



*INSTALLATION,
OPERATION
AND
MAINTENANCE
MANUAL*

**PATCH KING[®]
PK-40H
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 BEFORE 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 – 1500 PSI AT 6 GPM (OTHER PRESSURES AND FLOW RATES WILL WORK SATISFACTORILY). FLOW RATE EFFECTS SPEED WHICH CYLINDERS MOVE. PRESSURE CHANGES POWER THAT CYLINDERS HAVE.
- 2) PATCH-KING[®] MUST BE SECURELY MOUNTED INTO TRUCK BED. 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.
- 3) THERE IS A RELIEF VALVE ON EACH VALVE BODY THAT MAY BE SET TO THE CORRECT PRESSURES FOR PROPER TOP DOOR AND GATE OPERATION ON EACH INDIVIDUAL SYSTEM. RELIEF VALVES ARE FACTORY PRESET AT 1500 PSI. THE AMOUNT OF PRESSURE REQUIRED VARIES WITH THE INDIVIDUAL PRESSURE AND FLOW RATES OF THE TRUCK HYDRAULIC SYSTEM.

OPERATION INSTRUCTIONS

SETUP

- 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

- Patch King provides trouble free asphalt patching capable of heating your patch mix effortlessly without hot or cold spots
- No propane or open flame on public streets
- Heats cold mix to a more workable temperature
- Has timeclock for early morning pre-heating
- Uses safe, clean, reliable electric heat. Just plug it in.
- U.L. Listed controls, the brains of the Patch King



SPECIFICATIONS



Patch King Model PK-30H

PHCo's LO-DENSITY automatic electric 3-cubic yard asphalt patcher

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

240V 1Ø- 9.8KW - 41 Amp.
240V 3Ø- 10.0KW - 24 Amp.
480V 3Ø- 10.0KW - 12 Amp.

PHCo Automatic Nema 4 Control Panel-
Weatherproof - UL Listed

Houses - Non-indicating controlling thermostat,
contractors, timeclock and fusing.

Weatherproof plug and receptacle (pin & sleeve type)
with 25 foot rubber cord

Dimensions:

Length - 72" (96" w/"Tac-King" or leg model)
Width - 72"
Height - 55" - Door Open 74½"

Capacity:

4.5 Tons - 3 cubic yards

Loading Doors:

(2) Length - 72" Width - 24"
Hydraulic Operation

Discharge Doors:

Electrically heated discharge doors (2) opening length
24" height 18" (hydraulic operation)

Insulation:

Top - 2"-3# density fiberglass (minimum)
Bottom - 3"-3# density fiberglass (minimum)
Sides - 3"-3# density fiberglass (minimum)

Weight:

2,500 pounds

Patch King Model PK-40H

PHCo's LO-DENSITY automatic electric 4-cubic yard asphalt patcher

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

240V 1Ø- 12.3KW - 51.3 Amp.
240V 3Ø- 13.1KW - 31.3 Amp.
480V 3Ø- 13.0KW - 15.6 Amp.

PHCo Automatic Nema 4 Control Panel-
Weatherproof - UL Listed

Houses - Non-indicating controlling thermostat,
contractors, timeclock and fusing.

Weatherproof plug and receptacle (pin & sleeve type)
with 25 foot rubber cord

Dimensions:

Length - 96" (120" w/"Tac-King" or leg model)
Width - 72"
Height - 55" - Door Open 74½"

Capacity:

6 Tons - 4 cubic yards

Loading Doors:

(2) Length - 96" Width - 24"
Hydraulic Operation

Discharge Doors:

Electrically heated discharge doors (2) opening length
24" height 18" (hydraulic operation)

Insulation:

Top - 2"-3# density fiberglass (minimum)
Bottom - 3"-3# density fiberglass (minimum)
Sides - 3"-3# density fiberglass (minimum)

Weight:

3,000 pounds

Patch King Model PK-80H

PHCo's LO-DENSITY automatic electric 8-cubic yard asphalt patcher

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

240V 1Ø- 17KW - 71 Amp.
240V 3Ø- 17KW - 41 Amp.
480V 3Ø- 17KW - 20.5 Amp.

PHCo Automatic Nema 4 Control Panel-
Weatherproof - UL Listed

Houses - Non-indicating controlling thermostat,
contractors, timeclock and fusing.

Weatherproof plug and receptacle (pin & sleeve type)
with 25 foot rubber cord

Dimensions:

Length - 120" (144" w/"Tac-King")
Width - 72"
Height - 65" - Door Open 84½"

Capacity:

12 Tons - 8 cubic yards

Loading Doors:

(2) Length - 120" Width - 24"
Hydraulic Operation

Discharge Doors:

Electrically heated discharge doors (2) opening length
24" height 18" (hydraulic operation)

Insulation:

Top - 2"-3# density fiberglass (minimum)
Bottom - 3"-3# density fiberglass (minimum)
Sides - 3"-3# density fiberglass (minimum)

Weight:

4,500 pounds

PARTS LISTS - PK-40H, 240V, 1Ø

HYDRAULIC PARTS

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
2	Top door Cylinders	212DB	Cross
2	Rear Gate Cylinders	218DB	Cross
2	2-Spool, 4-Way, 3-Position valve	SBA22	Cross
2	Hydraulic Hose Assembly	Top Door Cylinder Hose - 26"	PHCo
2	Hydraulic Hose Assembly	Top Door Cylinder Hose - 11"	PHCo
2	Hydraulic Hose Assembly	Gate Cylinder Hose - 48"	PHCo
2	Hydraulic Hose Assembly	Gate Cylinder Hose - 31"	PHCo

CONTROL PANEL PARTS

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
1	Enclosure	EN4SD20166GY	Hammond
1	Temperature Control	120L-17JZ329	Zytron
1	Contactora - 35 amp	42AF35A1N	Siemens
1	Contactora - 50 amp	42CF35A1N	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
2	Heater Fuse	NON-25	Bussmann
2	Heater Fuse	NON-15	Bussmann
2	Heater Fuse - Tack Tank OPTIONAL	NON-12	Bussmann
1	Power Receptacle	ACR6023 (Reverse)	Appleton
1	Power Plug w/25' SO Cord	ACP6023BC (Reverse)	Appleton

TIMECLOCK PANEL - OPTIONAL

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
1	Enclosure	HW1412HWPL2 w/D.F.	Hoffman
1	Timeclock	4003-00BS	Paragon
1	Contactora - 75 amp	42EF35A1N	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	DESCRIPTION	PART NUMBER	MANUFACTURE
2	Top Door Rubber	PK6X96	PHCo
2	Coil Cord		PHCo

HOPPER HEATERS

Contact factory with Serial Number of equipment

GATE HEATERS

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
2	Gate Strip Heaters - Wired in Series	240V, 500W	CCI

TITLE

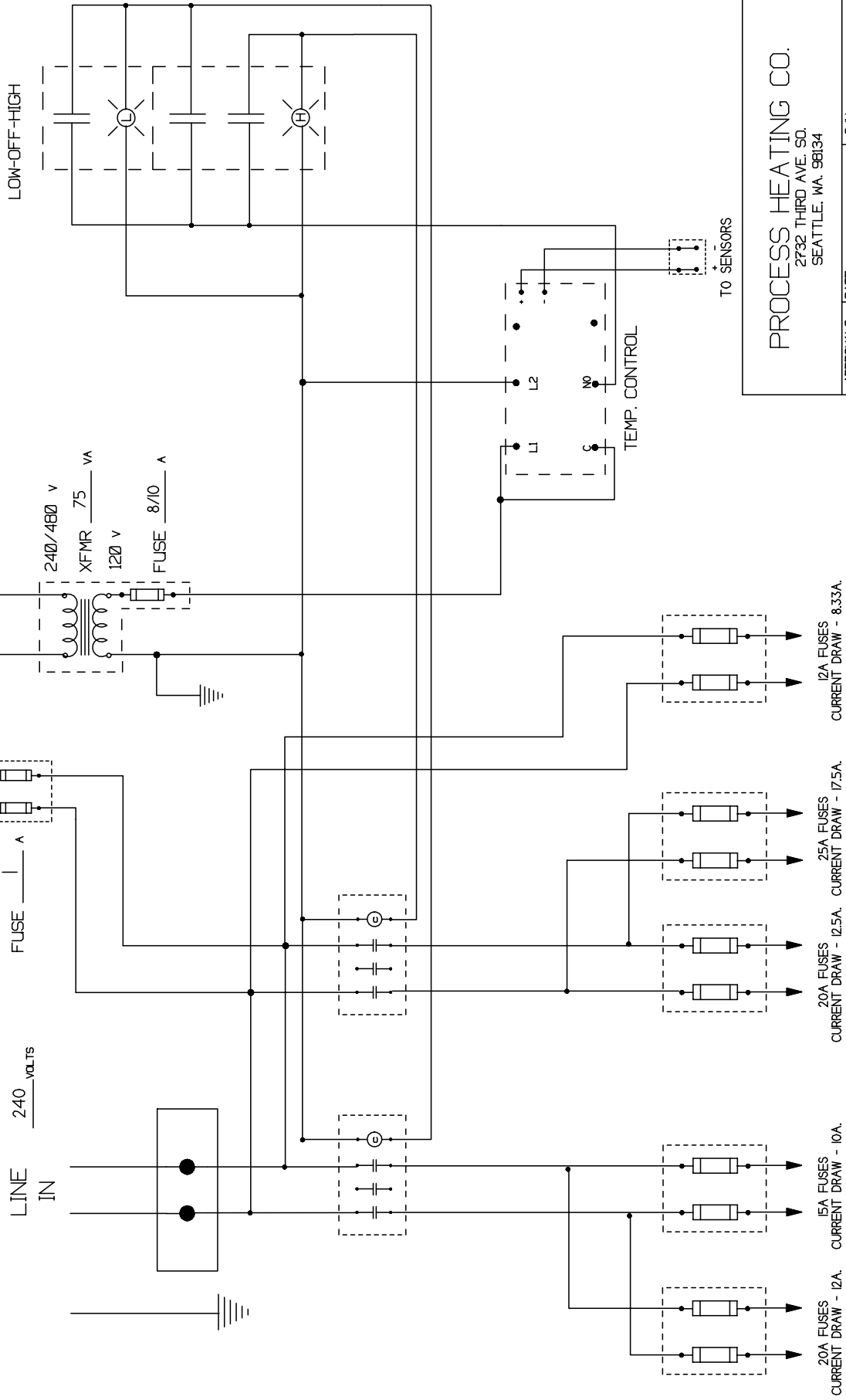
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ELECTRICAL RATING

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

PK-40H W/ TACK TANK (OPTIONAL)

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



TO HEATERS

TO TACK-TANK (OPTIONAL)

PROCESS HEATING CO.

2732 THIRD AVE. SO.
SEATTLE, WA. 98134

APPROVALS	DATE	S/N
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TITLE

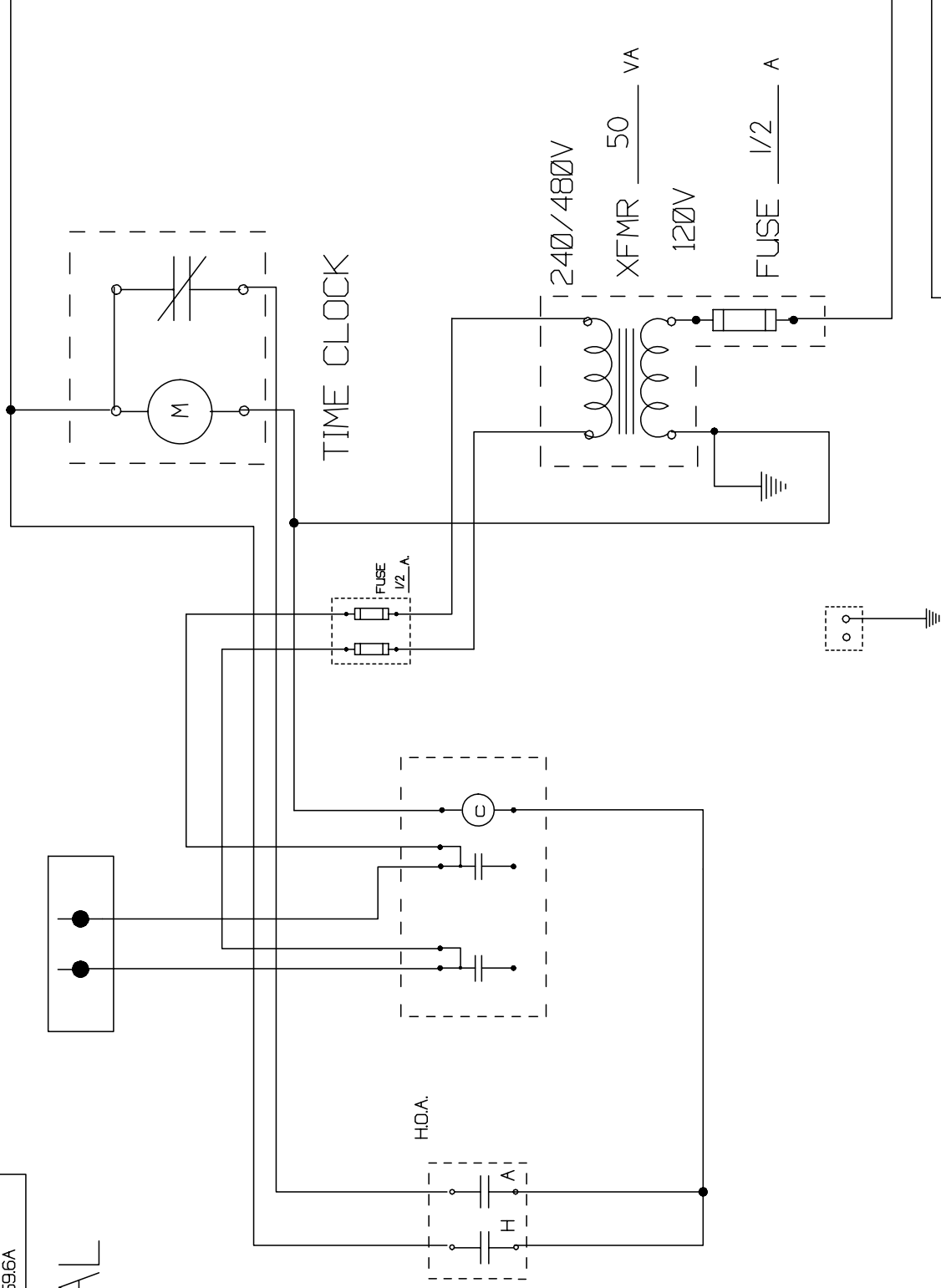
PHC077-TCLOCK

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

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DATE

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S/N

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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.

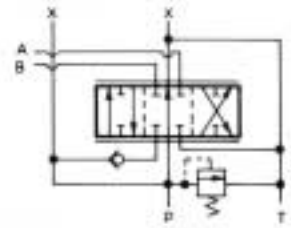
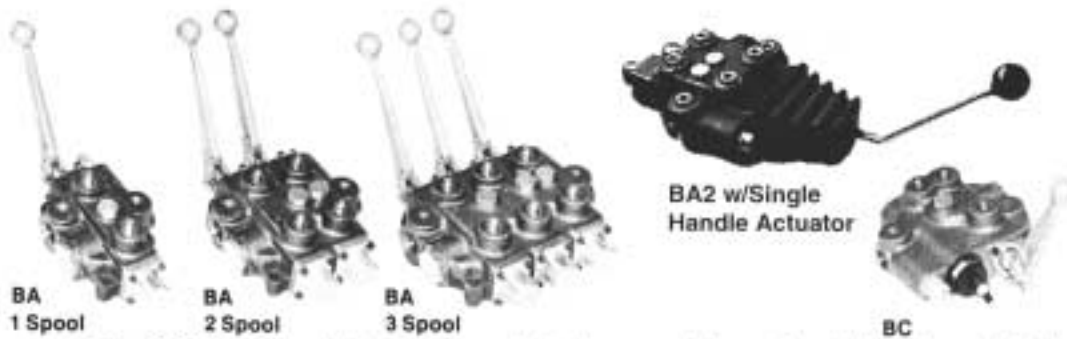
Unless otherwise agreed in writing by Process Heating Company ("PHCo"), all of the following terms & conditions shall apply to its transaction with you (the "buyer"):

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 POSSIBILITY 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



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

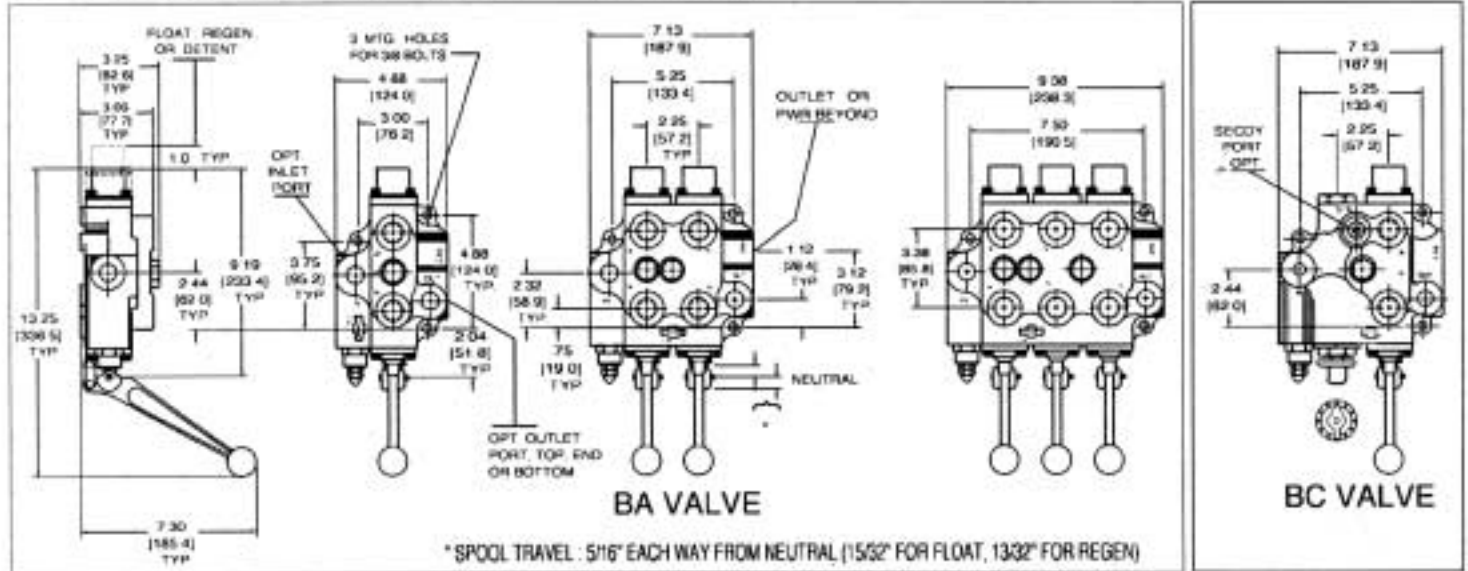
OPTIONAL FEATURES AVAILABLE

- 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)

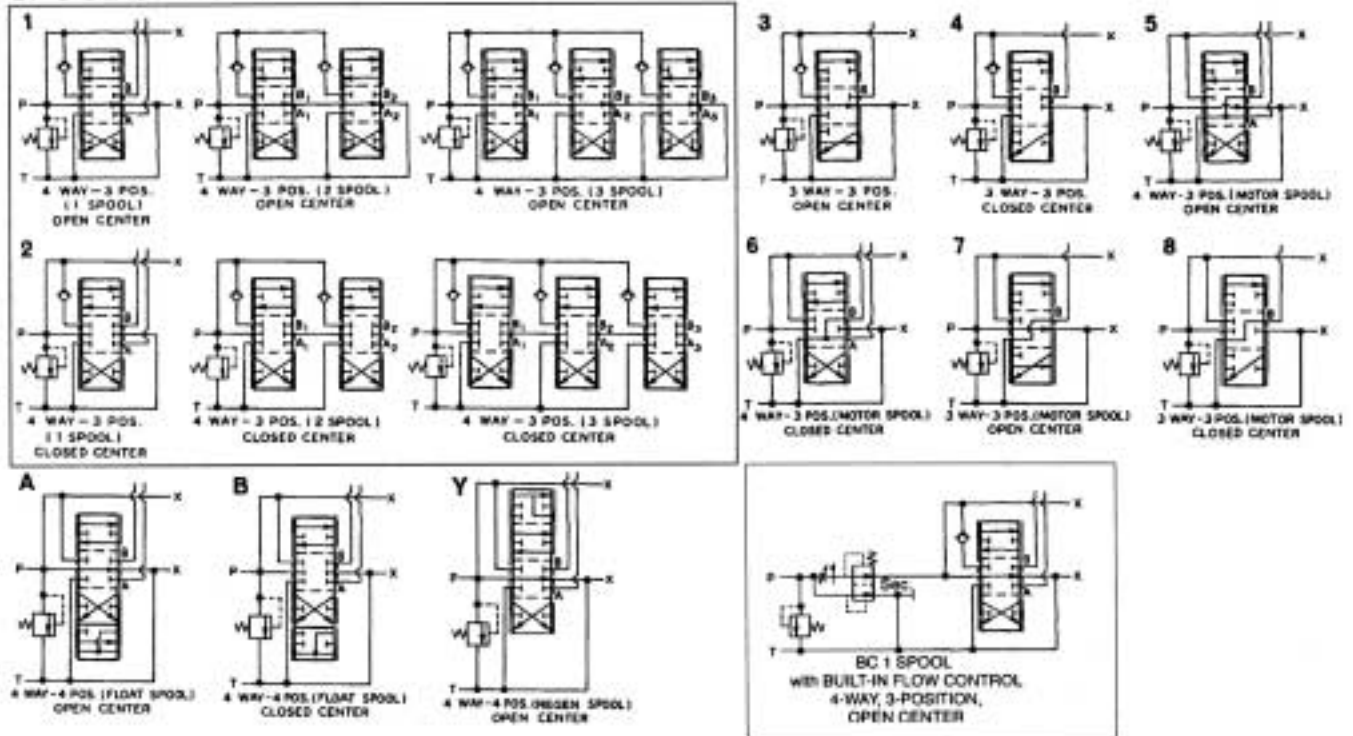
NOTE: Refer to CROSS Valve Technical/Service Sheet for recommendations and limitations.



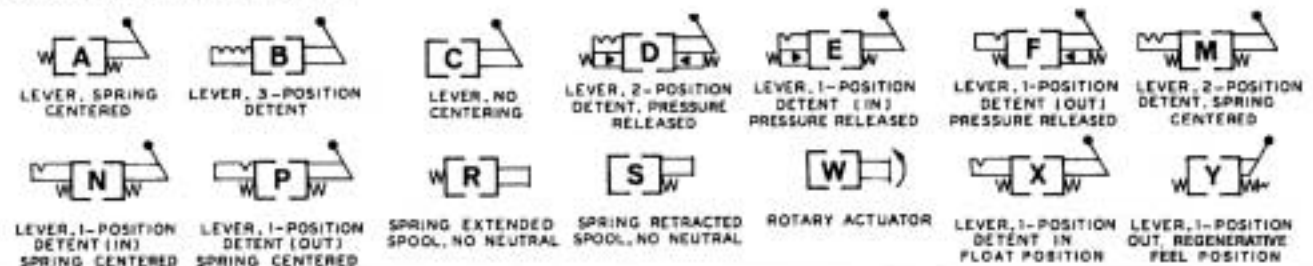
DIMENSIONAL DATA in inches and (millimeters)



SPOOL OPTIONS



ACTUATOR OPTIONS





HYDRAULIC VALVES

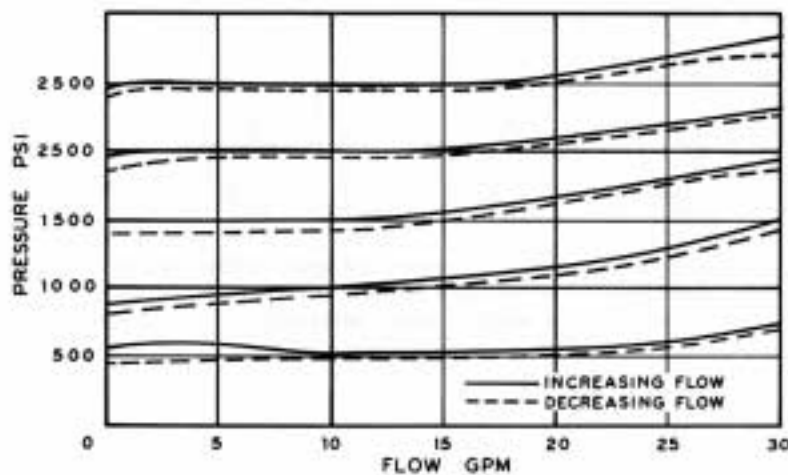
**DIRECTIONAL CONTROL
B SERIES**
Specification Sheet

TYPICAL PERFORMANCE DATA

PRESSURE DROP (with 100 SUS oil at 120° F, 3/4" NPTF in & out, 1/2" 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	

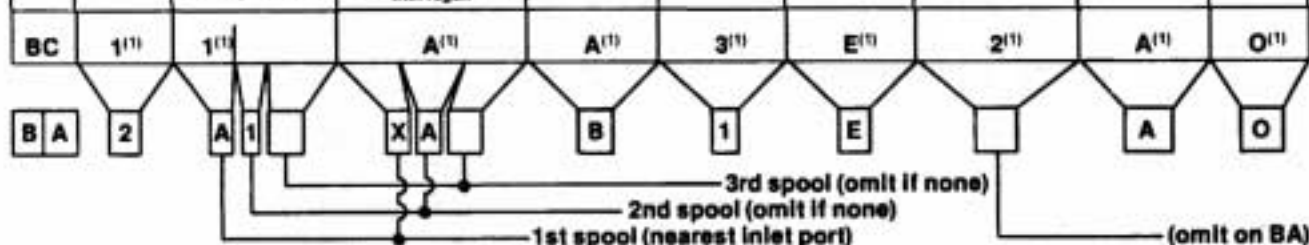
RELIEF VALVE CHARACTERISTICS (100 SUS oil at 120° F.)





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	1 4-way, 3-position open center	A 3-position spring centered	A 1000 psi	O None	O End Outlet when P/B not specified	O No Port (Plugged)	A In & Out 3/4" NPTF, Work 1/2" NPTF (8)	O Complete Handle Assembly
	2 Double	2 ⁽¹⁾ 4-way, 3-position closed center	B 3-position detent no centering spring	B 1500 psi	1 ^(R) 3/4" NPTF P/B sleeve port	T Top Outlet	1 7/8"-14 (SAE #10)	B In & Out 3/4" NPTF, Work 3/8" NPTF	1 Less Complete Handle Assembly
	3 Triple	3 3-way, 3-position open center	C Manual, no detent no centering spring	C 2000 psi	2 ^(R) 1 1/16-12 SAE #12 P/B sleeve port	B Bottom Outlet	2 1/2" NPTF	C In & Out 1 1/16-12 SAE#12, Work 3/8" NPTF	2 Less Handle Only (Link, pins & bracket included)
		4 ⁽¹⁾ 3-way, 3-position closed center	D ⁽³⁾ Pressure release detent "in" & "out"	D None	3 ^(R) Conversion plug	E End Outlet	3 3/4-16 (SAE #8)	D In & Out 1 1/16-12 SAE#12, Work 3/8" NPTF	3 ^(R) Single Handle Actuator
		5 4-way, 3-position open center w/motoring spool	E ⁽³⁾ Pressure release detent "in" only	E Other	4 ^(R) 7/8-14 SAE #10 P/B sleeve port	G Bottom Outlet with grommet	4 3/4" NPTF	E In & Out 1 1/16-12 SAE#12, Work 1 1/16-12 SAE#12	
		6 ⁽¹⁾ 4-way, 3-position closed center w/motoring spool	F ⁽³⁾ Pressure release detent "out" only	F ⁽⁵⁾ Adjustable 500-1500 psi (Set at 1000 psi)	5 Closed center plug	P Top Inlet & outlet	5 1 1/16-12 (SAE #12)	F Other	
		7 3-way, 3-position open center w/motoring spool	M 2-position detent "in & out", spr. centered	G ⁽⁵⁾ Adjustable 1500-2500 psi (Set at 2000 psi)		H Top Inlet			
		8 ⁽¹⁾ 3-way, 3-position closed center w/motoring spool	N 1-position detent "in" only, spr. centered						
		A ⁽²⁾ 4-way, 4-position open center detent float position	P 1-position detent "out" only, spr. centered						
		B ⁽¹⁾⁽²⁾ 4-way, 4-position closed center detent float position	R Spring extended no neutral						
		C 4-way, 4-position, open center w/regen float position	S Spring retracted no neutral						
			W Rotary detent						
			X 4 pos. sprg. ctr. to neutral. Detent in float position						
			Y 4-pos. spring centered with regen						



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, 1/2" NPTF power beyond sleeve port, outlet port in end position. Inlet & outlet ports are 3/4" NPTF; work ports 1/2" 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.

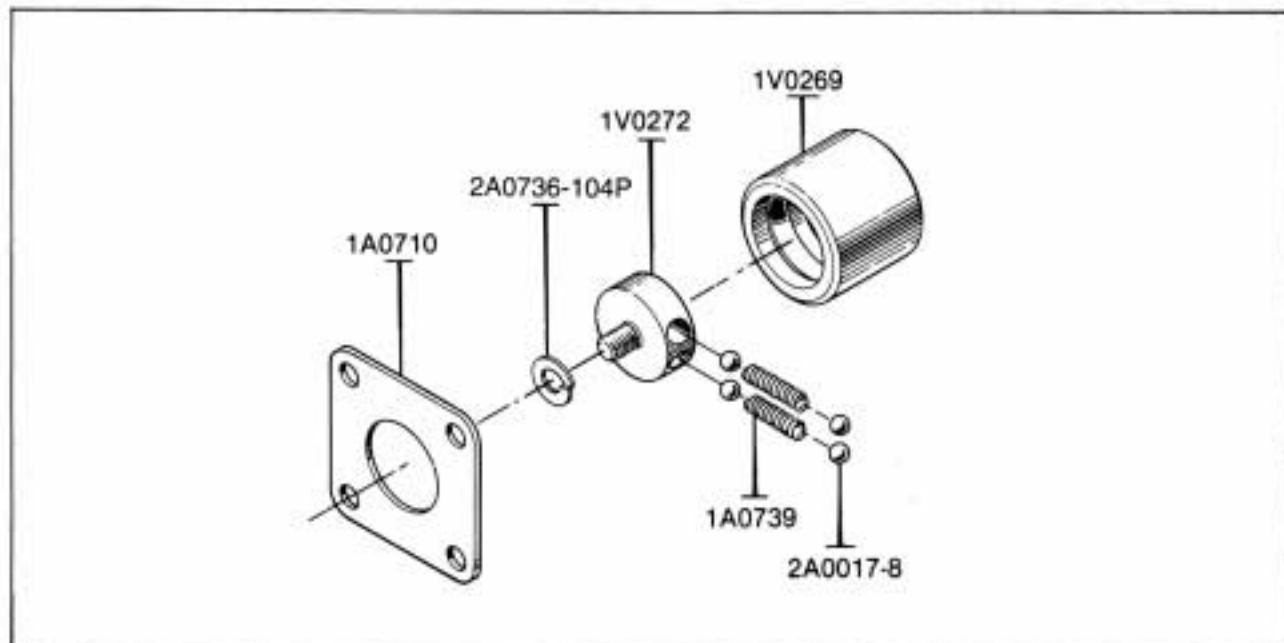


CROSS MANUFACTURING, INC.
100 Factory Street
Lewis, Kansas 67552
Phone 620/324-5525 Fax -5737



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.



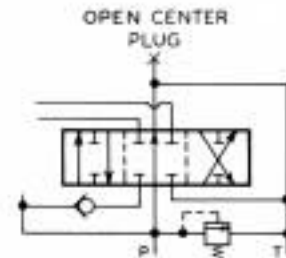
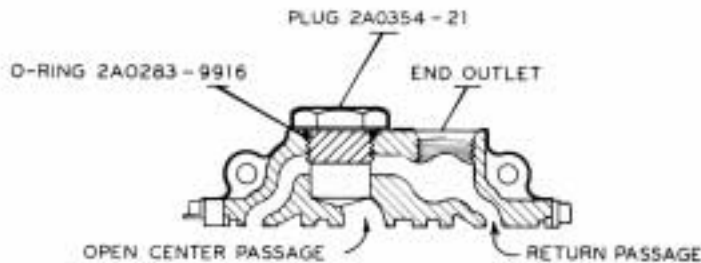
To convert from the standard 3-position spring-centered version to a 3-position detent, proceed as follows:

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.

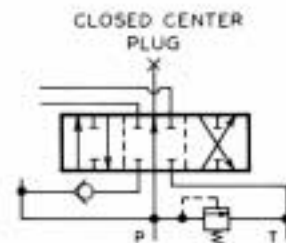
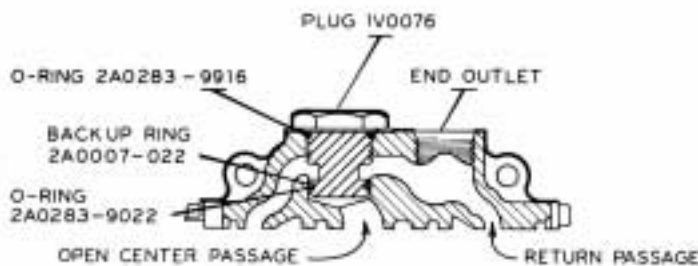
SERIES B DIRECTIONAL CONTROL VALVE CONVERSION PLUG OPTIONS
(Refer to B series Directional Control Valve Specification Sheet, Form VBA1)

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



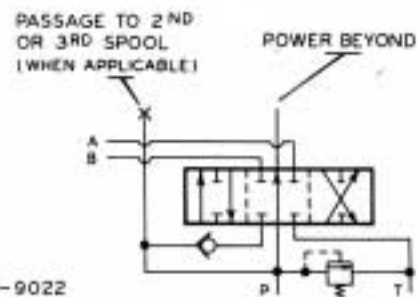
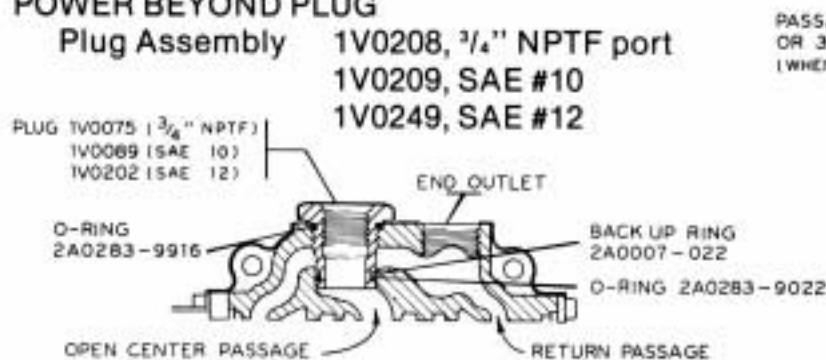
This option allows conversion from standard open center function to either power beyond or to a closed center function.

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, 3/4" 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.

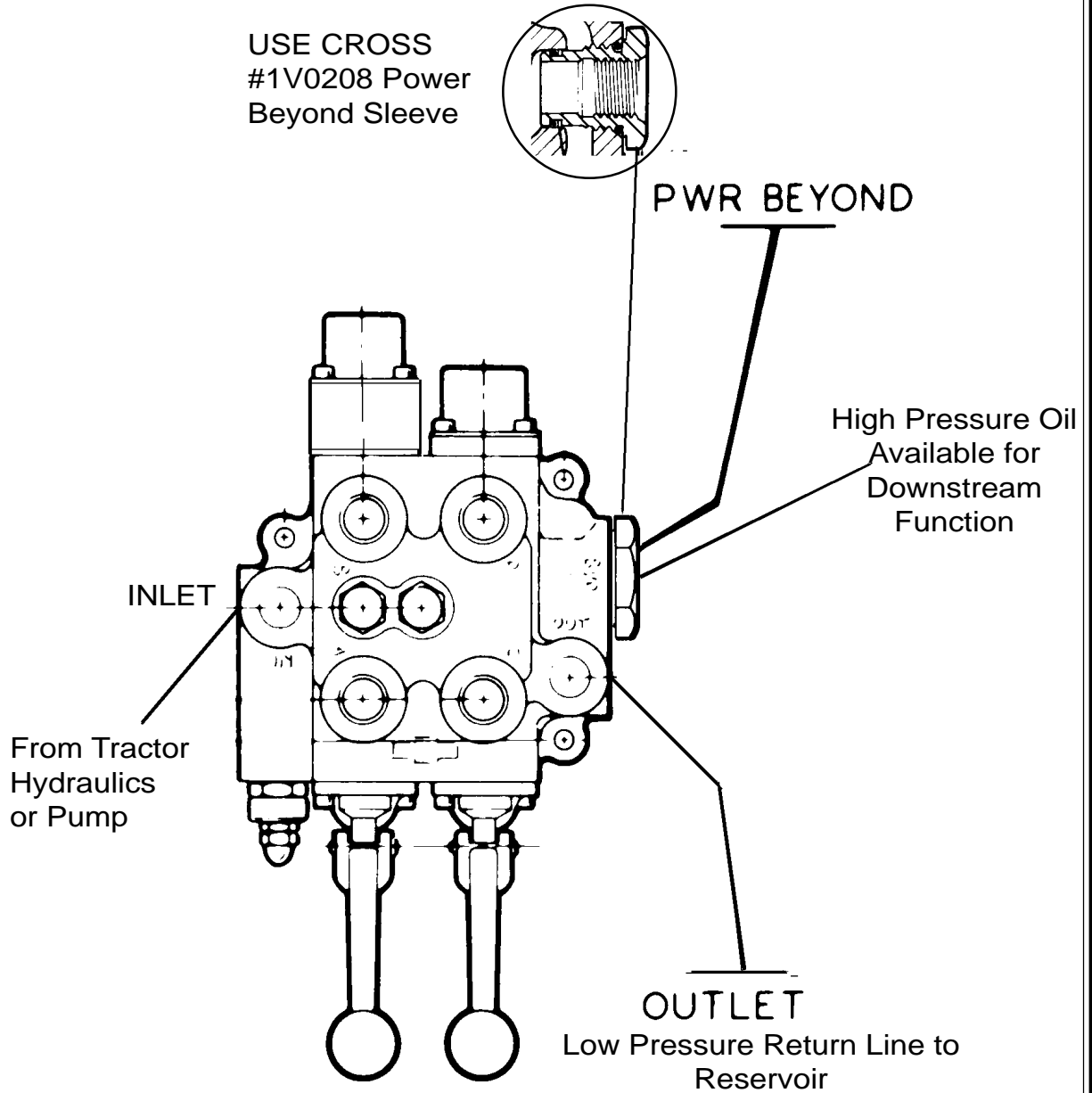
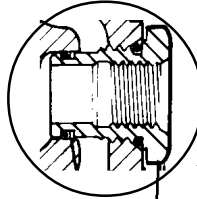
NOTE: Closed center or power beyond plugs CANNOT be installed in B series valves without the conversion plug option. Closed center version valves or valves with power beyond option may be converted using any of the above plug assemblies.



B Series

POWER BEYOND INSTALLATION

USE CROSS
#1V0208 Power
Beyond Sleeve



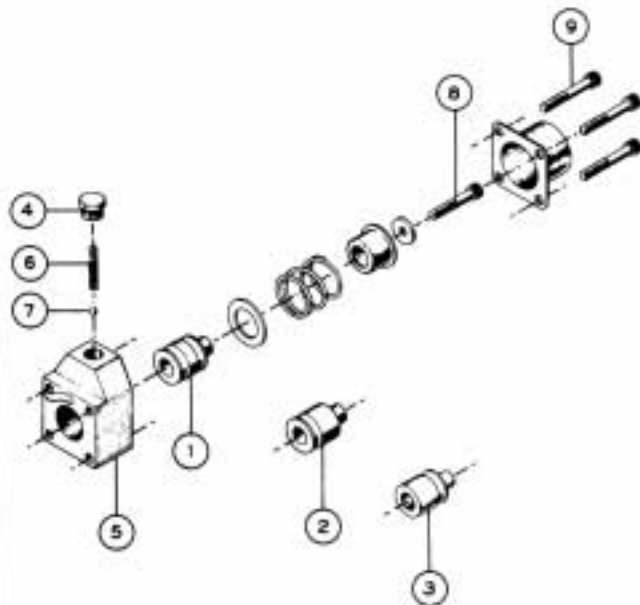


HYDRAULIC VALVES

**DIRECTIONAL CONTROL
ACCESSORIES**
Spool Action Options

SERIES B DIRECTIONAL CONTROL VALVE OPTIONS

DETENT WITH SPRING CENTERING

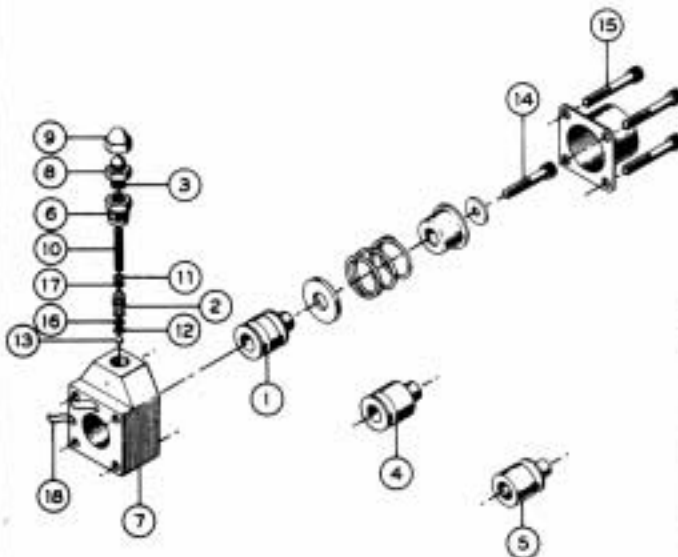


THIS FEATURE ALLOWS SPRING CENTERING TO NEUTRAL WITH A DETENT FOR THE "IN", "OUT" POSITION, OR BOTH THE "IN" AND "OUT" POSITIONS. THE ONE OR TWO POSITION DETENT WITH SPRING CENTERING IS DESIRABLE FOR THE OPERATION OF HYDRAULIC CYLINDERS OR MOTORS. THE ONE POSITION DETENT PROVIDES A FLOAT POSITION FOR 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 1V006T	2-POSITION DETENT SLEEVE	1
2 1V007D	1-POSITION DETENT SLEEVE, "IN" (OPT.)	1
3 1V007I	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-B	BALL (1/4 STEEL)	1
8 2A0078-414N	CAPSCREW	1
9 2A0078-418	CAPSCREW	4
<i>NOTE ORDER BY KIT NUMBER</i>		
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 RETURN TO NEUTRAL. FIELD INSTALLATION CAN BE MADE ONLY IF VALVE ALREADY HAS THIS OPTION.

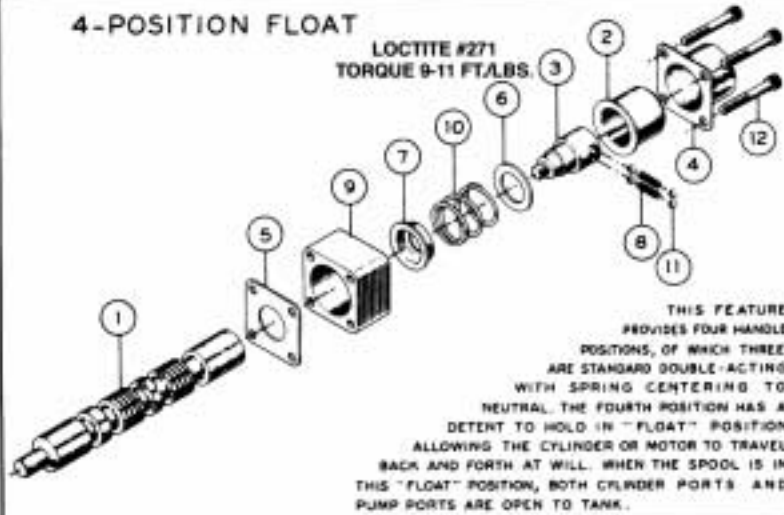
SPECIAL PARTS

PART NO.	DESCRIPTION	QTY REQD
1 1V006T	2-POSITION DETENT SLEEVE	1
* 2 1V006B	PRESSURE DETENT PISTON	1
* 3 1V0069	ADJUSTMENT SCREW	1
4 1V007D	1-POSITION DETENT SLEEVE "IN" (OPT.)	1
5 1V007I	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-B	BALL (1/4 STEEL)	1
14 2A0078-414N	CAPSCREW	1
15 2A0078-418	CAPSCREW	4
* 16 2A0283-1007	LOWER PISTON O-RING	1
* 17 2A0283-1008	UPPER PISTON O-RING	1
* 18 2A0283-8017	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



LOCTITE #271
TORQUE 9-11 FT./LBS.

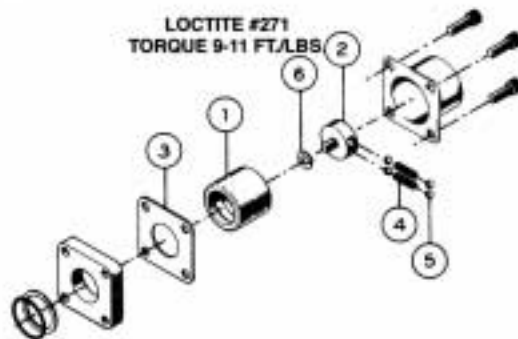
THIS FEATURE PROVIDES FOUR HANDLE POSITIONS, OF WHICH THREE ARE STANDARD DOUBLE-ACTING WITH SPRING CENTERING TO NEUTRAL. THE FOURTH POSITION HAS A DETENT TO HOLD IN "FLOAT" POSITION ALLOWING THE CYLINDER OR MOTOR TO TRAVEL BACK AND FORTH AT WILL. WHEN THE SPOOL IS IN THIS "FLOAT" POSITION, BOTH CYLINDER 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 1V0290	FLOAT DETENT RETAINER	1
4 1A0294P	END CAP	1
5 1A0710	RETAINER PLATE	1
6 1A0737	FLOAT STOP WASHER	1
7 1A0738P	FLOAT STOP COLLAR	1
8 1A0739	DETENT SPRING	2
9 1A0764	FLOAT SPACER	1
10 1A9251	FLOAT CENTERING SPRING	1
11 2A0017-8	BALL (1/4 STEEL)	4
12 2A0079-41.6	CAPSCREW	4

3-POSITION DETENT



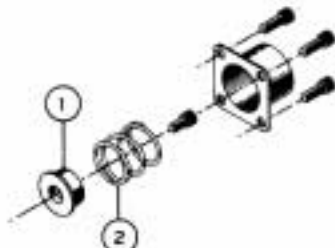
LOCTITE #271
TORQUE 9-11 FT./LBS.

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 1A0739	DETENT SPRING	2
5 2A0017-8	BALL (1/4 STEEL)	4
6 2A0738-104P	LOCKWASHER	1

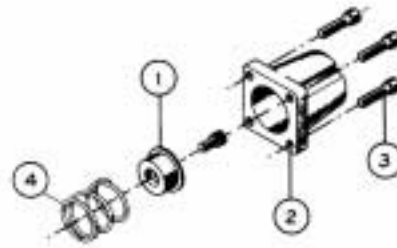
SPRING EXTENDED SPOOL



SPECIAL PARTS

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

SPRING RETRACTED SPOOL



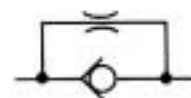
SPECIAL PARTS

PART NO.	DESCRIPTION	QTY REQD
1 1V2020M	SPOOL SPACER	1
2 1V2021	SPECIAL END CAP	1
3 2A0079-410	CAPSCREW	4
4 1A9008	SPRING	1



HYDRAULIC VALVES

DIRECTIONAL CONTROL ACCESSORIES ORIFICE PLATES



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.

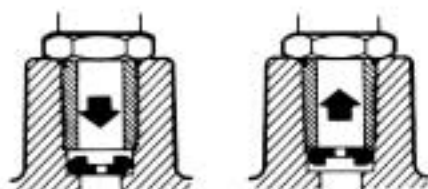
ORIFICE SIZES AVAILABLE

.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".

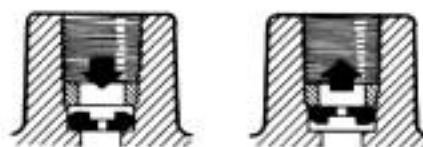
$\frac{3}{4}$ - 16 (SAE #8) Ports



IN-FLOW OUT-FLOW
RESTRICTION

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

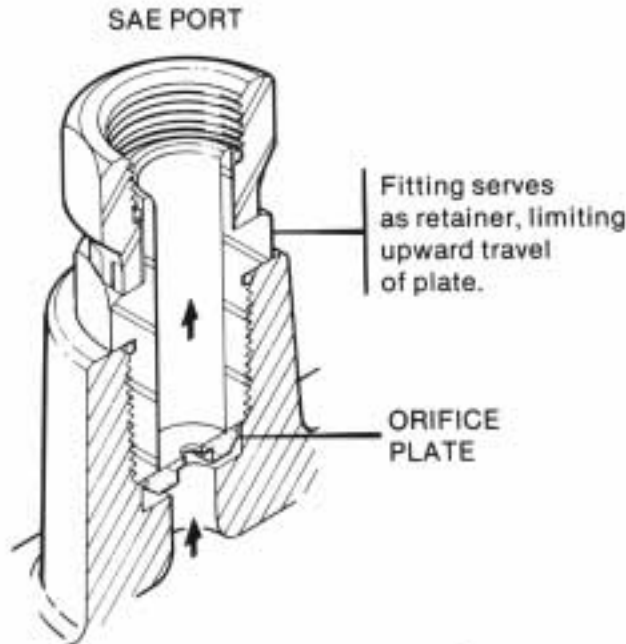
$\frac{1}{2}$ " NPTF Ports



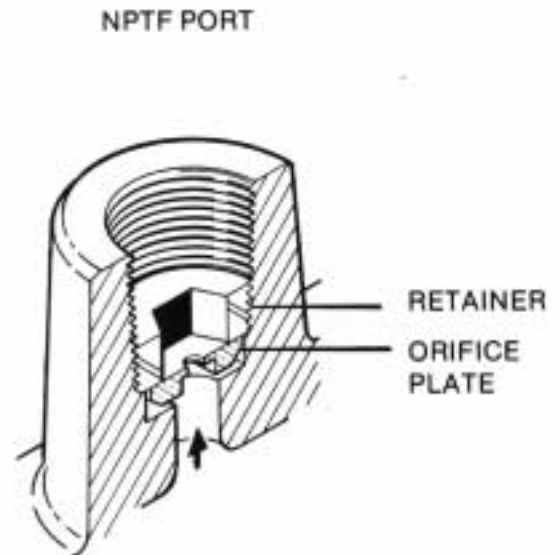
IN-FLOW OUT-FLOW
RESTRICTION

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 $\frac{1}{32}$ inch.

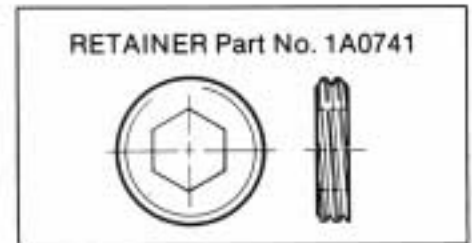
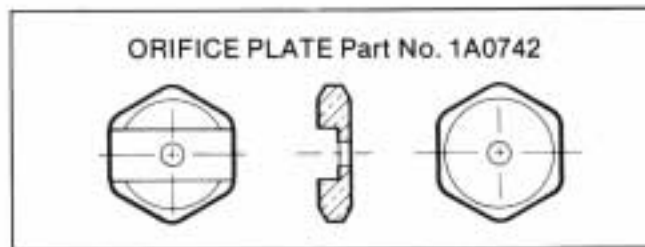
ORDERING INFORMATION



ORIFICE PLATE ONLY
Available for 1/4" - 16 (SAE #8)
ports only.



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



SAE #8 (1/4" - 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.

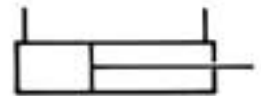


CROSS MANUFACTURING, INC.
100 Factory Street
Lewis, Kansas 67552
Phone 620/324-5525; FAX 620/324-5737; e-mail: info@crossmfg.com



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

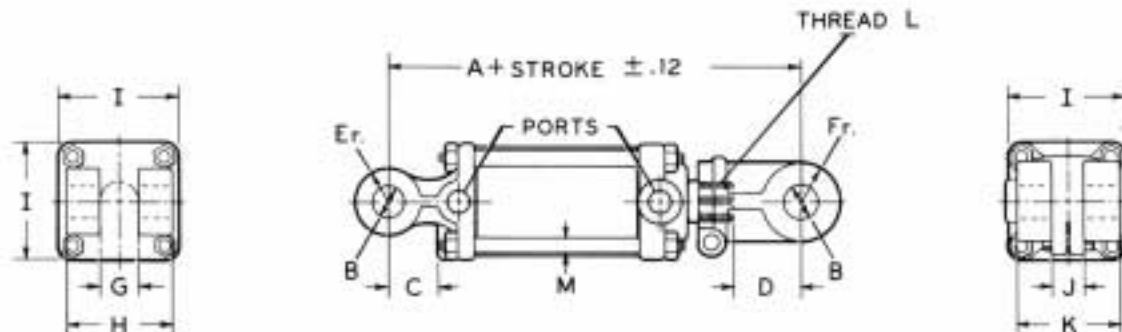
- Cylinder barrels are skived burnished precision finished to provide long seal life
- Rods are hardened, chrome plated and polished for long wear life and for protection from external damage and corrosion
- Rod wipers clean dirt and foreign matter from rod to insure long seal life
- High tensile strength 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)

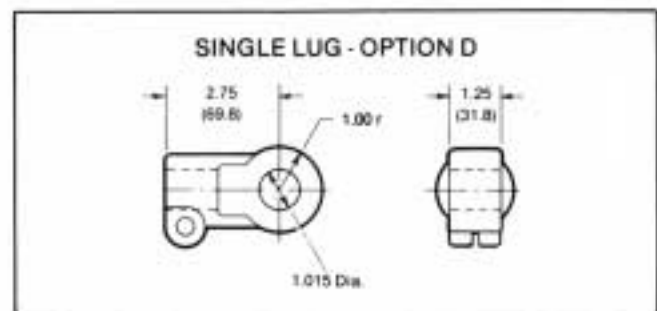
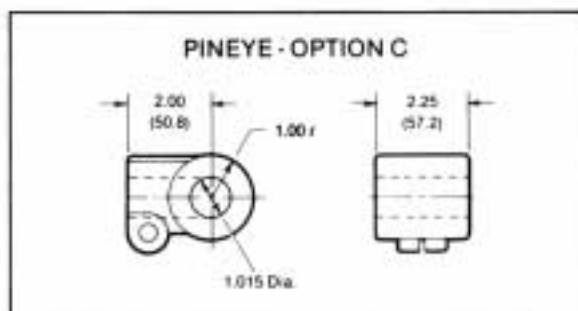


ALL DIMENSIONS ARE NOMINAL and ARE FOR STANDARD CONFIGURATIONS

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 / ₄ -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 / ₄ -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)	*	.750 (19.0)

*1¹/₂-12 for cylinders in distributor program.

OPTIONAL ROD END MOUNTINGS



These rod end mountings are optionally available on the 2", 2¹/₂", 3", 3¹/₂" and 4" diameter bore size cylinders only. (Standard mounting clevis will be supplied unless otherwise specified.)



HYDRAULIC CYLINDERS

TIE ROD CYLINDERS
DB SERIES
Specification Sheet

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

Hardened steel bushings are provided with hardened steel pins.



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	AS REQUIRED	106	C 3/16-18 SAE	C CLEVIS (Standard) P PINEYE S SINGLE LUG	A	O NONE X SPECIFY
	250		125	D 1/4-16 SAE		1.00 STL.	
	300		150	N 1/4 NPTF		B	
	350		200	P 3/4 NPTF		1.00 HARD	
	400			R 1/2 NPTF		C	
	500			S 3/4 NPTF		1.25 HARD	
						D	
						NONE	
						(1.015 hole)	
						E	
						NONE	
						(1.265 hole)	

EXAMPLE: DB250-1500-106CCAO is a standard 2 1/2" bore diameter DB Series cylinder with 15" stroke, 1.062" dia.rod, 3/16 - 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



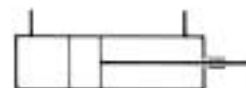
CROSS MANUFACTURING, INC.
100 Factory Street
Lewis, Kansas 67552
Phone: 620/324-5525 fax -5737



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 pressure4000 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 barrelsC1025 steel alloy

PistonsHigh strength aluminum alloy

RodsInduction hardened C1045 steel alloy

Base castings and rod clevisesDuctile iron

Cylinder headsHigh tensile strength gray iron

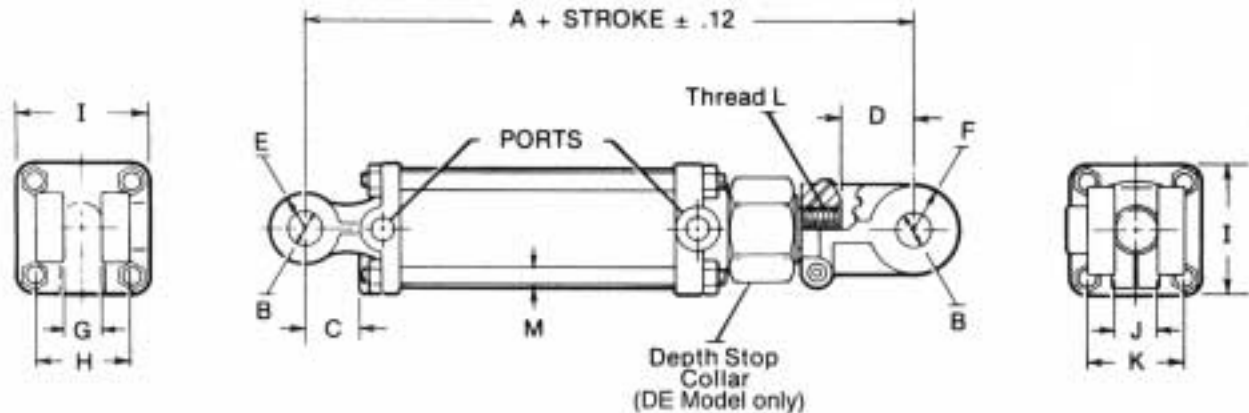
Seals70 durometer Buna N piston o-rings with Polyurethane back-ups
Double lipped Polyurethane u-cup seal

STANDARD FEATURES

- Mechanical depth stop collar (2 1/4" adjustment) (1 1/8" 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



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)



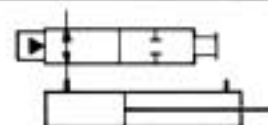
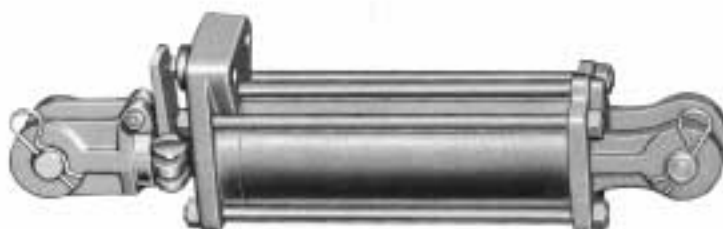
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HYDRAULIC CYLINDERS

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

Seals70 durometer Buna N o-rings with polyurethane back-up rings

. Double lipped polyurethane u-cup rod seal

STANDARD FEATURES

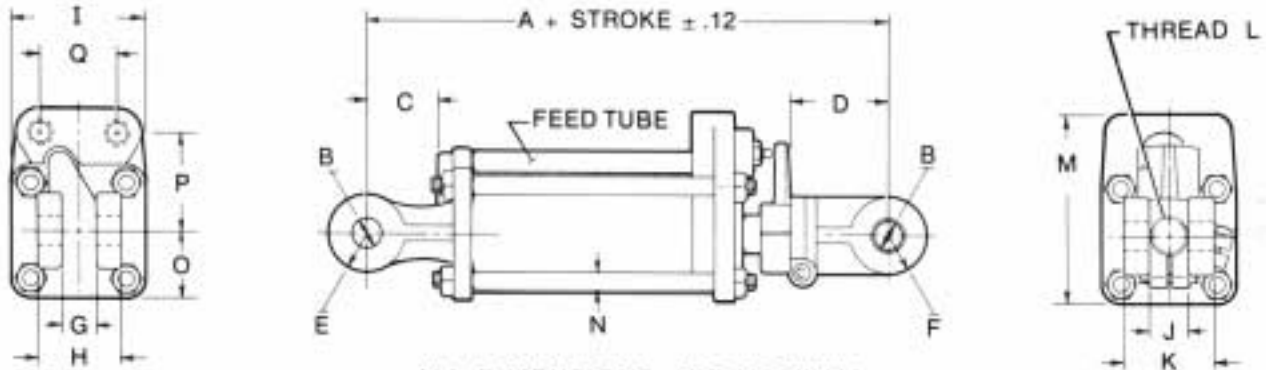
- Infinitely adjustable stroke from zero to maximum stroke
- Heavy duty rod clevis with hardened steel bushings
- Hardened steel pins
- Cylinder barrels are skived burnished precision finished to provide long seal life
- Rods are hardened, chrome plated and polished for long wear life and for protection 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)



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)	1 1/4 -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)	1 1/4 -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)	1 1/4 -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)	1 1/4 -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)			1.25 (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	800 1600	125	D
	350		150	3/4 - 16 SAE
	400		175	R
	500		200	1/2 NPTF

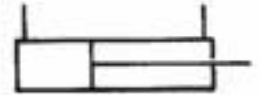


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HYDRAULIC CYLINDERS

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 pressure6000 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

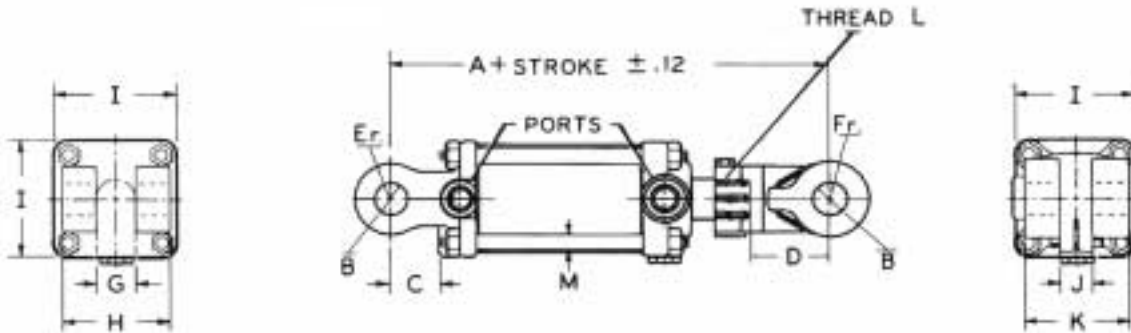
- Cylinder barrels are skived burnished precision finished to provide long seal life
- Rods are hardened, chrome plated and polished for long wear life and for protection from external damage corrosion
- Rod wipers clean dirt and foreign matter from rod to insure long seal life
- High tensile strength 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



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 1/8-12	.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 1/8-12	.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 1/8-12	.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 1/8-12	.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 1/8-12	.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



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.

ORDERING INFORMATION

SERIES	BORE DIA. INCH X 100	STROKE INCH X 100	ROD DIA. INCH X 100	PORT SIZE (SAE ONLY)	END MOUNT ING	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	X SPECIFY
	300		125			C. 1.25 HARD	
	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



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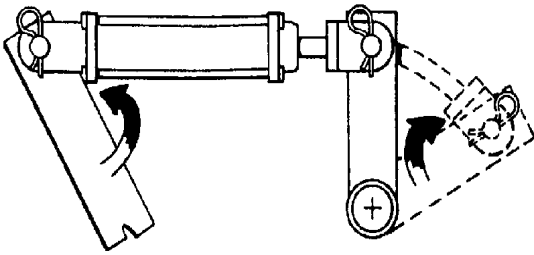


HYDRAULIC CYLINDER SAFETY

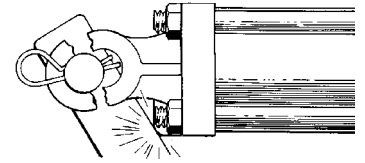
General Cautions:

- 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.

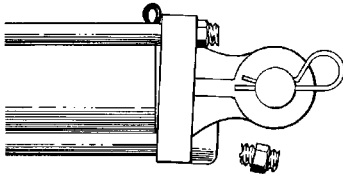
Binding



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.

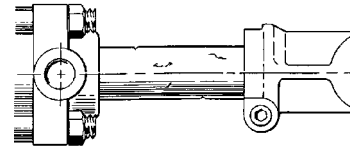


Too much pressure causes...



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!



www.crossmfg.com

MANUFACTURING, INC.

LEWIS, KANSAS

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FAX 620/324-5737

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CYL30077C 6/98

120L-17JZ329

PRODUCT SPECIFICATION SHEET

MODEL: **120L-17JZ329**

REV: **-**

DESCRIPTION: **DIN Rail/Surface Mtg. Temp Limit Controller**

CUSTOMER PN: **Process Heating**

DATE: **10/17/06**

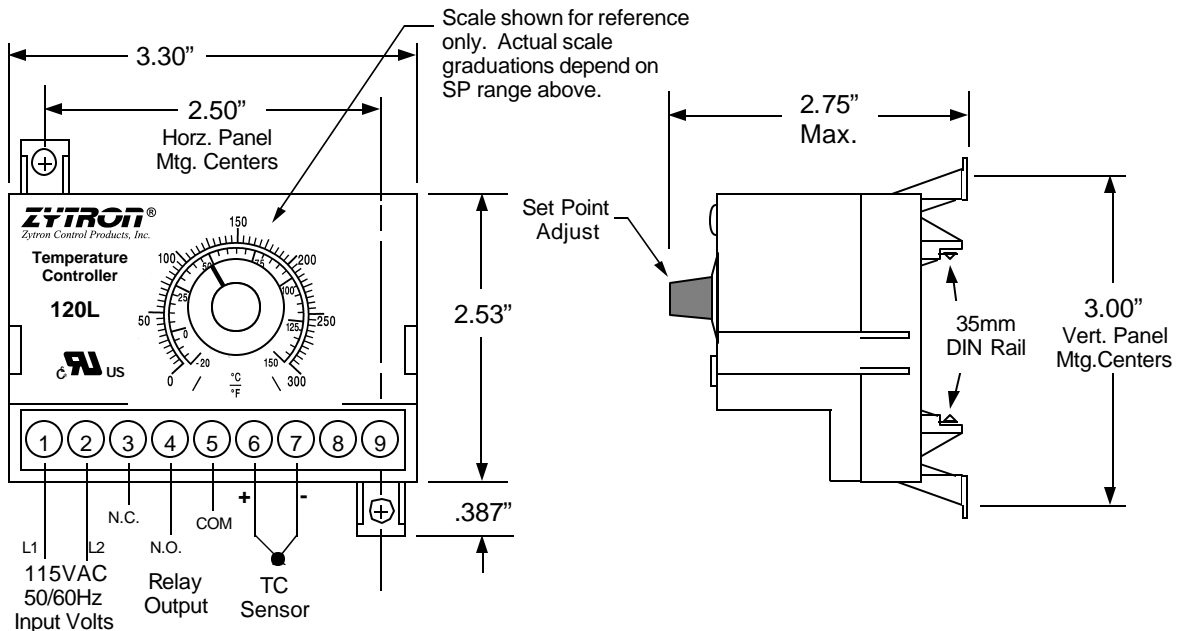
Input Voltage: 115VAC $\pm 15\%$, 50/60Hz, 3VA Max.
Control Output: SPDT Relay, N.O. contacts rated 8 Amps Res. 240VAC, 100,000 cycles
Control Mode: Relay de-energizes on temperature rise (N.O. contacts open).
Control Action: Latching with manual reset (Reset terminals open) or On-Off with 2°F Hyst. (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 $\pm 5mV/^\circ F$ ambient and .01% of span/% rated line voltage
Set Point Accuracy: $\pm 3\%$ 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 plates 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

- Find a safe location to install the Paragon Clear-view Time Switch Enclosure.
- Remove the time switch by pressing the two tabs on each side of the enclosure outward and lift switch out of enclosure.
- Punch out the knockout openings used to feed wire through the enclosure.
- Mount the enclosure with screws (not provided).
- 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

- 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).
- 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.
- 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.
- 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)

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

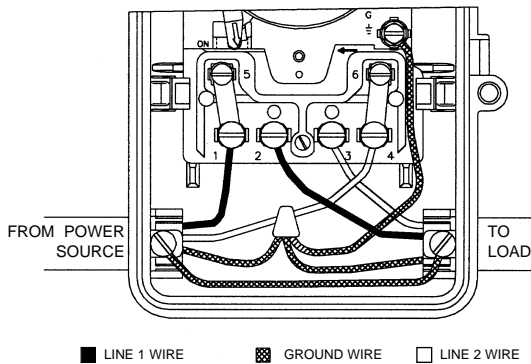


Figure 1

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

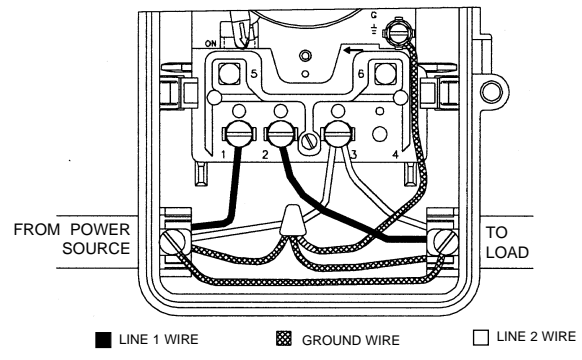


Figure 2

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

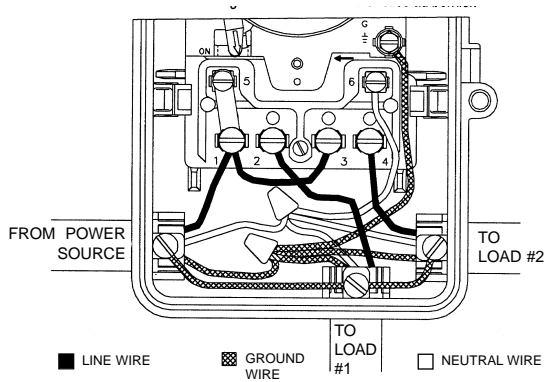


Figure 3

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.

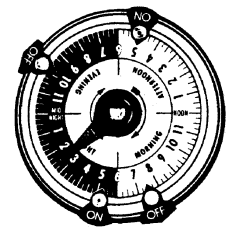


Figure 4

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 ⅛" 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.





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	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)

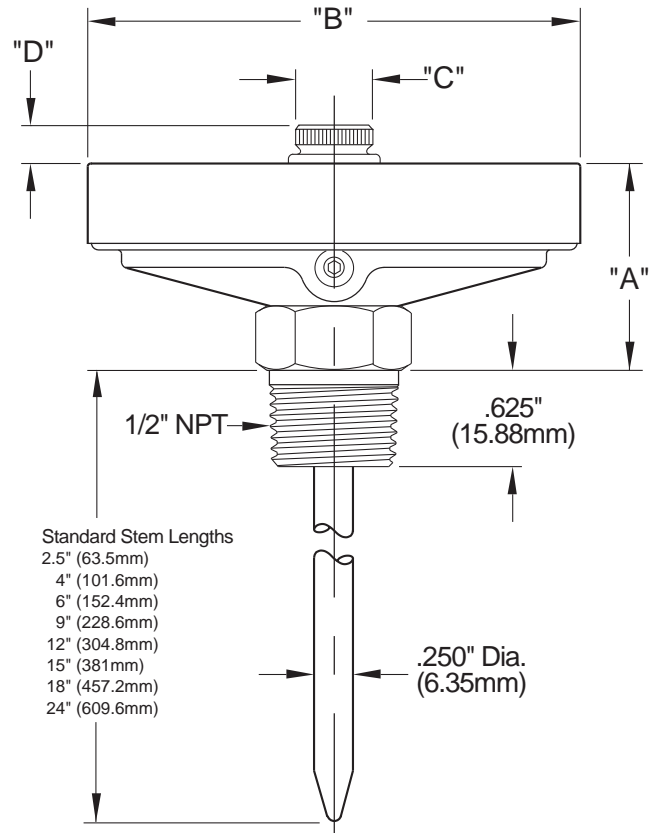
* Thermometers with temperature ranges 200/1000°F and 100/550°C are NOT RECOMMENDED FOR CONTINUOUS USE ABOVE 800°F/425°C (FOR INTERMITTENT USE ONLY).

➤ **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.

MODEL	Estimated Shipping Weights	
	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.

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

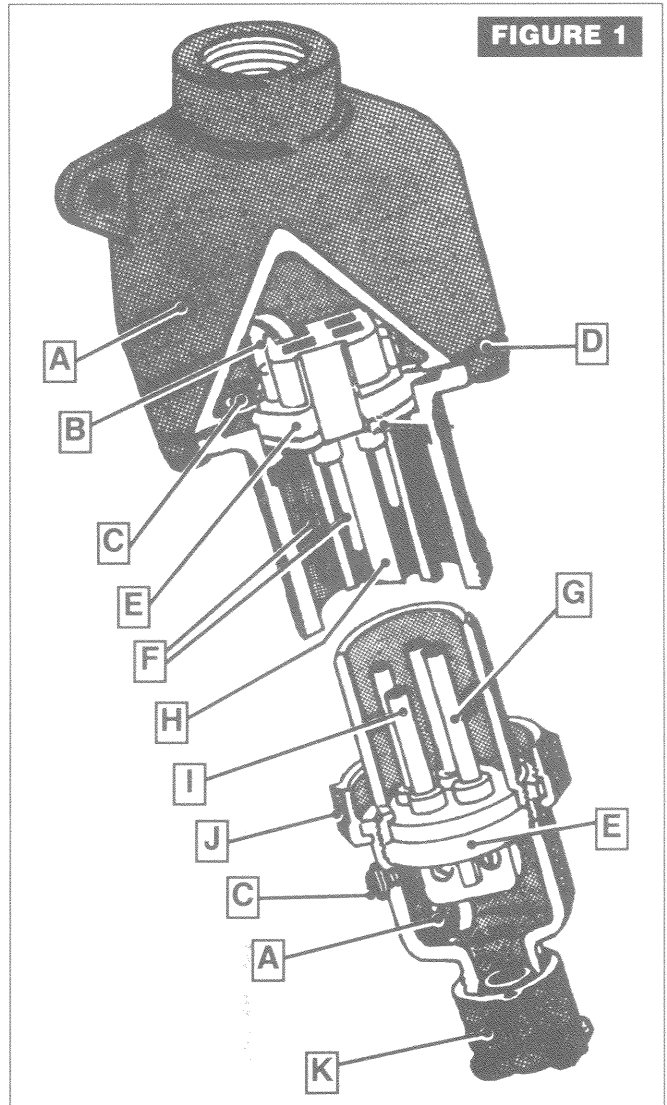
- Designed to supply power to portable or fixed electrical equipment such as motor generator units, welders, pumps, compressors and similar apparatus.
- Ideal for use on shipping docks, ports and other "ship to shore" applications.
- Suitable for use in locations where a watertight enclosure is required.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

FEATURES

- Rugged.** All components have copper-free aluminum housings.
- Two Grounding Styles.** Copper grounding straps in Style 2 receptacles and plugs (shown) ground thru shell and extra pole. Style 1 thru shell only.
- Convertible.** Two screws secure receptacle insulator block; one screw secures plug insulator block. Permits easy conversion to reverse service (30, 60, 100A).
- Watertight.** Mounting box sealed with gasket. Receptacle and connector seals with screw cap or plug. Plug sealed when in receptacle or connector
- Insulator Blocks.** Provide high mechanical and dielectric strength, very low "arc tracking".
- Positive Ground.** Grounding detent springs assure maintained ground contact.
- Self-Aligning.** "Floating" plug and receptacle contacts automatically align.
- 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.
- Positive Contacts.** Brass contacts have integral springs for positive maintained electrical contact.
- Clamping Ring, Plug.** Neoprene gasketed, 30A, 60A, 100A plugs thread onto receptacle for watertight union.
- 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.

COMPLIANCES:

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



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.

**RETAIN THIS INSTRUCTION SHEET FOR
FUTURE REFERENCE.**

**READ INSTRUCTIONS CAREFULLY AND
WITH FULL UNDERSTANDING FOR SAFE
INSTALLATION AND OPERATION.**

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!

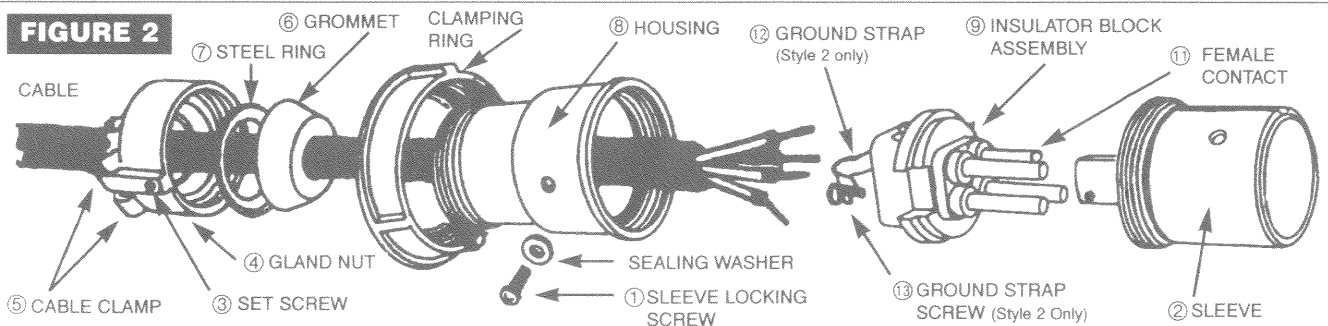
This condition could cause serious/fatal personal injury due to electrocution and/or equipment damage. Repair with proper replacement part(s) before continuing service.

WARNING

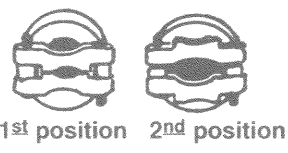
Electrical power must be turned "OFF" before and during installation and maintenance. Failure to do so may result in serious/fatal injuries due to electrocution.

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:**



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 ⑩ 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 installa-



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...

- Position insulator block assembly ⑨ in sleeve ②. For STYLE 2, attach ground strap ⑩ to sleeve ② with ground strap screw ⑪ 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.
- 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.
- 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.

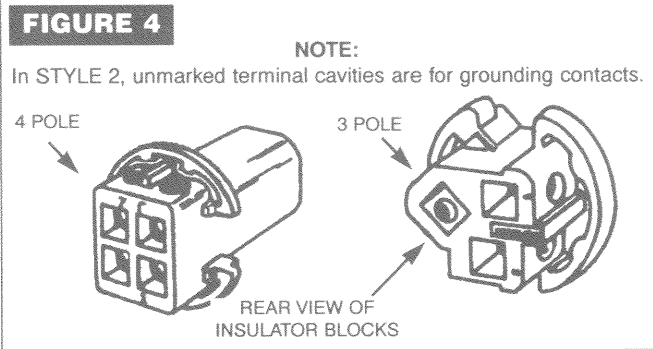
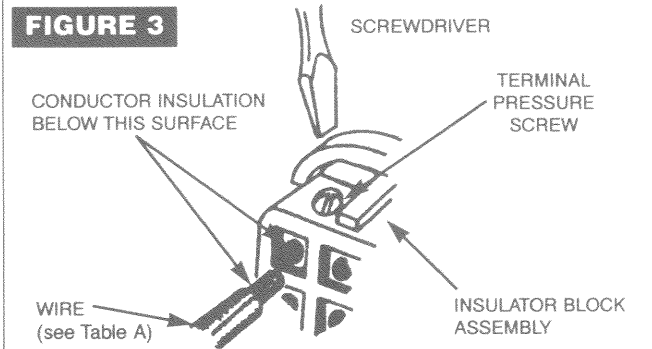
WARNING

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.

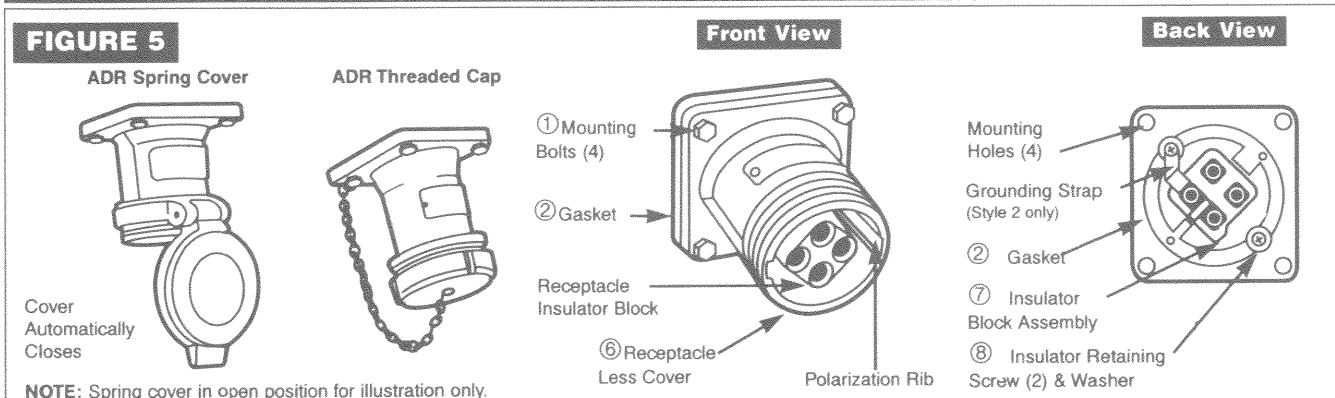
ELECTRICAL TESTING

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.



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



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.

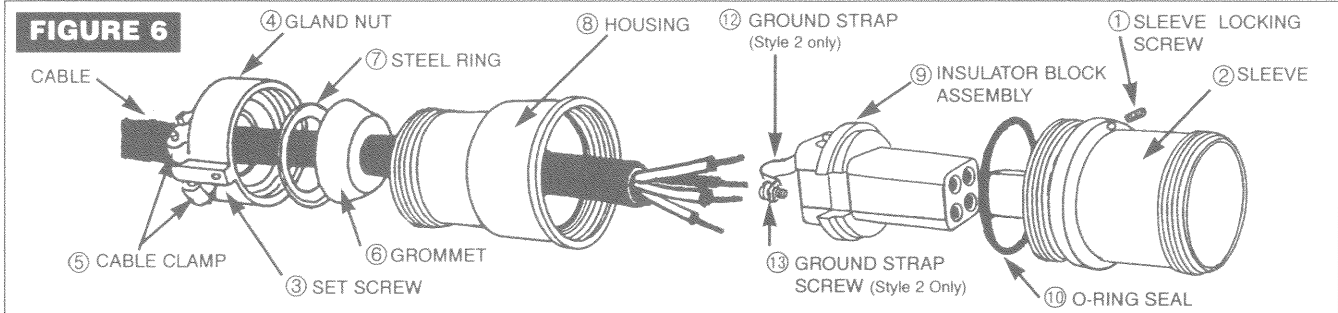
- Follow instruction given in paragraphs 2 and 5 for "ACP" plugs.
- Insert insulator block assembly ⑦ into receptacle housing ⑥ and install two retaining screws with washers ⑩. Torque

to 30 in. lbs. min. / 35 in. lbs. max.

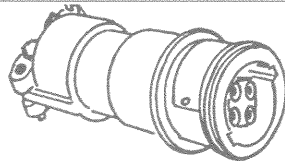
- Mount receptacle to previously installed back box using mounting bolts ① supplied with receptacle and torque to 30 in. lb. min. / 40 in. lb. max. Mounting screws provide electrical continuity between receptacle housing ⑥ and back box. Make sure gasket ② is positioned correctly to make a watertight seal.
- 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

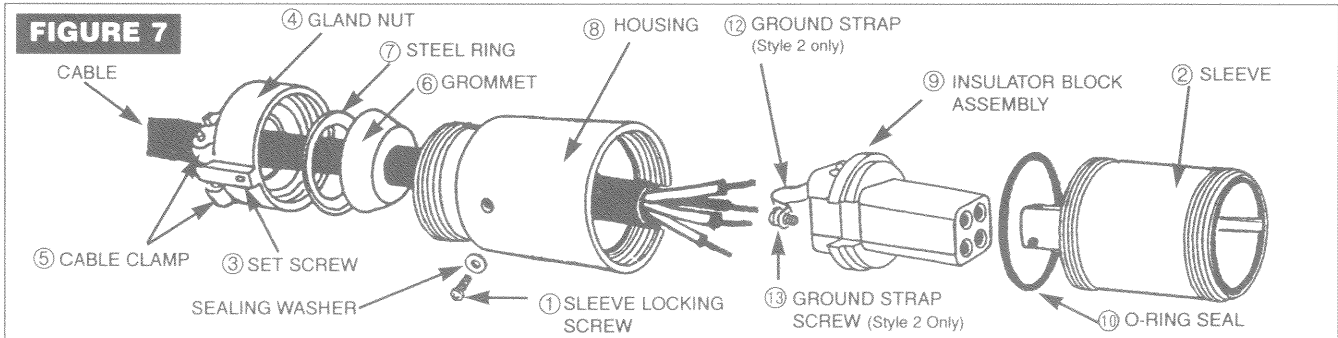


These Cable Connectors are for use with "ACP" Powertite Plugs and others. See Intermateability Chart

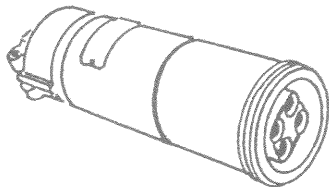


1. Disassemble connector as shown in Figure 6 by loosening sleeve locking set screw ① and gland nut set screw ③, then unscrew sleeve ② and gland nut ④.
2. Follow instructions given in paragraphs 2, 3, 4, 5 and 6 for the "ACP" plugs.
3. Screw the combination of sleeve and insulator block assembly into 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 7 and 8 for "ACP" plugs.

60A/100A CABLE CONNECTOR



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

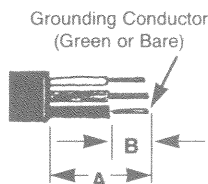


1. Disassemble connector as shown in Figure 7 by loosening sleeve locking set screw ① and gland nut set screw ③, then unscrew sleeve ② and gland nut ④.
2. Follow instructions given in paragraphs 2, 3, 4, 5 and 6 for the "ACP" plugs.
3. Screw the combination of sleeve ② and insulator block assembly ⑨ 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)		Terminal Wire Range (AWG)	
	Jacket A	Conductor B	Building	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	1
	.625-.812	.812	1
	.812-1.125	1.125	1
30 AMP ACP30xxB ARC30xxB	.500-.625	.625	1*
	.625-.750	.750	1*
	.750-.875	.875	1*
30 AMP ACP30xxC ARC30xxC	.875-1.000	1.000	1*
	1.000-1.188	1.188	2*
	1.188-1.375	1.375	2*
60 AMP ACP60xxBC ARC60xxBC	.625-.812	.812	1
	.812-1.125	1.125	1
	1.125-1.375	1.375	2*
60 AMP ACP60xxB ARC60xxB	.500-.625	.625	1*
	.625-.750	.750	1*
	.750-.875	.875	1*
60 AMP ACP60xxC ARC60xxC	.875-1.000	1.000	1*
	1.000-1.188	1.188	2*
	1.188-1.375	1.375	2*
100 AMP ACP10xxCD ARC10xxCD	.875-1.062	1.062	1
	1.062-1.281	1.281	1
	1.281-1.562	1.562	2
100 AMP ACP10xxC ARC10xxC	1.562-1.906	1.906	2
	.875-1.000	1.000	1*
	1.000-1.188	1.188	2*
100 AMP ACP10xxD ARC10xxD	1.188-1.375	1.375	2*
	1.375-1.625	1.625	2*
	1.625-1.188	1.188	2*

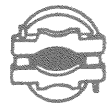
*Clamps B & C were replaced by clamp BC; also C & D replaced by CD. Some products with a B or C catalog number suffix were shipped with a BC clamp installed. Same for C or D but with a CD clamp.

Figure 8

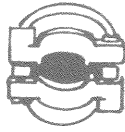
To reverse cable clamp, just remove screws, flip over and replace screws. Permits a wider cable range. Convenient in installations having different cable sizes.



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

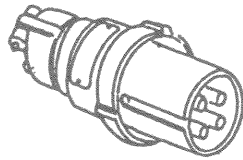
INTERMATEABILITY CHART FOR ORDINARY LOCATION PLUGS & RECEPTACLES

	100A				60A				30A				
	2W, 2P	3W, 3P	4W, 4P	3W, 4P	2W, 2P	3W, 3P	4W, 4P	3W, 4P	2W, 2P	3W, 3P	4W, 4P	3W, 4P	2W, 2P
APPLETON													
Plugs	ACP1022CD	ACP1033CD	ACP1044CD	ACP1034CD	ACP6022BC	ACP6033BC	ACP6044BC	ACP6034BC	ACP3022BC	ACP3033BC	ACP3044BC	ACP3034BC	ACP3022BC
Cable Connectors	ARC1022CD	ARC1033CD	ARC1044CD	ARC1034CD	ARC6022BC	ARC6033BC	ARC6044BC	ARC6034BC	ARC3022BC	ARC3033BC	ARC3044BC	ARC3034BC	ARC3022BC
Receptacles	ADR1022 ACR1022	ADR1033 ACR1033	ADR1044 ACR1044	ADR1034 ACR1034 WRDK1034 WRDK1034 312738	ADR6023 ACR6023	ADR6033 ACR6033	ADR6044 ACR6044	ADR6034 ACR6034 WRDK6034 WRDK6034 312726	ADR3023 ACR3023	ADR3033 ACR3033	ADR3044 ACR3044	ADR3034 ACR3034 WRDK3034 WRDK3034 312737	ADR3023 ACR3023
CROUSE-HINDS													
Plugs	APJ10277	APJ10377	APJ10477	APJ10487 NPJ10386 NPJ10387	APJ6385 NPJ6384 NPJ6385	APJ6375	APJ6475	APJ6485 NPJ6483 NPJ6484	APJ3385 NPJ3383 NPJ3384	APJ3375	APJ3475	APJ3485 NPJ3483 NPJ3484	APJ3275
Cable Connectors	APR10255 APR10257	APR10355 APR10357	APR10455 APR10457	APR10365 APR10367 NPR10366 NPR10367	APR6363 APR6365 NPR6364 NPR6365	APR6353 APR6355	APR6453 APR6455	APR6463 APR6465 NPR6463 NPR6464	APR3363 APR3365 NPR3363 NPR3364	APR3353 APR3355	APR3453 APR3455	APR3463 APR3465 NPR3463 NPR3464	APR3253 APR3255
Receptacles	AR1021 AR1023 AR1027	AR1031 AR1033 AR1037	AR1041 AR1043 AR1047	AR1032 AR1034 AR1038 AR1042 AR1044 AR1048 NR1032	AR632 AR634 AR638 NR632	AR631 AR633 AR637	AR641 AR643 AR647	AR621 AR623 AR627	AR332 AR334 AR338 NR332	AR331 AR333 AR337	AR341 AR343 AR347	AR342 AR344 AR346 NR342	AR321 AR323 AR327

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

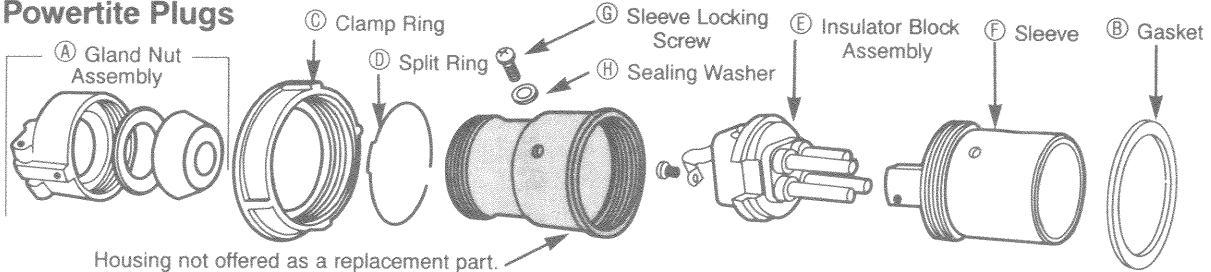
ACP Plugs can be used with ACR and ADR series receptacles and ARC cord connectors. ACP Plugs can also be used with the following receptacles in hazardous locations.



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

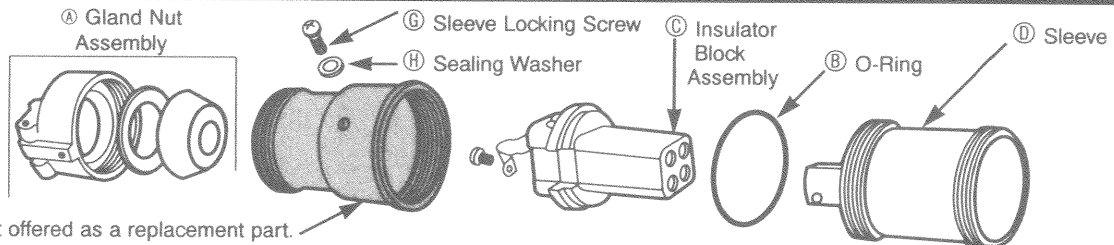
"ACP" Powertite Plugs



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		Item G Sleeve Locking Screw	Item H Sealing Washer
								STD Position	P4 Position		
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

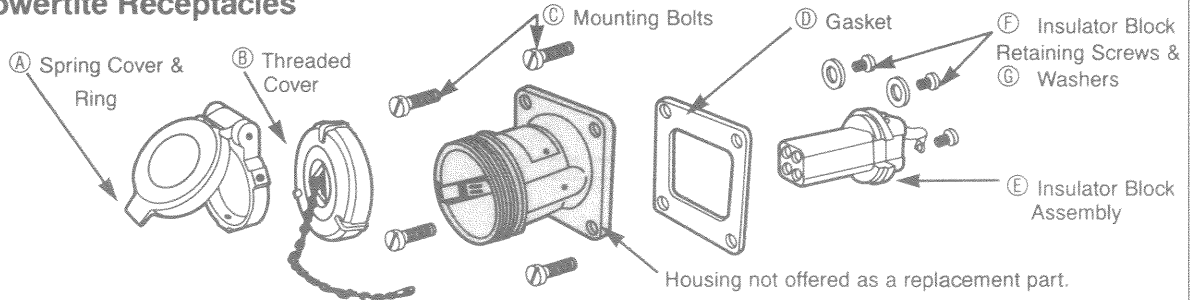
"ARC" Powertite Cable Connector



Ampacity	Style	Description	Item A Gland Nut Assembly	Item B O-Ring	Item C Contact Block Assembly	Item D Sleeve		Item E Sleeve Locking Screw	Item F Nylon Washer
						STD Position	P4 Position		
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.

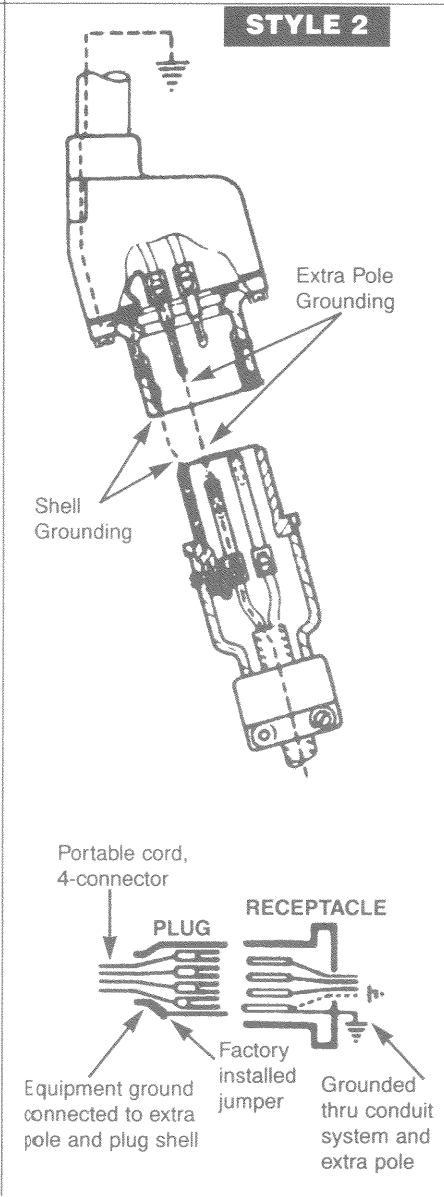
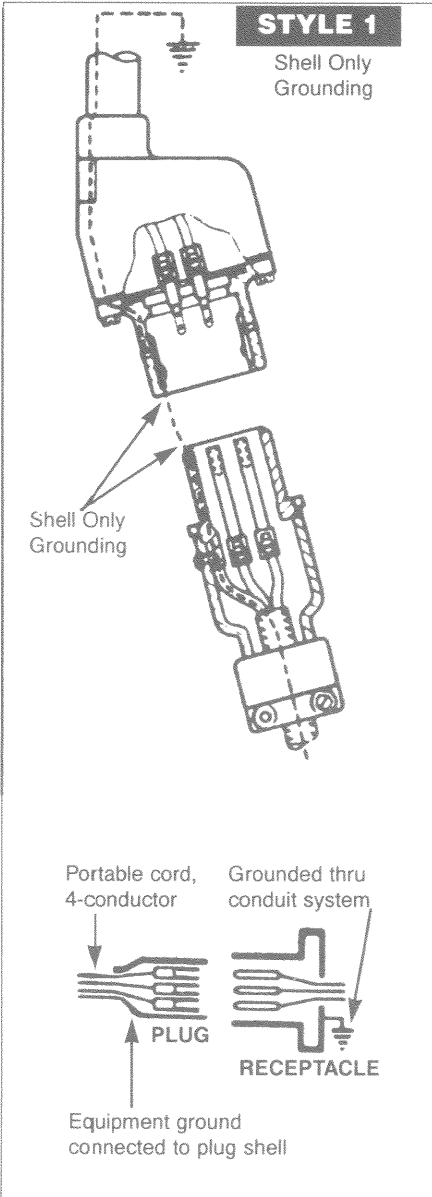
In addition to these required maintenance procedures, we recommend an Electrical Preventive Maintenance program as described in the National Fire Protection Association Bulletin NFPA No. 70B.

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".

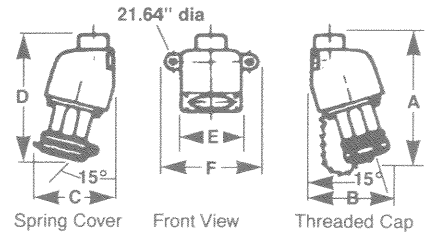
PLUG - Equipment grounding conductor is not only connected to the solderless lug in the plug housing, but also to an extra grounding pole. Grounding pole has copper alloy grounding jumper strap that connects to plug housing.

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".

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

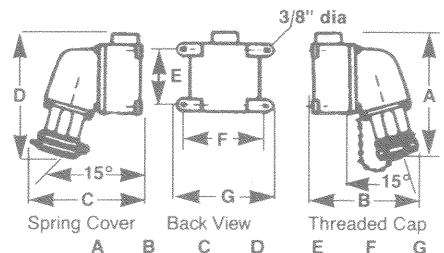
Dimensions in Inches

Receptacle Mounted on AEE Box



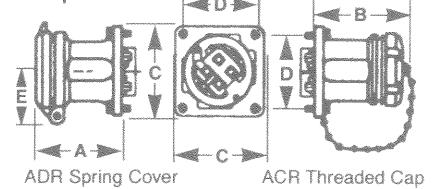
	A	B	C	D	E	F
30 Amp	6.88	3.75	4.25	7.13	3.88	5.00
60 Amp	9.75	5.25	5.50	10.00	4.25	6.38

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

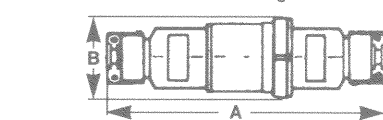
Receptacle



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

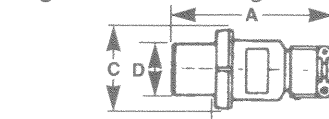
ACP Plug



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

