTE: Refer to page 34 for proper capscrew installation for the 269 & 278 Series

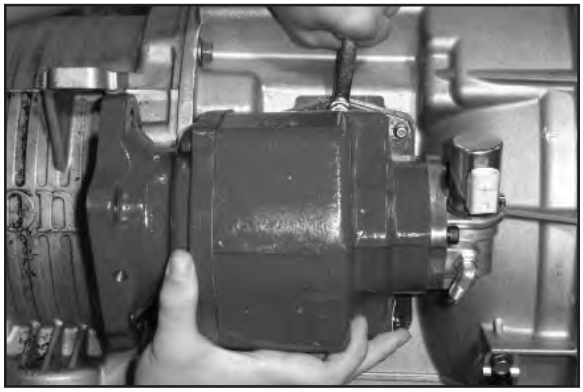

Fig. 6

7. Install the remaining capscrews. Torque all to 40 - 50 Lbs. ft. (54 - 68 N.m. or 5.5 - 6.9 Kg.m) (**Fig. 7**).

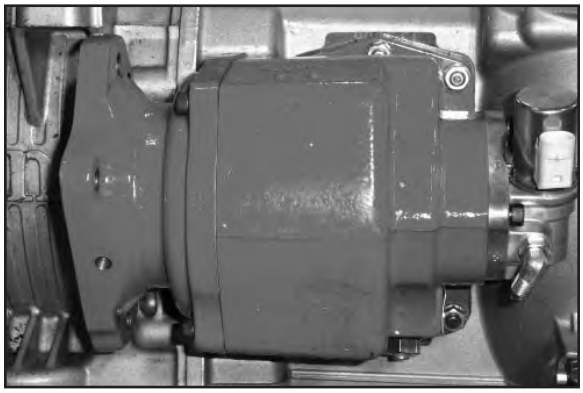

Fig. 7

8. Install P.T.O. pressure switch, part # 379502, into port on Hydraulic Valve Cap. Torque to 120-140 In-lbs (**Fig. 8**).

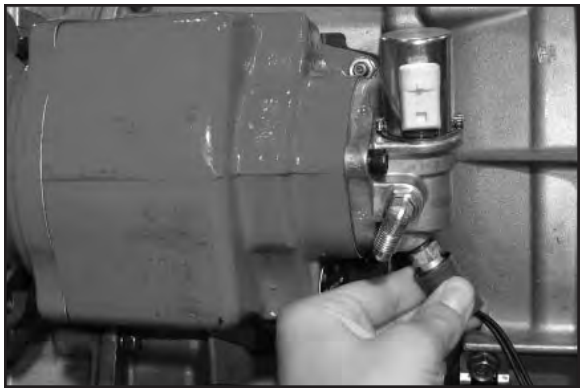

Fig. 8

Mounting the P.T.O. on the Transmission (Continued)

9. If using a rotatable flange see page 34 for bolt torque specifications. (**Fig. 9**).

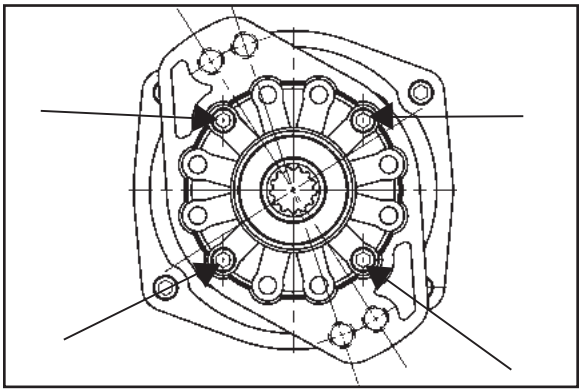

Fig. 9

10. Securely attach the high pressure line to the P.T.O. valve (**Fig. 10**).

Fig. 10

11. Use the special fitting to securely attach the high pressure line to the transmission. This fitting is included with the P.T.O. (**Fig. 11**). See the chart on page 12 for the correct hose specifications. With the hose and P.T.O. securely connected, refill the transmission to the manufacturer's suggested specifications.

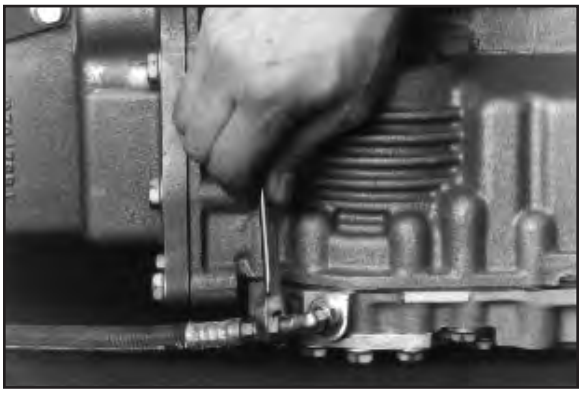

Fig. 11 (Right side shown)

12. Complete the assembly by installing the electrical connection to the valve assembly (**Fig. 12**) and the pressure switch (**Fig 13**).

Fig. 12

Fig. 13

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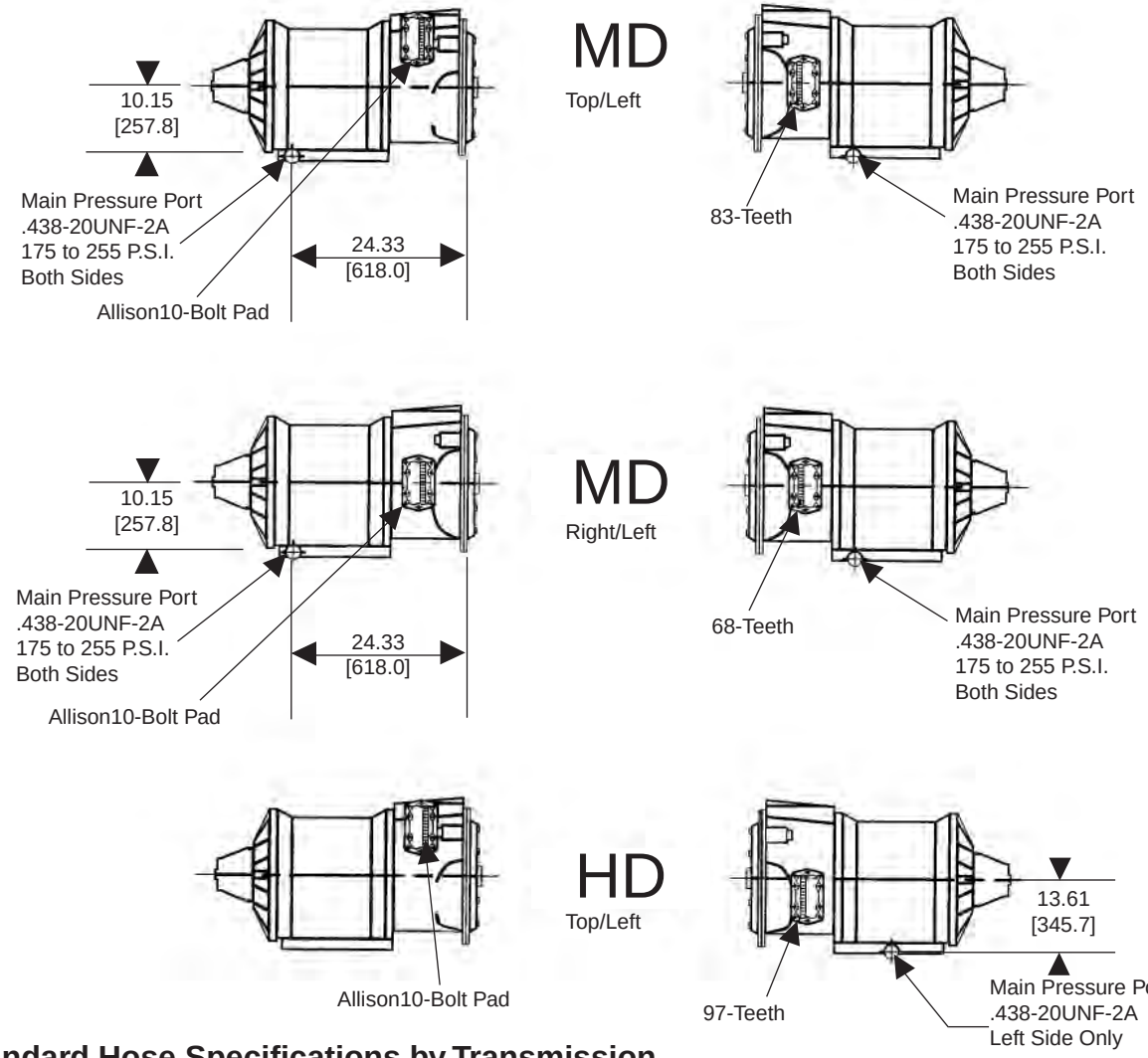
Pressure Port and Aperture Opening Identification

1. These drawings represent left and right views of the MD and HD pressure ports on the transmission.



Standard Hose Specifications by Transmission

TRANS.	LOCATION	267 Series	277 Series	278 Series	859 Series
MD	Top Right (Right Press. Port)	329130-6X	329075-2X	329075-2X	329075-2X
MD	L.H. Side (Left Press. Port)	329130-1X	329130-5X	329130-5X	329130-5X
MD	R.H. Side (Right Press. Port)	329130-4X	329075-1X	329075-1X	329075-1X
HD	Top Right (Left Press. Port)	329130-6X	329075-2X	329075-2X	329075-2X
HD	L.H. Side (Left Press. Port)	329130-1X	329130-4X	329075-4X	329130-4X
HD[1, 2]	L.H. Side (Left Press. Port)	—	329130-5X	329130-5X	329130-5X
HD[1, 2]	Top Right (Right Press. Port)	—	329130-4X	329075-4X	329130-4X
MD[1, 2]	L.H. Side (Left Press. Port)	—	329130-5X	329130-5X	329130-5X
MD[1, 2]	R.H. Side (Right Press. Port)	—	329075-1X	329075-1X	329075-1X

An HD with 2 P.T.O.'s requires a 379556 "T" fitting and a 379703 swivel nut 90 degree elbow to attach 2 hoses to the single port on the left side.

1 Lubrication Option "R", shifter Options "G" and "H" for 277 and 859 Series

2 Lubrication Option "R" for 278 Series

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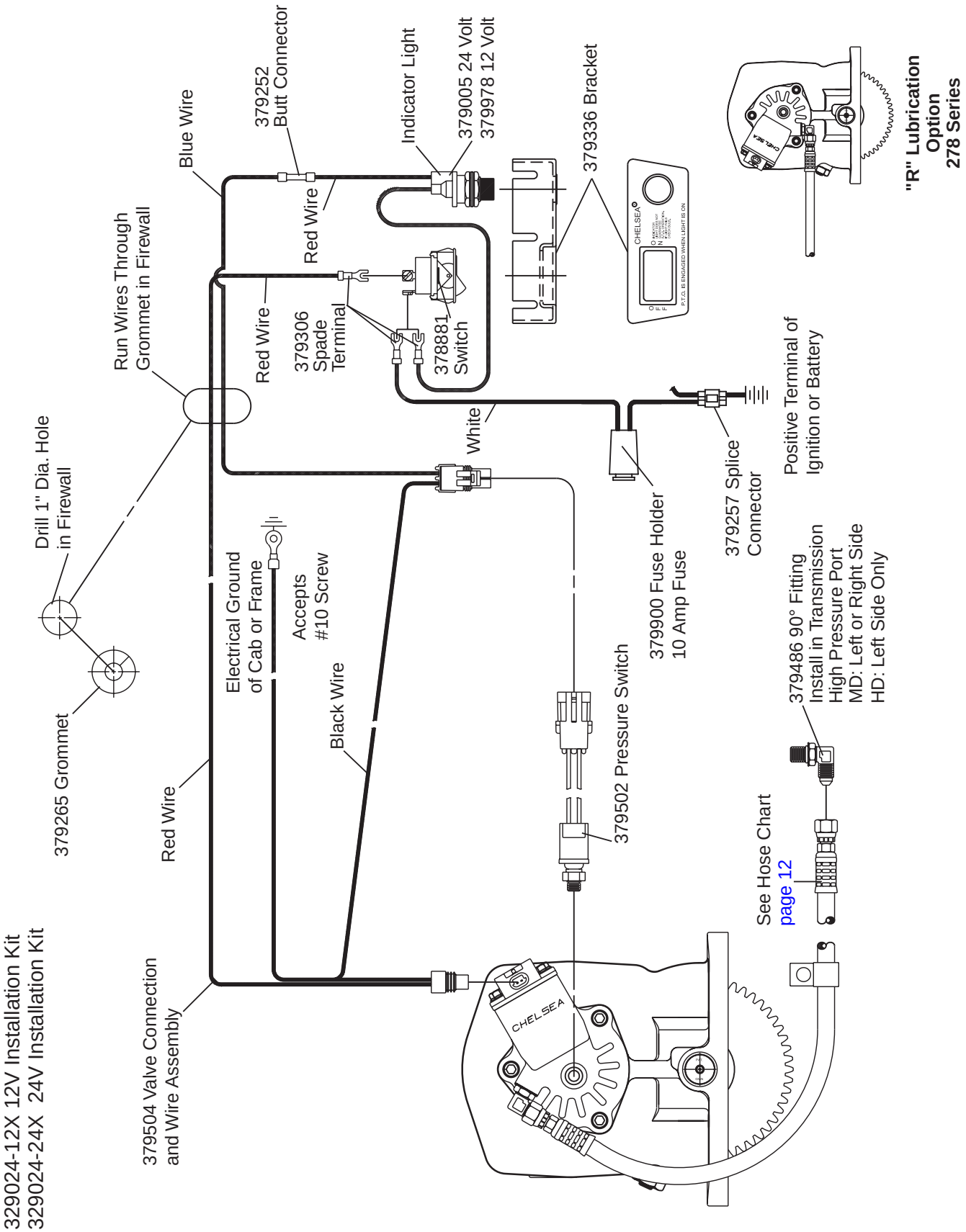
Shift Installation Kit 277, 278 & 859 Series without Electronic Overspeed Control (SK-347 Rev C) (Old Style)



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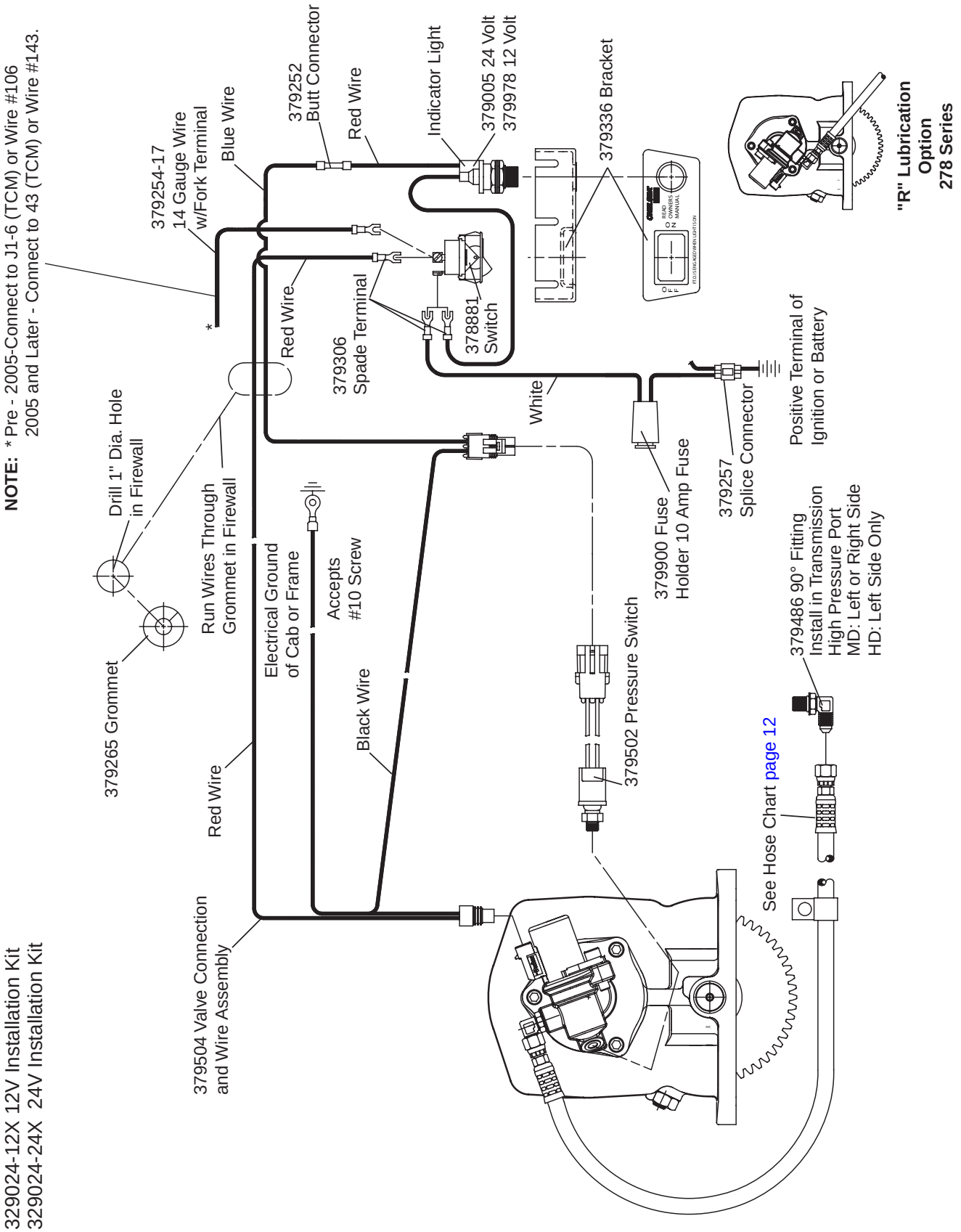
Shift Installation Kit 277, 278 & 859 Series without Electronic Overspeed Control (SK-347 Rev E) (New Style)



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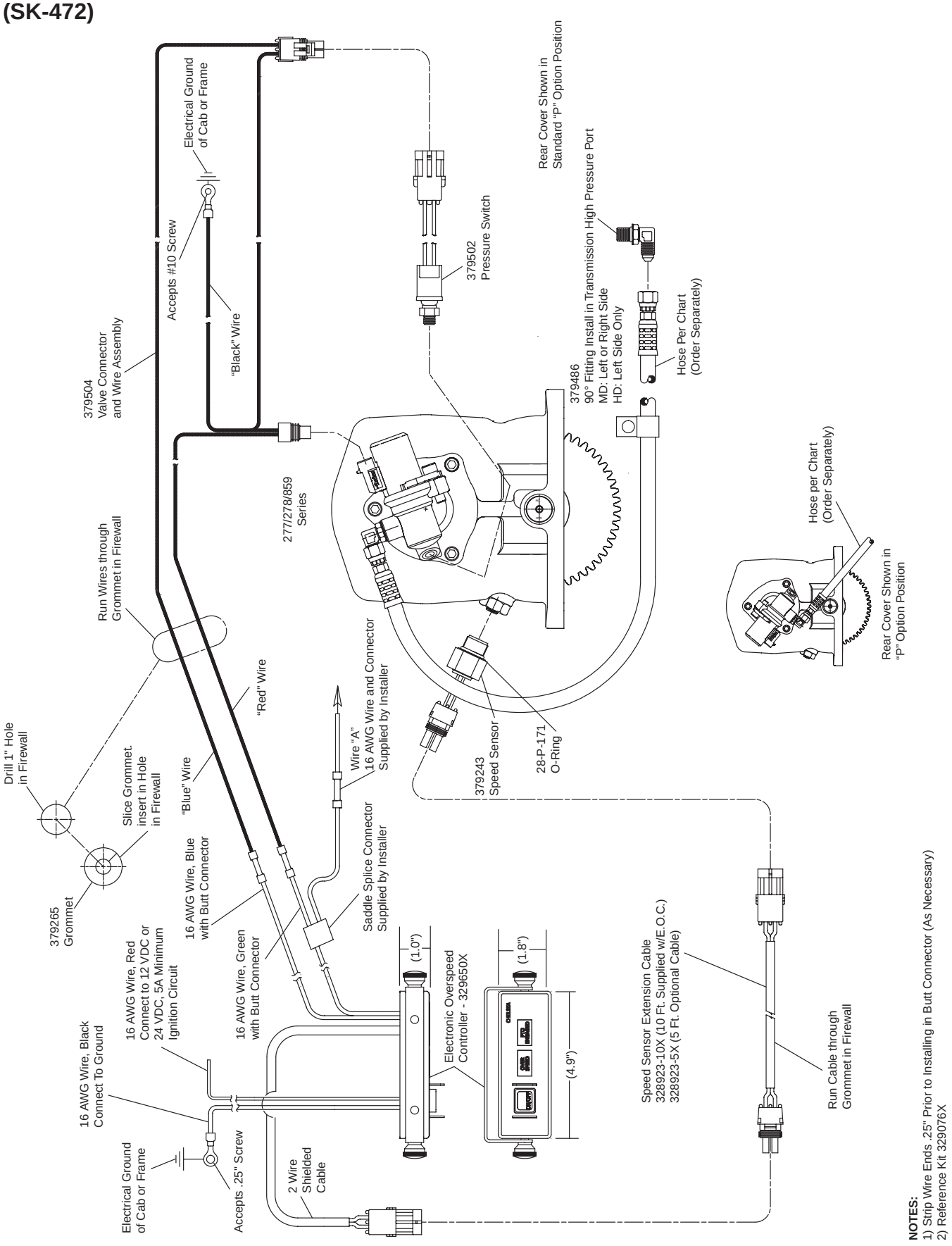
Shift Installation Kit 277, 278 & 859 Series with Electronic Overspeed Control (SK-472)



NOTES:
1) Strip Wire Ends .25" Prior to Installing in Butt Connector (As Necessary)
2) Reference Kit 329076X

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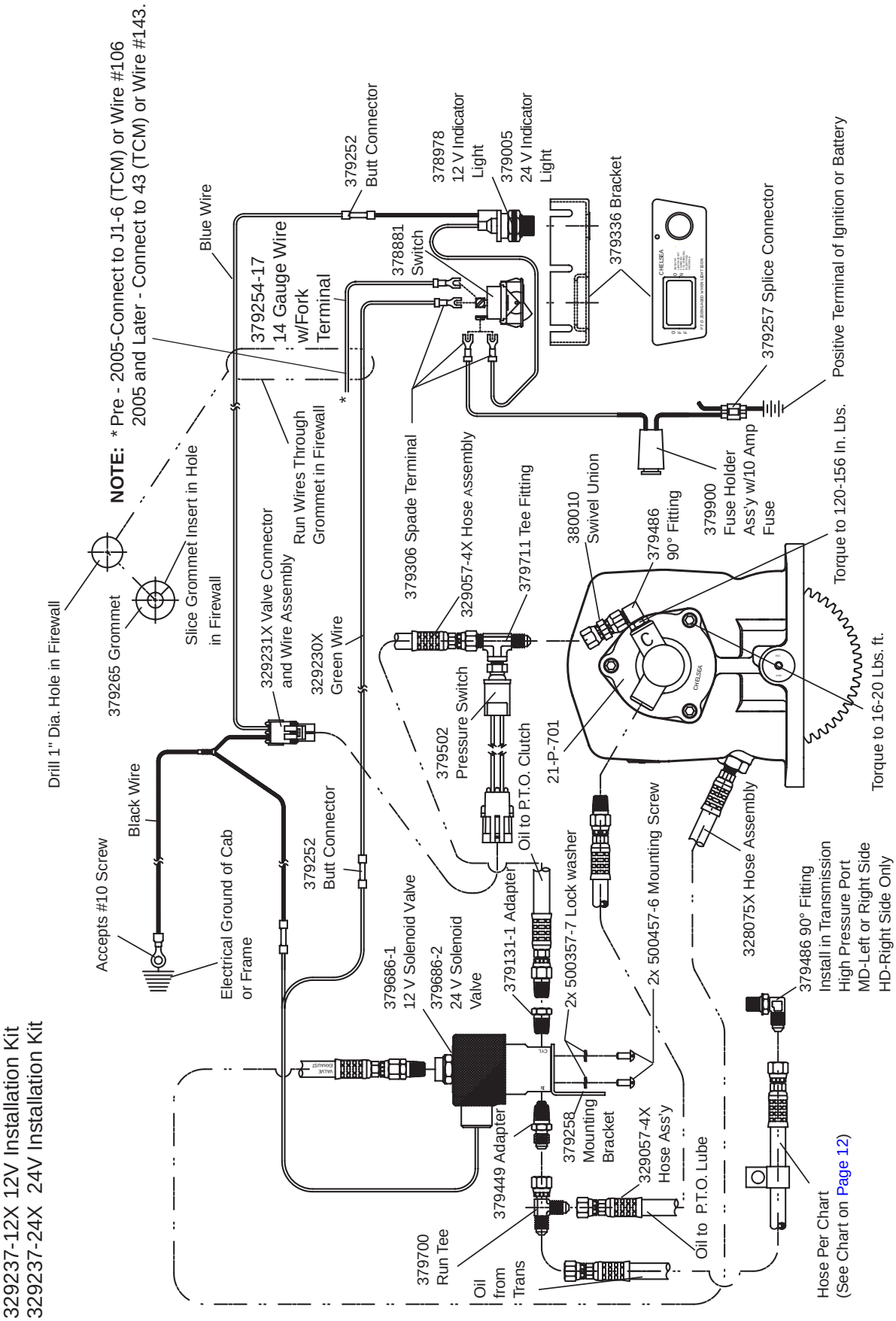
Shift Installation Kit 277, 278, & 859 Series with Remote Mount Solenoid (SK-432 Rev C)



329237-12X 12V Installation Kit
329237-24X 24V Installation Kit

NOTE: This option is not available with nor can it be used on E.O.C. applications.

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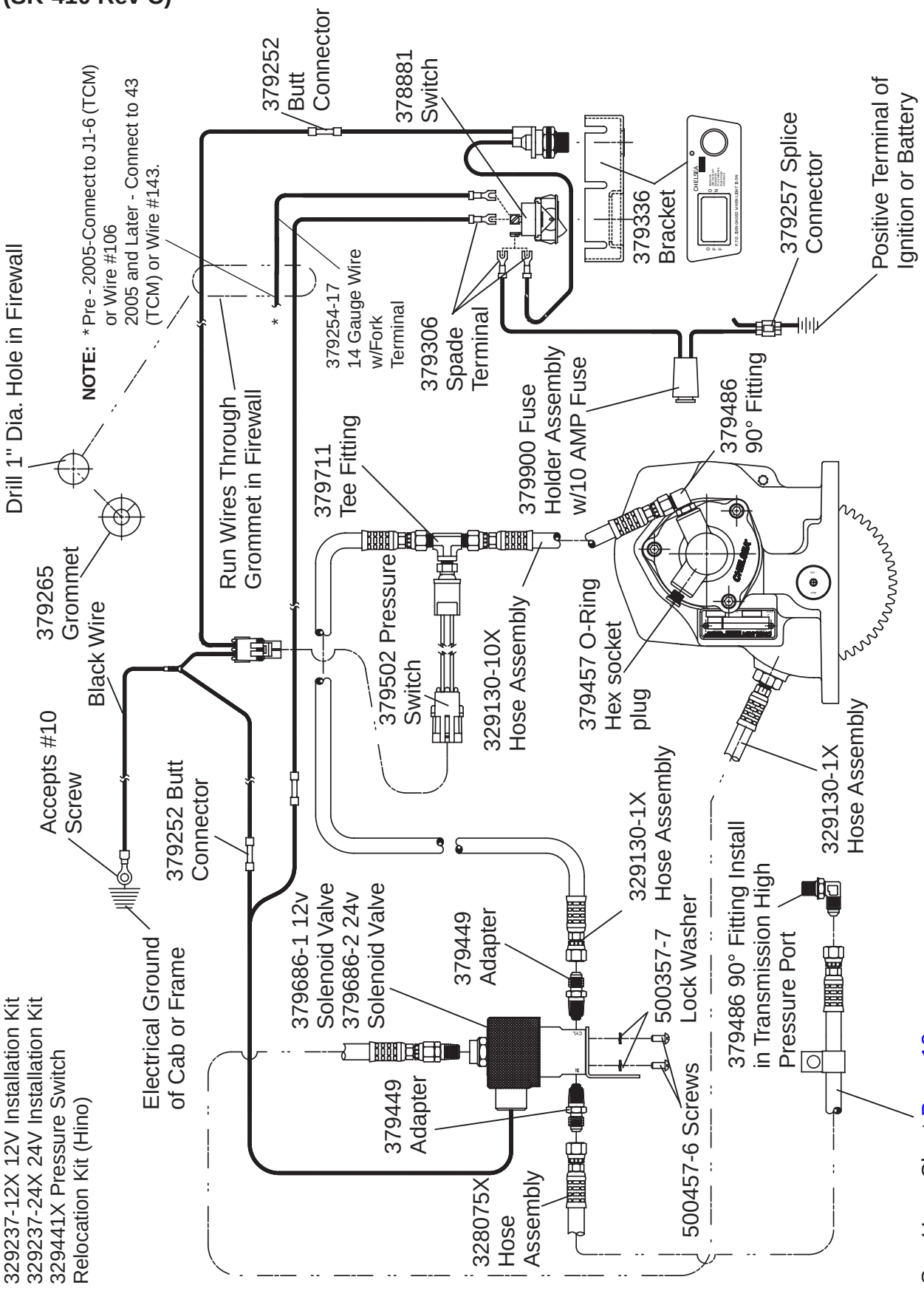
Shift Installation Kit 277 Series with Remote Mount Solenoid for Hino Model 338 (SK-410 Rev C)



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Olive Branch, MS 38654 USA

GMT C Series Trucks

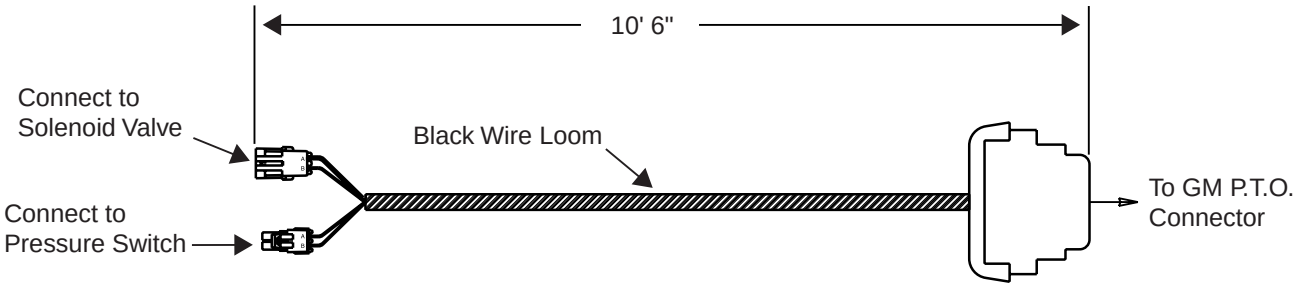
For model year 2003 GM C Series 4500, 5500, 6500, 7500 and 8500 trucks may be equipped with the Allison World (MD) transmission. In these vehicles GM Truck has integrated a P.T.O. connector, located in the right hand engine compartment area. A Power Take-Off switch has also been incorporated into the GM dash panel to control P.T.O. operation. With the P.T.O. option ordered on the truck, the P.T.O. connector and in-dash switch simplify the interface for the body builder.

In order for the customer to utilize the full capability of the P.T.O./transmission, Chelsea has design a wiring harness that must be used between the GM P.T.O. connector and the Chelsea Power Take-Off. These are for P.T.O. Non E.O.C. applications only.

On the Allison World (MD) transmission the P.T.O. drive gear is engine driven. The wiring harness is not "required" for the Power Take-Offs listed on the chart, but must be used if the GM supplied in-dash P.T.O. switch is to be utilized.

See wiring harness part number 379926 for the 277, 278 and 859 Series Power Take-Offs.

2003 GM "C" Series Wiring Harness for 277, 278 and 859 Series
Part Number 379926



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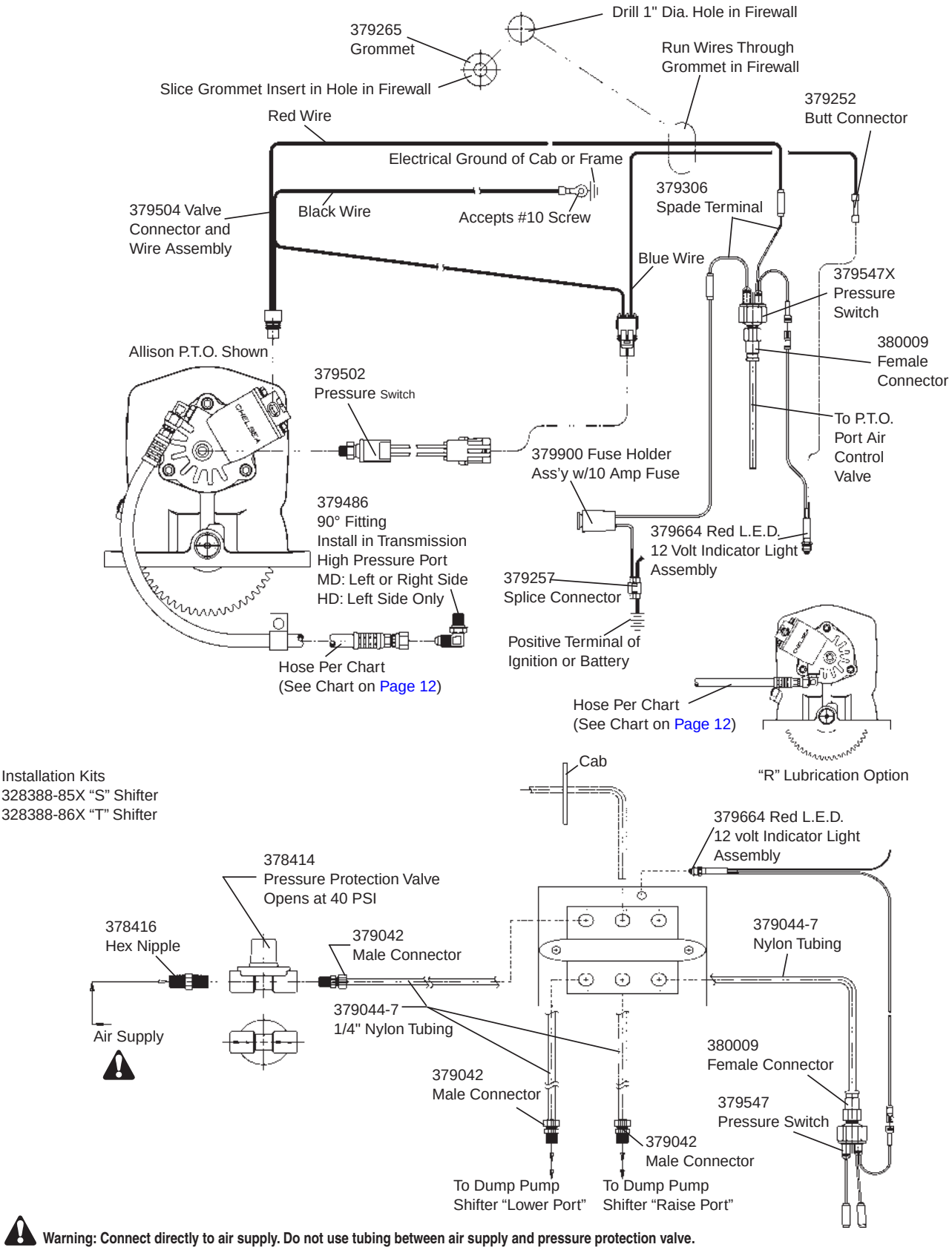
P.T.O. Combo Valve Installation Sketch, 277/278 Series (SK-427 Rev B) (Old Style)



Warning: Connect directly to air supply. Do not use tubing between air supply and pressure protection valve.

Caution: When installing nylon tubing avoid sharp angles, exhaust and manifold systems.

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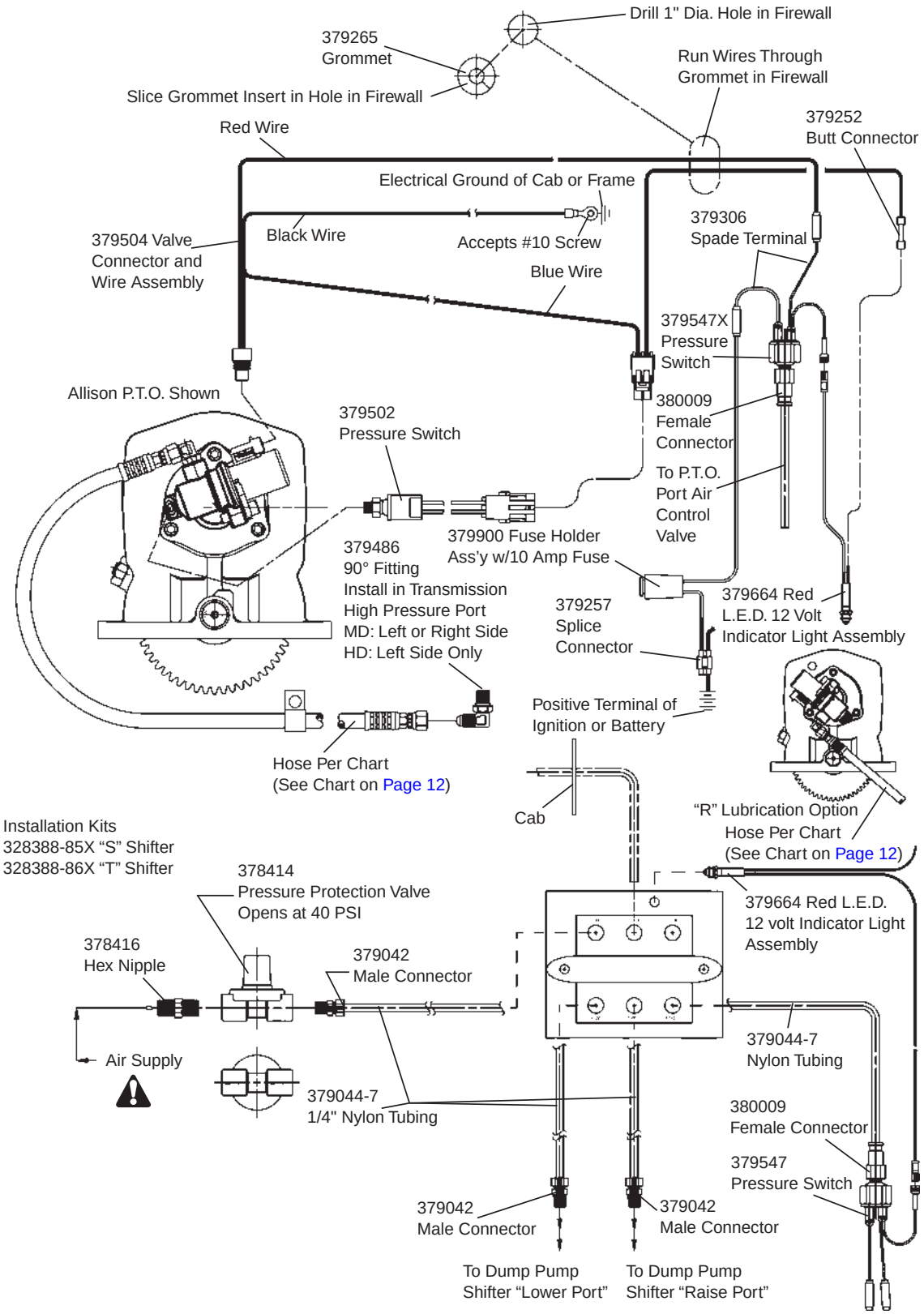
P.T.O. Combo Valve Installation Sketch, 277/278 Series (SK-427 Rev C) (New Style)



Warning: Connect directly to air supply. Do not use tubing between air supply and pressure protection valve.

Caution: When installing nylon tubing avoid sharp angles, exhaust and manifold systems.

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Mounting the P.T.O. on the Transmission

When installing a P.T.O., always wear protective clothing and safety glasses.

1. Remove the P.T.O. aperture plate with a 16mm socket (**Fig. 1**).

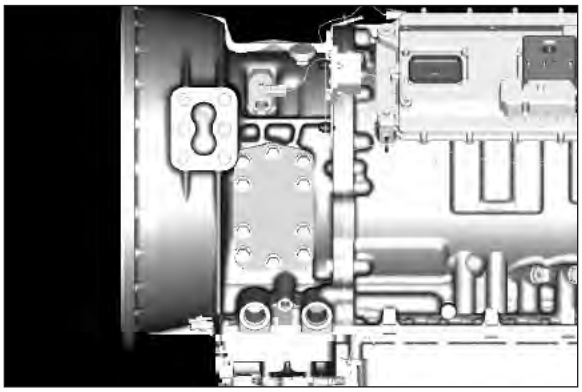

Fig. 1

2. Remove the gasket and clean the aperture surface (**Fig. 2**).

NOTE: Do not reuse the gasket that comes with the transmission.

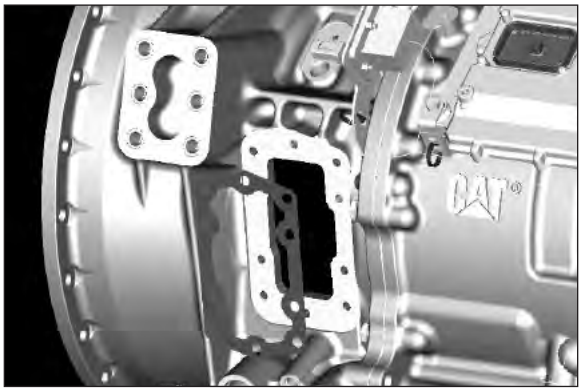

Fig. 2

3. Using a screwdriver, install the guide pins until they bottom out (**Fig. 3**) (see page 34).

NOTE: Do not use sealing compounds because they are generally incompatible with automatic transmission fluid.

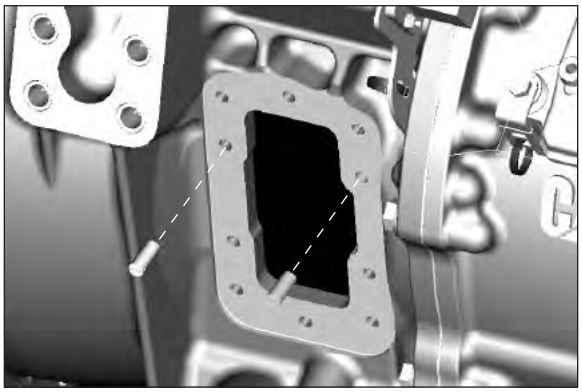

Fig. 3

4. Install the special gasket over the guide pins. The ribbed surface should face outward, toward the installer (**Fig. 4**).

NOTE: To ensure proper backlash and sealing of the P.T.O. to the transmission, only use Gasket furnished with the P.T.O.

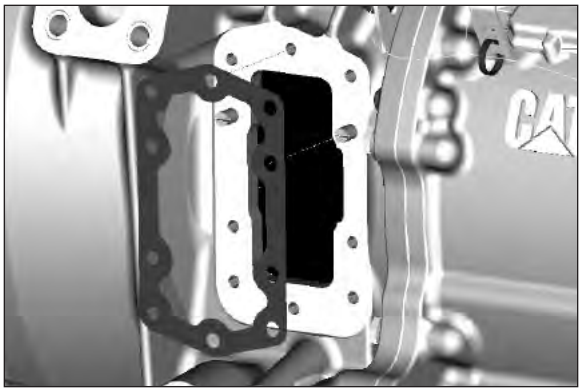

Fig. 4

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Mounting the P.T.O. on the Transmission (Continued)

5. Position the P.T.O. and secure it with the top capscrew provided. (**Fig. 5**)

NOTE: Refer to page 34 for proper capscrew installation for the 269 & 278 Series

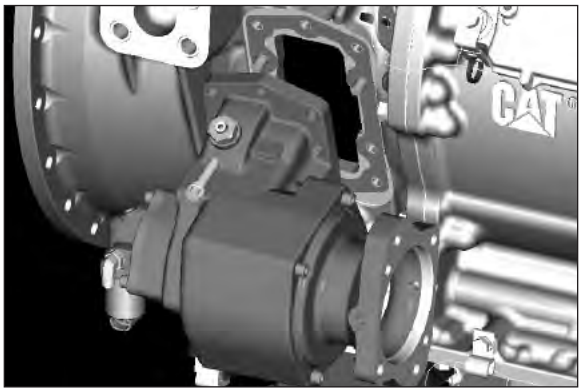

Fig. 5

6. Install the remaining capscrews. Torque them to 37-44 Lbs. ft. [50-60 N.m.] (**Fig. 6**).

Fig. 6

NOTE: There are two (2) high pressure ports available. Use the port located on the driver's side of the transmission unless there is an interference issue with a pump or driven object (**Fig. 7**).

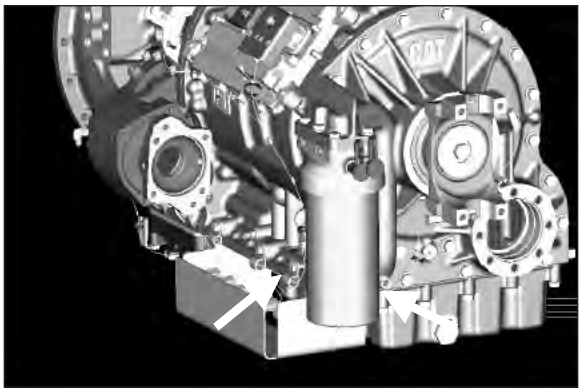

Fig. 7

7. Using the special fitting (379812) to securely attach the high pressure line to the transmission. This fitting is included with the P.T.O. Tighten to 8-10 Lbs. ft. [11.0 - 13.5 N.m.] (**Fig. 8**).

   See the hose chart on page 27 for the correct hose specifications. Tighten hose end fitting 2 flats from finger tight

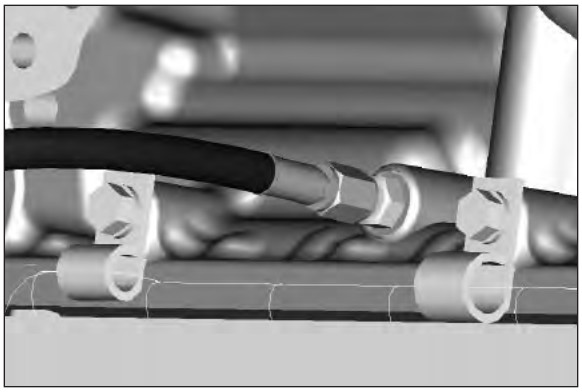
Fig. 8

Mounting the P.T.O. on the Transmission (Continued)

8. Securely attach the high pressure line to the valve. Tighten hose end fitting 2 flats from finger tight (**Fig. 9**).

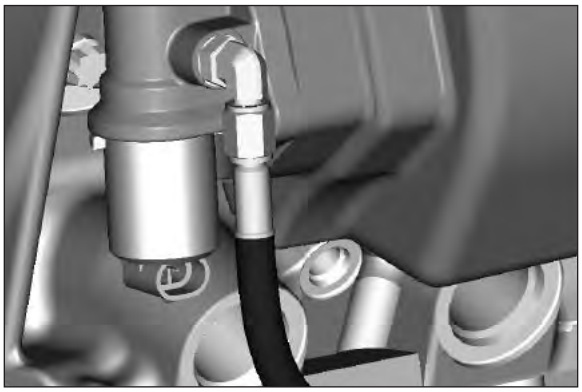

Fig. 9

9. Complete the assembly by installing the electrical connection (**Fig. 10**).

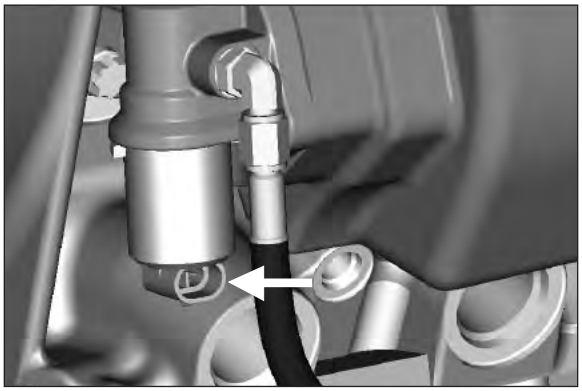

Fig. 10

NOTE: See page 24-26 for electrical connection drawings.

NOTE: If using a rotatable flange, see page 34 for bolt torque.

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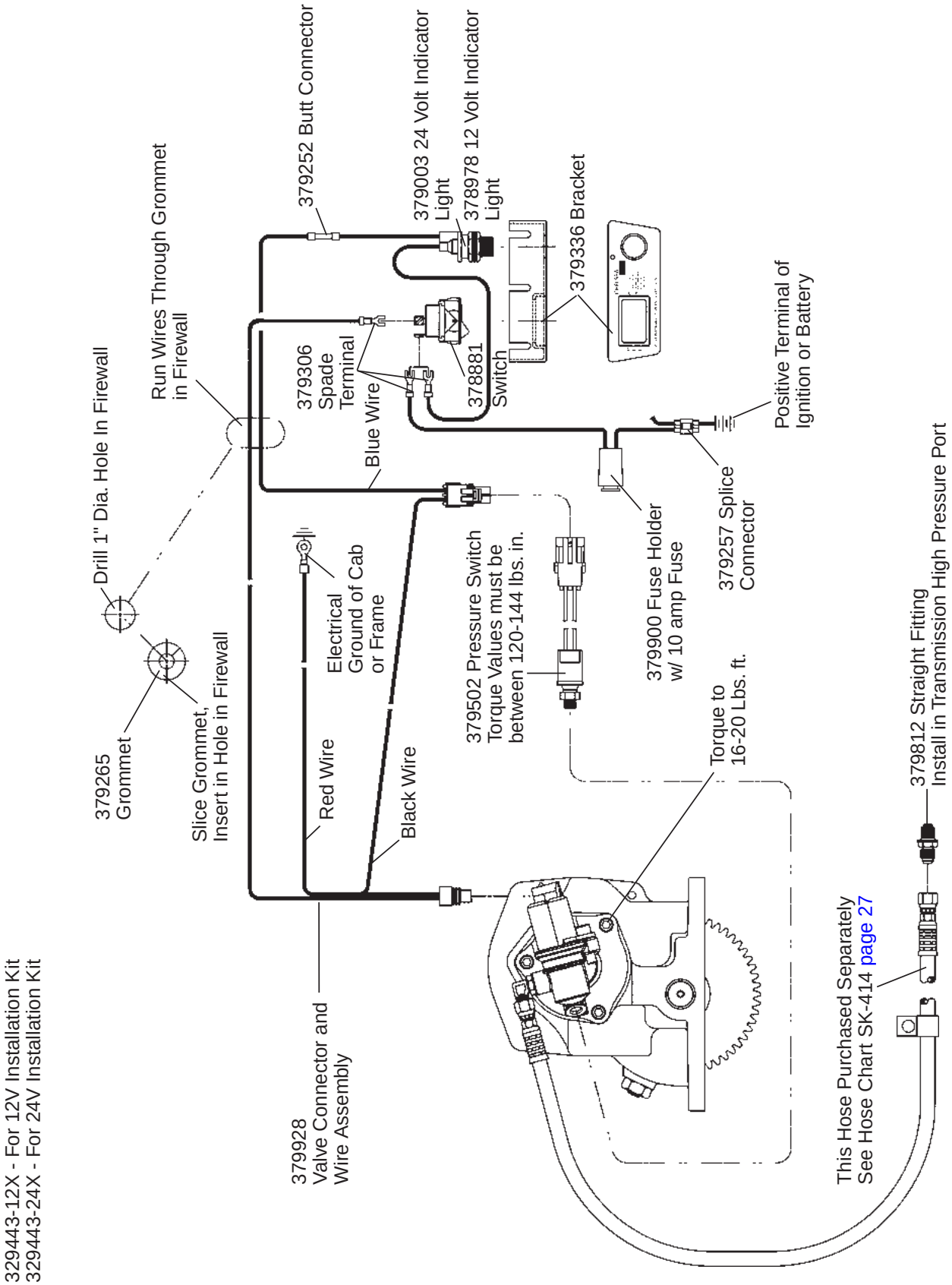
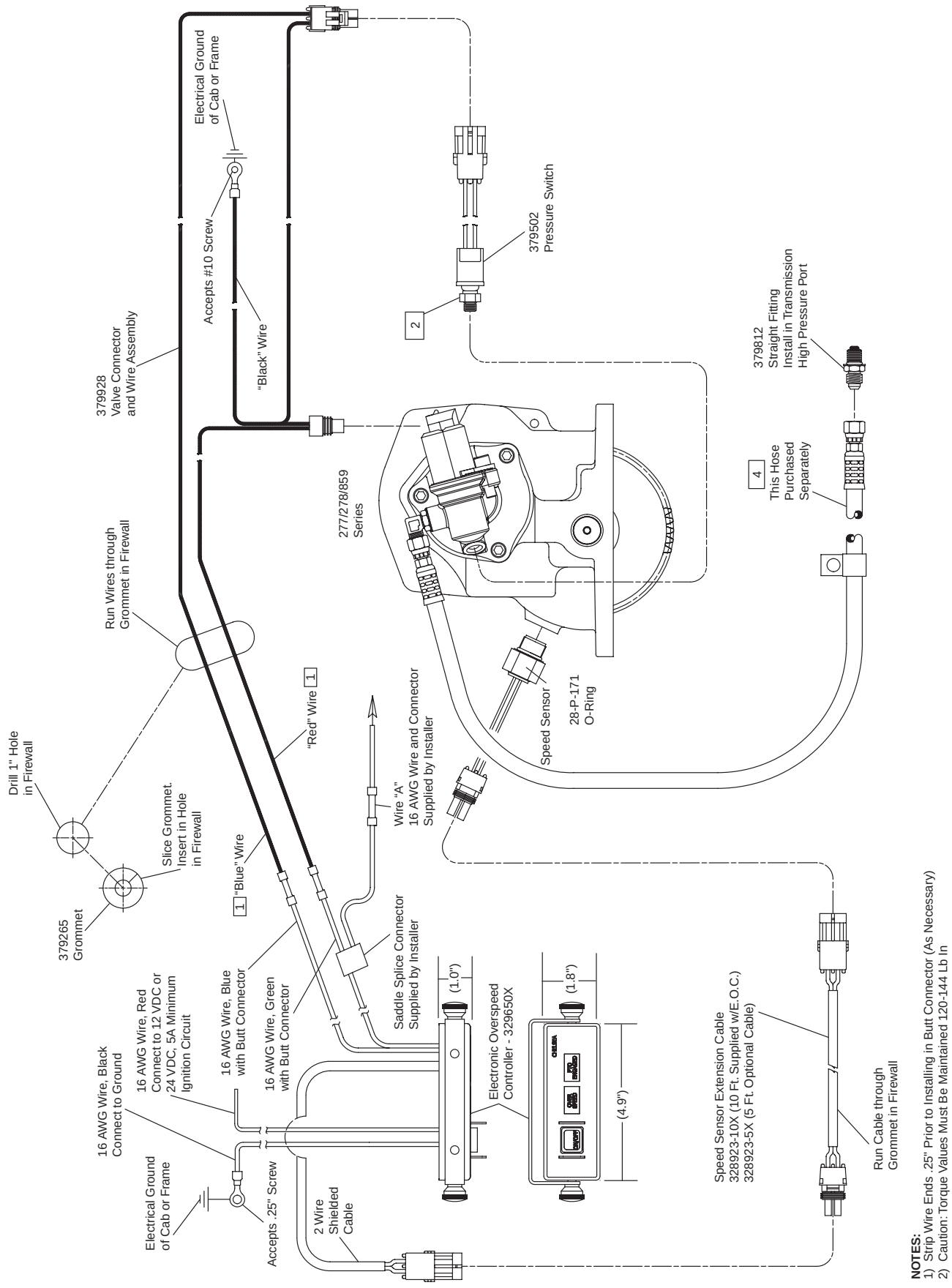
Shift Installation Kit 277, 278 and 859 Series without Electronic Overspeed Control (SK-411 Rev A)



329443-12X - For 12V Installation Kit
329443-24X - For 24V Installation Kit

Electronic Overspeed Control Installation Sketch for 277, 278 and 859 Series (SK-473)



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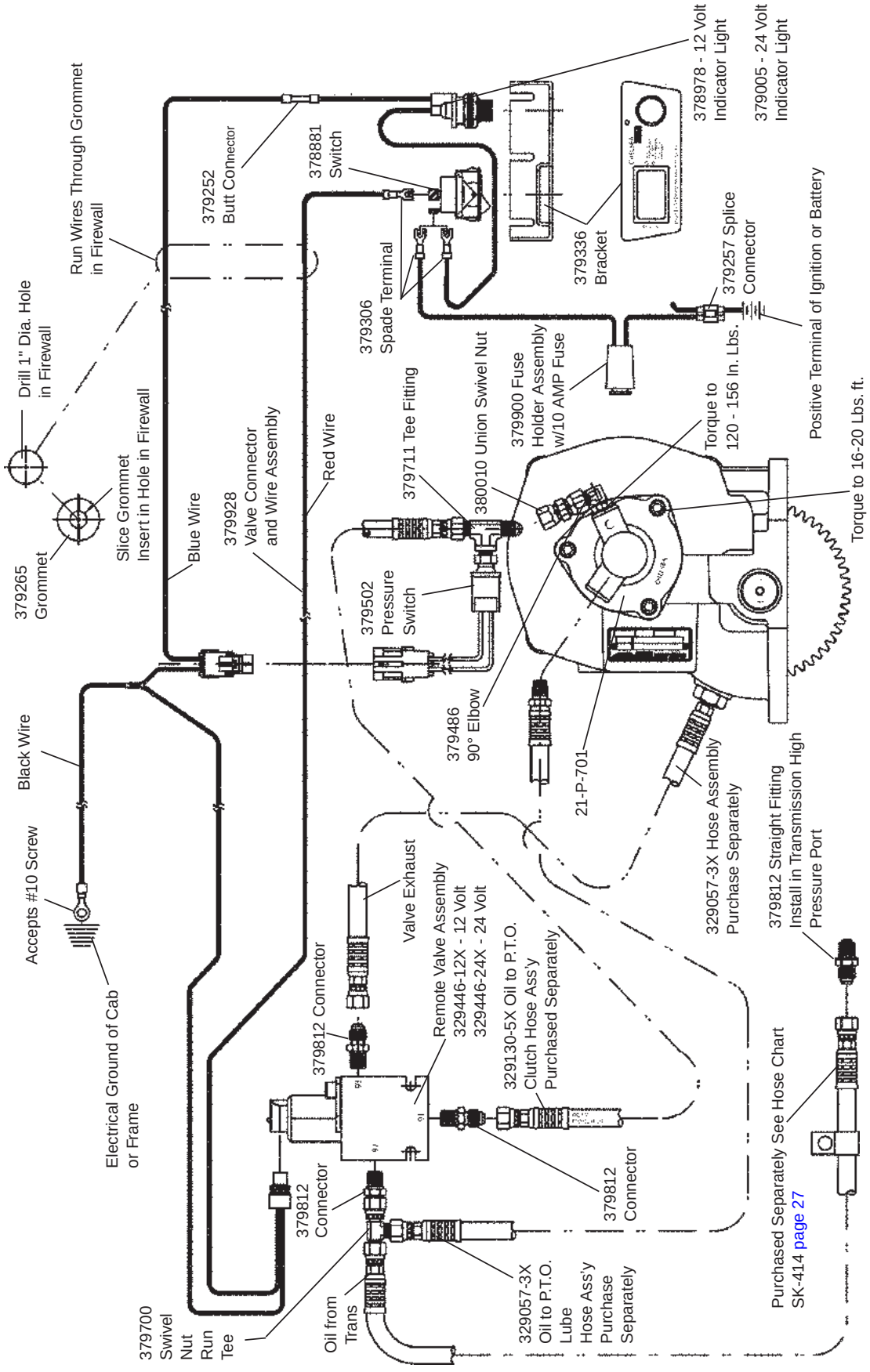
Remote Mount Installation Sketch for 277, 278 and 859 (SK-413 Rev C)



NOTE: This option is not available with, nor can it be used on E.O.C. applications.

329445-12X 12V Installation Kit
329445-24X 24V Installation Kit

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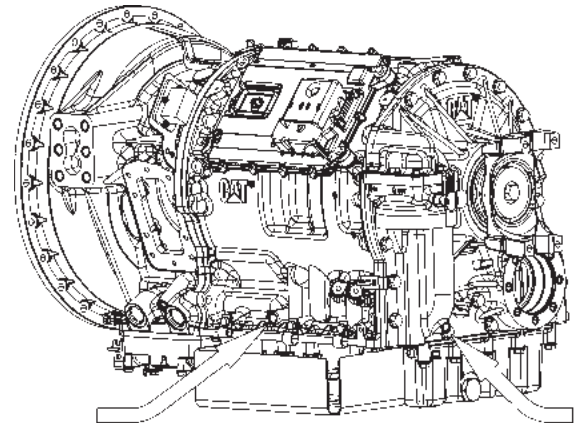
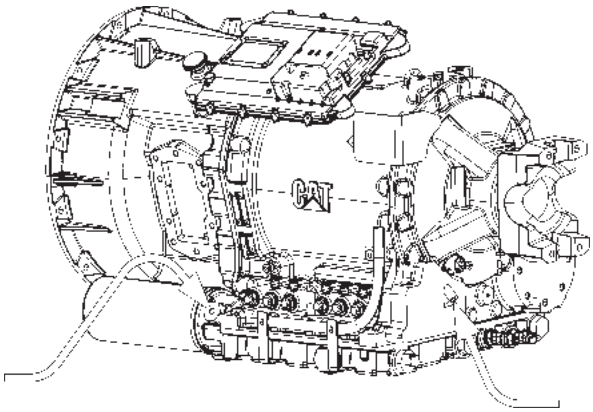
Pressure Port Locations & Hose Chart (SK-414 Rev B)



Left Side Port Rear Port

CX31
(Filter Removed for Clarity)



Left Side Port Rear Port

CX28

Both High Pressure Connections are -4 O-Ring Boss

HOSE CHART							
Trans.	**P.T.O.**	**P.T.O. Location**	**High Oil Pressure Location**	**P.T.O. Valve Location**	**P.T.O. Fitting**	**Trans. Fitting**	**Trans.-P.T.O. Valve Hose #**
CX31 CX28	277, 278 859	Driver (LHS)	LHS	Attached	379486	379812	329075-1X
		Driver (LHS)	Rear				329075-5X
		Pass. (RHS)	LHS				329075-2X
		Pass. (RHS)	Rear			379486	329075-5X
		Driver (LHS)	LHS	Remote	379486	379812	329130-6X
		Driver (LHS)	Rear				329130-6X
		Pass. (RHS)	LHS				329130-6X
		Pass. (RHS)	Rear				329130-6X
	267	Driver (LHS)	LHS	N/A	379486	379812	329130-3X
		Driver (LHS)	Rear			379486	329075-5X
		Pass. (RHS)	LHS			379812	329075-2X
		Pass. (RHS)	Rear			379812	329075-5X
	867	Driver (LHS)	LHS	N/A	379486	379812	329130-3X
		Driver (LHS)	Rear				329075-5X
		Pass. (RHS)	LHS				329075-2X
		Pass. (RHS)	Rear			379486	329075-5X

LHS = Left Side of Transmission, 8 o'clock position
RHS = Right Side of Transmission, 1 o'clock position

NOTES:

1. P.T.O. Fitting 379486 and Transmission Fitting 379812 included with the P.T.O. Unit. If Using 379486 in Transmission it Must be Purchased Separately
2. Hoses to be Purchased Separately
3. 379486 Elbow Will Not Install on Left Hand (Driver) Side Oil Port Due to Transmission Interference
4. If 379486 is Listed as Transmission Fitting for Rear Location, Route Hose Along Right Hand (passenger) Side of Transmission and Under Transmission Output Yoke

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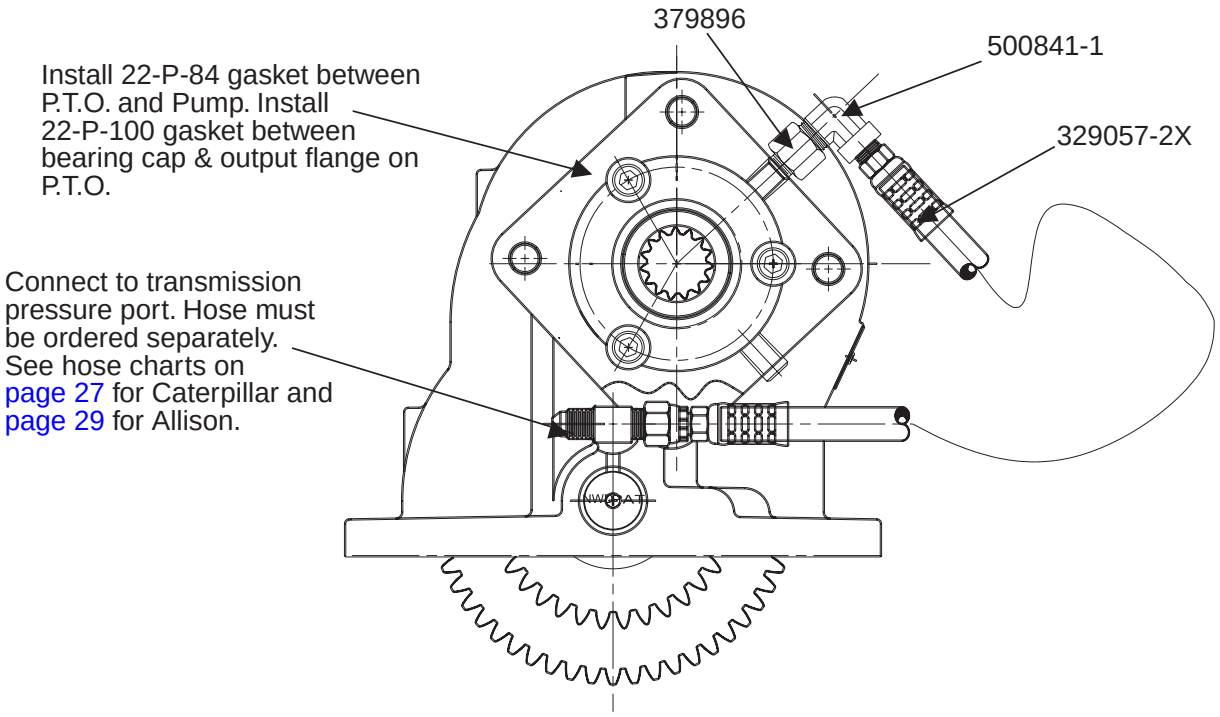
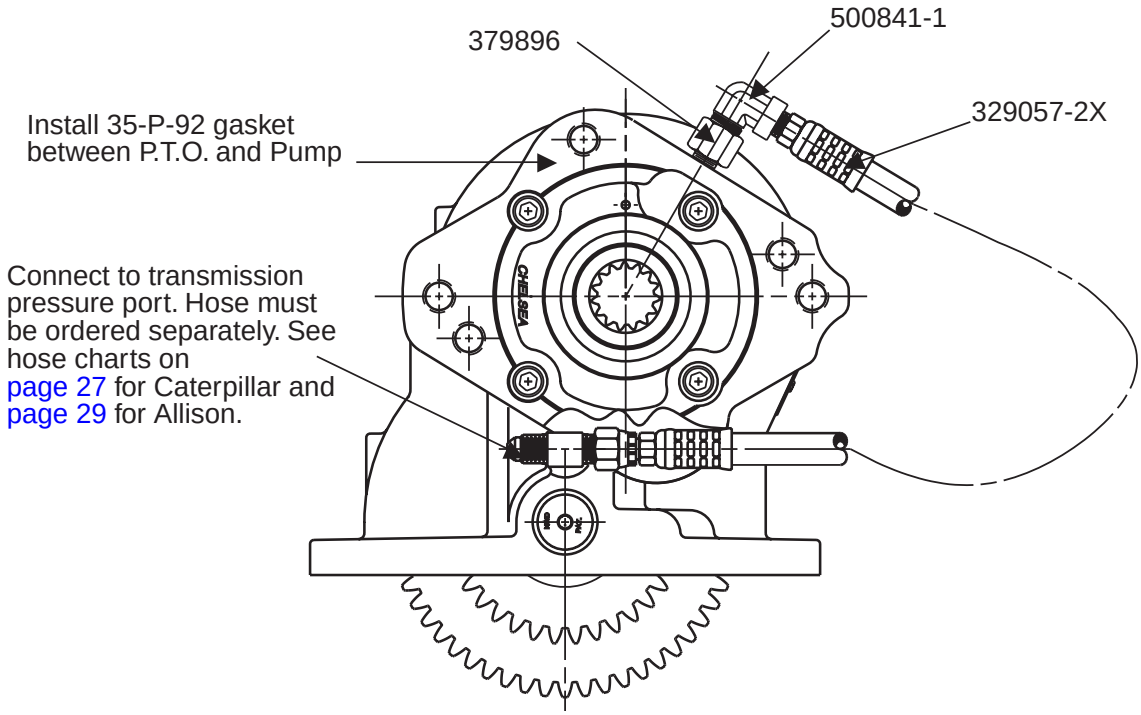
CAUTION: Wet Spline Options Must be used with a Pump that has a Contiguous Sealing surface to Ensure a proper seal between Pump and P.T.O.

Installation "RY" Wet 267 Series (SK-351 Rev C)



Installation "AF" Wet Spline 267 Series (SK-350 Rev C)



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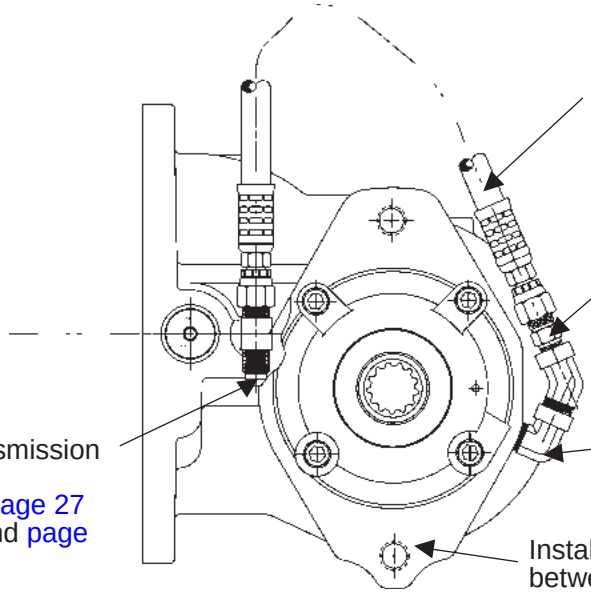
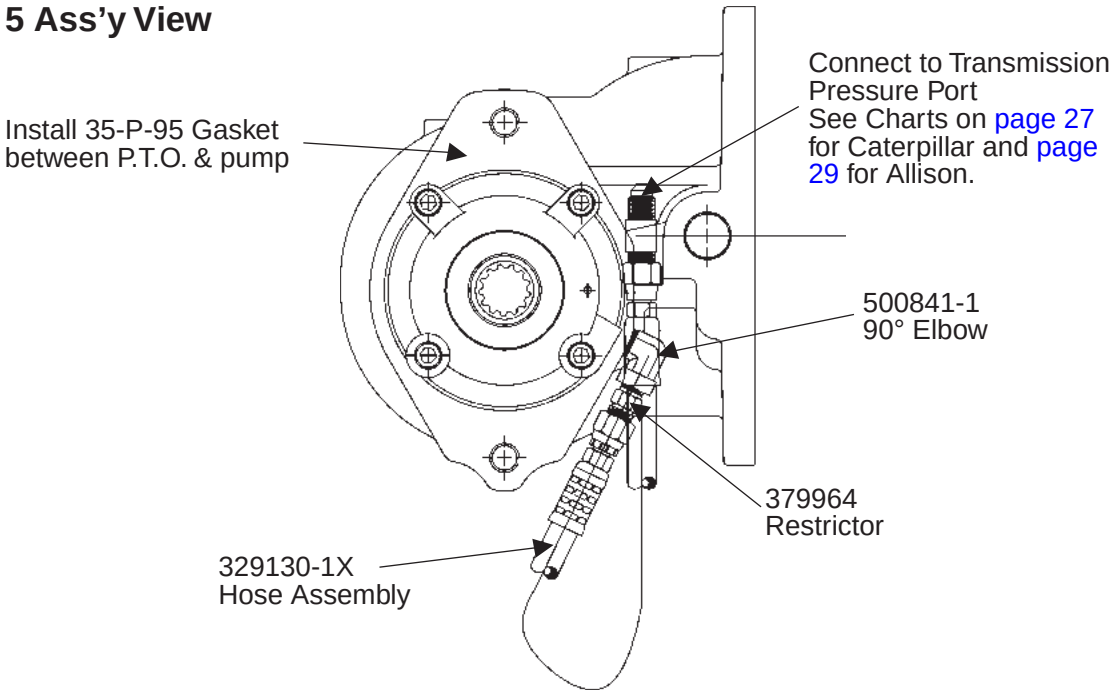
Installation "AK" Wet Spline 267 Series (SK-378 Rev A)

3 Ass'y View



Kit #329406X for Wet Spline
Installation Components

5 Ass'y View



Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-5X
MD	Right	329130-4X
HD	Left	329130-5X
HD	Top Right	329130-8X

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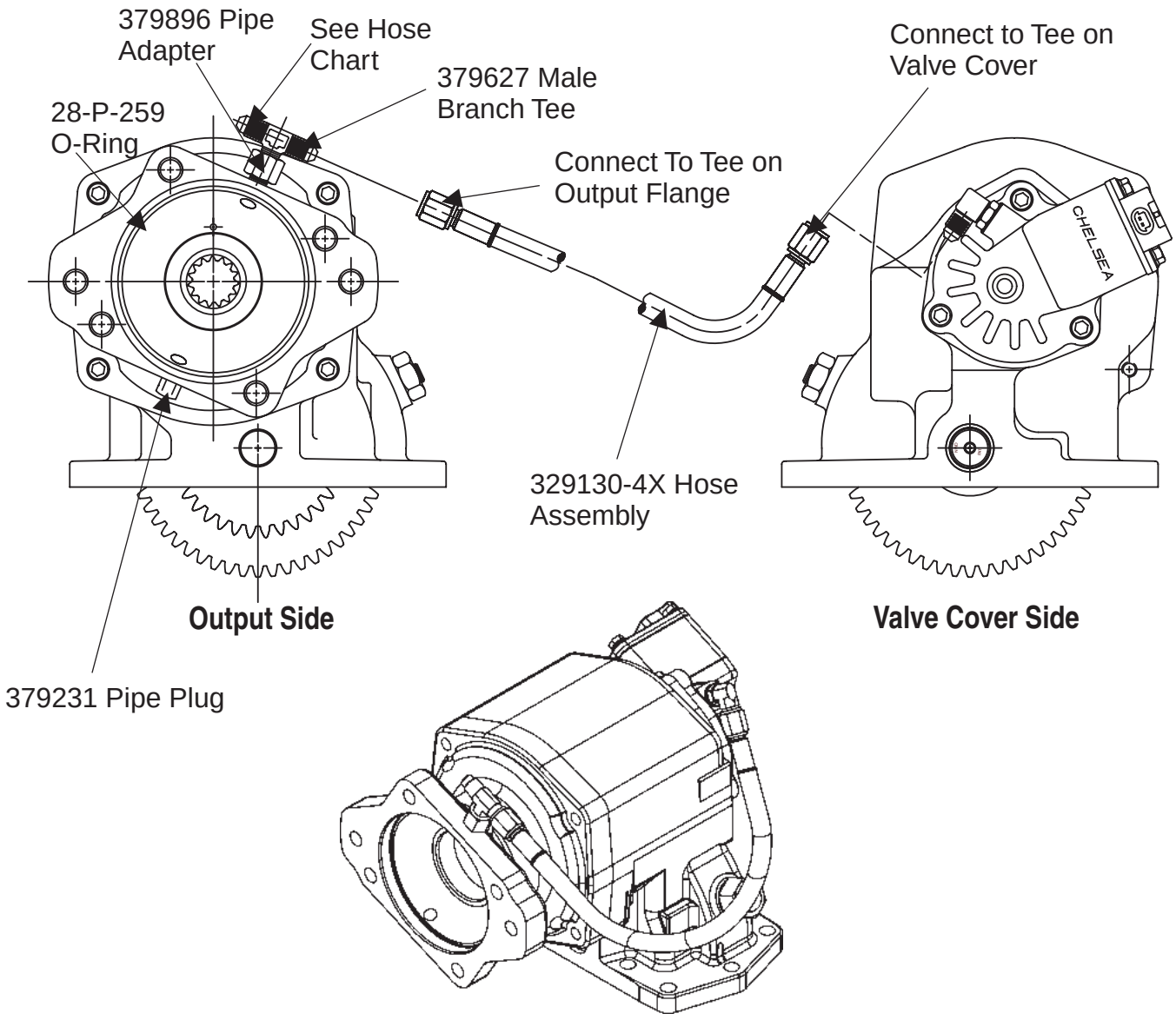
Installation "AF" Wet Spline 277 & 278 Series (SK-383 Rev B) (Old Style)



329337-6X - Wet Spline Installation Kit

Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-1X
MD	Right	329075-1X
HD	Left	329130-1X
HD	Right	329075-2X

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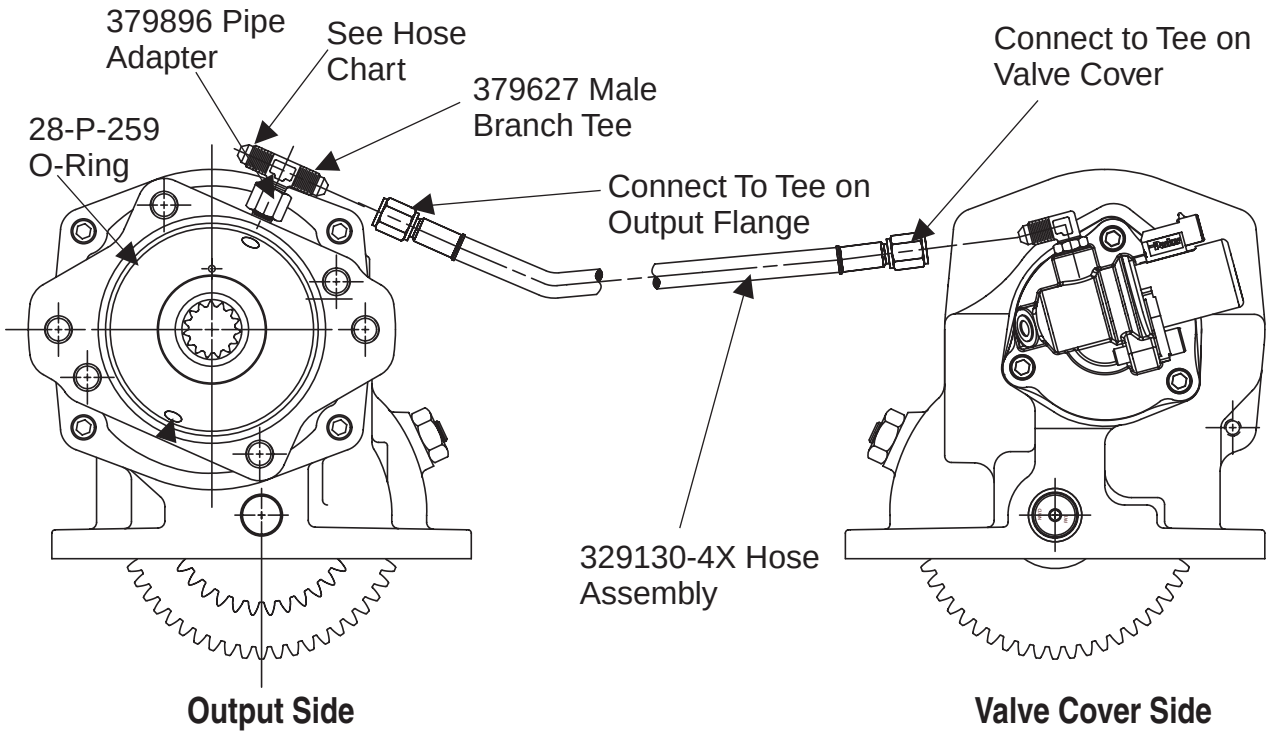
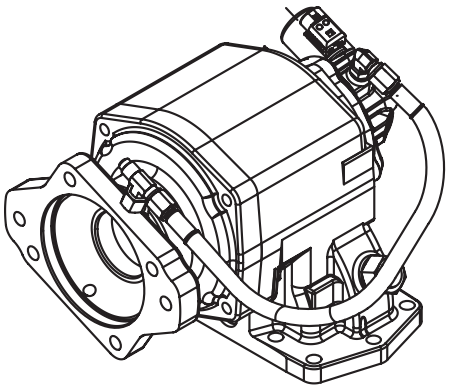
Installation "AF" Wet Spline 277 & 278 Series (SK-383 Rev D) (New Style)





Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-1X
MD	Right	329075-1X
HD	Left	329130-1X
HD	Right	329075-2X

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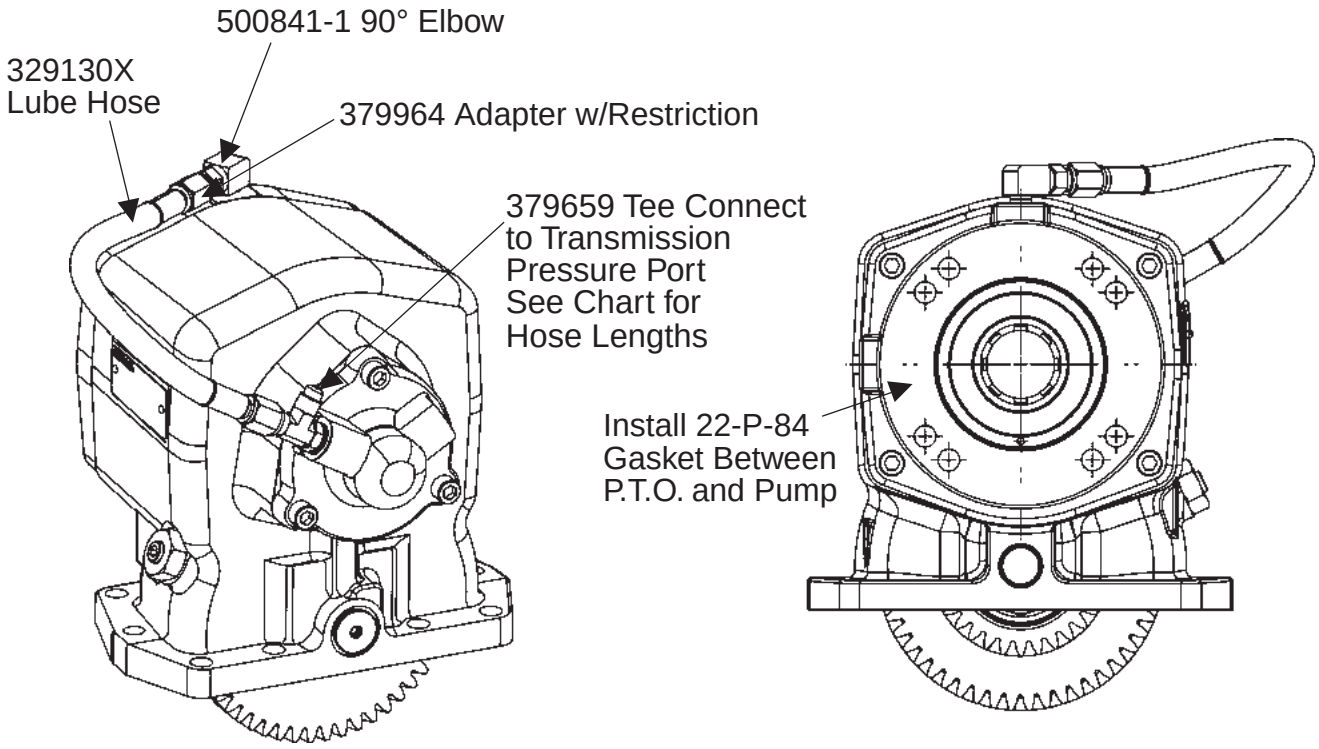
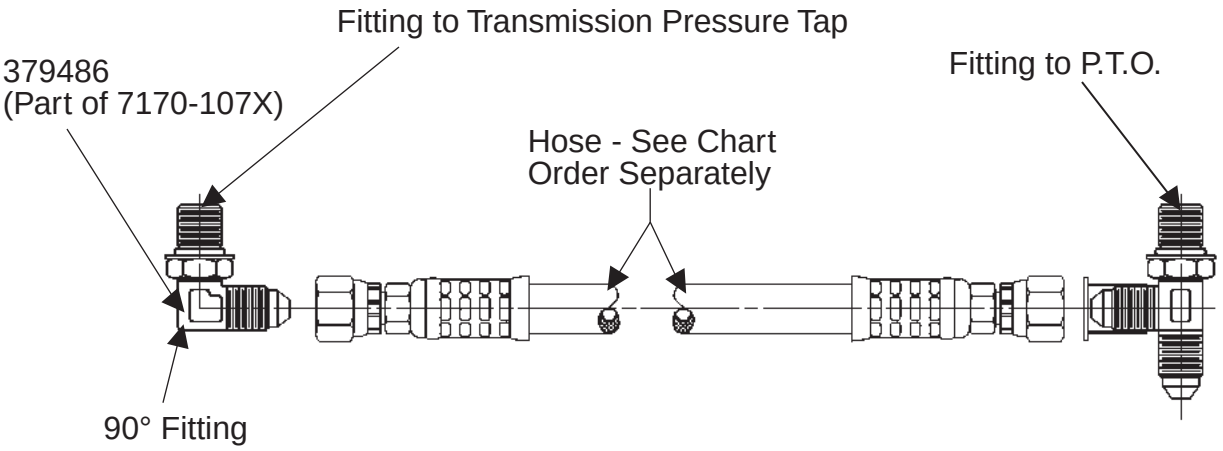
Installation "XY" Wet Spline 269 Series (SK-416 Rev B)





Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-5X
MD	Right	329075-1X
HD	Left	329075-4X
HD	Top Right	329075-2X

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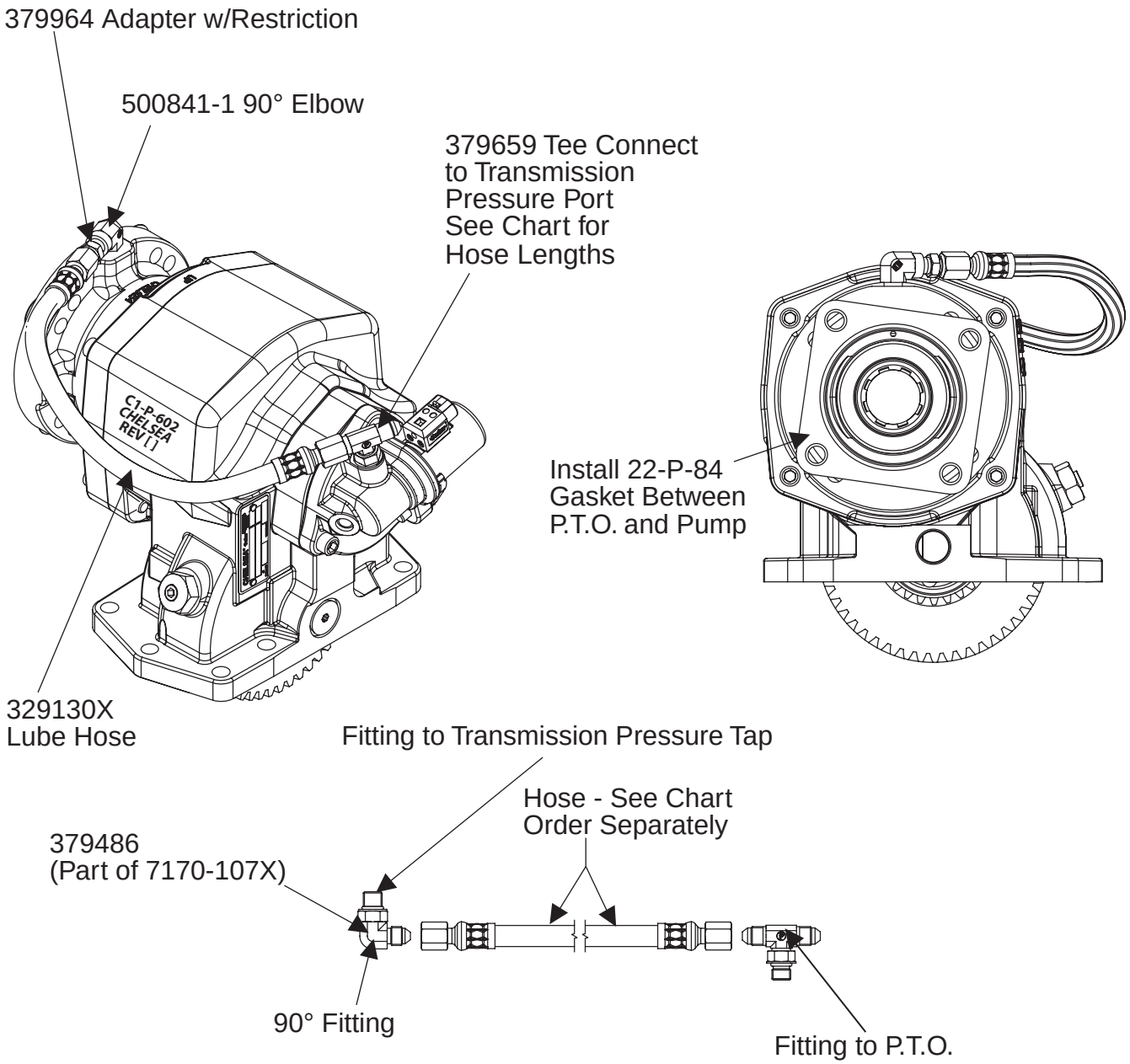
Installation "ZY" Wet Spline 277 & 278 Series (SK-454 Rev A)



Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-5X
MD	Right	329075-1X
HD	Left	329075-4X
HD	Right	329075-2X

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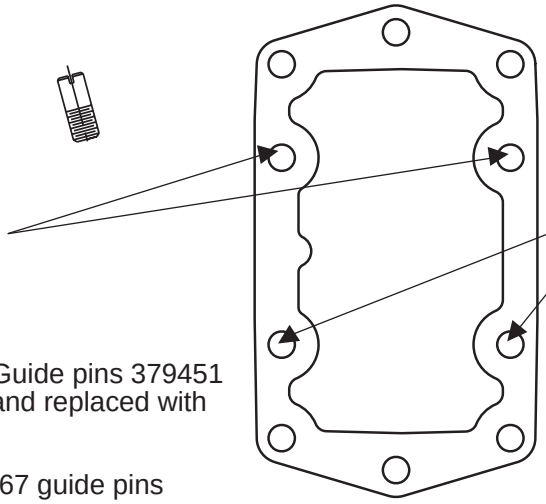
269 & 278 Series Installation Mounting Kit Instructions (SK-355 Rev B)



Dowel Pin Location if installing P.T.O. on Right Side (Curb Side) of Transmission.

Dowel Pin Locations if installing P.T.O. on Left Side (Street Side) of Transmission.

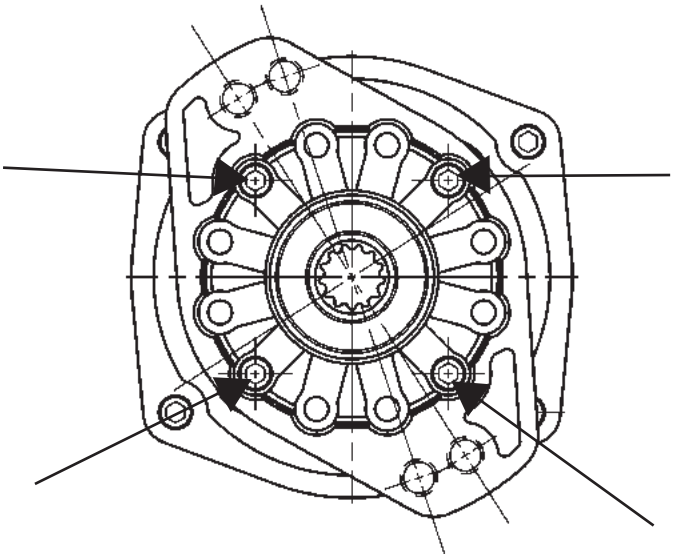
NOTE: P.T.O. Models 269 & 278 Guide pins 379451 may be removed after assembly and replaced with 379453-10 capscrews.

NOTE: Models 267, 277, 859 & 867 guide pins cannot be removed.

NOTE: Install Shorter 379453-8 capscrews Under Barrel of P.T.O. Housing in Either Hole Depending on Housing Orientation.

Installing Rotatable Flanges

The rotatable flange is shipped loose with the P.T.O. units for ease of installation. After determining the flange position, attach the flange to the P.T.O. bearing cap using the capscrews provided in the bag kit. Bag kit number 328170-207X (6-bolt family) will contain (3) capscrews (378447-6) and 328170-208X (277 Series) will contain (4) capscrews for attaching the flange to the P.T.O. bearing cap.
After installing the capscrews make sure to torque the screws to 16-20 Lbs. ft.
Consideration should be taken on the size and weight of the pump being installed. (see pages 3 and 4)



RA Flange Shown

NOTE: Reinstalling or tightening of a rotatable flange after it has become loose is not recommended. If a P.T.O. has run for a length of time after the flange has become loose, the flange and / or bearing cap may not be to manufacturing tolerance.

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P.T.O. Shifting Procedure & Precautions

CAUTION: This vehicle is equipped with a Power Take-Off. Shut engine off before working on the Power Take-Off or getting below the vehicle. Consult the operating instructions before using the P.T.O. (See sun visor.)

POWER TAKE-OFF OPERATION — VEHICLE STATIONARY

Automatic Transmission with Powershift P.T.O.s

Engage the P.T.O. with the engine at idle speed.

NOTE: Powershift P.T.O.s: The engine must be at idle or below 1000 R.P.M. when the P.T.O. is engaged. See the transmission manufacturer's instructions for special procedures.

IMPORTANT:

Failure to follow the proper shifting or operating sequences will result in premature P.T.O. failure with possible damage to other equipment.

Warning: Cold Weather Operation of Powershift P.T.O.s

During extreme cold weather operation [32° F (0° C) and lower], a disengaged Powershift Power Take-Off can momentarily transmit high torque that will cause unexpected output shaft rotation. This is caused by the high viscosity of the transmission oil when it is extremely cold. As slippage occurs between the Power Take-Off clutch plates, the oil will rapidly heat up and the viscous drag quickly decreases.

The Power Take-Off output shaft rotation could cause unexpected movement of the driven equipment, resulting in serious personal injury, death, or equipment damage.

To avoid personal injury or equipment damage:

- Driven equipment must have separate controls.
- Driven equipment must be left in the disengaged position when not in operation.
- Driven equipment must not be operated until the vehicle is allowed to warm up.

This symbol warns of possible personal injury.

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Notes

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Notes

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Power Take-Off Maintenance

Due to the normal and sometime severe torsional vibrations that Power Take-Off units experience, operators should follow a set maintenance schedule for inspections. Failure to service loose bolts or Power Take-Off leaks could result in potential auxiliary Power Take-Off or transmission damage.

Periodic P.T.O. MAINTENANCE is required by the owner/operator to ensure proper, safe and trouble free operation.

Daily: Check all air, hydraulic and working mechanisms before operating P.T.O. Perform maintenance as required.

Monthly: Inspect for possible leaks and tighten all air, hydraulic and mounting hardware, if necessary. Torque all bolts, nuts, etc. to Chelsea specifications. Ensure that splines are properly lubricated, if applicable. Perform maintenance as required.

With regards to the direct mounted pump splines, the P.T.O. requires the application of a specially formulated anti-fretting, high pressure, high temperature grease. The addition of the grease has been proven to reduce the effects of the torsional vibrations, which result in fretting corrosion on the P.T.O. internal splines as well as the pump external splines. Fretting corrosion appears as a "rusting and wearing" of the pump shaft splines. Severe duty applications, which require long P.T.O. running times and high torque may require more frequent regreasing. Applications such as Utility Trucks that run continuously and are lightly loaded also require frequent regreasing due to the sheer hours of running time. It is important to note that service intervals will vary for each and every application and is the responsibility of the end user of the product. Chelsea also recommends that you consult your pump owners manuals and technical services for their maintenance guidelines. Fretting corrosion is caused by many factors and without proper maintenance; the anti-fretting grease can only reduce its effects on components.

Chelsea offers the grease to our customers in two packages. The first is a 5/8 fluid ounce tube (379688), which is included with every applicable P.T.O., and the second is a 14-ounce grease cartridge (379831). Chelsea also offers greaseable shafts for most all output designators.

Warranty: Failure to comply entirely with the provisions set forth in the appropriate Owner's Manual will result in voiding of ALL Warranty consideration.

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Olive Branch, MS 38654 USA

Offer of Sale

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4. Warranty: Seller warrants that certain Products, namely PTOs, SEMs, and Wet Line Kits sold hereunder shall be free from defects in material or workmanship for a period of twenty four months from the date of delivery to Buyer. Seller warrants that certain Products namely Pumps, and Hydraulic Accessories shall be free from defects in material or workmanship for a period of eighteen months from the date of delivery to the Buyer. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

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6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain there/to. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

10/09-P

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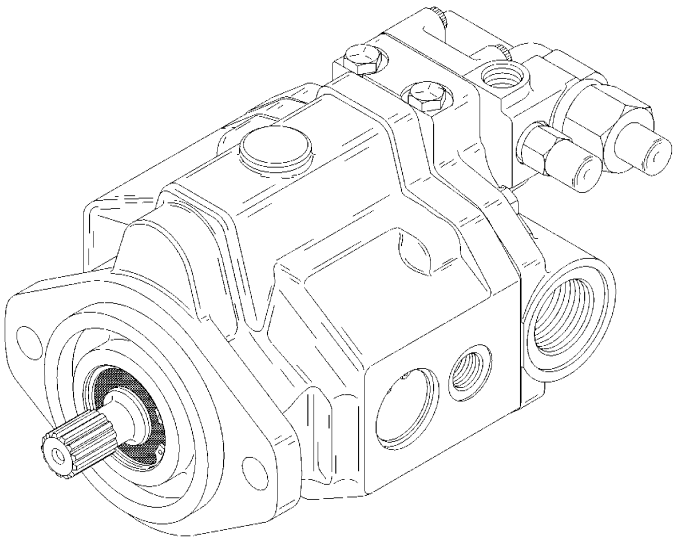
FP 03/10 4.5M

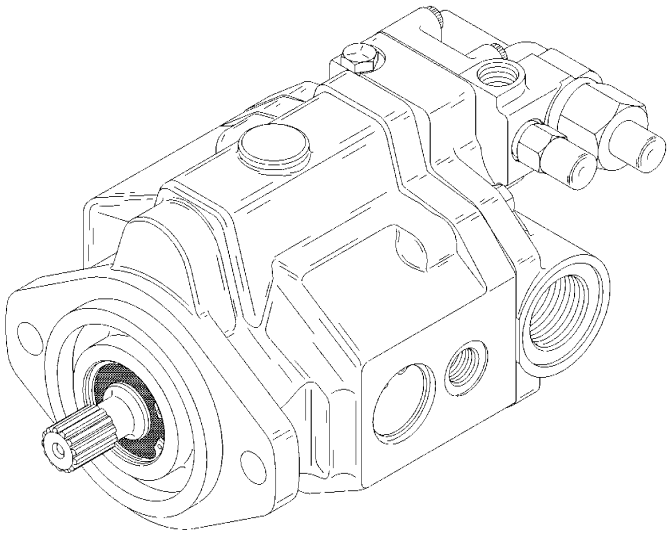
EATON | Hydraulics

Medium Duty Piston Pump

Pressure or Pressure-Flow Compensated Piston Pumps



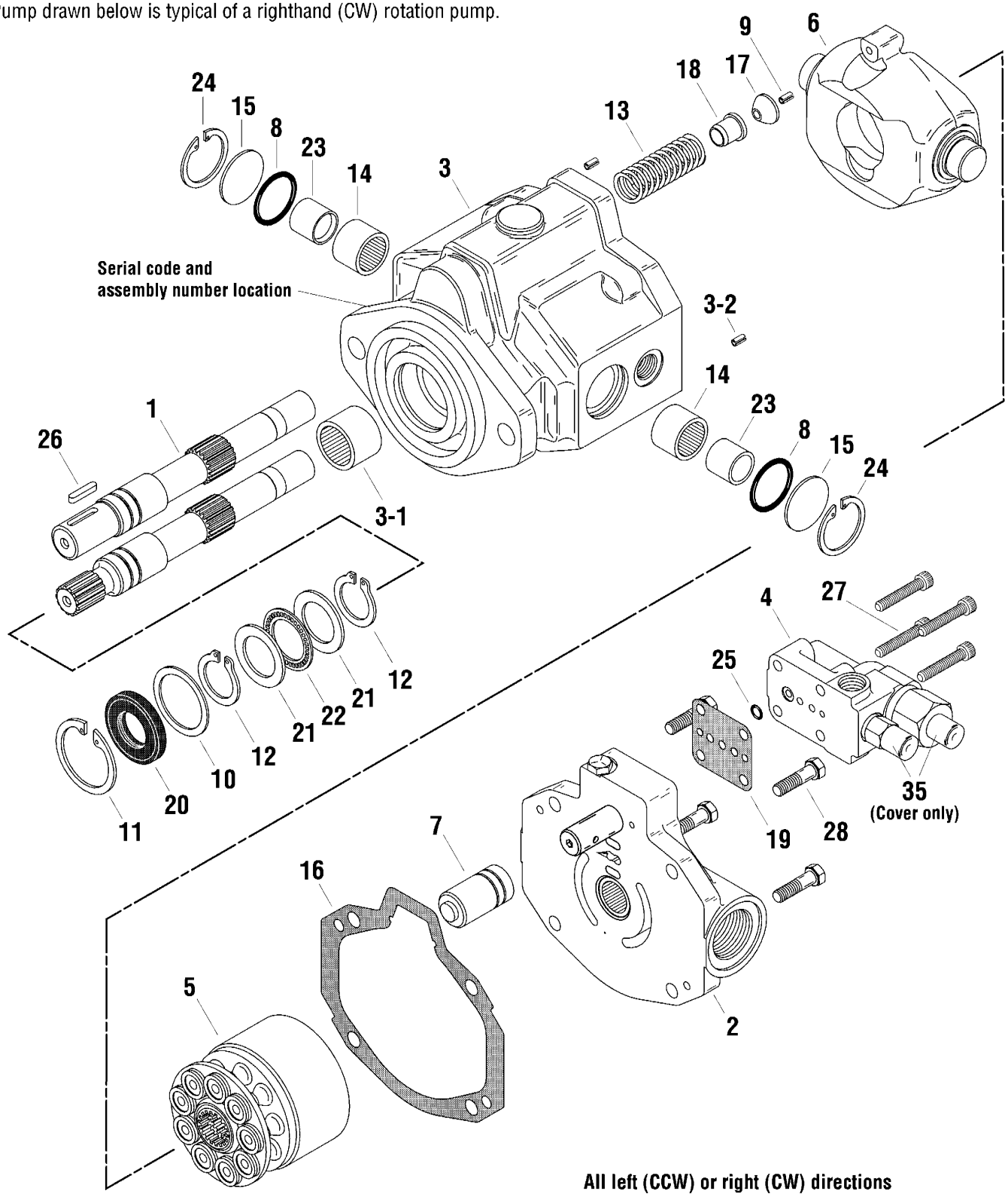
Model 70422 or 70452
0 - 38 cm^3/r [0 - 2.32 in^3/r]
Displacement



Model 70423 or 70453
0 - 45 cm^3/r [0 - 2.77 in^3/r]
Displacement

Parts Drawing

Pump drawn below is typical of a righthand (CW) rotation pump.



All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Parts List

	Item	Part No.	Qty.	Description
	1	◆	1	Drive Shaft (Identification drawing on page #6)
	2	◆	1	Backplate Assembly (Identification drawing on page #7 & 8)
	3	◆	1	Housing Assembly (Identification drawing on page #12)
	3-1	16238-11816	1	Bearing
	3-2	16026-808	2	Roll Pin
	4	◆	1	Compensator Assembly (Identification drawing on page #9, 10, & 11)
	5	◆	1	Rotating Kit Assembly (Parts list on page #12)
	6	70423-605	1	Camplate, 0 - 38 cm^3/r [0 - 2.32 in^3/r] Displacement
	6	70423-610	1	Camplate, 0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement
	7	70421-401	1	Control Piston, 0 - 38 cm^3/r [0 - 2.32 in^3/r] Displacement
	7	70423-418	1	Control Piston, 0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement
+	8	16015-27	2	O-ring, 2.38 mm Dia. x 36.51 mm ID. [.0937 in. Dia. x 1.4375 in. ID.]
	9	16026-608	1	Roll Pin
	10	16048-319	1	Washer
+	11	16077-32	1	Retaining Ring
+	12	16078-18	2	Retaining Ring
	13	17091-14	1	Spring
	14	70412-151	2	Thrust Bearing
	15	70412-607	2	Trunnion Cover
+	16	70412-626	1	Gasket
	17	70420-35	1	Pivot Button
	18	70420-59	1	Spring Collar
+	19	70422-600	1	Gasket
+	20	16253-18	1	Shaft Seal
	20	16253-218	1	Shaft Seal, Drive (fluorocarbon rubber)
	21	74308-100	2	Thrust Bearing Race
	22	74308-101	1	Thrust Bearing
	23	70402-100	2	Inner Race
+	24	16077-26	2	Retaining Ring
+	25	16003-405-90	1	O-ring, 1.59 mm Dia. x 6.35 mm ID. [.0625 in. Dia. x .25 in. ID.]
	26	16246-516	1	Key, Used on 19.05 [.75] diameter shaft
	26	24500-619	1	Key, Used on 22.2 [.875] diameter shaft
	27	16148-412	4	Cap Screw
	28	16032-612	4	Cap Screw
	32	170142-600	1	Cover Plate (In K3 kit)
	33	16032-610	2	Cap Screw, Cover Plate (In K3 kit)
+	34	16007-14	1	O-ring, (In K2 & K3 kit)
	35	70422-618	2	Cover

Mounting Kits (Drawings and parts list on Page #13)

K2	70442-929	1	Gear Pump Mounting Kit (for "A" SAE flange)
K3	70142-915	1	Cover Plate Kit, (for "A" SAE flange)
K6	990596-000	1	Cover Plate Kit, (for "B" SAE flange)
K7	70453-901	1	Gear Pump Mounting Kit, (for "B" SAE flange)

Seal Repair Kit

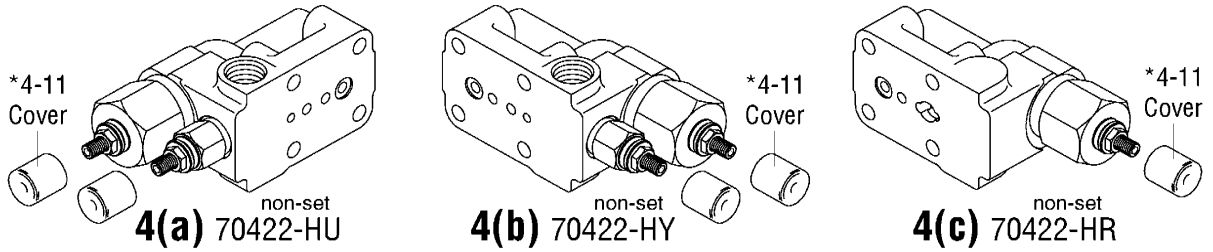
•	70422-915	1	Seal Repair Kit

Legend

◆ Refer to specific item parts list.
\+ Included in seal repair kits listed.

Item 4 - Compensator Assembly

Pressure-Flow Compensator | **Pressure Compensator**

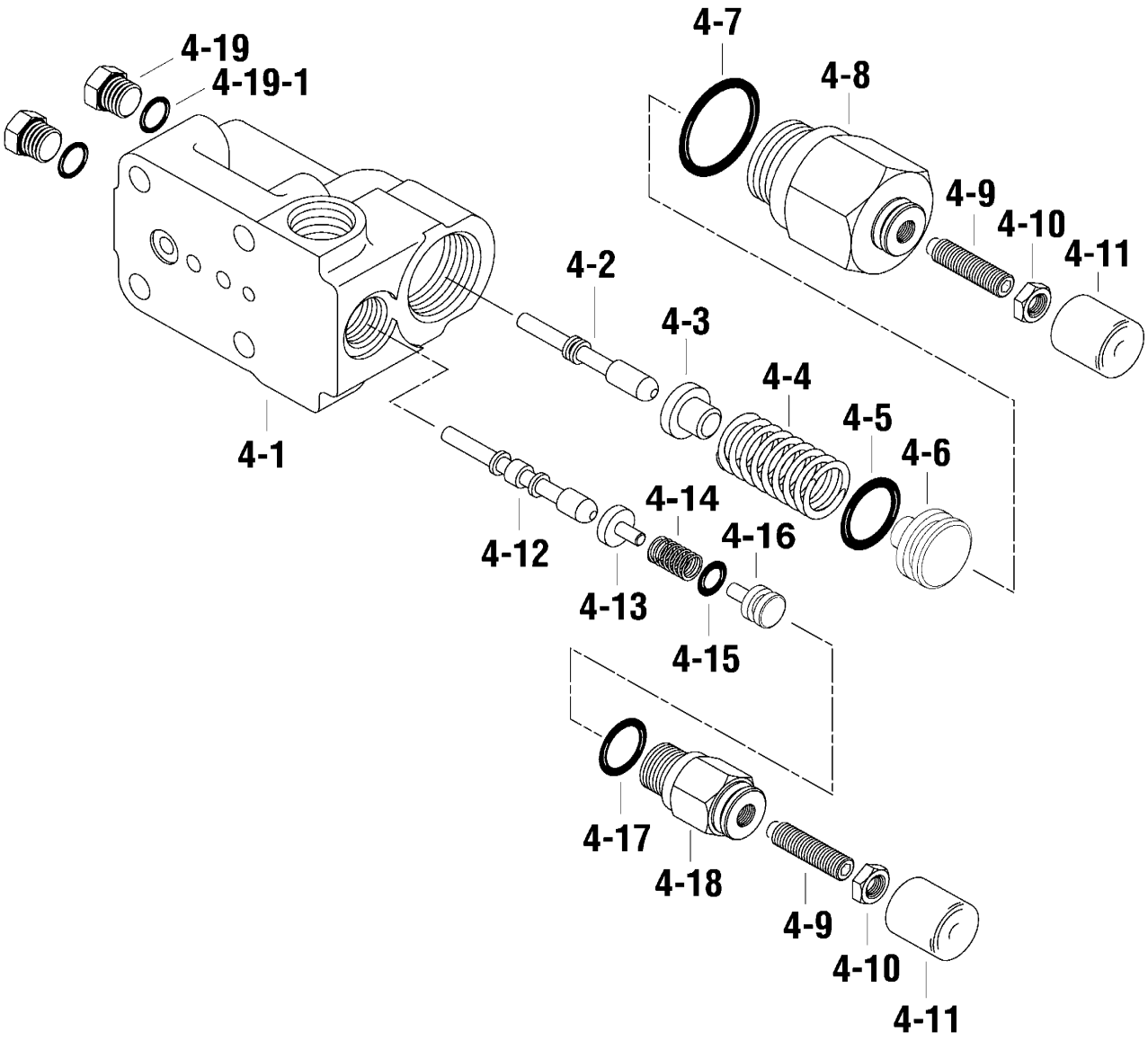


4(a) 70422-HU
Lefthand (CCW) **Pump Rotation**

4(b) 70422-HY
Righthand (CW) **Pump Rotation**

4(c) 70422-HR
Fits Both Pump Rotations
(Righthand (CW) rotation shown)

*4-11, Cover not included with non-set compensator assy.



Item 4 - Compensator Parts List

Item 4 - Parts List (Refer to drawings)

	Item	Part No.	Qty.	Description
	4(a)	70422-HU	1	Non-Set Pressure-Flow Compensator Assembly, Lefthand Rotation
	4(b)	70422-HY	1	Non-Set Pressure-Flow Compensator Assembly, Righthand Rotation
	4(c)	70422-HR	1	Non-Set Pressure Compensator Assembly
	4-**1**	N/S	1	Compensator Body
	4-**2**	N/S	1	Pressure Spool
	4-**3**	70422-405	1	Spring Pivot Cap
	4-**4**	17063-11	1	Spring
+	4-**5**	16003-11	1	O-ring, 2.38 mm Dia. x 14.29 mm I.D. [.0937 in. Dia. x .5625 in. I.D.]
	4-**6**	70421-453	1	Pressure Spring Follower
+	4-**7**	16015-18	1	O-ring, 2.38 mm Dia. x 22.23 mm I.D. [.0937 in. Dia. x .875 in. I.D.]
	4-**8**	70422-606	1	Adjustment Cap, Pressure
	4-**9**	70422-620	1or2	Set Screw
	4-**10**	16024-4	1or2	Nut
	4-**11***	70422-618*	1or2	Cover*
	4-**12**	N/S	1	Flow Spool
	4-**13**	70411-411	1	Spring Pivot Cap
	4-**14**	17029-5	1	Spring
+	4-**15**	16003-4-90	1	O-ring, 1.59 mm Dia. x 5.55 mm I.D. [.0625 in. Dia. x .2187 in. I.D.]
	4-**16**	70421-477	1	Flow Spring Follower
+	4-**17**	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm I.D. [.078 in. Dia. x .468 in. I.D.]
	4-**18**	70422-602	1	Adjustment Cap Flow
	4-**19**	16103-103	2	Plug Assembly
+	4-19-**1**	16133-3	2	O-ring, 1.59 mm Dia. x 7.54 mm I.D. [.0625 in. Dia. x .2969 in. I.D.]

Legend

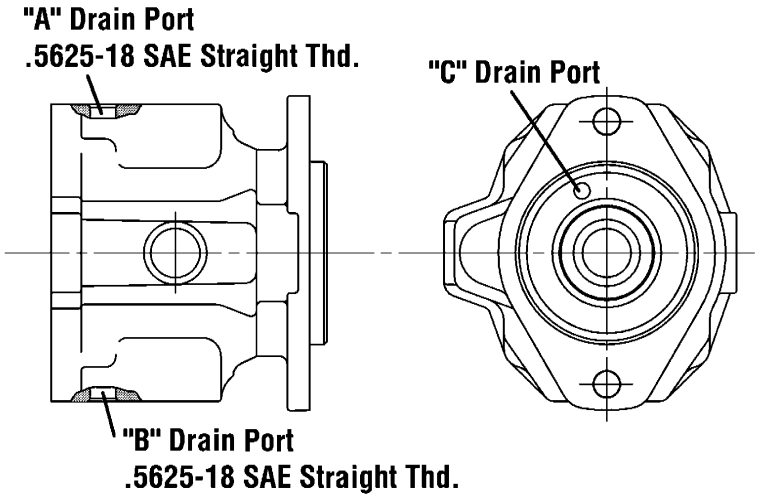
\+ Included in seal repair kit listed on page 5.

NSS Not Sold Separately

* Covers are not included with Non-Set Compensator

Factory Pre-set Compensator Assemblies listed on page #11.

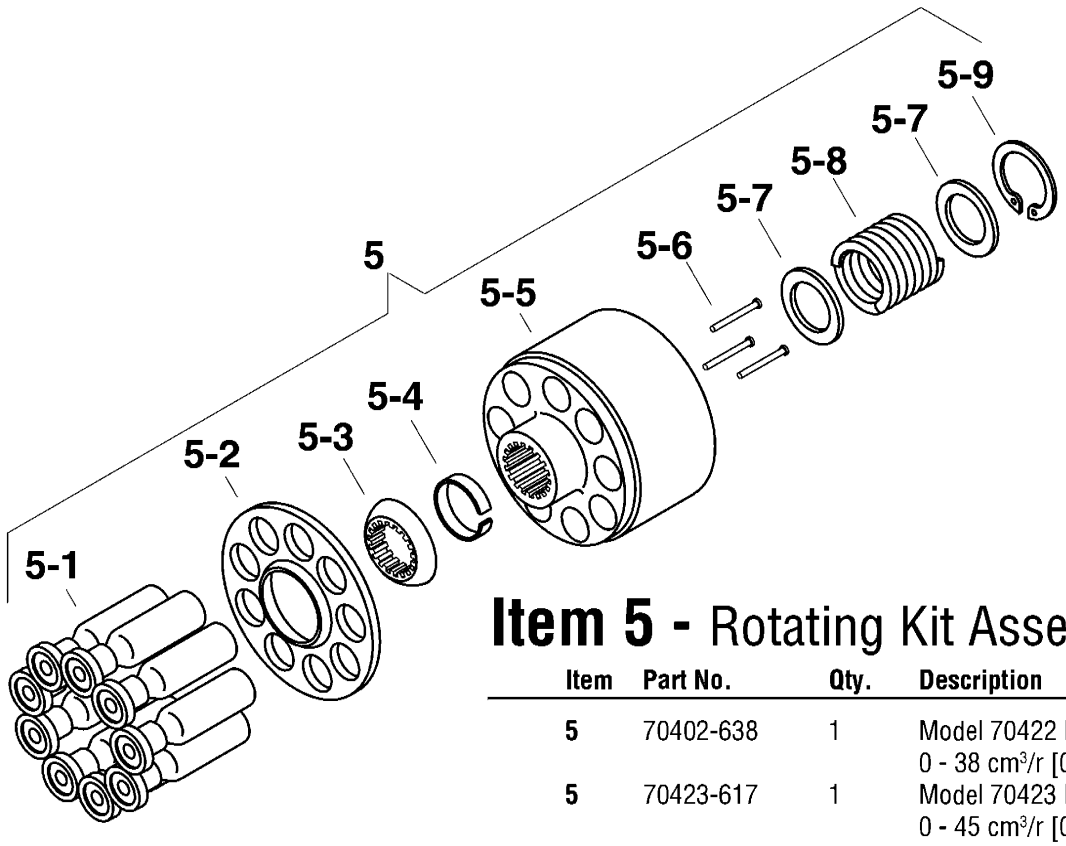
Item 3 - Housing Identification



Item 3

Housing Identification

Item	Part No.	Port Machined
3	70402-**304**	A
	70402-**310**	C
	70402-**336**	B
	70402-**371**	A, B



Item 5 - Rotating Kit Assembly

Item	Part No.	Qty.	Description
5	70402-638	1	Model 70422 Rotating Kit Assembly 0 - 38 cm^3/r [0 - 2.32 in^3/r] Disp.
5	70423-617	1	Model 70423 Rotating Kit Assembly 0 - 45 cm^3/r [0 - 2.77 in^3/r] Disp.
5-**1**	NSS	9	Piston Assembly
5-**2**	NSS	1	Spider
5-**3**	NSS	1	Spider Pivot
5-**4**	NSS	1	Retainer
5-**5**	NSS	1	Piston Block
5-**6**	NSS	3	Pins
5-**7**	NSS	2	Washer
5-**8**	NSS	1	Spring
5-**9**	NSS	1	Retaining Ring

NSS - Not Sold Separately

Repair Information

Cleanliness is extremely important when repairing these pumps. Work in a clean area. Before disconnecting the lines clean port area of pump. Disconnect hydraulic lines and remove pump assembly from vehicle and plug ports. Thoroughly clean the outside of pump. After cleaning, remove port plugs and drain oil.

Disassembly

ATTENTION: Removal of the adjusting screw covers from cap may void the warranty on this assembly.

1 Clamp the end of the drive shaft in a protected jaw vise with the body of the pump up and remove the four allen head screws (14) holding compensator

(4).

2 Remove the compensator assembly (4), 0-ring (28), and gasket (24).

3 Remove the four cap screws (27) from the backplate of the pump.

4 Place a screw driver in slots provided between housing and loosen backplate. Remove backplate (2) and gasket (21) from housing.

5 Remove the control piston (7) remaining on the backplate or in housing. Also remove plug (2-2) from backplate (2).

6 To remove rotating assembly (5) from housing, remove pump from vise and slide rotating assembly off shaft. Caution: pistons may not come out with piston block.

7 Remove pistons (5-1), spider (5-2), and spider pivot (5-3) from piston block (5-5).

8 The piston block assembly (5-5) need not be disassembled unless the internal pins (5-6) or spring (5-8) are damaged.

CAUTION: Use the following procedure if the spring is to be removed from the piston block. The spring (5-8) is highly compressed and the snap ring (5-9) should not be removed without compressing the spring.

The following parts will be needed to disassemble the piston block:

2 ea. 3/8 I.D. x 1-1/8 O.D. flat washer,
1 ea. 3/8 x 3-1/4 N.C. cap screw, and
1 ea. 3/8 N.C. nut.

Place one of the flat washers over the 5/16 cap screw and place this through the center of the piston block. Place the other washer over the cap screw and let it rest on the three pins. Screw the nut on and compress the spring inside the piston block. Use a pair of snap ring pliers and remove the internal snap ring (5-9). Remove the nut and bolt along with the two washers (5-7), three pins (5-6), and the internal pin keeper (5-4).

9 To free shaft seal and shaft, remove retaining ring (12).

10 Remove shaft (1) from housing (3) by tapping backplate end of shaft with a wooden or plastic mallet.

11 Remove shaft seal (17), washer (13), the two retaining rings (10), the two thrust washers (16), and bearing (15) from shaft.

12 To remove the camplate (6) from the housing, remove the two internal retaining rings (11) from the sides of the housing. Remove the two covers (20), the two o-rings (26), the two inner races (19), and the bearings (25). The camplate can now be moved over to one side and removed. The two camplate pivot bearings are a loose slip fit into the housing. Do not be concerned if they are not tight.

13 Remove the spring collar (22) and spring (18). Do not remove the button (23) and roll pin (9) unless they are worn or loose.

14 The pressure-flow compensator assembly (4) may be disassembled for cleaning and inspection.

Repair Information

ATTENTION: Removal of the adjusting screw covers from cap may void the warranty on this assembly.

15 Remove pressure adjustment cap (4-8) from compensator housing (4-1). Pressure spring follower (4-6) will remain in cap (4-8), pull follower from cap.

16 Remove flow adjustment cap (4-18) from compensator housing (4-1). Flow spring follower (4-16) will remain in cap (4-18). Pull follower from cap.

17 Remove springs (4-4 and 4-14) and spring pivots (4-3 and 4-13) from compensator housing.

18 Remove plugs (4-19), pressure compensator spool (4-2), and flow compensator spool (4-12) from compensator housing (4-1).

19 The shaft seal, all 0-rings, and all gaskets should be removed and replaced with new items upon reassembly.

Inspect Parts For Wear

1 Inspect the flat surface of the backplate (2), the finish on the piston block side should be smooth and free of grooves. The piston guide should be tight in the backplate. The needle bearing in the backplate should be free of excessive play and remain in the bearing cage. If the backplate has any of the wear characteristics outlined above, replace complete backplate assembly.

2 Inspect the piston block (5). The surface that contacts the backplate should be smooth and free of grooves.

3 The pistons (5-1) should move freely in the piston block bore. If they stick in the bore, examine the bore for scoring or contamination.

4 Examine the O.D. of the piston (5-1) for finish condition. They should not show wear or deep scratches. The shoes should be a snug fit on the ball end of the piston. The flat surface of the shoes should be flat, and smooth. Do not lap piston shoes.

5 Examine the spider (5-2). It should be flat, no cracks, and no signs of wear in the pivot area.

6 Examine the pivot (5-3). It should be smooth and show no signs of wear.

7 Inspect the camplate (6) for the condition of finish of the polished shoe surface. It should show no signs of scoring.

8 Inspect shaft (1) for wear in bearing and spline areas.

9 Inspect thrust bearing (15) and thrust washers (16) for wear.

10 Inspect the needle bearing in the housing assembly (3). If the needles are free of excessive play and remain in the bearing cage, there is no need to replace the housing.

11 Inspect the compensator springs (4-4 and 4-14) for breakage or weakness.

12 Inspect the spools (4-2 and 4-12) for scoring.

13 It is not necessary to inspect the o-rings, retaining rings, gaskets, or shaft seal as they should be replaced as new items and are included in the seal repair kit available for this assembly.

Reassembly

1 Clean all parts in suitable solvent; lubricate all critical moving parts before reassembly.

2 Install camplate control spring (18) and spring collar (22) in housing (3).

3 Insert camplate (6) into housing (3). Insert needle bearings (25) and bearing inner race (19) over the camplate arms and slide into housing (3). The numbered end of the bearing should face outward and the chamfered I.D. of the race should face inward.

4 Install new 0-ring (26) around O.D. of camplate

Repair Information

pivot bearing (25). Install trunnion covers (20) and secure with retaining rings (11).

5 Install retaining ring (10) on shaft (1). Install thrust washer (16), thrust bearing (15), and second thrust washer (16). Secure with second retaining ring (10).

6 Install shaft (1) in housing (3) and install washer (13), shaft seal (17), and retain with retaining ring (12). Make sure retaining ring is seated in the groove.

7 If piston block assembly was disassembled, compress the pin keeper (5-4), and install in the spline area of piston block. Install the three pins (5-6) with the head end to the inside of the block and install in the special grooves of the piston block spline.

8 Install the washer (5-7), spring (5-8), and second washer (5-7) in the piston block. Use the two 3/8 I.D. washers and the 3/8 x 3-1/4 cap screw to compress the spring and retain with retaining ring (5-9). Remove the 3/8 cap screw and the two washers.

9 Install the pivot (5-3), spider (5-2), and piston assemblies (5-1) in the piston block. Install this assembly in the housing assembly, the piston shoes must be in contact with the camplate. Be sure all the parts are in their proper position.

10 Clamp this assembly in a protected jaw vise with the open end of the housing (3) up.

11 Install new gasket (21).

12 Install control piston (7), and plug (2-2) with new o-ring onto backplate. Note roll pin (3-2) locations.

13 Install backplate (2) and retain with cap screws (27). Torque to 37 to 42 N-m [27 to 31 lb-ft].

14 Place new o-ring (4-19-1) on plug (4-19). Install plug assembly, flow compensator spool (4-12), spring pivot (4-13), spring (4-14), flow spring follower (4-16) with new o-ring (4-15), and flow adjustment cap (4-18) with new o-ring (4-17) into compensator housing (4-1). Torque plug (4-19) 8 to 11 N-m [6 to 8 lb-ft] and torque flow adjustment cap (4-18) 14 to 16 N-m [10 to 12 lb-ft].

15 Place new 0-ring (4-19-1) on plug (4-19). Install plug assembly, pressure compensator spool (4-2), spring pivot (4-3), spring (4-4), pressure spring follower (4-6) with new o-ring (4-5), and pressure adjustment cap (4-8) with new o-ring (4-7) into compensator housing (4-1). Torque plug (4-19) 8 to 10 N-m [6 to 8 lb-ft] and torque pressure adjustment cap (4-18) 47 to 54 N-m [35 to 40 lb-ft].

16 Install new gasket (24) and new o-ring (28), then install compensator assembly (4),and retain with four allen head cap screws (14) and torque to 14 to 16 N-m [10 to 12 lb-ft].

17 Plug ports to preserve cleanliness until installation on vehicle. (Refer to start up procedures.)

Start - up Procedure

When initially starting a rebuilt load sensing system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the pump which might occur if the system was not properly purged with oil before start-up.

1 After the pump has been properly installed onto the machine and all hydraulic connections have been made, check all fittings to make sure that they are tight.

2 Fill the pump housing at least 1/2 full with system oil that has been filtered through a 10 micron filter.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Leave the filler cap loose as a means of air that is trapped in the system.

4 Note on gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds. This procedure enables the pump to pick-up the oil before start-up. At this time disconnect the sensor line from the pump compensator and pull one of the valve spools while the engine is being turned over. This allows oil to flow through the sensor line, thus, removing any air in the sensor line. Reconnect the sensor line after a steady flow of oil is coming from the line.

5 Replace the coil wire or return the fuel flow to the injectors and start the engine. Run at low idle speed for one minute. The pump should immediately pick up oil and go into low pressure standby. If there is no indication of fill in 30 seconds, stop engine and determine the cause.

6 After the pump has stabilized in low pressure standby, operate the control valve and steering, if the system is equipped with one, to purge the system of air and to fill the cylinders with oil. Continue operating the system slowly with no load until it responds fully.

7 Check fluid level at the reservoir and refill if necessary to the proper level at the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks tighten if necessary.

9 The machine is now ready to be put into operation.

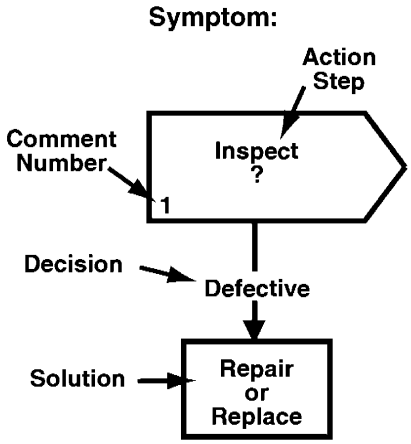
10 Short hour filter changes are recommended for the first two changes after placing the machine back into operation. The first filter would be changed in 3-5 hours and the second at approximately 50 hours. Routine scheduled filter changes are recommended for maximum life of hydraulic system.

Fault - Logic Troubleshooting

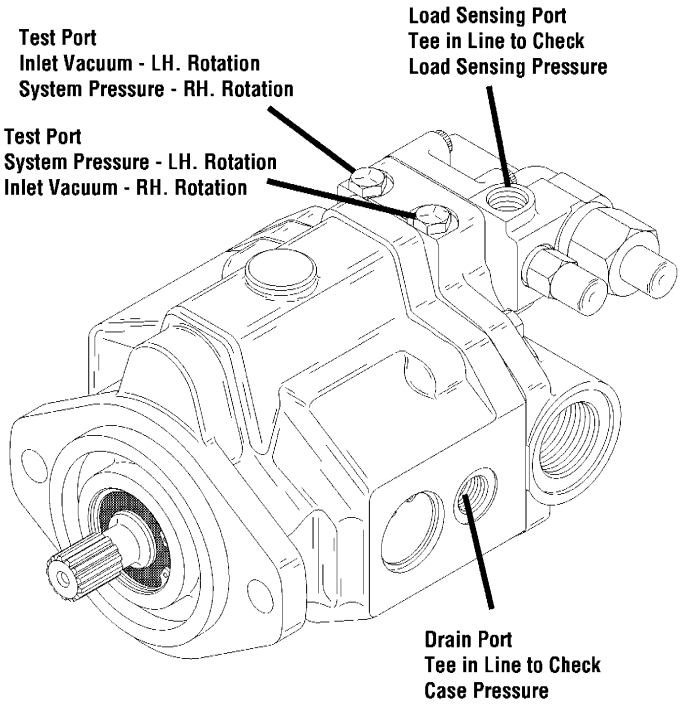
This fault - logic troubleshooting guide is a diagnostic aid in locating pump problems.

Match the pump systems with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

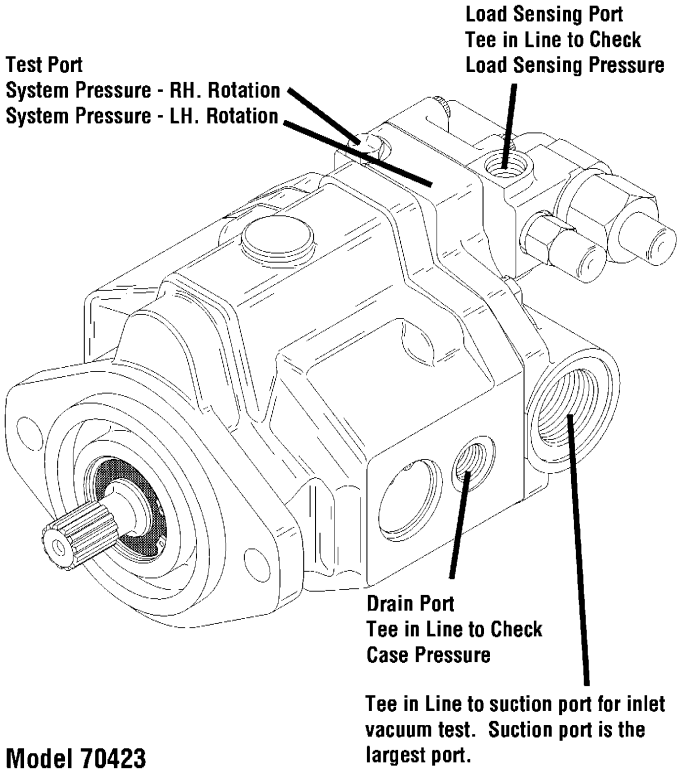
Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.



Recommended Gauge Locations



Model 70422
0 - 38 cm^3/r [0 - 2.32 in^3/r] Displacement



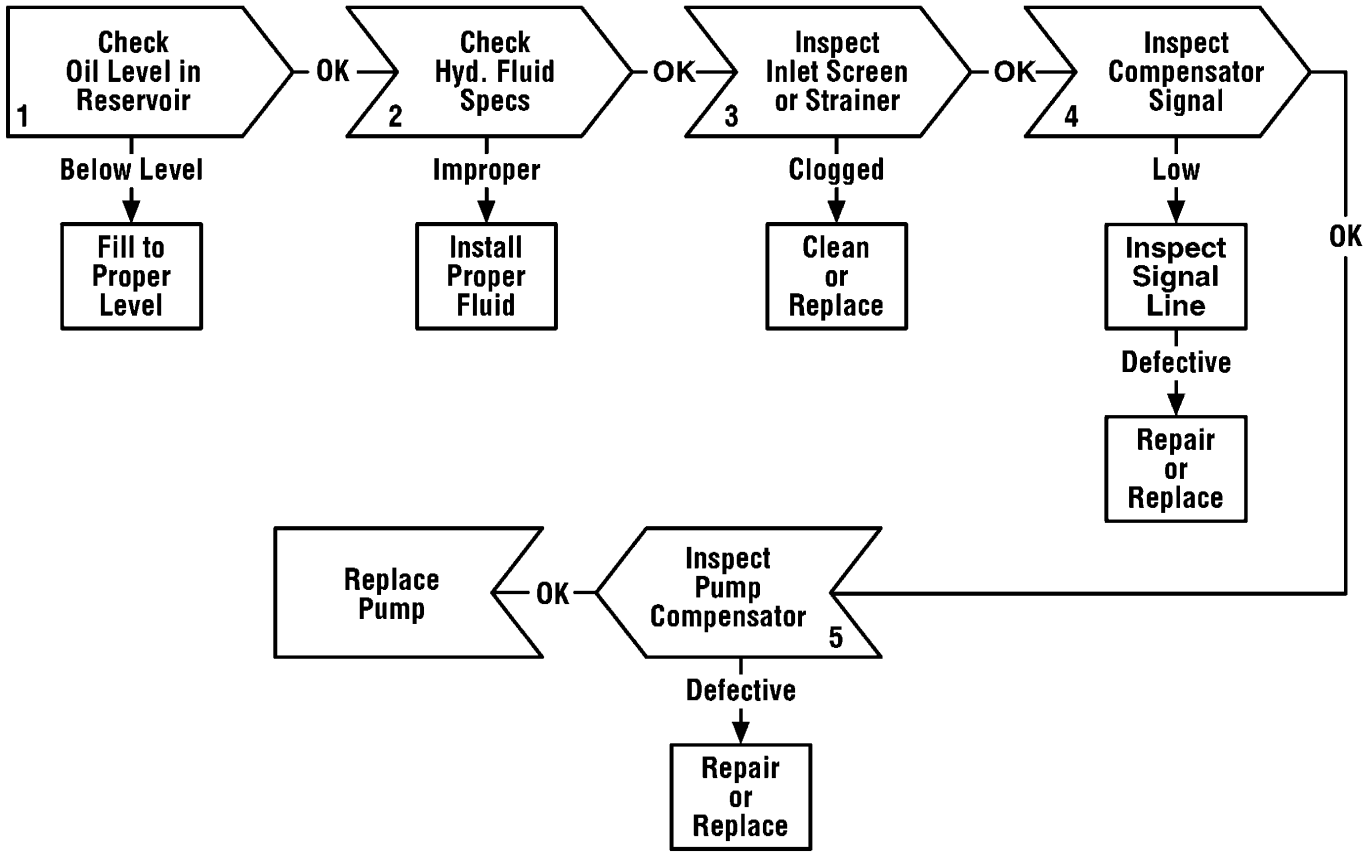
Model 70423
0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement

Gauges Recommended

Inlet vacuum gauge: 2 bar to 1 bar [30 PSI to 30 inHg]
System pressure gauge: 700 bar [10,000 PSI]
Case pressure gauge: 0 to 25 bar [0 to 300 PSI]

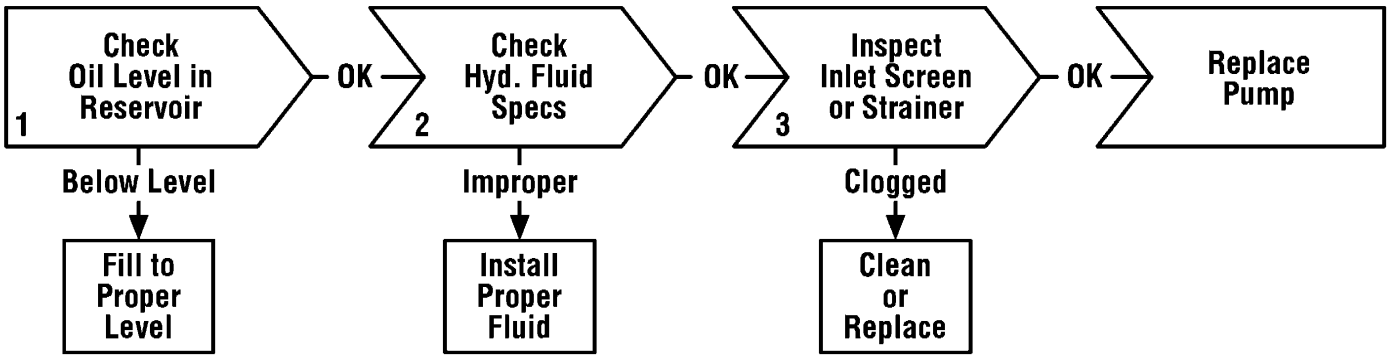
Fault - Logic Troubleshooting

Symptom:
System will not Develop Proper Pressure or Flow



Fault - Logic Troubleshooting

Symptom: Pump Noisy or Overheating



Fault - Logic Troubleshooting

Diagram Action Step Comments

1. **Check Oil Level in Reservoir:**
   A. Fill to proper level.

2. **Check Hydraulic Fluid Specifications:**
   A. Consult owner/operators manual for the proper type fluid.

3. **Inspect Inlet Screen or Strainer for:**
   A. Suction screen or strainer plugged.
   B. Suction line to small or too long
   C. Suction line collapsed or plugged.

4. **Inspect Compensator Signal for:**
   A. Improper size or length of signal line.
   B. Damaged or obstructed signal line

5. ***Inspect Pump Compensator for:**
   A. Misadjusted pressure or flow setting.
   B. Pressure or flow spool stuck open.
   C. Pressure or flow spring weak or broken.

***Standard factory compensator pressure settings**

A. Pressure compensator set at 3000 to 3100 PSI (Optional settings of 1500 min. to 3100 max. PSI)
B. Flow compensator set at 190 to 210 PSI (Optional settings of 190 min. to 450 max. PSI)

H10025 Series Crane

Maintainer Corp. of Iowa

SAFETY NOTICE

For the safety of the crane and those around it, we recommend periodic inspections of the crane overload protection system. The overload system should not be set to lift more than the rated load, listed on the crane-specific load chart.

The crane is set to lift 100% of the rated load. We recommend to test the overload system, making sure it does not lift more than 100% of rated load after the initial 30 hours of operation and periodically thereafter. Please contact the manufacturer for recommendations and specifications.

Maintainer Corp. of Iowa
1701 S. 2nd Ave
P.O. Box 349
Sheldon, IA 51201
1-800-831-8588

3/14/12

! WARNING !

CRANE LOAD CHART RATINGS ARE NOT LIFTING STABLITY RATINGS FOR THE VEHICLE.

DEATH OR INJURY

- **NEVER** **LIFT A LOAD THAT CAUSES THE VEHICLE TO BECOME UNSTABLE.**
- **ALWAYS** **HAVE THE OUTRIGGERS FULLY EXTENDED AND DOWN ON A FIRM SURFACE.**
- **ALWAYS** **HAVE THE VEHICLE LEVELED.**
- **ALWAYS** **BE IN FULL VIEW OF THE VEHICLE AND THE LOAD BEING LIFTED.**

IN THE EVENT THE VEHICLE BECOMES UNSTABLE, LIFTING SHOULD BE STOPPED AND THE LOAD SHOULD BE LOWERED IN THE SAME MANNER IT WAS LIFTED, AND THE VEHICLE SHOULD BE REPOSITIONED SO THAT TIPPING OR INSTABILITY DOES NOT OCCUR.

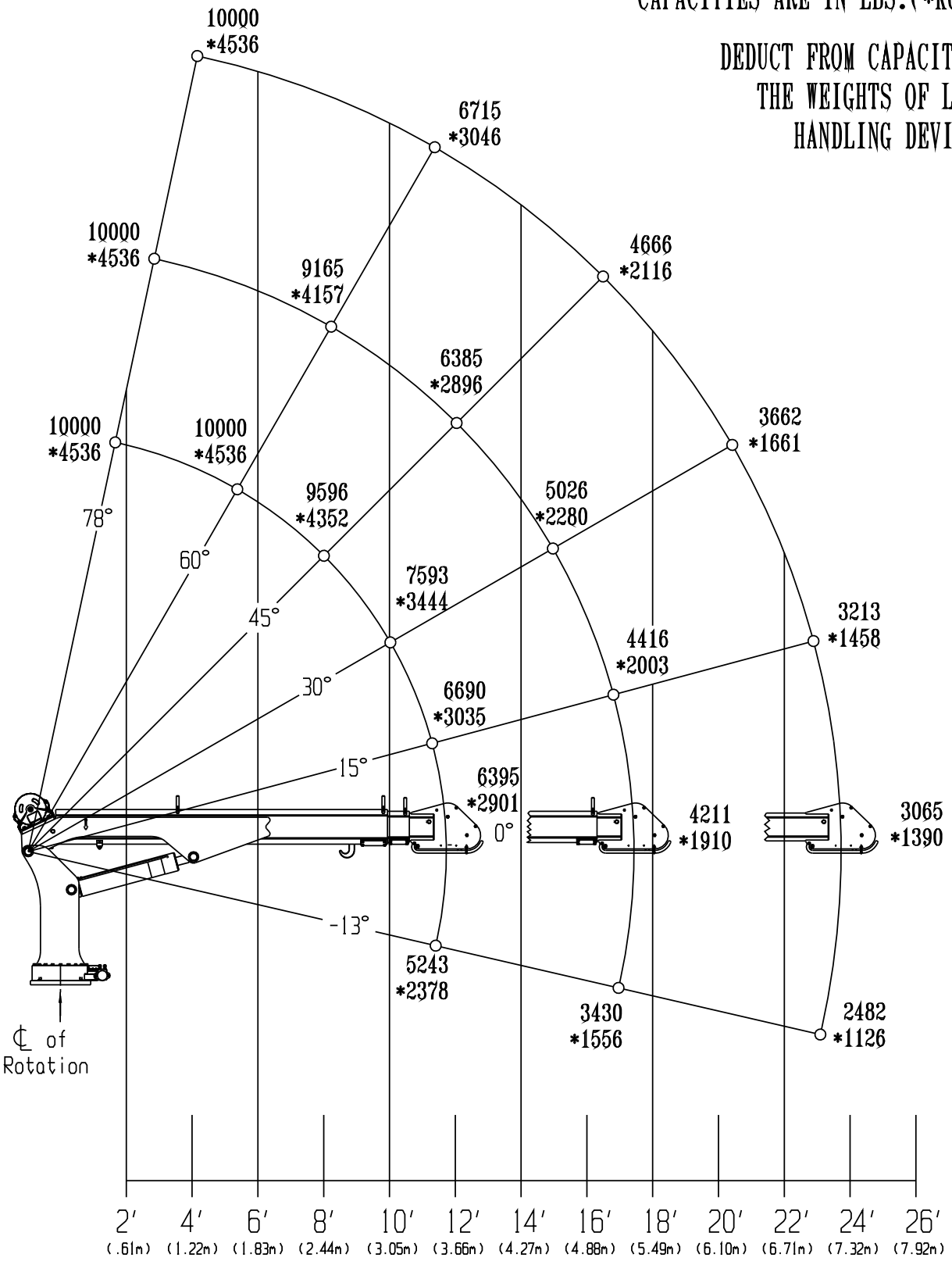
H10025 CRANE CAPACITY CHART

75,000 FT*LB CRANE RATING

HYDRAULIC
EXTENTION TO 24' 9"

CAPACITIES ARE IN LBS.(*KGS.)

DEDUCT FROM CAPACITIES THE WEIGHTS OF LOAD HANDLING DEVICES



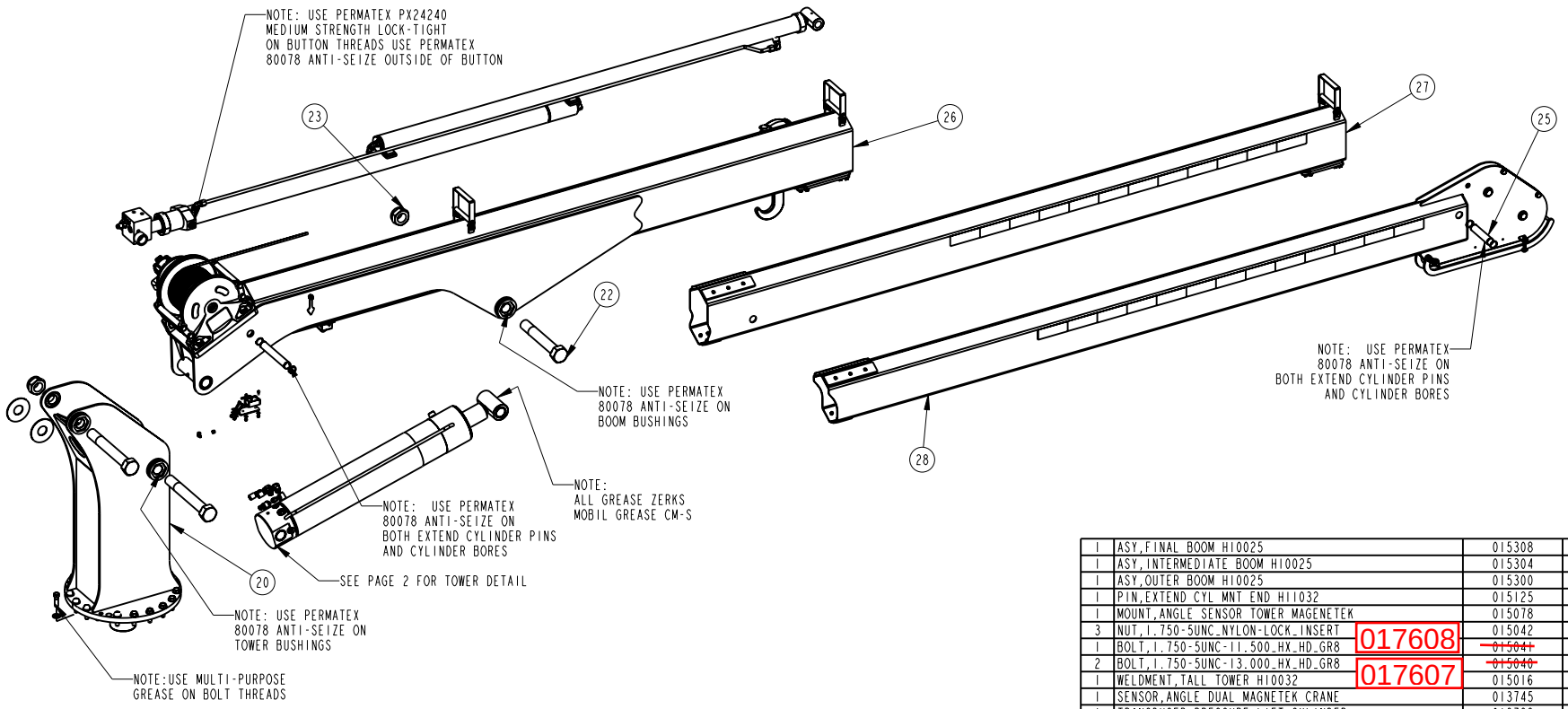
Distance in feet (meters) from boom pivot joint.

26' (7.92m)
24' (7.32m)
22' (6.71m)
20' (6.10m)
18' (5.49m)
16' (4.88m)
14' (4.27m)
12' (3.66m)
10' (3.05m)
8' (2.44m)
6' (1.83m)
4' (1.22m)
2' (.61m)
0'
-2' (-.61m)
-4' (-1.22m)
-6' (-1.83m)
-8' (-2.44m)
-10' (-3.05m)

Maintainer

1701 S 2ND AVE SHELDON, IA 51201
800-831-8588
WWW.MAINTAINER.COM

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/21/12	A	DRAWING RELEASED	-	NDS	KLV



REPLACEMENT WIRE ROPE 015859

NOTE: ASSEMBLY TO HAVE CLASS-3 EDGE FINISH ON ALL EXTERNAL SURFACES

HOSES FOR TALL TOWER

LIFT #6FX 004862 106" / 002522 90JIC / 002523 Straight JIC
EXTEND #6FX 004862 134" / 002522 90JIC / 002511 45JIC
WINCH #8FX 008425 150" / 002543 90JIC / 000194 Straight JIC
ROTATE #8FX 008425 74" / 002543 90JIC / 000194 Straight JIC

NOTES:

1) WEIGHT = 1884 LBS

2) MUST BE FREE OF BURRS WHICH MAY BE DETRIMENTAL TO SATISFACTORY ASSEMBLY, SAFE HANDLING, OR FUNCTION.

PART NUMBER	DESCRIPTION	TORQUE (ft*lbs)
015041	BOLT,1.750-5UNC-11.500_HX_HD_GR8	600
015040	BOLT,1.750-5UNC-13.000_HX_HD_GR8	600
013504	BOLT,0.250-20UNC-1.25_HX_HD_SS	UNSPECIFIED
003541	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	
003440	BOLT,0.625-11UNC-2.000_HX_HD_GR8	160 LUBED

QTY	DESCRIPTION	PART NUMBER	ITEM
1	ASY,FINAL BOOM H10025	015308	28
1	ASY,INTERMEDIATE BOOM H10025	015304	27
1	ASY,OUTER BOOM H10025	015300	26
1	PIN,EXTEND CYL MNT END H11032	015125	25
1	MOUNT,ANGLE SENSOR TOWER MAGENETEK	015078	24
3	NUT,1.750-5UNC_NYLON-LOCK_INSERT	015042	23
1	BOLT,1.750-5UNC-11.500_HX_HD_GR8	~~015041~~ 017608	22
2	BOLT,1.750-5UNC-13.000_HX_HD_GR8	~~015040~~ 017607	21
1	WELDMENT,TALL TOWER H10032	015016	20
1	SENSOR,ANGLE DUAL MAGNETEK CRANE	013745	19
1	TRANSDUCER,PRESSURE LIFT CYLINDER	013738	18
2	BOLT,0.250-20UNC-1.25_HX_HD_SS	013504	17
2	NUT,#10-24_NYLON_INSERT_LOCK_SS	013503	16
2	WASHER,FLAT_#10_SAE_SS	013501	15
4	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	14
20	WASHER,FLAT_0.625_SAE_THRU-HARD_EXTRA THICK	012893	13
3	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	12
4	6832_1.000_EXTERNAL_RETAINING_RING	007634	11
2	RING,TOWER_MT_PLATE_WEAR_SERIES-CRANES	007618	10
1	PIN,EXT_CYL_MT_TOWER_SIDE_SERIES-CRANES	007604	9
1	CYLINDER,LIFT_14000-SERIES	007558	8
1	CYLINDER,EXTEND_8-14000_SERIES-CRANES	007556	7
2	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	003541	6
20	BOLT,0.625-11UNC-2.000_HX_HD_GR8	003440	5
1	CLAMP,LOOM_3/16 TO 1/4 OD_200409 SS	003296	4
1	ADAPTER,6410-06-04_06ORB-04FOR	002649	3
2	ADAPTOR,6801-06-08_ELBOW_90_06MT-08ORB	002639	2
2	COUPLING,CRIMP_HY06-06FJ	002523	1

PART NUMBER 015001

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

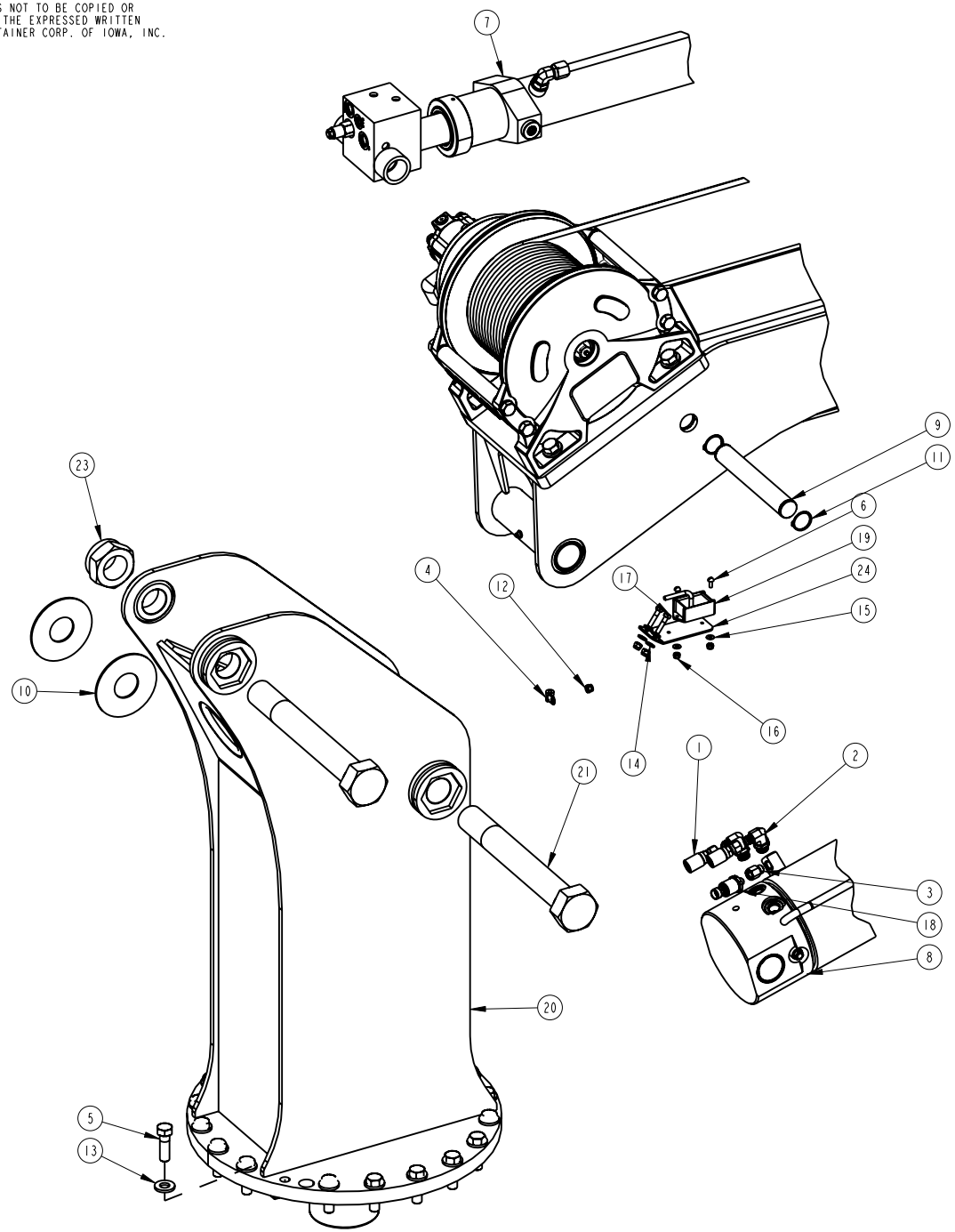
DR: AHB DATE: 5/21/12
CHK: NDS DATE: 5/21/12
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,CRANE H10025-TT MASTER

SCALE: 1:160 SIZE: C SHEET: 1 OF 2 DRAWING NUMBER: 015001 REV. LEVEL: A

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/21/12	A	DRAWING RELEASED	-	AHB	NDS



QTY	DESCRIPTION	PART NUMBER	ITEM
1	ASY,FINAL BOOM HI0025	015308	28
1	ASY,INTERMEDIATE BOOM HI0025	015304	27
1	ASY,OUTER BOOM HI0025	015300	26
1	PIN,EXTEND CYL MNT END HI1032	015125	25
1	MOUNT,ANGLE SENSOR TOWER MAGENETEK	015078	24
3	NUT,1.750-5UNC_NYLON-LOCK_INSERT	015042	23
1	BOLT,1.750-5UNC-11.500_HX_HD_GR8	015041	22
2	BOLT,1.750-5UNC-13.000_HX_HD_GR8	015040	21
1	WELDMENT,TALL TOWER HI0032	015016	20
1	SENSOR,ANGLE DUAL MAGNETEK CRANE	013745	19
1	TRANSDUCER,PRESSURE LIFT CYLINDER	013738	18
2	BOLT,0.250-20UNC-1.25_HX_HD_SS	013504	17
2	NUT,#10-24_NYLON_INSERT_LOCK_SS	013503	16
2	WASHER,FLAT_#10_SAE_SS	013501	15
4	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	14
20	WASHER,FLAT_0.625_SAE_THRU-HARD_EXTRA THICK	012893	13
3	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	12
4	6832_1.000_EXTERNAL_RETAINING_RING	007634	11
2	RING,TOWER_MT_PLATE_WEAR_SERIES-CRANES	007618	10
1	PIN,EXT_CYL_MT_TOWER_SIDE_SERIES-CRANES	007604	9
1	CYLINDER,LIFT_14000-SERIES	007558	8
1	CYLINDER,EXTEND_8-14000_SERIES-CRANES	007556	7
2	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	003541	6
20	BOLT,0.625-11UNC-2.000_HX_HD_GR8	003440	5
1	CLAMP,LOOM_3/16 TO 1/4 OD_200409 SS	003296	4
1	ADAPTER,6410-06-04_06ORB-04FOR	002649	3
2	ADAPTOR,6801-06-08_ELBOW_90_06MT-08ORB	002639	2
2	COUPLING,CRIMP_HY06-06FJ	002523	1

PART NUMBER 015001

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

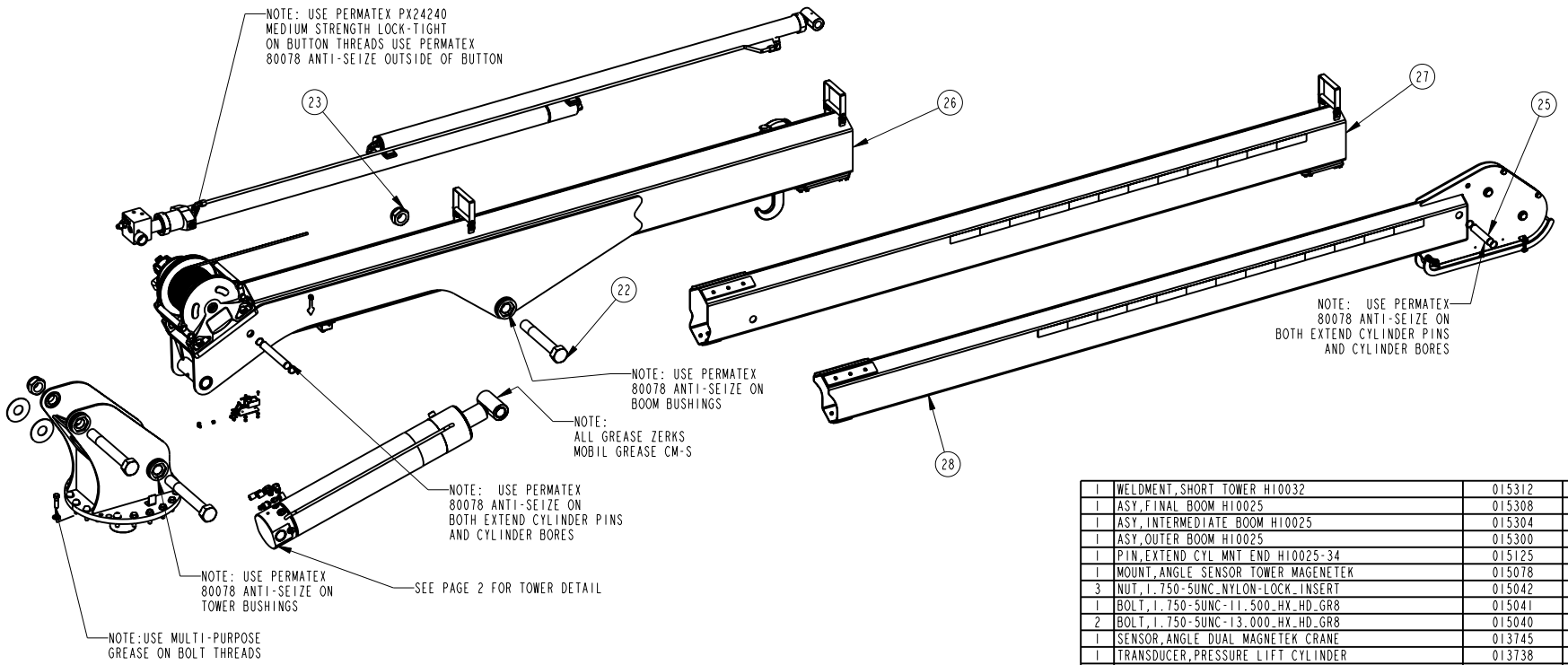
DR: AHB DATE: 5/21/12
CHK: NDS DATE: 5/21/12
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,CRANE HI0025-TT MASTER

SCALE: 3:16 SIZE: C SHEET: 2 OF 2 DRAWING NUMBER: 015001 REV. LEVEL: A

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/11/13	A	DRAWING RELEASED	-	AHB	NDS
7/22/13	B	ADDED P/N 012135	-	AHB	NDS



NOTE: ASSEMBLY TO HAVE CLASS-3 EDGE FINISH
ON ALL EXTERNAL SURFACES

NOTES:

1) WEIGHT = 1787 LBS

2) MUST BE FREE OF BURRS WHICH
MAY BE DETRIMENTAL TO SATISFACTORY
ASSEMBLY, SAFE HANDLING, OR FUNCTION.

QTY	DESCRIPTION	PART NUMBER	ITEM
1	WELDMENT,SHORT TOWER H10032	015312	29
1	ASY,FINAL BOOM H10025	015308	28
1	ASY,INTERMEDIATE BOOM H10025	015304	27
1	ASY,OUTER BOOM H10025	015300	26
1	PIN,EXTEND CYL MNT END H10025-34	015125	25
1	MOUNT,ANGLE SENSOR TOWER MAGENETEK	015078	24
3	NUT,1.750-5UNC_NYLON-LOCK_INSERT	015042	23
1	BOLT,1.750-5UNC-11.500_HX_HD_GR8	015041	22
2	BOLT,1.750-5UNC-13.000_HX_HD_GR8	015040	21
1	SENSOR,ANGLE DUAL MAGNETEK CRANE	013745	20
1	TRANSDUCER,PRESSURE LIFT CYLINDER	013738	19
2	BOLT,0.250-20UNC-1.25_HX_HD_SS	013504	18
2	NUT,#10-24_NYLON_INSERT_LOCK_SS	013503	17
2	WASHER,FLAT_#10_SAE_SS	013501	16
4	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	15
20	WASHER,FLAT_0.625_SAE_THRU-HARD_EXTRA THICK	012893	14
3	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	13
1	ANGLE,ROTATE_ALIGNMENT_DECAL_MOUNT	012135	12
4	6832_1.000_EXTERNAL_RETAINING_RING	007634	11
2	RING,TOWER_MT_PLATE_WEAR_SERIES-CRANES	007618	10
1	PIN,EXT_CYL_MT_TOWER_SIDE_SERIES-CRANES	007604	9
1	CYLINDER,LIFT_14000-SERIES	007558	8
1	CYLINDER,EXTEND_8-14000_SERIES-CRANES	007556	7
2	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	003541	6
20	BOLT,0.625-11UNC-2.000_HX_HD_GR8	003440	5
1	CLAMP,LOOM_3/16 TO 1/4 OD_200409 SS	003296	4
1	ADAPTER,6410-06-04_06ORB-04FOR	002649	3
2	ADAPTOR,6801-06-08_ELBOW_90_06MT-08ORB	002639	2
2	COUPLING,CRIMP_HY06-06FJ	002523	1

PART NUMBER	DESCRIPTION	TORQUE (ft*lbs)
015041	BOLT,1.750-5UNC-11.500_HX_HD_GR8	600
015040	BOLT,1.750-5UNC-13.000_HX_HD_GR8	600
013504	BOLT,0.250-20UNC-1.25_HX_HD_SS	UNSPECIFIED
003541	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	
003440	BOLT,0.625-11UNC-2.000_HX_HD_GR8	160 LUBED

PART NUMBER 015003

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

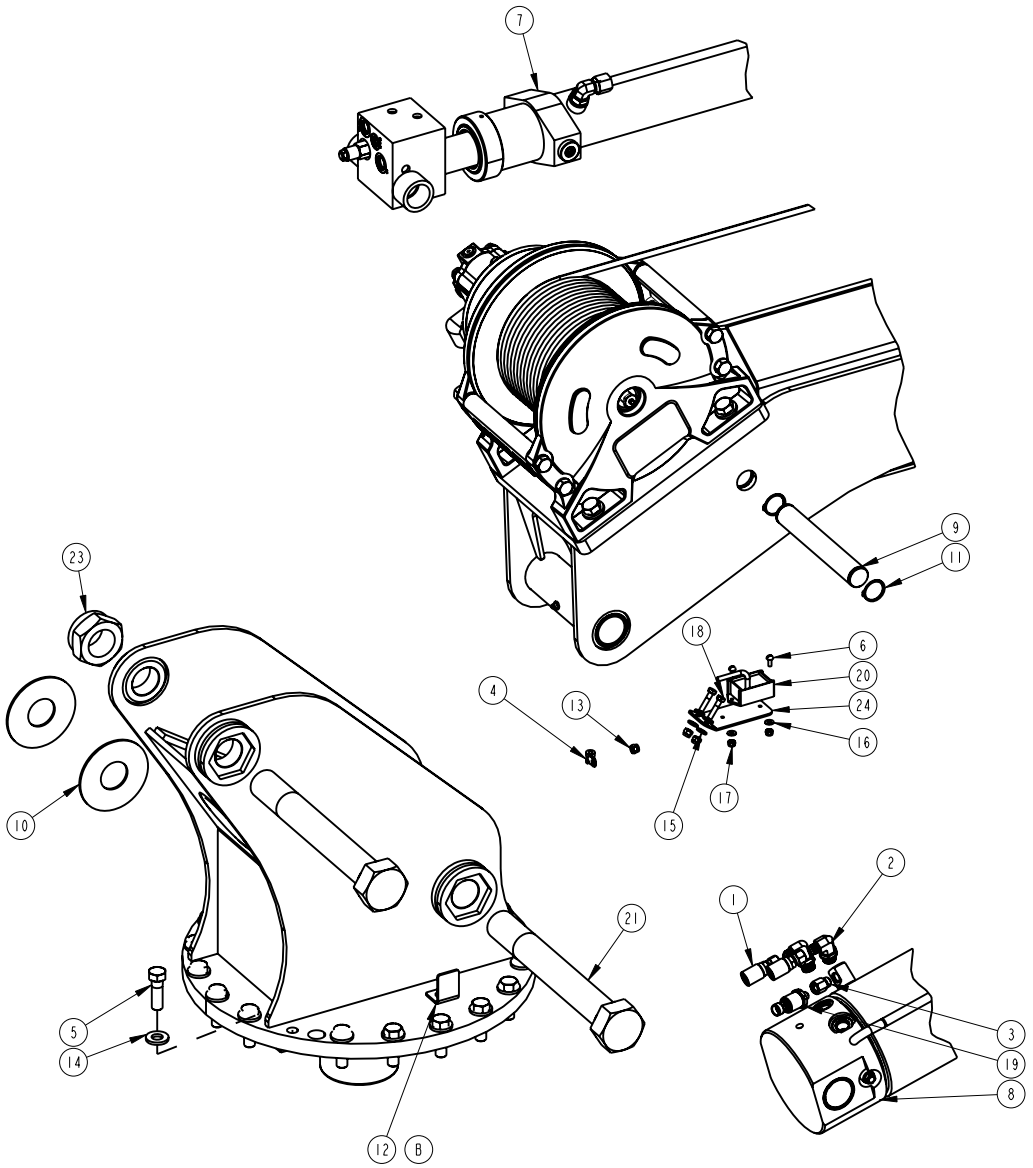
DR: AHB DATE: 4/11/13
CHK: NDS DATE: 4/11/13
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,CRANE H10025-ST MASTER

SCALE: 1:160 SIZE: C SHEET: 1 OF 2 DRAWING NUMBER: 015003 REV. LEVEL: B

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/11/13	A	DRAWING RELEASED	-	AHB	NDS
7/22/13	B	ADDED P/N 012135	-	AHB	NDS



QTY	DESCRIPTION	PART NUMBER	ITEM
1	WELDMENT,SHORT TOWER H10032	015312	29
1	ASY,FINAL BOOM H10025	015308	28
1	ASY,INTERMEDIATE BOOM H10025	015304	27
1	ASY,OUTER BOOM H10025	015300	26
1	PIN,EXTEND CYL MNT END H10025-34	015125	25
1	MOUNT,ANGLE SENSOR TOWER MAGENETEK	015078	24
3	NUT,1.750-5UNC_NYLON-LOCK_INSERT	015042	23
1	BOLT,1.750-5UNC-11.500_HX_HD_GR8	015041	22
2	BOLT,1.750-5UNC-13.000_HX_HD_GR8	015040	21
1	SENSOR,ANGLE DUAL MAGNETEK CRANE	013745	20
1	TRANSDUCER,PRESSURE LIFT CYLINDER	013738	19
2	BOLT,0.250-20UNC-1.25_HX_HD_SS	013504	18
2	NUT,#10-24_NYLON_INSERT_LOCK_SS	013503	17
2	WASHER,FLAT_#10_SAE_SS	013501	16
4	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	15
20	WASHER,FLAT_0.625_SAE_THRU-HARD_EXTRA THICK	012893	14
3	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	13
1	ANGLE,ROTATE_ALIGNMENT_DECAL_MOUNT	012135	12
4	6832_1.000_EXTERNAL_RETAINING_RING	007634	11
2	RING,TOWER_MT_PLATE_WEAR_SERIES-CRANES	007618	10
1	PIN,EXT_CYL_MT_TOWER_SIDE_SERIES-CRANES	007604	9
1	CYLINDER,LIFT_14000-SERIES	007558	8
1	CYLINDER,EXTEND_8-14000_SERIES-CRANES	007556	7
2	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	003541	6
20	BOLT,0.625-11UNC-2.000_HX_HD_GR8	003440	5
1	CLAMP,LOOM_3/16 TO 1/4 OD_200409 SS	003296	4
1	ADAPTER,6410-06-04_06ORB-04FOR	002649	3
2	ADAPTOR,6801-06-08_ELBOW_90_06MT-08ORB	002639	2
2	COUPLING,CRIMP_HY06-06FJ	002523	1

PART NUMBER 015003

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

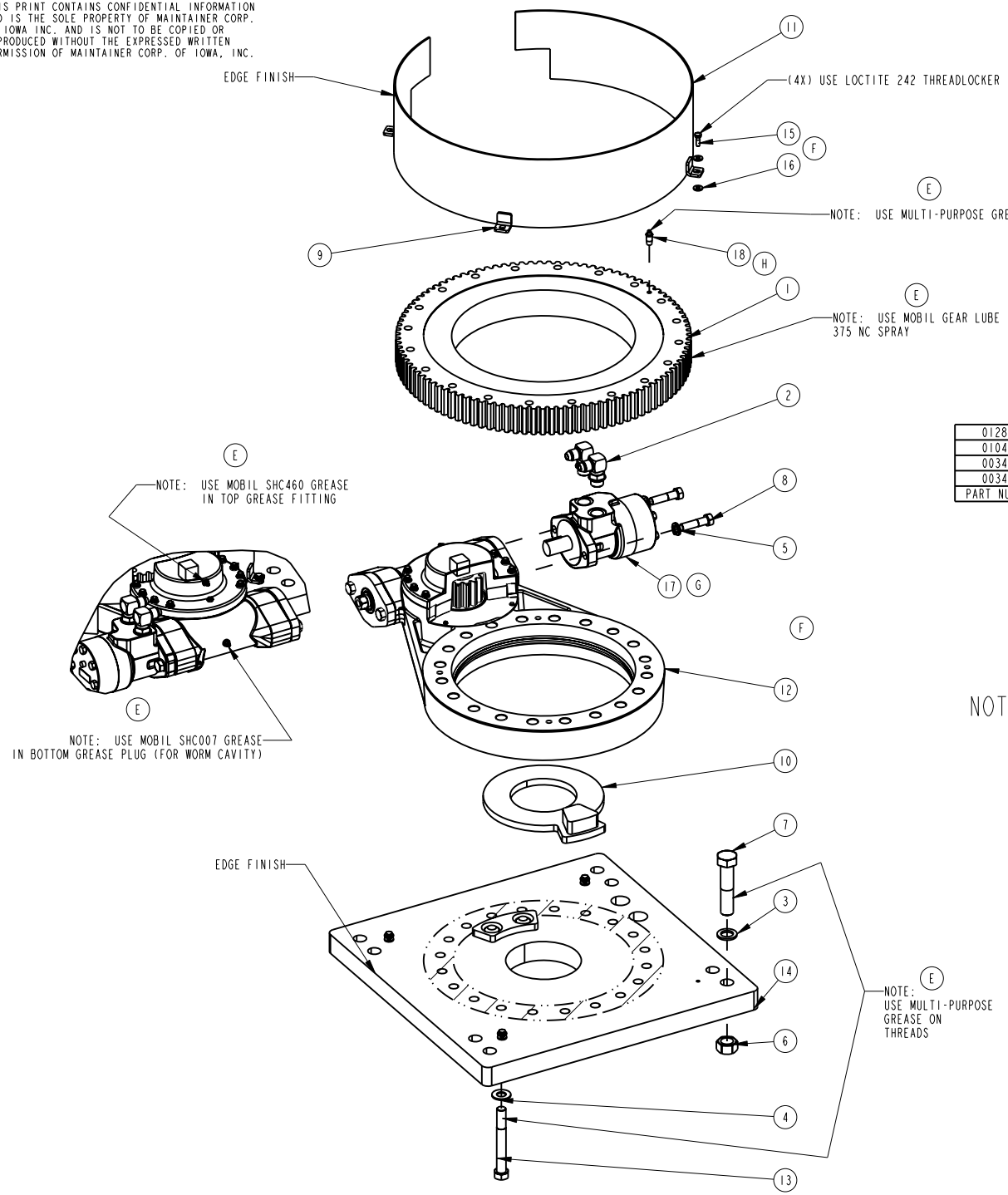
DR: AHB DATE: 4/11/13
CHK: NDS DATE: 4/11/13
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,CRANE H10025-ST MASTER

SCALE: 3:16 SIZE: C SHEET: 2 OF 2 DRAWING NUMBER: 015003 REV. LEVEL: B

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
7/2/07	A	DRAWING RELEASED	-	NDS	AHB
7/13/07	B	REPLACED 000199 WITH 010367	-	NDS	AHB
8/7/08	C	ADDED MOTOR FITTINGS, BACKLASH NOTE, ROTATE GREASE ZERK	-	MCL	KLV
9/8/09	D	UPDATED QUANTITIES & TORQUE SPECS	-	NDS	KLV
10/14/09	E	ADDED NOTES LUBE	-	BR	AHB
8/5/11	F	013199 MOTOR WAS 002866/REMOVED LOCK WASHERS ON ROTATE GUARD	-	RJW	KLV
5/1/13	G	UPDATED MOTOR FROM 013199 TO 015839	-	KJH	KLV
8/30/13	H	016537 GREASE ZERK REPLACES 003246	-	SVM	KLV



012868	BOLT,0.250-20UNC-0.750_HX_HD_SS	UNSPECIFIED
010450	BOLT,0.625-11UNC-5.000_HX_HD_GR8	160 LUBED
003459	BOLT,0.500-13UNC-2.000_HX_HD_GR5	80 LUBED
003412	BOLT,0.875-9UNC-4.000_HX_HD_GR8	450 LUBED
PART NUMBER	DESCRIPTION	TORQUE (ft*lbs)

GEAR BACKLASH 0 .008- 0.012"

NOTE: PART TO HAVE CLASS-3 EDGE FINISH

1	ZERK, GREASE_0.250X0.125_NPT_STRAIGHT	016537	18
1	MOTOR,HYD 4.3-DISP WHITE CRANE	015839	17
8	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	16
4	BOLT,0.250-20UNC-0.750_HX_HD_SS	012868	15
1	WELDMT,CRANE_ROT_BOLT-DOWN_PLT_1.50"	010473	14
20	BOLT,0.625-11UNC-5.000_HX_HD_GR8	010450	13
1	ROTATE,WORM/PINION_8-14000_CRANES	010367	12
1	GUARD,BEARING_8-14000_NO-NOTCH	009066	11
1	ASY,CRANE_STOP_RING_SERIES-CRANES	007629	10
4	ANGLE,MISCELLEANOUS_WITH HOLE	004572	9
2	BOLT,0.500-13UNC-2.000_HX_HD_GR5	003459	8
8	BOLT,0.875-9UNC-4.000_HX_HD_GR8	003412	7
8	NUT,0.875-9_GR8_STOVER	003367	6
2	WASHER,LOCK_0.500_GR2_SS	003355	5
20	WASHER,MACHINE_0.625X1.3125_HARDENED	003351	4
8	WASHER,FLAT_0.875X1.375X10GA_GR8	003331	3
2	ELBOW,6801-08-10_90_08MT-10ORB	002645	2
1	BEARING,ROTATION_8-14000_CRANES	002574	1
QTY	DESCRIPTION	PART NUMBER	ITEM

010452 PART NUMBER

THIRD ANGLE PROJECTION

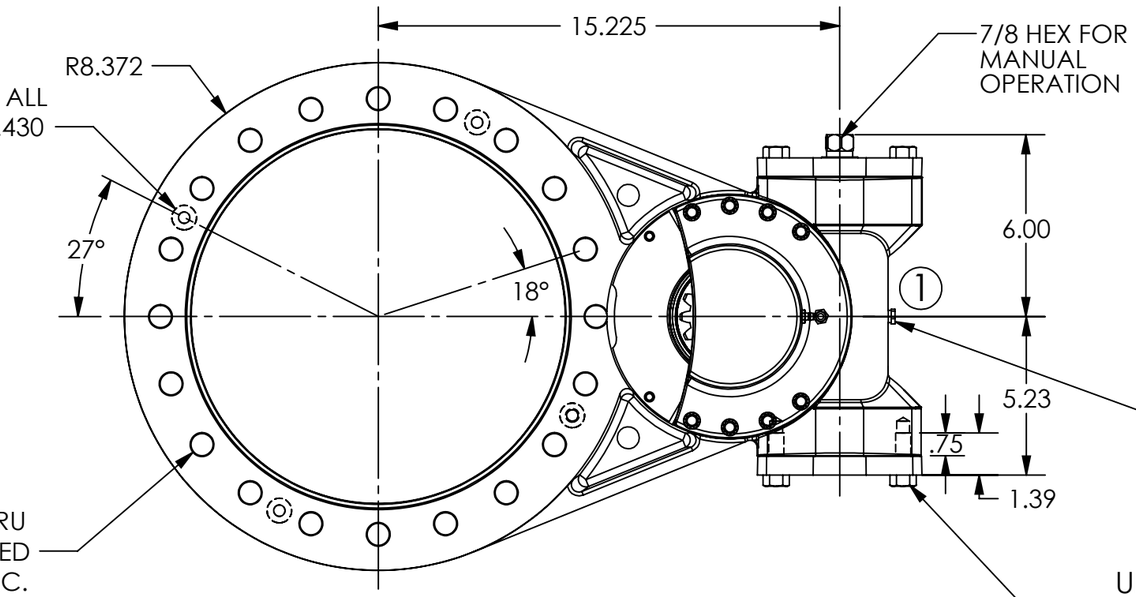
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: NDS DATE: 7/2/07
CHK: AHB DATE: 7/2/07
APPR:KRV DATE: 7/2/07

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,CRANE_BASE/ROTATE_11-12000TT_1.50"

SCALE: 3:16 | SIZE: B | SHEET: 1 OF 1 | DRAWING NUMBER: 010452 | REV. LEVEL: H



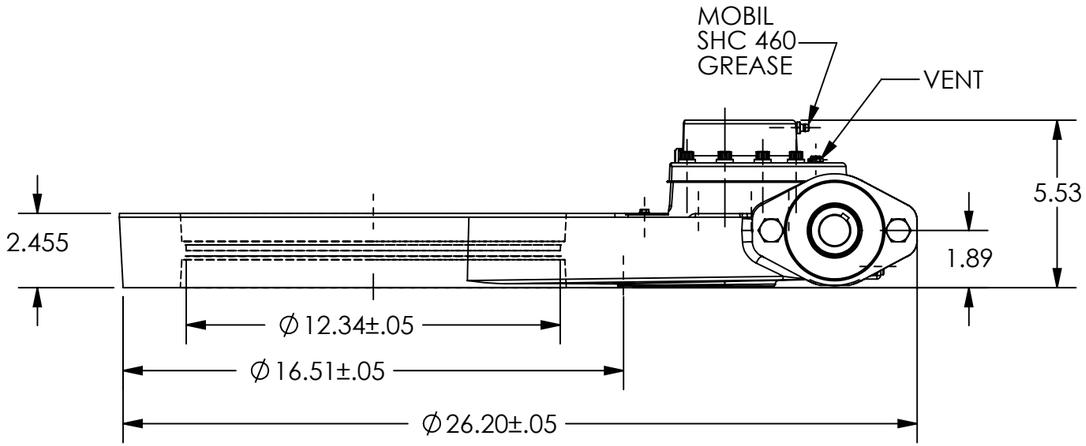
RATIO IS 229
RATING AT 1 RPM OUTPUT
OUTPUT TORQUE CONTINUOS = 92,000 LB-IN
MAX. INTERMITENT OUTPUT TORQUE = 116,000 LB-IN

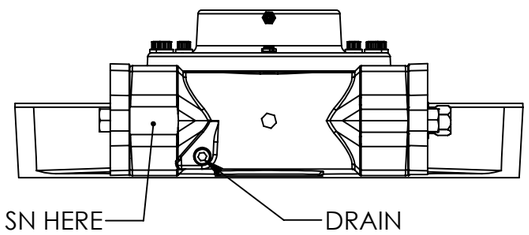
PAINTED WITH BLACK EPOXY

TYPICAL SLEW RING SPUR GEAR DATA
NUMBER OF TEETH = 101
PITCH = 5/7 FELLOWS STUB
PRESSURE ANGLE = 20 DEG.
ADDENDUM = .1429 REF.
FULL DEPTH = .3215 REF.

GREASE FILLED WITH MOBIL SHC
007 INSTALL HEX HEAD PIPE PLUG (1)

UNIT SHIPPED WITH (2) 1/2-13 X 1" LONG BOLTS
ON THIS END REPLACE WITH GRADE 5 BOLTS
AND TORQUE TO 75 FT-LBS WHEN MOUNTING
MOTOR MOTOR ADAPTER & MOUNTING HOLES
TO FIT S.A.E. "A" TYPE 2-BOLT STANDARD
HYDRAULIC MOTOR WITH 1" KEYED SHAFT





REF. MAINTAINER #010367

PATENT #6170350

REV	ECN	BY	DATE	REV	ECN	BY	DATE
				1	13272	PHB	11-13-07
				0	13217	PHB	6/11/2007

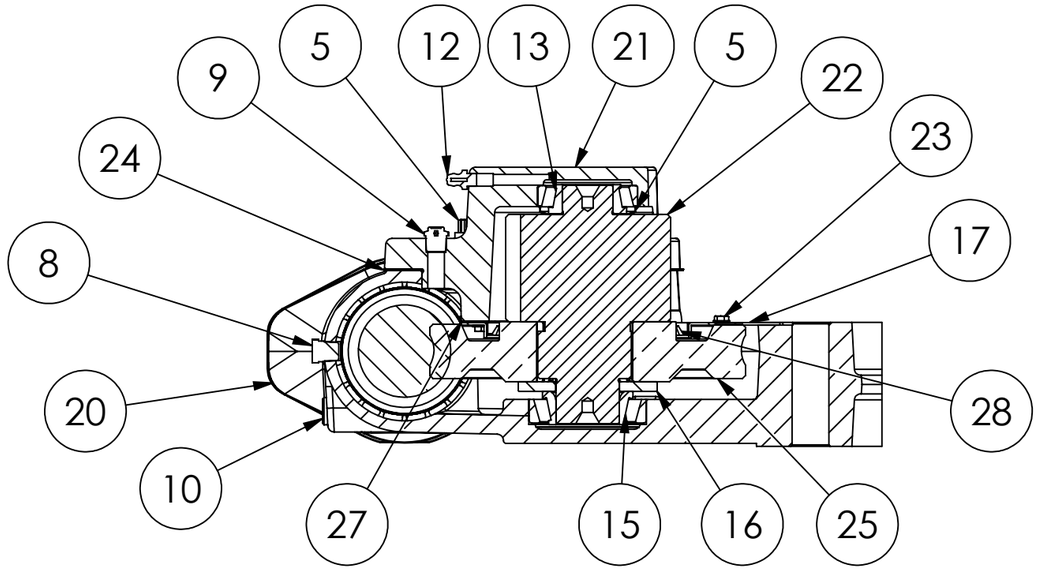
PERFECTION GEAR
9 N. BEAR CREEK RD. ASHEVILLE, N.C.

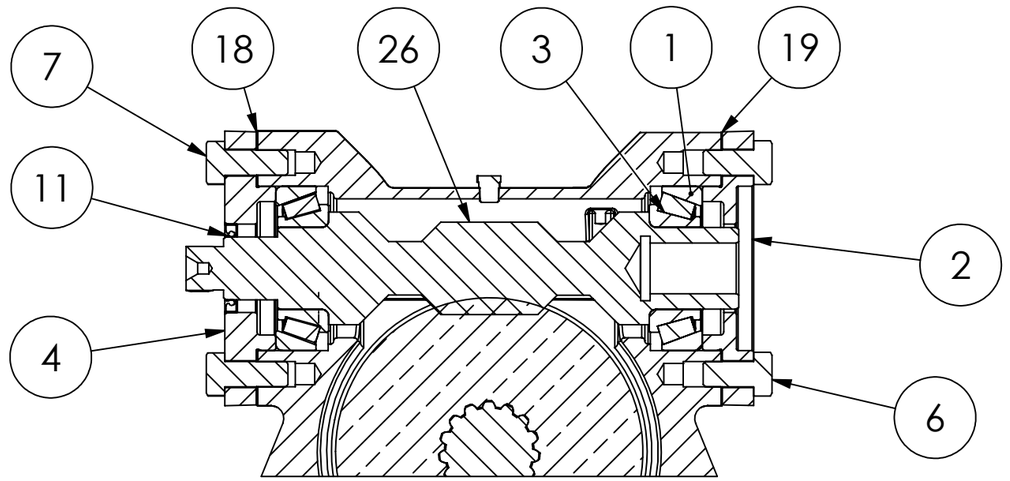
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES:
FRACTIONAL ± 1/32
ANGULAR ± 1/4
DECIMAL .XX ± 0.010 .XXX ± 0.005

DRAWN PHB | DATE 6/11/2007
ENG APPR. | SCALE: 1:5

TITLE: **OUTLINE**
DWG. NO. **SW15544S**
SIZE **B** | WEIGHT 118.34 | REV **1**

ITEM NO.	PART NUMBER	DESCRIPTION	SW15544S/QTY.
1	AT12561C	BRG CUP M802011	2
2	AT12561M	MOTOR ADAPTER	1
3	AT12561R	BRG CONE M802048	2
4	AT12562C	CAP, WORM	1
5	CBA3223G	3/8-16 X 1 1/4 12PT C'BORE BOLT	8
6	HCA4523C	1/2-13 X 1 HHCS	2
7	HCA4523E	1/2-13 X 1 1/4 HHCS	2
8	SB1371	1/8-27 NPTF HEX PLUG	1
9	SB1889	VENT, PRESSURE 1-5 PSIG	1
10	SB2671A	1/4-18 NPTF HEX PLUG	1
11	SB3263	OIL SEAL C/R 12364	1
12	SB3299C	GREASE FITTING 1/4-28 STRAIGHT	1
13	SU1861C & SU1861R	BRG ROLLER CUP L44610 & CONE L44643	1
5	SU1861N	GREASE RING	1
15	SU2461C & SU2461R	BRG ROLLER CUP LM67010 & CONE LM67048	1
16	SW13597SP	SPACER, WASHER	1
17	SW1706B-2	COVER, SEAL	1
18	SW1742SBP	GASKET .010 BROWN	AS REQ.
18	SW1742SHP	GASKET .0075 CLEAR	AS REQ.
18	SW1742SMP	GASKET .005 BLUE	AS REQ.
18	SW1742SYP	GASKET .003 GREEN	AS REQ.
19	SW1742SXP	GASKET .020 YELLOW	AS REQ.
20	SW2001	HOUSING	1
21	SW2006-2	CAP, GEAR	1
22	SW2015P-2	PINION, OUTPUT	1
23	SW2023	6-32 X 3/8" HWHTR SCREW	8
24	SW2032SYA	SHIM, CAP .003 GREEN	AS REQ.
24	SW2032SMA	SHIM, CAP .005 BLUE	AS REQ.
24	SW2032SHA	SHIM, CAP .0075 NATURAL	AS REQ.
25	SW2034G	WORM GEAR 34:1 SPLINED	1
26	SW2034X6	WORM 34:1	1
27	SW2042SMA	SHIM, COVER .005 BLUE	AS REQ.
27	SW2042SXA	SHIM, COVER .020 YELLOW	AS REQ.
28	SW2063-2	OIL SEAL CR #34840	1





REV	ECN	BY	DATE	REV	ECN	BY	DATE
				1	13272	PHB	11-13-07
				0	13217	PHB	6/11/2007

PERFECTION GEAR
9 N. BEAR CREEK RD. ASHEVILLE, N.C.

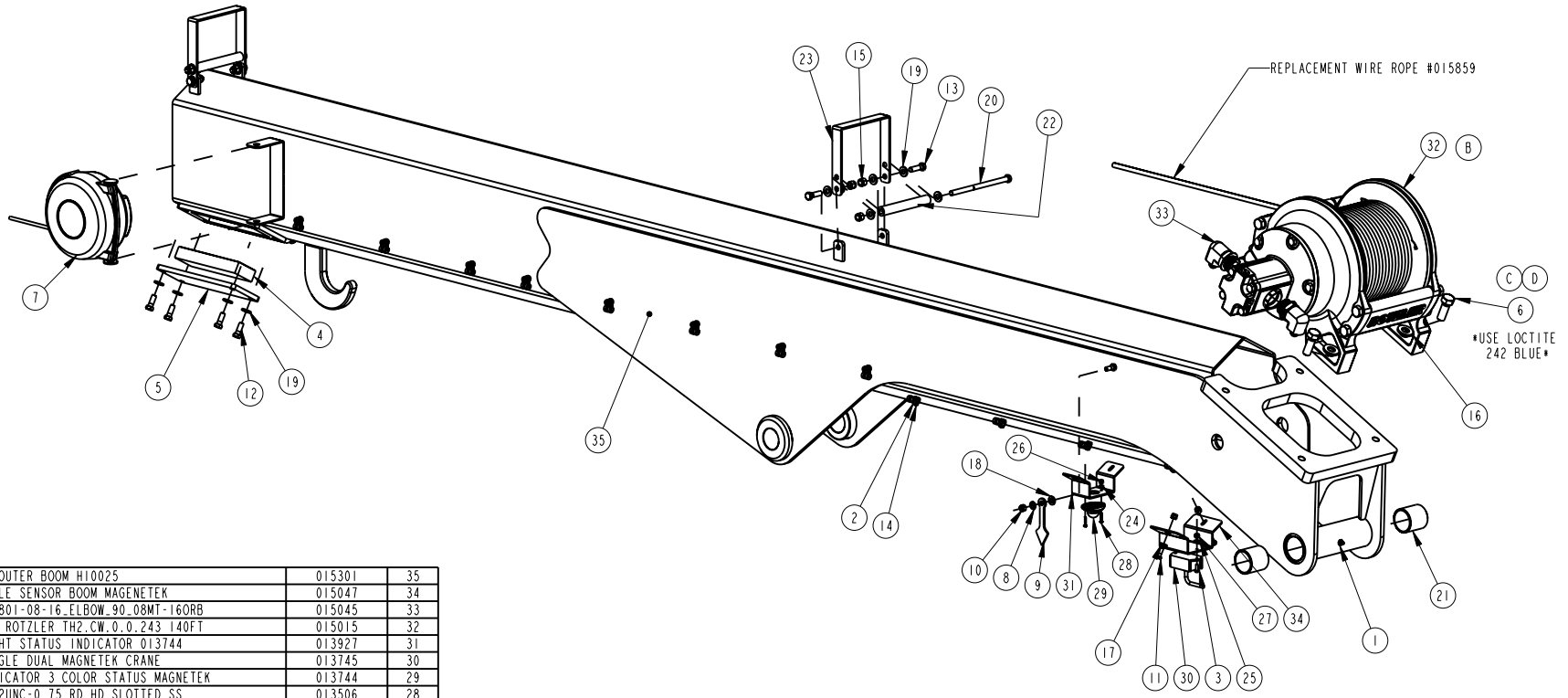
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES:
FRACTIONAL ± 1/32
ANGULAR ± 1/4
DECIMAL .XX ± 0.010 .XXX ± 0.005

DRAWN PHB | DATE 6/11/2007
ENG APPR. | SCALE: 1:3

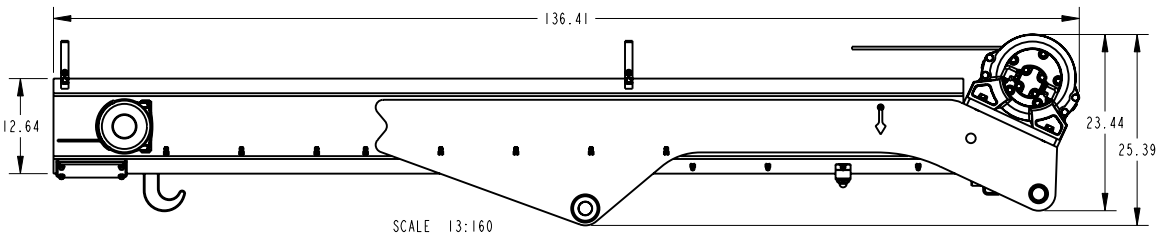
TITLE: **OUTLINE**
DWG. NO. **P-SW15544S**
SIZE **B** | WEIGHT 118.34 | REV **1**

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/21/12	A	DRAWING RELEASED	-	AHB	NDS
11/29/12	B	WINCH WAS 010263	-	AHB	NDS
2/22/13	C	011400 WAS 003429	-	AHB	NDS
9/12/13	D	ADDED LOCTITE NOTE	-	AHB	NDS

PART NUMBER	DESCRIPTION	TORQUE (ft*lbs)
013506	BOLT,#6-32UNC-0.75_RD_HD_SLOTTED_SS	
013245	BOLT,0.375-16UNC-6.500_HX_HD_SS	20 LUBED
012877	BOLT,0.375-16UNC-1.250_HX_HD_SS	20 LUBED
012876	BOLT,0.375-16UNC-1.000_HX_HD_SS	20 LUBED
012868	BOLT,0.250-20UNC-0.750_HX_HD_SS	UNSPECIFIED
011400	BOLT,0.625-11UNC-1.750_HX_HD_GR8	160 LUBED
003541	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	



QTY	DESCRIPTION	PART NUMBER	ITEM
1	WELDMENT,OUTER BOOM H10025	015301	35
1	MOUNT,ANGLE SENSOR BOOM MAGENETEK	015047	34
2	ADAPTER,6801-08-16_ELBOW_90_08MT-16ORB	015045	33
1	WINCH,KIT ROTZLER TH2.CW.0.0.243 140FT	015015	32
1	MOUNT,LIGHT STATUS INDICATOR 013744	013927	31
1	SENSOR,ANGLE DUAL MAGNETEK CRANE	013745	30
1	LIGHT,INDICATOR 3 COLOR STATUS MAGNETEK	013744	29
2	BOLT,#6-32UNC-0.75_RD_HD_SLOTTED_SS	013506	28
2	NUT,#10-24_NYLON_INSERT_LOCK_SS	013503	27
2	NUT,#6-32_NYLON_INSERT_LOCK_SS	013502	26
2	WASHER,FLAT_#10_SAE_SS	013501	25
2	WASHER,FLAT_#6_SAE_SS	013499	24
2	RETAINER,CABLE GUIDE H7024	013279	23
2	ROLLER,NYLATRON CABLE RETAINER H7024	013278	22
2	BEARING,MRP OUTER BOOM H7024	013276	21
2	BOLT,0.375-16UNC-6.500_HX_HD_SS	013245	20
20	WASHER,FLAT_0.375_SAE_EXTRA THICK_SS	012898	19
2	WASHER,FLAT_0.313_SAE_EXTRA THICK_SS	012897	18
2	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	17
4	WASHER,FLAT_0.625_SAE_THRU-HARD_EXTRA THICK	012893	16
6	NUT,0.375-16UNC_NYLON-LOCK_INSERT_SS	012885	15
15	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	14
4	BOLT,0.375-16UNC-1.250_HX_HD_SS	012877	13
8	BOLT,0.375-16UNC-1.000_HX_HD_SS	012876	12
2	BOLT,0.250-20UNC-0.750_HX_HD_SS	012868	11
2	NUT,LOCK_5/16-18_NYLON-INSERT_SS	012322	10
2	INDICATOR,CRANE_DEGREE	012211	9
2	SPACER,NYLON_SHOULDER_5/16-BOLT	012178	8
1	REEL,ANTI-2-BLOCK_ZECA_9001-MNT	011438	7
4	BOLT,0.625-11UNC-1.750_HX_HD_GR8	011400	6
2	CAP,OUTER_WEAR_PAD_SERIES-CRANES	007602	5
2	PADS,OUTER_LOWER_WEAR_SERIES-CRANES	007601	4
2	BOLT,#10-24UNC-0.500_RD_HD_SLOTTED	003541	3
12	CLAMP,LOOM_3/16 TO 1/4 OD_200409 SS	003296	2
1	ZERK, GREASE_0.250X0.125_NPT_STRAIGHT	003246	1



SCALE 13:160

WEIGHT = 655.1 LBS

015300 PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±1° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: AHB DATE: 5/21/12
CHK: NDS DATE: 5/21/12
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,OUTER BOOM H10025

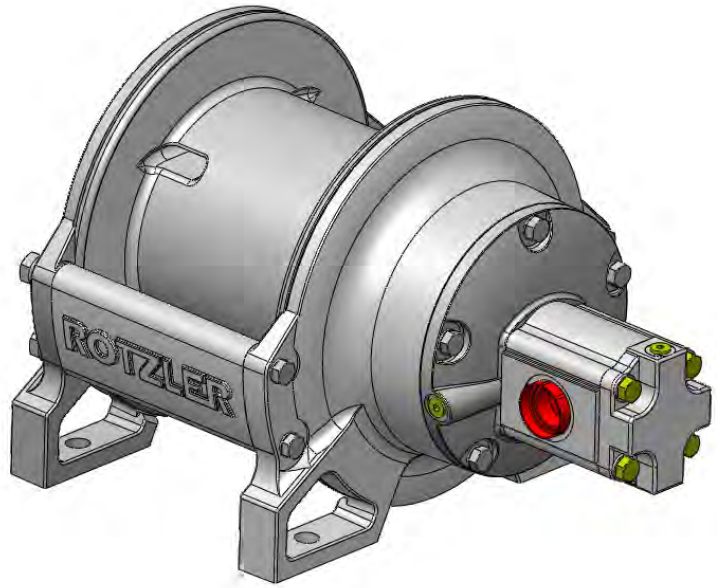
SCALE: 13:160 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 015300 REV. LEVEL: D

ROTZLER TITAN®

TH2

OWNER'S MANUAL

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR ROTZLER TITAN PLANETARY HYDRAULIC WINCHES



THIS MANUAL CONTAINS IMPORTANT INFORMATION FOR THE SAFE USE OF THIS WINCH.
READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE INSTALLING, OPERATING OR MAINTAINING THIS WINCH. MAKE THIS MANUAL AVAILABLE TO RESPONSIBLE PERSONNEL.

WARRANTY - INTRODUCTION

The Identification Label, located on the outside of the winch Final Base, lists important operating specifications for the particular winch. This Label must not be removed, altered or have its technical data obscured. If the data becomes illegible, contact the factory for a replacement Label.

The cable and other load lifting attachments are not part of the winch. Subsequently, Rotzler Inc. cannot be held responsible for any damages resulting from their failure.

WARRANTY

IMPORTANT: ROTZLER TITAN WINCHES ARE NOT DESIGNED NOR INTENDED TO MOVE PERSONNEL. ROTZLER INC. CANNOT BE HELD RESPONSIBLE FOR ACCIDENTS OCCURRING FROM SUCH USE.

I.) Rotzler Inc. warrants each new Titan winch, assemblies and components thereof, to be free from defects in materials and workmanship for a period of two years from the date of the original purchase by Rotzler Inc.'s original customer, provided the unit is installed, operated and maintained in accordance with the instructions given in the Owner's Manual.

II.) Wearable or consumable components such as O-rings, Shaft Seals, Brake Discs and Brake Separators are excluded from this warranty unless a material or workmanship defect is detected in these components at the time of the initial winch installation.

III.) The obligation of Rotzler Inc. under this warranty is exclusively limited. Rotzler Inc. reserves the option of either replacing all components, supplied and manufactured by Rotzler Inc. and found to be defective by reason of faulty material or workmanship, or furnishing a complete replacement winch. In either case, the replacement components or winch will be supplied freight collect, Free Carrier, the factory.

IV.) Rotzler Inc. shall not be liable for any consequential damages or expenses of disconnecting or removing a unit or components thereof, nor any cost incurred in diagnosing a failure.

V.) Rotzler Inc. neither assumes nor authorizes any person to assume on their behalf, any other liabilities in connection with the sale of Rotzler Inc. products.

VI.) This warranty shall not apply to any units which have been repaired or altered without express written consent from Rotzler Inc.

VII.) This warranty shall not apply to winches subjected to misuse or neglect or operated or maintained other than in strict accordance with the specifications provided and the instructions given in this Owner's Manual.

TABLE OF CONTENTS

1. INTRODUCTION

⚠ WARNING

FAILURE TO FOLLOW RECOMMENDATIONS CONTAINED IN THIS MANUAL COULD RESULT IN WINCH FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THIS MANUAL BEFORE INSTALLING, OPERATING OR MAINTAINING THIS WINCH.

Be familiar and comply with all local rules and regulations governing winches, hoisting and pulling units.

Rotzler Inc. Titan winches are not designed, nor intended to lift or move personnel.

Do not hesitate to contact Rotzler Inc. for assistance regarding the installation, operation and maintenance of the winch.

Rotzler Inc. reserves the right to change the design and documentation of the winch without notice and without obligation.

DESCRIPTION OF WINCH FUNCTION

- **DESCRIPTION OF WINCH FUNCTION - HOISTING**

Hydraulic pressure applied at the Motor hoisting port rotates the primary sun gear. The high-speed sun gear rotation is reduced through a two stage planetary gear reduction to provide high torque rotation of the Cable Drum.

The Sprag Clutch allows the Brake Shaft to turn freely in the hoisting direction, independent of the winch brake system.

Hydraulic pressure, proportional to the load that is being lifted, develops at the Motor hoisting port.

Increasing the volume of oil supplied to the Motor increases the hoisting speed. When the oil supply is halted, the winch stops hoisting. The Sprag Clutch then locks the Brake Shaft to the brake system and prevents the load from lowering.

- **DESCRIPTION OF WINCH FUNCTION - LOWERING**

When the winch is not moving, the Sprag Clutch locks the Brake Shaft to the spring applied, pressure released brake system and secures the load.

Some of the hydraulic fluid supplied to the Motor is diverted to the Brake Piston. As the operator increases pressure at the Motor lowering port, pressure also develops at the Brake Piston and partially releases the brake. When the diminished brake is no longer able to sustain the combined torque of the motor and load, the Brake Discs slip and the winch begins to lower the load.

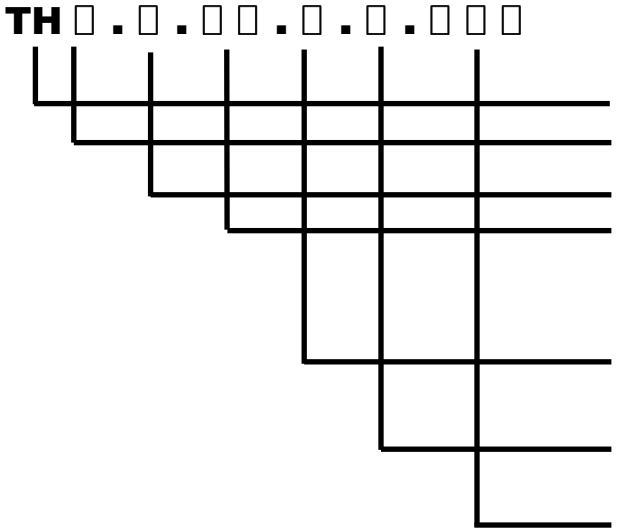
The Motor regulates pressure at the Brake Piston to control the speed of the lowering load. The force of gravity on the lowering load attempts to turn the winch Drum faster than the operator requires. The motor is then forced to turn faster than the hydraulic supply can satisfy and consumes oil, reducing pressure at the Brake Piston. The brake torque then increases and slows the load. In this manner, the Motor continuously regulates the Brake Piston pressure and positively controls the lowering load without using a counter-balance or holding valve.

Increasing the volume of oil supplied to the hydraulic motor increases the lowering speed. When the oil supply is halted, the winch stops lowering and the brake fully applies and secures the load.

When lowering a load, heat is generated as the Brake Discs slip through the Brake Separators. An orifice in the Brake Piston restricts the volume of oil permitted to circulate through the brake plate stack and dissipate this heat.

MODEL CODE

A model code describes the winch configuration as follows:



SERIES: Rotzler Titan TH Series Winch

SIZE: Nominal Bare Drum Line Pull Capacity (tonnes)

REVISION: Revision level indicates design changes for internal use only

ROTATION: Direction of Cable Drum rotation when hoisting, established by looking at the motor.
CC = Counterclockwise CW = Clockwise

MOTOR: Optional hydraulic Motor displacement.
0 = Standard X = Other Motor

CABLE DRUM: Configuration of optional Cable Drum.
0 = Standard X = Other Cable Drum

SPECIAL OPTIONS: Used to identify a winch equipped with options not described above.

AVAILABLE OPTIONS

Rotzler Titan TH2 winches are available with the following options:

- CC or CW Cable Drum rotation when hoisting.
- Other motors to suit special hydraulic systems.
- Special paint finish other than the standard white semi-gloss powder coating.
- Stainless steel screws for improved corrosion resistance.

AVAILABLE ACCESSORIES

Accessories for use with Rotzler Titan TH2 winches are available as follows:

- External Brake Release Kit allows releasing the brake and lowering a load with an auxiliary hydraulic supply capable of delivering at least 2 USGPM [7.5 L/min] at 1000 psi [70 bar].

PERFORMANCE DATA

Performance data follows for winches with standard cable and optional motors. When other options are supplied, the particular performance data is inserted as required.

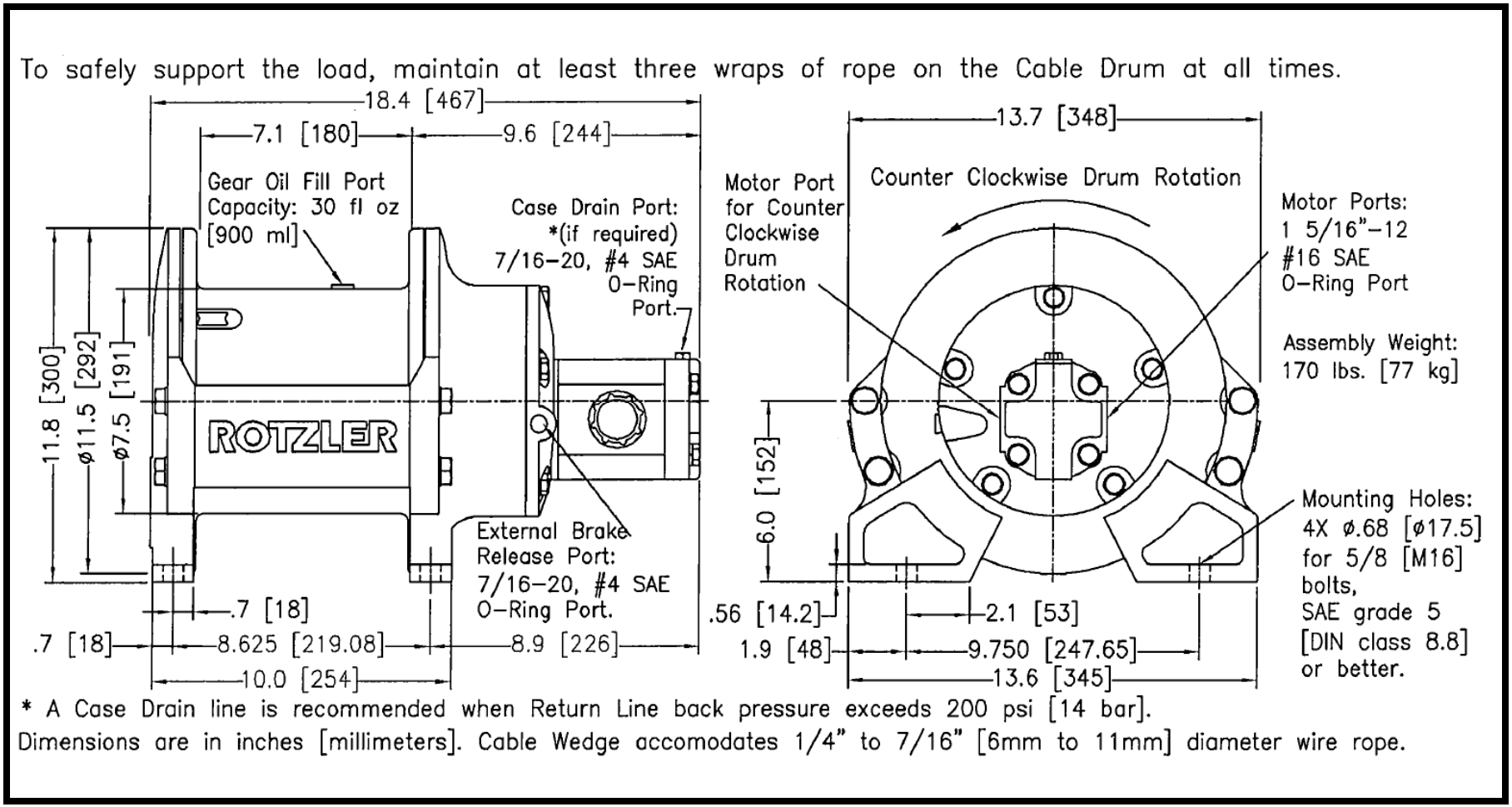
- **IDENTIFICATION LABEL**

An Identification Label is located on the outside of the Final Base, identifying the specific winch model configuration, serial number and important technical data critical for the safe operation of the winch. An area is provided at the back of this manual to record this data for future reference.

This Label must not be removed, altered or have its technical data obscured. If the data becomes illegible, contact Rotzler Inc. for a replacement label.

2. TECHNICAL DATA – TH2.XX.0.0

#TH2.**.0.0 REV D



- **CABLE DRUM STORAGE CAPACITY**

CABLE SIZE	1/4"	5/16"	3/8"	7/16"	6 mm	8 mm	9 mm	10 mm	11 mm
STORAGE CAPACITY	447'	308'	212'	142'	169 m	93 m	68 m	62 m	44 m

- **LINE PULL –TH2.XX.0.0**

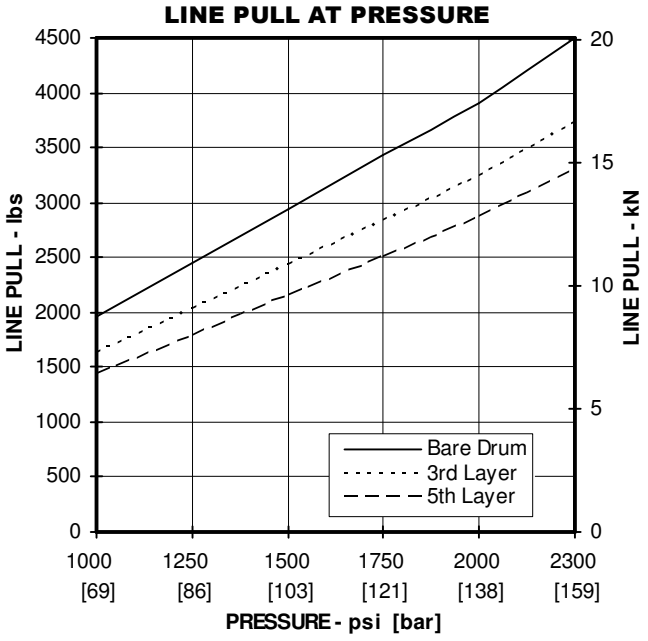
SYSTEM PRESSURE	DRUM TORQUE	LINE PULL AT SYSTEM PRESSURE
Maximum system pressure: 2300 psi [159 bar]	17600 in-lb [2000 N·m]	Bare Drum: 4500 lb [20 kN]
		Full Drum: 3300 lb [15 kN]
Minimum System Pressure: 1000 psi [70 bar]	7650 in-lb [870 N·m]	Bare Drum: 1960 lb [9 kN]
		Full Drum: 1430 lb [6 kN]

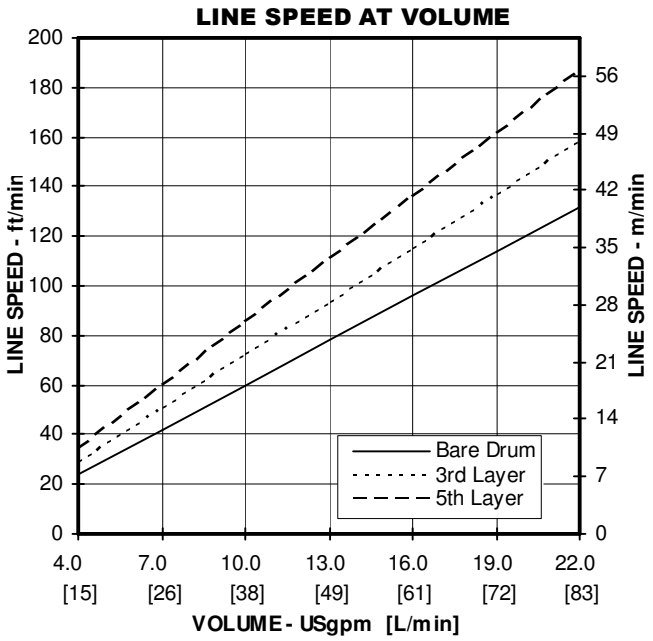
- **LINE SPEED – TH2.XX.0.0**

SYSTEM VOLUME	DRUM SPEED	LINE SPEED AT SYSTEM VOLUME
Maximum System Volume: 22 USGPM [83 L/min]	64 RPM	Bare Drum: 132 ft/min [40 m/min]
		Full Drum: 187 ft/min [57 m/min]
Minimum System Volume: 5 USGPM [20 L/min]	15 RPM	Bare Drum: 30 ft/min [9 m/min]
		Full Drum: 43 ft/min [13 m/min]

- **PERFORMANCE GRAPHS – TH2.XX.0.0**

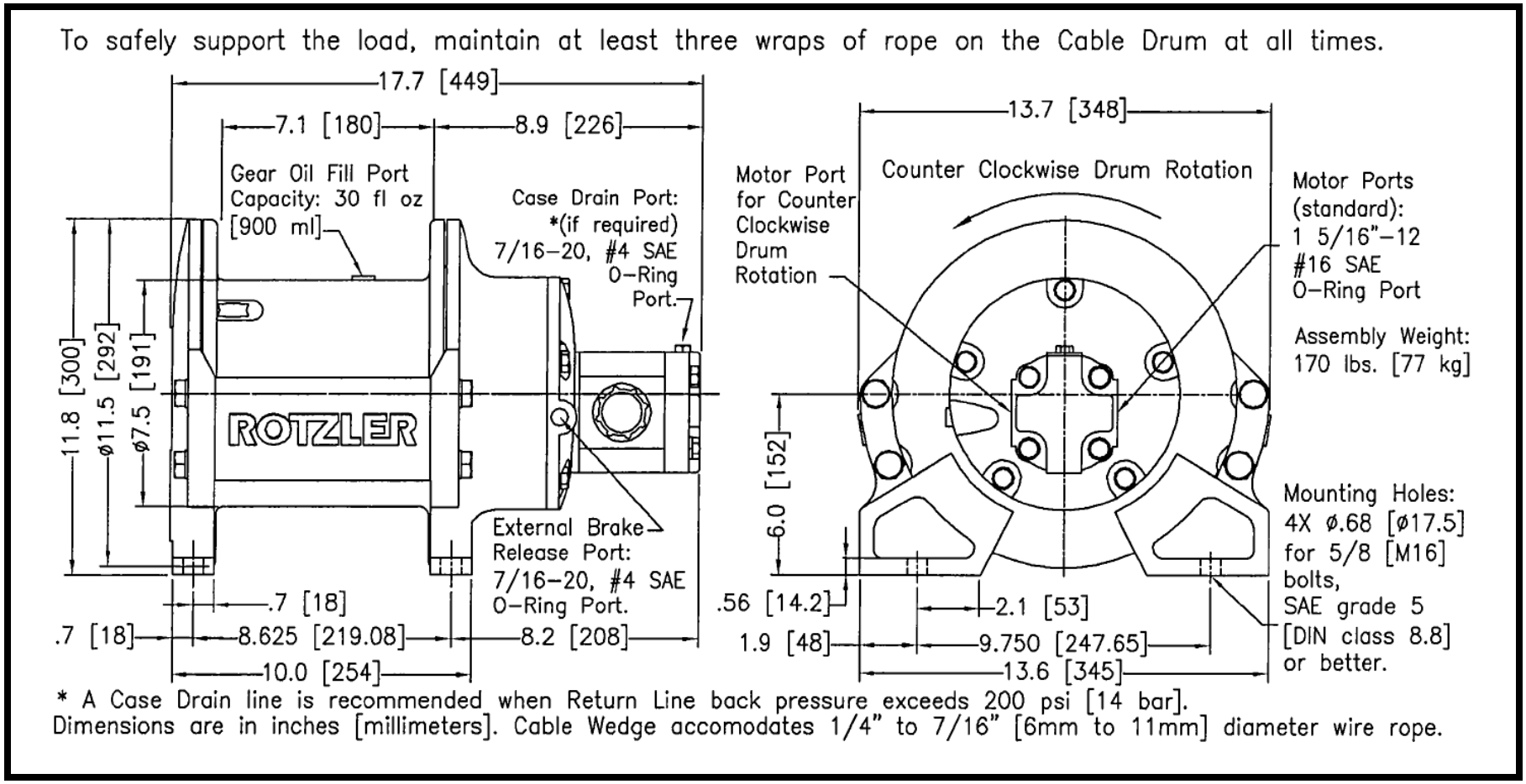
The following graphs show the winch performance with 3/8” diameter cable on various layers of the Cable Drum.





TECHNICAL DATA – TH2.XX.19.0

#TH2.**.19.0 REV D



- **CABLE DRUM STORAGE CAPACITY**

CABLE SIZE	1/4"	5/16"	3/8"	7/16"	6 mm	8 mm	9 mm	10 mm	11 mm
STORAGE CAPACITY	447'	308'	212'	142'	169 m	93 m	68 m	62 m	44 m

- **LINE PULL – TH2.XX.19.0**

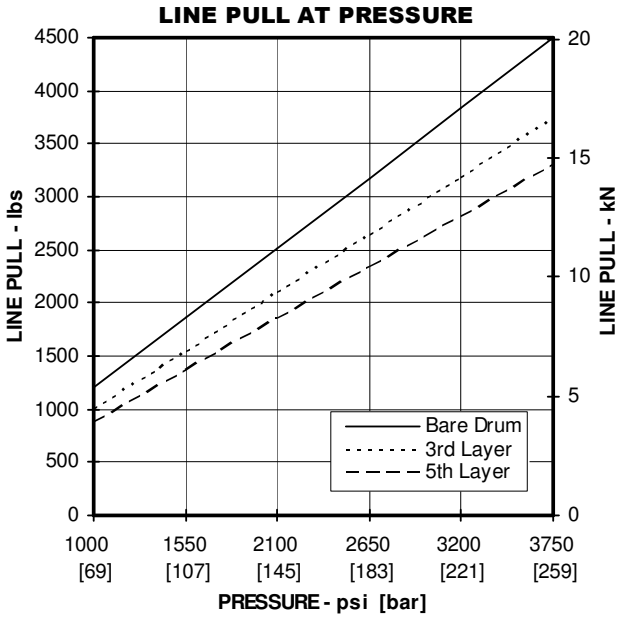
SYSTEM PRESSURE	DRUM TORQUE	LINE PULL AT SYSTEM PRESSURE
Maximum system pressure: 3750 psi [259 bar]	17600 in-lb [2000 N·m]	Bare Drum: 4500 lb [20 kN]
		Full Drum: 3300 lb [15 kN]
Minimum System Pressure: 1000 psi [70 bar]	4690 in-lb [530 N·m]	Bare Drum: 1200 lb [5 kN]
		Full Drum: 880 lb [4 kN]

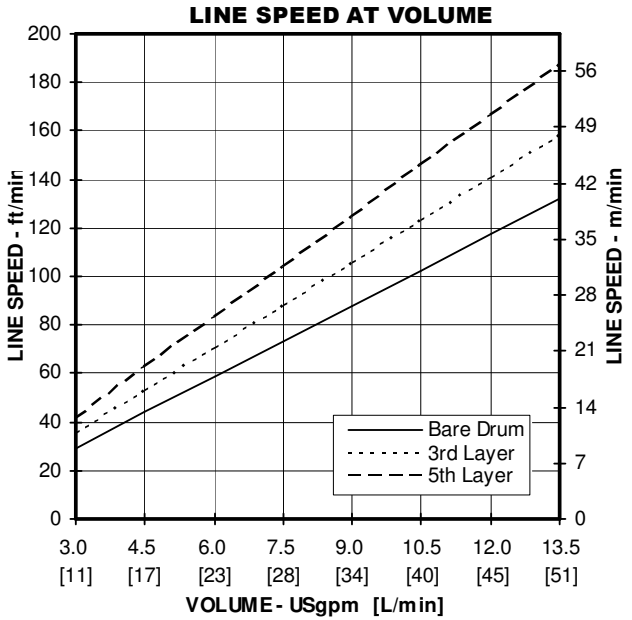
- **LINE SPEED – TH2.XX.19.0**

SYSTEM VOLUME	DRUM SPEED	LINE SPEED AT SYSTEM VOLUME
Maximum System Volume: 13.5 USGPM [51 L/min]	64 RPM	Bare Drum: 132 ft/min [40 m/min]
		Full Drum: 187 ft/min [57 m/min]
Minimum System Volume: 3 USGPM [11 L/min]	15 RPM	Bare Drum: 30 ft/min [9 m/min]
		Full Drum: 43 ft/min [13 m/min]

- **PERFORMANCE GRAPHS – TH2.XX.19.0**

The following graphs show the winch performance with 3/8” diameter cable on various layers of the Cable Drum.





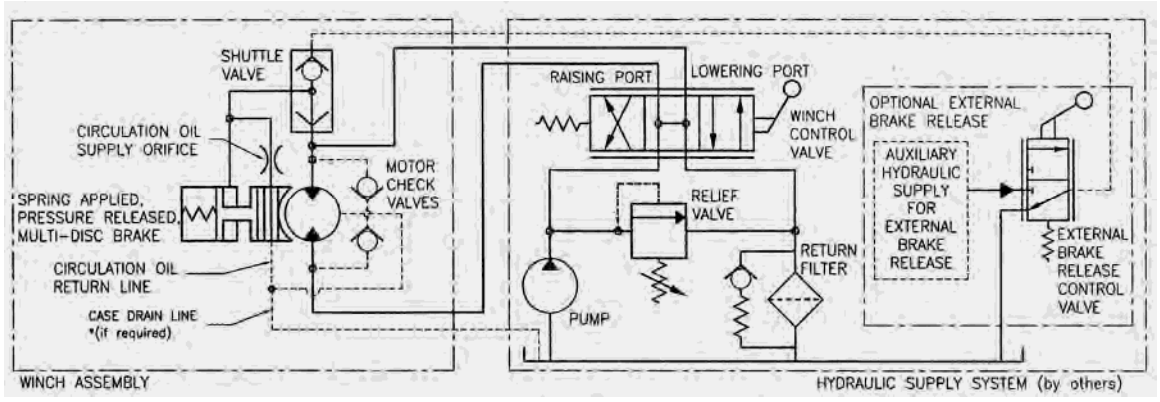
3. HYDRAULIC SYSTEM

To achieve the specified line pull and line speed performance, the hydraulic power unit must be capable of delivering the specified hydraulic pressure and flow.

The maximum allowable return line back pressure is 200 psi [14 bar]. If system back pressure cannot be limited to 200 psi [14 bar], remove one of the two ORB plugs located in the Port End Motor Cover #210 and connect a hose to drain the excess brake cavity pressure directly to tank. Do not connect to a common return line.

- **HYDRAULIC SYSTEM FLUID** - Use premium grade petroleum based hydraulic fluid. For optimum performance the fluid viscosity should be maintained between 60 and 1400 SUS [10 and 300 cSt]. The operating viscosity in extreme conditions, for short periods of time, should not exceed 45 and 4545 SUS [10 and 1000 cSt]. The recommended operating temperature range of the hydraulic fluid is between 5 and 150 deg F [-15 and 66 deg C].
- **CONTROL VALVE** - A four-way three position, spring centered control valve with motor spool is recommended. For optimum winch performance, work ports should be connected to tank in neutral position. If a control valve with cylinder spool must be used, remove one of the two ORB plugs located in the Port End Motor Cover #210 and connect a hose to drain the excess brake cavity pressure directly to tank. Do not connect to a common return line. To provide smooth control at low speeds, a valve with good metering capability is required.
- **RELIEF VALVE** - A pressure relief valve is required to limit the maximum system pressure supplied to the winch and avoid possible over load damage.
- **RESERVOIR** - A well designed and manufactured reservoir is important. Ensuring return lines enter the reservoir below the fluid level and using baffles to divert the oil path reduces air entrapment. To prevent oil contamination, the reservoir must be constructed and maintained in a clean condition. The reservoir must have sufficient surface cooling capacity to dissipate the heat generated in the oil by the brake during lowering.
- **FILTER** - A high quality, well maintained filter is an important component in any hydraulic system. Typically, other system components will dictate the required filtration level. The recommended minimum requirement is a 10 micron filter.
- **HOSES** - Size hydraulic hoses and fittings to accommodate the winch maximum hydraulic pressure and flow. The following minimum recommendation is made for the Rotzler Titan TH2 winch:
  - Standard Motor pressure hoses: 1” [25 mm] diameter, 2500 psi [170 bar] operating pressure, grade SAE 100R12 or better. Use larger diameter hoses when extra long lines are required. Refer to factory for hose recommendations when using optional motors.

When rigid tube or pipe is used to plumb the control valve, minimize vibration damage by using short flexible jumper hoses immediately at the winch.



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4. INSTALLATION

Rotzler Titan winches are to be installed by trained and authorized personnel who have read and understand the installation instructions in this manual. This manual is to be kept near the winch and made accessible to installation personnel.

⚠ WARNING

FAILURE TO FOLLOW WINCH MOUNTING INSTRUCTIONS COULD RESULT IN WINCH FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE INSTALLING THIS WINCH.

IMPORTANT: FOR PROPER LUBRICATION OF THE INTERNAL GEAR COMPONENTS, MOUNT THE WINCH HORIZONTALLY.

WINCH INSTALLATION

Initial winch mounting is critical for safe operation and optimum performance. Prevent distortion of the winch's centerline by mounting as follows:

- Verify that the winch mounting support structure is adequately designed and constructed to withstand the intended loads with minimal deflection.
- Verify that the mounting surface and the underside of the winch are clean of rust, scale, loose paint, dirt, oil and grease.
- Position the winch on the mounting structure.
- Use hardened steel Structural flat washers between the mounting bolt and the cast Base.
- Inspect each of the four winch feet for contact with the mounting surface. If one of the feet does not contact the mounting surface, correct as follows:
  - Install the recommended mounting bolts (refer to **GENERAL DIMENSIONS** for required size and grade) on the three mounting feet that are in contact with the mounting surface. Lightly tighten until snug.
  - Use shim stock to securely fill the gap beneath the fourth mounting foot.
  - Install the fourth mounting bolt.
  - Fully tighten all four mounting bolts to torque recommended for particular connection design.

ADDING GEAR LUBRICATING OIL

IMPORTANT: THE WINCH IS SHIPPED FROM THE FACTORY WITHOUT GEAR LUBRICATING OIL. TO PREVENT MAJOR WINCH COMPONENT FAILURE, ADD GEAR LUBRICATING OIL PRIOR TO RUNNING THE WINCH.

Add gear lubricating oil as follows:

- Remove the Pipe Plug located on the Cable Drum barrel and the Relief Valve located on the outside of the Final Base.
- Pour high quality SAE 90 gear lubricant oil into the Cable Drum through the Plug port (refer to **GENERAL DIMENSIONS** for required volume). In severe applications, gear tooth wear can be reduced by using a high performance gear lubricant such as Swepco #201 Multi-Purpose Gear Lube.
- Fill the Cable Drum until gear oil appears at the Final Base Relief Valve port. The Cable Drum is now properly half filled with gear oil.
- Install the Relief Valve and Cable Drum Pipe Plug, using Loctite #565 Thread Sealant to seal threads.

HYDRAULIC SYSTEM CONNECTION

Recommendations for the selection and arrangement of hydraulic system components are given in the **HYDRAULIC SYSTEM** section of this manual.

Before connecting the winch, verify that the hydraulic system produces the required hydraulic fluid pressure and volume. The Motor hoisting and lowering ports are identified in **GENERAL DIMENSIONS**.

Run the winch without load in both directions using the hydraulic system control valve. Ensure that the brake is effective in the appropriate direction of rotation by verifying that the motor develops significantly higher pressure when lowering than when hoisting.

CABLE SELECTION AND INSTALLATION

The cable and other load lifting attachments are not part of the winch and are not covered by this manual. Refer to the manufacturer's recommendations for proper cable selection, handling, inspection and maintenance.

It is the responsibility of the user to identify and follow applicable local regulations governing lifting operations and equipment, including the selection and allowable loading of cable.

- **CABLE INSTALLATION - FLEET ANGLE**

For proper spooling onto the Cable Drum, the cable angle must not exceed the maximum allowable fleet angle as indicated below. To satisfy this requirement, the distance from the drum to the first sheave must exceed 14 times the distance between the drum flanges.

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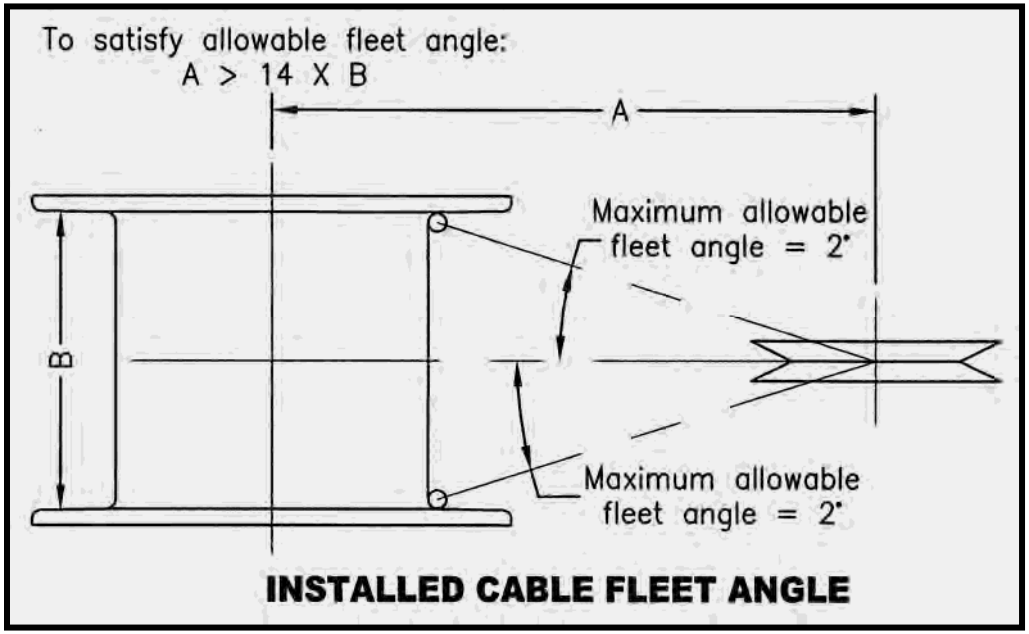

INSTALLED CABLE FLEET ANGLE

- **CONNECTING THE CABLE**

⚠ WARNING

IMPROPER CABLE CONNECTION COULD ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE CONNECTING THE CABLE.

The winch brake can support the load in one direction only. It is therefore critical to ensure that the cable is correctly connected to the Drum.

The Cable Drum has a single pocket that allows the cable to be connected for either counter clockwise or clockwise hoisting. When shipped from the factory, a Rotation Label indicating direction of hoisting and connection instructions is attached to the Cable Drum.

Connect the cable to the Drum as follows (refer to diagram):

- Identify the appropriate direction of rotation from the Rotation Label.
- Pass the cable through the cable slot as shown. Bring the loose end around and back into the slot to form a large loop.
- Push the loose end of the cable through the slot until it is even with the opening. Do not let it protrude from the Drum barrel.
- Insert the Cable Wedge tapered end first, into the slot at the center of the cable loop. Tighten the cable while maintaining the Wedge in position.
- As the cable is pulled tight, ensure that the end of the cable stays even with the slot opening as shown.
- Wind at least three complete wraps of cable onto the Cable Drum before connecting the load.

INSTALLATION INSPECTION

⚠ WARNING

HOISTING THE LOAD WITH AN IMPROPERLY INSTALLED WINCH COULD RESULT IN WINCH FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH.
INSPECT AND TEST WINCH INSTALLATION BEFORE HOISTING HEAVY LOADS TO POTENTIALLY DANGEROUS HEIGHTS.

Verify proper winch installation by slowly lifting and lowering a full test load to a safe height several times before lifting a heavy load to a potentially dangerous height.

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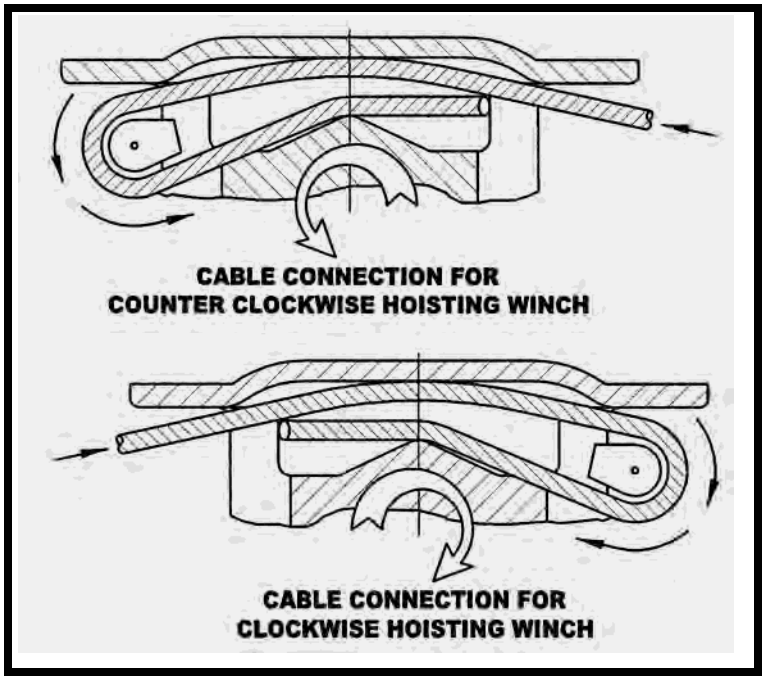


5. OPERATION

SAFETY INSTRUCTIONS

⚠ WARNING

IMPROPER WINCH OPERATION COULD ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE OPERATING THIS WINCH.

Rotzler Titan winches are to be operated by trained and authorized personnel who have read and understand the operating instructions in this manual. This manual is to be kept near the winch and made accessible to the operating personnel.

Rotzler Titan winches are not designed, nor intended to lift or move personnel.

Rotzler Titan winches must be installed and operated according to instructions given in this manual.

Operating and safety recommendations made by the manufacturers of other related equipment must also be followed.

It is the operator's responsibility to know and ensure that all local regulations governing hoisting operations are followed.

OPERATING INSTRUCTIONS

The hydraulic control valve controls the direction and speed of the winch. A valve with good metering characteristics will provide good low speed control of the load. Returning the valve to neutral allows the brake to apply and secure the load.

The Cable Wedge pocket is not intended to support the full load. To safely support the load, maintain at least three wraps of rope on the Cable Drum at all times.

The winch must be operated within the load and speed limits stated on the Final Base Identification Label.

When hoisting a load, the operator must maintain visual contact with the load and the immediate operating area. If the operator does not have clear sight of the load, auxiliary personnel or equipment must be used to ensure that the load is lifted safely.

Spooling is improved by maintaining tension on the wire rope.

ALLOWABLE OPERATING TEMPERATURE

Operate the winch only when the hydraulic fluid temperature is within the recommended operating temperature range specified in the **HYDRAULIC SYSTEM** section of this manual.

Operate the winch only when ambient temperature is between 5 and 140 deg F [-15 and 60 deg C].

Contact Rotzler Inc. if it is required to operate the winch in extreme temperatures, vibration, sand, dust or other detrimental environmental conditions.

CABLE HANDLING INSTRUCTIONS

When working with steel cable, always wear gloves. Never use your hands to guide a tight cable.

Do not allow the cable to pass over sharp edges.

Clean and check the cable after every use. Be familiar and comply with all local rules and regulations governing cable inspection and replacement criteria. Replace damaged cable immediately.

SPECIAL INSTRUCTIONS - EXTERNAL BRAKE RELEASE

Refer to the following instructions to release the winch brake and lower a load using an auxiliary hydraulic supply system and the optional External Brake Release Kit #9271804000 (#220-091).

- **DESCRIPTION OF EXTERNAL BRAKE RELEASE FUNCTION**

The External Brake Release Kit is comprised of a Steel Ball #400000668 (#220-051) and an External Brake Release Fitting #4000006890 (#220-050). These parts are positioned inside the external brake release port of the Motor Shaft End Cover.

The Steel Ball acts as a shuttle valve and prevents auxiliary hydraulic oil supplied at the External Brake Release Fitting from dumping to tank through the Motor. When auxiliary oil is supplied to the Brake Piston, pressure develops and partially releases the Brake. When the diminished brake can no longer hold the load, the Brake Discs slip and the load begins to lower.

Oil passes through the Brake Piston orifice and circulates through the Brake Discs to dissipate heat generated when slipping. This oil then passes through the Motor and back to tank.

⚠ WARNING

FAILURE TO VENT THE EXTERNAL BRAKE RELEASE FITTING TO TANK DURING NORMAL WINCH OPERATION COULD TRAP PRESSURE AT THE BRAKE PISTON AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. ENSURE THAT THE EXTERNAL BRAKE RELEASE FITTING IS VENTED TO TANK WHEN NOT IN USE.

- **AUXILIARY HYDRAULIC SUPPLY SYSTEM**

The auxiliary system must continuously supply at least 2 USGPM [7.5 L/min] at 1000 psi [70 bar] through a three way, two position, spring returned, control valve to the External Brake Release Fitting.

The valve work port must be connected to tank in the neutral position. A very sensitive control valve is required to control the speed of the lowering load.

The auxiliary system can be permanently plumbed to the External Brake Release Fitting or connected as required. In either case, the Fitting must be vented to tank when not in use and never capped.

- **INSTALLATION**

When installed at the factory, the External Brake Release Fitting comes installed in the Motor Shaft End Cover port and protected by a Plastic Cap #4000005989 (#220-082).

When installing the External Brake Release Kit into an existing winch, remove the Motor Shaft End Cover Plug #9272214000 (#220-072) and insert the Steel Ball into the Motor Shaft End Cover external brake release port. Then install and tighten the External Brake Release Fitting.

- **OPERATION**

Supply oil through the auxiliary control valve to the External Brake Release Fitting. Increase the flow of oil to increase pressure and allow the load to drop faster. Return the valve to neutral to reduce the flow of oil and slow or stop the lowering load. A valve with very fine metering capability can be carefully modulated to allow some speed control.

Oil passing through the Brake Piston orifice removes heat from the Brake Discs and must be allowed to vent to tank through the Motor hoses.

IMPORTANT: CIRCULATION OIL MUST BE ALLOWED TO RETURN TO TANK THROUGH THE MOTOR HOSES. ENSURE THAT THE MOTOR PORTS ARE NOT PLUGGED WHEN SUPPLYING AUXILIARY OIL AT THE EXTERNAL BRAKE RELEASE FITTING.

6. MAINTENANCE

⚠ WARNING

FAILURE TO PROPERLY MAINTAIN AND SERVICE THE WINCH COULD RESULT IN A MAJOR MECHANICAL FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE MAINTAINING THIS WINCH.

INTRODUCTION

Rotzler Titan winches are to be maintained by trained and authorized personnel who have read and understand the maintenance instructions in this manual. This manual is to be kept near the winch system and made accessible to the maintenance personnel.

Safe operation and optimum performance can only be assured when maintenance intervals are strictly followed. Be familiar and comply with all local rules and regulations governing the maintenance of hoisting equipment.

When maintaining the winch, ensure that the control system is deactivated and appropriate protective lock out devices are in place to prevent inadvertent winch start up during service.

CABLE MAINTENANCE

⚠ WARNING

CABLE WEARS OUT. FAILURE TO DETECT CABLE DAMAGE CAN LEAD TO UNEXPECTED CABLE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH.

The cable is supplied independent of the winch and is not covered in this manual. Refer to manufacturer's recommendations for inspection and maintenance instructions.

Be familiar with and adhere to any local or national regulations governing the replacement of wire ropes used in hoisting operations.

- **REPLACING A DAMAGED CABLE**

Replace damaged cable as follows:

- Spool the cable off of the Drum until only the end secured in the Cable Wedge remains.
- Rotate the Drum until the Cable Wedge socket is easily accessible.
- Dislodge the Cable Wedge by pushing the cable rope into the Cable Wedge socket.
- Remove the Cable Wedge and pull the free end of the cable through the socket.
- Discard damaged cable and install new cable according to instructions in **CABLE SELECTION AND INSTALLATION.**

PREVENTIVE MAINTENANCE

Perform a basic inspection of the winch daily, monitoring for unusual noise or hydraulic leaks. Clean and check the cable for damage daily. Verify the tension of all mounting bolts weekly.

- **MAINTAINING GEARBOX LUBRICATING OIL**

Inspect the gearbox lubricating oil level through the Final Base Relief Valve port every two months. Maintain the oil level at the half-full point. Repeated loss of lubricating oil indicates a leak and should be investigated.

After the initial 100 hours of operation or two months, whichever comes first, drain the lubricating oil, flush the Cable Drum and add new oil. Subsequently, change the lubricating oil after every 1000 hours of operation or every two years, whichever comes first.

- **MAINTAINING HYDRAULIC SYSTEM FLUID**

Inspect and maintain the hydraulic system filter and other components according to the manufacturers' recommendations. Once a year, verify the condition of the hydraulic system fluid by having it analyzed for cleanliness, oxidation, color and viscosity. Increase this frequency in severe operating or environmental applications. Clean or replace fluid as required.

- **PERIODIC PERFORMANCE VERIFICATION**

Verify the performance of the winch every two months. In critical applications, this frequency should be increased. Major service problems are avoided by careful monitoring and early fault detection.

Hoist and lower a full test load at full hydraulic volume. Record the following measurements for evaluation and retain for future reference:

	NO LOAD		FULL LOAD	
	HOIST	**LOWER**	**HOIST**	**LOWER**
Pressure at motor port A				
Pressure at motor port B				
Cable Drum RPM				

Refer to **WINCH TROUBLE SHOOTING** if:

- Winch does not smoothly hoist and lower the full test load.
- Any abnormal noises are detected.
- Test measurements vary from specifications listed in **PERFORMANCE DATA** or from previously recorded measurements
- Motor does not develop at least 200 psi [14 bar] at the lowering port when lowering full test load at full hydraulic volume.
- Any hydraulic fluid or gear box lubricating oil leaks are detected.

- **PERIODIC OVERHAUL AND INSPECTION**

A complete disassembly and internal inspection of the winch should be performed after every 1000 hours of operation or every two years, whichever comes first.

- Remove winch to a clean, well lit shop area.
- Disassemble, inspect and service winch as required according to **DISASSEMBLY INSTRUCTIONS**. Discard all O-Rings and Shaft Seals.
- Thoroughly clean all components.
- Assemble the winch according to **ASSEMBLY INSTRUCTIONS**, replacing all O-rings and Shaft Seals.
- Remount and test the winch according to **INSTALLATION INSTRUCTIONS**.

HYDRAULIC SYSTEM TROUBLE SHOOTING

Before trouble shooting an apparent winch fault, ensure that the hydraulic system is delivering the specified hydraulic pressure and volume. Hydraulic system problems are frequently incorrectly diagnosed as winch problems.

An in-line flow meter installed immediately at the winch can be used to confirm adequate hydraulic system supply volume through the winch motor. A faulty hydraulic system pump, relief valve or control valve could divert the hydraulic supply and reduce the winch speed.

Pressure gauges installed immediately at the winch motor ports can be used to confirm adequate hydraulic system supply pressure. A faulty hydraulic system pump, relief valve or control valve could reduce the hydraulic supply pressure and diminish the winch pulling capacity.

If the fault persists and the hydraulic system performance has been verified, refer to **WINCH TROUBLE SHOOTING**.

WINCH TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. Winch will not hoist/pull rated load.	a) Inadequate hydraulic system supply pressure.	a) Install gauges at motor ports to verify hydraulic system supply pressure and correct as required.
	b) Damaged winch motor.	b) Replace or repair winch motor.
	c) Winch centerline is distorted due to uneven mounting surface.	c) Refer to **INSTALLATION INSTRUCTIONS** for proper winch mounting.
	d) Binding load carrying sheaves.	d) Inspect and repair or lubricate sheaves as required.
2. Winch will not turn at rated speed.	a) Inadequate hydraulic system supply volume.	a) Use an in-line flow meter at the motor to verify hydraulic system supply volume and correct as required.
	b) Damaged winch Motor.	b) Replace or repair winch Motor.
	c) Winch centerline is distorted due to uneven mounting surface.	c) Refer to **INSTALLATION INSTRUCTIONS** for proper winch mounting.
	d) Binding load carrying sheaves.	d) Inspect and repair or lubricate sheaves as required.
3. Winch will not hold the load.	a) Wire rope is wound onto the cable drum in the wrong direction.	a) Install wire rope according to **INSTALLATION INSTRUCTIONS**.
	b) Hydraulic system is trapping pressure at external brake release port.	b) Vent the external brake release port to tank when in neutral.
	c) Hydraulic system control valve is equipped with the wrong spool and traps pressure at the motor lowering port when returned to the neutral position.	c) Install a control valve spool that connects both work ports to tank in the neutral position.
	d) Clutch assembly is damaged.	d) Disassemble and inspect the Sprag Clutch, Brake Shaft and Brake Hub according to **SERVICE INSTRUCTIONS**. Replace worn or damaged components.
	e) Brake Friction or Separator Plates are worn or damaged.	e) Disassemble and inspect the Brake Discs and Brake Separators according to **SERVICE INSTRUCTIONS**. Replace as required.
	f) Hydraulic fluid contamination is causing Brake Piston to bind in Primary Base.	f) Disassemble and inspect the bore of the Primary Base for contamination or abrasion damage according to **SERVICE INSTRUCTIONS**. Repair or replace as required.

WINCH TROUBLE SHOOTING (continued)

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
4. Winch will not turn in the lowering direction.	a) Inadequate hydraulic system supply pressure.	a) Install gauges at motor ports to verify hydraulic system supply pressure. Correct as required.
	b) Brake release pressure does not develop at Brake Piston due to damaged O-Rings.	b) Disassemble and inspect Brake Piston and Brake Conduit O-Rings according to **SERVICE INSTRUCTIONS**. Replace as required.
	c) Brake release pressure is prevented from reaching Brake Piston due to blocked Brake Conduit.	c) Disassemble and inspect Brake Conduit center bore is clear according to **SERVICE INSTRUCTIONS**. Repair as required.
	d) Damaged winch Motor.	d) Replace or repair winch Motor.
	e) Winch centerline is distorted due to uneven mounting surface.	e) Refer to **INSTALLATION INSTRUCTIONS** for proper winch mounting
5. Winch vibrates when lowering the load.	a) Inadequate hydraulic system supply volume.	a) Use an in-line flow meter at the motor port to verify hydraulic system supply volume is greater than the minimum volume specified in **PERFORMANCE DATA**. Correct as required.
	b) Air in hydraulic fluid.	b) Ensure that the hydraulic fluid is clear. If appearance is milky or cloudy, air is being introduced into the hydraulic system. Diagnose and correct as required.
	c) Cooling oil supply to Brake Discs is blocked by a plugged Brake Piston orifice.	c) Remove Brake Piston and inspect orifice according to **SERVICE INSTRUCTIONS**. Clear if plugged.
	d) Brake Discs or Separators are damaged or worn.	d) Disassemble and inspect the Brake Discs and Separators according to **SERVICE INSTRUCTIONS**. Replace as required.
	e) Clutch assembly is damaged.	e) Disassemble and inspect the Sprag Clutch, Brake Shaft and Brake Hub according to **SERVICE INSTRUCTIONS**. Replace worn or damaged components.

WINCH TROUBLE SHOOTING (continued)

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
6. Winch leaks oil.	a) Hydraulic fluid leaks from between the Motor Shaft End Cover and the Primary Base due to a damaged O-ring.	a) Disassemble and inspect the Motor Shaft End Cover O-ring and sealing surfaces according to **SERVICE INSTRUCTIONS**. Replace or repair as required.
	b) Hydraulic fluid leaks from the Motor Gear Housing due to damaged Motor Housing Seal.	b) Disassemble and inspect the Motor Shaft Seals and sealing surfaces according to **SERVICE INSTRUCTIONS**. Replace or repair as required.
	c) Gear lubricating oil leaks from between the Final Base and Cable Drum flange due to a damaged final end Cable Drum Seal.	c) Disassemble and inspect the final end Cable Drum Seal according to **SERVICE INSTRUCTIONS**. Ensure that the sealing surface of the Seal Sleeve is smooth and that the Seal Sleeve connection to the Final Base is intact. Replace seal and repair sealing surface or connection as required.
	d) Gear lubricating oil leaks from the Final Base Relief Valve due to one of the following faults: I) Relief Valve is damaged or blocked open. II) The Brake Shaft Seal is leaking hydraulic fluid into the Cable Drum and relieving through the Relief Valve. Inspect both areas between the Cable Drum flanges and Bases for oil leakage resulting from damaged Cable Drum Seals.	d) I) Remove and inspect Relief Valve. Clear any contamination or replace Valve as required. II) The Cable Drum cavity fills with hydraulic system fluid if the Brake Shaft Seal has failed. If this occurs, disassemble and inspect the Brake Shaft Seal according to **SERVICE INSTRUCTIONS**. Replace as required. If damaged, replace Cable Drum Seals also.
	e) Gear lubricating oil leaks from between the Primary Base and Cable Drum flange due to a damaged primary end Cable Drum Seal or Bearing Holder O-ring.	e) Disassemble and inspect the primary end Cable Drum Seal and Bearing Holder O-ring according to **SERVICE INSTRUCTIONS**. Inspect the corresponding sealing surfaces. Ensure that the Seal Sleeve connection to the Primary Base is intact. Replace seal, repair sealing surface or connection as required.

GENERAL SERVICE INSTRUCTIONS

- **INTRODUCTION**

Rotzler Titan winches are designed for easy field repair. If a fault is isolated to one of the three major assemblies, that assembly can be immediately replaced in its entirety and the failed assembly repaired when time permits or returned for factory service.

Perform service of internal components in a clean, well lit, shop area. Discard all O-Rings and Shaft Seals when servicing the winch. Do not attempt to re-use seals.

- **SERVICING CRITICAL COMPONENTS**

Due to their important function, several internal components are identified as CRITICAL COMPONENTS. CRITICAL COMPONENTS are tracked by the winch Serial Number located on the Final Base Identification Label.

Return Fax forms are provided when CRITICAL COMPONENTS are supplied as spare parts. Return this form to Rotzler Inc. when a CRITICAL COMPONENT is replaced and the manufacturing records for that winch Serial Number will be updated and the component history maintained. This service is offered to protect the end user and participation is left to the discretion of the end user.

- **SERVICE RECORDS**

Maintain a winch Service Log, identifying Serial Number, service performed, preventive maintenance and service dates.

- **ADHESIVE PROCEDURE**

Adhesive technology is used throughout Titan winches to structurally secure fasteners and other components. Cleanliness is critical for the successful application of adhesives. Oily contamination from a dirty work area, tools or hands will reduce the strength of adhesive bonds.

SECURING FASTENERS WITH ADHESIVES

1. Use Loctite #262 Threadlocker to secure fasteners.
2. Ensure that fasteners and threaded holes are clean and dry.
3. Apply a bead of Threadlocker axially along the bottom portion of the screw thread that will engage the female thread. Use a single bead approximately 1/8-3/16” [3-5mm] in diameter, depending on screw size.
4. Initially, install screws only finger tight. When a tightening sequence is required, the specified tightening order assumes that the screws are numbered in sequence around the bolt pattern. Screws are then tightened according to the defined order.
5. Wipe away excess Threadlocker.
6. Allow 24 hours for adhesive to cure before applying full service load.
7. Although considered to be a permanent bond, screws can be readily removed using normal hand tools.

SECURING BEARINGS WITH ADHESIVES

1. Use Loctite #648 Retaining Compound to secure bearings as required.
2. Ensure that the bearing and the machined bore are clean and dry.
3. Apply a single bead of Retaining Compound approximately 1/8” [3mm] in diameter around the inside perimeter of the bearing bore. Locate this bead at approximately the same distance from the bottom step as the bearing width.
4. Push bearing into bore until it rests against stop.
5. Wipe away excess compound.
6. Allow 24 hours for adhesive to cure before applying full service load.
7. Although considered to be a permanent bond, bearings can be removed using normal hand tools.

DISASSEMBLY INSTRUCTIONS

REMOVE AND DISASSEMBLE MOTOR ASSEMBLY

- **REMOVE MOTOR ASSEMBLY (Refer to WINCH DRAWING)**

Gradually loosen each of the five Motor Screws #450 to allow the Brake Springs #520 to expand evenly.

Remove the Motor Assembly #001. Leave the Brake Conduit #510 positioned in the Brake Piston #555.

Remove and discard the Motor O-Ring Seal #440.

- **DISASSEMBLE MOTOR (see MOTOR DRAWING)**

If a fault has been isolated to the Motor Assembly, replace the complete Motor Assembly or disassemble and service as follows:

INSPECTION NOTE: Examine the surface finish of the Brake Conduit bore in the Motor Shaft End Cover #272. Repair bore if scratched or damaged.

Before disassembling, match mark the Shaft End Cover #272, Gear Housing #250 and Port End Cover #210. Be careful to maintain the orientation of all major components for re-assembly.

Remove the four Motor Assembly Screws #220 and Washers #230. (If it is difficult to hold the Motor Assembly while loosening the Assembly Screws, leave the Motor mounted on the winch while starting to loosen the Screws.) Remove the Port End Cover.

Disengage the two Gear Housing Dowel Pins #270 while pulling the Motor Gear Housing #250 from the Motor Shaft End Cover.

Remove the Thrustblock Bushings #255 complete with Channel Seals #259 + #260 and Backups #265. Discard the Channel Seals and Backup.

Make note of and maintain the orientation of the Gear Set #290 + #291 while removing it from the Gear Housing.

INSPECTION NOTE: Examine the surface finish of the Thrustblock Bushing sealing area and discard if scratched or damaged.

Remove the two Section Seals #268 from the Gear Housing and discard.

INSPECTION NOTES:

Examine the surface finish of the Motor Shaft End Cover and Port End Cover face sealing area. Repair or replace as required.

Measure Dimension A, the distance from the top of the Brake Shaft Stopper #275 to the top of the Motor Shaft End Cover as indicated in **MOTOR ASSEMBLY DRAWING**. Replace Stopper if damaged or if Dimension A is greater than 0.181” [4.6 mm].

Examine the surface finish of the Gear Housing bores. Discard if scratched or damaged. Similarly, examine the outer diameter of the Gear Set and discard if damaged.

It is normally not advised to remove Pipe Plug #245, which is positioned in the Motor Shaft End Cover depending on the required direction of rotation when hoisting. Refer to **REVERSING DIRECTION OF ROTATION** instructions if it is necessary to change the direction of hoisting rotation.

REMOVE AND DISASSEMBLE PRIMARY ASSEMBLY

- **REMOVE PRIMARY (see WINCH DRAWING)**

Position the winch vertically with the Motor end up, resting on the Final Base. Remove the Motor Assembly #001 according to **REMOVE MOTOR ASSEMBLY** instructions.

Remove the four primary end Spacer Bar Screws #430 and Washers #431. Lift the Primary Assembly #002 off of the Final Assembly #003. Support the Primary Assembly on blocks with the Brake Springs facing up.

- **DISASSEMBLE PRIMARY (see PRIMARY DRAWING)**

If a fault has been isolated to the Primary Assembly, replace the complete Primary Assembly or disassemble and service as follows:

Remove the ten Brake Springs #520.

INSPECTION NOTE: Measure the free length of the Brake Springs and discard if less than 1.25" [32 mm] long.

Remove the Brake Conduit #510. Remove and discard two Brake Conduit O-Rings #513 and two Backup Rings #514.

INSPECTION NOTE: Examine the Brake Conduit bore and clean or replace if plugged.

Use two Motor mounting Screws #450, inserted finger tight into threaded holes provided in the Brake Piston #555 to pry the Piston out of the Primary Base #535. Remove and discard the two Piston O-Rings #530 and #540 and two Backup Rings #531 and #541.

INSPECTION NOTES:

Examine the surface finish of the Primary Base bores where the Piston O-Rings seal and repair if the surface is damaged.

Examine the Brake Piston orifice and clean or replace if plugged.

Pull the Clutch Assembly #500 out of the Primary Base and set it aside. Remove the three Brake Separators #565 and two Brake Discs #560.

INSPECTION NOTE: Examine the surfaces of the Brake Separators and Discs and replace if worn or damaged.

Remove the Brake Locator #570.

Remove the Brake Shaft Seal Retainer #585. Remove and discard the Brake Shaft Seal #580.

Reverse the Primary Base and lay it flat on the table with the threaded holes down.

INSPECTION NOTES:

Examine the inner bore of the Brake Shaft Bushing #535B that is permanently secured in the Primary Base. If Bushing is excessively worn or damaged, replace complete Primary Base. Refer to Rotzler Inc. for special instructions if it is essential to remove and replace the Brake Shaft Bushing.

Examine the outer sealing surface of the Primary Drum Seal Sleeve #535C that is permanently secured to the Primary Base. Repair any minor surface roughness. If Sleeve is worn or damaged beyond repair, replace complete Primary Base. Refer to Rotzler Inc. for special instructions if it is essential to remove and replace the Seal Sleeve.

- **DISASSEMBLE CLUTCH (See CLUTCH DRAWING)**

⚠ WARNING

FAILURE TO PROPERLY DETECT AND REPAIR A DAMAGED CLUTCH ASSEMBLY COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. CAREFULLY FOLLOW INSPECTION INSTRUCTIONS AND REPLACE THE COMPONENT OR COMPLETE ASSEMBLY IF UNCERTAIN.

If a fault has been isolated to the Clutch Assembly, replace the complete Clutch Assembly or disassemble and service as follows:

Remove the Bearing Retainer #360. Remove the two Thrust Washers #355 and Roller Bearing #350.

INSPECTION NOTE: Examine the Thrust Washers and Roller Bearing and replace if worn or damaged.

Remove the Motor End Clutch Retainer #320. Clamp the two Clutch Thrust Washers #330 against the Brake Hub and remove the Brake Hub #340, Sprag Clutch Cages #370A and End Bearings #370B together.

INSPECTION NOTE: Examine the Clutch Thrust Washers and replace if worn or damaged.

Remove the two Sprag Clutch Cages #370 and two End Bearings #370B from the Brake Hub.

INSPECTION NOTES:

Examine the surface finish of the Brake Shaft and Brake Hub where the Sprag Clutches engage. The surface finish, size and hardness of these surfaces are critically controlled. Replace the components if any wear or damage is evident.

Examine the Sprag Clutch Cages #370A and End Bearings #370B and replace if worn or damaged.

REMOVE AND DISASSEMBLE FINAL ASSEMBLY

- **REMOVE FINAL ASSEMBLY (Refer to WINCH DRAWING)**

Leave the Motor Assembly attached and remove the Primary Assembly #002 and Motor Assembly together from the Final Assembly #003 according to **REMOVE PRIMARY ASSEMBLY** instructions.

- **DISASSEMBLE FINAL (see FINAL DRAWING)**

If a fault has been isolated to the Final Assembly, replace the complete Final Assembly or disassemble and service as follows:

Remove ten Bearing Holder Screws #110. Remove the Bearing Holder #130. Remove and discard the Bearing Holder O-Ring #112. Remove and discard the Bearing Holder Shaft Seal #150.

INSPECTION NOTE: Examine the Holder Ball Bearing #125 and discard if damaged.

Lift the Primary Reduction #101 out of the Cable Drum #115.

INSPECTION NOTES:

Measure the thickness of the Carrier Stopper #155 and discard if damaged or if less than .16” [4 mm] thick.

Measure Dimension B, the distance that the Sun Gear Stopper #851 protrudes from the Final Sun Gear #880 as indicated in **FINAL ASSEMBLY DRAWING**. Discard the Stopper if damaged or if Dimension B is less than .046” [1.2 mm].

Examine the Primary Reduction gear teeth and Planet Gear Needle Bearings. Replace complete Primary Reduction Assembly if damaged. Refer to Rotzler Inc. for special instructions if it is essential to repair or rebuild the Primary Reduction.

Lift the Final Reduction #100 out of the Cable Drum.

INSPECTION NOTE: Examine the Final Reduction gear teeth and Planet Gear Needle Bearings. Replace complete Final Reduction Assembly if damaged. Refer to Rotzler Inc. if it is essential to repair or rebuild the Final Reduction.

Lift the Cable Drum off of the Final Base #145. Remove and discard the Cable Drum Shaft Seal #150.

INSPECTION NOTES:

Examine the Cable Drum Ball Bearing #125 and discard if damaged.

Examine the surface finish of the Cable Drum Bearing Holder bore and repair if damaged.

Examine the Cable Drum gear teeth and replace the Cable Drum if teeth are excessively worn or damaged.

Remove the Relief Valve #109 from the back end of the Final Base.

INSPECTION NOTES:

Examine the Relief Valve and clean or replace as required.

Examine the outer sealing surface of the Final Drum Seal Sleeve #145B that is permanently secured to the Final Base. Repair any minor surface damage. If Sleeve is worn or damaged beyond repair, replace complete Final Base. Refer to Rotzler Inc. for special instructions if it is essential to remove and replace the Seal Sleeve.

ASSEMBLY INSTRUCTIONS

Once removed, O-Rings and Shaft Seals should not be used again. It is therefore important that a Motor Seal Kit and a Winch Seal Kit be on hand before beginning any winch service. In addition to O-Rings and Shaft Seals, Service Kits contain the adhesives that might be required during assembly.

Refer to **ORDERING INFORMATION** for Seal and Service Kit component numbers.

After any winch service, always perform a safe test lift as described in **INSTALLATION INSPECTION**.

ASSEMBLE AND INSTALL MOTOR ASSEMBLY

- **ASSEMBLE MOTOR (see MOTOR DRAWING)**

Note that the Motor Gear Set #290 + #291 is a matched set of gears and must be maintained in its set. The Gear Set, Gear Housing #250 and Port End Cover #210 should be re-assembled according to the original orientation.

Clean and dry all components, particularly the threaded holes of the Motor Shaft End Cover #272.

It is normally not advised to remove Pipe Plug #245, which is positioned in the Motor Shaft End Cover depending on the required direction of rotation when hoisting. If the Plug has been removed, determine the correct location for the particular winch being serviced by referring to **MOTOR ASSEMBLY DRAWING.** Install Plug using Loctite #565 Sealant to seal the thread. Refer to **REVERSING DIRECTION OF ROTATION** instructions if it is necessary to change the direction of hoisting rotation.

If required, use Loctite #330 Acrylic Adhesive to secure a new Brake Shaft Stopper #275 in the Motor Shaft End Cover. Ensure that the Stopper is pushed all of the way to the bottom of its counterbore and that the grooves face outward as shown.

Lightly oil the inner bore of the Gear Housing, the Gear Set and all Seals.

Install new Channel Seals #259 + #260 with new Backup Seals #265 into each of the Thrustblock Bushing sets #255.

Install new Section Seals #268 in both ends of the Gear Housing.

Install two Dowel Pins #270 into the Motor Shaft End Cover.

Support the Motor Shaft End Cover on blocks elevated approximately 1" [25mm] off of the work surface.

Install the Gear Housing onto the Motor Shaft End Cover, carefully engaging the Dowel Pins and maintaining the original orientation. Install a Thrustblock Bushing set with Channel and Backup Seal facing down, into the Gear Housing cavity.

Insert the Gear Set into the Gear Housing, maintaining the original orientation.

Place the second Thrustblock Bushing set into the Gear Housing with the Seals facing up. Place the Port End Cover #210 onto the Gear Housing.

When originally assembled, the position of Plug #245 was externally indicated by marking one of the four Motor Assembly Screws #220 (see **MOTOR ASSEMBLY DRAWING**). When re-assembling the Motor, be sure to maintain the proper position of this marked screw.

Install and secure the four Motor Assembly Screws using the Threadlocker procedure described in **SECURING FASTENERS WITH ADHESIVES**. Tighten Screws to 31 ft-lb [42 Nm] in 1-3-4-2 sequence.

- **INSTALL MOTOR ASSEMBLY (See WINCH DRAWING)**

Lightly grease and install a new Motor O-Ring #440.

Remove the Brake Springs and align the Brake Conduit port in the Motor Shaft End Cover with the Brake Conduit #510 located in the Brake Piston #555. Replace the Brake Springs. Carefully engage the Motor spline with the Brake Shaft #310.

Install and secure the five Motor Screws #450 using the Threadlocker procedure described in **SECURING FASTENERS WITH ADHESIVES.** Gradually tighten each Screw in 1-3-5-2-4 sequence to evenly compress the Brake Springs #520.

- **ASSEMBLE CLUTCH ASSEMBLY (Refer to CLUTCH ASSEMBLY DRAWING)**

Thoroughly clean and dry all components.

Install a Clutch Retainer #320 into the middle groove of the Brake Shaft #310. Install a Clutch Thrust Washer #330 with the groove facing into the Clutch as shown.

⚠ WARNING

FAILURE TO PROPERLY INSTALL THE SPRAG CLUTCH COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. CONFIRM THE DIRECTION OF ROTATION AND INSTALL CLUTCH ACCORDING TO INSTRUCTIONS.

Proper orientation of the Sprag Clutch Cages #370A and End Bearings #370B in the Brake Hub #340 is critical for reliable brake function. Ensure that the Clutch Cages and End Bearings are properly oriented in the Brake Hub as shown in the **CLUTCH ASSEMBLY DRAWING**. Carefully push the Brake Shaft through the Sprag Clutch using a twisting motion, again referring to **CLUTCH ASSEMBLY DRAWING** for the correct Brake Shaft orientation.

Install the second Clutch Thrust Washer #330 with the groove facing into the Clutch as shown. Secure with the second Clutch Retainer #320.

Verify that the Clutch Assembly is properly assembled as follows:

- Hold the Clutch Assembly by the Brake Hub outer diameter and look at the Brake Shaft female spline from the Motor end. Ensure that the Brake Shaft rotates as follows:
    - Counterclockwise hoisting winch: Brake Shaft rotates free in the clockwise direction and locks in the counterclockwise direction.
    - Clockwise hoisting winch: Brake shaft rotates free in the counterclockwise direction and locks in the clockwise direction.

IMPORTANT: DISCARD THE SPRAG CLUTCH CAGE IF ANY OF THE INTERNAL SPRAGS COME LOOSE WHEN HANDLING. DO NOT ATTEMPT TO RE-ASSEMBLE.

After confirming that the assembly orientation is correct for the required direction of hoisting rotation, complete the Clutch Assembly by installing a Thrust Washer #355, the Thrust Roller Bearing #350 and the second Thrust Washer #355 onto the Reduction End of the Brake Shaft. Secure the bearing assembly by installing the Bearing Retainer #360.

ASSEMBLE AND INSTALL PRIMARY ASSEMBLY

- **ASSEMBLE PRIMARY ASSEMBLY (Refer to PRIMARY ASSEMBLY DRAWING)**

⚠ WARNING

FAILURE TO PROPERLY ASSEMBLE THE PRIMARY ASSEMBLY COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE ASSEMBLING THE PRIMARY ASSEMBLY.

Clean and dry all components, particularly the threaded holes of the Primary Base #535. Support the Primary Base on blocks with the threaded holes facing up.

Lightly oil the Primary Base at the Brake Shaft Seal gland. Grease a new Brake Shaft Seal #580 and install it into the Primary Base. Secure Brake Shaft Seal with Retainer #585.

Liberally grease the Reduction End of the Clutch Assembly #500. Use a twisting motion to insert the Clutch Assembly through the Brake Shaft Seal, carefully preventing the sharp Brake Shaft gear teeth from damaging the lip of the seal. Ensure that the Clutch Assembly Bearing is bottomed against the Primary Base.

Install the Brake Locator #570 into the Primary Base.

Lightly oil the two Brake Discs #560 and three Brake Separators #565. Install the first Brake Separator followed by the first Brake Disc. Install the second Brake Separator and then the second Brake Disc. Install the third Brake Separator.

IMPORTANT: BACKUP RINGS PREVENT O-RINGS FROM EXTRUDING UNDER HIGH PRESSURE AND MUST BE LOCATED BETWEEN THE O-RING AND EXTRUSION GAP. INSTALL BACKUP RINGS ACCORDING TO INSTRUCTIONS.

Lightly grease new Brake Piston large O-Ring #530 and small O-Ring #540. Install the O-Rings into the appropriate glands of the Brake Piston #555 with the large O-Ring at the gland nearest the Brake Spring side.

Slide both O-rings to the inside of their glands, towards the middle of the Piston. Install the large Backup Ring #531 and small Backup Ring #541 into the appropriate glands on the outside of the O-Rings. Refer to the **PRIMARY ASSEMBLY DRAWING** to ensure that the Backup Rings are in the correct position relative to the O-Rings.

Lightly oil the Primary Base where the two Piston O-Rings seat. Position the Brake Piston on the Primary Base, oriented so that the Brake Conduit port will align with the corresponding port on the Motor Assembly. Carefully and evenly, push the Piston all the way into the Primary Base until the Piston bottoms against the last Brake Separator. Verify the Piston orientation by temporarily installing a Motor Assembly with Brake Conduit onto the Primary Base. If not properly aligned, the Motor Assembly Brake Conduit can be used to spin the Piston until the Motor Cover bolt holes align with the Primary Base threaded holes.

Install two new Backup Rings #514 into the Brake Conduit #510 glands. Slide both Backup Rings to the inside of their glands, towards the middle of the Conduit. Lightly grease two new Brake Conduit O-Rings #513 and install in the glands on the outside of the Backup Rings. Refer to the **PRIMARY ASSEMBLY DRAWING** to ensure that the Backup Rings are in the correct position relative to the O-Rings.

Gently push the Brake Conduit into the Piston port.

Install ten Brake Springs #520 into the Brake Piston Spring cavities.

- **INSTALL PRIMARY ASSEMBLY (Refer to WINCH DRAWING)**

Position the Final Assembly #003 vertically, resting on its Final Base with the Bearing Holder facing up. Lower the Primary Assembly #002 into the Holder Bearing. Temporarily install four Spacer Bar Screws #430 and Washers #431. Do not secure screws with Threadlocker at this time.

Install Motor Assembly onto the Primary Base according to **INSTALL MOTOR ASSEMBLY**.

To ensure that the winch centerline is not distorted, position the Winch horizontally on a smooth, flat, clean surface. Secure the four Spacer Bar Screws #430 using the Threadlocker procedure described in **SECURING FASTENERS WITH ADHESIVES**. Tighten Screws in 1-3-2-4 sequence.

ASSEMBLE AND INSTALL FINAL ASSEMBLY

- **ASSEMBLE FINAL ASSEMBLY (Refer to FINAL ASSEMBLY DRAWING)**

Thoroughly clean and dry all components, particularly the threaded holes of the Spacer Bars #140.

Install the Relief Valve #109 into the outside of the Final Base #145 using Loctite #565 Sealant to seal the thread.

Position the Final Base flat with the male spline facing up.

If required, install a new Ball Bearing #125 into the Cable Drum #115 using the procedure described in **SECURING BEARINGS WITH ADHESIVES**. Ensure that the Bearing is fully pushed to the bottom of its seat. Lightly grease the bearing bore and press a new Shaft Seal #150 into the Cable Drum until the outside of the Seal case is flush with the Drum surface.

Carefully guide the Cable Drum onto the Final Base, engaging the Drum Bearing with the Final Base bearing pilot.

Install the Final Reduction #100 into the Cable Drum, ensuring that the female spline of the Final Carrier fully engages the male spline of the Final Base.

If required, install a new Sun Gear Stopper #850 into the Final Sun Gear #880 using Loctite #330 Acrylic to secure. If required, press a new Carrier Stopper #155 onto the Primary Reduction #101.

Install the Primary Reduction #101 into the Cable Drum, ensuring that the Final Sun Gear fully engages the Final Reduction.

If required, install a new Ball Bearing #125 into the Bearing Holder #130 using the procedure described in **SECURING BEARINGS WITH ADHESIVES**. Ensure that the Bearing is fully pushed to the bottom of its seat. Lightly grease the bearing bore and press a new Shaft Seal #150 into the Bearing Holder until the outside of the Seal case is flush with the Holder surface.

Lightly grease and install a new Holder O-Ring #112. Install the Bearing Holder into the Cable Drum. Install and secure the ten Bearing Holder Screws #110 using the procedure described in **SECURING FASTENERS WITH ADHESIVES**.

- **INSTALL FINAL ASSEMBLY (REFER TO WINCH DRAWING)**

Install Primary Assembly #002 onto the Final Assembly, #003 according to **INSTALL PRIMARY ASSEMBLY** instructions.

Inspect the Identification Label #410 and replace if damaged or difficult to read.

RE-MOUNT AND TEST WINCH

Re-mount the winch according to **INSTALLATION INSTRUCTIONS.** Always perform the safe test lift described in **INSTALLATION INSPECTION** after any winch service or maintenance.

SPECIAL INSTRUCTIONS - REVERSING DIRECTION OF ROTATION

- **GENERAL INFORMATION**

⚠ WARNING

FAILURE TO PROPERLY INSTALL THE SPRAG CLUTCH COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE CHANGING THE DIRECTION OF HOISTING ROTATION OF ANY WINCH.

Refer to the following instructions to change a winch's direction of Cable Drum rotation when hoisting. For clarity, some information found elsewhere in this Manual is repeated below.

- **DESCRIPTION OF BRAKE FUNCTION**

The direction of Cable Drum rotation when hoisting is established by looking at the motor end of the winch. The standard counterclockwise hoisting winch is designated CC and the Cable Drum rotates in a counterclockwise direction when hoisting as viewed from the motor end of the winch (refer to **GENERAL DIMENSIONS**). A clockwise hoisting winch is designated CW and rotates in the opposite direction.

The Brake Sprag Clutch Cage allows the Brake Shaft to turn freely in the hoisting direction, independent of the winch brake system. In the lowering direction, the Clutch Cage locks the Brake Shaft to the winch brake system and holds the load.

When lowering the load, the operator supplies hydraulic fluid to the Motor lowering port. Some of the hydraulic fluid is diverted to the Brake Piston to release the brake and allow the winch to drive in the lowering direction.

Two assemblies control the direction of rotation when hoisting and must be modified when reversing the winch's rotation:

- **MOTOR ASSEMBLY (see MOTOR DRAWING)**
  The Motor Shaft End Cover #272 is internally ported to supply hydraulic fluid to the Brake Piston when lowering and block hydraulic fluid when hoisting. A Pipe Plug #245 is positioned in the Motor Shaft End Cover depending on the required direction of rotation when hoisting. A specially marked Motor Assembly Screw #220 indicates the Motor's hoisting direction when viewed from the outside. Refer to **MOTOR ASSEMBLY DRAWING** to determine the correct Pipe Plug location and Motor Assembly Screw marking for the desired direction of rotation.
- **CLUTCH ASSEMBLY (see CLUTCH DRAWING)**
  The Clutch Assembly contains a Clutch Cage #370A positioned between two Clutch End Bearings #370B. The Clutch allows the Brake Shaft #310 to turn independent of the Brake Hub #340 when hoisting and locks the Shaft to the Hub when lowering. The Clutch Cage and End Bearings are oriented on the Brake Shaft depending on the required direction of rotation when hoisting. Refer to **CLUTCH ASSEMBLY DRAWING** to determine the correct Clutch orientation for the desired direction of rotation.

- **PROCEDURE FOR REVERSING DIRECTION OF ROTATION**

If attention is paid to cleanliness, the following procedure can be performed in the field without removing the winch from its mounting. If desirable to perform this service in the field, reduce spillage by draining half of the gear lubricating oil out of the Cable Drum before starting. Once completed, be sure to replenish the lubricating oil level according to **ADDING GEAR LUBRICATING OIL.**

It is always preferable to perform any winch service work in a clean, well-lit, shop area.

1. REVERSE MOTOR PIPE PLUG (See MOTOR DRAWING)
Remove the Motor Assembly #001 according to **DISASSEMBLY INSTRUCTIONS - REMOVE MOTOR ASSEMBLY**. If practical, this is easier done with the winch positioned on end with the Motor facing up.

Place the Motor Assembly resting on the Port End Cover #210. Remove both Pipe Plugs #246.

Remove Pipe Plug #245 from its current location and install it in the opposite location. If uncertain, refer to **MOTOR ASSEMBLY DRAWING** to verify the correct location of Pipe Plug #245. Replace Pipe Plugs #246. Use Loctite #565 Sealant to seal all Pipe Plug threads.

To visually identify the new motor rotation, use a permanent scriber to place an "X" over the existing identification mark on the head of the existing specially marked Motor Assembly Screw #220. Place a new mark on the opposite screw.

2. REVERSE SPRAG CLUTCH (See CLUTCH DRAWING)
Remove the Brake Springs #520 and Brake Conduit #510. Remove Brake Piston #555, Clutch Assembly #500, Brake Separators #565 and Brake Discs #560 according to **DISASSEMBLE PRIMARY ASSEMBLY** instructions.

Take the Clutch Assembly and remove the Motor End Clutch Retainer #320. Clamp the two Clutch Thrust Washers #330 against the Brake Hub #340 and remove the Brake Hub #340, Sprag Clutch Cage #370A and End Bearings #370B together.

The Clutch Assembly direction of rotation is reversed by turning the Sprag Clutch Cage and End Bearings around end for end inside the Brake Hub. Refer to **ASSEMBLE CLUTCH ASSEMBLY** for warnings and instructions. If uncertain, verify the correct Clutch Cage and End Bearing orientation for the desired direction of rotation before proceeding. Replace the Clutch Thrust Washers with the grooves facing into the Clutch as shown.

Carefully push the Brake Shaft through the Sprag Clutch Cage, End Bearings and Thrust Washers using a twisting motion. Secure with the Motor End Retainer.

Clean and dry all components, particularly the threaded holes of the Primary Base. Replace the Clutch Assembly, Brake Separators, Brake Discs and Brake Piston according to **ASSEMBLE PRIMARY ASSEMBLY** warnings and instructions. Replace the Brake Conduit and Brake Springs.

3. INSTALL MOTOR ASSEMBLY

Install the Motor Assembly onto the winch according to **INSTALL MOTOR ASSEMBLY** instructions**.**

4. REPLACE IDENTIFICATION LABEL (see WINCH DRAWING)

The Identification Label #410 is located on the winch Final Base, but must not be altered outside of our factory. The Model Code identifies the direction of hoisting rotation. When changing a winch's rotation, contact Rotzler Inc. for a replacement Identification Label.

- **RE-MOUNT AND TEST WINCH**

Re-mount the winch according to **INSTALLATION INSTRUCTIONS.** Always perform the safe test lift described in **INSTALLATION INSPECTION** after any winch service or maintenance.

SPECIAL INSTRUCTIONS - STAINLESS STEEL SCREWS

- **GENERAL INFORMATION**

Standard Rotzler Titan TH series winches are equipped with plated alloy steel screws. Stainless steel screws are optionally available for use in highly corrosive environments. The stainless screw option consists of replacement Stainless Steel as indicated in the **ASSEMBLY DRAWINGS.** Stainless steel screws are identified with "A4" on the head of the screw.

7. ORDERING

TECHNICAL INFORMATION

An Identification Label is located on the outside of the Final Base and identifies the winch model and serial numbers. Record the numbers below and retain for future reference:

MODEL: _____
SERIAL NUMBER: _____

The Identification Label must not be removed, altered or have its technical data obscured. If the data becomes difficult to read, contact Rotzler Inc. for a replacement Label.

SEAL AND SERVICE KITS

It is recommended that Winch and Motor Seal (or Service) Kits be available before beginning service as follows:

- **#9263277000 (220-093), TH2 WINCH SEAL KIT** (contains seals as indicated in **ASSEMBLY DRAWINGS**)
- **#4000005992 (220-086), TH2 WINCH SERVICE KIT** (contains Loctite adhesives in addition to the seals contained in the Seal Kit)
- **#4000005999 (220-094K), 511 MOTOR SEAL KIT** (contains seals as indicated in **MOTOR ASSEMBLY DRAWINGS**)
- **#4000005987 (220-080K), 511 MOTOR SERVICE KIT** (contains Loctite adhesives in addition to the seals contained in the Seal Kit)

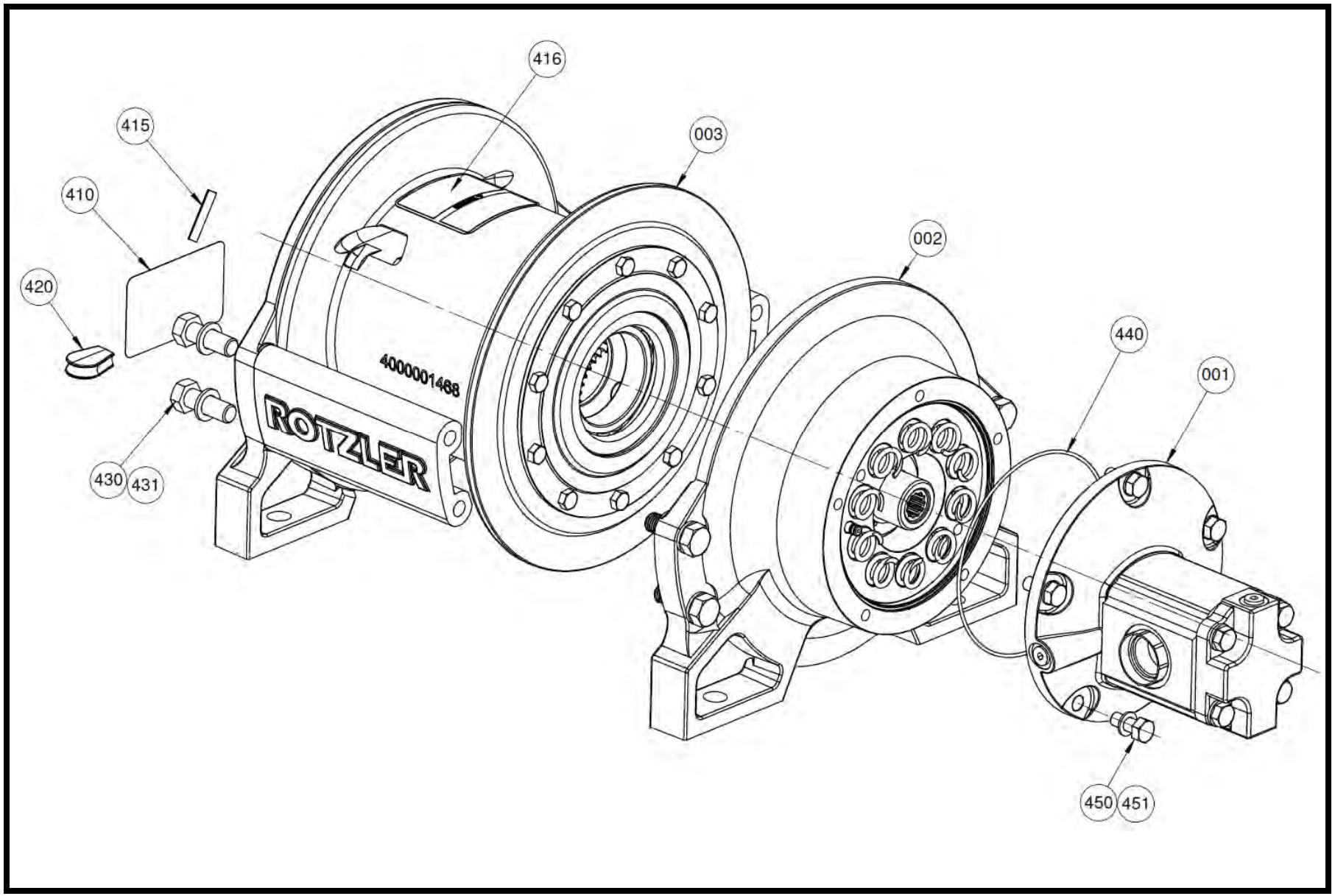
ORDERING REPLACEMENT COMPONENTS

When ordering replacement components for the winch or when making technical inquiries, refer to the Model and Serial Number listed on the winch Identification Label.

The winch model number does not distinguish what types of screws are installed on the winch. When ordering parts, it is therefore important to specify what type of screws is required.

WINCH DRAWING

#EW.TH2 REV F



WINCH COMPONENT LIST

#EW.TH2 REV F

REF.	NEW PART #	QTY	DESCRIPTION	OLD PART #	STAINLESS STEEL SCREW OPTION	
					NEW PART #	OLD PART #
001	See table 1	1	Assembly, Motor, 511-XX, XX	See table 1		
002	See table 1	1	Assembly, Primary, TH2.XX	See table 1		
003	N/A	1	Assembly, Final, TH2	F.TH2		
004	N/A	1	Assembly, Hardware, TH2. Includes:	H.TH2		
410	400 000 0701	1	Label, Identification	220-065		
415	400 000 0702	1	Label, Number	220-077		
416	400 000 0703	1	Label, Rotation, CC - counter clockwise hoisting	220-078		
	400 000 0704	1	Label, Rotation, CW - clockwise hoisting	220-079		
420	926 062 4000	1	Cable Wedge, 0.44"	220-067		
430	001 571 0000	8	Screw, Hex-Hd Cap, M14-2.0x40mm, DIN 933, Gr.8.8, Plated	220-062	001 571 0020	220-098
431	400 000 5915	8	Washer, M14, DIN 433, Plated	220-022	400 000 6006	220-099
* 440	012 859 0000	1	Seal, O-ring, #2-163	220-044		
450	001 553 0000	5	Screw, Hex-Hd Cap, M10-1.50x25mm, DIN933, Gr.8.8, Plated	220-032	001 553 0020	220-100
451	400 000 0707	5	Washer, M10, DIN 433, Plated	220-029	001 773 0020	220-101

* TH2 Winch Seal Kit #9262327000 (220-093), and TH2 Winch Service Kit #4000005992 (220-086) include item #440.

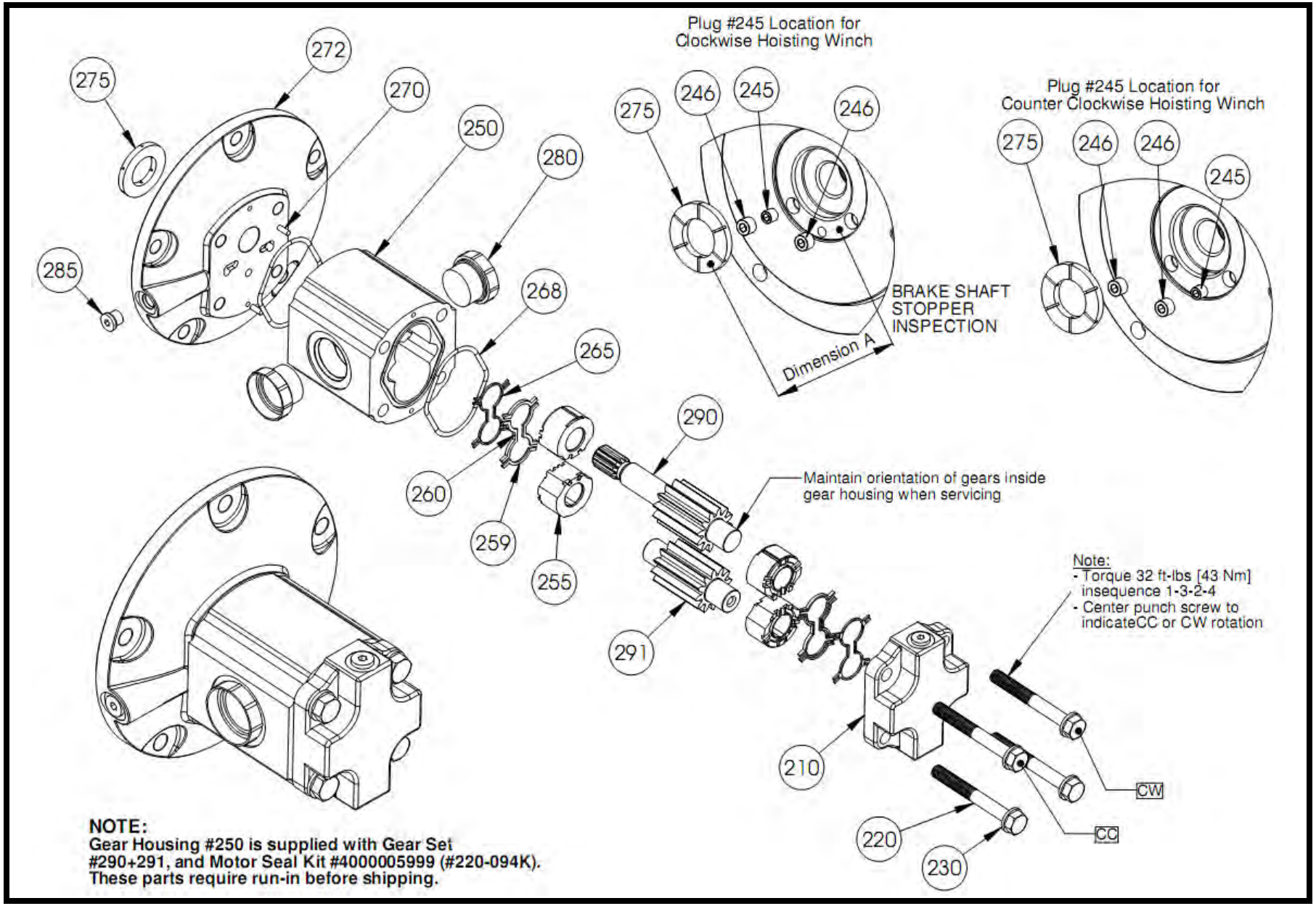
TABLE 1

REF.	VARIANCE	NEW PART #	DESCRIPTION	OLD PART #
001	Counter Clockwise hoisting, standard motor	400 000 6377	Assembly, Motor, 511-31, CC	M.TH2.CC.31
	Clockwise hoisting, standard motor	400 000 6388	Assembly, Motor, 511-31, CW	M.TH2.CW.31
	Counter Clockwise hoisting, -19 motor	400 000 6374	Assembly, Motor, 511-19, CC	M.TH2.CC.19
	Clockwise hoisting, -19 motor	400 000 6386	Assembly, Motor, 511-19, CW	M.TH2.CW.19
	Counter Clockwise hoisting, -16 motor	400 000 6371	Assembly, Motor, 511-16, CC	M.TH2.CC.16
	Clockwise hoisting, -16 motor	400 000 6383	Assembly, Motor, 511-16, CW	M.TH2.CW.16
	Counter Clockwise hoisting, -10 motor	400 000 6370	Assembly, Motor, 511-10, CC	M.TH2.CC.10
	Clockwise hoisting, -10 motor	400 000 6382	Assembly, Motor, 511-10, CW	M.TH2.CW.10
002	Counter Clockwise hoisting	400 000 6413	Assembly, Primary, TH2, CC	P.TH2.CC
	Clockwise hoisting	400 000 6414	Assembly, Primary, TH2, CW	P.TH2.CW

NOTE: The winch model number is located on the Identification label #410 and identifies rotation code (CC, CW) and motor code (16, 19, etc.)

511 STANDARD AND OPTIONAL MOTOR ASSEMBLY

#EM.TH2 REV D



511 STANDARD MOTOR COMPONENT LIST

#EM.TH2 REV D

	REF	QTY	OPTION	NEW PART #	DESCRIPTION	OLD PART #
	210	1		400 000 5909	Motor Cover, Port End, M/C, PH #332 9414 046	220-019M
	220	4	-10	400 000 6045	Motor Screw, 511-10, M10-1.50x85, DIN 931, Gr8.8, Plated, PH #391 1401 782	220-122
		4	-16	400 000 6022	Motor Screw, 511-16, M10-1.50x95, DIN 931, Gr8.8, Plated, PH #391 1401 768	220-110
		4	-19	400 000 6036	Motor Screw, 511-19, M10-1.50x100, DIN 931, Gr8.8, Plated, PH #391 1401 790	220-118
		4	-31	400 000 5922	Motor Screw, 511-31, M10-1.50x120, DIN 931, Gr8.8, Plated, PH #391 1401 657	220-028
	230	4		400 000 0707	Motor Washer, 511, PH #391 3782 245	220-029
	245	1		926 377 4000	Fitting, Plug, Pipe, 1/16, Airway #5409-1	220-057
	246	2		400 000 6055	Fitting, Plug, Pipe, 1/8, Airway #5409-2	220-135
	250	1	-10	400 000 6039	Motor Housing, Gear, M/C, 511-10, PH #334 8510 311	220-120KM
		1	-16	400 000 6016	Motor Housing, Gear, M/C, 511-16, PH #334 8516 311	220-108KM
		1	-19	400 000 6030	Motor Housing, Gear, M/C, 511-19, PH #334 8519 327	220-116KM
		1	-31	400 000 5905	Motor Housing, Gear, M/C, 511-31, PH #334 8531 327	220-018KM
*	255	4		927 239 4001	Motor Bushing, Thrustblock, 511, PH #8301-207-00L	220-020K
*	259	4		927 430 4000	Motor Seal, Channel, Top, 511, PH #8301-016-0B9	220-052K
*	260	4		927 429 4000	Motor Seal, Channel, Side, 511, PH #8301-016-0AB	220-053K
*	265	2		927 428 4000	Motor Seal, Backup, 511, PH #8301-015-006	220-055K
*	268	2		926 414 4001	Motor Seal, Section, 511, PH #9313-145-00B	220-056K
	270	2		400 000 5949	Motor Dowel Pin, 511, PH #391 2080 078	220-054
	272	1		400 000 5899	Motor Cover, Shaft End, M/C, 511	220-017KM
	275	1		400 000 5990	Stopper, Brake Shaft	220-084
	280	2	-10, -16	400 000 5789	Fitting, Plug, Plastic, SAE #10, Caplug #PDO-110	210-071
		2	-19, -31	400 000 5977	Fitting, Plug, Plastic, SAE #16, Caplug #PDO-116	220-071
	285	1		927 221 4000	Fitting, Plug, SAE #4, AW #6409-4, CI #391 2281 010	220-072
	290	1	-10	400 000 6043	Motor Gear, Drive, 511-10, PH #334 1110 300	220-121KA
		1	-16	400 000 6020	Motor Gear, Drive, 511-16, PH #334 1116 300	220-109KA
		1	-19	400 000 6034	Motor Gear, Drive, 511-19, PH #334 1119 300	220-117KA
		1	-31	400 000 5913	Motor Gear, Drive, 511-31, PH #334 1131 300	220-021KA
	291	1	-10	400 000 6044	Motor Gear, Driven, 511-10, PH #334 2710 000	220-121KB
		1	-16	400 000 6021	Motor Gear, Driven, 511-16, PH #334 2716 000	220-109KB
		1	-19	400 000 6035	Motor Gear, Driven, 511-19, PH #334 2719 000	220-117KB
		1	-31	400 000 5914	Motor Gear, Driven, 511-31, PH #334 2731 000	220-021KB

* Motor Seal Kit #4000005999 (220-094K) and Service Kit #4000005987 (220-080K) include: #255 (x 4), 259 (x 4), #260 (x 4), #265 (x 2), #268 (x 2)

511 OPTIONAL MOTOR COMPONENT LIST

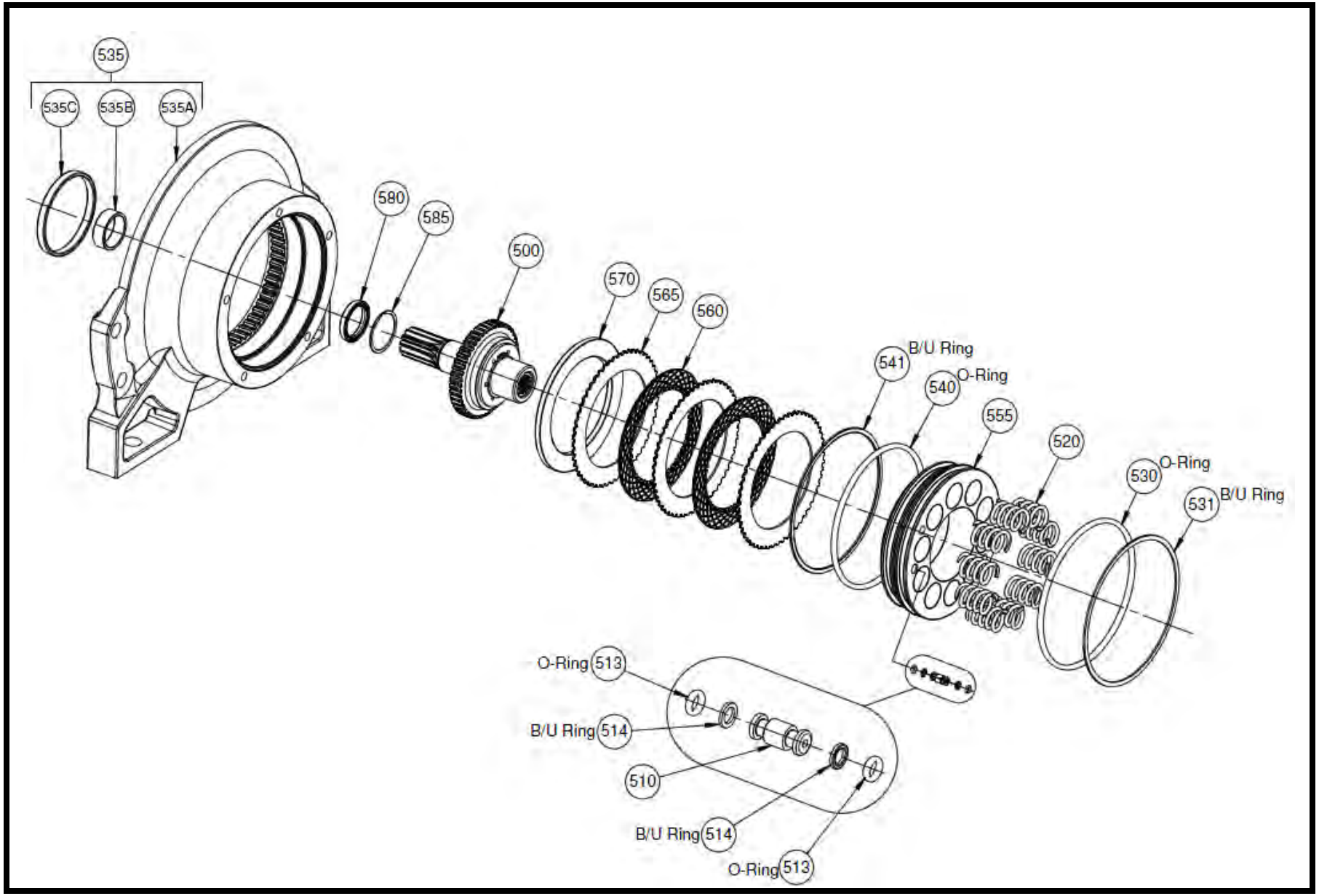
#EM.TH2 REV D

	REF	QTY	OPTION	NEW PART #	DESCRIPTION	OLD PART #
	210	1		400 000 5909	Motor Cover, Port End, M/C, PH #332 9414 046	220-019M
	220	4	-14	400 000 6074	Motor Screw, 511-14, M10-1.50x90, DIN 931, Gr8.8, Plated, PH #391 1401 651	220-163
		4	-21, -23	400 000 6086	Motor Screw, M10-1.50x105, DIN 931, Gr8.8, Plated, PH #391 1401 634	220-213
	230	4		400 000 0707	Motor Washer, 511, PH #391 3782 245	220-029
	245	1		926 377 4000	Fitting, Plug, Pipe, 1/16, Airway #5409-1	220-057
	246	2		400 000 6055	Fitting, Plug, Pipe, 1/8, Airway #5409-2	220-135
	250	1	-14	400 000 6069	Motor Housing, Gear, M/C, 511-14, PH #334 8514 311	220-161KM
		1	-21	400 000 6083	Motor Housing, Gear, M/C, 511-21, PH #334 8521 311	220-211KM
		1	-23	400 000 7787	Motor Housing, Gear, M/C, 511-23, PH #334 8523 327	N/A
*	255	4		927 239 4001	Motor Bushing, Thrustblock, 511, PH #8301-207-00L	220-020K
*	259	4		927 430 4000	Motor Seal, Channel, Top, 511, PH #8301-016-0B9	220-052K
*	260	4		927 429 4000	Motor Seal, Channel, Side, 511, PH #8301-016-0AB	220-053K
*	265	2		927 428 4000	Motor Seal, Backup, 511, PH #8301-015-006	220-055K
*	268	2		926 414 4001	Motor Seal, Section, 511, PH #9313-145-00B	220-056K
	270	2		400 000 5949	Motor Dowel Pin, 511, PH #391 2080 078	220-054
	272	1		400 000 5899	Motor Cover, Shaft End, M/C, 511	220-017KM
	275	1		400 000 5990	Stopper, Brake Shaft	220-084
	280	2	-14	400 000 5789	Fitting, Plug, Plastic, SAE #10, Caplug #PDO-110	210-071
		2	-21, -23	400 000 5977	Fitting, Plug, Plastic, SAE #16, Caplug #PDO-116	220-071
	285	1		927 221 4000	Fitting, Plug, SAE #4, AW #6409-4, CI #391 2281 010	220-072
	290	1	-14	400 000 6072	Motor Gear, Drive, 511-14, PH #334 1114 300	220-162KA
		1	-21	400 000 6084	Motor Gear, Drive, 511-21, PH #334 1121 300	220-212KA
		1	-23	400 000 7788	Motor Gear, Drive, 511-23, PH #334 1123 300	N/A
	291	1	-14	400 000 6073	Motor Gear, Driven, 511-14, PH #334 2714 000	220-162KB
		1	-21	400 000 6085	Motor Gear, Driven, 511-21, PH #334 2721 000	220-212KB
		1	-23	400 000 7789	Motor Gear, Driven, 511-23, PH #334 2723 000	N/A

* Motor Seal Kit #4000005999 (220-094K) and Service Kit #4000005987 (220-080K) include: #255 (x 4), 259 (x 4), #260 (x 4), #265 (x 2), #268 (x 2)

PRIMARY ASSEMBLY DRAWING

#EP.TH2 REV G



PRIMARY COMPONENT LIST

#EP.TH2 REV G

	PRIMARY COMPONENT LIST				EP.TH2
	REF.	NEW PART #	QTY	DESCRIPTION	OLD PART #
	500	See table 1	1	Assembly, Clutch, TH2.XX	See table 1
	510	400 000 0714	1	Brake Conduit	220-045
*	513	400 000 0715	2	Seal, O-ring, #2-008	220-047
*	514	400 000 0716	2	Seal, Backup Ring, #8-008	220-048
	520	400 000 5895	10	Spring, TH2	220-016
*	530	926 387 4000	1	Seal, O-ring, #2-357	220-043
*	531	926 388 4000	1	Seal, Backup Ring, #8-357	220-042
	535	400 000 8255	1	Base, Primary, Assembled, TH2. Includes:	220-076
	535A	400 000 5867	1	Base, Primary, TH2	220-002G
	535B	400 000 5973	1	Bearing, Sleeve, 1.26"	220-066
	535C	926 410 4000	1	Sleeve, Rotary Shaft Seal, TH2	220-058
*	540	926 384 4000	1	Seal, O-ring, #2-356	220-041
*	541	926 383 4000	1	Seal, Backup Ring, #8-356	220-040
	555	400 000 5882	1	Brake Piston, TH2	220-011
	560	926 382 4000	2	Brake Disc, TH2	220-039
	565	926 381 4000	3	Brake Separator, TH2	220-038
	570	926 380 4000	1	Brake Locator, TH2	220-015
*	580	926 425 4000	1	Seal, Brake Shaft, 1.25"	220-035
	585	400 000 5988	1	Retainer, Spirolox, #UR-162	220-081

When sold separately, Primary Assembly is supplied with:
- 4000006343 (#800-008) Shipping Plate
- 0015530000 (#220-032) (x3) screw
- 4000000707 (220-068) (x6) washer

NOTE: The winch model number is located on the Final Base Identification label and identifies rotation code (CC, CW).

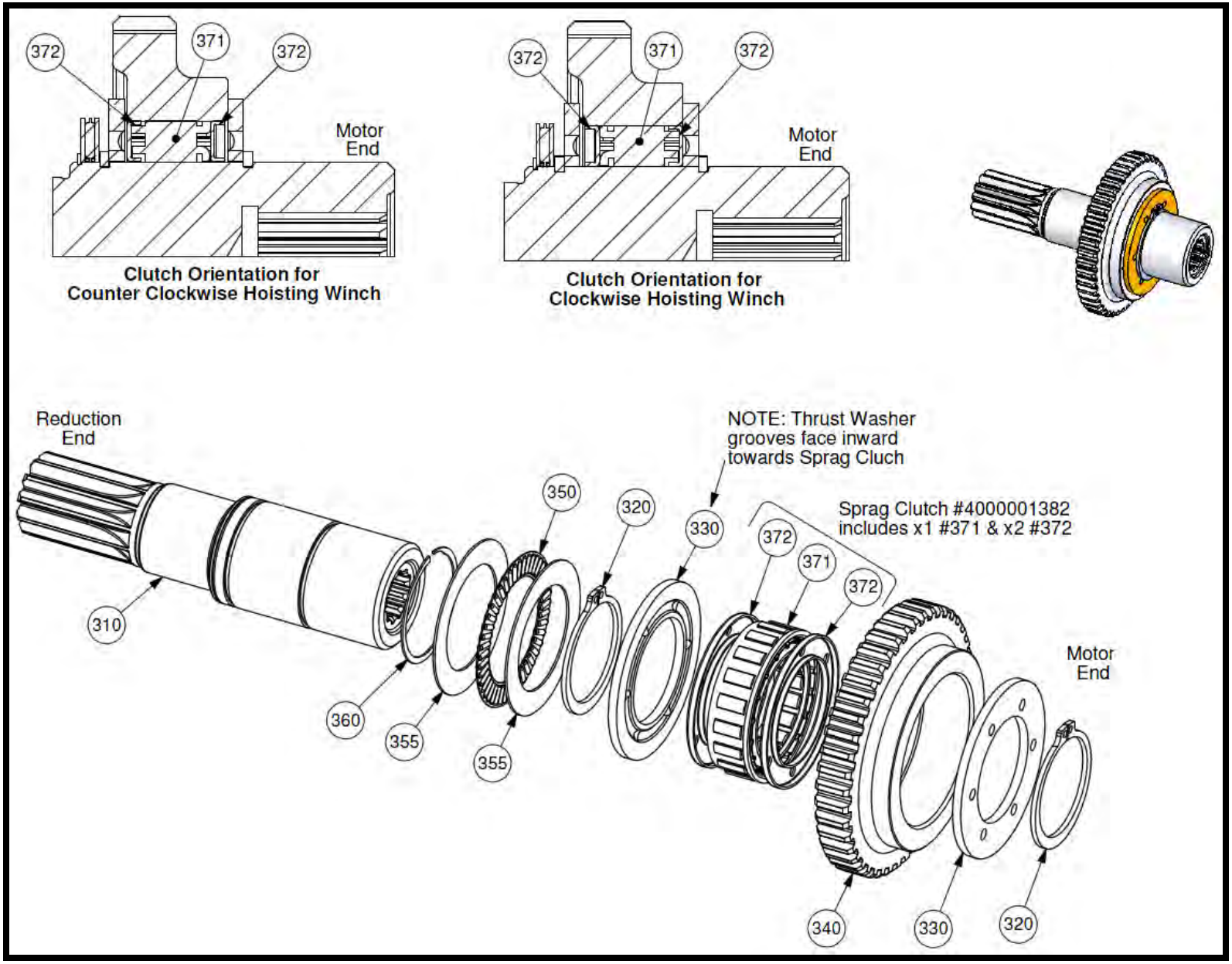
TABLE 1

REF.	VARIANCE	NEW PART #	DESCRIPTION	OLD PART #
500	Counter Clockwise hoisting	927 140 3000	Assembly, Clutch, TH2, CC	C.TH2.CC
	Clockwise hoisting	927 140 3001	Assembly, Clutch, TH2, CW	C.TH2.CW

* TH2 Winch Seal Kit #9262327000 (#220-093) includes #513 (x2), #514 (x2), #530, #531, #540, #541, and #580.

CLUTCH ASSEMBLY DRAWING

#EC.TH2 REV G



CLUTCH COMPONENT LIST

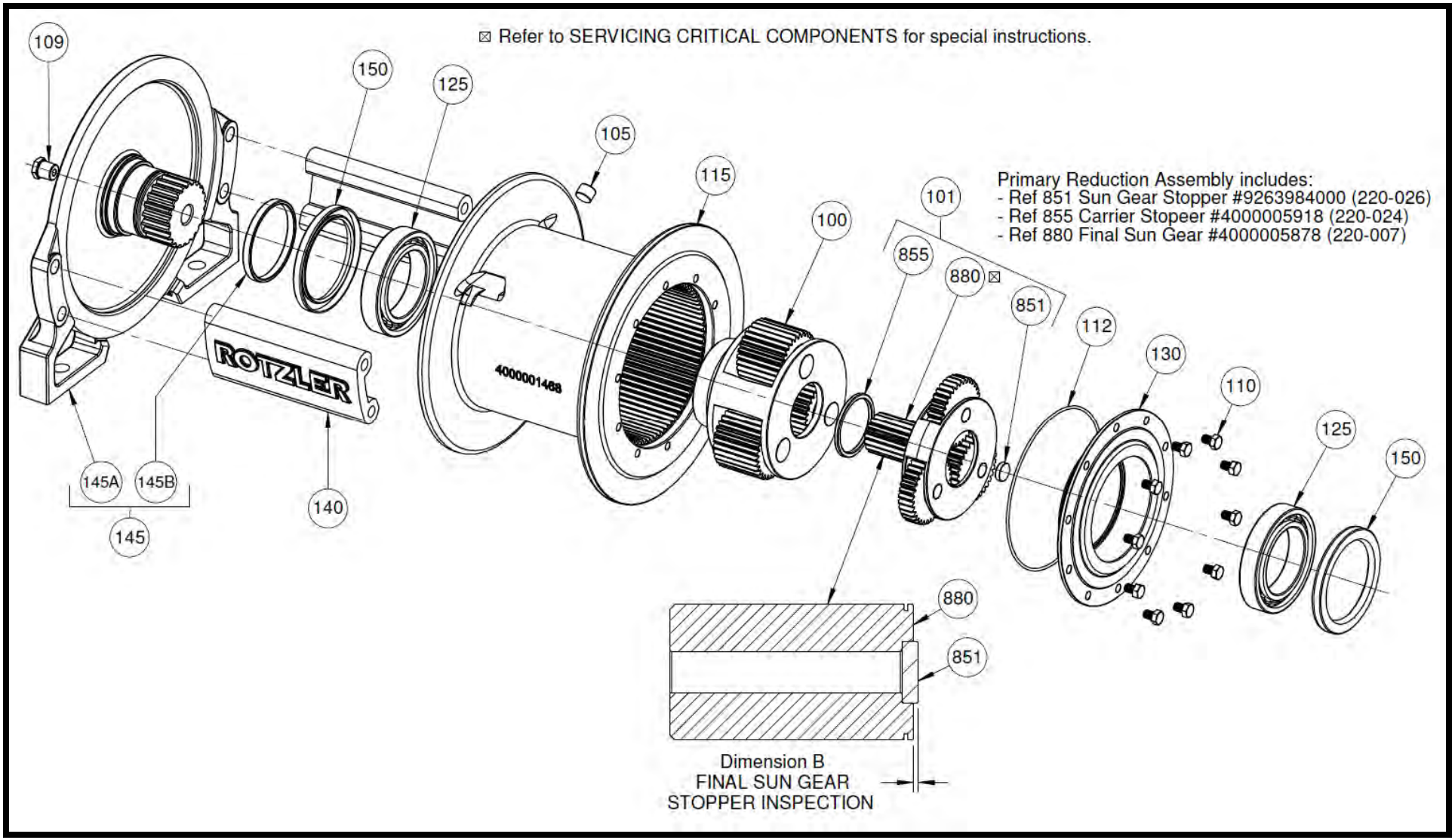
#EC.TH2 REV G

	New Part # for C.TH2.CC is 400 000 6354 New Part # for C.TH2.CW is 926 421 3000			WEIGHT: 3.58 lbs
	REF.	**NEW PART #**	**QTY.**	**DESCRIPTION**	**OLD PART #**
*	310	400 000 5893	1	Brake Shaft, TH2	220-014
	320	400 000 5932	2	Retainer, DIN 471 American Ring #471-0380	220-037
	330	400 000 0709	2	Brake Clutch Thrust Washer	220-036
*	340	400 000 1389	1	Brake Hub, 0.91"	220-010
	350	400 000 5929	1	Bearing, Thrust Roller, INA #TC 2435	220-034
	355	400 000 0710	2	Bearing, Thrust Washer, INA #TWA 2435	220-049
	360	400 000 0708	1	Retainer, Spirolox #US-150	220-046
*	371	400 000 0711	1	Brake Sprag Clutch Cage	220-124
	372	400 000 0712	2	Brake Sprag Clutch End Bearing	220-125

* Refer to SERVICING CRITICAL COMPONENTS for special instructions.

FINAL ASSEMBLY DRAWING

#EF.TH2 REV G



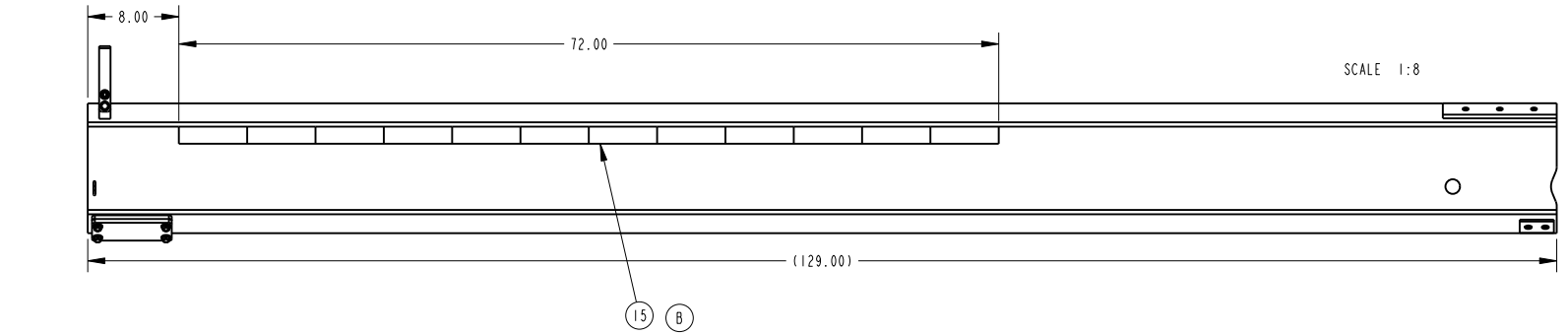
FINAL ASSEMBLY COMPONENT LIST

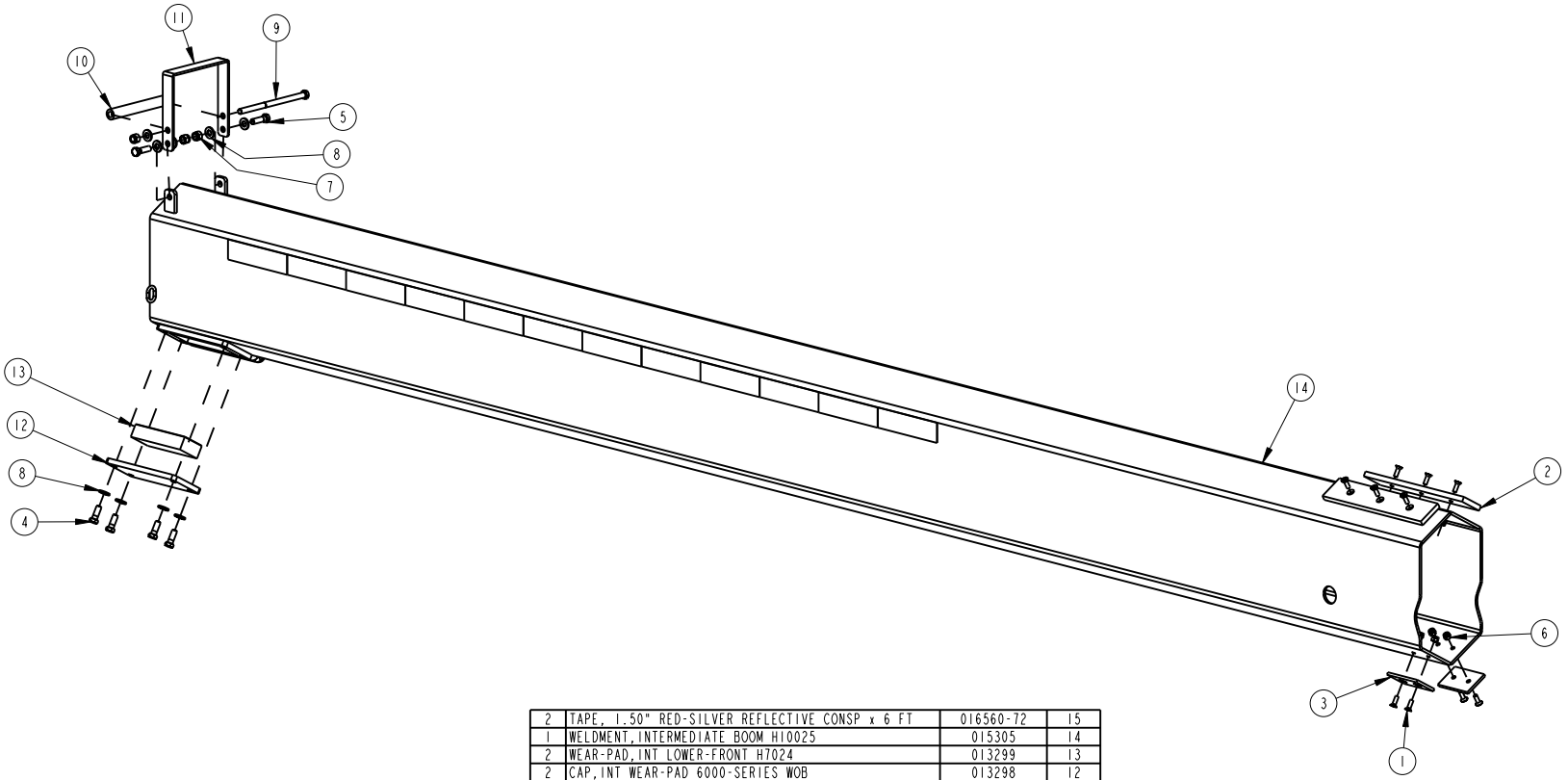
#EF.TH2 REV G

FINAL ASSEMBLY COMPONENT LIST				EF.TH2
REF.	NEW PART #	QTY	DESCRIPTION	OLD PART #
100	926 021 4000	1	Assembly, Reduction, Final, TH2	RF.TH2
101	926 022 4000	1	Assembly, Reduction, Primary, TH2	RP.TH2
105	926 064 4000	1	Fitting, Plug, Pipe, 3/8, SS 316, Seaway #D432	220-134
109	926 063 4000	1	Valve, Relief	220-063
110	001 543 0000	10	Screw, Hex Hd Cap, M8-1.25x12mm, DIN 933, SS Gr. A4	220-085
* 112	012 860 0000	1	Seal, O-ring, #2-165	220-064
115	400 000 5890	1	Cable Drum, TH2	220-013G
125	012 862 0000	2	Bearing, Ball, SKF #6014	220-059
130	926 032 2000	1	Holder, Bearing, TH2	220-012M
140	925 903 3001	2	Spacer Bar, TH2	220-030M
145	400 000 5980	1	Base, Final, Assembled, TH2. Includes:	220-074
145A	925 569 1011	1	Base, Final, TH2	220-001G
145B	926 410 4000	1	Sleeve, Rotary Shaft Seal, TH2	220-058
* 150	012 861 0000	2	Seal, Rotary Shaft, DIN3760, WA Style, 85X110X12 mm	220-060

* TH2 Winch Seal Kit #9262327000 (220-093), and TH2 Winch Service Kit #4000005992 (220-086) include item #112 and #150 (x2).

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/21/12	A	DRAWING RELEASED	-	AHB	NDS
4/23/13	B	016560 DECAL REPLACES 004834 DECAL	-	SVM	KLV





QTY	DESCRIPTION	PART NUMBER	ITEM
2	TAPE, 1.50" RED-SILVER REFLECTIVE CONSP x 6 FT	016560-72	15
1	WELDMENT,INTERMEDIATE BOOM H10025	015305	14
2	WEAR-PAD,INT LOWER-FRONT H7024	013299	13
2	CAP,INT WEAR-PAD 6000-SERIES WOB	013298	12
1	RETAINER,CABLE GUIDE H7024	013279	11
1	ROLLER,NYLATRON CABLE RETAINER H7024	013278	10
1	BOLT,0.375-16UNC-6.500_HX_HD_SS	013245	9
14	WASHER,FLAT_0.375_SAE_EXTRA THICK_SS	012898	8
3	NUT,0.375-16UNC_NYLON-LOCK_INSERT_SS	012885	7
10	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	6
2	BOLT,0.375-16UNC-1.250_HX_HD_SS	012877	5
8	BOLT,0.375-16UNC-1.000_HX_HD_SS	012876	4
2	PADS,BOLT-ON_FINAL/INT_WEAR_8-14000 SER	007583	3
2	PADS,BOLT_ON_FINAL/INT_WEAR_8-14000-SER	007582	2
10	BOLT,0.250-20UNC-0.750_FL_HD_SOCKET	006894	1

PART NUMBER 015304

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±1° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

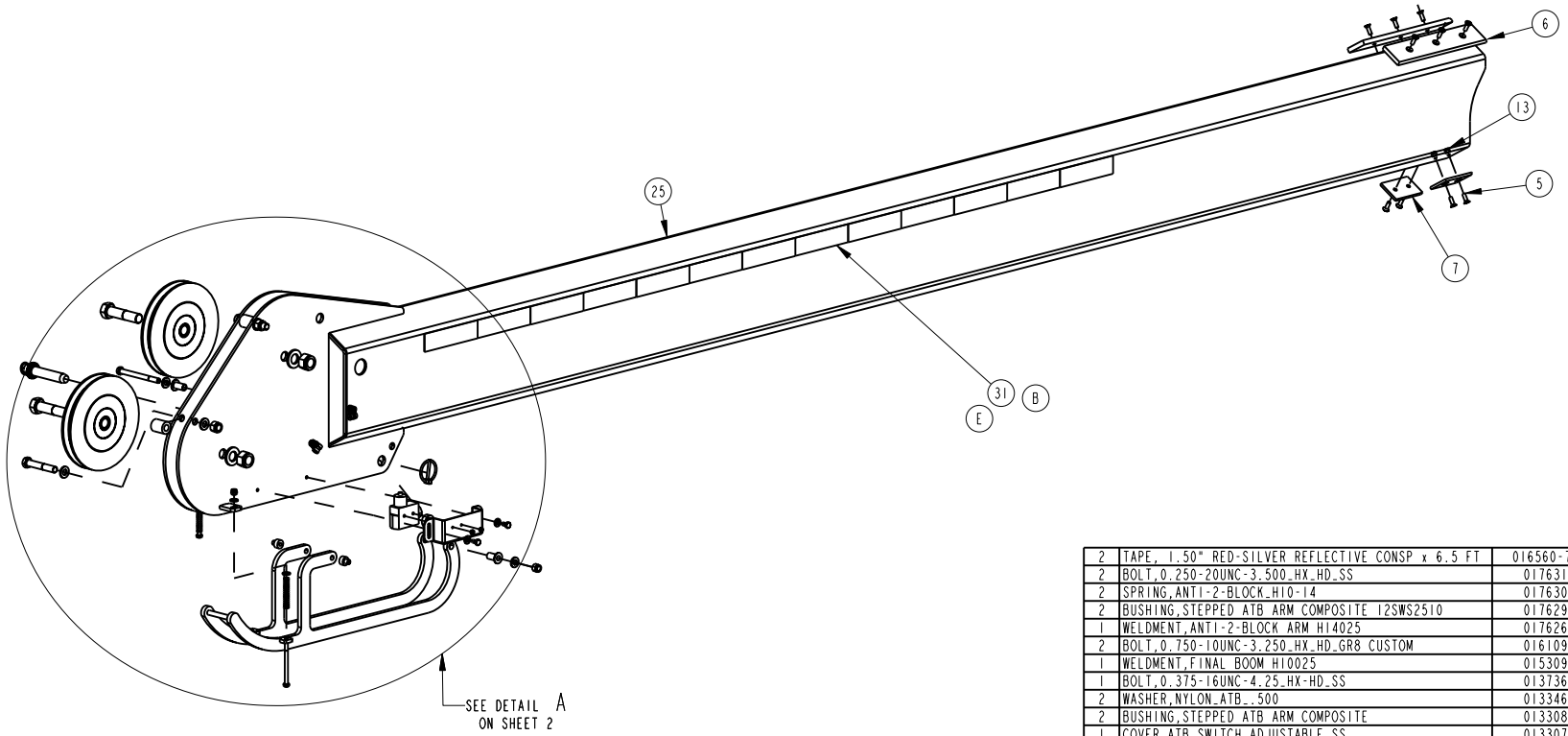
DR: AHB DATE: 5/21/12
CHK: NDS DATE: 5/21/12
APPR: DATE:

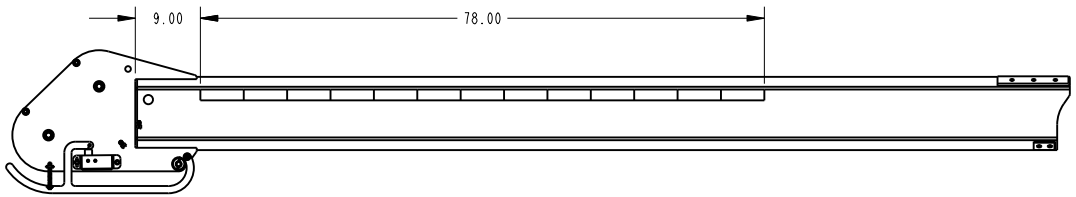
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY, INTERMEDIATE BOOM H10025

SCALE: 5:32 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 015304 REV. LEVEL: B

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/21/12	A	DRAWING RELEASED	-	AHB	NDS
8/21/12	B	REFLECTIVE TAPE WAS 7FT LONG	-	AHB	NDS
11/2/12	C	REPLACED SHOULDER BOLTS 015046 WITH BOLTS 000348	-	AHB	NDS
3/27/13	D	016109 WAS 000348	-	AHB	NDS
4/23/13	E	016560 DECAL WAS 004834 DECAL	-	SVM	KLV
4/21/14	F	017626 WAS 015011, 017630 WAS 007652, 017631 WAS 012871, ADDED 017629	-	AHB	NDS
8/4/14	G	ADDED ADDITIONAL 017629	-	AHB	NDS





SCALE 5:64

QTY	DESCRIPTION	PART NUMBER	ITEM
2	TAPE, 1.50" RED-SILVER REFLECTIVE CONSP x 6.5 FT	016560-78	31
2	BOLT,0.250-20UNC-3.500_HX_HD_SS	017631	30
2	SPRING,ANTI-2-BLOCK_H10-14	017630	29
2	BUSHING,STEPPED ATB ARM COMPOSITE 12SWS2510	017629	28
1	WELDMENT,ANTI-2-BLOCK ARM H14025	017626	27
2	BOLT,0.750-10UNC-3.250_HX_HD_GR8 CUSTOM	016109	26
1	WELDMENT,FINAL BOOM H10025	015309	25
1	BOLT,0.375-16UNC-4.25_HX-HD_SS	013736	24
2	WASHER,NYLON_ATB_.500	013346	23
2	BUSHING,STEPPED ATB ARM COMPOSITE	013308	22
1	COVER,ATB SWITCH ADJUSTABLE SS	013307	21
2	SHEAVE,NYLON 7.00" H7024	013305	20
4	WASHER,FLAT_0.438_SAE_EXTRA THICK_SS	012899	19
2	WASHER,FLAT_0.375_SAE_EXTRA THICK_SS	012898	18
6	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	17
2	WASHER,FLAT_0.750_SAE_THRU-HARD_EXTRA THICK	012894	16
2	NUT,0.500-13UNC_NYLON-LOCK_INSERT_SS	012886	15
1	NUT,0.375-16UNC_NYLON-LOCK_INSERT_SS	012885	14
14	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	13
2	BOLT,0.500-13UNC-3.000_HX_HD_SS	012882	12
2	BOLT,0.250-20UNC-0.500_HX_HD_SS	012867	11
2	NUT,#6-32_NYLON_LOCK_INSERT_PLATED	009091	10
1	SWITCH,LIMIT_ANTI-2-BLOCK_SERIES-CRANES	007651	9
1	PIN,HITCH_.75x3.63"_CABLE/SHEAVE-SERIES_CRANES	007639	8
2	PADS,BOLT-ON_FINAL/INT_WEAR_8-14000 SER	007583	7
2	PADS,BOLT_ON_FINAL/INT_WEAR_8-14000-SER	007582	6
10	BOLT,0.250-20UNC-0.750_FL_HD_SOCKET	006894	5
2	NUT,0.750-10_GR5_LOCK_NYLON	003387	4
2	CLAMP,LOOM_3/16 TO 1/4 OD_200409 SS	003296	3
1	PIN,LYNCH_0.1875_63-01	003259	2
2	NYLATRON_SPACER_FOR_SHEAVE_PLATE	000256	1

WEIGHT = 241.0 LBS

PART NUMBER 015308

THIRD ANGLE PROJECTION

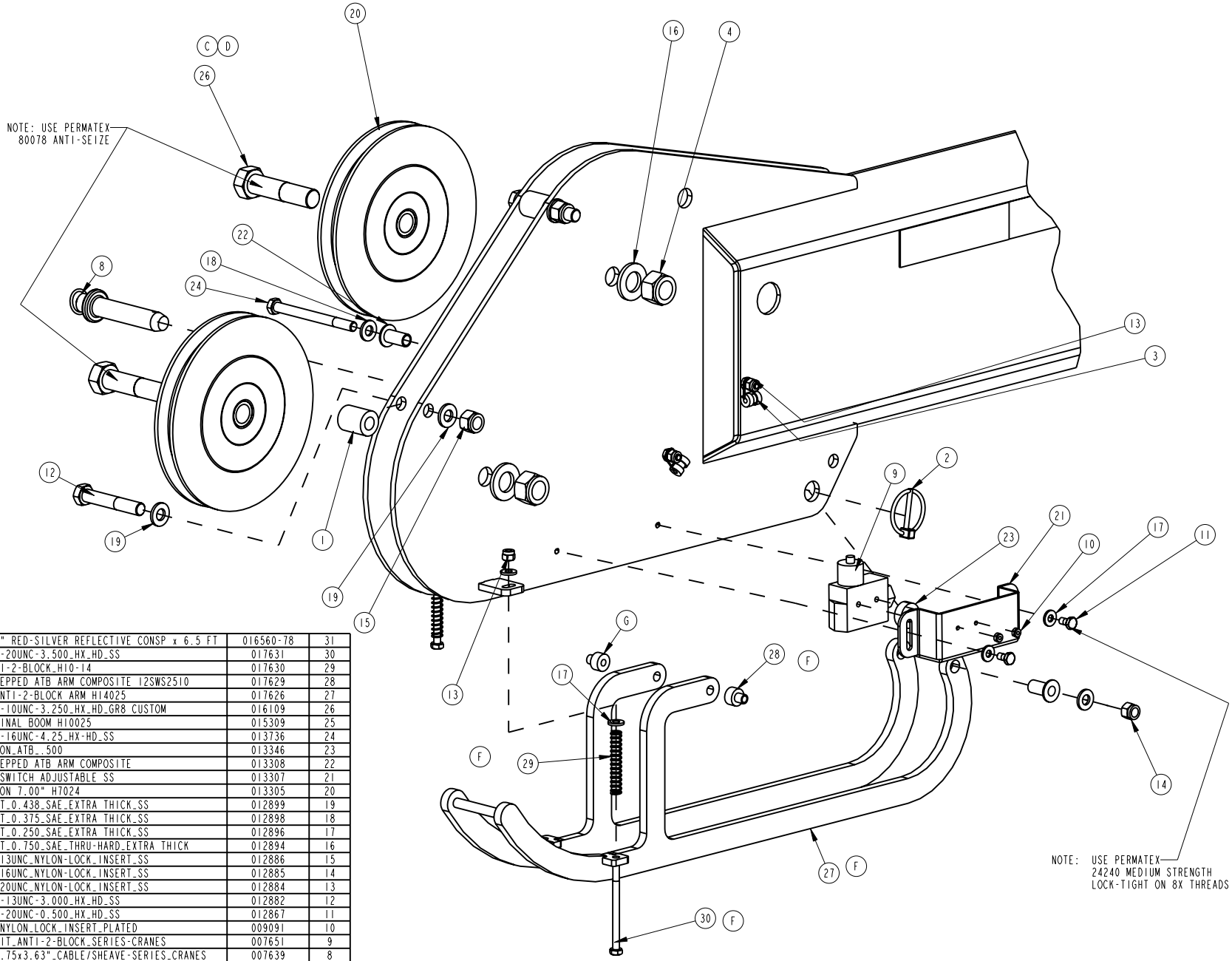
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±1° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: AHB DATE: 5/21/12
CHK: NDS DATE: 5/21/12
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,FINAL BOOM H10025

SCALE: 9:64 SIZE: C SHEET: 1 OF 3 DRAWING NUMBER: 015308 REV. LEVEL: G



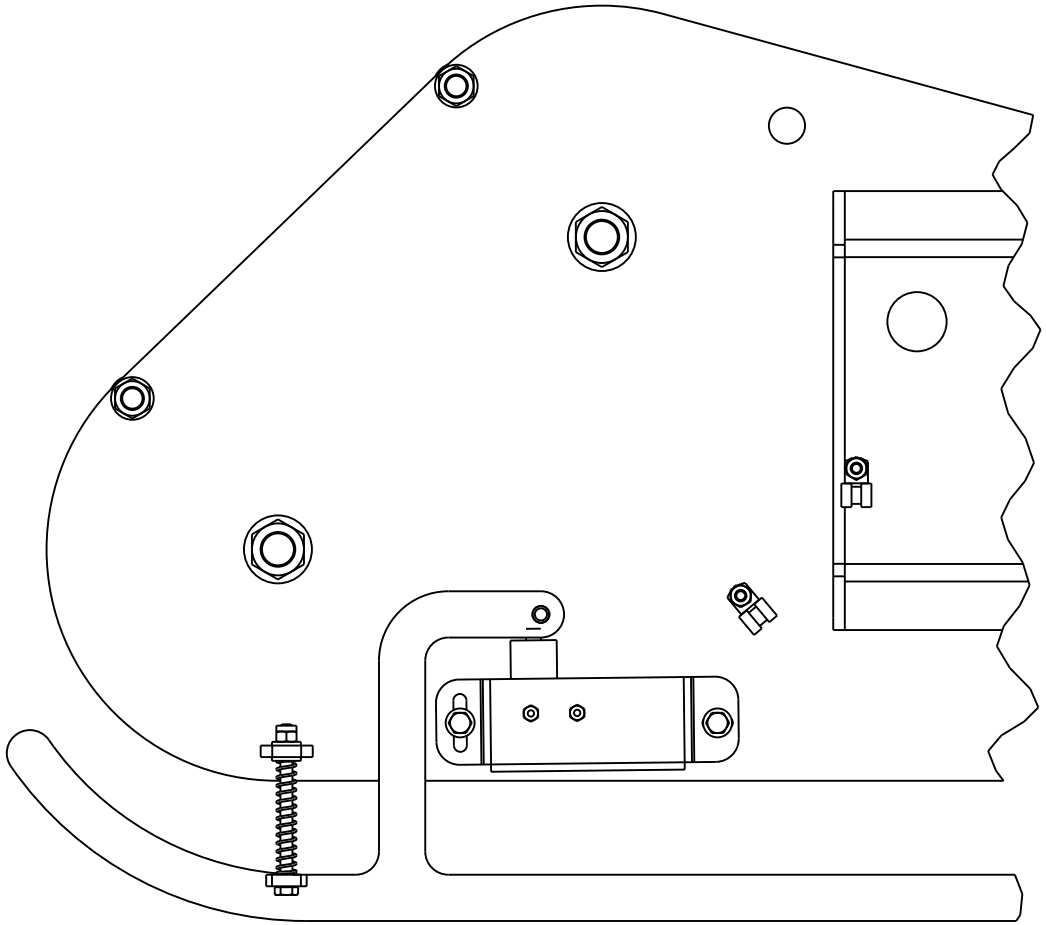
QTY	DESCRIPTION	PART NUMBER	ITEM
2	TAPE, 1.50" RED-SILVER REFLECTIVE CONSP x 6.5 FT	016560-78	31
2	BOLT,0.250-20UNC-3.500_HX_HD_SS	017631	30
2	SPRING,ANTI-2-BLOCK_HI0-14	017630	29
2	BUSHING,STEPPED ATB ARM COMPOSITE 12SWS2510	017629	28
1	WELDMENT,ANTI-2-BLOCK ARM HI4025	017626	27
2	BOLT,0.750-10UNC-3.250_HX_HD_GR8 CUSTOM	016109	26
1	WELDMENT,FINAL BOOM HI0025	015309	25
1	BOLT,0.375-16UNC-4.25_HX-HD_SS	013736	24
2	WASHER,NYLON_ATB_.500	013346	23
2	BUSHING,STEPPED ATB ARM COMPOSITE	013308	22
1	COVER,ATB SWITCH ADJUSTABLE SS	013307	21
2	SHEAVE,NYLON 7.00" H7024	013305	20
4	WASHER,FLAT_0.438_SAE_EXTRA THICK_SS	012899	19
2	WASHER,FLAT_0.375_SAE_EXTRA THICK_SS	012898	18
6	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	17
2	WASHER,FLAT_0.750_SAE_THRU-HARD_EXTRA THICK	012894	16
2	NUT,0.500-13UNC_NYLON-LOCK_INSERT_SS	012886	15
1	NUT,0.375-16UNC_NYLON-LOCK_INSERT_SS	012885	14
14	NUT,0.250-20UNC_NYLON-LOCK_INSERT_SS	012884	13
2	BOLT,0.500-13UNC-3.000_HX_HD_SS	012882	12
2	BOLT,0.250-20UNC-0.500_HX_HD_SS	012867	11
2	NUT,#6-32_NYLON_LOCK_INSERT_PLATED	009091	10
1	SWITCH,LIMIT_ANTI-2-BLOCK_SERIES-CRANES	007651	9
1	PIN,HITCH_.75x3.63"_CABLE/SHEAVE-SERIES_CRANES	007639	8
2	PADS,BOLT-ON_FINAL/INT_WEAR_8-14000 SER	007583	7
2	PADS,BOLT_ON_FINAL/INT_WEAR_8-14000-SER	007582	6
10	BOLT,0.250-20UNC-0.750_FL_HD_SOCKET	006894	5
2	NUT,0.750-10_GR5_LOCK_NYLON	003387	4
2	CLAMP,LOOM_3/16 TO 1/4 OD_200409 SS	003296	3
1	PIN,LYNCH_0.1875_63-01	003259	2
2	NYLATRON_SPACER_FOR_SHEAVE_PLATE	000256	1

DETAIL A
SCALE 3:8

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,FINAL BOOM HI0025

SCALE:	SIZE:	SHEET:	DRAWING NUMBER:	REV. LEVEL:
9:64	C	2 OF 3	015308	G



SCALE 1:2

NOTES:

1) ANTI-2-BLOCK SWITCH IS TO BE WIRED "NORMALLY OPEN"

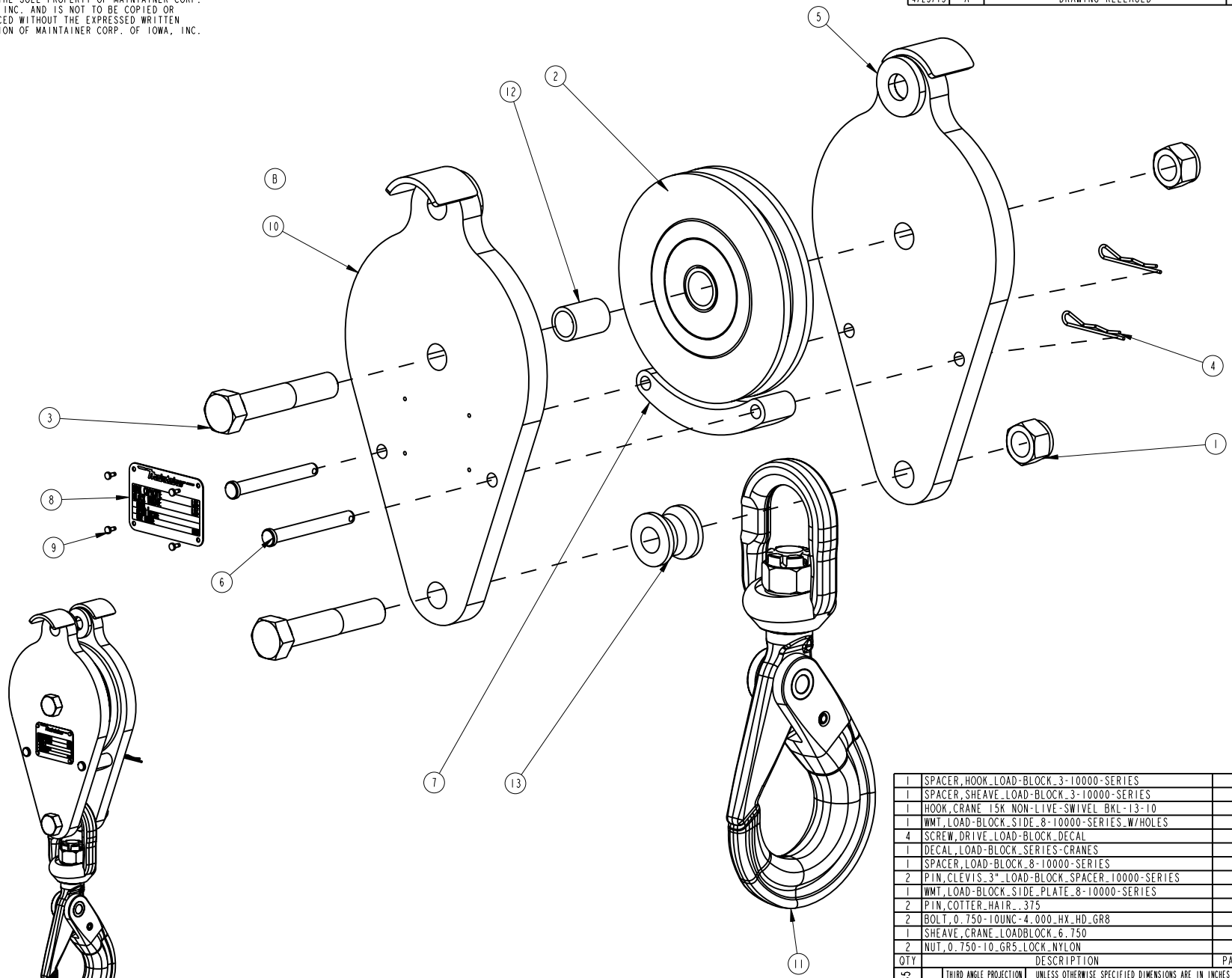
2) ANTI-2-BLOCK SWITCH IS SET BY LOOSENING THE UPPER 1/4" BOLT AND REPOSITIONING THE SWITCH & COVER TOGETHER

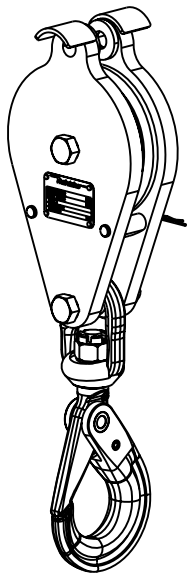
3) MOVING THE SWITCH AND COVER AWAY FROM THE CONTACT ON THE ARM WILL MAKE THE SWITCH ACTIVATE EARLIER

4) THE SWITCH SHOULD TRIP AT ~3/8" OF TRAVEL AT THE FRONT END OF THE ANTI-2-BLOCK ARM

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201					
DESCRIPTION: ASY,FINAL BOOM H10025					
SCALE: 5:32	SIZE: C	SHEET: 3 OF 3	DRAWING NUMBER: 015308	REV. LEVEL: G	

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/25/13	A	DRAWING RELEASED	-	SVM	AHB





SCALE 1:4

QTY	DESCRIPTION	PART NUMBER	ITEM
1	SPACER,HOOK_LOAD-BLOCK_3-10000-SERIES	012569	13
1	SPACER,SHEAVE_LOAD-BLOCK_3-10000-SERIES	012568	12
1	HOOK,CRANE 15K NON-LIVE-SWIVEL BKL-13-10	010430	11
1	WMT,LOAD-BLOCK_SIDE_8-10000-SERIES_W/HOLES	008332	10
4	SCREW,DRIVE_LOAD-BLOCK_DECAL	008192	9
1	DECAL,LOAD-BLOCK_SERIES-CRANES	008189	8
1	SPACER,LOAD-BLOCK_8-10000-SERIES	008004	7
2	PIN,CLEVIS_3"_LOAD-BLOCK_SPACER_10000-SERIES	008001	6
1	WMT,LOAD-BLOCK_SIDE_PLATE_8-10000-SERIES	007999	5
2	PIN,COTTER_HAIR_.375	007636	4
2	BOLT,0.750-10UNC-4.000_HX_HD_GR8	007182	3
1	SHEAVE,CRANE_LOADBLOCK_6.750	007091	2
2	NUT,0.750-10_GR5_LOCK_NYLON	003387	1

PART NUMBER 016635

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: SVM DATE: 4/25/13
CHK: AHB DATE: 4/25/13
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,LOAD BLOCK 3-10000-SERIES NON LIVE

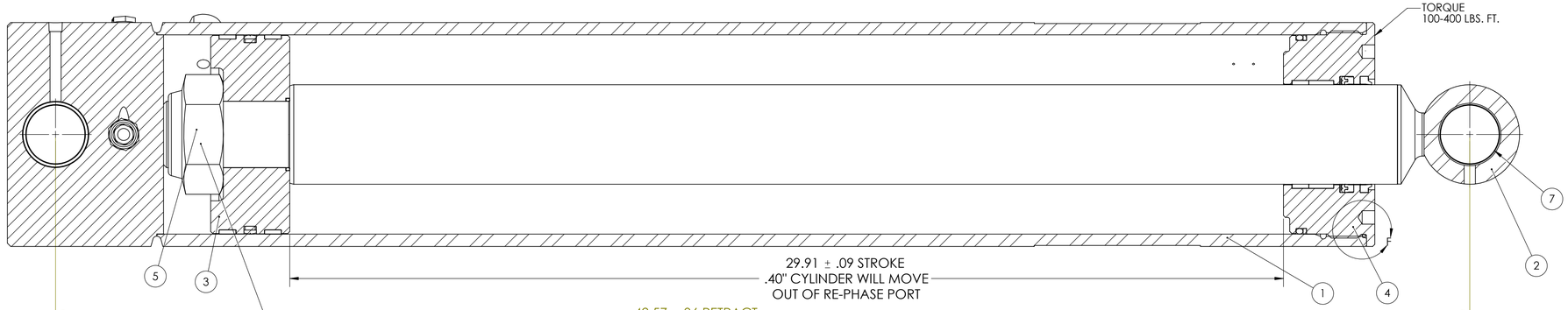
SCALE: 1:2 | SIZE: C | SHEET: 1 OF 1 | DRAWING NUMBER: 016635 | REV. LEVEL: A

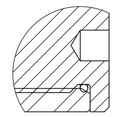
Thaintainer

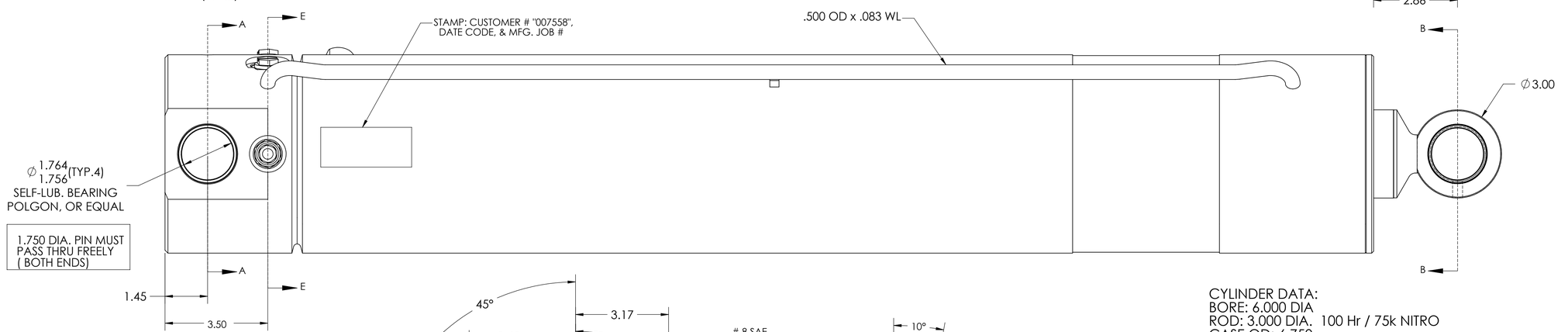
Hydraulic

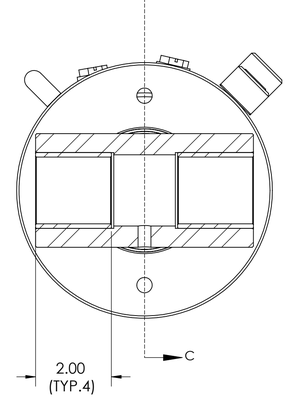
Cylinders

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	G10-0600-5065	CASE WELDMENT	1
2	G14-0300-5064	ROD WELDMENT	1
3	A26-0600-9000	PISTON	1
4	A24-0600-3011	HEAD THREADED	1
5	P10-42000	LOCK NUT	1
6	P22-10004	VALVE CBCA-LHN	1
7	P56-31753	SELF-LUB BEARING	4
10	P30-30017	#6 SAE STEEL PLUG	1
11	P30-70018	#8 H.H. PLSTC PLUG	2
15	P33-10161	O-RING	1
20	P30-30018	SOCKET HD STL PLG #8 SAE	1
21	K-0600-300-17	SEAL KIT	1
22	P62-10320	GRAY PRIMER	
12	P99-10300	PAINT ROBBER	1

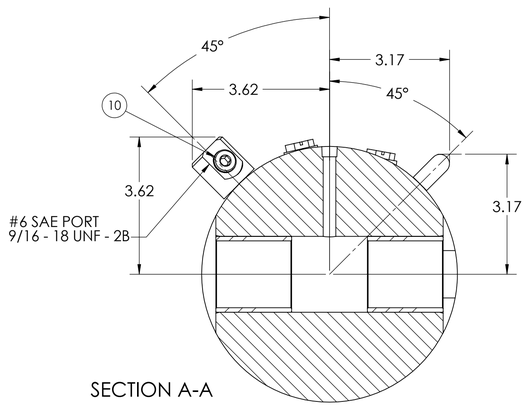




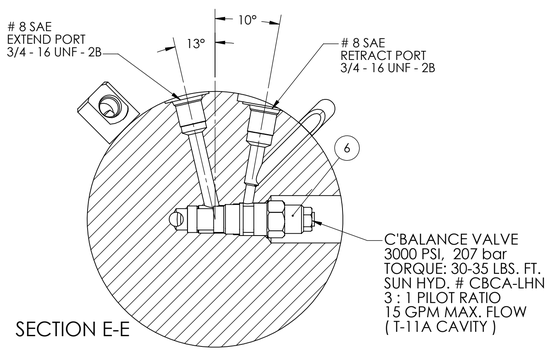




SECTION B-B



SECTION A-A



SECTION E-E

THIS PRINT HAS BEEN SUBMITTED FOR APPROVAL.
PLEASE INSPECT AND CONFIRM THAT ALL
DIMENSIONS ARE CORRECT. YOUR SIGNATURE
IS REQUIRED BEFORE AN ORDER CAN BE PROCESSED.

Approved by: _____

Date: _____

2/1/12

CYLINDER DATA:
BORE: 6.000 DIA
ROD: 3.000 DIA. 100 Hr / 75k NITRO
CASE OD: 6.750
OPERATING PRESSURE: 3000 PSI
TEST PRESSURE: 3500 PSI
TEST: 100%
FULL EXTEND, CHECK FOR BYPASS.
PLUG RETRACT SIDE PORT.
APPLY EXTEND TEST PRESSURE.
CHECK EXTERNAL LEAKAGE.
FULL RETRACT AND CHECK FOR INTERNAL
AND EXTERNAL LEAKAGE.
PAINT: GRAY PRIMER

WEIGHT : 225 LBS.

MAINTAINER CORP.
LIFT CYLINDER
14,000 CRANE
007558

				E	8/3/07	2609	KDK
				D	07-05-06	2435	TDM
				C	09-28-05	2315	TDM
J	1/30/12	3237	KDK	B	9/6/05	2302	TDM
H	6/16/11	3139	KDK	A	05-12-05	2241	DJB
G	6/17/10	3028	KDK	LEVEL	DATE	ECN NO.	BY
F	1/15/09	2842	KDK	REVISION HISTORY			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS ANGLE
X = +/- .06
.XX = +/- .03
.XXX = +/- .010
+/- 1
PROJECTION
SURFACE FINISH
MACHINED: 125 RMS
REMOVE ALL SHARP EDGES
SIZE D

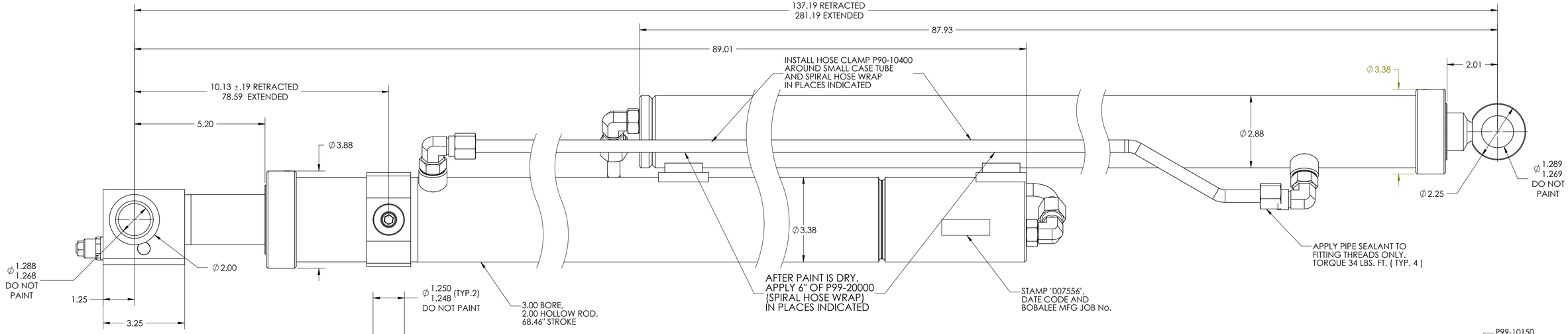
DO NOT SCALE DRAWING

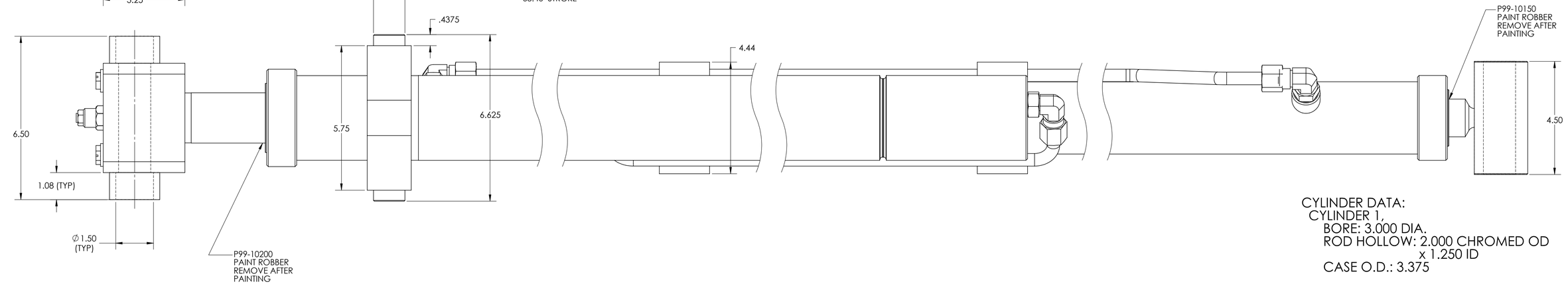
APPROVALS	DATE
DRAWN KDK	10/4/04
APPROVED TDM	10-28-04
RESP ENG	
MFG #	

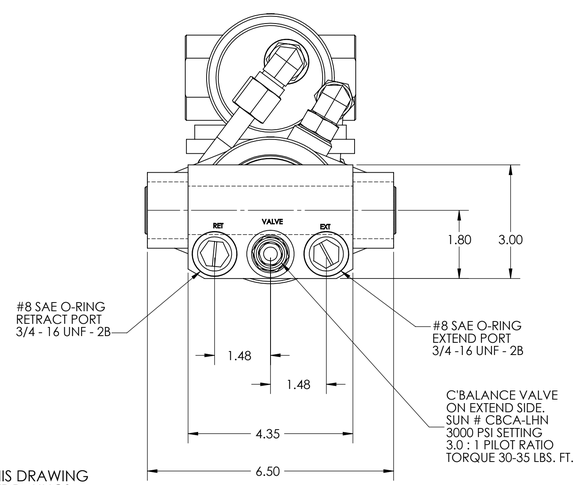
BOBALEE HYDRAULICS
WORLD CLASS HYDRAULICS

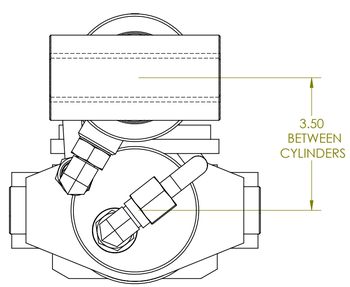
TITLE: CYLINDER ASSY

SHEET 1 or 2
DWG NO 0549-0600-0299A









07/03/12

THIS PRINT HAS BEEN SUBMITTED FOR APPROVAL.
PLEASE INSPECT AND CONFIRM THAT ALL
DIMENSIONS ARE CORRECT. YOUR SIGNATURE
IS REQUIRED BEFORE AN ORDER CAN BE PROCESSED.

Approved by: _____

Date: _____

SHEET ONE of TWO

CYLINDER DATA:
CYLINDER 1,
BORE: 3.000 DIA.
ROD HOLLOW: 2.000 CHROMED OD
x 1.250 ID
CASE O.D.: 3.375

CYLINDER 2,
BORE: 2.500 DIA.
ROD SOLID: 1.500 CHROMED DIA.
CASE O.D.: 2.875

MAX. OPERATING PRESSURE: 3000 PSI
FORCES AT 2700 PSI
CYLINDER 1:
EXTEND: 19,085 LBS.
RETRACT: 10,603 LBS.
CYLINDER 2:
EXTEND: 13,253 LBS.
RETRACT: 8,482 LBS.
CYCLE RATE:
AT 5.6 GPM
EXTEND: .75 MINUTES (45 SECONDS)
RETRACT: .50 MINUTES (30 SECONDS)
TEST PRESSURE: 3000 PSI
TEST: 100%
PAINT: GREY PRIMER
AND BLACK FINISH PAINT

CYLINDER WEIGHT
220 LBS. DRY

Maintainer Corp.
007556

				F	09-05-08	2789	DJB
				E	12/27/07	2675	KDK
				D	9/5/07	2623	KDK
				C	4/3/07	2556	KDK
K	07/03/12	3296	KDK	B	04-08-05	2222	DJB
J	05/10/12	3276	KDK	A	03-24-05	2215	DJB
H	04/18/12	3269	KDK	LEVEL	DATE	ECN NO.	BY
G	11/30/10	3078	KDK	REVISION HISTORY			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS X = +/- .06, XX = +/- .03, XXX = +/- .010
ANGLE +/- 1
PROJECTION
SURFACE FINISH MACHINED: 125 RMS
REMOVE ALL SHARP EDGES
SIZE D

DO NOT SCALE DRAWING

	APPROVALS	DATE
DRAWN	KDK	9/15/04
APPROVED	KDK	10/11/04
RESP ENG		
MFG #		

BOBALEE HYDRAULICS
WORLD CLASS HYDRAULICS

TITLE: CYLINDER ASSY

SHEET 1 of 3
DWG NO 0549-0300-1440A

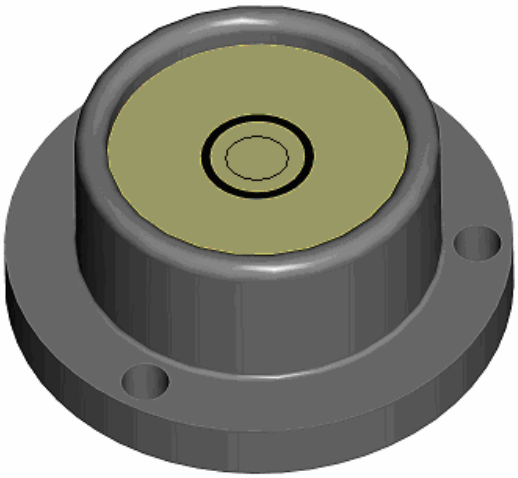
Crane level indicator

J:\Engineering\Crane level indicator.doc

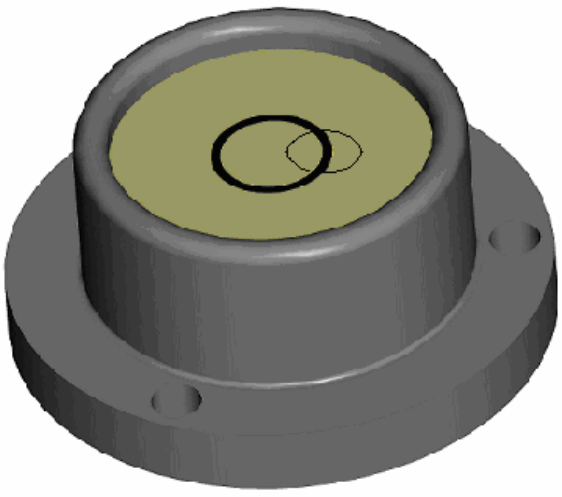
ANSI 2004 B30.5-1.9.11.d – Means shall be provided for the operator to visually determine the levelness of the crane

OSHA 1926.500(g)(3)(i)(D) – The crane shall be uniformly level within one percent of level grade and located on firm footing.

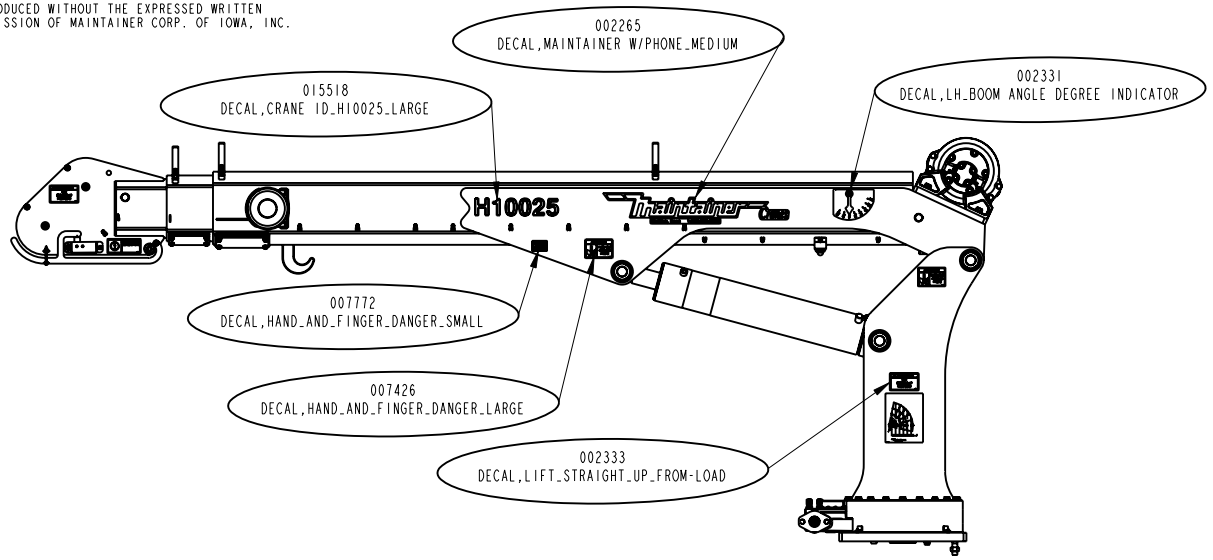
CORRECTLY LEVELED

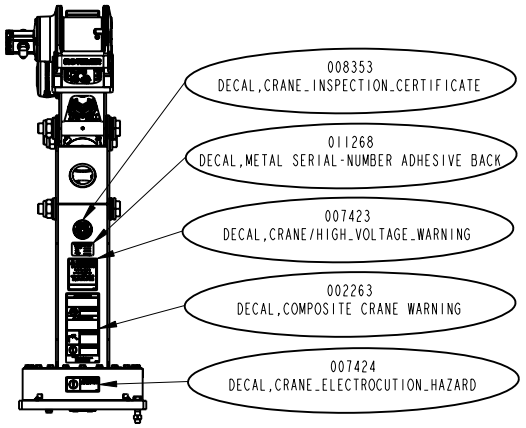


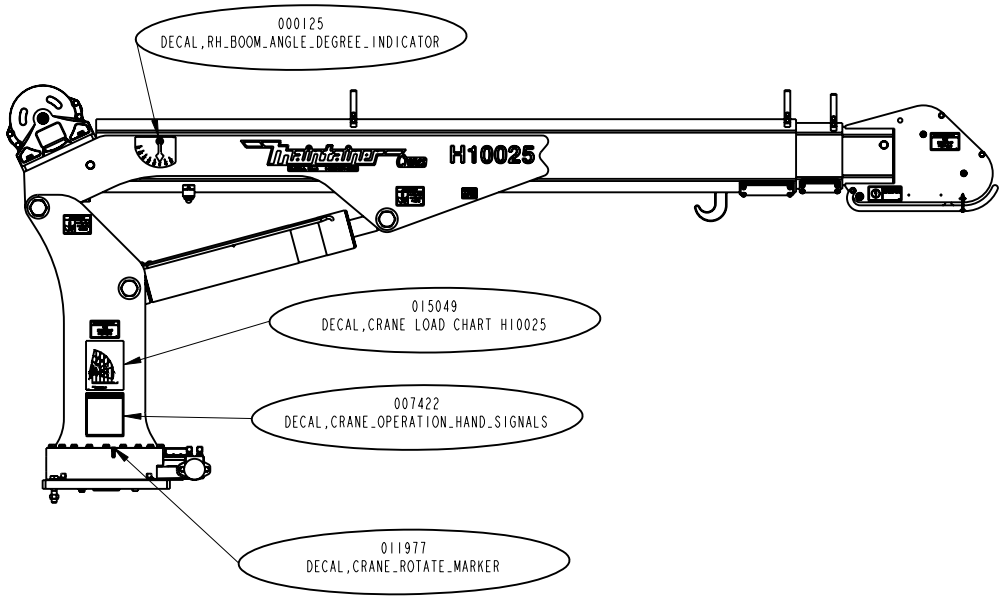
MAXIMUM OUT OF LEVEL
TO MAINTAIN COMPLIANCE



DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/30/12	A	DRAWING RELEASED	-	AHB	NDS







QTY	DESCRIPTION	PART NUMBER	ITEM
2	DECAL,CRANE ID_H10025_LARGE	015518	16
2	DECAL,CRANE LOAD CHART H10025	015049	15
1	ASY,CRANE H10025-TT MASTER	015001	14
2	DECAL,CRANE_ROTATE_MARKER	011977	13
1	DECAL,METAL SERIAL-NUMBER ADHESIVE BACK	011268	12
1	DECAL,CRANE_INSPECTION_CERTIFICATE	008353	11
2	DECAL,HAND_AND_FINGER_DANGER_SMALL	007772	10
4	DECAL,HAND_AND_FINGER_DANGER_LARGE	007426	9
3	DECAL,CRANE_ELECTROCUTION_HAZARD	007424	8
1	DECAL,CRANE/HIGH_VOLTAGE_WARNING	007423	7
1	DECAL,CRANE_OPERATION_HAND_SIGNALS	007422	6
4	DECAL,LIFT_STRAIGHT_UP_FROM-LOAD	002333	5
1	DECAL,LH_BOOM ANGLE DEGREE INDICATOR	002331	4
2	DECAL,MAINTAINER W/PHONE_MEDIUM	002265	3
1	DECAL,COMPOSITE CRANE WARNING	002263	2
1	DECAL,RH_BOOM_ANGLE_DEGREE_INDICATOR	000125	1

015001-DECAL

PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: AHB DATE: 5/30/12
CHK: NDS DATE: 5/30/12

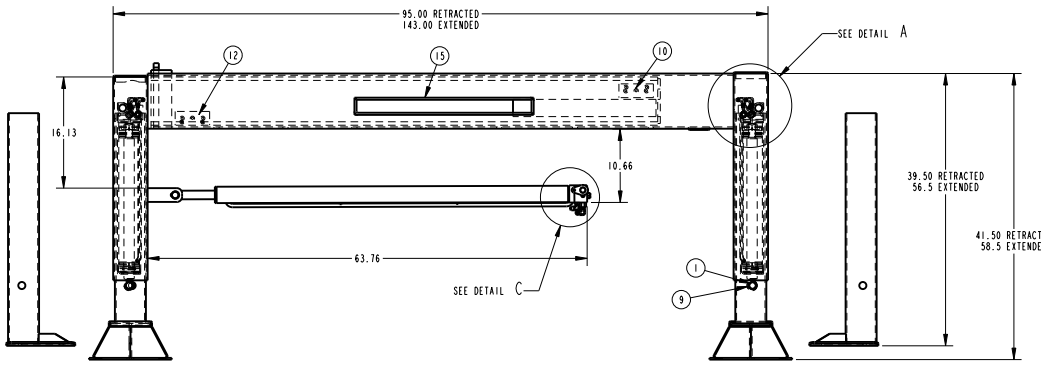
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

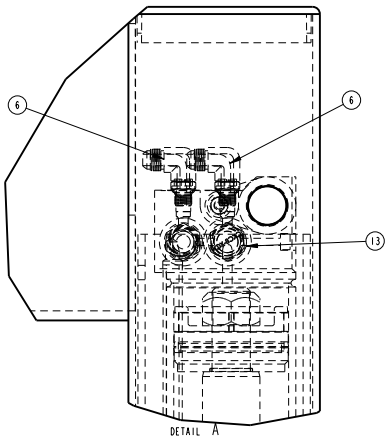
DESCRIPTION: ASY,CRANE H11025-TT DECAL MASTER

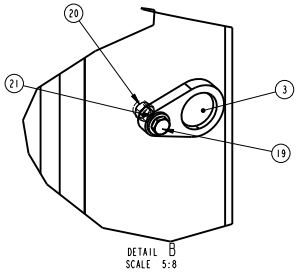
SCALE: 1:16 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 015001-DECAL REV. LEVEL: A

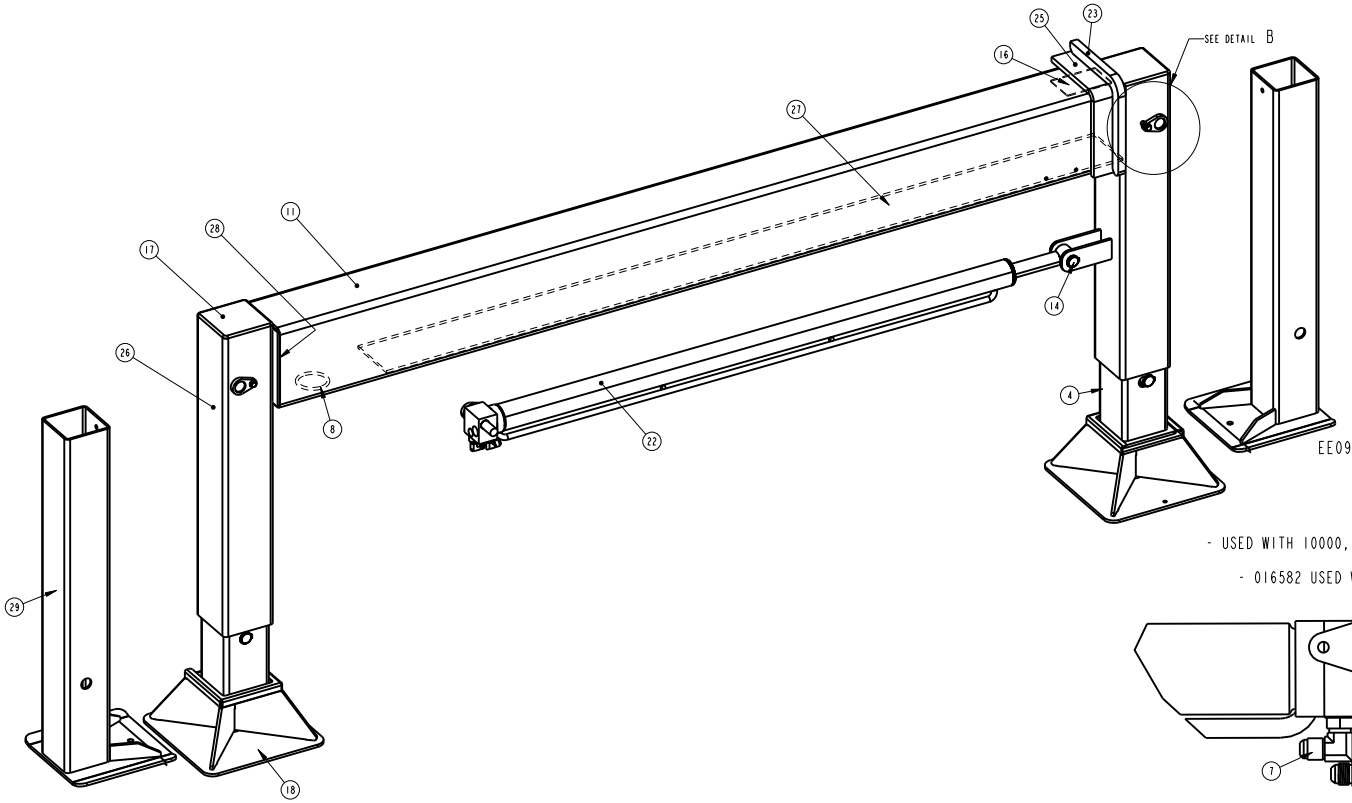
REF.	SPECIFICATION

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/7/13	A	DRAWING RELEASED	-	KJH	KLV







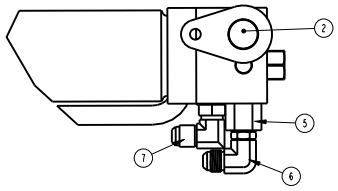


OPTIONAL

EE092-ORR AND 016425 WITH SHORT TOWER

- USED WITH 10000,12000,HI0025TT CRANES

- 016582 USED WITH HI0025ST, HI0034



QTY	DESCRIPTION	PART NUMBER	ITEM
2	ASM,INNER OR WELD-ON PAD LONG TUBE 33.75	X657-10R	29
1	CAP,BUMPER CROSS TUBE	U110-BUMPERF	28
1	FLAT 1/4 x 5 x 74"	OR14RE-LH	27
1	TUBE,OUTER OR SS 2 TON	EE056-001650	26
1	OUTRIGGER REINFORCEMENT 6X8 CROSS TUBE	AC300-ORR	25
1	WELDMENT,INNER OUTRIGGER 30" TALL	016581	24
1	COLLAR,HORSE OUTRIGGER 6x8***	015832	23
1	CYL,OUTRIGGER,EXTEND,48",CHECK ON EXTEND	014866	22
2	WASHER,FLAT,0.250,SAE,EXTRA THICK,SS	012896	21
2	NUT,0.250-20UNC,NYLON-LOCK INSERT,SS	012864	20
2	BOLT,0.250-20UNC-1.000,HX HD,SS	012869	19
2	ASY,SAND PAD OR SELF-FIXTURING	010583	18
2	CAP,OUTRIGGER,COMPOSITE,5x5	010567	17
1	SPACER,OR TOP-INSIDE CROSS TUBE***	010495	16
2	GUARD,SLIDE OUT,6x8,X-TUBE HOSE***	009092	15
1	PIN,EXT CYL OUTRIGGER***	007989	14
2	CYL,OUTRIGGER,DOUBLE-CHK,BOBALEE	007777	13
2	PAD,WEAR,SIDE OFF CENTER,14000***	006803	12
1	TUBE,OUTRIGGER,OUTER,REAR,14000***	006802	11
2	PAD,WEAR 6X8 OUTRIGGER / 3216-20-INNER***	003621	10
6	RING,RETAINING,EXTERNAL,1.000,6832	003245	9
1	RING,CADIUM,2.500***	003218	8
1	ADAPTOR,6801-06-06,ELBOW,90,06MT-06ORB	002751	7
5	ADAPTOR,6801-06-04,ELBOW,90,06MT-04ORB	002680	6
1	ADAPTER,6410-04-06,04ORB-06FOR.	002662	5
2	ASY,INNER OR TUBE,2 TON,LONG	001628	4
2	PIN,OR,CYL,END,CAP,MNT,2 TON	001619	3
1	PIN,OR,CYL,1-TON,TOP,0.750***	001612	2
2	PIN,BOTTOM OR,4.5 TUBE	000004	1

PART NUMBER 016663

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±1° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: KJH DATE: 5/7/13
CHK: KLV DATE: 5/7/13
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASM,OUTRIGGER_2-TON_CYL_#007777_HO

SCALE: 9:80 SIZE: D SHEET: 1 of 1 DRAWING NUMBER: 016663 REV. LEVEL: A

REF. SPECIFICATION

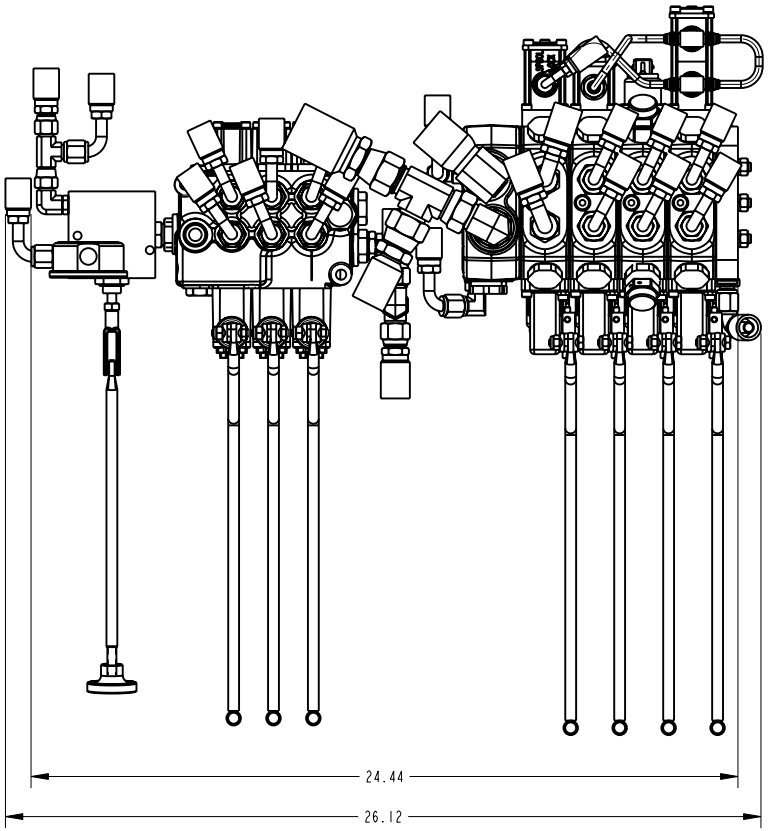
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
9/5/13	A	DRAWING RELEASED	-	KJH	KLV
12/19/13	B	ADDED NOTE 017382 HANDLE UNDER OR TUBE	-	KJH	KLV

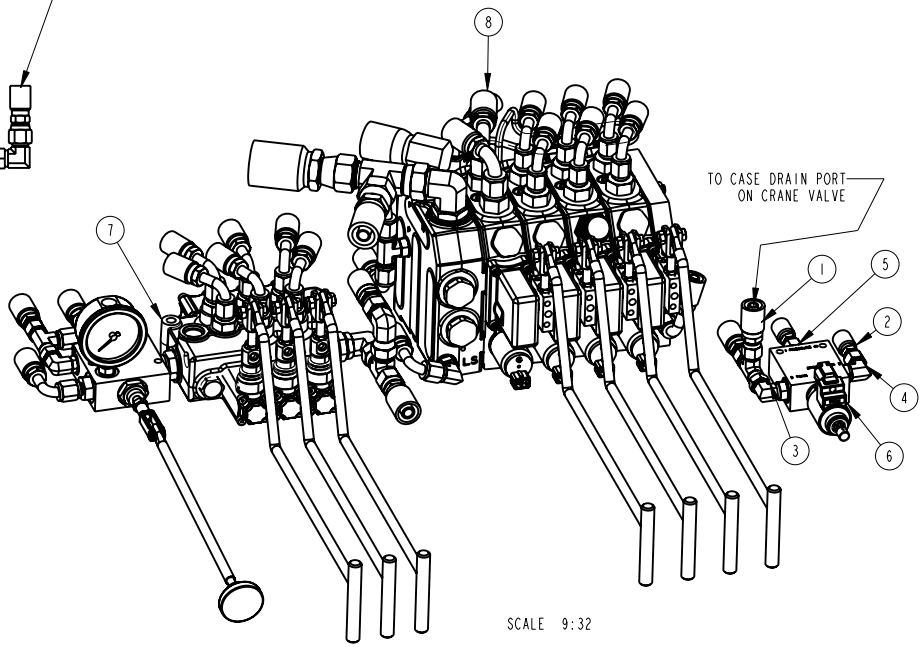
CLOSED CENTER HYDRO CONTROL

NOTE: SAME HANDLE USED FOR ALL 7

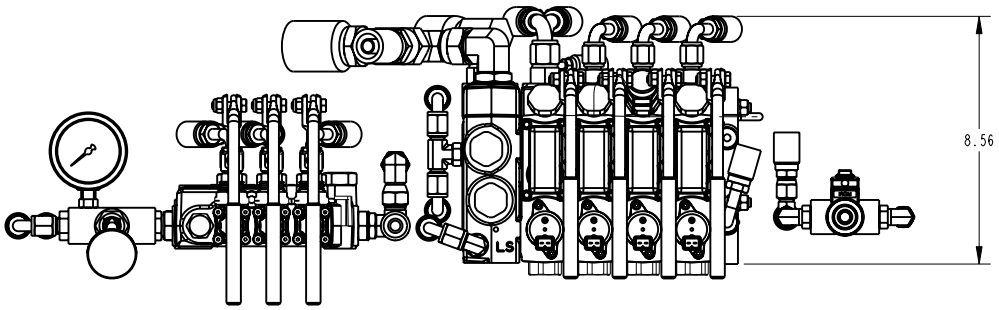
1-TON WORKBENCH HANDLE USE - 008299
2-TON WORKBENCH HANDLE USE - 008301
(B) 2-TON WORKBENCH RECESSED - 017382

1 & 2-TON STEP BUMPER USE HANDLE - 008302





SCALE 9:32



WORKS WITH AC305-VALVEWELL 1-TON WB
WORKS WITH DA023-VALVEWELL 2-TON WB
WORKS WITH AC189-VALVEWELL 1-TON STEP

QTY	DESCRIPTION	PART NUMBER	ITEM
1	ASY,VALVE 4-SEC_CRANE_HYDRO_CONTROL	017098	8
1	ASY,VALVE OUTRIGGER_3-SEC_HYDRO-CONTROL	017096	7
1	VALVE,UNLOADER NORM-OPEN LS HYDROCONTROL	013728	6
1	ADAPTER,6400-06-06_06MT-06ORB	002775	5
2	ADAPTOR,6801-06-06_ELBOW_90_06MT-06ORB	002751	4
1	ADAPTOR,6602-06-06-06_TEE_06MT-06MT-06FT	002683	3
2	COUPLING,CRIMP_HY04-06FJ	002533	2
2	COUPLING,CRIMP_HY06-06FJ	002523	1

PART NUMBER 017100

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

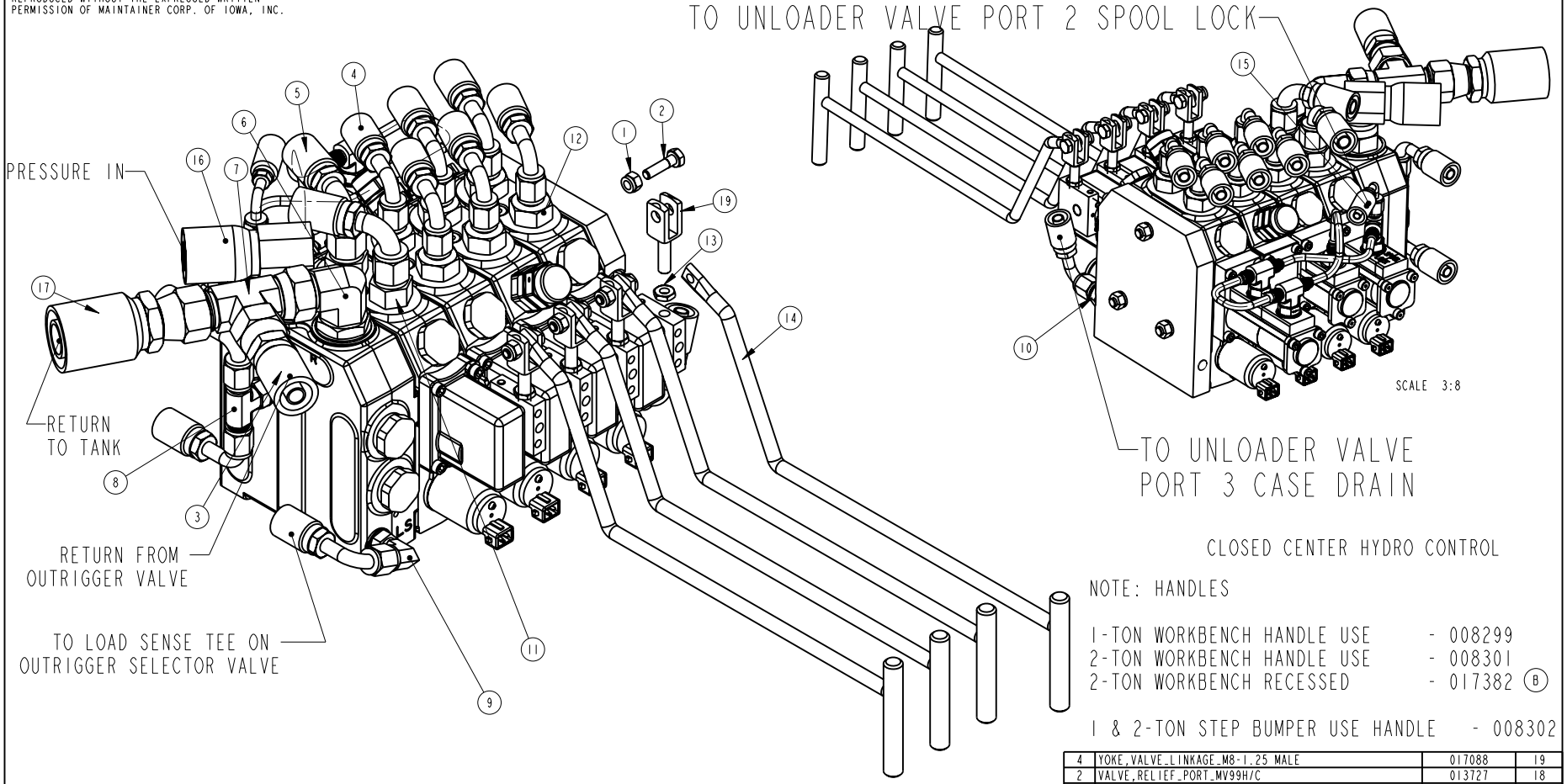
DR: KJH DATE: 9/5/13
CHK: KLV DATE: 9/5/13

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: MASTER,4-SEC_CRANE_3-SEC_OR_HYDRO_CONTROL

SCALE: 5:16 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 017100 REV. LEVEL: B

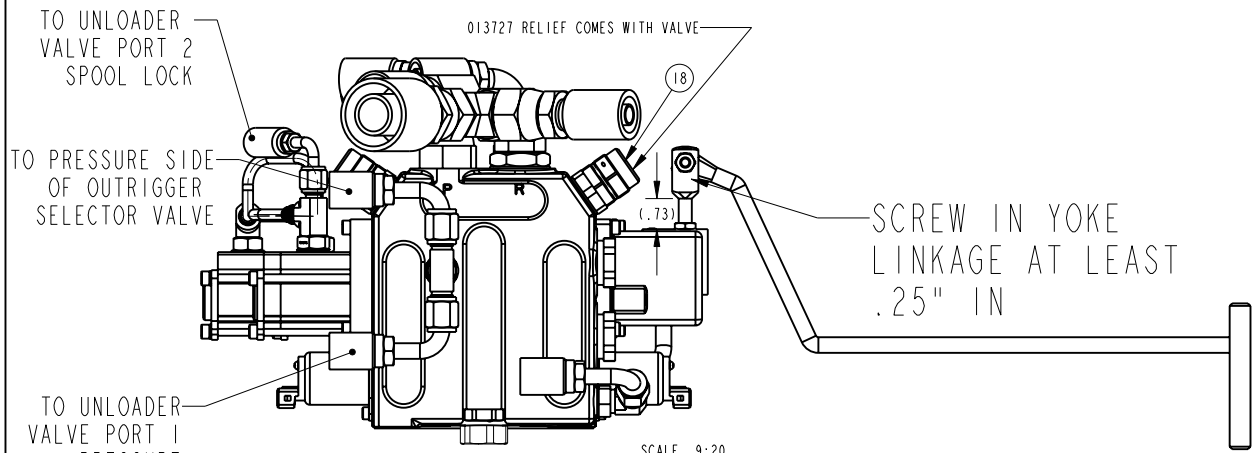
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
9/6/13	A	DRAWING RELEASED	-	KJH	KLV
12/19/13	B	ADDED NOTE 017382 HANDLE UNDER OR TUBE	-	KJH	KLV



NOTE: HANDLES

1-TON WORKBENCH HANDLE USE - 008299
2-TON WORKBENCH HANDLE USE - 008301
2-TON WORKBENCH RECESSED - 017382 (B)

1 & 2-TON STEP BUMPER USE HANDLE - 008302



QTY	DESCRIPTION	PART NUMBER	ITEM
4	YOKE,VALVE_LINKAGE_M8-1.25 MALE	017088	19
2	VALVE,RELIEF_PORT_MV99H/C	013727	18
1	COUPLING,CRIMP_W16-12FJX	013350	17
1	COUPLING,CRIMP_HY12-12RC90	012536	16
1	COUPLING,CRIMP_HY04-04FJ90T	010808	15
4	HANDLE,MANUAL_CONTROL_OR_2-TON_SALAMI	008301	14
4	NUT,METRIC_JAM_M8X1.25	007561	13
6	ADAPTER,6400-06-10_06MT-10ORB	002782	12
2	ADAPTER,6400-08-10_08MT-10ORB	002781	11
1	ADAPTER,6400-06-06_06MT-06ORB	002775	10
1	ADAPTOR,6801-06-06_ELBOW_90_06MT-06ORB	002751	9
1	ADAPTER,6803-06-06-06_TEE_06MT-06MT-06OR	002749	8
1	ADAPTOR,6602-12-12-12_TEE_12MT-12MT-12FT	002681	7
1	ADAPTOR,6801-12-12_ELBOW_90_12MT-12ORB	002677	6
2	COUPLING,CRIMP_HY08-08FJ90T	002543	5
10	COUPLING,CRIMP_HY06-06FJ90T	002522	4
1	COUPLING,CRIMP_HY08-12FJ	002518	3
4	BOLT,0.250-20UNC-1.000_HX_HD_GR5	000370	2
4	.25-20 LOCK NUT	000343	1

PART NUMBER 017098

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±0° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

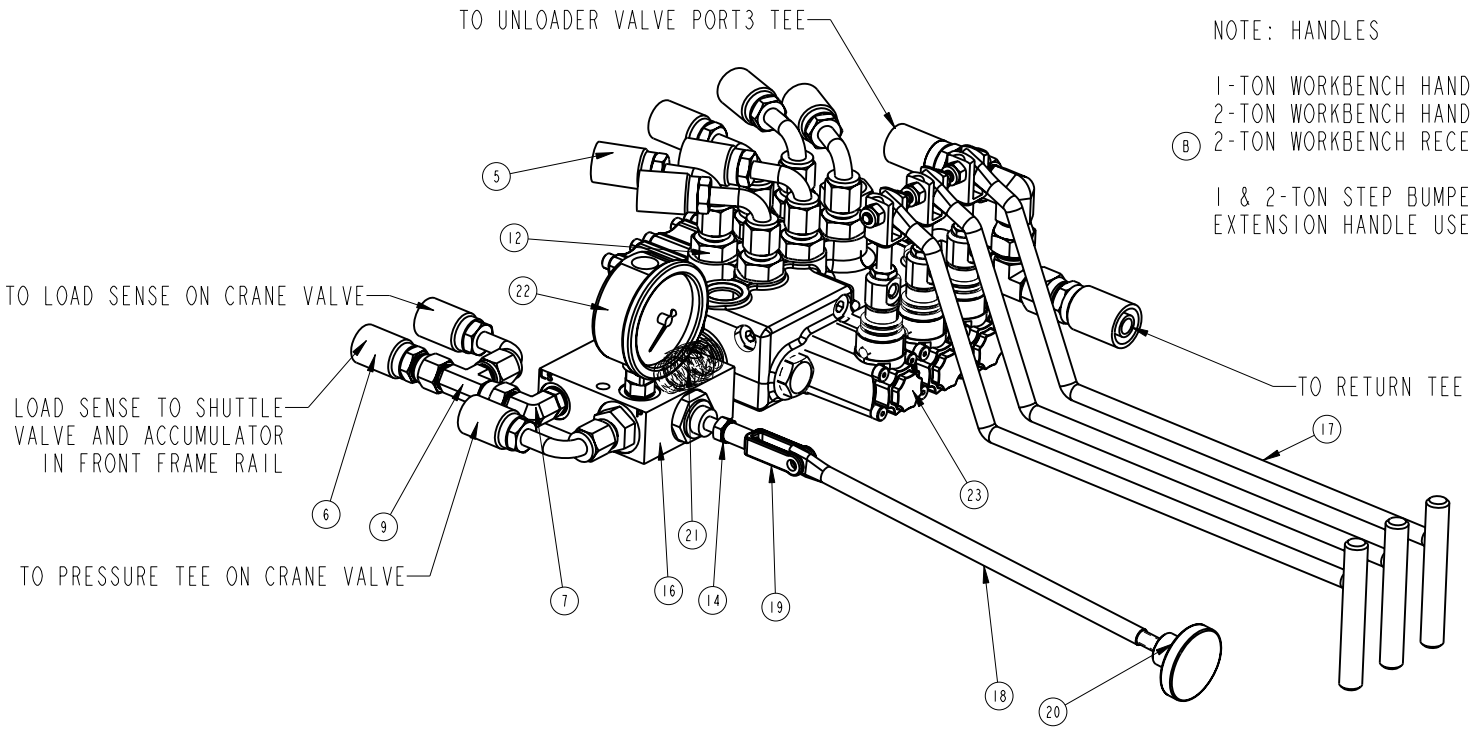
DR: KJH DATE: 9/6/13
CHK: KLV DATE: 9/6/13

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,VALVE 4-SEC_CRANE_HYDRO_CONTROL

SCALE: 1:2 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 017098 REV. LEVEL: B

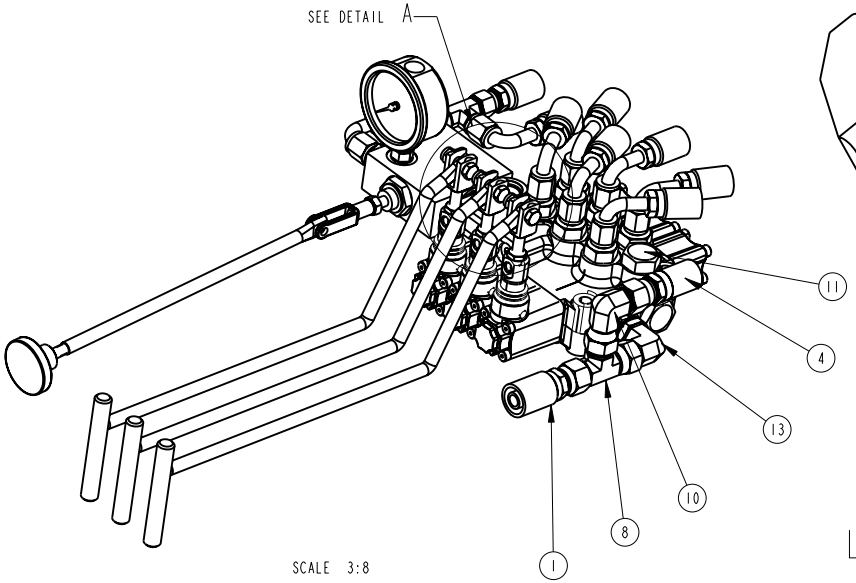
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
9/6/13	A	DRAWING RELEASED	-	KJH	KLV
12/19/13	B	ADDED 2-TON HANDLE 017382 RECCESSED UNDER OR TUBE	-	KJH	KLV

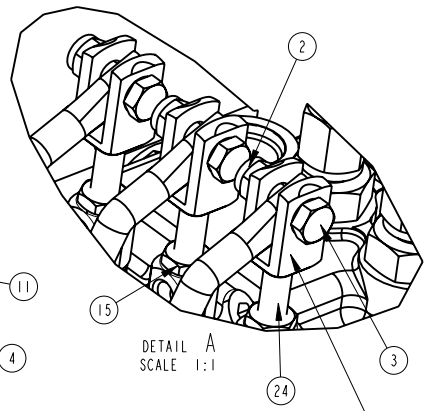


NOTE: HANDLES

1-TON WORKBENCH HANDLE USE - 008299
2-TON WORKBENCH HANDLE USE - 008301
(B) 2-TON WORKBENCH RECESSED - 017382

1 & 2-TON STEP BUMPER USE HANDLE - 008302
EXTENSION HANDLE USE - 008305





SCREW IN YOKE LINKAGE ABOUT .25"

QTY	DESCRIPTION	PART NUMBER	ITEM
3	YOKE,VALVE_LINKAGE_M8-1.25 MALE	017088	24
1	VALVE,OUTRIGGER_3-SEC_HYDRO-CONTROL	012695	23
1	GAUGE,2.5"_LIQUID-FILLED_STEM-MOUNT_SAE-	008803	22
1	ADAPTER,6403-NWO-08_08ORB-08ORB	008378	21
1	KNOB,SELECTOR_VALVE_ROUND_1/4-20	008354	20
1	YOKE,VALVE_LINKAGE_1/4-20_FEMALE	008339	19
1	EXTENSION,OR_HANDLE_SALOMI_SELECTOR	008304	18
3	HANDLE,MANUAL_CONTROL_OR_2-TON_SALAMI	008301	17
1	VALVE,SELECTOR_2-WAY_OUTRIGGER	008260	16
3	NUT,METRIC_JAM_M8X1.25	007561	15
1	NUT_0.250-28	003381	14
1	ELBOW,HYDR_90_08MT-08ORB	002814	13
6	ADAPTER,6400-06-08_06MT-08ORB	002783	12
1	ADAPTOR,6408-10_PLUG_10ORB	002774	11
1	ADAPTOR,6500-08-08_ELBOW_90_08MT-08FTX	002685	10
1	ADAPTOR,6602-06-06-06_TEE_06MT-06MT-06FT	002683	9
1	ADAPTOR,6602-06-06-06_TEE_06MT-06MT-06FT	002682	8
1	ADAPTOR,6801-06-04_ELBOW_90_06MT-04ORB	002680	7
1	COUPLING,CRIMP_HY06-06FJ	002523	6
8	COUPLING,CRIMP_HY06-06FJ90T	002522	5
1	COUPLING,CRIMP_HY06-08FJ	002500	4
3	BOLT,0.250-20UNC-1.000_HX_HD_GR5	000370	3
3	.25-20 LOCK NUT	000343	2
1	COUPLING,CRIMP_HY08-08FJ	000194	1

PART NUMBER 017096

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: KJH DATE: 9/6/13
CHK: KLV DATE: 9/6/13

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,VALVE OUTRIGGER_3-SEC_HYDRO-CONTROL

SCALE: 1:2 | SIZE: C | SHEET: 1 OF 1 | DRAWING NUMBER: 017096 | REV. LEVEL: B

RC40 Vanair

Air Compressor

Air system overview

Maintainer Corp. of Iowa installs air systems per the customer's requirements. They range from small gas powered air compressors to large hydraulic driven rotary screw air compressors.

Maintainer Corp. of Iowa designs and installs most hydraulic systems that run the air compressors. The systems are designed using the air compressor manufacturer's specifications for each unit. Horsepower requirements, R.P.M. and duty cycle are the determining factors when designing the systems.

The air system components are matched to the air compressor output. The air hose size, air storage capacity, **F**ilter – **L**ubricator – **R**egulator and hose reel are matched to the air compressor output.

The hydraulic system used on the air compressor may be an open or closed center hydraulic system. A solenoid valve and oil flow control valve control the hydraulic flow to the hydraulic motor. An electric pressure switch controls the solenoid valve. The pressure switch will energize the solenoid valve when the air system lowers to a set pressure. This pressure is approximately 120 P.S.I. The pressure switch will de-energize the solenoid valve when the air system reaches a higher set pressure. This pressure is approximately 150 P.S.I.

The air reservoir tank is equipped with a 165 P.S.I. pop off valve to prevent the tank from over pressurizing. There is a drain in the tank. The tank should be drained at the end of each shift. The air is directed out of the air tank to air system components.

How to set the Van Air RC 40 Compressor

Start by making sure the main hydraulic system pressures are at correct settings. Have the truck running, the hydraulic system engaged, and the system at normal operating temperature.

The compressor's rpm's are factory set at 840 to 865 RPM (Do not exceed 865 RPM). Begin by letting the air compressor run for fifteen minutes to warm up while venting to the atmosphere. Now stop venting the air and let pressure build up to check at what PSI the compressor shuts off. You will get the PSI reading from the FLR (Filter-Lubricator-Regulator) gauge that is in-line with the air reel. To adjust the pressure settings, access the pressure switch through the removable service panel. Remove the cover from the pressure switch and adjust by turning the screw between the four terminals. Turning in will increase pressure and turning out will decrease pressure. The small adjuster will affect the differential level only. Set the shut-off pressure at 150psi. The start-up pressure will normally be set 30psi lower.

Note: The Max air pressure of the system is 165psi.
Set Max RPM with 0-60psi with air venting to atmosphere.

Hydraulic motor requirements: 14 GPM @ 1700 PSI

Maintenance tips:
Change the oil once a year or 500 hours.
Change the oil more often under harsher conditions.
Van Air recommends Synthetic 10W-30 or 5W-30 or Van Air Kit 1091

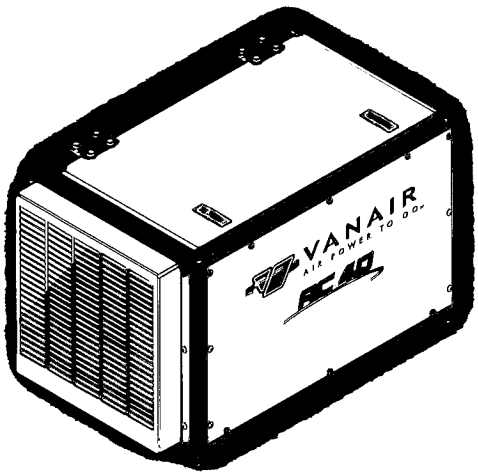
VANAIR®

AIR POWER TO GO™

RC40

40 CFM/100 PSIG HYDRAULIC CLOSED OR OPEN CIRCULATION RECIPROCATING COMPRESSOR

INSTALLATION, OPERATION, MAINTENANCE AND PARTS MANUAL



NOTE

Read this manual before installing, operating or servicing this equipment. Failure to comply with the operation and maintenance instructions in this manual WILL VOID THE EQUIPMENT WARRANTY.

KEEP THE MANUAL WITH THE VEHICLE

NOTE

Making unauthorized modifications to the compressor or system components WILL VOID THE WARRANTY!

Always inform Vanair Manufacturing, Inc., before beginning any changes to the RC40 system.

Vanair Manufacturing, Inc.
10896 West 300 North
Michigan City, IN 46360
Phone: (219) 879-5100
(800) 526-8817

Service Fax: (219) 879-5335
Parts Fax: (219) 879-5340
Sales Fax: (219) 879-5800
www.vanair.com

NOTE

Use only Vanair™ Premium Synthetic Oil and Genuine Vanair Parts. Inspect and replace damaged components before operation. Substituting non-Vanair™ Oil or non-genuine Vanair filter components WILL VOID THE COMPRESSOR WARRANTY!

P/N 090037-OP_r0
Effective Date: 10/12

RC 40

WARRANTY - RC 40 RECIPROCATING ABOVEDECK AIR COMPRESSOR

The reciprocating type air compressor pump is warranted by the manufacturer for three (3) years against defects in materials and workmanship. The unit will be replaced or repaired at VANAIR'S option as a result of such defects. The hydraulic motor unit is warranted for two (2) years. All other parts are warranted for twelve (12) months. This warranty does not cover damage caused by accident, misuse or negligence. If the compressor pump is disassembled the warranty is void. Any disassembly of major components must be approved by Vanair to avoid voiding of warranty. Any and all such claims for warranty consideration must be coordinated **prior** to work being performed through the Warranty-Service Department at the address below. Please do **not** return parts without prior authorization.

Warranty is limited to the supply of replacement parts failing within the warranty period. Credit for labor required to refit replacement parts is NOT included. All warranted parts are to be shipped PREPAID to VANAIR. Replacement parts will be shipped back to the customer by VANAIR via ground shipment. Cost to expedite delivery of replacement parts will be incurred by customer. Factory installed units will also include warranty on the installation for one year.

Warranty will commence upon receipt of the Warranty Registration Card. If the Warranty Registration Card is not received within six (6) months, then warranty commencement date shall be thirty (30) days from the date of shipment from VANAIR. Records of warranty adherence are the responsibility of end user.

This statement of warranty is expressly in lieu of and disclaims all other express warranties, implied warranties of merchantability and fitness for a particular purpose and all other implied warranties which extend beyond the description on the face hereof. In no event shall Vanair be responsible for special, indirect, incidental, consequential or punitive damages of any kind, including without limitation, lost profits or other monetary loss, whether or not any such matters or causes are within Vanair's control or due to negligence or other fault of Vanair, its agents, affiliates, employees or representatives.

This warranty shall be void and VANAIR shall have no responsibility to repair, replace or repay the purchase price of defective or damaged parts resulting from the use of or repair of replacement parts or fluids not of VANAIR'S manufacture or from buyer's failure to store, install, maintain and operate the compressor according to the recommendations contained in the Manual.

All claims under the Warranty shall be made by contacting VANAIR Warranty-Service Department.

VANAIR®
AIR POWER TO GO™

10896 W 300 North • Michigan City, IN 46360
TEL: (800) 526-8817 • FAX: (219) 879-5800 • PARTS FAX: (219) 879-5340 • vanair.com

Effective June 2011

Register Your Warranty Online at www.vanair.com
(800) 526-8817, ext. 400 • Fax: (219) 879-5800
10896 W 300 North • Michigan City, IN 46360

TABLE OF CONTENTS

Continued on next page...

Continued on next page...

SECTION 6: MAINTENANCE (CONTINUED)

Continued on next page...

SECTION 8: ILLUSTRATED PARTS LIST..... 71

WARRANTY CLAIMS PROCEDURE

CLAIMS PROCESS FOR WARRANTED VANAIR® PARTS

This process must be used by owners of Vanair® equipment in situations where a warranted item needs repair or replacement under the terms of the purchase warranty. Do not return items to Vanair without prior authorization from the Vanair Warranty Administrator.

PROCEDURE:

When a customer needs assistance in troubleshooting a system and/or returning parts, follow the steps below.

1. **Locate the machine's serial number:**

   The machine package serial number plate is located on the drive-side base frame floor, to the left of the compressor drive sheave (see ***Figure W-1***).

2. **Have a list of the symptoms/condition/malfunctions along with any applicable temperature and pressure readings, and also the number of operational hours available:**

NOTE
The unit's serial number is important to determine the proper configuration of the machine.

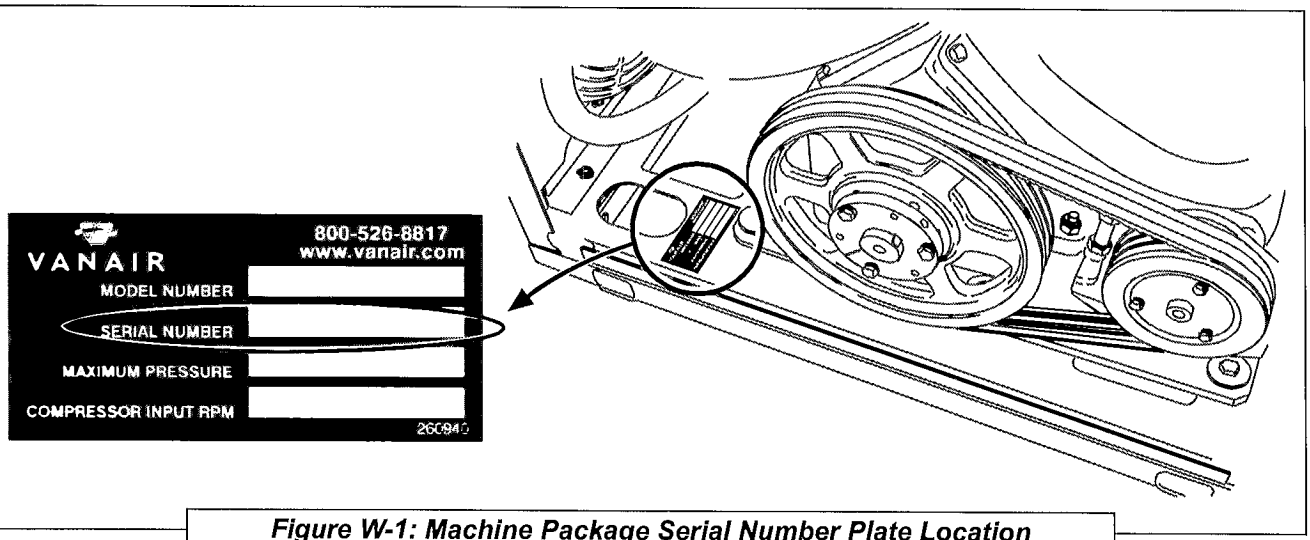


Figure W-1: Machine Package Serial Number Plate Location

IMPORTANT

Customers have 30 days after the RMA number is issued to return the item. If the part is not returned within this period, the RMA is void and any claims will be denied.

NOTE

The RMA number must be placed on the outside of the package being returned.

NOTE

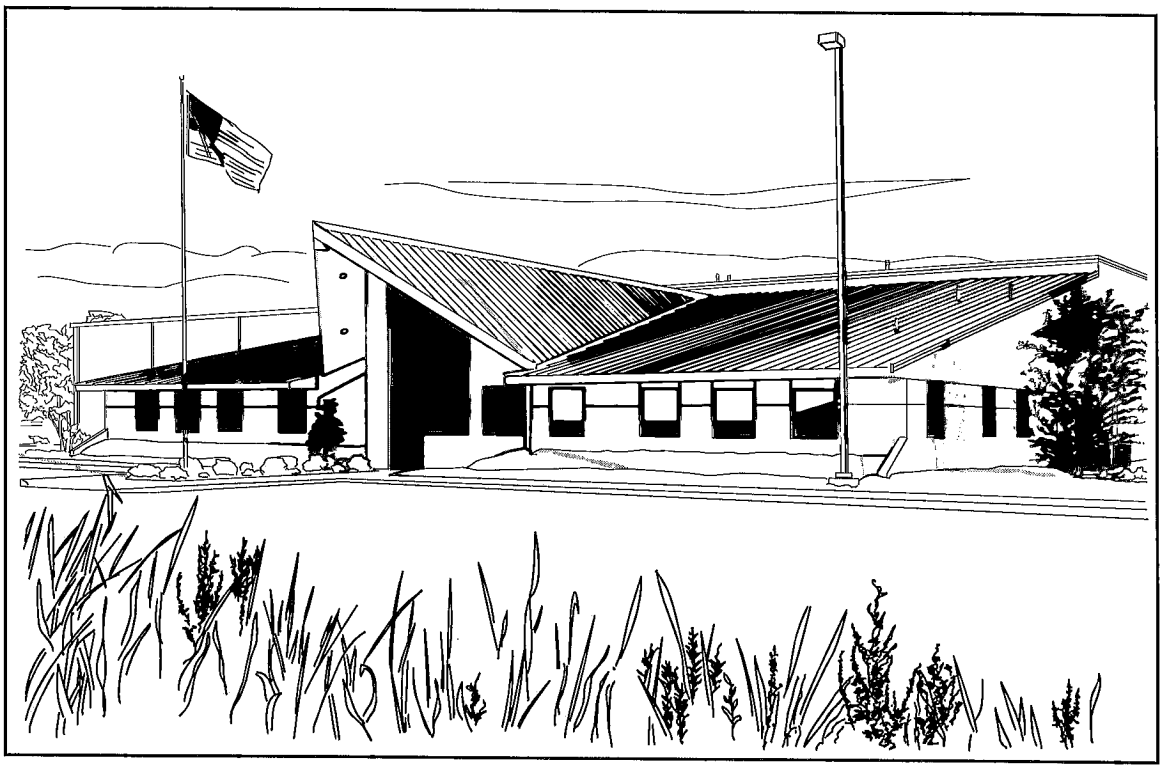
All labor claims or invoices must be approved by the Vanair Warranty Administrator prior to starting repair work along with the cost of the repair. All paper work associated with the returned item and warranty repair cost must reference the RMA number issued against the part, and be forwarded to Vanair within 30 days of the completion of work.

3. **Contact the Vanair Service Department by phone (1-219-879-5100 ext. 400) to speak with a Service Technician.**
4. **Vanair Service will troubleshoot the problem based on the information provided by the customer.**
5. **If the unit cannot be returned to service, and Vanair determines this matter may be a warranty issue, the Service Technician may assign an RMA (Return Material Authorization) number that will provide for the return of the item to Vanair® for analysis and a final determination as to the item's warranty status.**
6. **If the returned item, which in Vanair's judgment is proven to be defective as warranted, than Vanair will issue a credit for the cost of that item to the customer.**
7. **Returned parts eligible for warranty must have the RMA number on the packing slip.**

   No items can be returned "freight collect". The customer pays any additional costs for warranty parts delivered through expedited services (i.e., Next Day, Second day).

   Vanair Manufacturing strives to continuously improve its customer service. Please forward any questions, comments, or suggestions to Vanair Service (219-879-5100 ext. 400) or e-mail us (service@vanair.com).

INTRODUCTION



EXPERIENCE THE VANAIR® ADVANTAGE!

Since 1972, Vanair Manufacturing, Inc. has grown from a small subsidiary of Sullair Corporation® to the world's largest manufacturer of vehicle-mounted air compressors today. Vanair pioneered the use of transmission Power Take-Off (PTO) to power rotary screw air compressors, and continues to be the driving innovative force in this segment of the industry. Vanair offers air compressor products ranging from 20 to 900 CFM using various drive methods, allowing for installations for most vehicle applications. Vanair's brand new state of the art facility is driven by a highly-qualified and skilled workforce. Our professional engineering staff uses detailed 3D modeling technology to provide custom engineered solutions for complex and demanding customer applications. With their experienced service personnel, Vanair is able to

provide its customers prompt and comprehensive technical support.

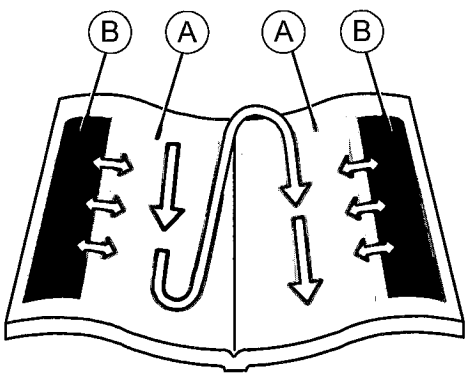
This publication contains the latest information available at the time of preparation. Every effort has been made to ensure accuracy. However, Vanair® Manufacturing, Inc. takes no responsibility for errors or consequential damages caused by reliance on the information contained herein.

Vanair Manufacturing, Inc. reserves the right to make design change modifications or improvements without prior notification.

A NOTE ON MANUAL LAYOUT NAVIGATION

Refer to ***Figure M-1***. This manual is presented in a two-column per page sequence. As shown in the figure, the inner columns represent the machine application data in a continuous page-by-page flow. The outer columns are reserved for auxiliary information relating to the specific data put forth in the inner column. This auxiliary data can, for example, be a relative warning or note detail. It will support the concept which is listed nearby in the inner column.

Sometimes, if an illustration is too large to fit in the outer column, or if a large table matrix is present, it may occupy the two-column space of a page. In such cases the inner column will always be continued on the next available page after the illustration.



KEY	DESCRIPTION
A	**INNER PAGE COLUMNS:** Main text flow of information layout represents the main body of machine applications divided into sections and sub-sections.
B	**OUTER PAGE COLUMNS:** Contain auxiliary information such as notes, warnings, and small illustrations. This information is related, and will be located in proximity, to the main, inner page column application.

Figure M-1: Manual Layout Navigation

SECTION 1: SAFETY

1.1 GENERAL INFORMATION

The products provided by Vanair® are designed and manufactured for safe operation and maintenance. But it is ultimately the responsibility of the users and maintainers for safe use of this equipment. Part of this responsibility is to read and be familiar with the contents of this manual before operation or performing maintenance actions.

System Component Group	Manual Section
GENERAL DESCRIPTION	**1.1**
DANGERS, WARNINGS, CAUTIONS AND NOTES	**1.2**
SUMMARY OF DANGERS, WARNINGS, CAUTIONS AND NOTES	**1.3**
DANGERS	1.3.1
WARNINGS	1.3.2
CAUTIONS	1.3.3
SAFETY DECALS	1.3.4
DISPOSING OF MACHINE FLUIDS	1.4

1.2 ⚠ DANGERS, WARNINGS, CAUTIONS AND NOTES

See information boxes at right column.

1.3 ⚠ SUMMARY OF DANGERS, WARNINGS, CAUTIONS AND NOTES

These boxed inserts are placed throughout this manual in the sections where they apply. This subsection is a general summary of their contents.

⚠ IMPORTANT

Read this manual before operating or servicing the RC40 Air Compressor System. Failure to do so could result in damaged equipment, bodily injury, or death.

⚠ DANGER

Identifies actions or conditions which will cause death, severe injury, or equipment damage or destructive malfunctions.

⚠ WARNING

Identifies actions or conditions which can cause death, severe injury, or equipment damage or destructive malfunctions.

⚠ CAUTION

Identifies actions or conditions which will or can cause injuries, equipment damage or malfunctions.

NOTE

Additional information (or existing information) which should be brought to the attention of operators/maintainers affecting safety, operation, maintenance, or warranty requirements.

1.3.1 ⚠ DANGERS

- Keep tools or other conductive objects away from live electrical parts.
- Never touch electrical wires or components while the machine is operating. They can be sources of electrical shock.

1.3.2 ⚠ WARNINGS

- **DO NOT** ever use this compressor as a breathing air source. Vanair® disclaims any and all liabilities for damage or loss due to fatalities, personal injuries resulting from the use of a Vanair compressor to supply breathing air.
- **DO NOT** perform any modifications to this equipment without prior factory approval.
- **DO NOT** operate the compressor or any of its systems if there is a known unsafe condition. Disable the equipment by disconnecting it from its power source. Install a lock-out tag to identify the equipment as inoperable to other personnel.
- **DO NOT** attempt to service the equipment while it is operating.
- **DO NOT** use the compressor for purposes other than for which it is intended. High pressure air can cause serious and even fatal injuries.
- **DO NOT** operate the compressor outside of its specified pressure and speed ratings. (See **Section 3, Specifications** or refer to the equipment data plate.)
- **DO NOT** use flammable solvents or cleaners for cleaning the compressor or it parts.
- **DO NOT** operate the compressor in areas where flammable, toxic, or corrosive fumes, or other damaging substance can be ingested by the compressor intakes.
- **DO NOT** operate the compressor with any by-pass or other safety systems disconnected or rendered inoperative.
- Keep arms, hands, hair and other body parts, and loose clothing away from fans, drive shafts, and other moving parts.
- **DO NOT** operate the compressor with any guards removed or damaged, or other safety devices inoperative.
- **DO NOT** operate the compressor in enclosed or confined spaces where ventilation is restricted or closed-off.
- **DO NOT** install shut-off valves between the compressor and the compressor receiver tank (sump).

- Ensure that hoses connected to service valves are fitted with correctly sized and rated flow limiting devices which comply with applicable codes. Pressurized broken or disconnected hoses can whip causing injuries or damage.
- **DO NOT** use tools, hoses, or equipment that have maximum ratings below that of this compressor.
- Keep metal tools, and other conductive objects away from live electrical components.
- Before performing maintenance or repair operations on the compressor, ensure that all power has been removed and been locked out to prevent accidental application.
- **DO NOT** assume that because the compressor is in a STOPPED condition that power has been removed.
- Use this compressor only to compress atmospheric air. Use of this equipment as a booster pump and/or to compress any other gaseous or aerosol substance constitutes improper use. It can also cause damage or injuries. Such misuse will also void the warranty.
- Install, operate, and maintain this equipment in full compliance with all applicable OSHA, other Federal, state, local codes, standards, and regulations.
- Before performing maintenance, or replacing parts, relieve the entire system pressure by opening a service valve which will vent all pressure to the atmosphere: remove all electrical power.

1.3.3 ⚠ CAUTIONS

- Check all safety devices for proper operation on a routine basis.
- Ensure that no tools, rags, or other objects are left on compressor drive systems or near intakes.
- Keep the equipment clean when performing maintenance or service actions. Cover openings to prevent contamination.
- **DO NOT** operate the compressor if cooling air is not available (fan/cooler not operating) or if lubricant levels are below their specified minimum levels.
- Ensure all plugs, hoses, connectors, covers, and other parts removed for maintenance actions are replaced before applying power to the compressor.
- Avoid touching hot surfaces and components.
- Ensure that electrical wiring, terminals; hoses and fittings are kept in serviceable condition through routine inspections and maintenance. Replace any damaged or worn components.
- Wear appropriate protective (eye and hearing protection) equipment and clothing when operating or maintaining this equipment. DO NOT wear jewelry,

loose clothing; and long hair should be restrained with headband or safety hat.

1.3.4 ⚠ *SAFETY DECALS*

Safety decals are placed onto, or located near, system components that can present a hazard to operators or service personnel. All pertinent decals listed in **Section 8.13, Decal Locations** are located near a component, which is subject to respect in terms of safety precautions. Always heed the information noted on the safety decals.

⚠ **WARNING**
DO NOT REMOVE OR COVER ANY SAFETY DECAL. Replace any safety decal that becomes damaged or illegible.

1.4 ♻ DISPOSING OF MACHINE FLUIDS

Always dispose of machine fluids under the guidance of all applicable local, regional and/or federal law.

Vanair® encourages recycling when allowed. For additional information, consult the fluid container label.

SECTION 2: DESCRIPTION

2.1 GENERAL DESCRIPTION

The RC40 unit is designed for heavy-duty performance, optimal power consumption, and for use in areas where installation space is limited.

This type of compressor increases the pressure of the supply air by reducing its volume. This equipment operates by taking in successive volumes of air, in repeated cycles, that is confined in an enclosed space, a sealed chamber, which then compresses this air mass to a higher pressure.

The reciprocating air compressor accomplishes this by using pistons to compress the air inside a set of cylinders, which confine the air mass. As the pistons move into the cylinders, the area containing the air mass decreases and the pressure increases.

The enclosure is constructed of powder-coated, galvanneal sheet steel to protect the unit. It is designed so that daily inspections can be accomplished without removing any panels. However, the panels can be removed easily for more extensive maintenance and repairs.

The unit's steel frame is also powder-coated and has bolt holes for securing it to a vehicle body mounting platform or base.

The component descriptions are presented in this section as follows:

System Component Group	Manual Section
GENERAL DESCRIPTION	**2.1**
COMPONENT DESCRIPTIONS	**2.2**
COMPRESSOR PUMP	2.2.1
COOLING SYSTEM	2.2.2
ELECTRICAL SYSTEM	2.2.3
AIR CONTROL SYSTEM	2.2.4

Continued on next page

⚠ WARNING

Before performing maintenance or repair operations on the compressor, ensure that all power has been removed and locked out to prevent accidental application.

DO NOT assume that because the compressor is in a STOPPED condition that power has been removed.

⚠ WARNING

DO NOT attempt to service the equipment while it is operating.

NOTE

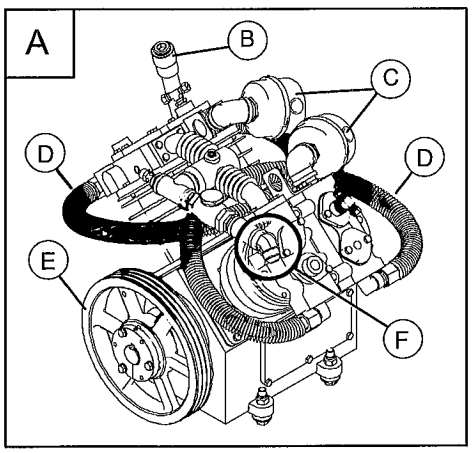
The purpose of this section is to provide descriptions of key machine components and systems, and their functions. For detailed information on servicing the compressor, consult *Section 6, Maintenance.*

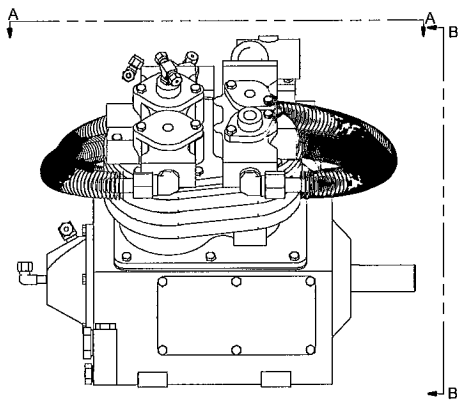
System Component Group	Manual Section
AIR PRESSURE RELIEF VALVES	2.2.5
HYDRAULIC CONTROL SYSTEM	2.2.6
MAIN FRAME AND ENCLOSURE	2.2.7

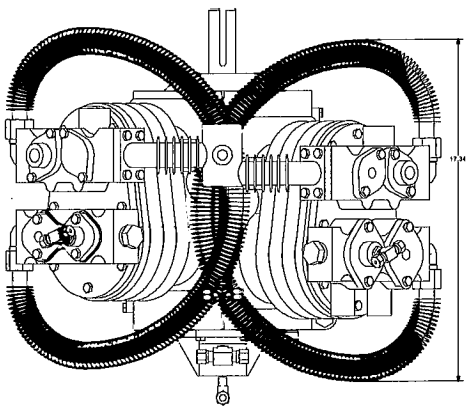
2.2 COMPONENT DESCRIPTIONS

2.2.1 COMPRESSOR PUMP

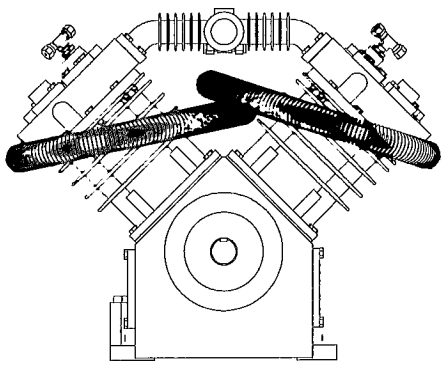
Refer to ***Figure 2-1***. The RC40 contains a two-stage, four cylinder splash-lubricated unit powered by a gear-type aluminum hydraulic motor through V-belts and a pulley.







VIEW A-A



VIEW B-B

KEY	DESCRIPTION	KEY	DESCRIPTION
A	RC40 RECIPROCATING COMPRESSOR	D	INTERCOOLERS (x 2)
B	OIL FILL PORT	E	COMPRESSOR DRIVE SHEAVE (PULLEY)
C	COMPRESSOR AIR FILTER HOUSINGS (x 2)	F	SERVICE AIR OUT (TO SERVICE PORT)

Figure 2-1: Reciprocating Compressor Unit Views

Air is drawn in through dual oversized, dry-type air filters that are located on the compressor pump to provide easy access and long service life.

2.2.2 COOLING SYSTEM

Refer to ***Figure 2-2***. The compressor cooling system consists of a hydraulic oil cooler and a 12V or 24V DC electric fan. It maintains a constant cooling air flow through the unit to ensure that it does not exceed its specified operating temperature limits.

Oil flows through the radiator type hydraulic cooler as long as the hydraulic system is supplying oil to the compressor, providing continuous cooling of the hydraulic circuit.

The fan is mounted at the unit's rear and draws air through the package, directly cooling the compressor, and providing cooling air for the oil cooler. The fan operates continuously anytime power is applied.

2.2.3 ELECTRICAL SYSTEM

Refer to ***Figure 2-3***. The control system's automatic START/STOP feature is controlled by air tank pressure, and also a manual ON/OFF (if equipped). Air pressure is available up to 175 psig. Instrumentation gauges for system pressure and operation hour accumulation are located on the outside panel.

2.2.4 AIR CONTROL SYSTEM

When the compressor is ON, the control system automatically starts and stops in order to maintain the receiver tank pressure.

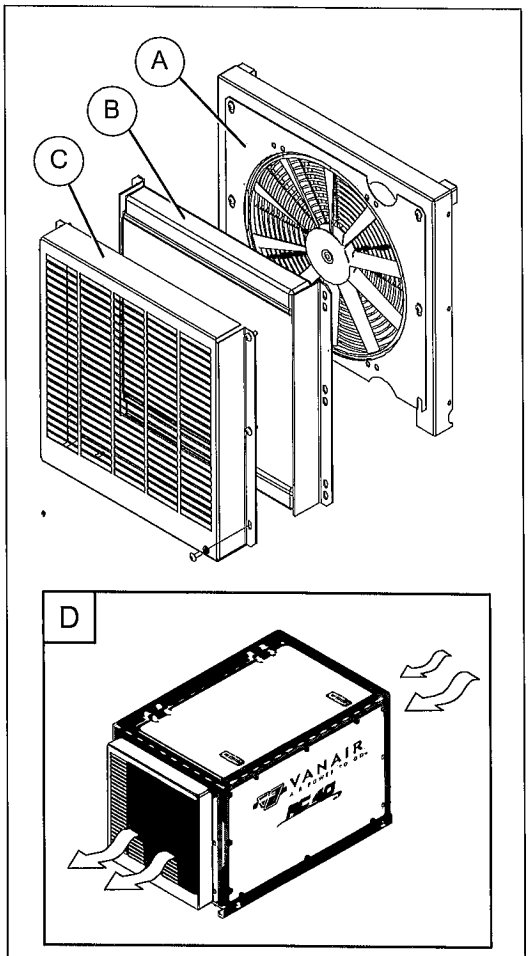
IMPORTANT

The compressor should not be operated at pressure settings above factory setting.

An unloader valve relieves pressure in the cylinders when the unit is unloaded.

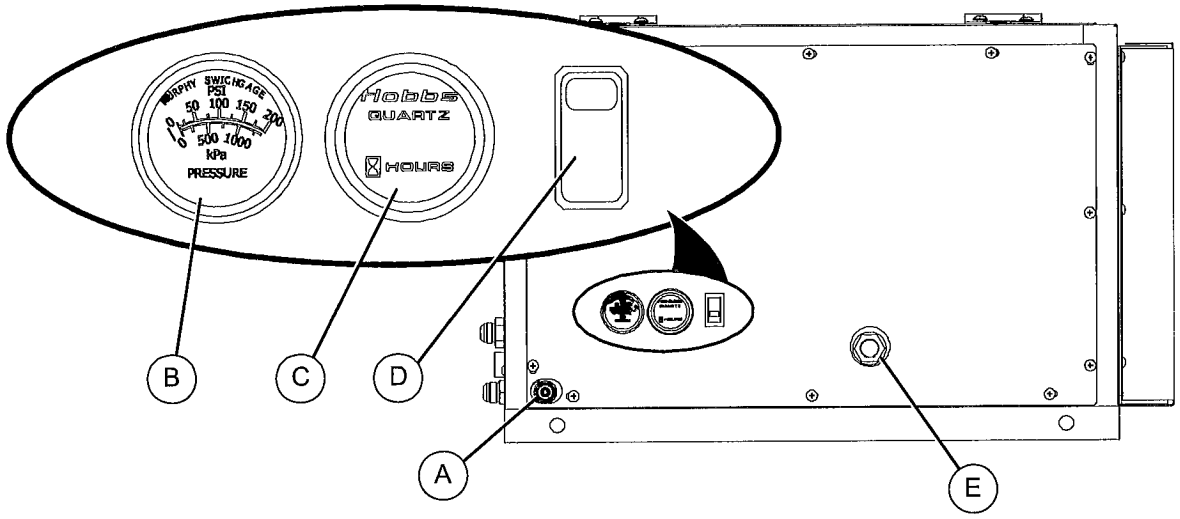
2.2.5 AIR PRESSURE RELIEF VALVES

See ***Figure 2-4***. There are three pressure relief valves located on the compressor unit assembly: one each on the cylinder heads (low pressure), and one on the service assembly piping (high pressure). These spring-backed, normally closed valves serve as safety devices that protect against over-pressurization. As the pressure begins to approach 70 psig for each of the head unloader valves, its relief valve will crack open to slowly relieve



KEY	DESCRIPTION
A	COOLER FAN & MOTOR ASSEMBLY
B	OIL COOLER
C	COOLER PANEL
D	DIRECTION OF COOLING AIR FLOW

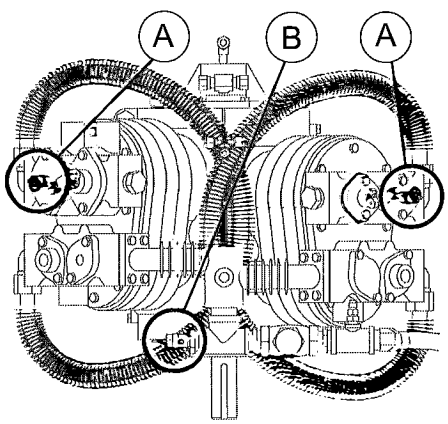
Figure 2-2: Cooler Assembly



KEY	DESCRIPTION	KEY	DESCRIPTION
A	RELIEF VALVE ADJUSTMENT[I]	D	ON/OFF TOGGLE SWITCH (OPTIONAL)
B	PRESSURE GAUGE	E	OIL LEVEL SIGHT GLASS
C	HOUR METER		

[I] The pressure relief valve is set at the factory. **DO NOT** adjust the pressure relief valve; consult the Vanair® Service Department for pressure relief resets.

Figure 2-3: Instrumentation Locations



KEY	DESCRIPTION
A	RELIEF VALVE (x 2) - low pressure
B	RELIEF VALVE - high pressure

Figure 2-4: Pressure Relief Valves

pressure. This siphoning action serves to vent excessive pressure level build-up of air to atmosphere in real time operation sequence. The valve located at the service assembly piping regulates pressure in the same way, bleeding off excessive air pressure over 200 psig.

Refer to ***Section 7: Troubleshooting***, for a failed pressure relief valve.

2.2.6 HYDRAULIC CONTROL SYSTEM

The hydraulic motor is used to power the compressor unit. If the hydraulic flow and pressure is supplied to maintain the rated compressor rpm, there should be many hours of trouble-free use in conjunction with the compressor.

The compressor unit has a built-in hydraulic manifold which has a directional control valve (solenoid) and a pressure relief valve (see **Section 8.9** [12V] or **8.11** [24V]).

The hydraulic pressure relief valve protects against an over-pressure condition by diverting the oil to the return line if such a condition occurs.

2.2.7 MAIN FRAME AND ENCLOSURE

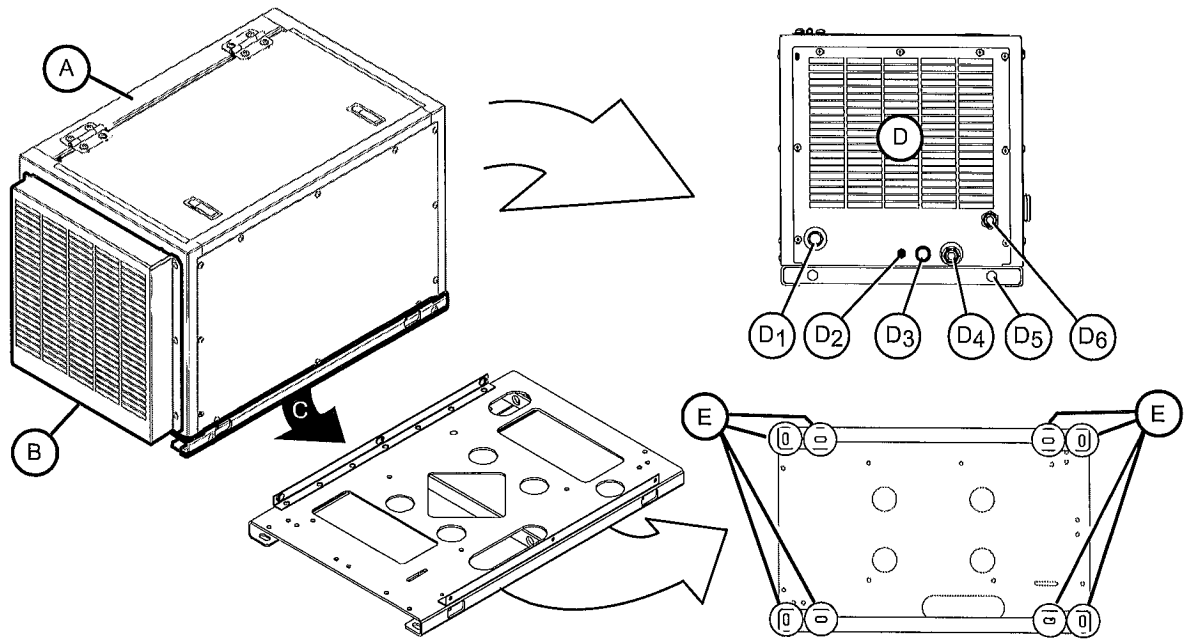
Refer to ***Figure 2-5***. The steel main frame is provided with bolt down holes.

⚠ WARNING

DO NOT operate machine with the roof panel open or removed.

The enclosure panels, which are attached to the main frame and frame supports, are made from galvanneal steel and are powder coated to provide a durable finish. The top panel is hinged for easy access to oil fill and other routine maintenance items.

The main enclosure housing provides overall protection for the various unit assemblies. The cooler assembly enclosure [**B**], is located on the opposite side from the connection port panel of the package [**D**]. The service air outlet [$\mathbf{D_1}$], compressor drain hose [$\mathbf{D_5}$], 4-pin connection



KEY	DESCRIPTION	KEY	DESCRIPTION
A	MAIN ENCLOSURE	D_3	ELECTRICAL CONNECTION (4-pin)
B	COOLER ASSEMBLY ENCLOSURE	D_4	HYDRAULIC SUPPLY
C	MAIN FRAME	D_5	COMPRESSOR OIL DRAIN
D	CONNECTION-SIDE PANEL	D_6	HYDRAULIC RETURN
D_1	SERVICE AIR OUT	E	FRAME: MOUNTING HOLE SLOTS
D_2	LOAD SENSE, IF EQUIPPED (CLOSED LOOP SYSTEM)		

[I] Use a minimum of four (4) mounting holes.

Figure 2-5: Main Frame, Mounting and Enclosure

[D_3] and hydraulic hose line connections [D_4 and D_6] are found on the connection port panel.

Compressor oil level can be checked from the outside of the enclosure (***Figure 2-3***, [**E**]), and filled via a fill port located at the inside left rear corner facing from the (opened) hinged-access roof panel (consult **Section 6.4.3, Compressor System Lubrication** for oil check/ change information).

Safety and Information decals are appropriately located on the machine. Please read and understand all the information contained thereon. For decal locations and information, refer to **Section 8.13**.

⚠ WARNING

DO NOT REMOVE OR COVER ANY SAFETY DECAL. Replace any safety decal that becomes damaged or illegible.

SECTION 3: SPECIFICATIONS

TABLE 3A - SPECIFICATIONS

GENERAL SYSTEM INFORMATION	SPECIFICATION							
RATINGS								
CFM Rating @ 100 psi:	30 [I]				40 [II]			
Air Pressure (psi):	100	125	150	175	100	125	150	175
Hydraulic flow (gpm):	9.5	9.5	9.5	9.5	12	12	12	12
Hydraulic pressure (psig):	1775	1875	2100	2200	1950	2070	2175	2275

[I] 30 CFM = 690 COMPRESSOR RPM

[II] 40 RPM = 865 COMPRESSOR RPM

NOTE

COMPRESSOR ADJUSTMENT SHOULD BE SET IN ACCORDANCE WITH RATED RPMs.

COMPRESSOR	
Type:	Two-stage, four cylinder, reciprocating
Compressor oil reservoir capacity:	3 quarts
Air inlet system:	Twin dry-type, single stage
Drive coupling:	Belt drive
Hydraulic motor:	Gear type
PACKAGE	
Main frame:	Formed powder-coated steel with a bolt-down provision
Electrical supply:	12V Standard; 24V Optional
Electrical connections:	Weatherpack
Enclosure:	Galvanneal sheet steel, powder-coated
Cooler:	Hydraulic oil cooler/radiator core — electric fan

Continued on next page

TABLE 3A - SPECIFICATIONS (CONTINUED)	
GENERAL SYSTEM INFORMATION	**SPECIFICATION**
PACKAGE (continued)	
Package connections:	Discharge air — 3/4" NPT female
	Hydraulic supply — 3/4" 37° JIC male
	Hydraulic return — " 37° JIC male
	Load sense line (closed loop only) — 1/4" 37° JIC male
	Electrical +12VDC 15A or +24VDC 10A
	+12VDC 5A or +f24VDC 5A (PTO activated)
Dimensions:	Length — 34.87"
	Width — 22.00"
	Height — 21.75"
Weight:	400 lbs.
CONTROLS	
Manual control switch:	ON/OFF (optional)
Hydraulic pressure relief	3000 psig
Hydraulic solenoid valve (for automatic load control)	12 or 24V
Air pressure switch (for automatic load control)	

TABLE 3B - CAPSCREW TIGHTENING TORQUE VALUES		
SIZE	**GRADE**	**LUBRICATED**
1/4 - 20 UNC	5	6 ft•lbs
5/16 - 18 UNC	5	13 ft•lbs
3/8 - 16 UNC	5	23 ft•lbs
1/2 - 13 UNC	5	55 ft•lbs
3/4 - 10 UNC	5	200 ft•lbs

TABLE 3C - COMPRESSOR TORQUE VALUES			
BOLTS SIZE	**GRADE**	**TORQUE (ft.-lb.)**	**POSITION**
1/4-20	5	8	Side Plate Bolts
1/4-28	8	11.76	HP Valve Nut
3/8-16	5	26	Cylinder to Base Bolts
3/8-24	8	33.8	Connecting Rod Bolts
5/16-18	5	17	Head to Cylinder
	5	10	LP & HP Valve Hold Down Covers
	5	17	End Cover/Discharge Manifold Bolts
5/16-24	8	21.3	LP Valve Nut

SECTION 4: INSTALLATION

4.1 MACHINE PACKAGE RECEIPT/ INSPECTION

Upon receipt of the machine package, inspect the exterior of the shipping crate for signs of shipping/transit damage. Any damage should be reported immediately to the shipping company. Open the lid and inspect the component parts and supports to ensure that there has been no internal movements of assemblies or components which may have caused damage. To install the RC40 compressor system, refer to the following sections:

⚠ WARNING

Install, operate, and maintain this equipment in full compliance with all applicable OSHA, other Federal, state, local codes, standards, and regulations.

4.2 GENERAL INSTRUCTIONS

This section provides general guidance for locating and preparing the RC40 compressor package for operation. Each installation is unique and can be affected by location, ventilation, and other factors such as electrical and hydraulic power supply availability and location.

⚠ WARNING

Before performing maintenance or repair operations on the compressor, ensure that all power has been removed and locked out to prevent accidental application.

DO NOT assume that because the compressor is in a STOPPED condition that power has been removed.

System Component Group	Manual Section
MACHINE PACKAGE RECEIPT/INSPECTION	4.1
GENERAL INSTRUCTIONS	4.2
DETERMINING THE RC40 UNIT MOUNTING LOCATION	4.3
CONNECTING THE ELECTRICAL SUPPLY	4.4
HYDRAULIC SYSTEM REQUIREMENTS	4.5
CONNECTING THE HYDRAULIC SUPPLY AND RETURN	4.6
CONNECTING THE AIR SUPPLY	4.7

⚠ WARNING

DO NOT perform any modifications to this equipment without prior factory approval.

⚠ WARNING

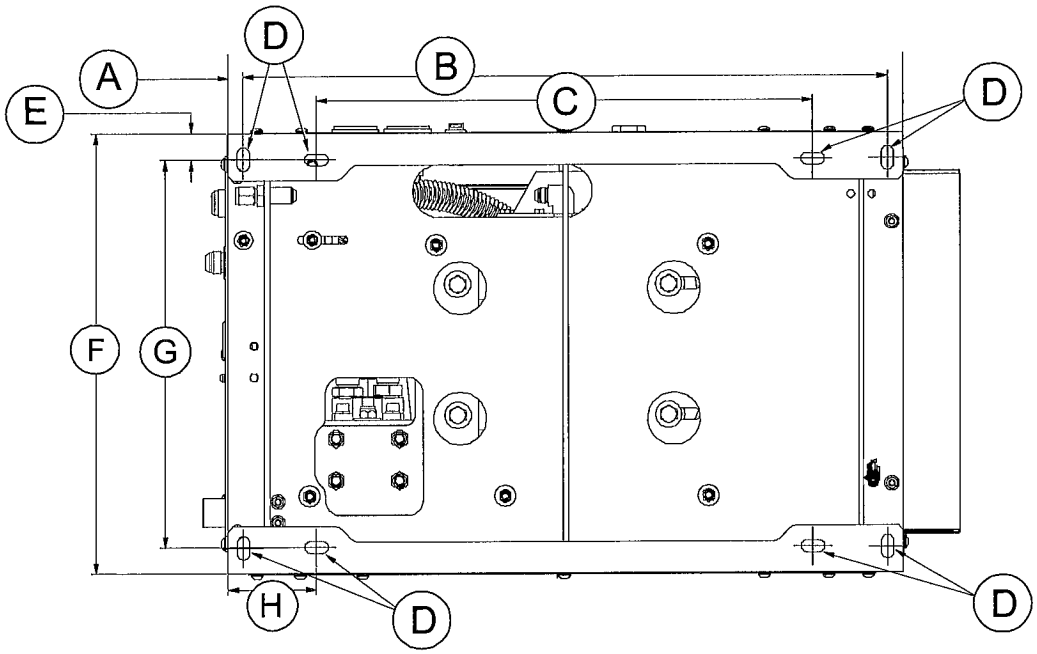
DO NOT use plastic pipe, or incorrectly rated piping or hose. Incorrectly rated connection material can fail and cause injury or equipment damage.

4.3 DETERMINING THE RC40 UNIT MOUNTING LOCATION

When determining the location to mount the RC40 unit, the following criteria must be taken into consideration:

⚠ WARNING

DO NOT operate the compressor in enclosed or confined spaces where ventilation is restricted or closed off.



KEY	DESCRIPTION	KEY	DESCRIPTION
A	0.75 inches	E	1.25 inches
B	30.5 inches	F	21 inches
C	23.5 inches	G	18.5 inches
D	MOUNTING SLOT Ø0.56 X 1.25 inches (x 8)	H	4.19 inches

NOTE: For additional machine measurements, consult ***Figure 4-2 and 4-3.***

Figure 4-1: Base Frame Mounting and Hole Locations

- The mounting surface must be level and able to accommodate the four [4] mounting bolts of the base frame. Refer to ***Figure 4-1***.
- The mounting surface must be able to support the unit's weight (400 lbs.). Mount the machine with a minumum of four (4) mounting slots.
- The location must allow for the machine dimensions (***Figure 4-2 and 4-3***), and additional space requirements for minimum cooling, maintenance and access. Refer to ***Figure 4-4*** to determine the additional minimum space requirement measurements.
- The external gauges must be easily visible to the operator.

It is recommended, for most installations, to mount the compressor on the driver's side of the vehicle. The unit should be situated in such a manner that the fan (rear) and hydraulic cooler (front) are not obstructed. Do not place the compressor in any location where it can ingest exhaust fumes, dust or debris.

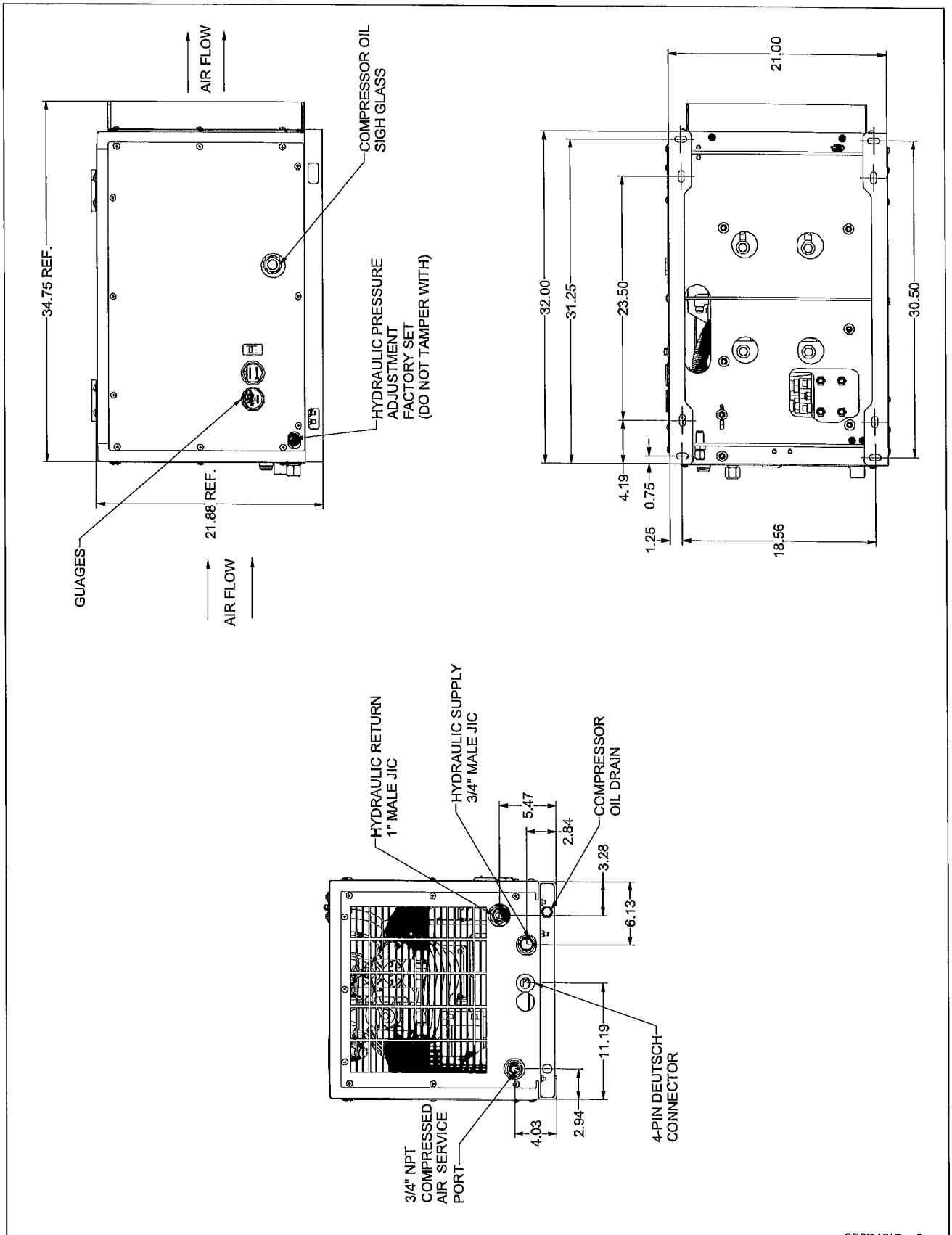


Figure 4-2: RC40 Open Loop Dimensions

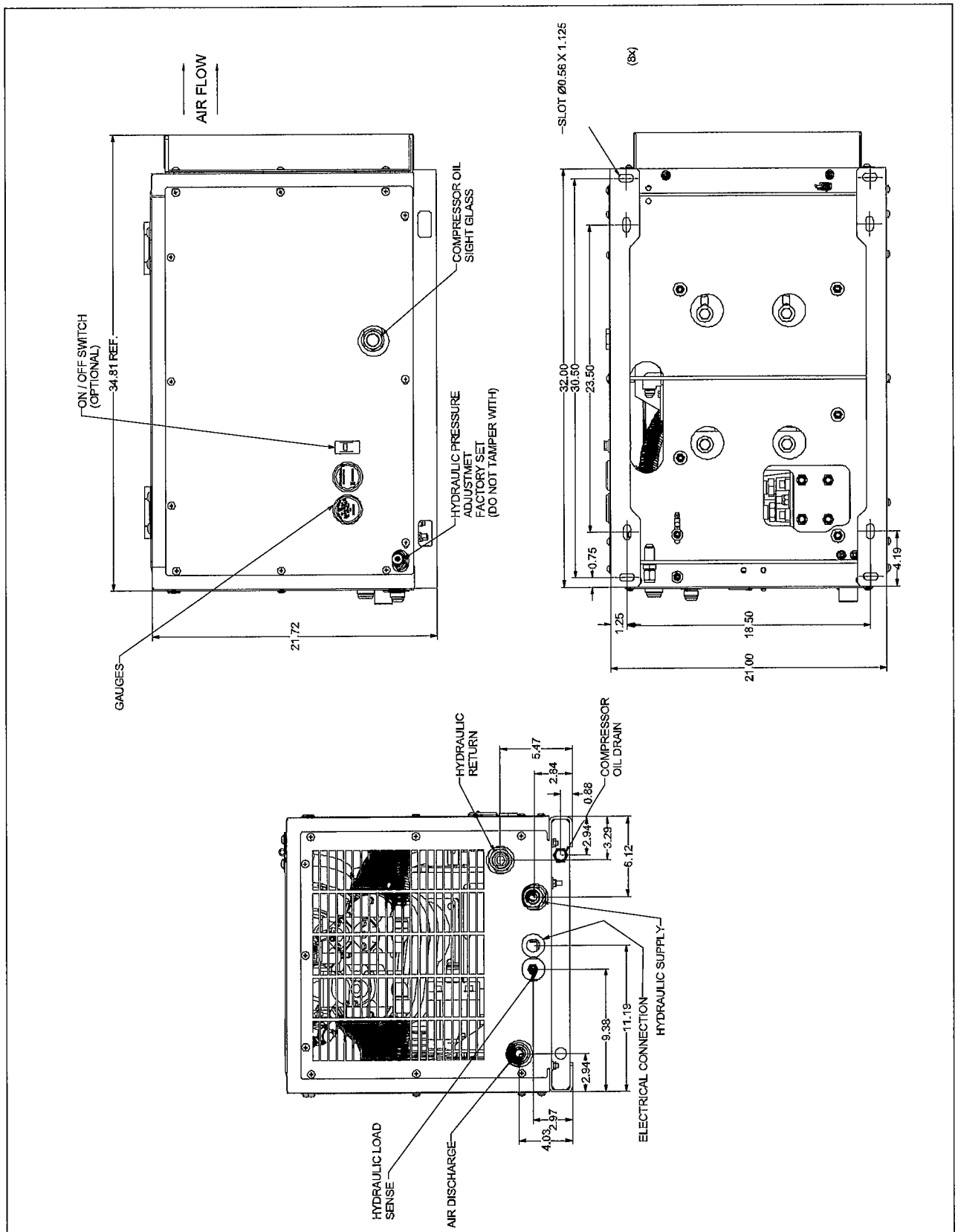


Figure 4-3: RC40 Closed Loop Dimensions

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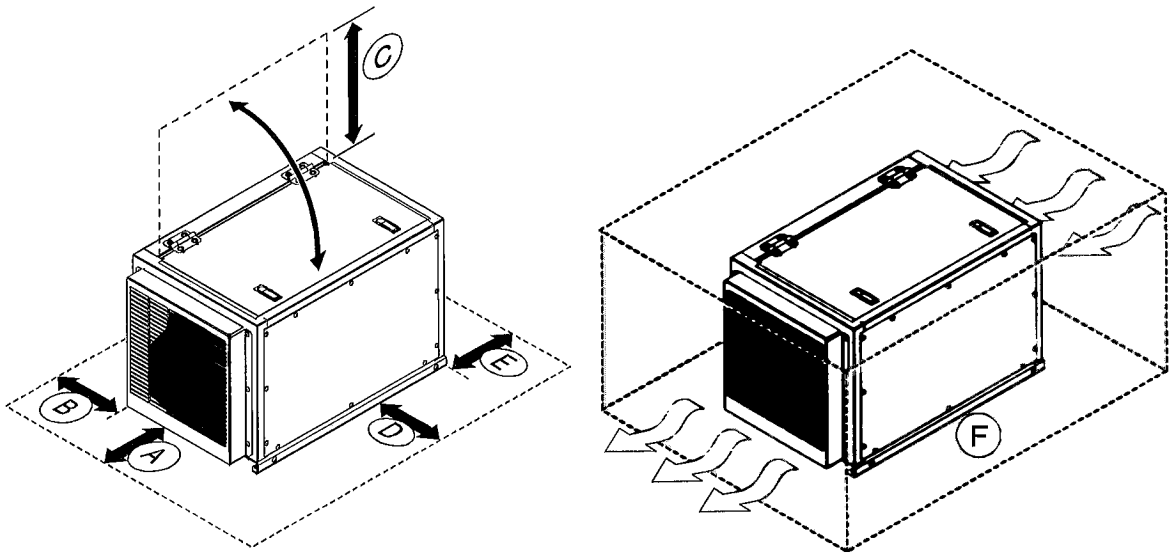

KEY	DESCRIPTION	KEY	DESCRIPTION
A	COOLER: 10 inches	D	ROOF PANEL ACCESS SIDE: 10 inches
B	INSTRUMENTATION SIDE: 10 inches	E	HOSE AND CONNECTION SIDE: 10 inches
C	ROOF PANEL ACCESS DOOR: 24 inches for hinged door clearance and/or maintenance	F	Additional allotted dimensional/surrounding space (measurements **A** through **E**) of package *must* allow for continuous circulation of air around and through the machine for cooling purposes. **DO NOT** install in an enclosed area.

NOTE: The dimensions listed above are the minimum required clearance distances needed for properly cooling the machine. Additional clearance room may be desired for easier access for control and/or maintenance functions.

Figure 4-4: Minimum Clearance Distances Needed for Machine Cooling and Access

4.4 CONNECTING THE ELECTRICAL SUPPLY

Refer to ***Figures 4-2, 4-3, 4-5*** and ***4-6***. Connect the electrical supply connector, located at the connection port panel end of the unit.

4.5 HYDRAULIC SYSTEM REQUIREMENTS

Refer to ***Figures 4-7*** and ***4-8*** for hydraulic system schematic. The following requirements should be taken into consideration before installing the hydraulic system:

- The hydraulic flow and pressure requirements of the air compressor.
- A continuous hydraulic load is necessary when the compressor is running.

- The duty cycle and ambient operating temperatures.
- Other hydraulic equipment which may share the same hydraulic supply system (Vanair® recommends a dedicated pump and hydraulic circuit).

4.6 CONNECTING THE HYDRAULIC SUPPLY AND RETURN

Refer to ***Figures 4-7*** and ***4-8*** for hydraulic supply and return hose location connections and layout routing. Use correctly rated hoses (3000 psi minimum) to securely connect both supply (3/4" J.I.C. 37° male) and return connectors (1" J.I.C. 37° male).

NOTE
Vanair recommends 3/4" supply and 1" return hose.

4.7 CONNECTING THE AIR SUPPLY

System Component Group	Manual Section
Connecting the Air Supply	**4.7**
Air Reservoir Tank Installation	4.7.1

Refer to ***Figures 4-2*** for service air discharge port location. Connect the service valve. Connect the discharge line to the ¾" NPT female connector.

4.7.1 AIR RESERVOIR TANK INSTALLATION

The RC40 air compression system will require the additional installation of an air tank/receiver, to be incorporated downstream of the unit's service air output. This tank will serve as a reservoir for accumulated air pressure, allowing for constant pressure availability for direct service needs. Vanair recommends the following criteria when determining the design of the receiver tank installation:

TANK SPECIFICATIONS

- 30 gallon minimum capacity (recommended).
- ASME-rated and compliant to applicable standards (200 psig minimum).
- Supplied with an adequately-rated relief valve.
- Supplied with moisture drain.

CONNECTION HOSING AND SERVICE VALVE SPECIFICATIONS

- Hose must be flexible; steel-braided enforcement.
- Rated for high temperature (450°F minimum).
- Pressure-rated for 200 psig (minimum).

MOUNTING SPECIFICATIONS

- If tank is to be permanently mounted, Vanair® recommends a mounting with no less than four (4) mounting/securing points.
- Tank mounted levelly.
- Service air out port of tank readily accessible, or piped/hosed for such availability.
- Drain is readily available, or piped/hosed for such availability.
- Tank drain function must have auto-drain, petcock, or valve that allows for tank to be purged of moisture while tank is pressurized/system is running.

The above listed features should serve as a minimum checklist of what to include when installing the reservoir portion of the compression system. However, if additional assistance is needed for designing the reservoir tank-side of the service out operation, consult the Vanair Service Department.

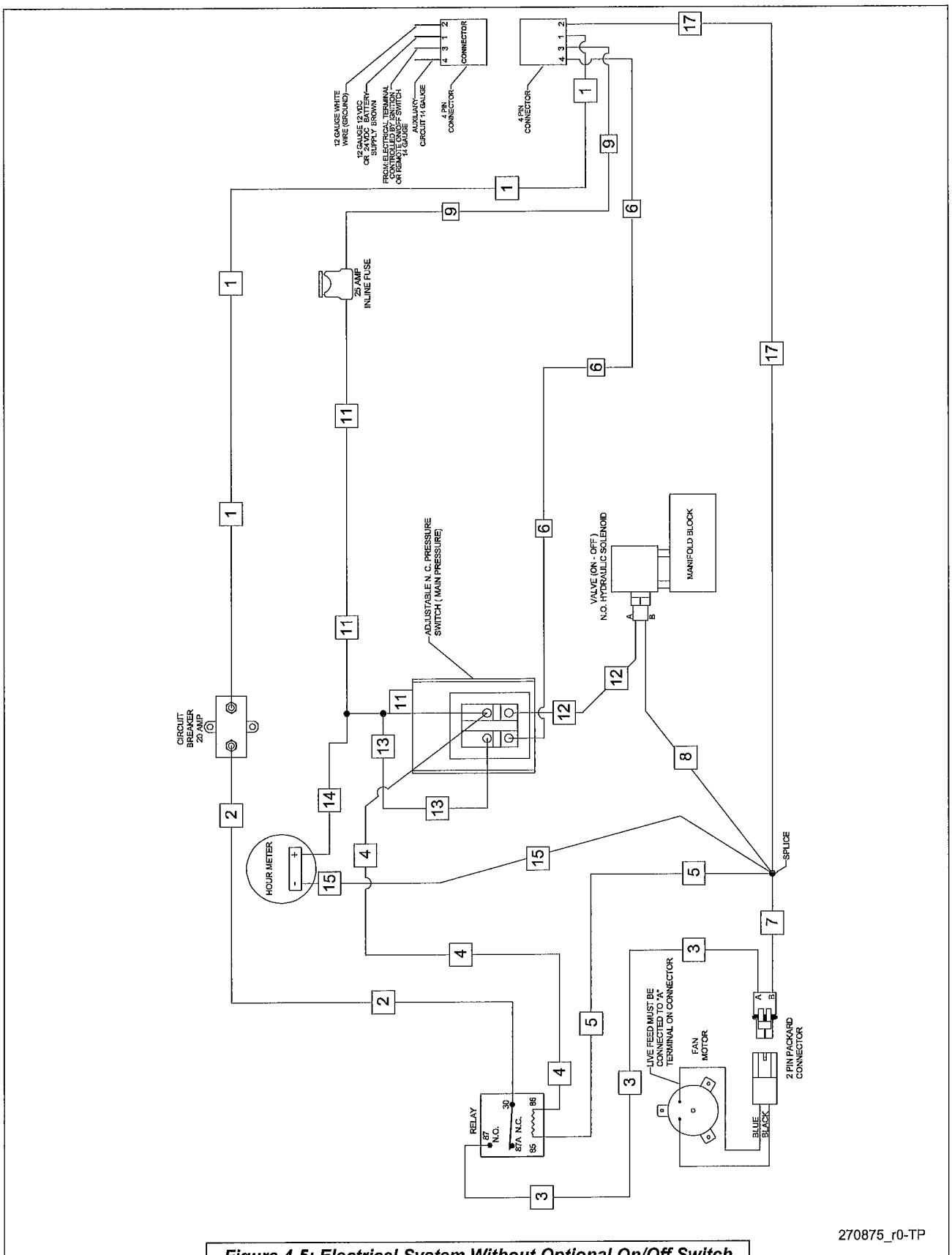

Figure 4-5: Electrical System Without Optional On/Off Switch

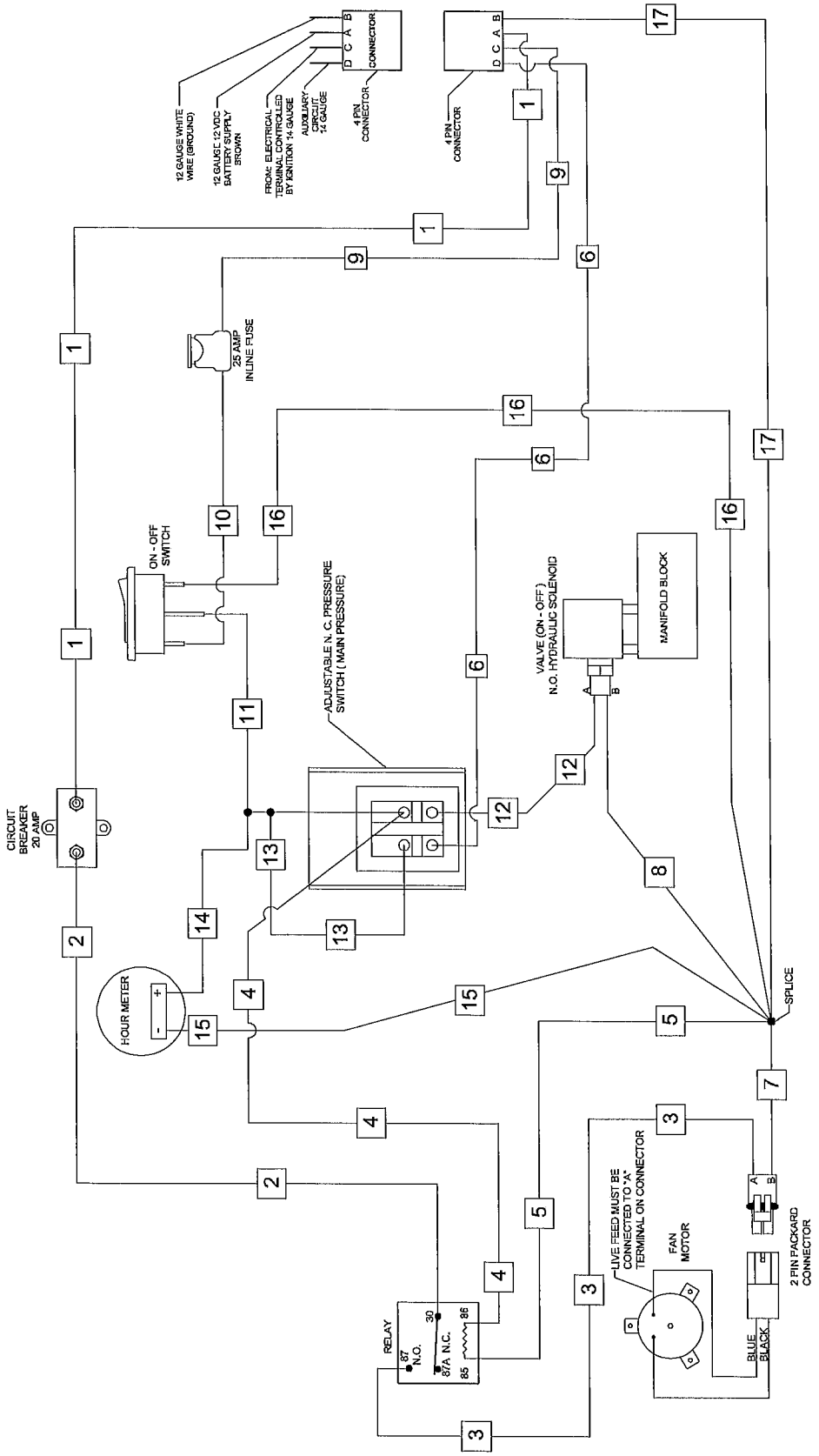

Figure 4-6: Electrical System With Optional On/Off Switch

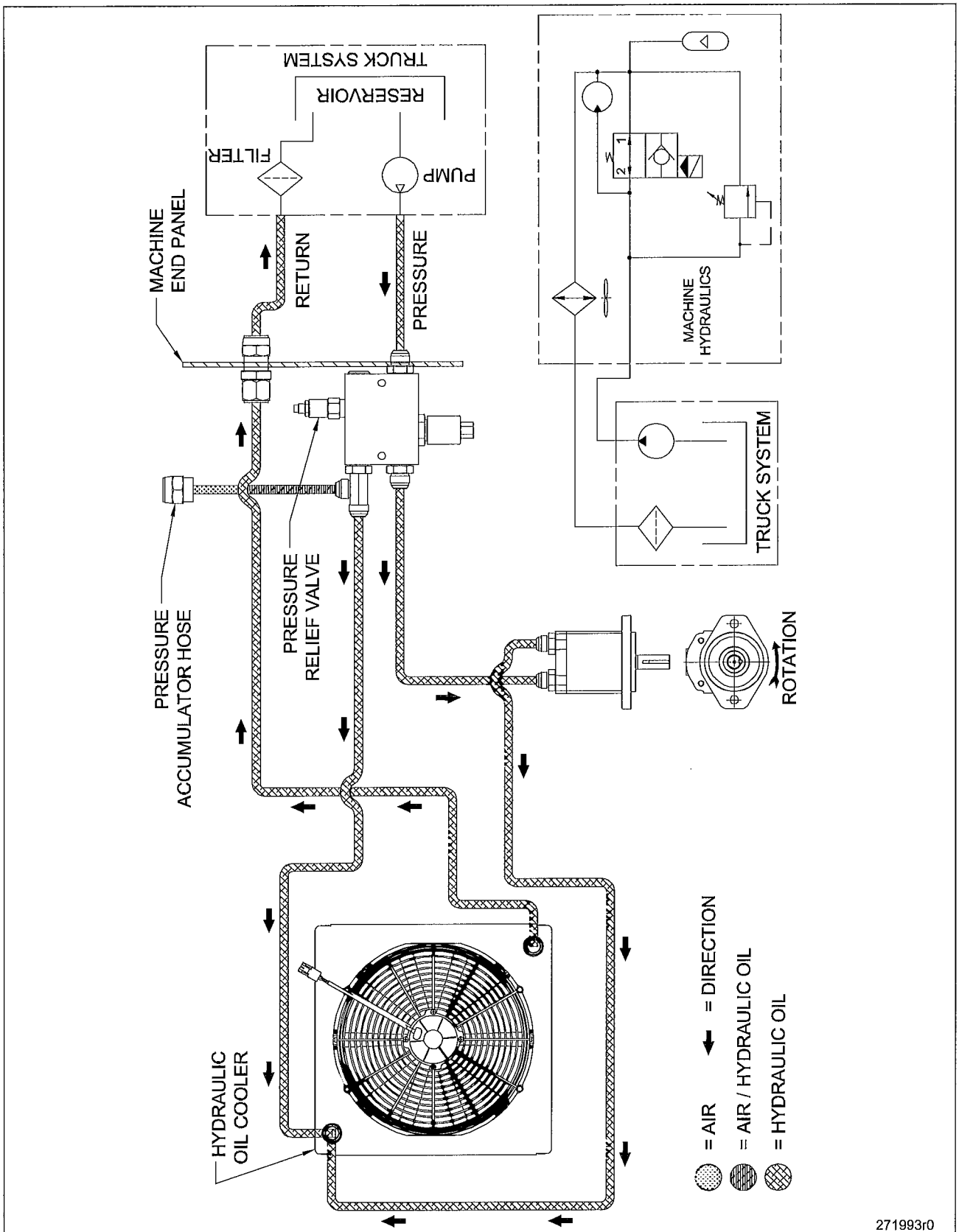

Figure 4-7: Hydraulic Flow Schematic Open System Diagram

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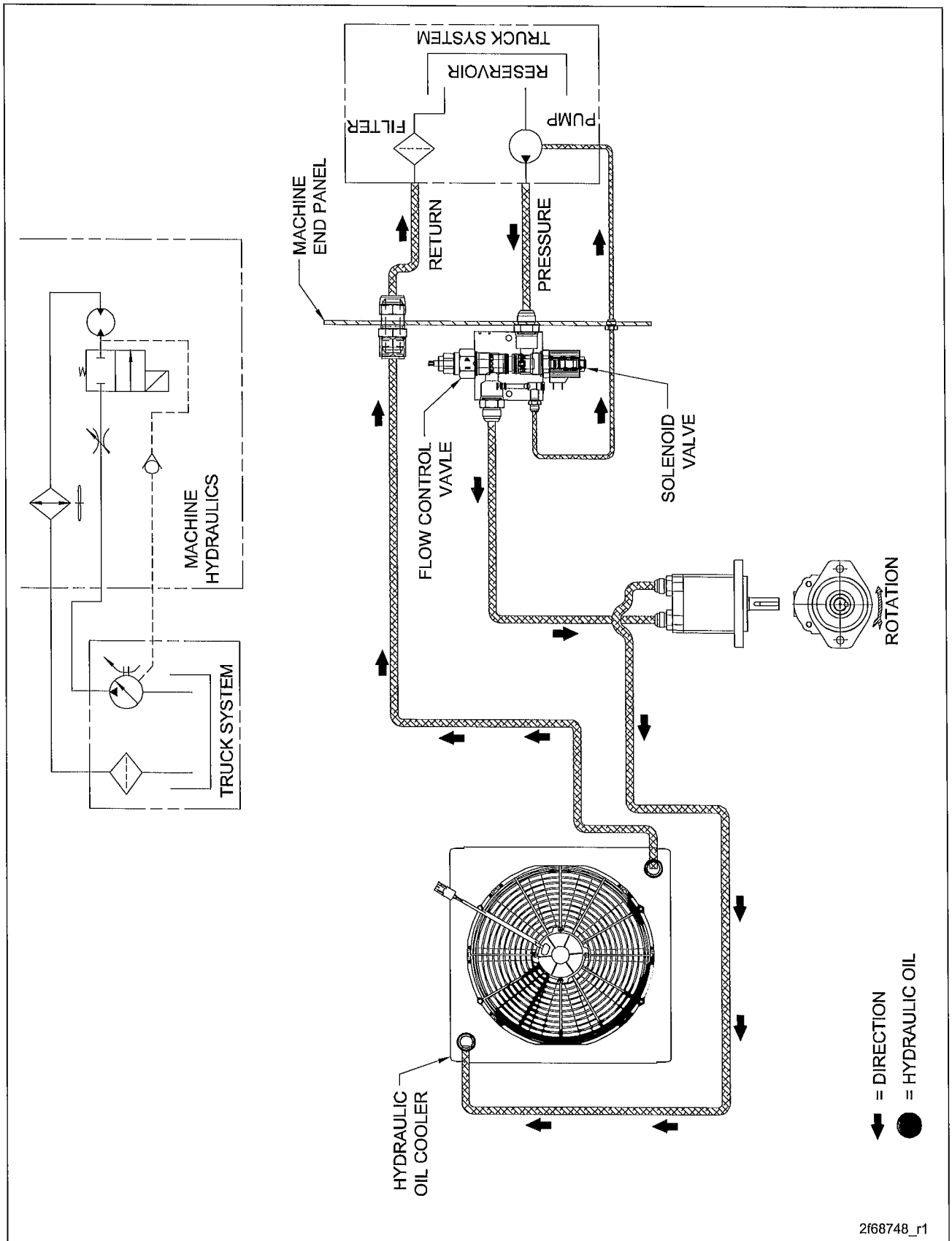


Figure 4-8: Hydraulic Flow Schematic Closed System Diagram

SECTION 5: OPERATION

5.1 GENERAL INFORMATION

The RC40 Hydraulic compressor has a comprehensive array of controls and indicators. Understanding the correct operation of the system will help you to understand and recognize when it is operating optimally. The information in the Operation Section will help the operator to recognize and interpret the readings, which will call for service or indicate the beginning of a malfunction.

⚠ WARNING

Before starting, performing maintenance, or replacing parts, relieve the entire system pressure by opening a service valve which will vent all pressure to the atmosphere: remove all electrical power.

System Component or Component Group	Manual Section
GENERAL INFORMATION	5.1
OPERATING CONDITIONS	5.2
FIRST TIME START-UP	5.3
SHUTDOWN (FIRST TIME AND ROUTINE)	5.4
ROUTINE START-UP	5.5
EXTREME OPERATING CONDITIONS	5.6

NOTE

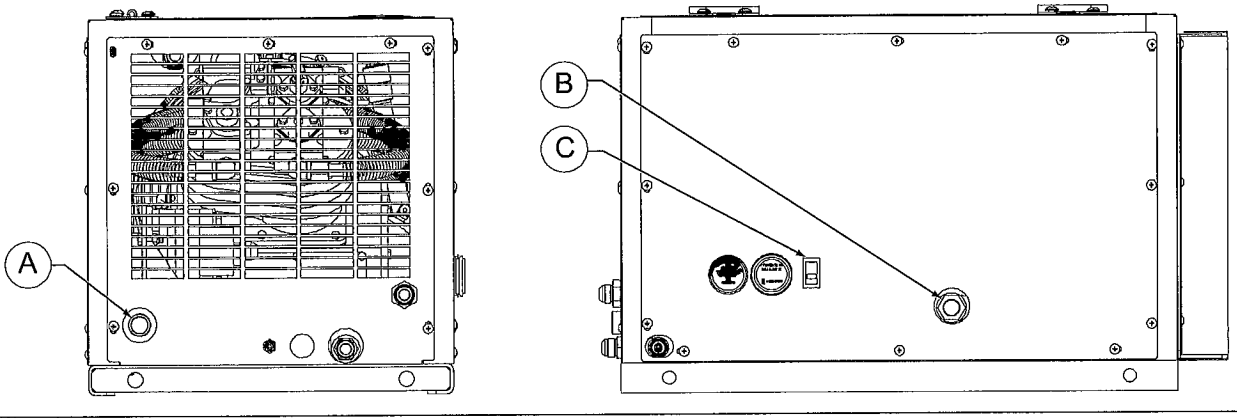
Before starting the RC40 compressor, read this section thoroughly and familiarize yourself with the controls and indicators - their purpose, location and use.

5.2 OPERATING CONDITIONS

- Operate only in well-ventilated areas.
- Ensure there are no obstructions of cooling air intakes and outlets around the machine.
- Do not leave anything resting on top of the machine. Hot cooling air will generate high heat and must not be restricted.
- Be sure to leave sufficient room around the machine for cooling air circulation. There must be a minimum of 10 (ten) inches for the cooler intake, and 10 (ten) inches for the sides and rear. Heated air must be able to vent away from the intake.
- Operate machine with the top cover closed, and all panels secured in place.
- Refer to specifications for operating parameters.
- Recommended: **DO NOT** exceed maximum capacity angle of 15°

NOTE

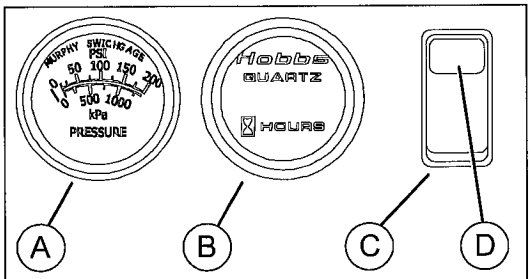
The vehicle should be on a level surface to ensure that the sight glass reading is accurate. Refer to *Section 6.4.3.1, Checking the Oil Level* for procedure on checking the oil.



KEY	DESCRIPTION
A	SERVICE AIR DISCHARGE PORT: Output to service valve
B	COMPRESSOR OIL SIGHT GLASS: Level should be mid-point mark of glass, with the machine off, and the oil settled.
C	ROCKER ON/OFF SWITCH: LED-side of switch lights when depressed (ON): Refer to ***Figure 5-2*** for additional rocker switch information.

Figure 5-1: Operation Check Locations

5.3 FIRST TIME START-UP



KEY	DESCRIPTION
A	PRESSURE GAUGE
B	HOUR METER
C	ON/OFF ROCKER SWITCH[I]
D	LED "ON" LAMP (amber)

[I] For models that do not contain an ON/OFF panel switch (optional for closed system), this panel access port contains an inset panel sealing plate.

Figure 5-2: Instrumentation

The compressor has been factory-tested and its air and hydraulic valves have been adjusted to their specified operating settings. Its crankcase has also been filled, but check the oil level before initial start-up. (Refer **Section 6.4.3 Lubricants**, for the correct lubricant type.)

The following steps apply to the first time start-up after the machine installation. Before attempting to start the unit, make sure that the machine (vehicle) is on a level surface, and check the sight glass to ensure that the oil level is within the acceptable range. Add oil if necessary. Refer to ***Figure 5-1*** for unit check locations and ***Figure 5-2*** for instrumentation. See **Section 6.4.3 Lubricants**, for the correct oil type, sight glass location and level range depiction.

1.) Ensure the ON/OFF switch is in the OFF position.
2.) Ensure all service outlets are closed.
3.) Apply hydraulic power.
4.) Check for hydraulic supply or return leaks and correct if required.
5.) Move the ON/OFF switch to the ON position to start the compressor.
6.) Allow air pressure to build up in the receiver tank.

The compressor is now operating automatically. It will continue to pump until the pressure reaches the factory set-point (100-175 psig). At this point the compressor unit will switch off and the hydraulic flow will be redirected back to the supply tank; any air in the compressor will be vented to the atmosphere. The accumulated pressure in the receiver tank is maintained by the check valve fitted to the compressor outlet connection.

For a closed loop system, the solenoid valve will be turned to the OFF position, causing the load sense line to adjust the piston pump to provide less or no flow to prevent Dead Heading Hydraulic Pressure.

When a demand is applied to the unit, the receiver tank pressure drops until it reaches the low pressure set-point. The compressor then automatically restarts and repeats this cycle in response to service demands and receiver tank pressure.

5.4 SHUTDOWN (FIRST TIME AND ROUTINE)

1.) Close all service valves.
2.) Move the compressor switch to the OFF position.
3.) Disengage the hydraulic supply.

5.5 ROUTINE START-UP

1.) Check the compressor oil level. Refer to ***Section 6.4.3.1, Oil Level Check*** for procedure on checking the oil.
2.) Close all service valves.
3.) Set the compressor toggle switch to OFF.
4.) Engage the hydraulic supply.
5.) Set the compressor toggle switch to ON.

5.6 EXTREME CONDITION OPERATION

When operating in extreme hot or cold conditions, extra attention should be given to any indications that could lead to a serious problem. Machine review and maintenance check schedules should be more frequent than the normal suggestions given in **Section 6, Table 6A, Route Maintenance Schedule**.

SECTION 6: MAINTENANCE

6.1 GENERAL INFORMATION

The RC40 requires routine maintenance to ensure its proper functioning and that its operational life is not prematurely shortened. This section contains general maintenance instructions for normal operating conditions. However, these maintenance actions should be performed more frequently in excessively dusty environments, or where the equipment will be exposed to extreme temperature variations.

⚠ WARNING

DO NOT perform any modifications to this equipment without prior factory approval.

System Component Group	Manual Section
GENERAL	6.1
MACHINE MAINTENANCE SCHEDULE	6.2
REPLACEMENT PARTS	6.3
PARTS REPLACEMENT AND ADJUSTMENT PROCEDURES	6.4
LONG TERM STORAGE	6.5

6.2 MACHINE MAINTENANCE SCHEDULE

Refer to **Table 6A: Routine Maintenance Schedule**. A routine maintenance schedule based on time and/or hours logged, is given in **Table 6A**. The intervals are determined from machine usage under typical operation conditions. However, the operator must be aware that operating conditions will vary depending on such things as specific customer requirements, environmental temperatures and cleanliness of the ambient air. With this in mind, the specifications given in **Table 6A** should be used as a guideline instead of a fixed agenda. A safe approach to routine maintenance would be to perform the given

⚠ WARNING

Install, operate, and maintain this equipment in full compliance with all applicable OSHA, other Federal, state, local codes, standards, and regulations.

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

⚠ WARNING

DO NOT attempt to service the equipment while it is operating.

⚠ WARNING

DO NOT touch electrical wires, wire harnesses, terminals, or other components when power is applied to the compressor unit.

⚠ WARNING

Keep metal tools, and other conductive objects away from live electrical components.

TABLE 6A: ROUTINE MAINTENANCE SCHEDULE

⚠ WARNING

Before performing maintenance:
Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.
NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:
Always clearly tag the start-up instrumentation against accidental system. start-ups during maintenance.

NOTES:

If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for compressor oil change, and compressor filter servicing.

For routine, as well as non-routine, maintenance procedures, consult the section title listing table in *Section 6.4* to locate specific maintenance components.

KEY	TASK DESCRIPTION	MAINTENANCE INTERVALS Hourly or Calendar Period - whichever comes first: Daily Maintenance	Weekly Maintenance	Every 500 Hours or Annually	ACTION TO TAKE
1	**Before starting**, check compressor crankcase oil level.	•	•	•	Ensure vehicle is situated on a level surface before checking oil level. Add oil if necessary. Refer to ***Section 6.4.3***.
2	Check for any loose bolts and/or loose connections.	•	•	•	Tighten if necessary.
3	Check drive belt for tension.	•	•	•	If necessary, consult ***Section 6.4.9*** for procedure on tightening the drive belts.
4	Check for leaks.	•	•	•	Visually note any leaks or evidence of leaks around the compressor unit and hose connections. Tighten any loose connection point where needed. Repair or replace any damaged part.
5	Inspect and clean the air discharge system.	•	•	•	Check/drain air reservoir daily, or more frequently, depending on working environment conditions.
6	**After starting,** check pressure gauge for correct operating pressure.	•	•	•	Refer to **Section 3, Table 3A**, and ***Section 6.4.2***.
7	Clean dust and foreign matter from the compressor oil cooler core.		•	•	Consult ***Section 6.4.5*** for procedure on cleaning the cooler core (external and internal).
8	Remove, inspect, and clear air intake filters if necessary [I].		•	•	Consult ***Section 6.4.4*** for procedure on how to inspect and/or change the air intake filters.
9	Inspect and clean the compressor valves.		*II*		Consult ***Section 6.4.6*** for maintenance procedure for the compressor valves.
10	Change the compressor crankcase oil.			•	Consult ***Section 6.4.3*** for procedure on changing the crankcase oil.
11	Check the hoses for damage or other signs of deterioration.			•	Consult **Section 8.16** for assistance with hose replacement.
12	Check the wiring for damage or deterioration and ensure that connections are secure.			•	Refer to ***Figure 4-5*** (Electrical System Wiring Diagram) for wire system route connections.

[I] Air filters inspection performed weekly (change if needed); air filters change interval is yearly, or sooner depending upon inspection.

[II] Valves should be removed from the cylinder heads every 500 hours or annually (whichever comes first) and examined for cleanliness and carbon formation (bulid-up).

maintenance task more frequently under harsher conditions.

Vanair® provides a routine maintenance parts list in **Section 8**, **Table 8A**. Should a non-routine part need replacement or servicing, peruse the various parts list illustrations in **Section 8** to help determine the exact part and part number in question. Our parts and service departments are ready to assist in identifying and/or replacing non-routine parts.

For assistance in obtaining routine maintenance or replacement parts, consult ***Section 8.1, Parts Ordering Procedure***, and **Table 8A: Recommended Spare Parts List.**

6.3 REPLACEMENT PARTS

Replacement parts should be purchased through your local Vanair representative or where the compressor system was purchased. If, for any reason, parts are not available in this manner, they can be purchased through Vanair directly.

Vanair Manufacturing, Inc.

10896 West 300 North
Michigan City, IN 46360
Phone: (219) 879-5100
(800) 526-8817
Service Fax: (219) 879-5335
Parts Fax: (219) 879-5340
Sales Fax: (219) 879-5800
www.vanair.com

NOTE

If additional spare parts are being stored for future use, make certain that they are stored in proper containers that allow for protection against contamination, and kept in a clean area of moderate temperature reading. For information on storing the machine package for periods of non-use, consult *Section 6.5, Long Term Storage*.

⚠ WARNING

DO NOT use tools, hoses, or equipment that have maximum ratings below that of this compressor.

⚠ WARNING

DO NOT use flammable solvents or cleaners for cleaning the compressor or its parts.

NOTE

Wear appropriate protective (eye and hearing protection) equipment and clothing when operating or maintaining this equipment. DO NOT wear jewelry, loose clothing; and long hair should be restrained with headband or safety hat.

NOTE

Keep the equipment clean when performing maintenance or service actions. Cover openings to prevent contamination.

NOTE

When using compressed air to clean the components, the nozzle pressure should not exceed 15 psig.

6.4 PARTS REPLACEMENT AND ADJUSTMENT PROCEDURES

6.4.1 REMOVING PANELS FOR MACHINE MAINTENANCE ACCESS

Although most of the routine maintenance procedures can be accessed from either outside of the compressor package or via the top roof access panel, some procedures will require the temporary removal of one or both side panels in order to freely service the maintenance item. Consult **Table 6B**, ***Figure 6-1*** and the proper panel removal sub-section listed below to remove the desired panel.

NOTE

Vanair® recommends removing both side housing panels to facilitate full access to the compressor, if needed.

System Component Group	Manual Section
Removing Panels for Machine Maintenance Access	**6.4.1**
Opening and Closing the Roof Panel	6.4.1.1
Removing and Replacing a Side Panel	6.4.1.2

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

6.4.1.1 OPENING AND CLOSING THE ROOF PANEL

Most of the routine maintenance tasks can be performed through access to the unit via the hinged roof panel. The panel is held in place by two pull bar latches, which set into the latch casing. To release the pull bars, refer to ***Figure 6-1*** and the following steps:

⚠ WARNING

DO NOT operate machine with the roof panel open or removed.

RELEASING THE ROOF PANEL

1. Each latch contains a securing button at the top part of the latch. Press on the button ❶ for each latch to release the pull bar handles [**G**].
2. Grasp the released pull bars ❷ and lift upward to disengage the roof panel.

TABLE 6B: ACCESS PANEL REMOVAL

PANEL	REMOVE FOR MAINTENANCE OF:
TOP (ROOF) PANEL [A][I]	Compressor Air Filters, (Safety) Relief Valves, Compressor Head Valves
DRIVE ASSEMBLY ACCESS PANEL [B][I]	Drive Belts, Compressor Finned Intercooler Tubes (Left- and Right-sides), Compressor Head Valves, Compressor Piston Ring Replacement, Compressor Overhaul, Hose Maintenance
INSTRUMENTATION-SIDE PANEL [C][I]	Compressor Finned Intercooler Tubes (Left- and Right-sides), Circuit Breaker, Compressor Head Valves, Compressor Piston Ring Replacement, Compressor Centrifugal Unloader, Compressor Overhaul, Hose Maintenance

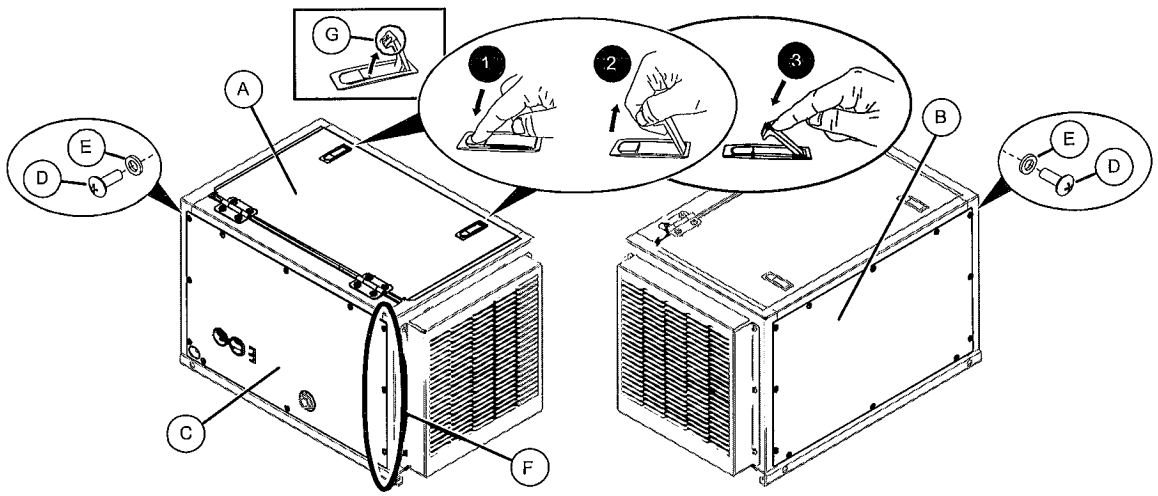
[I] Additional panels may need to be removed for easier/complete access to maintenance item.

⚠ WARNING

Before removing any access panel for maintenance:
Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.



KEY	DESCRIPTION		KEY	DESCRIPTION
A	TOP (ROOF) PANEL[I]		F	STABILIZING SCREWS[II]
B	DRIVE ASSEMBLY ACCESS PANEL		G	LATCH/PULL BAR HANDLE
C	INSTRUMENTATION-SIDE PANEL		1	Press the button located over the embedded pull bar to release each latch pull bar handle.
D	TRUSS SCREW, 1/4-20 x 3/4	x 12 per each side panel	2	Once released, grasp **both** pull bars and lift roof panel upward to disengage the roof panel.
E	WASHER, NYLON FLAT 1/4"		3	**To reset:** with the roof panel lowered into place, push downward on the top of each pull bar until the bar clicks/locks into the seated position of the latch.

[I] For instructions on *completely* removing the roof panel, consult **Appendix A.1**.

[II] Remove these screw and washer sets last; used to hold panel in place while disengaging the harness wires from the hour meter, and disconnecting the pressure gauge assembly tubing.

Figure 6-1: Main Access Panels for Maintenance Removal

SECURING THE ROOF PANEL

1. Replace the roof panel into the closed position.
2. Once the roof panel is seated properly, press down on the pull bars ❸ to reset them into position in the latches. When the handles click into position, the roof panel is secured.

6.4.1.2 REMOVING AND REPLACING A SIDE PANEL

To determine which side panel must be removed for a particular routine maintenance function, refer to **Table 6B: Access Panel Removal**. Consult ***Figure 6-1*** and the following procedures.

DRIVE ASSEMBLY ACCESS PANEL

DRIVE ASSEMBLY ACCESS PANEL ([B]) REMOVAL:

1. With a Phillips head screwdriver remove the twelve (12) 1/4-20 truss screws [**D**] and the twelve (12) 1/4" nylon flat washers [**E**] from the drive assembly access panel [**B**].
2. Remove panel from the frame and set aside.
3. Retain screws and washers for re-assembly.

DRIVE ASSEMBLY ACCESS PANEL ([B]) REPLACEMENT:

1. Align the mounting holes in the drive assembly access panel to the mounting holes on the drive assembly side of the machine.
2. With a Phillips head screwdriver, loosely replace the twelve (12) 1/4" nylon flat washers [**E**], and the twelve (12) 1/4-20 truss screws [**D**] sets.
3. Tighten the screws into position.

INSTRUMENTATION-SIDE ACCESS PANEL

INSTRUMENTATION-SIDE PANEL REMOVAL— *Figure 6-1 [C]*:

1. With a Phillips head screwdriver remove all of the the 1/4-20 truss screws [**D**] and 1/4" nylon flat washers [**E**], *except* for the three screw sets on the right side, as indicated by [**F**], from the instrumentation-side panel [**C**].

   Refer to ***Figure 6-2*** for steps #2 through #4.

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

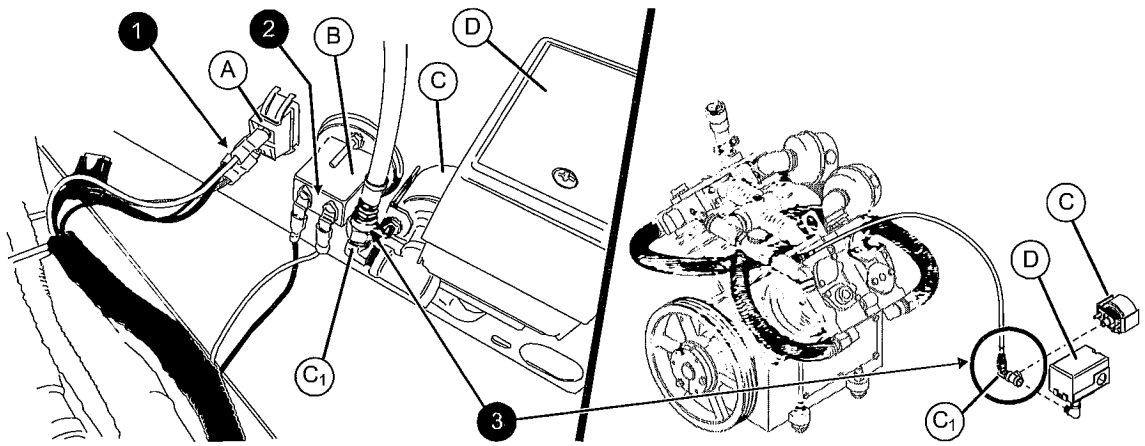
NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

2. Disconnect the three (3) wire connectors from the rocker switch ❶.
3. Disconnect the two (2) wire connectors from the hour meter ❷.
4. Disconnect the tubing from the elbow on the pressure gauge assembly ❸.
5. Remove the three (3) remaining sets of 1/4-20 truss screws [**D**] and 1/4" nylon flat washers [**E**], as indicated by [**F**] in ***Figure 6-1***, to free the instrument-side panel.
6. Place or lean the instrument-side panel in a safe place while maintenance is being performed, taking care not to put any undo stress on the pressure gauge assembly.

INSTRUMENTATION-SIDE PANEL REPLACEMENT—*Figure 6-1 [C]*:

1. Carefully re-set the instrumentation-side panel into position so that the twelve (12) panel mounting holes align to the instrumentation-side mounting holes of the machine.



KEY	DESCRIPTION		KEY	INSTRUCTION
A	ON/OFF ROCKER SWITCH (connection-side)	Refer to...	1	Remove the three (3) wire connectors from the rocker switch.
B	HOUR METER (connection-side)	Refer to...	2	Remove the two (2) wire connectors from the hour meter.
C	PRESSURE GAUGE (connection-side) (C_1 = pressure gauge assembly elbow [ref.])	Refer to...	3	Remove the tubing from the elbow on the pressure gauge assembly.
D	PRESSURE SWITCH (reference)			

Figure 6-2: Disconnections for Removal of Instrumentation-Side Panel

2. Place a 1/4-20 truss screw [**D**] and 1/4" nylon flat washer [**E**] each into the three mounting holes on the right side (facing) of the panel, as indicated by [**F**] in ***Figure 6-1***, and hand-tighten.

   Refer to *Figure 6-3* for step #3.

3. Reconnect the three (3) designated wires from the wiring harness to their proper connections on the rocker switch, as shown in [**A**]: White wire [$\mathbf{A_1}$] to top tab connector, black wire [$\mathbf{A_2}$] to middle tab connector, and red wire [$\mathbf{A_3}$] to bottom tab connector.

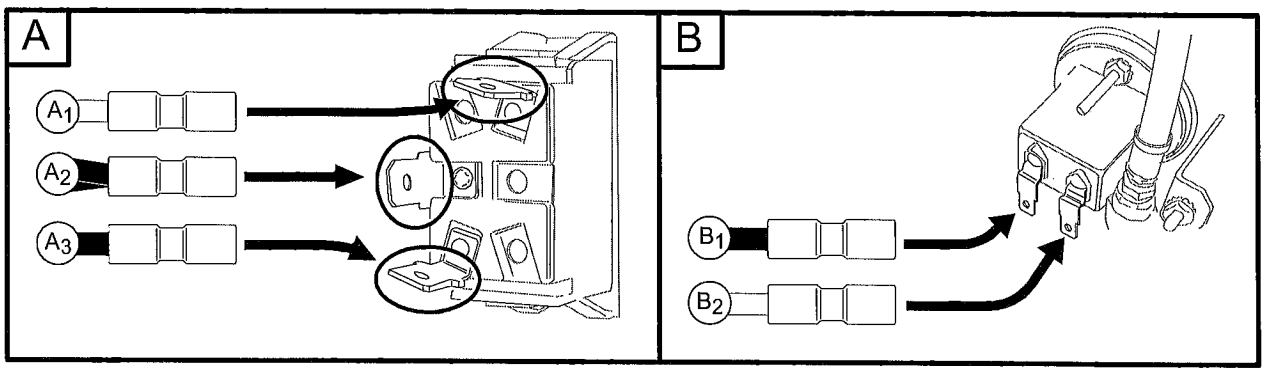
4. Reconnect the two (2) designated wires from the wiring harness to their proper connections on the two (2) hour meter [**B**] connections: The designated black wire [$\mathbf{B_1}$] connects to the left side; the designated white wire [$\mathbf{B_2}$] to the right, as shown in ***Figure 6-3***.

   Refer to *Figure 6-2* for step #4.

5. Reconnect the tubing from the elbow on the pressure gauge assembly (refer to ***Figure 6-2***, items **C** and $\mathbf{C_1}$).

   Refer to *Figure 6-1* for steps #5 and #6.

6. Loosely replace the remaining sets of 1/4-20 truss screws [**D**] and 1/4" nylon flat washers



KEY	DESCRIPTION
A	ON/OFF ROCKER SWITCH RE-CONNECTION
$\mathbf{A_1}$	White Wire (ON/OFF Switch Designated)
$\mathbf{A_2}$	Black Wire (ON/OFF Switch Designated)
$\mathbf{A_3}$	Red Wire

KEY	INSTRUCTION
B	HOUR METER RE-CONNECTION
$\mathbf{B_1}$	Black Wire (Hour Meter Designated)
$\mathbf{B_2}$	White Wire (Hour Meter Designated)

Figure 6-3: Instrument Panel Wire Reconnections

[**E**] into the remaining mounting holes of the instrumentation-side panel.

7. Tighten *all* panel truss screws, in sequence, to secure.

6.4.2 CHECKING PRESSURE GAUGE

Perform a visual inspection each time the compressor is started to ensure that the pressure gauge is operating normally. Allow the compressor to warm up, and verify that the pressure gauge is within its recommended range. Such inspections will minimize the possibility of damage or an unsafe condition from occurring. Refer to **Section 3: Specifications**.

6.4.3 COMPRESSOR SYSTEM LUBRICATION

The compressor is fully charged at the factory with a synthetic based lubricant. This section gives details on checking and changing the compressor oil.

System Component Group	Manual Section
Compressor System Lubrication	**6.4.3**
Oil Level Check	6.4.3.1
Changing the Compressor Oil	6.4.3.2

The compressor oil level sight glass is accessible from the outside of the canopy.

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

NOTE

When inspecting the oil level, ensure that the oil fill sight glass does not contain any cracks or pits.

⚠ IMPORTANT

To maintain warranty, Vanair® compressor oil must be used. DO NOT substitute compressor oil.

6.4.3.1 CHECKING THE OIL LEVEL

Refer to ***Figure 6-4***. Check oil level daily (preferred), or at least every week, and top off, if necessary. To ensure a proper oil level the compressor unit must be located on a level surface. Oil is filled via the fill port [**B**]. If low, fill the oil level until the sight glass is 1/4 to 3/4 full. **DO NOT** overfill.

⚠ CAUTION

DO NOT mix oil types, weights, or brands. Mixing oil types can cause equipment damage or failure.

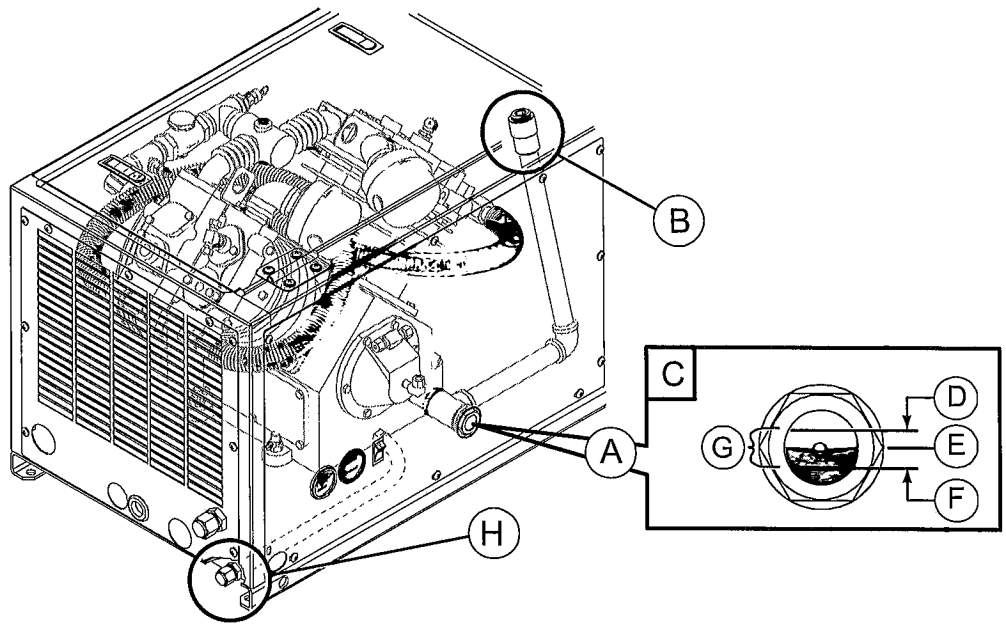
6.4.3.2 CHANGING THE COMPRESSOR OIL

The compressor oil fill port is accessible from the top of the unit. To access the oil fill port, disengage the hinged roof panel per **Section 6.4.1.1, Opening and Closing the Roof Panel.**

Refer to ***Figure 6-4*** and the following procedure:

NOTE

Dispose of discarded oil within the guidelines of all applicable local, regional and/or federal laws.



KEY	DESCRIPTION	KEY	DESCRIPTION
A	SIGHT GLASS	E	1/2 FULL
B	COMPRESSOR OIL FILL PORT	F	1/4 FULL
C	SIGHT GLASS LEVEL READING	G	OPTIMAL OIL LEVEL RANGE
D	3/4 FULL	H	COMPRESSOR OIL DRAIN

For oil maintenance, order replacement oil no. **KIT 1091** (sold in one [1] gallon containers).

Figure 6-4: Compressor Oil Fill and Oil Change

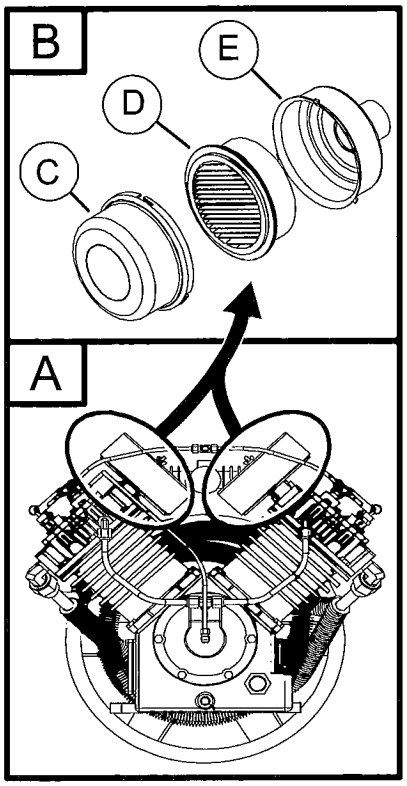
1. Place an open container (of at least three [3] quarts capacity) below the level of the compressor unit, within reach of the drain hose end [**H**] after it is disconnected from the hose clamp [**J**].
2. Disengage the oil drain hose cap [**K**] from the oil drain fill port [**B**] using a 3/4" male hex socket wrench.
3. Disengage the oil drain hose [**H**] from the hose clamp [**J**].
4. Remove the hose cap [**K**] from the end of the drain hose.
5. Thoroughly drain the existing oil into the container.
6. Replace the hose cap on the end of the drain hose and tighten.

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.



KEY	DESCRIPTION
A	COMPRESSOR UNIT
B	AIR FILTER ASSEMBLY
C	AIR FILTER COVER
D	AIR FILTER ELEMENT[I]
E	AIR FILTER BASE

[I] For maintenance on air filters order replacement filter elements kit no. **KIT 1090**.

NOTE: kit contains two (2) element filters. When a filter elment needs to be changed, always change both filters at the same time regardless of either elment's condition.

Figure 6-5: Compressor Air Filter Check/Replacement

NOTE

Always check both air filters when performing maintenance; if needed. To maintain a balance of suction, replace both filters at the same time.

7. At the oil fill port [**B**], fill crankcase with a full charge of Vanair reciprocating oil to the proper level indicated by the sight glass reading [**C**].
8. Replace the 3/4" hex socket plug on the oil fill port [**B**], and tighten.

6.4.4 AIR FILTER MAINTENANCE

Depending on the degree of contamination of the air taken in, regularly and carefully inspect the air filters on (at least) a weekly basis. The air filter elements should be replaced approximately every 500 operating hours or sooner, depending upon inspection. Plugged suction filters can cause high oil consumption and reduced delivery quantity! Change the filter more often when running in dusty conditions.

NOTE

If one of the air filters is in need of replacement, replace both air filters at the same time.

System Component Group	Manual Section
Air Filter Maintenance	**6.4.4**
Inspecting the Air Filter(s)	6.4.4.1
Replacing the Air Filter(s)	6.4.4.2

The compressor air filters are accessible from the top of the unit. To disengage the hinged roof panel, consult **Section 6.4.1.1, Opening and Closing the Roof Panel.**

To check and/or replace the air filter, refer to ***Figure 6-5***, and the following procedure:

6.4.4.1 INSPECTING THE AIR FILTER(S)

1. With the machine off and the ignition key removed, locate both of the air filter assemblies [**B**] on the compressor unit [**A**].

NOTE

Wipe off any soil or debris from the filter cover(s) and base(s) before accessing the air filter element(s).

2. Grasp the end cover [**C**], and push down (towards the compressor), while at the same

time twisting the cover counterclockwise until the cap slots move past the base mounting posts, freeing the cap.

3. Remove the air filter [**D**].
4. Visually and carefully inspect the air filter element, including between the pleats, for soiling, damage and/or signs of wear. If the element is intact, replace the element for further use. **DO NOT** replace the air filter element on the unit if it is damaged. Replace with new air filter element.

6.4.4.2 REPLACING THE AIR FILTER(S)

1. Seat the new (or cleaned) air filter [**D**] in position on the air filter base [**E**].
2. Place the end cover [**C**] in position over the air filter base [**E**].
3. Turn the end cap clockwise until it encounters the air filter base mounting posts; push down on the cap (toward the compressor), while turning the end cap past the mounting posts to secure the cap in position.
4. Dispose of worn air filters within the guidelines of all applicable local, regional and/or federal laws.

6.4.5 CHECKING COOLER CORE

Refer to ***Figure 6-6***. Periodically leaves, paper, or other debris can get wedged into the vents on the side panels of the enclosure. The cooler core within the enclosure can trap foreign matter that passes through the vents as well. Opening the roof panel and checking that the cooler is clean and free from debris will ensure that the RC40 hydraulic package operates safely within the temperature limits described in **Section 3, Specifications** of this manual.

Should the core become clogged, you can use low pressure compressed air to blow through the fins from the inside of the canopy to clean it out. You may need to remove the fan from the shroud in order to reach parts of the core. **DO NOT** use high pressure air or a pressure washer.

⚠ WARNING

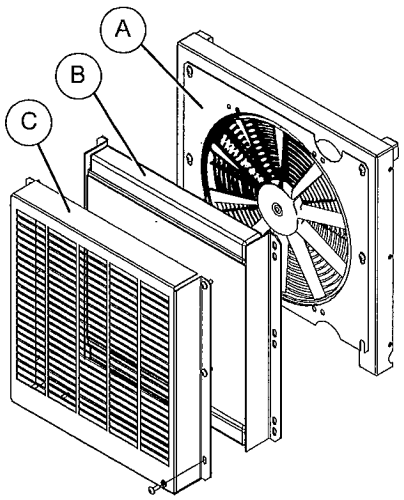
Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

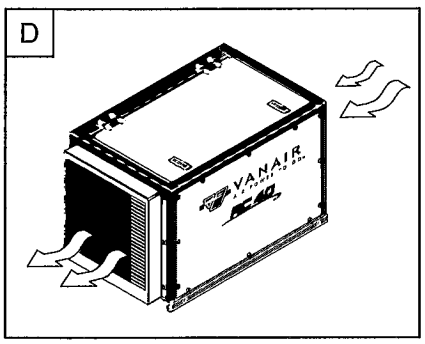
NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

NOTE

When using compressed air to clean the components, the nozzle pressure should not exceed 15 psig.





KEY	DESCRIPTION
A	COOLER FAN & MOTOR ASSEMBLY
B	OIL COOLER
C	COOLER PANEL
D	DIRECTION OF COOLING AIR FLOW

Figure 6-6: Oil Cooler

NOTE

DO NOT attempt to service reed valves. Replace with new plate assemblies when required.

6.4.6 COMPRESSOR VALVE MAINTENANCE

Valves are generally considered to be maintenance items and require care by the user. They are the most important part of the compressor, and the importance of proper care and maintenance cannot be over-emphasized.

System Component Group	Manual Section
Compressor Valve Maintenance	**6.4.6**
Installation	6.4.6.1
Lubrication	6.4.6.2
Service	6.4.6.3

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

⚠ DANGER

Valves must be reinstalled in original position. Incorrect valve replacement may result in overpressure of the cylinder head resulting in catastrophic failure, injury or death. Valve gaskets should be replaced each time valves are serviced.

To maximize the accessible work space needed for compressor unit maintenance, both side panels (drive assembly access panel and instrumentation panel) must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the side panels.

Refer to ***Figure 6-7***. If compressor fails to pump air or seems slow in filling up tank, the valves may need to be cleaned.

IMPORTANT

All valves should be removed from the cylinder head every two (2) or three (3) months of operation and examined for cleanliness and carbon formation (build-up).

1. Disconnect unit from power source.
2. Remove valves; for detailed compressor disassembly instructions, refer to ***Section 6.4.13, Disassembling the Compressor.***
3. Clean thoroughly, using compressed air and a soft wire brush.

NOTE

Clean with safety solvent and dry off with compressed air. Depending on what is found at this inspection, the next inspection should not be more than four (4) to six (6) months later. These two inspections will guide you in scheduling periodic cleaning times which will pay off many times over in providing trouble-free service and reduced down time.

NOTE

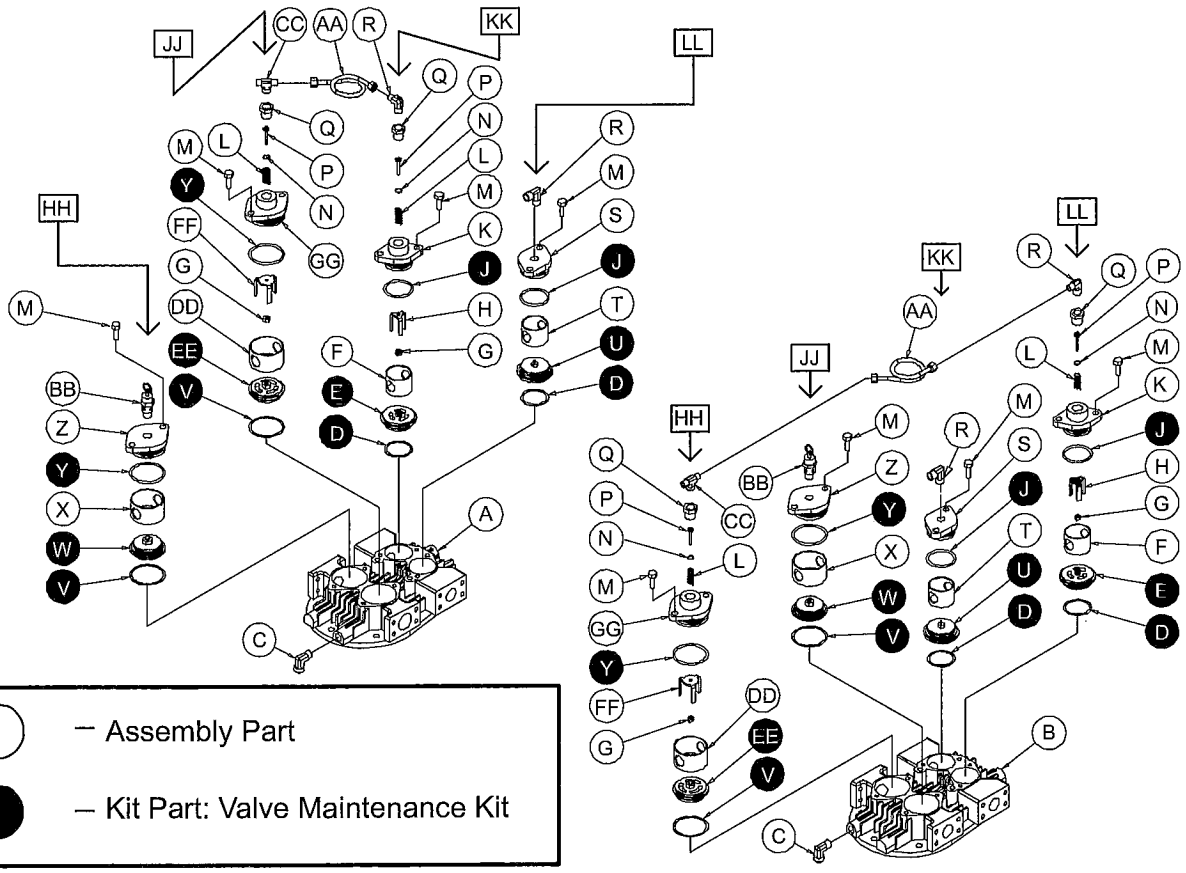
Valve gaskets should be replaced each time valves are removed from pump. Replace springs, discs and seats when worn or damaged.

4. After cleaning, exceptional care must be taken that all parts are replaced in *exactly* the same position, and all joints must be tight or the compressor will not function properly.
5. When all valves are replaced and connections are tight, close hand valve at tank outlet for final test.

NOTE

When performing valve maintenance, always replace machine parts with new kit parts regardless of part condition.

The four compressor valves should be inspected and cleaned every six months, after 500 hours of operation, or anytime the cylinder head is disassembled. The valves should also be inspected anytime there is a decrease in air flow or pressure output that is not the result of other causes. Install new gaskets anytime the valves are inspected, cleaned, or replaced, or, when the cylinder heads are disassembled.



KEY	DESCRIPTION	QTY	KEY	DESCRIPTION	QTY
A	Cylinder Head Left	1	U[I]	Valve Assembly, HP Discharge	2
B	Cylinder Head Right	1	V[I]	Valve Gasket LP	4
C	Elbow, Breather Connector	2	W[I]	Valve Assembly LP Discharge	2
D[I]	Valve Gasket HP	4	X	Cage LP Discharge	2
E[I]	Valve Assembly, HP Inlet	2	Y[I]	O Ring, L.P. Cover	2
F	Cage HP Inlet	2	Z	Hold Down Cover HP Discharge	2
G	Locknut	4	AA	Unloader Tube	2
H	Fingers HP	2	BB	Safety Valve	2
J[I]	O Ring HP Cover	4	CC	Tube Tee 1/4 X 1/4 X 1/4 NPT	2
K	Hold Down Cover HP Inlet	2	DD	Cage LP Inlet	2
L	Spring LP	4	EE[I]	Valve Assembly, LP Inlet	2
M	Capscrew Hold Down 5/16-18x3/4	16	FF	Fingers LP	2
N	O Ring Plunger	4	GG	Hold Down Cover, LP Inlet	2
P	Plunger	4	HH	LP Discharge Valve	2
Q	3/8 NPTX1/4 NPT bushing	4	JJ	LP Inlet Valve	2
R	Tube Elbow	4	KK	HP Inlet Valve	2
S	Hold Down Cover HP Discharge Left	2	LL	HP Discharge Valve	2
T	Cage HP Discharge	2			

[I] This replacement part is found in the maintenance kit; for maintenance on valves, order maintenance kit no. **KIT 1087**.

Figure 6-7: Compressor Head Valve Unloader Maintenance

Damaged valves can cause compressor damage and malfunctions. Contact Vanair for valve replacement kits.

6.4.6.1 INSTALLATION

Refer to ***Figure 6-7*** and the following procedure:

1. Place valve gaskets [**D**] & [**V**]; valves [**U**],[**E**], [**W**] and [**EE**]; and cages [**T**], [**F**], [**X**] and [**DD**] into head in sequence as shown. Install "O" ring [**N**] on plunger [**P**] and assemble with spring [**L**] into inlet hold-down cover [**GG**] and [**K**] (refer to **Section 6.4.6.2** for part lubrication).
2. Assemble fingers [**H**] and [**FF**] and locknut [**G**] to complete assembly.
3. Install hold-down cover assemblies with "O" rings [**J**] and [**Y**] using cap screws [**M**]. Tighten evenly to a torque of 10 foot-lbs. Connect unloader tube [**AA**] to tube elbow [**R**] and tube tee [**CC**]. Connect tubing from pilot valve to tube tee [**CC**].

6.4.6.2 LUBRICATION

When assembling plunger, [**P**] and "O" ring [**N**] to hold-down cover [**GG**] and [**K**], coat "O" ring with silicon grease to facilitate assembly.

6.4.6.3 SERVICE

Dirt in unloader line or defective pilot valve could hold valve open allowing unloading fingers to keep inlet valves open. Sometimes tapping the pilot valve will allow pilot valve to resume normal operation. If not, remove, clean or replace. Also broken "O" ring [**N**] may cause erratic operation. Refer to **unloader pilot operation NOTE** and **Section *6.4.6, Compressor Valve Maintenance*** description for details.

6.4.7 CENTRIFUGAL UNLOADER INSTALLATION

IMPORTANT

Required, precise adjustments are needed to perform maintenance on the centrifugal unloader. Vaniar suggests contacting the Service Department for assistance when performing this procedure.

To maximize the accessible work space needed for compressor unit maintenance, both side panels (drive assembly access panel and instrumentation

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

IMPORTANT

Required, precise adjustments are needed to perform maintenance on the centrifugal unloader. Vaniar suggests contacting the Service Department for assistance when performing this procedure.

NOTE

UNLOADER PILOT OPERATION:
The inlet valve unloaders are designed to provide CONSTANT PRESSURE CONTROL by holding open the inlet valves in both cylinders. When the air supply exceeds the demand and the discharge pressure rises above the maximum required, the pilot valve (not shown) admits air at discharge pressure to a plunger in each unloader, holding the inlet valve discs off their seats. Thus the air drawn into the cylinders is freely discharged without being compressed. When the pressure has dropped to the desired minimum, the pilot valve closes, allowing the inlet valves to seat and compression to be resumed.

panel) must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the side panels.

Refer to ***Figure 6-8***. The centrifugal unloader weight retainer assembly [**E**, **F**, **G**, **H** and **J**] may be assembled to the crankshaft in either of two methods:

The preferred method is to mount the assembly to the crankshaft when crankshaft is removed from base during assembly of pump.

The second method is used when only the centrifugal unloader is to be dismantled, and only the end cover [**L**] is removed. Then centrifugal unloader weight retainer assembly [**E**, **F**, **G**, **H** and **J**] may be assembled when crankshaft is in base.

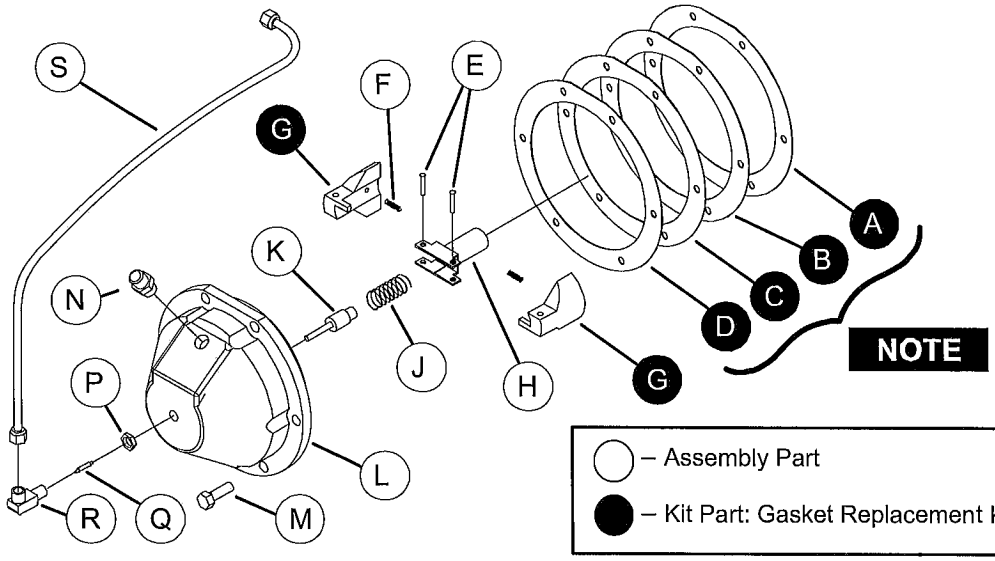
1. Assemble assembly into tapped hole in crankshaft (L. H. Threads). Apply wrench to weight retainer to tighten snugly. Do not bend wings of weight retainer.
2. Assemble end cover [**L**] end cover gaskets [**A**, **B**, **C** and **D**] to pump base with capscrews [**M**]. Check end play of crankshaft in accordance with **Section 6.4.13.1, Paragraph A**.
3. Insert plunger [**K**] into valve elbow assembly [**P**, **Q** and **R**] and screw into end cover until part of valve [**Q**] can be seen when looking into tube opening of elbow [**R**]. Do not screw elbow into end cover too far or unloader will not operate properly.
4. Secure valve elbow assembly in position by tightening jam nut [**P**].
5. Connect unloader tube [**S**] to elbow in high pressure discharge hold-down cover and valve elbow [**R**].
6. Connect breather tube to elbow in head and to straight connector [**N**] in end cover.

NOTE: When assembling unloader unit, coat plunger [**K**] and rivets [**E**] with good grade of machine oil.

Leakage of air out through the unloader valve elbow opening, after the unit has been shut off for a time, is an indication of a check valve leak and should be corrected by repair or replacement.

6.4.8 PISTON RING MAINTENANCE

To maximize the accessible work space needed for compressor unit maintenance, both side panels



KEY	DESCRIPTION	QTY	KEY	DESCRIPTION	QTY
A[I]	END COVER GASKET .005	2	K	PLUNGER	1
B[I]	END COVER GASKET .006	1	L	END COVER	1
C[I]	END COVER GASKET .003	2	M	END COVER CAPSCREW 5/16-18X1	6
D[I]	END COVER GASKET .0015	2	N	BREATHER CONNECTOR	1
E	RIVET	2	P	LOCKNUT	1
F	BUMPER SPRING	2	Q	UNLOADING TUBE	1
G[I]	WEIGHT UNLOADER	2	R	ELBOW VALVE & UNLOADER	1
H	HOLDER UNLOADER	1	S	UNLOADING TUBE	1
J	SPRING	1			

[I] For information on replacement gaskets for the centrifugal unloader, refer to **Section 6.4.11, Gasket Replacement Maintenance**, and **Section 8.15, Compressor Gasket Replacement KIT 1088 - Piece Parts**. For gasket replacement kit order gasket kit no. **KIT 1088**.

NOTE Gaskets **A** through **D** also serve as shims; various combinations of gaskets may be needed, depending on the correct dimension needed for proper unload operation.

Figure 6-8: Centrifugal Unloader Maintenance

(drive assembly access panel and instrumentation panel) must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the side panels.

Refer to *Figures 6-9, 6-10, 6-11* and ***Section 6.4.13, Disassembling the Compressor*** when performing piston ring maintenance.

There are two compression rings and one oil control ring per piston. The compression rings are beveled on their inside diameters, and must be installed with the bevel on top of the piston ring groove.

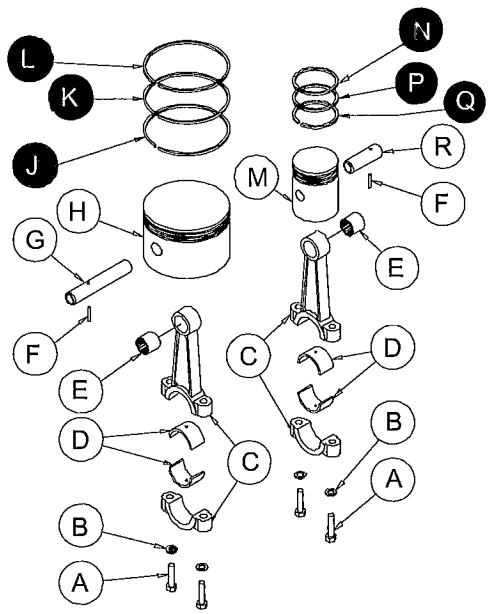
The oil control ring has an expander that should be placed behind the ring. To ensure that oil blow-by is

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.



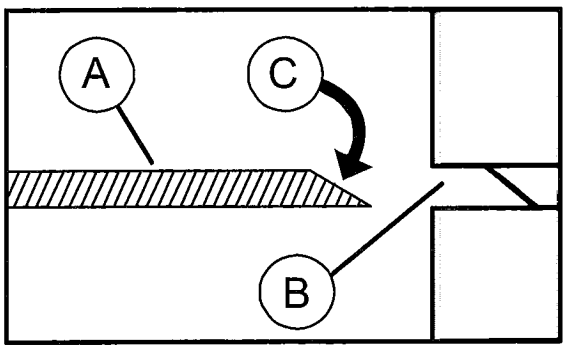
◯ – Assembly Part

● – Kit Part: Piston Ring Maintenance Kit

KEY	DESCRIPTION	QTY
A	ROD CAPSCREW	8
B	ROD LOCK WASHER	8
C	CONNECTING ROD	4
D	BEARING INSERT	4
E	NEEDLE BEARING WRIST PIN LP & HP	4
F	ROLL PIN	4
G	WRIST PIN LP	2
H	PISTON LP	2
J[I]	OIL CONTROL RING LP	2
K[I]	BOTTOM COMPRESSION RING LP	2
L[I]	TOP COMPRESSION RING LP	2
M	PISTON HP	2
N[I]	TOP COMPRESSION RING HP	2
P[I]	BOTTOM COMPRESSION RING HP	2
Q[I]	OIL CONTROL RING HP	2
R	WRIST PIN HP	2

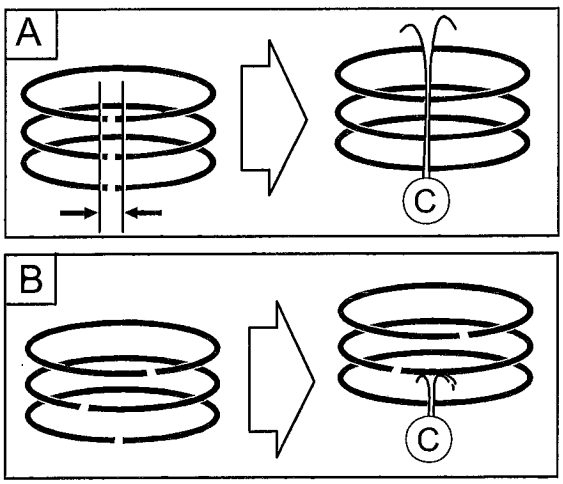
[I] This replacement part is found in the maintenance kit; for maintenance on piston rings, order kit no. **1089**.

Figure 6-9: Piston Ring Maintenance



KEY	DESCRIPTION
A	COMPRESSION RING - INSIDE EDGE BEVEL
B	PISTON RING GROOVE
C	Bevel positioned on top, facing upwards

Figure 6-10: Compression Ring Bevel Position



KEY	DESCRIPTION
A	GAP-ALIGNED RING GAPS: May allow oil blow back
B	STAGGARED RING GAPS: Deter/minimize oil blow back
C	OIL BLOW BACK DIRECTION

Figure 6-11: Staggered Piston Ring

minimized, the piston ring gap on each ring is staggered one from the other.

6.4.9 RE-ADJUSTING OR REPLACING THE COMPRESSOR DRIVE BELTS

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

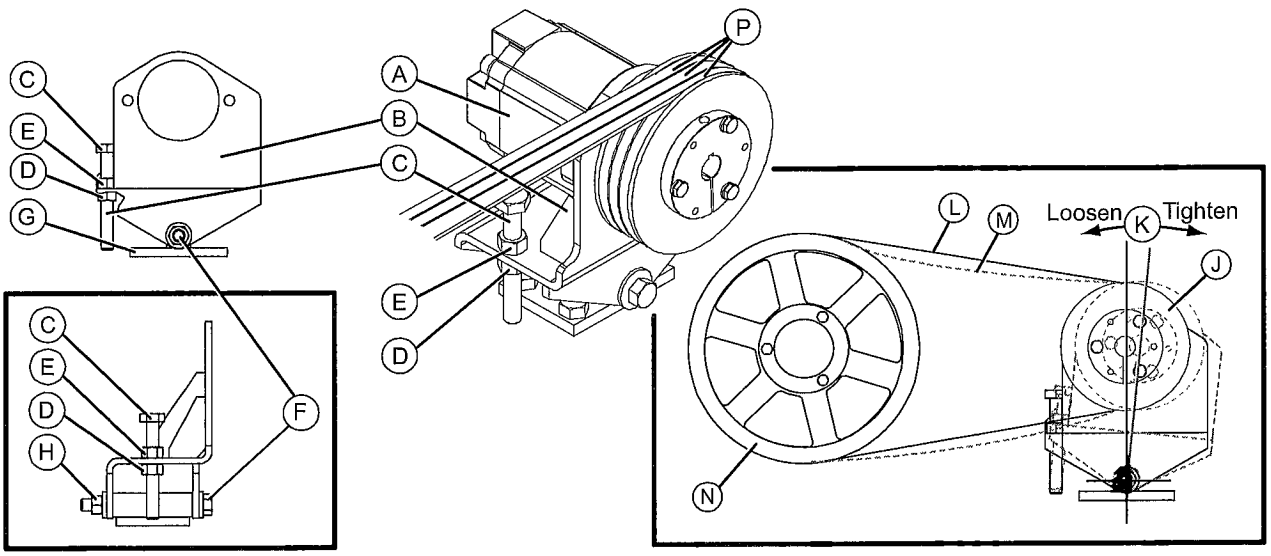
To access the package for drive belt maintenance, the drive assembly access panel must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the drive assembly access side panel.

To readjust or replace the compressor drive belts, refer to ***Figures 6-12*** and ***6-13***. The belts are slackened by pivoting the hydraulic motor assembly's bracket, which temporarily repositions the hydraulic motor sheave enough to allow removal and replacement of the belt. Note that the compressor sheave remains stationary.

NOTE

For worn or damaged belts: Always replace all the drive belts at the same time, regardless of any single belt's condition.

1. Loosen the horizontal tap bolt nut [**F**]. Loosen enough to allow movement, but **DO NOT** remove the tap bolt.
2. Loosen the adjustment/locking nut [**E**].
3. Loosen the vertical tap bolt [**C**] to allow for the hydraulic motor bracket [**B**] to pivot the motor assembly angle [**K**] toward the compressor unit, which causes the belt to slack.
4. Remove the belts when enough slack allows for them to slip off of the compressor sheave [**N**].
5. Re-thread the new drive belts into place over the compressor sheave [**N**] and motor drive sheave [**J**].
6. Adjust the vertical tap bolt [**C**] to tighten the belts by pivoting the hydraulic motor bracket



KEY	DESCRIPTION	KEY	DESCRIPTION
A	HYDRAULIC MOTOR	H	HORIZONTAL TAP BOLT NUT
B	HYDRAULIC MOTOR BRACKET	J	MOTOR DRIVE SHEAVE
C	VERTICAL TAP BOLT (anchor and adjustment)	K	BRACKET PIVOT ANGLE [I]
D	WELD NUT	L	BELT UNDER TENSION
E	ADJUSTMENT/LOCKING NUT	M	LOOSENED BELT [II]
F	HORIZONTAL TAP BOLT (anchor and adjustment)	N	COMPRESSOR SHEAVE (remains stationary)
G	BASE PLATE OF HYDRAULIC MOTOR BRACKET	P	BELT SET (x3 belts)

For maintenance on drive belts, order replacement belt no. **266727** (quantity of three [3]).

[I] Allows for slackening or tightening of the drive belt.

[II] Belt is loosened due to pivoting of hydraulic motor bracket [**B**] toward the compressor unit. Pivot only enough to remove/replace the belt.

Figure 6-12: Removing Drive Belt

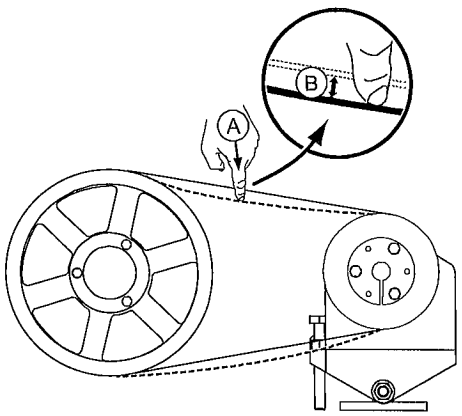
[**B**] away from the compressor unit [angle **K**], which causes tension in the belt.

NOTE

BELT TENSION DEFLECTION DATA

Refer to *Figure 6-13. Applied force* at center of belt span is seven (7) lbs. for a new belt, or five (5) lbs. for a conditioned belt.
***Deflection* factor is 0.15 inches for both new and conditioned belts.**

7. When the belt has been adjusted to proper tension, tighten the adjustment/locking nut [**E**].
8. Hold horizontal tap bolt nut [**H**] in place with a wrench while tightening the horizontal tap bolt [**F**] to secure the motor bracket in place.
9. Recheck the belt tension, and adjust as necessary until proper tightness is achieved. Check the belt tension routinely, as new belts may need to undergo a breaking-in period of adjustment.



KEY	DESCRIPTION
A	**Applied Force[I]:** New Belt: 7.0 lbs Conditioned Belt: 5.0 lbs
B	**Deflection[I]:** 0.15 in. (for New and Used Belts)

[I] Specifications given pertain to each belt separately.

Figure 6-13: Drive Belt Tension Deflection

6.4.10 DRIVE SHEAVE (PULLEY) ALIGNMENT

System Component Group	Manual Section
Drive Sheave (Pulley) Alignment	**6.4.10**
Testing Pulley Alignment	6.4.10.1
Adjusting the Motor Pulley for Alignment	6.4.10.2

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

To access the package for drive belt maintenance, the drive assembly access panel must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the drive assembly access side panel.

Refer to ***Figures 6-14*** through ***6-16***, and the following procedure:

Pulley alignment is set at factory and should not need to be adjusted. If it becomes necessary to adjust the pulley alignment, an alignment test may be performed with a straight edge, such as a yard stick, that is long enough to overlap both the compressor and motor drive sheaves. Adjustments are made via positioning of the hydraulic motor (bracket). **Note**

that the compressor pulley always remains stationary during adjustment.

6.4.10.1 TESTING PULLEY ALIGNMENT

In order to confirm that the pulleys are in alignment, several measurements must be taken to get an accurate account. For measurement point locations refer to ***Figure 6-14***; for tolerance measurements refer to ***Figure 6-15***.

1. Place the straight edge *flush* against both the face of the compressor pulley, and the face of the hydraulic motor pulley, just *above* the mounting screws. Make sure the straight edge overlaps both sheaves as much as possible.

Ideally the straight edge should be flush to both the compressor drive pulley and the hydraulic motor pulley. However, a tolerance of no more than a 1/16 inch clearance is acceptable at either side between the motor pulley face and the straight edge, depending on the direction (toward compressor, or toward cooler) of the skew (see ***Figure 6-15***).

2. Place the straight edge *flush* against both the face of the compressor pulley, and the face of the hydraulic motor pulley, just *below* the mounting screws. Make sure the straight edge overlaps both sheaves as much as possible.

The tolerance check should be within the 1/16" acceptable range.

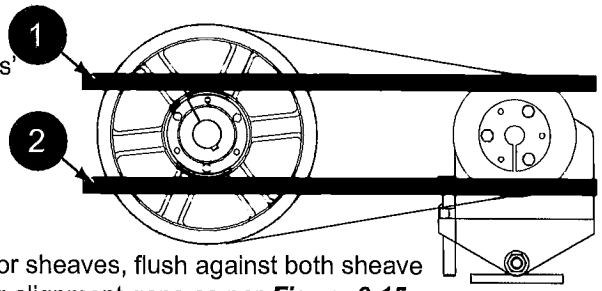
6.4.10.2 ADJUSTING THE MOTOR PULLEY FOR ALIGNMENT

The motor pulley is positioned, in regard to being aligned with the compressor pulley, by lateral adjustment of the hydraulic motor's base bracket. Before attempting to adjust the motor bracket to align the motor pulley, the drive belts should first be removed in order to relieve any tension while aligning the motor sheave. Consult ***Section*** to remove the drive belts.

Refer to ***Figures 6-14*** through ***6-16***. In order to adjust the motor pulley, the hydraulic motor bracket must be loosened enough to allow the motor to be moved laterally into alignment.

1. Refer to ***Figure 6-16***: Loosen, but do not remove, one or two of the four (4) mounting bolt sets (capscrews [**C**] and hex locking nuts [**D**]),

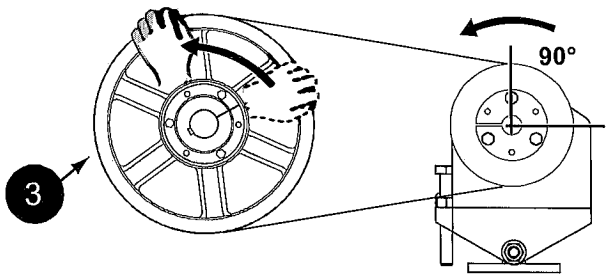
STEP #1:
Place a straight edge, long enough to span over both the compressor and motor sheaves, flush against both sheaves' face surfaces, just *above* the mounting screws.
Measure for sheave alignment gaps as per ***Figure 6-15***.
Measurements should falls within the allowable 1/16" limitation range.



STEP #2:
Place the straight edge over both the compressor and motor sheaves, flush against both sheave face surfaces, but *below* the mounting screws. Measure for alignment gaps as per ***Figure 6-15***.

Adjust the motor sheave lateral position (refer to **Section 6.4.10.2**) until both top and bottom measurements taken in **Step #1** and **Step #2** are within the acceptable tolerance range given in ***Figure 6-15***. Tighten the motor base frame bolt(s), but do not torque yet.

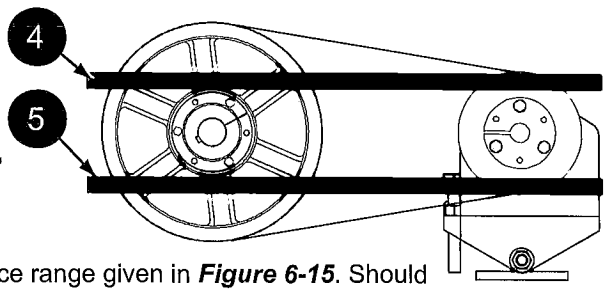
STEP #3:
Once alignment tolerance has been confirmed for **Step #1** and **Step #2**, rotate the sheaves 90° in order to take a second set of measurements.



STEP #4:
Take a new measurement as given in **Step #1**.

STEP #5:
Take a new measurement as given in **Step #2**.

STEP #6:
If measurements are within tolerlances, torque the 1/2-13" motor base frame bolts (x 4) to 80 ft-lbs.

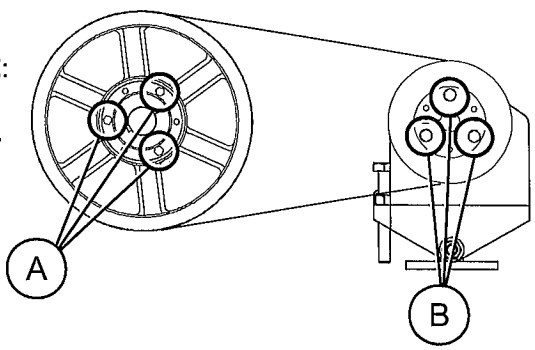


IF SHEAVES ARE OUT OF TOLERANCE RANGE:
Sheaves in correct alignment should be within the tolerance range given in ***Figure 6-15***. Should the second measurements taken in **Steps #4** and **#5** not yield correct tolerance ranges, there may be an alignment issue with the mounting hubs and/or bushings for either or both sheaves. Refer to **Step #7**.

STEP #7 (if necessary):
Loosen and reset the mounting bolts for the bushings of both sheaves, torquing the bolts to specifications given below (**NOTE**: Before resetting the bushings, remove *all* belt tension):

A: For compressor bushing torque 5/16-18 bolts to 180 in-lbs.
B: For motor bushing torque 1/4-20 bolts to 108 in-lbs.

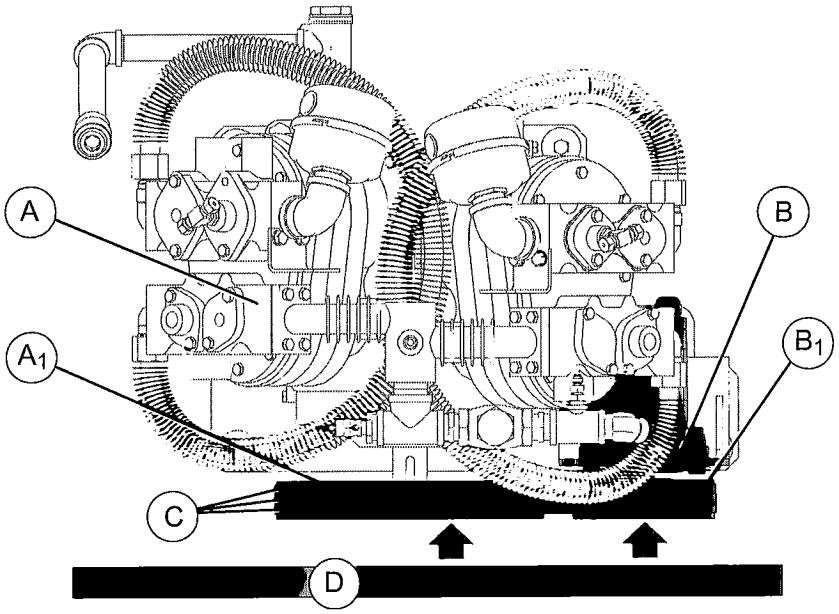
Once the sheaves have been re-set and torqued, repeat **Steps #1** through **#5** to confirm alignment at all check points.



NOTE

Should the process given in Step #7 not yield correct measurements after all bushing resets and sheave alignment steps have been performed, contact the Vanair® Service Department.

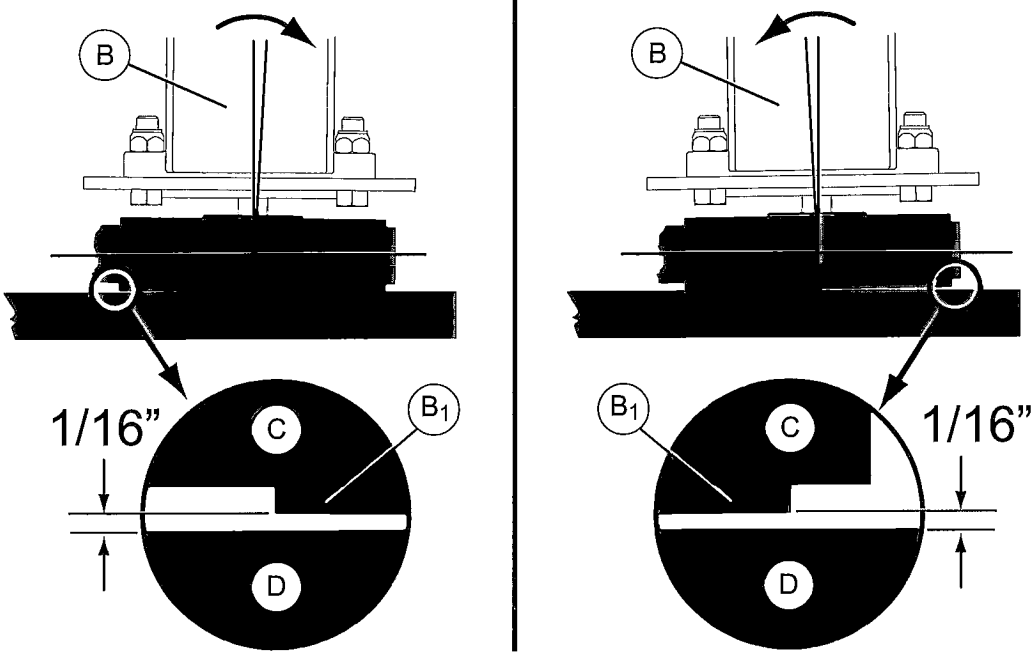
Figure 6-14: Drive Sheave (Pulley) Alignment Tolerance Check Measurement Points



With straight edge flush against both compressor and motor sheaves...

ALLOWABLE TOLERANCE CLEARANCES

SKEWED MOTOR: *COMPRESSOR/INNER-SIDE* CORNER OF MOTOR SHEAVE CLEARANCE ...or... SKEWED MOTOR: *OUTER-SIDE* CORNER OF MOTOR SHEAVE CLEARANCE



KEY	DESCRIPTION	KEY	DESCRIPTION
A	COMPRESSOR	B_1	HYDRAULIC MOTOR DRIVE SHEAVE (PULLEY)
A_1	COMPRESSOR DRIVE SHEAVE (PULLEY)	C	DRIVE BELT SET (x 3 separate belts)
B	HYDRAULIC MOTOR	D	STRAIGHT EDGE

Figure 6-15: Drive Sheave (Pulley) Alignment Check

fastening the hydraulic motor bracket to the frame.

NOTE

It should not be necessary to fully loosen all of the hydraulic motor bracket's mounting bolts. Loosening one or two of the mounting bolts should be enough to allow for the bracket to be adjusted.

The bracket should be just loose enough to allow for a rubber-headed mallet to move the bracket by applying short taps.

NOTE

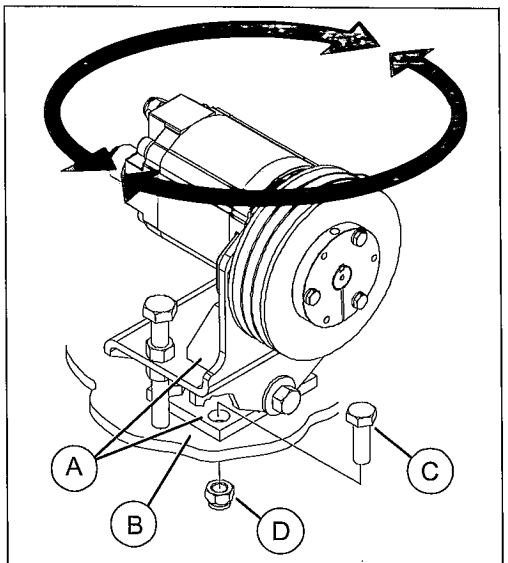
If using a rubber mallet to position the motor bracket, take care to strike the bracket face and not the sheave during adjustment.

2. Follow the steps and referrals given in ***Figures 6-14*** and ***6-15*** to determine if the drive sheaves are aligned within the operating tolerance range of 1/16".
3. Adjust the motor bracket position in slight increments, taking frequent tolerance measurements with the straight edge until the the alignment is within the acceptable range.
4. Once the bracket is positioned within range of all checks performed in ***Figure 6-14***, carefully tighten the motor bracket bolts that were loosened in step #1 to the proper torque (refer to **Table 3B** for torque specifications).
5. Replace the belts as per ***Section 6.4.9***, to achieve the correct belt tension.

IMPORTANT

DO NOT over-tension the belts.

Be aware that it may be necessary to repeat and check both belt tensions and pulley alignment several times before drive is properly set.



KEY	DESCRIPTION
A	HYDRAULIC MOTOR BRACKET
B	FRAME (MOUNTING SURFACE)
C	CAPSCREW (MOUNTING BOLT) (x 4)
D	HEX LOCKING NUT (x 4)

Figure 6-16: Hydraulic Motor Pulley Alignment - Lateral Adjustment

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

6.4.11 GASKET REPLACEMENT MAINTENANCE

To maximize the accessible work space needed for compressor unit maintenance, both side panels (drive assembly access panel and instrumentation panel) must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the side panels.

A gasket replacement kit (KIT 1088) is offered for maintenance on the compressor gasket set groups. Gasket replacement set locations consists of the following:

- Cylinder head/manifold (x 2; left and right sides).
- Cylinder head base (x 2; left and right sides).
- Crankcase side plates (x 2; left and right sides).
- Crankcase end cover (see note below).
- Low pressure inlet valves (x 4; two per each head).
- Low pressure discharge valves (x 4; two per each head).
- High pressure inlet valves (x 4; two per each head).
- High pressure discharge valves (x 4; two per each head).

NOTE

End cover gaskets or shims are furnished in three thicknesses, and the proper combination must be selected so that crankshaft can be "spun" in the bearings without "end play".

In order to replace gasket sets follow the steps, where applicable from ***Section 6.4.13, Disassembling the Compressor***, to access the gaskets that need to be replaced. For a full exploded-view assembly diagram of the gasket replacement kit parts' locations, refer to **Section 8.15, Compressor Gasket Replacement KIT 1088 - Piece Parts.** In addition, refer to **Section *6.4.7, Centrifugal Unloader Installation*** for assistance with the centrifugal unloader assembly.

6.4.12 PRESSURE SWITCH MAINTENANCE

Refer to ***Figure 6-17***. The pressure switch is pre-adjusted at the factory. Its cover is sealed with a tamper-proof coating. **Do not** remove this protective sealing.

IMPORTANT

Because of the risks involved with manually re-adjusting the pressure switch settings, the switch cover contains a tamper-proof seal, and should not be breached for any reason. Breach of the seal will VOID the warranty.

The pressure switch should never be used to manually-adjust the pressure settings, as injury or damage to the machine may result. If a problem concerning pressure levels exists, consult the troubleshooting section of this manual. Should the problem persist, contact the Vanair service department for assistance.

6.4.13 DISASSEMBLING THE COMPRESSOR

⚠ WARNING

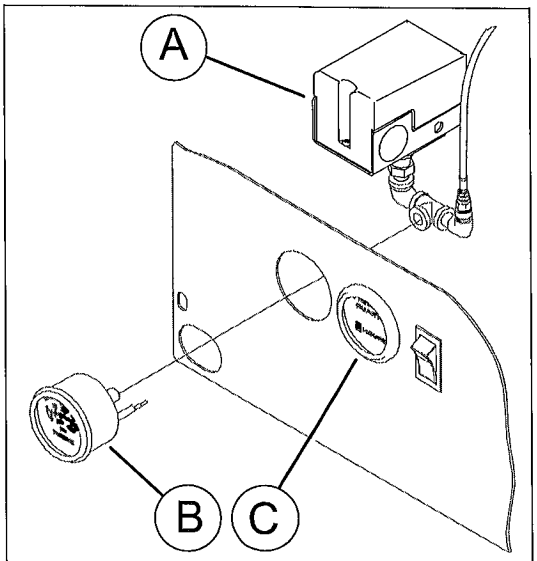
Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

NOTE

Before dismantling the compressor for overhauling it is advisable to obtain a set of valve parts, piston rings and gaskets, in addition to other required parts. Consult *Table 8A: Recommended Spare Parts List* to obtain ordering information.



KEY	DESCRIPTION
A	PRESSURE SWITCH
B	PRESSURE GAUGE (reference)
C	HOUR METER (reference)

Figure 6-17: Pressure Switch Location

To maximize the accessible work space needed for compressor unit maintenance, both side panels (drive assembly access panel and instrumentation panel) must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the side panels.

Refer to **Section 8.14, Compressor Overhaul KIT 1089 - Piece Parts**, for the full compressor overhaul maintenance piece part assembly. When performing internal maintenance and/or repairs on the compressor unit, refer to **Section 8.2, Compressor Unit Assembly** for a full, visual breakdown of parts.

A. Refer to ***Section 6.4.9***. Loosen motor bracket and remove belts. Drain oil from crankcase (**Section 6.4.3.2**).

B. Remove compressor sheave bushing and sheave from the drive shaft. Remove key. File edges of key way smooth to remove sharp edges which could cut oil seal during removal.

C. Remove the finned tubes from the cylinder head (***Section 6.4.16***). Remove air inlet filter assemblies from heads.

D. Remove cylinder heads from cylinders by removing cap screws (***Section 6.4.6***).

E. Before removing cylinder mark top of pistons nearest drive sheave, so that they can be reinstalled in same position. Remove cylinder by removing bolts. Cylinder can be removed easily by twisting slightly back and forth while pulling upward. Care should be taken that connecting rod and piston does not become damaged from striking metal when cylinder is removed. The condition of cylinder, pistons, rings and bearing fits can then be checked.

F. Refer to ***Section 6.4.7***. Remove end cover and slide crank shaft with connecting rods, pistons, etc. out of base being careful not to damage the oil feeder ring. Place pulley end of crankshaft in a soft jaw vice to prevent damage.

G. Refer to ***Section 6.4.8***. To remove pistons: Remove roll pins by driving them into the wrist pins. Push out wrist pins. Remove roll pins from wrist pins.

H. When removing connecting rods see that rods and caps are kept in matched sets, noting the position with reference to the crankshaft of the identification marks on one side of each so that the connecting rod can be replaced in the same position it originally occupied.

I. Drive oil seal out of base (only if replacement is necessary) with evenly spaced blows from inside.

J. Refer to ***Section 6.4.6***. To dismantle head, remove low pressure hold-down covers and high pressure hold-down covers by removing cap screws. Lift out low pressure cages and high pressure cages. Low pressure valves and high pressure valves can be lifted out as well as the low pressure seat gasket (***Figure 6-7***, [**V**]), and high pressure seat gasket (***Figure 6-7***, [**D**]).

K. Refer to ***Section 6.4.6***. To dismantle valves, place valve in a soft jaw vise and remove center screw. Valves are now free to take apart. Clean all parts thoroughly. Valve plates and seats must be smooth and flat; they can sometimes be resurfaced by rubbing on fine emery cloth held on a smooth surface.

IMPORTANT

Badly worn parts including springs, which lose tension after considerable use should be replaced.

6.4.13.1 FITTING AND REASSEMBLING

Clean all parts thoroughly before assembling. Refer to **Table 6C: Compressor Torque Values** for proper torque specifications for assembling parts.

A. Crankshaft — Base

Be sure base is free of all metal chips and dirt. Insert crankshaft and oil feeder ring only into base. Assemble end cover and tighten end cover bolts evenly. End cover gaskets or shims are furnished in three thicknesses, and the proper combination must be selected so that crankshaft can be "spun" in the bearings without "end play". Also see that oil feeder ring turns freely within the guide lugs in the base. Then remove crankshaft. For additional guidance, refer to ***Section 6.4.7***.

B. Piston — Cylinder

Check fit before assembling pistons to connecting rods. Pistons without rings should slide through the cylinder of their own weight and holding the skirt of the piston with the two thumbs there should be no appreciable side motion at any point of piston travel. Scored cylinders or pistons should be replaced. For additional guidance, refer to ***Section 6.4.8***.

C. Wrist Pins should be "tap" fitted by hammer. See that roll pin holes are in line.

D. Wrist Pin — Needle Bearing

Fit so that piston can be "rocked" with three fingers: the thumb on one side and index and middle fingers on the other. The piston should not rock of its own weight. Drive roll pin into wrist pin when piston and wrist pin holes are in line and piston is assembled to connecting rod. For additional guidance, refer to ***Section 6.4.8***.

If replacement of a needle bearing ever becomes necessary, be sure to press in the new bearing so that the small hole through casting lines up with oil hole in rod. Wrist pin should also be replaced.

E. Connecting Rod — Crankshaft

Tap cap, when insert bearings are assembled to rod and cap to make sure bearing is making contact and tighten rod bolts with lock washers in place to prevent loosening (torque to 25 foot-pounds). The combined piston and connecting rod should turn slowly on the crankshaft of their own weight if bearing adjustment incorrect. It will be noted that ends of the inserts extend slightly above the parting line of the rod and cap and under no circumstance should these ends of the inserts be filed. For additional guidance, refer to ***Section 6.4.8***.

TABLE 6C: COMPRESSOR TORQUE VALUES

BOLT SIZE	GRADE	TORQUE (ft.-lb.)	POSITION
1/4-20	5	8	Side Plate Bolts
1/4-28	8	11.76	HP Valve Nut
3/8-16	5	26	Cylinder to Base Bolts
38-24	8	33.8	Connecting Rod Bolts
5/16-18	5	17	Head to Cylinder
	5	10	LP/HP Valve Hold Down Covers
	5	17	End Cover Bolts
5/16-25	8	21.3	LP Valve Nut

F. Reinstall crankshaft with pistons and connecting rods attached being careful not to damage oil feeder ring when fitting within base lugs and being sure there are no burrs or dirt on the pulley end of the crankshaft that might cut the oil seal.

G. If oil seal is to be replaced slide over the crankshaft and press into place in the base, the lip or seal side toward the crankcase. Do not hammer directly on the seal.

H. Replace valve parts in sequence indicated in **Section 8.2, Compressor Unit Assembly,** being careful not to force any parts together when tightening this center screw and locknut (torque to 28 foot-pounds). After assembly depress valve plate to insure that the valve works freely.

I. Head Assembly — Refer to ***Section 6.4.6***.

Install seat gaskets valve assemblies, cages, "O" rings, hold down covers and cap-screws.

Tighten cap screws evenly so as not to break corners of hold down covers (torque to 10 foot-pounds). Assemble head to cylinder (Torque to 10 foot-pounds).

J. Install key and pulley after cylinder head and finned tubes are connected.

K. Turn pulley over by hand several times to insure that no interference of any kind exists.

6.4.14 CHECKING HOSES AND WIRING

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

To maximize the accessible work space needed for compressor unit maintenance, both side panels (drive assembly access panel and instrumentation panel) must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the side panels.

NOTE

For maintenance kit details on hoses, refer to *Section 8.16, Hydraulic Hose System.*

Hoses and wires are routed away from potential pinch points, heat sources, and other hazards. However, when service is performed on a machine, it can become necessary to cut zip ties or remove hose clamps, which can allow hoses and wires to become exposed to some hazards within the enclosure. Ver-

ify that no hoses or wires are near belts, exhaust, fan blades, sharp edges, or other pinch points.

Hoses and wires should perform for the service life of the product. Occasionally, a plug or hose end may work itself loose over time. Check all the hose fittings to see that there is no visible leakage.

6.4.15 SERVICING THE SYSTEM FUSE AND CIRCUIT BREAKER

To access the machine area where the fuse and/or circuit breaker are located, the instrumentation panel must be removed. Consult **Section 6.4.1.2, Removing and Replacing a Side Panel** to remove the instrumentation-side panel.

Consult ***Figure 6-18*** for the locations of the fuse and circuit breaker. Vanair® recommends using a fuse removal tool, though pliers will suffice, when removing the fuse.

⚠ WARNING

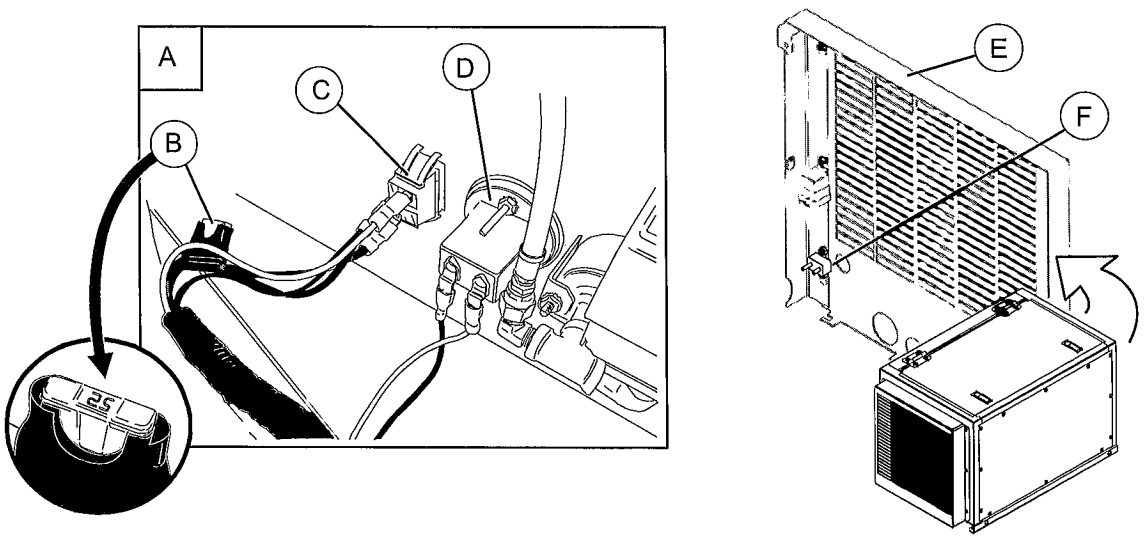
Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

⚠ DANGER

Fuses will need to be replaced if blown when tripped. When changing a fuse, or dealing directly with any function of the electrical system maintenance, always be aware of the safety warnings given in *Section 1, Safety.*



KEY	DESCRIPTION	KEY	DESCRIPTION
A	INSTRUMENT PANEL - Inside View	D	HOUR METER (Reference)
B	FUSE; 25A (12V), 15A (24V) [I]	E	FRONT (Hydraulic Utility-Side) SIDE PANEL - Inside View
C	ROCKER ON/OFF SWITCH	F	CIRCUIT BREAKER, 20A with STUDS[II]

[I] For fuse replacement: 12V - order 25A fuse no. **264316**; 24V - order 15A fuse no. **265909**.

[II] For circuit breaker replacment: 12V - order 20A circuit breaker with studs no. **260034**; 24V - order 10A circuit breaker with studs no. **262214-001**.

Figure 6-18: Fuse and Circuit Breaker

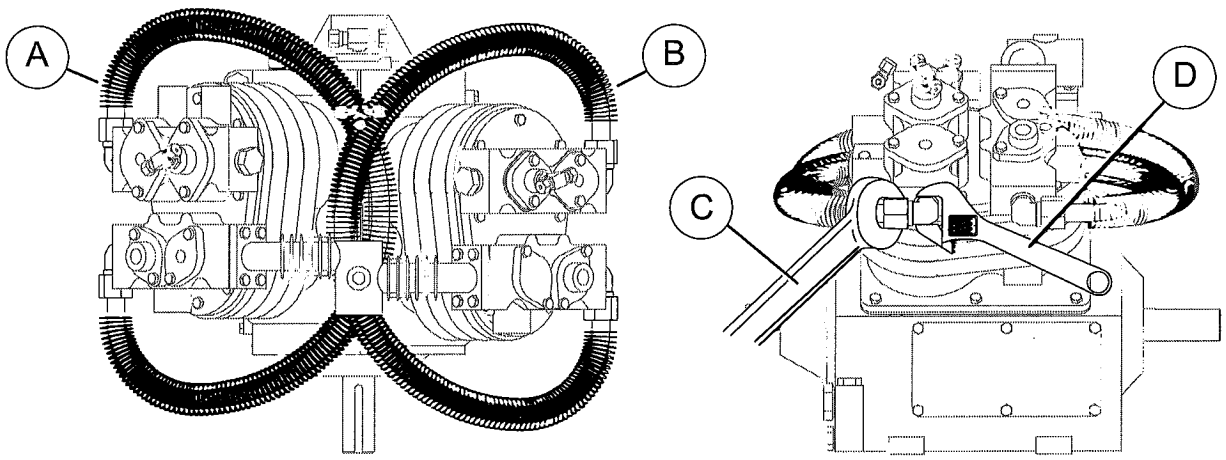
6.4.16 REPLACING THE INTERCOOLER FINNED TUBES

Refer to ***Figure 6-19***. The intercooler tubes (left and right, respectively) may need to be replaced if their fins become damaged. Damaged fins may hinder the intercooler tubes' ability to cool the compressed air. When replacing an intercooler tube:

- Never apply pressure to the finned-portions of the tubes, as they are fragile and subject to damage.
- If additional leverage is desired to loosen or tighten an intercooler tube connection, use and additional wrench **[D]**, placed on the connecting elbow, to stabilize the tube while loosening or fastening the tube end.
- When fitting a new intercooler tube into place, use minimal bending to alleviate stress on the fins.

6.4.17 PRESSURE (SAFETY) RELIEF VALVES

Refer to ***Figure 6-20***. Although the pressure (safety) relief valves have a reset ring at the cap, **DO NOT** test the valves by pulling on their reset rings. The



KEY	DESCRIPTION	KEY	DESCRIPTION
A	INTERCOOLER - RH[I]	C	TORQUING WRENCH - Use to loosen or tighten intercooler connection
B	INTERCOOLER - LH[I]	D	STABILIZING WRENCH - Position on elbow to relieve twisting pressure on intercooler during assembly/dis-assembly.

[I] For maintenance on intercoolers, order replacements coolers no. **266993-001** (for both left and right).

Figure 6-19: Intercooler Maintenance

pressure relief valves require no safety testing; should one prove faulty per indications given in the **Troubleshooting Guide** (**Section 7.2**), replace the valve.

NOTE
If valves vent *excessively* more than once, replace valve.

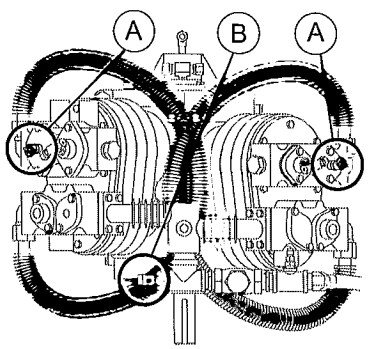
6.5 LONG TERM STORAGE

Parts can wear out over time, regardless of the degree of usage. If storing the RC40 unit for long periods of time, prepare the unit by doing the following:

- Depressurize the air tank and open the drain valve on the tank.
- Cover with a waterproof secured tarp or plastic sheet to prevent the accumulation of dust, but leave the bottom open for air circulation. The covering should allow for easy removal for in-storage maintenance.
- Whenever possible, store in a sheltered area to minimize exposure to the elements.
- While in storage, every two (2) to three (3) months rotate the compressor and motor by hand to prevent flat spots on the bearings that will lead to premature failure.

At the end of the storage period, follow the uncrating, general, and start-up procedures. If the unit has been stored for more than eighteen (18) months, the Vanair Service Department should be consulted before restarting the compressor.

NOTE
Vanair does not recommend outside storage.



KEY	DESCRIPTION
A	SAFETY RELIEF VALVE - low pressure[I]
B	SAFETY RELIEF VALVE - high pressure[II]

[I] For maintenance on high pressure valves, order replacement valve no. **266993-058** (qty of two).

[II] For maintenance on 200 psi-rated valves, order replacement valve no. **264232**.

Figure 6-20: Pressure (Safety) Relief Valves

SECTION 7: TROUBLESHOOTING

7.1 GENERAL INFORMATION

This troubleshooting guide has been compiled from operational and test data. It lists malfunctions/fault conditions, possible causes, and suggested corrective actions for the most common types of problems that may occur. However, **DO NOT** assume that these are the only problems that may occur. All available data concerning the trouble should be systematically analyzed before undertaking any repairs or component replacement procedures. While it is intended to be comprehensive, operators and maintainers can encounter malfunctions or problems not listed in this table.

A detailed visual inspection is worth performing for almost all problems, and may avoid unnecessary additional damage to the machine. The procedures which can be performed in the least amount of time and with the least amount of removal or disassembly of parts, should be performed first. Always remember to:

1. Check for loose wiring.
2. Check for damaged piping.
3. Check for parts damaged by heat or an electrical short circuit, usually noticeable by discoloration or a burnt odor.

Should the problem persist after making the recommended check, consult your nearest Vanair® representative or the Vanair Mfg., Inc. Service Department.

⚠ WARNING

DO NOT operate the compressor or any of its systems if there is a known unsafe condition. Disable the equipment by disconnecting it from its power source. Install a lock-out tag to identify the equipment as inoperable to other personnel.

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

Vanair Mfg., Inc.
10896 West 300 North
Michigan City, IN 46360
(219) 879-5100
(800) 526-8817
Service Fax: (219) 879-5335
Parts Fax: (219) 879-5340
Sales Fax: (219) 879-5800
www.vanair.com

7.2 TROUBLESHOOTING GUIDE

MALFUNCTION/FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Low air pressure (continued)	Blown head gasket	Replace (***Section 6.4.6***).
Abnormal pressure fluctuations	Air line leak	Inspect and replace hose or tighten connections.
Abnormal pressure fluctuations (continued)	Pressure switch incorrectly set	May need to be replaced or reset; consult Service Department for reset instructions.
	Pressure switch faulty	Replace; consult Service Department for reset instructions.
	Hydraulic supply problems	Refer to *Compressor runs slow* section of this table.
Pressure relief valve(s) open continuously	Defective air pressure gauge	Replace gauge (**Section 8.4**).
	Damaged, worn, or leaking valve	Replace valve (***Section 6.4.17***).
	Pressure switch set too high	May need to be replaced or reset; consult Service Department for reset instructions.
Compressor cycles too frequently	Air line leak	Inspect and replace hose or tighten connections.
	Pressure switch differential setting is too small	May need to be replaced or reset; consult Service Department for reset instructions.
	Pressure switch faulty	Replace; consult Service Department for reset instructions.
	Excessive moisture in receiver tank	Drain tank; check/drain on more frequent interval to prevent moisture build-up.
	Discharge air valve leaking	Replace.
	Pressure switch faulty (if it does not remove power from the solenoid valve)	Replace; consult Service Department for reset instructions.

Continued on next page

7.2 TROUBLESHOOTING GUIDE

MALFUNCTION/FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Compressor will not shut OFF or unload	Solenoid valve does not operate (no power to solenoid valve)	Replace solenoid valve (**Section 8.9 [12V]**, or **Section 8.11 [24V]**).
	Air line leak	Inspect and replace hose or tighten connections.
Oil in discharge air	Air intake restricted	Change air filters (***Section 6.4.4***).
	Compressor crankshaft overfilled	Drain to correct level.
	Compressor crankcase has oil with the wrong viscosity	Drain crankcase and refill with the correct oil (***Section 6.4.3***).
Oil in discharge air (continued)	Restricted crankcase breather	Clean or replace breather.
	Worn piston rings	Replace rings (***Section 6.4.8***).
	Piston rings incorrectly installed	Reinstall ensuring that they are installed according to the directions in this manual (***Section 6.4.8***).
	Worn or scored cylinder	Replace cylinder and rings (***Section 6.4.8***).
Knocking sound	Crankcase oil level low	Add oil to the correct level (***Section 6.4.3***).
	Soiled or defective check valve	Clean or replace.
	Worn piston ring	Replace piston and pin (***Section 6.4.8***).
	Worn main bearing	Replace bearings and/or shaft.
	Worn connecting rod	Replace connecting rod (***Section 6.4.8***).
	Excessive crackshaft end movement	Replace crank shaft bearings.
	Piston contacting piston plate	Inspect, repair, replace valves and piston (***Section 6.4.8***).

SECTION 8: ILLUSTRATED PARTS LIST

8.1 PARTS ORDERING PROCEDURE

Part orders should be placed through the distributor from whom the unit was purchased. If for any reason parts cannot be obtained in this manner, contact the factory directly at the address or phone numbers below.

When ordering parts always indicate the **Serial Number** of the machine package. This can be obtained form the Bill of Lading for the machine package, or from the compressor unit serial number plate. See ***Figure 8-1*** for location of machine package serial plate. Consult **Table 8A: Recommended Spare Parts List** on the next page for a listing of replacement parts.

Vanair Mfg., Inc.
10896 West 300 North
Michigan City, IN 46360
(219) 879-5100
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Service Fax: (219) 879-5335
Parts Fax: (219) 879-5340
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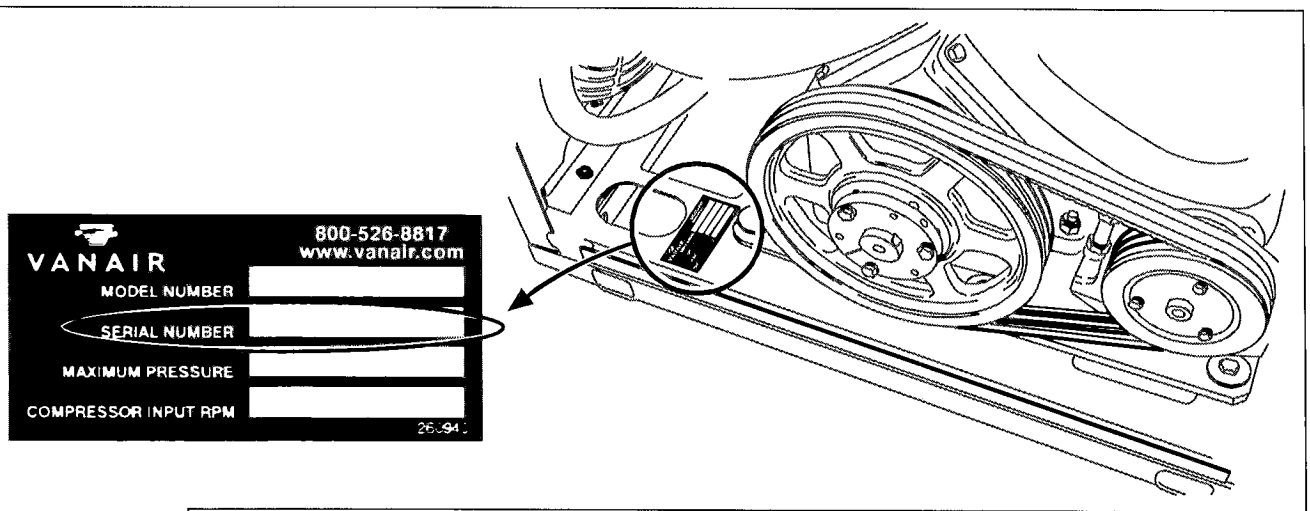


Figure 8-1: Machine Package Serial Number Plate Location

TABLE 8A: RECOMMENDED SPARE PARTS LIST

KEY NO.	PART NUMBER	DESCRIPTION	QTY	IDENTIFICATION REFERENCE	
				SECTION	KEY NO.
ROUTINE/SCHEDULED MAINTENANCE ITEMS					
1	KIT1090	Filter, Air Intake Receiver Compressor	2	Section 6.4.4, *Figure 6-5*	D
2	266727	Belt, Drive Cogged 3V x 450	3	Section 6.4.9, *Figure 6-12, etc.*	M
3	KIT1091	Oil, Reciprocating Compressor (see **NOTE** below)	1 gal.	Section 6, *Figure 6-4*	-
NON-ROUTINE/NON-SCHEDULED MAINTENANCE ITEMS					
4	KIT1086	Kit, Compressor Ring Repair	1	Section 6.4.8, *Figure 6-9*	various
5	KIT1087	Kit, Compressor Valve	1	Section 6.4.6, *Figure 6-7*	various
6	KIT1088	Kit, Compressor Gasket Replacement	1	Section 8.15	various
7	KIT1089	Kit, Compressor Overhaul Repair	1	Section 8.14	various
8	266993-089	Intercooler, Finned Tubed - Right	1	Section 6.4.16, *Figure 6-19*	A
9	266993-040	Intercooler, Finned Tubed - Left	1	Section 6.4.16, *Figure 6-19*	B
10	271936	Kit, Hydraulic Hose	1	Section 8.16	various
11	264316	Fuse, 25A Replacement	1	Section 6, *Figure 6-18*	B
12	265909	Fuse, 15A Replacement	1	Section 6, *Figure 6-18*	B
13	260034	Breaker, Circuit 20A with Studs (12VAC)	1	Section 6, *Figure 6-18*	C
14	262214-001	Breaker, Circuit 10A with studs (24VAC)	1	Section 6, *Figure 6-18*	C
15	266993-058	Valve, Relief (low pressure)	2	Section 6.4.17, *Figure 6-20*	A
16	264232	Valve, Relief (high pressure)		Section 6.4.17, *Figure 6-20*	B

NOTE: When ordering parts, always indicate the machine serial number, which can be found on the serial plate (see ***Figure 8-1***).

IMPORTANT

The above table listing contains items that require maintenance on a routine basis, and also those parts that may require maintenance over the course of the compressor package's performance schedule. Although this recommended list is pro-offered as a comprehensive guide to replacement parts, damage may occur to the machine beyond the scope of this listing.
Should any part of the compressor package that is not listed in Table 8A become damaged or inoperable, use the various sub-sections in Section 8 to best locate and identify the damaged part(s).

IMPORTANT

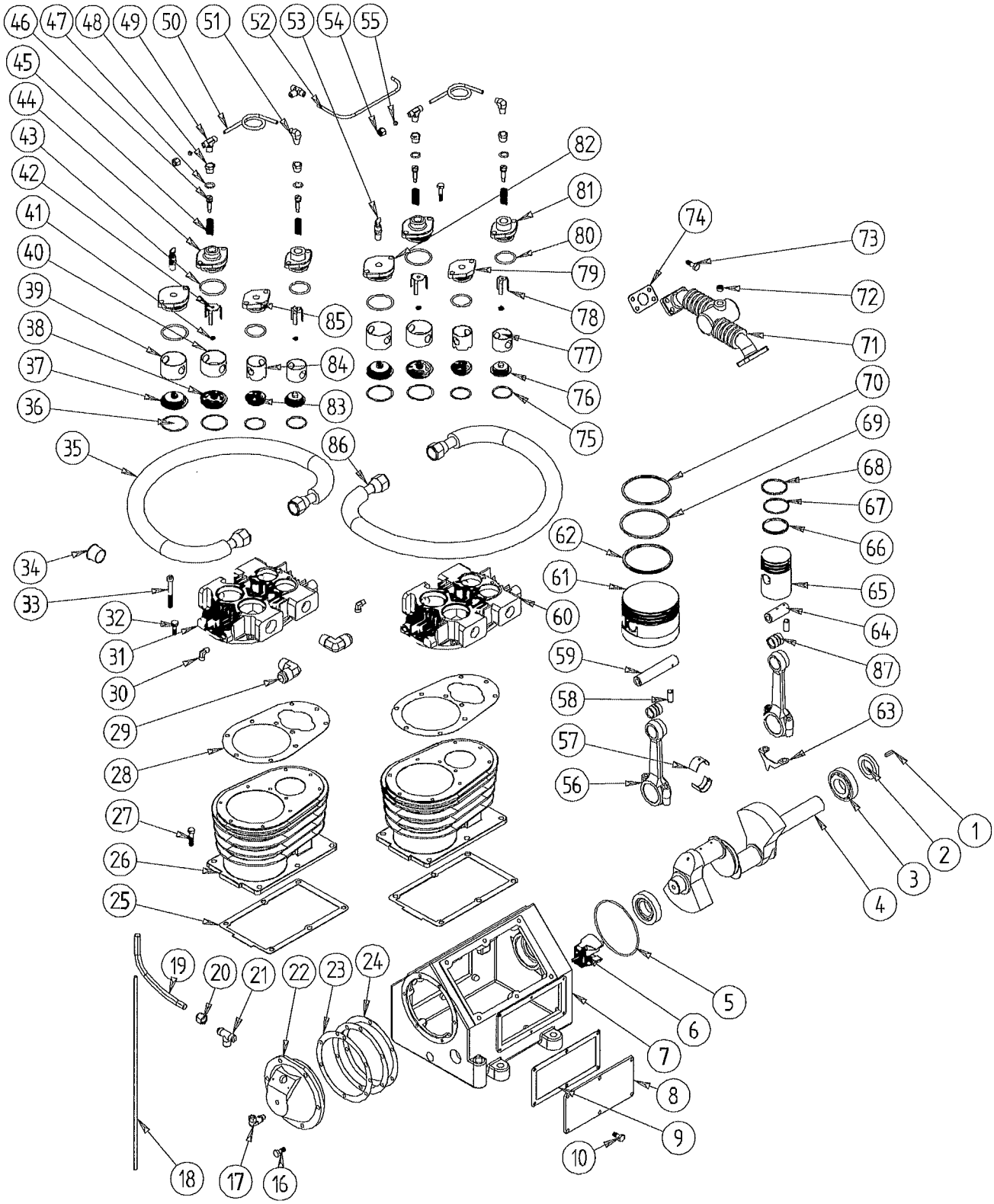
If additional spare parts are being stored for future use, ensure that they are stored in proper containers that allow for protection against contamination, and kept in a clean area of moderate temperature reading. For information on storing the machine package for periods of non-use, consult *Section 6.5, Long Term Storage*.

IMPORTANT

Use only approved oil and genuine Vanair® parts. Inspect damaged components before operation. Substituting non-approved oil will void the compressor warranty.

TABLE 8B: MAINTENANCE TRACKING LOG		
DATE	DESCRIPTION OF MAINTENANCE	PART(S) REPLACED

8.2 COMPRESSOR UNIT ASSEMBLY



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VANAIR. AIR POWER TO GO™

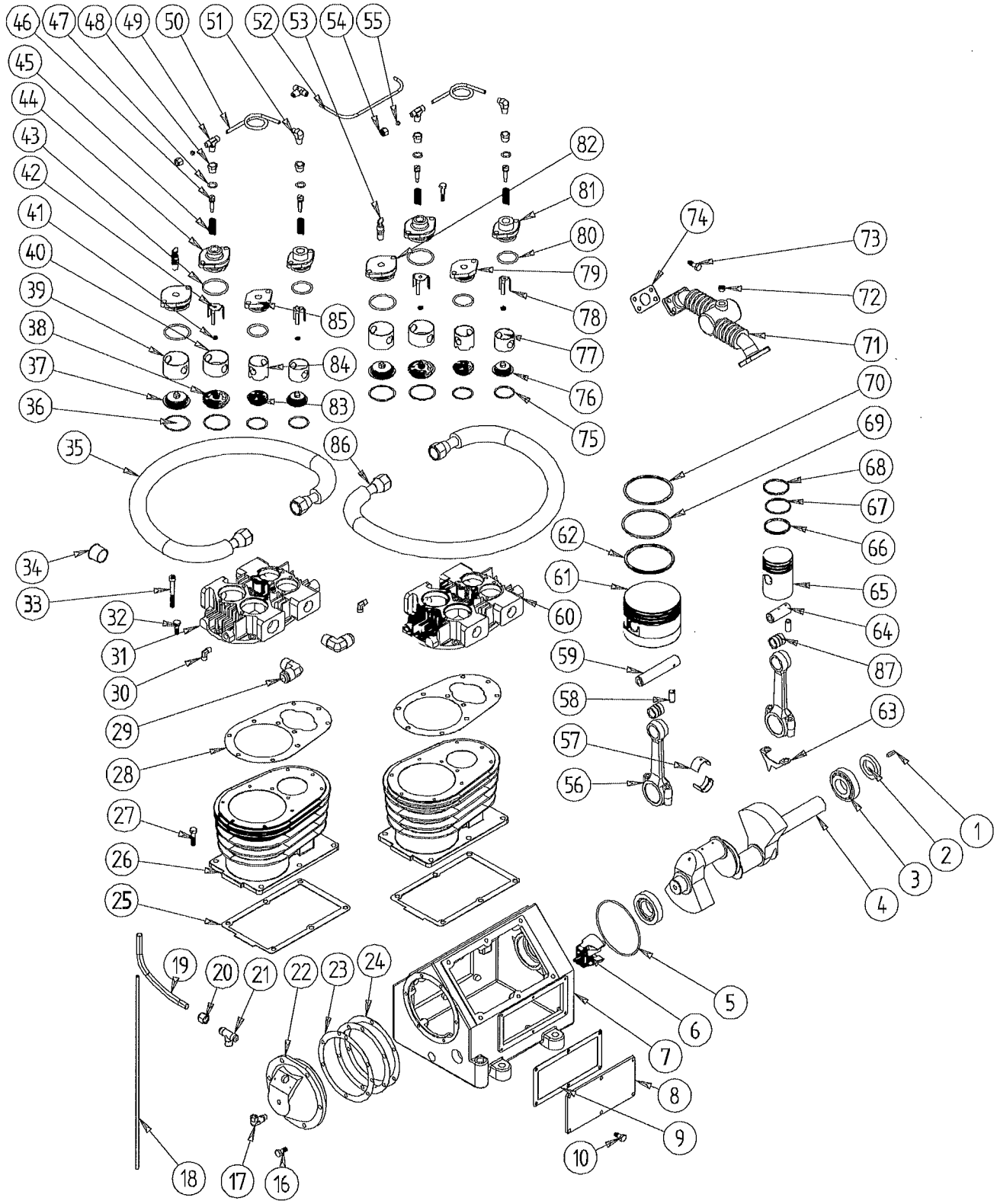
8.2 COMPRESSOR UNIT ASSEMBLY

ITEM	DESCRIPTION	PART NUMBER	QTY
1	KEY 8X8	266993-005	1
2	OIL SEAL	266993-006	1
3	BEARING	266993-007	2
4	CRANKSHAFT	266993-008	1
5	OIL FEEDER RING	266993-009	1
6	C.U. ASSY	266993-010	2
7	CRANKCASE	266993-011	1
8	SIDE COVER	266993-012	2
9	SIDE COVER GASKET	266993-013	2
10	SIDE COVER CAPSCREW	266993-014	12
16	END COVER CAPSCREW	266993-022	6
17	C.U. VALVE ASSY	266993-023	1
18	UNLOADING TUBE	266993-024	1
19	BREATHER TUBE	266993-025	2
20	TIGHTEN NUT-END COVER	266993-026	4
21	TEE, BREATHER CONNECTOR	266993-027	1
22	END COVER	266993-028	1
23	GASKET-END COVER	266993-029	1
24a	ADJUSTING GSKT-END CVR	266993-030	MANY
24b	ADJUSTING GSKT-END CVR	266993-031	MANY
25	GASKET-CRANKCASE	266993-032	2
26	CYLINDER	266993-033	2
27	SPINLOCK CAPSCREW	266993-034	12
28	GASKET, CYLINDER HEAD	266993-035	2
29	ELBOW, AFTERCOOLER	266993-003	4
30	ELBOW, AFTERCOOLER	266993-036	2
31	CYLINDER HEAD (LEFT)	266993-037	1
32	SOCKET HEAD CAPSCREW	266993-038	16
33	SOCKET HEAD CAPSCREW	266993-039	4
34	PLUG FOR PORT OF AIR FLTR	N/A	2

Continued on page 77

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.2 COMPRESSOR UNIT ASSEMBLY (CONTINUED)



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VANAIR. AIR POWER TO GO.

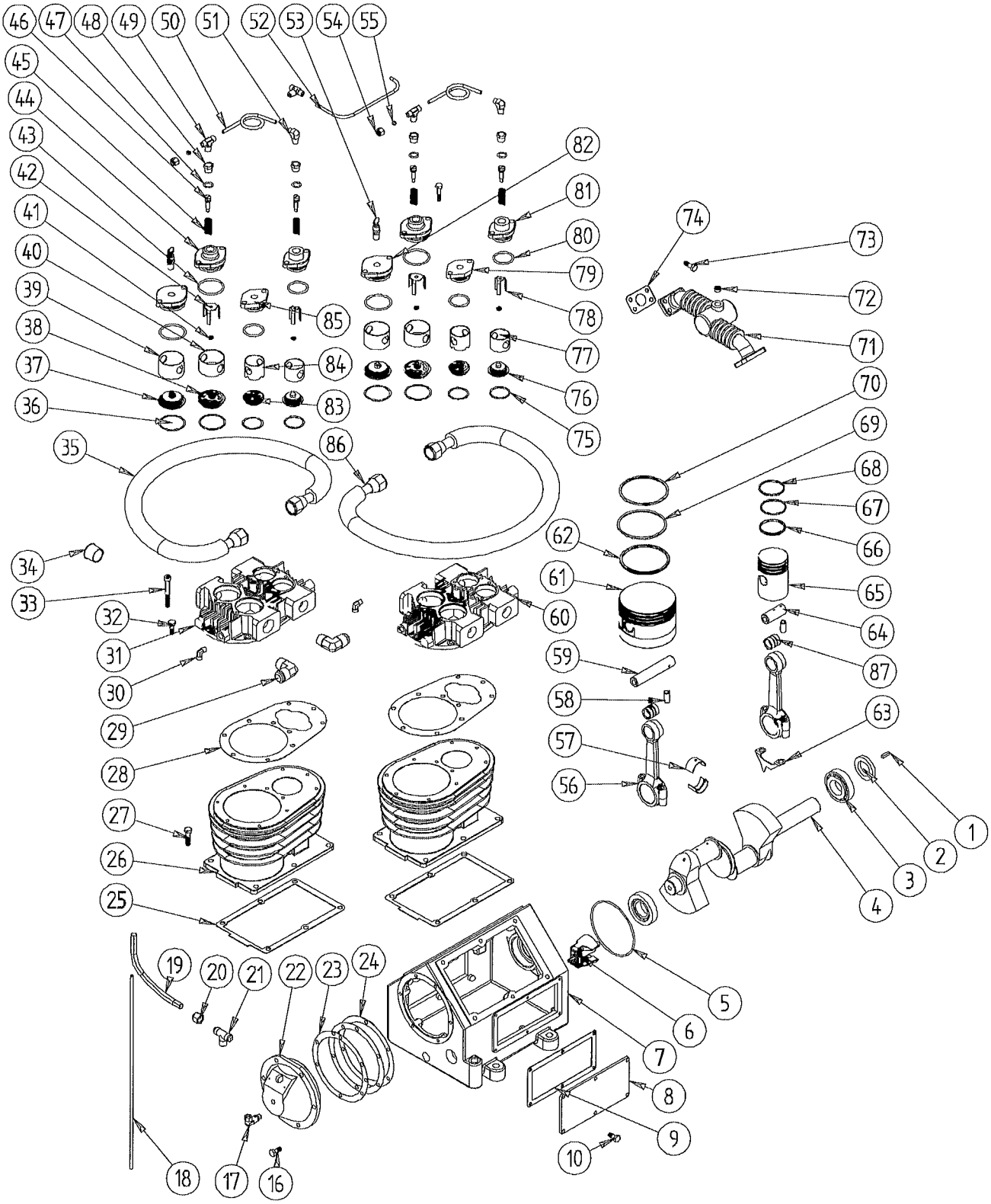
8.2 COMPRESSOR UNIT ASSEMBLY (CONTINUED)

ITEM	DESCRIPTION	PART NUMBER	QTY
35	FINNED TUBE INTERCOOLER (LEFT)	266993-040	1
36	COPPER GASKET L.P. VALVE	266993-041	4
37	DISCHARGE VALVE L.P.	266993-042	2
38	INLET VALVE L.P.	266993-043	2
39	CAGE, L.P. DISCHARGE	266993-044	2
40	CAGE, L.P. INLET	266993-045	2
41	LOCKNUT	266993-046	4
42	FINGER, L.P.	266993-047	2
43	O-RING L.P. COVER	266993-048	4
44	HOLD DOWN COVER L.P.	266993-049	2
45	UNLOADER SPRING INLET VLV	266993-050	4
46	PLUNGER INLET UNLOADER	266993-051	4
47	O-RING PLUNGER	266993-052	4
48	BUSHING 3/8'NPT x 1/4NPT	266993-053	4
49	TEE FITTING	266993-054	3
50	UNLOADER TUBE	266993-055	2
51	TUBE ELBOW	266993-056	2
52	UNLOADER TUBE	266993-057	1
53	SAFETY VALVE L.P. DISCHRG	266993-058	2
54	NUT	266993-059	9
55	COMPRESSOR RING	266993-060	9
56	CONNECTING ROD	266993-061	4
57	BEARING INSERT	266993-062	4 SETS
58	ROLL PIN	266993-063	4
59	WRIST PIN L.P.	266993-064	2
60	CYLINDER HEAD (RIGHT)	266993-065	1
61	PISTON L.P.	266993-066	2
62	OIL CONTROL RING L.P.	266933-067	2
63	OIL DIPPER	266993-068	2
64	WRIST PIN H.P.	266993-069	2

Continued on page 79

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.2 COMPRESSOR UNIT ASSEMBLY (CONTINUED)



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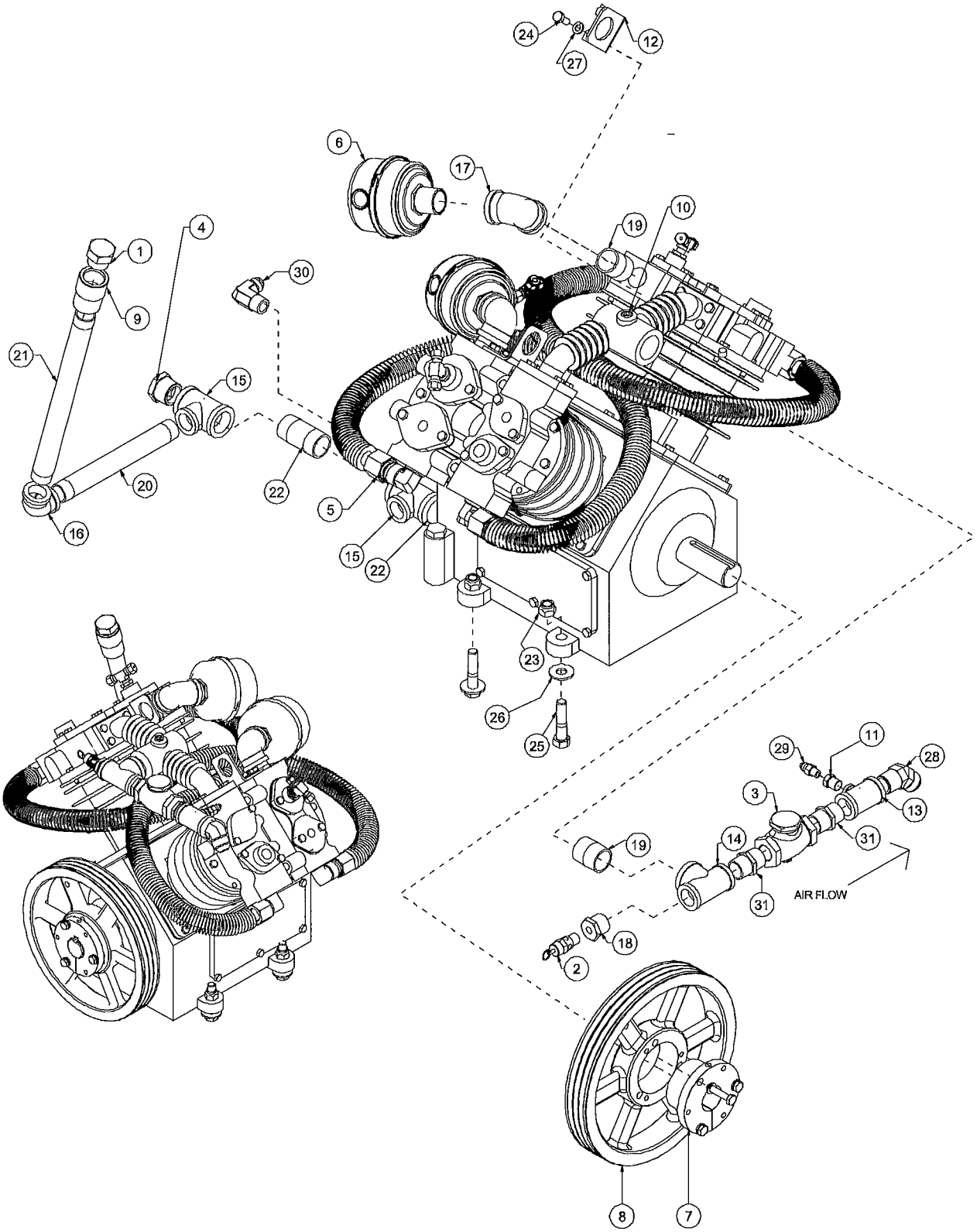
VANAIR. AIR POWER TO GO.

8.2 COMPRESSOR UNIT ASSEMBLY (CONTINUED)

ITEM	DESCRIPTION	PART NUMBER	QTY
65	PISTON H.P.	266993-070	2
66	OIL CONTROL RING H.P.	266993-071	2
67	BOTTOM COMPRESSION RING H.P.	266993-072	2
68	TOP COMPRESSION RING H.P.	266993-073	2
69	BOTTOM COMPRESSION RING L.P.	266993-074	2
70	TOP COMPRESSION RING L.P.	266993-075	2
71	AFTERCOOLER	266993-020	1
72	PLUG, PIPE 1/4 NPT HOLLOW HEX	267845	1
73	CAPSCREW, AFTERCOOLER	266993-077	8
74	GASKET, AFTERCOOLER	266993-021	2
75	COPPER GASKET	266993-078	4
76	VALVE ASSY H.P. INLET	266993-079	2
77	CAGE, H.P. INLET	266993-080	2
78	FINGER, H.P. INLET	266993-081	2
79	HOLD DOWN COVER H.P. DISCHARGE (LEFT)	266933-082	1
80	O-RING H.P. HOLD COVER	266993-083	4
81	HOLD DOWN, COVER H.P. INLET	266993-084	2
82	HOLD DOWN, COVER L.P. DISCHRG	266993-085	2
83	DISCHARGE VALVE H.P.	266993-086	2
84	CAGE, H.P. DISCHARGE	266993-087	2
85	HOLD DOWN COVER H.P. DISCHARGE (RIGHT)	266993-088	2
86	FINNED TUBE INTERCOOLER (RIGHT)	266993-089	1
87	NEEDLE BEARING	266993-090	4

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.3 COMPRESSOR AND FRAME ASSEMBLY



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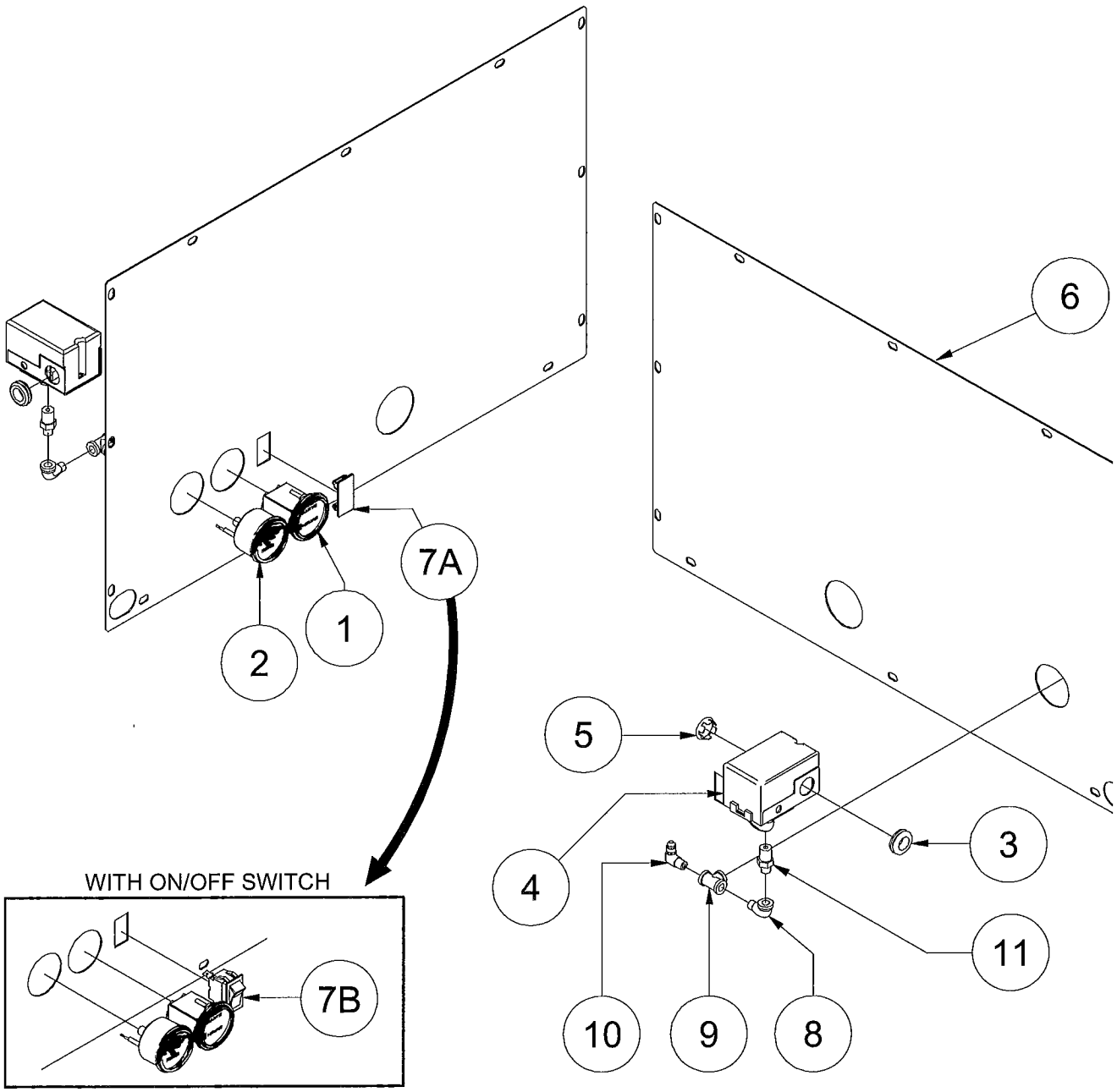
VANAIR. AIR POWER TO GO™

8.3 COMPRESSOR AND FRAME ASSEMBLY

ITEM	DESCRIPTION	PART NUMBER	QTY
1	PLUG, MALE O-RING 3/4"	263740	1
2	VALVE, RELIEF 200 PSI 1/4 NPT MALE	264232	1
3	VALVE, CHECK 3/4 BRASS	264246	1
4	GLASS, SIGHT 1" WITH BALL	266353	1
5	COMPRESSOR, RECIPROCATING 40CFM LP452	266993	1
6	FILTER, AIR INTAKE RECIP COMPR 25CFM	267273	2
7	BUSHING, SPLIT TAPER SKX1-3/8	267309	1
8	SHEAVE, DRIVEN 3-3V106	267311	1
9	ADAPTER, 3/4 NPT TO 1 1/16 SAE O-RING	267483	1
10	PLUG, PIPE SOCKET 1/4 NPT	267845	1
11	ORIFICE, .63 HEX x 1/8F x 1/4M x 0.031	268714	1
12	BRACKET, UNIT LIFTING RC 40	269379	2
13	TEE, PIPE GALV 3/4 x 3/4 x 1/4	802903-031	1
14	TEE, PIPE GALV 3/4 x 3/4 x 1	802903-034	1
15	TEE, PIE GALV 1 x 1 x 3/4	802904-043	2
16	ELBOW, PIPE GALV 90 DEG. 3/4	803515-030	1
17	ELBOW, PIPE 90 DEG. 1"	803515-040	2
18	BUSHING, PIPE GALV 3/4 x 1/4	804103-010	1
19	NIPPLE, PIPE XS 1" CLOSE	822216-000	3
20	NIPPLE, PIPE GALV 3/4 x 8.00" LG	823112-080	1
21	NIPPLE, PIPE GALV 3/4 x 12.00" LG	823112-120	1
22	NIPPLE, PIPE GALV 1 x 2 1/2	823116-025	2
23	NUT, HEX LOCKING 1/2-13 GR 8	825508-262	4
24	CAPSCREW, HEX GR 8 5/16-18 x 3/4	829405-075	4
25	CAPSCREW, HEX GR8 1/2-13 x 2.25 LG	829408-225	4
26	WASHER, FLAT 1/2 (7/16)	838208-112	4
27	WASHER, LOCK 5/16	838505-078	4
28	ELBOW, 45 DEG. 3/4 MPT x #12 MJIC	860012-075	1
29	CONNECTOR, 37FL/MPT #04 x 1/8	860104-012	1
30	ELBOW, 37FL/90M #08 x 1/2	860208-050	1
31	NIPPLE, PIPE HEX 3/4 x 3/4	860412-075	2

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.4 INSTRUMENT PANEL - WITH/WITHOUT ON/OFF SWITCH



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8.4 INSTRUMENT PANEL - WITH/WITHOUT ON/OFF SWITCH

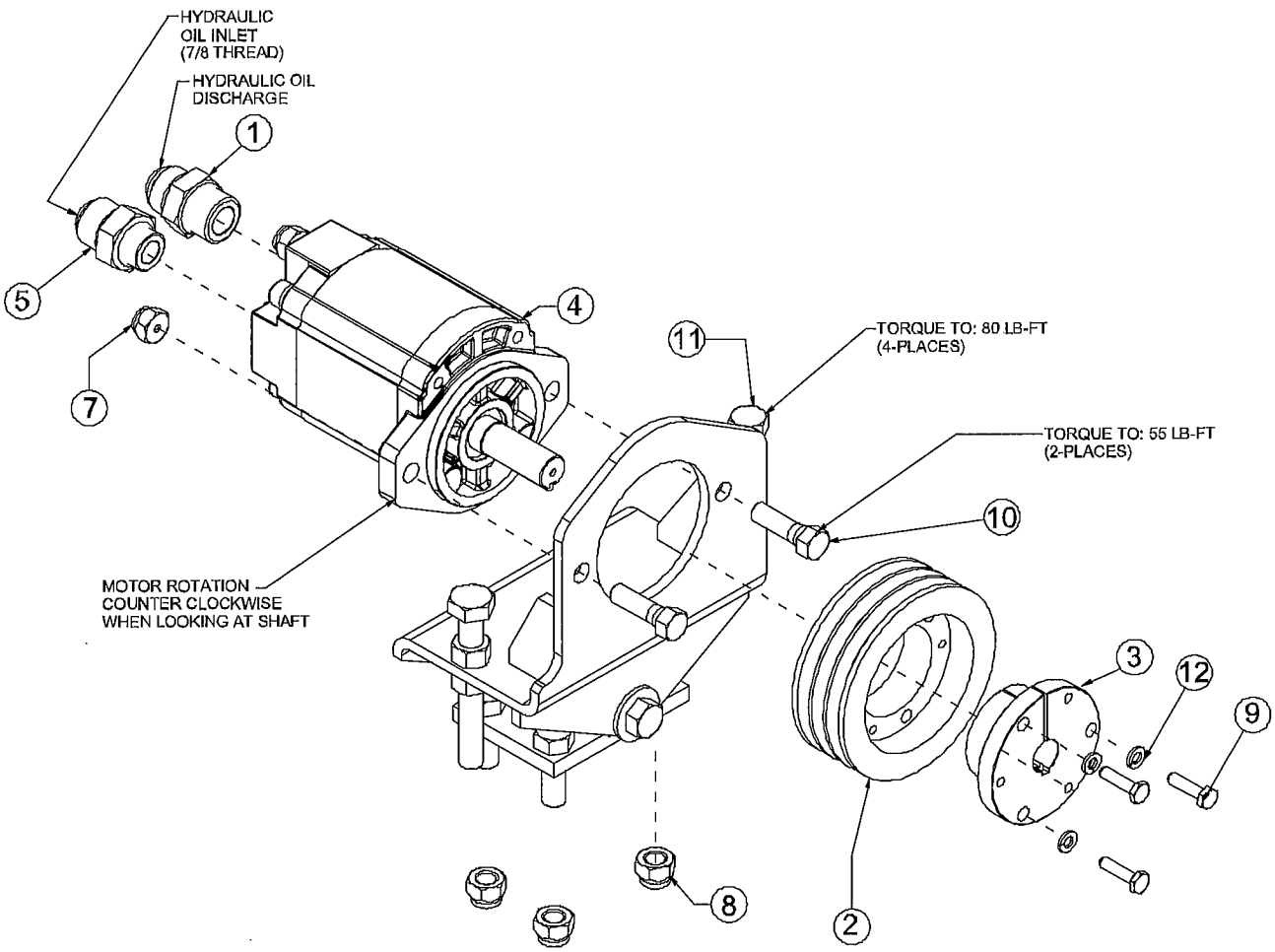
ITEM	DESCRIPTION	PART NUMBER	QTY
1	GAUGE, HOUR METER	040035	1
2	GAUGE, PRESSURE	261974	1
3	GROMMET, RUBBER 5/8 x 7/8 x 1/8	262905	1
4	SWITCH, PRESSURE ADJUSTABLE	263850	1
5	SEAL, KNOCKOUT 1/2"	264443	1
6	PANEL, CANOPY L.H. RC-40 PLAIN	268268	1
7A	COVER, ROCKER SWITCH[I]	269640	1
7B	SWITCH, ROCKER SPST RED PILOT[II]	264712	1
8	ELBOW, PIPE STREET 1/8	801115-005	1
9	TEE, PIPE GALV 1/8	804415-005	1
10	ELBOW, 37FL/90M #04 x 1/8	860204-012	1
11	NIPPLE, HEX RED 1/4 x 1/8	861604-012	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

[I] Used for machine built without ON/OFF rocker switch on panel.

[II] Used for machine built with ON/OFF rocker switch on panel.

8.5 MOTOR AND DRIVE PARTS



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AIR POWER TO GO.

8.5 MOTOR AND DRIVE PARTS

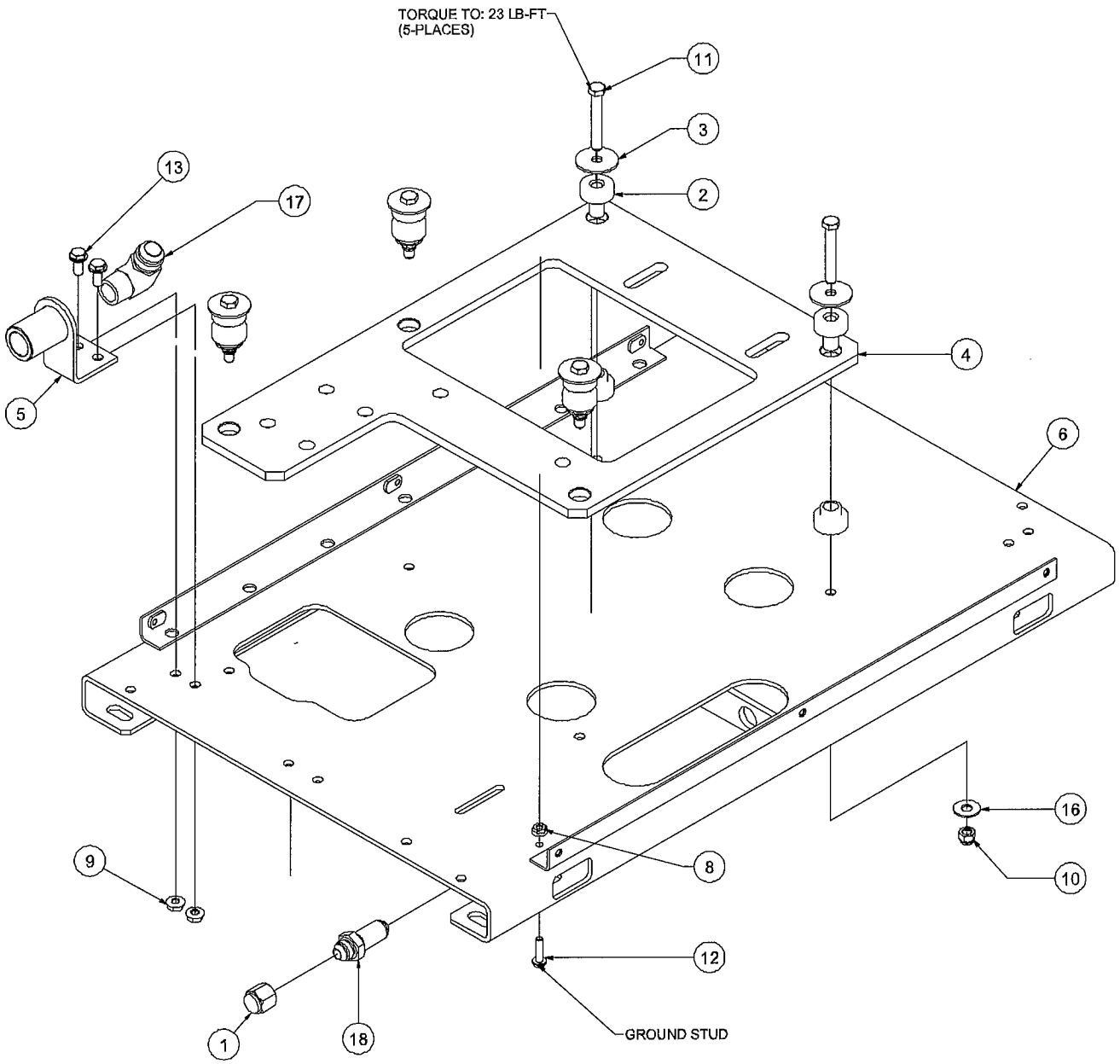
ITEM	DESCRIPTION	PART NUMBER	QTY
1	CONNECTOR, O-RING 3/4 x 3/4 JIC	260387-112	1
2	SHEAVE, 3 GROOVE 4.50 OD	264716	1
3	BUSHING, SPLIT TAPER SDS 3/4 0.75	267308	1
4	MTR, HDRLC EXTND SHAFT PLM 20.20	271075	1
5	CONECTR, 7/8-14 SAE O RING x 3/4 JIC 37 DEG	271134	1
6	BRACKET, MOTOR MNT	271797	1
7	NUT, HEX LOCKING 7/16-14	825507-223	2
8	NUT, HEX LOCKING 1/2-13 GR 8	825508-262	4
9	CAPSCREW, HEX RG5 1/4-20 x 1.00 LG	829104-100	3
10	CAPSCREW, HEX GR8 7/16-14 x 1.5	829407-150	2
11	CAPSCREW, HEX GR8 1/2-13 x 1.50 LG	829408-150	4
12	WASHER, LOCK 1/4	838504-062	3 [II]

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

[I] Motor shaft seal replacement requires precise tooling for set up. If the motor shaft seal needs to be replaced, please contact the Vanair Service Department.

[II] With bushing

8.6 FRAME AND PARTS



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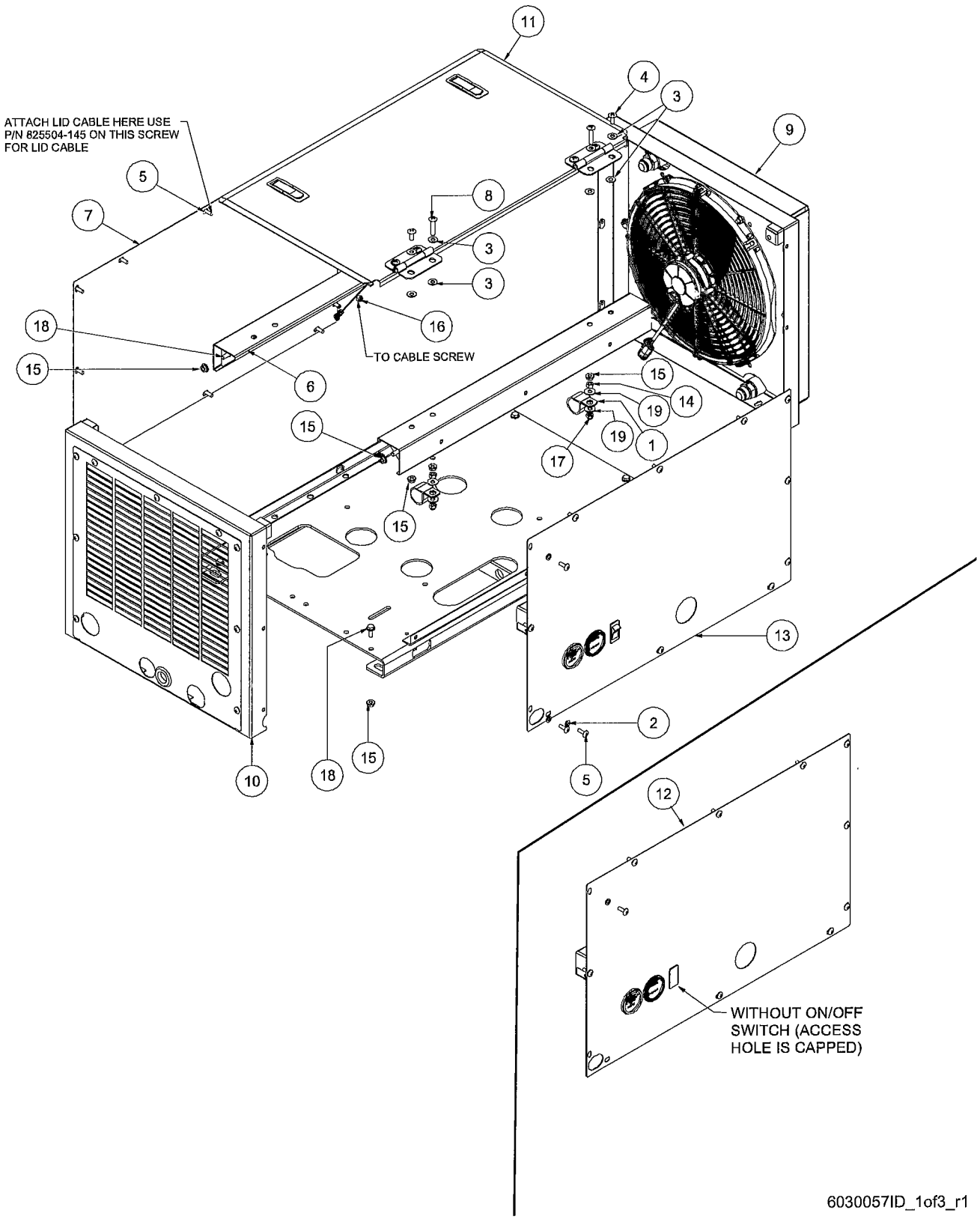
8.6 FRAME AND PARTS

ITEM	DESCRIPTION	PART NUMBER	QTY
1	CAP, FEMALE JIC 3/4-16 #8	264322-003	1
2	MOUNT, RUBBER 130# AXIAL (GREEN)	265330	5
3	WASHER, SNUBBING RUBBER MOUNT	265332	5
4	BASE, COMPR UNIT MNT RECIP RC40	267531	1
5	BRACKET, SERV AIR ASSY RC40	267980	1
6	FRAME, RC40 MULTI MNT PATTERN	271749	1
8	NUT, HEX FLANGE 1/4-20	825304-236	1
9	NUT, HEX FLANGE 5/16-18	825305-283	2
10	NUT, HEX LOCKING 3/8-16 GR 8	825506-198	5
11	CAPSCREW, HEX GR5 3/8-16 x 2.5	829106-250	5
12	SCREW, SER WASH 1/4-20 x 1	829704-100	1
13	SCREW, SER WAS 5/16-18 x 3/4	829705-075	2
15	WASHER, LOCK INTERNAL 3/4"	837412-005	1
16	WASHER, FLAT 3/8 (5/16)	838206-071	5
17	ELBOW, 37FL/90M #12 x 3/4	860212-075	1
18	BULKHEAD, MJIC x MJIC #8	862108-050	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.7 CANOPY AND PARTS (PART 1 OF 3)



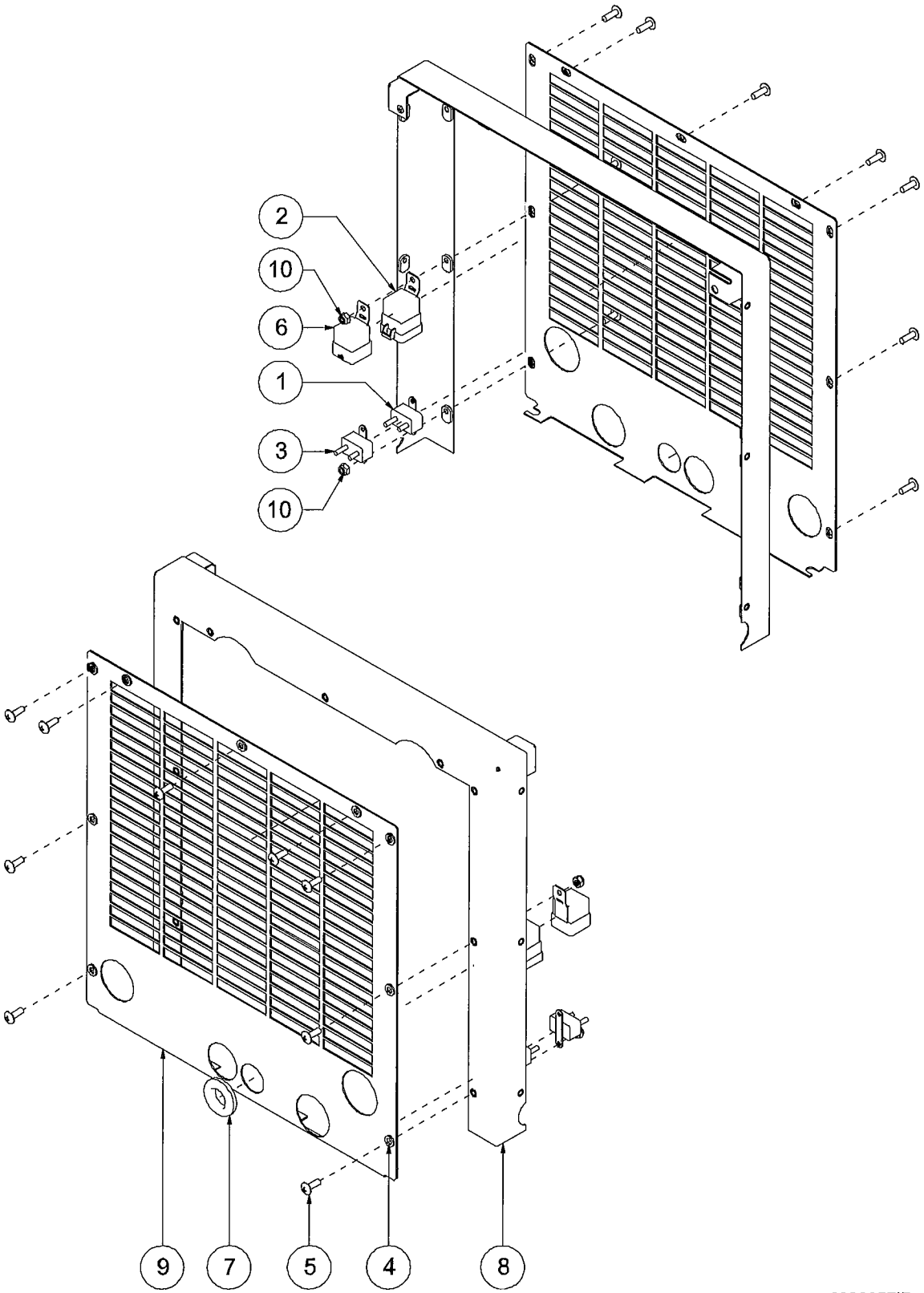
8.7 CANOPY AND PARTS (PART 1 OF 3)

ITEM	DESCRIPTION	PART NUMBER	QTY
1	CLAMP, HOSE SUPPORT 1.25 ID	261546	2
2	WASHER, NYLON FLAT 1/4	262704	24
3	WASHER, NYLON 5/16-18	262943	8
4	SCREW, TRUSS HD 5/16-18x3/4 SS	262945	2
5	SCREW, TRUSS HD 1/4-20 x 3/4	262953	24
6	SUPPORT, CNPY LONG SIDE RC40	268049	2
7	PANEL, CANOPY RC-40 R.H. PLAIN	268269	1
8	SCREW, TRUSS HD 5/16-18 x 1 1/2 SS	271962	2
9	ID, COOLING HYD OIL SYS RC40	6020049ID	1
10	ID, PANEL FRNT ASSY RC40	6030057ID-003	1
11	ID, ROOF PANEL ASSY RC40	6030057ID-004	1
12	ID, INSTRUMENT PANEL RC40 LESS ON/OFF [I]	6040045ID	1
13	ID, INSTRUMENT PANEL RC40 WITH ON/OFF [I]	6040046ID	1
14	NUT, HEX 5/16-18	825205-273	2
15	NUT, HEX FLANGE 5/16-18	825305-283	4
16	NUT, HEX LOCKING 1/4-20	825504-145	1
17	NUT, HEX LOCKING 5/16-18	825505-166	2
18	SCREW, SER WASH 5/16-18 x 3/4	829705-075	8
19	WASHER, FLAT 5/16	838205-071	4

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

[I] Panel used depends on specific machine feature—check machine to determine proper panel assembly part number (with or without the ON/OFF switch, as per key #'s 12 and 13 above).

8.7 CANOPY AND PARTS (PART 2 OF 3)



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8.7 CANOPY AND PARTS (PART 2 OF 3)

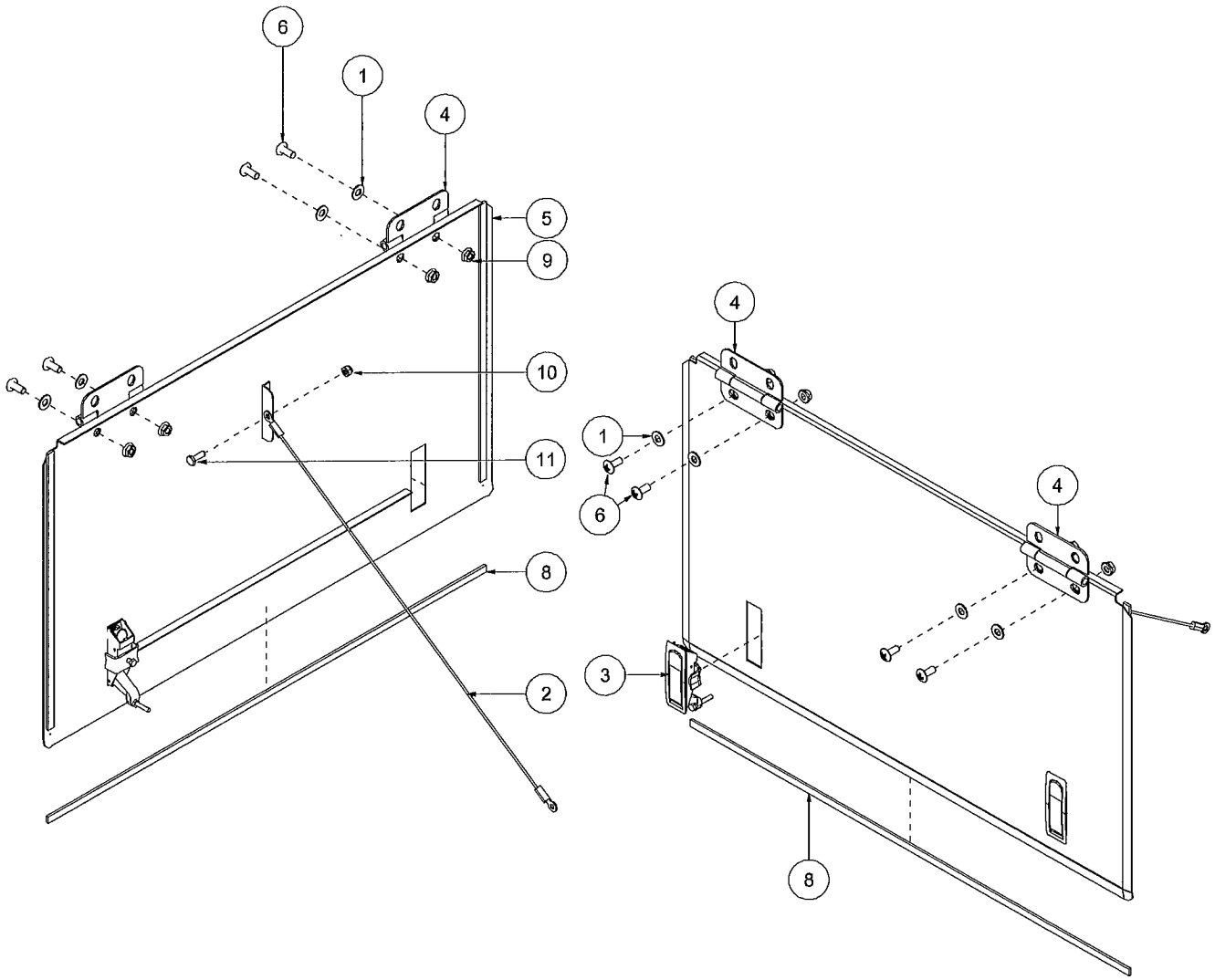
ITEM	DESCRIPTION	PART NUMBER	QTY
1	BREAKER, CIRCUIT w/ STUDS 20A	260034	1 [I]
2	RELAY, NO/NC WEATHERPROOF w/RESISTOR	260246	1 [I]
3	BREAKER, CIRCUIT w/STUDS 10A 24V	262214-001	1 [II]
4	WASHER, NYLON FLAT 1/4	262704	9
5	SCREW, TRUSS HD 1/4-20 UNC x 34 LG S.S.	262953	9
6	RELAY, NC/NO WEATHERPROOF 24V	265182	1 [II]
7	GROMMET, RUBBER 1 x 1 3/32 x 3/32	265879	1
8	SUPPORT, CANOPY SQUARE RC40 FRONT & REAR	268048	1
9	PANEL, FRONT END RC40 12 GPM	272269	1
10	NUT, HEX LOCKING 1/4-20	825504-145	2

[I] Use for 12V

[II] Use for 24V

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.7 CANOPY AND PARTS (PART 3 OF 3)



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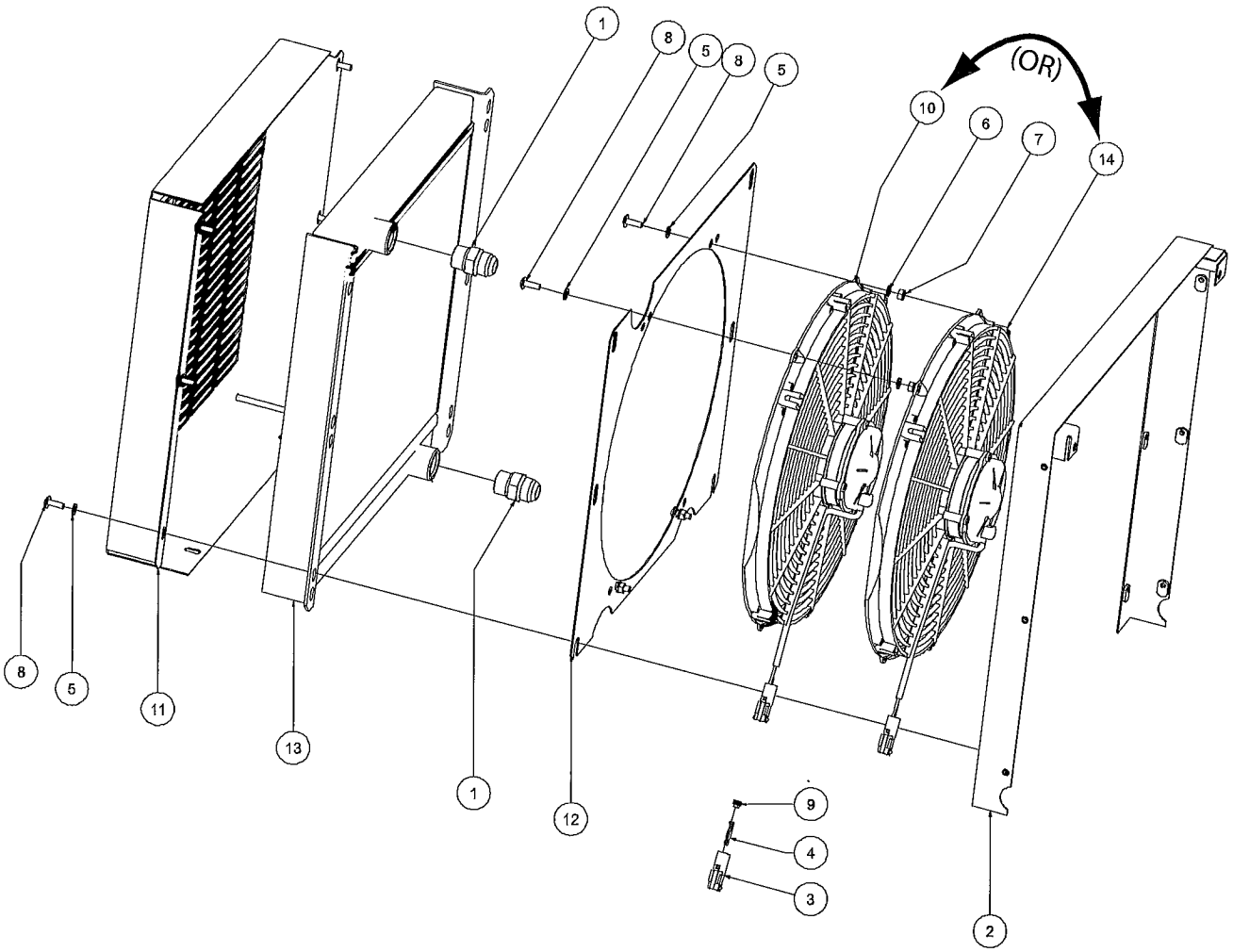
8.7 CANOPY AND PARTS (PART 3 OF 3)

ITEM	DESCRIPTION	PART NUMBER	QTY
1	WASHER, NYLON 5/16-18	262943	4
2	CABLE, ASSEMBLY CANOPY	262997	1
3	LATCH, SENTRY PANEL	267124	2
4	HINGE, RECP COMPRS ROOF PNL	267217	2
5	PANEL, ROOF RC 40 NARROW	267867	1
6	SCREW, TRUSS HD 5/16-18 x 3/4 SS	262945	4
7	TAPE, VINYL FOAM 1/8 x 3/8 CUT TO LENGTH	267940A	2
8	TAPE, VINYL FOAM 1/8 x 3/8 CUT TO LENGTH	267940B	1
9	NUT, HEX FLANGE 5/16-18	825305-283	4
10	NUT, HEX LOCKING 1/4-20	825504-145	1
11	CAPSCREW, HEX GR5 1/4-20 x 0.75	829104-075	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

I Panel used depends on specific machine feature—check machine to determine proper panel assembly part number (with or without the ON/OFF switch, as per key #'s 12 and 13 above).

8.8 OIL COOLING SYSTEM (12 AND 24V)



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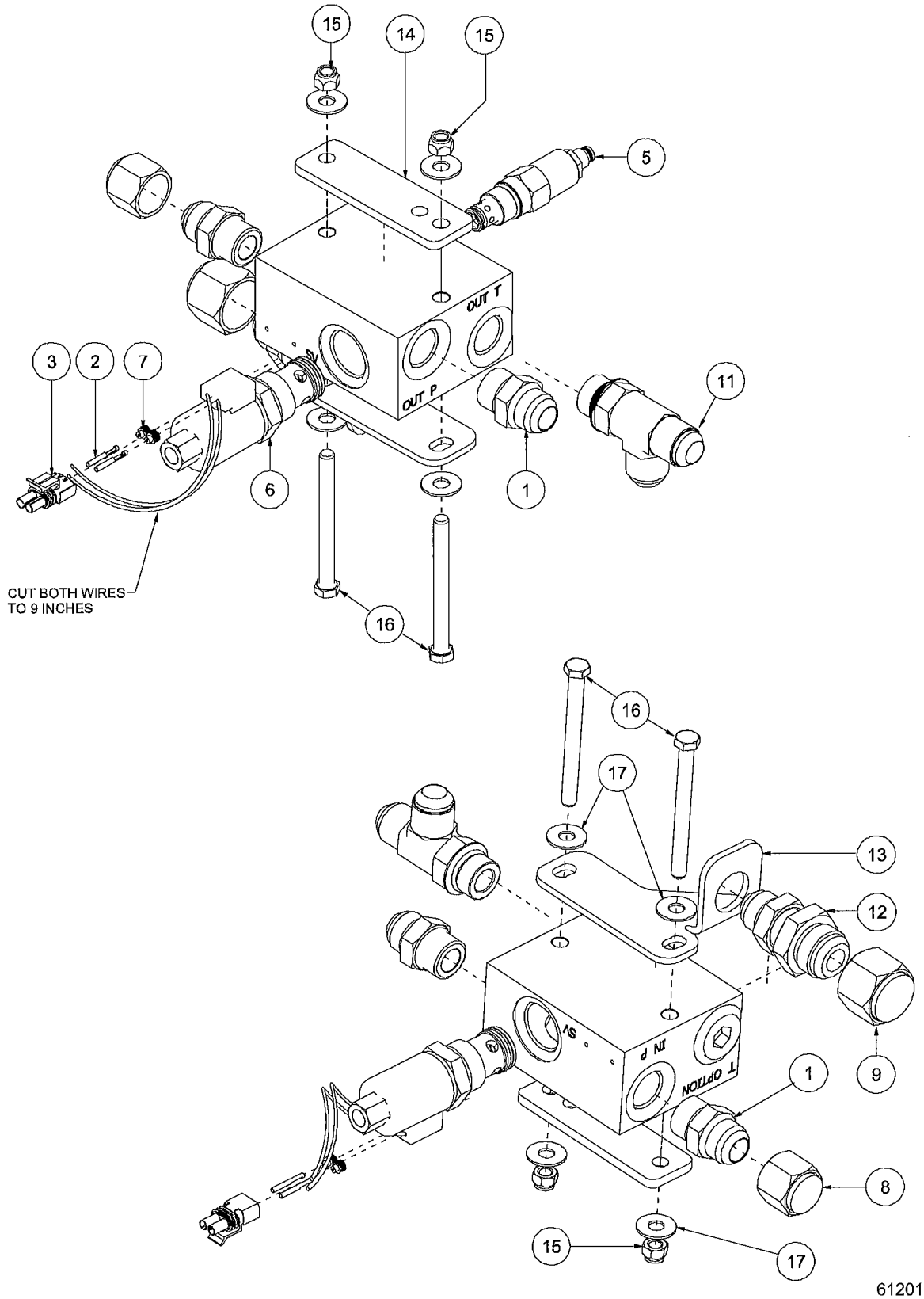
8.8 OIL COOLING SYSTEM (12 AND 24V)

ITEM	DESCRIPTION	PART NUMBER	QTY
1	CONNECTOR, O-RING 3/4 x 3/4 JIC	260387-112	2
2	SUPPORT, CANOPY SQRE RC40 FRONT & REAR	268048	1
3	CONNECTOR, MALE	262425-002	1
4	TERMINAL, MALE	262426	2
5	WASHER, NYLON FLAT 1/4	262704	10
6	WASHER, LOCK 1/4 STAINLESS	262951	4
7	NUT, HEX 1/4-20 STAINLESS	262952	4
8	SCREW, TRUSS HD 1/4-20x3/4 SS	262953	10
9	SEAL, CABLE GREEN 16-14 GA	264183	2
10	FAN AND MOTOR ASSY. PUSHER 12V[I]	264856-008	1
11	PANEL, CANOPY FAN SIDE RC40-2	269384	1
12	PANEL, FAN SHROUD RC40 - 2	269385	1
13	COOLER, OIL RC40 2.00 CORE SINGLE PASS	269563	1
14	FAN & MOTOR ASSY., 125/185 24V[I]	265057	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

[I] Use #10 for 12V; #14 for 24V.

8.9 CONTROL MANIFOLD FOR 12V (OPEN LOOP)



8.9 CONTROL MANIFOLD FOR 12V (OPEN LOOP)

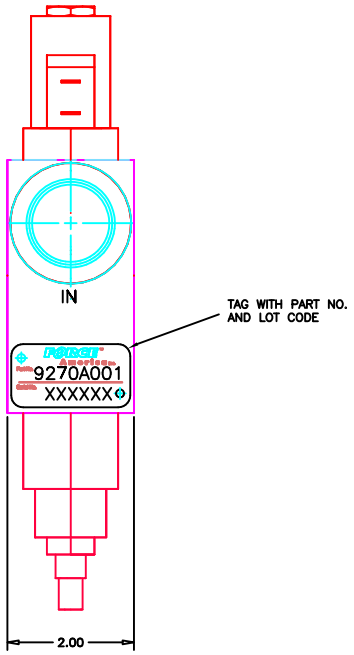
ITEM	DESCRIPTION	PART NUMBER	QTY
1	CONNECTOR, O-RING 3/4 x 3/4 JIC	260387-112	2
2	TERMINAL, FEMALE	262425	2
3	CONNECTOR, FEMALE	262425-001	1
4	MANIFOLD, HYDRAULIC SOLENOID	263878	1
5	VALVE, PRESSURE RELIEF	263878-003	1
6	VALVE, SOLENOID WITH 12V. COIL	263878-004	1
7	SEAL, CABLE GREEN 16-14 GA	264183	2
8	CAP, FEMALE JIC 1 1/16-12 #12	264322-005	1
9	CAP, FEMALE JIC 1 5/16-12 #16	264322-006	1
10	PLUG, SAE O-RING HOLLOW HEX #12	268081-008	1
11	TEE, 37 MJIC, 37MJIC. O-RING RUN 3/4	268591	1
12	BULKHEAD, 1 1/16 - 12UNF x 1 5/16 - UNF	269751	1
13	SUPPORT, OIL RETURN HOSE RC40	271122	1
14	FLAT, SHIM HYDRAULIC MANIFOLD	271836	1
15	NUT, HEX LOCKING 3/8-16	825506-198	2
16	CAPSCREW, HEX GR5 3/8-16X 4	829106-400	2
17	WASHER, FLAT 3/8	838206-071	4

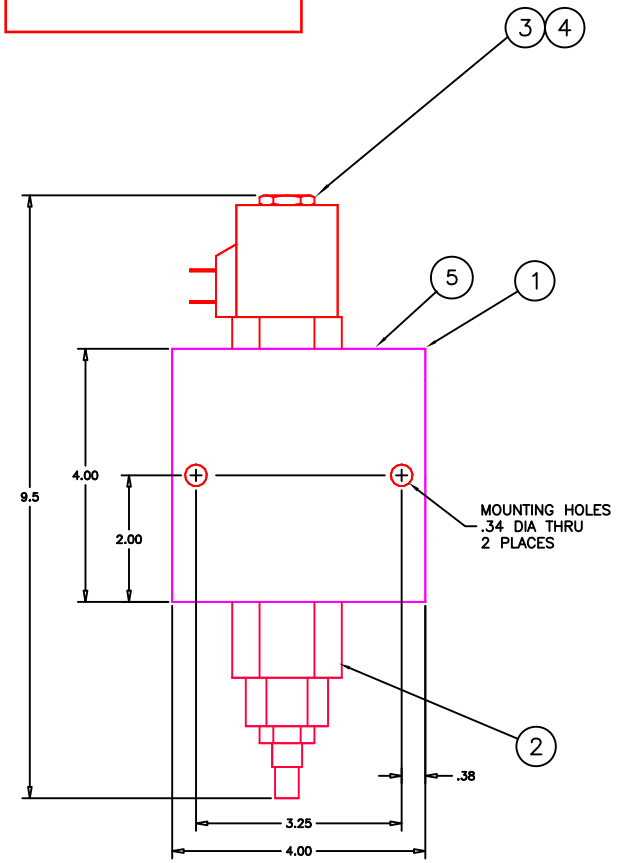
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

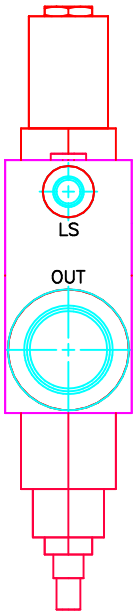
BILL OF MATERIALS			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	B1082001	BODY, ALUM., GRAY ANODIZE
2	1	2616	CARTRIDGE, FLOW REGULATOR
3	1	SV1-16-C-0-00	NORMALLY CLOSED SOLENOID VALVE
4	1	300AA00089A	COIL, 12 VDC DOUBLE SPADE
5	1	C10333-4	PLUG, SAE -4, 6408-HHP-04

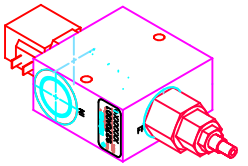
REVISIONS			
REV	ECO NUMBER	DATE	BY
A	10941	10/25/11	DPO
-			

014701 flow control









NOTES:

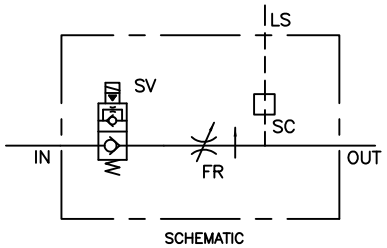
1. PORT SIZE
   SAE -04: LS
   SAE -16: IN, OUT

2. FLOW ADJUSTMENT RANGE: 2 TO 30 GPM

3. COIL VOLTAGE: 12 VDC

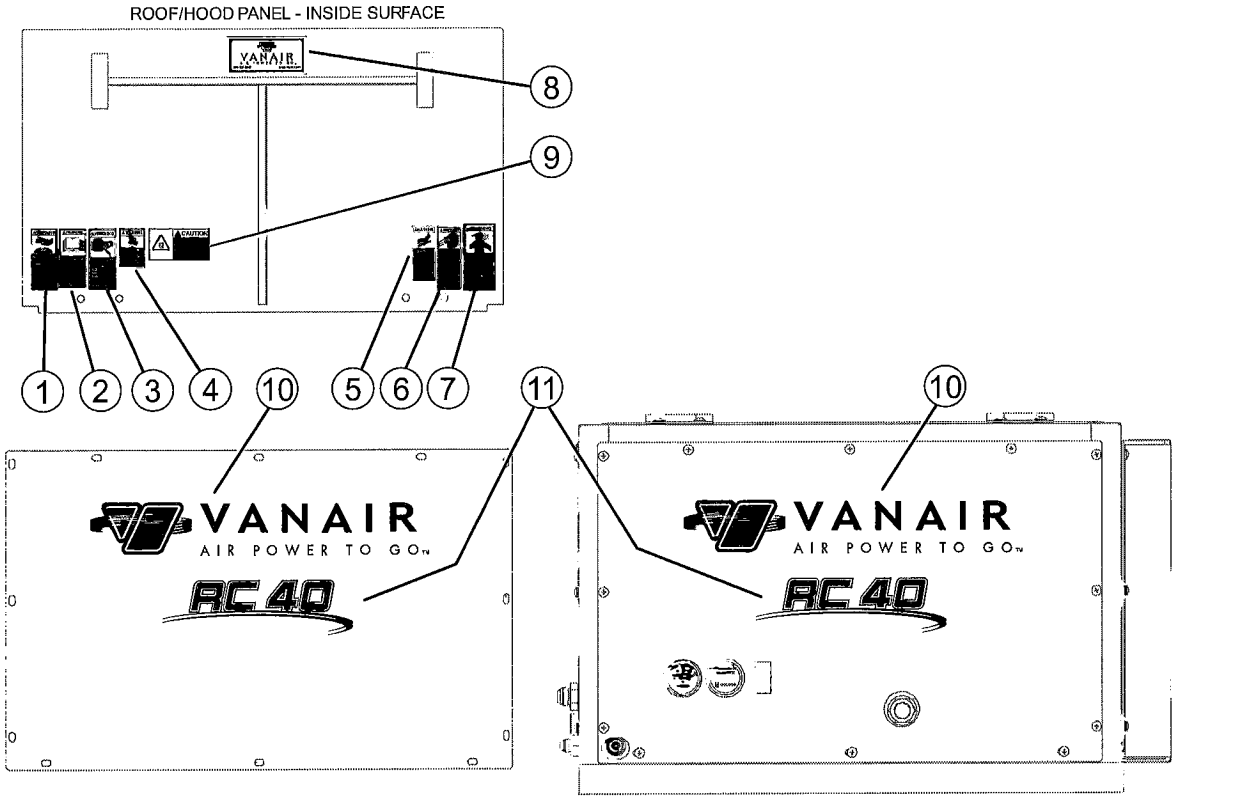
4. TORQUE SPECIFICATION
   -16 CARTRIDGE: 60 TO 65 FT LBS
   -16 COIL NUT: 4 TO 6 FT LBS

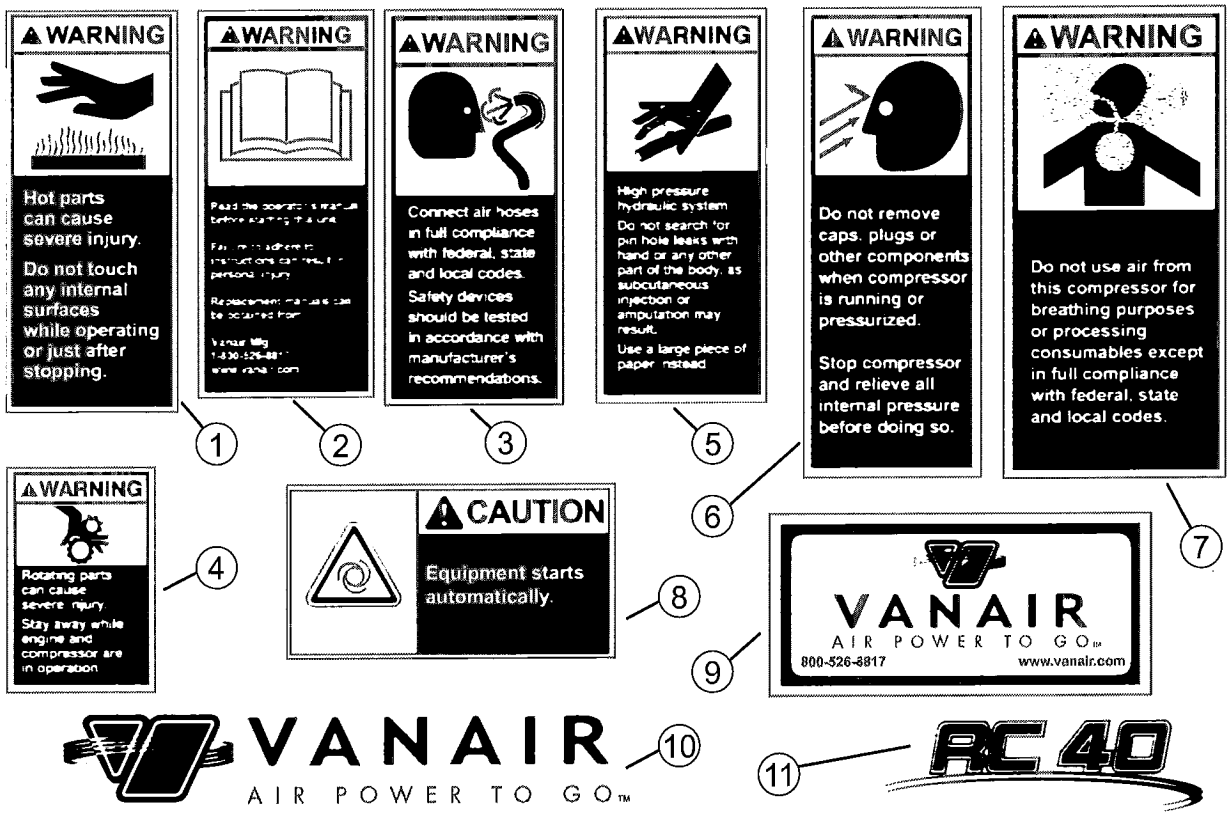
5. REF. NO.: 014701



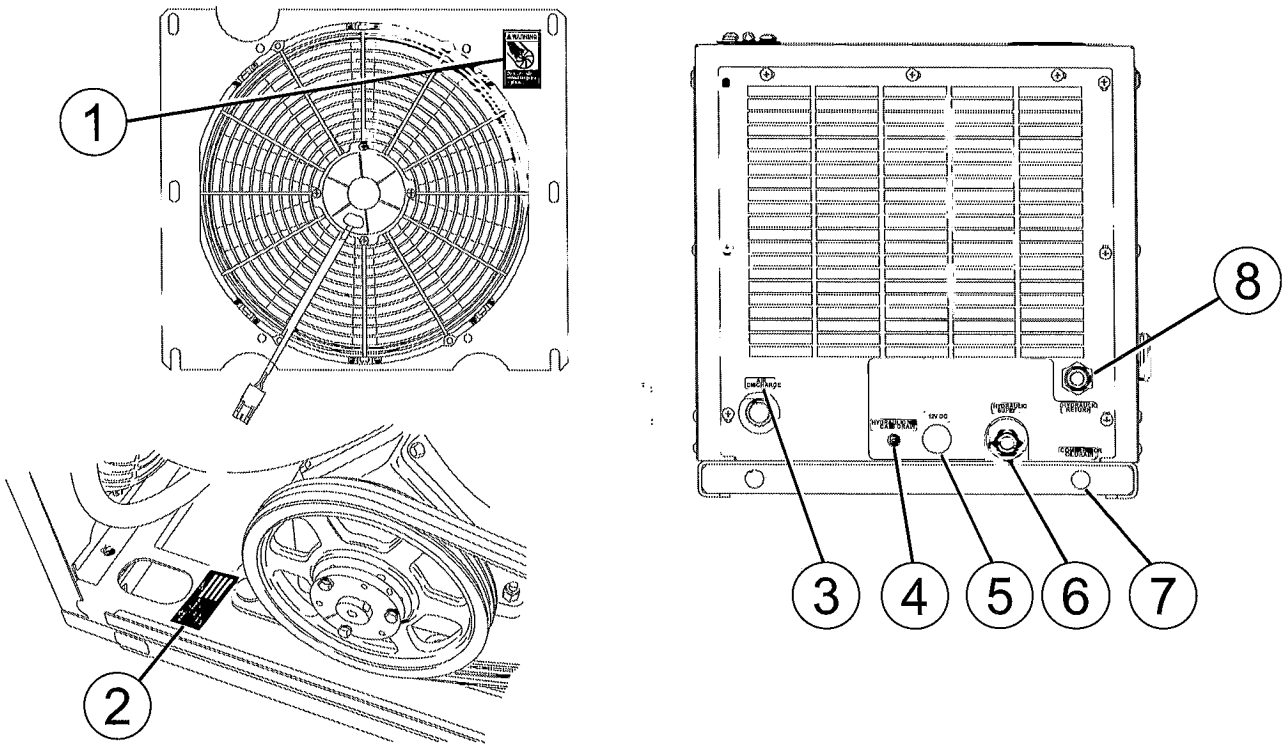
SCHEMATIC

8.13 DECAL LOCATIONS (PART 1 OF 2)





8.13 DECAL LOCATIONS (PART 2 OF 2)



3 — AIR DISCHARGE

4 — HYDRAULIC MOTOR CASE DRAIN

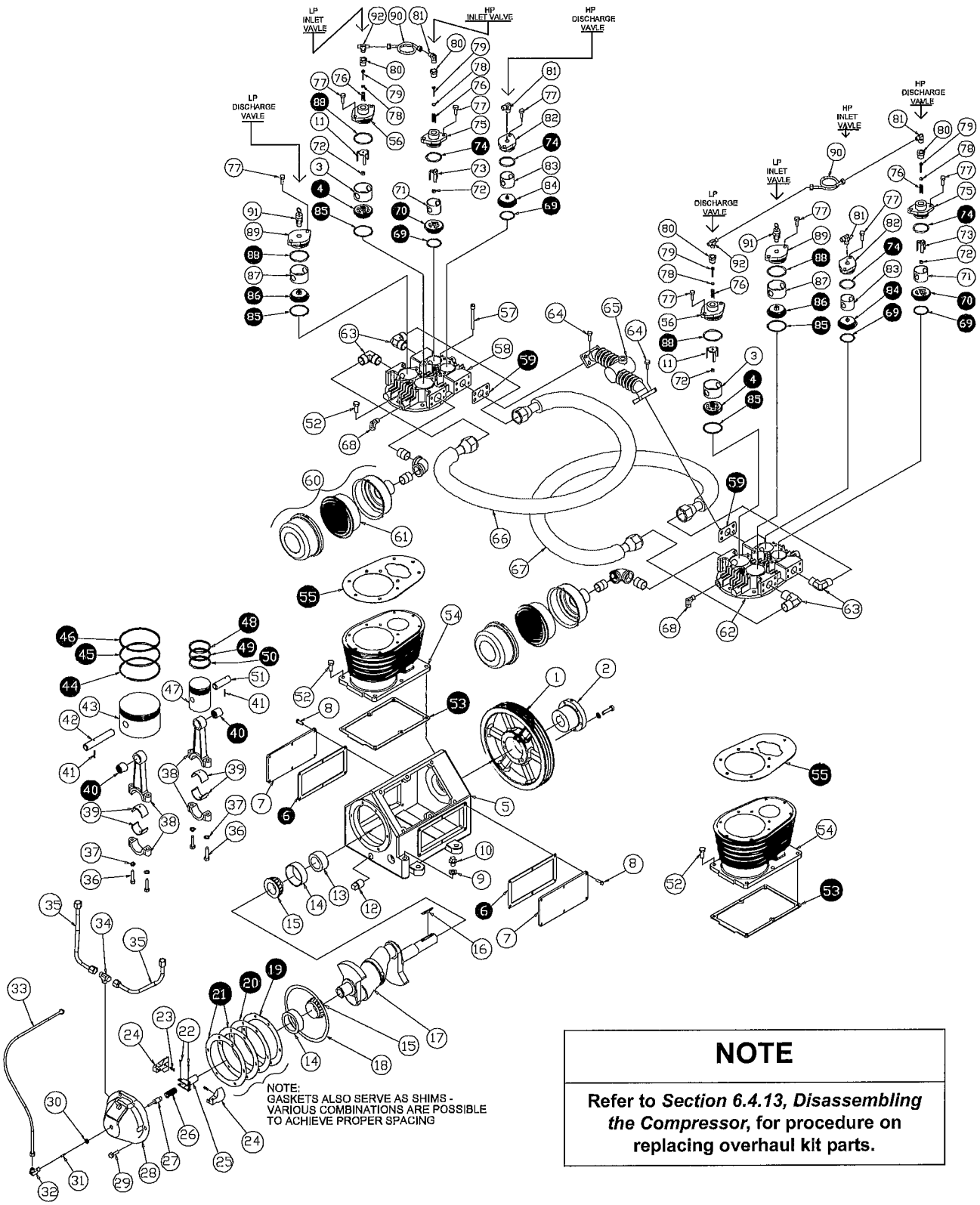
5 — 12V DC

6 — HYDRAULIC SUPPLY

7 — COMPRESSOR OIL DRAIN

8 — HYDRAULIC RETURN

8.14 COMPRESSOR OVERHAUL KIT1089 - PIECE PARTS



NOTE

Refer to *Section 6.4.13, Disassembling the Compressor*, for procedure on replacing overhaul kit parts.

VANAIR. AIR POWER TO GO.

8.14 COMPRESSOR OVERHAUL KIT1089 - PIECE PARTS

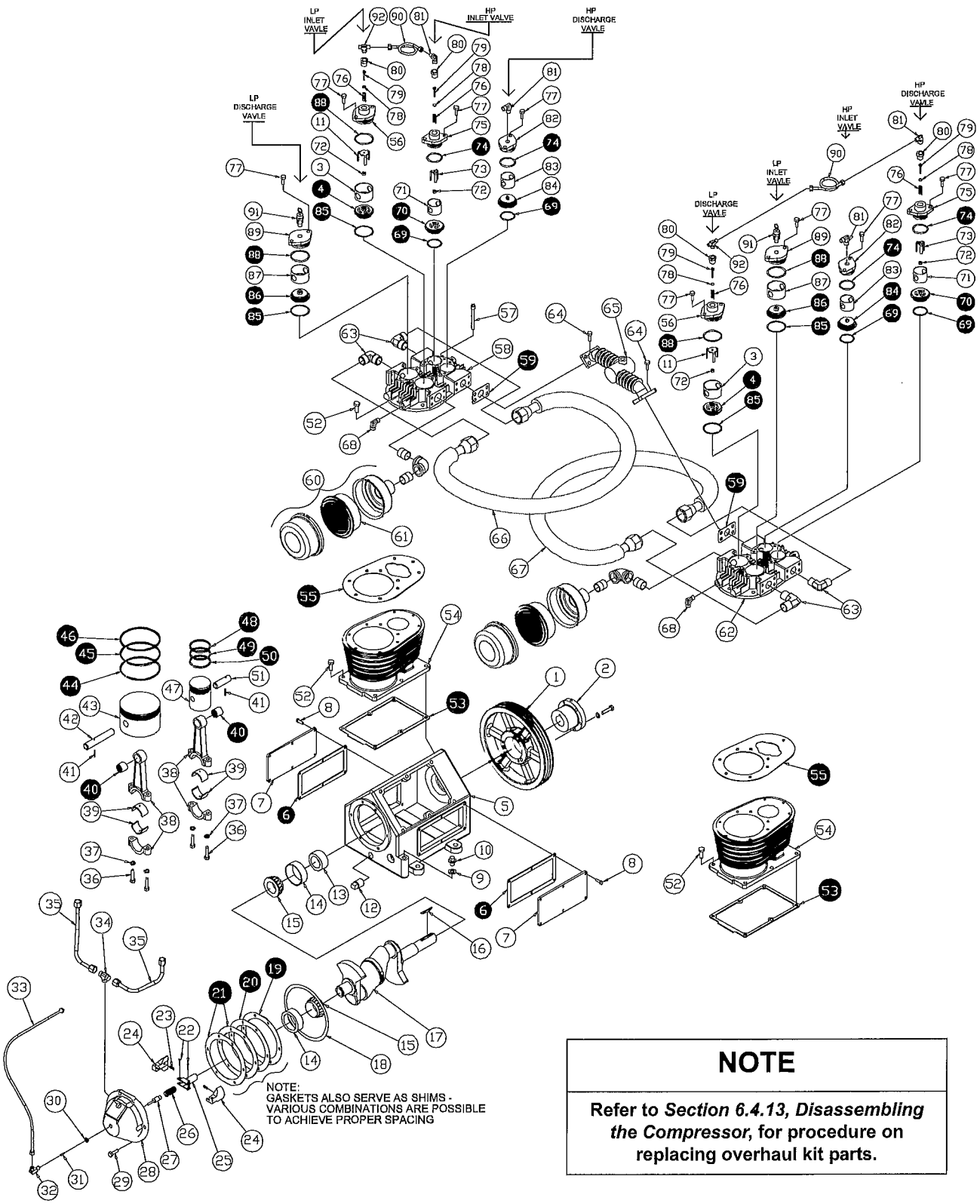
ITEM	DESCRIPTION	PART NUMBER	QTY
1	SHEAVE, DRIVEN	267311	1
2	BUSHING, SPLIT TAPER 1-3/8	267309	1
3	CAGE LP INLET	266993-045	2
4[I]	VALVE ASSEMBLY, LP INLET	266993-043	2
5	BASE & CUP ASSEMBLY	266993-011	1
6[I]	GASKET, SIDE PLATE	266993-013	2
7	SIDE PLATE	266993-012	2
8	CAPSCREW, SIDE PLATE 1/4-20 x 5/8	266993-014	12
9	OIL FILLER PLUG GASKET	266993-015	1
10	OIL FILLER PLUG	266993-016	1
11	FINGERS LP	266993-047	2
12	OIL DRAIN PLUG 3/8" NPT		1
13	SEAL OIL	266993-006	1
14	CONE BEARING		2
15	BEARING	266993-007	2
16	KEY, 8 X 8	266993-005	1
17	CRANKSHAFT	266993-008	1
18	OIL FEEDER RING	266993-009	1
19[I]	GASKET, END COVER 0.381		5
20[I]	GASKET, END COVER 0.1524		5
21[I]	GASKET, END COVER 0.127		5
22	RIVET		2
23	BUMPER SPRING		2
24a	WEIGHT		2
24b	HOLDER UNLOADER		1
25	SPRING		1
26	PLUNGER		1
27	END COVER	266993-029	1
28	CAPSCREW, END COVER 5/16 - 18 x 1	266993-022	1
29	LOCKNUT, END COVER		1
30	AIR VALVE		1
31	ELBOW VALVE & UNLOADER		1

Continued on page 109

[I] Denotes maintenance kit no. **73744209** part piece.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.14 COMPRESSOR OVERHAUL KIT1089 - PIECE PARTS (CONTINUED)



NOTE

Refer to *Section 6.4.13, Disassembling the Compressor*, for procedure on replacing overhaul kit parts.

VANAIR AIR POWER TO GO

8.14 COMPRESSOR OVERHAUL KIT1089 - PIECE PARTS (CONTINUED)

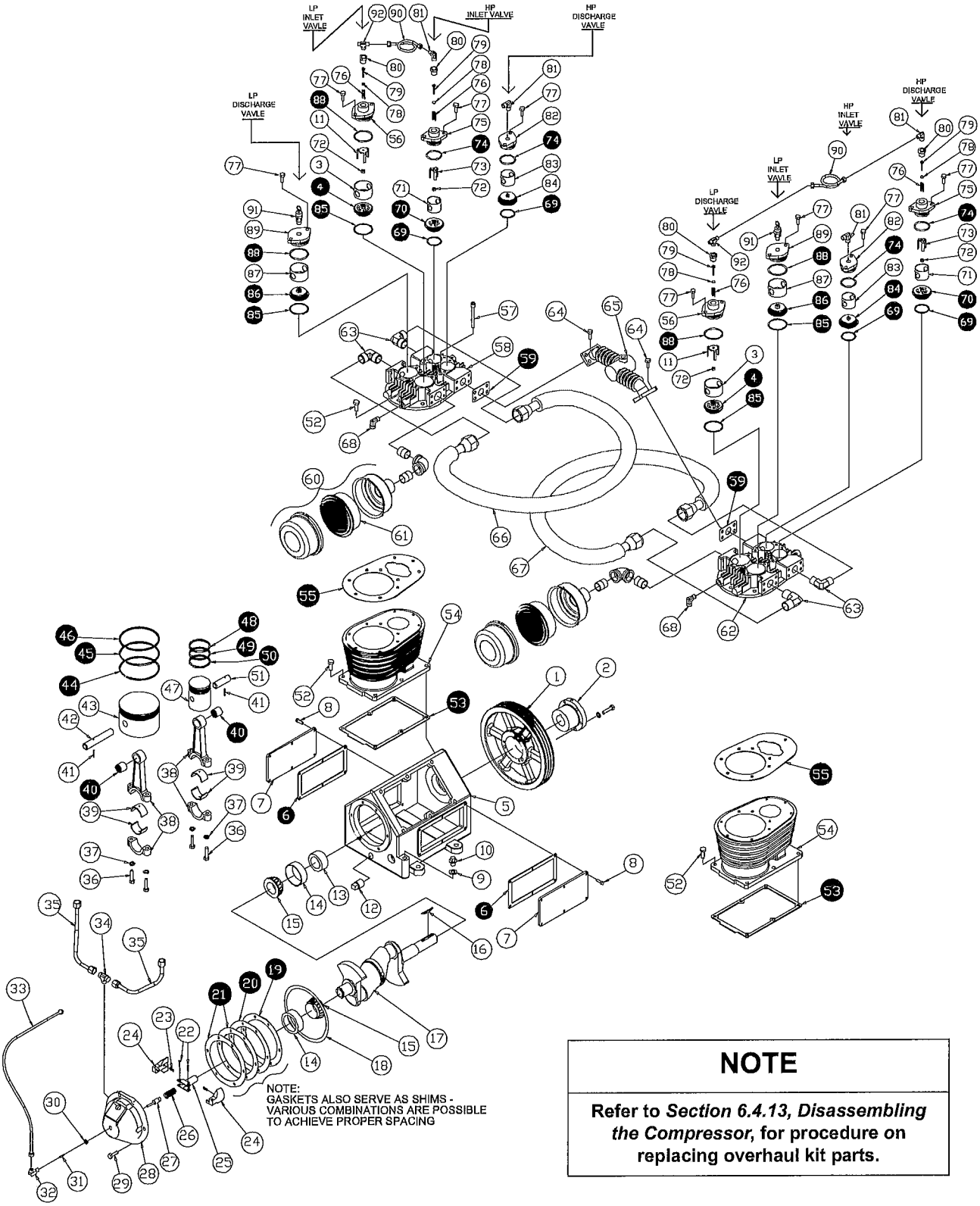
ITEM	DESCRIPTION	PART NUMBER	QTY
32	C.U. VALVE ASSY	266993-023	1
33	UNLOADING TUBE 5/16	266993-	1
34	TEE, BREATHER CONNECTOR	266993-	1
35	BREATHER TUBE	266993-	2
36	ROD CAPSCREW		8
37	ROD LOCK WASHER		8
38	CONNECTING ROD	266993-061	4
39	BEARING INSERT	266993-062	4
40[I]	NEEDLE BEARING WRISTPIN LP & HP	266993-090	4
41	ROLL PIN	266993-063	4
42	WRIST PIN LP	266993-064	2
43	PISTON LP	266993-066	2
44[I]	OIL CONTROL RING LP	266993-067	2
45[I]	BOTTOM COMPRESSION RING, LP	266993-074	2
46[I]	TOP COMPRESSION RING, LP	266993-075	2
47	PISTON HP	266993-070	2
48[I]	TOP COMPRESSION RING, HP	266993-073	2
49[I]	BOTTOM COMPRESSION RING, HP	266993-072	2
50[I]	OIL CONTROL RING HP	266993-071	2
51	WRIST PIN HP	266993-069	2
52	SOCKET HEAD CAPSCREW 5/16 -18 x 1	266993-034	16
53[I]	GASKET, BASE	266993-032	2
54	CYLINDER	266993-033	2
55[I]	GASKET CYLINDER HEAD	266993-035	2
56	HOLD DOWN COVER, LP INLET	266993-049	2
57	SOCKET HEAD CAPSCREW 5/16-18 x 3	266993-039	4
58	CYLINDER HEAD LEFT	266993-037	1
59[I]	GASKET - DISCHARGE MANIFOLD	266993-021	2
60	FILTER	267273	2
61	FILTER ELEMENT	KIT1090	2
62	CYLINDER HEAD RIGHT	266993-065	1
63	ELBOW 90, INTERCOOL CONNECTOR	266993-003	2

Continued on page 111

[I] Denotes maintenance kit no. **73744209** part piece.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.14 COMPRESSOR OVERHAUL KIT1089 - PIECE PARTS (CONTINUED)



NOTE

Refer to *Section 6.4.13, Disassembling the Compressor*, for procedure on replacing overhaul kit parts.

VANAIR AIR POWER TO GO

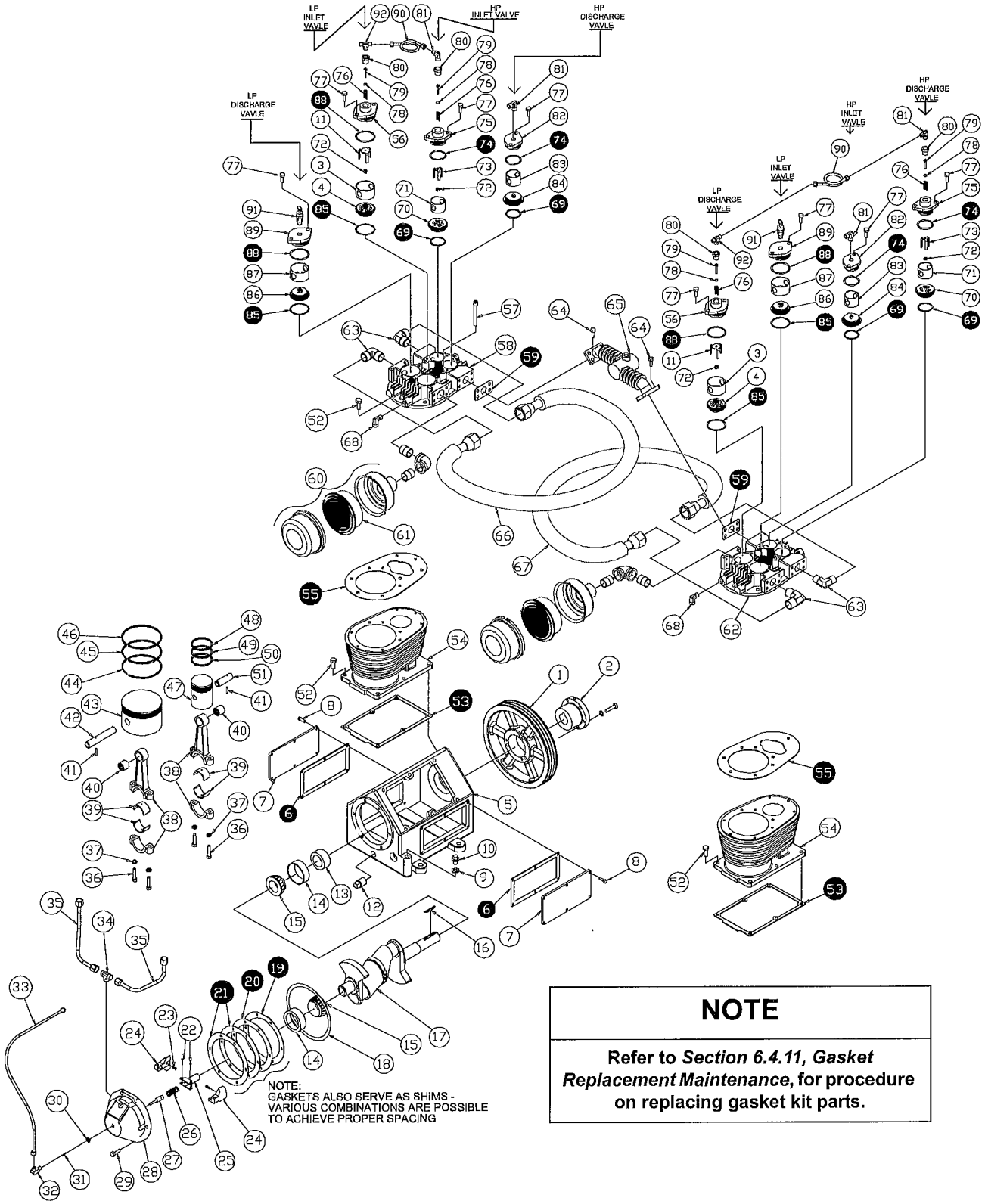
8.14 COMPRESSOR OVERHAUL KIT1089 - PIECE PARTS (CONTINUED)

ITEM	DESCRIPTION	PART NUMBER	QTY
64	CAPSCREW MANIFOLD 5/16 -18 X 7/8	266993-077	8
65	MANIFOLD DISCHARGE	266993-020	1
66	INTERCOOLER LH	266993-040	1
67	INTERCOOLER RH	266993-089	1
68	ELBOW, BREATHER CONNECTOR	266993-036	2
69[I]	VALVE GASKET HP	266993-078	4
70[I]	VALVE ASSEMBLY, HP INLET	266993-079	2
71	CAGE HP INLET	266993-080	2
72	LOCKNUT	266993-046	4
73	FINGERS HP	266993-081	2
74	O RING HP COVER	266993-083	4
75	HOLD DOWN COVER HP INLET	266993-084	2
76	SPRING LP	266993-050	4
77	CAPSCREW HOLD DOWN 5/16 -18 X 3/4		16
78	O RING PLUNGER	266993-052	4
79	PLUNGER	266993-051	4
80	3/8 NPT x 1/4 NPT BUSHING	266993-053	4
81	TUBE ELBOW	266993-056	4
82	HOLD DOWN COVER HP DISCHARGE LEFT	266993-082	2
83	CAGE HP DISCHARGE	266993-087	2
84[I]	VALVE ASSEMBLY, HP DISCHARGE	266993-086	2
85[I]	VALVE GASKET LP	266993-041	4
86[I]	VALVE ASSEMBLY, LP DISCHARGE	266993-042	2
87	CAGE LP DISCHARGE	266993-044	2
88[I]	O RING, L.P. COVER	266993-048	2
89	HOLD DOWN COVER HP DISCHARGE	266993-049	2
90	UNLOADER TUBE	266993-055	2
91	SAFETY VALVE	266993-058	2
92	TUBE TEE 1/4 x 1/4 x 1/4 NPT	266993-054	2

[I] Denotes maintenance kit no. **73744209** part piece.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.15 COMPRESSOR GASKET REPLACEMENT KIT1088-PIECE PARTS



NOTE

Refer to *Section 6.4.11, Gasket Replacement Maintenance*, for procedure on replacing gasket kit parts.

VANAIR. AIR POWER TO GO.

8.15 COMPRESSOR GASKET REPLACEMENT KIT1088-PIECE PARTS

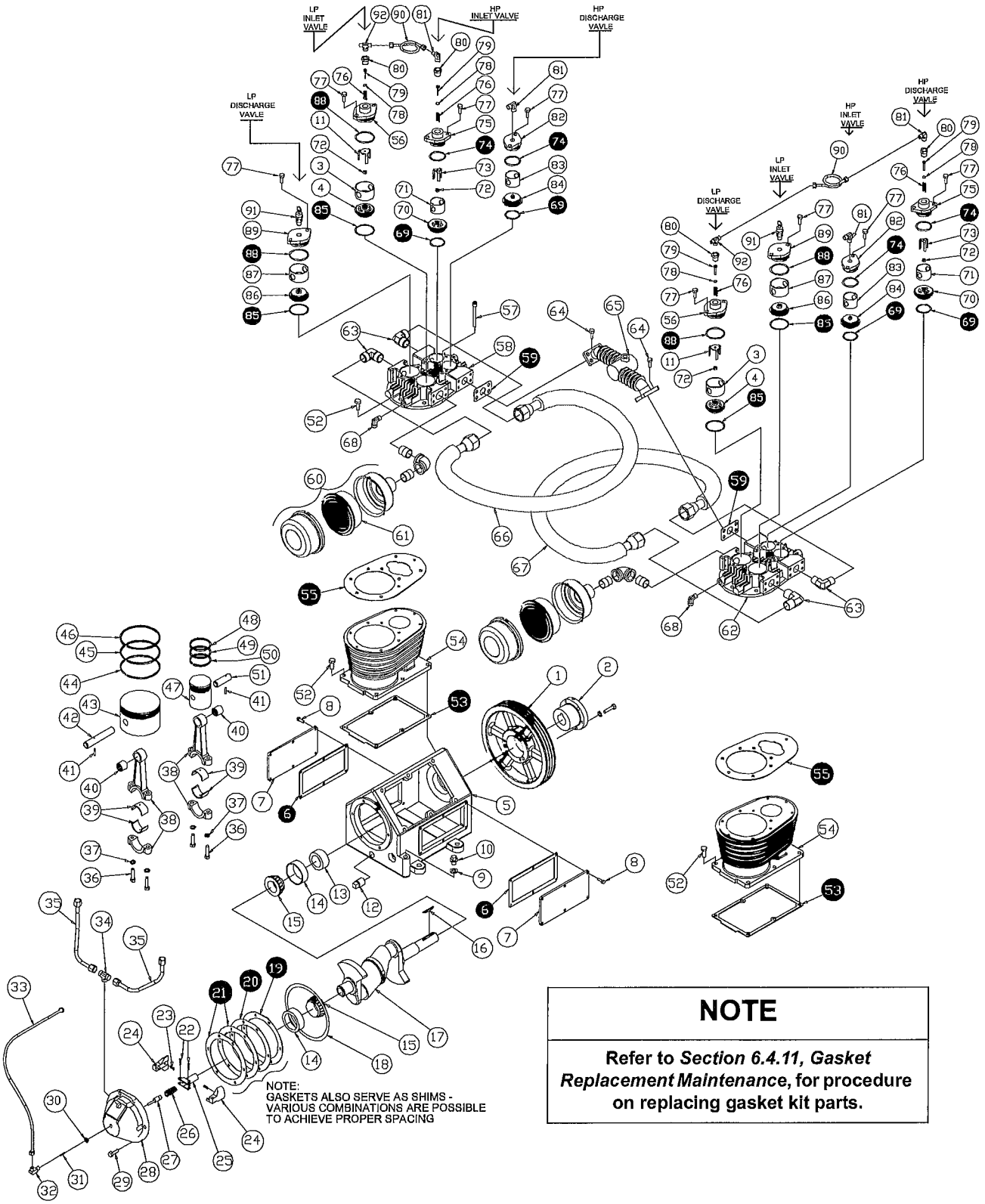
ITEM	DESCRIPTION	PART NUMBER	QTY
1	SHEAVE, DRIVEN	267311	1
2	BUSHING, SPLIT TAPER 1-3/8	267309	1
3	CAGE, LP INLET	266993-045	2
4	VALVE ASSEMBLY, LP INLET	266993-043	2
5	BASE & CUP ASSEMBLY	266993-011	1
6[I]	GASKET, SIDE PLATE	266993-013	2
7	SIDE PLATE	266993-012	2
8	CAPSCREW, SIDE PLATE 1/4-20X5/8	266993-014	12
9	OIL FILLER PLUG GASKET	266993-015	1
10	OIL FILLER PLUG	266993-016	1
11	FINGERS LP	266993-047	2
12	OIL DRAIN PLUG 3/8" NPT		1
13	SEAL, OIL	266993-006	1
14	CONE BEARING		2
15	BEARING	266993-007	2
16	KEY, 8 X 8	266993-005	1
17	CRANKSHAFT	266993-008	1
18	OIL FEEDER RING	266993-009	1
19[I]	GASKET, END COVER 0.381		5
20[I]	GASKET, END COVER 0.1524		5
21[I]	GASKET, END COVER 0.127		5
22	RIVET		2
23	BUMPER SPRING		2
24a	WEIGHT		2
24b	HOLDER UNLOADER		1
25	SPRING		1
26	PLUNGER		1
27	END COVER	266993-029	1
28	CAPSCREW, END COVER 5/16 - 18X 1	266993-022	1
29	LOCKNUT, END COVER		1
30	AIR VALVE		1
31	ELBOW VALVE & UNLOADER		1

Continued on page 115

[I] Denotes maintenance kit no. **73744208** part piece.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.15 COMPRESSOR GASKET REPLACEMENT KIT1088-PIECE PARTS (CONTINUED)



NOTE

Refer to *Section 6.4.11, Gasket Replacement Maintenance*, for procedure on replacing gasket kit parts.

VANAIR. AIR POWER TO GO.

8.15 COMPRESSOR GASKET REPLACEMENT KIT1088-PIECE PARTS (CONTINUED)

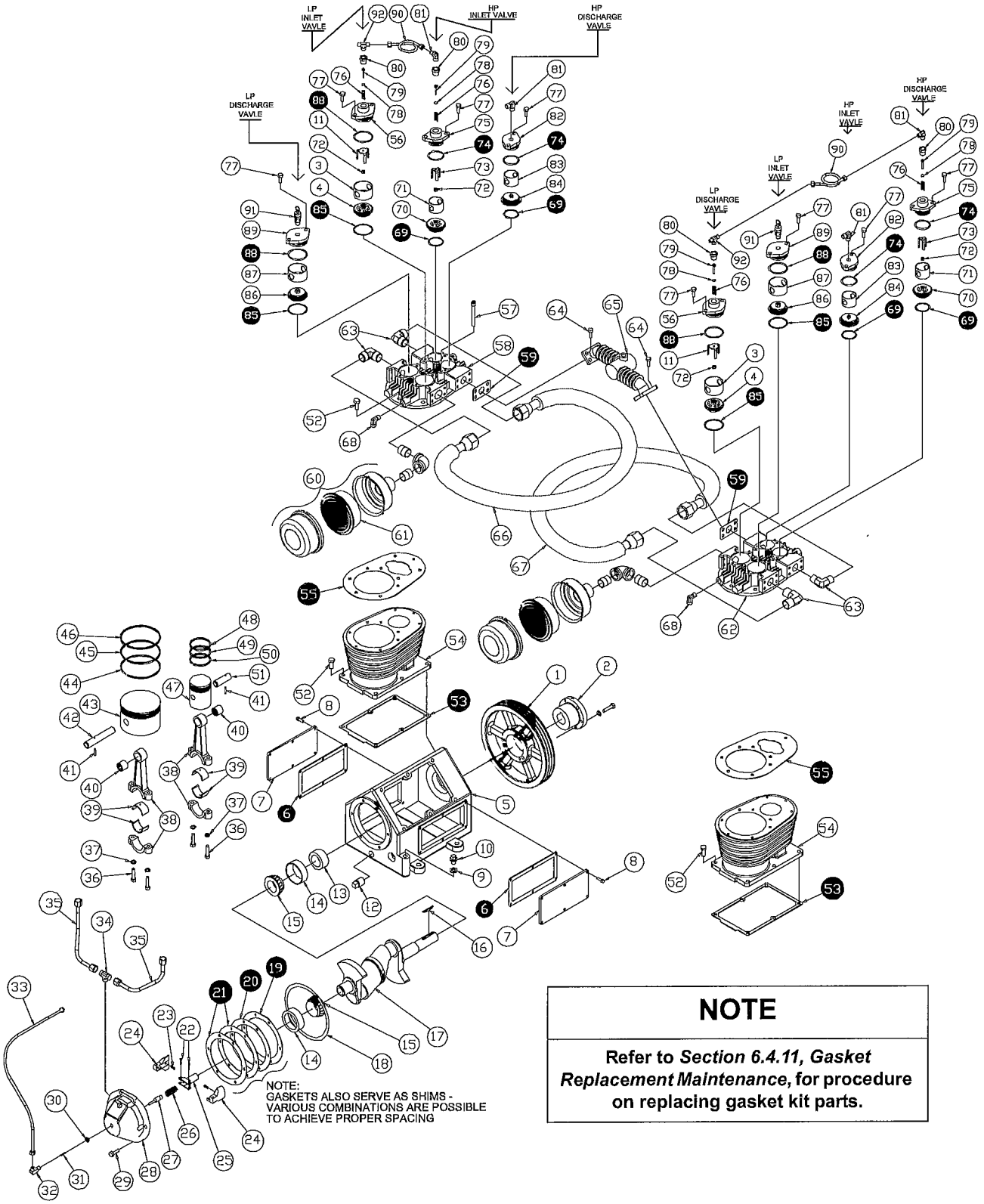
ITEM	DESCRIPTION	PART NUMBER	QTY
32	C.U. VALVE ASSY	266993-023	1
33	UNLOADING TUBE 5/16	266993-	1
34	TEE, BREATHER CONNECTOR	266993-	1
35	BREATHER TUBE	266993-	2
36	ROD CAPSCREW		8
37	ROD LOCK WASHER		8
38	CONNECTING ROD	266993-061	4
39	BEARING INSERT	266993-062	4
40	NEEDLE BEARING WRISTPIN LP & HP	266993-090	4
41	ROLL PIN	266993-063	4
42	WRIST PIN LP	266993-064	2
43	PISTON LP	266993-066	2
44	OIL CONTROL RING LP	266993-067	2
45	BOTTOM COMPRESSION RING, LP	266993-074	2
46	TOP COMPRESSION RING, LP	266993-075	2
47	PISTON HP	266993-070	2
48	TOP COMPRESSION RING, HP	266993-073	2
49	BOTTOM COMPRESSION RING, HP	266993-072	2
50	OIL CONTROL RING HP	266993-071	2
51	WRIST PIN HP	266993-069	2
52	SOCKET HEAD CAPSCREW 5/16 -18 x 1	266993-034	16
53[I]	GASKET, BASE	266993-032	2
54	CYLINDER	266993-033	2
55[I]	GASKET CYLINDER HEAD	266993-035	2
56	HOLD DOWN COVER, LP INLET	266993-049	2
57	SOCKET HEAD CAPSCREW 5/16-18 x 3	266993-039	4
58	CYLINDER HEAD LEFT	266993-037	1
59[I]	GASKET -DISCHARGE MANIFOLD	266993-021	2
60	FILTER	267273	2
61	FILTER ELEMENT	KIT1090	2
62	CYLINDER HEAD RIGHT	266993-065	1
63	ELBOW 90, INTERCOOL CONNECTOR	266993-003	2

Continued on page 117

[I] Denotes maintenance kit no. **73744208** part piece.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.15 COMPRESSOR GASKET REPLACEMENT KIT1088-PIECE PARTS (CONTINUED)



NOTE

Refer to *Section 6.4.11, Gasket Replacement Maintenance*, for procedure on replacing gasket kit parts.

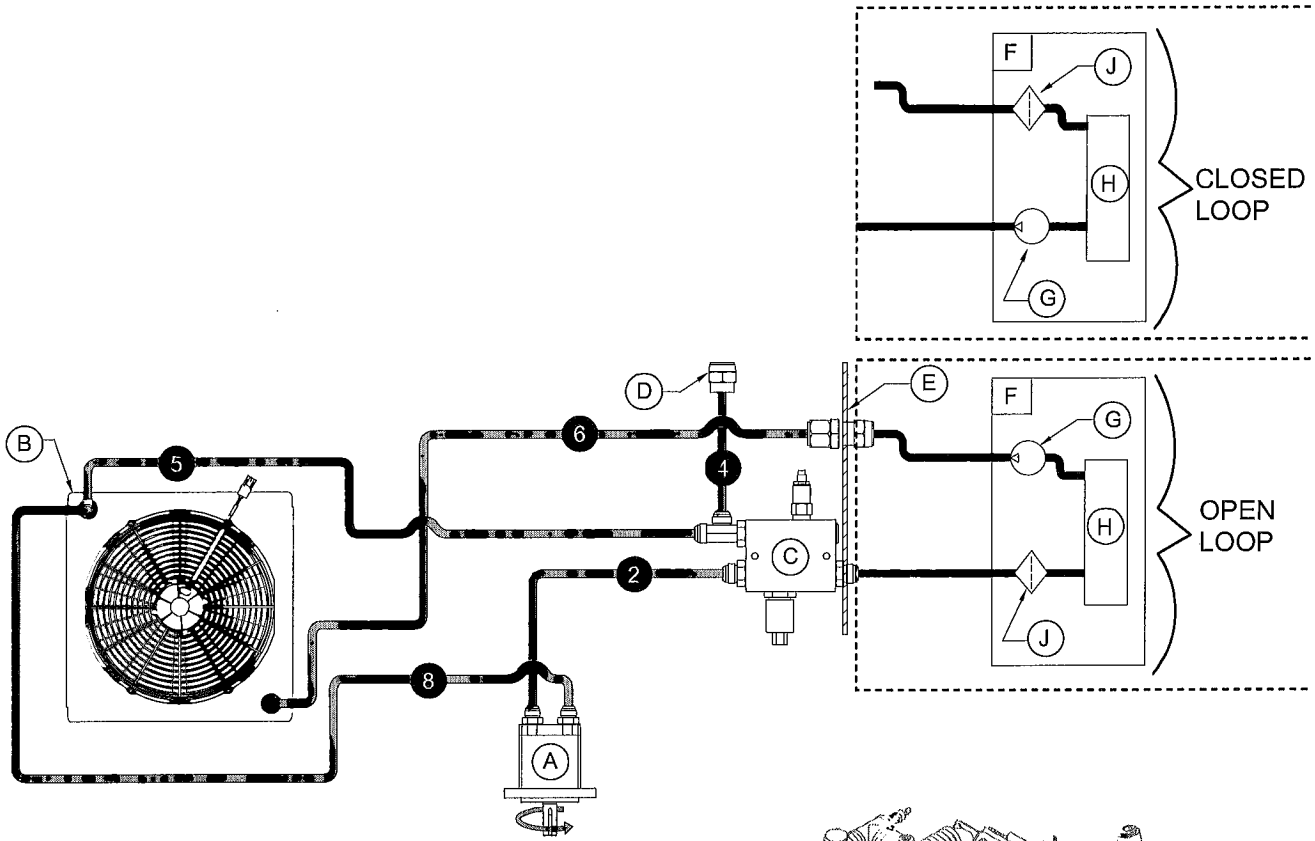
8.15 COMPRESSOR GASKET REPLACEMENT KIT1088-PIECE PARTS (CONTINUED)

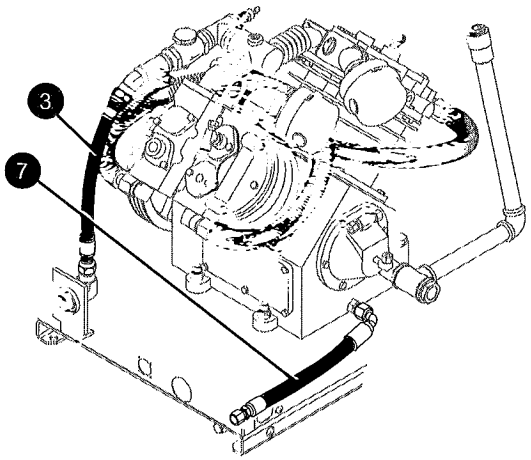
ITEM	DESCRIPTION	PART NUMBER	QTY
64	CAPSCREW MANIFOLD 5/16 -18 x 7/8	266993-077	8
65	MANIFOLD DISCHARGE	266993-020	1
66	INTERCOOLER LH	266993-040	1
67	INTERCOOLER RH	266993-089	1
68	ELBOW, BREATHER CONNECTOR	266993-036	2
69[I]	VALVE GASKET HP	266993-078	4
70	VALVE ASSEMBLY, HP INLET	266993-079	2
71	CAGE HP INLET	266993-080	2
72	LOCKNUT	266993-046	4
73	FINGERS HP	266993-081	2
74	O RING HP COVER	266993-083	4
75	HOLD DOWN COVER HP INLET	266993-084	2
76	SPRING LP	266993-050	4
77	CAPSCREW HOLD DOWN 5/16 -18 x 3/4		16
78	O RING PLUNGER	266993-052	4
79	PLUNGER	266993-051	4
80	3/8 NPT x 1/4 NPT BUSHING	266993-053	4
81	TUBE ELBOW	266993-056	4
82	HOLD DOWN COVER HP DISCHARGE LEFT	266993-082	2
83	CAGE HP DISCHARGE	266993-087	2
84	VALVE ASSEMBLY, HP DISCHARGE	266993-086	2
85[I]	VALVE GASKET LP	266993-041	4
86	VALVE ASSEMBLY, LP DISCHARGE	266993-042	2
87	CAGE LP DISCHARGE	266993-044	2
88[I]	O RING, L.P. COVER	266993-048	2
89	HOLD DOWN COVER HP DISCHARGE	266993-049	2
90	UNLOADER TUBE	266993-055	2
91	SAFETY VALVE	266993-058	2
92	TUBE TEE 1/4 x 1/4 x 1/4 NPT	266993-054	2

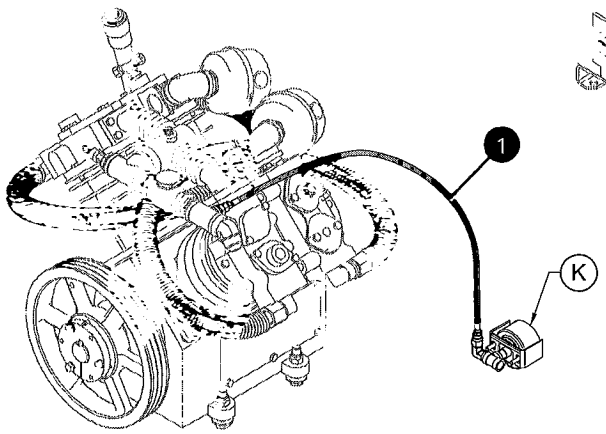
[I]Denotes maintenance kit no. **73744208** part piece.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

8.16 HYDRAULIC HOSE SYSTEM







NOTE

Hydraulic Hose Kit no. 271936:

Concerning the hydraulic hose kit—customer should be aware that the kit contains system hoses pertaining to the compressor-side of the hydraulic set up only. It is the customer's responsibility to maintenance the vehicle-side hoses of the hydraulic system.

8.16 HYDRAULIC HOSE SYSTEM

8.16A HYDRAULIC SYSTEM COMPONENTS

KEY	DESCRIPTION	KEY	DESCRIPTION
A	HYDRAULIC MOTOR	F	VEHICLE-SIDE OF HYDRAULIC SYSTEM:
B	HYDRAULIC OIL COOLER	G	HYDRAULIC PUMP
C	MANIFOLD	H	HYDRAULIC OIL RESERVOIR
D	PRESSURE ACCUMULATOR HOSE	J	HYDRAULIC OIL RESERVOIR FILTER
E	MACHINE END PANEL	K	PRESSURE GAUGE

8.16B HYDRAULIC SYSTEM HOSE IDENTIFICATION (hose kit no. 271936)

KEY	DESCRIPTION	HOSE ID #	KEY	DESCRIPTION	HOSE ID #
1	Hose, 0.25 x 27.0 lrg pilot pressure gauge	267437	5	Hose, 3/4 x 48.0 lg oil cooler to manifold	269546
2	Hose, 3/4 x 10-1/4 hydraulic motor	267640	6	Hose, 3/4 x 31.5 strt x 45°elbow	269547
3	Hose, 5/8 x 17.00 disch to ser vlv Teflon braided	267643	7	Hose, 1/4 x 13.0 strt x 90° elbow	269548
4	Hose, 3/4 x 46.0 pressure accumulator	271955	8	Hose, 3/4 x 52.00 motor to cooler	271937

IMPORTANT

Customer is responsible for hoses on the *vehicle-side* of the hydraulic system, including set-up and maintenance. Customer should be aware of, and make arrangements for, any vehicle-side hose maintenance or replacements, as these hoses are not included with the IMT kit.

Note also that any oil filter(s) used on vehicle-side of hydraulic system are not included with the kit.

⚠ WARNING

DO NOT use plastic pipe, or incorrectly rated piping or hose. Incorrectly rated connection material can fail and cause injury or equipment damage.

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AIR POWER TO GO™

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Sales Fax: (219) 879-5800
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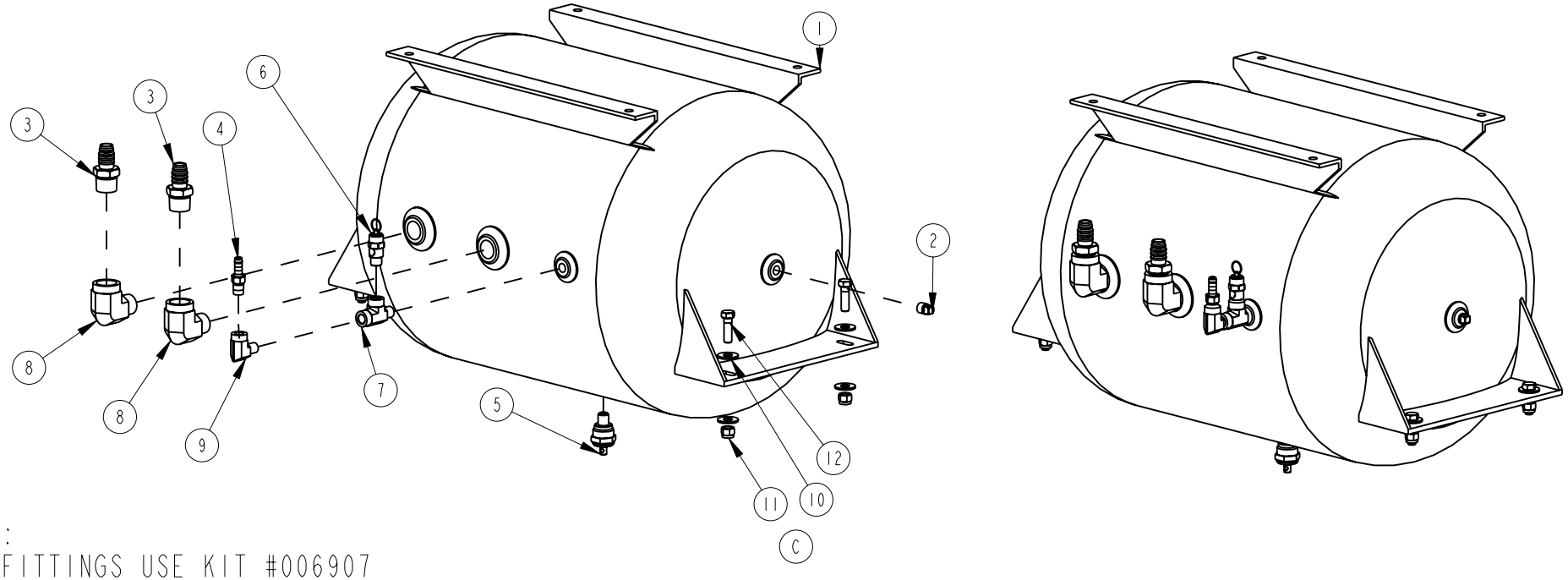
Specifications Subject to
Change Without Prior Notice

050842
050843

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
3/20/09	A	DRAWING RELEASED	-	MEA	NDS
9/4/09	B	EDITED NOTE	-	MEA	KLV
2/25/10	C	BOLTS WERE .5"/CHANGED NOTE TO IR ONLY	-	RJW	KLV



NOTE:
FOR FITTINGS USE KIT #006907
ADD ITEMS #7 (002800) AND #4 (002165) ONLY WHEN TANK IS USED WITH A 40 CFM INGERSOLL-RAND AIR COMPRESSOR

REF.	SPECIFICATION	QTY	DESCRIPTION	PART NUMBER	ITEM
		4	BOLT,0.375-16UNC-1.250_HX_HD_GR5	003502	12
		4	NUT,0.375-16_GR5_LOCK	003395	11
		8	WASHER,FLAT_0.375	003358	10
		1	ELBOW,HYDR_90_04MP-04FP	002809	9
		2	ELBOW,HYDR_90_12MP-12FP	002806	8
		1	ADAPTER,5602-04-04-04_TEE_04MP-04FP-04FP	002800	7
		1	VALVE.SAFETY(POP-OFF)_ST25-165PSI	002173	6
		1	DRAIN,UNIVERSAL _307E5	002171	5
		1	BARB,HOSE_0.375_0.250NPT_BRASS	002165	4
		2	BARB,HOSE_0.750_0.750NPT	002163	3
		1	PLUG,PIPE_0.250	000060	2
		1	TANK,AIR_20GAL_165PSI	000012	1

012158 PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

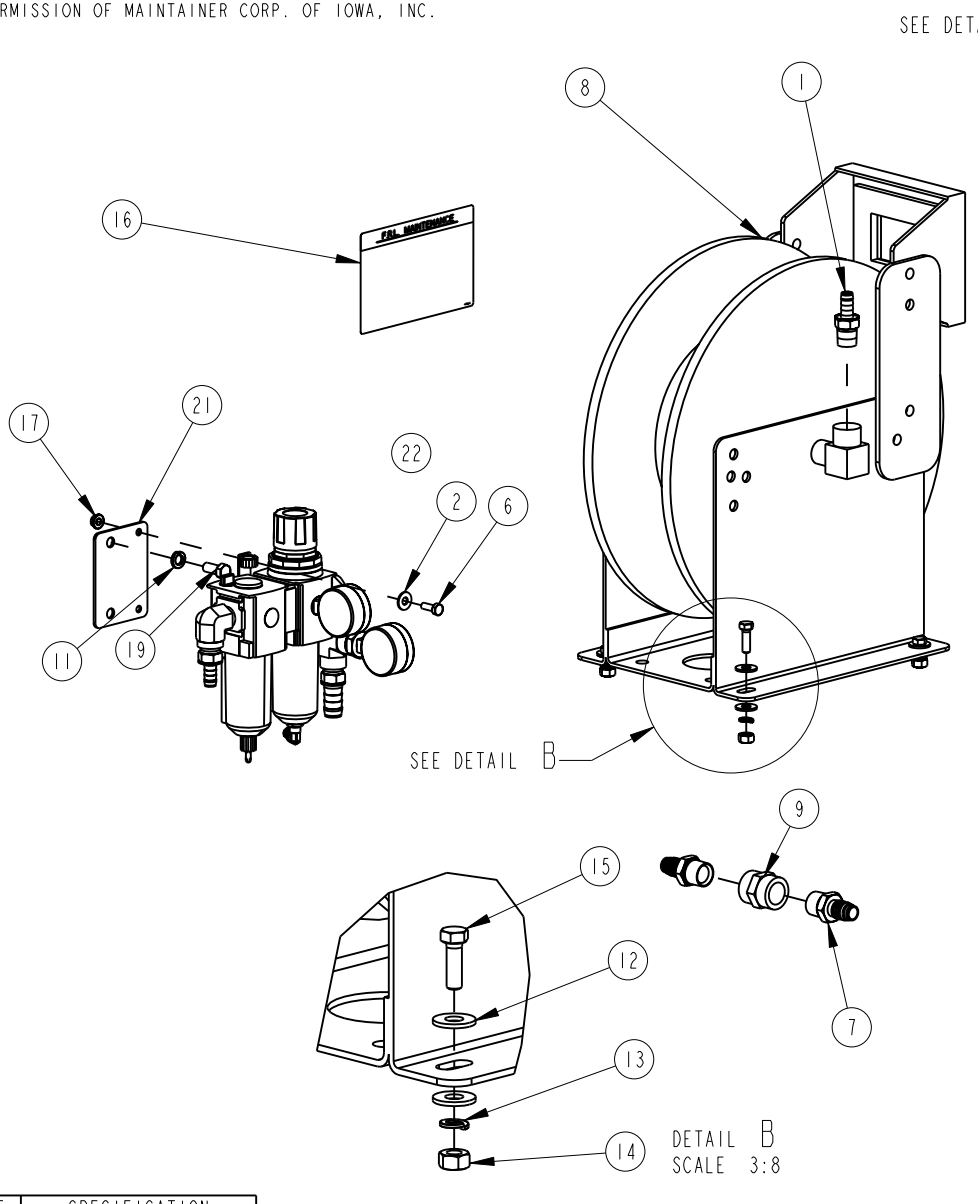
DR: MEA DATE: 3/20/09
CHK: NDS DATE: 3/20/09
APPR: DATE: -

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: MASTER,AIR_TANK_20GAL_165PSI

SCALE: 3:16 SIZE: B SHEET: 1 OF 1 DRAWING NUMBER: 012158 REV. LEVEL: C

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/1/09	A	DRAWING RELEASED	-	MEA	NDS
11/6/12	B	016041 WAS 008570	-	MEA	KLV



QTY	DESCRIPTION	PART NUMBER	ITEM
1	FILTER,WILKERSON 0.50 250PSI SIDE GAUGE	016041	22
1	PLT,NORGREN_FRL_MOUNT_TO_REAR	012024	21
1	BOX,BLACK_HINGED_COVER_AIR HOSE_PRECUT	011740	20
2	BOLT,0.375-16UNC-0.875_HX_HD_GR5	009400	19
1	RING,WELDED_STEEL_.375X41D	008714	18
2	1/4 SERRATED, FLANGED LOCK NUT	007309	17
1	DECAL,FRL_MAINTENANCE	007238	16
4	BOLT,0.3125-18UNC-1.000_HX_HD_GR5	003522	15
4	NUT,0.3125-18_GR5	003396	14
4	WASHER,5/16_LOCK_GR2	003361	13
8	WASHER,FLAT_0.3125_GR2	003360	12
2	WASHER,LOCK_0.375_GR2	003359	11
8	WASHER,RUBBER BACK_0.250_FLAT	003338	10
1	COUPLING,HYDR_12FP-12FP	002754	9
1	REEL,HANNAY_1/2 X 50'_AIR	002339	8
2	BARB,HOSE_0.750_0.750NPT	002163	7
2	BOLT,0.250-20UNC-0.750_HX_HD_GR5	000371	6
4	BOLT,0.250-20UNC-1.000_HX_HD_GR5	000370	5
4	NUT,0.250-20_GR5	000342	4
4	WASHER,LOCK_0.250_GR2	000338	3
2	.25 x .56 x .07 FLAT WASHER	000337	2
1	BARB,HOSE_0.500X0.500_NPT	000117	1

REF.	SPECIFICATION

PART NUMBER 020005-1

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MEA DATE: 4/1/09
CHK: NDS DATE: 4/1/09
APPR: DATE: -

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,1/2 X 50 TOP WIND AIR PACKAGE

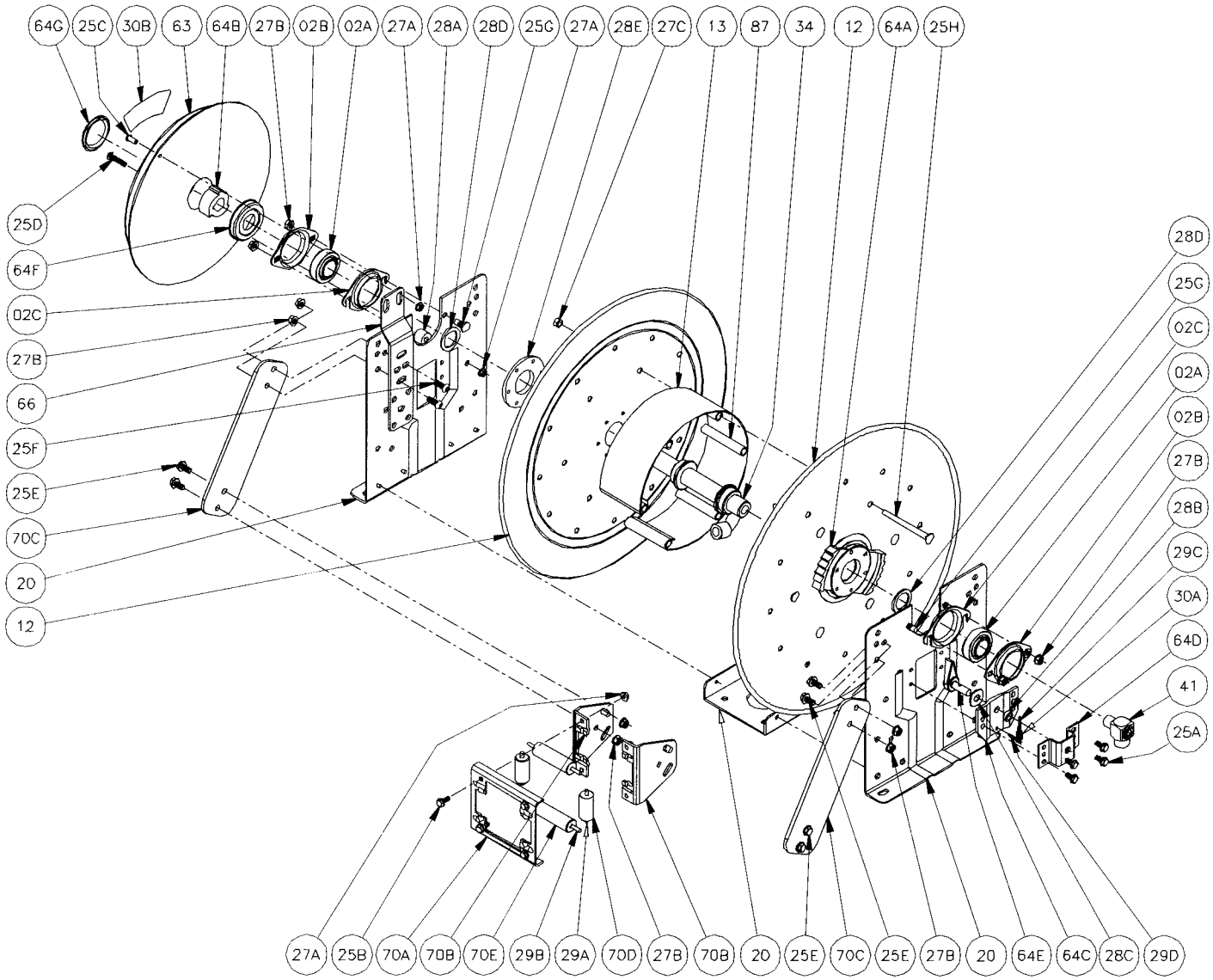
SCALE: 3:16 | SIZE: B | SHEET: 1 OF 1 | DRAWING NUMBER: 020005-1 | REV. LEVEL: B

Hannay Reels®
The reel leader.
Hannay Reels, Inc., 553 State Route 143
Westerlo, NY 12193-0159
Telephone 518-797-3791; Toll Free 1-877-GO-REELS (467-3357)
FAX 1-800-REELING (733-5464)
INT'L FAX (518) 797-3259
Website: www.hannay.com
E-mail: reels@hannay.com

ISO 79

PARTS LIST

N-700 SERIES
Spring Retractable Reels
For Single Hose



Hannay ISO Parts Lists are available at www.hannay.com

PARTS LIST
ISO 79
N-700 SERIES

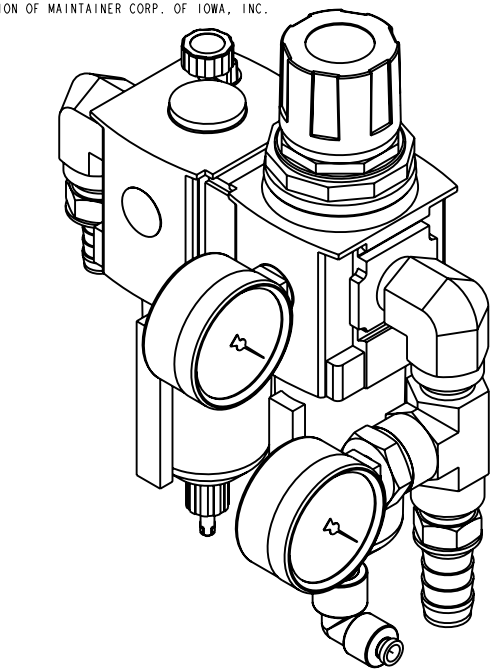
When ordering parts

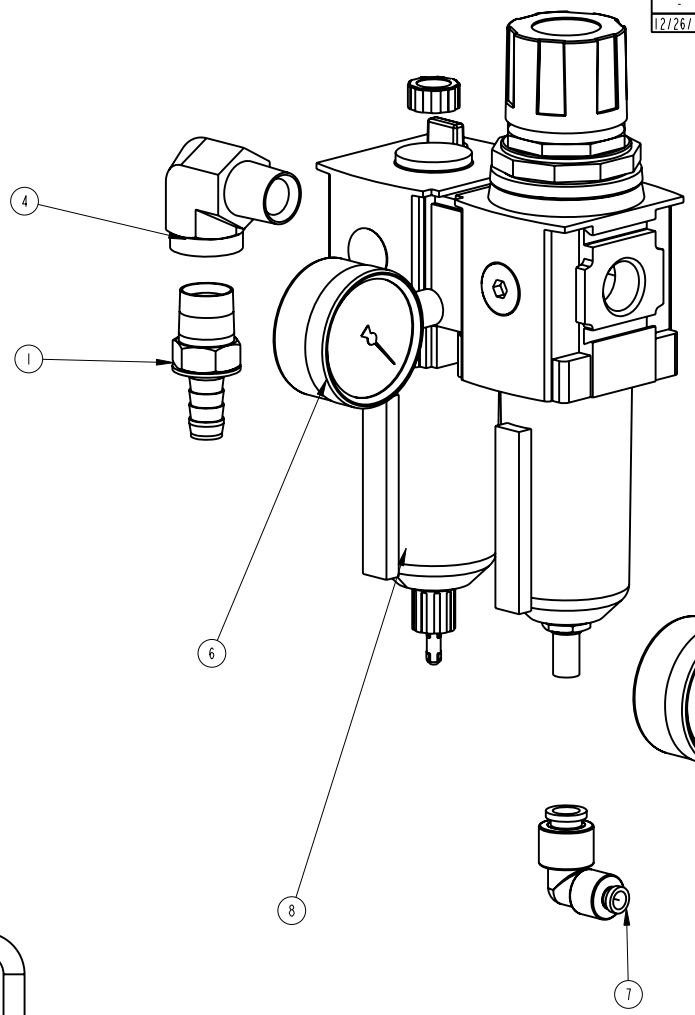
BE SURE TO SPECIFY COMPLETE MODEL NUMBER and SERIAL NUMBER OF REEL.

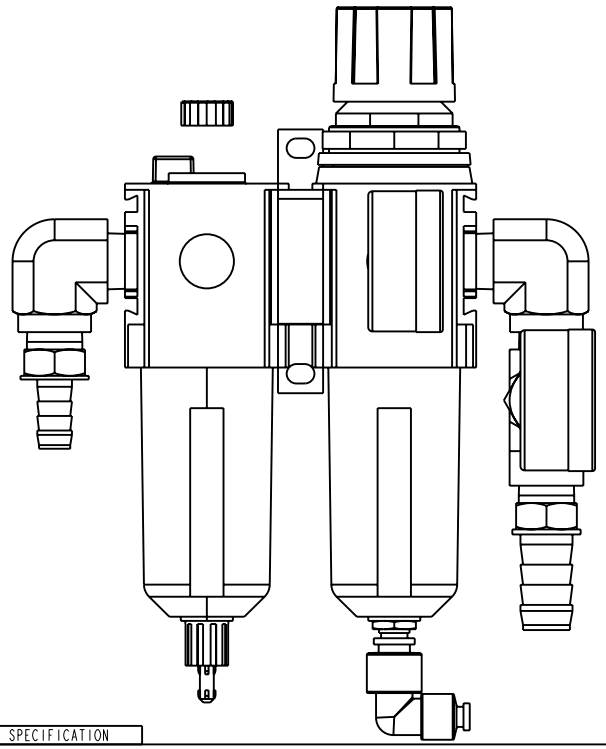
USE PART NUMBER!

Item No.	Description	PART NUMBER	Quantity
02A	Self-Aligning Bearing Insert	9902.1500	2
02B	Self-Aligning Bearing Holder	9902.2800	2
02C	Self-Aligning Bearing Holder (Slotted for N Series)	9902.2801	2
12	16-17, 15 3/4″ Dia. Disc (Specify Model & Front, Back)	9903.0421	2
12	19-20, 18 3/4″ Dia. Disc (Specify Model & Front, Back)	9903.0821	2
12	23-24, 22 3/4″ Dia. Disc (Specify Model & Front, Back)	9903.1121	2
12	25-26, 24 3/4″ Dia. Disc. (Specify Model & Front, Back)	9903.1621	2
13	Drum, 10 1/2″ Dia. - Wrap Around (Specify Model)	9905.0138	1
13	Drum, 15 1/2″ Dia. - Wrap Around (Specify Model)	9905.0178	1
20	Frame Assembly	(Specify Model)	1
25A	5/16″-18 x 3/4″ Thread Cutting Hex Head Bolt	9958.0055	4
25B	5/16″ x 3/4″ Spinlock Bolt	9904.2101	4
25C	5/16″ -18 x 3/4″ Hex Socket Button Head Cap Screw	9904.9101	1
25D	5/16″ -18 x 1 1/2″ Hex Socket Button Head Cap Screw	9904.9104	1
25E	3/8″-16 x 3/4″ Spinlock Bolt	9904.2201	6
25F	3/8″-16 Button Socket Head Cap Screw, 1″ Long	9904.9202	2
25G	3/8″-16 x 7/8″ Panhead Knurled Bolt	9904.4276	4
25H	3/8″-16 x 3/4″ Spinlock Bolt	9904.2201	as needed
27A	5/16″ - 18 Spinlock Nut	9904.6100	4
27B	3/8″ - 16 Spinlock Nut	9904.6200	12
27C	3/8″ - 16 Hex Head Nut	9904.5200	6
28A	Spring Mounting Spacer (C&J)	9922.0033	1
28A	Spring Mounting Spacer (B, D, & G)	9922.0032	2
28B	Spacer, Ratchet Pawl	9922.0022	1
28C	1/2″ Flat Washer	9954.0008	1
28D	1″ Hub Spacer	9954.0021	as needed
28E	Disc Washer	9965.0015	1
29A	1/4″ Dia. Stainless Steel Rod, 2-3/4″ Long	9940.0190	2
29B	1/4″ Dia. Stainless Steel Rod	(Specify Model)	2
29C	1/8″ x 1″ Stainless Steel Cotter Pin for Pawl & Pin	9922.0024	1
29D	3/16″ x 1″ Stainless Steel Cotter Pin for N Series Ratchet	9922.0028	1
30A	Ratchet Locking Spring	9922.0008	1
30B	Spring Under Tension Caution-Decal	9922.0010	1
34	1/2″ FNPT Welded Barstock Steel Hub Assy (Specify Model)	9901.0631	1
41	1/2″ 90^0 MxF Swivel Joint	9927.8138	1
63	Spring Motor, B (Specify Model)	9921.0015	1
63	Spring Motor, C (Specify Model)	9921.0018	1
63	Spring Motor, D (Specify Model)	9921.0020	1
63	Spring Motor, G (Specify Model)	9921.0021	1
63	Spring Motor, J (Specify Model)	9921.0030	1
64A	Ratchet Wheel	9922.0015	1
64B	Spring Arbor for D Spring	9922.0001	1
64B	Spring Arbor for B, C, G, & J Spring	9922.0002	1
64C	Ratchet Pawl Housing, Inner (N Series)	9922.0027	1
64D	Ratchet Pawl Housing, Outer (N Series)	9922.0026	1
64E	Pawl & Pin	9922.0019	1
64F	Cap-Plug for Spring (Inner Side)	9922.0036	1
64G	Cap-Plug for Spring (Outer Side)	9922.0037	1
66	Spring Mounting Bracket (N Series)	9922.0050	1
70A	Roller Bracket Frame	(Specify Model)	1
70B	N Series Roller Mounting Bracket	9940.0171	2
70C	N Series Roller Arm Only (Specify Model)	9941.0030	2
70D	1″ Dia. x 2″ Long Roller for Stamped Housing	9940.0180	2
70E	1″ Dia.Roller for Stamped Housing	(Specify Model)	2
87	Threaded Spacer Tube	(Specify Model)	as needed

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
-	A	DRAWING RELEASED	-	MEA	KLV
12/26/12	B	015403 REPLACED 010710	-	MEA	KLV







ALSO INCLUDE WITH KIT:
(1X) 000117 HOSE BARB
(1X) 002806 ADAPTOR
(2X(002163 HOSE BARB

QTY	DESCRIPTION	PART NUMBER	ITEM
1	FRL,COMBO .50 WIL D18-04-GH00	015481	8
1	ENTER DESCRIPTION HERE	015403	7
2	GAUGE,AIR_200-PSI STEM MAINTAINER	014584	6
1	BUSHING,HYDR_08MP-04FP	002850	5
2	ELBOW,HYDR_90_08MP-08FP	002807	4
1	ADAPTER,5602-08-08-08_TEE_08MP-08FP-08FP	002799	3
1	BARB,HOSE_0.750_0.500 NPT	002155	2
1	BARB,HOSE_0.500X0.500_NPT	000117	1

PART NUMBER 016041

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MEA DATE: 11/6/12
CHK: KLV DATE: -

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,FRL WILKERSON 0.50 250PSI SIDE GAUGE

SCALE: 3:4 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 016041 REV. LEVEL: B

REF.	SPECIFICATION

Electrical

HOW OUR SYSTEM WORKS

The chassis key switch powers the main power switch in the chassis cab. The main power switch has two positions on/off. In the on position (light on) the solenoid in the switch box is energized. The solenoid provides power to the fuse panels mounted in the switch box (usually located in one of the body compartments). From the fuses the wires run to the accessories switch, or directly to the desired accessory.

The off position turns off the solenoid cutting off the power to the fuse panel in the body. Trucks with PSS fan option (Pressurized Storage System Fans), the fans will run only when the key is on and the main power switch off.

The different accessories and functions are given their own color wire and remain the same throughout the Maintainer body

The wiring diagram is supplied with the Maintainer body, if you need addition help contact Customer Service at **1-800-831-8588**.

WIRING TROUBLE SHOOTING

For safety, check the electrical wiring with the key in the accessory position.

Basic tools required for trouble shooting include a12 volt test light and a ½" wrench.

There are three basic types of problems that may arise.

Problem #1: The light on the main power switch does not work.

Problem #2: Main power light is on in the cab but none of the body accessories work.

Problem #1: No light on with the switch on.

Step #1: Check the in-line fuse or chassis supplied fuse for factory switch Inline fuse located near the chassis fuse panel or behind dash panel. If it is defective replace and test, if okay go to step #2.

Step #2: Check the main power switch in the cab with a test light.

- With the switch in the "ON" position the 14ga. wire from the in-line fuse and, also the14ga. Red / Blue wire should be energized. If not, the switch is defective, replace and retest the wire.
- With the switch in the "OFF" position the 14ga. Red wire from the in-line fuse is energized and also the 14ga. Blue wire to the PSS fans, if not replace the switch. If equipped with a double throw switch.

Problem #2: Main power is on in the cab, but none of the body accessories work.

- Check the circuit breaker near the chassis batteries there should be power on both red wires on the breaker.
- With a 1/2” wrench remove the two bolts closest to you in the lower portion of the switch box. This will allow the panel to swing down and expose the wires, solenoid and the back side of the switches (see Figure 2).

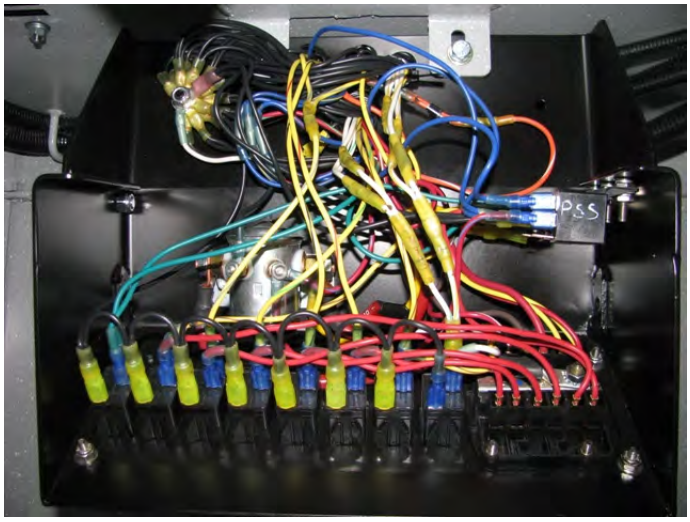


Figure 2: Shows the inside of the fuse panel.

When fuse panel is open use a test light to test the incoming RED wire to the solenoid from the circuit breaker.

- If there is no power, you may have a break between the main circuit breaker and solenoid.
- If there is power turn the “Main Power” switch on (red/blue wire on solenoid should have 12v power) this will energize the solenoid and power up the fuse block. If no power output on the solenoid replace.
- If no power on the red/blue wire check the “Main Power” wiring to get 12v and retest output of solenoid to the fuse block.

REMOTE ENGINE START/STOP

This vehicle may be equipped with engine start/stop. The main power switch must be on to use this operation. The engine should run at least 5 seconds before stopping the truck with the remote, and off at least 5 seconds before restarting the truck.

Engine Start (see wiring diagram supplied for detailed info)

- The remote start is wired to the chassis ignition wire or to the starter solenoid. This is an ORANGE wire with a RED tracer and sends 12V power to the ignition wire, sometimes a relay is used to power the ignition wire.
- Manual Transmission - the start circuit will only function if the neutral safety bracket is flipped over the shifter in the cab, and your main power switch is in the on position.
- For normal truck operation flip the neutral safety bracket back away from the shifter.

Figure #3 shows a neutral safety bracket in the normal driving position.

Engine Stop (see wiring diagram supplied for detailed info)

- The engine stop is wired to a chassis circuit that shuts the engine off through a relay
- The relay is located under or in the dash and will have an ORANGE wire with a BLACK tracer on it. This wire is sending 12v power to the relay to open the circuit.
- To bi-pass the relay connect the 2 wires on the relay that are the same color

SPEED CONTROL DOES NOT WORK PROPERLY.

(Refer to prints in service manual)

Speed control does not work at all.

1) Is parking brake engaged?
2) Is main power turned on?
   - May be a blown fuse check fuses in body fuse panel and also the main power fuse in the cab. Replace fuse.
   - May be a bad main power switch, or speed control switch in remote.
3) Is the PTO engaged?
   - Manual Trans: Cable may not be properly adjusted.
   - Manual Trans: Loose cable may leave PTO engaged/disengaged all of the time.
4) May be bad diodes in the switch panel.
5) Is the relay functioning properly?
6) The relay may not be getting the signal from the remote. Turn on speed control switch in remote and test orange/white wire at relay with test light.
7) The relay may not be getting a good ground.
   - The PTO ball / pressure switch may be bad, not allowing the relay to ground properly.
   - Remove ball / pressure switch and test.

Speed control works with compressor but not on remote

1) Is your transmitter linked with the receiver?
2) Diode in the switch panel may be blown. Check to see if current travels in only one direction, if not replace.

Speed control does not work with compressor or lube functions.

1) Main power is not turned on.
2) The diodes may be bad in switch panel. . Check to see if current travels in only one direction, if not replace.
3) If equipped, is speed control switch on in the switch panel.
4) Check the pressure switch on the air compressor.

Remote control troubleshooting

1) **No functions work with remote**
   - Is your main power switch on in the cab as well as on the remote
   - Battery in wireless remote may not have an adequate charge to run functions, or the batteries may need to be replaced.
   - See Manual for the remote control for more info

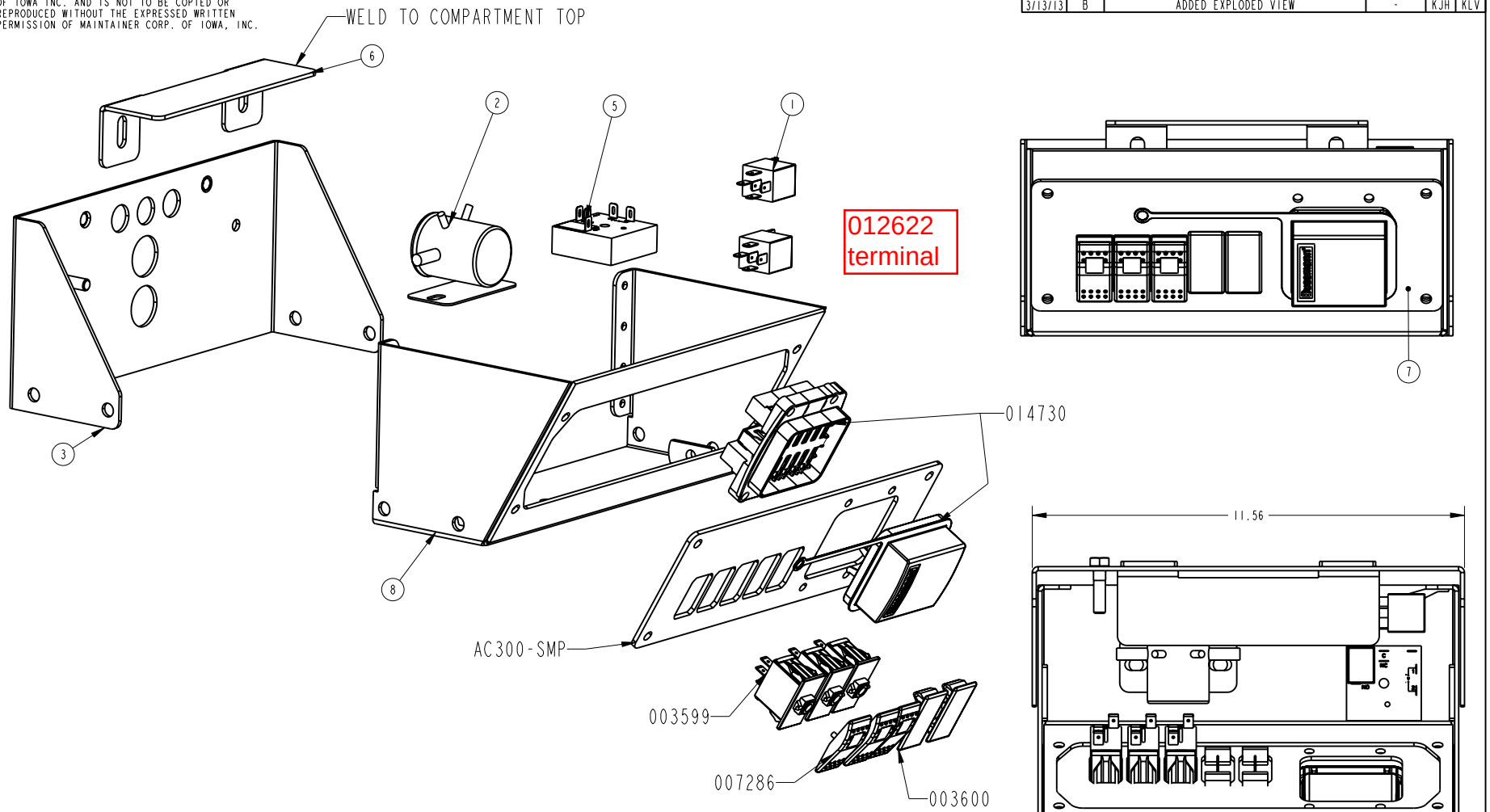
2) **One or more functions do not work on remote**
   - Anti-2-block switch may be activated or bad
     - Test the switch on anti 2 block switch with continuity test (switch is under the metal cover on the crane head).

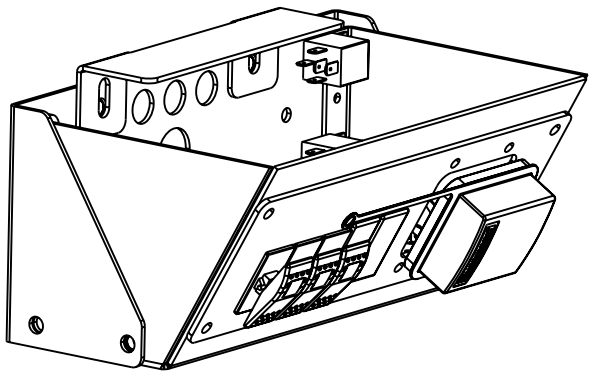
   Note: Anti-2 block shut down
   - If the winch is mounted on the **tower** Anti-2- block shuts off boom down, winch up, and extend out.
   - If the winch is mounted on the **boom** Anti-2 block shuts off winch up and extend out.

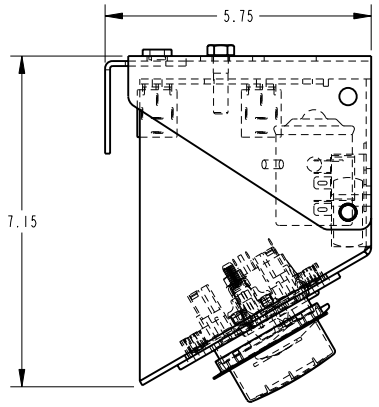
   - Unloader valve may have gone bad
     - This valve is located in the valve well with the crane valve
     - If the crane is over load this valve loses power
     - If coil on valve goes bad it will shut down below functions

   Note: Unloader shut down
   - Unloader valve shut off Boom up and down, winch up, and extend out

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
11/30/12	A	DRAWING RELEASED WAS AC300-SPA	-	KJH	KLV
3/13/13	B	ADDED EXPLODED VIEW	-	KJH	KLV







QTY	DESCRIPTION	PART NUMBER	ITEM
1	ASY,SWITCH_BOX_5 OR 7	016095	8
1	2-TON REDESIGN SWITCH MOUNT PLATE ASSEMBLY	014893	7
1	BRKT,COMP_WIRING_BOX_MNT_ANGLE	010626	6
1	RELAY,TIME_DELAY_DELAY_ON_MAKE_KRDM120	007394	5
3	SWITCH,ROCKER_ACTUATOR(COVER)	007286	4
1	WELDMENT,COMP_WIRING_BRKT_MNT	004448	3
1	SOLENOID,CONTINOUS_DUTY_NORMALLY_OFF	000505	2
2	RELAY,SP/DP_20/30	000475	1

PART NUMBER 016096

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: KJH DATE: 11/30/12
CHK: KLV DATE: 11/30/12

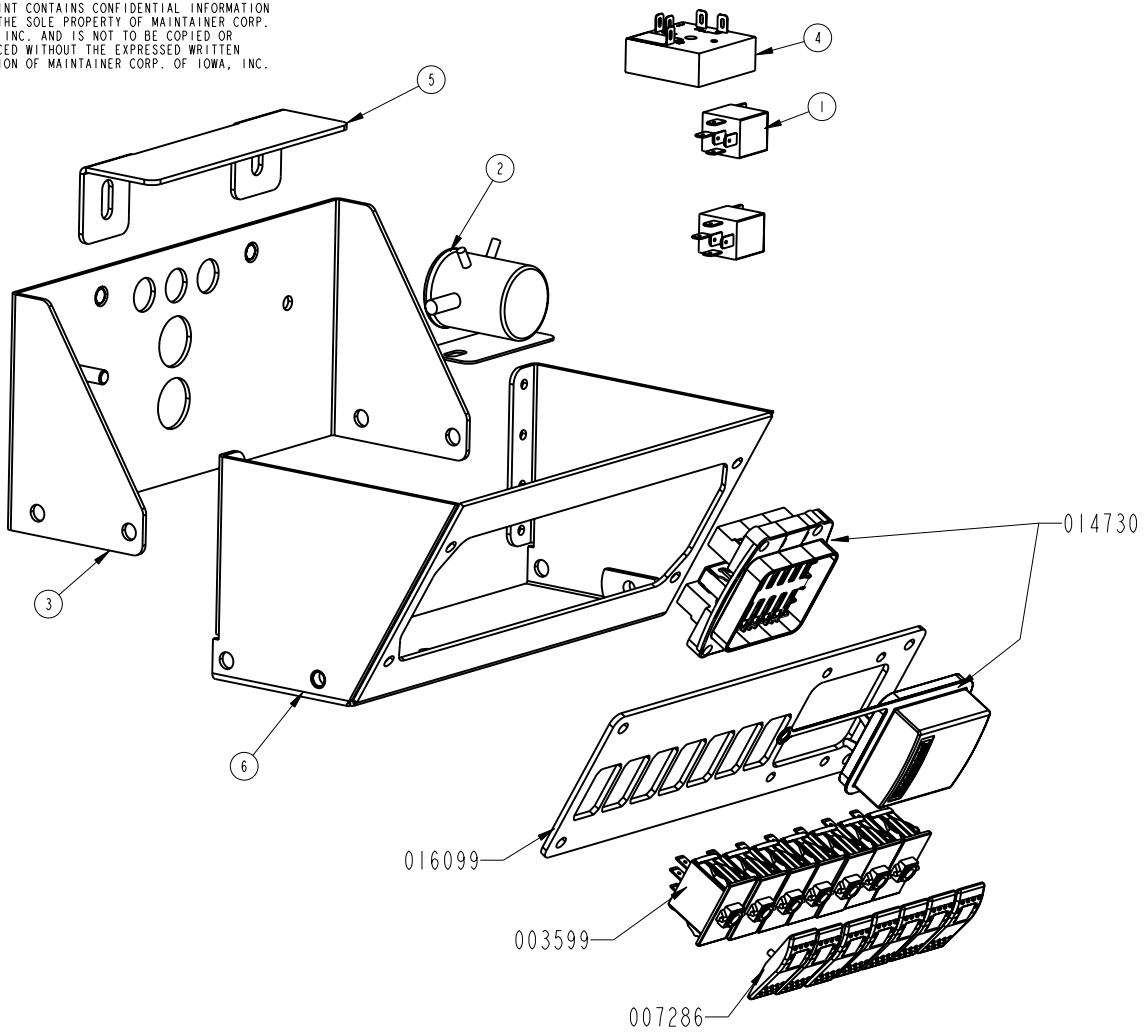
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

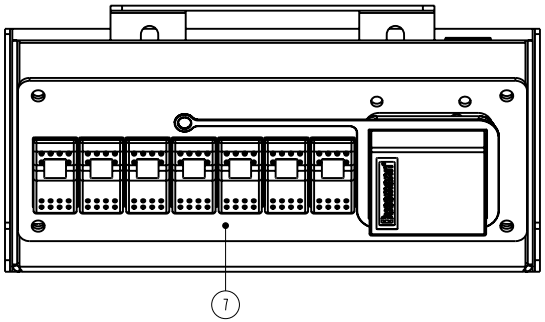
DESCRIPTION: ASY,SWITCH BOX 5 SWITCH, ANGLED

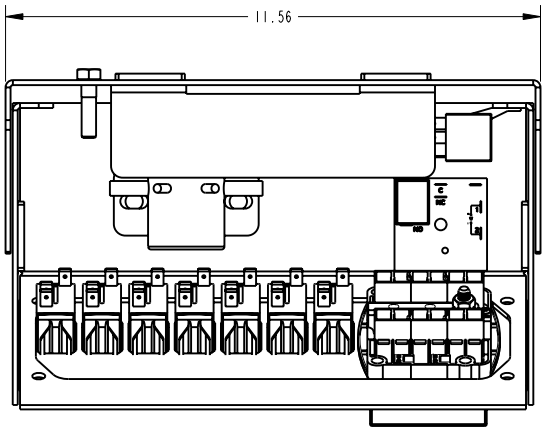
SCALE: 1:2 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 016096 REV. LEVEL: B

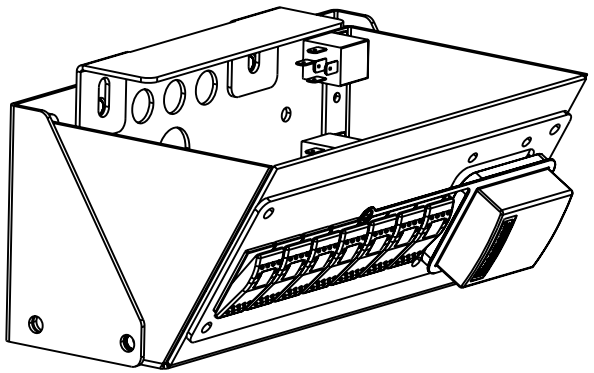
REF. SPECIFICATION

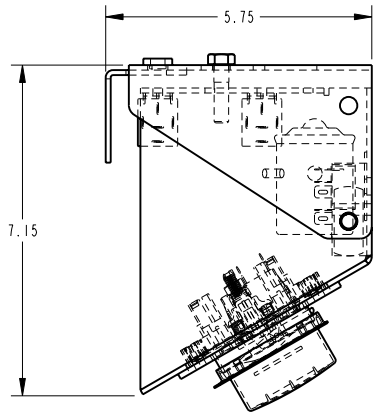
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
11/30/12	A	DRAWING RELEASED	-	KJH	KLV











QTY	DESCRIPTION	PART NUMBER	ITEM
1	ASY, 7 SWITCH & FUSE MOUNT PLATE	016098	7
1	ASY,SWITCH_BOX_5 OR 7	016095	6
1	BRKT,COMP_WIRING_BOX_MNT_ANGLE	010626	5
1	RELAY,TIME_DELAY_DELAY_ON_MAKE_KRDM120	007394	4
1	WELDMENT,COMP_WIRING_BRKT_MNT	004448	3
1	SOLENOID,CONTINOUS_DUTY_NORMALLY_OFF	000505	2
2	RELAY,SP/DP_20/30	000475	1

PART NUMBER 016097

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: KJH DATE: 11/30/12
CHK: KLV DATE: 11/30/12

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,SWITCH BOX 7 SWITCH, ANGLED

SCALE: 1:2 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 016097 REV. LEVEL: A

REF.	SPECIFICATION

Maintainer Body Wiring -- Color Designation

- **Red with or without a stripe indicates a wire carrying a main power source.**
  - 2 ga. Red = Main Power
  - 4 ga. Red = Main Power
  - 8 ga. Red = Main Power
  - 10 ga. Red = Crane Power
  - 14 ga. Red = Power from Chassis for Strobe or Auxiliary Power
  - 14 ga. Red with Black Stripe = Power from Chassis to Main Power Switch
  - 14 ga. Red with Brown Stripe = Strobe Light
  - 14 ga Red with Blue Stripe = From Main Power to Solenoid in Switch Panel
  - 14 ga. Red with Green Stripe = Hour Meters
  - 14 ga. Red with White Stripe = Warning Horn
- **Blue with or without stripe indicates cooler of fan circuit**
  - 10 ga. Blue = Trailer Brake
  - 14 ga. Blue with Black Stripe = A/C Pressure Switch to Relay
  - 14 ga. Blue = PSS Fans
  - 14 ga. Blue with Red Stripe = Hydraulic Cooler
- **Green with or without stripe indicates compressor circuit**
  - 10 ga. Green = Compressor Cooler Fan Circuit
  - 14 ga. Green = Air Compressor Circuits
  - 14 ga. Green with Brown Stripe = Air Compressor Shut Off From Gang to Switch Panel
- **Orange with or without stripe indicates engine speed control, start/stop or fuel solenoid circuits**
  - 10 ga. or 14 ga. Orange with White Stripe =Primary Speed Control Power
  - 14 ga. Orange = Speed Control Signal Wire
  - 14 ga. Orange with Red Stripe = Engine Start
  - 14 ga. Orange with Black Stripe = Engine Stop

- **Purple indicates generator circuit or electronic engine speed control engine speed control engine connection/relay wire**
  - 14 ga. Purple = Generator
  - 16 ga. Purple = Speed Control Engine Connection/Relay Wire

- **Grey with or without stripe indicates PTO circuit**
  - 14 ga. Grey = PTO light and PTO Grounding Switch
  - 14 ga. Grey with Red Stripe = PTO Clutch
  - 14 ga. Grey with Black Stripe = Auxiliary
- **Brown with or without stripe indicates body or chassis marker lights**
  - 14 ga. Brown = Tail Lights
  - 14 ga. Brown with Yellow Stripe = Left Turn Signal
  - 14 ga. Brown with Green Strip = Right Turn Signal
  - 14 ga. Brown with Blue Stripe = Back Up Lights
  - 14 ga. Brown with White Stripe = Auxiliary
- **White with or without stripe indicates compartment light circuits**
  - 10 ga. White = Auxiliary
  - 14 ga. White = Auxiliary
  - 14 ga. White with Yellow Stripe = Street Side Compartments
  - 14 ga. White with Brown Stripe = Center Deck
  - 14 ga. White with Green Stripe = Curb Side Compartments
- **Pink with out strip indicates engine stop**
  - 16 ga. Pink = Engine Stop
- **Pink with strip indicates horn circuit**
  - 16 ga. Pink with Orange Strip = Horn Circuit
- **White without stripe indicates Anti-2 block**
  - 16 ga. White = Anti-2 Block
- **Yellow with or without stripe indicates flood light circuits**
  - 14 ga. Yellow = Remote Receptacles
  - 14 ga. Yellow with Red Stripe = Auxiliary
  - 14 ga. Yellow with Grey Stripe = Street Side Flood
  - 14 ga. Yellow with Brown Stripe = Rear Flood for Backup Light or Extra Rear Flood
  - 14 ga. Yellow with Green Stripe = Curb Side Flood
  - 14 ga. Yellow with Black Stripe = Crane Flood or Center Deck Flood
- **Black indicates ground circuits**
  - 2 ga. Black = Ground Circuits

- 4 ga. Black = Ground Circuits
- 10 ga. Black = Ground Circuits
- 14 ga. Black = Ground Circuits

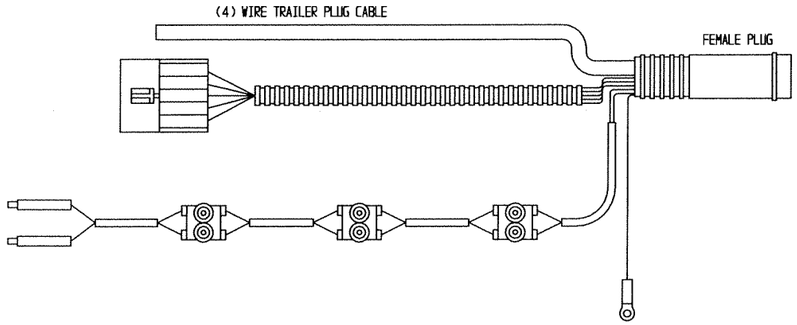
Lube Panel Wires

All double tracer wires are for product functions from switch to lube manifold.

- 14 ga. Blue/Double Green = Product Switch #1
- 14 ga. Blue/Double Yellow = Product Switch #2
- 14 ga. Red/Double White = Product Switch #3
- 14 ga. Red/Double Blue = Product Switch # 4
- 14 ga. White/Double Blue = Product Switch #5
- 14 ga. White/Double Green = Product Switch #6
- 14 ga. Yellow/Double Brown = Product Switch #7
- 14 ga. Yellow/Double Grey = Product Switch #8
- 14 ga. Green/Double Yellow = Product Switch #9
- 14 ga. Green/Double Brown = Product Switch #10
- 14 ga. Orange/Double Red = Product Switch #11
- 14 ga. Orange/Double White = Product Switch # 12
- 14 ga. Purple/Double Orange = Product Switch #13
- 14 ga. Purple/Double Red = Product Switch #14

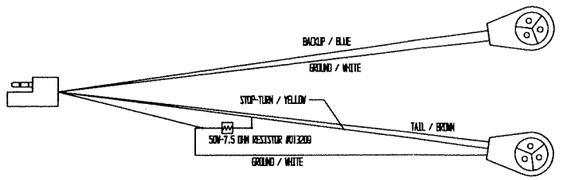
REVISIONS			
REV.	DESCRIPTION	DATE	APRVD
-	added Ford SD 2011 tail light wiring	8-20-10	JPM

CHASSIS HARNESS ADAPTER
2-TON PRT# 009079, GM 5500 010256

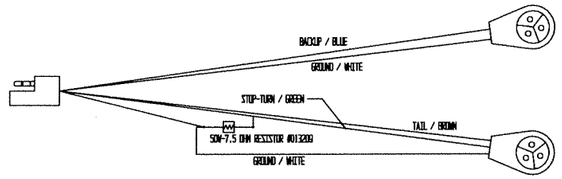


TAIL LIGHT HARNESSES FORD SD 2011

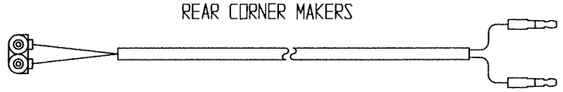
Street Side



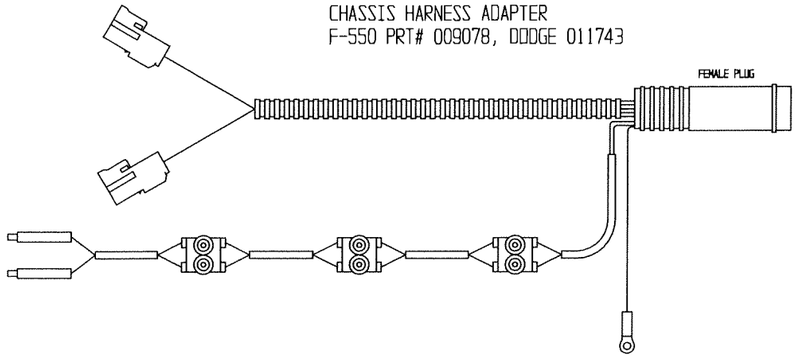
Curb Side



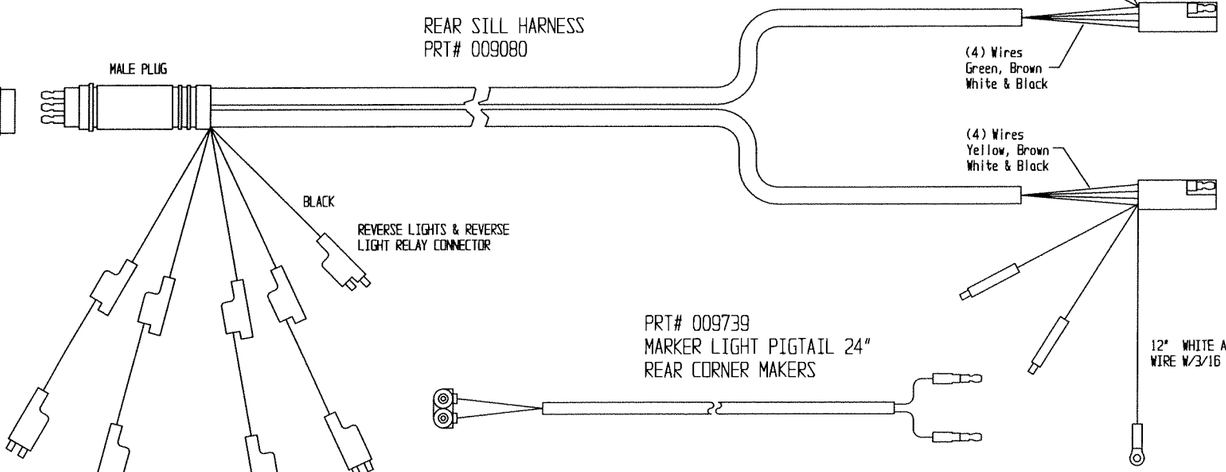
PRT# 009739
MARKER LIGHT PIGTAIL 24"
REAR CORNER MAKERS



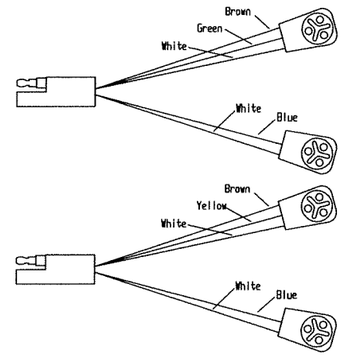
CHASSIS HARNESS ADAPTER
F-550 PRT# 009078, DODGE 011743



REAR SILL HARNESS
PRT# 009080



TAIL LIGHTS & BACKUP LIGHT
Y-HARNESS CURBSIDE
PRT# 009083

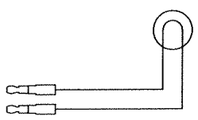


TAIL LIGHTS & BACKUP LIGHT
Y-HARNESS STREETSIDE
PRT# 009084

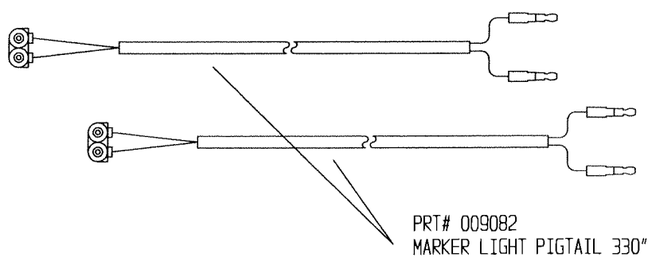
PRT# 009739
MARKER LIGHT PIGTAIL 24"
REAR CORNER MAKERS

PRT# 012011
LICENSE PLATE LIGHT

COMES WITH LED
LIGHT KIT PRT# 011754 (A)



PRT# 009082
MARKER LIGHT PIGTAIL 330"
FRONT MARKERS



UOS DIMENSIONS ARE IN INCHES
GENERAL TOLERANCES

BREAK ALL EDGES .01 X 45°

ANGULAR ± 1°
.XX ± .03
.XXX ± .005

UOS RADII —

UOS ANGLES —

MADE IN THE USA

MATERIAL: —

SCALE: —

SIZE: B

DRAWING NUMBER: 1&2 TON LIGHTING HARNESS

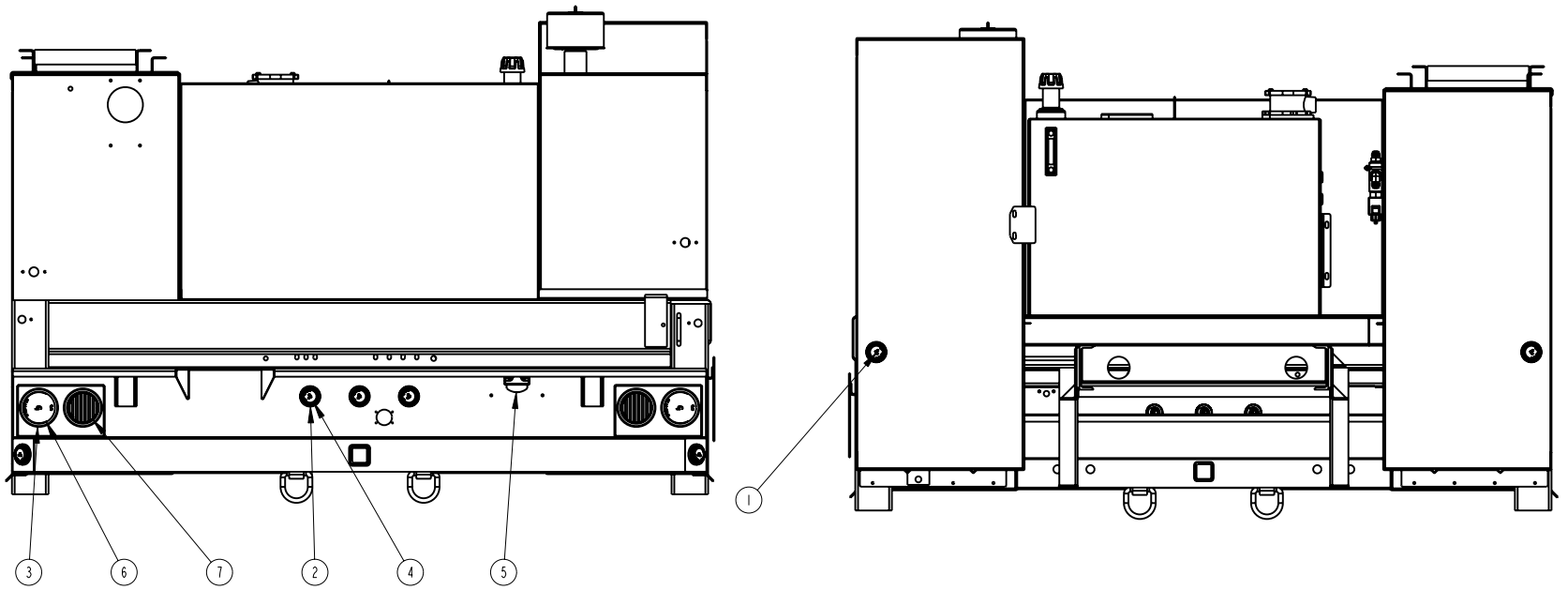
Maintainer
Corporation of Iowa, Inc.
P.O. Box 349 1701 S. 2nd Avenue
Sheldon, Iowa 51201

DFTM. JPM

DATE: 2-09-10

BODY & CHASSIS LIGHTING WIRING HARNESS 1 & 2 TON

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/3/09	A	DRAWING RELEASED	-	MEA	NDS



QTY	DESCRIPTION	PART NUMBER	ITEM
2	LIGHT,BACK-UP_4"ROUND_LED_GROTE_62091	012013	7
2	LIGHT,STOP-TURN-TAIL_4"ROUND_LED_GROTE_5	012012	6
1	LIGHT,LICENSE PLATE LED NEW	012011	5
5	IGHT,CLEARANCE_RED_GROTE_LED_47112	008184	4
4	GROMMET,GROTE_91740_4''_LIGHT	007873	3
7	GROMMET,2 5/16HOLE_GROTE_92120_CLEARANCE	007477	2
2	LIGHT,CLEARANCE_AMBER_LED_GROTE_47113	007476	1

PART NUMBER 011754

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MEA DATE: 4/3/09
CHK: NDS DATE: 4/3/09
APPR: DATE: -

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,LIGHT_PLACEMENT

SCALE: 1:320 | SIZE: C | SHEET: 1 OF 1 | DRAWING NUMBER: 011754 | REV. LEVEL: A

REF.	SPECIFICATION

Thaintainer

Wiring Diagrams

REVISIONS			
REV.	DESCRIPTION	DATE	APRVD

Connect to Battery +12VDC — 6-Red — 80 Amp Circuit Breaker (008064) Mount Near Battery — 6-Red

To Chassis Ground — 10-Blk — Blk — Connon Ground

Red-Blu — B — 6-Red — 6-Red — Main Power Solenoid N.O.

Blu — To P.S.S. Fans

Speed control signal wires. — Org-Wht — Org — diodes — Org

KENWORTH T370 CAB SWITCHES

MAIN POWER SWITCH — Blu

chassis wire — Ignition Hot — 011125 — Red/Blu

Wire #117 — Gray/Red

Wire #103 — Red/White

ALLISON Wires Found Behind Dash Panel

Red

PTO Switch

Wire #143 — Blue/Yellow

ALLISON Wire Found Behind Dash Panel

Red — To PTO

Red — 10 Amp

014893

15 AMP 1	10 AMP 2		
10 AMP 3	10 AMP 4		
10 AMP 5	15 AMP 6		
10 AMP 7	30 AMP 8		
15 AMP 9		10	
11	12		

Red — Yel — To C.S. Remote Light Receptacle

Red — Yel — To S.S. Remote Light Receptacle

Red — 10-R

Red — 12-Brown

Wht

Grn-Brn — Air Comp. Shut-off Relay — Prt. 000475

Red — To Backup Light. — Brn-Wht — Rear Flood/ Reverse Relay — Prt. 000475

Air Comp — Grn

Rear Flood Light — Blk

S.S. Flood Lights

C.S. Flood Light

Compt Lights

Blk

Yel-Brn

Yel-Brn — To S.S. Rear Flood Light

Grn

Yel-Gry — To S.S. Flood Lights

Yel-Grn — To C.S. Flood Light

Wht-Yel — To S.S. Compt Lights

Wht-Grn — To C.S. Compt Lights

12-Brn

Org

Org-Wht

Org-Red

Org-Blk

Grn-Brn

AIR COMPRESSOR RC 40 (015850)

AIR COMPRESSOR HARNESS		COMPRESSOR PIGTAIL HARNESS		MAINTAINER WIRES	
Wire #17	12-White	2	2	12-White Wire #17	12-White to Ground
Wire #1	12-Brown	1	1	12-Brown Wire #1	12-Brown
Wire #9	Black	3	3	Black Wire #9	Green
Wire #6	Black	4	4	Black Wire #6	Orange

Remote Engine Start-Stop

Chassis Starter Relay on Starter — Org-Red — Org-Blk

Red/Green — Red/Green

Pin-5 Ingnition Key Switch — Org 3112-0 Chassis Wire Fron ECM

Relay In Cab Behind Gauge Panel — Prt. 000475

Wire in Harness SS of Firewall

Pin-5 Ingnition Key Switch — Org 3112-0 Chassis Wire

Org-Wht — Relay Behind Dash Panel — Prt. 000479

Gray — Ground Through PTO Pressure Switch

12-PIN CUSTOMER ACCESS CONNECTOR LOCATED IN ENGINE COMPARTMENT

16 GA. Purple — 16 GA. Purple

PIN-5 — Gray Pin-94 — Wires Fron Engine Connector

PIN-3 — Green Pin-62

PTO Speed Control Circuit

Cummins/Paccar 96-Pin ECU Connector

Harness 014135: Hoist Up, Hoist Down, Boon Retract, Boon Extend, Rotate Left, Rotate Right, Boon Up, Boon Down

MICRO SWITCH DETAIL — Norn Open 3–1 — Norn Closed 2 — Connon

Harness 013951: J13 Unloader Valve; Angle Sensor J16; J18 Status Light; ANTI-2 BLOCK WIRING — Connon, Normally Open, J15; J19 Pressure Transducer

Terminal Block in Valve Well

Engine Start Circuit.	Org/Red	YELLOW	REMOTE ENGINE START
Engine Stop Circuit.	Org/Blk	GREEN	REMOTE ENGINE STOP
Air Comp. On/Off	Grn-Brn	BLUE	(AUX) AIR COMPRESSOR ON/OFF
Speed Control	Org	BROWN	PTO-SPEED CONTROL
Crane Power	10-Red	RED	POWER +12/24 VDC
		BLACK	To Grnd

Magnetek Wireless Crane Remote Valve Well Wiring

HORN CIRCUIT — 2E1 — Harness 014135 — 2E3 — Warning Horn Prt. 014418

All Wires 14 Gauge Unless Otherwise Noted (ie 10-Red). Second Color Indicates Tracer Color (ie Yel-Gry) or (Grn//Yel) with Double Tracer Colors

WIRING COLOR CODE	
Blk	Black
Blu	Blue
Red	Red
Yel	Yellow
Pnk	Pink
Brn	Brown
Gry	Gray
Org	Orange
Wht	White
Grn	Green
Ppl	Purple

UOS DIMENSIONS ARE IN INCHES GENERAL TOLERANCES — BREAK ALL EDGES .01 X 45° — ANGULAR ± 1° — .XX ± .03 — .XXX ± .005 — UOS RADII — UOS ANGLES

MATERIAL: —

SCALE: — SIZE: B

DRAWING NUMBER: WDFF306 — DFTM. JPM — DATE: 08-12-14

MADE IN THE USA

Maintainer Corporation of Iowa, Inc. P.O. Box 349 1701 S. 2nd Avenue Sheldon, Iowa 51201

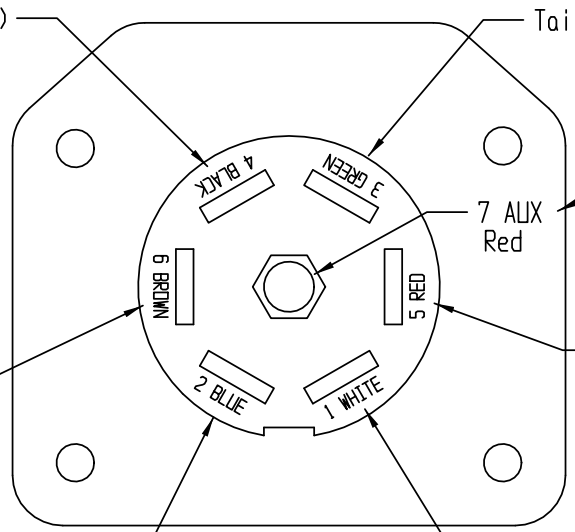
WIRING DIAGRAM, FF-306 HEWS CO. - COMPREHENSIVE LAND

REVISIONS			
REV.	DESCRIPTION	DATE	APRVD
-	added wire colors	4-11-06	JPM
A	changed wire gauge for brake controller was 14 now 12	10-10-06	JPM
B	changed the Red/"Double" Yellow to Red/"Single" Yellow	10-10-06	JPM

RUN 14Ga WIRE TO CAB
AND LABEL "TRAILER 12V"

RUN 14Ga WIRE TO CAB
AND LABEL "TRAILER AUX"

7-WAY BLADE TRAILER SOCKET
VEHICLE END PRT# 007486
WIRE SIDE SHOWN



12 Volt (4)
Red/Yellow
(B)

Tail Lights (3)
Brown

7 AUX
Red

Right Turn (6)
Brown/Green

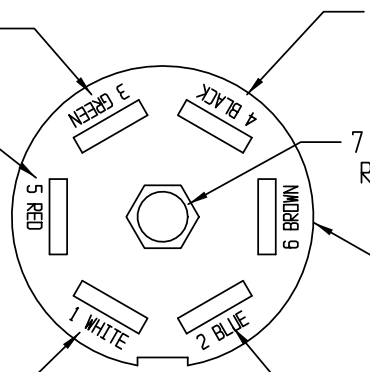
Left Turn (5)
Brown/Yellow

Electric Brakes (2)
Blue

Ground (1)
White

CONNECT TO BRAKE CONTROL
IF AVAILABLE ON VEHICLE IF NOT
AVAILABLE RUN 12Ga WIRE TO CAB AND
LABEL "BRAKE CONTROL"
(A)

7-WAY BLADE PLUG
TRAILER END PRT# 007487
WIRE SIDE SHOWN



Tail Lights (3)
Brown

12 Volt (4)
Red/Yellow
(B)

Left Turn (5)
Brown/Yellow

7 AUX
Red

Right Turn (6)
Brown/Green

Ground (1)
White

Electric Brakes (2)
Blue

THIS DRAWING IS FOR ALL TRUCKS EXCEPT FOR
F-550 FORDS, SEE DRAWING 7POLEBLADEF550 FOR THE F-550

WIRE SIDE OF PLUG AND RECEPTACLE SHOWN

PROPRIETARY DATA PROPERTY OF MAINTAINER CORPORATION OF IOWA, INC.			COPYRIGHT (C) 2006
UOS DIMENSIONS ARE IN INCHES GENERAL TOLERANCES		MATERIAL:	Maintainer Corporation of Iowa, Inc. P.O. Box 349 1701 S. 2nd Avenue Sheldon, Iowa 51201
BREAK ALL EDGES .01 X 45°	ANGULAR ± 1° .XX ± .03 .XXX ± .005	SCALE:	SIZE: A
UOS RADII ———	UOS ANGLES ———	DRAWING NUMBER: 7POLEBLADE	DFTM. JPM DATE: 10-10-06
MADE IN THE USA		7-WAY BLADE TRAILER PLUG	

8/6/13
Nathan Schiermeyer

Output 1	Boom up
Output 2	Boom Down
Output 3	Rotate CW
Output 4	Rotate CCW
Output 5	Hoist/winch Up
Output 6	Hoist/winch Down
Output 7	Boom Extend
Output 8	Boom Retract
Output 9	Horn
Output 10	Dump Solenoid
Output 11	Engine Stop
Output 12	Engine Start
Output 13	Auxiliary
Output 14	High Idle
Output 15	90% alarm (light)
Output 16	100% alarm (light)

A1. BOOM PSI LOW
A2. CW LIMIT
A3. CCW LIMIT
A4. TRK TILT WARNing
A5. TRK TILT ALARM
A6. ANTI-2-BLOCK
A7. 90% LOAD WARN
A8. 100% LOAD ALARM
A9. SLOW ROTATE ACT
A10. BOOM SENSOR ERR
A11. BOOM ANGLE RANGE
A12. BOOM PT ERR
A13. Outrigger pressure low
A14. CW OR ERROR
A15. CCW OR ERROR
A16. BOOM 50% LIMIT
A17. TRK TILT BOOM SLOW

S0. E-STOP ACTIVE
S1. RECEPTION OF A CAN MESSAGE TIMED OUT
S2. TEMP OUT OF RANGE -40°c TO +85°C
S16. OUTPUT 1 (Boom down) OVERCURRENT ERROR
S17. OUTPUT 2 (Boom up) OVERCURRENT ERROR
S18. OUTPUT 3 (Rotate CW) OVERCURRENT ERROR
S19. OUTPUT 4 (Rotate CCW) OVERCURRENT ERROR
S20. OUTPUT 5 (Winch up) OVERCURRENT ERROR
S21. OUTPUT 6 (Winch down) OVERCURRENT ERROR

S22. OUTPUT 7 (Boom Extend) OVERCURRENT ERROR
S23. OUTPUT 8 (Boom Retract) OVERCURRENT ERROR
S24. OUTPUT 9 (Horn) OVERCURRENT ERROR
S25. OUTPUT 10 (Over-ride valve) OVERCURRENT ERROR
S26. OUTPUT 11 (Eng. Stop) OVERCURRENT ERROR
S27. OUTPUT 12 (Eng. Start) OVERCURRENT ERROR
S28. OUTPUT 13 (Auxiliary) OVERCURRENT ERROR
S29. OUTPUT 14 (High Idle) OVERCURRENT ERROR
S30. OUTPUT 15 (90% light) OVERCURRENT ERROR
S31. OUTPUT 16 (100% light) OVERCURRENT ERROR

S32. OUTPUT 1 (Boom down) +vb SHORT
S33. OUTPUT 2 (Boom up) +VB SHORT
S34. OUTPUT 3 (Rotate CW) +VB SHORT
S35. OUTPUT 4 (Rotate CCW) +VB SHORT
S36. OUTPUT 5 (Winch up) +VB SHORT
S37. OUTPUT 6 (Winch down) +VB SHORT
S38. OUTPUT 7 (Boom Extend) +VB SHORT
S39. OUTPUT 8 (Boom Retract) +VB SHORT
S40. OUTPUT 9 (Horn) +VB SHORT
S41. OUTPUT 10 (Over-ride valve) +VB SHORT
S42. OUTPUT 11 (Eng. Stop) +VB SHORT
S43. OUTPUT 12 (Eng. Start) +VB SHORT
S44. OUTPUT 13 (Auxiliary) +VB SHORT
S45. OUTPUT 14 (High Idle) +VB SHORT
S46. OUTPUT 15 (90% light) +VB SHORT
S47. OUTPUT 16 (100% light) +VB SHORT

S48. OUTPUT 1 (Boom down) -vb SHORT
S49. OUTPUT 2 (Boom up) -vb SHORT
S50. OUTPUT 3 (Rotate CW) -vb SHORT
S51. OUTPUT 4 (Rotate CCW) -vb SHORT
S52. OUTPUT 5 (Winch up) -vb SHORT
S53. OUTPUT 6 (Winch down) -vb SHORT
S54. OUTPUT 7 (Boom Extend) -vb SHORT
S55. OUTPUT 8 (Boom Retract) -vb SHORT
S56. OUTPUT 9 (Horn) -vb SHORT
S57. OUTPUT 10 (Over-ride valve) -vb SHORT
S58. OUTPUT 11 (Eng. Stop) -vb SHORT
S59. OUTPUT 12 (Eng. Start) -vb SHORT
S60. OUTPUT 13 (Auxiliary) -vb SHORT
S61. OUTPUT 14 (High Idle) -vb SHORT
S62. OUTPUT 15 (90% light) -vb SHORT
S63. OUTPUT 16 (100% light) -vb SHORT

REV 8/6/13 added all System S error codes
REV 2/21/13 added A13-17

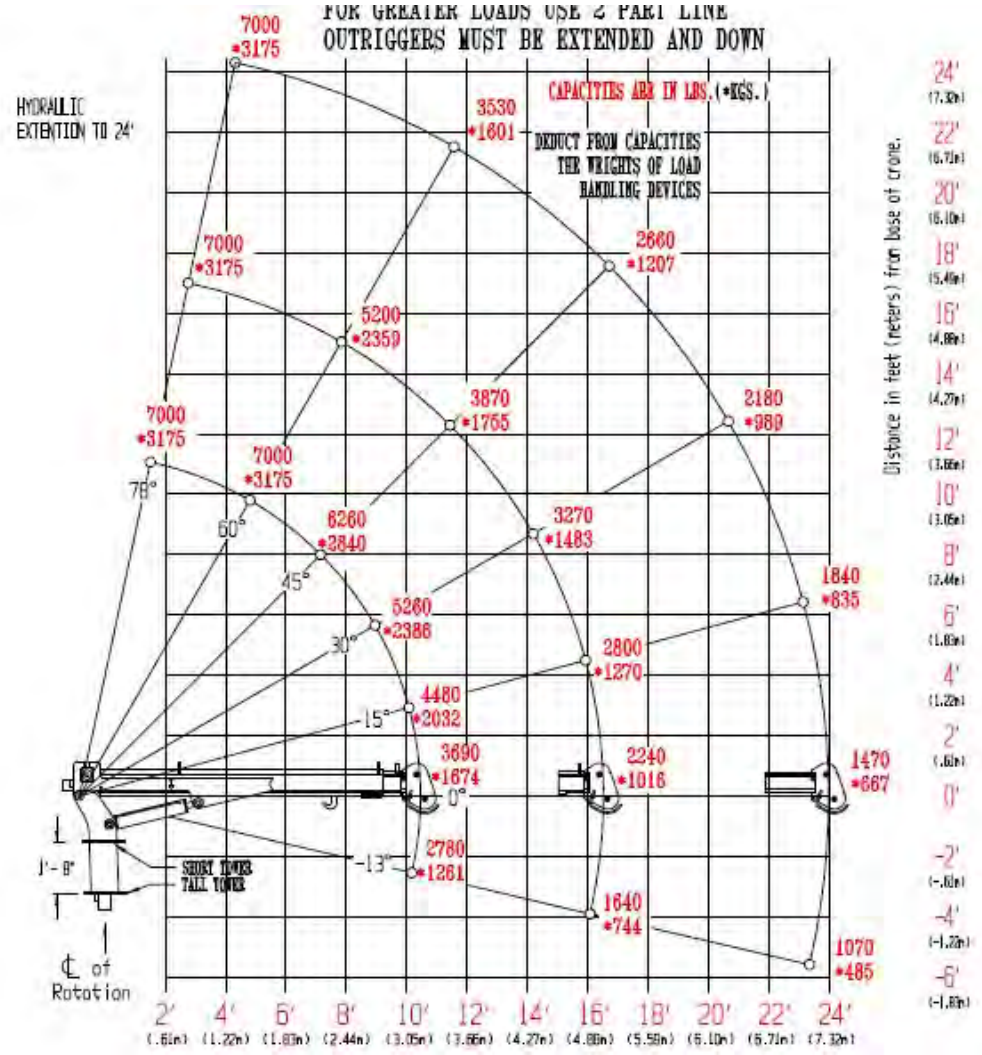
RADIO CONTROL SYSTEMS

LMI Load Moment Indication

LMI- Load Moment Indication
When lifting a load the loading of the boom depends on the weight of the load, the angle of the boom, and the distance the boom is from the truck.

Warning Light- We inform the operator of the current lifting status
Green Light – 0- 90% Load of the Crane
Yellow Light - 90-100% Load of the Crane
Red Light - 100%+ Load of the Crane

The LMI system allows the crane to pick up extra capacity in various positions, without increasing the overall foot-lb rating of the crane.



Transmitter

FM Transmitter

• 100% Proportional push button control. Allows for multiple speed control on each function independently. Non Contacting Push Buttons – Neoprene Seal
• Multiple Speed control settings for the Crane to allow for four speed rates From full speed to creep. Settings are 100%, 75%, 50%, and 25% for fine control
• Multiple functions can be enabled simultaneously without reduction in flow to other functions
• Fully sealed transmitter -Light weight- 70% weight reduction
• Belt clip attachment, for reduced job site loss
• Environmental Sealing IP66 rated Heavy Duty Water Spray Certified
• CE certified (for Europe)
•ON/OFF Button Removable to disable Radio
•300 Foot Range of Radio Control

Receiver

Receiver

- LCD Display - Complete Diagnostics for the crane that a field operator can easily read
- Alarm System - Names the functions - No obscure error codes
- Environmental Sealing - IP66 rated
- CE Certified for full Crane Operation and Machine Safety per EC rules
- Transmitter Signal Strength indicator (similar to cell phone bar graph)
- Transmitter Battery Life Display
    - Warning on Low Battery - 100 hours of functioning battery life (40% longer than previous remote)
- Verification of output to hydraulic valve as you actuate the FM transmitter
- Crane Hours are monitored with hours displayed on front screen
- USB port for programming, monitoring and diagnostics
- Full smooth "RAMP UP" and "RAMP DOWN" of each crane function independenly

Wireless Transmitter

OFF-ON-START/SPEED- Enables the transmitter to communicate with the Receiver and sets the Machine speeds

Off- Transmitter is Suspended From Operation and Shuts Down
NOTE: MUST BE TURNED TO THE OFF POSISITION TO PREVENT BATTERY DRAIN

On- Transmitter is told to activate and begin Communication- Status light will blink showing activation

Start/Speed- Momentary Setting- After Turning "ON" the transmitter "Start" tells the transmitter to talk to the Crane Receiver (think of it like a car's ignition key switch, start and run)

OFF-ON-START/SPEED

E-STOP

LED – Speed Indicator- Status

Main Boom- Up Down Speed Setting Buttons

Rotate- CW/CCW

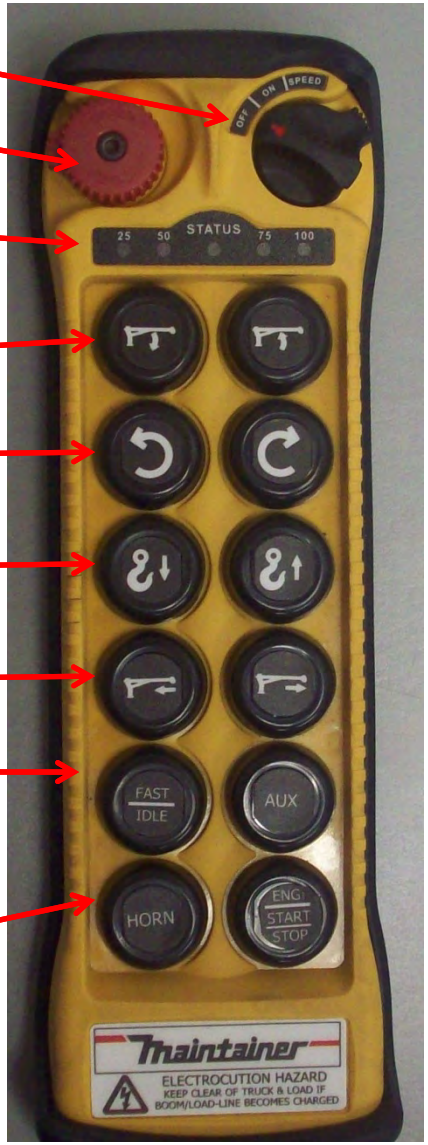
Hoist – Up/Down

Telescope- Extend/Retract

Engine Fast Idle- Auxiliary – A/C

Horn

Engine Start- Engine Stop



Setting Crane Speed

Start /Speed- By Holding the Start/Speed Switch and the Pressing Boom Up/Down Buttons the Speed of the Crane can be changed.

Action
Hold Down Start/Speed Switch, simultaneously press Up or Down on the MAIN BOOM Switches to change Speed output to the valves

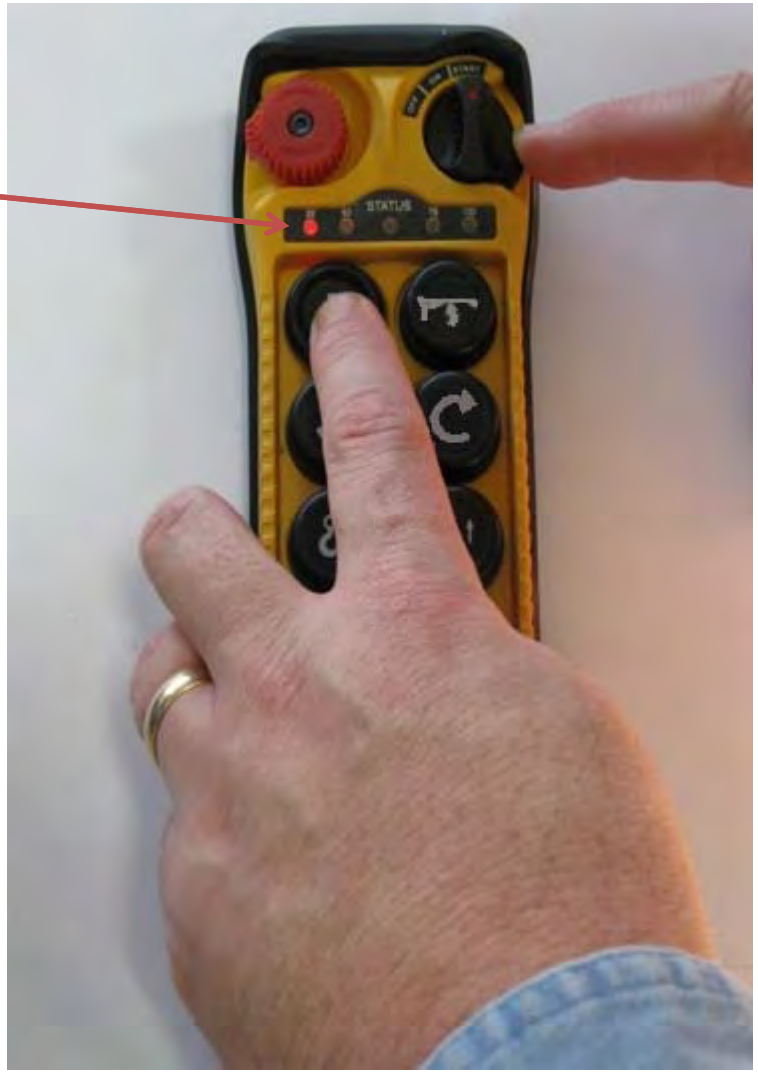
What does this mean-
Ability to change the maximum speed of the crane from 100% to 25% (creep) directly from the Transmitter

This allow the Operator to "CREEP" the load and allow for precise location of the load without fear of damage.

Status Indicator- Light flashes when button is pressed

Speed- 25%,50%,75%,100%
LED shows current speed selected
Center Status Light
turns Red when:

- You press a button while enabling the transmitter.
- When E Stop is pressed.
- Error in Transmitter.



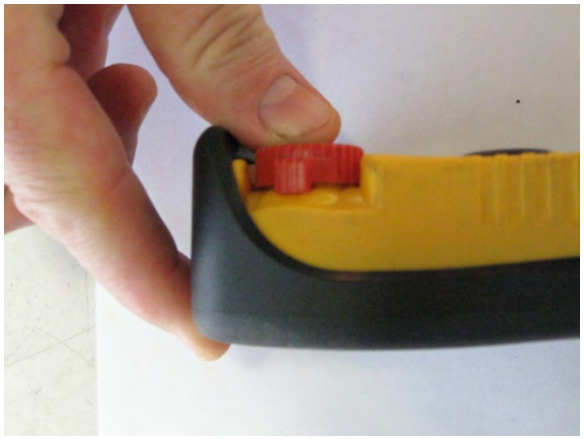
E-Stop

E Stop- Normal Operation Mode- E Stop is in the “UP” position

Release E Stop-
Use Your Thumb and Press “UP” on the E Stop - This will Snap back to the Normal Position.

NOTE: VERY IMPORTANT
To begin transmitting again the Start Indicator on the Right must be reactivated.

E Stop activated when pressed “DOWN” – Locks in this condition- All Outputs to the transmitter are stopped and the receiver will show E-Stop Activated. Additionally, the signal rate will go to zero (0)

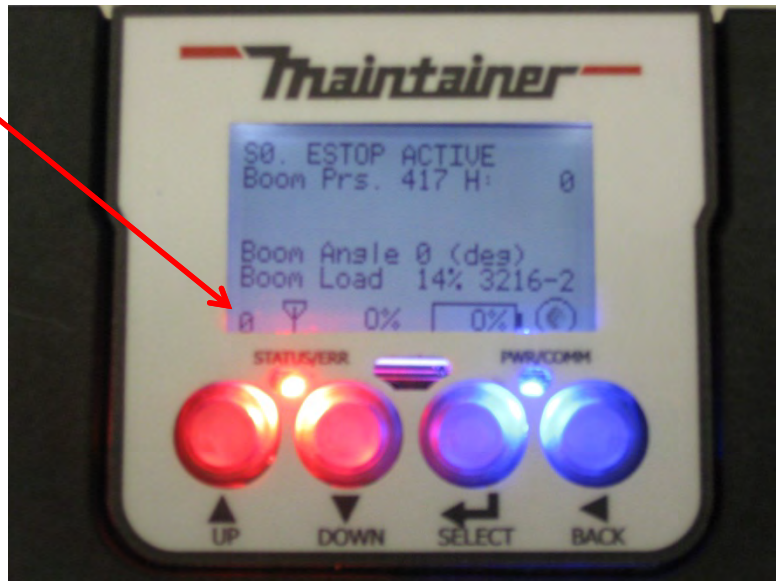


Sleep Mode

Sleep Mode- To save battery life the transmitter

When a System is “AWAKE” the transmitter will be sending messages- This number should read 5 or 6.

Transmitter goes to “Sleep Mode” after five (5) minutes of not operating.
When a system is in “Sleep Mode” the transmitter signals will read zero (0). Same as E-Stop



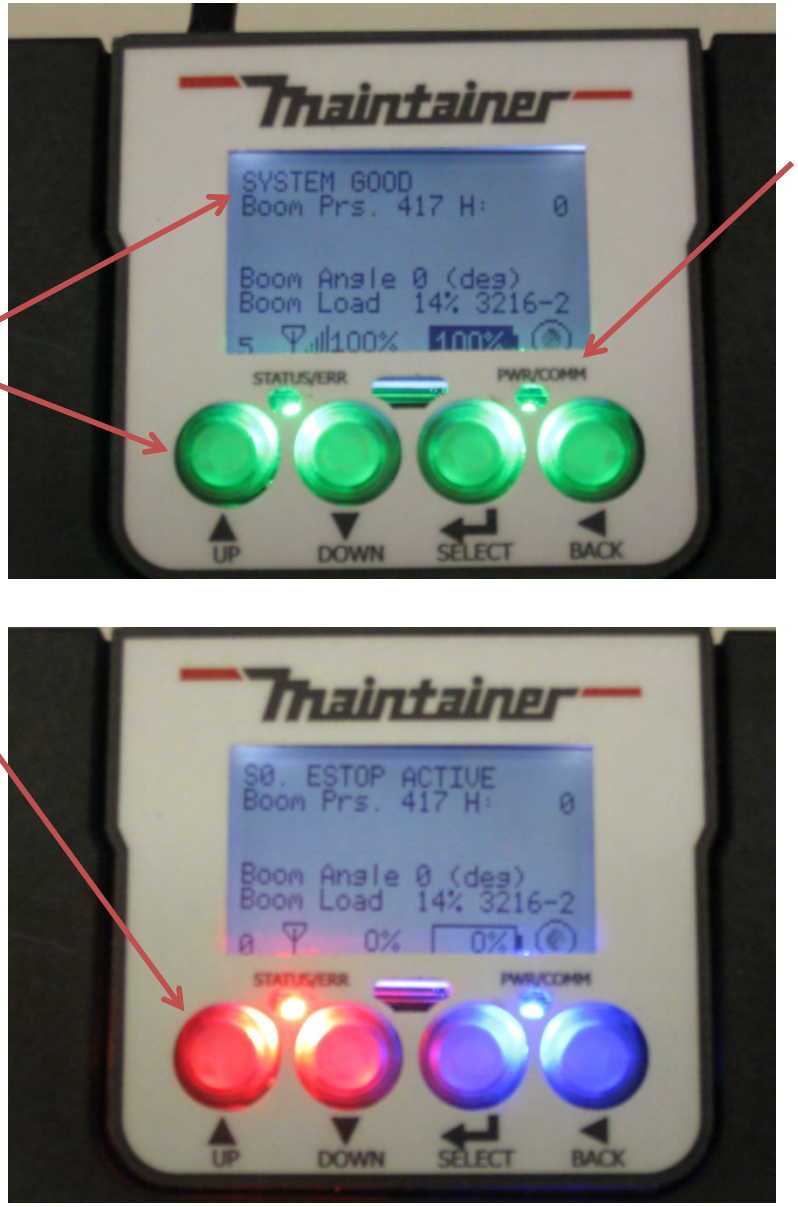
To bring the system out of “Sleep Mode”, press the Start/Speed button for 2 seconds.

Four Light Indicators

<u>UP/DOWN Lights</u>- These lights indicate all is good with a pair of Green Lights. When a Alarm as defined by Maintainer occurs then the Lights turn red.

SYSTEM GOOD- Indicates crane is ready and boom load pressure is below 600 PSI.

When an alarm is activated (such as E-Stop) then the UP/DOWN Light flags an issue and turns red.



The Status Error Light also show issues. The PWR/COM are used for data transfer and output.

All four buttons are used for accessing and changing the adjustable parameters of the program.

Machine Control
Proportional Buttons

Proportional Controls-
The transmitter controls the speed of each crane function the farther the button is depressed.

Ramping- All functions have a Ramp-On and Ramp-Off feature. Even when a button is quickly depressed, the function is “ramped”, which reduces the shock loading and bouncing of the boom.

Reducing shock loading means longer life, and less downtime.

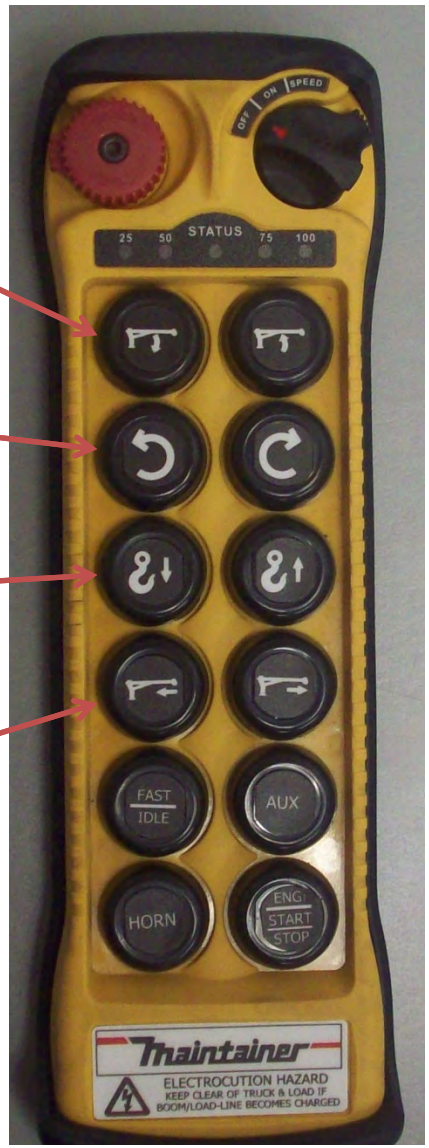
Variable speed to each function means the operator gets infinite control while reducing “bouncing” of the load.

Main Boom- Up Down Speed Setting Buttons

Rotate- CW/CCW

Hoist – Up/Down

Telescope- Extend/Retract



Transmitter Additional Functions

Fast Idle- Ramps engine from low-idle to high-idle. Pressing button toggles On/OFF

Auxiliary- Welder/ Air Compressor- Pressing button toggles On/OFF

Engine Start/Stop- Momentary- By pressing holding and holding, the receiver sends a command to the engine to stop
Pressing the button a second time gives a separate output for engine start.

Horn– Momentary- By pressing and holding, the Receiver sends a command to the horn for safety clear. (Required by OSHA)

Receiver Controller and Display

Receiver – Processing unit
The receiver takes the inputs from the transmitter and inputs from the crane sensors and sends outputs to the crane valve.

The LCD display allows the operator a clear and exact understanding of what is occurring on the crane.

The receiver explains what inputs and outputs are occurring and displays for the operator if there is a problem. The screen allows for clear understanding of machine functions for assisting and helping the operator.

Receiver Controller and Display

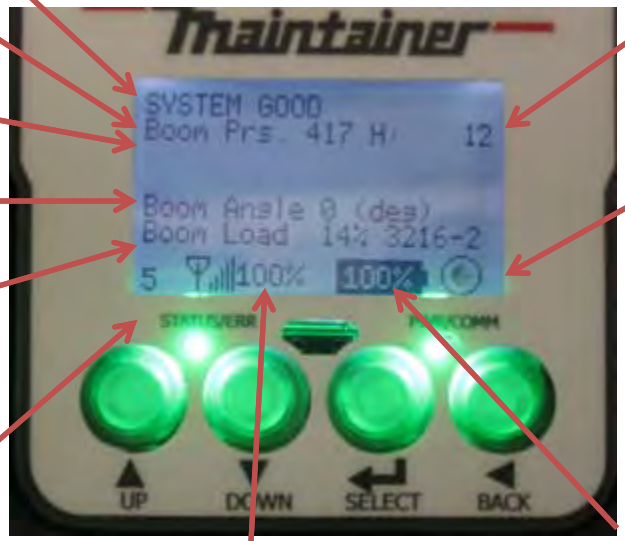
Machine/Alarm Status

Boom Pressure (psi)

Function Activated
Signal Percent %

Boom Angle
(Degrees)

Boom Load
(% of Total Load)



Crane Hours- H….12
- = 12 hours

Watch Dog Timer-
Continuous rotation shows that the processor in the receiver is functioning properly

Active Signals From Transmitter
0= Not Active
5-6 Active but Waiting
9-10 Means Button being pressed

Transmitter Signal Range %
Signal strength from transmitter to receiver

Battery Life In Transmitter
Explains How Much Expected Life in AA Batteries
2 Batteries Per transmitter
% Percent left

Receiver Additional Functions

Additional On/Off Functions displayed on Receiver

1. Fast Idle-
2. Auxiliary- For Compressor or other onboard equipment
3. Engine Start/Stop
4. Horn

Fast Idle

Auxiliary

Engine Start/Stop

Horn

Crane Alarms and States-Basic

Basic-
Standard Boom Pressure Transducer is installed but no boom angle sensor, or alarm status light

Alarms and Monitoring
The control system knows when things are in the correct state and functions are controlled in a particular way when we reach the state.

1. **Bridging- When boom Pressure is below 30 psi**
2. **OPEN**
3. **OPEN**
4. **OPEN**
5. **OPEN**
6. **Anti 2 Block Engaged**
7. **Load Moment Alarm 90%**
8. **Load Moment Alarm 100%**
9. **Slow Rotate Alarm- When Boom Pressure is above 600 PSI**
10. **OPEN**
11. **OPEN**
12. **Boom Pressure Transducer Error**

Crane Alarms and States-LMI

LMI-
Includes boom angle sensor and alarm status light

Alarms and Monitoring
The control system knows when things are in the correct state and functions are controlled in a particular way when we reach the state.

The LMI has better control as it has more available inputs

1. **Bridging- When boom Pressure is below 30 psi**
2. **OPEN**
3. **OPEN**
4. **Truck Angle Limit Warning 7% Slope (4.5 Degrees)**
5. **Truck Angle Limit Alarm 11.3 % Slope (6.5 Degrees)**
6. **Anti 2 Block Engaged**
7. **Load Moment Alarm 90%**
8. **Load Moment Alarm 100%**
9. **Slow Rotate Alarm- When Boom Pressure is above 600 PSI**
10. **Boom Angle Sensor Error- Cable issue or fault**
11. **Boom Angle Sensor out of Range**
12. **Boom Pressure Transducer Error**

Alarm: A1- Bridging

Bridging- A1 BOOM PSI LOW
When the boom Pressure Drops Below 30 PSI the A1 Alarm Occurs.

<u>Functions Allowed:</u>
Hoist/Winch Down
Boom Up
Boom Extend/Retract

<u>Functions Disabled:</u>
Hoist/Winch Up
Boom Down
Rotate- CW/CCW

Alarm A4 and A5 Truck Angle

<u>Truck Tilt Alarm</u>- with LMI

A4 - TRUCK TILT WARNING

- The alarm occurs when the truck is greater than 4.5 degrees out of level.
- Alarm status light flashes yellow
- All crane functions reduced to 50% maximum load

A5 - TRUCK TILT ALARM

- The alarm occurs when the truck is greater than 6.5 degrees out of level.
- Alarm status light flashes red
- All crane functions reduced to 50% maximum load
- Functions Allowed: Hoist/Winch down, Telescope In/ Retract

Alarm A6- Anti 2 Block

A6 Anti 2 Block

When the load block has been retracted too far, a limit switch is activated to prevent damage to the crane or load block.

Functions Allowed:

- Hoist/Winch Down
- Boom Up/Down
- Boom Retract
- Rotate- CW/CCW

Functions Disabled:

- Hoist/Winch: Up
- Extend Out

Note: The Limit Switch is wired normally closed, so a broken or disconnected limit switch will activate the alarm as well.

A7- 90% Load Alarm

A7 90% Load Warning

When the load value exceeds 90% of the allowed load moment for the crane the A7 Alarm activates.

The alarm status light goes from GREEN to YELLOW.

Function limits:

- Hoist/Winch Up- 100% Speed
- Hoist/Winch Down- 100%Speed
- Boom Up – 50% Speed
- Boom Down- 50% Speed
- Boom Ext- 75 % Speed
- Boom Retract- 75% Speed
- Rotate CW/CCW- 50% Speed

A8- 100% Load Alarm

A8 100% Load Alarm
When the load value exceeds 100% of the allowed load moment for the Crane the A8 Alarm activates.
The alarm status light goes from YELLOW to RED.

Functions Allowed:
Hoist/Winch Down- 50%Speed
Boom Retract- 50% Speed
Rotate CW/CCW- 25% Speed

Unloader Valve Opens

Functions Disabled:
Hoist/Winch - Up
Boom - Down
Boom - Up
Boom - Extend

A8- 100% Load Alarm- Reset

A8 100% Load Alarm
Once the Alarm is triggered and the Red light activated, the load must be reduced below the 100% point.

RESET- to reset out of 100% overload the boom pressure must be reduced by moving the load to eliminate boom pressure.

Functions Allowed:
Hoist/Winch Down- 50%Speed
Boom Retract- 50% Speed
Rotate CW/CCW- 25% Speed

Functions Disabled:
Boom - Down
Boom - Up
Hoist/Winch - Up
Boom - Extend

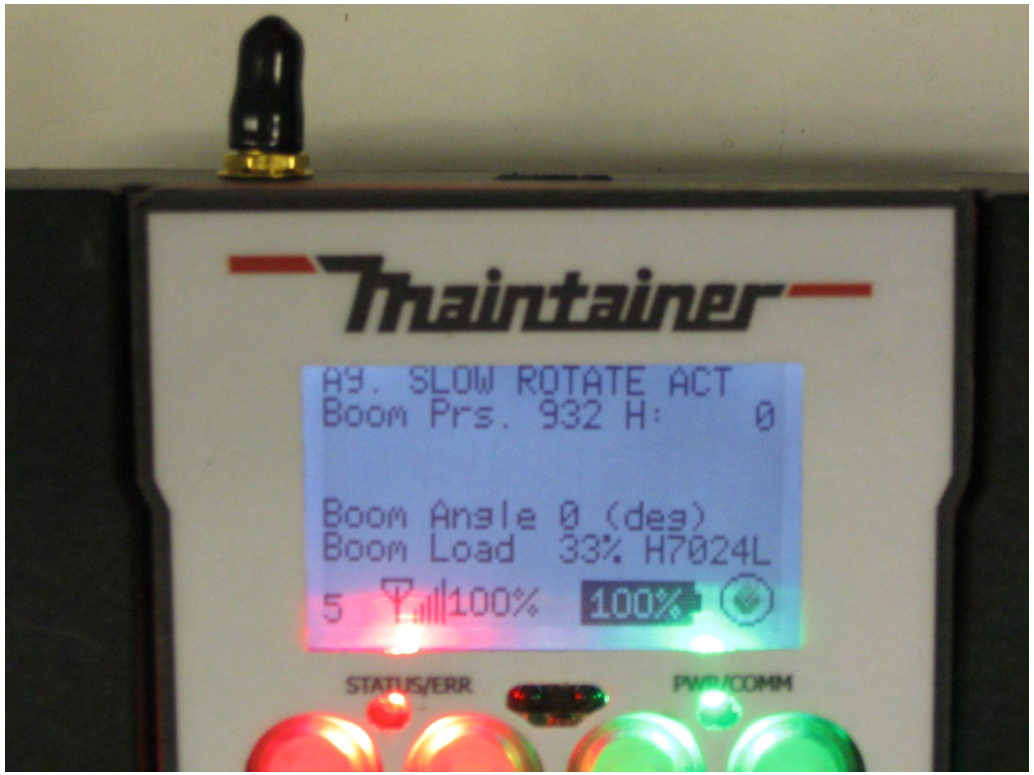
A9- Boom Slow Rotate

A9 SLOW ROTATE

When the Boom Pressure Transducer exceeds 600psi. The rotate speed goes from fast rotate to reduced speed rotation. This ensures that when a operator has no load, the boom is quick and nimble, but once loaded the speed is reduced to a safe rate to reduce undesirable load swing.

Functions Allowed:

Hoist/Winch Up/Down- Full Speed
Boom Up/Down – Full Speed
Boom Ext/Retract- Full Speed
Rotate CW/CCW- Max Speed 75%



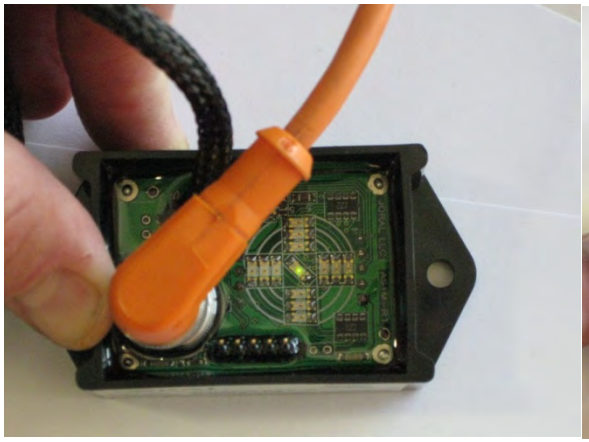
A10 - Boom Angle Sensor Error

A10 BOOM SENSOR ERROR

If the system must be in constant communication with the boom angle sensor. The sensor is powered if you can see Green or Red LED's on the base sensor.

- Green Centered LED means machine is level in both directions.
- Red LED's indicate amount of angle off in that direction.

If sensor fails the green light will flash on/off & all table values will default to the 30°boom operation values (As if it was a non-LMI system)



A11- Boom Angle Range

A11 BOOM ANGLE RANGE
If the Main Boom angle Sensor is less than – 15 degrees or greater than +85 degrees then this error occurs.

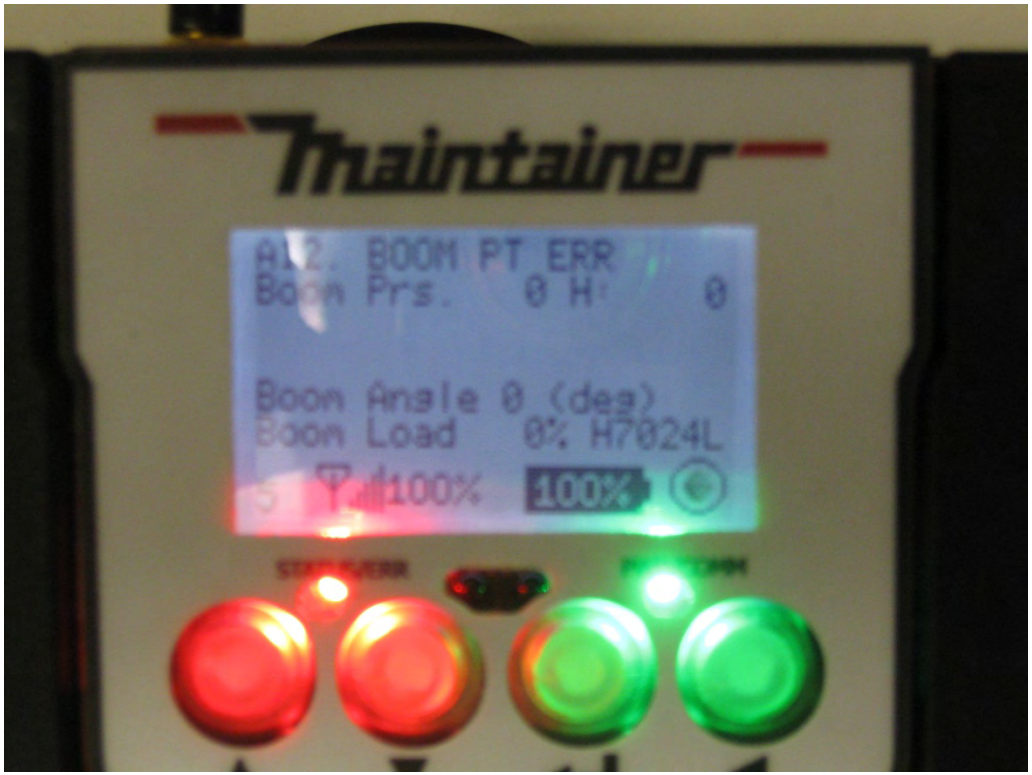
Functions Allowed:
Boom Up Normal
All other crane functions disabled

A12- Boom Pressure Transducer Error

A12- BOOM PT ERROR
If the Pressure Transducer is damaged or disconnected, the control system senses the missing transducer, and there will be an A12 alarm

No more “hotwired” pressure switches!

Functions Disabled:
All crane functions disabled



Pressure Transducer

Boom Pressure Transducer:

The Boom Transducer is a 0-3000 psi sensor.

The sensor is given a 5 Volt Supply Signal but reads from 0.5 for 0 psi to 4.5 volts for 3000 psi.

If a cable is broken , the system can sense the error and it is displayed on the LCD Screen.

System Alarms- Proportional Output Error

System Errors-

If the cable to the coil is broken or not connected the system can see this problem. The receiver monitors the current out to a function and monitors the current back from the function. When you read the output signal to a valve coil you are actually looking at the current returning from the valve coil. If the function displays 0% while the transmitter button is fully depressed, the coil is disconnected or broken.

System Errors

The S error codes are the System Errors S(xx).

Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
S0. ESTOP ACTIVE	Estop activated from the transmitter	1. Both Estop outputs active 2. All outputs shutoff as defined by the project	Disable condition that activated estop and press start
S1. CAN RX TO	Reception of a CAN message timed out	1. CAN message not received and processed 2. Depending on how the CAN messages are used, outputs may be shutoff as defined by the project	Determine why the message(s) is(are) not being received. Once message(s) is(are) received again, the alarm will clear
S2. TEMP OUT OF RANGE	Temperature is out of the operating range of -40C to +85C	Outputs are shut off	Get temperature into acceptable operating range and the alarm will clear after 1 minute permitting outputs to operate again
S16. OUT 1 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shutoff to prevent damage to the hardware.	Output is shutoff and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the over current draw, fix the cause, and power cycle the system

S16-31

- **Output 1-16 Over Current Errors- Current over 3.5 Amps on Output.**

S32-47

- **Output 1-16 Over Voltage beyond + V Battery.**

S48-63

- **Output 1-16 Sees a negative Voltage below – V Battery 0 Volts**

- **For detailed error codes reference Receiver Manual**

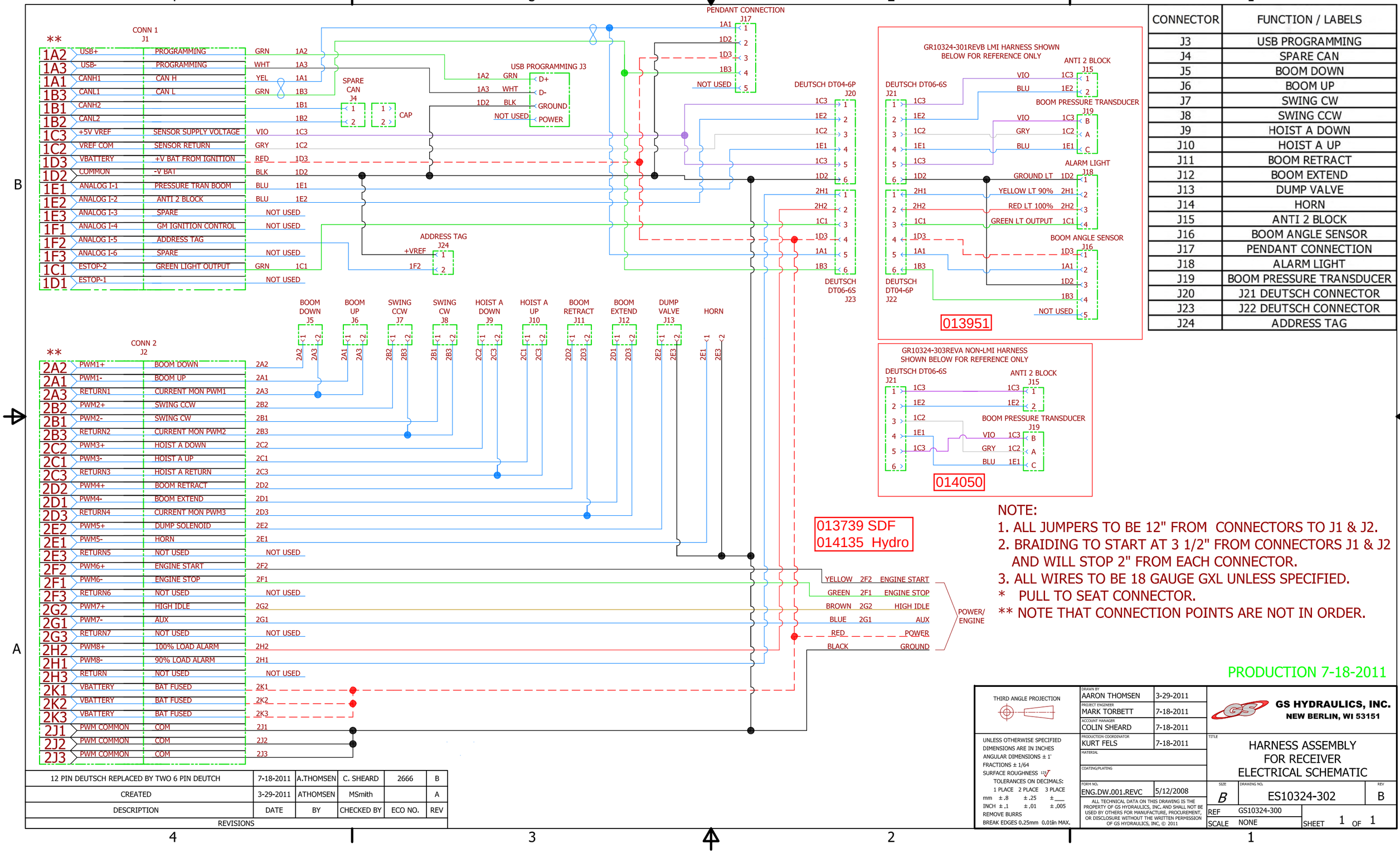
12/1/11

Magnetek Error Codes

IO1 Boom up
IO2 Boom Down
IO3 Rotate CW
IO4 Rotate CCW
IO5 Hoist/winch Up
IO6 Hoist/winch Down
IO7 Boom Extend
IO8 Boom Retract
IO9 Horn
IO10 Dump Solenoid
IO11 Engine Stop
IO12 Engine Start
IO13 Auxiliary
IO14 High Idle
IO15 90% alarm (light)
IO16 100% alarm (light)

12/15/11
Nathan Schiermeyer

Light	Status
Green-solid	All systems good, no errors
Yellow-solid	90% load warning
Red-solid	100% load alarm
Green-yellow flashing	4.5° truck tilt warning
Green-red flashing	6.5° truck tilt warning



CONNECTOR	FUNCTION / LABELS
J3	USB PROGRAMMING
J4	SPARE CAN
J5	BOOM DOWN
J6	BOOM UP
J7	SWING CW
J8	SWING CCW
J9	HOIST A DOWN
J10	HOIST A UP
J11	BOOM RETRACT
J12	BOOM EXTEND
J13	DUMP VALVE
J14	HORN
J15	ANTI 2 BLOCK
J16	BOOM ANGLE SENSOR
J17	PENDANT CONNECTION
J18	ALARM LIGHT
J19	BOOM PRESSURE TRANSDUCER
J20	J21 DEUTSCH CONNECTOR
J23	J22 DEUTSCH CONNECTOR
J24	ADDRESS TAG

DESCRIPTION	DATE	BY	CHECKED BY	ECO NO.	REV
REVISIONS					
12 PIN DEUTSCH REPLACED BY TWO 6 PIN DEUTCH	7-18-2011	A.THOMSEN	C. SHEARD	2666	B
CREATED	3-29-2011	ATHOMSEN	MSmith		A

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ANGULAR DIMENSIONS ± 1°
FRACTIONS ± 1/64
SURFACE ROUGHNESS 125
TOLERANCES ON DECIMALS:

	1 PLACE	2 PLACE	3 PLACE
mm	±.8	±.25	±___
INCH	±.1	±.01	±.005

REMOVE BURRS
BREAK EDGES 0.25mm 0.01in MAX.

DRAWN BY	AARON THOMSEN	3-29-2011
PROJECT ENGINEER	MARK TORBETT	7-18-2011
ACCOUNT MANAGER	COLIN SHEARD	7-18-2011
PRODUCTION COORDINATOR	KURT FELS	7-18-2011
MATERIAL		
COATING/PLATING		
FORM NO.	ENG.DW.001.REVC	5/12/2008

GS HYDRAULICS, INC.
NEW BERLIN, WI 53151

TITLE
HARNESS ASSEMBLY
FOR RECEIVER
ELECTRICAL SCHEMATIC

SIZE	DRAWING NO.	REV
B	ES10324-302	B

REF	GS10324-300	SHEET	1 OF 1
SCALE	NONE		

Notice: This vehicle is equipped with remote engine Start/Stop.

<u>Automatic Transmissions</u>: The parking brake must be applied and the truck in park or neutral for this feature to work.

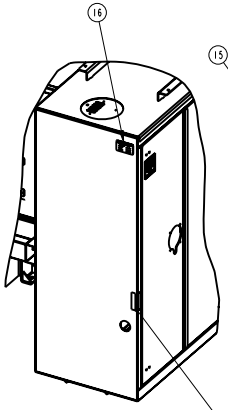
<u>Manual transmissions</u>: Truck must be in neutral and parking brake applied with the hinged arm of the neutral safety bracket around the shifter for this feature to work.

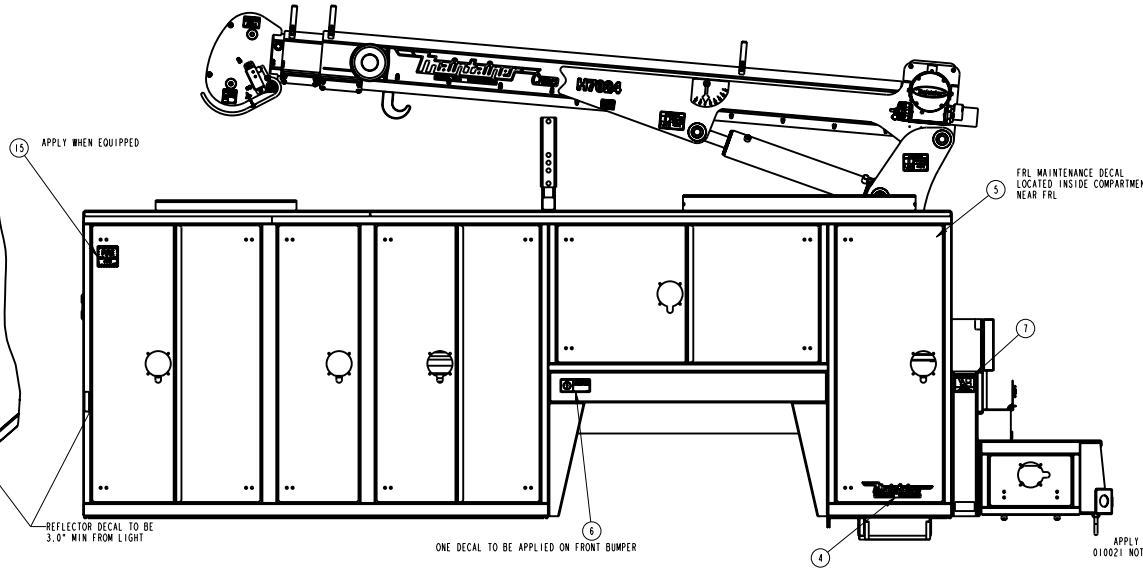
If you are experiencing problems with the starting of the engine or engine shutting off during operation, contact Maintainer Corporation for possible trouble shooting information on this problem.

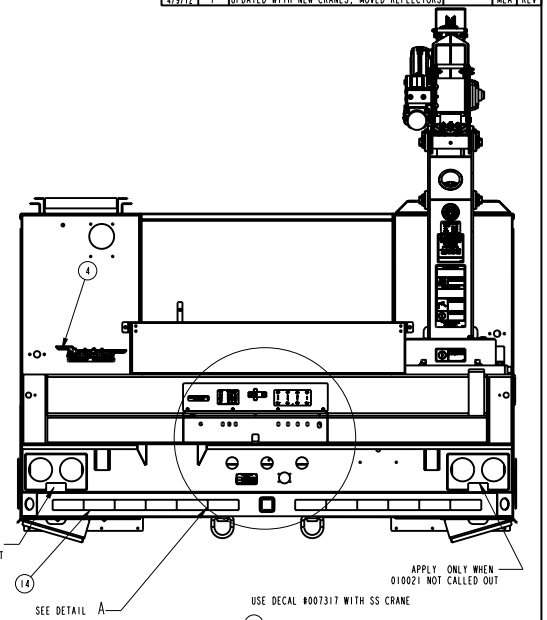
Phone: 1-800-831-8588

Accessories

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
3/6/09	A	DRAWING RELEASED	-	MEA	NDS
6/11/09	B	MOVED DECAL FROM CAP TO SIDE		MEA	KLV
6/12/09	C	REORIENT FRONT CORNER REFLECTOR	-	MEA	KLV
8/12/09	D	ADDED METAL SERIAL TAGS #011268	-	NDS	KLV
11/12/09	E	UPDATED DECAL DESCRIPTIONS THAT WERE INCORRECT	-	NDS	KLV
4/9/12	F	UPDATED WITH NEW CRANES, MOVED REFLECTORS	-	MEA	KLV



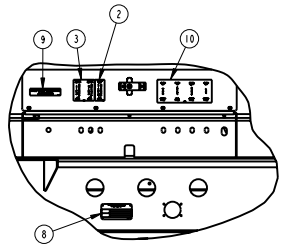




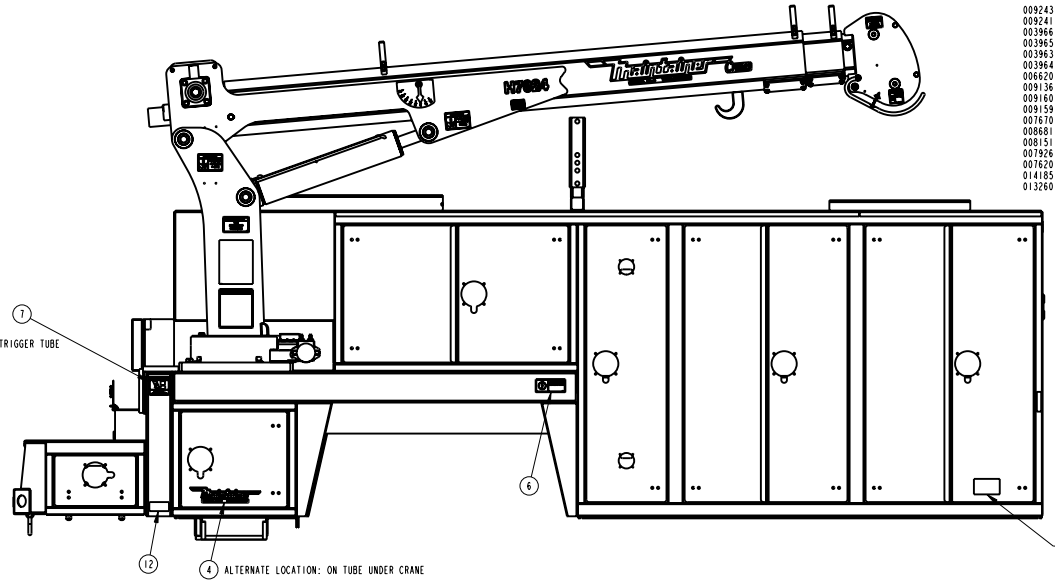
FOR DECALS LOCATED ON CRANE
SEE CORRESPONDING CRANE DECAL PRINT:

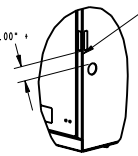
009243-DECAL	1115TT
009241-DECAL	1115ST
003966-DECAL	3216TT
003965-DECAL	3216ST
003963-DECAL	3220TT
003964-DECAL	3220ST
006620-DECAL	6000TT-SERIES
009136-DECAL	6000ST-SERIES
009160-DECAL	8000TT-SERIES
009159-DECAL	8000ST-SERIES
007670-DECAL	10000TT-SERIES
008681-DECAL	10000ST-SERIES
008151-DECAL	11000TT-SERIES
007926-DECAL	12000TT-SERIES
007620-DECAL	14000TT-SERIES
014185-DECAL	H6520TT
013260-DECAL	H7024TT

USE DECAL #007317 WITH SS CRANE



DETAIL A
SCALE 1:8





CS FRONT CORNER SHOWN
USE ITEM #009356
CUT IN HALF AND APPLY AS SHOWN
REPEAT ON SS FRONT CORNER

QTY	DESCRIPTION	PART NUMBER	ITEM
1	ASY,CRANE H7024-TT-DECAL	013260-DECAL	17
1	DECAL,METAL SERIAL-NUMBER ADHESIVE BACK	011268	16
1	DECAL,FIRE EXTINGUISHER INSIDE,4X4,RED/W	011212	15
2	TAPE,RED/SILVER,REFLECTIVE	010021	14
2	REFLECTOR,AMBER,STICK-ON,RECTANGULAR,GROTE	009336	13
4	REFLECTOR,RED,STICK-ON,RECTANGULAR,GROTE	009355	12
1	ASY,ROTATE,6000-TT,SPUR-ROTATE,DRIVE	009142	11
1	DECAL,BASIC,REAR,CRANE,FUNCTION,SDF	008665	10
1	DECAL,PULL WHILE OPERATING OUTRIGGERS	008436	9
1	DECAL,HITCH,RATING	008255	8
2	DECAL,OUTRIGGER,STAND,CLEAR,WARNING	007425	7
3	DECAL,CRANE,ELECTROCUTION,HAZARD	007424	6
1	DECAL,FLR,MAINTENANCE	007238	5
3	DECAL,MAINTAINER W/PHONE,MEDIUM	002264	4
1	DECAL,BASIC REAR OUTRIGGER FUNCTION	002205	3
1	DECAL,HYD,CS,OUTRIGGER,EXTEND	002204	2
1	DECAL,NOTICE,THIS VEHICLE,START,STOP	000127	1

(1) APPLY IN CAB (E)

008037

PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

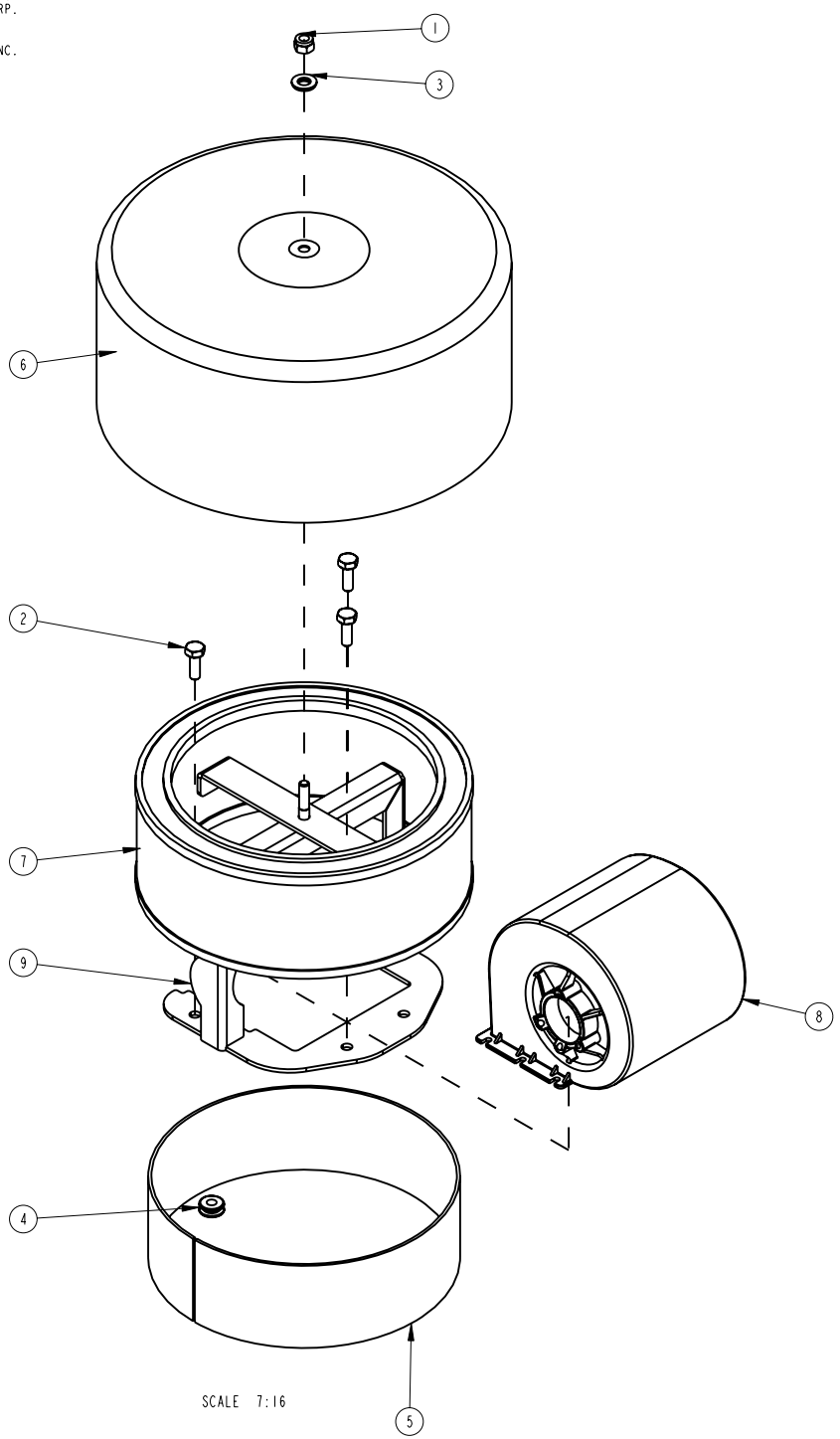
DR: MEA DATE: 3/6/09
CHK: NDS DATE: 3/6/09
APPR: DATE: -

Maintainer
1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: DIAGRAM,DECAL LOCATION

SCALE: 27:320 SIZE: D SHEET: 1 of 1 DRAWING NUMBER: 008037 REV. LEVEL: F

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/22/09	A	DRAWING RELEASED	-	NDS	KLV



SCALE 7:16

QTY	DESCRIPTION	PART NUMBER	ITEM
1	HOLDDOWN,SPAL_PSS	012130	9
1	FAN,PSS_SPAL_008-A100-93	012053	8
1	FILTER,PSS_NEW_SPAL	012052	7
1	COVER,AIR_FILTER_SPAL-PSS	011801	6
1	RING,PSS_RISER_NEW_SPAL	011798	5
1	GROMMET,1/4"HOLE 1/8"GROOVE 7/16"DRILL H	010712	4
1	WASHER,RUBBER BACK_0.3125_FLAT	003337	3
3	BOLT,0.250-20UNC-0.750_HX_HD_GR5	000371	2
1	.25-20 LOCK NUT	000343	1

PART NUMBER 012331

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: NDS DATE: 5/22/09
CHK: KLV DATE: 5/22/09
APPR: DATE: -

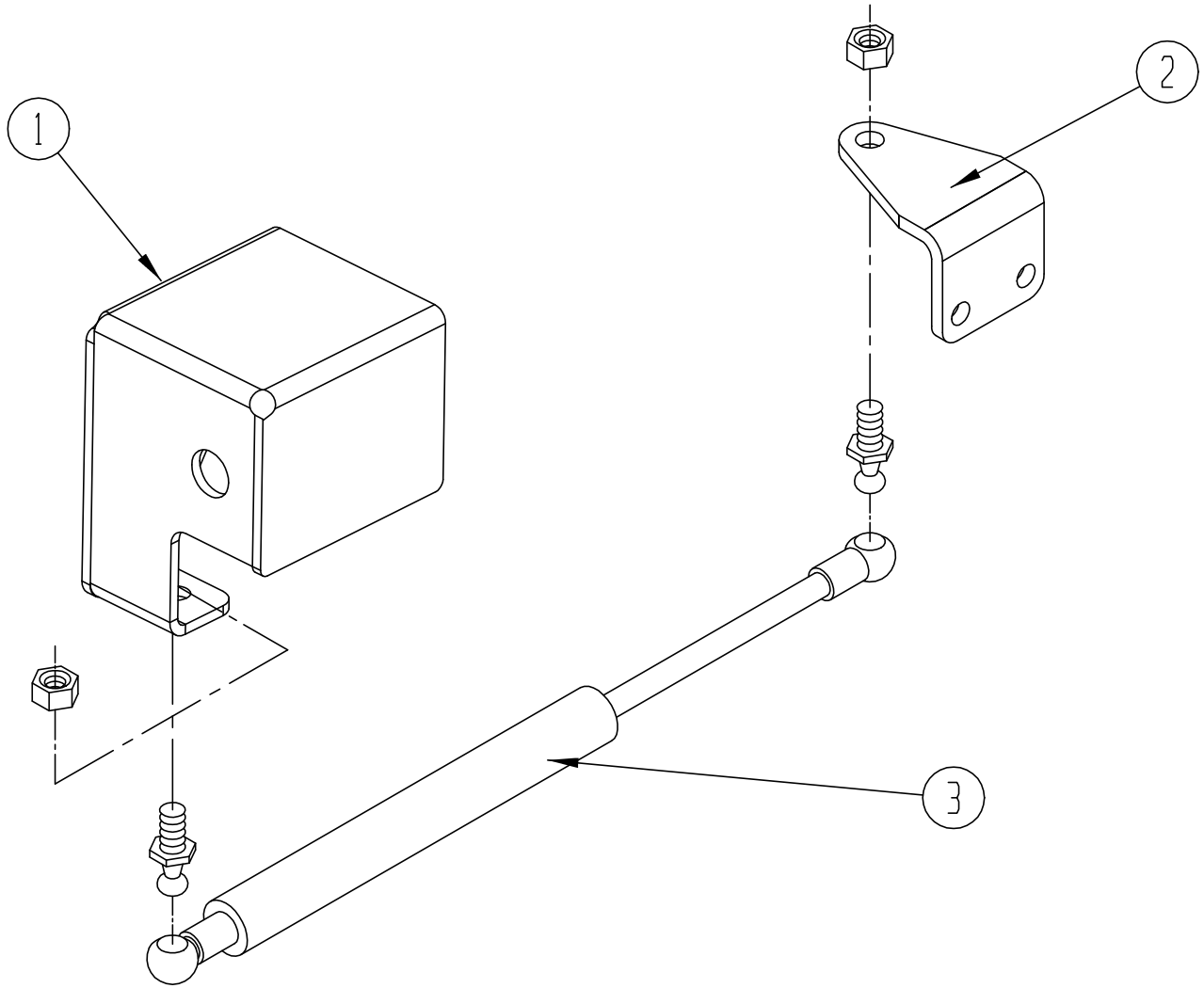
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: MASTER,SPAL_PSS-FILTER_COMPARTMENT-MT

SCALE: 7:16 | SIZE: C | SHEET: 1 OF 2 | DRAWING NUMBER: 012331 | REV. LEVEL: A

REF.	SPECIFICATION

REVISED 4-9-08



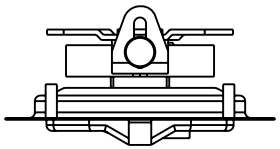
1. PRT# 010517 - GAS SPRING DOOR HOLDER ASSEMBLY.
2. PRT# 010624 - GAS SPRING DOOR MOUNT BRACKET.
3. PRT# 003184 - GAS SPRING DOOR CHECK.
   PRT# 003397 - 5/16 LOCKNUTS.

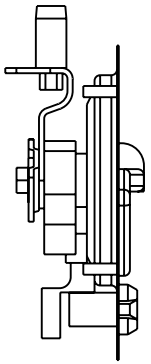
GASDRCHK2.PRT

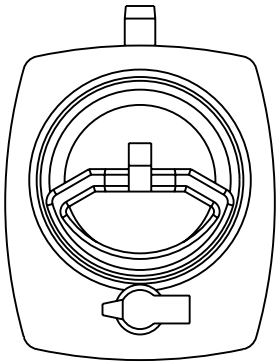
Thaintainer
Corporation of Iowa, Inc.
P.O. Box 349 1701 S. 2nd Avenue
Sheldon, Iowa 51201

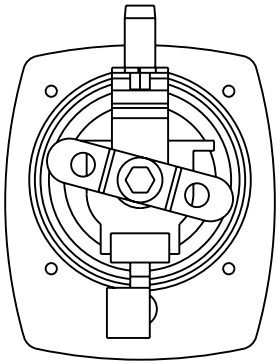
DFTM. KLV | DATE: 10/31/06

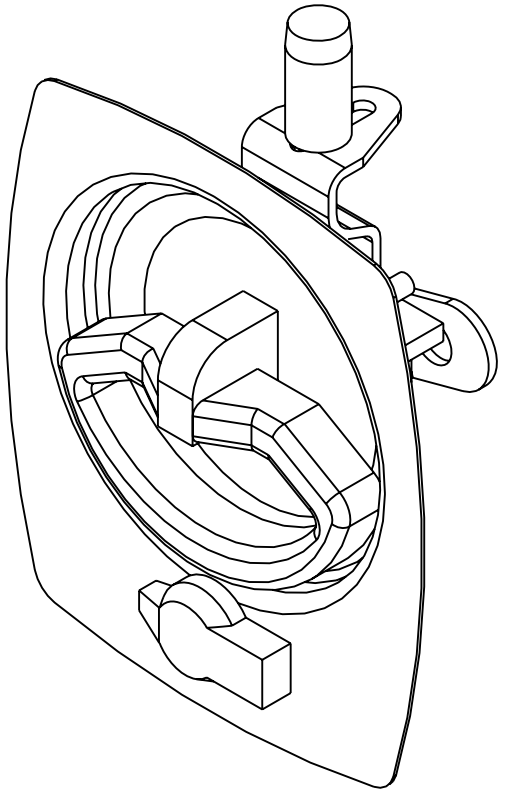
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
5/24/10	A	DRAWING RELEASED	-	RJW	KLV











LH LATCH IS #012743

REF.	SPECIFICATION

012742

PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: RJW DATE: 5/24/10
CHK: KLV DATE: 5/24/10
APPR: DATE: -

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: LATCH,RH_3POINT_D_I-M8194-SSUR-10_STAIN

SCALE:	SIZE:	SHEET:	DRAWING NUMBER:	REV. LEVEL:
11:32	B	1 OF 1	012742	A

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
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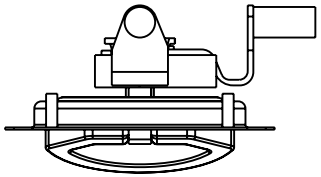
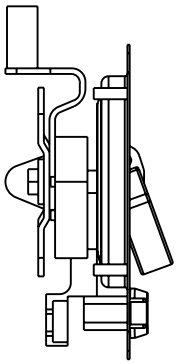
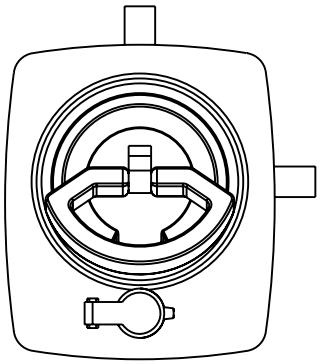
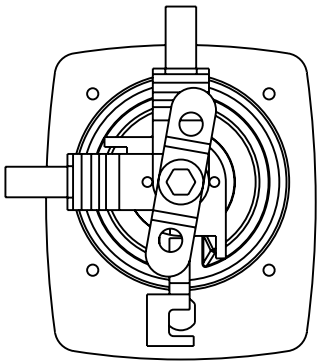
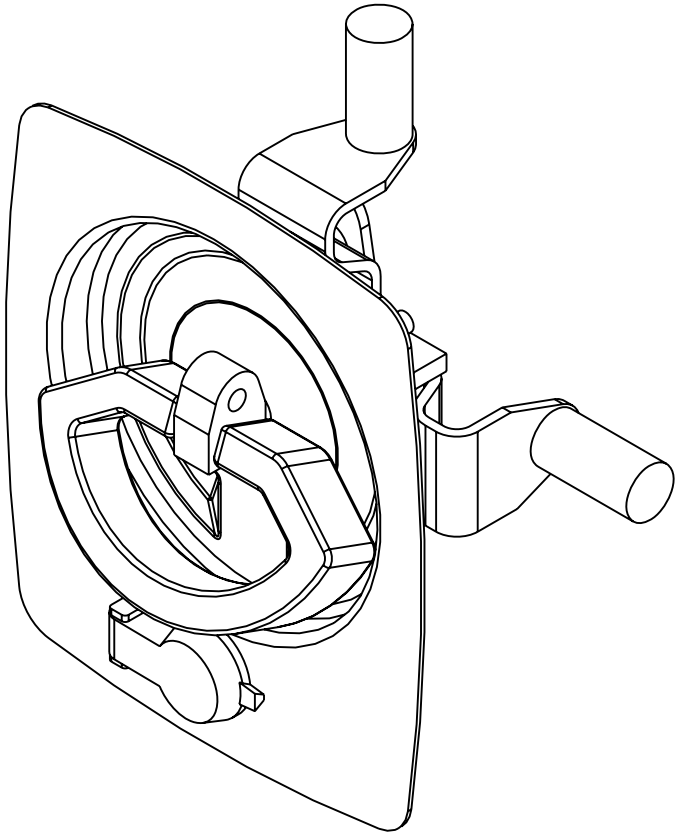








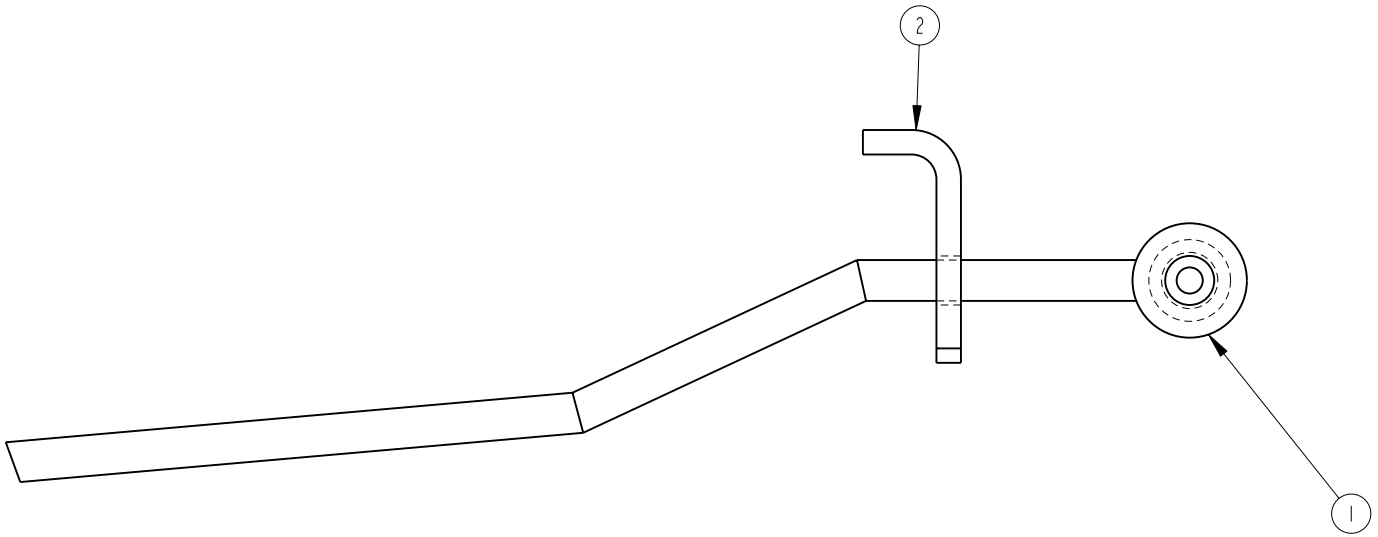


RH LATCH IS #012742

012743 PART NUMBER	THIRD ANGLE PROJECTION	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DR: RJW	DATE: 5/24/10
		TOLERANCE ON: ANGLE ±0° 2 PL ±0.01 3 PL ±0.001	CHK: KLV	DATE: 5/24/10
		INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994	APPR:	DATE:
	Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201			
	DESCRIPTION: LATCH,LH_3POINT_D_1-M8194-SSUL-10_STAINL			
	SCALE: 1:1 32	SIZE: B	SHEET: 1 OF 1	DRAWING NUMBER: 012743	REV. LEVEL: A

REF.	SPECIFICATION

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/2/09	A	DRAWING RELEASED	-	MEA	NDS



QTY	DESCRIPTION	PART NUMBER	ITEM
1	MOUNT,DOOR_ROD_HOLDER_ALUM_W/_BEND	010621	2
1	ROD,ROLLER_D-RING_HANDLE	007389	1

007389 PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MEA DATE: 4/2/09
CHK: NDS DATE: 4/2/09
APPR: DATE: -

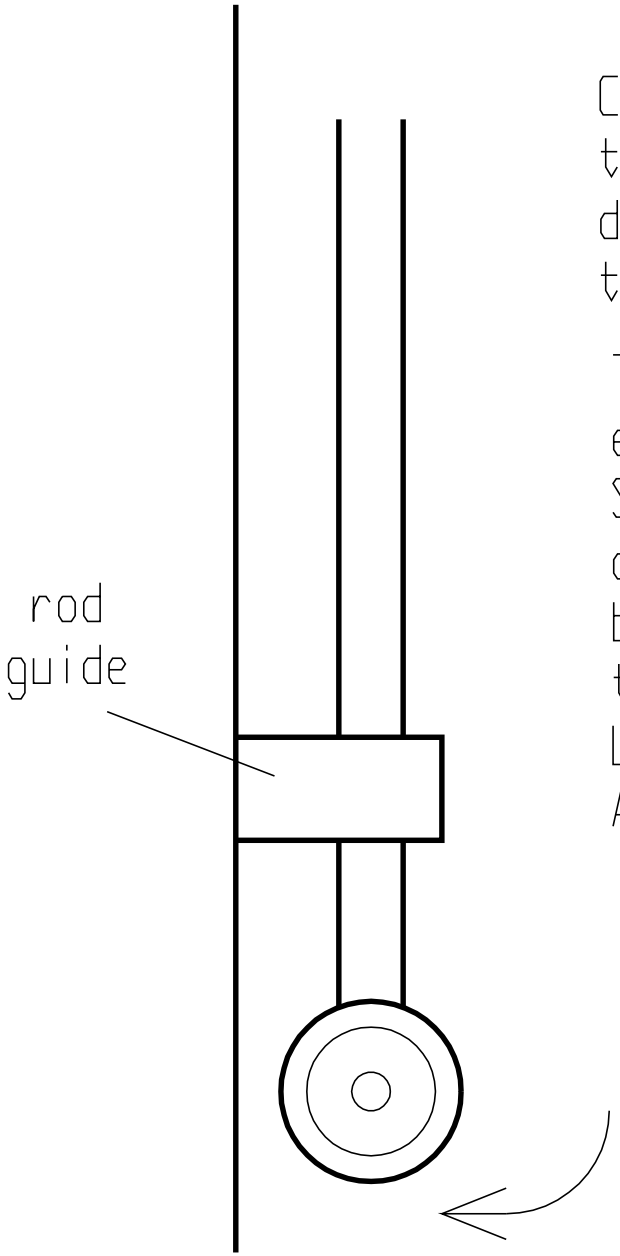
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ROD,ROLLER_D-RING_HANDLE w/ TAB

SCALE: 1:1 SIZE: B SHEET: 1 OF 1 DRAWING NUMBER: 007389 REV. LEVEL: A

REF.	SPECIFICATION

REVISIONS			
REV.	DESCRIPTION	DATE	APRVD



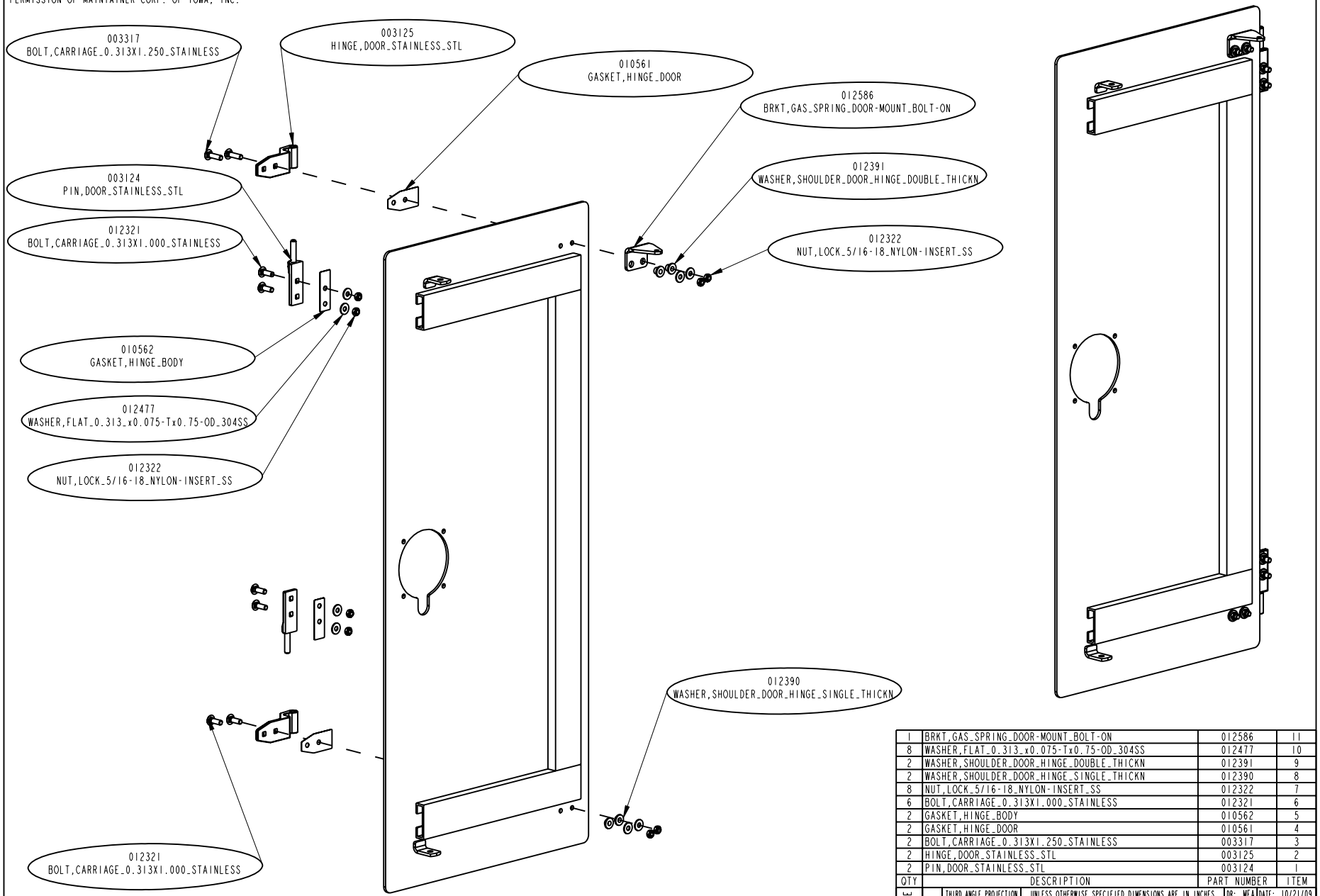
EDGE VIEW OF COMPARTMENT DOOR

Compartment door rods are adjusted at the factory to seal out weather, through normal usage the door rods may need readjusting to halt any water that may be entering.

To make this adjustment open the door and fully extend the door rods.
Support the door rod between the rod guide and latch and with an adjustable wrench, gently bend the end of the rod towards the door to tighten door seal, bend away from the door to loosen.
Use the same procedure for the top side of the door.
Adjust so that door will seal firmly.

PROPRIETARY DATA PROPERTY OF MAINTAINER CORPORATION OF IOWA, INC.			COPYRIGHT © 1995
UOS DIMENSIONS ARE IN INCHES GENERAL TOLERANCES		MATERIAL:	Maintainer Corporation of Iowa, Inc. P.O. Box 349 1701 S. 2nd Avenue Sheldon, Iowa 51201
BREAK ALL EDGES .01 X 45°	ANGULAR ± 1° .XX ± .03 .XXX ± .005	SCALE: — SIZE: A	
UOS RADII —	UOS ANGLES —	DRAWING NUMBER: DOOR2	DFTM. KLV DATE: 10/31/06
MADE IN THE USA		Compartment door adjustment	

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
10/21/09	A	DRAWING RELEASED	-	MEA	NDS
10/28/09	B	UPDATED CARRIAGE BOLT LENGTH DESC.	-	NDS	KLV



QTY	DESCRIPTION	PART NUMBER	ITEM
1	BRKT,GAS_SPRING_DOOR-MOUNT_BOLT-ON	012586	11
8	WASHER,FLAT_0.313_x0.075-Tx0.75-OD_304SS	012477	10
2	WASHER,SHOULDER_DOOR_HINGE_DOUBLE_THICKN	012391	9
2	WASHER,SHOULDER_DOOR_HINGE_SINGLE_THICKN	012390	8
8	NUT,LOCK_5/16-18_NYLON-INSERT_SS	012322	7
6	BOLT,CARRIAGE_0.313X1.000_STAINLESS	012321	6
2	GASKET,HINGE_BODY	010562	5
2	GASKET,HINGE_DOOR	010561	4
2	BOLT,CARRIAGE_0.313X1.250_STAINLESS	003317	3
2	HINGE,DOOR_STAINLESS_STL	003125	2
2	PIN,DOOR_STAINLESS_STL	003124	1

HINGE-PROCEDURE

PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

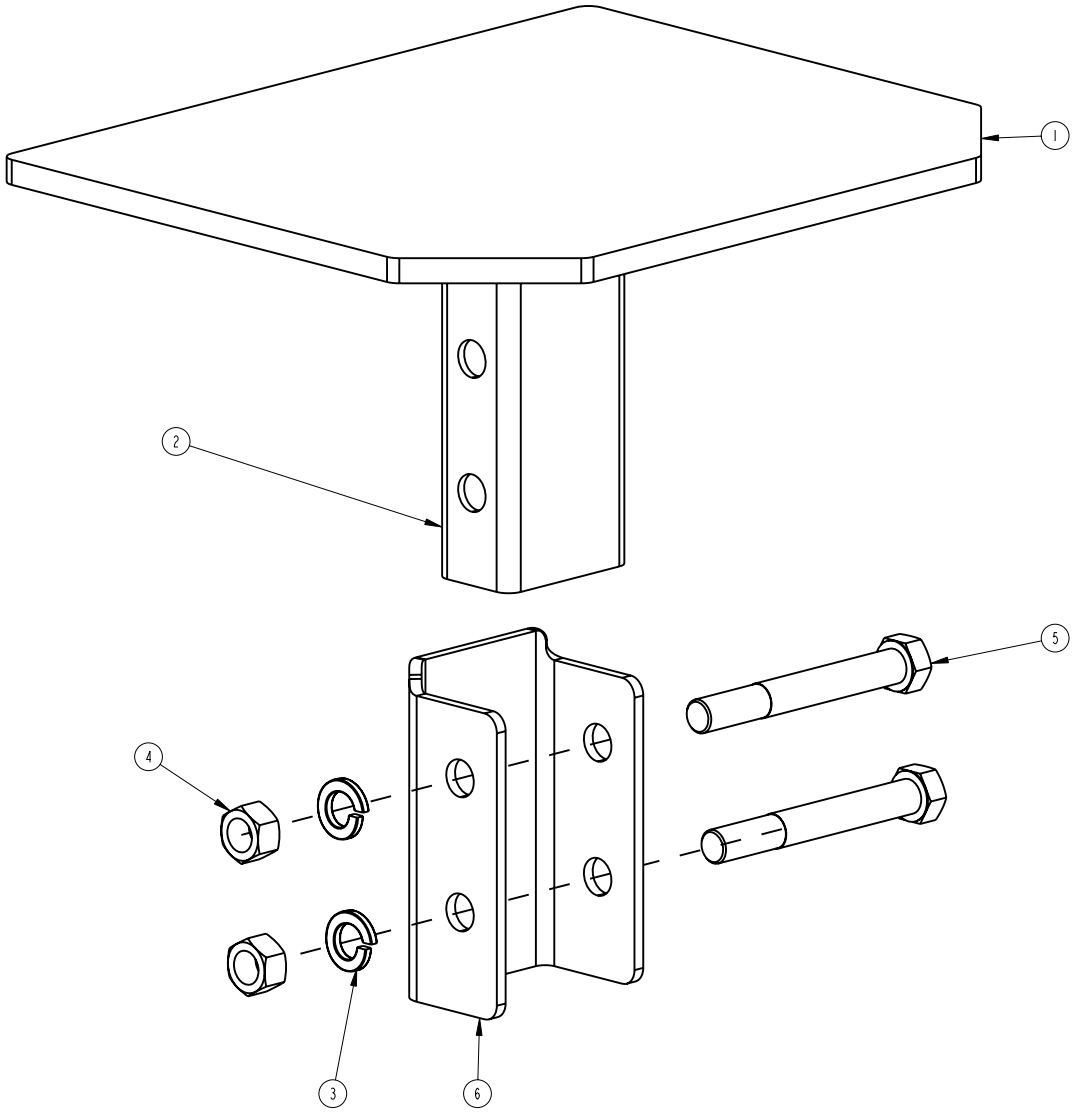
DR: MEA DATE: 10/21/09
CHK: NDS DATE: 10/21/09
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: DOOR HINGE HARDWARE PROCEDURE

SCALE: 7:32 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: HINGE-PROCEDURE REV. LEVEL: B

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/2/09	A	DRAWING RELEASED	-	MEA	NDS



QTY	DESCRIPTION	PART NUMBER	ITEM
1	HOLDER,VICE_MT_BUMPER_NT	009468	6
2	BOLT,0.500-13UNC-4.000_HX_HD_GR5	003454	5
2	NUT,0.500-13_GR5_SS	003390	4
2	WASHER,LOCK_0.500_GR2_SS	003355	3
1	TUBE,VISE AND GRINDER MNT INNER	001436	2
1	PLT,2 TON VISE MNT	001407	1

001407-CS

PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MEA DATE: 4/2/09
CHK: NDS DATE: 4/2/09
APPR: DATE: -

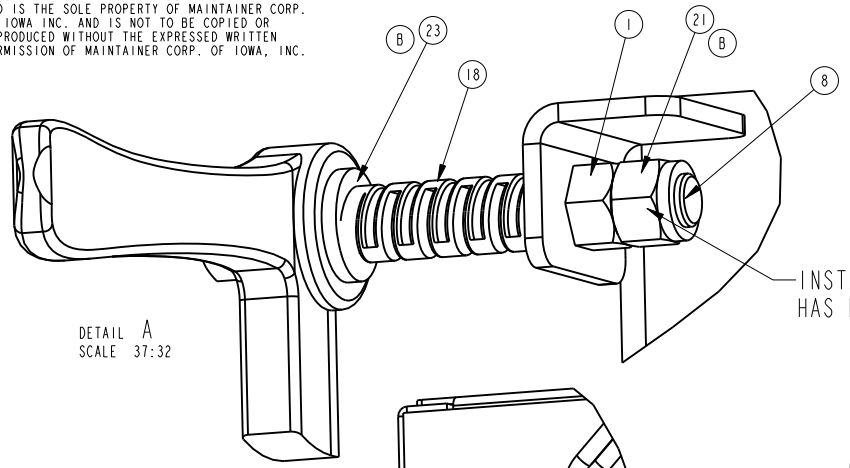
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: MNT,PLT,2-TON_VISE

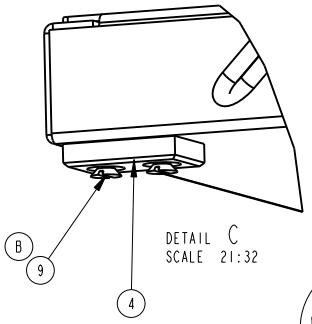
SCALE: 3:4 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 001407-CS REV. LEVEL: A

REF.	SPECIFICATION

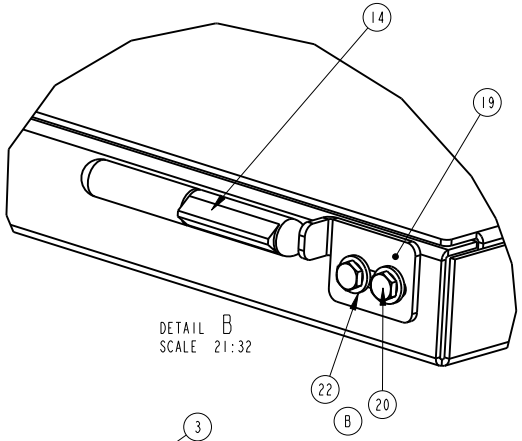
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
11/5/09	A	DRAWING RELEASED	-	RJW	KLV
11/4/10	B	ADDED STAINLESS HARDWARE	-	RJW	KLV



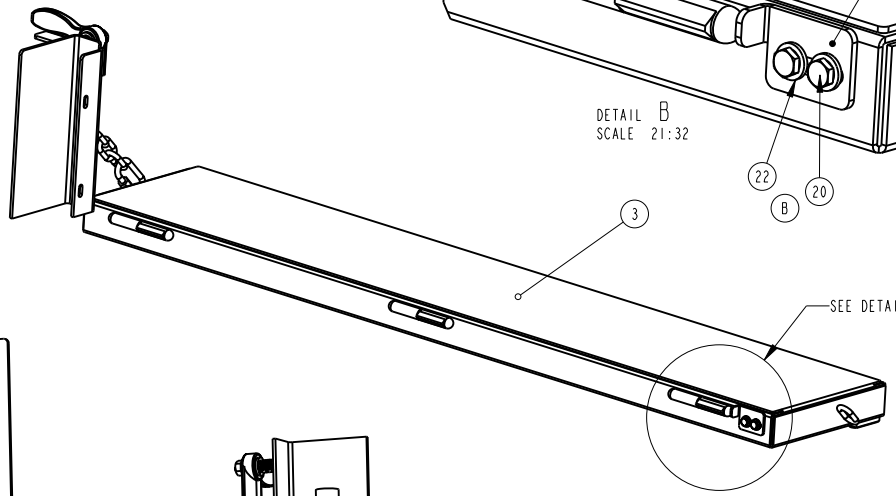
DETAIL A
SCALE 37:32

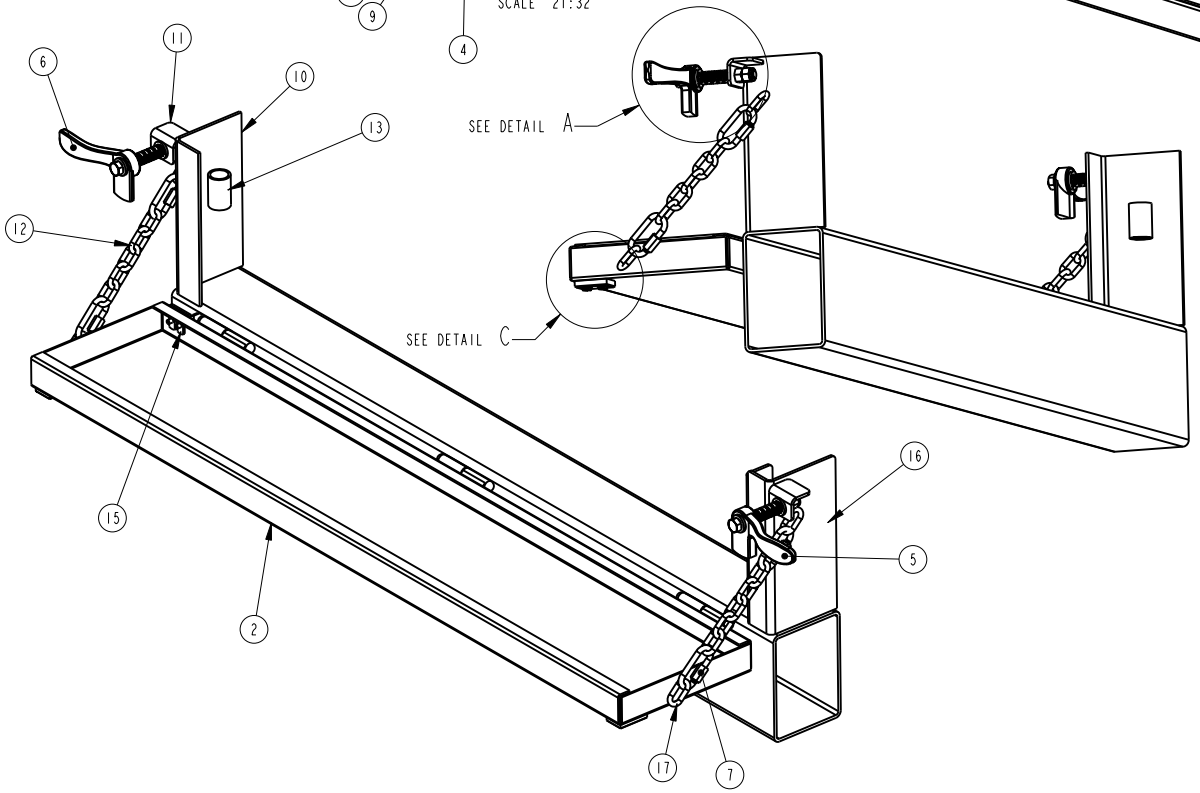


DETAIL C
SCALE 21:32



DETAIL B
SCALE 21:32





QTY	DESCRIPTION	PART NUMBER	ITEM
6	WASHER,FLAT_0.500_SAE_EXTRA THICK_SS	012900	23
2	WASHER,FLAT_0.250_SAE_EXTRA THICK_SS	012896	22
2	NUT,0.500-13UNC_NYLON-LOCK_INSERT_SS	012886	21
2	BOLT,0.250-20UNC-0.750_HX_HD_SS	012868	20
1	STOP,TAIL_GATE_HINGE_BENT	012606	19
2	SPRING,COMP_LC105J09S_LEE_SPRING_CO.	012605	18
4	LINK,1/4"_INDIVIDUAL_CHAIN_PLATED	011778	17
1	ANGLE,GATE_5"_CS	010754	16
6	NUT,0.250-20_2TAB_WELD	008715	15
3	HINGE,WELD_ON_TAILGATE	006834	14
1	TUBE,T-HANDLE_STORAGE	005561	13
2	TAILGATE CHAIN	004909-TGC	12
2	ANGLE,GATE_HANDLE	004287	11
1	ANGLE,2_TON_GATE	004283	10
4	BOLT,0.250-20UNC-0.750_FL_HD_SLOTTED_COU	003536	9
2	BOLT,0.500-13UNC-4.500_HX_HD_GR5	003453	8
4	LINK,QUICK_CHAIN_0.313	003220	7
1	LATCH,L-END_GATE	003156	6
1	LATCH,R-END_GATE	003155	5
2	PAD,GATE_LATCH_GSM_NYLATRON	002999	4
1	CAP,TAIL GATE_53	001185	3
1	SHELL,TAIL_GATE_53_WIDE	001184	2
2	NUT,0.500-13_GR8	000340	1

TAILGATE-INSTALL

PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

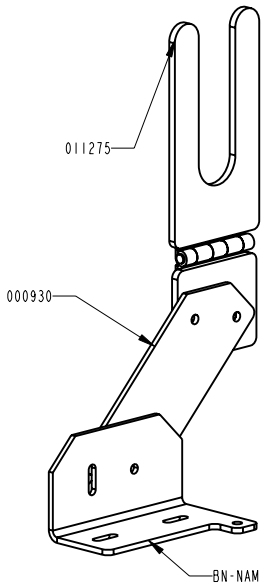
DR: RJW DATE: 11/5/09
CHK: KLV DATE: 11/5/09

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

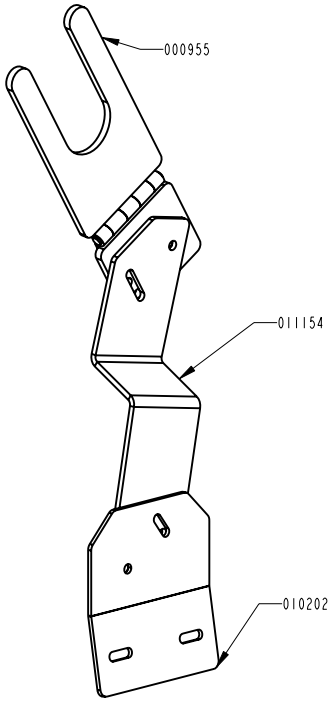
DESCRIPTION: ASM,TAILGATE 53" GATE

SCALE: 3:16 SIZE: C SHEET: 1 OF 2 DRAWING NUMBER: AILGATE-INSTAL REV. LEVEL: B

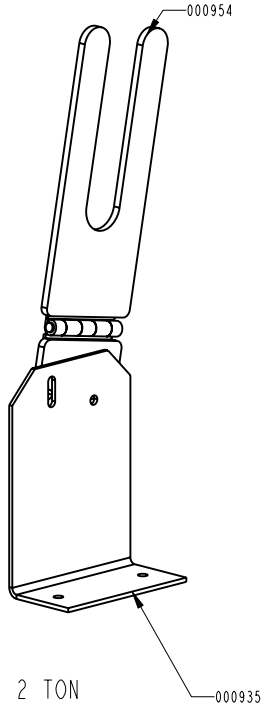
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
4/3/09	A	DRAWING RELEASED	-	MEA	NDS



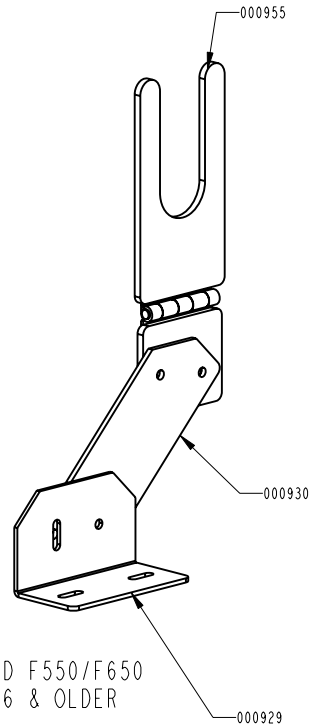
INT'L



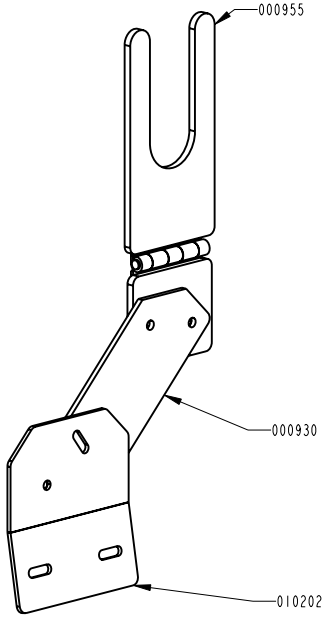
DODGE /STERLING



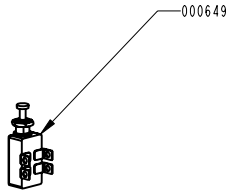
2 TON



FORD F550/F650
2006 & OLDER



FORD F550
'07 & NEWER



QTY	DESCRIPTION	PART NUMBER	ITEM
1	BRKT,NUETRAL_SHIFT_ADJ_ARM_BN	BN-NAM	10
1	BRKT,NUETRAL_SHIFT_ADJ_ARM_INT'L	011275	9
1	BRKT,ARM_ADJ_NEUTRAL_SHIFT_DODGE	011154	8
2	MNT,NEUTRAL_SHIFT_ARM_08_FORD	010202	7
3	BRKT,NUETRAL_SHIFT_ADJ_ARM_FORD	000955	6
1	BRKT,NUETRAL_SHIFT_ADJ_ARM_9.25	000954	5
1	BRKT,ADJ_NUETRAL_SHIFT_BOLT_DOWN	000935	4
3	BRKT,ARM_ADJ_NUETRAL_SHIFT	000930	3
1	BRKT,NUETRAL_SHIFT_ADJ_ARM_FORD	000929	2
1	SWITCH,DOOR	000649	1

NEUTRAL_SHIFT

PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MEA DATE: 4/2/09
CHK: NDS DATE: 4/3/09
APPR: DATE: -

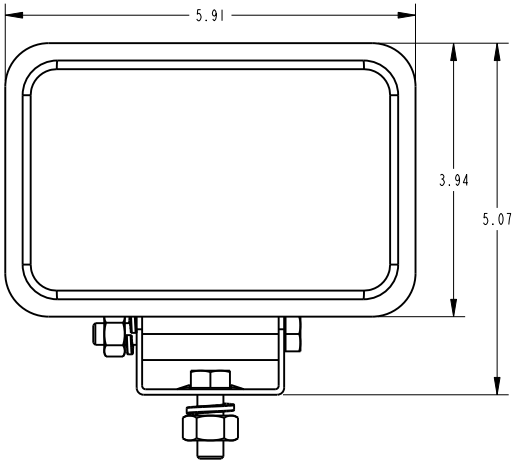
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

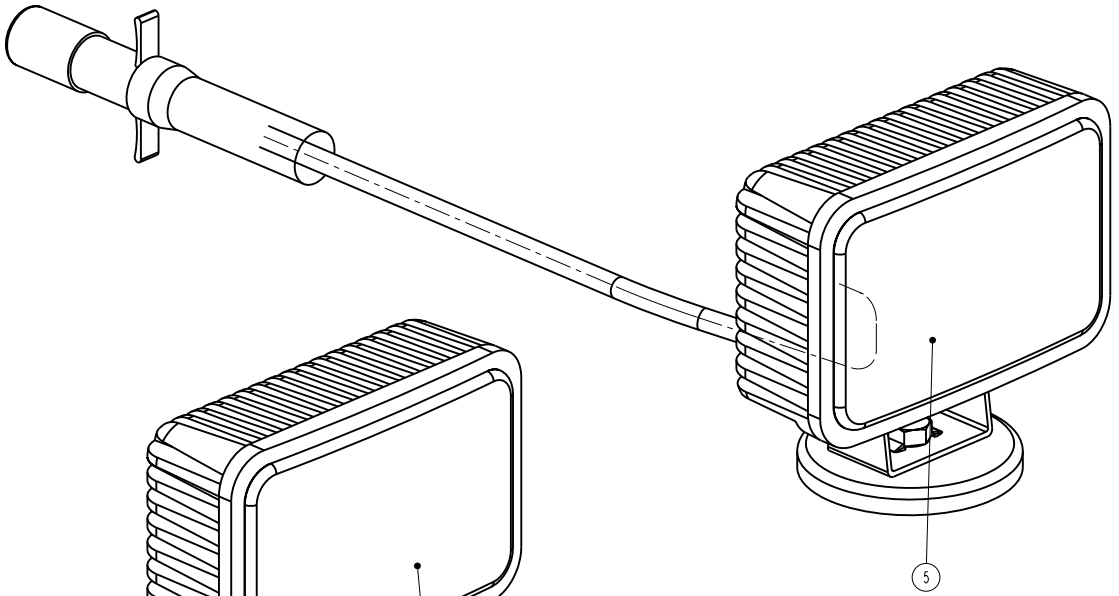
DESCRIPTION: NUETRAL SAFTY CIRCUIT COMPONENTS

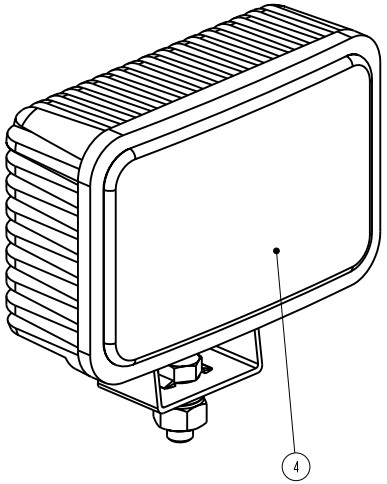
SCALE: 1:32 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: NEUTRAL_SHIFT REV. LEVEL: A

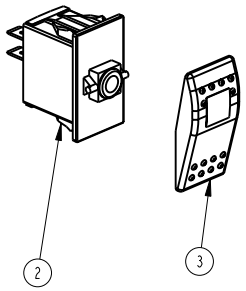
REF.	SPECIFICATION

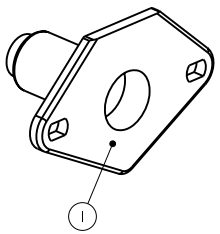
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
1/28/14	A	DRAWING RELEASED	-	KJH	KLV











QTY	DESCRIPTION	PART NUMBER	ITEM
1	LIGHT,MAGNETIC LED-FLOOD HDL 1350-LUMEN	016765	5
1	LIGHT,LED-FLOOD HDL 1350-LUMEN RECTANGULAR	016764	4
1	SWITCH,ROCKER_ACTUATOR(COVER)	007286	3
1	SWITCH,ROCKER_BODY	003599	2
1	CONNECTOR,FEMALE_4 POLE	000412	1

PART NUMBER 017468

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: KJH DATE: 1/28/14
CHK: KLV DATE: 1/28/14

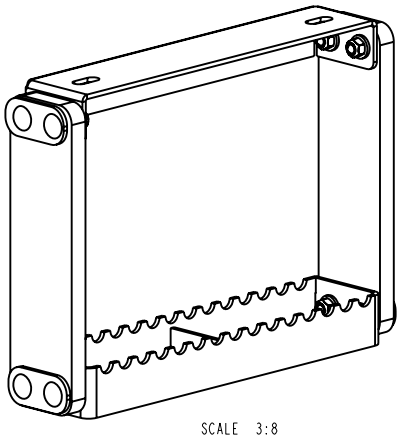
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: MASTER,EXTERIOR_HEAVY DUTY LED LIGHT PACKAGE

SCALE: 3:4 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 017468 REV. LEVEL: A

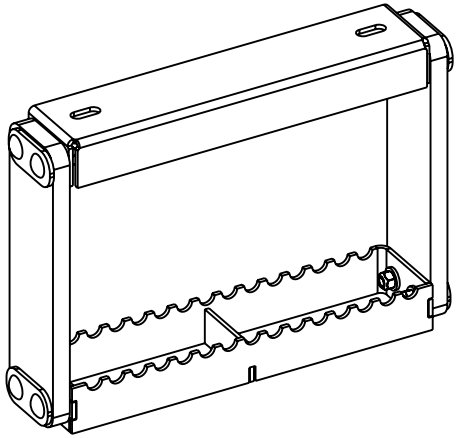
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
10/28/10	A	DRAWING RELEASED, REPLACES 010480	-	NDS	KLV

REAR/OUTSIDE OF TRUCK

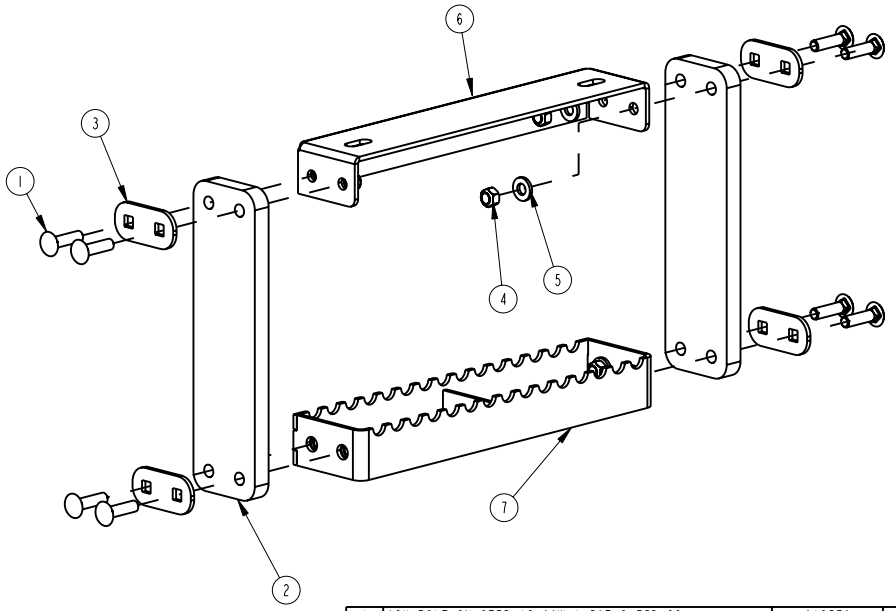


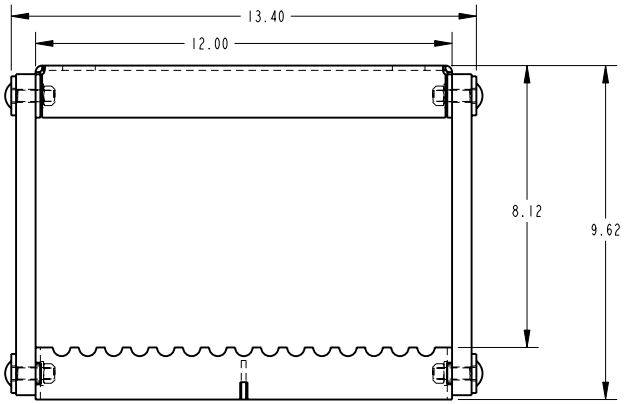
SCALE 3:8

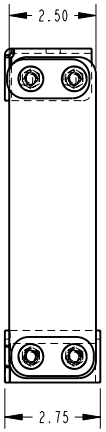
FRONT/INSIDE OF TRUCK
(TOP LIP SAME SIDE AS NOTCH IN STEP)



SCALE 3:8







QTY	DESCRIPTION	PART NUMBER	ITEM
1	ASY,BOLT ON STEP 12.00Wx1.50Tx2.75D SS	013579	7
1	STEP,BOLT_ON_BRACKET STAINLESS	013578	6
8	WASHER,FLAT_0.313_SAE_EXTRA THICK_SS	012897	5
8	NUT,LOCK_5/16-18_NYLON-INSERT_SS	012322	4
4	STEP,BOLT_REINFORCEMENT	010479	3
2	STEP,RUBBER_SIDE_PIECE	010477	2
8	BOLT,CARRIAGE_0.313X1.250_STAINLESS	003317	1

PART NUMBER 013577

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

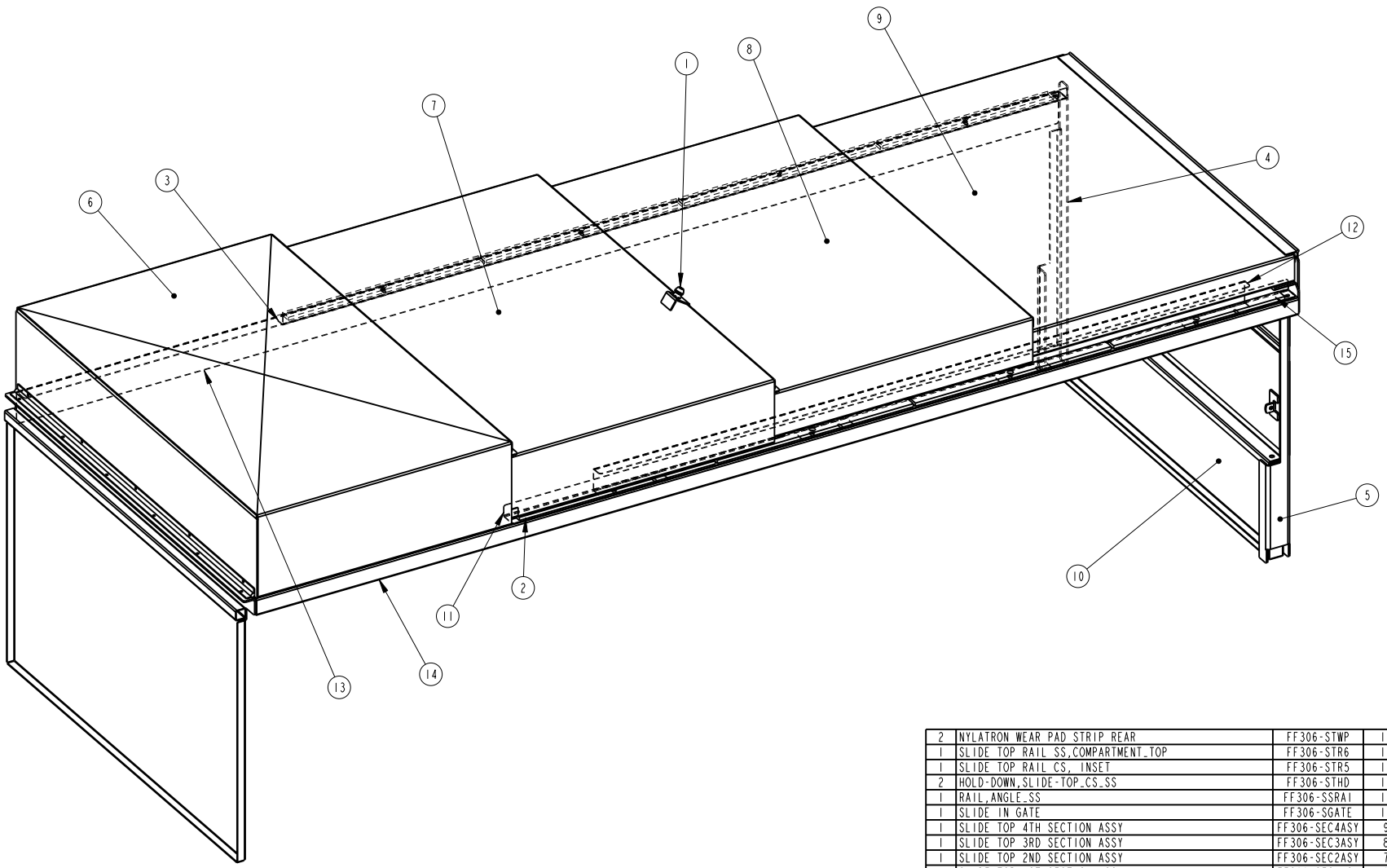
DR: NDS DATE: 10/28/10
CHK: KLV DATE: 10/28/10
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: ASY,BOLT ON STEP STAINLESS

SCALE: 3:8 SIZE: C SHEET: 1 OF 1 DRAWING NUMBER: 013577 REV. LEVEL: A

DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
8/11/14	A	DRAWING RELEASED	-	KAL	KLV



QTY	DESCRIPTION	PART NUMBER	ITEM
2	NYLATRON WEAR PAD STRIP REAR	FF306-STWP	15
1	SLIDE TOP RAIL SS,COMPARTMENT_TOP	FF306-STR6	14
1	SLIDE TOP RAIL CS, INSET	FF306-STR5	13
2	HOLD-DOWN,SLIDE-TOP_CS_SS	FF306-STHD	12
1	RAIL,ANGLE_SS	FF306-SSRA1	11
1	SLIDE IN GATE	FF306-SGATE	10
1	SLIDE TOP 4TH SECTION ASSY	FF306-SEC4ASY	9
1	SLIDE TOP 3RD SECTION ASSY	FF306-SEC3ASY	8
1	SLIDE TOP 2ND SECTION ASSY	FF306-SEC2ASY	7
1	SLIDE TOP 1ST SECTION ASSY	FF306-SEC1ASY	6
1	CHANNEL,GATE_CS_SLIDETOP_CS_CRANE	FF306-GATECHSS	5
1	CHANNEL,GATE_CS_SLIDETOP	FF306-GATECHCS	4
1	RAIL,ANGLE_CS	FF306-CSRA1	3
6	ADHESIVE BONDED WEAR PAD STRIP 1 HOLE	AB-STWP1	2
1	HOLDER,DOOR_38-RC, BALL	002948-A	1

FF306-SLIDETOP — PART NUMBER

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: KAL DATE: 8/11/14
CHK: KLV DATE: 8/11/14
APPR: DATE:

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

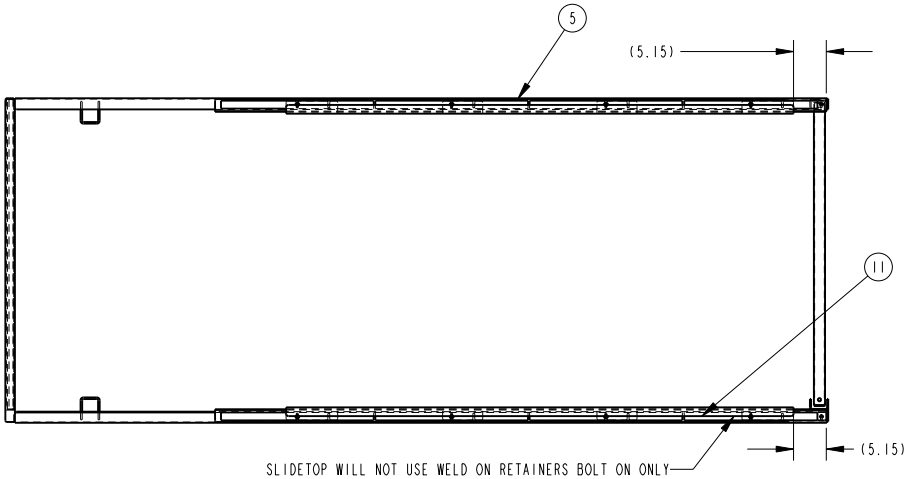
DESCRIPTION: 4 SECTION ALUM SLIDE TOP HINGE UP

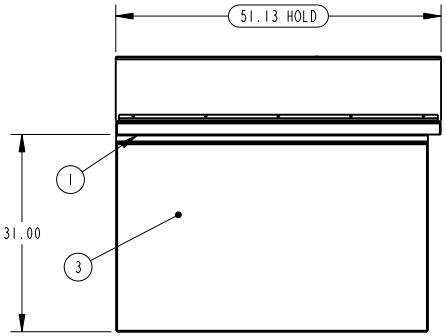
SCALE: 1:8 SIZE: C SHEET: 1 OF 3 DRAWING NUMBER: FF306-SLIDETOP REV. LEVEL: A

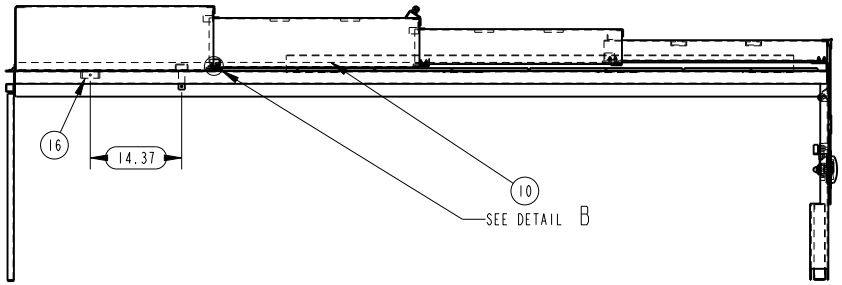
REF.	SPECIFICATION

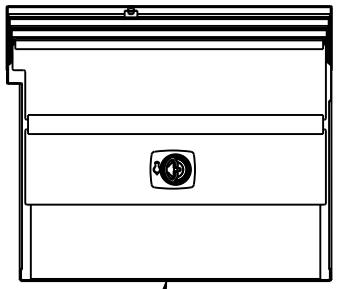
DATE	LEVEL	REVISION RECORD	AUTHORITY	DR	CHK
3/19/14	A	DRAWING RELEASED	-	SVM	KLV

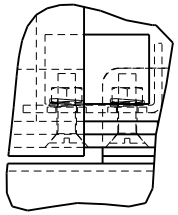
USE STAINLESS STEEL FASTENERS ONLY TO BOLT ON NYLATRON WEAR STRIPS
011653 - .25 x 1.25 " BOLT (nylatron wear strips)
011654 - .25 x 1.00" BOLT (section wear pads)











DETAIL B
SCALE 3:4

ITEM	QTY	DESCRIPTION	PART NUMBER	REF.
1	1	TUBE,BULKHEAD_49	001509	
2	1	HOLDER,DOOR_38-RC, BALL	002948-A	
3	1	BULKHEAD,SOLID_49_WIDE	010220	
4	6	ADHESIVE BONDED WEAR PAD STRIP 1 HOLE	AB-STWP1	
5	1	RAIL,ANGLE_CS	FF306-CSRA1	
6	1	CHANNEL,GATE_CS_SLIDETOP_CS_CRANE	FF306-GATECHICS	
7	1	CHANNEL,GATE_CS_SLIDETOP_CS_CRANE	FF306-GATECHSS	
8	1	SLIDE TOP 3RD SECTION ASSY	FF306-SEC3ASY	
9	1	SLIDE IN GATE	FF306-SGATE	
10	1	RAIL,ANGLE_SS	FF306-SSRA1	
11	2	HOLD-DOWN,SLIDE-TOP_CS_SS	FF306-STHD	
12	1	SLIDE TOP HINGE MOUNT ANGLE	FF306-STMA	
13	1	SLIDE TOP RAIL CS, INSET	FF306-STR5	
14	1	SLIDE TOP RAIL SS,COMPARTMENT_TOP	FF306-STR6	
15	2	NYLATRON WEAR PAD STRIP REAR	FF306-STWP	
16	2	SLIDE TOP GAS SHOCK MOUNT	Y502K-STGSM	

FF306-SLIDETOP

PART NUMBER

THIRD ANGLE PROJECTION

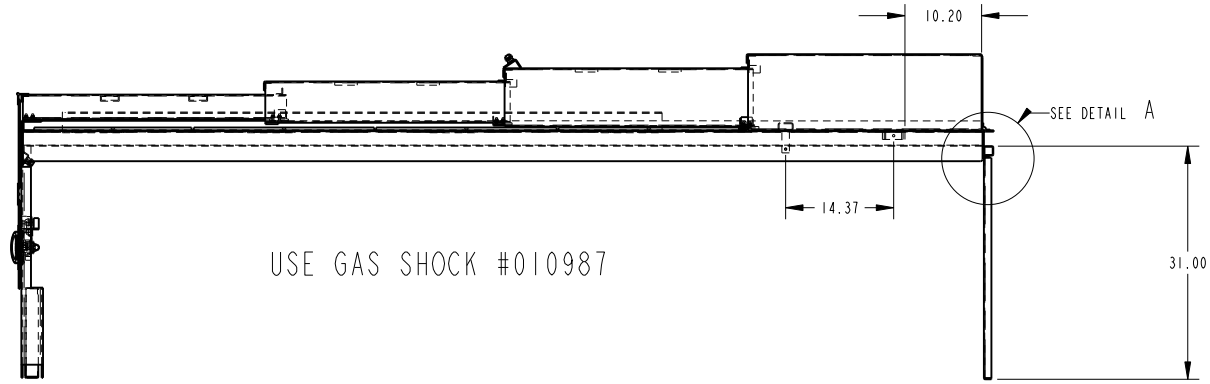
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON: ANGLE ±2° 2 PL ±0.06 3 PL ±0.030
INTERPRET DIMENSION AND TOLERANCE AS PER ASME Y14.5M-1994

DR: MEA DATE: 9/20/12
CHK: KLV DATE: 9/20/12
APPR: DATE:

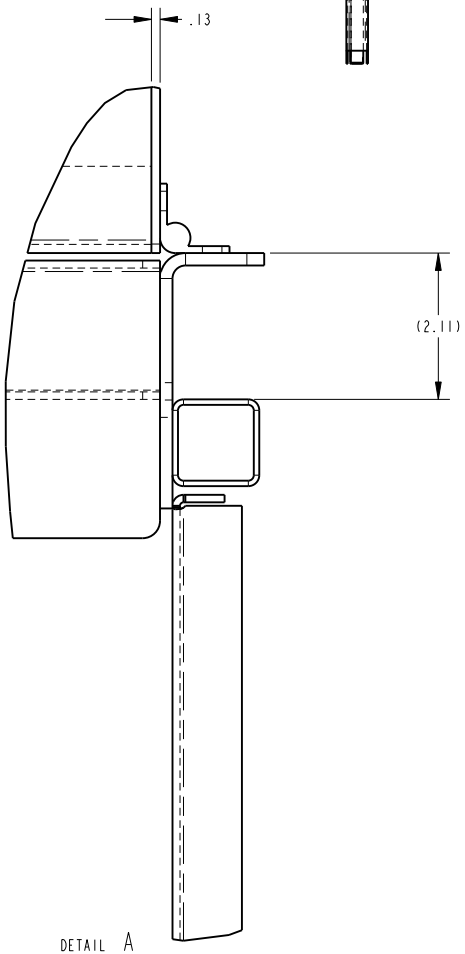
Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201

DESCRIPTION: 4 SECTION ALUM SLIDE TOP HINGE UP

SCALE: 1:1.60 | SIZE: C | SHEET: 2 OF 3 | DRAWING NUMBER: FF306-SLIDETOP | REV. LEVEL: A



USE GAS SHOCK #010987



DETAIL A
SCALE 3:4

Maintainer 1701 S. 2nd. Ave., PO Box 349, SHELDON, IA 51201					
DESCRIPTION: 4 SECTION ALUM SLIDE TOP HINGE UP					
SCALE: 3:160	SIZE: C	SHEET: 3 OF 3	DRAWING NUMBER: FF306-SLIDETOP	REV. LEVEL:	A