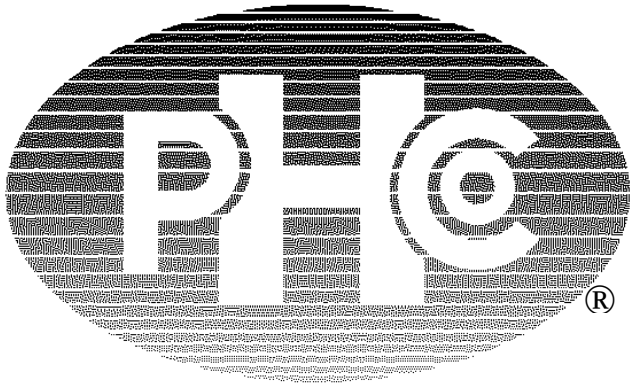


INSTALLATION, OPERATION AND MAINTENANCE MANUAL

PATCH KING®

PK-40HSD

240V, 1Ø

PROCESS HEATING COMPANY, INC.

POST OFFICE BOX 84585

SEATTLE, WASHINGTON 98124-5885

PHONE: (206) 682-3414 FAX: (206) 682-1582

WARNINGS

1) READ AND UNDERSTAND ALL TAGS AND INSTALLATION AND OPERATING INSTRUCTIONS BEORE COMMENCING.

2) CHECK THAT THE ELECTRICAL SERVICE WILL HANDLE THE LOAD. UNIT MUST BE ADEQUATELY GROUNDED.

3) ALL WIRING SHOULD CONFORM TO REQUIREMENTS OF NATIONAL AND LOCAL ELECTRICAL CODES AND STANDARDS.

4) ONLY LICENSED ELECTRICIAN SHOULD CONNECT POWER TO PANEL AND SYSTEM.

5) IF THERE ARE ANY QUESTIONS CONCERNING THE RATINGS OR INSTRUCTIONS PLEASE CONTACT YOUR LOCAL DISTRIBUTOR OR THE FACTORY. PHONE (206) 682-3414, FAX (206) 682-1582, E-MAIL: inquire@processheating.com, WEBSITE: www.processheating.com

ADDITIONAL IMPORTANT INFORMATION

1) THESE INSTRUCTIONS CANNOT POSSIBLY COVER EVERY SITUATION CONCERNING THE OPERATION, INSPECTION, ADJUSTMENT AND TEST OF THE EQUIPMENT FURNISHED. PROCESS HEATING COMPANY (PHCo), IN THE FURNISHING OF THIS EQUIPMENT AND THESE INSTRUCTIONS, MUST PRESUME THAT THE OPERATING AND MAINTENANCE PERSONEL USING THIS EQUIPMENT HAVE SUFFICIENT TECHNICAL KNOWLEDGE AND EXPERIENCE TO APPLY SOUND SAFETY AND OPERATIONAL PRACTICES WHICH MAY NOT BE MENTIONED.

2) IN APPLICATIONS WHERE PHCo FURNISHED EQUIPMENT THAT IS TO BE INTEGRATED WITH A PROCESS OR OTHER EQUIPMENT, THESE INSTRUCTIONS SHOULD BE THOROUGHLY REVIEWED TO DETERMINE THE PROPER INTEGRATION OF THE EQUIPMENT INTO THE OVERALL PLANT OR SYSTEM OPERATIONAL PROCEDURES.

3) PHCo DOES NOT SUPPLY, RECOMMEND OR APPROVE THE VARIOUS SYSTEMS IN WHICH ITS PRODUCTS ARE OR MAY BE USED. UNLESS DESIGNED, MANUFACTURED AND USED PROPERLY, VARIOUS SYSTEMS MAY BE INHERENTLY UNSAFE OR DANGEROUS. THE USER SHOULD CHECK AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS AND OTHER REGULATIONS AND RECOMMENDATIONS SUCH AS: NFPA, UL, API, OSHA, ETC.

INSTALLATION

1) RECOMMENDED HYDRAULIC SPECIFICATIONS – 2500 PSI AT 10 GPM MINIMUM. LOWER PRESSURE MAY CAUSE THE AUGER TO STALL. LOWER FLOW WILL CAUSE THE AUGER TO TURN SLOWER AND DELIVER LESS MATERIAL.

2) PATCH-KING® MUST BE SECURELY MOUNTED INTO TRUCK BED.

3) HYDRAULIC CONNECTIONS ARE MADE AT REAR OF BOX AT OPERATING VALVES. THE PRESSURE LINE IS CONNECTED TO THE PORT MARKED **"IN"**. THE RETURN LINE IS CONNECTED TO THE PORT MARKED **"OUT"**. BOTH LINES (PRESSURE AND RETURN) MAY BE RUN THROUGH THE DIVERTER VALVE (IF SUPPLIED) IF DESIRED. CONNECTIONS ARE ¾" FPT.

4) THERE IS A RELIEF VALVE ON EACH VALVE BODY THAT MAY BE SET TO THE CORRECT PRESSURES FOR PROPER TOP DOOR AND AUGER OPERATION ON EACH INDIVIDUAL SYSTEM. RELIEF VALVES ARE FACTORY PRESET AT 2500 PSI ON AUGER CONTROL VALVE AND 300 PSI ON THE TOP DOOR CONTROL VALVE.

OPERATION INSTRUCTIONS

AUGER

1) ENGAGE TRUCK HYDRAULIC CIRCUIT AND CHECK HYDRAULIC PRESSURE AND FLOW TO INSURE PROPER EQUIPMENT OPERATION.

2) PULL AUGER OPERATING HANDLE AWAY FROM BOX FOR FORWARD AUGER OPERATION. THIS WILL DISPENSE MATERIAL FROM BOX.

3) WHEN FINISHED DISPENSING MATERIAL PUSH HANDLE TOWARD BOX FOR REVERSE OPERATION. THIS WILL MOVE MATERIAL AT THE DISCHARGE END OF THE AUGER BACK INTO TH BOX. ONLY RUN IN REVERSE DIRECTION FOR 2 – 3 SECONDS TO CLEAR DISCHARGE.

   CAUTION: ONLY RUN IN REVERSE DIRECTION MOMENTARILY. EXTENDED OPERATION IN REVERSE WILL PACK MATERIAL INTO FRONT OF THE BOX AND COULD DAMAGE THE AUGER. RUN FOR A MAXIMUM OF ONE OR TWO REVOLUTIONS. AUGER CAN ALSO BE RUN IN REVERSE MOMENTARILY IF JAMMING OCCURS, (JOGGING FROM FORWARD TO REVERSE).

4) AUGER IS DESIGNED FOR HANDLING AND DISPENSING OF ASPHALT PRODUCTS. DISPENSING OF OTHER MATERIALS (i.e. SAND, ROCK, SALT, etc.) COULD CAUSE EXCESSIVE WEAR OR DAMAGE EQUIPMENT.

ANTI-BRIDGE DEVICE

1) HYDRAULIC HANDLE (LOCATED NEXT TO THE AUGER CONTROL HANDLE) CAN BE OPERATED IN EITHER DIRECTION. THIS DEVICE HELPS TO BREAK UP ANY BRIDGING THAT OCCURS IN THE MIX OVER THE AUGER. IF THE MATERIAL IS DISCHARGING SLOWLY OUT OF THE BOX IT MAY NEED TO BE BROKEN UP BY THE ANTI-BRIDGING DEVICE.

******DRIVE CHAIN TIGHTENING******

AFTER THE FIRST 16 HOURS OF OPERATION AND WEEKLY THEREAFTER, INSPECT AND ADJUST IF NECESSARY, THE TENSION ADJUSTMENT BOLT ON THE LEFT HAND SIDE OF THE AUGER DRIVE MOTOR. FACTORY ADJUSTMENT ALLOWS FOR APPROXIMATELY ¼" MOVEMENT OF THE CHAIN.

TOP DOORS

1) OPEN RIGHT HAND (CURB SIDE) TOP DOOR FIRST. CLOSE LEFT HAND (STREET SIDE) DOOR FIRST. OPEN DOORS FULLY WHEN FILLING BOX.

   IMPORTANT – CLEAN ANY EXCESS MATERIAL OFF OF TOP EDGS OF BOX BEFORE CLOSING DOORS.

ELECTRICAL CONTROLS

1) CONNECT TO APPROPRIATE VOLTAGE AND PHASE (REFER TO LABEL INSIDE CONTROL PANEL). MAKE SURE PANEL IS PROPERLY GROUNDED. CIRCUIT BREAKER OR FUSED DISCONNECT IS RECOMMENDED.

2) MAKE SURE SELECTOR SWITCH ON THE MAIN CONTROL PANEL IS IN **"OFF"** POSITION BEFORE CONNECTING OR REMOVING MAIN POWER PLUG.

3) PRIOR TO LOADING WITH HOT OR COLD MIX, PREHEAT BOX TO DESIRED MIX TEMPERATURE (COLD: 90°F, HOT: 300°F). THIS WILL MINIMIZE TEMPERATURE DROP WHEN MATERIAL IS LOADED INTO BOX.

4) ALLOW APPROXIMATELY FOUR HOURS TO PREHEAT THE EMPTY BOX.

TO PREHEAT BOX AUTOMATICALLY
(WITH OPTIONAL TIMECLOCK PANEL)

1) SELECT **"AUTOMATIC"** OPERATION USING **"H.O.A."** SELECTOR SWITCH LOCATED ON THE SIDE OF THE REMOTE MOUNTED TIMECLOCK PANEL.

2) SET THE TIME CLOCK TO THE TIME OF DAY BY PULLING OUT THE DIAL AND ALIGNING THE TIME OF DAY OPPOSITE THE INDICATING ARROW.

3) SET **"ON – OFF" RIDERS** – 4 HOURS PRIOR TO YOUR STARTING TIME TO PREHEAT BOX.

4) SET DAY OF WEEK AND PLACE **"SKIP SCREWS"** IN DAYS TO BE OMITTED (NORMALLY SATURDAY AND SUNDAY). TURN CLOCK TO **"OFF"** – SET SELECTOR SWITCH ON THE SIDE OF THE MAIN CONTROL PANEL **"HIGH"**.

5) SET TEMPERATURE ACCORDING TO MIX TYPE TO BE USED.

6) SEE TIMECLOCK OPERATION SHEET FOR ADDITIONAL INFORMATION.

TO HOLD MATERIAL OVERNIGHT

1) TURN TIMECLOCK SELECTOR SWITCH TO **"HAND"** POSITION.

2) CHECK TEMPERATURE OF MATERIAL IN BOX AT THERMOMETER AND SET THE TEMPERATURE CONTROL IN MAIN PANEL TO THAT READING. EXAMPLE: IF MATERIAL TEMPERATURE IS 300°F, SET TEMPERATURE CONTROL AT 300°F.

3) FOR MAINTAINING HALF LOADS OR LESS OVERNIGHT, RUN BOTTOM HEAT ONLY BY USING **"LOW"** POSITION ON SELECTOR SWITCH.

4) FOR MAINTAINING HALF LOADS OR MORE, RUN BOTH BOTTOM AND SIDE HEAT, **"HIGH"** POSITION ON SELECTOR SWITCH.

5) IT IS NOT RECOMMENDED TO HOLD MIX LONGER THAN OVERNIGHT. IF HELD LONGER THAN OVERNIGHT COVER MIX WITH A TARP TO KEEP OXIDATION TO A MINIMUM.

6) TO PREHEAT STOCKPILED COLD MIX, LOAD AND SET DESIRED TEMPERATURE. HEAT-UP TIME WILL VARY DEPENDING ON TEMPERATURE AND MOISTURE CONTENT OF PATCHING MATERIAL.

7) IT WOULD TAKE APPROXIMATELY 12 – 14 HOURS TO HEAT 6 TONS OF COLD MIX.

BOX PREPERATION

1) BEFORE LOADING STORAGE HOPPER WITH ASPHALT, SPRAY INTERIOR SURFACES OF BOX WITH A RELEASE AGENT.

MAINTANENCE

1) PERIODICALLY CHECK ALL WIRING CONNECTIONS TO INSURE THEY ARE TIGHT AND FREE OF OXIDATION.

2) PERIODICALLY CHECK CONTACTS ON THE CONTACTORS FOR WEAR AND REPLACE CONTACTOR IF WORN.

PATCH KING

ROTARY AUGER MODEL PK-40HSD

- The reversible rotary conveyor is driven by a hydraulic motor and supported by heavy-duty ball bearings.
- A mix/anti-bridging device features separate hydraulic drive and controls.
- The wear parts, including auger and trough, are easily replaceable.
- Reversible auger feeds patch mix to work area to eliminate costly dump beds and hoists.

UL Listed Controls

SPECIFICATIONS

ETL Listed Elements

Patch King Model PK-35HSD

Electrical: PHCo Lo-Density® heating.
Not to exceed 1 watt per square inch of heating surface.

240V 1 phase - 10.0KW - 42 Amp.
240V 3 phase - 10.0KW - 24 Amp.
480V 3 phase - 10.0KW - 12 Amp.

PHCo Automatic Nema 4 Control Panel-
Weatherproof - UL Listed

Houses - Non-indicating controlling thermostat, contactors, switches and fusing.

Weatherproof plug and receptacle w/25' Type SO rubber cord

Dimensions:
Length - 96" (120" w/"Tac-King")
Width - 48" bottom, 84" top
Height - 54" - Door Open 76"

Capacity:
95 cubic feet - (3.5 cubic yards)

Loading Doors:
Two (2) Length - 96" Width - 30" each
Hydraulic Operation

Material Delivery:
Hydraulically driven rotating auger

Insulation:
Top - 2" 3-pound density fiberglass (minimum)
Sides and Ends - 3" 3-pound density (minimum)

Weight:
3,400 pounds

Patch King Model PK-40HSD

Electrical: PHCo Lo-Density® heating.
Not to exceed 1 watt per square inch of heating surface.

240V 1 phase - 12.0KW - 50 Amp.
240V 3 phase - 12.0KW - 29 Amp.
480V 3 phase - 12.0KW - 14.5 Amp.

PHCo Automatic Nema 4 Control Panel-
Weatherproof - UL Listed

Houses - Non-indicating controlling thermostat, contactors, switches and fusing.

Weatherproof plug and receptacle w/25' Type SO rubber cord

Dimensions:
Length - 114" (138" w/"Tac-King")
Width - 48" bottom, 84" top
Height - 54" - Door Open 76"

Capacity:
110 cubic feet - (4.0 cubic yards)

Loading Doors:
Two (2) Length - 114" Width - 30" each
Hydraulic Operation

Material Delivery:
Hydraulically driven rotating auger

Insulation:
Top - 2" 3-pound density fiberglass (minimum)
Sides and Ends - 3" 3-pound density (minimum)

Weight:
3,800 pounds

Process Heating Company

over 50 years since 1947

Distributed By:

Post Office Box 84585 - Seattle, WA 98124 Phone (206) 682-3414 Fax (206) 682-1582 e-mail: inquire@processheating.com www.processheating.com

PARTS LISTS - PK-40HSD, 240V, 1Ø

HYDRAULIC PARTS

QTY	DESCIPTION	PART NUMBER	MANUFACTURE
2	Top door Cylinders	212DB	Cross
1	3-Spool, 4-Way, 3-Position valve	SBA222	Cross
1	Detent Kit	1V0559	Cross
1	Detent Kit	1V0294	Cross
1	Power Beyond Kit	1V028	Cross
1	2-Spool, 4-Way, 3-Postion valve	SBA22	Cross
1	Top Door Cylinder Hose - 8" 3/8th	3/8FJX663X1/2MP/8" HOSE	AEROQUIP
1	Top Door Cylinder Hose - 24" 3/8th	3/8FJX663X1/2MP/24" HOSE	AEROQUIP
1	Top Door Cylinder Hose - 50" 3/8th	3/8FJX663X1/2MP/50" HOSE	AEROQUIP
1	Top Door Cylinder Hose - 65" 3/8th	3/8FJX663X1/2MP/65" HOSE	AEROQUIP
1	Auger Motor - 22" 1/2 hose	FJX663-8X90FJ/22HC HOSE	AEROQUIP
1	Auger Motor - 24" 1/2 hose	FJX663-8X90FJ/24HC HOSE	AEROQUIP
1	Anti Bridge Motor - 13" 1/2 hose	FJX663-8X90FJ/13HC HOSE	AEROQUIP
1	Anti Bridge Motor - 14" 1/2 hose	FJX663-8X90FJ/14HC HOSE	AEROQUIP

CONTROL PANEL PARTS

QTY	DESCIPTION	PART NUMBER	MANUFACTURE
1	Enclosure	EN4SD20166GY	Hammond
1	Temperature Control	120L-17JZ329	Zytron
2	Contactor - 40 amp	42BF35A1N	Siemens
1	Control Voltage Transformer	9070TF75D1	Square-D
1	High-Low-Off Selector Switch	ZB4-BD3, BZ101, BE101	Telemecanique
2	Pilot Lights	ZB4-BV6, BV01	Telemecanique
2	Transformer Primary Fuse	FNQ-R-1	Bussmann
1	Transformer Secondary Fuse	FNM-8/10	Bussmann
4	Heater Fuse	NON-20	Bussmann
4	Heater Fuse	NON-12	Bussmann
2	Heater Fuse - Tack Tank OPTIONAL	NON-12	Bussmann
1	Power Receptacle	ACR6023 (Reverse)	Appleton
1	Power Plug w/25' SO Cord 4/3	ACP6023BC (Reverse)	Appleton

TIMECLOCK PANEL - OPTIONAL

QTY	DESCIPTION	PART NUMBER	MANUFACTURE
1	Enclosure	HW1412HWPL2 w/D.F.	Hoffman
1	Timeclock	4003-00BS	Paragon
1	Contactor - 63 amp	42DF35A1N	Siemens
1	Control Voltage Transformer	9070TF50D1	Square-D
1	H.O.A. Switch	ZB4-BZ101, BE101	Telemecanique
2	Transformer Primary Fuse	FNQ-R-1/2	Bussmann
1	Transformer Secondary Fuse	FNM-1/2	Bussmann
1	Line Terminal Block	1412300	Marathon

MISC. PARTS

QTY	DESCIPTION	PART NUMBER	MANUFACTURE
2	Top Door Rubber	PK6X96	PHCo

HOPPER HEATERS

Contact factory with Serial Number of equipment

AUGER ASSEMBLY

QTY	DESCIPTION	PART NUMBER	MANUFACTURE
1	Auger Motor	109-1106-006	Charlynn
1	Screw Auger, 6 x 6 x 122"	6H312-RH	Martin
4	1/2" x 3" Coupling Bolts w/Locknuts	CCB3	Martin
1	End Shaft, 1 1/2" x 8 1/4" Long	CE3BB	Martin
1	4-Bolt, Med Duty Flange Bearing 1 1/2" dia	F4BSCM108	Dodge
1	1 1/2" dia, 4-Bolt Thrust Bearing & Drive Shaft	CT3D	Martin
1	1 1/4" Finished Bore Sprocket	80BS13 x 1 1/4	Martin
1	1 1/2" Finished Bore Sprocket	80BS23 x 1 1/2	Martin
1	Auger Roller Chain	80RIV	Morse
1	Roller Chain Part	80 CONN CSF	Morse
1	Roller Chain Part	80 OFFSET	Morse

ANTI-BRIDGE ASSEMBLY

QTY	DESCIPTION	PART NUMBER	MANUFACTURE
1	Anti-Bridge Motor	104-1028-006	Charlynn
2	Paddle Shafts, 2" sch 40 Pipe B&D, 1 1/2" x 51 3/4"	2" sch 40 x 51-3/4 oal	Applied
1	1 1/2" dia x 11 1/2" Coupling Shaft	CC3	Martin
1	1 1/2" dia x 8 1/4" End Shaft	CE3BB	Martin
1	1 1/2" dia x 11 1/2" Drive Shaft	1CD3BB	Martin
2	1 1/2" 4-Bolt Normal Duty Flange Bearing	F4BSC108	Dodge
1	1 1/2" 2-Bolt Normal Duty Pillow Block Bearing	P2BSC108	Dodge
8	1/2" x 3" Coupling Bolts w/Locknuts	CCB3	Martin
1	Roller Chain	5016CHN	Martin
1	Sprocket Hub for Motor	5016 x 1 1/4	Martin
1	Sprocket Hub for Drive Shaft	5016 x 1 1/2	Martin

TITLE

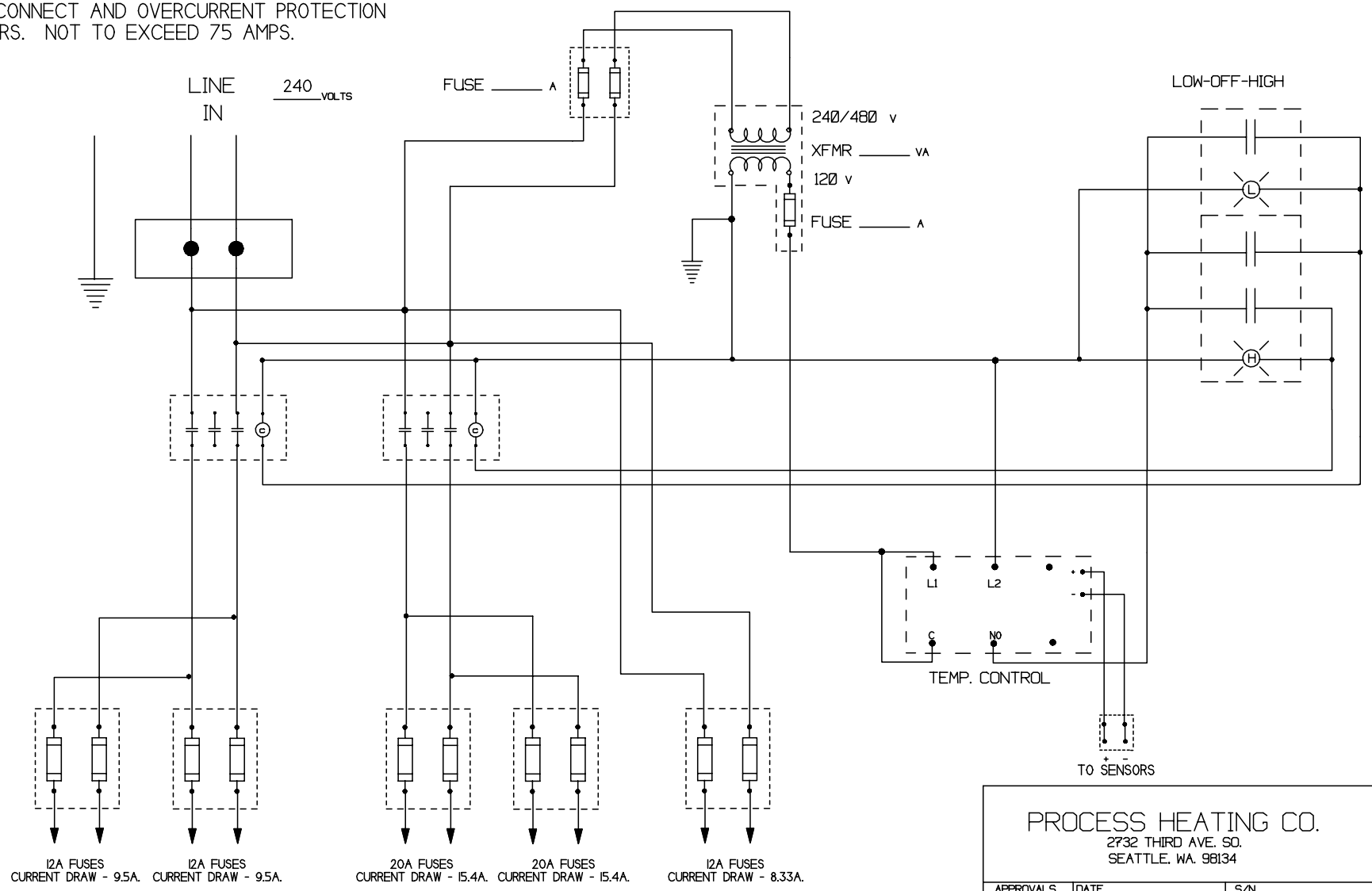
PHC07C4

ELECTRICAL RATING

14KW\ 240V\ 58A\ 1PH\

PK-40HSD W/ TACK TANK (OPTIONAL)

MAIN DISCONNECT AND OVERCURRENT PROTECTION
BY OTHERS. NOT TO EXCEED 75 AMPS.



PROCESS HEATING CO.
2732 THIRD AVE. SO.
SEATTLE, WA. 98134

APPROVALS	DATE	S/N
	DRAWING BY:	

TITLE

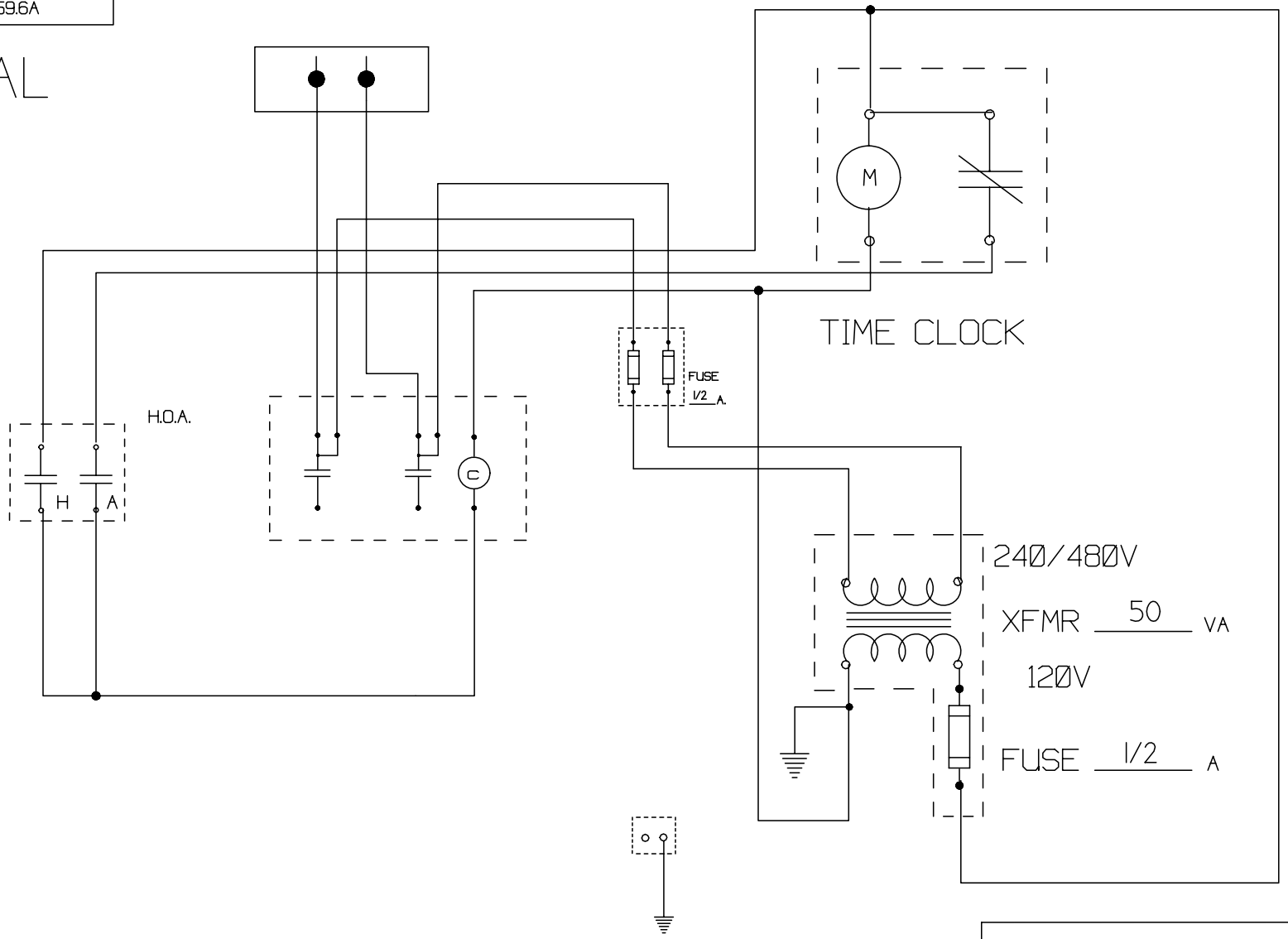
PHC077-TCLOCK

ELECTRICAL RATING

14.3KW. 240V. 1-PH. 59.6A

MAIN DISCONNECT AND OVERCURRENT PROTECTION
BY OTHERS. NOT TO EXCEED 75 AMPS.

OPTIONAL



PROCESS HEATING CO.
2732 THIRD AVE. SO.
SEATTLE, WA. 98134

APPROVALS	DATE	S/N
	DRAWING BY:	

WARRANTY

PHCO "PATCH KING" AND "TAC-KING" PRODUCTS

Process Heating Company shall at any time during the first year after delivery –(heating elements have an additional four year warranty for parts only)- replace any electrical or mechanical components found defective. This work shall be done at the Process Heating Company factory or any authorized distributor's shop (to be determined by Process Heating Company). The electrical components that are supplied in the control panel shall carry the manufacturer's warranty. This warranty will not be valid if the equipment is not maintained, operated and serviced to meet the manufactures recommendations and does not cover damage from misuse whether accidental or intentional.

Unless otherwise agreed in writing by Process Heating Company ("PHCo"), all of the following terms & conditions shall apply to its transaction with you (the "buyer"):

1. LIMITED WARRANTY; DISCLAIMERS. PHCo warrants that the goods sold under this contract shall be free from defects in workmanship and materials at the time delivery is tendered. If there is discovered any failure of goods to conform to this warranty within one (1) year after tender of delivery (five (5) years in the case of immersion type heating elements other than drop-in style elements), and if Buyer notifies PHCo in writing of such fact within thirty (30) days following such discovery, PHCo at its own expense either will repair the defective item, or replace it, or refund to Buyer the purchase price paid for that item (with choice between repair, replacement or refund to be made solely by PHCo). The foregoing limited warranty and remedy are exclusive of all other warranties, express or implied, and constitute PHCo's exclusive liability, and Buyer's exclusive remedy, on account of any claim relating to any item sold. PHCo DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. If PHCo should elect to repair or replace a defective item and if for any reason the repair or replacement should fail in its essential purpose (which is to provide Buyer with a non-defective item), then PHCo's liability nevertheless shall be limited to the purchase price charged by PHCo for the goods. PHCo shall have no liability on account of any claim asserted under principles of negligence or other tort, breach of any statutory duty, indemnity or contribution, or on any other basis, if PHCo's liability on account of such claim would exceed or in any respect differ from its liability under forgoing limited warranty and exclusive remedy.

2. LIABILITY OF PHCo UNDER THE FOREGOING LIMITED WARRANTY SHALL EXIST ONLY IF:
a. The goods are installed, operated and tested in accordance with the PHCo approved installation and operation instruction.
b. The goods are used and maintained in conformity with installation and operation instructions approved or published by PHCo.
c. Written authorization must be given by PHCo before any warranty work is done.
The above limited warranty shall be void and no longer in effect if the goods are subject to abuse, strain, impact or loading that is greater than their normal.

3. LIMITATION OF LIABILITY. UNDER NO CIRCUMSTANCES SHALL PHCO OR ANYONE ELSE INVOLVED IN THE MANUFACTURE OR SALES OF THE GOODS BE LAIBLE TO BUYER OR OTHERS FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, EVEN IF PHCO HAS BEEN ADVISED OF THE POSSIBILTY OF SUCH DAMAGES, OR FOR ANY DAMAGES OR SUMS PAID BY BUYER OR OTHER THIRD PARTIES. THE FOREGOING LIMITATION OF LIABILITY SHALL APPLY WHETHER ANY CLAIM FOR ANY SUCH DAMAGES IS BASED UPON PRINCIPLES OF CONTRACT, WARRANTY, NEGLIGENCE OR OTHER TORT, BREACH OF STATUTORY DUTY, PRINCIPLES OF INDEMNITY OR CONTRIBUTION, THE FAILURE OF ANY LIMITED OR EXCLUSIVE REMEDY TO ACHIEVE ITS ESSENTIAL PURPOSE, OR ANY OTHER BASIS.

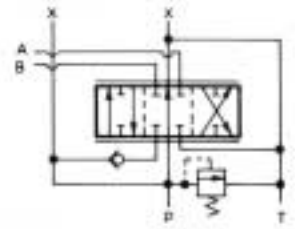
4. AUTHORITY OF PHCo's AGENTS. No agent, employee or representative of PHCo has any authority to bind PHCo to any other affirmation, representation, promise or warranty concerning the goods sold under this contract, unless it is in writing and included as part of the terms of this contract.

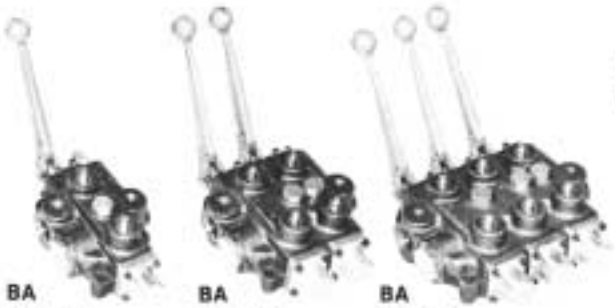
5. MODIFICATION OF WAIVER. No subsequent waiver or modification of this Limited Warranty and Liability shall be effective unless the same is in writing and signed by the party against whom such waiver or modification is asserted. No waiver in any one instance shall constitute a waiver of the same or any other term or condition on any subsequent occasion. None of the express terms of this Limited Warranty and Liability may be waived or varied by course of dealing or usage of trade.

6. DISPUTES. This agreement shall be governed by the laws of the State of Washington without reference to its choice of law rules. Any action to enforce any of the terms or conditions of this agreement may be commenced or maintained at the option of either party in any federal or state court located in King County, Washington having jurisdiction over the matter, and both parties consent in advance to the exercise by such courts of jurisdiction over them personally. No action by either party arising out of or relating to this contract (including any action based upon principles of contract, tort or otherwise) may be commenced more than one (1) year after the cause of the action has accrued, and any action commenced by a party thereafter shall be dismissed at the instance of the other party.

HYDRAULIC VALVES

DIRECTIONAL CONTROL
B SERIES
Specification Sheet





BA
1 Spool

BA
2 Spool

BA
3 Spool

BA2 w/Single
Handle Actuator

BC

The CROSS series B directional control valves provide good metering characteristics and long dependable service life. Optimum versatility is provided due to the many standard and optional features. Balanced spools are select-fit for minimum leakage and load holding checks prevent load drop when shifting. Parallel flow path permits spools to be operated independently or simultaneously.

GENERAL SPECIFICATIONS

Number of spools	one, two or three
Rated working pressure	3000 psi (206 bar)*
Maximum shock and surge pressure	4000 psi (276 bar)
Rated flow capacity	30 gpm (114 l/m)
Maximum spool leakage (at 1000 psi w/100 SUS oil at 120° F)	16 cc/min.
Mounting, any position	Three mounting holes for 3/8" dia. bolts
Weight	1 spool: 13 lbs. (6 Kg); 2 spool: 21 lbs. (9.5 Kg); 3 spool: 33 lbs. (15 Kg)

* SAE threads only, 2500 psi for NPTF

MATERIAL SPECIFICATIONS

Body	High tensile strength cast iron
Spools	Ground, plated and polished steel alloy
Seals	Buna N

STANDARD FEATURES

- Integral load holding check valves (prevent reverse flow through valve when shifting)
- Integral differential poppet type relief valve, adjustable (set at 2000 psi, 10 gpm)
- Balanced, select-fit spools (provide minimum leakage, smooth operation)
- External spool seals (permit easy replacement, reduced maintenance cost)
- 3/4" NPTF inlet and outlet ports; 1/2" NPTF work ports
- Complete handle assembly • 1, 2, or 3 spools

OPTIONAL FEATURES AVAILABLE

- Open or closed center positions, 3-way or 4-way operation, 3-position or 4-position (float position), full open center (motoring spool) and other spool options
- Power beyond (permits use of neutral flow at system pressure); also permits field conversion from closed center to open center (tandem) operation
- Top, bottom or end location of outlet port
- Top or end location of inlet port
- Pressure release detent, in either or both work positions
- Integral pressure compensated flow control (Model BC), adjustable from 0 to 25 gpm, ± 5% flow regulation. Available in 1-spool version only. 21 lbs. (9.5 Kg)

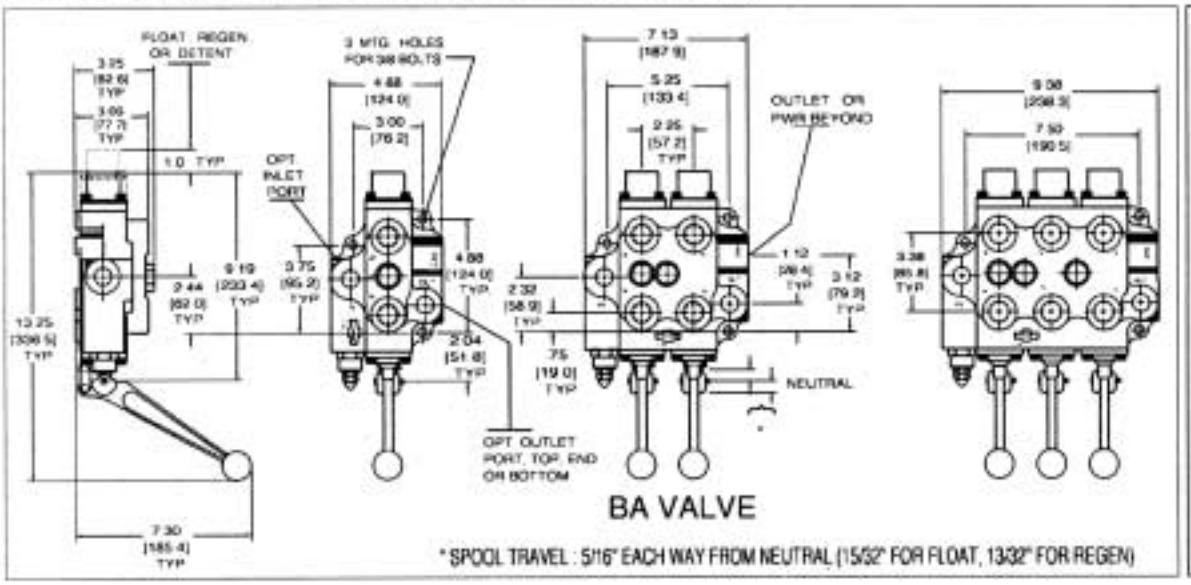
NOTE: Refer to CROSS Valve Technical/Service Sheet for recommendations and limitations.

DIRECTIONAL CONTROL
B SERIES
Specification Sheet

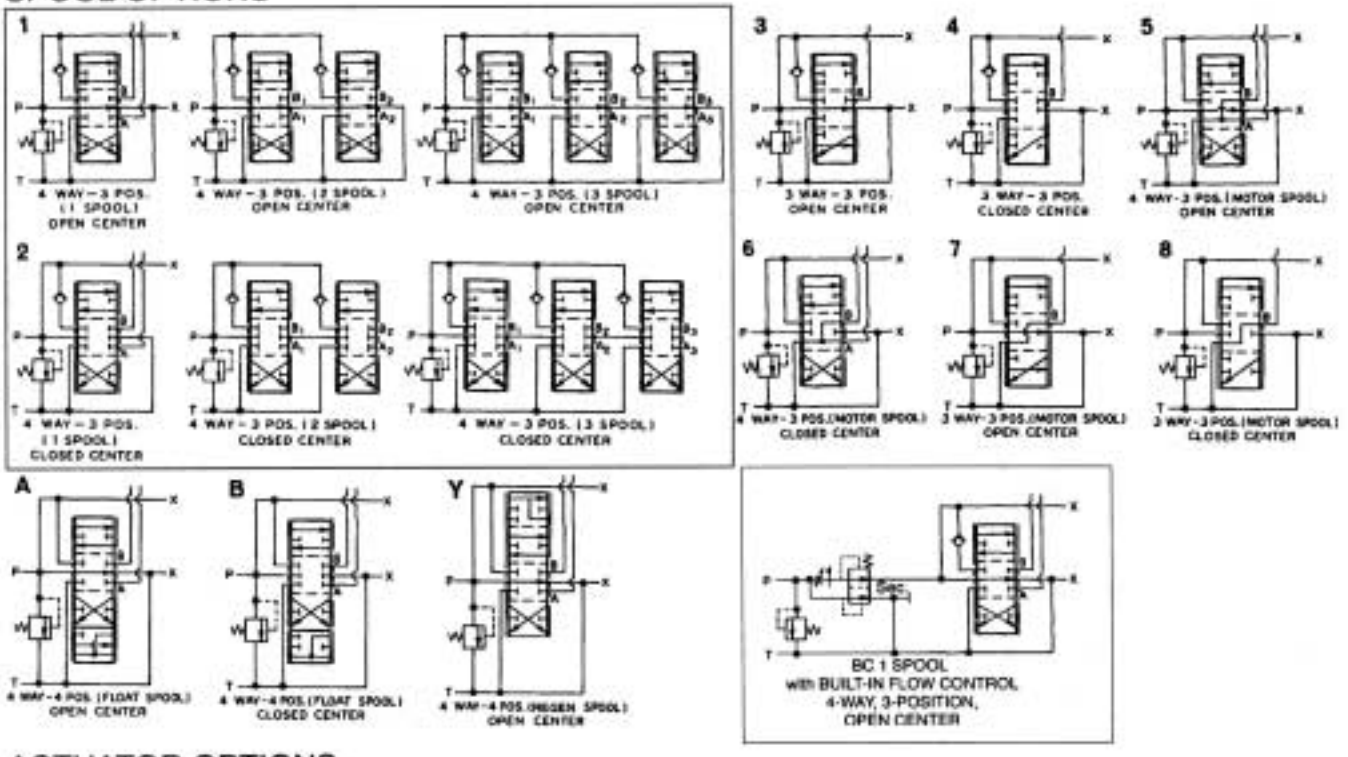
HYDRAULIC VALVES

CROSS

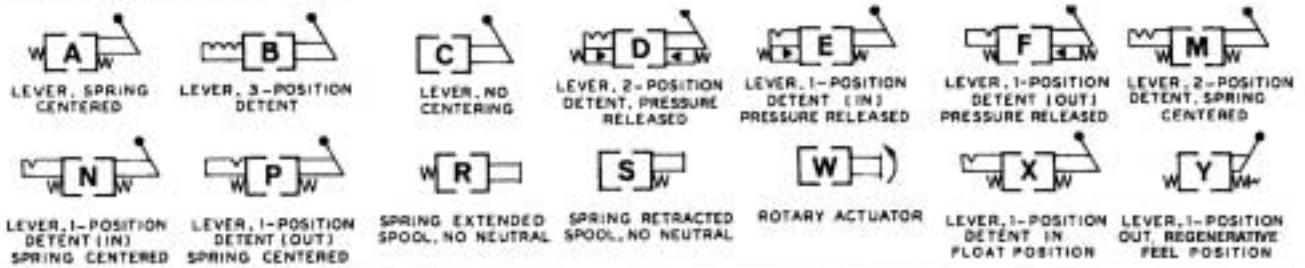
DIMENSIONAL DATA in inches and (millimeters)



SPOOL OPTIONS



ACTUATOR OPTIONS

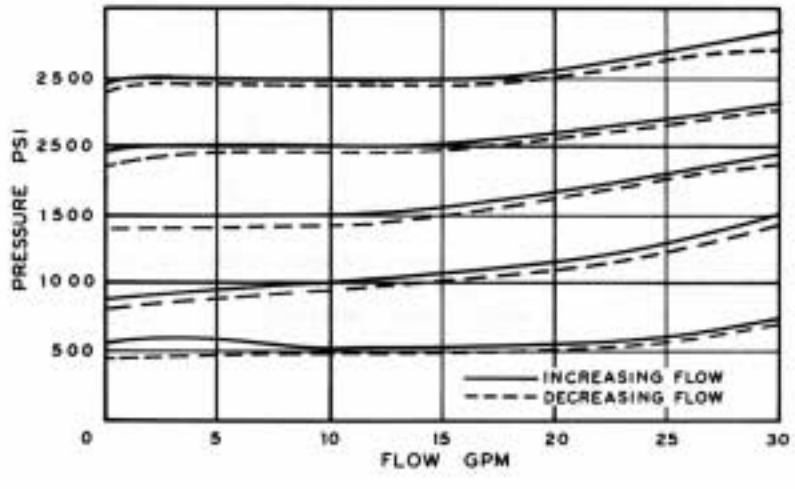


TYPICAL PERFORMANCE DATA

PRESSURE DROP (with 100 SUS oil at 120° F, ¾" NPTF in & out, ½" work ports)

FLOW RATE		P to T		P to A or B		A_1 or B_1 to T		A_2 or B_2 to T		A_3 or B_3 to T		
GPM	l/m	PSI	bar	PSI	bar	PSI	bar	PSI	bar	PSI	bar	
5	19	—	—	8	.6	2	.1	—	—	—	—	ONE SPOOL
10	38	3	.2	20	1.4	6	.4	—	—	—	—	
15	57	6	.4	36	2.5	13	.9	—	—	—	—	
20	76	11	.8	55	3.8	23	1.6	—	—	—	—	
25	95	17	1.2	83	5.7	35	2.4	—	—	—	—	
30	114	25	1.7	120	8.3	48	3.3	—	—	—	—	
35	132	33	2.3	159	11.0	64	4.4	—	—	—	—	
5	19	—	—	10	.7	6	.4	2	.1	—	—	TWO SPOOL
10	38	5	.3	20	1.4	15	1.0	6	.4	—	—	
15	57	10	.7	38	2.6	33	2.3	14	1.0	—	—	
20	76	18	1.2	60	4.1	58	4.0	22	1.5	—	—	
25	95	29	2.0	90	6.2	92	6.3	33	2.3	—	—	
30	114	41	2.8	127	8.8	133	9.2	36	2.5	—	—	
35	132	54	3.7	174	12.0	184	12.7	64	4.4	—	—	
5	19	—	—	8	.6	8	.6	6	.4	2	1.1	THREE SPOOL
10	38	12	.8	16	1.1	24	1.7	16	1.1	6	.4	
15	57	24	1.7	28	1.9	48	3.3	33	2.3	10	.7	
20	76	41	2.8	44	3.0	84	5.8	58	4.0	18	1.2	
25	95	64	4.4	64	4.4	134	9.2	93	6.4	28	1.9	
30	114	92	6.3	88	6.1	202	13.9	140	9.7	42	2.9	
35	132	124	8.6	120	8.3	276	19.0	196	13.5	58	4.0	

RELIEF VALVE CHARACTERISTICS (100 SUS oil at 120° F.)



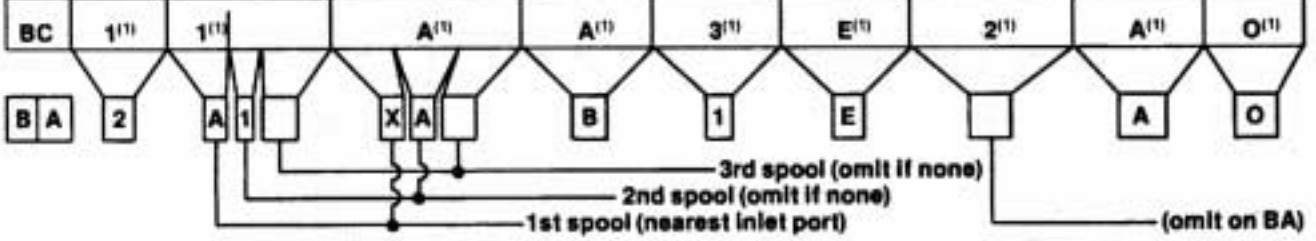
DIRECTIONAL CONTROL
B SERIES
Specification Sheet

HYDRAULIC VALVES

CROSS

ORDERING INFORMATION

MODEL NO.	NO. OF SPOOLS	SPOOL TYPE	SPOOL ACTION (ACTUATOR OPTIONS)	RELIEF VALVE (4)	POWER BEYOND	OUTLET PORT LOCATION	SECONDARY FLOW OUTLET PORT BC ONLY (OPTIONAL)	PORT SIZE & TYPE	HANDLE
BA Manual	1 Single 2 Double 3 Triple	1 4-way, 3-position open center 2(1) 4-way, 3-position closed center 3 3-way, 3-position open center 4(1) 3-way, 3-position closed center 5 4-way, 3-position open center w/motoring spool 6(1) 4-way, 3-position closed center w/motoring spool 7 3-way, 3-position open center w/motoring spool 8(1) 3-way, 3-position closed center w/motoring spool A(2) 4-way, 4-position open center detent float positon B(1)(2) 4-way, 4-position closed center detent float positon C 4-way, 4-position, open center w/regen fast position	A 3-position spring centered B 3-position detent no centering spring C Manual, no detent no centering spring D(3) Pressure release detent "In" & "out" E(3) Pressure release detent "In" only F(3) Pressure release detent "out" only M 2-position detent "In & out", spr. centered N 1-position detent "In" only, spr. centered P 1-position detent "out" only, spr. centered R Spring extended no neutral S Spring retracted no neutral W Rotary detent X 4 pos. spng. ctr. to neutral. Detent in float position Y 4-pos. spring centered with regen	A 1000 psi B 1500 psi C 2000 psi D None E Other F(5) Adjustable 500-1500 psi (Set at 1000 psi) G(5) Adjustable 1500-2500 psi (Set at 2000 psi)	O None 1(6) 3/4" NPTF P/B sleeve port 2(6) 1 1/16-12 SAE #12 P/B sleeve port 3(6) Conversion plug 4(6) 7/8-14 SAE #10 P/B sleeve port 5 Closed center plug	O End Outlet when P/B not specified T Top Outlet B Bottom Outlet E End Outlet G Bottom Outlet with grommet P Top Inlet & outlet H Top Inlet (7)	O No Port (Plugged) 1 7/8"-14 (SAE #10) 2 1/2" NPTF 3 3/4-16 (SAE #8) 4 3/4" NPTF 5 1 1/16-12 (SAE #12)	A In & Out 3/4" NPTF, Work 1/2" NPTF (8) B In & Out 3/4" NPTF, Work 3/4" NPTF C In & Out 1 1/16-12 SAE#12, Work 3/4-16 SAE#8 (8) D In & Out 1 1/16-12 SAE#12, Work 1 1/16-12 SAE#12 E In & Out 3/4" NPTF, Work 3/8" NPTF F Other	O Complete Handle Assembly 1 Less Complete Handle Assembly 2 Less Handle Only (Link, pins & bracket included) 3(9) Single Handle Actuator
BC	1(1)	1(1)	A(1)	A(1)	3(1)	E(1)	2(1)	A(1)	O(1)



EXAMPLE: BA2A1XAB1EAO is a BA manually operated double spool valve, the first spool being 4-way, 4 position, open center, spring centered with detent in float position; the second spool being 4-way, 3-position, open centered, spring centered. The non-adjustable relief valve is set at 1500 psi. ¾" NPTF power beyond sleeve port, outlet port in end position. Inlet & outlet ports are ¾" NPTF; work ports ½ NPTF. Complete handle assembly.

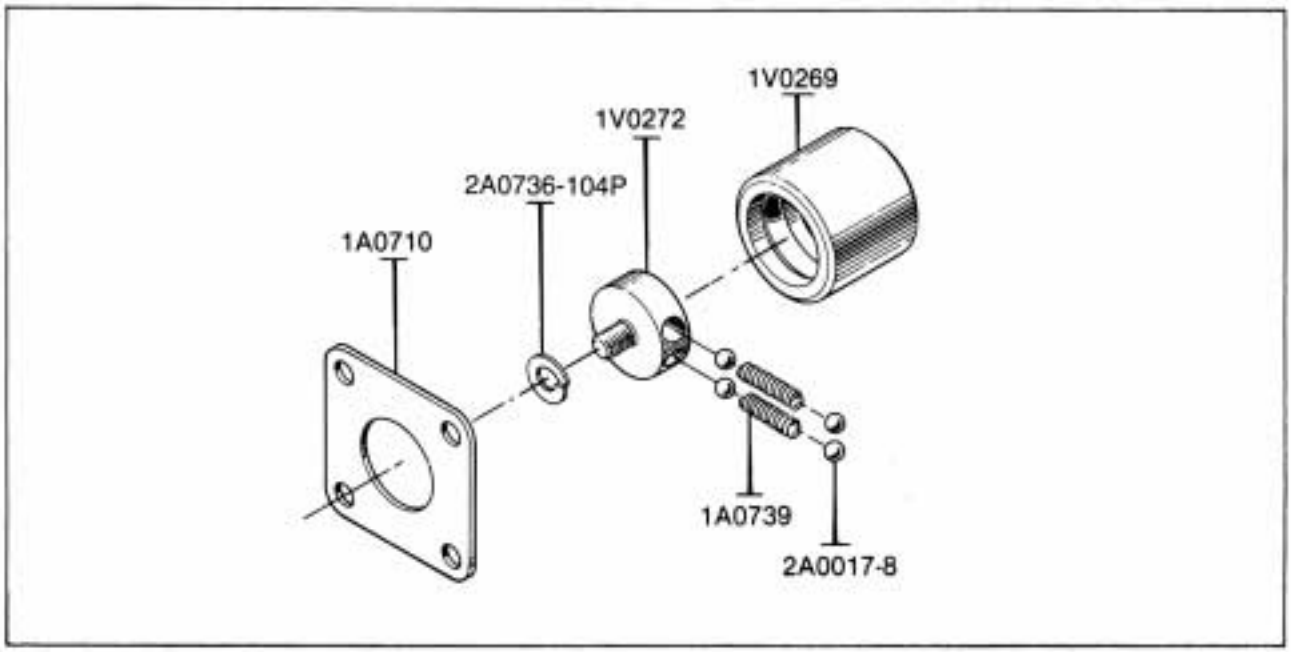
NOTES: (1) Model BC is a one-spool combination adjustable priority flow divider and directional control valve, open centered, with conversion plug installed; available power beyond capability by adding kit. Not available as closed center. (2) Float position A or B is available on 1st spool only on 2 or 3-spool valves. (3) Specify detent kick-out pressure if other than 1,000 psi (4) Pressure settings at 10 gpm. (5) If other setting is desired, specify on order. (6) Top, end or bottom outlet (specify). (7) Specify T, B, or E when ordering closed center spool, power beyond, or conversion plug. (8) Machined for unidirectional orifice plates. (9) Available for BA2 and BA3 spool models.

CROSS

CROSS MANUFACTURING, INC.
100 Factory Street
Lewis, Kansas 67552
Phone 620/324-5525 Fax -5737

SERIES B and C DIRECTIONAL CONTROL VALVE DETENT KIT
PART NO. 1V0294

With this option, the valve spool will remain in any of three positions in which it is placed manually. There is no spring return to neutral when this detent option is installed.



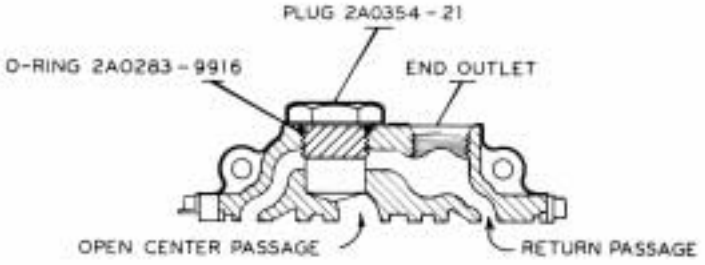
To convert from the standard 3-position spring-centered version to a 3-position detent, proceed as follows:

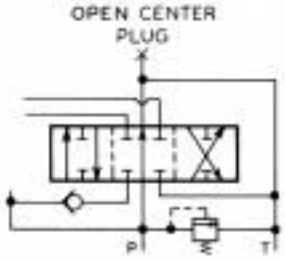
1. Remove the four socket head cap screws and end cap.
2. Remove the socket head cap screw from the spool end and take out the spring centering mechanism.
3. Position the retainer plate (1A0710) on end of valve body.
4. Install lockwasher (2A0736-104P) on threaded end of retainer (1V0272).
5. Screw the factory assembled detent mechanism into the end of the spool. Loctite #271, 9-11 ft. lbs. torque recommended.
6. Replace end cap and the four socket head cap screws.

Conversion is now complete. Save the spring centering mechanism in the event that reconversion should ever be desired.

SERIES B DIRECTIONAL CONTROL VALVE CONVERSION PLUG OPTIONS
(Refer to B series Directional Control Valve Specification Sheet, Form VBA1)

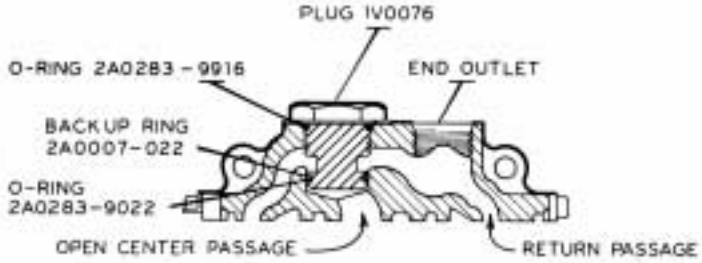
STANDARD OPEN CENTER VALVE WITH CONVERSION PLUG (option #3)
Plug Assembly 2A0354 - 121

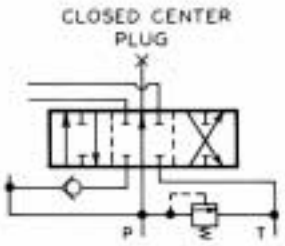




This option allows conversion from standard open center function to either powe beyond or to a closed center function.

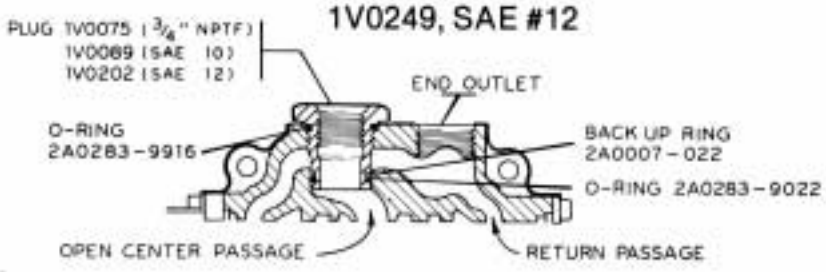
CLOSED CENTER PLUG
Plug Assembly 1V0206

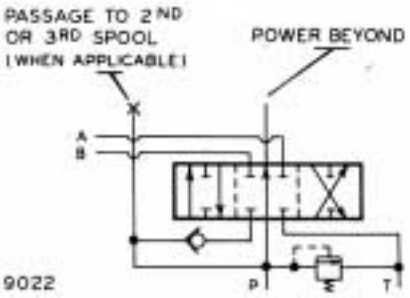




By replacing the conversion plug assembly (2A0354-121) with the closed center plug assembly (1V0206) the directional control valve is converted from open center to closed center function.

POWER BEYOND PLUG
Plug Assembly 1V0208, ¾" NPTF port
1V0209, SAE #10
1V0249, SAE #12





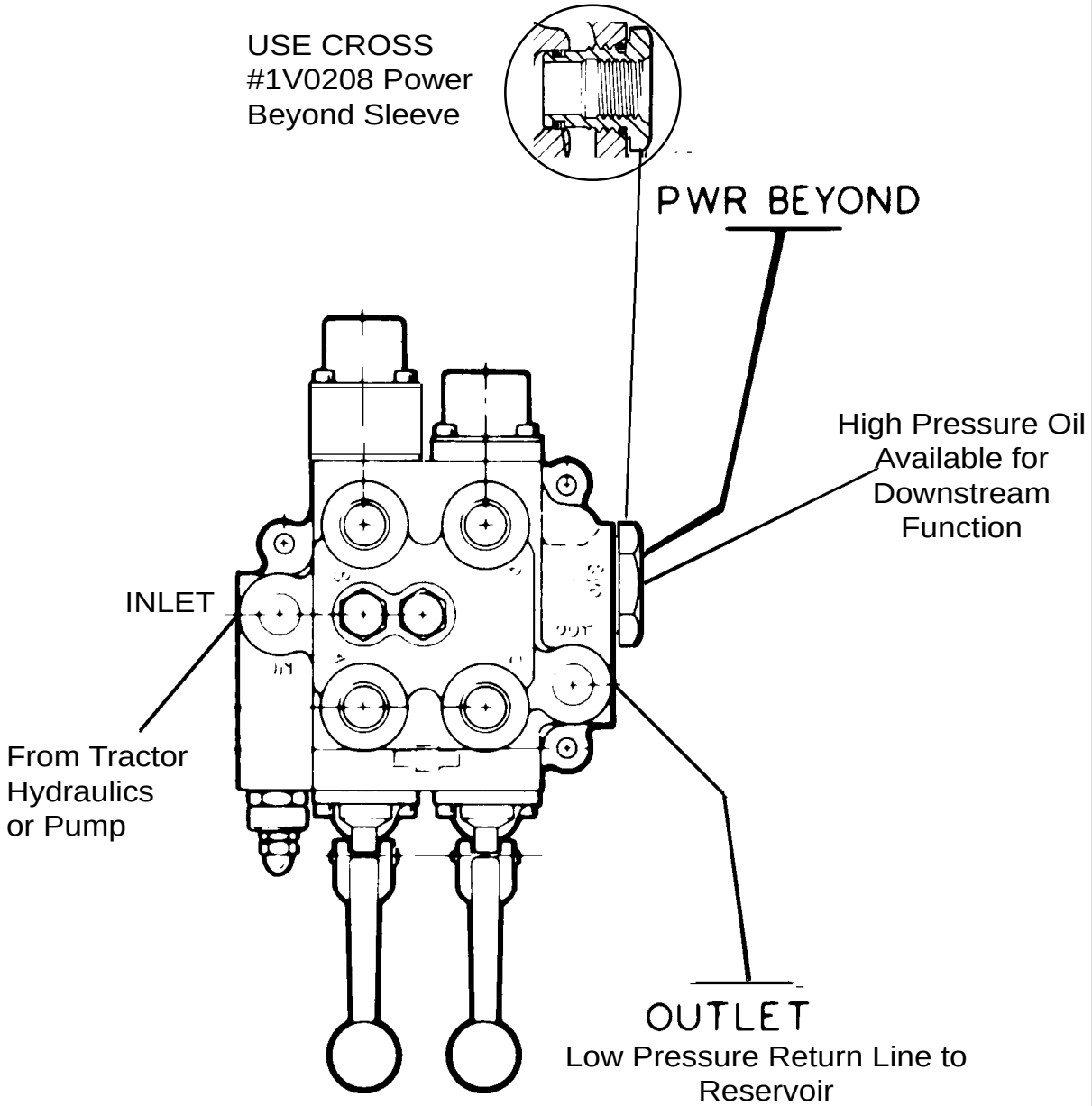
By replacing plug assembly 2A0354-121 with the power beyond plug assembly, an additional valve may be connected downstream of the B series valve.

NOTE: Closed center or power beyond plugs CANNOT be installed in B series valves without the conversion plug option. Closed center version valves or valves with power beyond option may be converted using any of the above plug assemblies.

CROSS

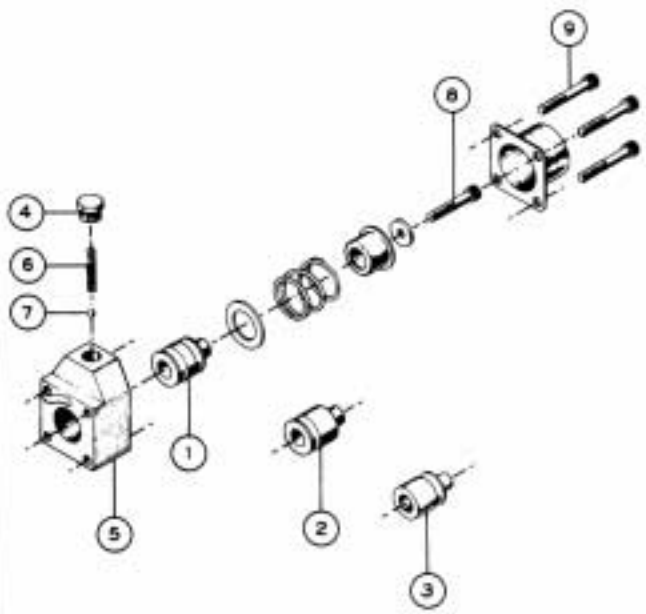
B Series

POWER BEYOND INSTALLATION



SERIES B DIRECTIONAL CONTROL VALVE OPTIONS

DETENT WITH SPRING CENTERING

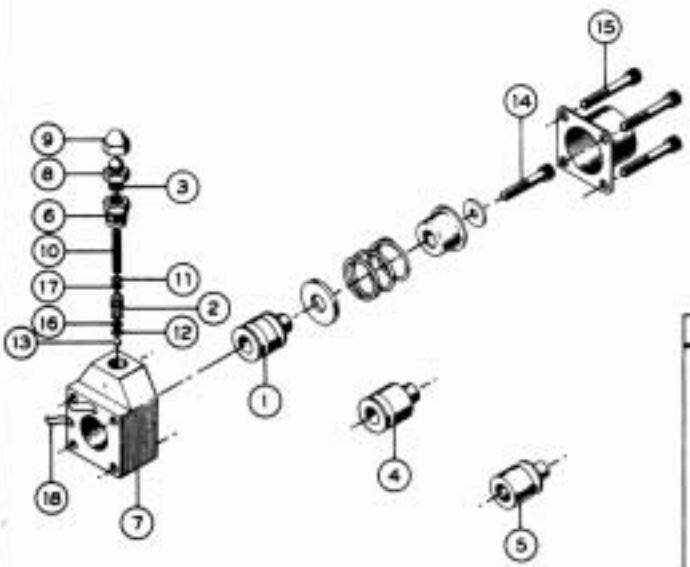


THIS FEATURE ALLOWS SPRING CENTERING TO NEUTRAL WITH A DETENT FOR THE "IN", "OUT" POSITION, OR BOTH THE "IN" AND "OUT" POSITIONS. THE ONE OR TWO POSITION DETENT WITH SPRING CENTERING IS DESIRABLE FOR THE OPERATION OF HYDRAULIC CYLINDERS OR MOTORS. THE ONE POSITION DETENT PROVIDES A FLOAT POSITION FOR A THREE-WAY SPOOL IN THE "IN" OR DUMP POSITION. THIS DETENT FEATURE IS APPLICABLE WHERE QUICK RELEASE AND CENTERING IS NEEDED OR FOR GOOD METERING OF FLOW BEFORE PLACING INTO DETENT.

SPECIAL PARTS

	PART NO.	DESCRIPTION	QTY REQD
1	1V0087	2-POSITION DETENT SLEEVE	1
2	1V0070	1-POSITION DETENT SLEEVE, "IN" (OPT.)	1
3	1V0071	1-POSITION DETENT SLEEVE, "OUT" (OPT.)	1
4	1V0217	DETENT PLUG	1
5	1V0264	DETENT HOUSING ASSEMBLY	1
6	1A0610	DETENT SPRING	1
7	2A0017-8	BALL (1/4 STEEL)	1
8	2A0079-414N	CAPSCREW	1
9	2A0079-416	CAPSCREW	4
		NOTE ORDER BY KIT NUMBER	
	1V0557	DETENT KIT (2 POSITION)	1
	1V0558	DETENT KIT (1 POSITION "IN")	1
	1V0559	DETENT KIT (1 POSITION "OUT")	1

PRESSURE DETENT KIT NO. 1V0642



"BA" VALVES WITH THREE-POSITION SPOOLS CAN BE PROVIDED WITH THIS OPTION ON ANY OR ALL SPOOLS. A PRESSURE DETENT HOLDS THE SPOOL IN THE "IN" POSITION, "OUT" POSITION OR BOTH "IN" AND "OUT" POSITIONS. THE DETENT IS HELD UNTIL THE CYLINDER OR MOTOR REACHES A PRE-SET PRESSURE, RELEASING THE DETENT, ALLOWING THE SPOOL TO SPRING RETURN TO NEUTRAL. *FIELD INSTALLATION CAN BE MADE ONLY IF VALVE ALREADY HAS THIS OPTION.*

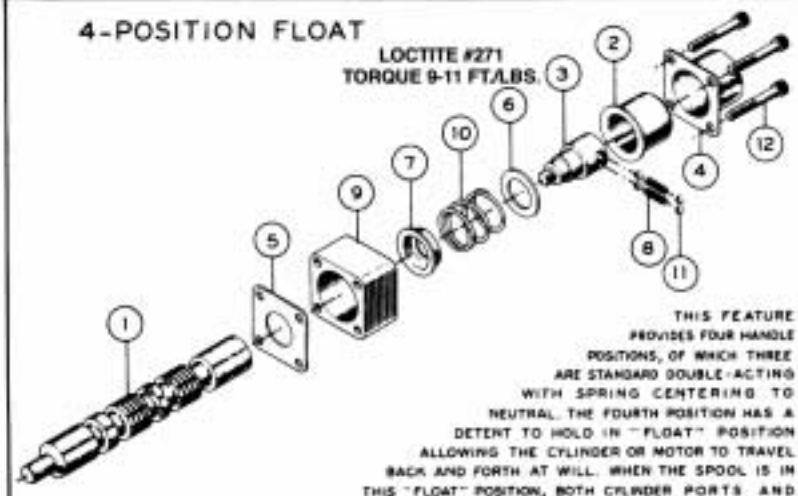
SPECIAL PARTS

		PART NO.	DESCRIPTION	QTY REQD
	1	1V0087	2-POSITION DETENT SLEEVE	1
*	2	1V0068	PRESSURE DETENT PISTON	1
*	3	1V0089	ADJUSTMENT SCREW	1
	4	1V0070	1-POSITION DETENT SLEEVE "IN" (OPT.)	1
	5	1V0071	1-POSITION DETENT SLEEVE "OUT" (OPT.)	1
*	6	1V0072	PISTON STOP	1
*	7	1V0264	DETENT HOUSING ASSEMBLY	1
*	8	1A0569	NUT	1
*	9	1A0570	ACORN NUT	1
*	10	1A0610	DETENT SPRING	1
*	11	2A0012-008	UPPER O-RING BACK-UP	1
*	12	2A0012-007	LOWER O-RING BACK-UP	1
*	13	2A0017-8	BALL (1/4 STEEL)	1
	14	2A0079-414N	CAPSCREW	1
	15	2A0079-416	CAPSCREW	4
*	16	2A0283-1007	LOWER PISTON O-RING	1
*	17	2A0283-1008	UPPER PISTON O-RING	1
*	18	2A0283-4017	HOUSING O-RING	1

* CONTAINED IN KIT NO. 1V0642. DETENT SLEEVE (1) (4) OR (5) & CAPSCREWS (14) & (15) MUST BE ORDERED SEPARATELY.

SERIES B DIRECTIONAL CONTROL VALVE OPTIONS

4-POSITION FLOAT



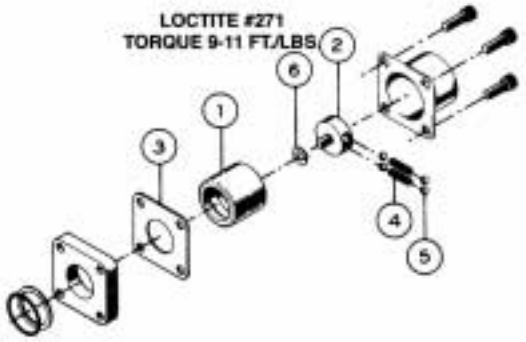
THIS FEATURE PROVIDES FOUR HANDLE POSITIONS, OF WHICH THREE ARE STANDARD DOUBLE-ACTING WITH SPRING CENTERING TO NEUTRAL. THE FOURTH POSITION HAS A DETENT TO HOLD IN "FLOAT" POSITION ALLOWING THE CYLINDER OR MOTOR TO TRAVEL BACK AND FORTH AT WILL. WHEN THE SPOOL IS IN THIS "FLOAT" POSITION, BOTH CYLINDER PORTS AND PUMP PORTS ARE OPEN TO TANK.

Kit No. 1V1600
(Spool not included)

SPECIAL PARTS

	PART NO.	DESCRIPTION	QTY REQD
1	1V0094	FLOAT SPOOL	1
2	1V0205	FLOAT DETENT SLEEVE	1
3	1V0280	FLOAT DETENT RETAINER	1
4	1A0284P	END CAP	1
5	1A0710	RETAINER PLATE	1
6	1A0737	FLOAT STOP WASHER	1
7	1A0738P	FLOAT STOP COLLAR	1
8	1A0738	DETENT SPRING	2
9	1A0784	FLOAT SPACER	1
10	1A9231	FLOAT CENTERING SPRING	1
11	2A0017-8	BALL (1/4 STEEL)	4
12	2A0078-416	CAPSCREW	4

3-POSITION DETENT

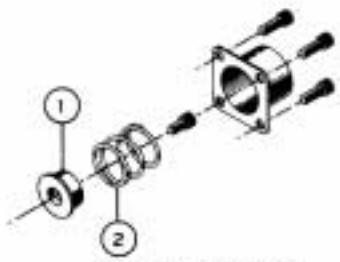


THIS FEATURE PROVIDES THREE HANDLE POSITIONS, ALL OF WHICH ARE HELD WITH A DETENT, AND HAS NO SPRING CENTERING TO NEUTRAL. THIS OPTION ALLOWS CONTROL AND DIRECTING OF FLOW TO STOP, START OR REVERSE HYDRAULIC MOTORS. IT CAN BE USED TO DIVERT FLOW TO ONE OR MORE SEPARATE CIRCUITS.

SPECIAL PARTS

	PART NO.	DESCRIPTION	QTY REQD
TO CONVERT FROM SPRING CENTERING TO 3-POSITION DETENT:			
	1V0294	DETENT CONVERSION KIT	1
KIT CONTAINS THESE PARTS:			
1	1V0269	DETENT SLEEVE	1
2	1V0272	DETENT RETAINER	1
3	1A0710	RETAINER PLATE	1
4	1A0738	DETENT SPRING	2
5	2A0017-8	BALL (1/4 STEEL)	4
6	2A0738-104P	LOCKWASHER	1

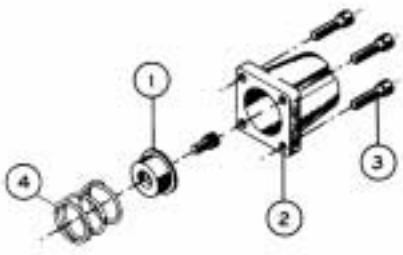
SPRING EXTENDED SPOOL



SPECIAL PARTS

	PART NO.	DESCRIPTION	QTY REQD
1	1V0082	STOP COLLAR	1
2	1A9008	SPRING	1

SPRING RETRACTED SPOOL



SPECIAL PARTS

	PART NO.	DESCRIPTION	QTY REQD
1	1V2020M	SPOOL SPACER	1
2	1V2021	SPECIAL END CAP	1
3	2A0078-410	CAPSCREW	4
4	1A9008	SPRING	1

FUNCTION

To restrict the fluid flow in or out of valve ports.

APPLICATION

"IN-FLOW" POSITION

Orifice plates installed in this position restrict flow entering the valve port from a cylinder or motor, offering these advantages:

1. Prevents cavitation of cylinder or motor having an inertia load.
2. Improves control of operation for double or single acting cylinders when lowering.
3. Improves control of rotary cylinders which have inertia loads in both directions. (use an orifice plate in both cylinder ports)

"OUT-FLOW" POSITION

Orifice plates installed in this position restrict flow of pressurized oil flowing out of the valve port to a cylinder or motor, offering the advantage of:

Improved control for extending single or double acting cylinders or speed of a hydraulic motor.

ORIFICE SIZING:

CROSS Engineering will calculate the proper orifice size for each application if flow rate, system pressure, and pressure drop requirements are supplied.

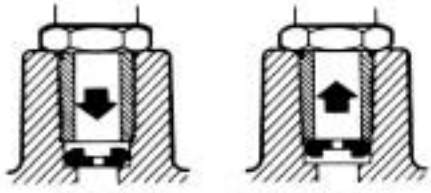
ORIFICE SIZES AVAILABLE

.031	.081
.040	.094
.047	.109
.052	.125
.055	.140
.060	.156
.063	.204
.078	.250

INSTALLATION INSTRUCTIONS

Insert orifice plate into port in proper position to obtain desired direction of flow restriction. Lips of plate always point toward the pressure source to assure proper seating. (For "IN-FLOW" restriction, plate lips point "OUT". For "OUT-FLOW" restriction, plate lips point "IN".

3/4 - 16 (SAE #8) Ports

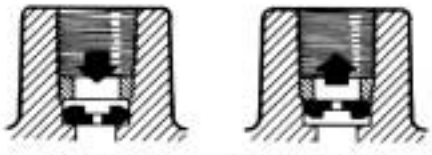


IN-FLOW OUT-FLOW

RESTRICTION

The lower face of the fitting inserted into the port will limit the upward travel of the orifice plate.

1/2" NPTF Ports



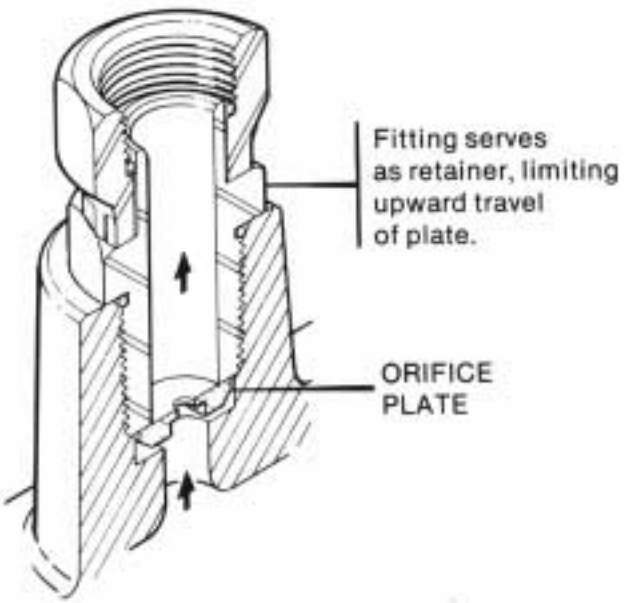
IN-FLOW OUT-FLOW

RESTRICTION

It is necessary to use the retainer (#1A0741) screwed into the port until it bottoms on the port thread, to limit the upward travel of the orifice plate. CAUTION: After installation of retainer, check to see that orifice plate is free to move at least 1/32 inch.

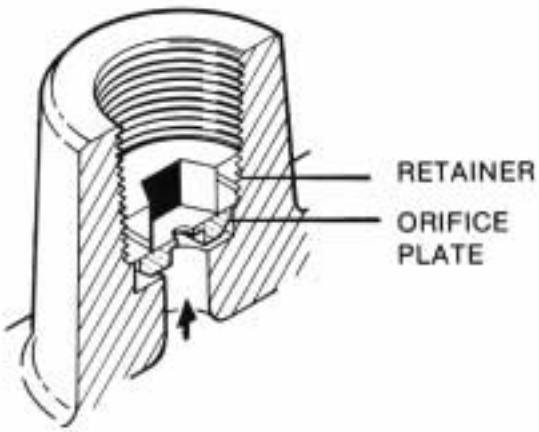
ORDERING INFORMATION

SAE PORT



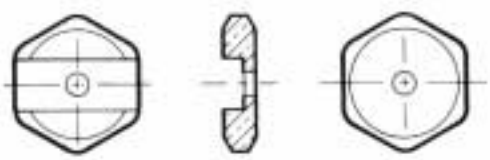
ORIFICE PLATE ONLY
Available for 3/4 - 16 (SAE #8) ports only.

NPTF PORT



ORIFICE PLATE and RETAINER
Available for 1/2" ports only.

ORIFICE PLATE Part No. 1A0742



RETAINER Part No. 1A0741

SAE #8 (3/4 - 16)	ORIFICE PLATE - 1A0742	HOLE DIA. use 3 digit decimal to identify diameter of hole in orifice plate.
NPTF (1/2")	RETAINER - 1A0741 ORIFICE PLATE - 1A0742	

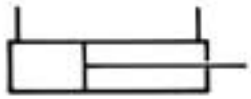
EXAMPLE: 1A0742-125 describes an orifice plate with 1/8" hole. If the hole diameter is not specified, plates without hole will be shipped and customer must drill.

CROSS

CROSS MANUFACTURING, INC.
100 Factory Street
Lewis, Kansas 67552
Phone 620/324-5525; FAX 620/324-5737; e-mail: info@crossmfg.com

CROSS HYDRAULIC CYLINDERS

TIE ROD CYLINDERS
DB SERIES
Specification Sheet



The CROSS series DB tie rod type cylinders provide long life and reliable operation due to high quality materials and workmanship plus the many design features included in this cylinder design. An infinite number of stroke sizes are available as well as many standard and optional features.

GENERAL SPECIFICATIONS

Rated working pressure (max. relief valve setting at full flow) . . . . . 2500 psi (172 bar)
(See pin recommendations page 3)

Maximum shock and surge pressure . . . . . 4000 psi (276 bar)

Bore diameters . . . . . .

2.00	2.50	3.00	3.50	4.00	5.00	inches
51	64	76	89	102	127	mm

MATERIAL SPECIFICATIONS

Cylinder barrels . . . . . ST52.3 steel alloy
Pistons . . . . . High tensile strength gray iron or aluminum alloy
Rods . . . . . Induction hardened C1045 steel alloy*
Base castings and rod clevises . . . . . Ductile iron
Cylinder heads . . . . . High tensile strength gray iron
Seals . . . . . 70 durometer Buna N piston o-rings with Polyurethane back-ups
Double lipped Polyurethane u-cup rod seal

*Rods over 3/4" diameter, strokes up to 65"

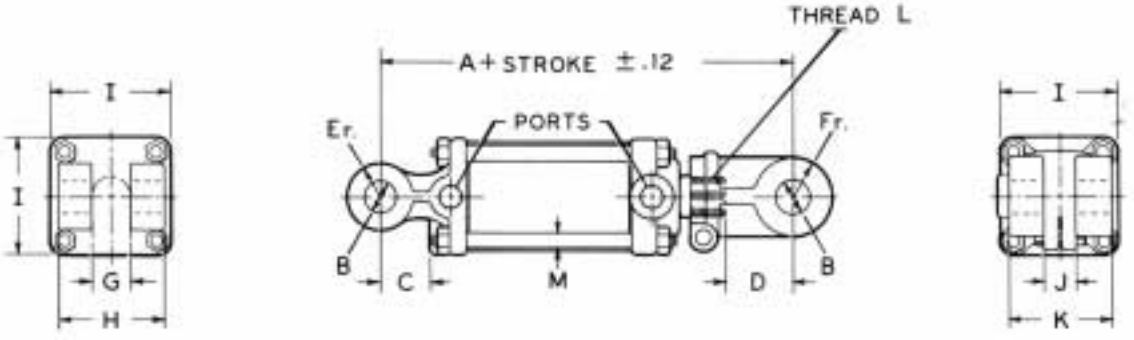
STANDARD FEATURES

- Cylinder barrels are skived burnished precision finished to provide long seal life
- Rods are hardened, chrome plated and polished for long wear life and for protection from external damage and corrosion
- Rod wipers clean dirt and foreign matter from rod to insure long seal life
- High tensile strength tie rods with rolled threads for durability
- NPTF dryseal pipe thread ports in line with pins
- Double ported base allows connections to be made at 90° to pins

OPTIONAL FEATURES AVAILABLE

- SAE straight thread o-ring ports
- Pineye or single lug rod end mountings
- Hardened steel pins and bushings
- Breather plugs

DIMENSIONAL DATA in inches and (millimeters)

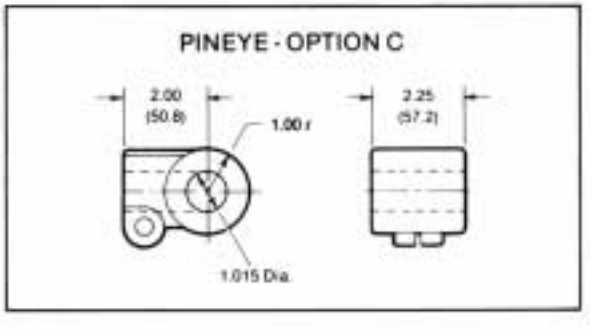


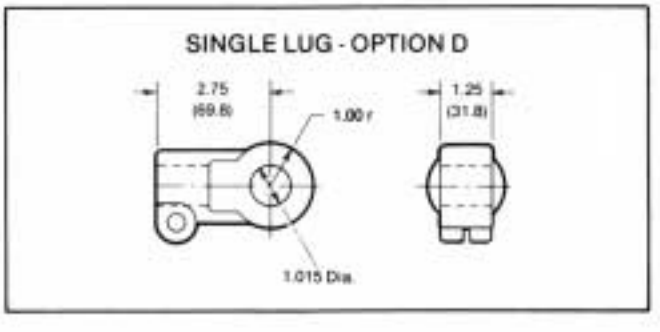
ALL DIMENSIONS ARE NOMINAL and ARE FOR STANDARD CONFIGURATIONS

BORE DIA.	A	B	C	D	Er.	Fr.	G	H	I	J	K	L	M
2.00 (51)	10.25 (260)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	.875 (22.2)	1.000 (25.4)	1.125 (28.6)	2.500 (63.5)	2.875 (73.0)	1.125 (28.6)	2.625 (66.7)	1 1/16-12	.375 (9.5)
2.50 (64)	10.25 (260)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	1.000 (25.4)	1.000 (25.4)	1.125 (28.6)	2.625 (66.7)	3.250 (82.6)	1.125 (28.6)	2.625 (66.7)	1 1/16-12	.375 (9.5)
3.00 (76)	10.25 (260)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	1.000 (25.4)	1.000 (25.4)	1.125 (28.6)	2.625 (66.7)	3.750 (95.3)	1.125 (28.6)	2.625 (66.7)	1 1/4-12	.500 (12.7)
3.50 (89)	10.25 (260)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	1.000 (25.4)	1.250 (31.8)	1.250 (31.8)	2.750 (69.8)	4.250 (107.9)	1.250 (31.8)	2.750 (69.8)	1 1/4-12	.562 (14.3)
4.00 (102)	10.62 (270)	1.015 (25.8)	2.000 (50.8)	2.125 (53.9)	1.125 (28.6)	1.250 (31.8)	1.250 (31.8)	2.875 (73.0)	5.000 (127)	1.250 (31.8)	2.750 (69.8)	1 1/4-12	.625 (15.9)
5.00 (127)	12.25 (311)	1.015 (25.8)	2.312 (58.7)	2.125 (53.9)	1.500 (38.1)	1.250 (31.8)	1.375 (34.9)	3.500 (88.9)	6.000 (152.4)	1.250 (31.8)	2.750 (69.8)	* 1 1/2-12	.750 (19.0)

*1 1/4-12 for cylinders in distributor program.

OPTIONAL ROD END MOUNTINGS





These rod end mountings are optionally available on the 2", 2 1/2", 3", 3 1/2" and 4" diameter bore size cylinders only. (Standard mounting clevis will be supplied unless otherwise specified.)

CYLINDER PORTS AND RODS

BORE DIA.	SIZE & TYPE PORTS		STANDARD RODS*		OPTIONAL RODS	
	STANDARD	OPTIONAL	DIA.	MAX. STROKE**	DIA.	MAX. STROKE**
2.00 (51)	3/8 NPTF	9/16-18 SAE 1/4 NPTF	1.062 (26.97)	19" (483)	1.125 (28.6)	22" (559)
2.50 (64)	3/8 NPTF	9/16-18 SAE 1/4 NPTF	1.062 (26.97)	14" (356)	1.25 (25.4)	21" (533)
3.00 (76)	1/2 NPTF	3/4-16 SAE 3/8 NPTF	1.250 (31.8)	17" (432)	1.500 (38.1)	27" (686)
3.50 (89)	1/2 NPTF	3/4-16 SAE 3/8 NPTF	1.250 (31.8)	14" (356)	1.500 (38.1)	22" (559)
4.00 (102)	1/2 NPTF	3/4-16 SAE 3/8 NPTF	1.500 (38.1)	19" (483)	1.250 (31.8) 2.000 (50.8)	11" (279) 38" (965)
5.00 (127)	1/2 NPTF	3/4-16 SAE 3/8 NPTF	2.000 (50.8)	28" (711)	1.500 (38.1)	13" (330)

*Consult CROSS Full Line catalog for rod sizes applicable to distributor program.

**At 2500 psi rated operating pressure. Longer strokes are possible at reduced pressures. Additionally, smaller diameter rods can be provided for usage at lower pressures or shorter length strokes. Consult CROSS Sales Dept. for maximum stroke at given pressures. For extended cylinder lengths of over 30" (762 mm), 1" (25.4 mm) of stop tubing should be used for each additional 10" (254 mm) of stroke. Stroke limitation applies to compressive loading only.

CLEVIS PINS

BORE DIA.		STANDARD PINS DIA. / MAT'L		STANDARD PINS MAX. PRESS.		OPTIONAL PINS DIA. / MAT'L		OPTIONAL PINS MAX. PRESS.	
INCHES	mm	INCHES	mm	PSI	BAR	INCHES	mm	PSI	BAR
2.00	(51)	1.00 STEEL	(25.4)	2500	(172)	NONE			
2.50	(64)	1.00 STEEL	(25.4)	2500	(172)	NONE			
3.00	(76)	1.00 STEEL	(25.4)	2500	(172)	NONE			
3.50	(89)	1.00 STEEL	(25.4)	2000	(138)	1.00 HARDENED STEEL	(25.4)	2500	(172)
4.00	(102)	1.00 STEEL	(25.4)	1500	(103)	1.00 HARDENED STEEL	(25.4)	2500	(172)
5.00	(127)	1.00 STEEL	(25.4)	1000	(69)	1.25 HARDENED STEEL	(31.8)	2500	(172)

Hardened steel bushings are provided with hardened steel pins.

HYDRAULIC CYLINDERS

CROSS

ORDERING INFORMATION

(Standard configurations will be supplied unless specified)

SERIES	BORE DIA. INCH x 100	— STROKE INCH x 100	— ROD DIA. INCH x 100	PORT SIZE and TYPE	END MOUNTING	CLEVIS PIN	OTHER
DB	200 250 300 350 400 500	AS REQUIRED	106 125 150 200	C 9/16-18 SAE D 3/4-16 SAE N 1/4 NPTF P 3/8 NPTF R 1/2 NPTF S 3/4 NPTF	C CLEVIS (Standard) P PINEYE S SINGLE LUG	A 1.00 STL. B 1.00 HARD C 1.25 HARD D NONE (1.015 hole) E NONE (1.265 hole)	O NONE X SPECIFY

EXAMPLE: DB250-1500-106CCAO is a standard 2 1/2" bore diameter DB Series cylinder with 15" stroke, 1.062" dia.rod, 9/16 - 18 ports, standard clevis end mountings with 1" dia. steel clevis pins.

ASAE STANDARD CYLINDERS

The DB-ASAE cylinders are designed for use where ASAE 8" and 16" stroke cylinders are required. To obtain an ASAE cylinder, the following model number may be used. Characteristics of these cylinders are shown for reference purposes as there are no options available. (Contact CROSS Sales Department for DB-ASAE cylinders with SAE straight thread o-ring ports).

MODEL NUMBER	BORE DIA. INCHES	STROKE INCHES	ROD DIA. INCHES	CLOSED CENTER DIM. INCHES	PORT SIZE & TYPE	CLEVIS PIN	WEIGHT LBS.
208DB-ASAE	2	8	1 1/16	20 1/4	3/8" NPTF	1"	18
2508DB-ASAE	2 1/2	8	1 1/16	20 1/4	3/8" NPTF	1"	20
308DB-ASAE	3	8	1 1/4	20 1/4	1/2" NPTF	1"	24
3508DB-ASAE	3 1/2	8	1 1/4	20 1/4	1/2" NPTF	1"	30
408DB-ASAE	4	8	1 1/4	20 1/4	1/2" NPTF	1"	37
508DB-ASAE	5	8	1 1/2	20 1/4	1/2" NPTF	1" *	66
316DB-ASAE	3	16	1 1/4	31 1/2	1/2" NPTF	1 1/4"	35
3516DB-ASAE	3 1/2	16	1 1/2	31 1/2	1/2" NPTF	1 1/4"	51
416DB-ASAE	4	16	2	31 1/2	1/2" NPTF	1 1/4"	65
516DB-ASAE	5	16	2	31 1/2	1/2" NPTF	1 1/4"	88

*Limited to 1500 psi maximum operating pressure

CROSS

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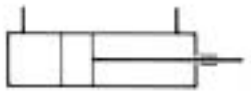
HYDRAULIC CYLINDERS
with Mechanical Depth Stop Option

TIE ROD CYLINDERS
DE-ASAE, DU SERIES
Specification Sheet



The CROSS series DE and DU tie rod cylinders have been designed for use where an 8" stroke ASAE mechanical depth stop cylinder may be required. The DE-ASAE incorporates the depth control collar. The DU cylinder features a threaded rod extension so that a mechanical depth control collar may be added if desired. For requirements not needing the depth control, refer to the CROSS DB series.

GENERAL SPECIFICATIONS

Rated working pressure (Max. relief valve setting at full flow) . . . . . .2500 psi (172 bar)*

Maximum shock and surge pressure . . . . . .4000 psi (276 bar)

Bore diameters . . . . . .

2.00	2.50	3.00	3.50	4.00	inches
51	64	76	89	102	mm

*See pin recommendations on reverse.

MATERIAL SPECIFICATIONS

Cylinder barrels . . . . . .C1025 steel alloy

Pistons . . . . . .High strength aluminum alloy

Rods . . . . . .Induction hardened C1045 steel alloy

Base castings and rod clevises . . . . . .Ductile iron

Cylinder heads . . . . . .High tensile strength gray iron

Seals . . . . . .70 durometer Buna N piston o-rings with Polyurethane back-ups
Double lipped Polyurethane u-cup seal

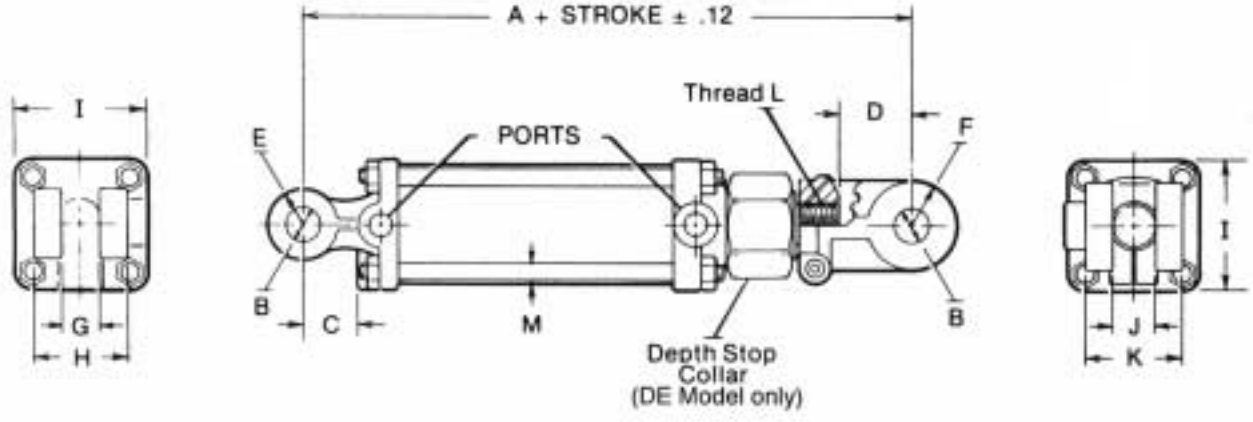
STANDARD FEATURES

- Mechanical depth stop collar (2¼" adjustment) (1⅛) adjustment on 4" bore) on DE
- Cylinder barrels are skived burnished precision finished to provide long seal life
- Rods are hardened, chrome plated and polished for long wear life and for protection from external damage and corrosion
- Rod wipers clean dirt and foreign matter from rod, to insure long seal life
- High tensile strength tie rods with rolled threads for durability
- Double ported base allows connections to be made at 90° to pins
- NPTF dryseal pipe thread ports
- Standard ASAE 8" stroke

TIE ROD CYLINDERS
DE-ASAE, DU SERIES
Specification Sheet

HYDRAULIC CYLINDERS
with Mechanical Depth Stop Option

DIMENSIONAL DATA in inches and (millimeters)



ALL DIMENSIONS ARE NOMINAL AND ARE FOR STANDARD CONFIGURATIONS.

BORE DIA.	A	B	C	D	E	F	G	H	I	J	K	L	M
2.00 (51)	12.25 (311)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	.875 (22.2)	1.000 (25.4)	1.125 (28.6)	2.500 (63.5)	2.875 (73.0)	1.125 (28.6)	2.625 (66.7)	1 1/16 -12	.375 (9.5)
2.50 (64)	12.25 (311)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	1.000 (25.4)	1.000 (25.4)	1.125 (28.6)	2.625 (66.7)	3.250 (82.6)	1.125 (28.6)	2.625 (66.7)	1 1/16 -12	.375 (9.5)
3.00 (76)	12.25 (311)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	1.000 (25.4)	1.000 (25.4)	1.125 (28.6)	2.625 (66.7)	3.750 (95.2)	1.125 (28.6)	2.625 (66.7)	1 1/4 -12	.500 (12.7)
3.50 (89)	12.25 (311)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	1.000 (25.4)	1.000 (25.4)	1.250 (31.8)	2.750 (69.8)	4.250 (107.9)	1.250 (31.8)	2.750 (69.8)	1 1/4 -12	.562 (14.3)
4.00 (102)	12.25 (311)	1.015 (25.8)	2.000 (50.8)	2.125 (53.9)	1.125 (28.6)	1.000 (25.4)	1.250 (31.8)	2.875 (73.0)	5.000 (127)	1.250 (31.8)	2.750 (69.8)	1 1/4 -12	.625 (15.9)

PIN RECOMMENDATIONS: For pressures above 2000 psi on 3 1/2" bore or 1500 psi on 4" bore, hardened pins and bushings are required.

ORDERING INFORMATION

Characteristics of the DE-ASAE and DU cylinders are shown for reference purposes. (Contact CROSS Sales Department for DE-ASAE or DU cylinders with SAE straight thread o-ring ports or hardened pins and bushings.)

MODEL NUMBER	BORE DIA. inches mm	ROD DIA. inches mm	PIN DIA. inches mm	PORT size type	WEIGHT lbs. Kg
208	2.00 (51)	1.062 (27.0)	1 (25.4)	3/8 NPTF	20 (9.07)
2508	2.50 (64)	1.062 (27.0)	1 (25.4)	3/8 NPTF	21 (9.5)
308	3.00 (76)	1.250 (31.8)	1 (25.4)	1/2 NPTF	25 (11.34)
3508	3.50 (89)	1.250 (31.8)	1 (25.4)	1/2 NPTF	33 (14.97)
408	4.00 (102)	1.250 (31.8)	1 (25.4)	1/2 NPTF	44 (19.96)

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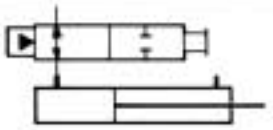
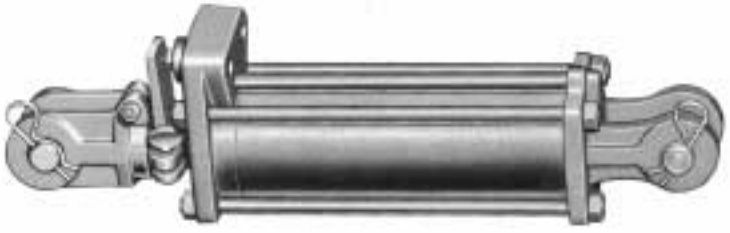
HYDRAULIC CYLINDERS
with Hydraulic Depth Control

TIE ROD CYLINDERS
DC SERIES
Specification Sheet





The CROSS series DC tie rod type hydraulic cylinders feature hydraulic depth control with an infinitely variable adjustment from zero to maximum stroke. Long life and reliable operation are provided by the many design features plus high quality workmanship and materials.

GENERAL SPECIFICATIONS

Rated working pressure (Max. relief valve setting at full flow) . . . . . 2500 psi (172 bar)
Maximum shock and surge pressure . . . . . 4000 psi (276 bar)

Bore diameters	3.00	3.50	4.00	5.00	in.
	76	89	102	127	mm

MATERIAL SPECIFICATIONS

Cylinder barrels . . . . . .ST 52.3 steel alloy
Pistons . . . . . .High strength aluminum or gray iron
Rods . . . . . .Introduction hardened C1045 steel alloy
Base castings and rod clevises . . . . . .Ductile iron
Cylinder heads . . . . . .High tensile strength gray iron
Seals . . . . . .70 durometer Buna N o-rings with polyurethane back-up rings
. . . . . .Double lipped polyurethane u-cup rod seal

STANDARD FEATURES

- Infinitely adjustable stroke from zero to maximum stroke
- Heavy duty rod clevis with hardened steel bushings
- Hardened steel pins
- Cylinder barrels are skived burnished precision finished to provide long seal life
- Rods are hardened, chrome plated and polished for long wear life and for protection from external damage and corrosion
- Rod wipers clean dirt and foreign matter from rod to insure long seal life
- High tensile strength tie rods with rolled threads for durability
- NPTF dryseal pipe thread ports
- Standard ASAE 8" and 16" strokes

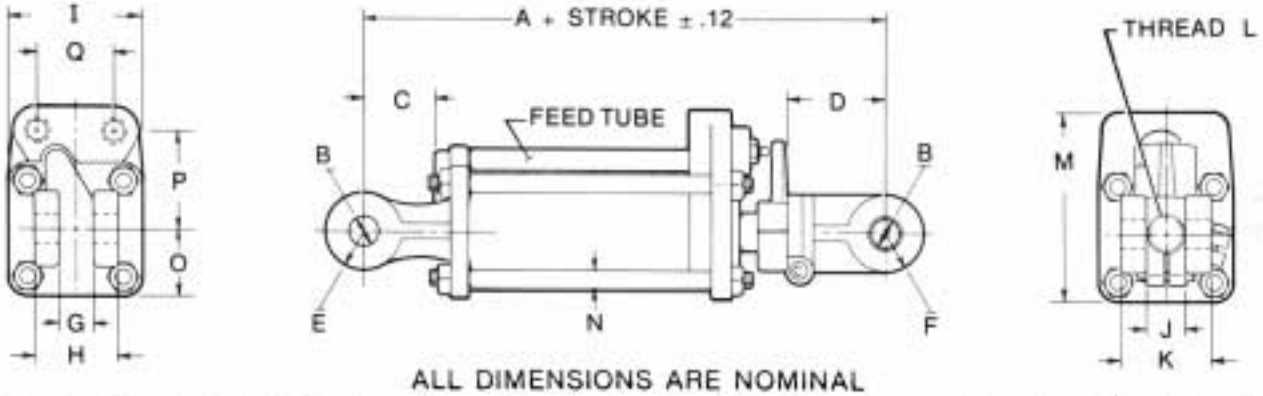
OPTIONAL FEATURES AVAILABLE

- SAE straight thread o-ring ports (top ported)
- 1.25 diameter hardened pins (standard on 16" stroke ASAE and 5.00 bore diameter cylinders)

TIE ROD CYLINDERS
DC SERIES
Specification Sheet

HYDRAULIC CYLINDERS
with Hydraulic Depth Control

DIMENSIONAL DATA in inches and (millimeters)



ALL DIMENSIONS ARE NOMINAL

BORE DIA	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
3.0" (76)	12.25 (305)	1.015 (25.8)	2.38 (60.4)	3.25 (82.5)	1.25 (31.8)	1.25 (31.8)	1.12 (28.4)	2.75 (69.8)	3.75 (95.2)	1.25 (31.8)	2.75 (69.8)	1¼ -12	5.88 (149.4)	.50 (12.7)	1.88 (47.8)	3.25 (82.6)	2.50 (63.5)
3.5" (89)	12.25 (305)	1.015 (25.8)	2.38 (60.4)	3.25 (82.5)	1.25 (31.8)	1.25 (31.8)	1.12 (28.4)	2.75 (69.8)	4.25 (108)	1.25 (31.8)	2.75 (69.8)	1¼ -12	6.12 (155.4)	.56 (14.2)	2.12 (53.8)	3.25 (82.6)	2.50 (63.5)
4.0" (102)	12.25 (305)	1.015 (25.8)	2.38 (60.4)	3.25 (82.5)	1.25 (31.8)	1.25 (31.8)	1.12 (28.4)	2.75 (69.8)	5.00 (127)	1.25 (31.8)	2.75 (69.8)	1¼ -12	6.69 (169.9)	.62 (15.7)	2.50 (63.5)	3.44 (87.4)	2.50 (63.5)
5.0" (127)	12.25 (305)	1.265 (32.1)	2.28 (57.9)	3.25 (82.5)	1.41 (35.8)	1.25 (31.8)	1.34 (34.0)	3.50 (88.9)	6.00 (152)	1.25 (31.8)	2.75 (69.8)	1½ -12	7.26 (184.4)	.75 (19.0)	3.0 (76.2)	3.54 (89.9)	2.50 (63.5)

CYLINDER PORTS and RODS

BORE DIA.	PORT SIZE & TYPE		8 INCH STROKE (20.25" RETRACTED)			16 INCH STROKE (31.5" RETRACTED)	
	STANDARD	OPTIONAL	STD. ROD	OPT. ROD.		STD. ROD	OPT. ROD.
3.0" (76)	1/2" NPTF	3/4-16	1.25 (31.8)	1.50 (38.1)		1.25 (31.8)	1.50 (38.1)
3.5" (89)	1/2" NPTF	3/4-16	1.25 (31.8)	1.50 (38.1)	1.75 (44.4)	1.50 (38.1)	NONE
4" (102)	1/2" NPTF	3/4-16	1.25 (31.8)	1.50 (38.1)	2.00 (50.8)	1.75 * (44.4)	2.00 (50.8)
5" (127)	1/2" NPTF	3/4-16	2.00 (50.8)	1.75 (44.4)		2.00 (50.8)	NONE

* Limited to 2300 psi maximum working pressure.

ORDERING INFORMATION

SERIES	BORE DIA. (in. x 100)	STROKES (in. x 100)	ROD DIA. (in. x 100)	PORT SIZE & TYPE
DC	300 350 400 500	800 1600	125 150 175 200	D ¾ - 16 SAE R ½ NPTF

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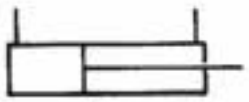
CROSS HYDRAULIC CYLINDERS

TIE ROD CYLINDERS
DH SERIES
Specification Sheet



The DH cylinder is rated to a full 3000 psi working pressure and designed for tough applications. It is the cylinder of choice for today's higher pressure systems. Upgraded castings and heavy duty seals assure peak performance and a long and dependable service life.

GENERAL SPECIFICATIONS

Rated continuous working pressure (Max. relief valve setting at full flow). . .3000 psi (207 bar)

Maximum proof pressure . . . . . .6000 psi (414bar)

Bore diameters . . . . . .

2.00	2.50	3.00	3.50	4.00	inches
51	64	76	89	102	mm

MATERIAL SPECIFICATIONS

Cylinder barrels . . . . . ST52.3 steel alloy

Pistons . . . . . Aluminum alloy

Rods . . . . . .Induction hardened C1045 steel alloy

Base castings and rod clevises . . . . . Ductile iron

Cylinder heads . . . . . .High tensile strength grey iron on 2" and 2 1/2" bores
Ductile iron 3" bore and up

Seals . . . . . .O-ring with backup on tube; Wear ring and teflon seal on piston
Double lipped polyurethane u-cup rod seal

STANDARD FEATURES

- Cylinder barrels are skived burnished precision finished to provide long seal life
- Rods are hardened, chrome plated and polished for long wear life and for protection from external damage corrosion
- Rod wipers clean dirt and foreign matter from rod to insure long seal life
- High tensile strength tie rods with rolled threads for durability
- Double ported base allows connections to be made at 90° to pins
- SAE straight thread o-ring ports
- Hardened steel pins 3", 3 1/2" and 4" bore

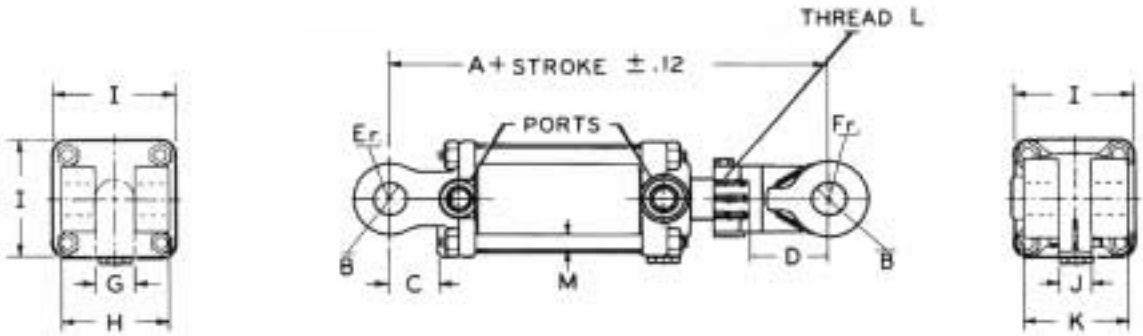
OPTIONAL FEATURES

- Bushings
- Breather plugs

HYDRAULIC CYLINDERS

CROSS

DIMENSIONAL DATA in inches and (millimeters)



ALL DIMENSIONS ARE NOMINAL and ARE FOR STANDARD CONFIGURATIONS

BORE DIA.	A	B	C	D	Er.	Fr.	G	H	I	J	K	L	M
2.00 (51)	10.25 (260)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	.875 (22.2)	1.000 (25.4)	1.125 (28.6)	2.500 (63.5)	2.875 (73.0)	1.125 (28.6)	2.625 (66.7)	1 1/16-12	.375 (9.5)
2.50 (64)	10.25 (260)	1.015 (25.8)	1.625 (41.3)	2.125 (53.9)	1.000 (25.4)	1.000 (25.4)	1.125 (28.6)	2.625 (66.7)	3.250 (82.6)	1.125 (28.6)	2.625 (66.7)	1 1/16-12	.375 (9.5)
3.00 (76)	10.25 (260)	1.015 (25.8)	1.938 (49.2)	2.125 (53.9)	1.125 (28.6)	1.125 (28.6)	1.125 (28.6)	2.625 (66.7)	3.750 (95.3)	1.125 (28.6)	2.625 (66.7)	1 1/4-12	.500 (12.7)
3.50 (89)	10.25 (260)	1.015 (25.8)	2.000 (50.8)	2.125 (53.9)	1.125 (28.6)	1.125 (28.6)	1.250 (31.8)	2.750 (69.8)	4.250 (107.9)	1.125 (28.6)	2.625 (66.7)	1 1/4-12	.562 (14.3)
4.00 (102)	10.62 (270)	1.015 (25.8)	2.000 (50.8)	2.125 (53.9)	1.125 (28.6)	1.125 (28.6)	1.250 (31.8)	2.875 (73.0)	5.000 (127)	1.125 (28.6)	2.625 (66.7)	1 1/4-12	.625 (15.9)

SEE DH-ASAE *Cylinders on Page 4 for special closed center and clevis pins specifications on certain 8 & 16 inch stroke cylinders.*

Port Sizes: 9/16-18 SAE are standard on 2" & 2 1/2" bores
3/4 - 16 SAE standard on 3" through 4" bores
NPTF threads are not available

CROSS

HYDRAULIC CYLINDERS

TIE ROD CYLINDERS
DH SERIES
Specification Sheet

STANDARD DH CYLINDER SIZES

Description	Rod Dia. *	Closed Center	**
208DH-ASAE	1.06	20.25	3000
210DH	1.06	20.25	3000
212DH	1.06	22.25	3000
214DH	1.06	24.25	3000
216DH	1.12	26.25	3000
218DH	1.12	28.25	3000
220DH	1.12	30.25	2387
224DH	1.12	34.25	1783
230DH	1.12	40.25	1225
2508DH-ASAE	1.25	20.25	3000
2510DH	1.25	20.25	3000
2512DH	1.25	22.25	3000
2514DH	1.25	24.25	3000
2516DH	1.25	26.25	3000
2518DH	1.25	28.25	2802
2520DH	1.25	30.25	2363
2524DH	1.25	34.25	1752
2530DH	1.25	40.25	1202
308DH-ASAE	1.25	20.25	3000
310DH	1.25	20.25	3000
312DH	1.25	22.25	3000
314DH	1.50	24.25	3000
316DH-ASAE	1.50	31.50	3000
318DH	1.50	28.25	3000
320DH	1.50	30.25	3000
324DH	1.50	34.25	2455
330DH	1.50	40.25	1691
336DH	1.50	46.25	1231
3508DH-ASAE	1.25	20.25	3000
3510DH	1.25	20.25	3000
3512DH	1.50	22.25	3000
3514DH	1.50	24.25	3000
3516DH-ASAE	1.50	31.50	3000
3518DH	1.50	28.25	3000
3520DH	1.75	30.25	3000
3524DH	1.75	34.25	3000
3530DH	1.75	40.25	2333
3536DH	1.75	46.25	1694
408DH-ASAE	1.25	20.25	3000
410DH	1.50	20.62	3000
412DH	1.50	22.62	3000
414DH	1.50	24.62	3000
416DH-ASAE	2.00	31.50	3000
418DH	2.00	28.62	3000
420DH	2.00	30.62	3000
424DH	2.00	34.62	3000
430DH	2.00	40.62	3000
436DH	2.00	46.62	2240

** Piston rods are sized with a safety factor of 2.* *** Max. PSI at base port due to column loading.*

HYDRAULIC CYLINDERS CROSS

ORDERING INFORMATION

SERIES	BORE DIA. INCH X 100	STROKE INCH X 100	ROD DIA. INCH X 100	PORT SIZE (SAE ONLY)	END MOUNTING	CLEVIS PIN	OTHER
DH	200	AS	106	C - 9/16-18 SAE	C	A. 1.00 STEEL	0 -NONE
	250	REQUIRED	112	D - 3/4-16 SAE	CLEVIS (STD.)	B. 1.00 HARD	
	300		125			C. 1.25 HARD	X SPECIFY
	350		150				
	400		175				
			200				

ASAE STANDARD CYLINDERS

The DH-ASAE cylinders are designed for use where 8" and 16" stroke ASAE cylinders are required to match specifications on certain types of equipment. Pin sizes and closed centers are standardized on these cylinders to match ASAE specifications. Therefore, no additional options are available.

MODEL NUMBER	BORE DIA. INCHES	STROKE INCHES	ROD DIA. INCHES	CLOSED CTR. DIM. INCHES	PORTING	CLEVIS PIN	WEIGHT LBS.
208DH-ASAE	2	8	1.06	20.25	9/16-18 SAE	1"	18
2508DH-ASAE	2 1/2	8	1.25	20.25	9/16-18 SAE	1"	20
308DH-ASAE	3	8	1.25	20.25	3/4-16 SAE	1"	24
3508DH-ASAE	3 1/2	8	1.25	20.25	3/4-16 SAE	1"	30
408DH-ASAE	4	8	1.25	20.25	3/4-16 SAE	1"	37
316DH-ASAE	3	16	1.50	31.50	3/4-16 SAE	1 1/4"	35
3516DH-ASAE	3 1/2	16	1.50	31.50	3/4-16 SAE	1 1/4"	51
416DH-ASAE	4	16	2.00	31.50	3/4-16 SAE	1 1/4"	65

CROSS

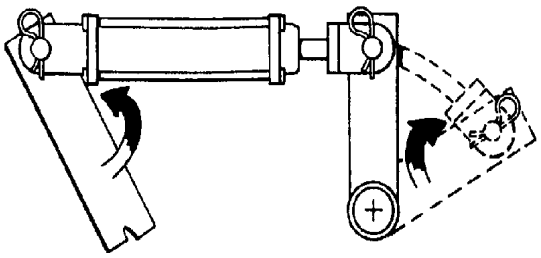
CROSS MANUFACTURING, INC.
100 Factory Street
Lewis, Kansas 67552
PHONE 620/324-5525 FAX620/324-5737

HYDRAULIC CYLINDER SAFETY

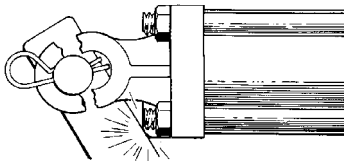
General Cautions:

- Always use a relief or bypass in your hydraulic system to prevent personal injury and/or breakage of equipment or components. Never operate a cylinder above rated pressures.
- Never use a cylinder as a transport device.
- Use correct fittings and proper hydraulic oil - Contact CROSS if you have questions.

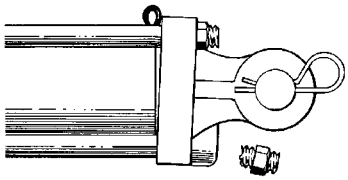
Binding



Check clevis clearances before, during and after extending the cylinder and before using the cylinder under pressure to avoid possible injury, or bent or broken rods or clevises caused by binding.

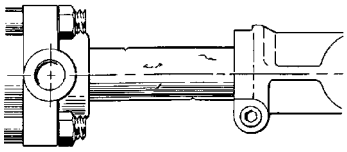


Too much pressure causes...



Extruded static seals and/or broken tie rods. Check pressure rating of cylinder against pump pressure of the tractor.

Rough or scored rod



Protect the rod at all times and make sure that nothing hits or rubs it when it is extended. Rough places on the rod damage the seals and reduce their normal life resulting in the necessity for frequent replacement.

Dirty Oil

Oil must be filtered to a minimum of 25 microns. Filters should be changed regularly - spin-on types after 50 hours of initial use and then after every two hundred fifty hours of use. Use of a condition indicator is recommended. Consult your tractor or implement owner's manual for filtration and changing recommendations for internal systems

Pinhole Leaks

If you observe a pinhole leak, discontinue use of the component. If oil has penetrated your skin or contacted your eye, seek medical attention immediately!

CROSS MANUFACTURING, INC.

LEWIS, KANSAS

PHONE 620/324-5525

FAX 620/324-5737

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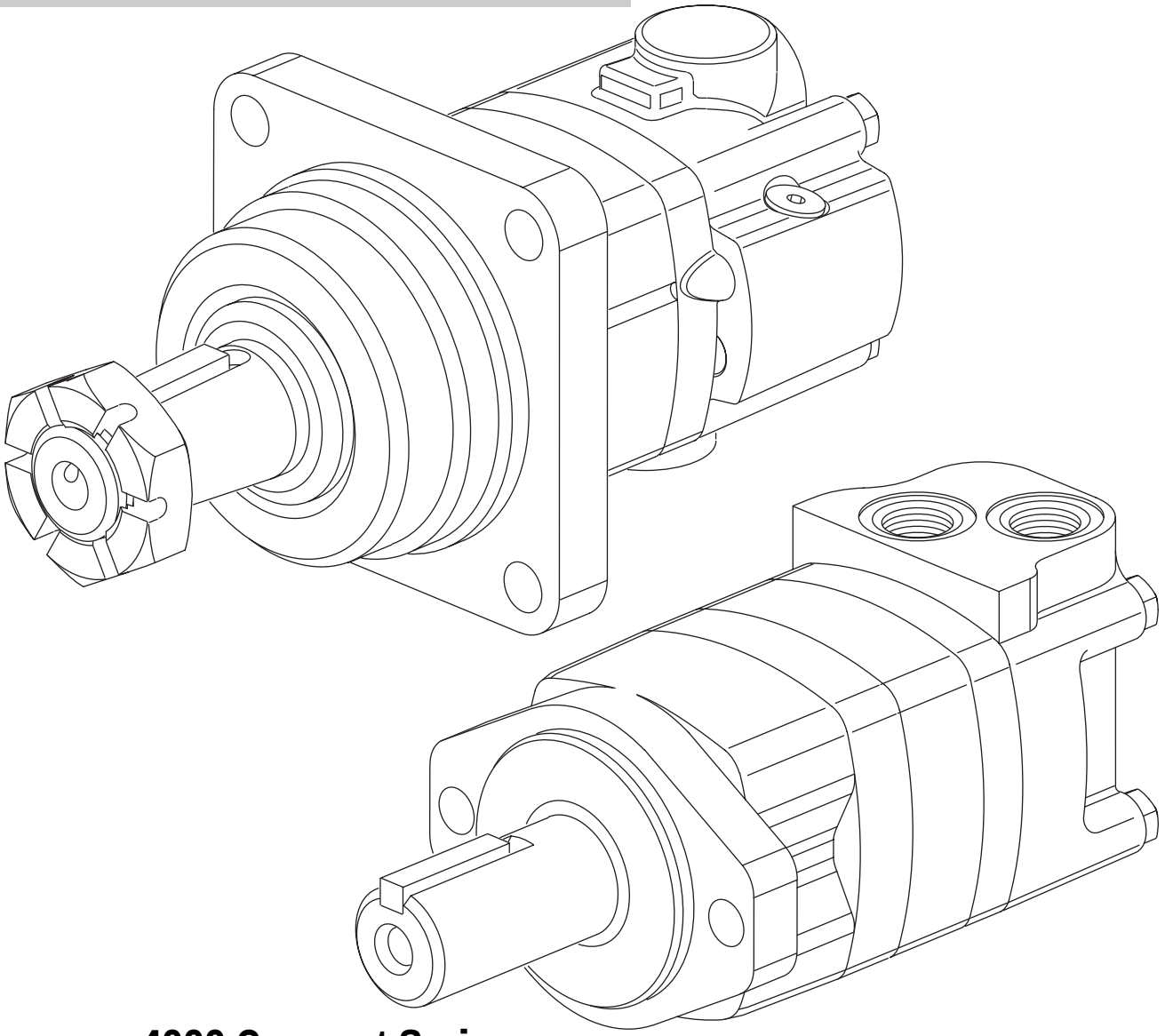
CYL30077C 6/98

Char-Lynn®
Hydraulic Motor

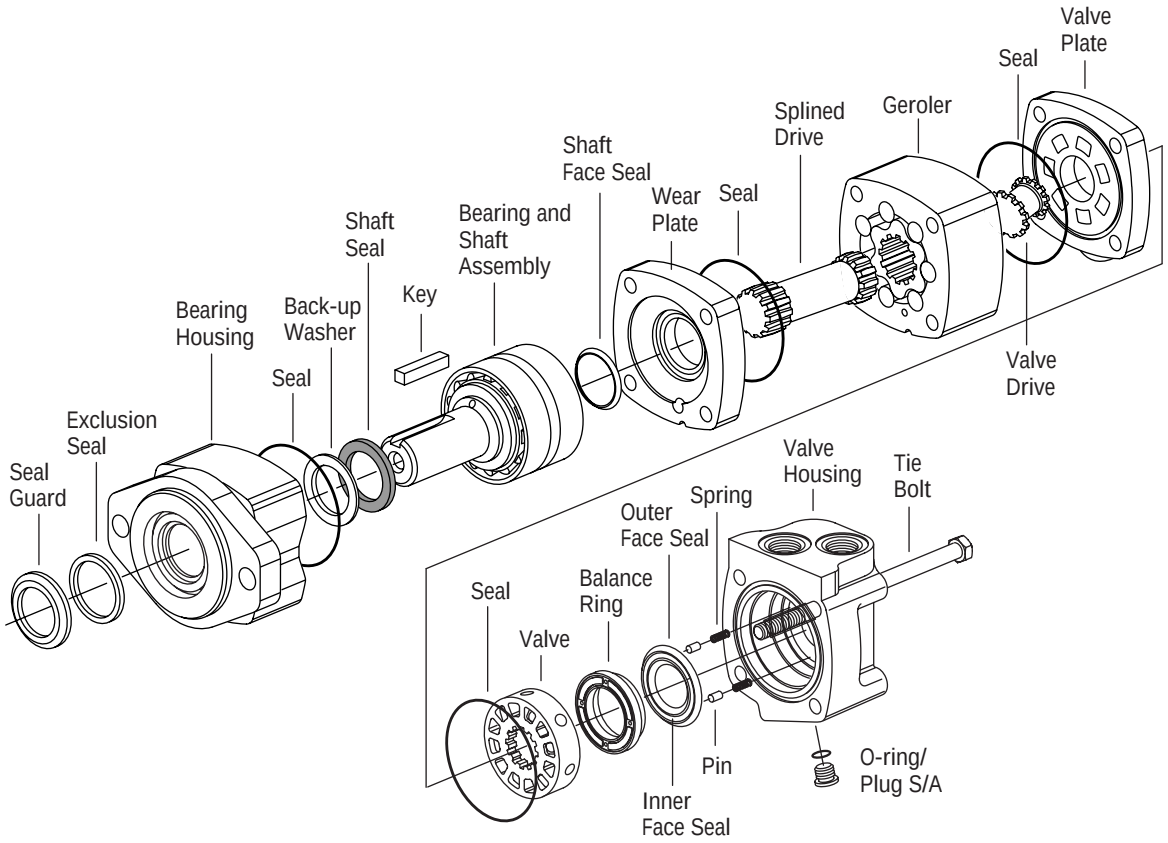
07-01-160
EN-0500

Repair Information



4000 Compact Series
Disc Valve Geroler Motor

001



Tools required for disassembly and reassembly.

Torque wrench 57Nm [500 lb-in] capacity

300 - 450 mm [12 - 16 inch]* breaker bar

9/16 socket

Small screwdriver 150-200 L x 6,5 W [6-8 L x 1/4 W] blade

3/16 Allen wrench

Press

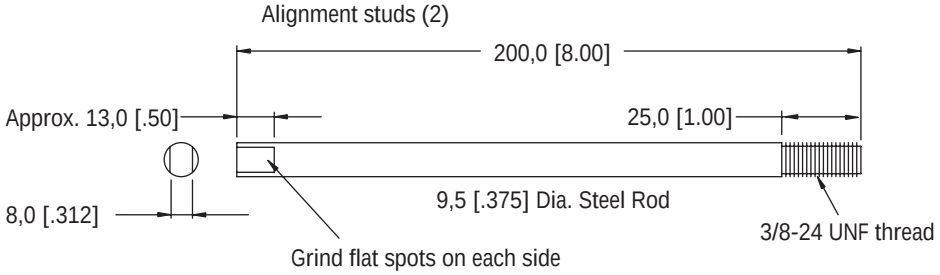
Shaft Bullet (600465) 1–1/4 inch or 32 mm shafts

* Unless indicated otherwise, measurements are given in mm [inches]

** Shaft seal installation tool (600496) 1–1/4 inch or 32 mm shafts

** Shaft seal installation tool (600421-2) 1–1/2 inch or 40 mm shafts

The following tools are not necessary for disassembly and reassembly, but are extremely helpful.



Disassembly

Alignment studs (2)

Cleanliness is extremely important when repairing a hydraulic motor. Work in a clean area. Before disconnecting the lines, clean the port area of the motor thoroughly. Use a wire brush to remove foreign material and debris from around the exterior joints of the motor. Check the shaft and key slot, remove all nicks, burrs or sharp edges that might damage the bearing housing seals when installing the shaft

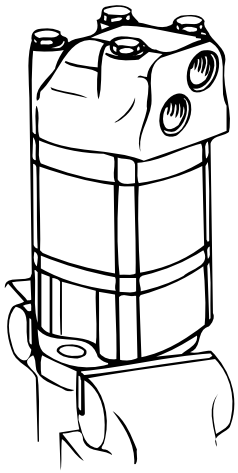


Figure 1

and bearing assembly. Before starting the disassembly procedures, drain the oil from inside the motor.

1 Place the motor in a vise with the output shaft down. Clamp across the mounting flange of the motor not the housing. Excessive clamping pressure will cause distortion. When clamping, use some protective device on the vise, such as special soft jaws, pieces of hard rubber or board.

Although not all drawings show the motor in a vise, we recommend

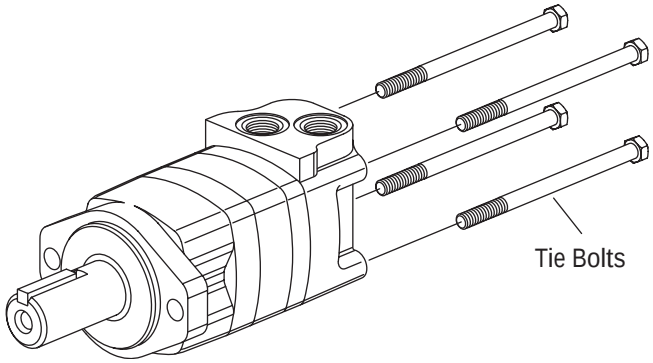


Figure 2

that you keep the motor in the vise during disassembly and reas-

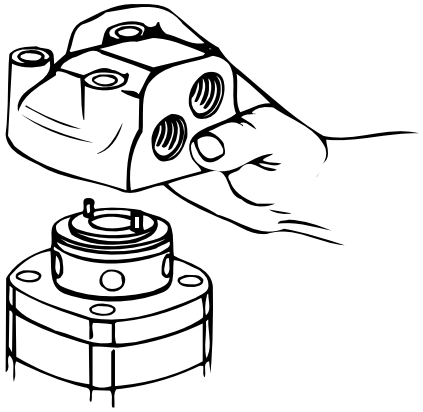


Figure 3

sembly. Follow the clamping procedures explained throughout the manual.

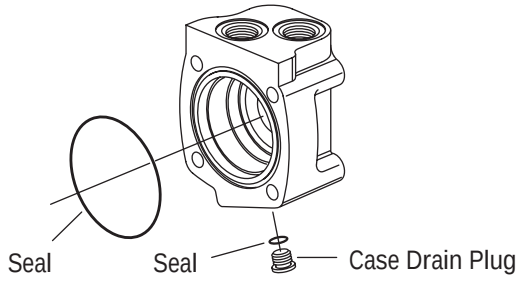


Figure 4

2 Remove 4 bolts from motor.

3 Lift valve housing straight up. If done carefully the pins, springs, balance ring assembly, and valve will remain on the valve plate.

4 Carefully remove 76,0 [3.00] diameter seal from valve housing.

5 Remove case drain plug—with seal, from valve housing.

6 Remove 2 pins and 2 springs from balance ring assembly, see Figure 5.

Disassembly

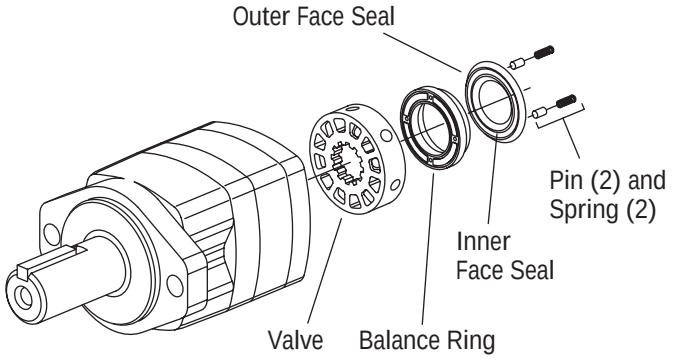


Figure 5

7 Remove balance ring assembly.

8 Remove inner and outer face seals from balance ring.

9 Remove the valve.

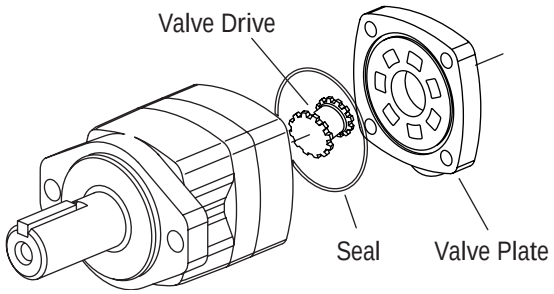


Figure 6

10 Remove the valve plate.

11 Remove the 76,0 [3.00] diameter seal from valve plate.

12 Remove the valve drive.

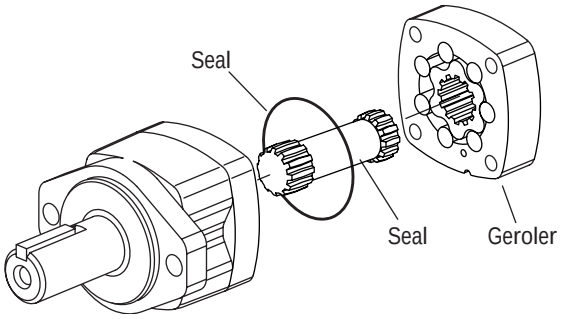


Figure 7

13 Remove the Geroler. Be sure to retain the rollers in the outer ring if they are loose.

14 Remove the drive.

15 Remove the 76,0 [3.00] diameter seal from wear plate, see Figure 7.

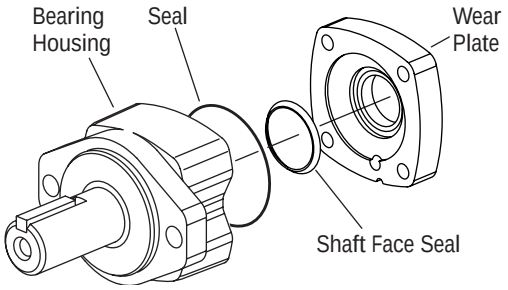


Figure 8

16 Remove the wear plate.

17 Remove the shaft face seal from the wear plate.

18 Remove the 76,0 [3.00] diameter seal from bearing housing.

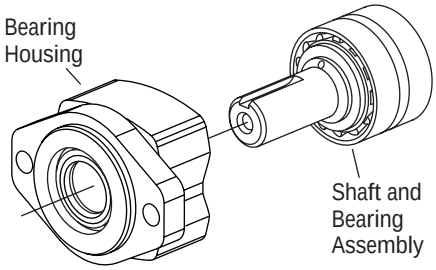


Figure 9

19 You may need a press to remove shaft and bearing assembly from bearing housing. (Key must be removed before removing shaft.)

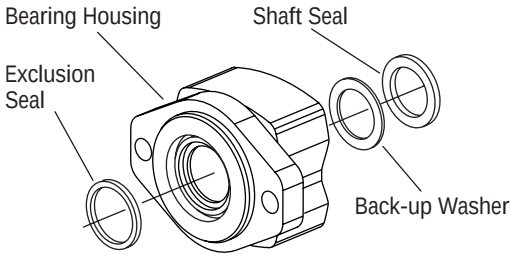


Figure 10

20 Use a small screwdriver to remove shaft seal, back-up washer and exclusion seal from bearing housing, see Figure 10. Do not damage bore of housing.

Note: Individual parts of shaft and bearing assembly are not sold separately. Replace as a unit.

Reassembly

Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe dry with cloth or paper towel because lint or other matter can get in the hydraulic system and cause damage. Do not use a coarse grit or try to file or grind these parts. Check around the keyway and chamfered area of the shaft for burrs, nicks or sharp edges that can damage the seals when reassembling the bearing housing.

Note: Lubricate all seals (prior to installation) with petroleum jelly such as Vaseline. Use new seals when reassembling this motor. Refer to parts list (6-129) for proper seal kit number.

21 Use a press to install exclusion seal in outer bore of bearing housing. Lip of seal must face outward. See Figure 11. If a press is not available use a plastic or rubber hammer, being careful not to damage or cock seal in the bore.

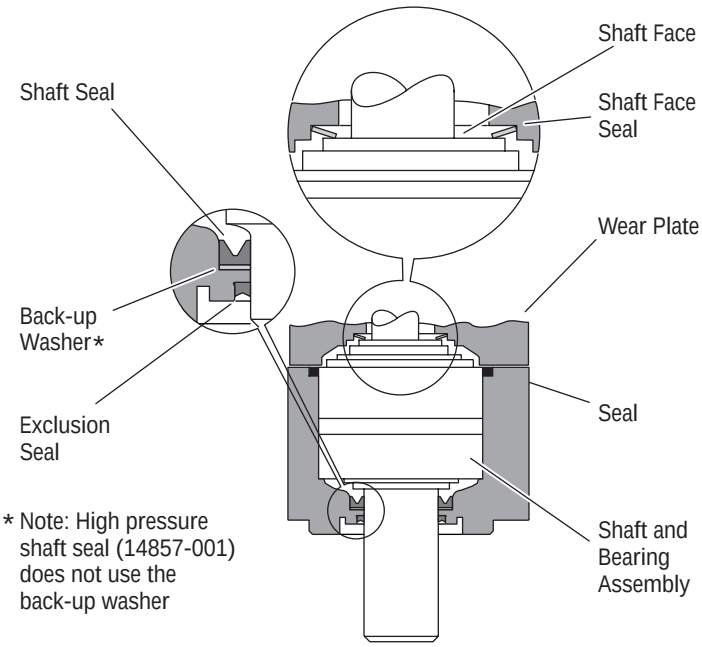


Figure 11

22 Place back-up washer into seal bore. Place shaft seal onto installation tool (600496) 1–1/4 inch or 32 mm shafts or (00000) 1–1/2 inch 40 mm shafts and press seal into seal bore of the housing.

23 Clamp housing in vise, see Figure 1.

24 Place protective bullet (see note below) over shaft. Apply petroleum jelly to inside diameter of dust and shaft seal. You may need a press to install shaft and bearing assembly. Do not distort shaft seal. Damage to this seal will cause leakage.

Note: Bullet (600465) for 1–1/4 inch or 32 mm shafts,— by special order.

25 Apply small amount of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal into the bearing housing.

26 Alignment studs can be very helpful in reassembly of the motor. See special tool listing page 2. If you use studs, install 2 studs diagonally opposed in the bearing housing.

27 Install the shaft face seal in the wear plate as shown in Figure 11. Do not distort seal.

28 Install the wear plate, see Figure 11.

29 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal and install seal in the wear plate.

30 Install the drive into the output shaft.

31 Align the notch on the outside of the Geroler with the notch on the wear plate. Install the Geroler against the wear plate. Be sure to retain the rollers in the outer ring if they are loose.

32 Install the valve drive in the Geroler.

Note: Installation at this time involves 3 steps in the timing of the motor. Timing determines the direction of rotation of the output shaft. Timing parts include:

1. Geroler
2. Valve Drive
3. Valve Plate
4. Valve

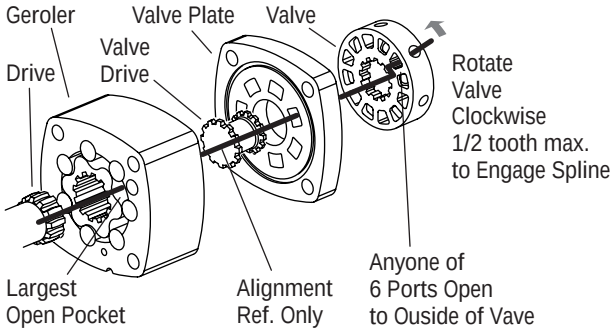


Figure 12 Timing Alignment

Timing Step # 1 — Locate the largest open pocket in the Geroler and mark it on the outside edge of the Geroler.

33 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal in groove of valve plate.

Reassembly

34 Align the notch on the outside of the valve plate with the notch on the Geroler as shown in Figure 12.

Timing Step # 2 — Locate the slot opening in the valve plate which is in line with the largest open pocket of the Geroler.

Timing Step # 3 — Locate any one of the side openings of the valve and align this opening with the open slot of the valve plate that is in line with the largest open pocket of the Geroler. Install the valve by rotating it clockwise until the spine teeth engage (1/2 spine tooth max.). This will provide the proper rotation when pressurized as shown in Figure 13.

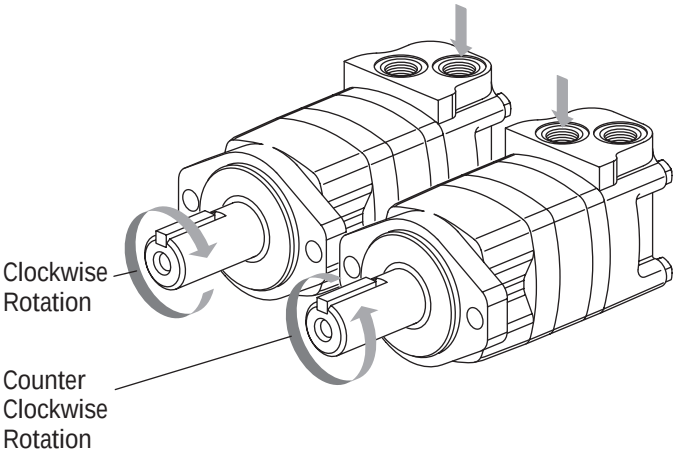


Figure 13

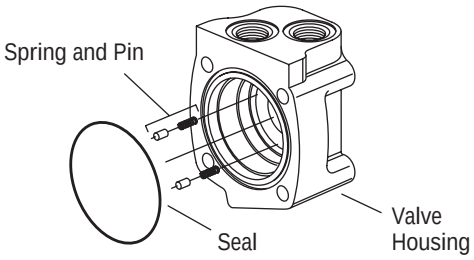


Figure 14

35 Install 2 springs and 2 pills in the holes located in the bore of the valve housing, as shown in Figure 14.

36 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal in the valve housing.

37 Apply petroleum jelly to inner and outer face seals. Install seals on balance ring as shown in Figure 15.

Important: Install face seals in the positions shown in Figure 15, or the motor will not operate properly. Do not force or bend the face seals. Any damage to these seals will affect the operation of the motor.

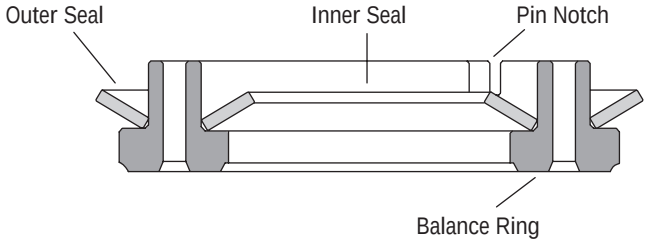


Figure 15

38 Align pin notches in balance ring with pins in bore of valve housing. Install balance ring assembly in valve housing.

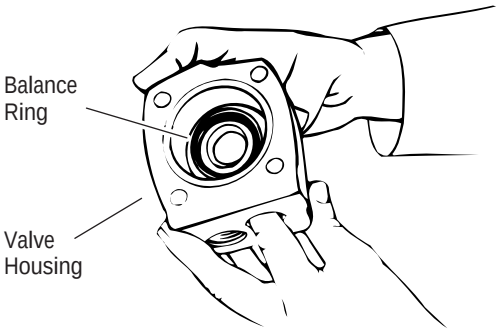


Figure 16

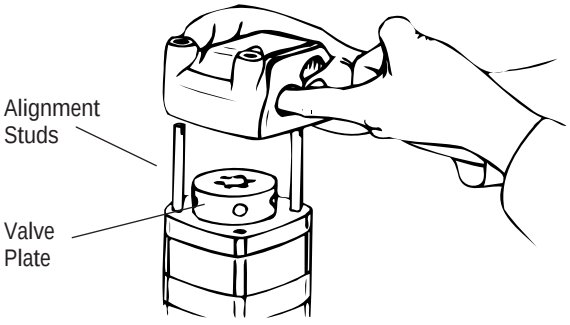


Figure 17

39 Insert your finger through port of valve housing. Apply pressure to side of balance ring as shown in Figure 16. Hold ring in position until valve housing is in place against valve plate (see Figure 17).

Note: After installing the valve housing on the valve plate check for proper placement. Push down on the valve housing. You should get a slight spring action.

Reassembly

40 Install tie bolts. If you use alignment Studs, install 2 bolts opposite the studs. Finger tighten the bolts. Remove the alignment studs and replace with the two remaining bolts. Torque all four bolts alternately to 50 Nm [450 lb-in].

41 Install seal on case drain plug then install in valve housing. Torque to 6 Nm [50 lb-in.]

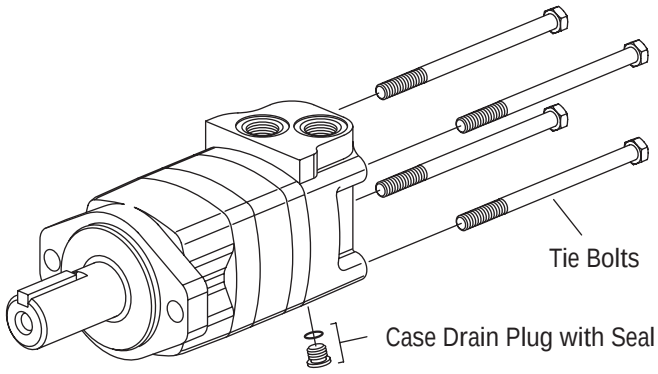


Figure 18

Wheel Motor

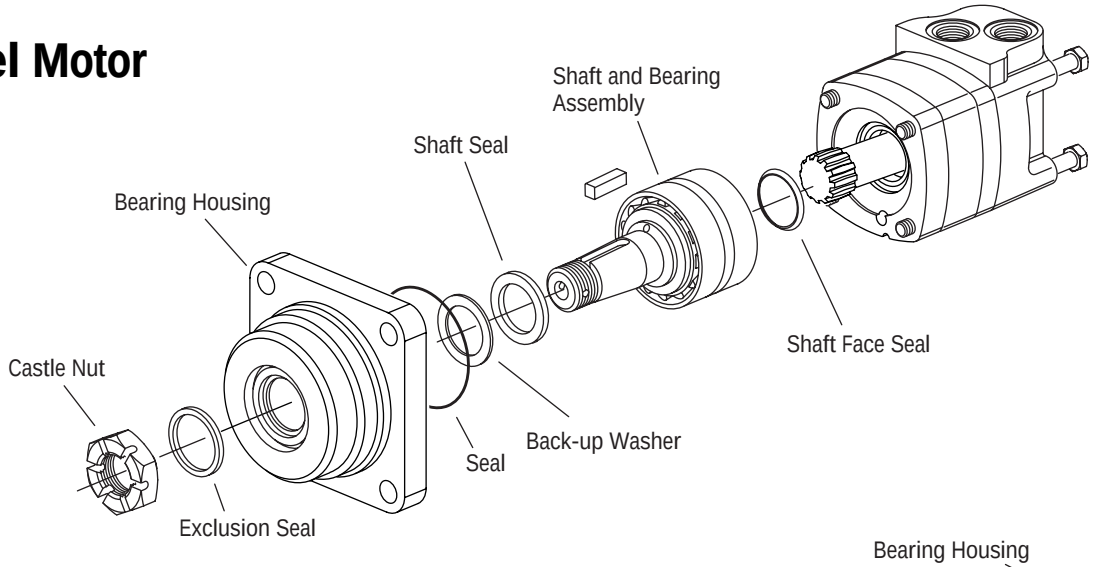
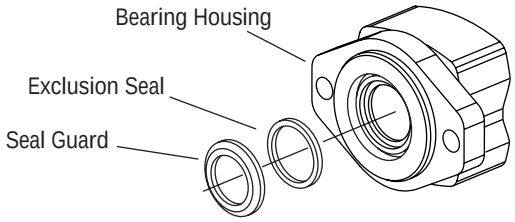
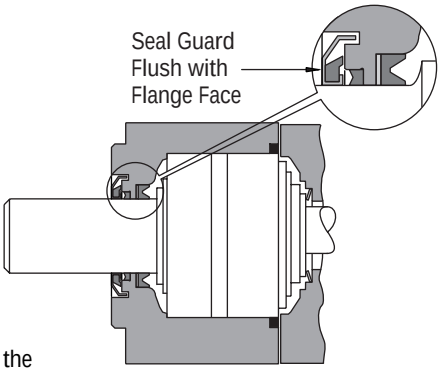


Figure 19

On wheel motors, a different bearing housing is used, see Figure 19. Other than this the same parts are the same as the standard motor and the same disassembly and reassembly procedures apply.





Wheel Motor with Seal Guard

Installation of Seal Guard:

After completing assembly of the shaft and bearing assembly into the bearing housing, press the seal guard onto the shaft with a tool that will provide an even push over the seal. This tool must bottom out against the bearing housing and provide a 4,5 mm [.177 inch] stop for the seal guard.

Bearingless Motor

This motor is the same as the standard motor without the shaft/ bearing assembly, and bearing housing. The mounting flange replaces the bearing housing, see Figure 20. Follow same disassembly and reassembly procedures as rear section of standard motor.

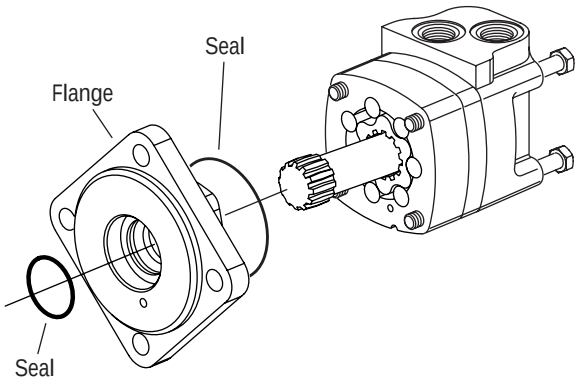


Figure 20

Disassembly Reassembly Shuttle Valve Option

Disassembly of shuttle valve option, this valve is located in the valve housing. Clean and inspect shuttle valve parts and reassemble with new seals, torque plugs to 8-11 Nm [75-100 lb-in].

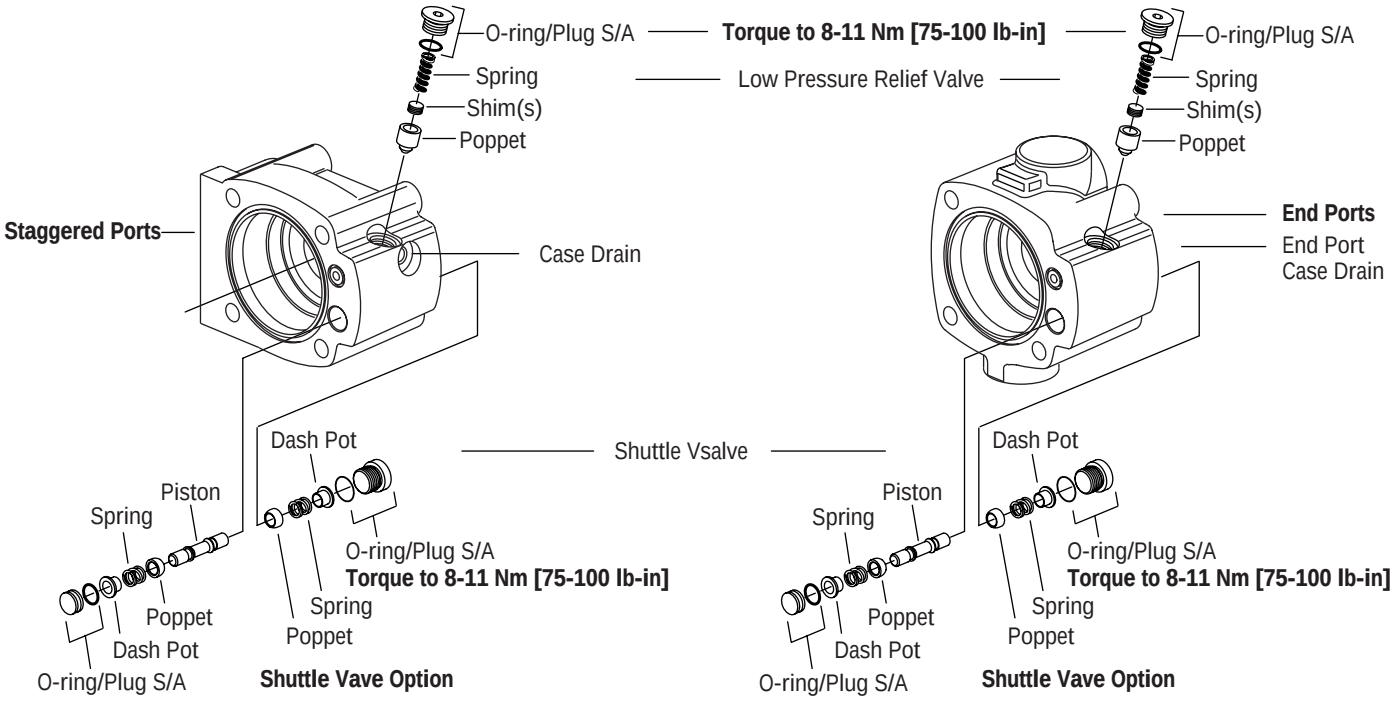


Figure 21

Reassembly — Speed Sensor

1 Rotate the motor shaft until a (gear/target) tooth is centered in the speed sensor port. If this is not done, the sensor may be damaged during the operation of the motor.

2 Make sure the lock nut and its threads are clean and dry for the proper torque. Position the lock nut against the alignment nut as shown in Figure 22.

3 Move the washer and the o-ring up against the speed sensor body threads as shown in Figure 22.

4 By hand, lightly thread the speed sensor body into the housing until the sensor touches against the motor (gear/target) tooth. **Do not force the sensor against the (gear/target) tooth, damage may occur.** Make sure the o-ring or the washer do not touch the housing — see Figure 23.

5 Turn the speed sensor body out one quarter turn (CCW) plus the additional amount (CCW) needed to make the alignment notches perpendicular to the motor shaft centerline (90° +/-5 degrees from the motor shaft centerline — Figure 24 and 25).

6 Maintain the speed sensor body alignment (Figure 25), and tighten the lock nut to 8,5-14 Nm [75-125 lb-in.] (torque values are for clean dry threads).

7 Check the speed sensor body for correct alignment (Figure 25), reinstall the sensor if it is not correct.

Speed Sensor Installation

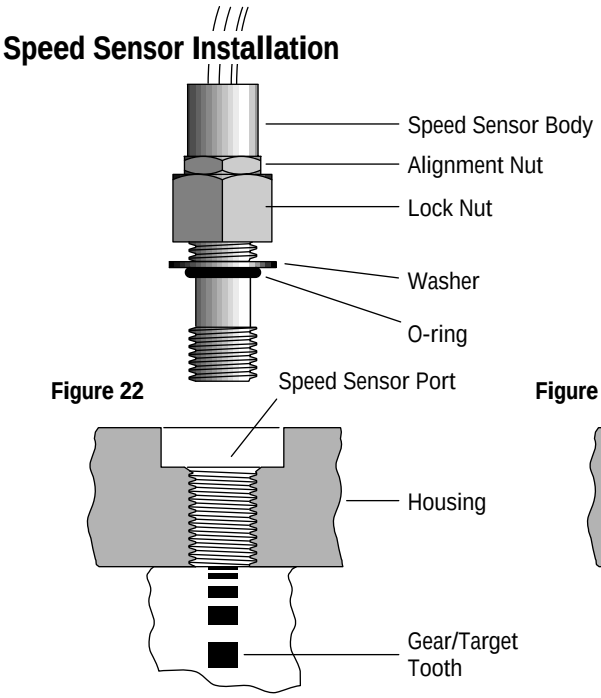


Figure 22

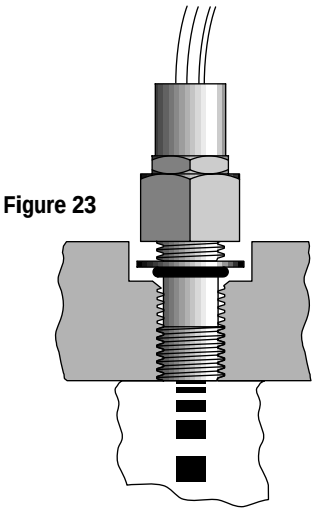


Figure 23

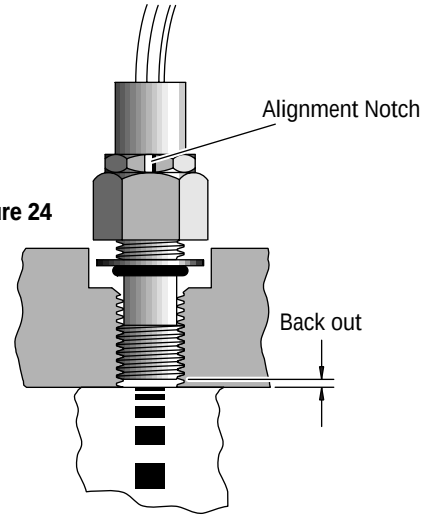


Figure 24

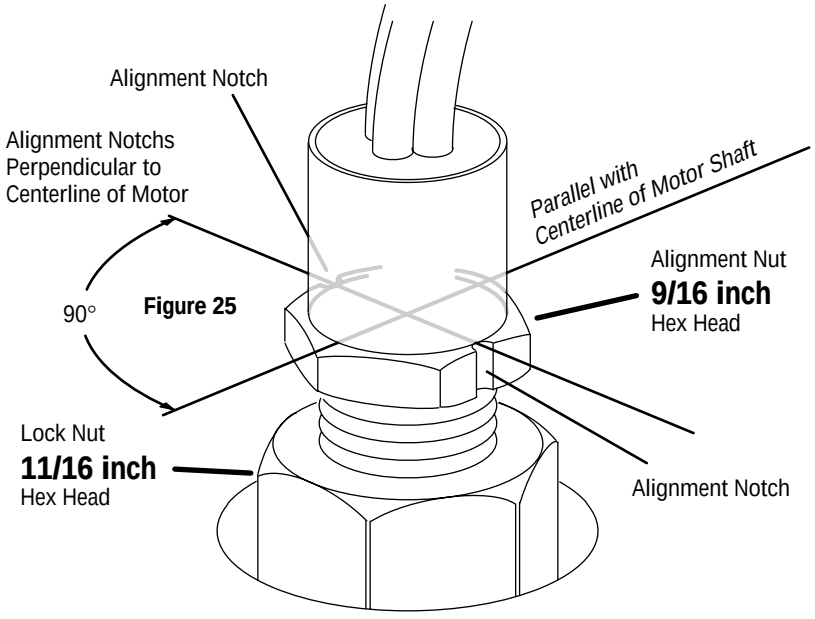


Figure 25

Reassembly — Quadrature Speed Sensor

1) Rotate the motor shaft until a (gear/target) tooth is centered in the speed sensor port. If this is not done, the sensor may be damaged during the operation of the motor.

2) Make sure the lock nut and its threads are clean and dry for the proper torque. Position the lock nut against the alignment nut as shown in Figure 1.

3) Move the washer and the o-ring up against the speed sensor body threads as shown in Figure 1.

4) By hand, lightly thread the speed sensor body into the housing until the sensor touches against the motor (gear/target) tooth. **Do not force the sensor against the (gear/target) tooth, this might damage the sensor.** Make sure the o-ring and the washer are not touching the housing, see Figure 2.

5) Back out the speed sensor body one half turn (CCW) plus the additional amount (CCW) needed to make the sensor alignment notch point to your right (when viewing from the shaft end of the motor). The speed sensor must be backed out (turned CCW) from the (gear/target) tooth **no more than a turn and a half (540 degrees) total.** The sensor alignment notch should be perpendicular to the motor shaft +/- 5 degrees (Figure 3 and 4).

To verify that the speed sensor is installed properly, review the following steps:

A) Imagine holding the motor shaft in your hand with the end of the motor pointing away from your body.

B) Rotate the motor such that the speed sensor is pointing straight up.

C) The alignment notch should be pointing directly to your right.

D) The sensor alignment notch should be perpendicular to the motor shaft centerline +/- 5 degrees.

6) Maintain the speed sensor body alignment (Figure 4) and tighten the lock nut to 8,5 - 14 Nm [75-125 lb-in]. Torque values are for clean dry threads.

7) Check the speed sensor body for correct alignment (Figure 4) and reinstall the sensor if it is not correct.

Speed Sensor Installation

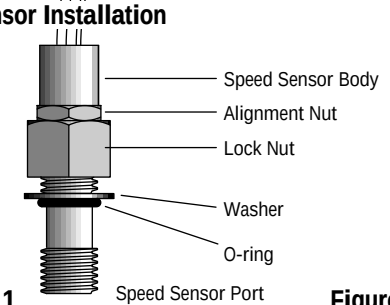


Figure 1

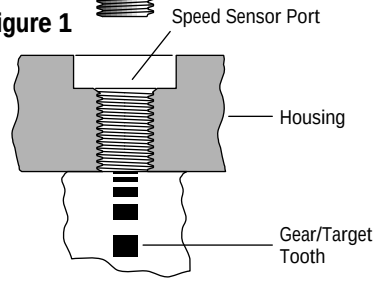
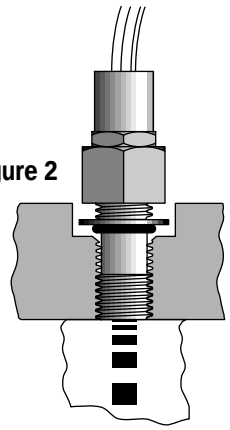
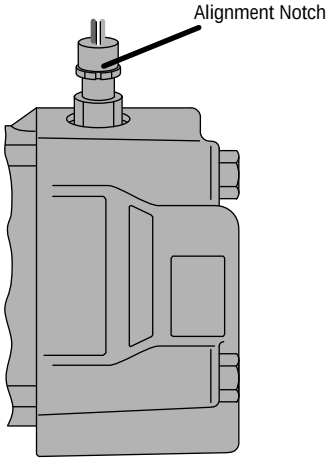


Figure 2





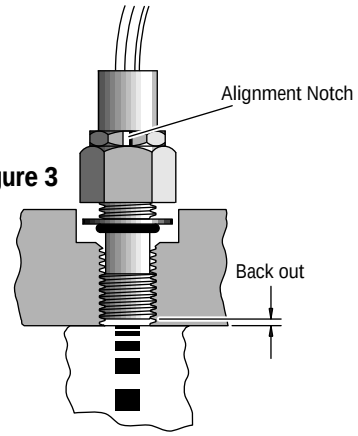
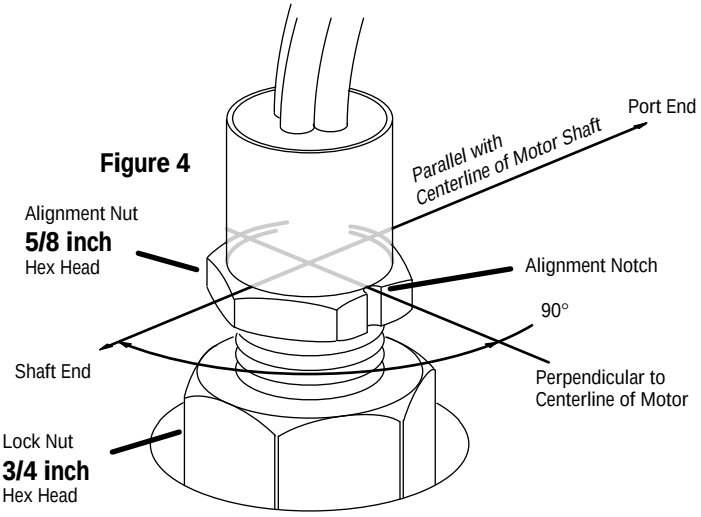


Figure 3

Figure 4



Product Identification

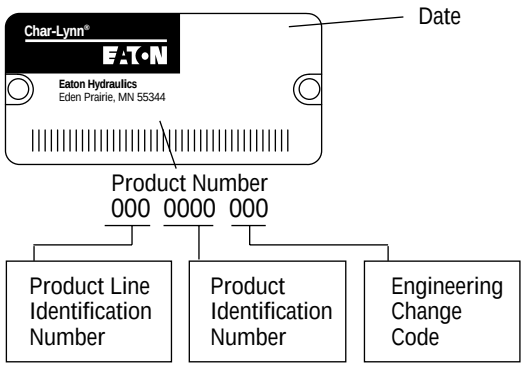
For Additional Literature Contact Eaton Hydraulics
14615 Lone Oak Road Eden Prairie, MN 55344.

- Specifications and performance data, Catalog 11-01-113
- Replacement part numbers and kit information — Parts Information 06-01-168

How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts



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Telephone: 952 937-7254
Fax: 952 937-7130
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46 New Lane, Havant
Hampshire PO9 2NB
England
Telephone: (44) 170-548-6451
Fax: (44) 170-548-7110

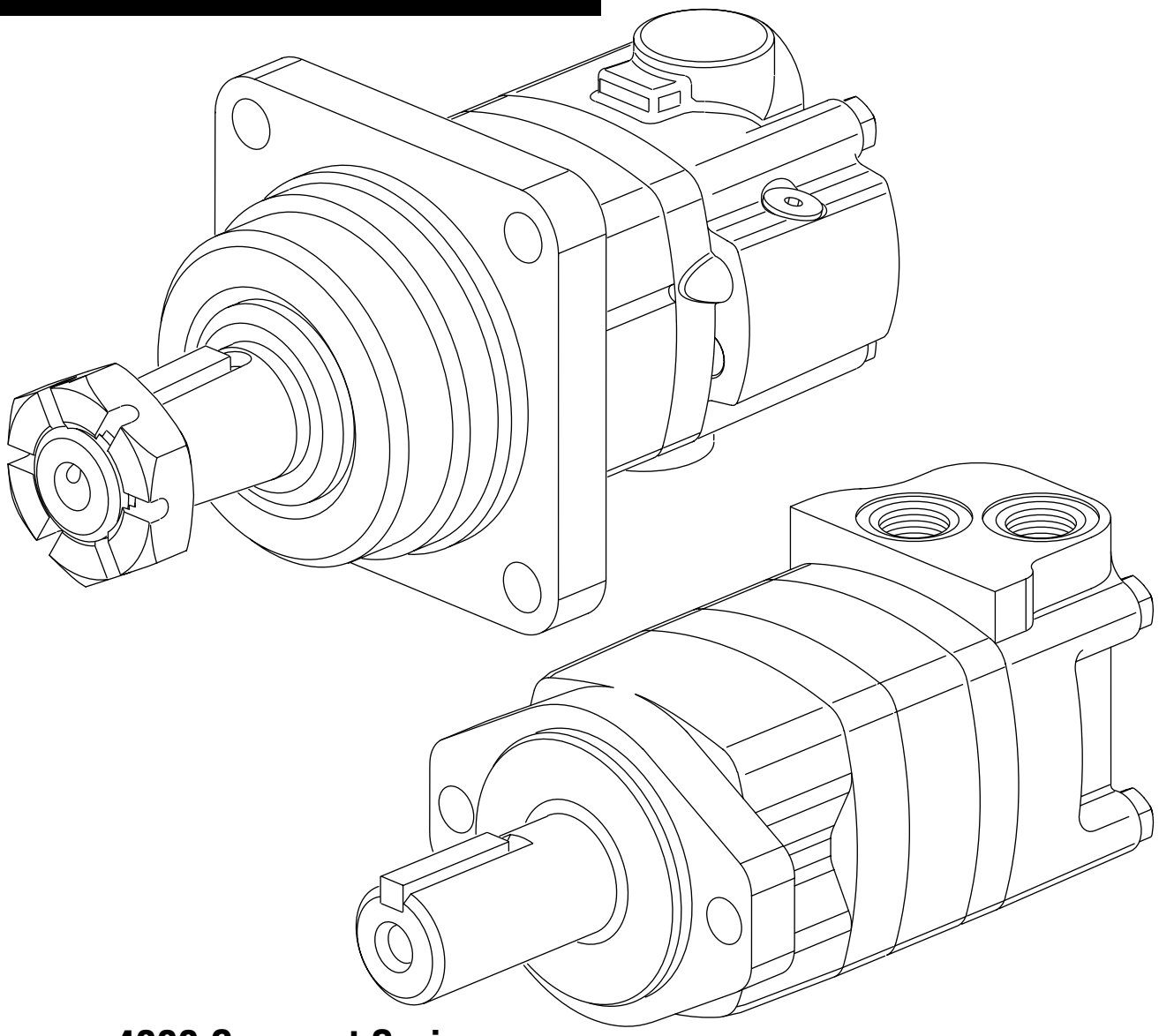
Quality System Certified
Products in this catalog are manufactured in an ISO-9001-certified site.

07-01-160
EN-0500

Char-Lynn®
Disc Valve Motors

06-01-168
EN-0500

Parts Information

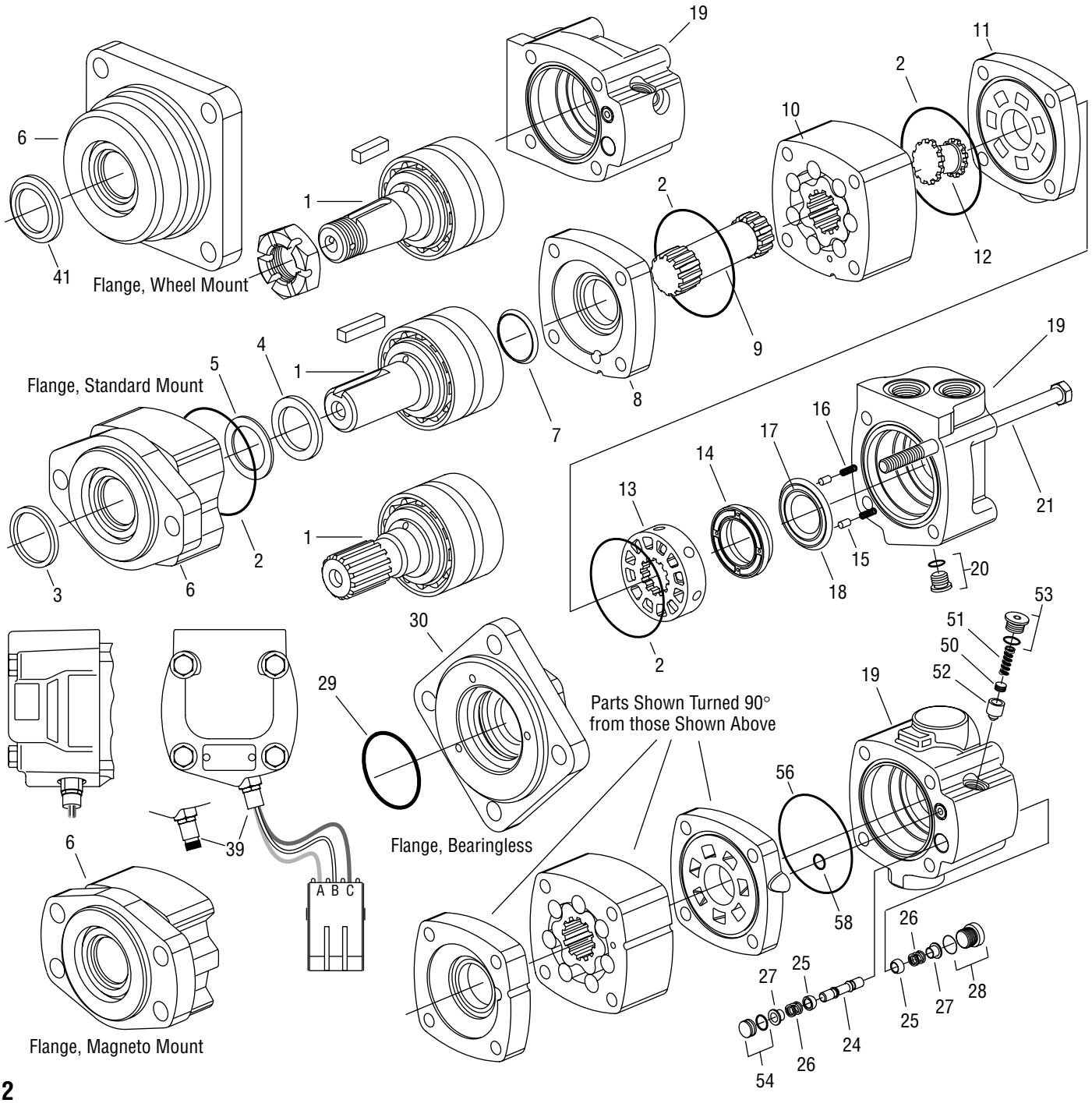


4000 Compact Series
Geroler® Motors

001

Parts Drawing/List

Displacement cm³/r [in³/r]	Drive, Main Item No. 9 —Part No./Length		Geroler® Item No. 10 —Part No./Width		Screw, Cap (Standard/Wheel) Item No. 21 —Part No./Length		Screw, Cap (Bearingless) Item No. 21 —Part No./Length	
	Part No.	mm [inch]	Part No.	mm [inch]	Part No.	mm [in.]	Part No.	mm [in.]
160 [9.8]	202989-004	82,3 [3.24]	202871-004	35,6 [1.40]	14384-008	144,8 [5.70]	14384-004	127,3 [5.01]
200 [12.3]	202989-005	91,6 [3.60]	202871-005	44,7 [1.76]	14384-010	154,9 [6.10]	14384-007	138,4 [5.45]
250 [15.4]	202989-006	102,9 [4.05]	202871-006	56,0 [2.21]	14384-012	164,5 [6.48]	14384-008	144,8 [5.70]
305 [19.8]	202989-007	119,1 [4.69]	202871-007	72,0 [2.83]	14384-014	182,4 [7.18]	14384-012	164,5 [6.48]
395 [24.0]	112643-008	119,1 [4.69]	112644-008	72,0 [2.83]	14384-014	182,4 [7.18]	14384-012	164,5 [6.48]
490 [29.8]	112643-012	136,1 [5.36]	112644-010	89,4 [3.52]	14384-019	199,6 [7.86]	14384-014	182,4 [7.18]



Parts List 1 of 2

	Ref No.	Part Number (per shaft size)	Part Number (per shaft size)	Description	Quantity per Unit Std.	Whl.	Brgl.
	1	202861-002		Shaft and Bearing Kit (1-1/4 inch Straight)	1	1	
		14392-008		Key (for 1-1/4 Straight Shaft)	1	1	
			202861-011	Shaft and Bearing Kit (1-1/2 inch Straight)	1	1	
			14393-015	Key (for 1-1/2 Straight Shaft)	1	1	
		202861-010		Shaft and Bearing Kit (32 mm Straight)	1	1	
		14460-005		Key (for 32mm Straight Shaft)	1	1	
			202861-008	Shaft and Bearing Kit (40 mm Straight)	1	1	
			14458-007	Key (for 40mm Straight Shaft)	1	1	
		202861-003		Shaft and Bearing Kit (1-1/4 in. Tapered)	1	1	
		14163-000		Nut, Hex (1-1/4 in. Tapered Shaft)	1	1	
		14392-006		Key (for 1-1/4 in. Tapered Shaft)	1	1	
			202861-098	Shaft and Bearing Kit (1-5/8 in. Tapered)	1	1	
			14230-000	Nut, Hex (1-5/8 in. Tapered Shaft)	1	1	
			14394-007	Key (for 1-5/8 in. Tapered Shaft)	1	1	
		202861-004		Shaft and Bearing Kit (1-1/4 in. Splined 14T)	1	1	
			202861-099	Shaft and Bearing Kit (1-1/2 in. Splined 17T)	1	1	
† O Δ	3	9121-001	9031-001	Seal, Exclusion	1	1	
† O	4	9057-009	9057-012	Seal, Shaft	1	1	
Δ		14857-001		Seal, Shaft — High Pressure (no Back-up Ring required)	1	1	
† O	5	7382-000	6943-000	Ring, Back-up	1	1	
	6	202442-004	202442-098	Housing, Bearing, SAE A (Two Bolt)	1		
		202442-003	202442-099	Housing, Bearing, Wheel Mount (Four Bolt)		1	
		202442-015		Housing, Bearing, Wheel Mount (Four Bolt) — Compatible for HAYES Brake		1	
		202442-001		Housing, Bearing, SAE B (Two Bolt)	1		
		202442-005		Housing, Bearing, Diagonal (Four Bolt)	1		
		202442-008		Housing, Bearing, Magneto (Four Bolt)	1		
Δ	41	14628-006	14628-004	Seal Guard	1	1	
		61333-000	61353-000	Seal Kit (Std. and Whl. Motors with back pressure relief valve)—Contains Parts Indicated by †			
		61334-000	61352-000	Seal Kit (Std. and Whl. Motors without back pressure relief valve)—Contains Parts Indicated by O			
		61337-000	N/A	Seal Kit (Std. and Whl. Motors with high pressure shaft seal)—Contains Parts Indicated by Δ			

	Ref No.	Part Number	Description	Quantity per Unit Std.	Whl.	Brgl.
† O # X Δ	2	112530-040	Seal	4	4	
† O X Δ	7	202877-001	Seal, Shaft Face	1	1	
	8	202862-003	Plate, Wear (no leakage slots)	1	1	
		202862-004	Plate, Wear (with leakage slots)	1	1	
	9	*	Drive, Main	1	1	1
	10	*	Geroler®	1	1	1
	11	203330-001	Plate, Valve (for motor without Shuttle)	1	1	1
		203330-002	Plate, Valve (for motor with Shuttle)	1	1	1
	12	202827-001	Drive, Valve	1	1	1
	13	21466-000	Valve	1	1	1
		201307-002	Valve — Speed Sensor Valve	1	1	1
		201307-003	Valve — Speed Sensor Valve – Quadrature	1	1	1
	14	8915-000	Balance Ring	1	1	1
	15	14351-000	Pin, Balance Ring	2	2	2
	16	7383-000	Spring, Compression	2	2	2
† O # X Δ	17	9049-001	Seal, Face, Inner	1	1	1
† O # X Δ	18	9135-002	Seal, Face, Outer	1	1	1

Continued on Page 5

*—See Chart on Opposite Page.

Page 2 (Duplicated)

Displacement cm³/r [in³/r]	Drive, Main Item No. 9 —Part No./Length		Geroler® Item No. 10 —Part No./Width		Screw, Cap (Standard/Wheel) Item No. 21 —Part No./Length		Screw, Cap (Bearingless) Item No. 21 —Part No./Length	
	Part No.	mm [inch]	Part No.	mm [inch]	Part No.	mm [in.]	Part No.	mm [in.]
160 [9.8]	202989-004	82,3 [3.24]	202871-004	35,6 [1.40]	14384-008	144,8 [5.70]	14384-004	127,3 [5.01]
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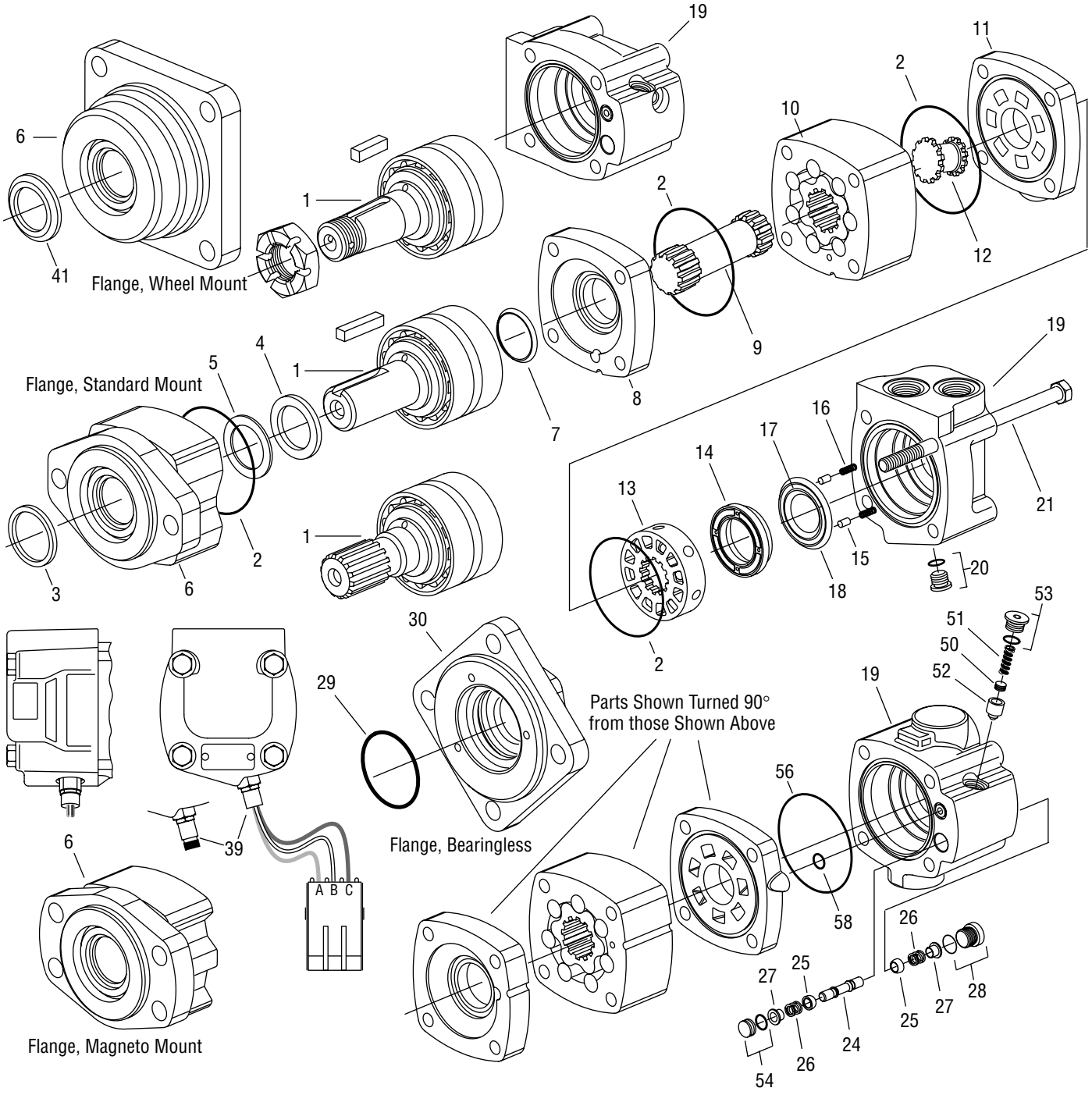


Parts List — 2 of 2

Continued from Page 3

	Ref No.	Part Number	Description	Quantity per Unit Std.	Whl.	Brgl.
	19	21564-001	Housing, Valve (7/8-14 Str. Thrd. O-ring (Staggard Ports) — 7/16-20 Case Drain Port)	1	1	1
		21564-007	Housing, Valve (G 1/2 (BSP) (Staggard Ports) — G 1/4 (BSP) Case Drain Port)	1	1	1
		204113-004	Housing, Valve (7/8-14 Str. Thrd. O-ring (End Ports) — 7/16-20 Case Drain Port Shuttle and Low Press. Relief)	1	1	1
		21564-012	Housing, Valve (7/8-14 Str. Thrd. O-ring (Staggard Ports) — 7/16-20 Case Drain Port) — for Speed Sensor (201137-001 Ref. 39)	1	1	1
		21564-033	Housing, Valve (7/8-14 Str. Thrd. O-ring (Staggard Ports) — 7/16-20 Case Drain Port) — for Quadrature Speed Sensor (Ref. 39)	1	1	1
		21564-002	Housing, Valve (1–1/16-12 Str. Thrd. O-ring Ports (180° Apart) — 7/16-20 Case Drain Port)	1	1	1
		21564-009	Housing, Valve (7/8-14 Str. Thrd. O-ring (End Ports) — 7/16-20 Case Drain Port)	1	1	1
		204113-005	Housing, Valve (7/8-14 Str. Thrd. O-ring (Staggard Ports) — 7/16-20 Case Drain Port) — Shuttle and Low Press. Relief	1	1	1
	20	9072-003	Plug/O-ring Assembly (7/16-20 Case Drain Plug)	1	1	1
†		250003-904	O-ring	1	1	1
		9170-002	Plug/O-ring Assembly (G 1/4 (BSP) Case Drain Plug)	1	1	1
†		250003-904	O-ring	1	1	1
	21	*	Screw, Cap	4	4	4
	24	201494-002	Piston Shuttle	1	1	1
	25	8567-000	Poppet	2	2	2
	26	230079-000	Spring	2	2	2
	27	8755-000	Sleeve, Dash Pot	2	2	2
	28	9072-005	Plug/O-ring Assembly (9/16-18 Shuttle Valve End)	2	2	2
†		250003-906	O-ring	2	2	2
#	29	15128-000	Seal			1
	30	203971-001	Flange, Mounting — with leakage slots			1
		203971-002	Flange, Mounting — without leakage slots			1
	39	201137-001	Sensor, Speed — (127mm [5.0 in.] lead wire)	1	1	1
		202925-001	Sensor, Speed – Quadrature — Two speed signals in quadrature each providing one pulse per target tooth	1	1	1
		202925-002	Sensor, Speed – Quadrature — One speed signal providing two pulses per target tooth and one directional signal	1	1	1
		113003-001	Sensor, Speed – Quadrature — Two speed signals in quadrature each providing one pulse per target tooth**	1	1	1
		113003-002	Sensor, Speed – Quadrature — One speed signal providing two pulses per target tooth and one directional signal**	1	1	1
	50	16048-500	Shim	A/R	A/R	A/R
	51	17024-026	Spring	1	1	1
	52	201495-004	Poppet	1	1	1
	53	9072-004	Plug/O-ring S/A	1	1	1
†		250003-905	O-ring	1	1	1
	54	201868-003	Plug/O-ring S/A	1	1	1
†		250002-012	O-ring	1	1	1
†	56	250002-039	Seal	1	1	1
†	58	250002-012	O-ring	1	1	1
		61335-000	Seal Kit (Bearingless Motors with mounting flange)—Contains Parts Indicated by #			
		61336-000	Seal Kit (Bearingless Motors without mounting flange)—Contains Parts Indicated by X			

*— See Chart on Opposite Page.

**— Mates wiith DC Micro Connectors or Equivalent:
Turk Eurofast WKCV 4.4T Cable
Brad Harrison Micro-Change Single Keyway Plugs
Lumberg "Micro" Style 12mm DC Connector

A/R As Required

Notes:

Notes:

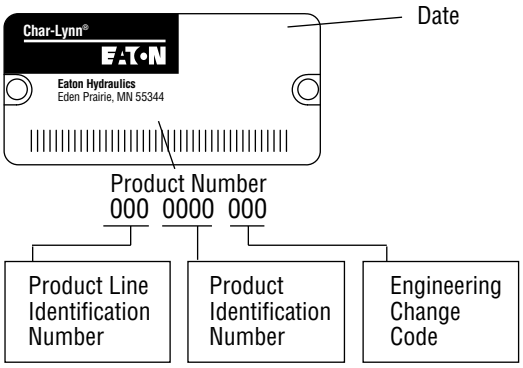
For Additional Literature Contact Eaton Hydraulics
14615 Lone Oak Road Eden Prairie, MN 55344.

- Specifications and performance data, Catalog 11-01-113.
- When servicing 4000 Compact Series Motors refer to Repair Information 07-01-160. This repair manual lists tools required, and step by step disassembly and reassembly procedures.

How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts



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EATON

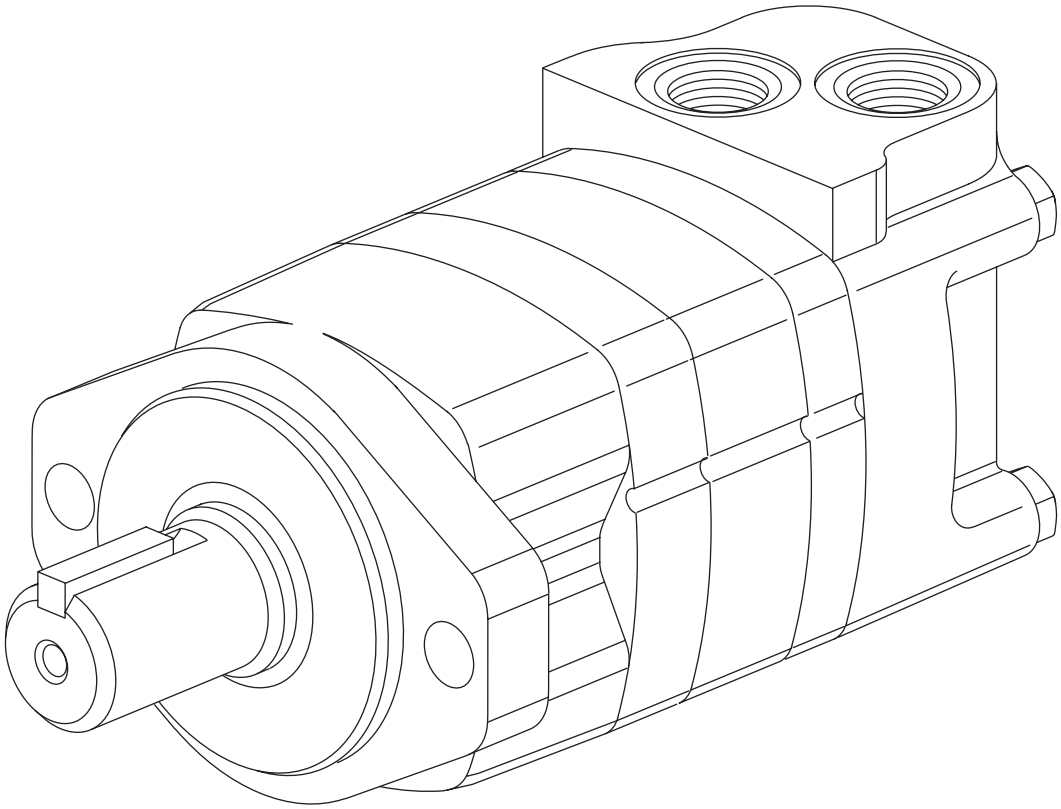
06-01-168
EN-0500

Char-Lynn®
Hydraulic Motor

No. 7-124
July, 1999

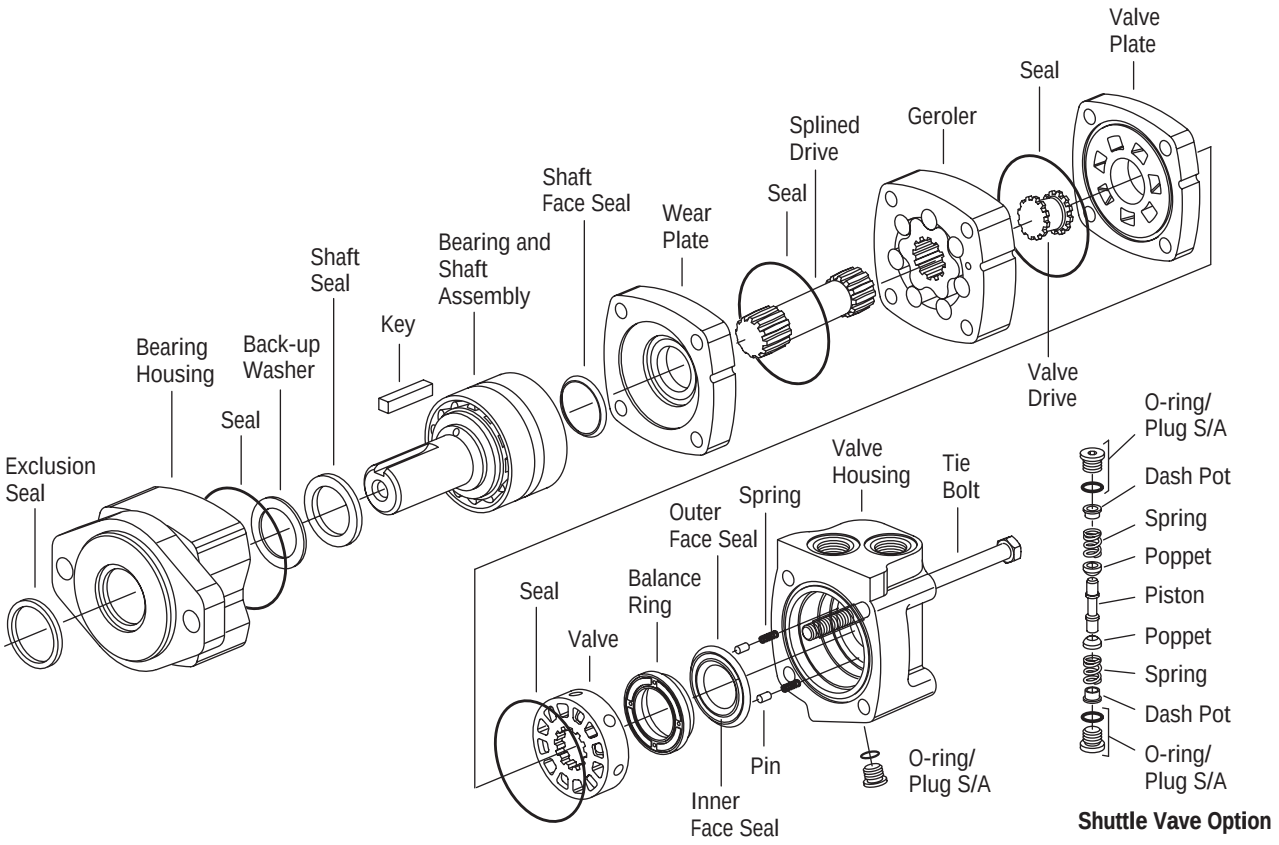
EATON

Repair Information



2000 Series
Disc Valve Geroler Motor

006



Shuttle Vave Option

Tools required for disassembly and reassembly.

Torque wrench 57Nm [500 lb-in] capacity

300-450 [12-16]* breaker bar

9/16 socket

Small screwdriver 150-200 x 6,5 [6-8 x 1/4] blade

3/16 Allen wrench

Press

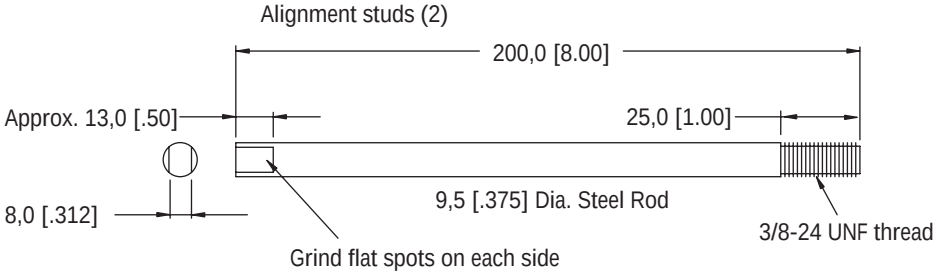
* Unless indicated otherwise, measurements are given in mm [inches]

** Shaft seal installation tool (600496)

** Bullet (600465) for 1 diameter shafts

The following tools are not necessary for disassembly and reassembly, but are extremely helpful.

Alignment studs (2)



Disassembly

Cleanliness is extremely important when repairing a hydraulic motor. Work in a clean area. Before disconnecting the lines, clean the port area of the motor thoroughly. Use a wire brush to remove foreign material and debris from around the exterior joints of the motor. Check the shaft and key slot, remove all nicks, burrs or sharp edges that might damage the bearing housing seals when installing the shaft and bearing assembly. Before starting the disassembly procedures, drain the oil from inside the motor.

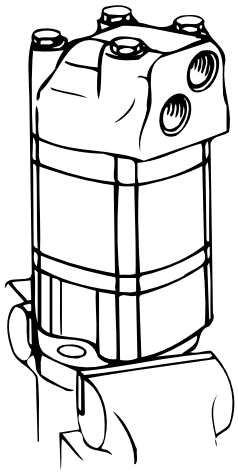


Figure 1

1 Place the motor in a vise with the output shaft down. Clamp across the mounting flange of the motor not the housing. Excessive clamping pressure will cause distortion. When clamping, use some protective device on the vise, such as special soft jaws, pieces of hard rubber or board.

Although not all drawings show the motor in a vise, we recommend that you keep the motor in the vise during disassembly and reassembly. Follow the clamping procedures explained throughout the manual.

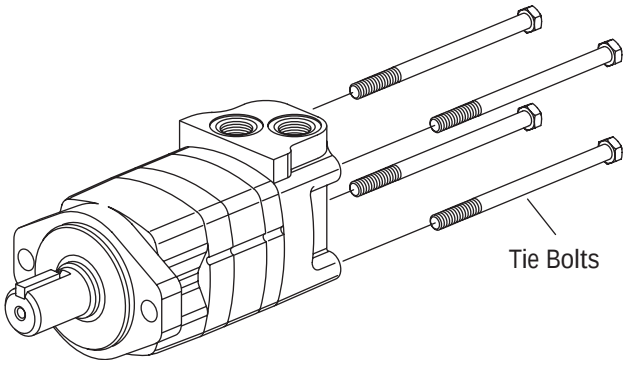


Figure 2

2 Remove 4 bolts from motor.

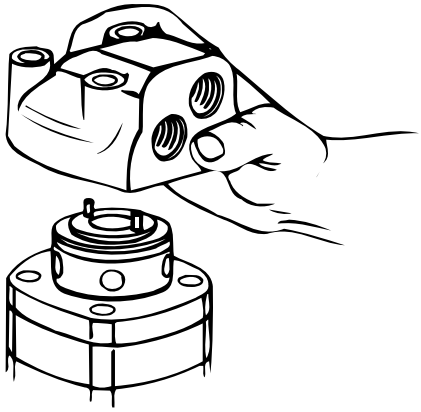


Figure 3

3 Lift valve housing straight up. If done carefully the pins, springs, balance ring assembly, and valve will remain on the valve plate.

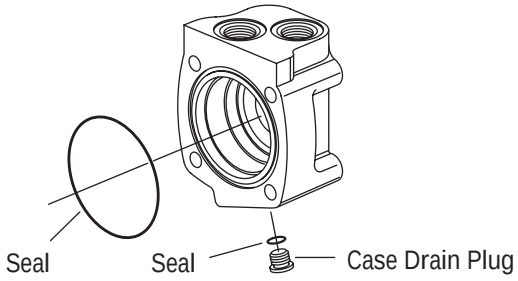


Figure 4

4 Carefully remove 76,0 [3.00] diameter seal from valve housing.

5 Remove case drain plug—with seal, from valve housing.

6 Remove 2 pins and 2 springs from balance ring assembly, see Figure 5.

Disassembly

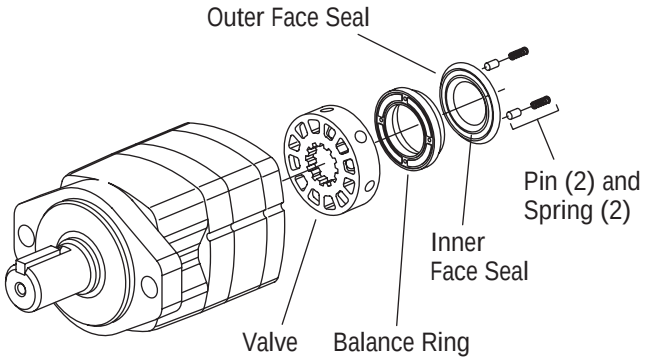


Figure 5

7 Remove balance ring assembly.

8 Remove inner and outer face seals from balance ring.

9 Remove the valve.

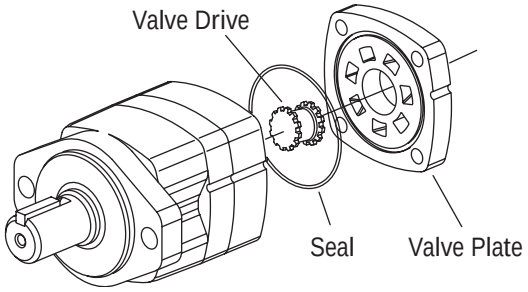


Figure 6

10 Remove the valve plate.

11 Remove the 76,0 [3.00] diameter seal from valve plate.

12 Remove the valve drive.

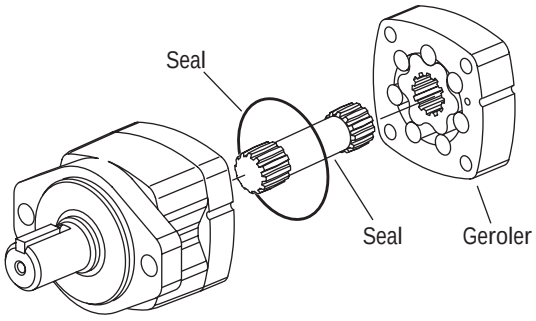


Figure 7

13 Remove the Geroler. Be sure to retain the rollers in the outer ring if they are loose.

14 Remove the drive.

15 Remove the 76,0 [3.00] diameter seal from wear plate, see Figure 7.

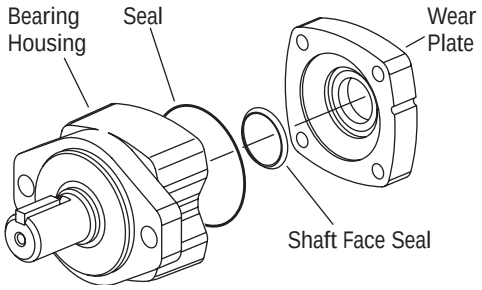


Figure 8

16 Remove the wear plate.

17 Remove the shaft face seal from the wear plate.

18 Remove the 76,0 [3.00] diameter seal from bearing housing.

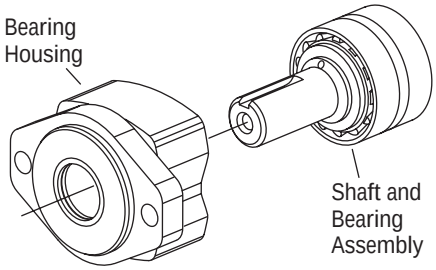


Figure 9

19 You may need a press to remove shaft and bearing assembly from bearing housing. (Key must be removed before removing shaft.)

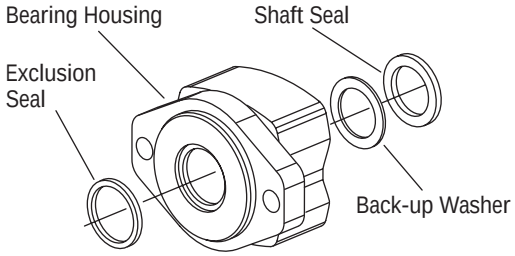


Figure 10

20 Use a small screwdriver to remove shaft seal, back-up washer and exclusion seal from bearing housing, see Figure 10. Do not damage bore of housing.

Note: Individual parts of shaft and bearing assembly are not sold separately. Replace as a unit.

Reassembly

Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe dry with cloth or paper towel because lint or other matter can get in the hydraulic system and cause damage. Do not use a coarse grit or try to file or grind these parts. Check around the keyway and chamfered area of the shaft for burrs, nicks or sharp edges that can damage the seals when reassembling the bearing housing.

Note: Lubricate all seals (prior to installation) with petroleum jelly such as Vaseline. Use new seals when reassembling this motor. Refer to parts list (6-129) for proper seal kit number.

21 Use a press to install exclusion seal in outer bore of bearing housing. Lip of seal must face outward. See Figure 11. If a press is not available use a plastic or rubber hammer, being careful not to damage or cock seal in the bore.

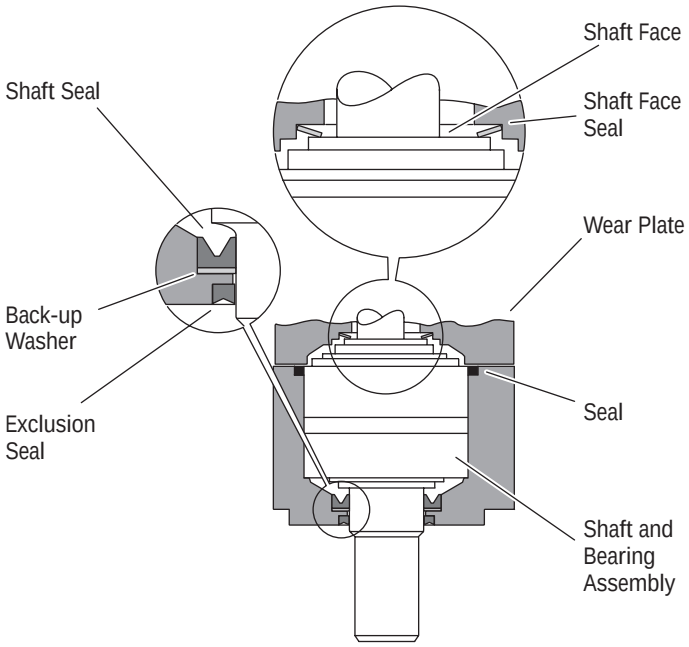


Figure 11

22 Place back-up washer into seal bore. Place shaft seal onto installation tool (600496) and press seal into seal bore of the housing.

23 Clamp housing in vise, see Figure 1.

24 Place protective bullet (see note below) over shaft. Apply petroleum jelly to inside diameter of dust and shaft seal. You may need a press to install shaft and bearing assembly. Do not distort shaft seal. Damage to this seal will cause leakage.

Note: Bullet (600465), for 1inch dia. shafts, available— by special order. Use tape over other shafts to prevent cutting the seals.

25 Apply petroleum jelly to the 76,0 [3.00] diameter seal. Install seal into the bearing housing.

26 Alignment studs can be very helpful in reassembly of the motor. See special tool listing page 2. If you use studs, install 2 studs diagonally opposed in the bearing housing.

27 Install the shaft face seal in the wear plate as shown in Figure 11. Do not distort seal.

28 Install the wear plate, see Figure 11.

29 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal and install seal in the wear plate.

30 Install the drive into the output shaft.

31 Align the notch on the outside of the Geroler with the notch on the wear plate. Install the Geroler against the wear plate. Be sure to retain the rollers in the outer ring if they are loose.

32 Install the valve drive in the Geroler.

Note: Installation at this time involves 3 steps in the timing of the motor. Timing determines the direction of rotation of the output shaft. Timing parts include:

1. Geroler
2. Valve Drive
3. Valve Plate
4. Valve

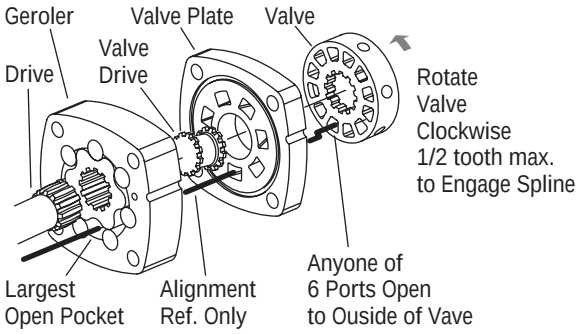


Figure 12 Timing Alignment

Timing Step # 1 — Locate the largest open pocket in the Geroler and mark it on the outside edge of the Geroler.

33 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal in groove of valve plate.

Reassembly

34 Align the notch on the outside of the valve plate with the notch on the Geroler as shown in Figure 12.

Timing Step # 2 — Locate the slot opening in the valve plate which is in line with the largest open pocket of the Geroler.

Timing Step # 3 — Locate any one of the side openings of the valve and align this opening with the open slot of the valve plate that is in line with the largest open pocket of the Geroler. Install the valve by rotating it clockwise until the spine teeth engage (1/2 spine tooth max.). This will provide the proper rotation when pressurized as shown in Figure 13.

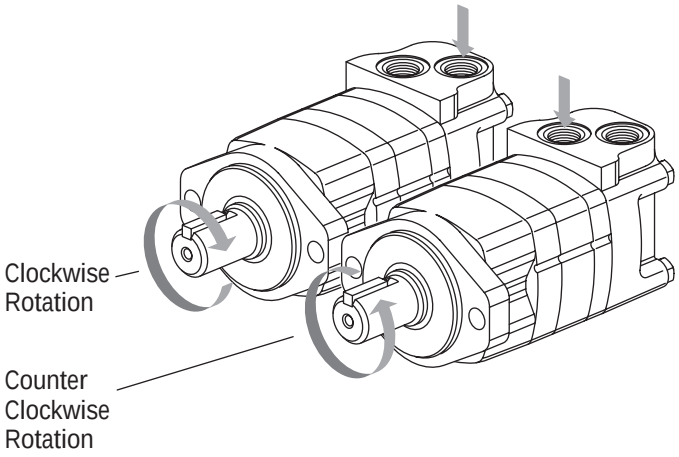


Figure 13

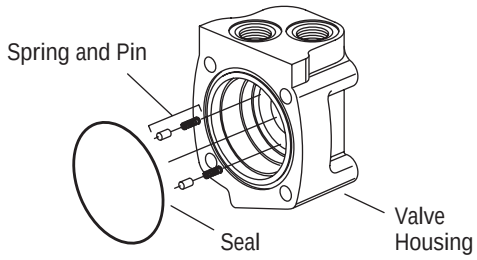


Figure 14

35 Install 2 springs and 2 pins in the holes located in the bore of the valve housing, as shown in Figure 14.

36 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal in the valve housing.

37 Apply petroleum jelly to inner and outer face seals. Install seals on balance ring as shown in Figure 15.

Important: Install face seals in the positions shown in Figure 15, or the motor will not operate properly. Do not force or bend the face seals. Any damage to these seals will affect the operation of the motor.

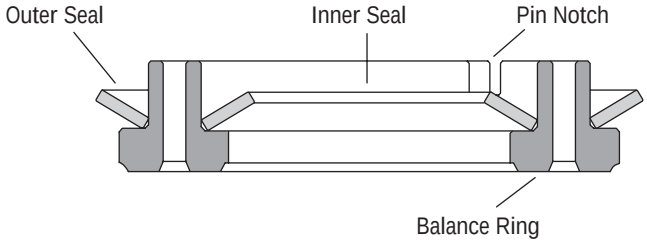


Figure 15

38 Align pin notches in balance ring with pins in bore of valve housing. Install balance ring assembly in valve housing.

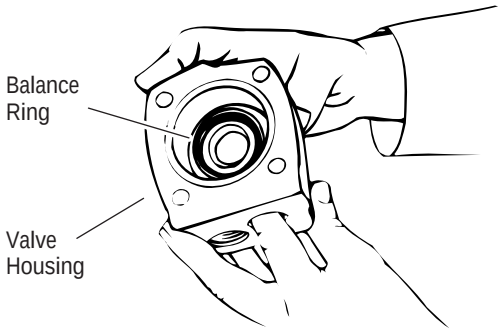


Figure 16

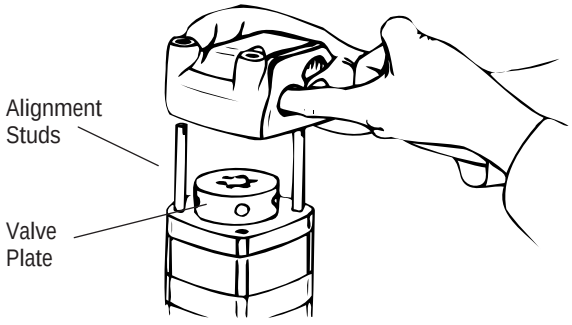


Figure 17

39 Insert your finger through port of valve housing. Apply pressure to side of balance ring as shown in Figure 16. Hold ring in position until valve housing is in place against valve plate (see Figure 17).

Note: After installing the valve housing on the valve plate check for proper placement. Push down on the valve housing. You should get a slight spring action.

Reassembly

40 Install tie bolts. If you use alignment Studs, install 2 bolts opposite the studs. Finger tighten the bolts. Remove the alignment studs and replace with the two remaining bolts. Torque all four bolts alternately to 50 Nm [450 lb-in].

41 Install seal on case drain plug then install in valve housing. Torque to 6 Nm [50 lb-in.]

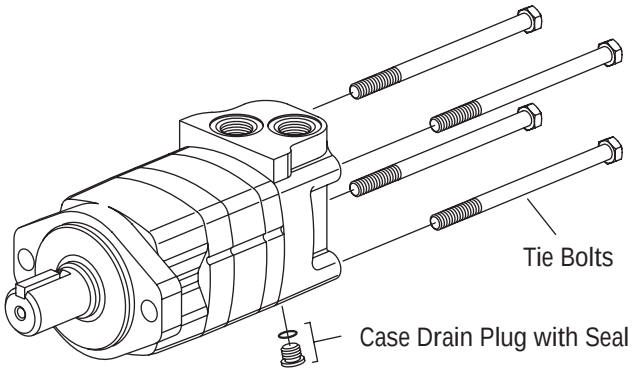


Figure 18

Wheel Motor

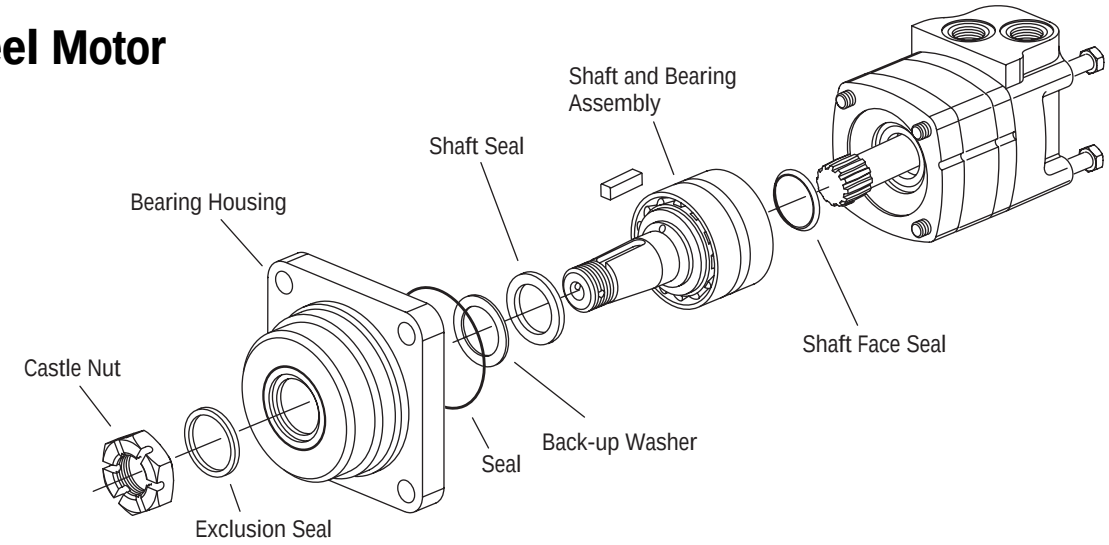
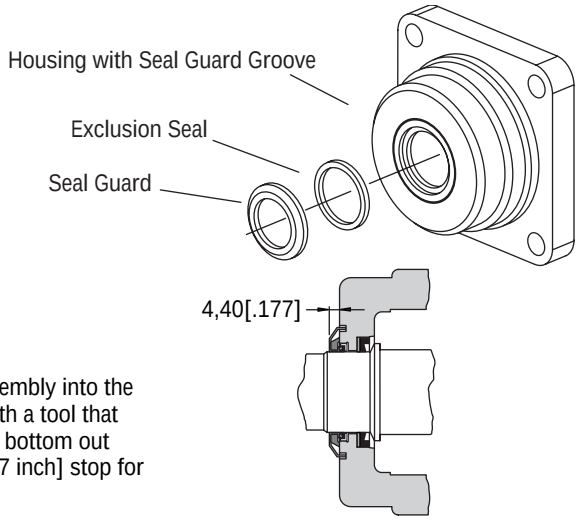


Figure 19

On wheel motors, a different bearing housing is used, see Figure 19. Other than this the parts are the same as the standard motor and the same disassembly and reassembly procedures apply.

Wheel Motor with Seal Guard



Installation of Seal Guard:

After completing assembly of the shaft and bearing assembly into the bearing housing, press the seal guard onto the shaft with a tool that will provide an even push over the seal. This tool must bottom out against the bearing housing and provide a 4,5 mm [.177 inch] stop for the seal guard.

Bearingless Motor

This motor is the same as the standard motor without the shaft/ bearing assembly, and bearing housing. The mounting flange replaces the bearing housing, see Figure 20. Follow same disassembly and reassembly procedures as rear section of standard motor.

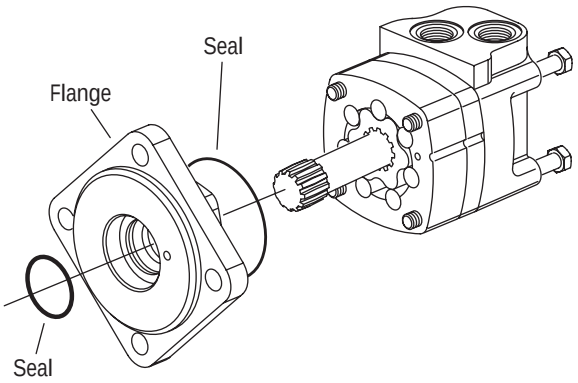
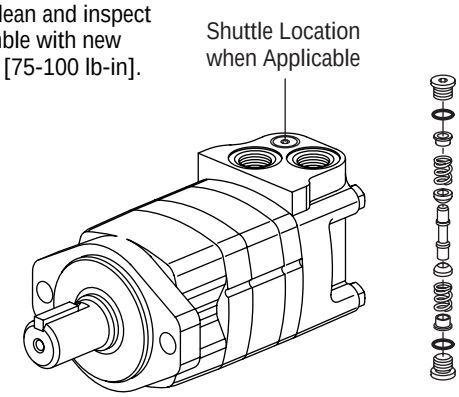


Figure 20

Disassembly Reassembly Shuttle Valve Option

Disassembly of shuttle valve option, this valve is located in the valve housing. Clean and inspect shuttle valve parts and reassemble with new seals, torque plugs to 8-11 Nm [75-100 lb-in].



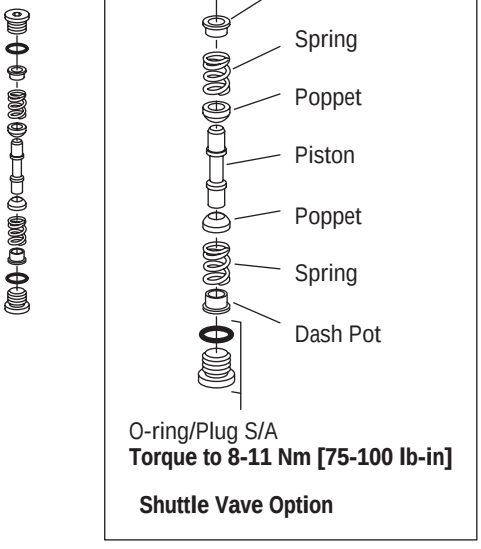


Figure 21

Reassembly — Speed Sensor

1 Rotate the motor shaft until a (gear/target) tooth is centered in the speed sensor port. If this is not done, the sensor may be damaged during the operation of the motor.

2 Make sure the lock nut and its threads are clean and dry for the proper torque. Position the lock nut against the alignment nut as shown in Figure 22.

3 Move the washer and the o-ring up against the speed sensor body threads as shown in Figure 22.

4 By hand, lightly thread the speed sensor body into the housing until the sensor touches against the motor (gear/target) tooth. **Do not force the sensor against the (gear/target) tooth, damage may occur.** Make sure the o-ring or the washer do not touch the housing — see Figure 23.

5 Turn the speed sensor body out one quarter turn (CCW) plus the additional amount (CCW) needed to make the alignment notches perpendicular to the motor shaft centerline (90° +/-5 degrees from the motor shaft centerline — Figure 24 and 25).

6 Maintain the speed sensor body alignment (Figure 25), and tighten the lock nut to 8,5-14 Nm [75-125 lb-in.] (torque values are for clean dry threads).

7 Check the speed sensor body for correct alignment (Figure 25), reinstall the sensor if it is not correct.

Speed Sensor Installation

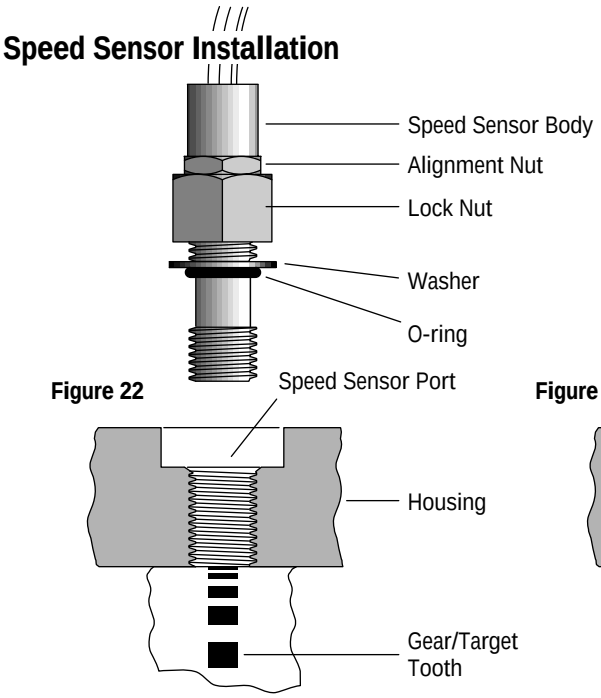


Figure 22

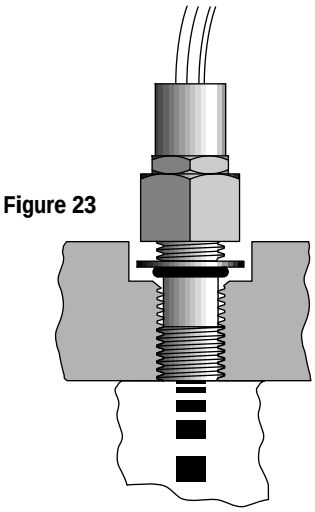


Figure 23

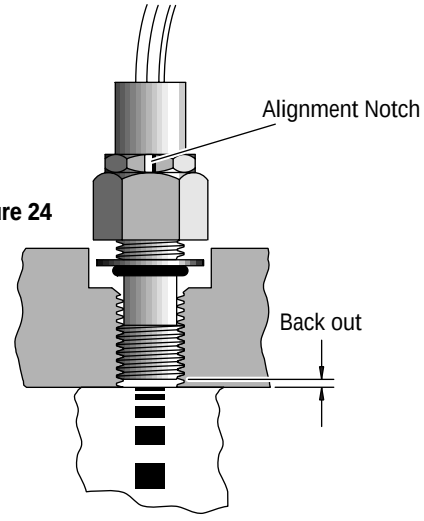


Figure 24

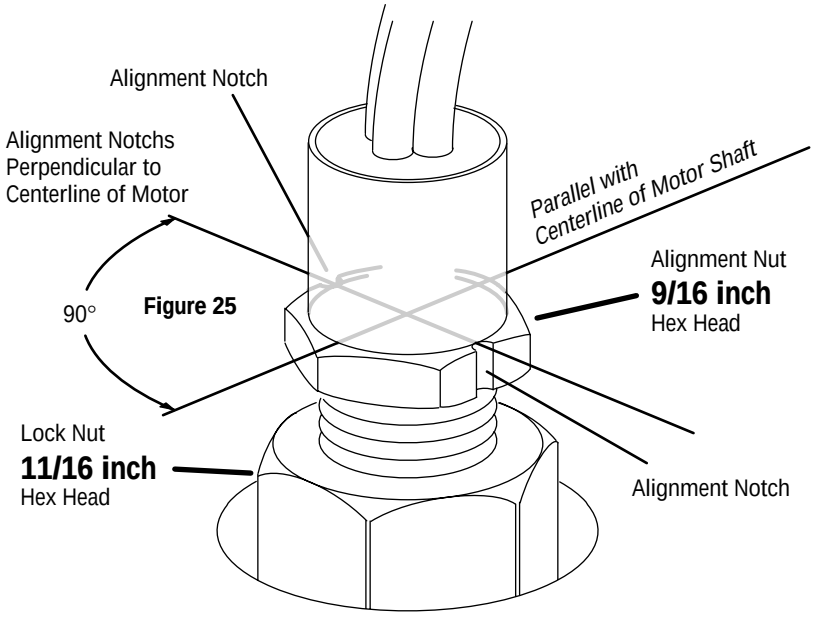


Figure 25

Product Identification

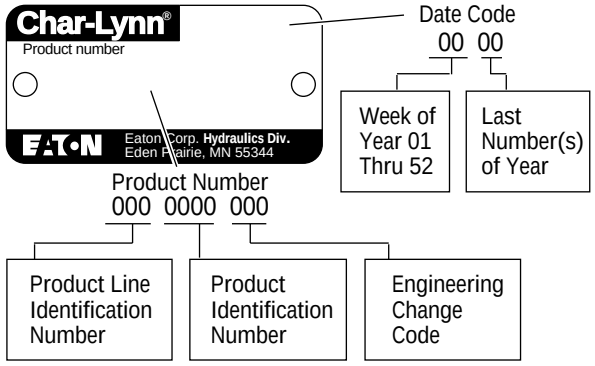
For Additional Literature Contact Eaton Corp. Hydraulics Division 15151 Highway 5 Eden Prairie, MN 55344.

- Specifications and performance data, Catalog No. 11-878
- Replacement part numbers and kit information — Parts Information No. 6-129

How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts



Product Numbers—2000 Series

Use digit prefix —104-, 105-, or 106- plus four digit number from charts for complete product number—Example 106-1039.

104-1007

Mounting	Shaft	Ports	Displacement cm³/r [in³/r] and Product Number 80 [4.9]	100 [6.2]	130 [8.0]	160 [9.6]	195 [11.9]	245 [14.9]	305 [18.7]	395 [24.0]	490 [29.8]
2 Bolt SAE A Flange	1 inch Straight	7/8-14 O-ring Staggered	104-1001	-1002	-1003	-1004	-1005	-1006	-1007	-1143	—
		1-1/16—12 O-ring 180° Apart	104-1037	-1038	-1039	-1040	-1041	-1042	-1043	-1044	—
	1-1/4 Inch Straight	7/8-14 O-ring Staggered	104-1022	-1023	-1024	-1025	-1026	-1027	-1028	-1228	-1420
		1-1/16—12 O-ring 180° Apart	104-1061	-1062	-1063	-1064	-1065	-1066	-1067	-1068	-1421
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	104-1029	-1030	-1031	-1032	-1033	-1034	-1035	-1229	-1422
		1-1/16—12 O-ring 180° Apart	104-1087	-1088	-1089	-1090	-1091	-1092	-1093	-1094	-1423
2 Bolt SAE B Flange	1-1/4 Inch Straight	7/8-14 O-ring Staggered	104-1200	-1201	-1202	-1203	-1204	-1205	-1206	-1207	—
	1-1/4 In. Involute SAE C Splined	7/8-14 O-ring Staggered	104-1208	-1209	-1210	-1211	-1212	-1213	-1214	-1215	—
	1 Inch SAE 6B Splined	7/8-14 O-ring Staggered	104-1193	-1194	-1195	-1196	-1197	-1198	-1199	—	—
	7/8 Inch SAE B Splined	7/8-14 O-ring Staggered	104-1216	-1217	-1218	-1219	-1220	—	—	—	—
Standard with 4 Bolt Square Flange	32 mm Straight	G 1/2 (BSP)	104-1384	-1385	-1386	-1387	-1388	-1389	-1390	-1391	—
	1-1/4 Inch 14 T Splined	G 1/2 (BSP)	104-1376	-1377	-1378	-1379	-1380	-1381	-1382	-1383	—
Wheel Motor	1-1/4 Inch Straight	7/8-14 O-ring Staggered	105- —	—	—	—	—	—	—	—	-1148
		1-1/16—12 O-ring 180° Apart	105- —	—	—	—	—	—	—	—	-1149
	32 mm Straight	G 1/2 (BSP)	105-1134	-1135	-1136	-1137	-1138	-1139	-1140	-1141	—
	1-1/4 Inch Tapered	7/8-14 O-ring Staggered	105-1001	-1002	-1003	-1004	-1005	-1006	-1007	-1060	-1152
		1-1/16—12 O-ring 180° Apart	105-1071	-1072	-1073	-1074	-1075	-1076	-1077	-1078	—
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	105-1029	-1030	-1031	-1032	-1033	-1034	-1035	-1096	—
		1-1/16—12 O-ring 180° Apart	105-1079	-1080	-1081	-1082	-1083	-1084	-1085	-1086	—
Bearingless		7/8-14 O-ring Staggered	106-1008	-1009	-1010	-1011	-1012	-1013	-1014	-1015	-1047
		G 1/2 (BSP)	106-1038	-1039	-1040	-1041	-1042	-1043	-1044	-1045	—

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DNV
ACCREDITED BY THE DUTCH COUNCIL FOR CERTIFICATION Reg. No. 24
ISO-9001 CERTIFICATED FIRM
DET NORSKE VERITAS INDUSTRY BV, THE NETHERLANDS

Qualitiy System Certified
Products in this catalog are manufactured in an ISO-9001-certified site.

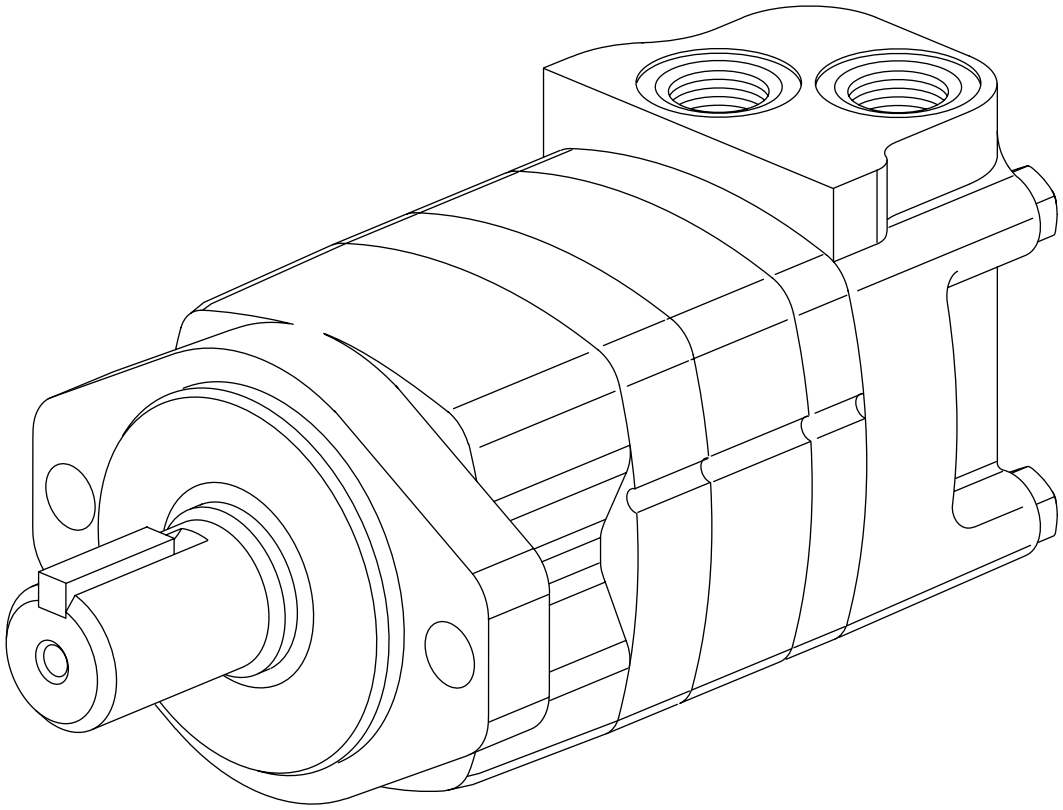
www.eatonhydraulics.com

Form No. 7-124
Printed in USA

Char-Lynn®
Disc Valve Motors

No. 6-129
October, 1997

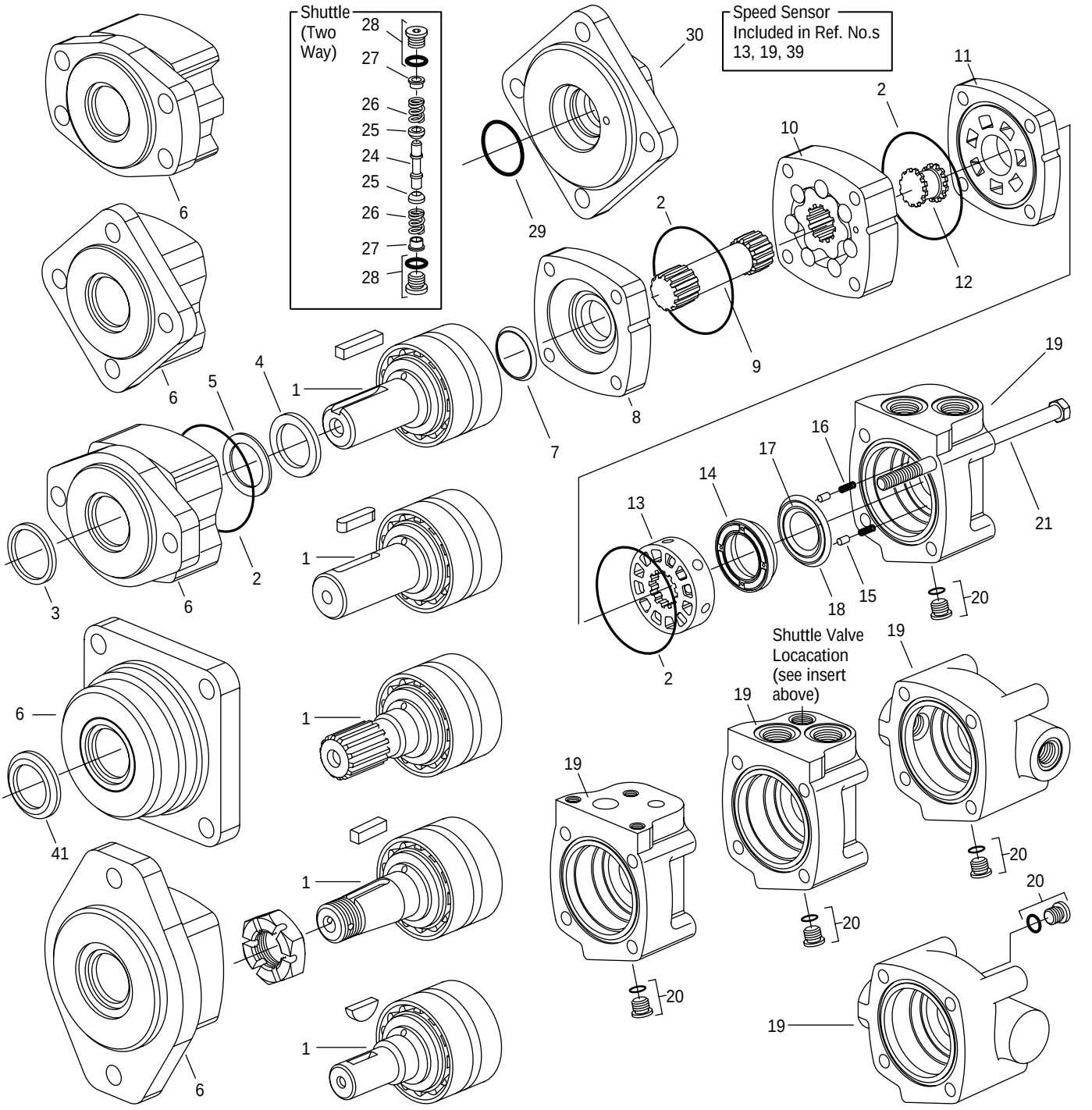
Parts Information



2000 Series
Geroler® Motors

006

Displacement cm³/r [in³/r]	Drive, Main Item No. 9 —Part No./Length		Geroler® Item No. 10 —Part No./Width		Screw, Cap (Standard/Wheel) Item No. 21 —Part No./Length		Screw, Cap (Bearingless) Item No. 21 —Part No./Length	
	Part No.	mm [inch]	Part No.	mm [inch]	Part No.	mm [in.]	Part No.	mm [in.]
80 [4.9]	21371-009	76,2 [3.00]	21625-001	17,8 [.70]	14384-004	127,3 [5.01]	14384-001	108,2 [4.26]
100 [6.2]	21371-010	80,8 [3.18]	21625-002	22,5 [.88]	14384-006	135,4 [5.33]	14384-002	113,0 [4.45]
130 [8.0]	21371-004	87,2 [3.43]	21625-003	28,9 [1.14]	14384-007	138,4 [5.45]	14384-003	121,1 [4.77]
160 [9.6]	21371-004	87,2 [3.43]	21625-004	28,9 [1.14]	14384-007	138,4 [5.45]	14384-003	121,1 [4.77]
195 [11.9]	21371-005	94,0 [3.70]	21625-005	35,6 [1.40]	14384-008	144,8 [5.70]	14384-004	127,3 [5.01]
245 [14.9]	21371-006	103,1 [4.06]	21625-006	44,7 [1.76]	14384-010	154,9 [6.10]	14384-007	138,4 [5.45]
305 [18.7]	21371-007	114,4 [4.51]	21625-007	56,0 [2.21]	14384-012	164,5 [6.48]	14384-008	144,8 [5.70]
395 [24.0]	21371-008	130,4 [5.13]	21625-008	72,0 [2.83]	14384-014	182,4 [7.18]	14384-012	164,5 [6.48]
490 [29.8]	21371-012	147,9 [5.82]	21625-010	89,4 [3.52]	14384-019	199,6 [7.86]	14384-014	182,4 [7.18]



	Item No.	Part Number	Description	Quantity per Unit Std.	Whl.	Brgl.
	1	21618-001	Shaft and Bearing Kit (1 inch Straight)	1	1	
		14193-000	Key (for 1 Straight Shaft)	1	1	
		21618-002	Shaft and Bearing Kit (1-1/4 inch Straight)	1	1	
		14392-008	Key (for 1-1/4 Straight Shaft)	1	1	
		21618-003	Shaft and Bearing Kit (1-1/4 in. Tapered)	1	1	
		21618-032	Shaft and Bearing Kit (1-1/4 in. Tapered — *Special shaft for Seal Guard*		1	
		14163-000	Nut, Hex (1-1/4 in. Tapered Shaft)	1	1	
		14392-006	Key (for 1-1/4 in. Tapered Shaft)	1	1	
		21618-004	Shaft and Bearing Kit (1-1/4 in. Splined 14T)	1	1	
		21618-005	Shaft and Bearing Kit (1 in. 6B Splined)	1	1	
		21618-007	Shaft and Bearing Kit (7/8 Splined 13T)	1	1	
		21618-023	Shaft and Bearing Kit (32 mm Straight)	1	1	
		14460-005	Key (for 32 mm Straight Shaft)	1	1	
		21618-026	Shaft and Bearing Kit (25 mm Straight)	1	1	
		14462-006	Key (for 25 mm Straight Shaft)	1	1	
O†	2	14559-006	Seal	4	4	3
†	3	9121-001	Seal, Exclusion	1	1	
†	4	9057-009	Seal, Shaft	1	1	
†	5	7382-000	Ring, Back-up	1	1	1
	6	21578-004	Housing, Bearing, SAE A (Two Bolt)	1		
		21578-003	Housing, Bearing, Wheel Mount (Four Bolt)		1	
		21578-015	Housing, Bearing, Wheel Mount (Four Bolt) — *Compatible for HAYES Brake*		1	
		21578-001	Housing, Bearing, SAE B (Two Bolt)	1		
		21578-005	Housing, Bearing, Diagonal (Four Bolt)	1		
		21578-008	Housing, Bearing, Magneto (Four Bolt)	1		
		21578-016	Housing, Bearing, Wheel Mount (Four Bolt) — *with Seal Guard Groove*		1	
†	7	9050-000	Seal, Shaft Face	1	1	
	8	22102-000	Plate, Wear	1	1	
	9	*	Drive, Main	1	1	1
	10	*	Geroler®	1	1	1
	11	22134-000	Plate, Valve	1	1	1
	12	8433-000	Drive, Valve	1	1	1
	13	21466-000	Valve	1	1	1
		201307-002	Valve — *Speed Sensor Valve*	1	1	1
	14	8915-000	Balance Ring	1	1	1
	15	14351-000	Pin, Balance Ring	2	2	2
	16	7383-000	Spring, Compression	2	2	2
O†	17	9049-001	Seal, Face, Inner	1	1	1
O†	18	9135-002	Seal, Face, Outer	1	1	1
	19	21564-001	Housing, Valve (7/8-14 Str. Thrd. O-ring Ports — 7/16-20 Case Drain Port)	1	1	1
		21564-012	Housing, Valve (7/8-14 Str. Thrd. O-ring Ports — 7/16-20 Case Drain Port) — *Speed Sensor Housing*	1	1	1
		21564-002	Housing, Valve (1 - 1/16-12 180° Apart — 7/16-20 Case Drain Port)	1	1	1
		21564-016	Housing, Valve (1 - 1/16-12 180° Apart — 7/16-20 Case Drain Port) — *Speed Sensor Housing*	1	1	1
		21564-007	Housing, Valve (G 1/2 (BSP) Ports — G 1/4 (BSP) Case Drain Port)	1	1	1
		21564-015	Housing, Valve (G 1/2 (BSP) Ports — G 1/4 (BSP) Case Drain Port) — *Speed Sensor Housing*	1	1	1
		21564-010	Housing, Valve (7/8-14 Str. Thrd. O-ring Ports — 7/16-20 Case Drain Port) — *Shuttle Valve Housing*	1	1	1
		21564-004	Housing, Valve (Manifold Mount — 7/16-20 Case Drain Port)	1	1	1
		21564-008	Housing, Valve (Manifold Mount — G 1/4 (BSP) Case Drain Port)	1	1	1
		21564-006	Housing, Valve (7/8-14 Str. Thrd. O-ring End Ports — 7/16-20 Case Drain Port)	1	1	1

Continued on Page 5

Page 2 (Duplicated)

Displacement cm³/r [in³/r]	Drive, Main Item No. 9 —Part No./Length		Geroler® Item No. 10 —Part No./Width		Screw, Cap (Standard/Wheel) Item No. 21 —Part No./Length		Screw, Cap (Bearingless) Item No. 21 —Part No./Length	
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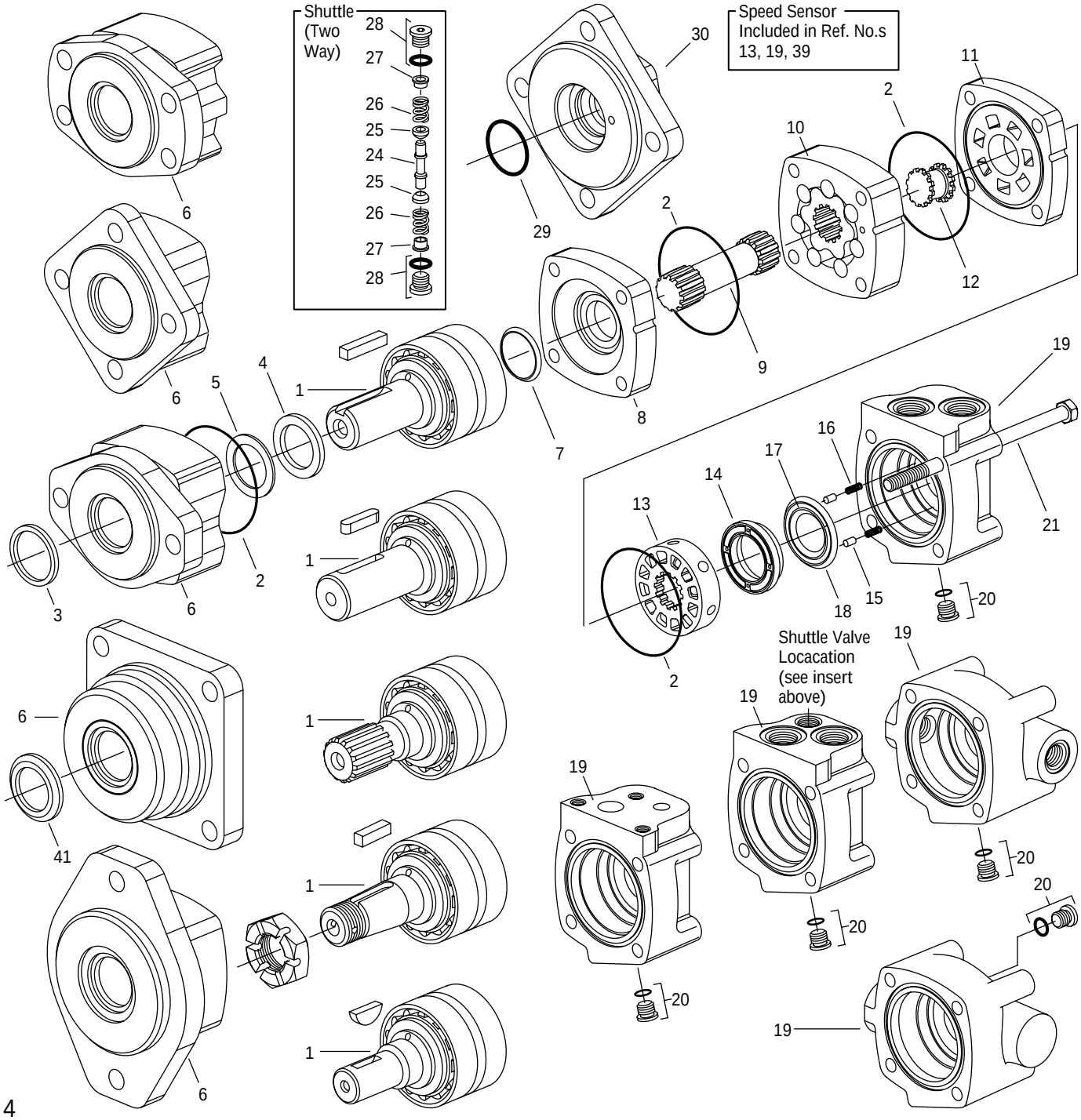


Continued from Page 3

	Item No.	Part Number	Description	Quantity per Unit Std.	Whl.	Brgl.
	20	9072-003	Plug Assembly (7/16-20 Case Drain Plug)	1	1	1
O†		250003-904	O-ring	1	1	1
		9170-002	Plug Assembly (G 1/4 (BSP) Case Drain Plug)	1	1	1
O†		250003-904	O-ring	1	1	1
	21	*	Screw, Cap	4	4	4
	24	8566-000	Piston Shuttle	1	1	1
	25	8567-000	Poppet	2	2	2
	26	230079-000	Spring	2	2	2
	27	8755-000	Sleeve, Dash Pot	2	2	2
	28	9072-005	Plug Assembly (9/16-18 Shuttle Valve End)	2	2	2
		250003-906	O-ring	2	2	2
O	29	15127-000	Seal			1
	30	21569-000	Seal, Flange, Mounting			1
	39	201137-001	Sensor, Speed — 127mm [5.0 in.] Lead Wire		1	
	41	14628-002	Guard, Seal		1	

61258-000	Seal Kit (Std. and Whl. Motors)—Contains Parts Indicated by †
61259-000	Seal Kit (Bearingless Motor Only)—Contains Parts Indicated by O
61263-000	Seal Kit, Viton** (Std. and Whl. Motors)—Contains Parts Indicated by †
61261-000	Seal Kit,Viton** (Bearingless Motor Only)—Contains Parts Indicated by O
61289-000	Seal Kit, Wheel Motor with Seal Guard—Contains Parts Indicated by † and Seal Guard (Item No. 41)

Viton® is a Registered Trade Name of Dupont Corporation.

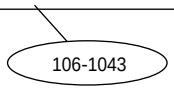
*—See Chart on Opposite Page.

**—Viton Seal Part Numbers Differ from Part Numbers Shown above. Note: Backup Ring Item 5 is not used with Viton Shaft Seal Item 4.

Product Numbers—2000 Series

Use digit prefix —104-, 105-, or 106- plus four digit number from charts for complete product number—Example 106-1043.

Mounting	Shaft	Ports	Displacement cm^3/r [in^3/r] and Product Number								
			80 [4.9]	100 [6.2]	130 [8.0]	160 [9.6]	195 [11.9]	245 [14.9]	305 [18.7]	395 [24.0]	490 [29.8]
2 Bolt SAE A Flange	1 inch Straight	7/8-14 O-ring Staggered	104-1001	-1002	-1003	-1004	-1005	-1006	-1007	-1143	—
		1-1/16—12 O-ring 180° Apart	104-1037	-1038	-1039	-1040	-1041	-1042	-1043	-1044	—
	1-1/4 Inch Straight	7/8-14 O-ring Staggered	104-1022	-1023	-1024	-1025	-1026	-1027	-1028	-1228	-1420
		1-1/16—12 O-ring 180° Apart	104-1061	-1062	-1063	-1064	-1065	-1066	-1067	-1068	-1421
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	104-1029	-1030	-1031	-1032	-1033	-1034	-1035	-1229	-1422
		1-1/16—12 O-ring 180° Apart	104-1087	-1088	-1089	-1090	-1091	-1092	-1093	-1094	-1423
2 Bolt SAE B Flange	1-1/4 Inch Straight	7/8-14 O-ring Staggered	104-1200	-1201	-1202	-1203	-1204	-1205	-1206	-1207	—
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	104-1208	-1209	-1210	-1211	-1212	-1213	-1214	-1215	—
	1 Inch SAE 6B Splined	7/8-14 O-ring Staggered	104-1193	-1194	-1195	-1196	-1197	-1198	-1199	—	—
	7/8 Inch SAE B Splined	7/8-14 O-ring Staggered	104-1216	-1217	-1218	-1219	-1220	-1455	—	—	—
Standard with 4 Bolt Square Flange	32 mm Straight	G 1/2 (BSP)	104-1384	-1385	-1386	-1387	-1388	-1389	-1390	-1391	-1546
	1-1/4 Inch 14 T Splined	G 1/2 (BSP)	104-1376	-1377	-1378	-1379	-1380	-1381	-1382	-1383	-1660
Wheel Motor	1-1/4 Inch Straight	7/8-14 O-ring Staggered	105-1022	1023	1024	1025	1026	1027	1028	1063	-1148
		1-1/16—12 O-ring 180° Apart	105-1052	1053	1054	1055	1056	1057	1058	1059	-1149
	32 mm Straight	G 1/2 (BSP)	105-1134	-1135	-1136	-1137	-1138	-1139	-1140	-1141	1177
	1-1/4 Inch Tapered	7/8-14 O-ring Staggered	105-1001	-1002	-1003	-1004	-1005	-1006	-1007	-1060	-1152
		1-1/16—12 O-ring 180° Apart	105-1071	-1072	-1073	-1074	-1075	-1076	-1077	-1078	—
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	105-1029	-1030	-1031	-1032	-1033	-1034	-1035	-1096	—
		1-1/16—12 O-ring 180° Apart	105-1079	-1080	-1081	-1082	-1083	-1084	-1085	-1086	—
Bearingless		7/8-14 O-ring Staggered	106-1008	-1009	-1010	-1011	-1012	-1013	-1014	-1015	-1047
		G 1/2 (BSP)	106-1038	-1039	-1040	-1041	-1042	-1043	-1044	-1045	1063



Notes:

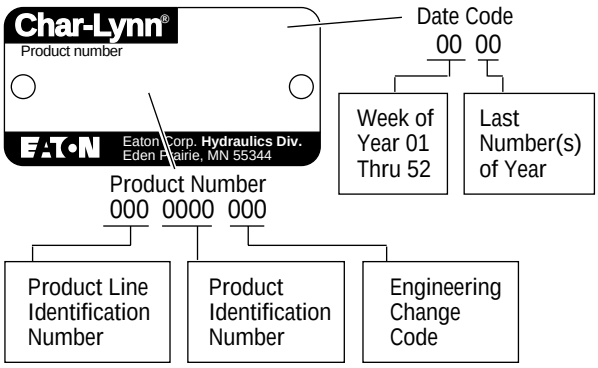
For Additional Literature Contact Eaton Corp. Hydraulics Division 15151 Highway 5 Eden Prairie, MN 55344.

- Specifications and performance data, Catalog No. 11-878.
- When servicing 2000 Series Motors refer to Repair Information No. 7-124. This repair manual lists tools required, and step by step disassembly and reassembly procedures.

How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts



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Form No. 6-129
Printed in USA

WARNING AND SAFETY REMINDERS FOR SCREW , DRAG , AND BUCKET ELEVATOR CONVEYORS

APPROVED FOR DISTRIBUTION BY THE SCREW CONVEYOR SECTION OF THE CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION (CEMA)

It is the responsibility of the contractor, installer, owner and user to install, maintain and operate the conveyor, components and, conveyor assemblies in such a manner as to comply with the Williams-Steiger Occupational Safety and Health Act and with all state and local laws and ordinances and the American National Standards Institute (ANSI) B20.1 Safety Code.

In order to avoid an unsafe or hazardous condition, the assemblies or parts must be installed and operated in accordance with the following minimum provisions.

1. Conveyors shall not be operated unless all covers and/or guards for the conveyor and drive unit are in place. If the conveyor is to be opened for inspection cleaning, maintenance or observation, the electric power to the motor driving the conveyor must be LOCKED OUT in such a manner that the conveyor cannot be restarted by anyone; however remote from the area, until conveyor cover or guards and drive guards have been properly replaced.

2. If the conveyor must have an open housing as a condition of its use and application, the entire conveyor is then to be guarded by a railing or fence in accordance with ANSI standard B20.1.(Request current edition and addenda)

3. Feed openings for shovel, front loaders or other manual or mechanical equipment shall be constructed in such a way that the conveyor opening is covered by a grating. If the nature of the material is such that a grating cannot be used, then the exposed section of the conveyor is to be guarded by a railing or fence and there shall be a warning sign posted.

4. Do not attempt any maintenance or repairs of the conveyor until power has been LOCKED OUT.

5. Always operate conveyor in accordance with these instructions and those contained on the caution labels affixed to the equipment.

6. Do not place hands, feet, or any part of your body, in the conveyor.

7. Never walk on conveyor covers, grating or guards.

8. Do not use conveyor for any purpose other than that for which it was intended.

9. Do not poke or prod material into the conveyor with a bar or stick inserted through the openings.

10. Keep area around conveyor drive and control station free of debris and obstacles.

11. Eliminate all sources of stored energy (materials or devices that could cause conveyor components to move without power applied) before opening the conveyor

12. Do not attempt to clear a jammed conveyor until power has been LOCKED OUT.

13. Do not attempt field modification of conveyor or components.

14. Conveyors are not normally manufactured or designed to handle materials that are hazardous to personnel. These materials which are hazardous include those that are explosive, flammable, toxic or otherwise dangerous to personnel. Conveyors may be designed to handle these materials. Conveyors are not manufactured or designed to comply with local, state or federal codes for unfired pressure vessels. If hazardous materials are to be conveyed or if the conveyor is to be subjected to internal or external pressure, manufacturer should be consulted prior to any modifications.

CEMA insists that disconnecting and locking out the power to the motor driving the unit provides the only real protection against injury. Secondary safety devices are available; however, the decision as to their need and the type required must be made by the owner-assembler as we have no information regarding plant wiring, plant environment, the interlocking of the screw conveyor with other equipment, extent of plant automation, etc. Other devices should not be used as a substitute for locking out the power prior to removing guards or covers. We caution that use of the secondary devices may cause employees to develop a false sense of security and fail to lock out power before removing covers or guards. This could result in a serious injury should the secondary device fail or malfunction.

There are many kinds of electrical devices for interlocking of conveyors and conveyor systems such that if one conveyor in a system or process is stopped other equipment feeding it, or following it can also be automatically stopped.

Electrical controls, machinery guards, railings, walkways, arrangement of installation, training of personnel, etc., are necessary ingredients for a safe working place. It is the responsibility of the contractor, installer, owner and user to supplement the materials and services furnished with these necessary items to make the conveyor installation comply with the law and accepted standards.

Conveyor inlet and discharge openings are designed to connect to other equipment or machinery so that the flow of material into and out of the conveyor is completely enclosed.

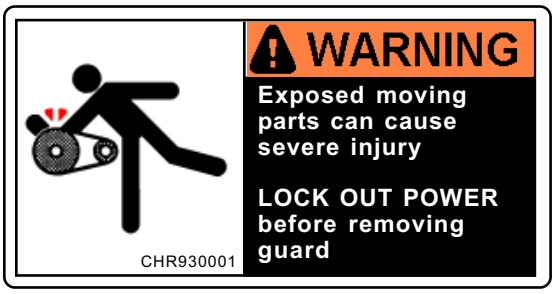
One or more warning labels should be visible on conveyor housings, conveyor covers and elevator housings. If the labels attached to the equipment become illegible, please order replacement warning labels from the OEM or CEMA.

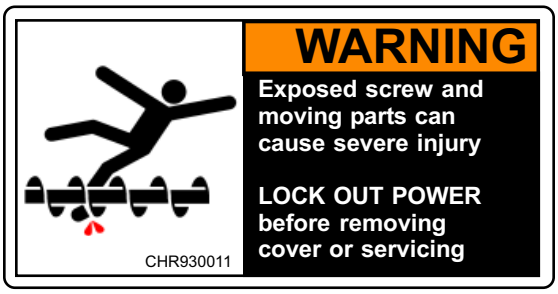
The Conveyor Equipment Manufacturers Association (CEMA) has produced an audio-visual presentation entitled “Safe Operation of Screw Conveyors, Drag Conveyors, and Bucket Elevators.” CEMA encourages acquisition and use of this source of safety information to supplement your safety program.

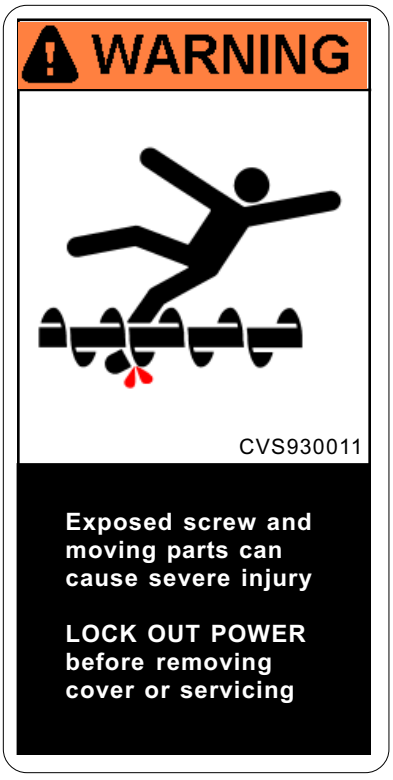
SEE OTHER SIDE FOR SAFETY LABELS

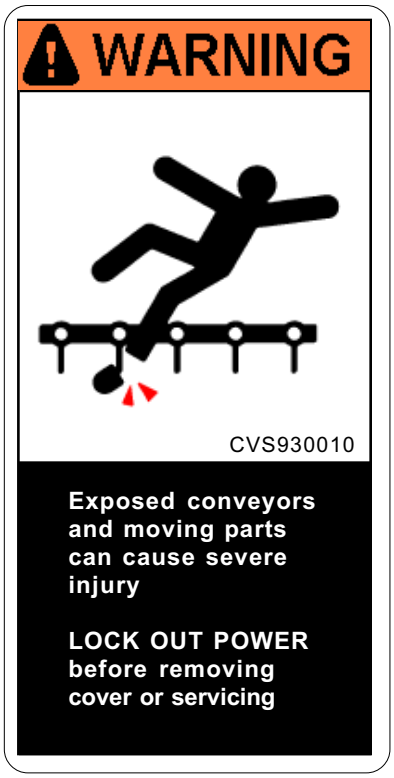
CEMA Safety Labels

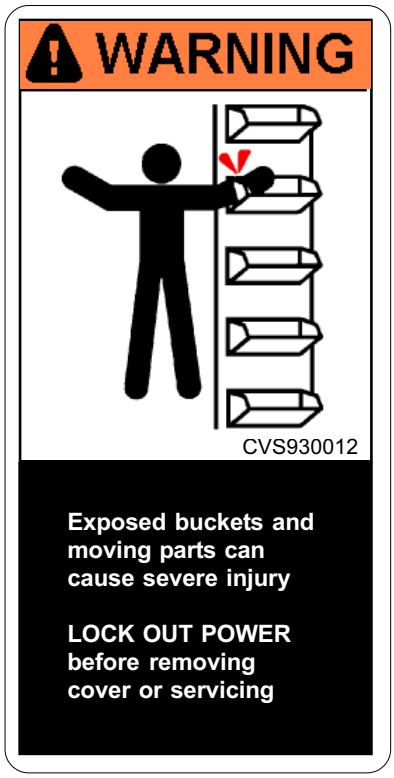
The CEMA safety labels shown below should be used on screw conveyors, drag conveyors, and bucket elevators. Safety labels should be placed on inlets, discharges, troughs, covers, inspection doors & drive guards. See CEMA Safety Label Placement Guidelines on CEMA Web Site: http://www.cemanet.org/safety/guidelines.html











PROMINENTLY DISPLAY THESE SAFETY LABELS ON INSTALLED EQUIPMENT

SEE OTHER SIDE FOR SAFETY REMINDERS

Note: Labels alone do not substitute for a thorough in-plant safety training program centered on the hazards associated with operating your installed equipment.

Contact CEMA or Your Equipment Manufacturer for Replacement Labels

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION
6724 Lone Oak Blvd., Naples, Florida 34109
239-514-3441

PRODUCT SPECIFICATION SHEET

MODEL:	REV:
120L-17JZ329	-

DESCRIPTION:	CUSTOMER PN:	DATE:
DIN Rail/Surface Mtg. Temp Limit Controller	Process Heating	10/17/06

120L-17JZ329

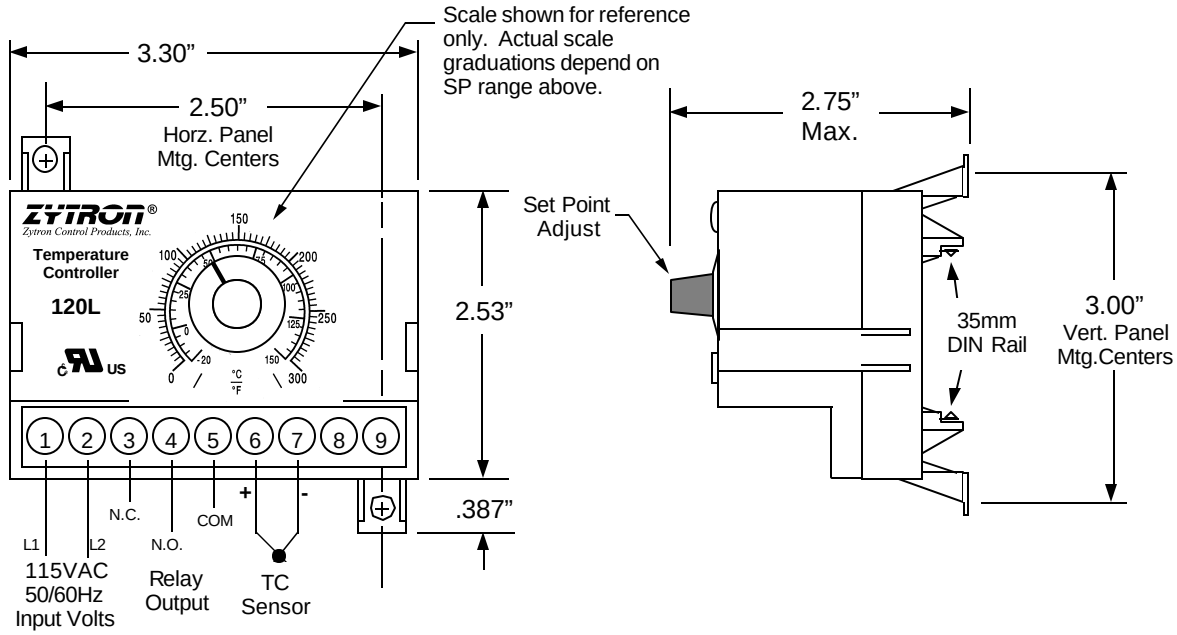
Input Voltage:	115VAC ±15%, 50/60Hz, 3VA Max.
Control Output:	SPDT Relay, N.O. contacts rated 8 Amps Res. 240VAC, 100,000 cycles
Control Mode:	Relay de-energizes on temperature rise (N.O. contacts open).
Control Action:	Latching with manual reset (Reset terminals open) or On-Off with 2°F Hyst. (Reset terminals shorted) .
Manual **Reset:**	Cycle power off & on or momentarily short Reset terminals with N.O. momentary switch (customer supplied). .
Set Point Range:	0 to 600°F
Setpoint Adj.:	Local SP pot with dual °F/°C graduated scales
Sensor Type:	"J" Thermocouple
Compensation:	Automatic cold junction compensation
Control Stability:	Typically better than ±5mV/°F ambient and .01% of span/% rated line voltage
Set Point Accuracy:	±3% of FS maximum at 25°C and rated line voltage
Sensor Failure Prot:	Contacts open for thermocouple break
Amb. Oper. Temp:	0 to 55°C (32 to 131°F)

MECHANICAL

Enclosure Material:	Noryl, Black color
Field Terminations:	Screw termininals with wire clamping plat es and touch safe shield.
Mounting:	35mm DIN rail and surface mounting base

AGENCY APPROVALS UL 873 & CUL per CSA C22.2 No. 24 File #E105669

DIMENSIONS:



LTR	DESCRIPTION	DATE

4000PC Series Time Switch Installation and Operation Instructions

Specifications - 4000PC Series Time Switches

Model	Switch Arrangement	Switch Rating per pole	AC Line
4014-71PC	DPST	40 amp resistive, 40 amp tungsten, 690 VA, 2 HP	208-277 volts, 60 Hz
4011-00PC	SPST	40 amp resistive, 40 amp tungsten, 690 VA, 1 HP	120 volts, 60 Hz
4013-00PC	DPST	40 amp resistive, 40 amp tungsten, 690 VA, 1 HP	120 volts, 60 Hz

Minimum time settings: One and one half hour minimum on or off time.

Enclosure: NEMA type 3R plastic indoor/outdoor with hasp for padlock or seal.

Dimensions: 9 5/8" H x 6 3/4" W x 3 3/4" D

Full one year warranty on all 4000PC Series Time Switches

Before You Begin Installation

If you are familiar with electrical circuits and the installation site's existing wiring meets the National Electrical Code and your local codes, you should be able to install the Paragon 4000PC Series Time Switch correctly and safely. Carefully follow the step-by-step instructions listed below.

Make sure the installation site's electrical system has been correctly wired without changes or modifications. A load which is incorrectly wired or is not properly grounded is a hazard.

If you have any doubts about the installation's existing wiring, it is recommended you have a licensed electrician check the existing wiring before you install the Paragon Time Switch. If you have any doubts about your ability to install the time switch, hire a licensed electrician to do it for you.

Before you add or install wiring, contact your local building inspector for the latest local and national electrical code information. You may need a permit for electrical work, as well as a safety inspector once the installation is complete.

IMPORTANT: WIRING ADDED TO INSTALL A PARAGON 4000PC SERIES TIME SWITCH MUST BE COMPATIBLE WITH YOUR EXISTING WIRING (BX, Romex or wires in conduit).

Electrical Requirements

See the inner door of the time switch enclosure for information regarding voltage, amperage and horsepower requirements.

PLEASE READ THROUGH ALL INSTRUCTIONS BEFORE STARTING! This will help you determine what tools and material you will need to complete the installation.

1. Disconnect Power

Turn off power for the load at the fuse or circuit breaker box.

Remove fuses for the load circuit (water heater, pool pump, lights, etc.) or turn the circuit breaker switch for the load circuit to the OFF position.

2. Install the Enclosure

A. Find a safe location to install the Paragon Clear-view Time Switch Enclosure.

B. Remove the time switch by pressing the two tabs on each side of the enclosure outward and lift switch out of enclosure.

C. Punch out the knockout openings used to feed wire through the enclosure.

D. Mount the enclosure with screws (not provided).

E. Place the switch back into the enclosure by locating the four sets of hangers on the top inside of the enclosure. Slide the top of the switch between the two lowest sets of hangers. Press the switch back into place.

3. Install Wire from Power Source to Enclosure

A. If this is a new installation: Run a length of appropriate cable from the power source to the enclosure leaving enough at each end to make the electrical connections (Skip to D).

B. If this is an existing installation: BE SURE THE POWER SUPPLY TO THE LOAD IS TURNED OFF AT THE FUSE OR CIRCUIT BREAKER BOX. Before touching any electrical parts, use an appropriate volt tester to be sure the power is off at the load.

C. Carefully disconnect all wires from the load. Make note of how the connections are made so you will know how to reconnect them once the wire is installed from the enclosure to the load.

D. Place this wire in the enclosure (using conduit clamp or connector) leaving enough wire to work with. Strip approximately 1/2 inch of insulation from each of the wires.

4. Install Wire from Enclosure to Load(s)

A. Install a new length of power cable (compatible with the existing home wiring) with conduit clamp or connector (not provided) from the enclosure through another knockout hole to each load.

B. Strip the insulation from the new length of power cable leaving enough wire in the enclosure to work with.

C. At the load end, connect the load in the same manner in which it was removed. If this is a new installation, follow the instructions that came with the load.

D. At this point, both the source and the load should be connected leaving only the control to be connected.

5. Connect Source and Load Wires to Control

Each control is wired differently depending on the model #. Choose the correct model # from the table below and go to the appropriate step.

MODEL #	Voltage	Step #
4014-71PC	208-277V	Go to step #5.1
4011-00PC	120V	Go to step #5.2
4013-00PC	120V	Go to step #5.3

5.1 MODEL #4014-71PC (208-277V)

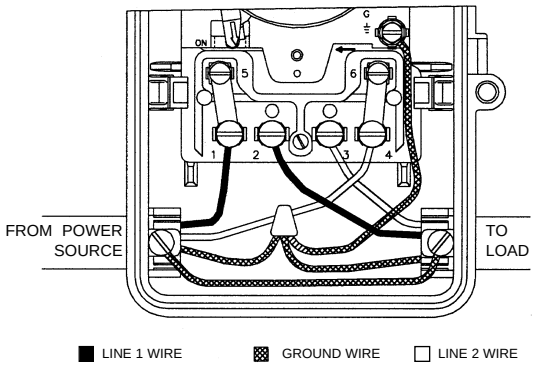


Figure 1

REFER TO FIGURE 1 ABOVE FOR FOLLOWING INSTRUCTIONS

A. Place the line 1 voltage wire from the source (typically black) under terminal 1 and tighten screw.

B. Place the line 2 voltage wire from the source (typically red for 208 or 240V and typically white for 277V) under terminal 4 and tighten screw.

C. Place the line 1 voltage wire from the load (typically black) under terminal 2 and tighten screw.

D. Place the line 2 voltage wire from the load (typically red for 208 or 240V and typically white for 277V) under terminal 3 and tighten screw.

E. Attach an additional piece of ground wire to the ground terminal of the time switch. Tie the other end of the additional piece of ground wire to the ground wires from the source and load using a wire nut.

F. If using metal conduit, a separate grounding wire or wires must be used to bond the conduits together by attaching the grounding wire to the grounding bushings on the conduit ends.

G. Double check all connections to be sure they are secure and tight. LOOSE SCREWS OR TERMINALS CAN CAUSE HAZARDOUS OVERHEATING.

H. Replace the cover plate on the control and loads.

I. Proceed to section #6 (TEST TIME SWITCH).

5.2 MODEL #4011-00PC (120V) One Load

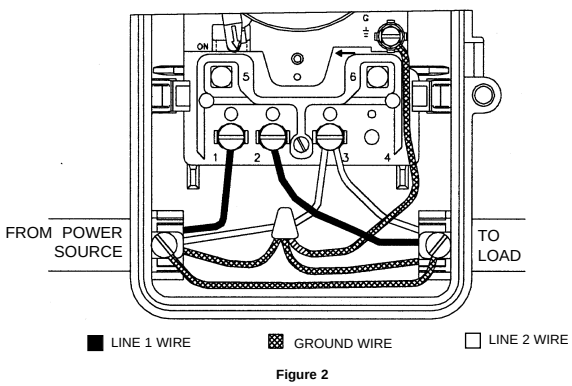


Figure 2

REFER TO FIGURE 2 ABOVE FOR FOLLOWING INSTRUCTIONS

A. Place the line voltage wire from the source (typically black) under terminal 1 and tighten screw.

B. Place the line neutral wire from the source (typically white) under terminal 3 (do not tighten at this time).

C. Place the line neutral wire from the load (typically white) under terminal 3 and tighten the screw, making sure both wires are secure.

D. Place the line voltage wire from the load (typically black) under terminal 2 and tighten the screw.

E. Attach an additional piece of ground wire to the ground terminal of the time switch. Tie the other end of the additional piece of ground wire to the ground wires from the source and load using a wire nut.

F. If using metal conduit, a separate grounding wire or wires must be used to bond the conduits together by attaching the grounding wire to the grounding bushings on the conduit ends.

G. Double check all connections to be sure they are secure and tight. LOOSE SCREWS OR TERMINALS CAN CAUSE HAZARDOUS OVERHEATING.

H. Replace the cover plate on the control and loads.

I. Proceed to section #6 (TEST TIME SWITCH).

5.3 MODEL #4013-00PC (120V) Two Loads

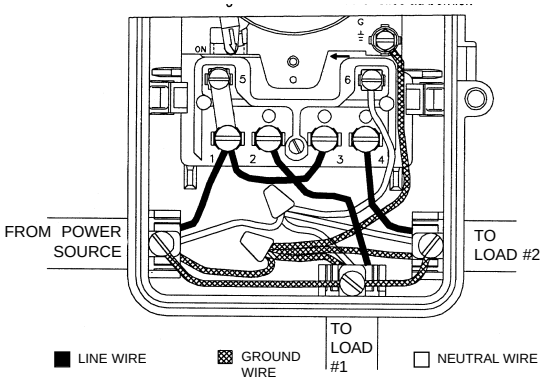


Figure 3

REFER TO FIGURE 3 ABOVE FOR FOLLOWING INSTRUCTIONS

A. Place the line voltage wire from the source (typically black) under terminal 1 but do not tighten screw at this time.

B. Install a jumper wire (use appropriate wire) from terminal 1 to terminal 3 (see figure 3). Once the jumper is in place, tighten terminals 1 and 3.

C. Place the line voltage wire from load 1 (typically black) under terminal 2 and tighten screw.

D. Place the line voltage wire from load 2 (typically black) under terminal 4 and tighten screw.

E. Attach an additional piece of neutral wire (typically white) under terminal 6 and tighten. Tie the other end of the additional piece of neutral wire to the neutral wires of the source, load 1 and load 2, using a wire nut.

F. Attach an additional piece of ground wire to the ground terminal of the time switch. Tie the other end of the additional piece of ground wire to the ground wires of the source, load 1 and load 2, using a wire nut.

G. If using metal conduit, a separate grounding wire or wires must be used to bond the conduits together by attaching the grounding wire to the grounding bushings on the conduit ends.

H. Double check all connections to be sure they are secure and tight. LOOSE SCREWS OR TERMINALS CAN CAUSE HAZARDOUS OVERHEATING.

I. Replace the cover plate on the control and loads.

J. Proceed to section #6 (TEST TIME SWITCH).

6. Test Time Switch

Once all wires are connected, review the instructions to be sure you have properly wired the Paragon Time Switch to the load.

Replace terminal insulator on the time switch. Move manual operation switch lever to the OFF position. Turn on power supply to the time switch at fuse or circuit breaker box. Move the manual operation switch lever to the ON position and close the enclosure door. This should turn the load(s) ON. (If using the timer to control a water heater, the water heater will turn ON provided the water temperature is below the thermostat temperature setting). If the load does not operate, turn off the power supply to the time switch at the fuse or circuit breaker box and consult a licensed electrician.

7. Set ON and OFF Trippers

Once the 4000PC Series Time Switch has been properly installed, you will be ready to set the ON and OFF trippers. Two sets of trippers are included with your time switch (one set in bag) enabling you to turn the load ON and OFF twice in a 24-hour period.

First, determine the daily times when you want the load(s) to be ON. Attach an ON tripper to the clock-face dial at the time the load(s) are to be ON. Attach an OFF tripper to the clock-face dial at the time when the load(s) are to be OFF. Attach the second set of trippers to the dial in the same manner if required. Make certain tripper screws are tightened on top dial ridge.

8. Set Dial to Time of Day

After setting the On and OFF time(s) of your Paragon 4000PC Series Time Switch, you must set the clock:

Turn the dial of the time switch clockwise until the current time is in line with the black indicator (see figure 4). After a power outage, be sure to remember to include your time switch when resetting clocks to the correct time when power resumes.

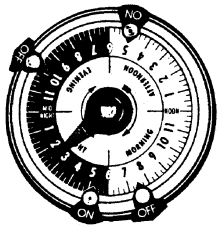


Figure 4

9. To Turn the Load ON/OFF Manually

Simply move the manual operation switch lever, located to the bottom left of the time dial, to the desired ON or OFF position.

These instructions are applicable to most common installations. Consult your electrician for assistance with other than standard electrical hookups.

Maple Chase Company
2820 Thatcher Road
Downers Grove, Illinois 60515
Made in Mexico

Customer Service 800-951-5526
Technical Support 800-732-8400

ISO 9002 registered

Paragon Electric Canada, Ltd.
5785 Kennedy Road
Mississauga, Ontario L4Z 2G3

From outside North America
630-719-5500

3", 4" and 5" Back Connected Industrial Thermometers

A rugged 90° back angle, rear threaded connection design. Commonly used in industrial, pulp and paper, food and beverage processing, HVAC, and OEM applications.

➤ MODEL CODES:

GT-300	3" diameter head
GT-300R	3" diameter head with calibration feature
MX-325R	3" diameter head with calibration feature and min ***or*** max temperature indicator
MM-325R	3" diameter head with calibration feature and min ***and*** max temperature indicator
GT-400	4" diameter head
GT-400R	4" diameter head with calibration feature
GT-500	5" diameter head
GT-500R	5" diameter head with calibration feature
MX-525R	5" diameter head with calibration feature and min ***or*** max temperature indicator
MM-525R	5" diameter head with calibration feature and min ***and*** max temperature indicator

➤ SPECIFICATIONS:

Stem Lengths:	2½", 4", 6", 9", 12", 15", 18" and 24" (available up to 120").
Stem Diameter:	.250" standard up to 42" stem. .375" standard over 42" stem.
Connection:	½" NPT.
External Reset:	Models with calibration feature are easy to calibrate by inserting 1/16" Allen wrench into reset opening.
Construction:	304 stainless steel external parts. Welded construction. Corrosion resistant to most chemicals.
Hermetic seal:	Per ASME B40.3 dustproof and leakproof.
Dial:	True Anti-Parallax dial, easy-to-read from any angle, minimizes reading errors. Anodized aluminum with large black numbers and graduations.
Lens:	Glass.
Bimetal Coil:	Helix coil is silicone coated on ranges below 500°F for vibration dampening and to maximize heat transfer and response time.
Accuracy:	±1% full span per ASME B40.3 Grade A. When using maximum or minimum temperature indicator, accurate to within 1½% full span.
Over Temperature Limits:	Up to 250°F 100%; 250°F to 550°F, 50%; 550°F to 1000°F, continuous use up to 800°F, intermittent use over 800°F.

MADE IN USA

Tel-Tru Manufacturing Company
408 St. Paul St., Rochester, New York 14605 USA
Phone: 585.232.1440 • 800.232.5335 • Fax: 585.232.3857 • E-mail: info@teltru.com • Web: www.teltru.com

STANDARD RANGES:

Fahrenheit	°/Div.	Celsius	°/Div.	Dual Fahrenheit	Dual Celsius
-100/100°	2°	-75/175°	5°	-100/100	-75/40
-50/120°	2°	-70/70°	1°	-40/160	-40/70
-40/160°	2°	-50/100°	1°	-0/140	-18/60
0/140°	1°	-50/25°	1°	0/180	-18/82
0/180°	2°	-50/50°	1°	0/220	-10/100
0/200°	2°	-40/70°	1°	0/250	-20/120
0/220°	2°	-20/120°	1°	20/240	-10/110
0/250°	2°	-10/110°	1°	25/125	-5/50
0/300°	5°	0/50°	1/2°	50/300	10/150
0/500°	10°	0/60°	1°	50/400	0/200
20/240°	2°	0/80°	1/2°	50/500	10/260
25/125°	1°	0/100°	1°	150/750	50/400
50/250°	2°	0/150°	1°	* 200/1000	*100/550
50/300°	2°	0/200°	2°		
50/400°	5°	0/250°	2°		
50/500°	5°	0/300°	5°		
50/550°	5°	0/400°	5°		
100/800°	10°	0/450°	5°		
150/750°	10°	100/400°	5°		
* 200/1000°	10°	*100/550°	5°		

(Additional Ranges Available – Consult factory)

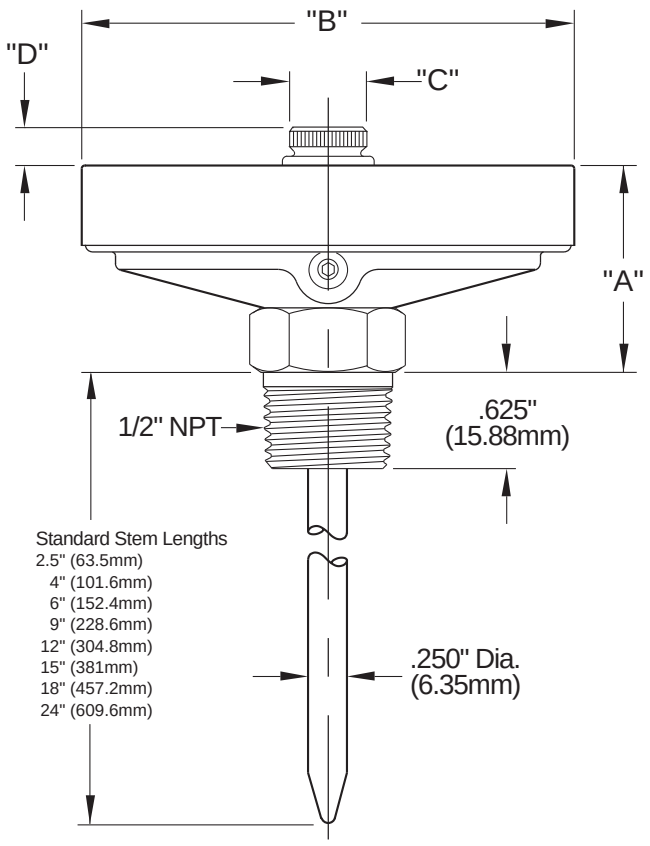
* Thermometers with temperature ranges 200/1000°F and 100/550°C are NOT RECOMMENDED FOR CONTINUOUS USE ABOVE 800°F/425°C (FOR INTERMITTENT USE ONLY).

OPTIONS:

- Union connection or other connection types and sizes.
- Silicone filled.
- Other lenses are acrylic, polycarbonate, shatterproof glass or tempered glass (acrylic only for MX and MM models).
- Other stem diameters .236" (6mm), .315" (8mm), .375" (9.5mm).
- 316SS wetted parts.
- Other configuration combinations available upon request.
- Some ranges NSF® certified.

Estimated Shipping Weights		
MODEL	DRY	SILICONE FILLED
GT-300 and GT-300R	11 oz.	14 oz.
GT-400 and GT-400R	1 lb.	1 lb. 6 oz.
GT-500 and GT-500R	1 lb. 4 oz.	1 lb. 14 oz.
MX-325R and MM-325R	11 oz.	N/A
MX-525R and MM-525R	1 lb. 4 oz.	N/A

GT-300, GT-300R, GT-400, GT-400R, GT-500, GT-500R, MX-325R, MM-325R, MX-525R AND MM-525R



MODEL	"A"	"B"	"C"	"D"
GT-300, GT-300R	1.375" (34.93mm)	3.187" (80.95mm)	N/A	N/A
GT-400, GT-400R	1.375" (34.93mm)	4.115" (104.50mm)	N/A	N/A
GT-500, GT-500R	1.718" (43.63mm)	5.040" (128.02mm)	N/A	N/A
MX-325R, MM-325R	1.375" (34.93mm)	3.187" (80.95mm)	.500" (12.70mm)	.275" (6.99mm)
MX-525R, MM-525R	1.718" (43.63mm)	5.040" (128.02mm)	.500" (12.70mm)	.275" (6.99mm)

FOR HOW TO ORDER, SEE PAGE 6

IMPORTANT NOTES:

1) Thermowells are recommended for pressure, corrosive fluid or high velocity applications.
2) ASME B40.3— Bimetal thermometers manufactured by Tel-Tru and offered in this brochure are designed to meet or exceed this Standard issued by the American Society of Mechanical Engineers.

EGS Electrical Group

Appleton®

330086-000
INSTRUCTION SHEET

Instruction for Installation and Maintenance of Powertite® Series: Pin and Sleeve Receptacles, Plugs and Cable Connectors (30, 60 and 100 Ampere) For Use With Copper Conductors Only

Electrical Rating
Maximum Voltage: 600 VAC at 50-400Hz, 250V DC; Maximum.
Continuous Current: 30, 60, or 100 Amperes.

Applications

- Designed to supply power to portable or fixed electrical equipment such as motor generator units, welders, pumps, compressors and similar apparatus.
- Ideal for use on shipping docks, ports and other "ship to shore" applications.
- Suitable for use in locations where a watertight enclosure is required.
- Rough usage construction.

Features

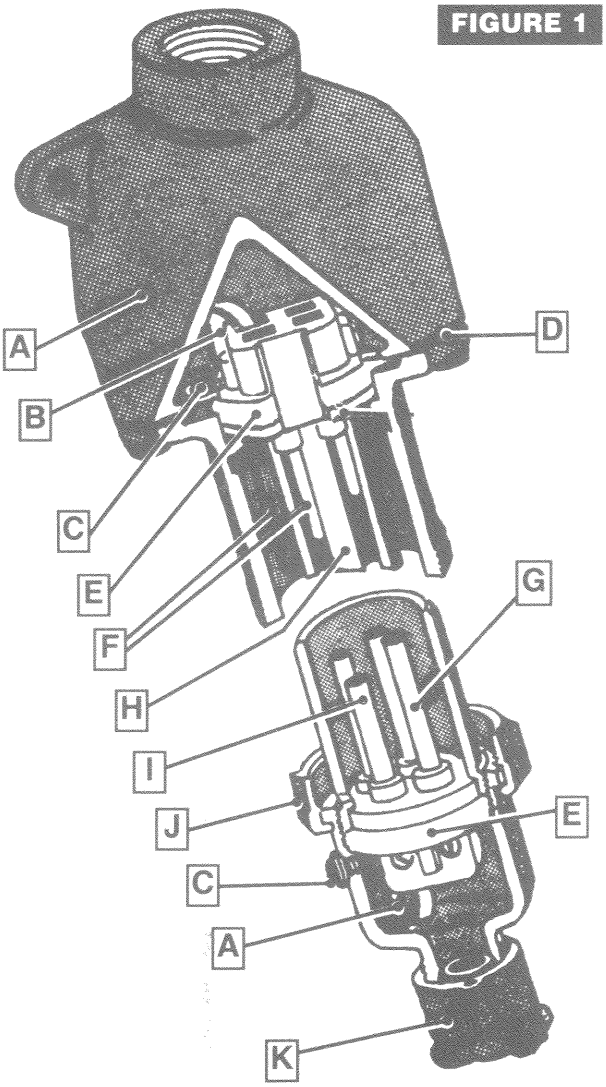
A. **Rugged.** All components have copper-free aluminum housings.
B. **Two Grounding Styles.** Copper grounding straps in Style 2 receptacles and plugs (shown) ground thru shell and extra pole. Style 1 thru shell only.
C. **Convertible.** Two screws secure receptacle insulator block; one screw secures plug insulator block. Permits easy conversion to reverse service (30, 60, 100A).
D. **Watertight.** Mounting box sealed with gasket. Receptacle and connector seals with screw cap or plug. Plug sealed when in receptacle or connector
E. **Insulator Blocks.** Provide high mechanical and dielectric strength, very low "arc tracking".
F. **Positive Ground.** Grounding detent springs assure maintained ground contact.
G. **Self-Aligning.** "Floating" plug and receptacle contacts automatically align.
H. **Arcing Confined.** Contacts made and broken in snuffing chamber. In emergency, plugs can be withdrawn under full rated loads (30A thru 100A). Positive polarization helps prevent mismatching plugs.
I. **Positive Contacts.** Brass contacts have integral springs for positive maintained electrical contact.
J. **Clamping Ring, Plug.** Neoprene gasketed, 30A, 60A, 100A plugs thread onto receptacle for watertight union.
K. **Positive Cable Clamp.** Plugs supplied with neoprene bushing and a reversible cable clamp for firm, watertight fit over a wide range of cable diameters. Locking screw prevents Gland Nut from turning.

Retain this instruction sheet for future reference.

Read instructions carefully and with full understanding for safe installation and operation.

Compliances:
UL Standards 1682, 1686 (all) and 1010 (plugs only);
CSA Specification C22.2 No. 182.1
Enclosure Type 3, 4, 4X

FIGURE 1



Style 2 Powertite Plugs, Receptacles and Cable Connectors are equipped (since mid-1990) with contacts designed to provide a safety polarization means called **"Controlled Length"** contacts, as indicated on product nameplate. This feature will not allow the plug grounding contact (Style 2) to touch an energized receptacle "line" contact in the event the plug becomes damaged and/or loses its primary polarization means and/or is rotated into the incorrect position.

Except as expressly provided by Appleton Electric (Appleton) in writing, Appleton products are intended for ultimate purchase by industrial users and for operation by persons trained and experienced in the use and maintenance of this equipment and not for consumers or consumer use. Appleton warranties do not extend to and no reseller is authorized to extend Appleton's warranties to any consumer.

CAUTION

To prevent ignition of hazardous atmospheres do not use in Class 1, Group F locations that contain electrically conductive dusts.

WARNING

Use cable with diameters within the specified range given in TABLE B for any given grommet size and clamp orientation. Failure to do so may result in over stressed wire terminations which could cause the conductors to pull out of the contacts and cause serious/fatal injuries due to electrocution or fire.

WARNING

Do not modify these devices in any way.

Replace any missing or broken parts with proper replacements parts from Appleton Electric. Modification of these devices or substitution of parts with non-standard parts may result in serious/fatal personal injury from electrocution.

CAUTION

ACP series plugs may be mated with Powertite Series Receptacles in ordinary locations and with the DBR, MD2SR, JBR, EBR and EBRH Series Receptacles for use in hazardous (classified) locations as defined in the National Electrical Code and the Canadian Electric Code. Portable utilization equipment connected to the ACP Series plug must be approved for use in the intended location. Equipment **NOT** approved for use in hazardous location as defined by the N.E.C. and C.E.C., connected to an ACP plug must be used in non-hazardous locations. If used in a hazardous area, the equipment must be approved for that location, or the area must be purged of the hazard and declared non-hazardous.

WARNING

If any parts of the plug, receptacle or cable connector appear to be missing, broken or show signs of damage;

DISCONTINUE USE IMMEDIATELY!

This condition could cause serious/fatal personal injury due to electrocution and/or equipment damage. Repair with proper replacement part(s) before continuing service.

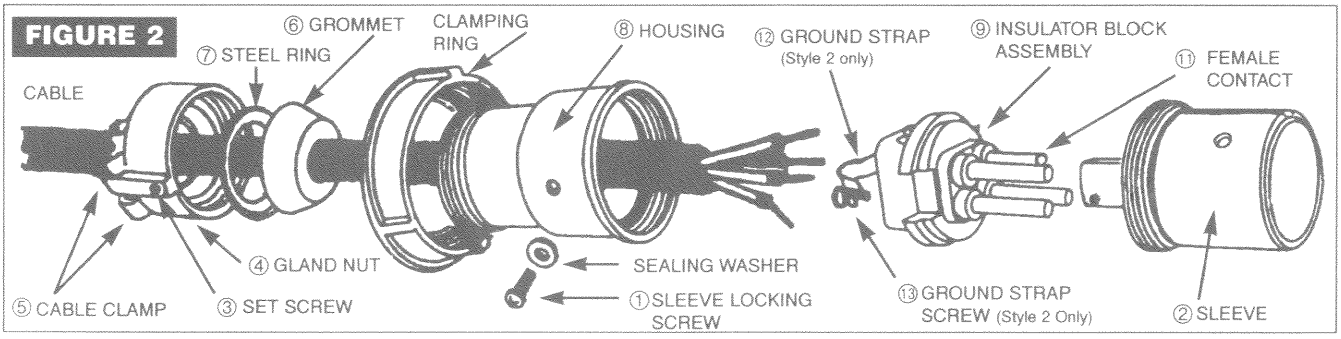
WARNING

Electrical power must be turned **"OFF"** before and during installation and maintenance. Failure to do so may result in serious/fatal injuries due to electrocution.

Plug is watertight when inserted in proper receptacle or cable connector and the clamping ring is fully tightened.

INSTALLATION INSTRUCTIONS FOR POWERTITE "ACP" PLUGS: 30A, 60A, 100A:

FIGURE 2



1. Disassemble plug as shown in Figure 2 by removing sleeve locking screw ①, loosening set screw ③ and unscrewing gland nut ④. It is not necessary to remove female contacts ⑪ from insulator block ⑨. In case of STYLE 2 insulator block, make sure grounding contact with strap ⑫ is in the proper location. See Figure 4.
2. Strip the cable jacket and individual conductors per Table "A".
3. Select proper grommet ⑥ and cable clamp ⑤ orientation per Table "B". Reversible cable clamps (just remove screws, flip over and replace screws) permit wide cable range. Convenient in installations having different cable sizes. See Figure 8.

4. Slide gland nut ④, steel ring ⑦, proper grommet ⑥ and housing ⑧ in that order back over cable.
5. Connect wires to proper terminals in insulator block by loosening (but not removing) terminal pressure screws on contacts. Then insert conductors including all strands into contact terminals according to your established wiring scheme. Tighten terminal pressure screws to a torque value between 30-35 inch lbs. (Conductors must bottom in contact terminal well and insulation must extend below surface of insulator block.) See Figure 3.

Continued on next page...

6. Position insulator block assembly ⑨ in sleeve ②. For STYLE 2, attach ground strap ⑫ to sleeve ② with ground strap screw ⑬ and torque in 25 in. lb. min. / 30 in. lb max. Screw the combination of sleeve and contact block assembly into housing ⑧ until the threaded hole in sleeve ② is aligned with the hole in housing ⑧. Thread in sleeve locking screw ① including sealing washer and torque to 30 in. lb. min. / 35 in. lb. max.
7. Slide grommet ⑥ and steel ring ⑦ up and as close to housing as possible. Force cable into wiring chamber to induce a minimum of 1/8 in. slack in the wire between clamp and terminal. Screw gland nut ④ onto housing ⑧ and torque per Table "C". Finally torque the set screw ③ in place at 10 in. lb. min. / 15 in. lb. max.
8. Refer to Table "B" and Figure 8 for correct cable clamp orientation. Tighten cable clamp screws to 30 in. lb. min. / 35 in. lb. max. Screws were lubricated at the factory but if needed, relubricate with a good grade of grease.

WARNING

A wire scheme must be followed so that the same color wire is always put into the same numbered contact opening in all plugs, connectors and receptacles in the system. This will help insure correct polarity for the system and helps to eliminate possibilities for equipment damage and/or personal injuries due to electrocution or fire.

ELECTRICAL TESTING

Do not connect to power until conducting the following electrical tests.

- Test continuity of wiring to verify correct phasing and grounding connections.
- Measure insulation resistance to be sure system does not have any short circuits or unwanted grounds.

FIGURE 3

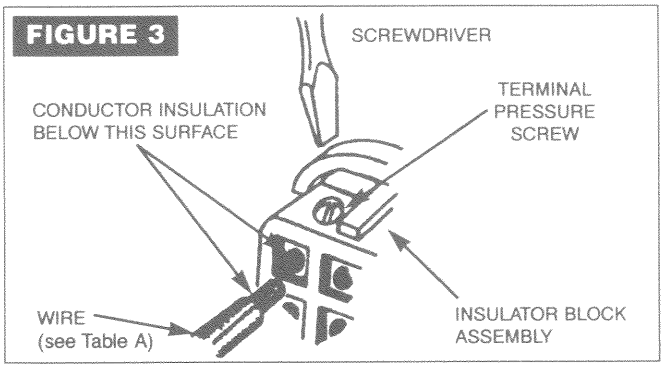
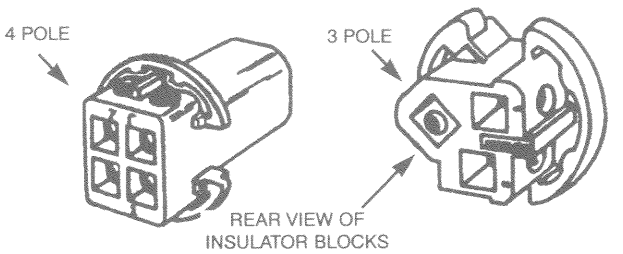


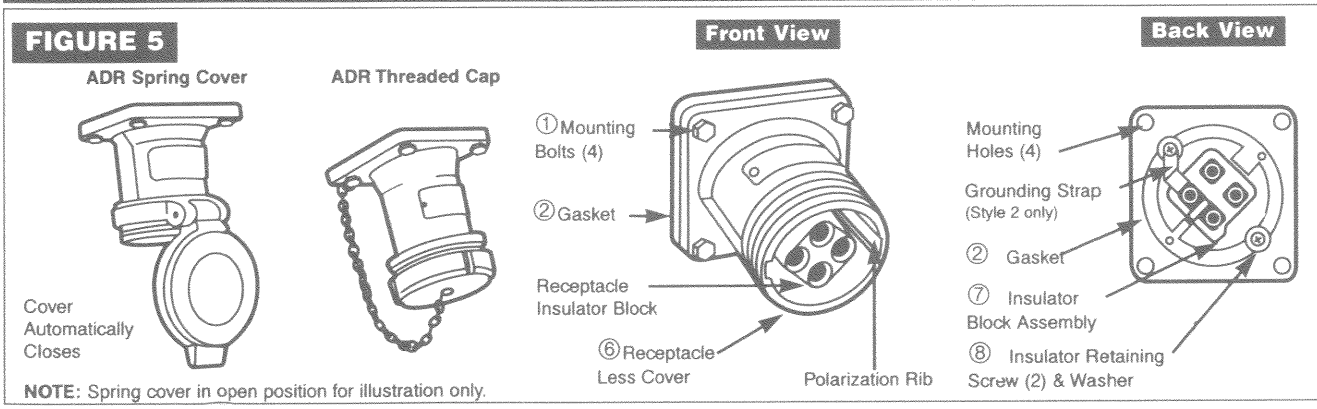
FIGURE 4

NOTE:
In STYLE 2, unmarked terminal cavities are for grounding contacts.



INSTALLATION INSTRUCTIONS FOR POWERTITE "ADR" RECEPTACLES: 30A, 60A, 100A

FIGURE 5



NOTE: Spring cover in open position for illustration only.

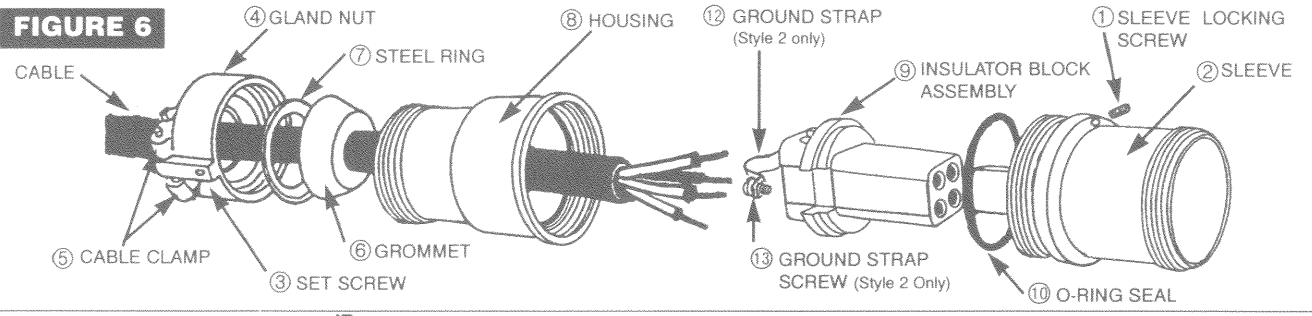
Spring Cover and Screw Cover receptacles are threaded to accept the clamping ring of the ACP plug. The ring threads onto the receptacle to form a watertight assembly with plug in use and also to prevent plug fallout. When the plug is withdrawn, the gasketed Spring Cover automatically closes tightly against receptacle opening providing weather-proof protection.

1. Follow instruction given in paragraphs 2 and 5 for "ACP" plugs.
2. Insert insulator block assembly ⑦ into receptacle housing ⑥ and install two retaining screws with washers ⑧. Torque to 30 in. lbs. min. / 35 in. lbs. max.
3. Mount receptacle to previously installed back box using mounting bolts ① supplied with receptacle and torque to 30 in. lb. min. / 40 in. lb. max. Mounting screws provide electrical continuity between receptacle housing ⑥ and back box. Make sure gasket ② is positioned correctly to make a watertight seal.
4. The spring cover can be positioned to open in any direction by loosening the set screws ⑤, repositioning the spring cover ④, and retightening the set screws ⑤. Torque set screws ⑤ to 7 in. lb. min. / 12 in. lb. max.

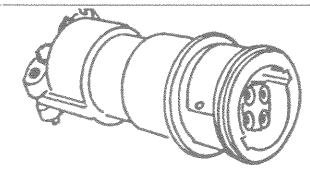
Installation Instructions for Powertite "ARC" Cable Connectors: 30A, 60A, 100A

30A Cable Connector

FIGURE 6



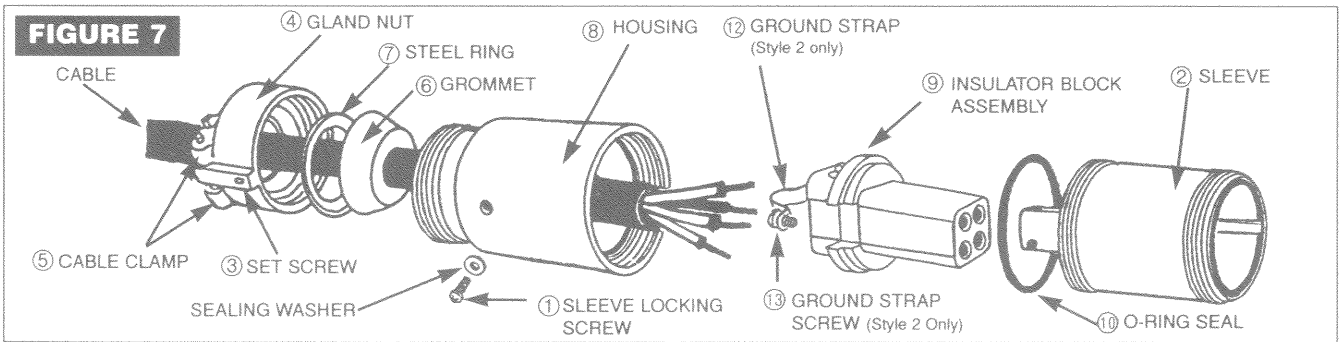
These Cable Connectors are for use with "ACP Powertite Plugs and others. See Intermateability Chart



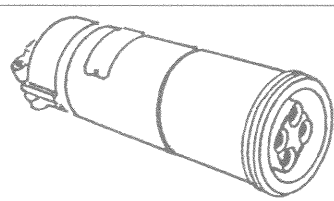
1. Disassemble connector as shown in Figure 6 by loosening sleeve locking set screw ① and gland nut set screw ③, then unscrew sleeve ③ and gland nut ④.
2. Follow instructions given in paragraphs 2, 3, 4, 5 and 6 for the "ACP" plugs.
3. Screw the combination of sleeve and insulator block assembly into the housing ⑧ until the gasket ⑩ is tightened between the sleeve ② and the housing ⑧.
4. Tighten sleeve locking set screw ① and torque to 30 in. lb. min. / 35 in. lb. max.
5. Follow instruction given in paragraphs 7and 8 for "ACP" plugs.

60A/100A Cable Connector

FIGURE 7



These Cable Connectors are for use with "ACP Powertite Plugs and others. See Intermateability Chart

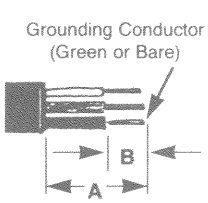


1. Disassemble connector as shown in Figure 7 by loosening sleeve locking set screw ① and gland nut set screw ③, then unscrew sleeve ② and gland nut④.
2. Follow instructions given in paragraphs 2, 3, 4, 5 and 6 for the "ACP" plugs.
3. Screw the combination of sleeve ② and insulator block assembly ⑨ into the housing ⑧ until the "O"-ring ⑩ seats against the sleeve ② and housing ⑧. At this point continue to screw the two components together until the hole in the housing is aligned with the threaded hole of the sleeve ②. Replace sleeve locking screw ① and torque to 30 in. lb. min. / 35 in. lb. max.
4. Follow instruction given in paragraphs 7 and 8 for "ACP" plugs.

TABLE A Dimensions in Inches

Terminal Wire Range and Stripping Guide, Copper Conductors Only

Amperes Rating	Strip Length (inches) Jacket A	Strip Length (inches) Conductor B	Terminal Wire Range (AWG) Building	Terminal Wire Range (AWG) Extra Flex
30	1 1/2	1/2	#10 - #6	#10 - #8
60	1 7/8	5/8	#6 - #2	#6 - #4
100	2 1/2	7/8	#4 - #1	#4 - #2



Terminal Wire Size and Electrical Ratings
Plug and Cord Connector Ratings

AMPERES	MAX. VOLTAGE	WIRE RANGE EXTRA FLEX
30	600 VAC @ 50-400 Hz, 250 VDC	#10 - #8
60	600 VAC @ 50-400 Hz, 250 VDC	#6 - #4
100	600 VAC @ 50-400 Hz, 250 VDC	#4 - #2

CAUTION

Plug and cord connectors are rated for use with Type SO or equivalent portable cord with copper conductors ONLY.

CAUTION

Care must be taken not to cut into the individual conductor insulation when removing the outer cable jacket and to not damage the conductors when removing individual wire insulation. Failure to do so will seriously degrade the electrical properties of the cable and may produce overheating/electrical hazard due to electrocution.

WARNING

Use cable with diameters within the specified range given in TABLE "B" for any given grommet size and clamp orientation. Failure to do so may result in over stressed wire terminations which could cause the conductors to pull out of the contacts and cause serious/fatal injuries due to electrocution.

TABLE B

DIMENSIONS IN INCHES

Grommet Selection and Cable Clamp Orientation Guide (figure 8)

AMP SIZE & CAT. NO.	CABLE DIA. RANGE (In.)	GROMMET I.D. (in.)	REVERSIBLE CLAMP POSITION
30 AMP ACP30xxBC ARC30xxBC	.390-.625 .625-.812 .812-1.125	.625 .812 1.125	1 1 1
30 AMP ACP30xxB ARC30xxB	.500-.625 .625-.750 .750-.875	.625 .750 .875	1* 1* 1*
30 AMP ACP30xxC ARC30xxC	.875-1.000 1.000-1.188 1.188-1.375	1.000 1.188 1.375	1* 2* 2*
60 AMP ACP60xxBC ARC60xxBC	.625-.812 .812-1.125 1.125-1.375	.812 1.125 1.375	1 1 2*
60 AMP ACP60xxB ARC60xxB	.500-.625 .625-.750 .750-.875	.625 .750 .875	1* 1* 1*
60 AMP ACP60xxC ARC60xxC	.875-1.000 1.000-1.188 1.188-1.375	1.000 1.188 1.375	1* 2* 2*
100 AMP ACP10xxCD ARC10xxCD	.875-1.062 1.062-1.281 1.281-1.562 1.562-1.906	1.062 1.281 1.562 1.906	1 1 2 2
100 AMP ACP10xxC ARC10xxC	.875-1.000 1.000-1.188 1.188-1.375	1.000 1.188 1.375	1* 2* 2*
100 AMP ACP10xxD ARC10xxD	1.375-1.625 1.625-1.188	1.625 1.188	2* 2*

*Clamps B & C were replaced by clamp BC; also C & D replaced by CD. Some products with a B or C catalog number suffix were shipped with a BC clamp installed. Same for C or D but with a CD clamp.

Figure 8

To reverse cable clamp, just remove screws, flip over and replace screws. Permits a wider cable range. Convenient in installations having different cable sizes.

1st POSITION 2nd POSITION Clamp position for B, C and D clamps.

ACP plugs are supplied with four bushings to accommodate a wide variety of cable diameters.

For minimum torque tightening, see Table C.

Table C Gland Nut Tightening Torque Guide

DEVICE AMP RATING	MINIMUM TIGHTENING TORQUE (in. lb.)
30A	60.0
60A	60.0
100A	72.0

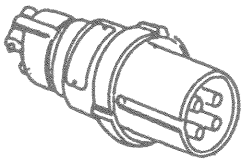
INTERMATEABILITY CHART FOR ORDINARY LOCATION PLUGS & RECEPTACLES

		30A				60A				100A			
		2W, 2P	3W, 3P	4W, 4P	3W, 4P	2W, 2P	3W, 3P	4W, 4P	3W, 4P	2W, 2P	3W, 3P	4W, 4P	2W, 2P	3W, 4P
APPLETON														
Plugs		ACP3022BC	ACP3033BC	ACP3044BC	ACP3034BC	ACP6022BC	ACP6033BC	ACP6044BC	ACP6034BC	ACP1022CD	ACP1033CD	ACP1044CD	ACP1023CD	ACP1034CD
Cable Connectors		ARC3022BC	ARC3033BC	ARC3044BC	ARC3034BC	ARC6022BC	ARC6033BC	ARC6044BC	ARC6034BC	ARC1022CD	ARC1033CD	ARC1044CD	ARC1023CD	ARC1034CD
Receptacles		ADR3022 ACR3022	ADR3033 ACR3033	ADR3044 ACR3044	ADR3034 ACR3034 WRDK3034 WRDK30SQ 312737	ADR6022 ACR6022	ADR6033 ACR6033	ADR6044 ACR6044	ADR6034 ACR6034 WRDK6034 WRDK60SQ 312726	ADR1022 ACR1022	ADR1033 ACR1033	ADR1044 ACR1044	ADR1023 ACR1023	ADR1034 ACR1034 WRDK1034 WRDK10SQ 312738
CROUSE-HINDS														
Plugs		APJ3275	APJ3375	APJ3475	APJ3485 NPJ3483 NPJ3484	APJ6275	APJ6375	APJ6475	APJ6385 NPJ6384 NPJ6385	APJ10277	APJ10377	APJ10477	APJ10387 NPJ10386 NPJ10387	APJ10487 NPJ10486 NPJ10487
Cable Connectors		APR3253 APR3255	APR3353 APR3355	APR3453 APR3455	APR3463 APR3465 NPR3463 NPR3464	APR6253 APR6255	APR6353 APR6355	APR6453 APR6455	APR6463 APR6365 NPR6364 NPR6365	APR10255 APR10257	APR10355 APR10357	APR10455 APR10457	APR10365 APR10367 NPR10366 NPR10367	APR10465 APR10467 NPR10466 NPR10467
Receptacles		AR321 AR323 AR327	AR331 AR333 AR337	AR341 AR343 AR347	AR342 AR344 AR348 NR342	AR621 AR623 AR627	AR631 AR633 AR637	AR641 AR643 AR647	AR642 AR644 AR648 NR642	AR1021 AR1023 AR1027	AR1031 AR1033 AR1037	AR1041 AR1043 AR1047	AR1032 AR1034 AR1038 NR1032	AR1042 AR1044 AR1048 NR1042

ANY PLUG WILL FIT AND OPERATE IN ANY RECEPTACLE OR CORD CONNECTOR IN THAT SAME COLUMN.

ACP Plugs for EBR, EBRH, JBR, MD2SR and DBR Receptacles

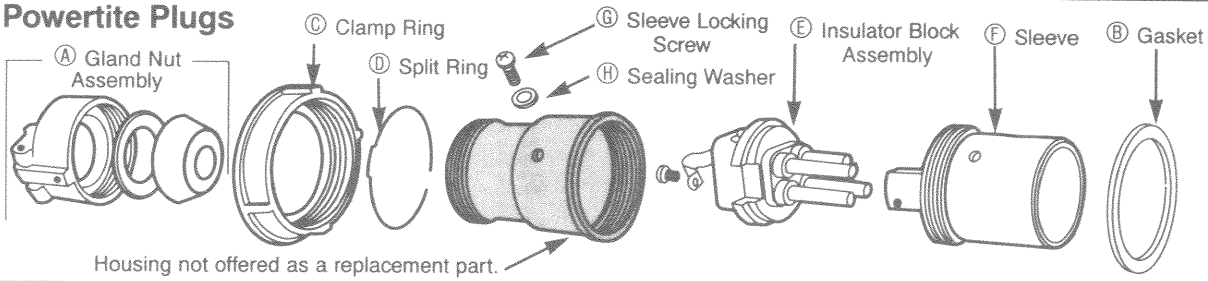
ACP Plugs can be used with ACR and ADR series receptacles and ARC cord connectors. ACP Plugs can also be used with the following receptacles in hazardous locations.



PLUG	RECEPTACLE
ACP3023BC	DBR, EBR, EBRH, JBR, MD2SR-3023
ACP3034BC	DBR, EBR, EBRH, JBR, MD2SR-3034
ACP6023BC	DBR, EBR, EBRH, JBR, MD2SR-6023
ACP6034BC	DBR, EBR, EBRH, JBR, MD2SR-6034
ACP1023CD	DBR, EBR, EBRH, JBR, MD2SR-1023
ACP1034CD	DBR, EBR, EBRH, JBR, MD2SR-1034

Replacement Parts Lists for Powertite "ACP" plugs

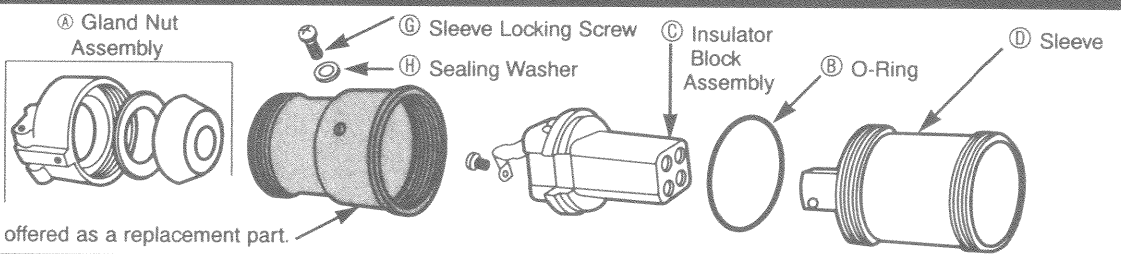
"ACP" Powertite Plugs



Ampacity	Style	Description	Item A Gland Nut Assembly	Item B Gasket	Item C Clamp Ring	Item D Split Ring	Item E insulator Block Assembly	Item F Sleeve STD Position	Item F Sleeve P4 Position	Item G Sleeve Locking Screw	Item H Sealing Washer
30	1	2W, 2P	350482-2	304023-004	304073	____	API-3022	304368-001	304368-003	P06174	W05146-3
30	1	3W, 3P	350482-2	304023-004	304073	____	API-3033	304368-001	304368-003	P06174	W05146-3
30	1	4W, 4P	350482-2	304023-004	304073	____	API-3044	304368-001	304368-003	P06174	W05146-3
30	2	2W, 3P	350482-2	304023-004	304073	____	API-3023	304368-002	304368-005	P06174	W05146-3
30	2	3W, 4P	350482-2	304023-004	304073	____	API-3034	304368-002	304368-005	P06174	W05146-3
60	1	2W, 2P	350482	304023-004	304351	____	API-6022	304339-001	304339-003	P06175	W05146-1
60	1	3W, 3P	350482	304023-004	304351	____	API-6033	304339-001	304339-003	P06175	W05146-1
60	1	4W, 4P	350482	304023-005	304351	____	API-6044	304339-001	304339-003	P06175	W05146-1
60	2	2W, 3P	350482	304023-004	304351	____	API-6023	304340-002	304340-005	P06175	W05146-1
60	2	3W, 4P	350482	304023-005	304351	____	API-6034	304340-002	304340-005	P06175	W05146-1
100	1	2W, 2P	350495	304023-006	304353	____	API-1022	304341-001	304341-003	P06175	W05146-1
100	1	3W, 3P	350495	304023-006	304353	____	API-1033	304341-001	304341-003	P06175	W05146-1
100	1	4W, 4P	350495	304023-007	304353	____	API-1044	304342-001	304342-003	P06175	W05146-1
100	2	2W, 3P	350495	304023-006	304353	____	API-1023	304341-002	304341-005	P06175	W05146-1
100	2	3W, 4P	350495	304023-007	304353	____	API-1034	304342-002	304342-005	P06175	W05146-1

Replacement Parts Lists for Powertite "ARC" Cable Connectors

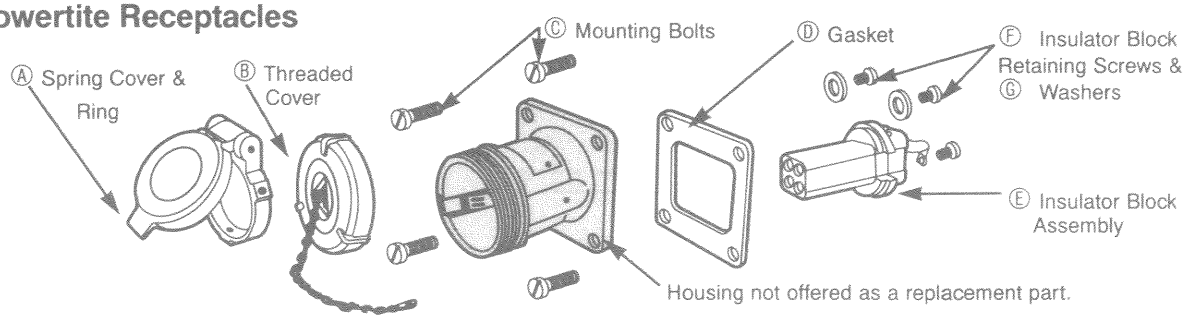
"ARC" Powertite Cable Connector



Ampacity	Style	Description	Item A Gland Nut Assembly	Item B O-Ring	Item C Contact Block Assembly	Item D Sleeve STD Position	Item D Sleeve P4 Position	Item E Sleeve Locking Screw	Item F Nylon Washer
30	1	2W, 2P	350482-2	304117-001	API-3022	351037-001	351037-003	----	----
30	1	3W, 3P	350482-2	304117-001	API-3033	351037-001	351037-003	----	----
30	1	4W, 4P	350482-2	304117-001	API-3044	351037-001	351037-003	----	----
30	2	2W, 3P	350482-2	304117-001	API-3023	351037-002	351037-004	----	----
30	2	3W, 4P	350482-2	304117-001	API-3034	351037-002	351037-004	----	----
60	1	2W, 2P	350482	304374-001	API-6022	351038-001	351038-005	P06175	W05146-1
60	1	3W, 3P	350482	304374-001	API-6033	351038-001	351038-005	P06175	W05146-1
60	1	4W, 4P	350482	304374-002	API-6044	351038-002	351038-006	P06175	W05146-1
60	2	2W, 3P	350482	304374-001	API-6023	351038-003	351038-007	P06175	W05146-1
60	2	3W, 4P	350482	304374-002	API-6034	351038-004	351038-008	P06175	W05146-1
100	1	2W, 2P	350495	304374-003	API-1022	351039-005	351039-005	P06175	W05146-1
100	1	3W, 3P	350495	304374-003	API-1033	351039-005	351039-005	P06175	W05146-1
100	1	4W, 4P	350495	304374-004	API-1044	351039-006	351039-006	P06175	W05146-1
100	2	2W, 3P	350495	304374-003	API-1023	351039-007	351039-007	P06175	W05146-1
100	2	3W, 4P	350495	304374-004	API-1034	351039-008	351039-008	P06175	W05146-1

Replacement Parts Lists for Powertite "ACR" and "ADR" Receptacles

"ADR" Powertite Receptacles



Ampacity	Style	Description	Item A Spring Cover & Ring	Item B Threaded Cover	Item C Mounting Bolts	Item D Gasket	Item E Contact Block Assembly	Item F Insulator Block Retaining Screws	Item G Washers
30	1	2W, 2P	350565	350251	P-5340	60871	API-3022	P05738	W05127
30	1	3W, 3P	350565	350251	P-5340	60871	API-3033	P05738	W05127
30	1	4W, 4P	350565	350251	P-5340	60871	API-3044	P05738	W05127
30	2	2W, 3P	350565	350251	P-5340	60871	API-3023	P05738	W05127
30	2	3W, 4P	350565	350251	P-5340	60871	API-3034	P05738	W05127
60	1	2W, 2P	350424	350417	P-7311	60567	API-6022	P05738	W05127
60	1	3W, 3P	350424	350417	P-7311	60567	API-6033	P05738	W05127
60	1	4W, 4P	350425	350420	P-7311	60567	API-6044	P05738	W05127
60	2	2W, 3P	350424	350417	P-7311	60567	API-6023	P05738	W05127
60	2	3W, 4P	350425	350420	P-7311	60567	API-6034	P05738	W05127
100	1	2W, 2P	350425	350447	P-7311	60567	API-1022	P05738	W05127
100	1	3W, 3P	350425	350447	P-7311	60567	API-1033	P05738	W05127
100	1	4W, 4P	350453	350449	P-7311	60567	API-1044	P05738	W05127
100	2	2W, 3P	350425	350447	P-7311	60567	API-1023	P05738	W05127
100	2	3W, 4P	350453	350449	P-7311	60567	API-1034	P05738	W05127

Maintenance

Electrical and mechanical inspection of all components must be performed regularly. It is recommended that inspection be performed a minimum of once a year.

WARNING

If any parts of the plug, receptacle or cable connector appear to be missing, broken or show signs of damage;

DISCONTINUE USE IMMEDIATELY!

This condition could cause serious/fatal personal injury due to electrocution and/or equipment damage. Repair with proper replacement part(s) before continuing service.

1. Inspect all contact wire terminals for tightness. (Retorque). Discoloration due to excessive heat is an indicator of possible problems and should be thoroughly investigated and repaired as necessary.
2. Check grounding and bonding for correct installation and secure connection. (**Re-torque**)
3. Check gaskets for deterioration and replace if necessary.
4. Clean exterior surfaces making sure nameplates remain legible.
5. Inspect gland nut and cable grip tightness to ensure proper cord/cable gripping.
6. Torque all screws as described in instructions before re-using device.
7. Inspect housing parts and replace those which are broken or excessively worn.
8. Check contacts for signs of excessive arcing or burning and replace if necessary.

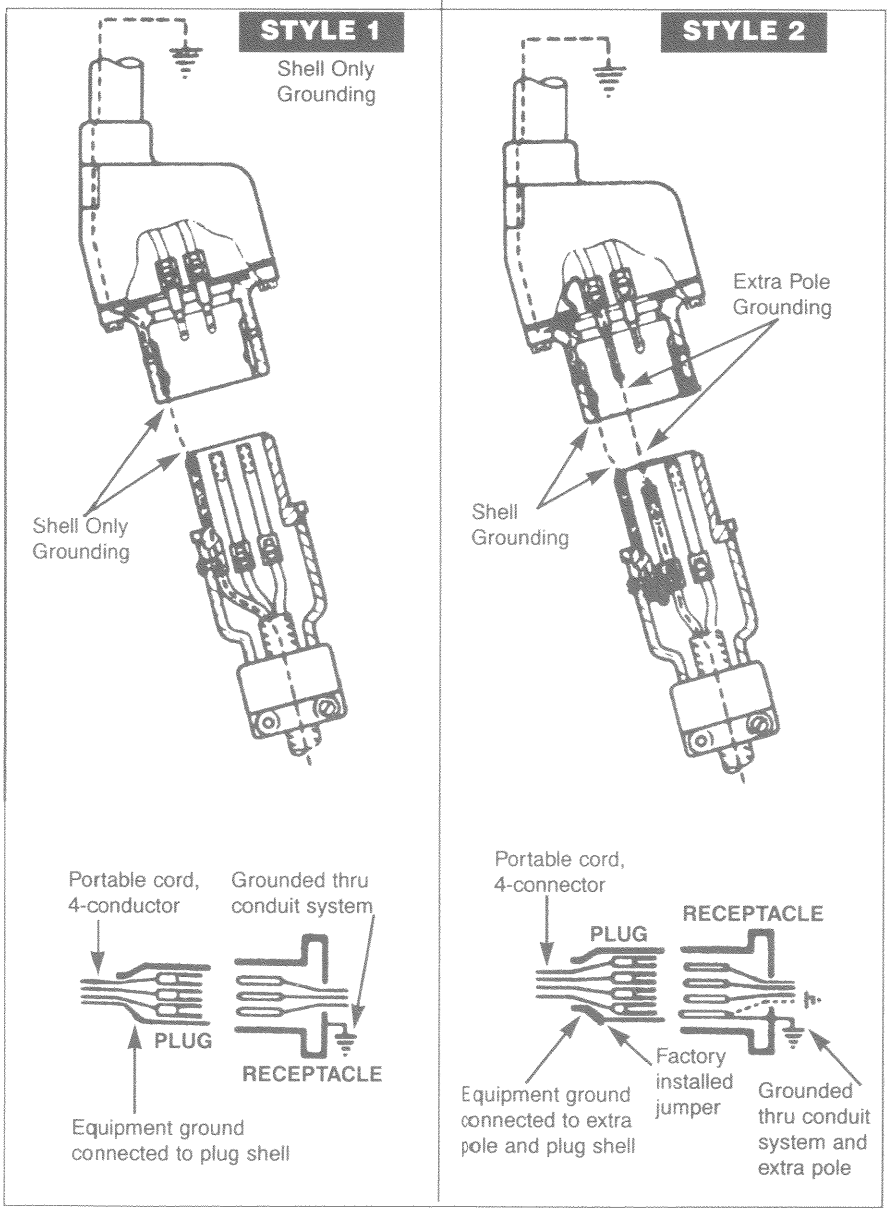
In addition to these required maintenance procedures, we recommend an Electrical Preventive Maintenance program as described in the National Fire Protection Association Bulletin NFPA No. 70B.

ELECTRICAL RATING

Maximum Voltages: 600 VAC @ 50-400Hz, 250V DC;
Maximum continuous current: 30, 60 or 100 Amperes.

Retain this Instruction Sheet for Future Reference

Powertite Plugs and Receptacles available in two grounding styles:



PLUG - Equipment grounding conductor is wired directly to a solderless lug which is connected to the plug housing with pressure connector. All contacts are "current carrying".

RECEPTACLE - Two detent spring clips engage the grounded plug housing on plug insertion - grounded plug shell makes contact with receptacle ground spring before line and load poles are engaged. Grounding path is maintained until after current-carrying contacts disengage. All contacts are "current carrying".

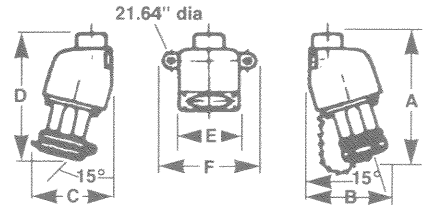
PLUG - Equipment grounding conductor is not only connected to the solderless lug in the plug housing, but also to an extra grounding pole. Grounding pole has copper alloy grounding jumper strap that connects to plug housing.

RECEPTACLE - Two detent spring clips engage the grounded plug housing on plug insertion. Jumper from extra grounding pole is electrically connected to a screw on receptacle housing. Longer grounding pole "makes first and breaks last".

Powertite 30, 60, 100 Amp Pin and Sleeve Receptacles, Plugs and Connectors

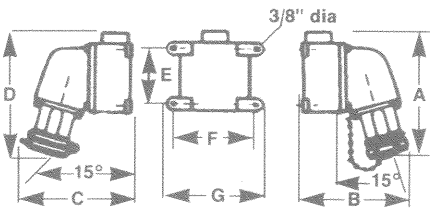
Dimensions in Inches

Receptacle Mounted on AEE Box



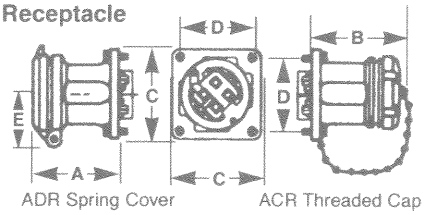
	A	B	C	D	E	F
30 Amp	6.88	3.75	4.25	7.13	3.88	5.00
60 Amp	9.75	5.25	5.50	10.00	4.25	6.38

Receptacle Mounted on AJA-AJAC Box



	A	B	C	D	E	F	G
30 Amp	9.63	8.00	8.81	10.69	4.88	6.88	7.88
60 Amp	11.44	9.00	9.19	11.82	4.88	6.88	7.88

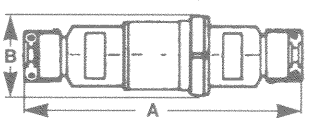
Receptacle



No. Poles		A	B	C	D	E
30 Amp	2,3,4	3.31	3.19	3.38	2.72	2.06
60 Amp	2,3	4.88	4.63	4.50	3.50	2.31
60 Amp	4	4.88	4.63	4.50	3.50	2.44
100 Amp	2,3	5.81	5.50	4.50	3.50	2.44
100 Amp	4	5.81	5.50	4.25	3.50	2.56

Connector

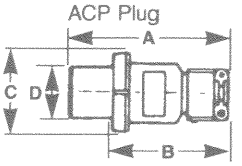
ACP Plug



	A	B
30 Amp	10.50	3.13
60 Amp	13.25	3.81
100Amp	16.00	4.25

Plug

ACP Plug



No. Poles		A	B	C	D
30 Amp	2,3,4	6.00	4.75	3.13	1.86
60 Amp	2,3	7.81	4.94	3.50	2.23
60 Amp	4	7.81	4.94	3.81	2.55
100 Amp	2,3	10.50	6.63	4.00	2.47
100 Amp	4	10.50	6.63	4.25	2.72

Notes

Process Heating Company, Inc.

With Over Fifty Years of Designing & Manufacturing Lo-Density Automatic Electric Heating Systems