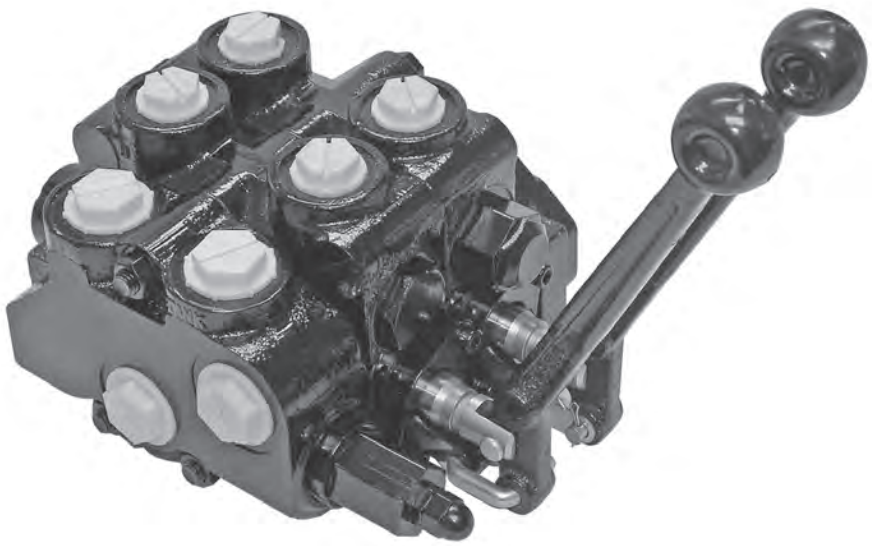
SECTIONAL BODY



Series "20"

STANDARD FEATURES

- 1 -10 Work Sections
- Power Beyond Capability
- Load Checks on Each Work Port
- Extra Fine Spool Metering
- Reversible Handle
- Hard Chrome Plated Spools
- A Float Section can be Installed in any Location in Valve Assembly
- Interchangeable Mounting With Other Popular "20" gpm Stack Valves
- Optional Work Section with Pilot Operated Checks

SPECIFICATIONS

Parallel or Tandem Circuit
Pressure Rating
Maximum Operating Pressure ..... 3500 psi
Maximum Tank Pressure ..... 500 psi

Nominal Flow Rating ..... 20 gpm
Please Refer to Pressure Drop Charts.
Allowable Pressure Loss thru Valve
Determines the Maximum flow.

Foot Mounting
Weight
Inlet Cover ..... Approx 6 lbs
Outlet Cover ..... Approx 3.5 lbs
Work Section ..... Approx 9 lbs

Maximum Operating Temp .....180°F

Filtration: For general purpose valves, fluid cleanliness should meet the ISO 4406 19/17/14 level . For extended life or for pilot operated valves, the 18/16/13 fluid cleanliness level is recommended.

ORDERING INFORMATION:
The following is a listing of valve sections available from stock on a standard basis.
STANDARD SECTIONS AVAILABLE:

STANDARD INLET SECTIONS

ALL SECTIONS HAVE BOTH TOP AND SIDE INLET AND TANK PORTS

PART NO.	RELIEF TYPE AND SETTING	PORT SIZE
20I2A	NO RELIEF	#12 SAE ORB
20I2C	SHIM ADJUSTABLE 1351-1750 PSI, SET AT 1750 PSI @ 10 GPM	#12 SAE ORB
20I2D	SHIM ADJUSTABLE 1751-2200 PSI, SET AT 2200 PSI @ 10 GPM	#12 SAE ORB
20I2E	SHIM ADJUSTABLE 2201-3000 PSI, SET AT 2500 PSI @ 10 GPM	#12 SAE ORB
20I2G	ADJUSTABLE 1351-1750 PSI, SET AT 1750 PSI @ 10 GPM	#12 SAE ORB
20I2H	ADJUSTABLE 1750-2200 PSI, SET AT 2200 PSI @ 10 GPM	#12 SAE ORB
20I2J	ADJUSTABLE 2201-3000 PSI, SET AT 2500 PSI @ 10 GPM	#12 SAE ORB

STANDARD PARALLEL CIRCUIT WORK SECTIONS

ALL WORK SECTIONS HAVE #10 SAE ORB PORTS, LOAD CHECKS, AND STANDARD LEVER HANDLES.
MODELS WITH PORT RELIEFS ARE SHIM ADJUSTABLE.

PART NO.	SPOOL TYPE AND ACTION	PORT RELIEFS
20P1AA1AA	3-WAY SINGLE ACTING W/SPRING CENTER	PLUGGED
20P1BA1AA	4-WAY DOUBLE ACTING W/SPRING CENTER (WORK PORTS BLOCKED IN NEUTRAL)	PLUGGED
20P1BA5AA-S12Q	4-WAY DOUBLE ACTING W/SPRING CENTER, 12VDC SOLENOID OPERATED	PLUGGED
20P1BA6AA-S12Q	4-WAY DOUBLE ACTING W/SPRING CENTER, 12VDC SOLENOID OPERATED W/LEVER HANDLE	PLUGGED
20P1BB1AA	4-WAY DOUBLE ACTING W/3 POSITION DETENT (WORK PORTS BLOCKED IN NEUTRAL)	PLUGGED
20P1CA1AA	4-WAY FREE FLOW MOTOR W/SPRING CENTER (WORK PORTS OPEN TO TANK IN NEUTRAL)	PLUGGED
20P1CB1AA	4-WAY FREE FLOW MOTOR W/3 POSITION DETENT (WORK PORTS OPEN TO TANK IN NEUTRAL)	PLUGGED
20P1DD1AA	4-WAY 4 POSITION FLOAT W/SPRING CENTER AND FLOAT DETENT	PLUGGED
20P1BA1DD	4-WAY DOUBLE ACTING W/SPRING CENTER (WORK PORTS BLOCKED IN NEUTRAL)	2200 PSI
20P1DD1DD	4-WAY 4 POSITION FLOAT W/SPRING CENTER AND FLOAT DETENT	2200 PSI
20L1CA1	4-WAY 3 POSITION W/SPRING CENTER AND P.O. CHECKS	NONE
20LP1JA1AA	LOAD SENSE 4-WAY DOUBLE ACTING WITH SPRING CENTER	PLUGGED

STANDARD TANDEM CIRCUIT WORK SECTIONS

PART NO.	SPOOL TYPE AND ACTION	PORT RELIEFS
20T1BA1AA	4-WAY DOUBLE ACTING W/ SPRING CENTER (WORK PORTS BLOCKED IN NEUTRAL)	PLUGGED
20T1BA1DD	4-WAY DOUBLE ACTING W/ SPRING CENTER (WORK PORTS BLOCKED IN NEUTRAL)	2200 PSI
20T1CA1AA	4-WAY FREE FLOW MOTOR W/ SPRING CENTER (WORK PORTS OPEN TO TANK IN NEUTRAL)	PLUGGED

STANDARD OUTLET SECTIONS

ALL SECTIONS HAVE SIDE OUTLET

PART NO.	EXHAUST OPTION	PORT SIZE
20E21	OPEN CENTER OUTLET W/ CONVERSION PLUG	#12 SAE ORB
20E22	POWER BEYOND OUTLET W/ #10 SAE POWER BEYOND PORT	#12 SAE ORB
20E23	CLOSED CENTER OUTLET	#12 SAE ORB
20LE21	LOAD SENSE OUTLET WITH #4 LOAD SENSE PORT AND BLEED ORIFICE	#12 SAE ORB

TIE-ROD KITS

TIE-ROD TORQUE 30-32 ft-lbs

PART NO.	WORK SECTIONS	PART NO.	WORK SECTIONS
660402001	1 SECTION	660402006	6 SECTION
660402002	2 SECTION	660402007	7 SECTION
660402003	3 SECTION	660402008	8 SECTION
660402004	4 SECTION	660402009	9 SECTION
660402005	5 SECTION	660402010	10 SECTION

SERIES 20 HARDWARE AND SEAL KITS

660190003	SPRING CENTER KIT
660190004	3 POSITION DETENT KIT
660190005	FRICTION DETENT KIT
660190028	SPRING CTR PNEUMATIC ACTUATOR KIT
660190001	VERTICAL HANDLE, LINK & PINS
660190002	STD. HANDLE, LINK & PINS
660190006	COMPLETE VERT. HANDLE KIT
660190007	COMPLETE STD. HANDLE KIT
660190025	SEAL RETAINER PLATE
660190026	HANDLE CLEVIS
660290004	POWER BEYOND PLUG #10 SAE
660290017	POWER BEYOND PLUG 3/4" NPTF
660290005	CLOSED CENTER PLUG
660290006	OPEN CENTER OUTLET PLUG
660585001	WORK SECTION SEAL KIT
660585008	LOCK SECTION SEAL KIT
660590030	SOLENOID OPERATED SECTION SEAL KIT
660585002	INLET SECTION SEAL KIT
660585003	OUTLET SECTION SEAL KIT
660585004	SEAL KIT 0-RINGS BETWEEN SECTION ONLY
660585006	SOLENOID PILOT PASSAGE SEAL KIT
660390103	20 WORK SECT COIL & CART ASSY 12VDC/LEADS
660390107	20 WORK SECT COIL & CART ASSY 24VDC/LEADS
660290010	20 UTIL SECT CONTINUOUS ON PBU CART
660390153	20 UTIL SECT PBU COIL & CART ASSY 12VDC/LEADS
660390157	20 UTIL SECT PBU COIL & CART ASSY 24VDC/LEADS
270006092	20 UTIL SECT PRESSURE REDUCING CART
660290012	20 UTIL SECT POWER BEYOND PLUG #10 SAE

PORT RELIEF KITS

660290002	NO RELIEF LOAD CHECK PLUG
660290301	SHIM ADJ. 500 - 1350 PSI
660290303	SHIM ADJ. 1351 - 1750 PSI
660290305	SHIM ADJ. 1751 - 2200 PSI
660290307	SHIM ADJ. 2201 - 3000 PSI
660290401	ADJUSTABLE 500 - 1350 PSI
660290403	ADJUSTABLE 1351 - 1750 PSI
660290405	ADJUSTABLE 1751 - 2200 PSI
660290407	ADJUSTABLE 2201 - 3000 PSI
660290003	ANTI-CAVITATION CARTRIDGE

RELIEF CARTRIDGES ARE ALSO AVAILABLE WITH STAINLESS STEEL RELIEF SPRINGS.

INLET RELIEF KITS

660290001	NO RELIEF PLUG
660290101	SHIM ADJ. 500 - 1350 PSI
660290103	SHIM ADJ. 1351 - 1750 PSI
660290105	SHIM ADJ. 1751 - 2200 PSI
660290107	SHIM ADJ. 2201 - 3000 PSI
660290201	ADJUSTABLE 500 - 1350 PSI
660290203	ADJUSTABLE 1351 - 1750 PSI
660290205	ADJUSTABLE 1751 - 2200 PSI
660290207	ADJUSTABLE 2201 - 3000 PSI

RELIEF HARDWARE KITS

660190024	SHIM STYLE TO ADJ STYLE CONVERSION KIT
672000201	.006 SHIM FOR RELIEF
672000202	.010 SHIM FOR RELIEF
672000203	.018 SHIM FOR RELIEF
672000205	.041 SHIM FOR RELIEF

LOAD SENSE KITS

660290018	LOAD SENSE PLUG W/DRAIN ORIFICE
660290019	LOAD SENSE PLUG W/O DRAIN ORIFICE

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SEE PAGE 11 OF THE STANDARD PRODUCT PRICE LIST FOR PRICING

SPECIAL SECTIONS AVAILABLE:

Valves other than standard models listed can be made to order. Use order code Matrix below to generate a model number that meets your requirements. If you prefer, contact your Sales Representative with your specific requirements and a model number will be assigned for you. This model number can then be used for future orders. A minimum order quantity will apply to special valves. Please consult Sales Representative.

WORK SECTION

2 0 X X X X X X X

WORK SECTION TYPE
P-STANDARD PARALLEL
T-TANDEM CENTER
L-PARALLEL WITH BUILT IN
PILOT OPERATED CHECKS**

PORT SIZE
1. #10 SAE (7/8-14 THREAD)
2. #8 SAE (3/4-16 THREAD)
3. #12 SAE (1 1/16-12 THREAD)
4. 1/2 NPTF (2000 PSI MAX)
5. 3/8 NPTF (2000 PSI MAX)

SPOOL TYPE
A - 3 WAY 3 POSITION
B - 4 WAY 3 POSITION
C - 4 WAY 3 POSITION FREE FLOW MOTOR
D - 4 WAY 4 POSITION FLOAT
E - 3 WAY 3 POSITION FREE FLOW MOTOR

SPOOL ACTIONS
A - SPRING CENTER TO NEUTRAL
B - 3 POSITION DETENT
C - FRICTION DETENT
D - FLOAT DETENT
E - SPRING CENTER PNEUMATIC ACTUATOR
F - 2 POSITION DETENT NEUTRAL & OUT (NO IN POSITION)
J - SPRING CENTER W/ MICROSWITCH (SWITCHES ON IN OR OUT)***
K - SPRING CENTER W/ MICROSWITCH (SWTCHES ON SPOOL IN ONLY)***
M - SPRING CENTER DETENT IN
N - SPRING CENTER DETENT OUT
P - 2 POSITION DETENT NEUTRAL & IN (NO OUT POSITION)

HANDLE OPTIONS
1 - STANDARD LEVER HANDLE*
2 - LESS HANDLE ONLY
3 - LESS COMPLETE HANDLE
4 - VERTICAL LEVER HANDLE*
7 - BLANK FOR OPTIONAL JOYSTICK HANDLE

PORT RELIEF "B"

PORT RELIEF "A"
A - NO RELIEF
B - SHIM ADJUSTABLE RELIEF 500-1350 PSI SET AT 1350
C - SHIM ADJUSTABLE RELIEF 1351-1750 PSI SET AT 1750
D - SHIM ADJUSTABLE RELIEF 1751-2200 PSI SET AT 2200
E - SHIM ADJUSTABLE RELIEF 2201-3000 PSI SET AT 2500
F - ADJUSTABLE RELIEF 500-1350 PSI SET AT 1350*
G - ADJUSTABLE RELIEF 1351-1750 PSI SET AT 1750*
H - ADJUSTABLE RELIEF 1751-2200 PSI SET AT 2200*
J - ADJUSTABLE RELIEF 2201-3000 PSI SET AT 2500*
K - ANTI-CAVITATION CHECK
L - PORT RELIEF/ANTI-CAV SHIM ADJ 500-1350 PSI SET AT 1350
M - PORT RELIEF/ANTI-CAV SHIM ADJ 1351-1750 PSI SET AT 1750
N - PORT RELIEF/ANTI-CAV SHIM ADJ 1751-2200 PSI SET AT 2200
R - PORT RELIEF/ANTI-CAV SHIM ADJ 2201-3000 PSI SET AT 2500
S - PORT RELIEF/ANTI-CAV ADJUSTABLE 500-1350 PSI SET AT 1350*
T - PORT RELIEF/ANTI-CAV ADJUSTABLE 1351-1750 PSI SET AT 1750*
W - PORT RELIEF/ANTI-CAV ADJUSTABLE 1751-2200 PSI SET AT 2200*
Y - PORT RELIEF/ANTI-CAV ADJUSTABLE 2201-3000 PSI SET AT 2500*

*ADJUSTABLE PORT RELIEF CARTRIDGES CANNOT BE USED ON THE "A" PORT END OF WORK SECTION WHEN THE STANDARD LEVER HANDLE IS USED BECAUSE OF INTERFERENCE

FOR WORK PORT RELIEF SETTING OTHER THAN STANDARD

20P1BA1DH-18-20
- "B" PORT RELIEF PRESSURE IN HUNDREDS EXAMPLE: 20=2000 PSI
- "A" PORT RELIEF PRESSURE IN HUNDREDS EXAMPLE: 18=1800 PSI

* LEVERS ARE COATED WITH BLACK RUBBER
** L WORK SECTION REQUIRES SPOOL TYPE C & PORT RELIEFS NOT AVAILABLE
*** MICROSWITCH INCLUDED.

INLET SECTION

2 0 I X X - X X X X

INLET TYPE
I - STANDARD INLET

PORT SIZE
1. #10 SAE (7/8-14 THREAD)
2. #12 SAE (1 1/16-12 THREAD)
3. 3/4 NPTF (2000 PSI MAX)

RELIEF OPTION
Blank - LEAVE BLANK FOR INLET WITHOUT RELIEF OR RELIEF PLUG
A - NO RELIEF PLUG
B - SHIM ADJUSTABLE RELIEF 500-1350 PSI
C - SHIM ADJUSTABLE RELIEF 1351-1750 PSI
D - SHIM ADJUSTABLE RELIEF 1751-2200 PSI
E - SHIM ADJUSTABLE RELIEF 2201-3000 PSI
F - ADJUSTABLE RELIEF 500-1350 PSI
G - ADJUSTABLE RELIEF 1351-1750 PSI
H - ADJUSTABLE RELIEF 1751-2200 PSI
J - ADJUSTABLE RELIEF 2201-3000 PSI
K - ADJUSTABLE RELIEF 3001-3500

RELIEF SETTINGS: THE LAST FOUR DIGITS REPRESENT THE RELIEF SETTING IN PSI

OUTLET SECTION

2 0 E X X

OUTLET TYPE
E - STANDARD OUTLET

PORT SIZE
1. #10 SAE (7/8-14 THREAD)
2. #12 SAE (1 1/16-12 THREAD)
3. 3/4 NPTF (2000 PSI MAX)

EXHAUST OPTIONS
1-STANDARD OPEN CENTER OUTLET WITH CONVERSION PLUG
2-POWER BEYOND OUTLET WITH #10 SAE POWER BEYOND PORT
3-CLOSED CENTER OUTLET °

° Often used with no relief. Review application

VALVE ASSEMBLIES

The Series 20 sectional body directional control valve can be ordered as separate sections as outlined or as a complete factory tested assembly. This will need to be specified with each order. An assembly model number will be assigned at the time of the order. This assembly number can then be used for future orders.

ASSEMBLY MODEL NUMBER 20A - X X X X

XXXX = Sequence of Numbers. This number will be assigned to final valve to be assembled and tested at the factory. Each new order or quote will be assigned a new assembly model number.

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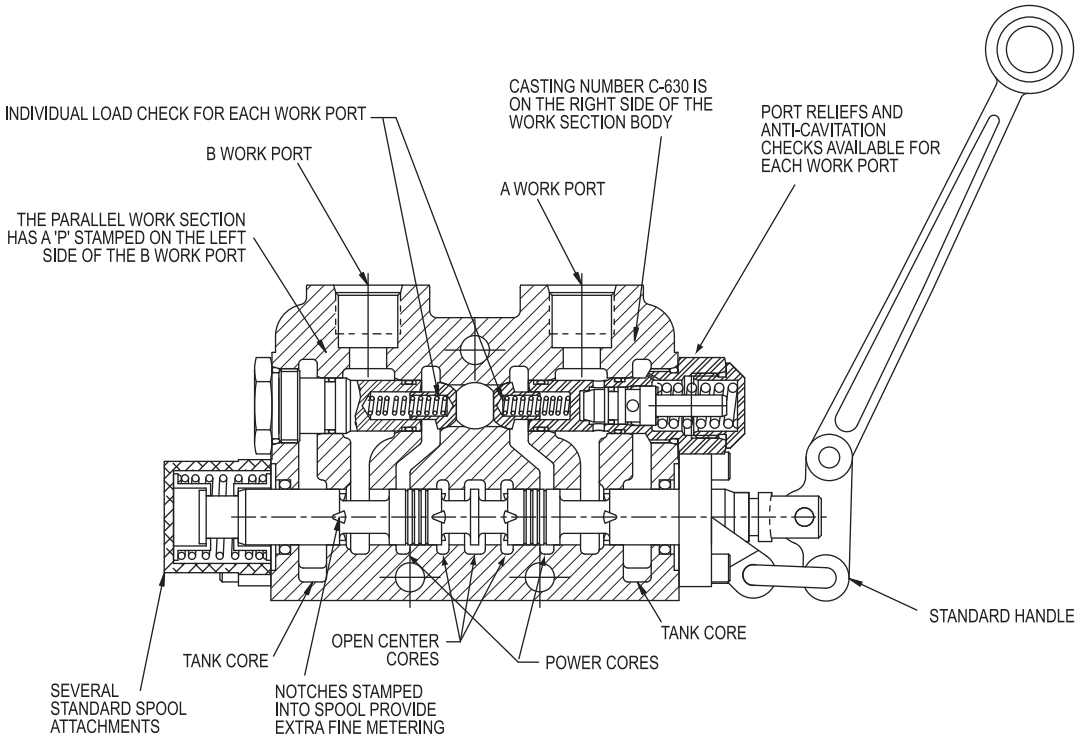
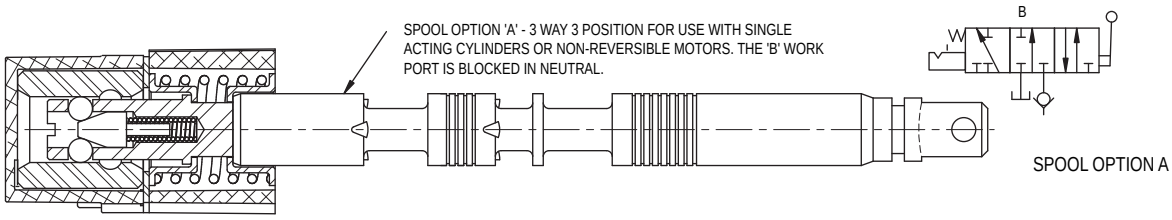
SEE PAGE 11 OF THE STANDARD PRODUCT PRICE LIST FOR PRICING

CROSS SECTION OF 20P1BA1DA PARALLEL WORK SECTION

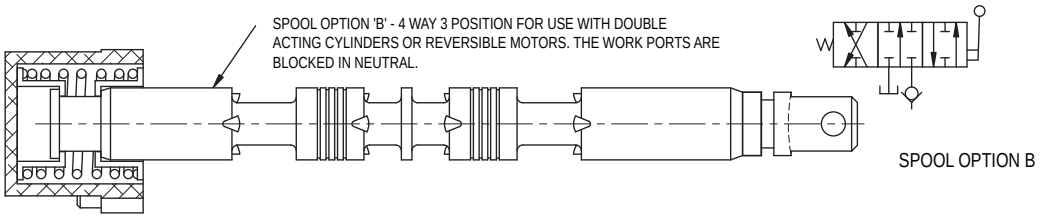


SPOOLS AND SPOOL ATTACHMENTS

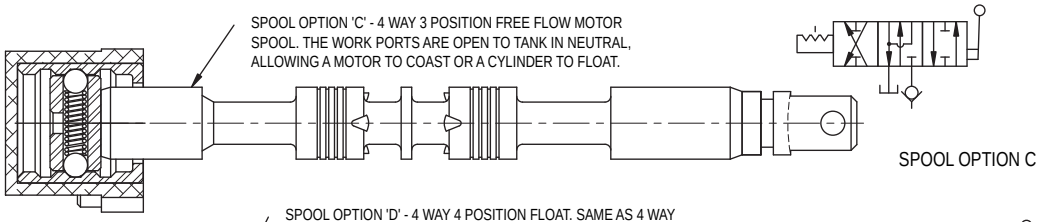
OPTION N-
DETENT
SPOOL-OUT W/
SPRING CENTER



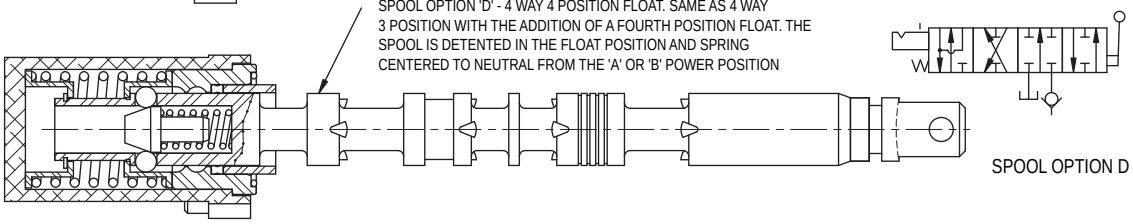
OPTION A-
SPRING CENTER TO NEUTRAL



OPTION B-
3 POSITION DETENT



OPTION D-
FLOAT DETENT WITH
SPRING CENTER



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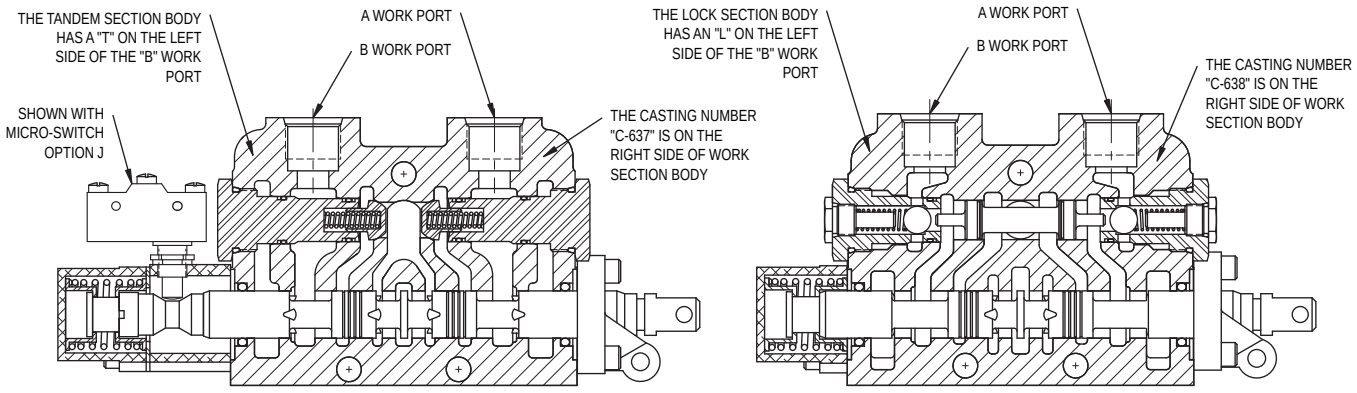
CROSS SECTION OF TANDEM WORK SECTION AND LOCK SECTION



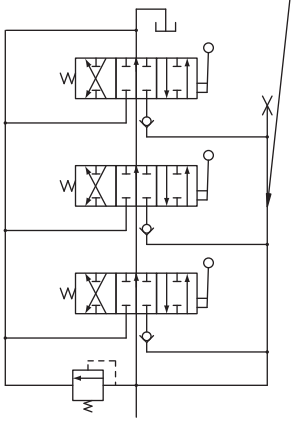
TANDEM SECTION

LOCK SECTION

MODEL 20P PARALLEL CIRCUIT

Parallel circuit construction is the most common. When any one of the spools in a valve bank is shifted it blocks off the open center passage. The oil then flows into the parallel circuit core making oil available to all spools. If more than one spool is fully shifted then oil will go to the section with the lowest pressure requirements. It is possible, however, to meter flow to the spool with the least load and power two unequal loads. The schematic below shows a three section parallel circuit stack valve.

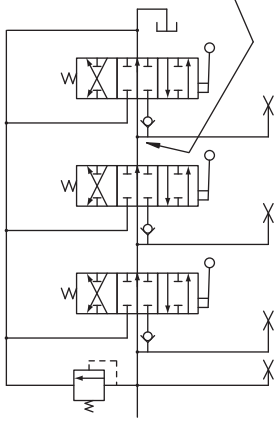
THE POWER CORE OF ALL SECTIONS IN THE VALVE STACK ARE CONNECTED TOGETHER BY THE PARALLEL CORE THAT RUNS THROUGH THE LENGTH OF THE VALVE



MODEL 20T TANDEM CIRCUITS

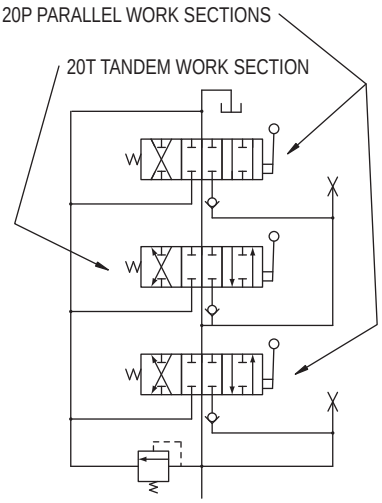
Tandem circuit construction is also referred to as priority circuit. When the spool of a section is shifted, oil is cut off to all downstream sections. Thus the section nearest to the inlet has priority over the other sections in the valve bank. If more than one spool is fully shifted all the oil will go to the section nearest to the inlet. Metering the up stream section will allow two sections to operate at the same time. The schematic below shows a three section tandem circuit stack valve.

THE POWER CORE OF A WORK SECTION IS FED BY THE OIL EXITING THE OPEN CENTER OF THE ADJACENT UPSTREAM WORK SECTION



COMBINED PARALLEL/ TANDEM CIRCUITS

Parallel and tandem circuit work sections can be combined in the same valve bank. Below the 1st and last sections are parallel and the 2nd is tandem. The 1st parallel section has priority over the other two. The 2nd and 3rd sections are in parallel with each other. If the spool of the 1st section is shifted it will cut off oil to the other two. If the spools of the 2nd and 3rd section are both shifted oil will go to the one with the least resistance. It should be noted that it is the section just prior to the tandem section that has priority, not the tandem section. Further if a parallel section is placed just after a tandem, the two sections will be in a parallel.



LOAD CHECK

Each work port of the Series 20 stack valve has a separate load check. The load check prevents the fall of a cylinder as the spool is shifted. It also prevents the back-flow of oil from the work port to the inlet. The pump must build up enough pressure to overcome the pressure on the work port caused by the weight of the load before the cylinder can move.

PLEASE NOTE that the load check has nothing to do with how well the valve will hold up a cylinder with the spool in neutral. The load check is functional only when the spool is shifted.

OPEN CENTER APPLICATIONS

The standard Series 20 stack valve is open center. When the spools are in neutral hydraulic oil is directed from the inlet to the outlet (or power beyond) through the open center core. Moving one or more spools closes off the open center core and directs oil to the work ports. Open center systems most often contain fixed displacement pumps like The Prince SP series gear pumps.

PLEASE NOTE that the maximum pressure in an open center system is controlled by a relief valve. The Series 20 inlet sections are available with a built in inlet relief for this purpose.

CLOSED CENTER APPLICATIONS

The Series 20 stack valve can be converted to closed center by adding the closed center plug to the outlet section. This blocks off the open center core when the spools are in neutral. These systems often use a variable displacement pressure compensated pump that limits the maximum pressure. When spools are in neutral system pressure is maintained at inlet of the valve. A relief is normally not required or must be set at a higher pressure than the pump compensator.

PLEASE NOTE that this closed center option does not provide for the drain off of standby spool leakage. This can allow a very small amount of oil to enter the work ports when in neutral.

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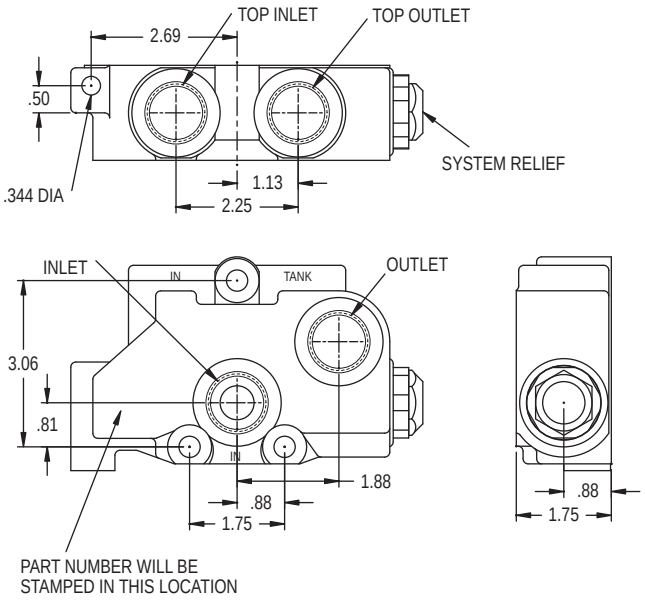
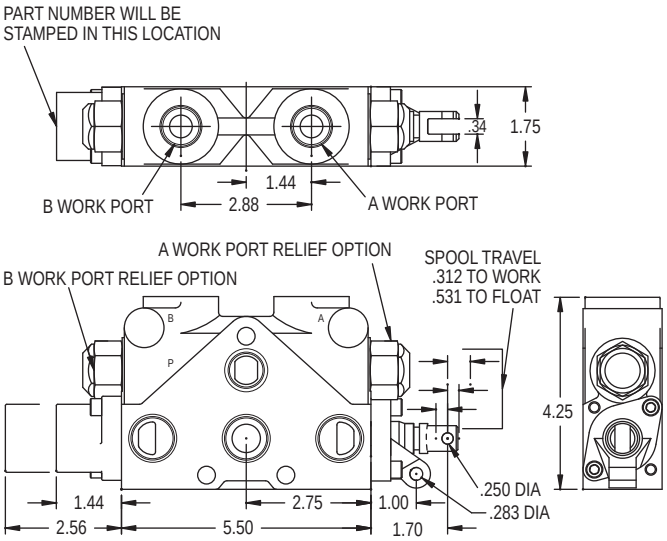
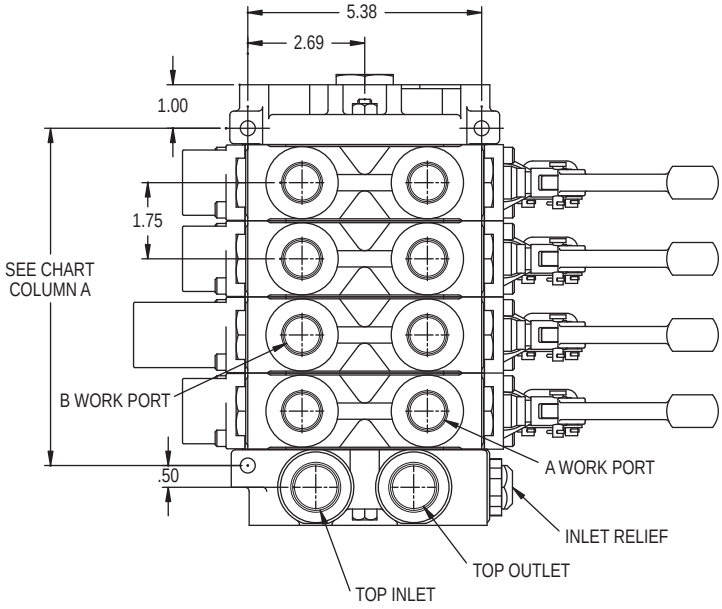
INLET COVER DIMENSIONS



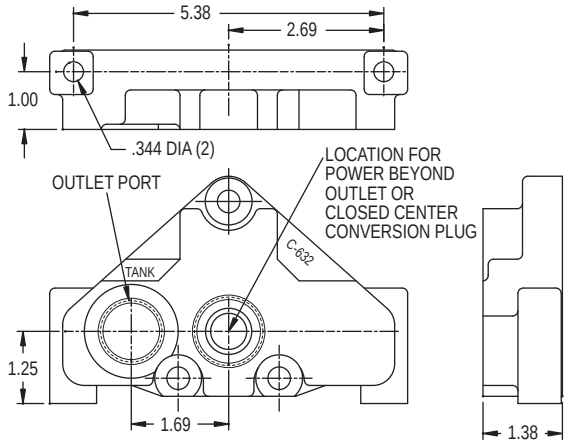
WORK SECTIONS DIMENSIONS



DIMENSIONAL DATA

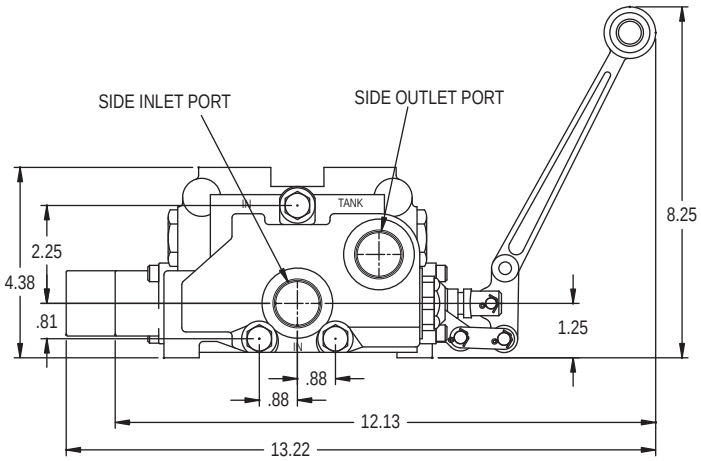


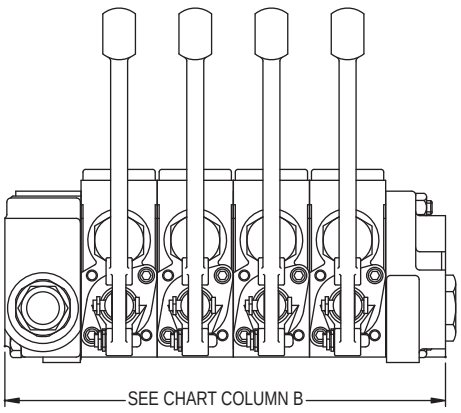
OUTLET COVER DIMENSIONS



NUMBER OF WORK SECTIONS

	1	2	3	4	5	6	7	8	9	10
A	2.50	4.25	6.00	7.75	9.50	11.25	13.00	14.75	16.50	18.25
B	4.88	6.63	8.38	10.13	11.88	13.63	15.38	17.13	18.88	20.63





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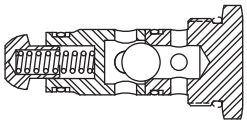
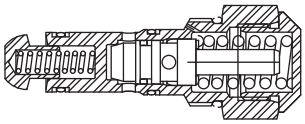
WORK PORT RELIEF CARTRIDGES



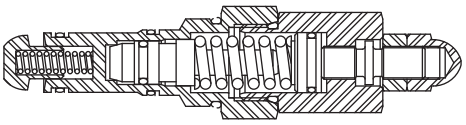
OPTION K ANTI-CAVITATION CHECK
This option allows oil to be drawn from the tank core into the work port if there is a vacuum on the work port. This vacuum would be caused by a overrunning motor or cylinder. The check will be open whenever the pressure in the tank core is higher than that in the work port.

OPTIONS B, C, D, AND E, SHIM ADJUSTABLE PORT RELIEF



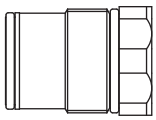
A port relief can be installed to limit the pressure at the work port to less than the system pressure. Also, it can be installed to provide spike pressure protection when the spool is in the neutral position. The pressure of these reliefs can be changed by changing shims.

OPTIONS F, G, H, AND J, ADJUSTABLE PORT RELIEF



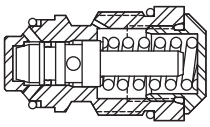
This is the same differential poppet type relief as above but externally adjustable within the specified range.

INLET RELIEF CARTRIDGES



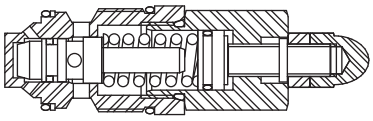
OPTION A NO RELIEF
When no main inlet relief is required the no relief plug is installed. All inlet sections have the relief cavity machined so a inlet relief can be installed in the field.

OPTIONS B, C, D, AND E, SHIM ADJUSTABLE INLET RELIEF



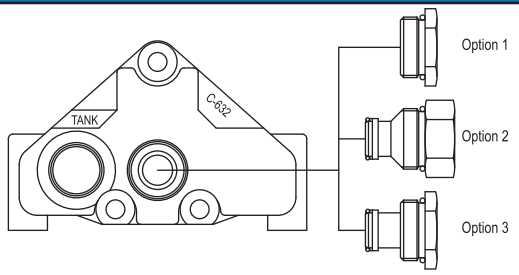
These options provide for an internally shim adjustable main inlet relief. The relief is a hydraulically dampened differential poppet design. This provides for smooth quiet operation in a relief that is moderately tolerant to contamination. The pressure of these reliefs can be changed, within the specified range, by changing shims. This relief is also available with stainless steel relief springs, consult factory.

OPTIONS F, G, H, AND J, ADJUSTABLE RELIEF



This is the same relief as above except it is externally adjustable, within the specified range.

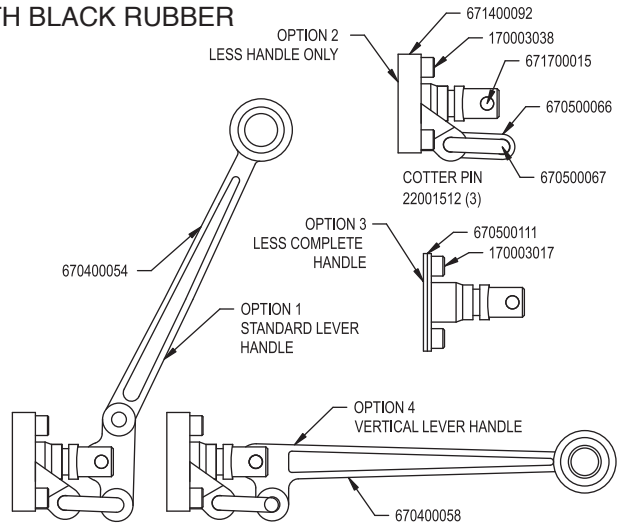
OUTLET SECTION OPTIONS



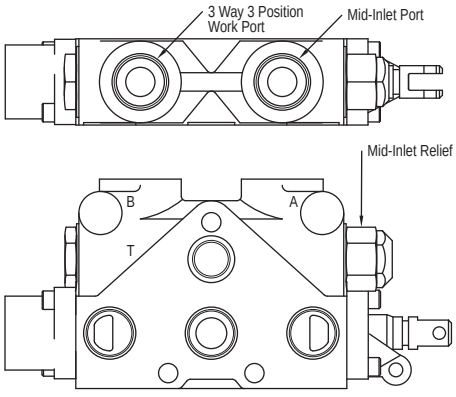
OPTION 1 STANDARD OPEN CENTER WITH CONVERSION PLUG
This is the standard outlet option. This option allows for conversion in the field for power beyond or closed center applications. When the spools are in neutral the inlet is unloaded to tank.
OPTION 3 CLOSED CENTER OUTLET
This option provides for closed center operation. This is typically used with a variable displacement pressure compensated pump or in a system with an unloading valve. When the spools are in neutral the inlet port is blocked.
OPTION 2 POWER BEYOND WITH #10 SAE BEYOND PORT
This option provides for a high pressure power beyond port. This would be used if a valve is to be added downstream. The outlet must be connected to tank. When the spools are in neutral the inlet is connected to power beyond port.

HANDLE OPTIONS

NOTE: HANDLES ARE COATED WITH BLACK RUBBER



SERIES 20 COMBINATION 3 WAY AND COMBINED FLOW MID-INLET SECTION



*See Series 20 Tandem Center work section for dimensional data.

20TM 3 A A 1 E A - X X X X

PORT SIZE*
SPOOL ACTION*
HANDLE OPTIONS *

DIGITS SPECIFY A NON-STANDARD RELIEF PRESSURE IN PSI. LEAVE BLANK FOR STANDARD SETTING.

WORK PORT RELIEF *

MID-INLET RELIEF		
RELIEF TYPE	STANDARD SETTING	OPTION NO.
NO RELIEF		A
SHIM ADJUSTABLE	1350 PSI @ 10 GPM 1750 PSI @ 10 GPM 2200 PSI @ 10 GPM 2500 PSI @ 10 GPM	B C D E
ADJUSTABLE (not available with handle option 1)	1350 PSI @ 10 GPM 1750 PSI @ 10 GPM 2200 PSI @ 10 GPM 2500 PSI @ 10 GPM	F G H J

*See Series 20 Tandem Center work section order code for additional options.

Description: This section acts as a combination mid-inlet and 3 way 3 position section. The mid-inlet provides an inlet port for a second pump mid stream in the stack valve. The A port is the mid-inlet port and provides combined flow for this section and any downstream sections. The B port and the rest of the section function the same as a 3 way 3 position section. When shifted any upstream sections take priority of the main inlet flow over downstream sections. Both an inlet relief and a mid-inlet relief are required to provide relief protection when both upstream and downstream sections are shifted.

VALVES

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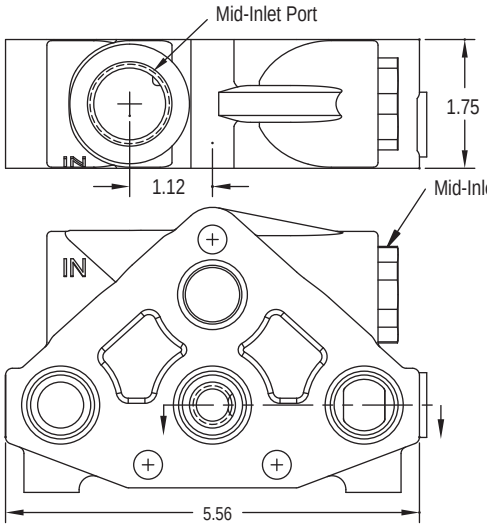
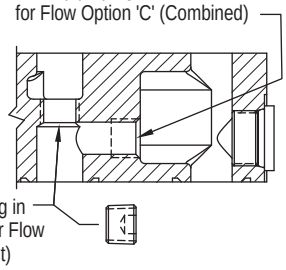
SERIES 20 MID-INLET SECTION



Section can be converted from C to S, or S to C, prior to installing section in the stack valve assy.



20IM X X X X -XXXX

FLOW OPTION
C - COMBINED FLOW
S - SPLIT FLOW

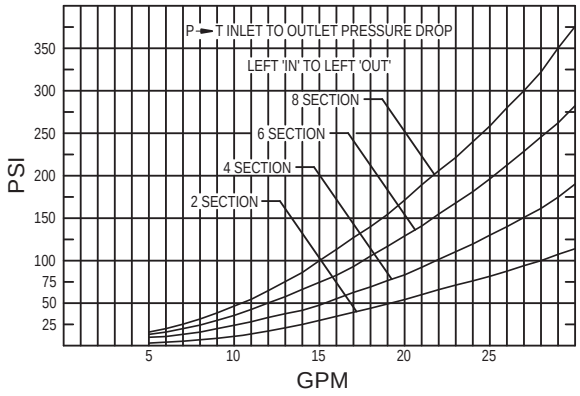
PORT SIZE
10 - #10 SAE (7/8-14 THREAD)
20 - #12 SAE (1 1/16-12 THREAD)
30 - 1/2-NPTF
40 - 3/4-NPTF

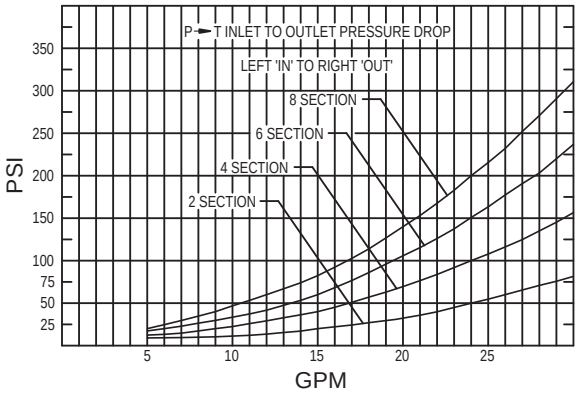
LAST FOUR DIGITS SPECIFY A NON-STANDARD RELIEF PRESSURE IN PSI. LEAVE BLANK FOR STANDARD SETTING.

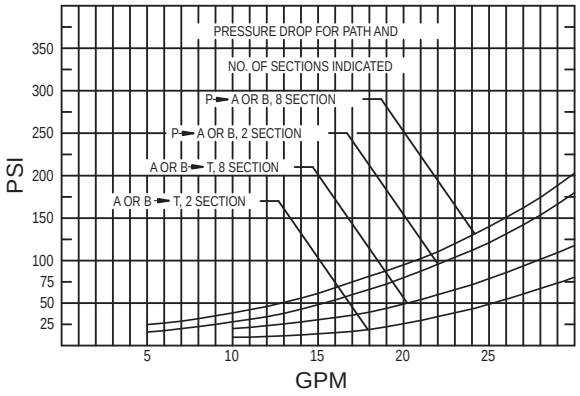
MID-INLET RELIEF OPTIONS:

OPTION NO.	RELIEF TYPE	STD. SETTING @ 10 GPM
"BLANK"	BODY LESS RELIEF CARTRIDGE/PLUG	--
A	NO-RELIEF PLUG	--
B	SHIM ADJUSTABLE 500-1350 PSI	1350 PSI
C	SHIM ADJUSTABLE 1350-1750 PSI	1750 PSI
D	SHIM ADJUSTABLE 1750-2200 PSI	2200 PSI
E	SHIM ADJUSTABLE 2200-3000 PSI	2500 PSI
F	ADJUSTABLE 500-1350 PSI	1350 PSI
G	ADJUSTABLE 1350-1750 PSI	1750 PSI
H	ADJUSTABLE 1750-2200 PSI	2200 PSI
J	ADJUSTABLE 2200-3000 PSI	2500 PSI
K	ADJUSTABLE 3000-3500 PSI	3250 PSI

TEST DATA



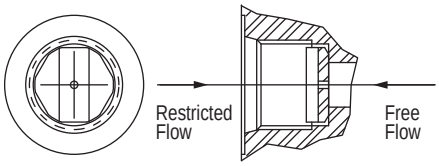




Oil 140 SUS at 110 degrees F. The pressure drop curves are representative, but the actual pressure drop will vary some from valve to valve. More detailed test data is available upon request.

ONE WAY WORK PORT RESTRICTOR FOR 20 SERIES SECTIONS

This restrictor will restrict oil in one direction and allow free flow in the opposite direction. This restrictor consists of an orifice plate that simply drops into the #8 SAE or #10 SAE work port of a 20P, 20T, or 20L work section.



ORDERING INFORMATION

HEX BRASS RESTRICTOR #8 **670805XXX**

HEX BRASS RESTRICTOR #10 **670811000**

The last three digits of part number are the orifice size in thousandths of an inch.

EXAMPLE: 670805062 .62 ORIFICE
670805125 .125 ORIFICE
670805000 NO ORIFICE

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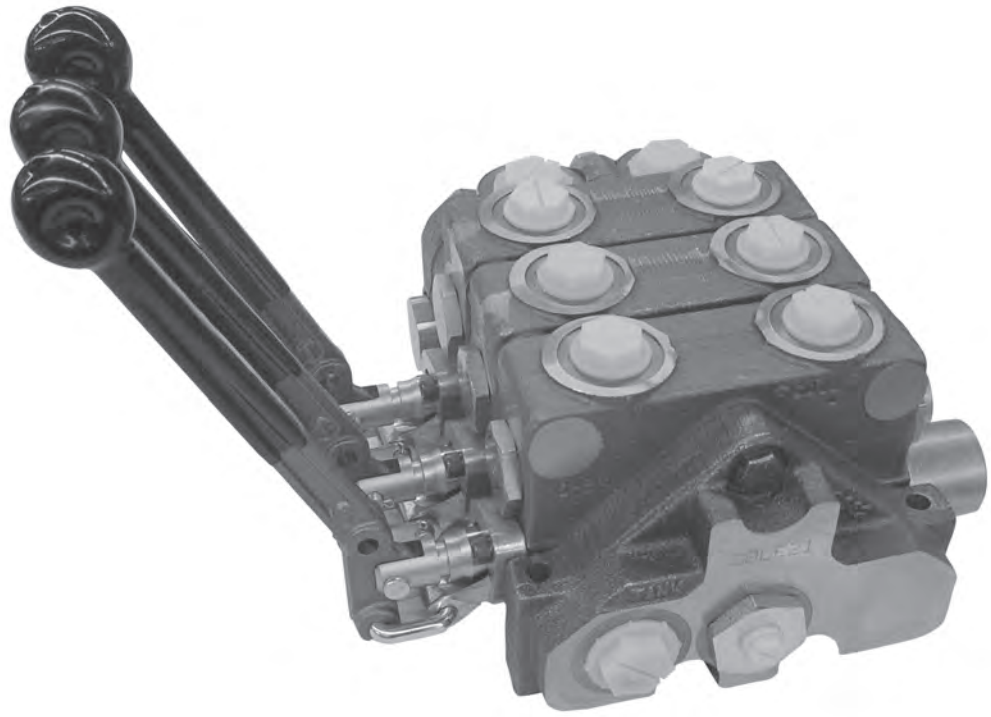
LOAD SENSE SECTIONS



Series "20"

STANDARD FEATURES

- **Extended Length Notches for Very Fine Metering**
- **Machined Internal Lands for Precise Control and reduced Dead Band**
- **Low Standby Pressures**
- **Spool Design for reduced Flow Forces**
- **Low Spool Actuating Forces**
- **Use of Standard Series 20 Inlet Sections (20I) and Tie Rod Kits**
- **Same Mounting Pattern and Envelope as Standard Series 20 Valve**

SPECIFICATIONS

Pressure Rating
Maximum Operating Pressure 3500 psi
Maximum Tank Pressure..... 500 psi
Nominal Flow Rating .....20 GPM
Please Refer to Pressure Drop and Flow Charts for Your Application

Foot Mounting
Maximum Operating Temp......180°F

20LP Section Weight .....Approx 10.1 lbs.
20LE Section Weight .....Approx 4.3 lbs.

SPECIAL SECTIONS AVAILABLE:

Valves other than standard models listed can be made to order. Use order code Matrix below to generate a model number that meets your requirements. If you prefer, contact your Sales Representative with your specific requirements and a model number will be assigned for you. This model number can then be used for future orders. A minimum order quantity will apply to special valves. Please consult Sales Representative.

WORK SECTION

2 0 XX X X X X X X

WORK SECTION TYPE

LP-STANDARD LOAD SENSE SECTION

PORT SIZE

1. #10 SAE (7/8-14 THREAD)
2. #8 SAE (3/4-16 THREAD)
3. #12 SAE (1 1/16-12 THREAD)
4. 1/2 NPTF (2000 PSI MAX)
5. 3/8 NPTF (2000 PSI MAX)

SPOOL TYPE

H - 3 WAY 3 POSITION
J - 4 WAY 3 POSITION
K - 4 WAY 3 POSITION FREE FLOW MOTOR
M - 4 WAY 4 POSITION FLOAT (USE W/D SPOOL ACTION)

SPOOL ACTIONS

A - SPRING CENTER TO NEUTRAL
B - 3 POSITION DETENT
C - FRICTION DETENT
D - FLOAT DETENT
E - SPRING CENTER PNEUMATIC ACTUATOR
F - 2 POSITION DETENT NEUTRAL & OUT (NO IN POSITION)
J - SPRING CENTER W/MICROSWITCH (SWITCHES ON IN OR OUT)***
K - SPRING CENTER W/MICROSWITCH (SWTCHES ON SPOOL IN ONLY)***
M - SPRING CENTER DETENT IN
N - SPRING CENTER DETENT OUT
P - 2 POSITION DETENT NEUTRAL & IN (NO OUT POSITION)

HANDLE OPTIONS

1 - STANDARD LEVER HANDLE*
2 - LESS HANDLE ONLY
3 - LESS COMPLETE HANDLE
4 - VERTICAL LEVER HANDLE*
7 - BLANK FOR OPTIONAL JOYSTICK HANDLE

PORT RELIEF "B"

PORT RELIEF "A"

A - NO RELIEF
B - SHIM ADJUSTABLE RELIEF 500-1350 PSI SET AT 1350
C - SHIM ADJUSTABLE RELIEF 1351-1750 PSI SET AT 1750
D - SHIM ADJUSTABLE RELIEF 1751-2200 PSI SET AT 2200
E - SHIM ADJUSTABLE RELIEF 2201-3000 PSI SET AT 2500
F - ADJUSTABLE RELIEF 500-1350 PSI SET AT 1350*
G - ADJUSTABLE RELIEF 1351-1750 PSI SET AT 1750*
H - ADJUSTABLE RELIEF 1751-2200 PSI SET AT 2200*
J - ADJUSTABLE RELIEF 2201-3000 PSI SET AT 2500*
K - ANTI-CAVITATION CHECK
L - PORT RELIEF/ANTI-CAV SHIM ADJ 500-1350 PSI SET AT 1350
M - PORT RELIEF/ANTI-CAV SHIM ADJ 1351-1750 PSI SET AT 1750
N - PORT RELIEF/ANTI-CAV SHIM ADJ 1751-2200 PSI SET AT 2200
R - PORT RELIEF/ANTI-CAV SHIM ADJ 2201-3000 PSI SET AT 2500
S - PORT RELIEF/ANTI-CAV ADJUSTABLE 500-1350 PSI SET AT 1350*
T - PORT RELIEF/ANTI-CAV ADJUSTABLE 1351-1750 PSI SET AT 1750*
W - PORT RELIEF/ANTI-CAV ADJUSTABLE 1751-2200 PSI SET AT 2200*
Y - PORT RELIEF/ANTI-CAV ADJUSTABLE 2201-3000 PSI SET AT 2500*

*ADJUSTABLE PORT RELIEF CARTRIDGES CANNOT BE USED ON THE "A" PORT END OF WORK SECTION WHEN THE STANDARD LEVER HANDLE IS USED BECAUSE OF INTERFERENCE

FOR WORK PORT RELIEF SETTING OTHER THAN STANDARD

20P1BA1DH-18-20

"B" PORT RELIEF PRESSURE IN HUNDREDS
EXAMPLE: 20=2000 PSI
"A" PORT RELIEF PRESSURE IN HUNDREDS
EXAMPLE: 18=1800 PSI

* LEVERS ARE COATED WITH BLACK RUBBER
***MICROSWITCH INCLUDED.

SEE PAGE 11 OF THE STANDARD PRODUCT PRICE LIST FOR PRICING

LOAD SENSE OUTLET SECTION

2 0 LE X X

OUTLET TYPE

LE - STANDARD LOAD SENSE OUTLET

PORT SIZE

1. #10 SAE (7/8-14 THREAD)
2. #12 SAE (1 1/16-12 THREAD)
3. 3/4 NPTF (2000 PSI MAX)

LOAD SENSE PORT OPTIONS

1. #4 SAE WITH DRAIN ORIFICE
2. #4 SAE WITHOUT DRAIN ORIFICE

The Prince LE outlet includes a load sense port in a cartridge that is installed in the section. There are two versions of the cartridge, one with a load sense line drain orifice and one without a drain orifice. There is normally a drain orifice in either the valve or the pump controls. Cartridges can be changed in the field to change the configuration. Power beyond is not available in a load sense system.

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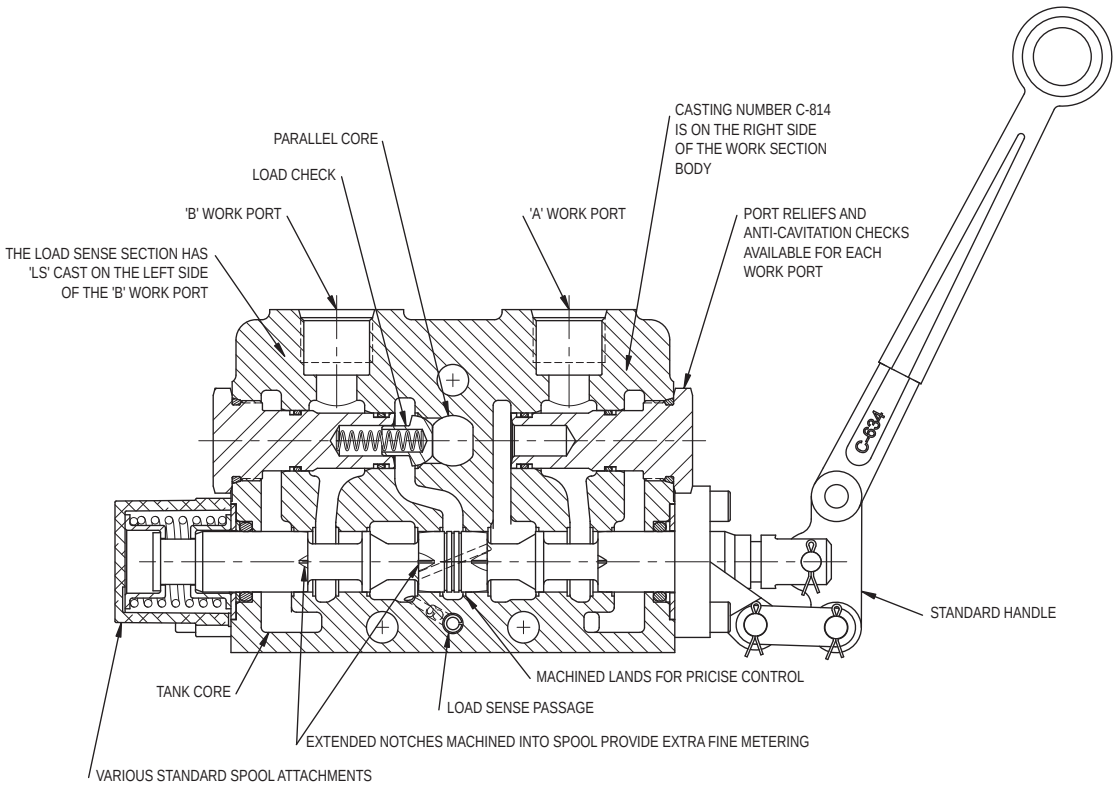
CATV 12-09-04-01

SEE PAGE 13 OF THE STANDARD PRODUCT PRICE LIST FOR PRICING

CROSS SECTION OF 20LP1JA1AA LOAD SENSE WORK SECTION

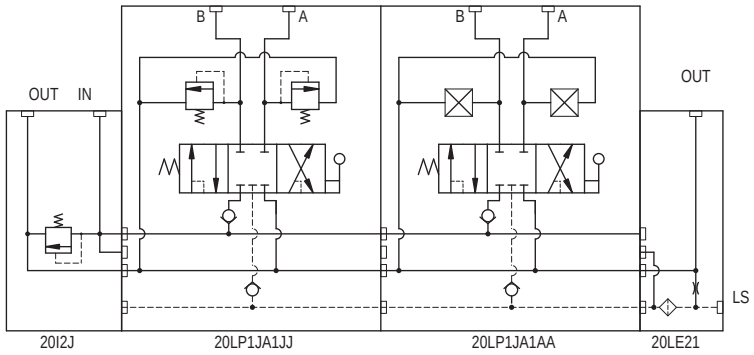


LOAD SENSE CIRCUITS

MODEL 20LP LOAD SENSE CIRCUIT

The Series 20LP work sections are specifically designed to be used with a pressure-flow compensated pump, commonly known as a load sense pump. The valve is a parallel circuit, closed center design, where flow does not flow through the valve when the spools are centered. A load sense signal line must be connected to the load sense port on the pump and to the load sense port on the 20LE outlet section of the valve. The pressure-flow compensator portion of a load sense pump will maintain (within its flow and pressure limitations) an output pressure equal to the pressure at the load sense port plus the load sense differential pressure. The differential pressure is typically between 150 and 350 psi. The valve is designed so that when a spool is shifted, the pressure at the out flow work port is presented to the valve's load sense port. The valve incorporates logic and load sense check valves so that when multiple spools are shifted, the highest pressure of any of the work ports is directed to the load sense port. A load sense line bleed orifice needs to be present in either the Prince load sense outlet or the load sense pump controls. The bleed orifice will prevent high pressure from being trapped in the load sense line and sending false signals to the pump.

There are a number of benefits to load sense systems, one of the primary ones being in the metering of the flow to the work ports. Metering is typically accomplished when the flow passes through metering notches in the spool. In a load sense valve, the pressure that drives the flow through the notches is typically limited to the relatively low and nearly constant differential pressure. This relatively low differential pressure makes the notches more effective and gives more resolution in regard to spool travel versus flow out of the work port. Also this "resolution" remains relatively the same regardless of the pressure required at the work port. The metering notches in the Prince load sense valve have been optimized to give excellent metering characteristics over an extended portion of the spool travel and over the full flow rating of the valve. The internal lands of the casting have also been machined to give repeatable, precise control to the metering characteristics. Another benefit to load sense valves is that, in the minimum flow standby mode, the pump only has to generate the rather low differential pressure thus saving energy as compared to typical open center or standard closed center systems. In summary, the Prince load sense valve provides more precise control, conserves energy and reduces heat generation.



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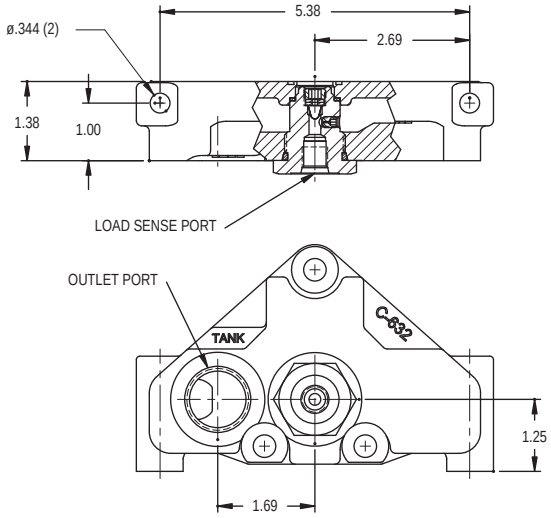
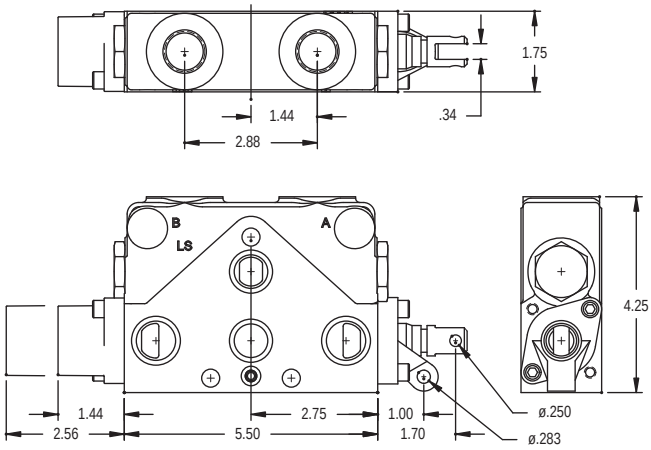
LOAD SENSE OUTLET DIMENTIONS

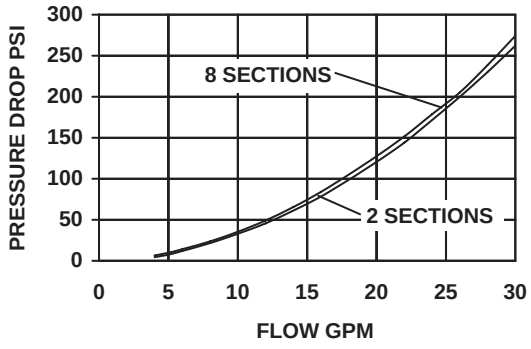


LOAD SENSE WORK SECTION DIMENSIONS

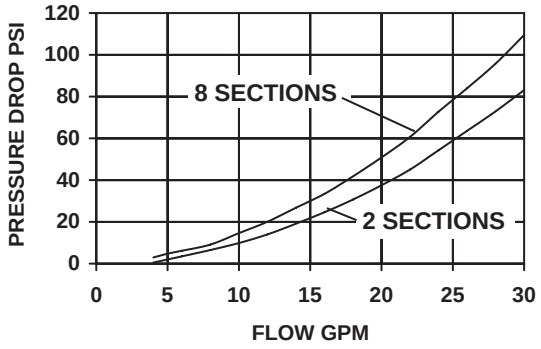


TEST DATA

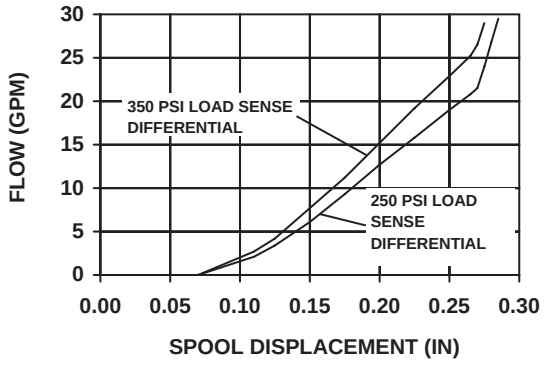
PRESSURE DROP - INLET TO WORK PORT



PRESSURE DROP - WORK PORT TO TANK



WORK PORT FLOW VS. SPOOL POSITION



VALVES

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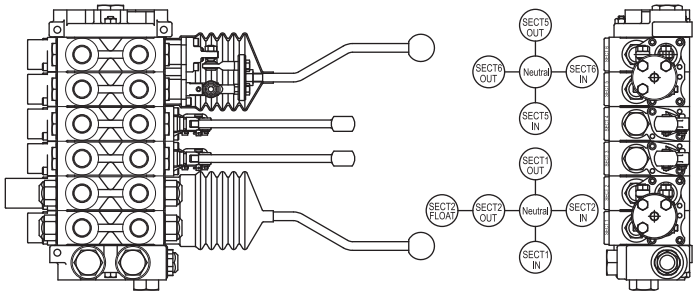
JOYSTICK HANDLES FOR SERIES “20”



This is a special handle for the SERIES 20 stack valve that allows the spools of two adjacent sections to be operated by one common handle. The spools can be operated independently or simultaneously depending on handle movement. The option is typically used on spring center to neutral sections. Normally, the handle is installed at the factory on sections ordered with handle option 7. However, the handle can also be installed in the field on valves originally equipped with standard handles (handle options 1 through 4). This drawing shows two joysticks with offset handles installed on a six section valve.

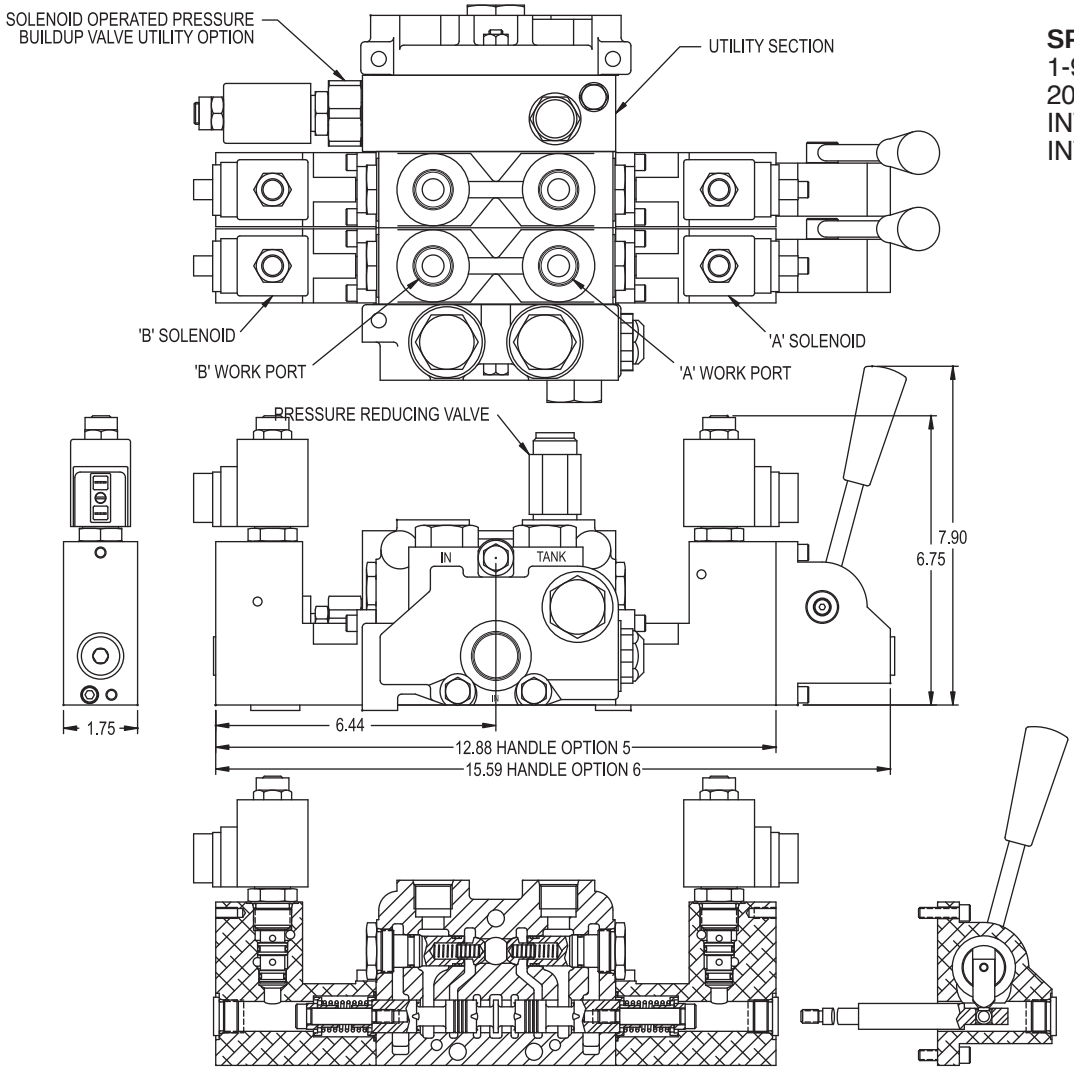
A typical handle to spool movement pattern is shown. Different patterns are also available. The Joystick handle can be used with standard three position spools or with four position float spools. If work port reliefs are required on the joystick end of a section, the relief cartridges must be the shim adjustable type. When two joysticks are installed on the same valve assembly, it is recommended that there be two standard section between them to prevent handle interference.

When ordering a valve assembly, please refer to the following part numbers and indicate which sections the handle is to be installed on. The part numbers refer to the complete joystick assembly required to control two valve sections. Use the same part numbers to order kits for field installation.

JOYSTICK ASSEMBLY W/ STRAIGHT HANDLE:
ASSEMBLED ON VALVE 20JS
KIT 660190016

JOYSTICK ASSEMBLY W/ OFFSET HANDLE:
ASSEMBLED ON VALVE 20JO
KIT 660190017

SERIES “20” SPLIT SOLENOID OPERATORS (SOLENOID OPERATORS ON BOTH ENDS)



SPECIFICATIONS:
1-9 SECTIONS
20 GPM
INTERNAL PILOT
INTERNAL DRAIN

VALVES

PRINCE MANUFACTURING CORPORATION • P.O. BOX 7000 • NORTH SIOUX CITY, SOUTH DAKOTA 57049-7000
URL: www.princehyd.com • E-MAIL: prince@princehyd.com
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SERIES "20" SOLENOID OPERATED WORK SECTION

The Solenoid Operated Series 20 Work Section allows remote electrical on-off or manual control. The Solenoid Operated Section contains two, 3 way-2 position solenoid cartridge valves and a pilot operated piston attached to the main control spool. When both solenoids are de-energized both sides of the pilot piston are open to tank pressure and the spool remains spring centered. When solenoid "A" is energized, pilot pressure is applied to one side of the pilot piston causing the spool to shift from the neutral position to work port "A". When solenoid "B" is energized, pilot pressure is applied to the other side of the pilot piston causing the spool to shift to work port "B". Internal pilot lines provide pilot pressure to the solenoid actuator. Pilot pressure to initiate spool shift is generated by a "Pressure Build-Up Valve" that is installed in the Utility Section, which must be installed between the last section and the outlet cover, (see Order Code). Two versions of the Pressure Build-up Valve are offered. Options 1 & 2 supply approximately 300 PSI pilot pressure to the solenoid actuator. Load induced pressure is required to complete the spool shift and hold the spool in the shifted position. For over center or light load applications a restrictor installed in the work port or line may be required. Any manual sections must be upstream of any solenoid sections in the stack valve assembly. Consult your sales representative for your application.

SOLENOID OPERATED WORK SECTION

20PXXXXXX-SXXX

WORK SECTION TYPE
P - Standard Parallel

PORT SIZE
1. #10 SAE (7/8-14 THREAD)
2. #8 SAE (3/4-16 THREAD)
3. #12 SAE (1 1/16-12 THREAD)
4. 1/2 NPTF (2000 PSI MAX)

SPOOL TYPE
A - 3 - Way 3-Position
B - 4 - Way 3-Position
C - 4 - Way 3-Position Free Flow Motor

SPOOL ACTION
A - Spring Center

HANDLE OPTION
5. Solenoid Operated Only (No Lever)
6. Solenoid Operated With Manual Lever

*See page V34 for coil details.

COIL VOLTAGE & TERMINATION *
S12Q, 12 VDC Double Spade
S12L, 12 VDC Double Wire
S12H, 12 VDC DIN 43650
S12W, 12VDC Weather Pack®
S24Q, 24 VDC Double Spade
S24L, 24 VDC Double Wire
S24H, 24 VDC DIN 43650
S11C, 120 VAC Conduit
S11H, 120 VAC DIN 43650

PORT RELIEF "B" OPTION
A - Relief Cavity Plugged
B - Shim Adjustable Relief 500-1350 PSI Set at 1350
C - Shim Adjustable Relief 1351-1750 PSI Set at 1750
D - Shim Adjustable Relief 1751-2200 PSI Set at 2200
E - Shim Adjustable Relief 2201-3000 PSI Set at 2500

PORT RELIEF "A" OPTION
A - Relief Cavity Plugged
B - Shim Adjustable Relief 500-1350 PSI Set at 1350
C - Shim Adjustable Relief 1351-1750 PSI Set at 1750
D - Shim Adjustable Relief 1751-2200 PSI Set at 2200
E - Shim Adjustable Relief 2201-3000 PSI Set at 2500

UTILITY SECTION

20UX - XXX

UTILITY TYPE
U - Standard Utility

UTILITY OPTION
1. Solenoid On-Off Press. Build-Up Valve
2. Mechanical Continuous On Press. Build-up Valve
3. Closed Center Utility Section
4. Power Beyond Utility with #10 SAE Power Beyond Port *
5. External Pilot Supply Utility

* **Note:** With Series 20 solenoid operator assemblies, the power beyond line is connected to the utility section and **not** to a power beyond port in the outlet section.

COIL VOLTAGE & TERMINATION*
Omit For Options 2 thru 5
12Q, 12 VDC Double Spade
12L, 12 VDC Double Wire
12H, 12 VDC DIN 43650
12W, 12VDC Weather Pack ®
24Q, 24 VDC Double Spade
24L, 24 VDC Double Wire
24H, VDC DIN 43650
11C, 120 VAC Conduit
11H, 120 VAC DIN 43650

PRESET INLET RELIEF CARTRIDGE

20IR - OX - XXXX

Setting in PSI - Leave Blank for Standard

CARTRIDGE CODE / STYLE	STD SETTING
B - SHIM ADJ 500-1350 PSI	1350 PSI @ 10 GPM
C - SHIM ADJ 1351-1750 PSI	1750 PSI @ 10 GPM
D - SHIM ADJ 1751-2200 PSI	2200 PSI @ 10 GPM
E - SHIM ADJ 2201-3000 PSI	2500 PSI @ 10 GPM
F - SCREW ADJ 500-1350 PSI	1350 PSI @ 10 GPM
G - SCREW ADJ 1351-1750 PSI	1750 PSI @ 10 GPM
H - SCREW ADJ 1751-2200 PSI	2200 PSI @ 10 GPM
J - SCREW ADJ 2201-3000 PSI	2500 PSI @ 10 GPM
K - SCREW ADJ 3001-3500 PSI	3250 PSI @ 10 GPM

PRESET WORK PORT RELIEF CARTRIDGE

20PR - OX - XXXX

Setting in PSI - Leave Blank for Standard

CARTRIDGE CODE / STYLE	STD SETTING
B - SHIM ADJ 500-1350 PSI	1350 PSI @ 3 GPM
C - SHIM ADJ 1351-1750 PSI	1750 PSI @ 3 GPM
D - SHIM ADJ 1751-2200 PSI	2200 PSI @ 3 GPM
E - SHIM ADJ 2201-3000 PSI	2500 PSI @ 3 GPM
F - SCREW ADJ 500-1350 PSI	1350 PSI @ 3 GPM
G - SCREW ADJ 1351-1750 PSI	1750 PSI @ 3 GPM
H - SCREW ADJ 1751-2200 PSI	2200 PSI @ 3 GPM
J - SCREW ADJ 2201-3000 PSI	2500 PSI @ 3 GPM
L - ANTI-CAV/SHIM RELIEF 500-1350 PSI	1350 PSI @ 3 GPM
M - ANTI-CAV/SHIM RELIEF 1351-1750 PSI	1750 PSI @ 3 GPM
N - ANTI-CAV/SHIM RELIEF 1751-2200 PSI	2200 PSI @ 3 GPM
R - ANTI-CAV/SHIM RELIEF 2201-3000 PSI	2500 PSI @ 3 GPM
S - ANTI-CAV/SCREW RELIEF 500-1350 PSI	1350 PSI @ 3 GPM
T - ANTI-CAV/SCREW RELIEF 1351-1750 PSI	1750 PSI @ 3 GPM
W - ANTI-CAV/SCREW RELIEF 1751-2200 PSI	2000 PSI @ 3 GPM
Y - ANTI-CAV/SCREW RELIEF 2201-3000 PSI	2500 PSI @ 3 GPM

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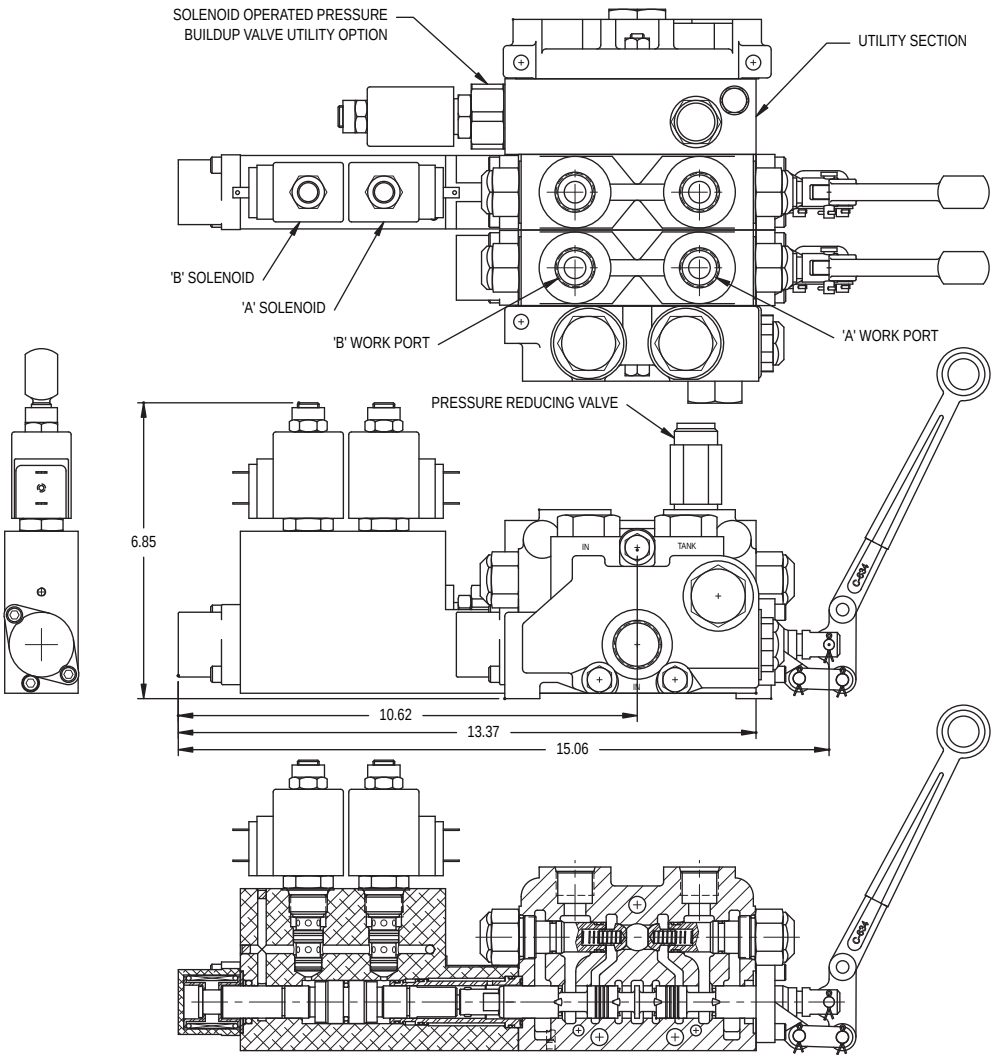
SEE PAGE 13 OF THE STANDARD PRODUCT PRICE LIST FOR PRICING

CATV 16-09-04-01

SERIES “20” DUAL SOLENOID OPERATORS (BOTH SOLENOID OPERATORS ON ONE END)

The Series “20” Dual Solenoid Operators offer a work section with solenoid operators and the same handle configurations as the standard manual sections. The work sections operate on the same principal as the Series “20” Split Solenoid Operators. When a solenoid is energized, pilot pressure is applied to a piston which causes the spool to shift. The work sections have internal pilot passage ways and internal pilot drains. The work sections must be used in conjunction with a utility section, as shown in the 20U catalog section, and this section must be installed between the last section and the outlet. The Dual Solenoid work section can be used with split solenoid sections or with manual sections, but the manual sections must be upstream of the solenoid sections. A minimum of approximately 300 psi load induced pressure is required to complete the spool shift and hold the spool in the shifted position. For over running or light load applications, a restrictor installed in the work port or line may be required.



SOLENOID OPERATED WORK SECTION

20 P X X X X X X - S X X X

WORK SECTION TYPE
P - Standard Parallel

PORT SIZE
1. #10 SAE (7/8-14 THREAD)
2. #8 SAE (3/4-16 THREAD)
3. #12 SAE (1 1/16-12 THREAD)
4. 1/2 NPTF (2000 PSI MAX)

SPOOL TYPE
A - 3 - Way 3-Position
B - 4 - Way 3-Position
C - 4 - Way 3-Position Free Flow Motor
E - 3 - Way 3-Position Free Flow Motor

SPOOL ACTION
A - Spring Center

HANDLE OPTION
1. Standard Lever Handle
2. Less Handle Only
3. Less Complete Handle
4. Vertical Lever Handle

COIL VOLTAGE & TERMINATION *
S12Q, 12 VDC Double Spade
S12L, 12 VDC Double Wire
S12H, 12 VDC DIN 43650
S12W, 12VDC Weather Pack®
S24Q, 24 VDC Double Spade
S24L, 24 VDC Double Wire
S24H, 24 VDC DIN 43650
S11C, 120 VAC Conduit
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PORT RELIEF “B” OPTION
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E - Shim Adjustable Relief 2201-3000 PSI Set at 2500

PORT RELIEF “A” OPTION
A - Relief Cavity Plugged
B - Shim Adjustable Relief 500-1350 PSI Set at 1350
C - Shim Adjustable Relief 1351-1750 PSI Set at 1750
D - Shim Adjustable Relief 1751-2200 PSI Set at 2200
E - Shim Adjustable Relief 2201-3000 PSI Set at 2500

*See page V34 for coil details.

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