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**Installation of the modular pump kit
onto M683, M3493, M3593,
M3500V and M3551 pump base**

Installation of the modular pump kit FP12171-250-SA onto M683 pump base

- 1) Remove the old pump and pump parts from the pump base. Take the shaft seal out from pump base. Remove all needle bearing rollers from the idler shaft hole (be sure that there are no needle bearing rollers left in the hole - because the pump can fail) (see detail 1). Check that all needle bearing rollers are present in the drive shaft hole (see detail 1).
- 2) Assembly of the modular pump kit FP12171-250-SA:
 - a) Place 'O'-ring FP0120 on the pump base (see detail 1)
 - b) Place 'O' ring FP0116 in the pump groove (see detail 2)
 - c) Insert the drive shaft of pump through pump base and orientate pump in correct orientation (see detail 3)
 - d) Insert 4 screws FP7818 through pump and torque to approximately 150 in-lbs (see detail 3)
 - e) Put shaft seal on drive shaft with lip facing towards pump base. Press seal into pump base until seal is against the bottom of the seal cavity. The seal should be approximately 0.030" below the top of the seal cavity.
 - f) Install the suction tube in pump (apply sealant on the thread of tube (do not put sealant on the couple threads on the end of tube) and do not use Teflon tape) and put the suction screen on suction tube.

Note: on the manifolds with the old acorn nuts on the cross-overs', the return tube is located in the center of the manifold and suction tube may interfere with that return tube, when assembling the unit. In order to avoid that interference turn the return tube towards the transfer tube location as far as possible and the new suction tube in the other direction as far as possible.

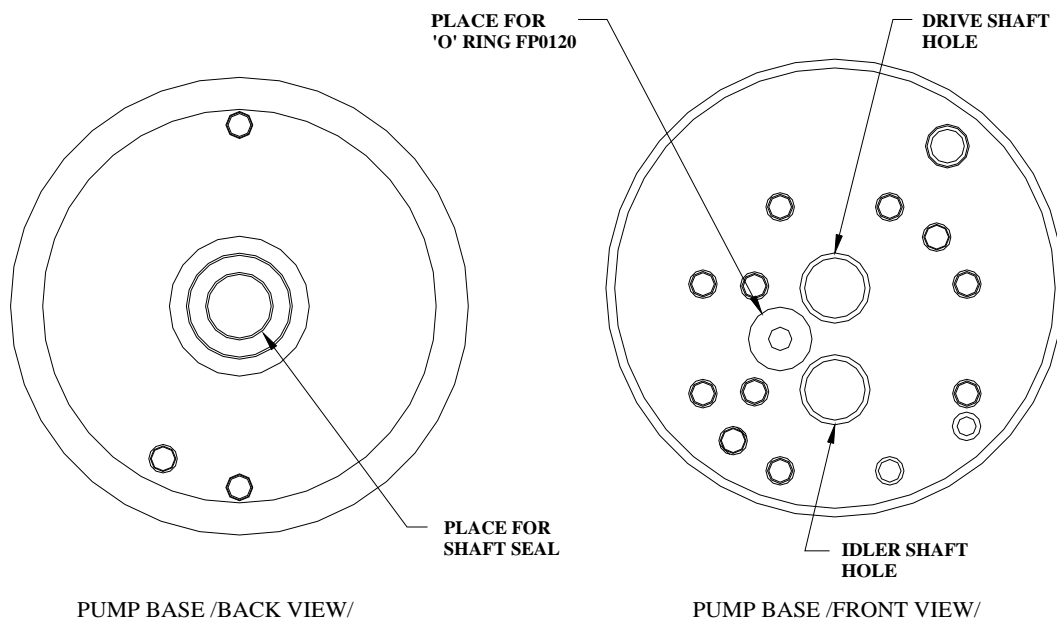
Installation of the modular pump kit FP12171-250-SA onto M3551, M3493 M3593 pump base and FP12171-380-SA onto M3500V pump base

Following is the recommended procedure for replacing an M-Series pump with a modular pump.

1. Drain oil from the reservoir. Do not reuse this oil.
2. It is generally recommended to replace the pump shaft seal when the pump is being replaced. To remove the seal, the motor needs to be removed.
3. Remove the reservoir from the power unit by removing the (6) collar screws (steel reservoir).
4. Note the orientation of the suction screen and tube assembly on the old pump. Remove pump.
5. Remove the 10 pump screws in the old pump (only 4 bolts on modular pup). Remove the pump and the 2 dowel pins from the pump base.
6. Remove the existing seal.
7. There are two shaft holes in the base, one goes all the way through (drive shaft) and one does not (idler shaft). In the past, two bearing styles have been used. If the needles are "caged" do nothing. If the needles are loose:
 - a) Remove all loose needle bearings from the idler shaft hole and throw them away, as they

are not needed with the new pump

- b) You will need to reinstall the needles in the drive shaft hole. There are twenty-four (24) needles in each bearing. Coat the needle bearings with grease and place them back in the bearing housings in the drive shaft hole
8. Wipe surface of the base clean, removing old oil, dirt, etc.
9. Replace FP0120 O-ring provided in pump kit (See Detail 1). Place O-ring FP0116 into the groove of the pump (see detail 2).
10. Carefully slide the pump into place.

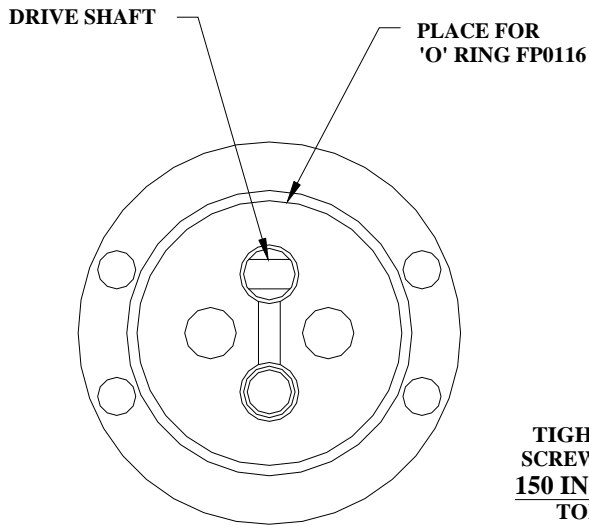


DETAIL 1

11. Align (4) through holes with (4) empty screw holes in the pump. (See Detail 3)
12. Drop the (4) screws provided in the pump kit into the holes. The screws should be started by hand -- no air tools. Torque (4) provided screws to approximately 150 in-lbs. Do not over tighten! Do not tighten any other screws in the pump other than the (4) provided loose in the kit.
13. To install seal, grease the end of the pump shaft and place the seal on the shaft with the lip facing towards the pump base. Press seal into pump base until the seal is against the bottom of the seal cavity. The seal should be approximately 0.030" below the top of the seal cavity. Inspect the seal and verify the lip has not been caught by the pump shaft and reversed.
14. Remove the suction tube and screen assembly from the old pump's suction plate.
15. Apply a small amount of sealant on a couple threads half way around the suction tube. Sealant should be applied a couple of threads in from the end of tube, do not put sealant on the end of tube. Do not use Teflon tape.
16. Orientate the suction and return tubes to the bottom of the reservoir (or as noted in step 4).

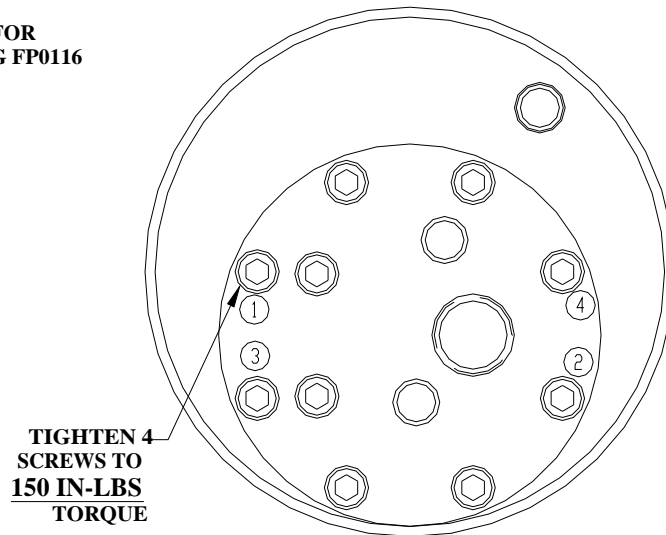
17. Grease the reservoir O-ring and slide the pump assembly back into the reservoir collar.
 Caution; A pinched or deformed seal may result in leaking.

Modular Pump Kit FP12171-250-SA/ FP12171-380-SA			
Item	Part #	Description	Quantity
1	FP12171-250	Pump, Modular, 03 gear (only with FP12171-250-SA)	1
1a	FP12171-380	Pump, Modular 05 gear (only with FP12171-380-SA)	1
2	FP7818	Screw, SHCS, 1/4"-20 x 3" long	4
3	FP13092	Tube, Suction	1
4	FP0120	'O'-ring, 1/16" x 1/2" x 5/8"	1
5	FP0116	'O'-ring, 1/16" x 2-1/4" x 2-3/8"	1
6	FP2159	Seal, pump shaft	1
7	FP2352	'O'-ring, 1/8" x 3-5/8" x 3-7/8"	1
8	FP1134	Suction Strainer	1



MODULAR PUMP /BACK VIEW/

DETAIL 2



ASSEMBLY OF MODULAR PUMP ON PUMP BASE

DETAIL 3



FP12171-380-SA
RELIEF VALVE
TO BE SET AT 1500 PSI



FP12171-250-SA
RELIEF VALVE
TO BE SET AT 2250 PSI

Installation of the modular pump kit FPK12311-250 onto M673F pump base

1.) Remove the old pump and pump parts from the pump base (bolts and dowels). Take the shaft seal out from pump base. There are two shaft holes in the base, one goes all the way through (drive shaft) and one does not (idler shaft). Remove all needle bearing rollers from the idler shaft hole (be sure that there are no needle bearing rollers left in the hole - because the pump can fail) . Check that all needle bearing rollers are present in the drive shaft hole, there are twenty-four (24) needles.

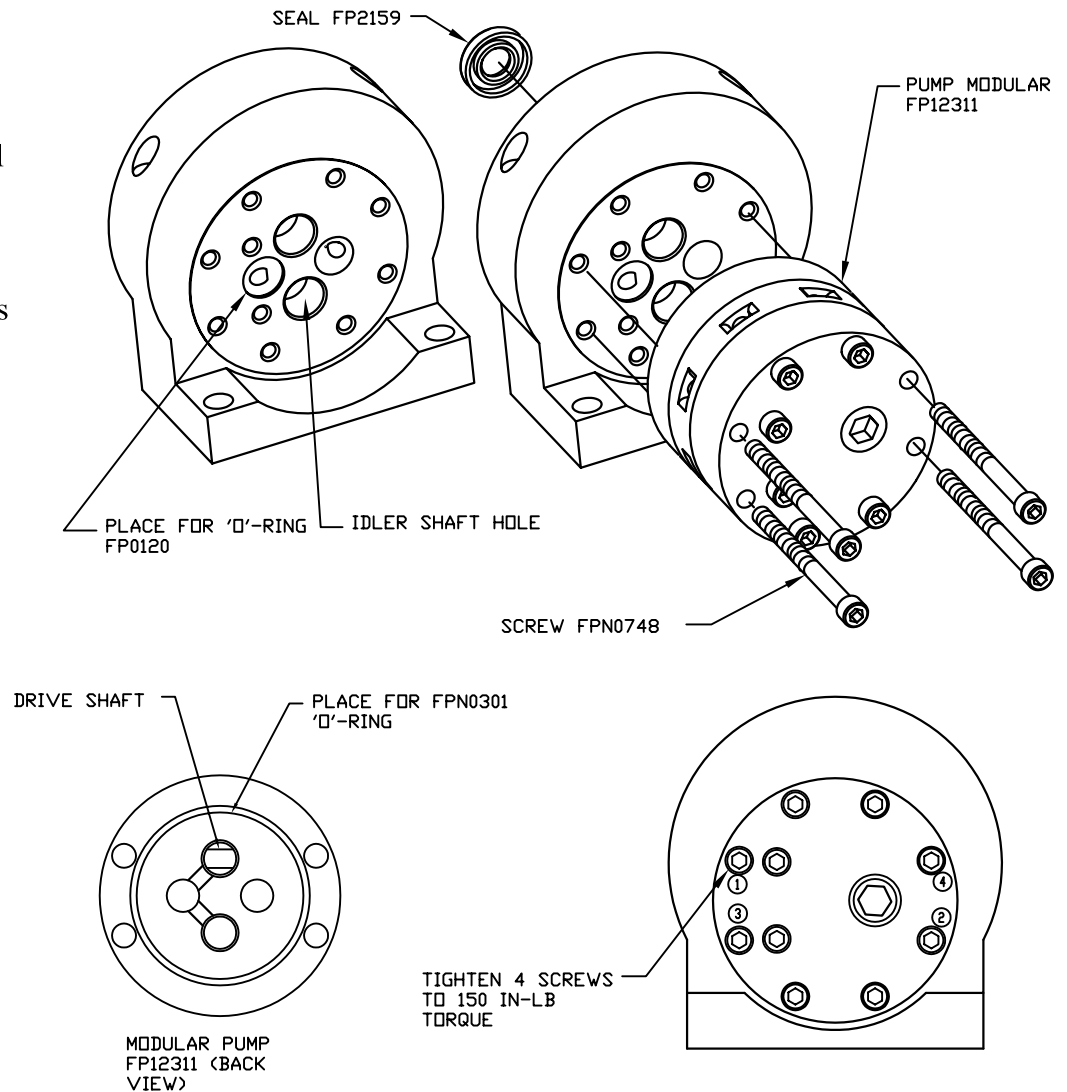
Note: If needle bearing in idler shaft is caged (needles are not loose ; they can not be moved out from bearing) needles do not have to be removed.

2.) Assembly of the modular pump FP12311:





- place 'O'-ring FP0120 on the pump base ,
- place 'O' ring FPN0301 in the pump groove,
- insert the drive shaft of pump through pump base and orientate pump in correct orientation ,
- insert 4 screws FPN0748 through pump and torque to approximately 150 in-lbs,
- put shaft seal FP2159 on drive shaft with lip facing towards pump base. Press seal into pump base until seal is against the bottom of the seal cavity. The seal should be approximately 0.030" below the top of the seal cavity.

3) When pump is installed slide cap FPN0719 over a pump.





M673F Modular Pump Kit FPK12311-250			
ITEM	QTY	PART#	DESCRIPTION
1	1	FP12311	Pump, Modular
2	4	FPN0748	Screw, Socket Head Cap Screw 1/4" - 20UNC x 3"
3	1	FP0120	'O'-ring, 1/16" x 1/2" x 5/8"
4	1	FPN0301	'O' ring, Metric, 56 x 2
5	1	FPN0719	Cap
6	1	FP2159	Seal



Valve Chart (Valves used in Arctic Hydraulic Power Units)

	Valve/ Part #	Place where valve was used	It can be replaced with:
	Deltrol Valve (3/8" stem): -FP0490 (cartridge + coil) - FP0307 cartridge - FP0496 coil	- M673F (1997-2002): "A", "B" and "C" position - M673F (2002-2007): "B" and "C" position - M3593 (2001-2007) : "B" position - M3500 (2002-2007): "B" position - M200 (2002-2007): "B" and "C" position - M3551 (2000-2008): "B" position	Deltrol Valve (1/2" stem): -FP0490-D (cartridge + coil) -Cartridge: FP10907-D <i>*If cartridge FP0307 is replaced with FP10907-D, coil FP0496 must be replaced with FP10861-D</i> -Coil : FP10861-D <i>*If coil FP0496 is replaced with Coil FP10861-D, Cartridge FP0307 must be changed to FP10907-D</i>
	Deltrol Valve (1/2" stem): - FP0262-P cartridge - FP10977 coil	- M3593 (2000): "B" position - M3551 (2000): "B" position	Deltrol Valve (1/2" stem): - FP0490-D (cartridge + coil) - Cartridge: FP10907-D - Coil : FP10861-D
	Deltrol Valve (1/2" stem): -FP0490-D (cartridge + coil) -Cartridge: FP10907-D - Coil : FP10861-D	- M673F (2007 & up): "B" position - M200 (2007 & up): "B" position	Deltrol Valve (1/2" stem): -FP0490-D (cartridge + coil) -Cartridge: FP10907-D - Coil : FP10861-D
	Deltrol Valve (1/2" stem): - Cartridge FP10907-D - Coil with single screw	- M3593 (2007only): A", "B", "C" and "D" position - M673F (2007 only): A", "C" and "D" position	Deltrol Valve (1/2" stem): -FP0490-D (cartridge + coil) - Cartridge FP10907-D - Coil : FP10861-D

Valve Chart (Valves used in Arctic Hydraulic Power Units)

	Valve/ Part #	Place where valve is used	It can be replaced with:
	Deltrol Valve (1/2" stem): -FP0490-D (cartridge + coil) - Cartridge FP10907-D - Coil FP18835-D	- M673F (2007 & up): "C" position - M3593 (2007 & up): "B" position - M3500 (2007 & up): "B" position - M200 (2007 & up): "C" position - M3551 (2008 & up): "B" position	Deltrol Valve (1/2" stem): -FP0490-D (cartridge + coil) - Cartridge FP10907-D - Coil : FP10861-D
	Deltrol Valve (1/2" stem): - Cartridge FP10907-D - Coil with double spade connector	- M3593 (2007only): "B" - M350V (2007 only): "B" - M673F (2007 only): "C"	Deltrol Valve (1/2" stem): -FP0490-D (cartridge + coil) - Cartridge FP10907-D - Coil : FP10861-D
	Parker Valve (1/2" stem): -FP7249 (cartridge + coil) - Cartridge FP0679 - Coil FP10977	- M673F (2003-2007): "A" and "D" position - M3593(2002-2007): "A", "C" and "D" position - M3500 (2004-2007): "A1", "A2", "C", "D1", "D2" position - M200(2003-2007): "A" and "D" position	Deltrol Valve (1/2" stem): -FP7249-D (cartridge + coil) • Cartridge: FP0679-D *note: if cartridge FP0679 is replaced with FP0679-D, coil FP10977 must be changed to FP18835-D • Coil : FP18835-D
	Parker Valve (1/2" stem): -FP10978 (cartridge + coil) - Cartridge FP0679 - Coil FPN0408	- M673F (2002): "A" and "D" position	Deltrol Valve (1/2" stem): -FP7249-D (cartridge + coil) • Cartridge: FP0679-D *note: If cartridge FP0679 is replaced with FP0679-D, coil must be changed to FP18835-D - Coil : FP18835-D

Valve Chart (Valves used in Arctic Hydraulic Power Units)

	Valve/ Part #	Place where valve is used	It can be replaced with:
	Deltrol Valve: - Cartridge FP0679-D - Coil with double spade connector	- M673F (2007 only): “A” and “D” position - M3593 (2007 only): : “A”, “C” and “D” position - M3500 (2007 only): : “A1”, “A2”, “C”, “D1”, “D2” position	Deltrol Valve (1/2” stem): -FP7249-D (cartridge + coil) - Cartridge: FP0679-D - Coil : FP18835-D
	Deltrol Valve: - FP0679-D cartridge - Coil with single screw	- M673F (2007 only): “A” and “D” position - M3593 (2007 only): : “A”, “C” and “D” position - M3500 (2007 only): : “A1”, “A2”, “C”, “D1”, “D2” position	Deltrol Valve (1/2” stem): -FP7249-D (cartridge + coil) - Cartridge: FP0679-D - Coil : FP18835-D
	Deltrol Valve (1/2” stem): -FP7249-D (cartridge + coil) - Cartridge: FP0679-D - Coil : FP18835-D	- M673F (2007 & up): “A” and “D” position - M3593 (2007 & up): : “A”, “C” and “D” position - M3500 (2007 & up): : “A1”, “A2”, “C”, “D1”, “D2” position	Deltrol Valve (1/2” stem): -FP7249-D (cartridge + coil) - Cartridge: FP0679-D - Coil : FP18835-D
	Parker Valve (1/2” stem): -FPN0352 (cartridge + coil) - FPN0406 cartridge - FPN0408 coil	- M673F (1996-2001): “D” position - M3551(2000-2008): “D” position	Deltrol Valve (1/2” stem): -FP10833-D (cartridge + coil) • Cartridge: FP11111 *note: If cartridge FPN0406 is replaced with FP11111, coil FPN0408 must be changed to FP18835-D - Coil : FP18835-D

Valve Chart (Valves used in Arctic Hydraulic Power Units)

	Valve/ Part #	Place where valve is used	It can be replaced with:
	Parker Valve (1/2" stem): -FP10833 (cartridge + coil) - FPN0406 cartridge - FP10977 coil	- M673F (1996-2001): "D" position - M3551(2004-2007): "D" position	Deltrol Valve (1/2" stem): -FP10833-D (cartridge + coil) • Cartridge: FP11111 <i>*note: If cartridge FPN0406 is replaced with FP11111, coil FP10977 must be changed to FP18835-D</i> - Coil : FP18835-D
	Deltrol Valve (1/2" stem): -FP10833-D (cartridge + coil) - Cartridge: FP11111 - Coil : FP18835-D	- M3551(2008 & up): "D" position	Deltrol Valve (1/2" stem): -FP10833-D (cartridge + coil) - Cartridge: FP11111 - Coil : FP18835-D
	Parker Valve (1/2" stem): -FPN0862-SA (cartridge + coil) - Cartridge FPN0565 - Coil FP10977	- M3500V (2003 & 2007): "E" position	Deltrol Valve (1/2" stem): - FPN0862-SA-D (cartridge + coil) • Cartridge: FP7276-D <i>*note: If cartridge FPN0565 is replaced with FPN0862-SA-D, coil FP10977 must be changed to FP18835-D</i> - Coil : FP18835-D
	Deltrol Valve (1/2" stem): - FPN0862-SA-D (cartridge + coil) - Cartridge: FP7276-D - Coil : FP18835-D	- M3500V (2007 & up): "E" position	Deltrol Valve (1/2" stem): - FPN0862-SA-D (cartridge + coil) - Cartridge: FP7276-D - Coil : FP18835-D

Valves 2 way /2 position (2w/2p) cavity (O-ring) change

1. Power units manufactured prior to 2010

Typically manufactured with "Monarch-style" valve cavity, identifiable by:

- a) Cavity without identification mark (without Greek letter delta (triangle)) (see picture 1)
- b) Black O-ring, with 0.070" cross-section (see picture 3)

2. Units manufactured in 2010 and beyond

Typically manufactured with "Industry standard" valve cavity, identifiable by:

- a) Cavity with identification mark - Greek letter delta (triangle) (see picture 2)
- b) Blue O-ring, with 0.087" cross-section (see picture 3)



Valve replacement

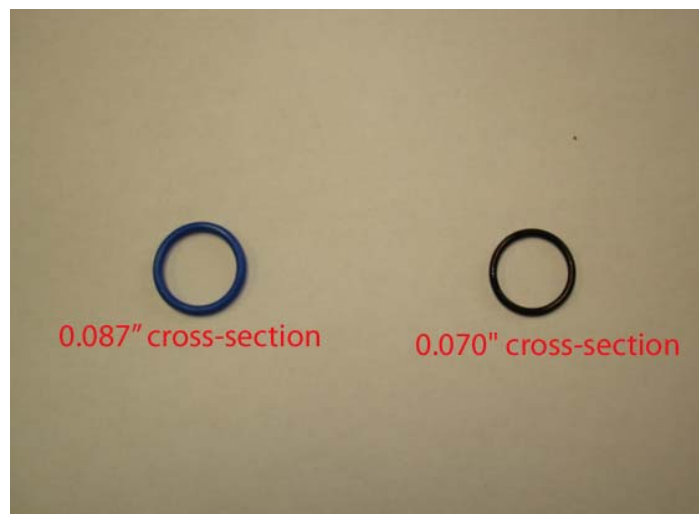
- a) Cavity and O-ring **must be selected correctly** for proper sealing function, the rest of the valve is the same. If necessary, replace O-ring with the proper O-ring to match the valve cavity:
- b) Cavity without identification mark requires black O-ring, with 0.070" cross-section (see picture 3)
- c) Cavity with identification mark requires blue O-ring, with 0.087" cross-section (see picture 3)



Picture 1



Picture 2



Picture 3

Terminals and connectors

53418-M, 3 Way Repair Harness Kit



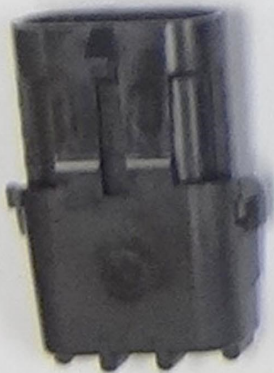
Part # 53516-N
Connector 4 way female



Part# 53404-N
Terminal female (pin)



Part# 53401-N
Seal



Part # 53515-N
Connector 4 way female



Part# 53404-N
Terminal male (pin)



Part# 53401-N
Seal

Item	Part#	Description	Quantity
1	53515-N	Connector male	1
2	53516-N	Connector female	1
3	53400-N	Terminal female	6
4	53404-N	Terminal male	6
5	53401-N	Seal	12

Terminals and connectors

53415-M, 4 Way Harness Repair Kit Kit



53415-M, 4 Way Harness Repair Kit			
Item	Part #	Description	Quantity
1	53403-N	Connector Male	1
2	53402-N	Connector Female	1
3	53400-N	Terminal Female	10
4	53404-N	Terminal Male	10
5	53401-N	Seal	20

Terminals and connectors

53416-M, 6 Way Harness Repair Kit Kit



Part # 53408-N
Connector 6 way male



Part# 53405-N
Terminal female



Part# 53406-N
Seal



Part # 53409-N
Connector 6 way female



Part# 53407-N
Terminal male



Part# 53406-N
Seal

53416-M, 6 Way Harness Repair Kit			
Item	Part #	Description	Quantity
1	53408-N	Connector Male	1
2	53409-N	Connector Female	1
3	53405-N	Terminal Female	10
4	53407-N	Terminal Male	10
5	53406-N	Seal	20

Terminals and connectors

53417-M, 8 Way Harness Repair Kit



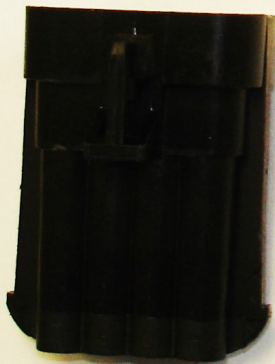
Part # 53410-N
Connector 8 way male



Part# 53405-N
Terminal female



Part# 53406-N
Seal



Part # 53411-N
Connector 8 way female



Part# 53407-N
Terminal male



Part# 53406-N
Seal



Part# 53412-N
Cavity plug

53417-M, 8 Way Harness Repair Kit			
Item	Part #	Description	Quantity
1	53410-N	Connector Male	1
2	53411-N	Connector Female	1
3	53405-N	Terminal Female	10
4	53407-N	Terminal Male	10
5	53406-N	Seal	20
6	53412-N	Cavity Plug	5

Repair Tools

Pressure gauge tool for M673F

To check pressure in M673F install a pressure gauge (shown above) in the top cap (Note: If the hole in M673F has NPT thread use gauge with NPT thread on the end, or if has 'O' ring use tool with 'O' ring.)

Seal installation tool



To install a seal in the top cap use tool as shown at the pictures above.

Motor bearing removal tool



If a motor bearing is “stuck” in the pump base, weld 3/4” bolt to the bearing to pull it out. (Note: A pump seal must be changed after bearing removal.)

Connector removal tools (used with Harness Repair Kits)



Needle bearing installation tool

To install a needle bearing in the pump base use a tool below.



Pump Seal installation tool

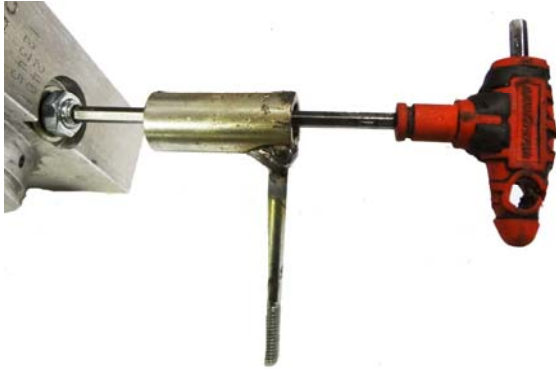


To install a pump seal in the pump base use a tool above.



Relief Valve adjustment tool





To set relief valve pressure use 3/16" Allen key and 9/16" deep socket (as shown at the picture).



Pressure (inline) testing tool



To check relief valve pressure install this tool in the C3 port (inline).