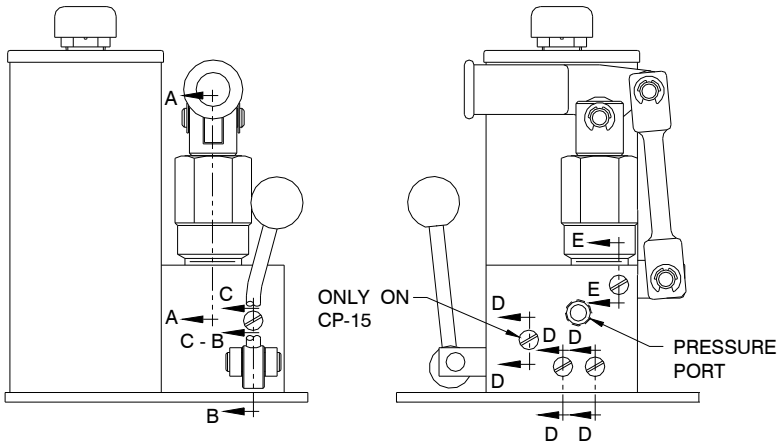
DUAL PISTON HYDRAULIC PUMPS

SERVICE MANUAL
(Hi-Lo Two Speed, Hand or Foot Operated)

STAR HYDRAULICS, INC.
2727 CLINTON STREET
RIVER GROVE, ILLINOIS 60171
708/453/3238
www.starhyd@starhyd.com

In servicing hydraulic units, cleanliness is of the utmost importance. A clean work place and proper tools are necessary to insure efficient and effective repair. Special tools can be furnished on request.

NOTE: Please specify pump model number when ordering parts. If you are not sure of your pump model number, call the factory and request a pump model identification sheet be faxed or e-mailed to your. Pump parts lists are also available for your model.



Typical assembly drawing of two speed pump showing sectional view location.

TROUBLE	POSSIBLE CAUSE	CORRECTIVE REPAIR INSTRUCTIONS
Pump will not hold pressure	**1. Release valve ball not seating properly**	**Refer to "Release Valve" notes**
	2. Ball valves not seating properly	**Refer to "Pump Valve" notes**
	3. Overload valve ball not seating properly	**Refer to "Overload Valve" notes**
	4. Large piston unloading valve seal faulty	**Refer to "Large piston unloading valve"**
Pump fails to supply pressure	**1. Lack of oil**	**Refer to "Oil" notes**
	2. Air bound pump	**Refer to "Air Bleeding" notes**
	3. Release valve ball not seating properly	**Refer to "Release Valve" notes**
	4. Small ball in valve circuit not seating properly	**Refer to "Pump Valve" notes**
	5. Overload valve ball not seating properly	**Refer to "Overload Valve" notes**
	6. Large piston unloading valve seal faulty	**Refer to "Large piston unloading valve"**
Pump piston does not draw a full charge. (This is evident by a cushion effect at the top of the pump stroke)	**1. Air bound system**	**Refer to "Air Bleeding" notes**
	2. Lack of oil	**Refer to "Oil" notes**
Pump piston raises by itself under pressure	**Large ball in ball valve circuit not seating properly**	**Refer to "Pump Valve" notes**
Pump functions properly but will generate only a given pressure below its normal pressure maximum	**Overload valve not properly set**	**Refer to "Overload Valve" notes**
Pump fails to supply greater output at no load than under load.	**Large piston unloading valve not set properly**	**Refer to "Large piston unloading valve"**

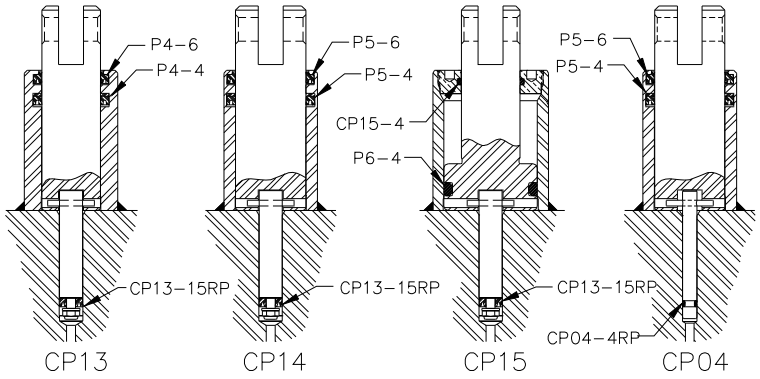
Air Bleeding

Air accumulation in a hydraulic system will cause erratic action. This may appear as pump failure to the inexperienced user. For this reason, it is advisable to air bleed each pump before attempting to operate. To emove air from the pump, open release valve with the pump in an upright position. Operate the pump slowly through the full piston stroke about a dozen times. Close the release valve. Pump should be ready for use.

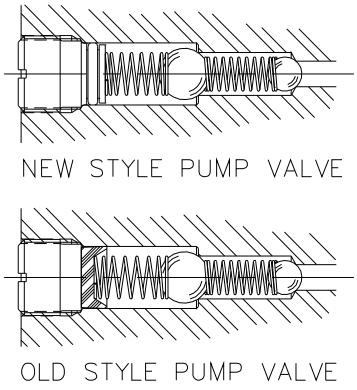
Oil
If the pump fails to operate, check the oil level before attempting any repairs.
The maximum fill level is 1 ½" below the inside of the reservoir cover.
CAUTION: Use only hydraulic oil when refilling. NEVER USE BRAKE FLUID.

Pump Piston
Leakage of oil around the pump piston may indicate worn or damaged piston packings.
To replace packings:

a) Remove the piston actuating linkage
b) Remove the piston. (See piston section drawing A-A)
c) Remove all packings. (see piston section drawing A-A)
d) Clean all parts and dry with compressed air.
e) Install new packings, wipers, and static seals making sure that packing seal lips are face down toward the pressure. (Lubricate each part into clean hydraulic oil before assembly)
f) Open the release valve (to allow air to bleed from the piston barrel back to the reservoir) and insert the piston.
g) Replace piston linkage.
h) NOTE: With release valve open, stroke pump about a dozen times to bleed air completely from the pump.

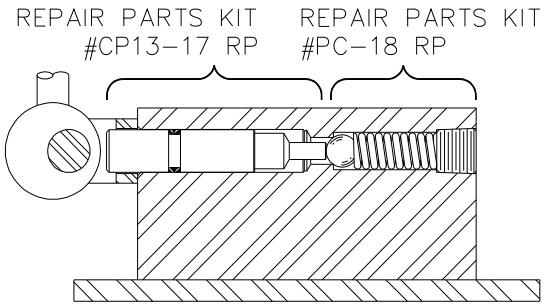


PUMP PISTON SECTION A – A



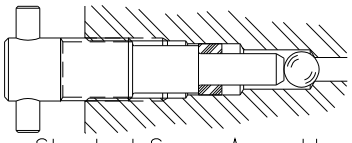
SECTION D–D

Pump Valves
If the pump fails to supply pressure or if the pump piston is under pressure at all times, the pump valves may need cleaning. Stand pump in an upright position. Remove the valve plug and seal. Tilt the pump to remove valve springs and balls. Allow oil to drain from the reservoir through these valve holes to wash foreign matter from the valve cavity. Lay pump on its side to clean and inspect valve chamber. Be careful not to mar or nick the ball valve seats. Clean the valve balls and springs in solvent. Replace rusted or corroded balls. Do not stretch the ball springs. To reassemble, insert in sequence, the small ball, small spring, large ball, and large spring into the cleaned chamber. Finally, screw in valve seal plug. Note that the seal kit contains the new style valve plug and seal. This procedure should be carried out in all ball valve circuits. If the valves fail to operate properly after they have been cleaned, it may be necessary to reseat the valve balls. Remove the springs and tap each ball lightly in its respective seat using the ¼" ball seating tool (CP13-42) for the small ball and the 3/8" ball seating tool (CP13-43) for the large ball. Remove balls to make sure they are not stuck to the seats. Reassemble pump valves as before. See "Air Bleeding" instructions before attempting to operate the pump.

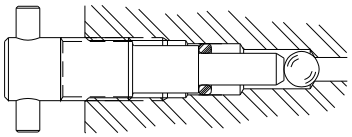


SECTION B–B
RELEASE VALVE – CAM TYPE

Release Valve – Cam Type
If the pump fails to lift or hold a load, the release valve may be dirty. From back of pump remove the release valve plug, release ball spring and 3/8" release ball. From the front, remove the release lever pin, release lever and release plunger and seal. Clean release valve chamber and inspect the ball seat. If necessary, re-seat the release ball by tapping it lightly on the ball seat, using the 3/8" ball seating tool (CP13-43). Clean plunger and inspect the plunger packing and replace if necessary. To reassemble, insert the ball, ball spring, and release valve plug. Lubricate the release plunger packing with hydraulic oil and carefully insert into the plunger chamber. Re-install the release lever and lever pin. See "Air Bleeding" instructions before attempting to operate the pump.



Standard Screw Assembly



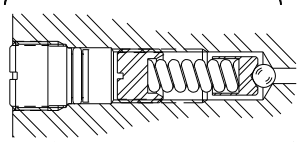
EPR/Viton Screw Assembly

SECTION B–B
SCREW RELEASE VALVE
KIT No. P1–3 RP

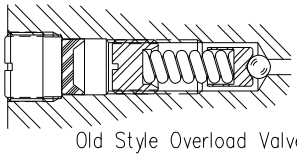
Release Valve – Screw Type

If the pump fails to lift or hold a load, the release valve may be dirty. Remove the release screw, release valve seal and 9/32" release valve ball. Clean and inspect valve seat and screw. A slight depression in the end of the screw is not harmful. Screws with excessive deformation should be replaced. Re-seat the release ball using the ¼" ball seating tool (CP13-42). To reassemble, insert the release valve packing using inserting tool P1A-40. Reinstall the release screw. See "Air Bleeding" instructions before attempting to operate the pump.

CP13–13 RP FOR P1A MODELS
P3A–13 RP FOR P2A, P3A, P4A MODELS
P5A–13 RP FOR P5A MODELS
P6A–13 RP FOR P6A MODELS



New Style Overload Valve' Ass y.

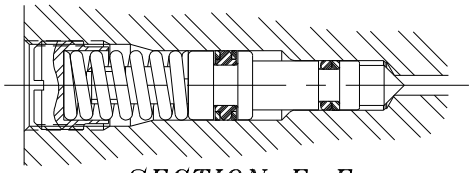


Old Style Overload Valve Ass'y.

SECTION C–C
OVERLOAD VALVE

Overload Valve

If the pump fails to lift or hold a load after the release valve and pump valves have been checked, the overload valve may be dirty. To clean the valve, remove valve plug and valve plug seal. Using a screwdriver, remove the overload valve screw, valve spring, valve plunger and steel ball. Clean and inspect valve cavity. If the ball seat is marred, re-seat the overload ball by lightly tapping the ball on seat using tool (CP13-45). Remove the ball to prevent sticking. Reassemble the ball, plunger, spring and valve screw. Connect a pressure gage to the pressure outlet. Stroke the pump to obtain maximum desired pressure. Turn the valve screw clockwise to increase the pressure reading and counter-clockwise to reduce the maximum reading. After valve is set properly, replace valve plug. Note that the seal kit contains the new style valve plug and seal. See "Air Bleeding" instructions before attempting to operate the pump.

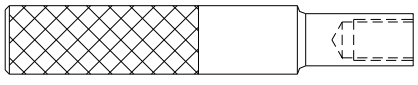


SECTION E–E
LARGE PISTON RELIEF VALVE

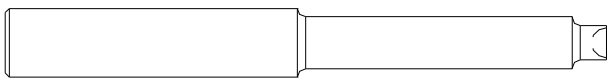
Large Piston Pump Relief Valve

If the pump fails to lift faster under no load than it does under heavy load, the large piston unloading valve may be dirty. This valve is covered with a sealing compound to prevent tampering. Remove the sealing compound, valve screw, spring and plunger with seals. Use threaded socket tool (CP13-41) to remove plunger. Clean and inspect the valve cavity. Inspect the plunger packings and replace if necessary. To reassemble, lubricate the plunger seals with hydraulic fluid and carefully insert it back into the valve cavity taking care not to damage the seals. Reassemble the spring and valve screw. Tighten the screw to obtain the desired effort on lever bar at large piston change-over point. If the screw is tightened too far it will restrict the unloading valve movement and cause excessive handle effort throughout the high pressure cycle.

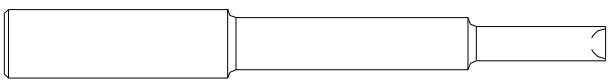
SPECIAL TOOLS AVAILABLE FOR REPAIRING STAR PUMPS ARE SHOWN BELOW



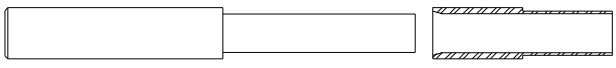
UNLOADING VALVE TOOL
(PART No. CP13–41)



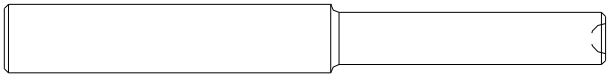
OVERLOAD VALVE BALL SEATING
TOOL (PART No. CP13–45)



1/4" BALL SEATING TOOL
(PART No. CP13–42)



INSERTING TOOL FOR P1A–4 RELEASE
VALVE SEAL (PART No. P1A–40)

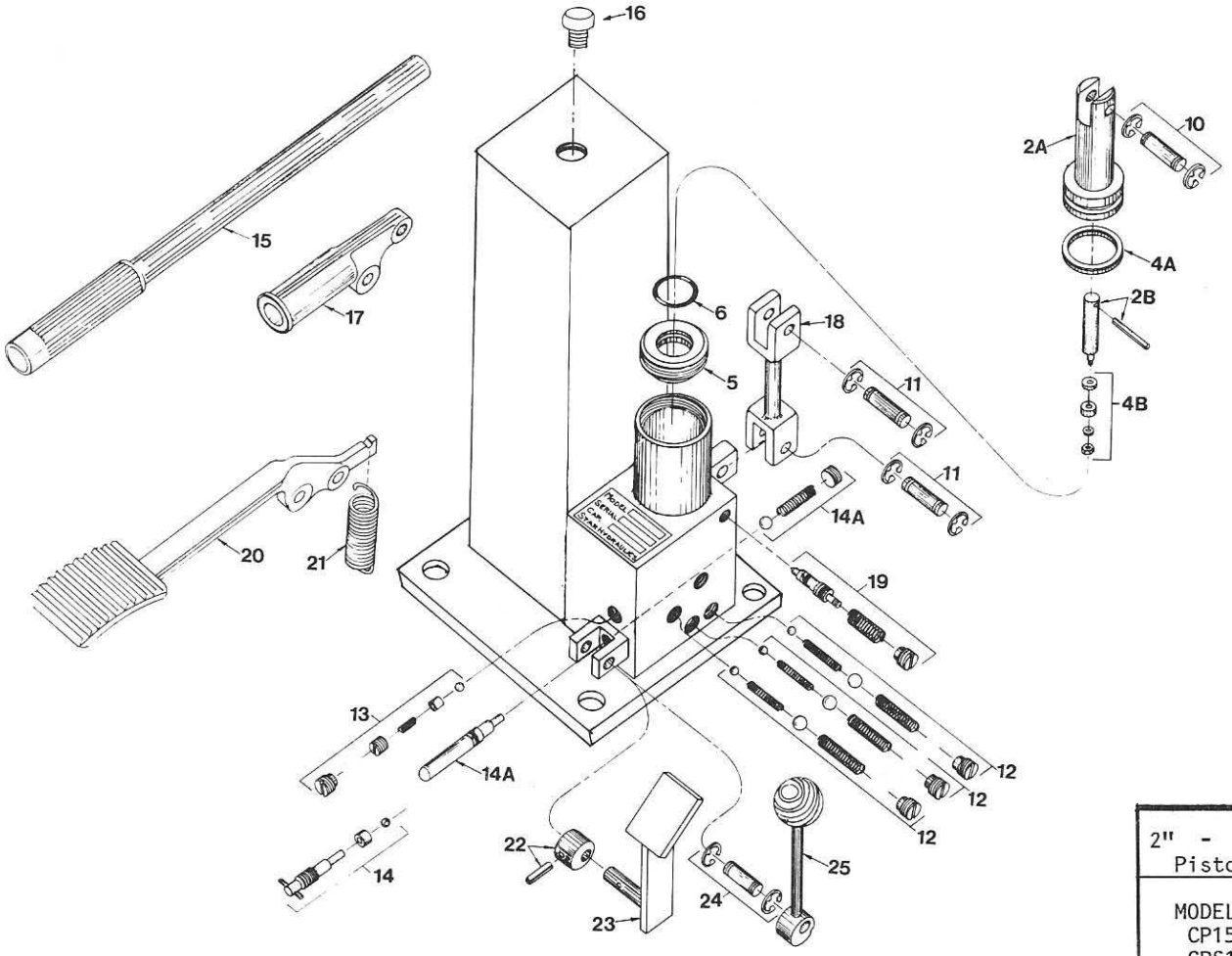


3/8" BALL SEATING TOOL
(PART No. CP13–43)

CP SERIES

STAR Hi-Lo Two Speed Pumps

1¼", ½" — 1½", ½" — 1½", 5/16" Diameters



Item No.	Part Name	2" - 1/2" Piston MODELS: CP15 CPS15 FCP15 Part No.
	Repair Kit (incl parts with *)	CP15-RK
2A	Large Piston	CP15-2
2B	Small Piston (incl pin)	CP13-4RP
4A	Large Piston Packing	* P6-4
4B	Small Piston Packing	* CP13-5RP
5	Pump Packing Nut	CP15-7
6	Pump Piston Wiper	* CP15-4
10	Piston Pin (incl. Rings)	CP13-10RP
11	Link Pin (incl Rings)	CP13-10RP
12	Pump Valve (Complete incl. 2)	* CP13-19RP
13	Overload Valve (Complete)	* CP13-13RP
14	Release Valve (Complete)	P1-3RP
14A	Release Plunger (Complete)	* CP13-17RP
14B	Release Valve (Complete)	* PAC-18RP
15	Lever Handle	CP13-23
16	Breather Screw	P1-16
17	Pump Socket	CP13-9
18	Pump Link	CP13-12
19	Relief Valve (Complete)	* CP13-25RP
20	Foot Lever	FCP12-9
21	Foot Lever Return Spring	FCP13-23
22	Release Lever Cam & Pin	FCP13-13RP
23	Foot Release Lever	FCP13-14
24	Release Lever Pin (incl Rings)	CP13-10RP
25	Cam Release Lever	CP13-14
	Inserting Tool	* CP13-44

These models can be:

- -hand or foot operated
- -screw or cam released
- -with reservoirs
- -base mounted

Please give the following information when ordering parts:

- Part Number
- Part Name
- Model No. of Pump

STAR HYDRAULICS, INC. 2727 CLINTON ST., RIVER GROVE, IL 60171-1598 • 708 453-3238

STAR HYDRAULICS, INC.

Hydraulic oil recommendations for Star Hydraulic hand and foot pumps.

Typical test data

Gravity	29
Flash	234° F
Fire	380° F
Viscosity at 100° F	80 S.U.S.
Viscosity at 210° F	37.4 S.U.S.
Average Viscosity Index	75
Pour	Minus 55 / 60° F
Neutralization No.	.03
Conradson Carbon	Less than .01
Rust and Oxidation Inhibited Incorporated Foam Depressant	
Aniline Point	185 – 230

Approved Sources:

Mobile DTE 11M – Product Number 603100-0
Lubriplate “Special low pour hydraulic oil” #76762 (pour -75° F)

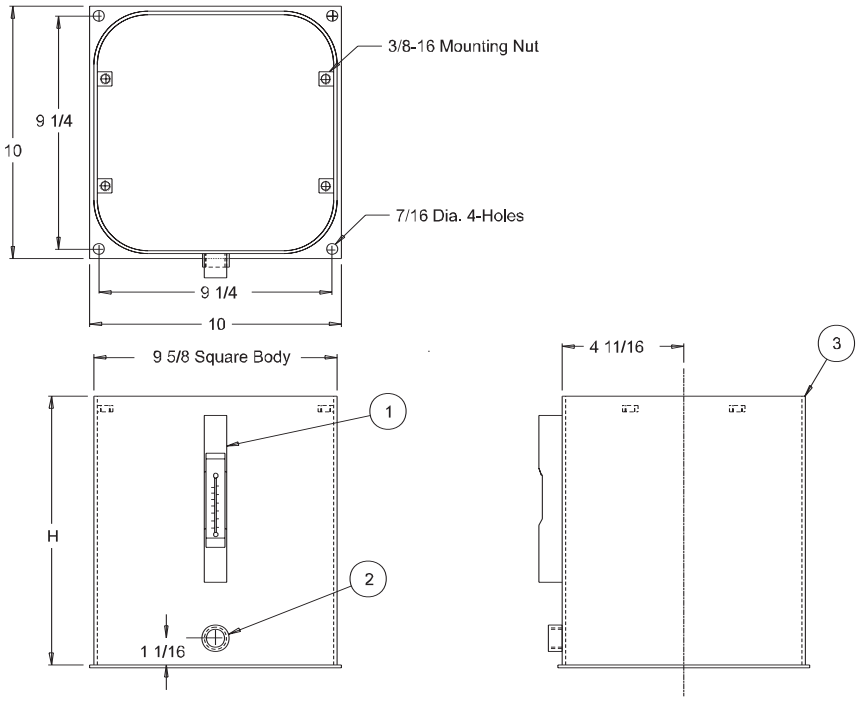
Emergency Sources:

SAE 5 Motor Oil – (Viscosity 60 S.U.S.)
Automatic transmission fluid

SPECIAL HYDRAULIC CYLINDERS AND HAND PUMPS

2727 Clinton St. · River Grove, IL 60171-1598 · 1-708/453-3238 · Fax: 1-708/453-0297
Web Site address: www.starhyd.com · E-mail address: starhyd@starhyd.com

2, 3 and 5 Gallon Capacity



Each Vari-Pak Reservoir Includes:

1. (1) Oil Level & Temp. Gauge
2. (1) 1/2" NPT Drain
3. Channel Gasket for Top Plate Seal
4. Steel Construction with Customer Choice of Top Plate
5. Exterior of reservoir prime painted
6. Interior of reservoir coated with rust preventive oil

Sight Gauge

2, 3 to 5 gallon - 5" sight gauge (ALG5T)

NOTE: Cover Plate ordered as separate item
(see below)

Sight Gauge shipped loose inside reservoir, Filler Breather included with cover plate

Vescor Part Number	H (height)	Capacity	Shipping Weight
29902	8"	2 Gallons	18#
29903	12"	3 Gallons	23#
29905	16"	5 Gallons	28#

*Weight does not include covers

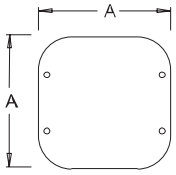
COVER PLATES

Vescor Vari-Pak Reservoirs allow you to choose the style cover plate for your individual needs.

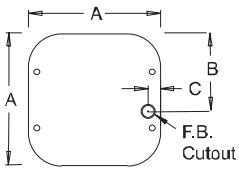
Reservoir and Cover Plate must be ordered as separate items. *Please use part number when ordering.*

Cover Part Number	A (SQ)	B	C	D	E	F (ADAPTER CUTOUT)
99908 **99909** **99910** **99911**	$10^{1}/_{8}$"	$5^{15}/_{16}$"	$1^{3}/_{16}$"	$5^{1}/_{16}$"	$3^{21}/_{32}$"	cutout for 56/145TC adapter (style 1, 1A, 1B)
99907	$10^{1}/_{8}$"	N/A	N/A	$5^{1}/_{16}$"	$5^{1}/_{16}$"	cutout for 182/256TC adapter only (style 7)

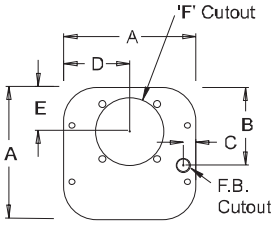
All covers include (1) PMB07-10 Mini Breather



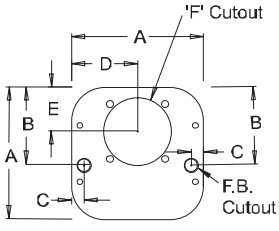
Style A Cover Plate
Blank Cover
Part Number 99908



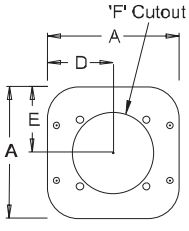
Style B Cover Plate
with Breather Cutout
Part Number 99909



Style C Cover Plate
with Breather Cutout and
56C/145TC Adapter Cutout
Part Number 99910



Style D Cover Plate
with Breather Cutout and
56C/145TC Adapter Cutout
1/2" NPT Connection
Part Number 99911

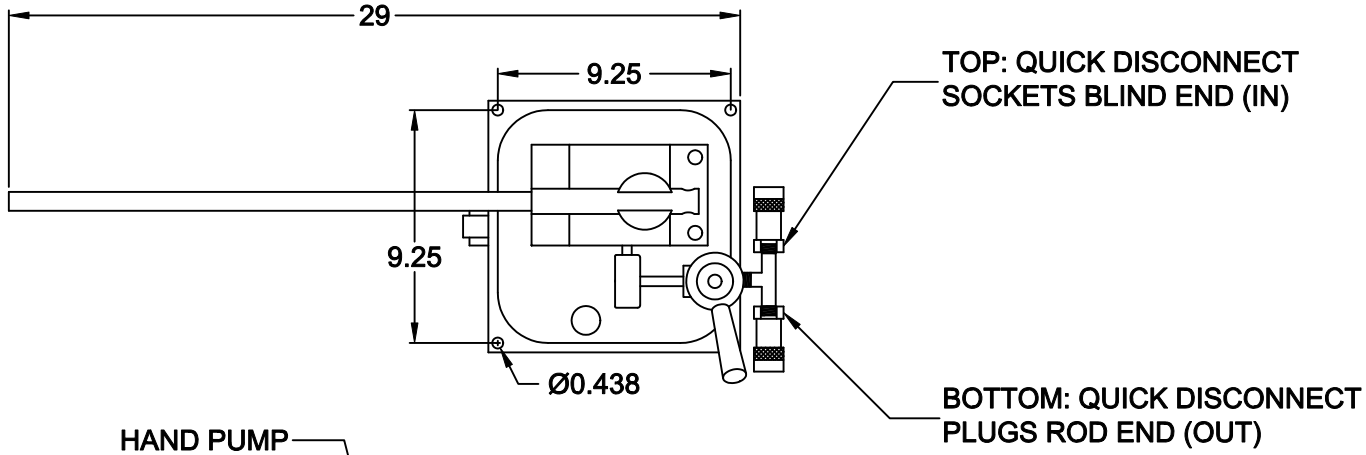


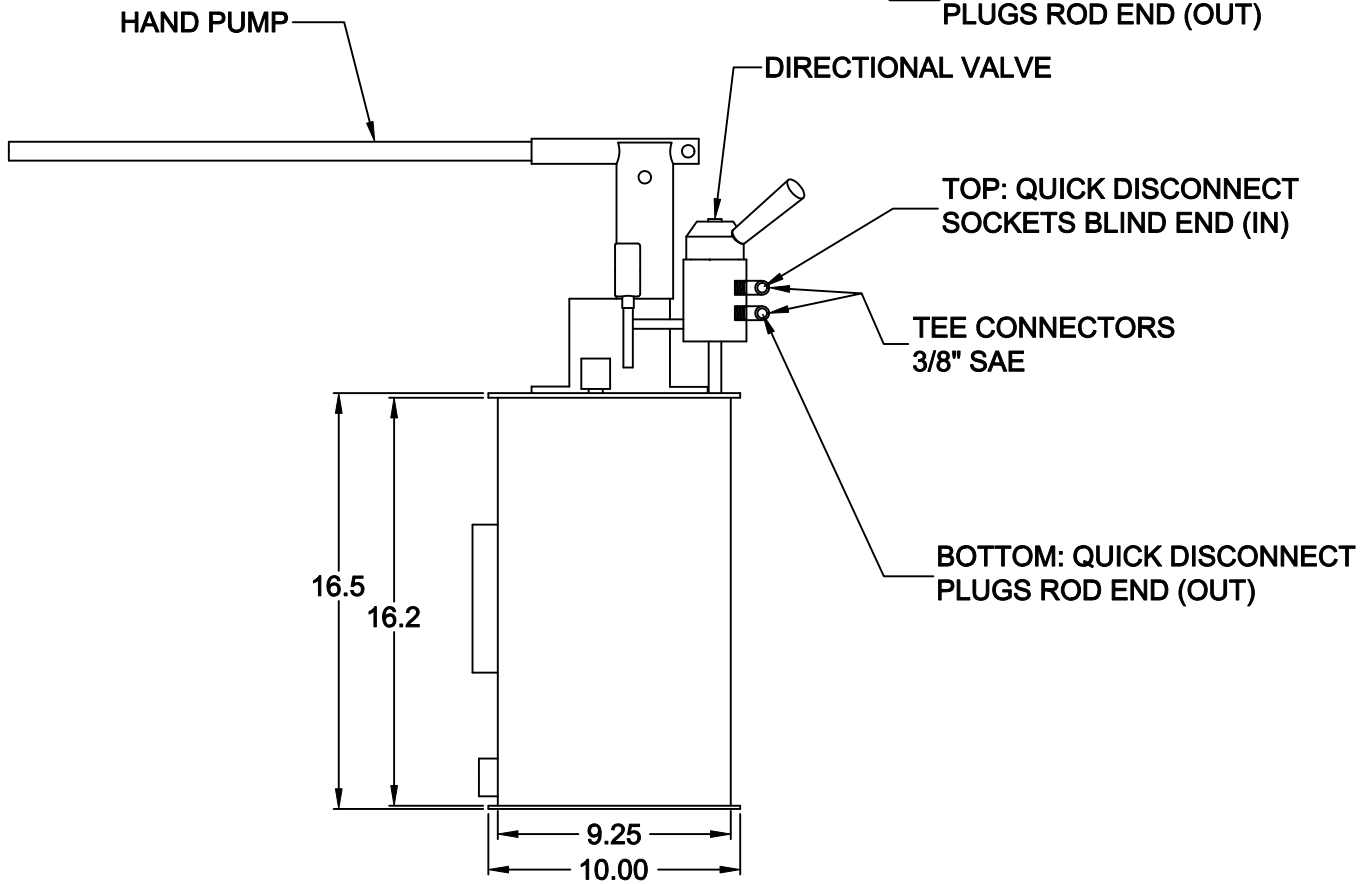
Style E Cover Plate
182/256TC Adapter Cutout
Part Number 99907

PART NO: HYDHPUMP

QTY.	DESCRIPTION
1	PUMP
1	RESERVOIR (5 GAL) WITH OIL LEVEL GAGE, DRAIN PLUG, & CAP
1	DIRECTIONAL VALVE
2	TEE CONNECTOR
2	QUICK DISCONNECT SOCKET
2	QUICK DISCONNECT PLUG

NOTE: OIL IS NOT SUPPLIED WITH PUMP.





Tolerances (Unless Otherwise Specified)	TU Frame	Series	Travel	Suffix	Bearing	Weight	Item Class	Scale
Decimal .XX± .XXX± .XXXX± ANGULAR ±1°	N/A	N/A	N/A	N/A	N/A	63	T4	UNK

Assembly Part Number	Item Description	Temp No	Revision:	
JMG: 050403-5C	HYD HAND PUMP WITH 5 GAL. RESERVOIR	N/A	1 ECO7225	7/19/07 JPM

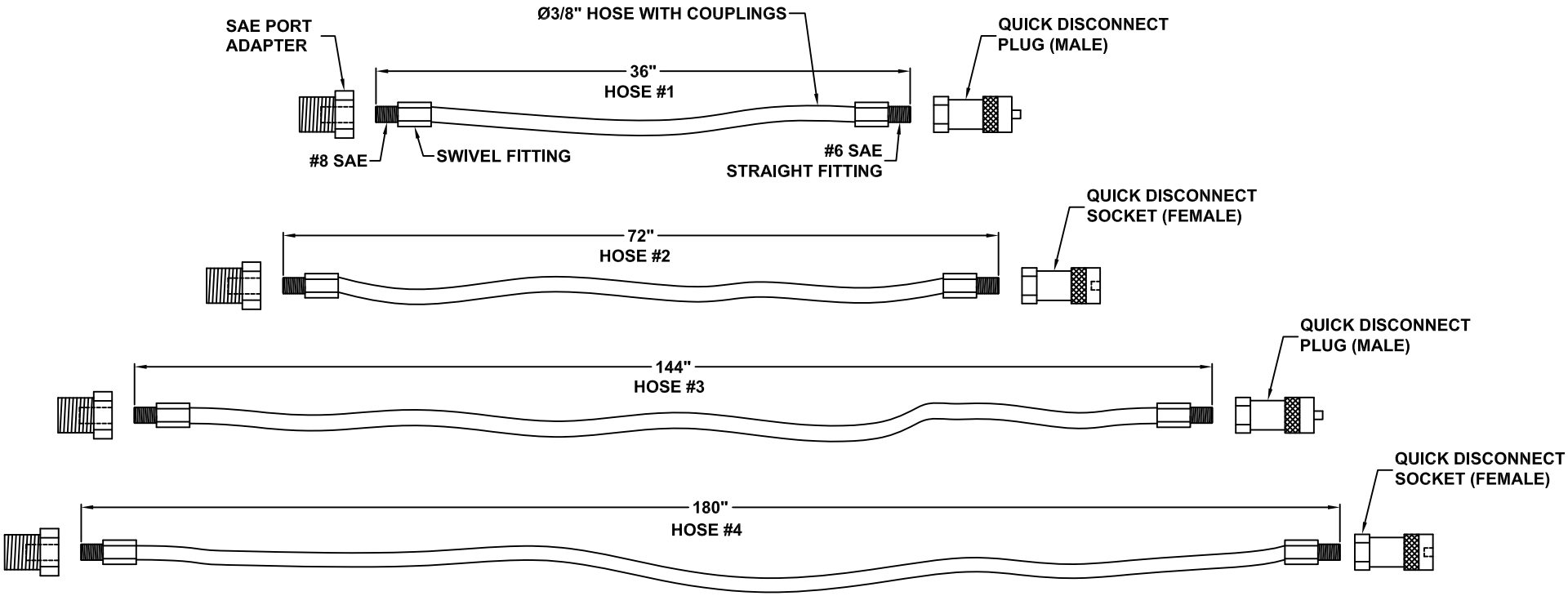
PPI™ Precision Pulley & Idler
P.O. Box 287 • Pella, IA 50219 • 641-628-3115

By:	EJA	Dwg No.:	HYD H PUMP
Date:	11/25/03	Part No.:	HYDHPUMP

PART NO: MHOSE JMG: 050403-10-12	
QTY.	DESCRIPTION
1	3' HOSE (36")
1	6' HOSE (72")
1	12' HOSE (144")
1	15' HOSE (180")
4	#10 SAE PORT ADAPTER
4	#12 SAE PORT ADAPTER
2	QUICK DISCONNECT SOCKET
2	QUICK DISCONNECT PLUG

PART NO: LHOSE JMG: 050403-16-20	
QTY.	DESCRIPTION
1	3' HOSE (36")
1	6' HOSE (72")
1	12' HOSE (144")
1	15' HOSE (180")
4	#16 SAE PORT ADAPTER
4	#20 SAE PORT ADAPTER
2	QUICK DISCONNECT SOCKET
2	QUICK DISCONNECT PLUG

PART NO: XHOSE JMG: 050403-24	
QTY.	DESCRIPTION
1	3' HOSE (36")
1	6' HOSE (72")
1	12' HOSE (144")
1	15' HOSE (180")
4	#16 SAE PORT ADAPTER
4	#24 SAE PORT ADAPTER
2	QUICK DISCONNECT SOCKET
2	QUICK DISCONNECT PLUG



Tolerances	TU Frame	Series	Travel	Suffix	Bearing	Weight	Item Class	Scale	PPI™ Precision Pulley & Idler
Unless Otherwise Specified Decimal .XX± .XXX± .XXXX± ANGULAR ±1°	N/A	N/A	N/A	N/A	N/A	N/A	N/A	UNK	P.O. Box 287 • Pella, IA 50219 • 641-628-3115

Assembly Part Number	Item Description	Temp No	Revision:	By: EJA	Dwg No.: HYDHOSE
	HYD HOSE KITS	N/A	0 ENPR3090	Date: 11/25/03	Part No.: SEE TABLE

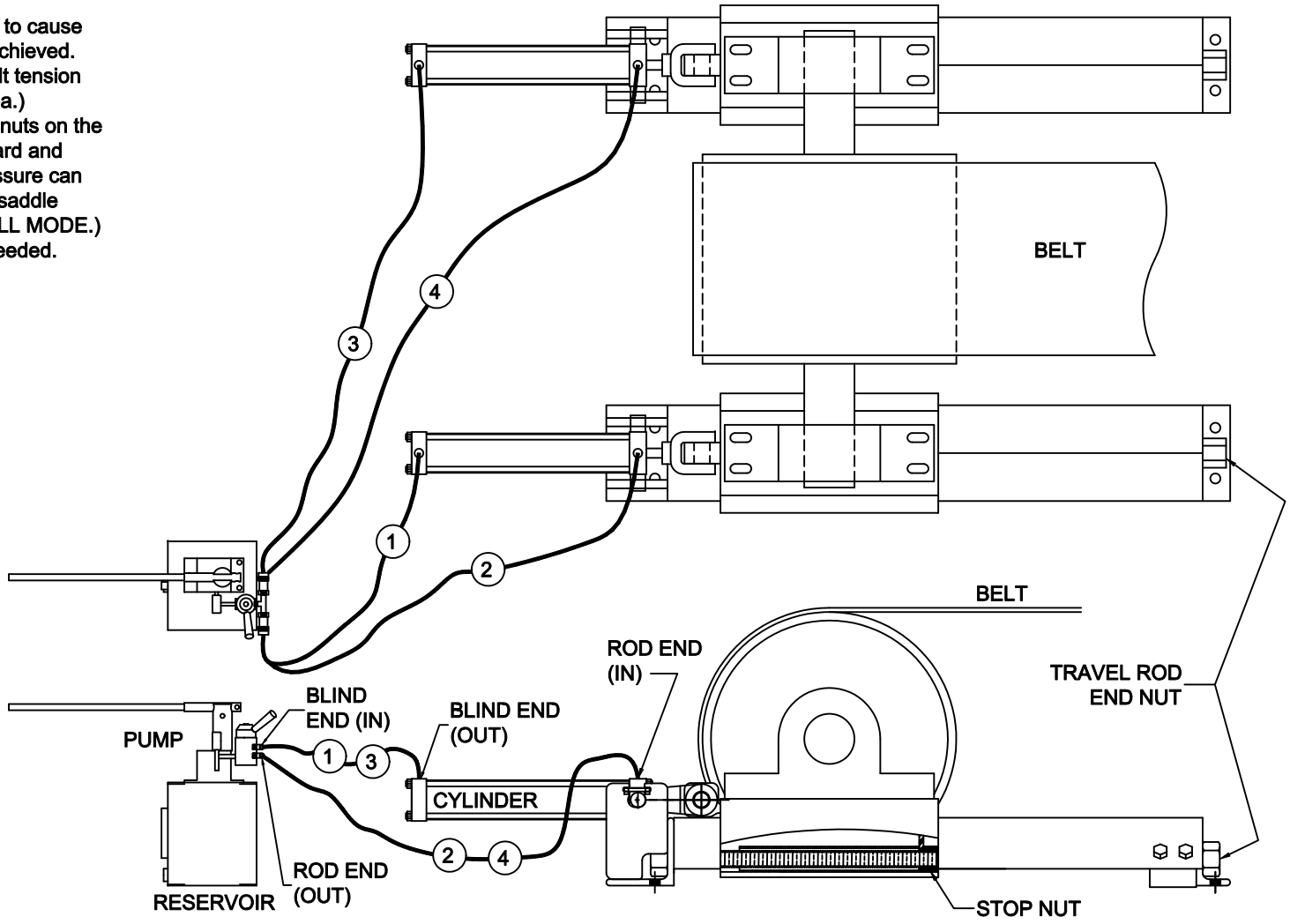
HYDRAULIC ASSISTED TAKE-UP IN PULL MODE.

Principal of Operation:
Hydraulic Cylinder movement is used to move the pulley. The threaded rod is rotated to engage STOP NUT and lock pulley from movement.

Operations To Increase Belt Tension
1) Apply hydraulic pressure to the rod end of the cylinder to cause Take-up pulley movement until desired belt tension is achieved. (Pressure gage on cylinder can be used to establish belt tension from cylinder area. Force is equal to pressure times area.)
2) When finished adjusting tension, rotate travel rod end nuts on the end opposite the cylinder moving the STOP NUTS toward and against the saddle until resistance is felt. Hydraulic pressure can now be released. (The STOP NUT is on the end of the saddle opposite the cylinder when using Take-up Frame in PULL MODE.)
3) If further movement is needed, repeat step 1 & 2 as needed.

Operations To Decrease Belt Tension
1) Apply hydraulic pressure to the rod end of cylinder.
2) Rotate the travel rod end nuts on the end opposite the cylinder moving the STOP NUTS away from the saddle. This will allow the saddle to move in the desired direction. (The STOP NUT is on the end of the saddle opposite the cylinder when using Take-up Frame in PULL MODE.)
3) Actuate cylinder applying hydraulic pressure to the cylinder end of the cylinder (or allow pressure to bleed off of the rod end of the cylinder). This will cause Take-up pulley movement until desired belt tension is achieved.
3) If further movement is needed, repeat step 1 through 3 as needed.
4) When finished adjusting tension, rotate travel rod end nuts in opposite direction to step 2 until resistance is felt. Hydraulic pressure can now be released.

NOTES
1) Hydraulic Take-Up Frame and cylinder ship unassembled.
2) The Pump Kit comes with a 5 gallon reservoir, pressure gauge, oil level gauge, and valves.
3) The Hose Kit comes with Ø3/8" hoses, fittings, and adapters.



CYLINDERS ARE SHOWN IN "PULLING" CONFIGURATION WITH STOP NUT POSITIONED TO PREVENT PULLEY MOVEMENT.

Tolerances	TU Frame	Series	Travel	Suffix	Bearing	Weight	Item Class	Scale	
Unless Otherwise Specified Decimal .XX± .XXX± .XXXX± ANGULAR ±1°	N/A	HYD	N/A	N/A	N/A	N/A	N/A	UNK	PPI™ Precision Pulley & Idler P.O. Box 287 • Pella, IA 50219 • 641-628-3115
	Assembly Part Number			Item Description HYD TAKE-UP FRAMES WITH PUMP & HOSE KITS			Temp No N/A	Revision: 1 7/19/07 ECO7225 JPM	By: EJA Date: 11/25/03
									Dwg No.: HYD LAYOUT Part No.: N/A