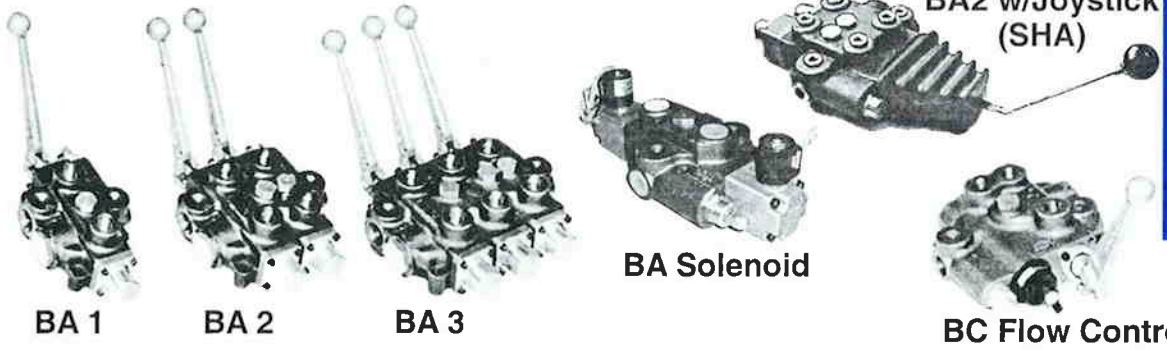
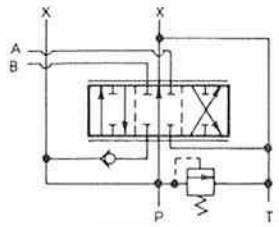
HYDRAULIC VALVES

DIRECTIONAL CONTROL
B SERIES
Specification Sheet



BA 1 BA 2 BA 3

BC Flow Control



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

GENERAL SPECIFICATIONS

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

* SAE threads only, 2500 psi for NPTF

MATERIAL SPECIFICATIONS

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

STANDARD FEATURES

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

OPTIONAL FEATURES AVAILABLE

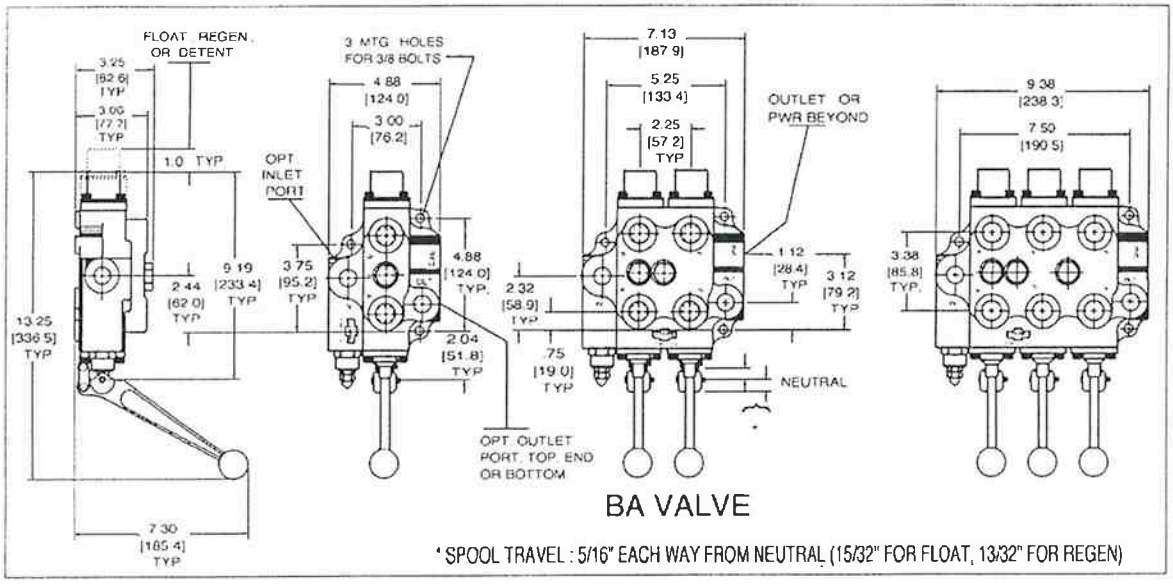
- Open or closed center positions, 3-way or 4-way operation, 3-position or 4-position (float position), full open center (motoring spool) and other spool options
- Power beyond (permits use of neutral flow at system pressure); also permits field conversion from closed center to open center (tandem) operation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

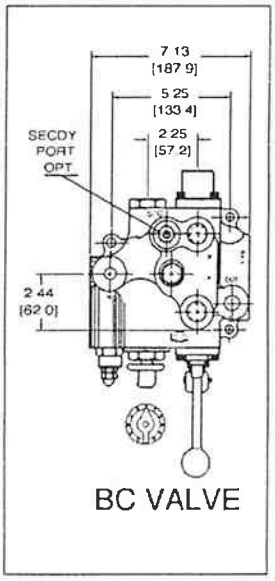
NOTE: Refer to CROSS Valve Technical/Service Sheet for recommendations and limitations.

DIRECTIONAL CONTROL
B SERIES
Specification Sheet

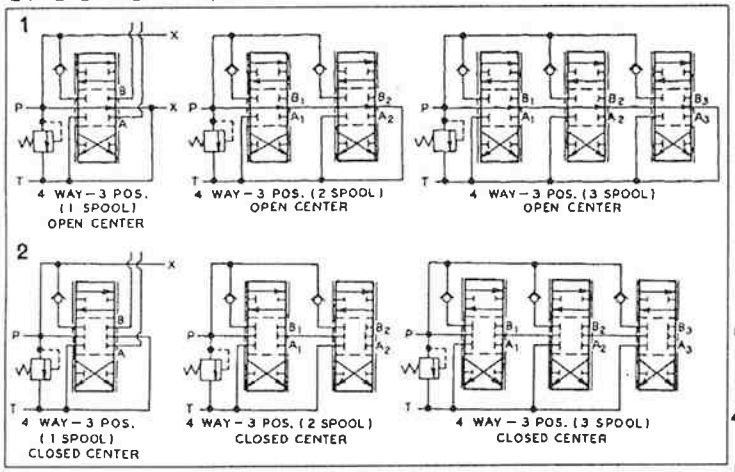
HYDRAULIC VALVES

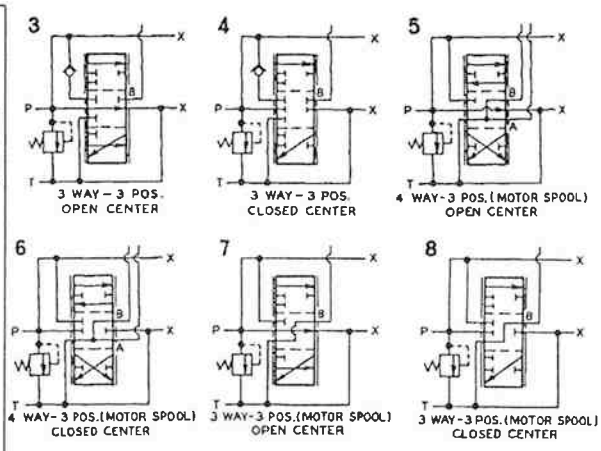
DIMENSIONAL DATA in inches and (millimeters)

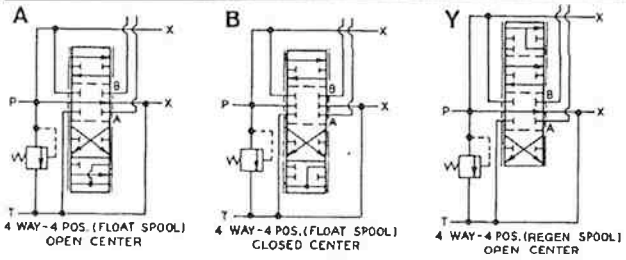


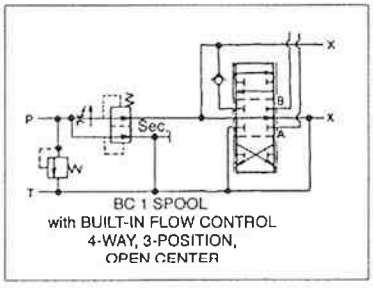


SPOOL OPTIONS

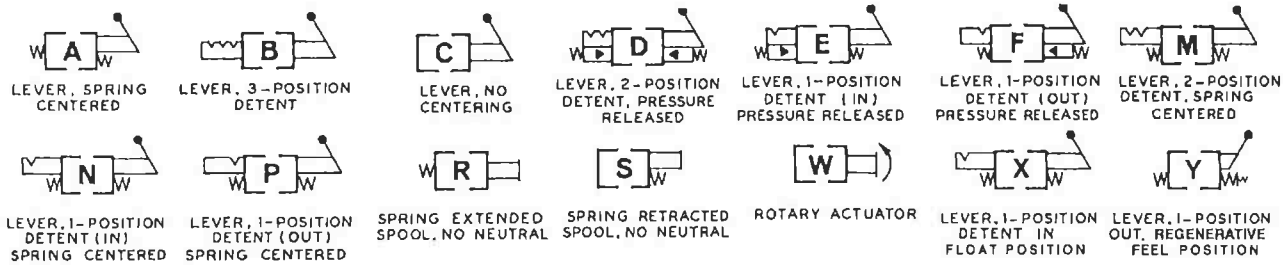








ACTUATOR OPTIONS

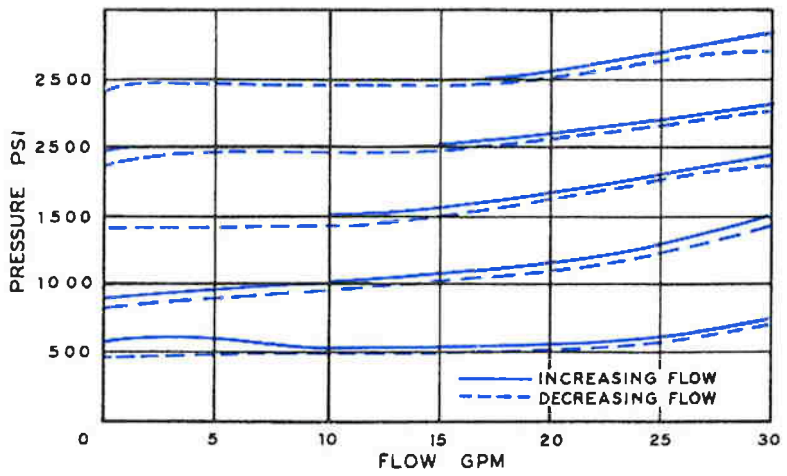


TYPICAL PERFORMANCE DATA

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

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

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



DIRECTIONAL CONTROL
B SERIES
Specification Sheet

HYDRAULIC VALVES

ORDERING INFORMATION

MODEL NO.	# OF SPOOLS	SPOOL TYPE	ACTUATOR OPTIONS	RELIEF VALVE(4)	POWER BEYOND	OUTLET PORT LOCATION	SECONDARY FLOW OUTLET BC ONLY (OPTIONAL)	PORT SIZE & TYPE	HANDLE
BA	1	1	A	A	0	O	0	A	O
Manual	Single	4-way, 3-position, open center	3 position Spring centered	1000 psi	None	End Outlet when P/B not specified	No Port (plugged)	In & Out 3/4" NPTF, Work 1/2" NPTF(8)	Complete handle assy.-
	2	2 (1)	B	B	1 (6)	T	1	B	1
	Double	4-way, 3-position, closed center	3 position detent - no spring centering	1500 psi	3/4" NPTF P/B sleeve port	Top Outlet	7/8-14 (SAE #10)	In & Out 3/4" NPTF, Work 3/4" NPTF	Less Complete handle assy.-
	3	3	C	C	2 (6)	B	2	C	2
	Triple	3-way, 3-position, open center	Manual - no detent - no centering spring	2000 psi	1/16-12 SAE #12, P/B sleeve port	Bottom Outlet	1/2" NPTF	In & Out 1 1/16-12 SAE #12, Work 3/4-16 SAE #8(8)	Less handle only (Links, pins & bracket included)
		4 (1)	D (3)	D	3 (6)	E	3	D	3 (9)
		3-way, 3-position, closed center	Pressure detent "in & out"	None	Conversion plug	End Outlet	3/4-16 (SAE #8)	In & Out SAE #12, Work SAE #12	Single Handle Actuator
		5	E (3)	E	4 (6)	G	4	E	4
		4-way, 3-position, open center w/motoring spool	Pressure detent, "in" only, spring centering(4)	Other	7/8-14 SAE #10, P/B sleeve port	Bottom Outlet with Grommet	3/4" NPTF	In & Out 3/4" NPTF, Work 3/8" NPTF	No handle - solenoid operated
		6 (1)	F (3)	F(5)	5	P	5	F	5
		4-way, 3-position, closed center w/motoring spool	Pressure detent, "out" only, spring centering(4)	Adj. 500-1500 (set at 1000)	Closed center plug	Top Inlet & outlet	1 1/16-12 (SAE #12)	Other	Proportional
		7	H	G(5)	6	H	(OMIT ON BA)		6
		3-way, 3-position, open center w/motoring spool	Solenoid, 12 volt DC	Adj. 1500-3000 (set at 2000)	Check valve for solenoid oper.	Top Inlet			Heavy Duty Steel Handle
		8 (1)	J						
		3-way, 3-position, closed center w/motoring spool	Solenoid , 24 volt DC			(7)			
		A (2)	K						
		4-way, 4-position, open center detent float position	Solenoid, 120 volt, AC						
		B (1) (2)	L						
		4-way, 4-position, closed center detent float position	Solenoid, 240 volt, AC						
		C	M						
		4-way, 4-position, open center w/regen feel position	2 position detent, "in & out" spring centering						
			N						
			1 position detent, "in only" spring centering						
			P						
			1 pos. detent, "out only" spring centering						
			R						
			Spring ext., no neutral						
			S						
			Spring retr., no neutral						
			X						
			4-way, spr. center to neutral. detent in float.						
			Y						
			4-way, spring center with regen						
			W						
			Rotary actuator						
BC		1(1)	A(1)	A(1)	3(1)	E(1)	2(1)	A(1)	0(1)

Open Center BA Solenoid Valve must be externally drained.

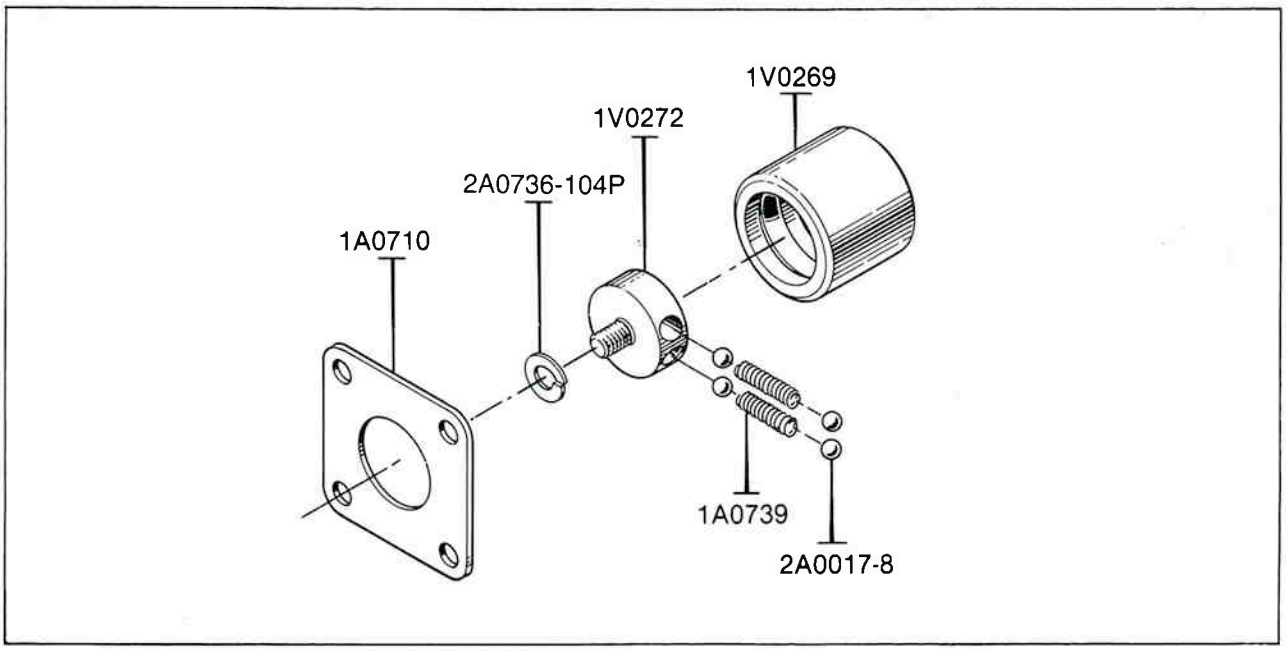
Part number building example:
BA2A1XAB1EA0 is a manually operated double spool valve: the **first** spool being 4-way, 4-position. open center, spring centered with detent in float position; the **second** spool being 4-way, 3-position, open center spring centered. The non-adjustable relief is set at 1500 psi. 3/4" NPTF power beyond sleeve port, outlet port in end position. Inlet and outlet ports are 3/4" NPTF and the work ports are 1/2" NPTF. Complete handle assembly included.

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 behond 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 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 models.

CROSS MANUFACTURING
100 James H. Cross Blvd.
Lewis, Kansas 67552
Phone 620/324-5525; FAX 620/324-5737
e-mail: info@crossmfg.com

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

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



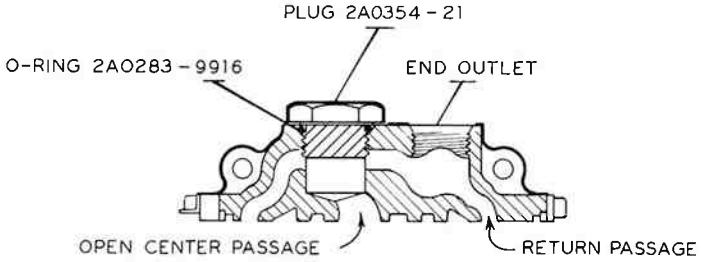
To convert from the standard 3-position spring-centered version to a 3-position detent, proceed as follows:

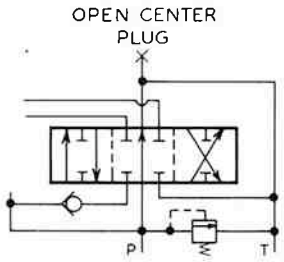
1. Remove the four socket head cap screws and end cap.
2. Remove the socket head cap screw from the spool end and take out the spring centering mechanism.
3. Position the retainer plate (1A0710) on end of valve body.
4. Install lockwasher (2A0736-104P) on threaded end of retainer (1V0272).
5. Screw the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

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

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

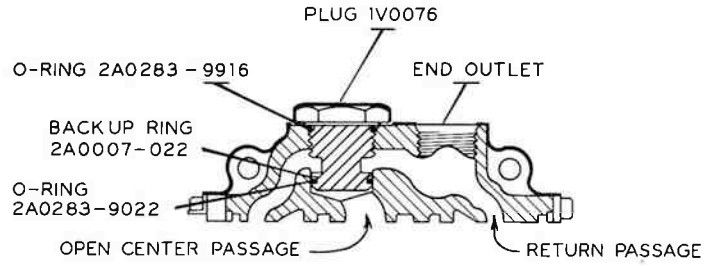
STANDARD OPEN CENTER VALVE WITH CONVERSION PLUG (option #3)
Plug Assembly 2A0354 - 121

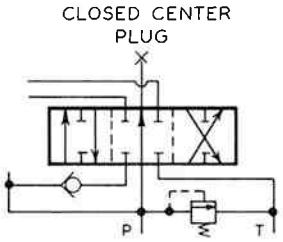




This option allows conversion from standard open center function to either powe beyond or to a closed center function.

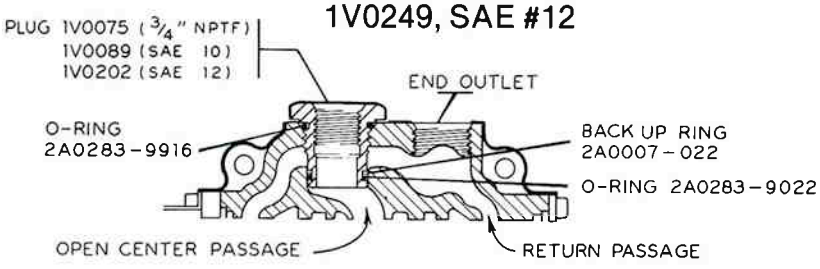
CLOSED CENTER PLUG
Plug Assembly 1V0206

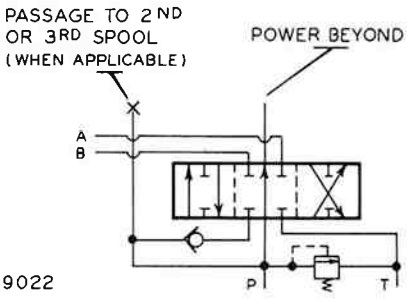




By replacing the conversion plug assembly (2A0354-121) with the closed center plug assembly (1V0206) the directional control valve is converted from open center to closed center function.

POWER BEYOND PLUG
Plug Assembly 1V0208, 3/4" NPTF port
1V0209, SAE #10
1V0249, SAE #12



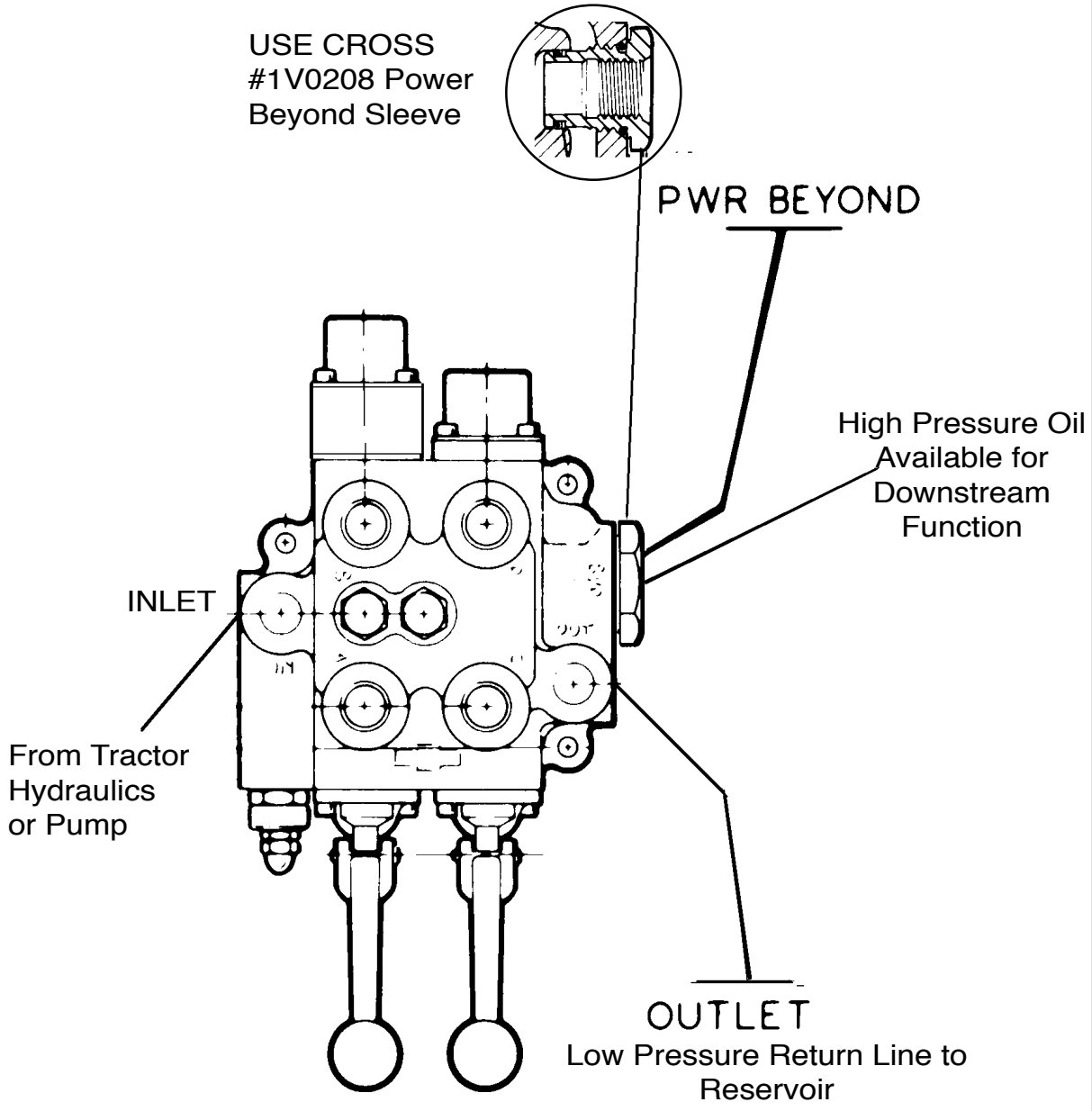


By replacing plug assembly 2A0354-121 with the power beyond plug assembly, an additional valve may be connected downstream of the B series valve.

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.

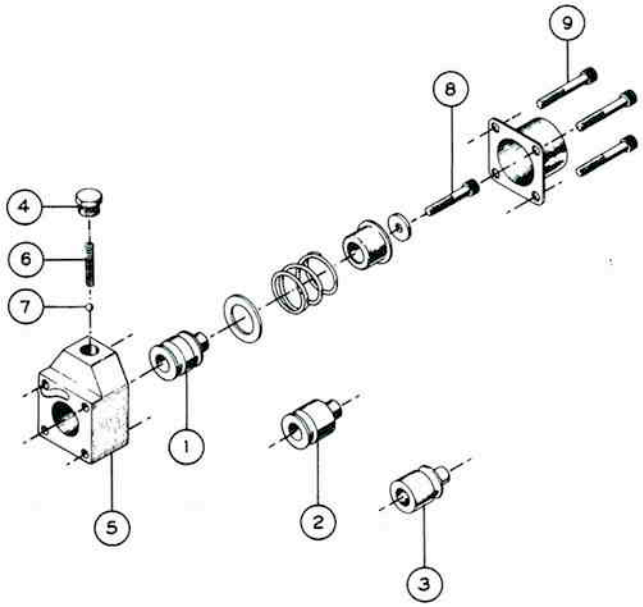
B Series

POWER BEYOND INSTALLATION



SERIES B DIRECTIONAL CONTROL VALVE OPTIONS

DETENT WITH SPRING CENTERING

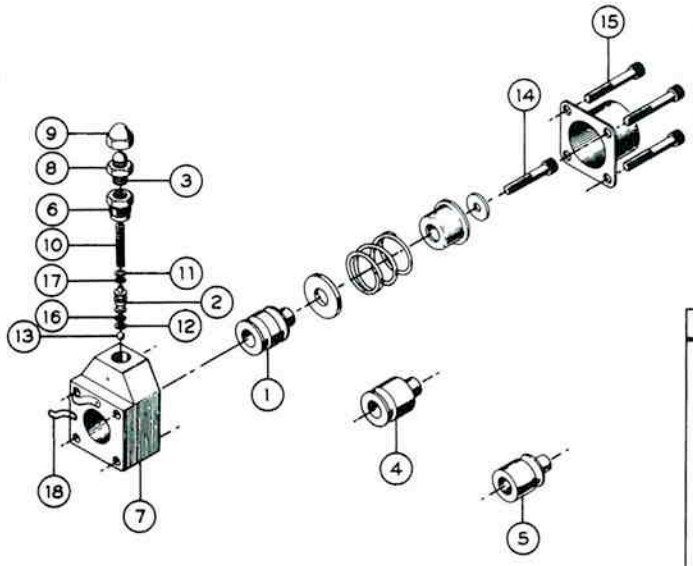


THIS FEATURE ALLOWS SPRING CENTERING TO NEUTRAL WITH A DETENT FOR THE "IN", "OUT" POSITION, OR BOTH THE "IN" AND "OUT" POSITIONS. THE ONE OR TWO POSITION DETENT WITH SPRING CENTERING IS DESIRABLE FOR THE OPERATION OF HYDRAULIC CYLINDERS OR MOTORS. THE ONE POSITION DETENT PROVIDES A FLOAT POSITION FOR 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	1V0067	2-POSITION DETENT SLEEVE	1
2	1V0070	1-POSITION DETENT SLEEVE, "IN" (OPT.)	1
3	1V0071	1-POSITION DETENT SLEEVE, "OUT" (OPT.)	1
4	1V0217	DETENT PLUG	1
5	1V0264	DETENT HOUSING ASSEMBLY	1
6	1A0610	DETENT SPRING	1
7	2A0017-8	BALL (1/4 STEEL)	1
8	2A0079-414N	CAPSCREW	1
9	2A0079-416	CAPSCREW	4
		NOTE: ORDER BY KIT NUMBER	
	1V0557	DETENT KIT (2 POSITION)	1
	1V0558	DETENT KIT (1 POSITION "IN")	1
	1V0559	DETENT KIT (1 POSITION "OUT")	1

PRESSURE DETENT KIT NO. 1V0642



"8A" VALVES WITH THREE-POSITION SPOOLS CAN BE PROVIDED WITH THIS OPTION ON ANY OR ALL SPOOLS. A PRESSURE DETENT HOLDS THE SPOOL IN THE "IN" POSITION, "OUT" POSITION OR BOTH "IN" AND "OUT" POSITIONS. THE DETENT IS HELD UNTIL THE CYLINDER OR MOTOR REACHES A PRE-SET PRESSURE, RELEASING THE DETENT, ALLOWING THE SPOOL TO SPRING RETURN TO NEUTRAL. *FIELD INSTALLATION CAN BE MADE ONLY IF VALVE ALREADY HAS THIS OPTION.*

SPECIAL PARTS

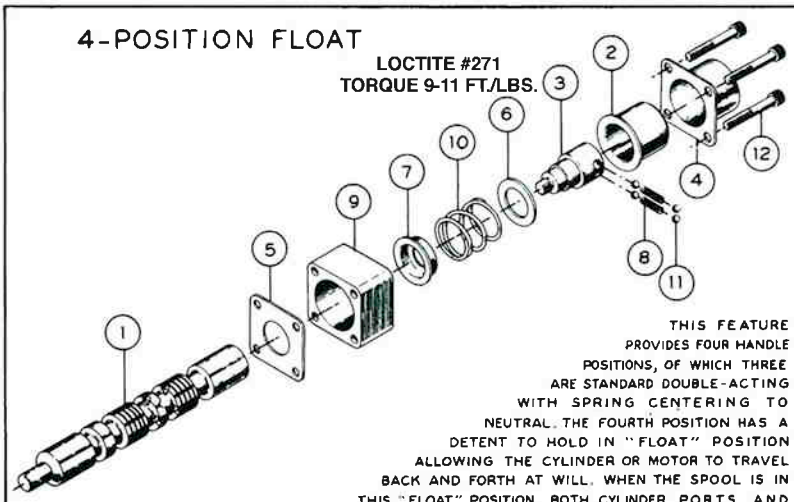
	PART NO.	DESCRIPTION	QTY REQD
1	1V0067	2-POSITION DETENT SLEEVE	1
* 2	1V0068	PRESSURE DETENT PISTON	1
* 3	1V0069	ADJUSTMENT SCREW	1
4	1V0070	1-POSITION DETENT SLEEVE "IN" (OPT.)	1
5	1V0071	1-POSITION DETENT SLEEVE "OUT" (OPT.)	1
* 6	1V0072	PISTON STOP	1
* 7	1V0264	DETENT HOUSING ASSEMBLY	1
* 8	1A0569	NUT	1
* 9	1A0570	ACORN NUT	1
* 10	1A0610	DETENT SPRING	1
* 11	2A0012-008	UPPER O-RING BACK-UP	1
* 12	2A0012-007	LOWER O-RING BACK-UP	1
* 13	2A0017-8	BALL (1/4 STEEL)	1
14	2A0079-414N	CAPSCREW	1
15	2A0079-416	CAPSCREW	4
* 16	2A0283-7007	LOWER PISTON O-RING	1
* 17	2A0283-7008	UPPER PISTON O-RING	1
* 18	2A0283-9017	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.

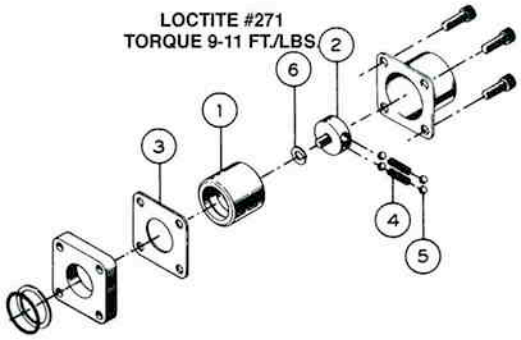
KIT NO. 1V1600
(SPOOL NOT INCLUDED)

SPECIAL PARTS

	PART NO.	DESCRIPTION	QTY REQD
1	1V0094	FLOAT SPOOL	1
2	1V0205	FLOAT DETENT SLEEVE	1
3	1V0260	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	1A9231	FLOAT CENTERING SPRING	1
11	2A0017-8	BALL (1/4 STEEL)	4
12	2A0079-416	CAPSCREW	4

3-POSITION DETENT

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

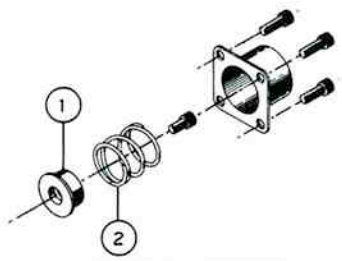


THIS FEATURE PROVIDES THREE HANDLE POSITIONS, ALL OF WHICH ARE HELD WITH A DETENT, AND HAS NO SPRING CENTERING TO NEUTRAL. THIS OPTION ALLOWS CONTROL AND DIRECTING OF FLOW TO STOP, START OR REVERSE HYDRAULIC MOTORS. IT CAN BE USED TO DIVERT FLOW TO ONE OR MORE SEPARATE CIRCUITS.

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	2A0736-104P	LOCKWASHER	1

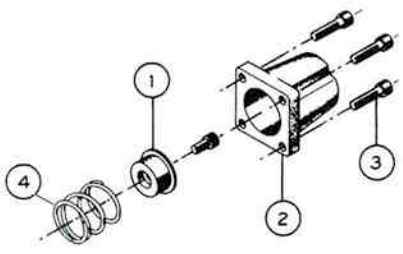
SPRING EXTENDED SPOOL



SPECIAL PARTS

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

SPRING RETRACTED SPOOL

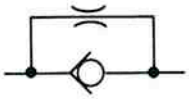


SPECIAL PARTS

	PART NO.	DESCRIPTION	QTY REQD
1	1V2020	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.

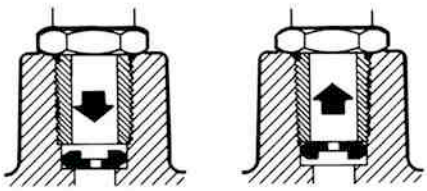
ORIFICE SIZES AVAILABLE

.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".

3/4 - 16 (SAE #8) Ports

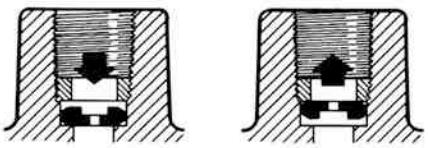


IN-FLOW OUT-FLOW

RESTRICTION

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

1/2" NPTF Ports



IN-FLOW OUT-FLOW

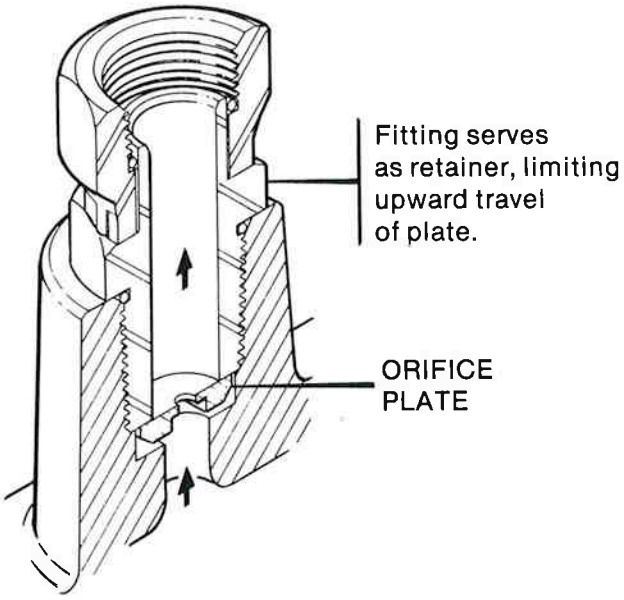
RESTRICTION

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

HYDRAULIC VALVES

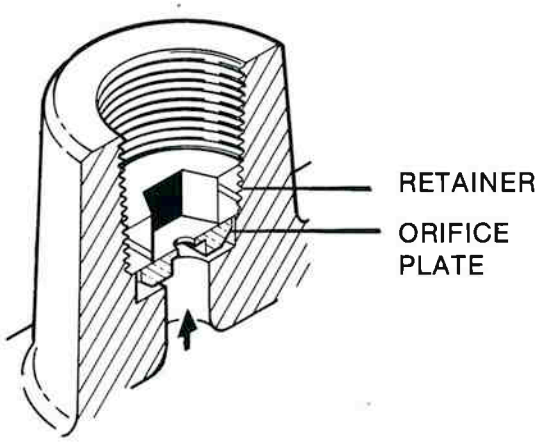
ORDERING INFORMATION

SAE PORT



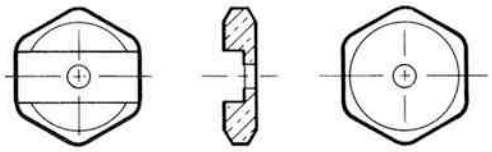
ORIFICE PLATE ONLY
Available for 3/4 - 16 (SAE #8) ports only.

NPTF PORT

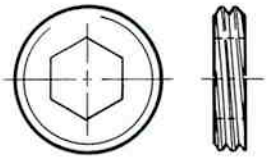


ORIFICE PLATE and RETAINER
Available for 1/2" ports only.

ORIFICE PLATE Part No. 1A0742



RETAINER Part No. 1A0741

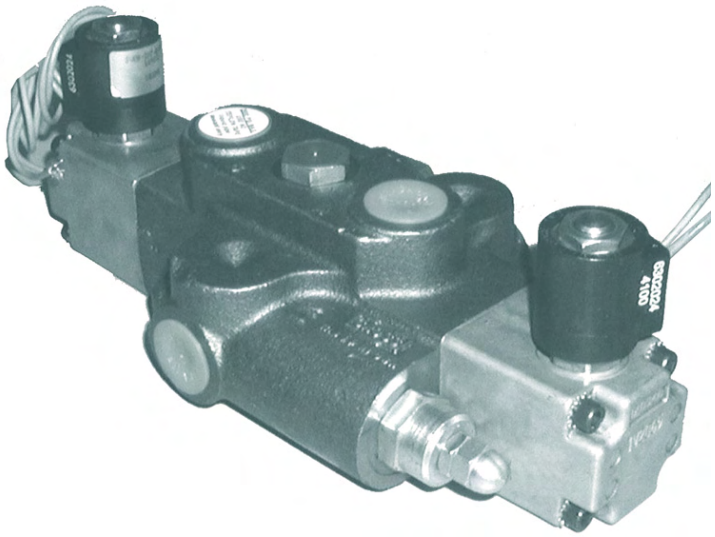


SAE #8 (3/4 - 16)	ORIFICE PLATE - 1A0742	HOLE DIA. use 3 digit decimal to identify diameter of hole in orifice plate.
NPTF (1/2")	RETAINER - 1A0741 ORIFICE PLATE - 1A0742	

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

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

Solenoid Option for BA Series Valve



CROSS is pleased to announce the addition of a solenoid option for the 30 Gallon 3000 psi Series BA valve. Available in 12 or 24 volts DC, or 120 or 240 volts AC, this feature offers the convenience and remote control capabilities of electrical operation with the load check advantages of the BA Valve for lifting applications. External drains are required on all open center models. The versatile BA valve is available in a single, double, or triple spool model with power beyond option as well as a variety of spool and actuator choices.

Standard Valves — 4 way, 3 position open center (tandem), 12 volt solenoid, 2000 psi adjustable relief, with end outlet and 1V3636 check plug in power beyond, SAE ports — 1 1/16-12 in and out & 3/4-16 work

Single spool	**SBS2**	**132040**	**BA11HG6EC4**
Double spool	**SBS22**	**137020**	**BA211HHG6EC4**
Triple spool	**SBS222**	**146505**	**BA3111HHHG6EC4**

These standard valves are included in our Full Line catalog.

Ordering Notes: Nomenclature will be similar to the BA valve.

- For actuator options use "H" for 12 volt, "J" for 24 volt, "K" for 120 volt , and "L" for 240 volt.
- Specify #6 for the 1V3636 check valve in the power beyond machining (unless you are specifying a power beyond sleeve or closed center plug).
- A #4 designation for the handle option will indicate "no handle" for those spools where a solenoid option has been specified.

External Drain Kits:

BA1 - #12 SAE - #1V2171	BA2 - #12 SAE - #1V2173	BA3 - #12 SAE - #1V2175
BA1 - 3/4" NPTF - #1V2172	BA2 - 3/4" NPTF - #1V2174	BA3 - 3/4" NPTF - #1V2176