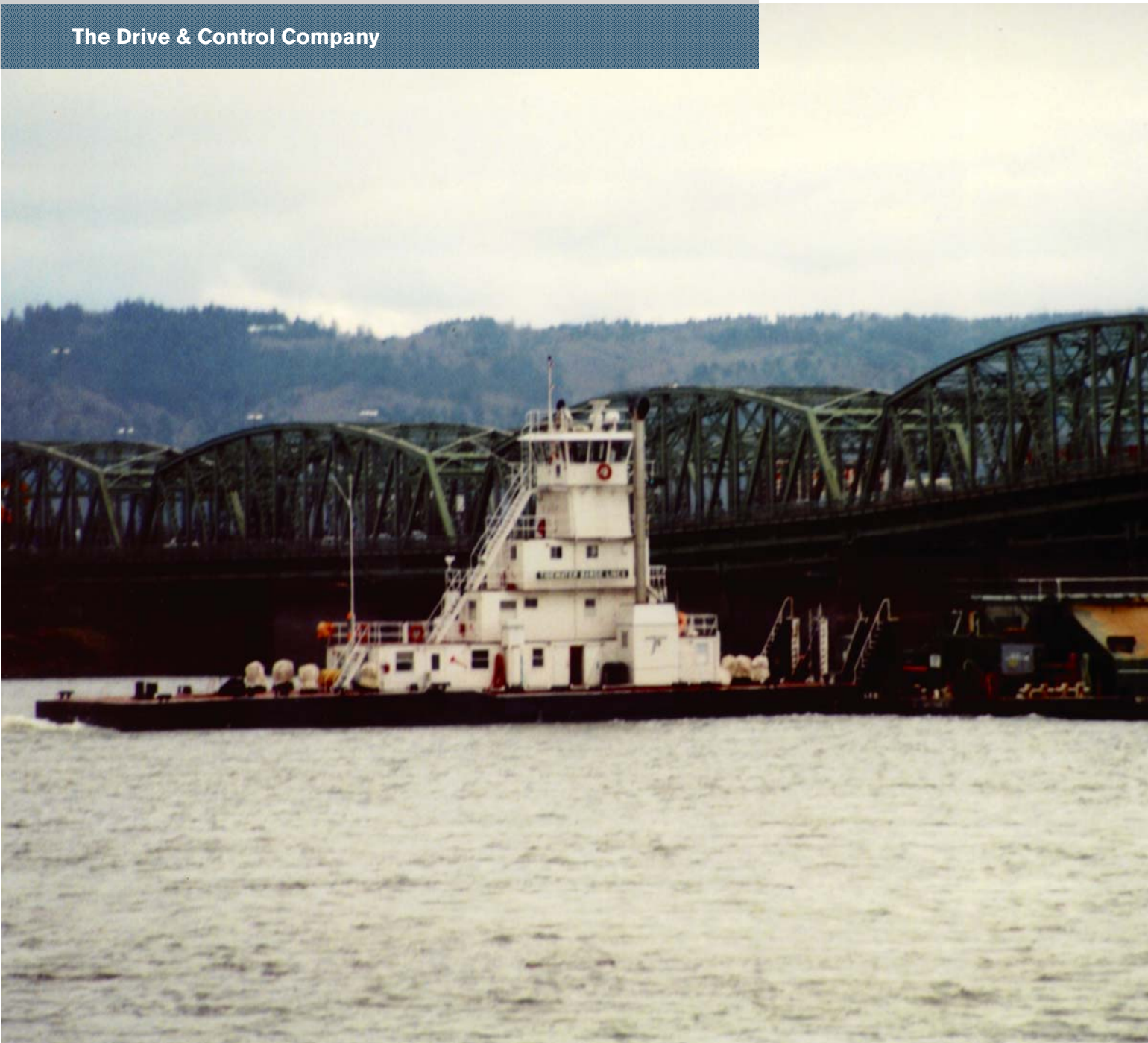


Pneumatic Marine Products for Propulsion Control

The Drive & Control Company





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Marine Control Systems such as LOGICMASTER® and GEARMASTER® Propulsion Control Systems protect engines and equipment on tugs, offshore supply, and other vessels.

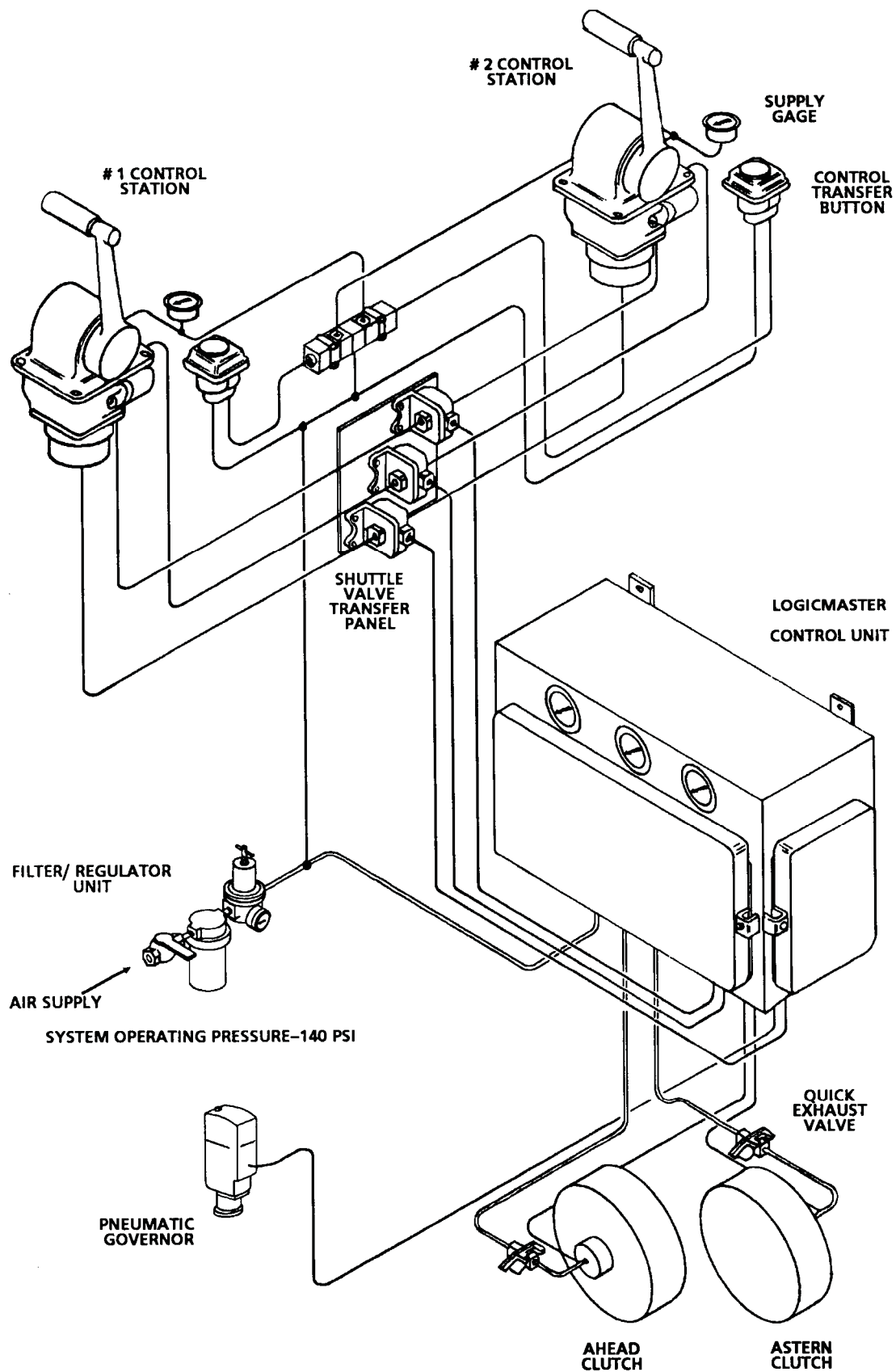
See page 52 for overview of our Electronic Marine Controls.

Control Units & Systems

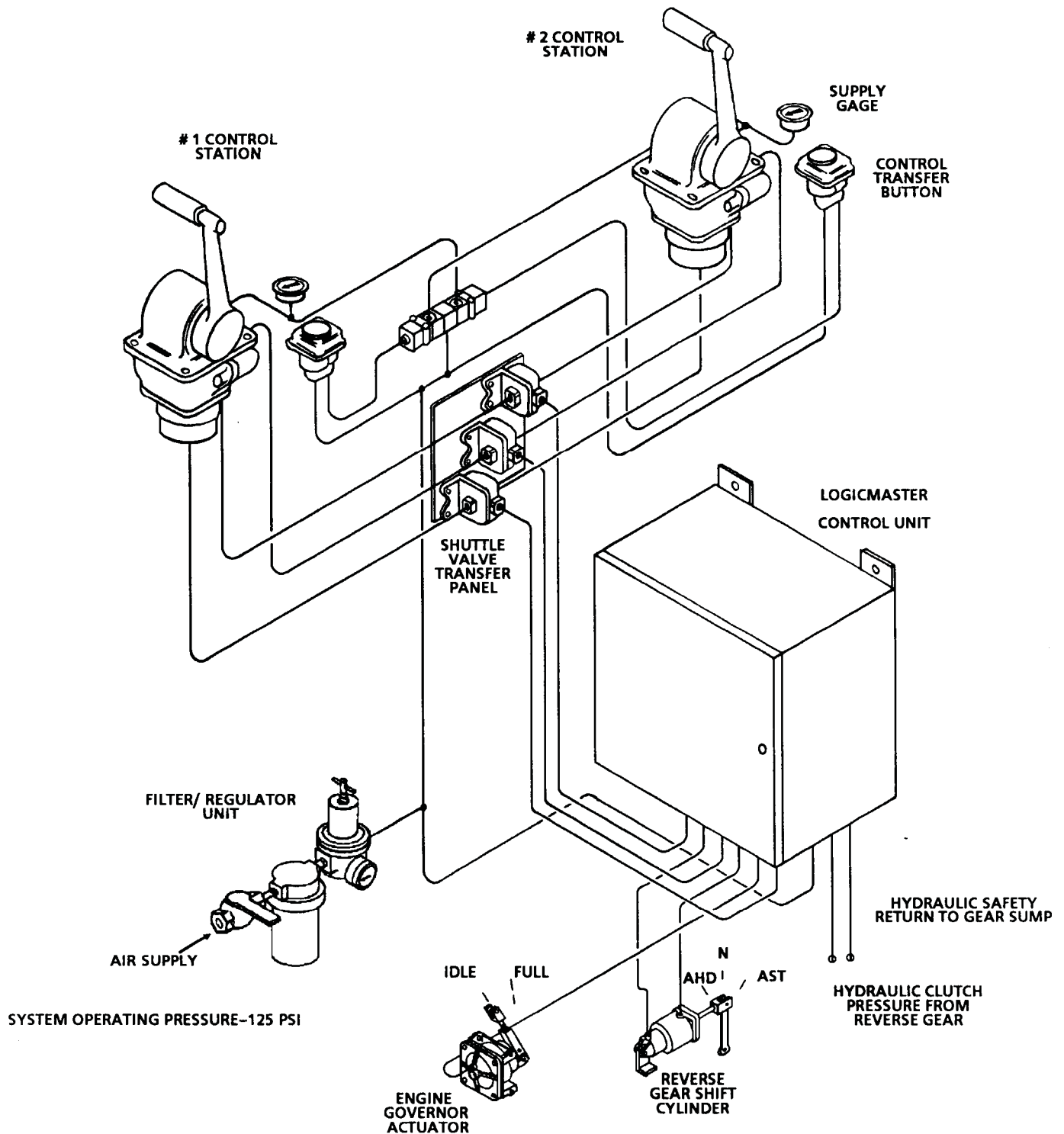
Typical Control System Schematic

Rexroth
Bosch Group

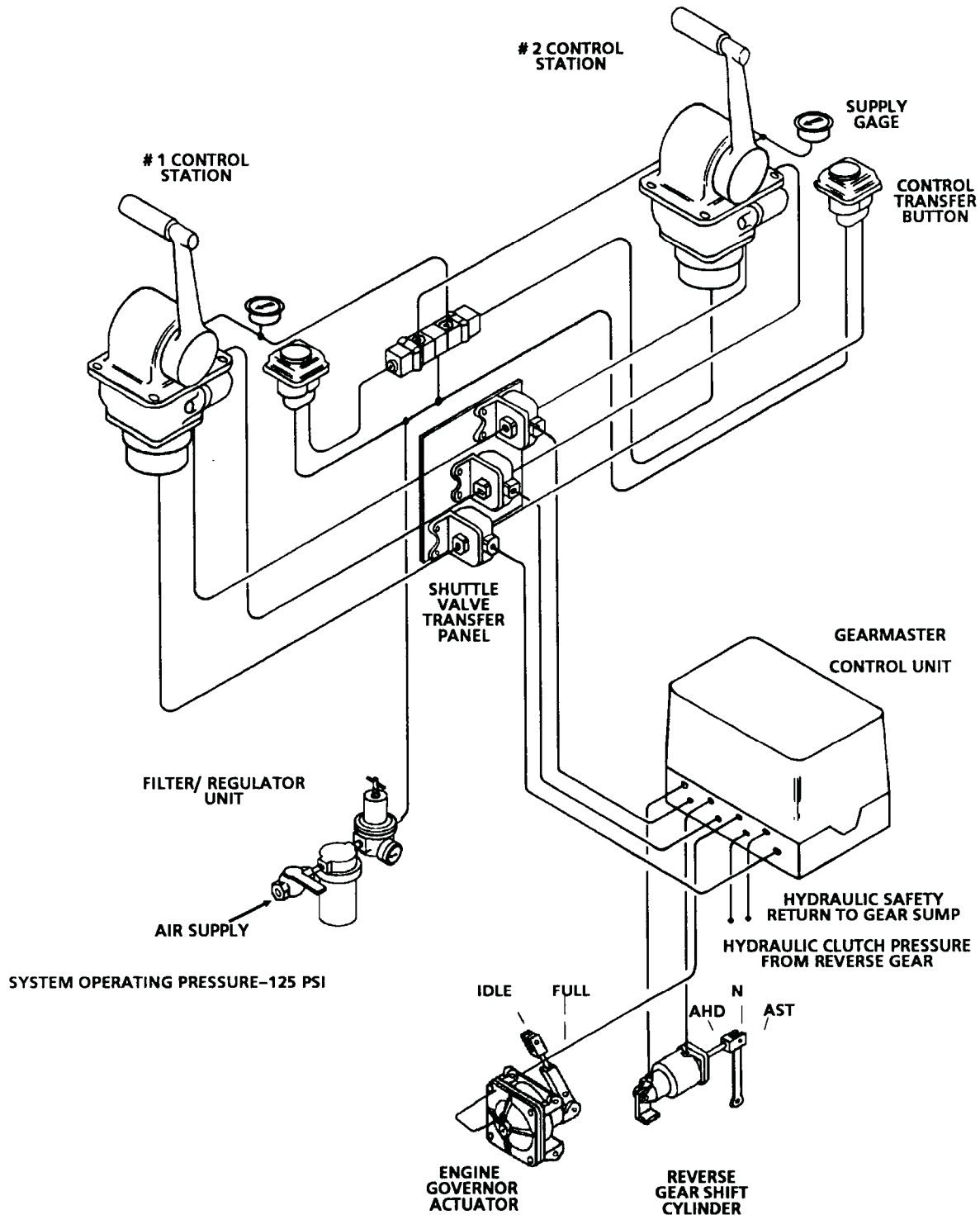
LOGICMASTER® AIR CLUTCH CONTROL SYSTEM SINGLE ENGINE—TWO CONTROL STATIONS



LOGICMASTER® HYDRAULIC CLUTCH CONTROL SYSTEM SINGLE ENGINE—TWO CONTROL STATIONS



GEARMASTER® HYDRAULIC CLUTCH CONTROL SYSTEM SINGLE ENGINE—TWO CONTROL STATIONS

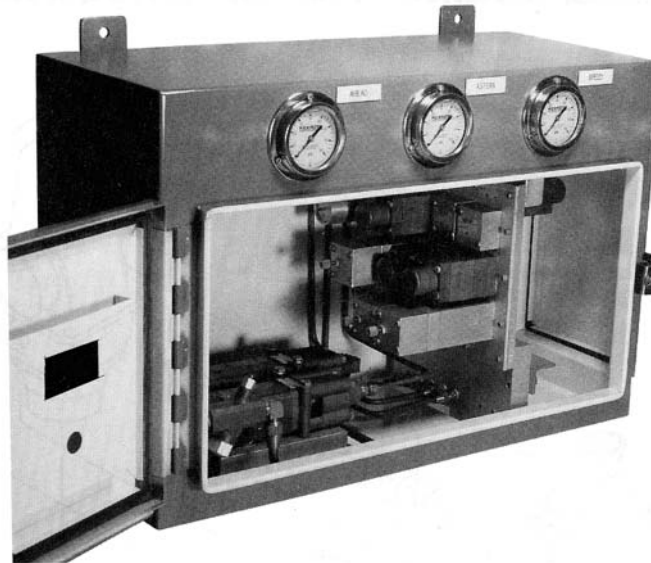


Control Units & Systems

LogicMaster® Air Clutch Control Units

Rexroth
Bosch Group

LOGICMASTER® AIR CLUTCH CONTROL UNITS



- **1,000 TO 4,000 H.P.**
- **TUGS, OFFSHORE SUPPLY BOATS, TOW BOATS, FISHING & GENERAL SERVICE BOATS**

FEATURES...

- Fast maneuvering
- Maximum protection for propulsion machinery
- Rugged, service proven control valves
- Compact arrangement simplifies shipboard installations
- Manifolding assembly minimizes piping & potential leakage problems
- Factory tested for 100% operational performance and timing adjustments
- Simplified maintenance and troubleshooting

LOGICMASTER Air Clutch Control Units combine proven, high performance pneumatic components into factory assembled, tested and pre-timed units, ready for shipboard installation and operation. All operating valves are subbase mounted for simplified service, maintenance and troubleshooting. Standard service and parts are as near as your authorized Rexroth Marine distributor.

LMAC units incorporate the pneumatic pressure interlocks and protective circuits required for proper engine and reverse gear operation without the necessity to rely on operator judgement to time, sequence or anticipate the propulsion machinery functions. The **built-in control system logic program** provides safe operation of the engine and reverse gear under all maneuvering conditions. The propulsion machinery responds to maneuvering commands without wear or damage from high speed clutch engagement or engine stalling during reversal maneuvers.

CONTROL SYSTEM SEQUENCE OF OPERATION...from FULL AHEAD to FULL ASTERN

- | | | |
|--|--|---|
| • Operator moves control handle from FULL AHEAD to FULL ASTERN | • Timed interlock holds clutches in NEUTRAL (adjustable) | • Shaft brake releases as clutch inflates |
| • Governor goes to the IDLE position | • Propeller speed reduces to acceptable level | • Governor power boost prevents engine stalling on initial engagement |
| • AHEAD clutch exhausted | • ASTERN clutch inflates at a controlled rate | • Clutch reaches lock-up pressure; governor advances to FULL SPEED. |
| • Shaft Brake applied (if used) | | |

Control Units & Systems

LogicMaster® Air Clutch Control Units

Rexroth
Bosch Group

Ordering Information			
Model	Part No.	Old Part No.	Description
LMAC-1	R431007550	P-090196-00000	Standard Unit
LMAC-2	R431007552	P-090197-00000	Standard Unit with shaft brake control signal
LMAC-3	R431009156	P-090198-00000	Unit with proportional reversing interlock timing
LMAC-3C	R431009167	P-090393-00000	Unit with proportional reversing interlock timing for 3600 Series Caterpillar® engine

Weight: 87 lbs. (40kg.)

Maintenance kit for the above units is Part Number R431006453 (P-064517-00000).

Caterpillar® engine is a registered trademark of Caterpillar, Inc., Mossville, IL

LMAC CONTROL UNITS INCORPORATE THE FOLLOWING INTERLOCKS AND OPERATIONAL FEATURES . . .

GOVERNOR POWER BOOST—applied at the time of clutch engagement to prevent engine stalling and possible engine reversal—boost is adjustable for magnitude and duration.

CROSS-ENGAGEMENT

INTERLOCKS—monitor clutch pressure to insure that one clutch fully vents before the opposite clutch can be inflated, i.e. "ahead" clutch must fully disengage before "astern" clutch can engage.

TIMED REVERSING INTERLOCK

CONTROL—provides an adjustable "neutral" hold time during fast reversals to allow engine and propeller speed to decrease to an acceptable level before opposite clutch can be engaged.

CLUTCH PRESSURE/ENGINE SPEED

INTERLOCK—insures that selected clutch inflates to lock-up pressure before engine speed can be increased.

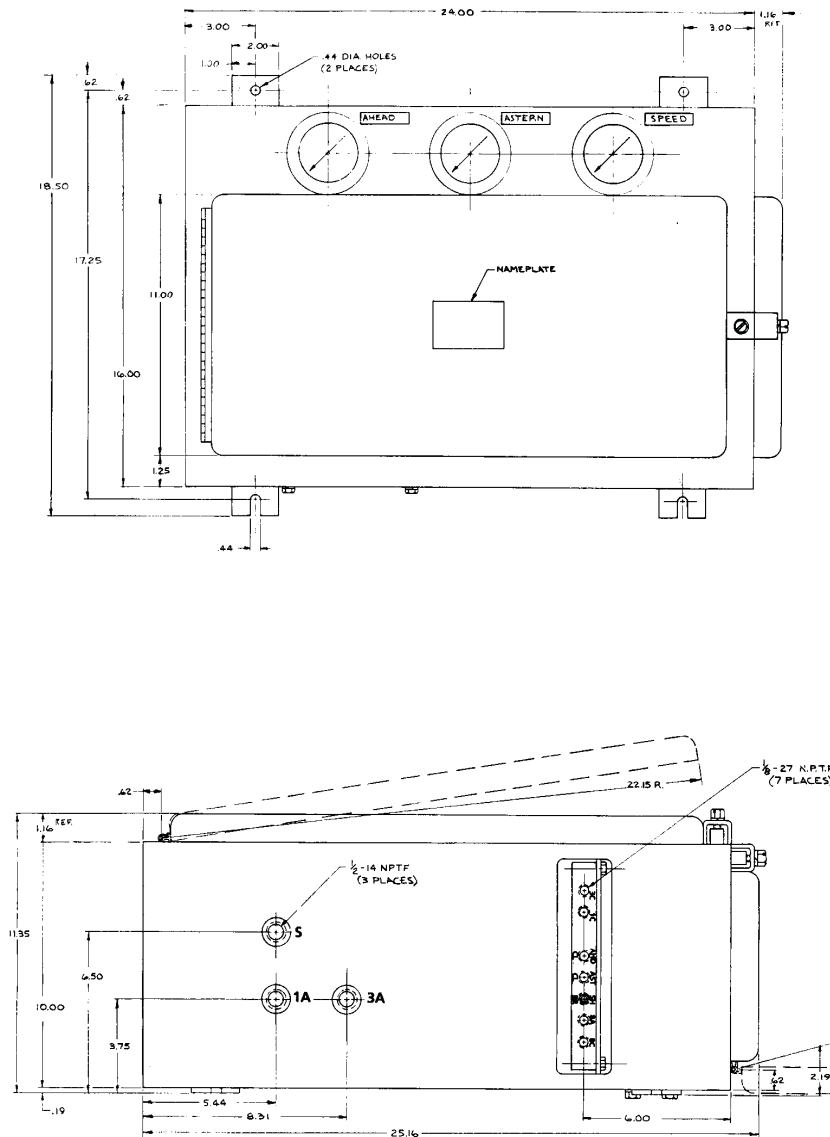
SOFT CLUTCH ENGAGEMENT—provides smooth engagement to reduce gear shock and engine loading by two-stage rate of clutch fill. Initial fill is at a controlled rate for soft engagement then opens to maximum flow rate for rapid fill.

SHAFT BRAKE CONTROL

(optional)—activates shaft brake in synchronization with clutches. Brake releases when clutch engagement starts and applies when clutches release. With brake control the "timed reversing interlock" provides neutral hold time to permit the propeller to be stopped.

PROPORTIONAL TIMED REVERSING

INTERLOCK (optional)—provides an ahead to astern reversing time which is in proportion to vessel speed (adjustable). Since timing is proportional to speed, low speed maneuvers for docking and shifting are performed with minimum interlock timing for faster handling.



Port Numbers

- 1A – Ahead Clutch Out
- 1C – Ahead Signal In
- 3A – Astern Clutch Out
- 3C – Astern Signal In
- 8A – Speed Signal Out
- 8C – Speed Signal In
- AHD CL – Ahead Interlock
- AST CL – Astern Interlock
- SH BR – Shaft Brake Signal

LOGICMASTER® HYDRAULIC CLUTCH CONTROL UNITS & CONTROL SYSTEMS

- 800 TO 2,000 H.P
- OFFSHORE SUPPLY BOATS, CREW BOATS, TUGS, FISHING & GENERAL SERVICE BOATS

LOGICMASTER Hydraulic Clutch Control Units combine proven, high-performance pneumatic components into factory assembled, tested and pre-timed units ready for shipboard installation and operation. All operating valves are subbase mounted for simplified service, maintenance and troubleshooting.



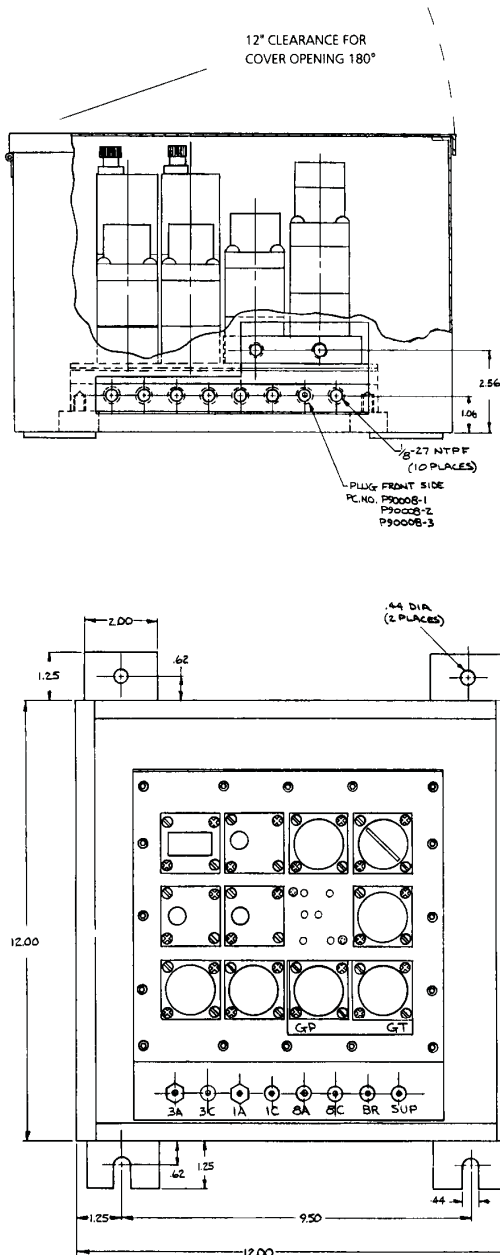
FEATURES...

- Compact arrangement —permits simplified shipboard installation
- Rugged, service proven operating valves
- Integral circuit manifold eliminates piping, fittings and potential leakage problems
- Standard circuit layout simplifies field maintenance and troubleshooting
- Factory performance tested—100% pressure tested for operational performance and timing
- Enclosure protects equipment and minimizes tampering
- Operates on standard 125 psi shipboard air supply

Both systems include the standard interlock features of timed reversing interlock, governor power boost on clutch engagement and clutch pressure — throttle control interlock. The LM2 system **offers the additional** clutch pressure-shaft brake in coordination with the clutch operation.

CONTROL SYSTEM SEQUENCE OF OPERATION...from FULL AHEAD to FULL ASTERN

- | | | |
|--|---|---|
| • Operator moves control handle from FULL AHEAD to FULL ASTERN | • Timed interlock holds reverse gear in neutral | • Governor power boost applied |
| • Governor goes to the IDLE position | • Engine & Shaft speed to IDLE or SHAFT STOP | • Clutch pressure reaches lock-up |
| • Reverse gear to NEUTRAL | • Reverse gear shifts ASTERN | • Governor power boost terminates; governor advances to FULL SPEED. |
| • Shaft Brake applied (if used) | • Shaft brake releases (if used) | |



LOGICMASTER® Hydraulic Clutch Control systems are specifically designed for the hydraulic clutch type of marine reverse gears and include these service proven interlocks and features:

POWER BOOST...Advances governor setting during clutch engagement to provide increased engine torque and prevent stalling as the propeller load is applied. On completion of clutch engagement, the boost drops off and the governor is positioned to the setting called for by the pilothouse control lever. Governor power boost can be adjusted for desired magnitude and duration.

CLUTCH PRESSURE—THROTTLE CONTROL INTERLOCK...Monitors the buildup of hydraulic pressure in the clutch during engagement. Clutch pressure must reach preset engagement level before engine speed can be advanced from the remote control station to prevent high engine speed during clutch engagement and resultant clutch wear. This feature also protects the reverse gear if clutch pressure drops during operation. Loss of clutch pressure releases the interlock and engine speed is reduced to idle, preventing clutch damage.

TIMED REVERSING INTERLOCK...Holds the clutch control in neutral position for a preset time on reversals even though the remote control lever is shifted directly through neutral. This allows engine and propeller speeds to decrease to an acceptable level before reversal is initiated. When a shaft brake is used, the neutral timing is long enough for the brake to apply and stop the propeller before reversing. Timing is adjustable.

CLUTCH PRESSURE—SHAFT BRAKE INTERLOCK...Prevents the shaft brake from being applied when either clutch is engaged. As the clutch pressure is applied, the shaft brake control valve is actuated to release the brake. This clutch pressure interlock prevents simultaneous engagement of the clutch and brake.

Port Numbers

1A - Ahead Out
1C - Ahead In
3A - Astern Out
3C - Astern In
8A - Speed Out
8C - Speed In
GP - Gear Pressure
GT - Hydraulic Safety Return
BR - Shaft Brake Signal
SUP - Supply

Ordering Information

Model	Part No.	Old Part No.	Description
LM1	R431007529	P -090008-00001	Unit less shaft brake control
LM2	R431007528	P -090008-00000	Unit with shaft brake control signal
	R431006452	P -064517-00000	Maintenance kit for R431007529 (Old Part No. P -090008-00001)
	R431006454	P -064518-00000	Maintenance kit for R431007528 (Old Part No. P -090008-00000)

Weight: 31 lbs. (14.1kg.)

GEARMASTER® MARINE PROPULSION CONTROL SYSTEMS

- **HYDRAULIC CLUTCH REVERSE GEARS**
- **200 TO 1200 H.P.**
- **TOWBOATS, TUGS, TRAWLERS, SEINERS**



GEARMASTER® Controls incorporate the necessary interlock and protective circuits for proper engine and reverse gear operation without relying on operator judgement to time or anticipate propulsion machinery functions. With GEARMASTER controls, the propulsion machinery responds to maneuvering demands without wear or damage from high speed clutch engagement or engine stalling.

Part Numbers of Control Units—

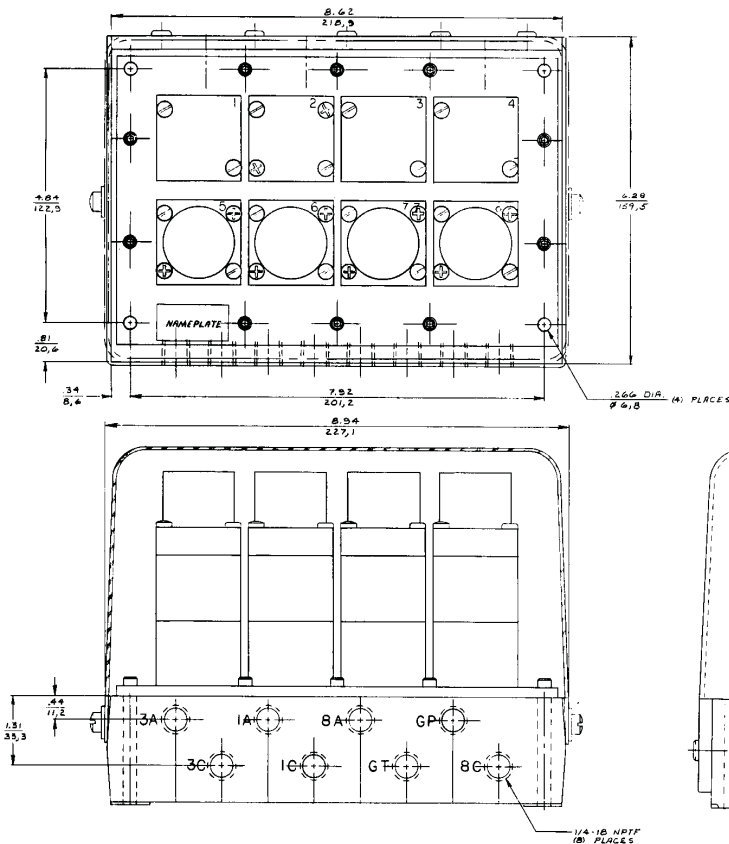
- R431007068 - with pneumatic clutch/throttle interlock (Old Part No. P -067393-00000)
- R431007069 - with hydraulic clutch/throttle interlock (Old Part No. P -067394-00000)

FEATURES...

- Compact size...simplified installation
- Simplicity...minimum number of components
- Serviceability...manifold mounted components
- Service proven...components and control circuit
- Minimum piping connections with manifolded circuit
- Timed reversing interlocks
- Clutch engagement/ throttle interlock
- Controlled engine acceleration
- Shaft brake timing

Ordering Information		
Part No.	Old Part No.	Description
R431007068	P -067393-00000	Pneumatic throttle interlock unit
R431007069	P -067394-00000	Hydraulic throttle interlock unit
R431000806	P -027493-00000	Maintenance kit for R431007068 (Old Part No. P -067393-00000)
R431000807	P -027494-00000	Maintenance kit for R431007069 (Old Part No. P -067394-00000)

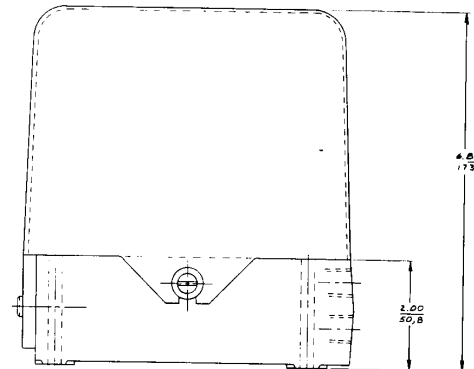
Weight: 15 lbs. (6.8 kg.)



Port Numbers

- 1A – Ahead Clutch Out
- 1C – Ahead Signal In
- 3A – Astern Clutch Out
- 3C – Astern Signal In
- 8A – Speed Signal Out
- 8C – Speed Signal In
- GP – Gear Pressure
- GT – Hydraulic Safety Return

$$\text{Dimensions} = \frac{\text{IN}}{\text{mm}}$$

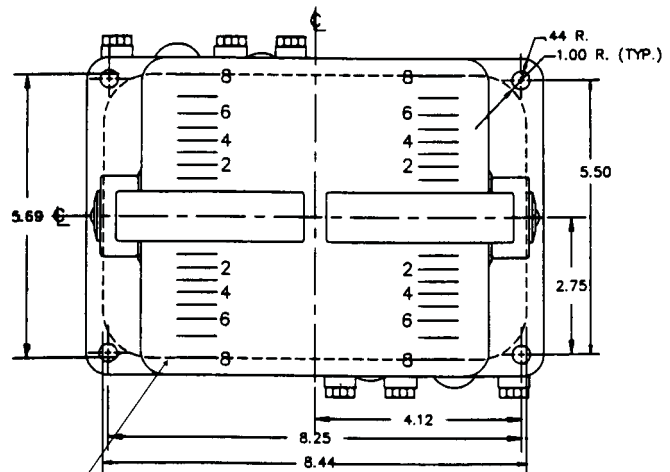


Twin Engine Marine Control Valve



THD-2-FM Valves provide single handle control for propulsion direction and engine speed for two engines. This top of the line model is ruggedly built from non-ferrous materials and has an attractive chrome plated brass cover with chrome handles. The completely enclosed cover and rugged construction make it ideal for exposed station installations.

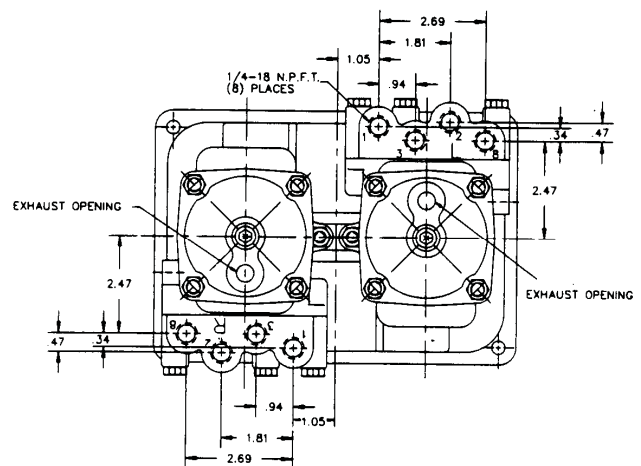
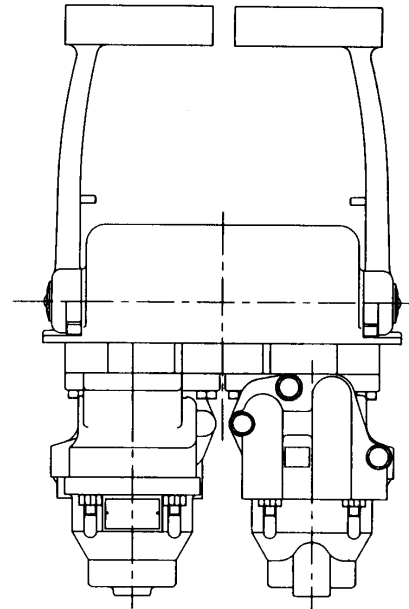
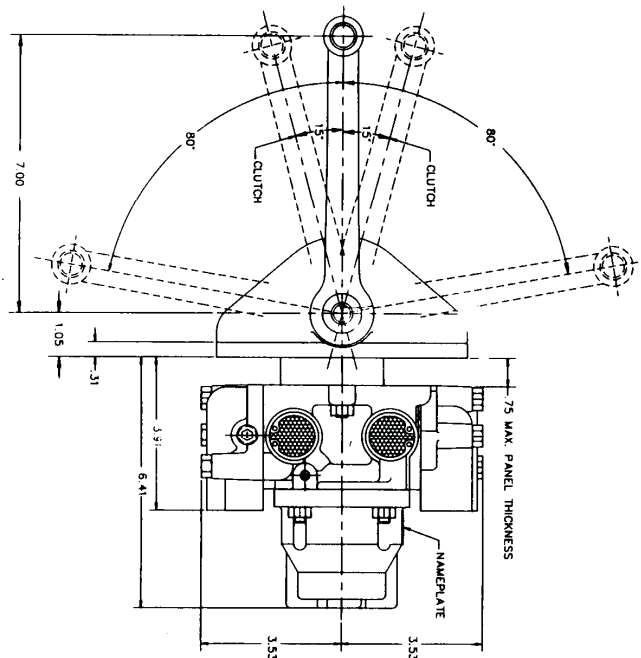
Fore or aft movement of either control handle from neutral to the clutch position delivers supply pressure into the appropriate ahead or astern control line to engage the clutch. Further movement increases the pressure signal delivered to the engine governor. The neutral and clutch positions are detented for positive position indication. An adjustable friction brake holds the handles in any selected position.



NOTE:
(1) PANEL MOUNTING CUTOUT – ONE PIPE BRACKET MUST BE REMOVED FOR INSTALLATION.
(2) CUTOUT TEMPLATE PACKAGED WITH EACH VALVE.

FEATURES...

- Modern, Low Profile Design
- Rugged Construction
- Polished Chrome Plated Brass Cover and Handles
- Provides Direction and Speed Control of Two Engines in One Assembly
- Enclosed Upper Cover for Exposed Station Service
- Simplified Console Installation
- Accommodates up to 3/4" Console Thickness



MAX. INLET AIR
200 PSI (13.8 BAR)

TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)

PORT CONNECTIONS:
2 = SUPPLY
1 = CLUTCH
3 = CLUTCH
8 = SPEED
WEIGHT: 25 LBS.
(11.3 KG.)

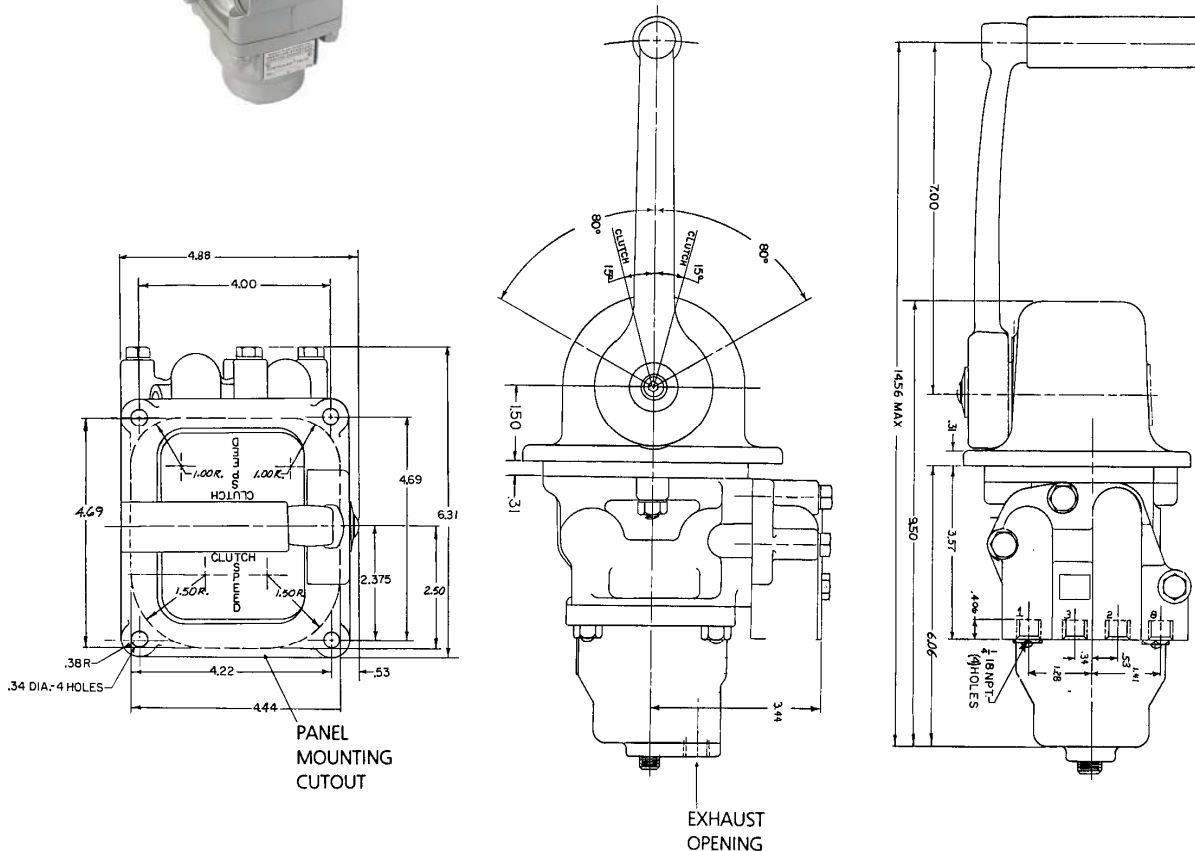
THD-2-FM Order Information:		
Part No.	Old Part No.	Description
R431000720	P -027121-00101	THD-2-FM (10-65 PSI)
R431000721	P -027121-00109	THD-2-FM (30-70 PSI)

Maintenance kit (2 Required) R431006521
(Old Part No. P -064894-0002)



HD-2-FM Valves provide single handle control for propulsion direction and engine speed. This middle of the line model is ruggedly built from non-ferrous materials and has an attractive chrome plated bronze cover with a chrome handle. The completely enclosed cover and rugged construction make it ideal for exposed station installations.

Fore or aft movement of the control handle from neutral to the clutch position delivers supply pressure into the ahead or astern control line to engage the appropriate clutch. Further movement increases the pressure signal delivered to the engine governor. The neutral and clutch positions are detented for positive position indication. The HD-2-FM is designed with an L-shaped handle so that two units can be mounted side by side for operation with one hand. An adjustable friction brake holds the handle in any selected position.



HD-2-FM Order Information:

Designation	Part No.	Old Part No.	Setting
HD-2-FM	R431006281	P -063470-00101	10-65 PSI
HD-2-FM	R431006282	P -063470-00109	30-70 PSI
HD-2-FM	R431006283	P -063470-00111	10-70 PSI

Maintenance kit R431006521 (Old Part No. P -064894-00002)

MAX. INLET AIR
200 PSI (13.8 BAR)

TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)

PORT CONNECTIONS:

2 = SUPPLY
1 = CLUTCH
3 = CLUTCH
8 = SPEED

WEIGHT: 12 LBS.
(5.44 KG.)

Controlair® Valves

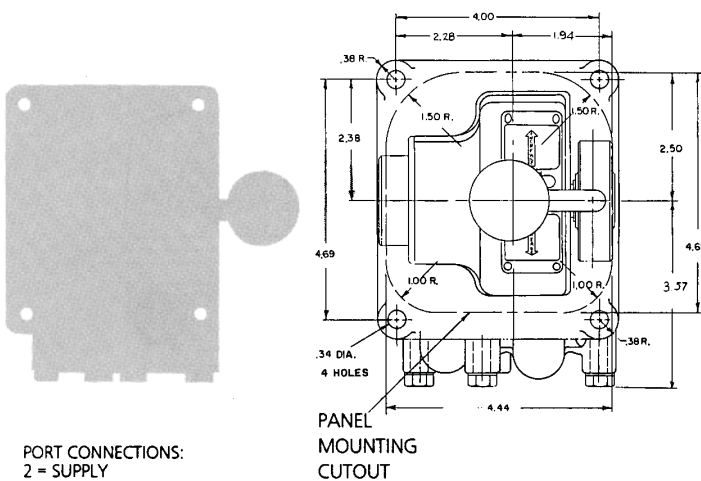
Model HD-2-FC

Rexroth
Bosch Group

The HD-2-FC CONTROLAIR Valve is a handle operated pressure control and directional flow control valve. It contains two 3-way directional valves and a pressure regulating portion, which are arranged to furnish inlet air pressure to two directional clutch control lines and graduated pressure to one infinite positioning speed control line.

The selection between the two clutch control lines depends upon handle movement to either side of "Neutral" position. The pressure in the speed control line is proportional to the position of the handle in either quadrant.

The cover is die-cast aluminum with grey textured polyester paint, with stainless steel handle, hub and yoke. The angled handle, so designed that when mounted side by side they can be operated by one hand, is equipped with an adjustable friction brake that will hold the handle in any selected position.



HD-2-FC Order Information:

Designation	Part No.	Old Part No.	Setting	Style
HD-2-FC	R431006249	P -063420-00001	0-65 PSI	Right Hand
HD-2-FC	R431006251	P -063421-00001	0-65 PSI	Left Hand

Maintenance kit R431006521 (Old Part No. P -064894-00002)

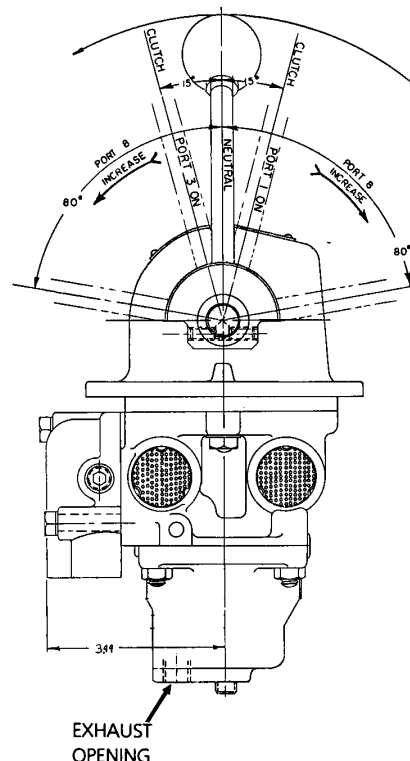
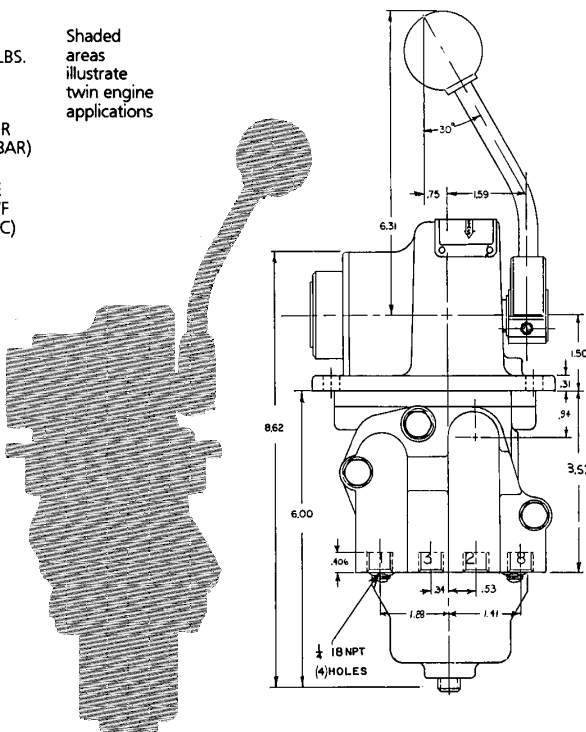
PORT CONNECTIONS:

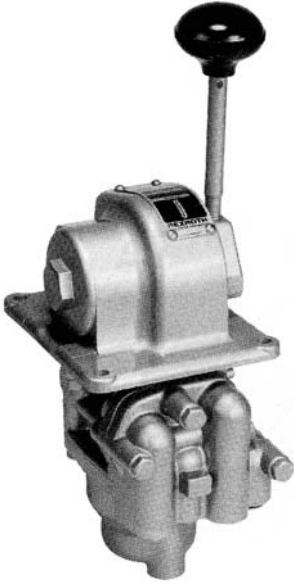
2 = SUPPLY
1 = CLUTCH
3 = CLUTCH
8 = SPEED
WEIGHT: 8.1 LBS.
(3.7 KG.)

Shaded areas illustrate twin engine applications

MAX. INLET AIR
200 PSI (13.8 BAR)

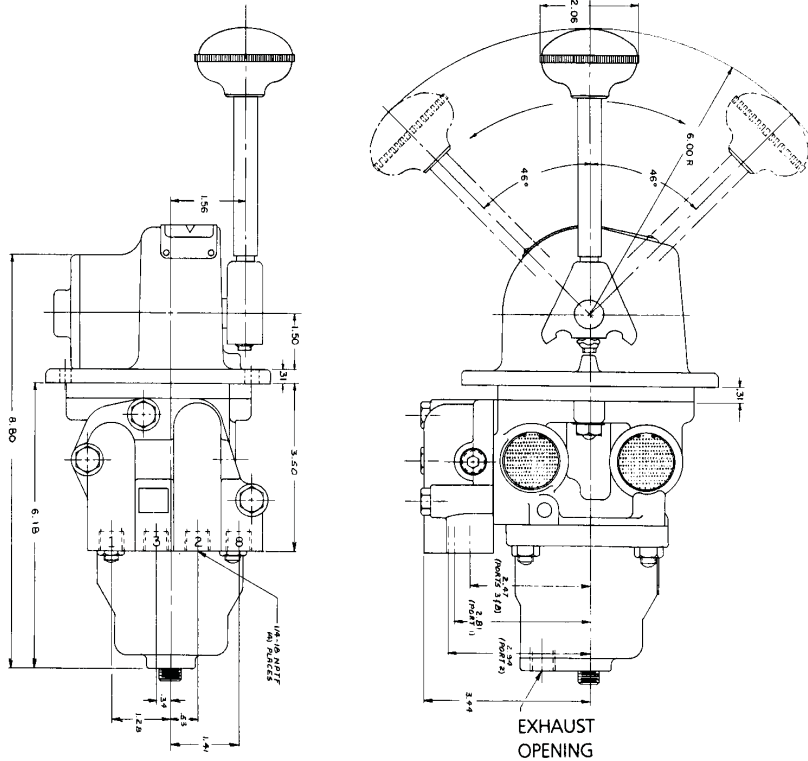
TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)





The HD-2-FX valve provides simple and efficient single handle control for propulsion direction and engine speed. It is frequently used as an engine room control, or on smaller craft as a bridge control.

Lightweight and rugged, non-ferrous construction, HD-2-FX valves are made of anodized die-cast aluminum for economy. The lever remains in the position where released. Holding friction is adjustable. Functional operation is the same as HD-2-FM and HD-2-FC CONTROLAIR Valves.

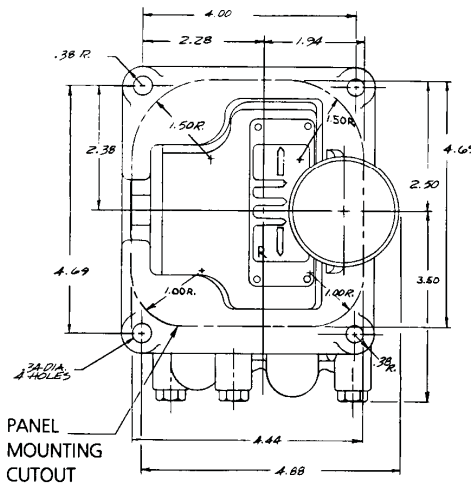


MAX. INLET AIR
200 PSI (13.8 BAR)

TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)

PORT CONNECTIONS:

2 = SUPPLY
1 = CLUTCH
3 = CLUTCH
8 = SPEED
WEIGHT: 7 LBS.
(3.17 KG.)

**HD-2-FX Order Information:**

Part No.	Old Part No.	Pressure	Cover
R431002823	P -050970-00001	0-65 PSI	Plain
R431002824	P -050970-00002	0-100 PSI	Plain
R431002825	P -050970-00003	0-125 PSI	Plain
R431002826	P -050970-00004	0-150 PSI	Plain
R431001204	P -066514-00001	0-65 PSI	Chrome*
R431001749	P -064924-00017	30-70 PSI	Plain

*Chrome cover and handle yoke.

Maintenance kit R431006521

(Old Part No. P -064894-00002)

Controlair® Valves

Model HC-2-FM

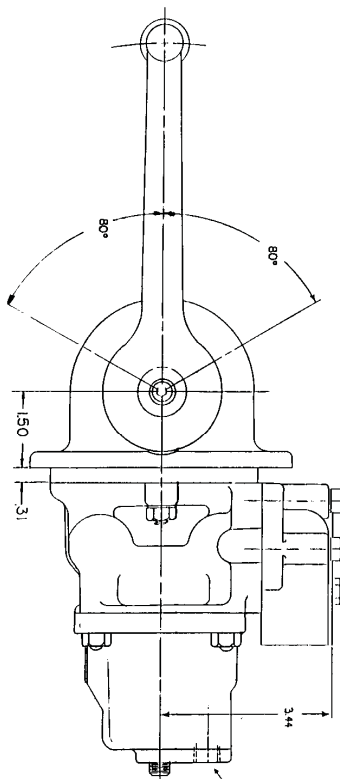
Rexroth
Bosch Group

The HC-2-FM valve is designed for open deck marine service and is the same as the HC-2-FX CONTROLAIR valve, except it features longer handle travel, more accurate positioning and a polished chrome plated bronze cover and handle.

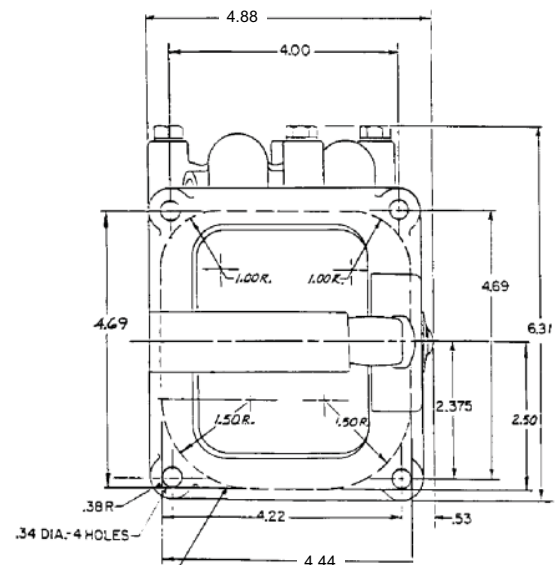
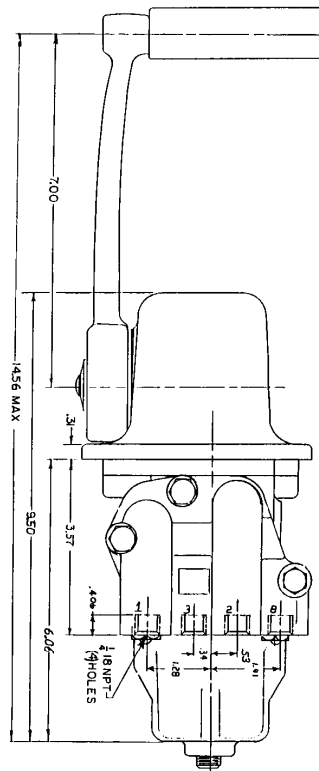
The valve is a lever operated, pressure regulating, 4-way directional valve. It consists of two 3-way directional valves and a 3-way pressure regulating portion. The regulating portion furnishes inlet air to the directional valves. Each directional valve has its own outlet port.

Initial lever movement from "mid" position selects the outlet port to be activated. Further lever movement in the same direction controls the outlet pressure at that point. The opposite port remains connected to atmosphere. Lever remains in the position where released. Handle holding friction is adjustable.

Use these valves to control two clutches, a clutch and a brake, two single acting cylinders or a double acting cylinder...wherever you want to selectively control pressure in either of two separate air lines with one lever.



EXHAUST
OPENING



PANEL MOUNTING CUTOUT

HC-2-FM Order Information:

Part No.	Old Part No.	Pressure	Style	Handle Travel
R431000809	P-027592-0101	0-65 PSI	Chrome	80°

MAX. INLET AIR
200 PSI (13.8 BAR)

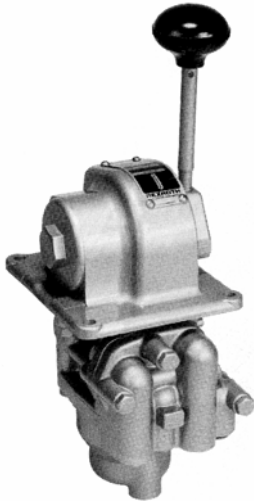
TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)

PORT CONNECTIONS:
2 = SUPPLY
1 = CONTROL OUT
3 = CONTROL OUT
8 = PLUGGED
WEIGHT: 12 LBS.
(5.44 KG.)

Maintenance kit R431006521 (Old Part No. P-064894-00002)

Model HC-2-FX

Rexroth
Bosch Group



The H-2-FX valve is a lever operated, pressure regulation, 4-way directional valve made of anodized die-cast aluminum. It consists of two 3-way directional valves and a 3-way pressure regulating portion. The regulating portion furnishes inlet air to the directional valves. Each directional valve has its own out port.

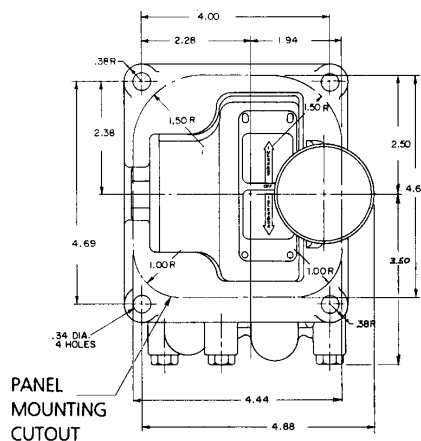
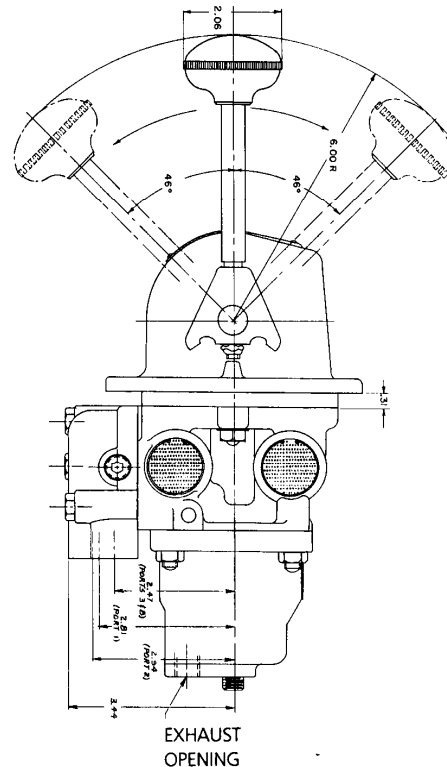
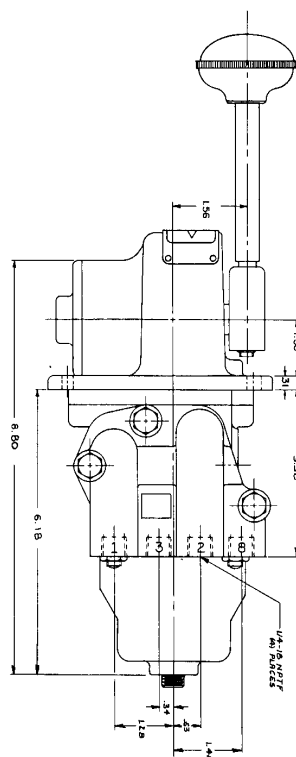
Initial lever movement from “mid” position selects the out port to be activated. Further lever movement in the same direction controls the outlet pressure at that port. The opposite port remains connected to atmosphere. Lever remains in the position where released. Handle holding friction is adjustable.

Use these valves to control two clutches, a clutch and a brake, two single acting cylinders or a double acting cylinder...wherever you want to selectively control pressure in either of two separate air lines with one lever.

PORT CONNECTIONS:
2 = SUPPLY
1 = CONTROL OUT
3 = CONTROL OUT
8 = PLUGGED
WEIGHT: 12 LBS.
(5.44 KG.)

MAX. INLET AIR
200 PSI (13.8 BAR)

TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)

**HC-2-FX Order Information:**

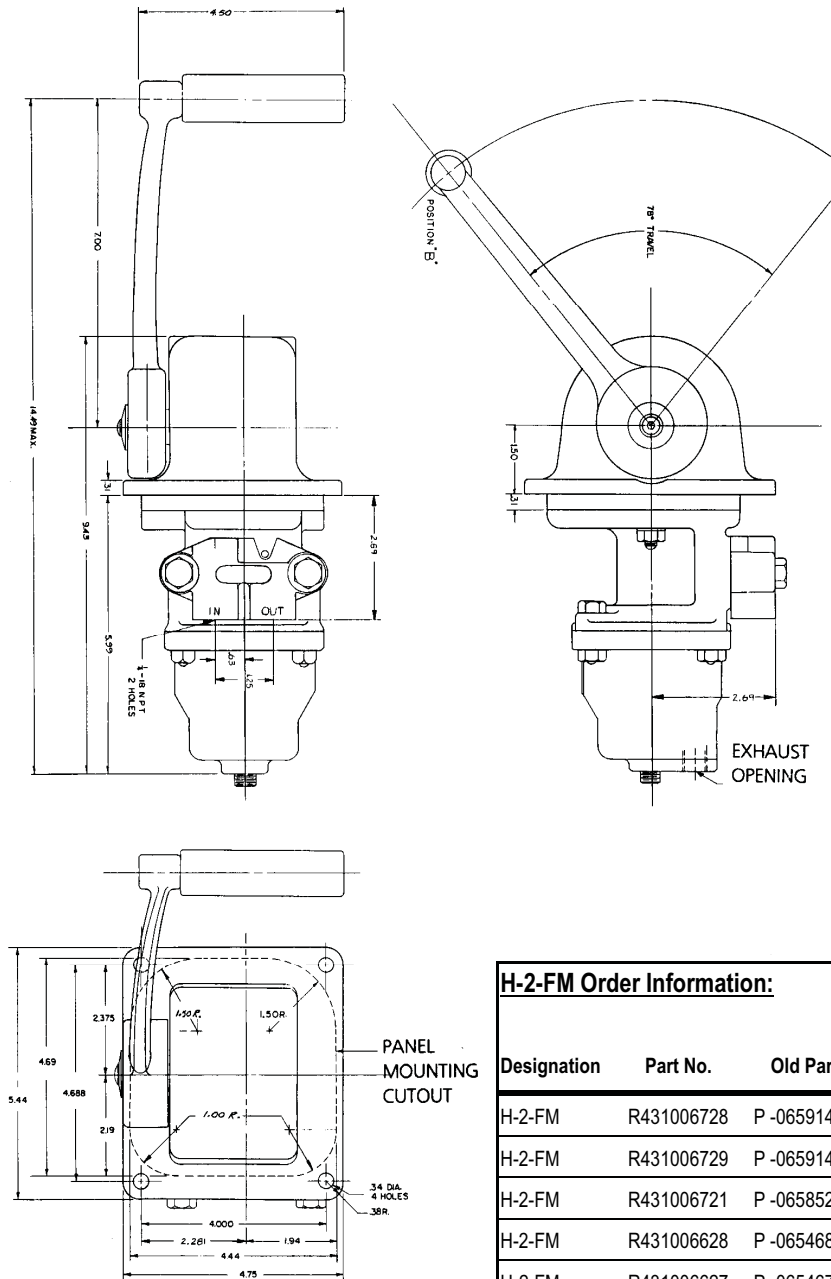
Part No.	Old Part No.	Pressure
R431002839	P -050976-00001	0-65 PSI
R431002840	P -050976-00002	0-100 PSI
R431002841	P -050976-00003	0-125 PSI
R431002842	P -050976-00004	0-150 PSI
R431002843	P -050976-00008	0-30 PSI

Maintenance kit R43100652

(Old Part No. P -064894-00002)

The H-2-FM valve is designed for open deck marine service and features handle travel of 78°, plus accurate pressure control and a polished chrome plated bronze cover, handle and grip.

This valve controls engine governor operation permitting the engine to be run at advanced speed for warm-up and check-out without engaging the clutch. After engine warm-up, control is transferred to the bridge.



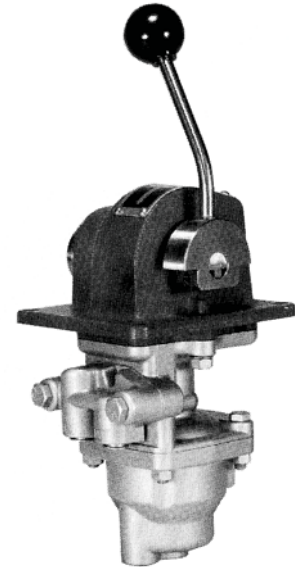
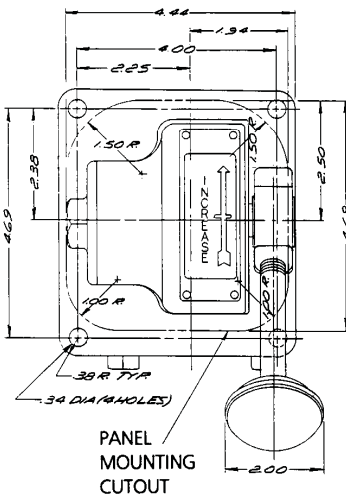
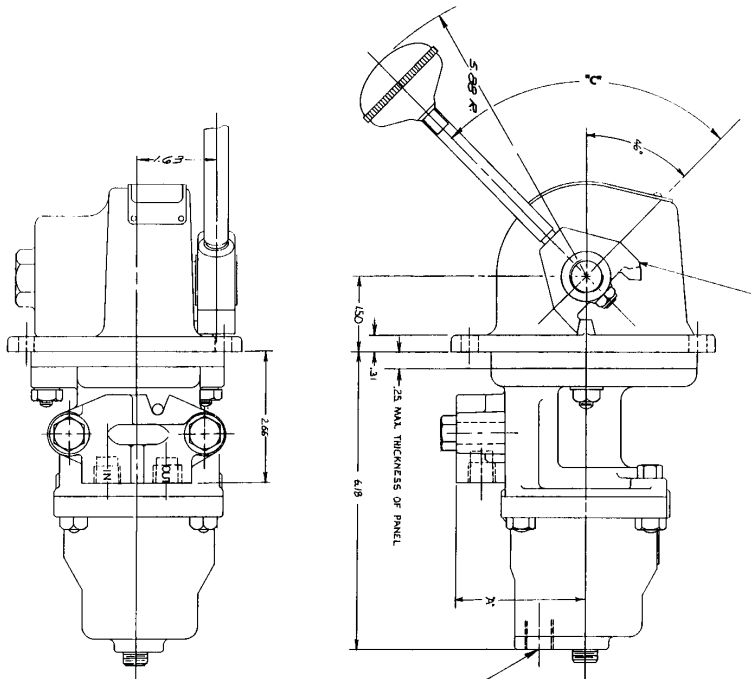
MAX. INLET AIR 200 PSI (13.8 BAR)
TEMPERATURE -40°F TO 106°F (-40°C TO 71°C)
PORT CONNECTIONS:
2 = SUPPLY
1 = CONTROL OUT
3 = CONTROL OUT
8 = PLUGGED
WEIGHT: 12 LBS. (5.44 kg.)

H-2-FM Order Information:

Designation	Part No.	Old Part No.	Delivery Pressure		
			Position A	Position B	Style
H-2-FM	R431006728	P-065914-00111	65 PSI	10 PSI	Right Hand
H-2-FM	R431006729	P-065914-00122	150 PSI	10 PSI	Right Hand
H-2-FM	R431006721	P-065852-00111	10 PSI	65 PSI	Left Hand
H-2-FM	R431006628	P-065468-00118	30 PSI	70 PSI	Left Hand
H-2-FM	R431006627	P-065467-00118	70 PSI	30 PSI	Right Hand

Maintenance kit R431004887 (Old Part No. P-059028-00000)

The H-2-FX CONTROLAIR valve is a lever operated regulating valve used for engine warm-up applications. Installed in the engine room, this valve controls governor operation, permitting the engine to be run at advanced speed for warm-up and check-out without engaging the clutch. After engine warm-up, control is transferred to the fridge. It is made of anodized die-cast aluminum.



92° YOKE ASSEMBLY AS SHOWN -
REVERSE ASSEMBLY FOR 78°
HANDLE TRAVEL

MAX. INLET AIR
200 PSI (13.8 BAR)

TEMPERATURE
-40°F TO 106°F
(-40°C TO 71°C)

PORT CONNECTIONS:
2 = SUPPLY
1 = CONTROL OUT
3 = CONTROL OUT
8 = PLUGGED

WEIGHT: 7 LBS.
(3.17 kg.)

H-2-FX Order Information:

Part No.	Old Part No.	Pressure	"C" Handle Travel
R431002643	P -050494-00001	0-65 PSI	92°
R431002644	P -050494-00002	0-100 PSI	92°
R431002649	P -050494-00011	10-60 PSI	78°

Maintenance kit R431004887

(Old Part No. P -059028-00000)

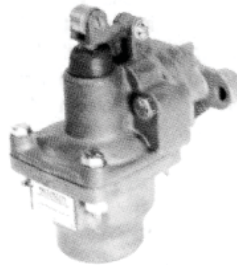
Controlair® Valves

Models H-3 & H-3-G

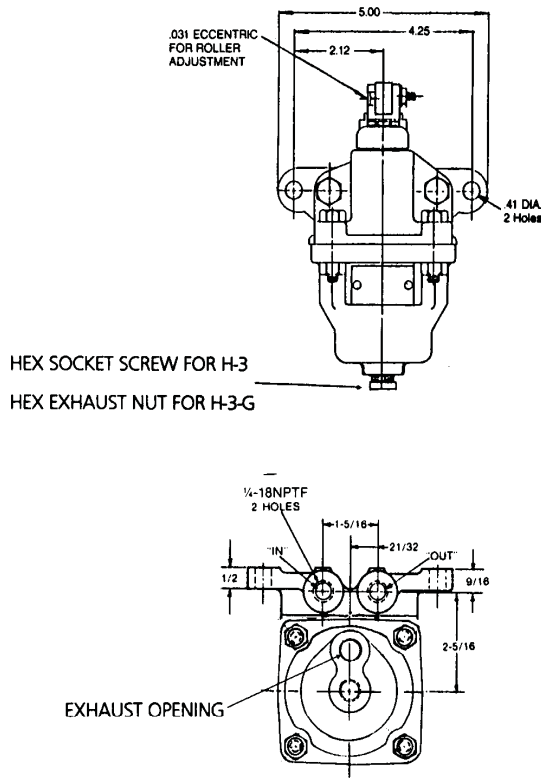
Rexroth
Bosch Group

H-3

The H-3 CONTROLAIR Valve is equipped with a roller for operation by a cam or a similar mechanical device. Graduated pressure which is directly proportional to the amount of downward movement of the roller lever is delivered from the OUT port. Total movement is approximately 5/16" (7.9 mm) with the initial 1/16" (1.6 mm) travel used to close the exhaust valve.



Approximate weight 4.5 lbs. (2.04 Kg)



H-3 Order Information:

Part No.	Old Part No.	Pressure
R431002626	P -050382-00001	0-65 PSI
R431002627	P -050382-00002	0-100 PSI
R431002628	P -050382-00003	0-125 PSI
R431002629	P -050382-00004	0-150 PSI
R431002630	P -050382-00006	0-15 PSI
R431002631	P -050382-00008	0-25 PSI
R431002632	P -050382-00009	0-75 PSI

Maintenance kit R431004887 (Old Part No. P -059028-00000)

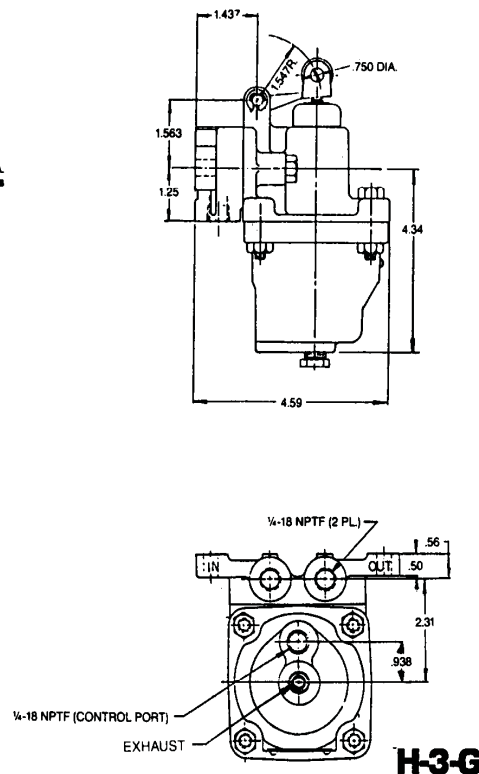
Maintenance kit (Roller ass'y.) R431006648

(Old Part No. P -065636-00000)

H-3-G

This design is similar to the H-3 CONTROLAIR except the spring housing area is sealed and a biasing control pressure can be introduced through the tapped lower housing port to the underside of the diaphragm. By varying this signal, the output of the H-3-G CONTROLAIR can be biased or adjusted in proportion. This bias signal must be lower than the output signal.

Approximate weight 5 lbs. (2.27 Kg)



MAX. INLET AIR
200 PSI (13.8 BAR)

TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)

H-3-G Order Information:

Part No.	Old Part No.	Pressure	Ports
R431009131	P -052550-00008	0-30 PSI	1/4-18
R431002981	P -052550-00001	0-65 PSI	1/4-18

Maintenance kit R431003896 (Old Part No. P -055687-00002)

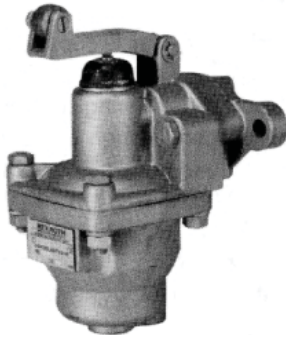
Maintenance kit R431006648 (Old Part No. P -065636-00000)

(Roller ass'y)

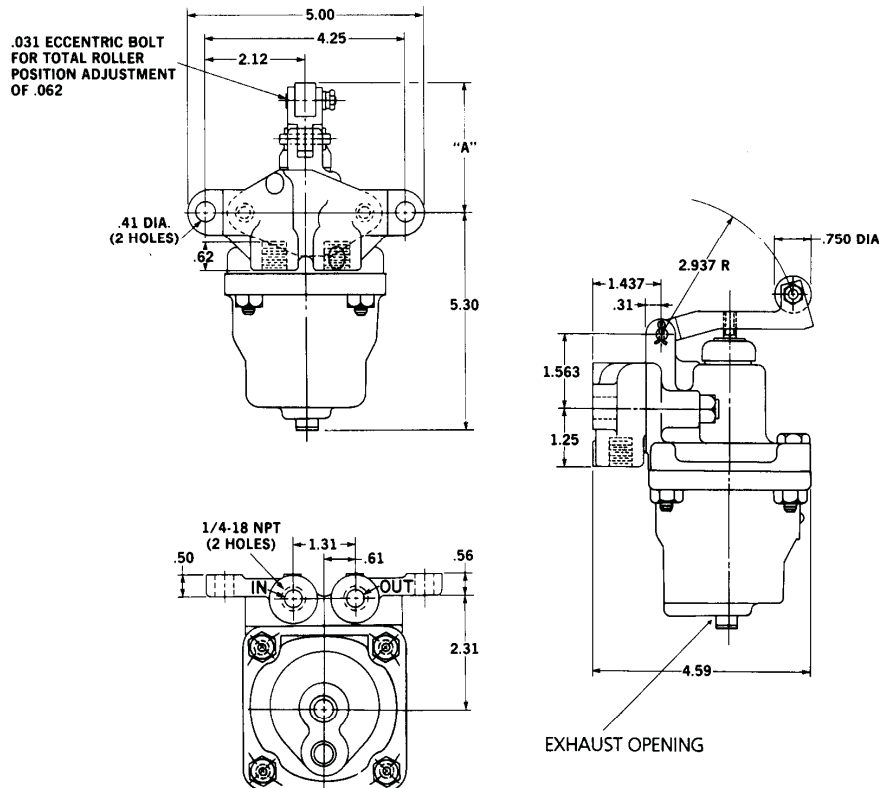
Controlair® Valves

Model SH-3

Rexroth
Bosch Group



The SH-3 CONTROLAIR Valve is a pressure graduating valve similar to the H-3 CONTROLAIR Valve, but with a larger, more sensitive diaphragm for minimum hysteresis and maximum sensitivity of pressure graduation for optimum control of positioning devices such as Servo Positioners and applications where very precise control is required. (Hysteresis = $\pm \frac{3}{4}$ psi.) Weight: 4 lbs. (1.81 Kg)



SH-3 Order Information:			"A" FACTORY SETTING*		
Part No.	Old Part No.	Pressure	2.718	2.531	2.114
R431006528	P -064920-00001	10-60 PSI	FULL EXH	10 PSI	+5
					60 PSI
					-0
R431006529	P -064920-00005	3-15 PSI	FULL EXH	3 PSI	+2
					15 PSI
					-1/2

MAX. INLET AIR
200 PSI (13.8 BAR)

WEIGHT: 4 LBS.
(1.81 KG.)

TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)

*Travel further than this can damage valve mechanism.

Maintenance kit P -065018-00000

Controlair® Valves

Models H-4 and H-4-G

Rexroth
Bosch Group

H-4

The H-4 CONTROLAIR Valve is a knob operated, 3-way pressure regulating valve. Arranged for panel mounting, this valve gives fine, vernier type pressure control in one delivery line. The knob holds in all positions and has adjustable stops to limit maximum and minimum travel.

Clockwise rotation of the knob increases pressure in the standard models. Opposite knob action is available.

Approximate weight: 5.5 lbs. (2.5 Kg)



H-4-G

This design is similar to the H-4 CONTROLAIR except the spring housing area is sealed and a control signal can be introduced under the diaphragm through the tapped lower housing port.

The delivery pressure is then regulated by the applied control signal and can be biased by operation of the control knob to adjust the output pressure approximately 10 psi (0.7 bar).

Approximate weight: 6 lbs. (2.72 Kg)

HEX SOCKET SCREW FOR H-4
HEX EXHAUST NUT FOR H-4-G

EXHAUST OPENING

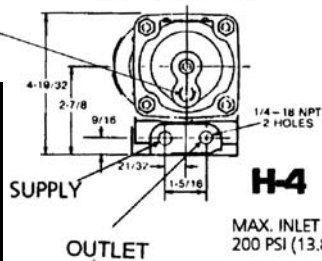
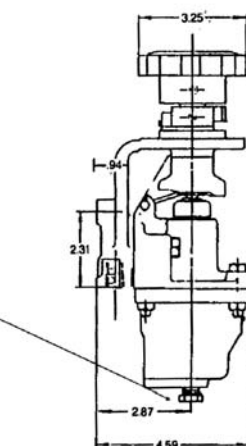
H-4 Order Information:

Part No.	Old Part. No.	Pressure
R431002818	P -050967-00001	0-65 PSI
R431002819	P -050967-00002	0-100 PSI
R431002820	P -050967-00003	0-125 PSI
R431002821	P -050967-00004	0-150 PSI
R431002822	P -050967-00008	0-30 PSI
R431002885	P -051173-00001(1)	0-65 PSI
R431002886	P -051173-00002(1)	0-100 PSI

(1) Counterclockwise rotation increases pressure.

Maintenance kit R431004887(Old Part No. P -059028-00000)

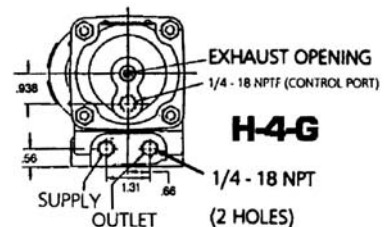
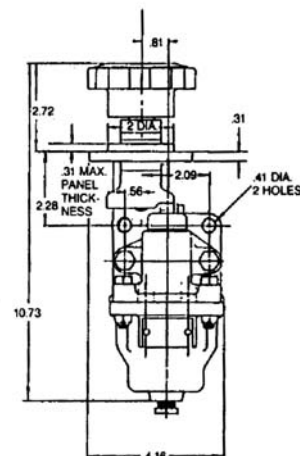
Maintenance kit R431006421 (Roller ass'y.) (Old Part No. P -064421-00007)



H-4

MAX. INLET AIR
200 PSI (13.8 BAR)

TEMPERATURE
-40°F TO 160°F
(-40°C TO 71°C)



H-4-G

1/4 - 18 NPT
(2 HOLES)

H-4-G Order Information:

Part No.	Old Part No.	Bias Range Pressure	Ports
R431002962	P -052035-00001	10 PSI	1/4 - 18
R431002963	P -052035-00002	10 PSI	9/16 - 18

Maintenance kit R431003896

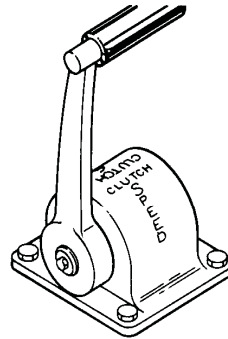
(Old Part No. P -055687-00002)

Mechanical Control Heads

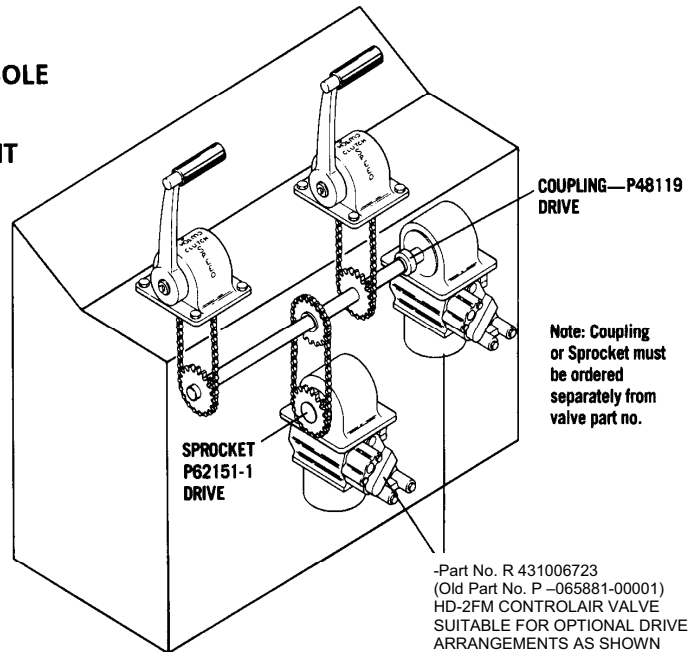
These control heads are used to mechanically connect two or more control stations, or as a remote mechanical drive for pneumatic control units.

Control head assembly is polished chrome-plated cast brass with a chrome handle.

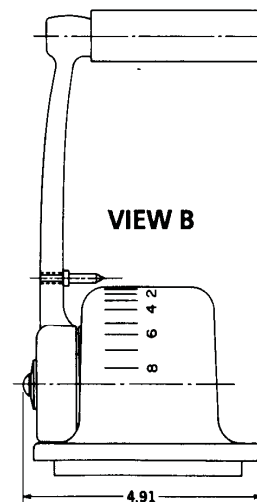
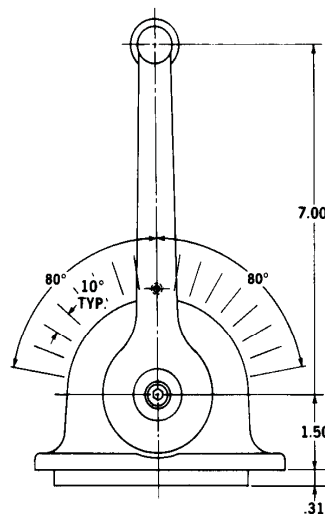
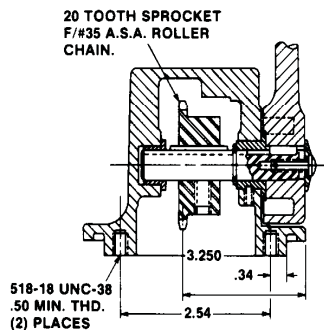
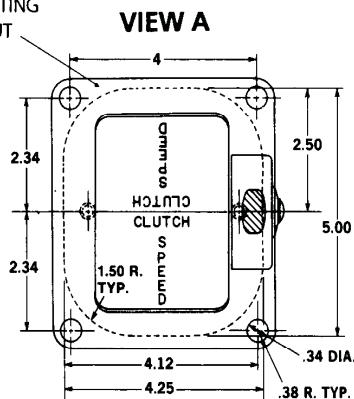
Part No.	Cover Marking	
P -062130-00101	Clutch-Speed	View A
P -062130-00103	No. 0 thru 8	View B

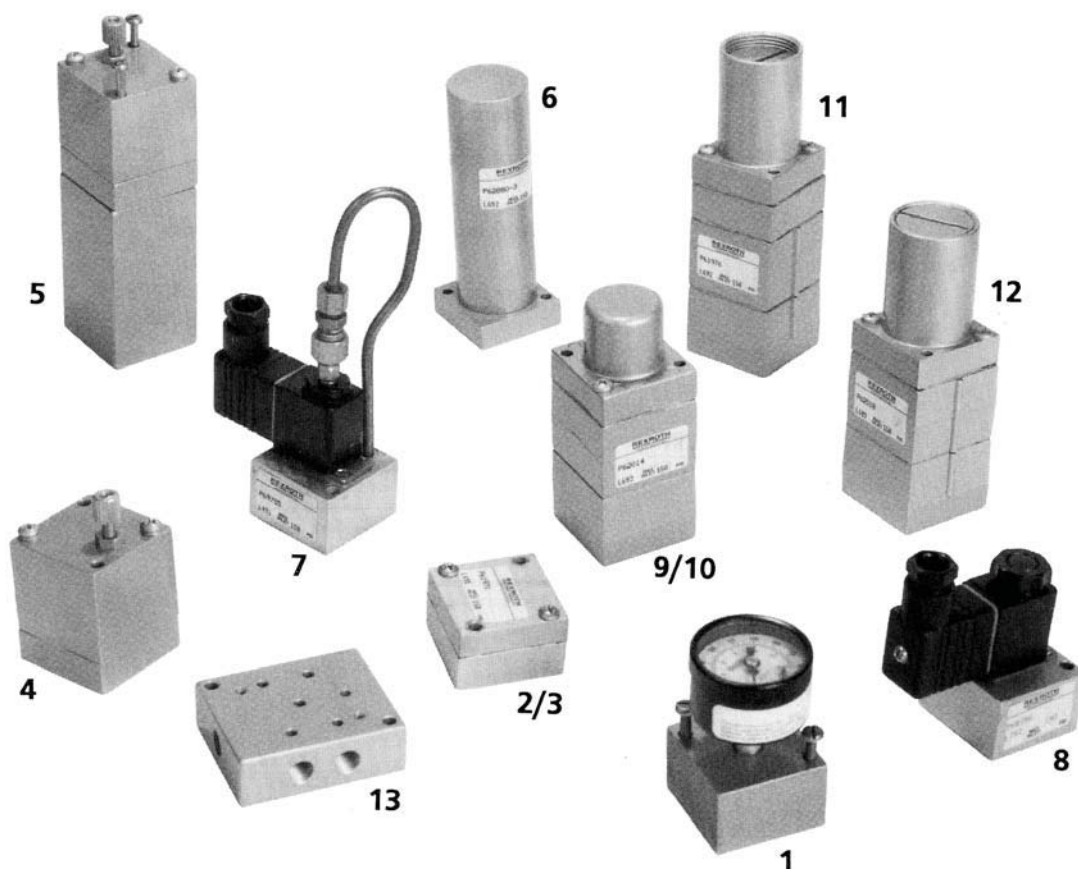


TYPICAL CONSOLE MOUNTING ARRANGEMENT



PANEL
MOUNTING
CUTOUT





REF.#	DESCRIPTION/Page	PART NO.	OLD PART NO.
1	Gauge Block p. 24	R431006136	P -062885-00000
2	Shuttle Valve , Marine Logic p. 25	R431005928	P -061971-00000
3	Check Valve p. 26	R431009231	P -062988-00002
4	Flow Control Valve p. 27	R431005931	P -061975-00002
5	Timer (Timed Application) p. 28	R431006335	P -064003-00000
5	Timer (Timed Release) p. 28	R431006336	P -064003-00001
6	Volume p. 29	R431006133	P -062880-00003
7	Solenoid Valve (N.O.) p. 30	R431007506	P -069785-00000
8	Solenoid Valve (N.C.) p. 31	R431007507	P -069786-00000
9	Multifunction Pneumatic Valve p. 32	R431005976	P -062016-00000 series
10	Multifunction Hydraulic Valve p. 33	R431005962	P -062014-00000 series
11	Multifunction Adjustable Valve p. 34	R431005932	P -061976-00000 series
12	Pressure Regulator p. 35	R431005985	P -062018-00000
13	Subplate p. 36	R431006017	P -062129-00001

Air Logic Valves and Accessories

Gauge Block

Rexroth
Bosch Group

Gauge Block



Purpose:

To read a pressure in a Logic System.

Installation:

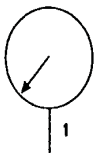
Gage may be mounted in any position on a logic panel or subplate. Two (2) mounting screws are provided with the subplate version. Screw part number R431001772 ((Old part No. P -049467-00013) is used for mounting to logic panel (2 required).

Maintenance:

Replace air gauge if damaged.

Notes:

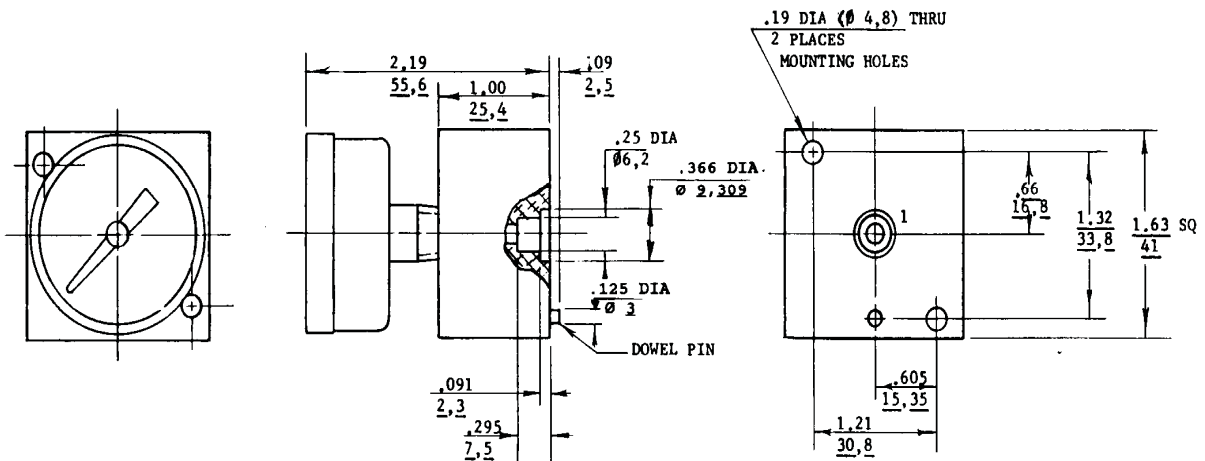
1. Working pressure: 150 psi max.
(10.3 bar)
2. Operating temperature: -40°F to 165 °F
(-40°C to 74°C)
3. Gauge 0 to 160° psig total graduation
20 psig figure intervals
2 psi graduation marks



Dimensions = $\frac{\text{IN}}{\text{mm}}$

Part Number	Old Part No.	Description
R431006136	P -062885-00000	Gauge Block less Subplate
R431009166	P -062885-00001*	Gauge Block with Subplate

* For subject dimensions see Page 36.



Air Logic Valves and Accessories

Shuttle Valve, Marine Logic

Rexroth
Bosch Group

Shuttle Valve, Marine Logic

Purpose:

The Shuttle Valve automatically selects and directs the flow of air from one or the other of two controlling devices to a common outlet. It serves to connect two independent lines to a common line without destroying the segregation.

Function:

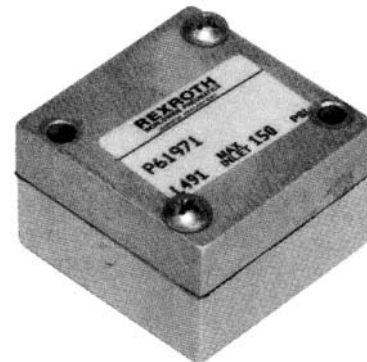
The diaphragm is moved by the higher pressure of the two inlets (ports 1 and 3) to seal off the other and allow the higher pressure to be delivered from port 5. There is always the air connection between the higher pressure inlet and the delivery line (port 5).

Installation:

Shuttle valves may be mounted in any position. The valve must be mounted on a logic panel or subplate. Two mounting screws are provided with the subplate version. Order screw number R431001772 (Old Part No. P -049467-00013) for mounting shuttle valve to a logic panel.

Maintenance:

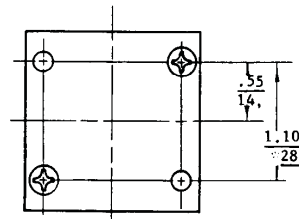
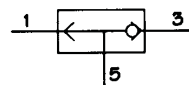
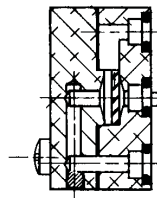
Kit part number R431006240 (Old Part No. P -063400-00000)



DIMENSIONS = $\frac{\text{IN}}{\text{mm}}$

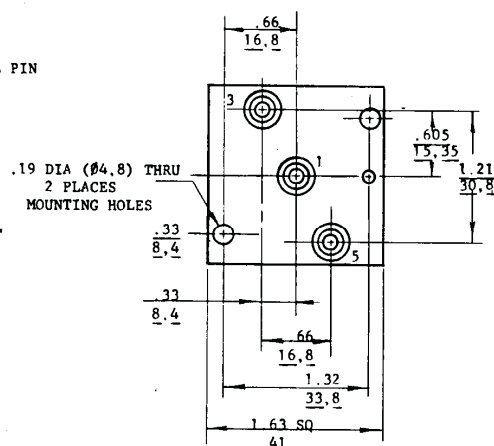
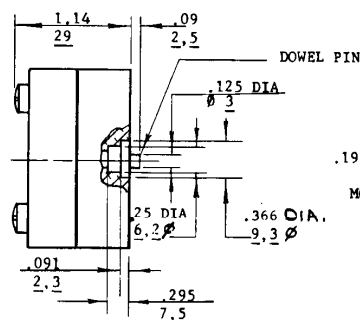
Notes:

1. Working Pressure: 125 psi max. (8.6 bar)
2. Operating temperature: -20°F to 165°F (-28°C to 74°C)
3. Flow rating-flow factor: $F = .14$
4. Shift differential: 1.0 psi max.



Part Number	Old Part No.	Description
R431005928	P -061971-00000	Valve less Subplate
R431005929	P -061971-00001*	Valve with Subplate

* For subplate dimensions see page 36.



Air Logic Valves and Accessories

Check Valve

Rexroth
Bosch Group

Check Valve



Purpose:

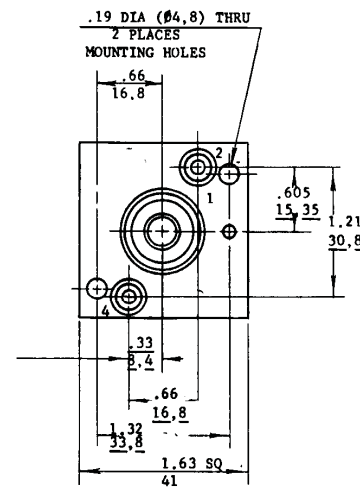
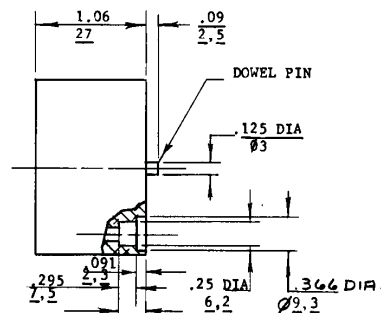
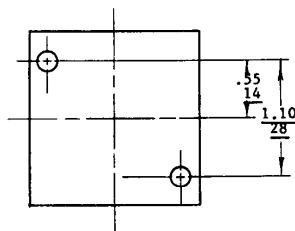
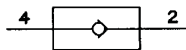
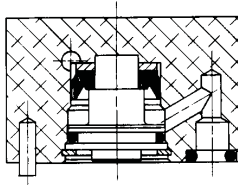
The valve allows air to flow freely in one direction, while not allowing any reverse flow.

Function:

In the rest position, the pre-stressed piston cup cuts off the connection between port 2 and 4. When the pressure at Port 2 exceeds the pre-stressing of the cup (3 psi or 0.21 bar), air flows to Port 4.. When the pressure at port 4 exceeds the pressure at port 2 (3 psi or 0.21 bar) the piston cup acts as check valve to prevent return flow.

Installation:

Check valves may be mounted in any position. Pay attention to the direction of airflow. The valve must be mounted on a logic panel or subplate. Two mounting screws are provided with the subplate version. Order screw no. R431001772 (Old Part No. P -049467-00013) (2 required) for mounting logic valve to a logic panel.



Maintenance:

Kit part number R431006239 (old P -063398-00000)

Notes:

1. Working Pressure: 150 psi max. (10.3 bar)
2. Operating temperature: -25°F to 165°F (-32°C to 74°C)
3. Flow rating-flow factor: F = 0.14
4. Cracking pressure: 3.0 psi (0.21 bar) max.

Part No.	Description
R431009231	Check Valve less Subplate

(old part no. P -062988-00002)

* For subplate see page 36.

Flow Control Valve

Flow Control Valve

27

Air Logic Valves and Accessories

Time Delay With Volume

Rexroth
Bosch Group

Time Delay With Volume



DIMENSIONS = $\frac{\text{IN}}{\text{mm}}$

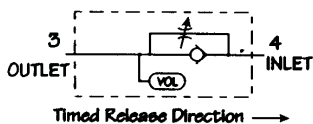
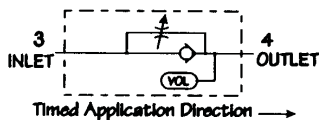
Purpose:

To time the sequence of system operations by controlling the rate of pressure increase to or release from a control sequence valve or actuating circuit.

Function:

(Timed Application)

Inlet air pressure is applied to Port 3, the internal check valve blocks flow, flow is diverted through the adjustable needle orifice and pressure increases at port 4 and the downstream control circuit at a timed rate determined by the orifice setting.



(Timed Release)

The charged downstream pressure at port 3 is blocked by the check valve and must be released through the adjustable orifice at a timed rate determined by the orifice setting.

Adjustment:

Rotate the adjustment knob clockwise to increase time delay; rotate counter-clockwise to shorten time delay.

Installation:

Install the time delay valve with the proper designation according to circuit symbol.

Two mounting screws are included with the subplate version. Order screw no. R431001775 (Old Part No. P -049467-00016) for mounting valve to logic panel (2 required).

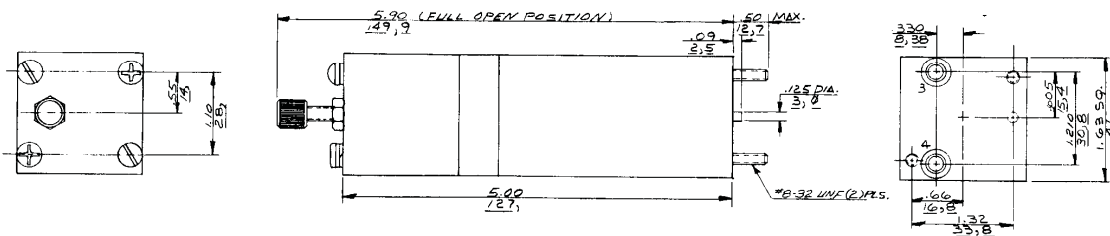
Notes:

1. Working Pressure 150 psi max. (10.3 bar)
2. Operating temperature -25°F to 165°F (-32°C to 74°C)
3. Flow rating-flow factor: F = .14
4. Volumetric capacity: 2.2 cu. in. (36 cc)

Part Number less Subplate	Old Part Number less Subplate	Part Number with Subplate*	Old Part Number with Subplate	Description
R431006335	P -064003-00000	R431009148	P -064003-00002	Timed Application
R431006336	P -064003-00001	R431006337	P -064003-00003	Timed Release

* For subplate dimensions see page 36.

Repair Kit (for all four part numbers) R431006224 (Old Part No. P -063393-00000)



Air Logic Valves and Accessories

Air Volume



Air Volume

Purpose:

The volume serves as a reservoir which can be used in conjunction with the flow control valve to provide additional capacity for improved or extended timing operations.

Installation:

Volumes may be mounted in any position. The volume must be mounted on a logic plate or subplate. Two mounting screws are provided with the subplate version. Order screw part number R431001762 (Old part number P-049467-00004) for mounting valve to logic plate.

Maintenance:

Repair by replacement.

Notes:

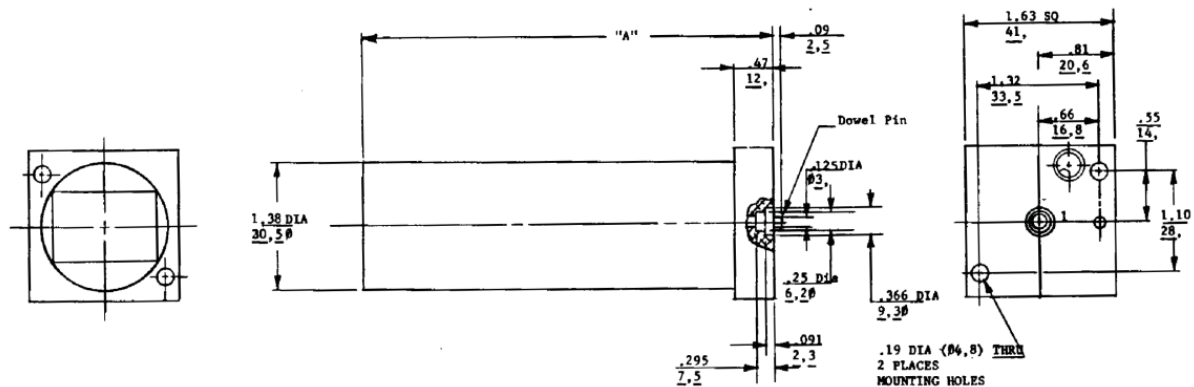
1. Working Pressure: 125 psi max.
(8.6 bar)
2. Operating temperature: -20°F to 165°F
(-29°C to 74°C)
3. Timing Volume: 3 cu. in. (49 cc)

Part Number	Old Part Number	Description
R431006133	P-062880-00003	Volume less Subplate

* For subplate see page 36.



Dimensions = $\frac{\text{IN}}{\text{MM}}$

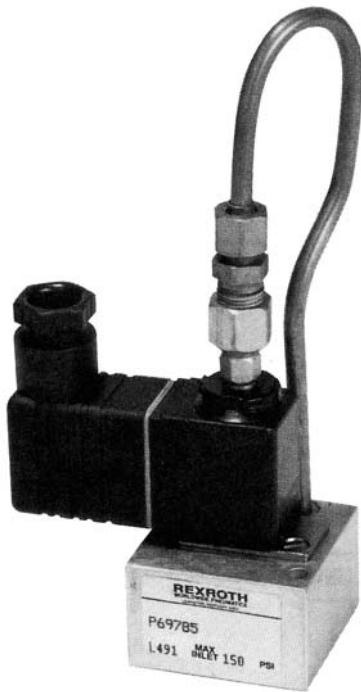


Air Logic Valves and Accessories

3-Way Solenoid Valve - Normally Open

Rexroth
Bosch Group

3-Way Normally Open Solenoid Valve



Purpose:

The valve provides operational control from remote locations by an electrical signal.

Function:

The valve functions as a normally open 3-way valve, single solenoid operator, spring return. Port 3 inlet to port 5 outlet normally open, port 1 to exhaust.

Installation:

The valve may be mounted in any position. The valve must be mounted on a subplate or logic plate. Two mounting screws are provided with the subplate version. Order screw part number R431001772 (Old Part No. P -049467-00013) for mounting the valve to a logic plate.

Maintenance:

Kit Part No. P -027420-00000

Notes:

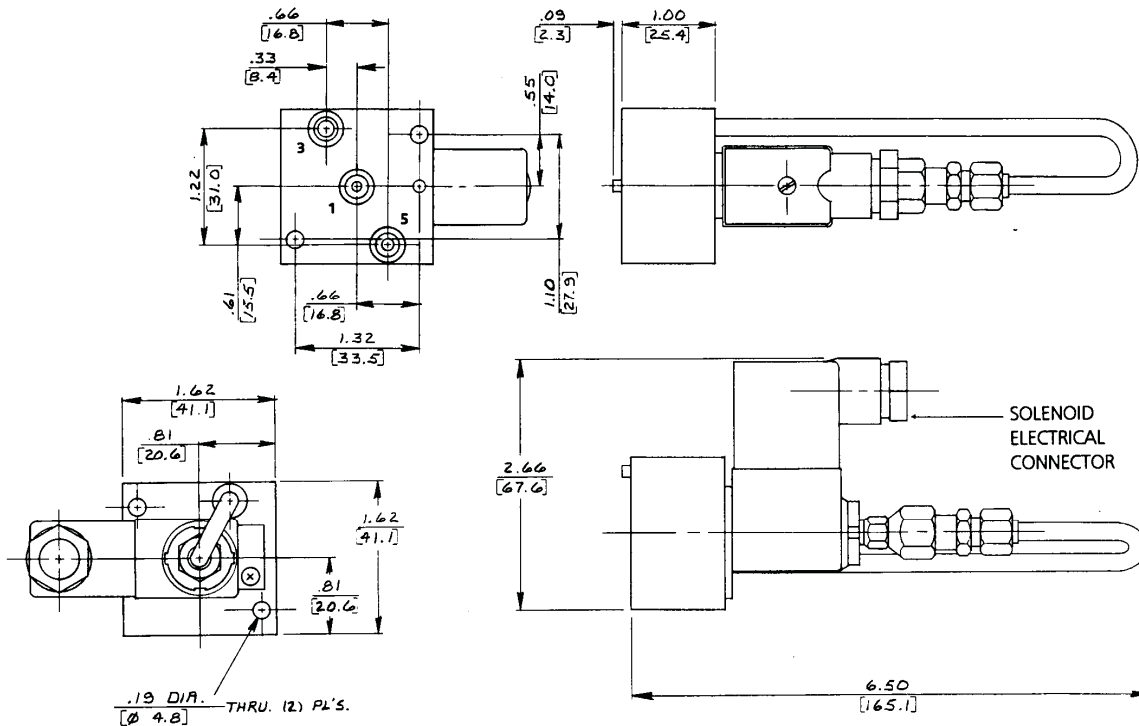
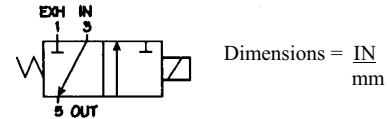
1. Working pressure: 120 psi (8.27 bar) max
2. Operating temperature: 25°F to 165°F (-32°C to 74°C)
3. Flow rating-flow factor: F = .14
4. Cracking pressure: 3.0 psi (0.2 bar) max
5. Voltage: 24 vdc

Replacement Solenoid Connectors

Part Number	Old Part Number	Description
8941004702	H -894100-4702	Non-Lighted
R432013881	P -067858-00000	Lighted

Part Number less Subplate	Old Part Number less Subplate	Part Number with Subplate*	Old Part Number with Subplate	Connector Type
R431007506	P -069785-00000	R431000904	P -028359-00000	Non-Lighted

* For subplate dimensions see page 36



3-Way Solenoid Valve - Normally Closed

3-Way Normally Closed Solenoid Valve

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Air Logic Valves and Accessories

3-Way Multifunction Logic, Pneumatic Signal
Preset Actuation Point

Rexroth
Bosch Group

3-Way Multifunction Logic Preset Actuation Point



Purpose:

The multifunction logic valve is used to sequence and interlock control system operations and can be connected for either normally open or normally closed control operation.

Function:

When the control signal at port 2 is less than the present control spring setting, port 3 and 5 are connected and port 1 is closed. When the control signal at port 2 exceeds the control spring setting, the valve is actuated to connect ports 1 and 5 and port 3 is closed.

Port 4 must be connected to exhaust for proper operation. Under proper conditions, port 4 can be used as an override signal.

Maintenance:

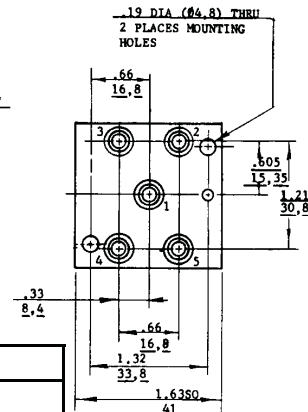
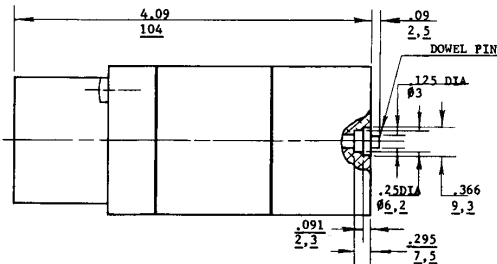
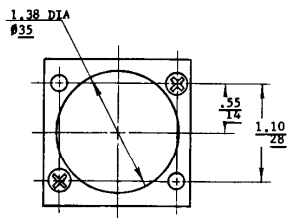
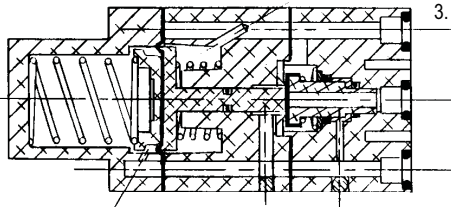
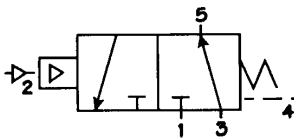
Kit part number R431006223
(Old part number P -063392-00000)

Installation:

The logic valve must be mounted on a subplate or logic plate. The two mounting screws are provided with the subplate version. If the valve is ordered separately for mounting to a logic plate, order mounting screws part no. R431001771 (old part no. (P -049467-00012) (2 required)

Notes:

1. Working pressure: 150 psi max (10.3 bar)
2. Operating temperature: -20°F to 165°F (-29°C to 74°C)
3. Flow rating-flow factor: F = .14



Actuation Pressures - PSI							
Part Number less Subplate	Old Part No. less Subplate	Part Number with Subplate*	Old Part No. with Subplate*	N.C.		N.O.	
				Max.	Min.	Max.	Min.
				Increasing Pilot	Decreasing Pilot	Increasing Pilot	Decreasing Pilot
R431005976	P -062016-00000	R431005982	P -062017-00000	18	3	25	10
R431005977	P -062016-00001			32	16	38	22
R431005978	P -062016-00002			47	30	53	36
R431005979	P -062016-00003	R431005983	P -062017-00003	60	40	66	48
R431005980	P -062016-00004	R431005984	P -062017-00004	82	62	88	70
	P -062016-00005	R431009173	P -062017-00005	100	78	104	86
	P -062016-00006†			82	62	88	70
	P -068659-00000†			60	40	66	48

† Valve for use with minimum differential pressure between control pressure and supply pressure.

* For subplate dimensions see page 36.

Dimensions = $\frac{\text{IN}}{\text{mm}}$

Function	Port 1	Port 2	Port 3	Port 4	Port 5
NO 3 Way	Exhaust	Pilot	Input	Vent	Output
NC 3 Way	Input	Pilot	Exhaust	Vent	Output

3-Way Multifunction Logic - Hydraulic Signal

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3-Way Multifunction - Pneumatic Signal Adjustable Actuation Point

3-Way Multifunction Logic Adjustable Actua- tion Point



The adjustable multifunction logic valve is used to sequence and control system operations and can be connected for either normally open or normally closed control operation.

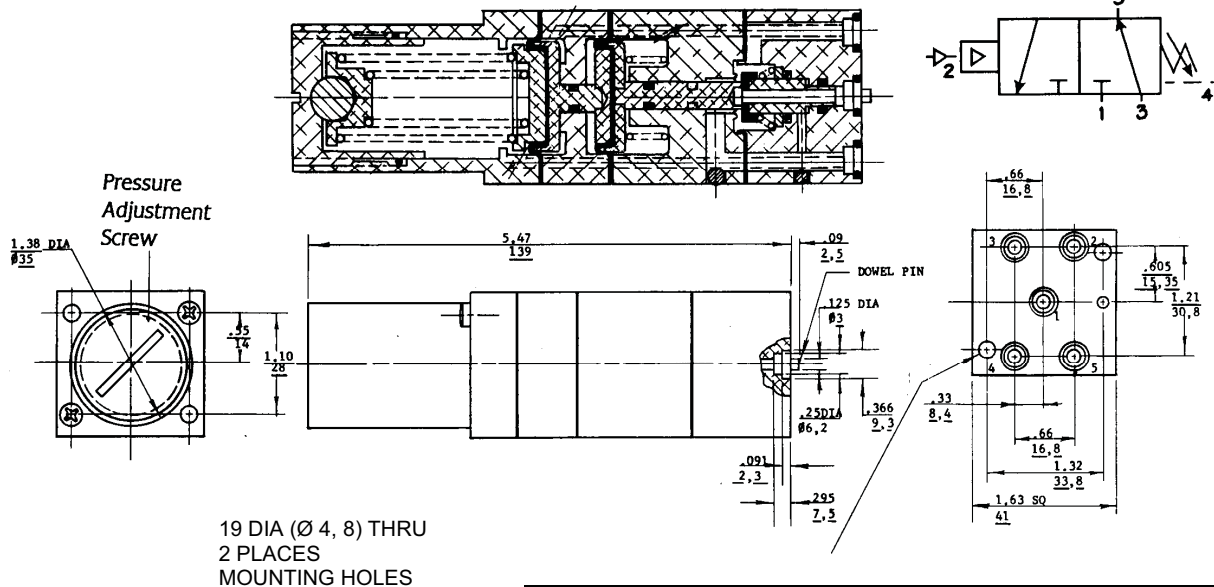
The pressure actuation point setting is adjustable by turning the adjustment screw clockwise for pressure increase, or counter-clockwise for pressure decrease.

Port 4 must be connected to exhaust for proper operation.
Under proper conditions port 4 can be used as an override
signal.

Kit part number R431006380
(Old part number. P -064201-00000)

1. Working pressure: 150 psi max
(10.3 bar)
2. Operating temperature: -20°F to 165°F
(-29°C to 74°C)
3. Flow rating-flow factor: F = .14
4. Range: Cracking pressure to reseal

R431005932	4 psi (0.28 bar) max
R431005933 & R431005934	7 psi (0.48 bar) max



Part Number less Subplate	Old Part No. less Subplate	Part Number with Subplate*	Old Part No. with Subplate	Adjustable Trip Range psi (bar)
R431005932	P -061976-00000	R431005936	P -061978-00000	5-40 (0.34-2.76)
R431005933	P -061976-00001			40-80 (2.76-5.52)
R431005934	P -061976-00002			80-120 (5.52-8.27)
R431005935	P -061976-00003†			80-120 (5.52-8.27)

†Valve for use with minimum differential pressure between control pressure and supply pressure.

Function	Port 1	Port 2	Port 3	Port 4	Port 5
N0 3 Way	Exhaust	Pilot	Input	Vent	Output
NC 3 Way	Input	Pilot	Exhaust	Vent	Output

Air Logic Valves and Accessories

Pressure Regulating Valve

Rexroth
Bosch Group

Pressure Regulator

Purpose:

The pressure regulating valve serves to reduce a primary pressure with a maximum of 150 psi (10.3 bar) to an adjustable outlet pressure within the range of 0 to 140 psi (0 to 9.65 bar) or 0 to 75 psi (0 to 5.2 bar).

Function:

The pressure adjusting screw loads the control spring to determine the output pressure setting. The spring load lifts the inlet valve off its seat and supply pressure flows from port 3 out port 5 and below the control diaphragm. When the diaphragm pressure and adjusted spring load reach a balance, the inlet valve closes off the connection between port 3 and port 5, and the delivery pressure is maintained.

The regulator is self-maintaining. If delivery pressure drops, the inlet valve will reopen to deliver additional pressure to balance the adjusting spring load. If delivery pressure increases, the exhaust valve will open to relieve the excess pressure through port 1.

Port 4 must be connected to exhaust for proper operation.

The outlet pressure may be changed by turning the adjusting screw clockwise for pressure increase, or counter-clockwise for pressure decrease.

Maintenance:

Kit part number R431006319
(old part number P-063966-00000)

Installation:

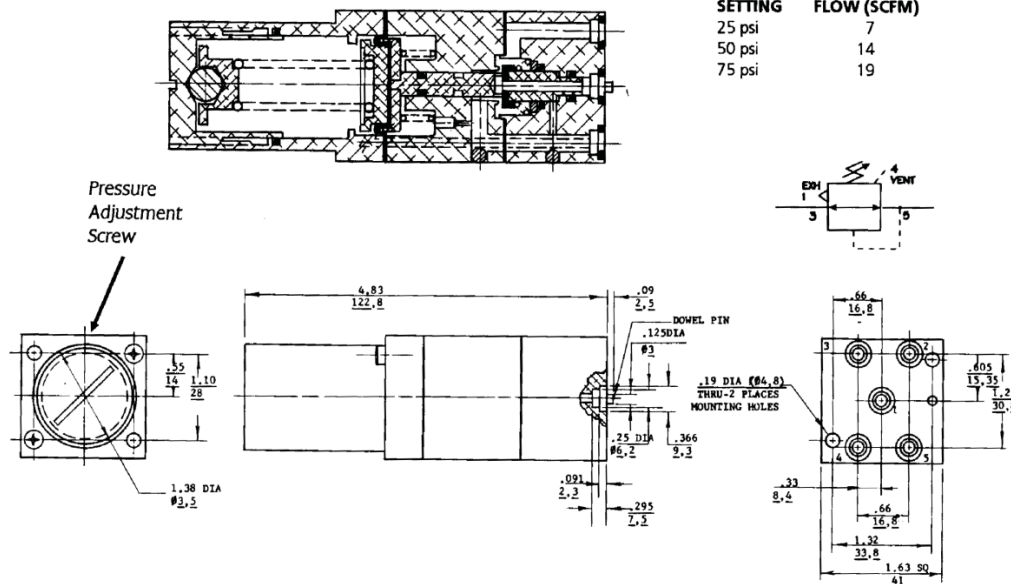
A pressure regulating valve may be mounted in any position. Pay attention to the direction of air flow. The valve has to be mounted on a subplate or logic plate. Two screws are provided with the subplate version. Order screw part number R431001771 (old part number P-049467-00012) if the valve is ordered separately for mounting to a logic plate.



Notes:

1. Working pressure: 150 psi max inlet (10.3 bar)
2. Operating temperature: -20°F to 165°F (-29°C to 74°C)
3. Flow rating-flow factor: F = .14
4. Flow characteristics : (Supply pressure @ 100 psi with 50% pressure drop from set pressure)

SETTING	FLOW (SCFM)
25 psi	7
50 psi	14
75 psi	19



Part No. less Subplate	Old Part No. less Subplate	Adjustable Range psi (bar)
R431005985	P-062018-00000	0-75 (0-5.17)
R431005986	P-062018-00001	0-140 (0-9.65)

* For subplate dimensions see page 36.

Dimensions = $\frac{\text{IN}}{\text{mm}}$

Air Logic Valves and Accessories

Subplate

Rexroth
Bosch Group

Purpose:

For mounting all logic valves.

Installation:

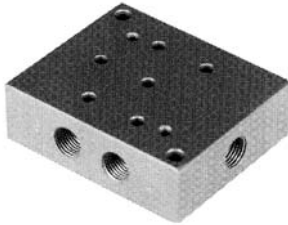
Subplate may be mounted in any position. Two (2) mounting holes are provided in the subplate

Maintenance:

Replace if damaged.

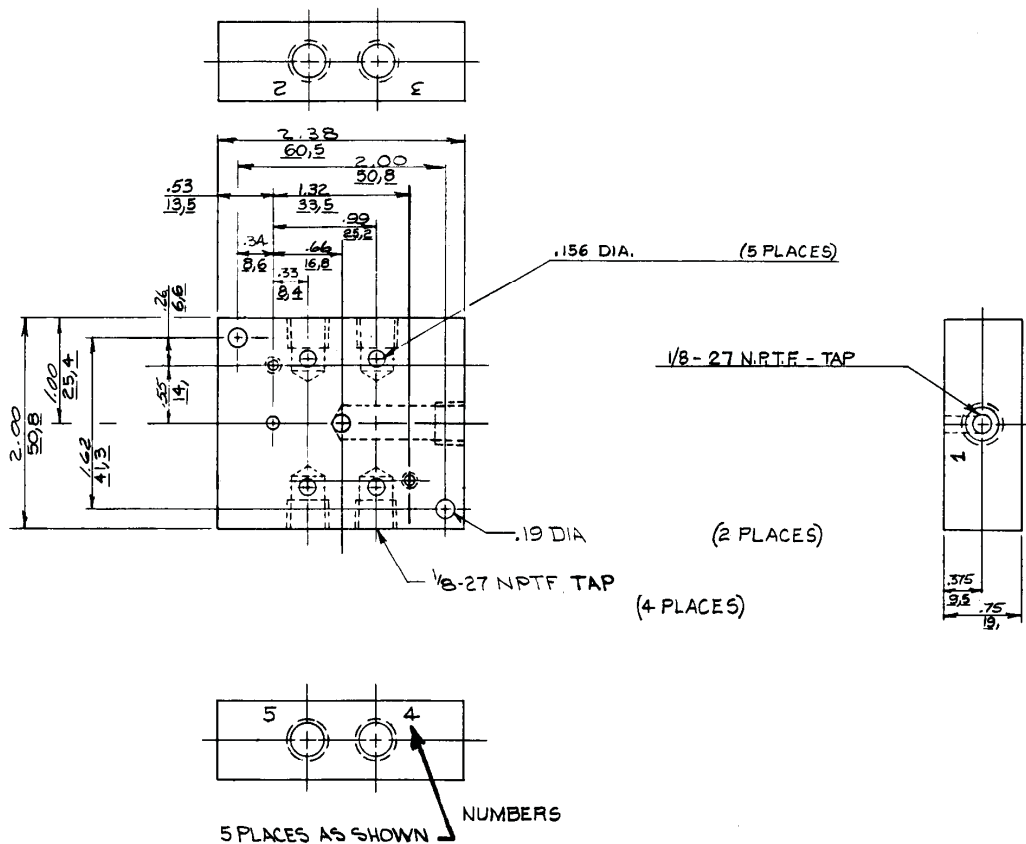
Notes:

1. Working pressure 150 psi max. (10.3 bar)
2. Operating temperature -40°F to 165°F
(-40°C to 74°C)



Part Number	Old Part Number	Description
R431006017	P-062129-00001	Subplate

Dimensions = $\frac{\text{IN}}{\text{mm}}$



Air Logic Valves and Accessories

Hydraulic Shuttle Valve



Hydraulic Shuttle Valve

Part Number R431006763 (Old Part No. P -066143-00000)

Purpose:

The Hydraulic Shuttle Valve automatically connects pressure from one or the other of two input lines and directs the flow to a common outlet. The valve serves to connect two segregated lines to a common line without destroying the segregation.

applied to one inlet port the ball is forced over to seal the opposite inlet port of the valve and fluid flows out the common outlet. The opposite inlet port is sealed from both the outlet and the pressurized inlet port.

Installation:

The Shuttle Valve can easily be supported by piping alone, but mounting holes are included for installations with vibration or long pipe runs.

Adjustment:

The Shuttle Valve does not require adjustment. Reference service bulletin B6-104.03H for parts.

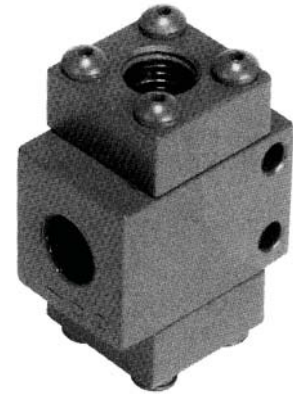
Operations:

Maximum Operating Pressure is 500 psi (34.5 bar). Temperature range is -40°F to 160°F (-40°C to 71°C) with intermittent exposure up to 200°F (93°C).

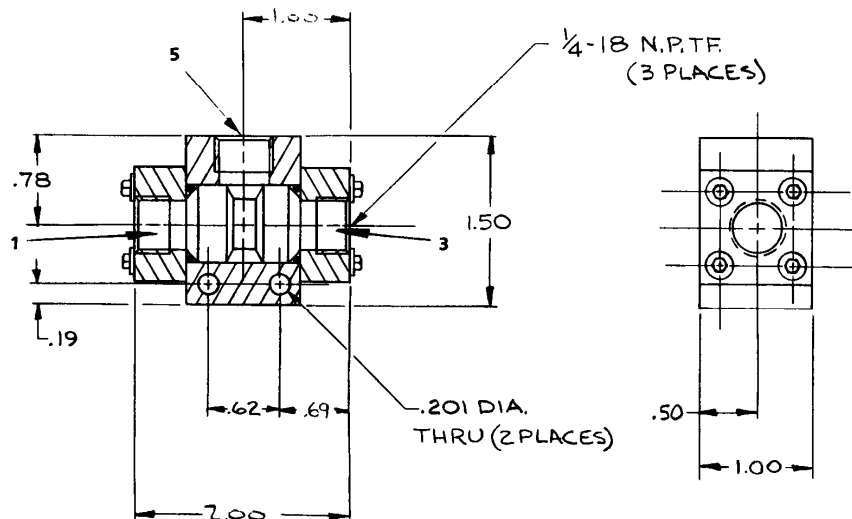
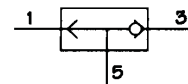
The Shuttle Valve has 3 ports (1/4" NPT) as shown in the assembly view. When pressure of more than 2.5 psi (0.17 bar) is

Maintenance:

Note: A 3/32" hex allen wrench is required. Replace the cover seals if damaged or worn. The valve cartridge is a non-serviceable assembly and should be replaced as a complete unit if required.



Dimensions = $\frac{\text{IN}}{\text{mm}}$



Associated Components

Shuttle Valve, Inline

Rexroth
Bosch Group

Ports

Type
Supply Pressure 200 psi max.
Temperature range -40°F to 160°F; intermittent 200°F is permissible.
Media Air or inert gas

Application data

The Shuttle Valve automatically selects and directs the flow of air from one or the other of two controlling devices to a common outlet. It serves to connect two independent lines to a common line without destroying the segregation.



	Port (NPT)	Valve Part No.	Old Part No.	Weight lbs. (kg)	Flow C _v	Repair Kit
	1/8"	R431003347	P -054350-00001	0.44 (0.20)	1.25	R431005614
	1/4"	R431003348	P -054350-00002	0.44 (0.20)	1.58	R431005614
	3/8"	R431003349	P -054350-00003	1.19 (0.54)	3.61	R431005615
	1/2"	R431003350	P -054350-00004	1.19 (0.54)	5.12	R431005615

Repair kits include diaphragm and gasket.

Operating Characteristics

FEATURES-

SIMPLE-Contains only one moving part-an easily replaceable fabric reinforced synthetic rubber diaphragm.

Two body segments, a gasket and four screws complete the assembly.

It has no spring; nothing can bind or stick. Its compact size presents no installation problems.

LIGHTWEIGHT-The Shuttle Valve can easily be supported by piping alone.

Mounting feet are included, however, for installations with vibration or long pipe runs.

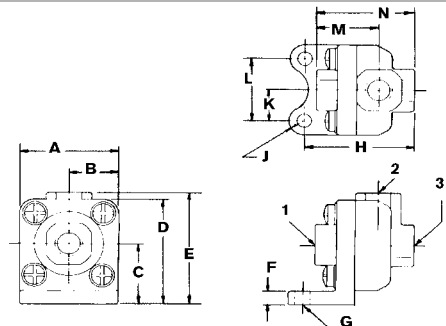
SENSITIVE-Will seal off the opposite inlet line with less than one psi pressure differential.

LONG LIFE-Tests have shown no diaphragm wear after hundreds of thousands of cycles.

► To order, refer to port size and part number.

When a pressure differential of one psi or more exists at either inlet port, the higher pressure forces the diaphragm to seal against the opposite

The low (or zero) pressure inlet port is sealed from both the outlet and the opposite inlet port.



DIMENSIONS

DRYSEAL NPTF Ports		
ALL PORTS	1/8"-27 and 1/4"-18	3/8"-18 and 1/2"-14
A	1 7/8"	2 1/2"
B	15/16"	1 1/4"
C	1 1/2"	1 7/8"
D	2 7/16"	3 1/8"
E	2 5/8"	3 3/4"
F	9/32"	5/16"
G dia.	9/32"	9/32"
H	2 1/8"	3 1/4"
J radius	9/32"	21/64"
K	21/32"	29/32"
L	1 5/16"	1 13/16"
M	1 7/32"	2 1/8"
N	1 29/32"	3 3/8"

Associated Components

Quick Release Valve, Inline
Aluminum body version, 1/4" - 1" NPT

Rexroth
Bosch Group

Technical Data

Type	Aluminum Body, for in-line or right-angle piping
Working Pressure	200 psi (13.8 bar) max. on 1/4" and 3/8"
	150 psi (10.3 bar) max. on 1/2" thru 1" sizes
Temperature Range	-40°F to 160°F, 200°F intermittent (-40° to 71°C, 93°C intermittent)
Media	Air or inert gas
Port Size	1/4" to 1" NPTF



Port (NPT)	Piping	Valve Part No.	Old Part No.	Weight lbs. (kg)	C _v in to out	C _v out to exh.	Repair Kit	Old Repair Kit
1/4"	Inline	R431003038	P -052935-00002	0.64 (0.29)	1.77	2.50	R431005410	P -060213-00002
1/4"	Right angle	R431003043	P -052935-00021	0.64 (0.29)	1.77	2.50	R431005410	P -060213-00002
3/8"	Inline	R431003039	P -052935-00003	0.64 (0.29)	2.73	3.08	R431005410	P -060213-00002
3/8"	Right angle	R431003044	P -052935-00031	0.64 (0.29)	2.73	3.08	R431005410	P -060213-00002
1/2"	Inline	R431003040	P -052935-00004	1.44 (0.46)	5.00	5.50	R431005412	P -060214-00002
3/4"	Inline	R431003041	P -052935-00006	2.88 (1.31)	9.70	10.55	R431005414	P -060215-00001
1"	Inline	R431003042	P -052935-00008	3.32 (1.51)	11.95	13.45	R431005414	P -060215-00001

Mounting bracket for 1/4" and 3/8" models: Part no. R431003093 (old part no. P -053067-00000).

Sizes 1/2" through 1" have integral mounting brackets.

Repair kits include diaphragm and gasket.

Inch dimensions: QRV-Aluminum (in-line configuration shown)

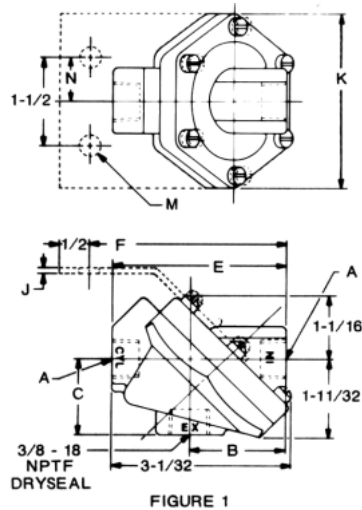


FIGURE 1

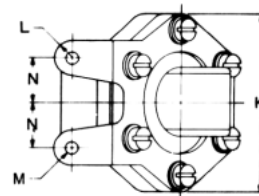


FIGURE 2

Inch dimensions: QRV-Aluminum

Fig. No.	A NPTF Dryseal	B	C	D	E	F	G	H	J	K	L	M (2 Holes)	N	O
Fig. 1	1/4-18	1 3/4	1 11/32	—	3	3 3/8	—	—	1/16	3	—	11/32 Ø	3/4	—
Fig. 1	3/8-14	1 3/4	1 11/32	—	3	3 3/8	—	—	1/16	3	—	11/32 Ø	3/4	—
Fig. 2	1/2-14	1 3/4	1 11/32	1 1/2	3 11/16	3 7/16	3 15/32	4 1/8	3/8	3 15/16	3/8 R.	9/32 Ø	1	7/8
Fig. 2	3/4-14	2 11/16	2 21/32	2 1/16	5 1/4	5	4 13/16	5 1/2	7/16	6 1/2	1/2 R.	13/32 Ø	1 1/2	1 1/8
Fig. 2	1"-11 1/2	2 11/16	2 21/32	2 1/16	5 1/4	5	4 13/16	5 1/2	7/16	6 1/2	1/2 R.	13/32 Ø	1 1/2	1 1/8

Associated Components

Relayair® Valve, Type "H" & "L"
Pilot operated sequence valves

Rexroth
Bosch Group

"H" and "L" Relayair® Valves

Type Pilot operated sequence valve
Supply Pressure 200 PSI Max. Except P -059158-00045 (300 PSI)
Control Pressure 140 psi max.
Temperature range -40°F to 160°F
Media Air or inert gas
Port Size:
Control port (port 10), breather port (port 1): 1/4" NPT
All other ports: 3/8" NPT



Operating Characteristics

The Relayair® Valve has three basic uses:

1. As a nongraduated relay to provide a large flow of air from a separate source when piloted by small amount of control media and to stop this flow and exhaust the air to atmosphere when the control pressure is vented.
2. As an interlock to govern the flow in one circuit by placing its control in another independent circuit.
3. As a pressure-sensitive sequence valve for such circuit functions as timing, cycling, etc.

Application Notes

RELAYAIR Valves operated by pilot pressures less than 35 psi utilize one control spring while valves operated by pilot pressures greater than 35 psi use two springs. To obtain pilot pressures less than 10 psi, two diaphragms are used in series.

Model	Part No.	Old Part No.	Pilot Press. (psi)	Max. Supply Press. (psi)	Max. Control Press. (psi)	Weight lbs. (kg)
H-5-D	R431005195	P -059567-00003	3	200	140	15 (6.8)
H-5-D	R431005196	P -059567-00012	12	200	140	15 (6.8)
H-5	R431004910	P -059155-00010	10	200	140	5 (2.3)
H-5	R431004911	P -059155-00015	15	200	140	5 (2.3)
H-5	R431004912	P -059155-00020	20	200	140	5 (2.3)
H-5	R431004913	P -059155-00025	25	200	140	5 (2.3)
H-5	R431004914	P -059155-00030	30	200	140	5 (2.3)
H-5	R431004915	P -059155-00035	35	200	140	5 (2.3)
H-5	R431004916	P -059155-00045	45	200	140	5 (2.3)
H-5	R431004917	P -059155-00050	50	200	140	5 (2.3)
H-5	R431004918	P -059155-00060	60	200	140	5 (2.3)
H-5	R431004919	P -059155-00070	70	200	140	5 (2.3)
H-5	R431004920	P -059155-00080	80	200	140	5 (2.3)
H-5	R431004921	P -059155-00090	90	200	140	5 (2.3)
H-5	R431004922	P -059155-00100	100	200	140	5 (2.3)
H-5	R431004923	P -059155-00110	110	200	140	5 (2.3)
H-5	R431004927	P -059158-00045	45	300	140	5 (2.3)
L-2-A	R431006062	P -062482-00040	4	200	300	5.75 (2.6)
L-2-A	R431006063	P -062482-00070	70	200	300	5.75 (2.6)
L-2-A	R431006064	P -062482-00085	85	200	300	5.75 (2.6)
L-2-A	R431006065	P -062482-00110	110	200	300	5.75 (2.6)
L-2-A	R431006067	P -062482-00135	135	200	300	5.75 (2.6)
L-2-A	R431006068	P -062482-00150	150	200	300	5.75 (2.6)
L-2-A	R431006573	P -065215-00000	220	200	300	5.75 (2.6)

Repair Kits:

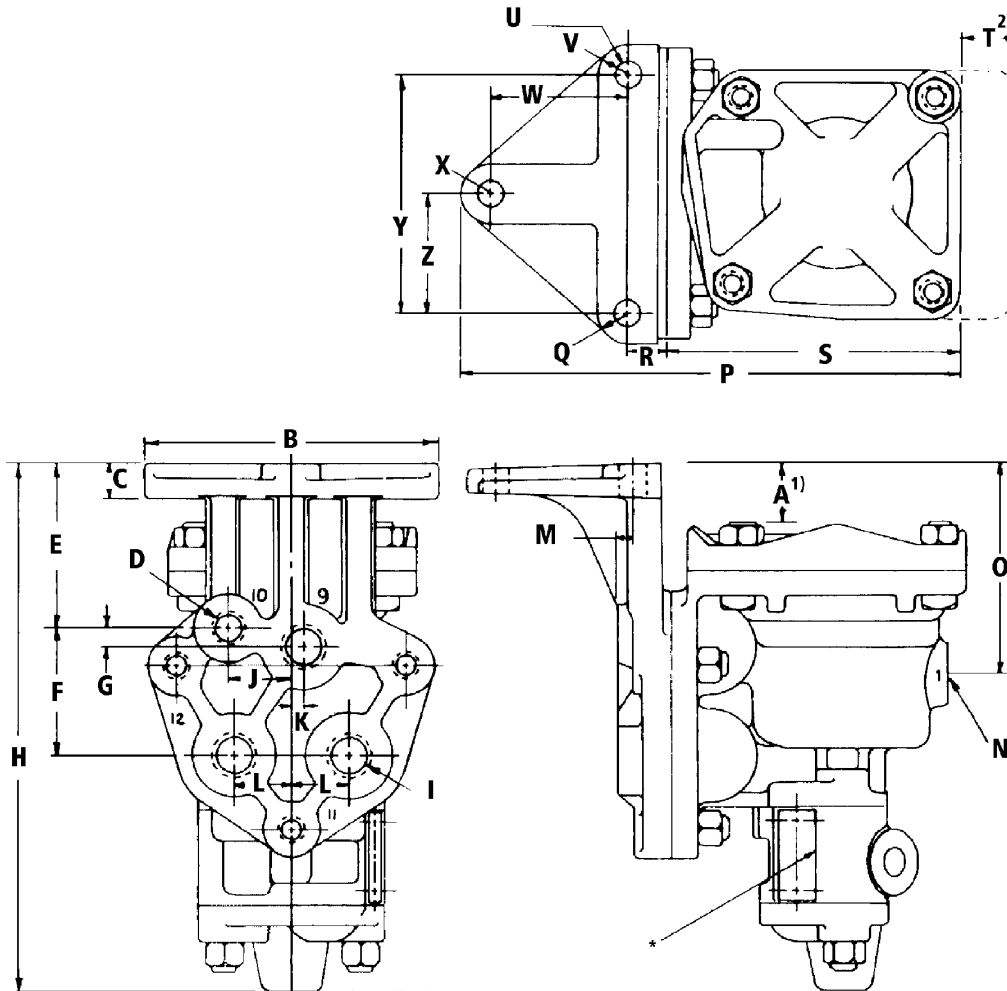
H-5-D	R431005479	P -060310-00000	H-5-D rubber parts repair kit
H-5	R431005478	P -060309-K0000	H-5 rubber parts repair kit
L-2-A	R431005480	P -060311-00000	L-2-A rubber parts repair kit
	R431005482	P -060312-K0000	Metal parts repair kit, all models up to 200 psi supply
	R431005483	P -060313-00000	Metal parts repair kit, all models up to 300 psi supply

Associated Components

Relayair® Valve, Type "H" & "L"
Pilot operated sequence valves

Rexroth
Bosch Group

H-5 Relayair Valve Dimensions



9 = Exhaust
10 = Pilot
11 = Delivery
12 = Supply

* Nameplate location.

H-5 Relay Dimensions

A ¹⁾	B	C	D - NPTF	E	F	G	H	I - NPTF	J	K	L	M
13/16	4-3/8	1/2	1/4-18	2-7/16	1-7/8	9/32	7-3/4	3/8-18	15/16	3/16	27/32	1/4
N - NPT	O	P	Q	R	S	T ²⁾	U (3 places)	V	W	X	Y	Z
1/4-18	3-1/8	7-3/8	Ø7/16	9/16	4-3/8	13/16	13/32	Ø7/16	2	Ø7/16	3-1/2	1-3/4

1) H-5 shown. "A" for H-5-D = 1/8"; for L-2-A = 5/16".

2) Clearance required for removal.

* Nameplate location.

Associated Components

Three-Position Cylinder
Spring centered

Rexroth
Bosch Group



The three-position cylinder is a fixed position device when controlled by a four-way, three-position, exhaust-center, control valve such as the "A" or "D" PILOTAIR® Valve. The cylinder has a wide range of applications, being particularly suited for shifting transmissions and positioning hydraulic valves. It is corrosion-resistant and constructed of lightweight, die-cast, anodized aluminum heads, pistons and body.

Maximum stroke of the piston rod is one inch on each side of the center position, making a total piston rod travel of two inches. External envelope dimensions of the cylinder do not change, but shorter strokes are available in increments of 1/16-inch for each position. The complete piece number of the cylinder and the piece number of the piston stop will have an identical four-digit suffix. The first digit denotes the stroke in inches; the last three digits show the stroke in thousandths of an inch.

INSTALLATION & ADJUSTMENT

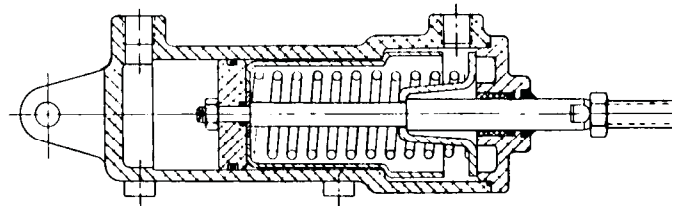
Because cylinders are installed at the end of an air system, they are vulnerable to dirt and moisture carried through the air lines. Therefore, before installing the three-position cylinder, all air lines in the system should be blown clean. It is recommended that the cylinder mounted with the ports facing down. Gravity can then assist in preventing foreign material from accumulating in the cylinder by removing it through the control valve exhaust.

In providing a mounting for the cylinder, an adjustable link must be included between the piston rod and the lever to which the rod is connected. The cylinder stroke should be checked in its center position when aligned with the lever to be operated. Check for exact register, making sure the clevis pin is free from load in the center position.

This procedure will allow any inaccuracies in leverage ratio or manufacturing tolerance to be absorbed at the extremes of the stroke where exact registration is of least importance. Also, any inaccuracies will be divided between the extreme positions. When alignment is done at one of the extreme positions, inaccuracies are all in the same direction.

OPERATION

Maximum operating pressure of the three-position cylinder is 150 psi at a temperature range of -40° F to 180° F. The cylinder is held in its center position by a coil spring caged on the piston rod. When air pressure is supplied to the cap-end port, the piston rod moves to its extended position. When pressure is supplied to the head-end port, the piston rod moves to its retracted position.



ASSEMBLY VIEW

MAINTENANCE

Periodically disassemble the cylinder for cleaning, inspection and lubrication. Clean all metal parts with a nonflammable solvent, and wash all rubber parts with soap and water. Rinse thoroughly and blow dry with a low-pressure air jet. Replace those parts which are damaged or worn.

Reassemble the cylinder, using the exploded and assembly views as reference. No special tools are required. To avoid cutting or nicking the piston O-ring, carefully insert the piston rod assembly into the cylinder bore with the piston tilted at a slight angle. As the assembly proceeds, lubricate all O-rings with Dow Corning 55M grease.

Max. operating pressure: 150 psi (10.3 bar)
Temperature range: -40°F to 180°F (-40°C to 82°C)

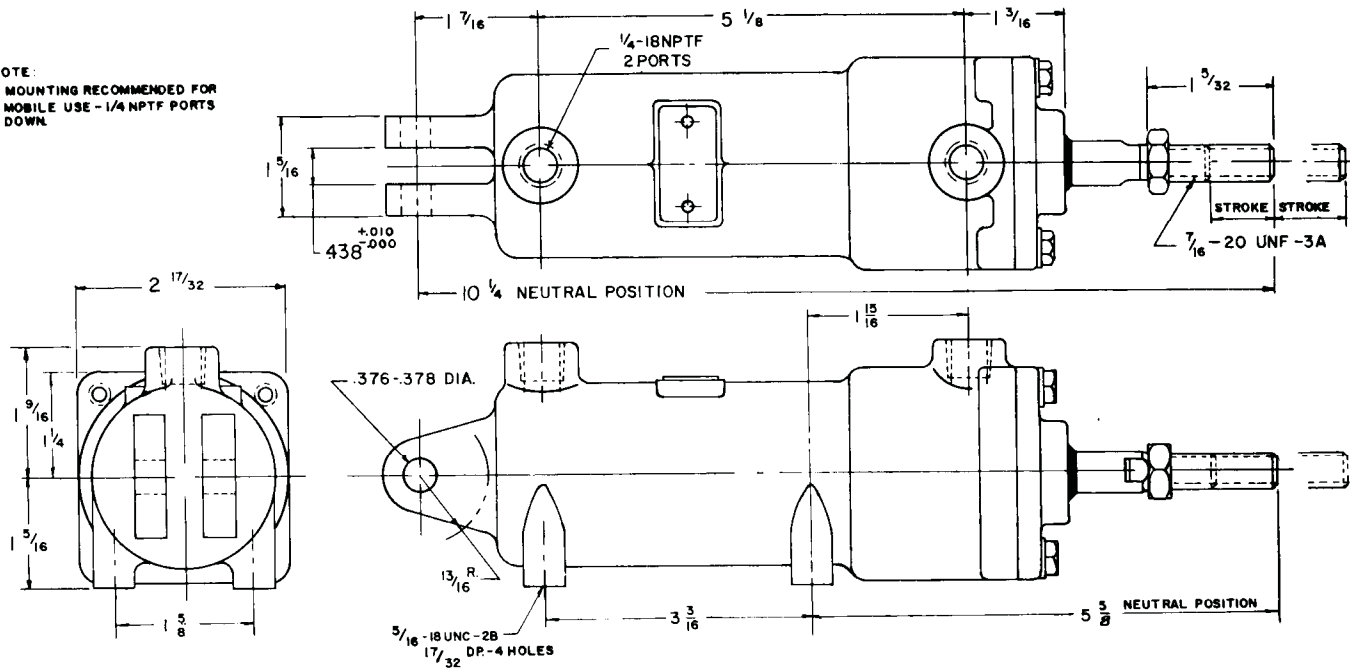
Associated Components

Three-Position Cylinder
Spring Centered

Rexroth
Bosch Group

NOTE:

MOUNTING RECOMMENDED FOR
MOBILE USE - 1/4 NPTF PORTS
DOWN



Part No.	Old Part No.	Stroke*
R431004060	P -057378-00312	0.312
R431004053	P -057378-00375	0.375
R431004053	P -057378-00438	0.438
R431004055	P -057378-00500	0.500
R431004056	P -057378-00625	0.625
R431004057	P -057378-00688	0.688
R431004058	P -057378-00750	0.750
R431004059	P -057378-00875	0.875
R431004060	P -057378-01000	1.000
R431004943	P -059211-00000	1.062

*Effective stroke each side of center.

Repair kit part no. R431005249 (old part no. P -059819-K0000)

Associated Components

A-2-H Actuator

Rexroth
Bosch Group



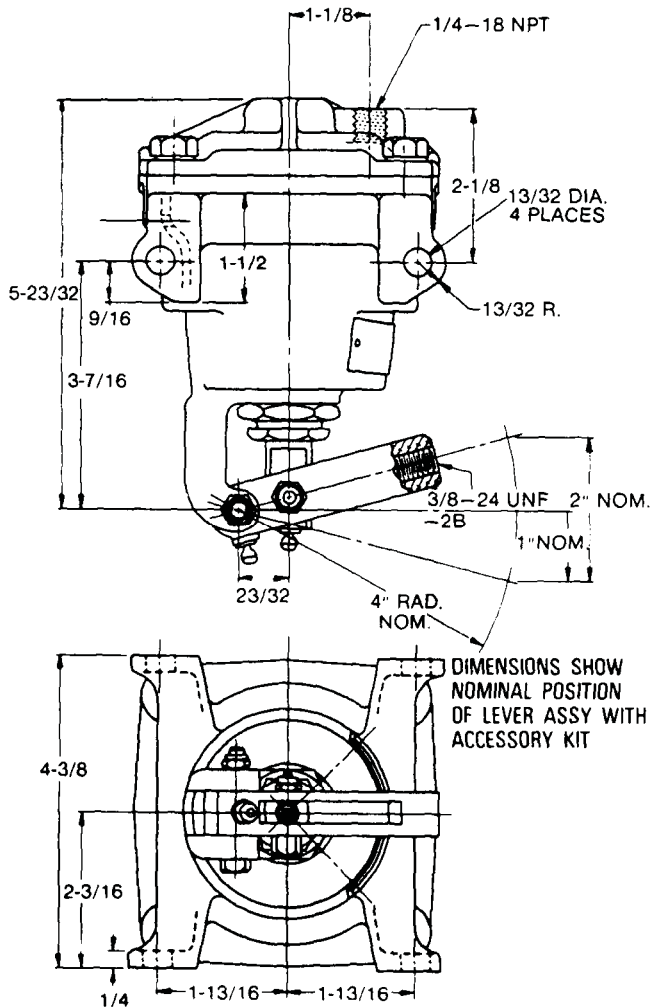
Pressure Range psi (bar)	Description	Part No.	Old Part No.
3-15 (0.21 - 1.0)	Less Accessories	R431005216	P -059718-00010
3-15 (0.21 - 1.0)	With Accessories	R431005217	P -059718-00011
10-60 (0.69 - 4.14)	Less Access.-w/Drain Hole	R431005745	P -061289-00010
10-60 (0.69 - 4.14)	Less Accessories	R431004009	P -057159-00010
10-60 (0.69 - 4.14)	With Accessories	R431004010	P -057159-00011
10-60 (0.69 - 4.14)	With Ball Joint Kit	R431004011	P -057159-00012
15-80 (1.0 - 5.52)	With Accessories	R431004529	P -058430-00011
35-90 (2.41 - 6.21)	Less Accessories	R431003983	P -057086-00010
35-90 (2.41 - 6.21)	With Accessories	R431003984	P -057086-00011

Force rating: 410 in.-lb. degrees (46.3 Nm)

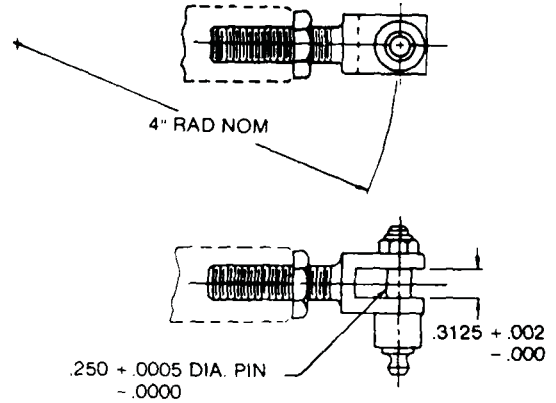
Nominal stroke: 2" (50.8 mm), adjustable from 1 7/8" to 2 1/4" (47.63 to 57.15 mm)

Weight: 3 lbs. (1.36 kg)

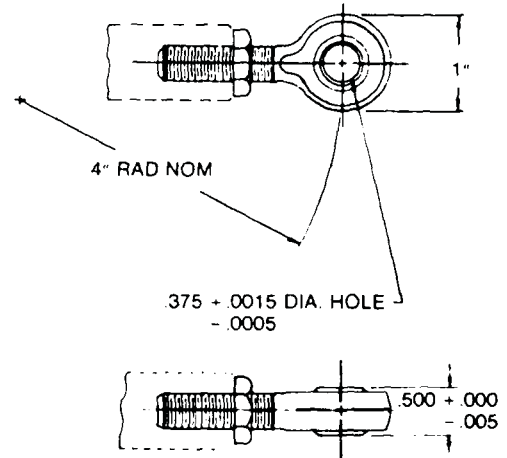
Integral mounting lugs make installation simple and clean



Accessory kit, part no. R431004143
(Old part no. P -057415-00000)



Operating lever kit, part no. R431004145
(Old part no. P -057416-00000)



Associated Components

AA-1 Actuator

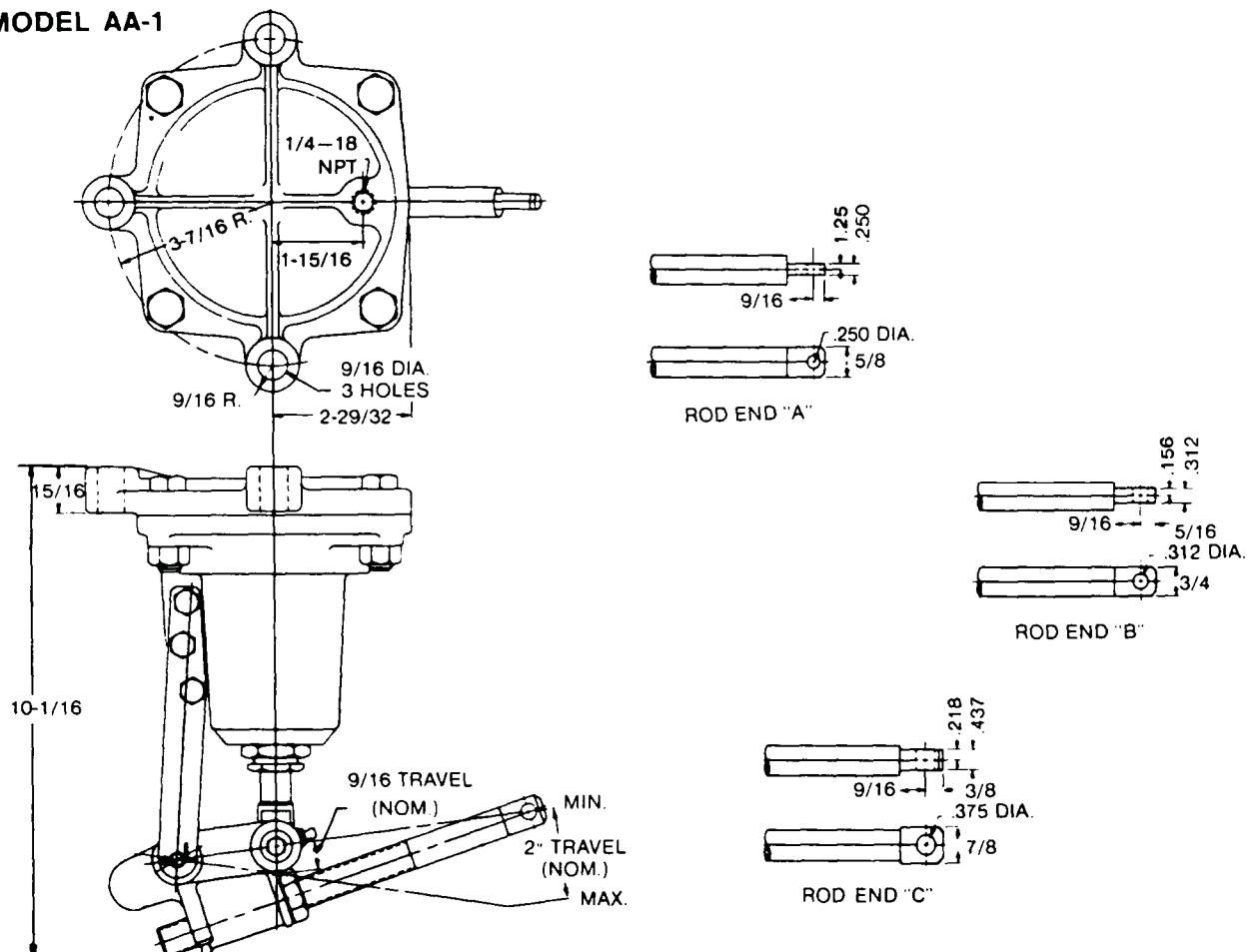
Rexroth
Bosch Group



Description	Part No.	Old Part No.	Weight lbs. (kg)
AA-1, 1/4" rod eye	R431005436	P -060263-00001	8 (3.63)
AA-1, 5/16" rod eye	R431005437	P -060263-00002	8.5 (3.86)
AA-1, 3/8" rod eye	R431005438	P -060263-00003	8.5 (3.86)

Type: diaphragm-lever actuator, single direction
 Force rating: 1125 in.-lb. degrees (127.1 Nm)
 Pressure range: 10 to 60 psi (0.69 to 4.14 bar)
 Output travel adjustment: from 7/8" to 2 1/4" (22.23 to 57.15 mm)
 Weight: 3 lbs. (1.36 kg)

MODEL AA-1



Associated Components

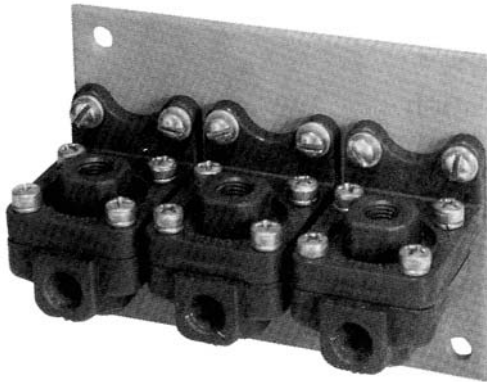
Shuttle Valve Panel
Two Station, Single Engine

Rexroth
Bosch Group

Shuttle Valve Panel

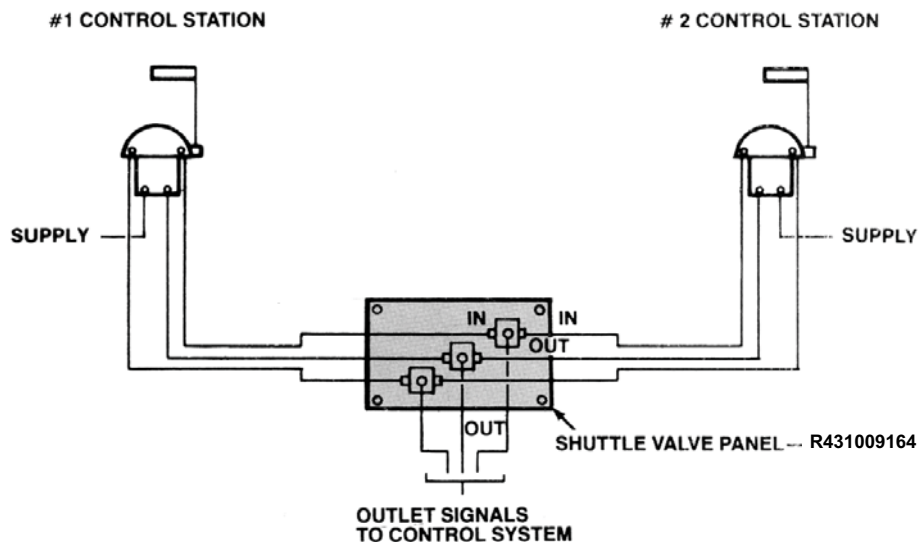
Two Station, Single Engine

Part Number R431007564 (Old Part Number P -090277-00000)



The Shuttle Valve Panel is designed to mount as a single unit the three Shuttle Valves required for interconnecting two single engine control stations to simplify shipboard control system installations.

Standard 1/4" NPT Shuttle Valves part number R431003348 as covered by sales catalog SC-400 and service bulletin SM-400.09 are utilized. All operation and maintenance conditions and procedures covered in these publications should be observed.

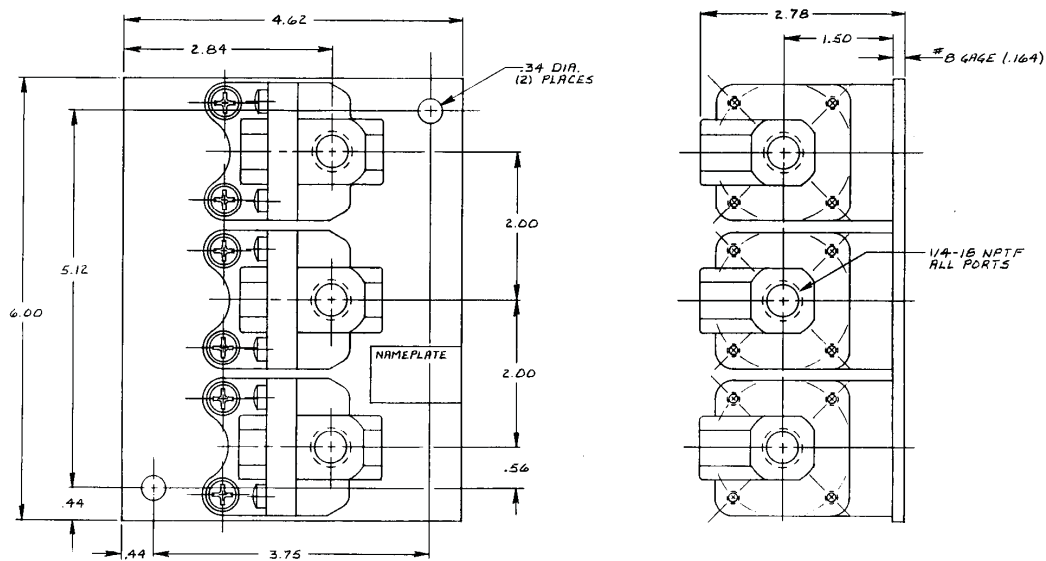


Associated Components

Shuttle Valve Panel
Two Station, Single Engine

Rexroth
Bosch Group

Outline View Two Station - Single Engine Shuttle Valve Panel



Weight 3.5 lbs (1.6 kg)
(Dimensions in inches)

Parts List: R431007564 (Complete Panel)

Ref. No.	Qty.	Description	Part No.	Old Part No.
1	3	Shuttle Valve	R431003348	P -054350-00002
2	6	Screws, 1/4-20	R431002261	P -049835-00037
3	6	Washer, 1/4 Lock	R431002345	P -049866-00009
4	1	Panel	R431000704	P -026892-00001

Associated Components

Shuttle Valve Panel
Two Station, Twin Engine

Rexroth
Bosch Group

Shuttle Valve Panel

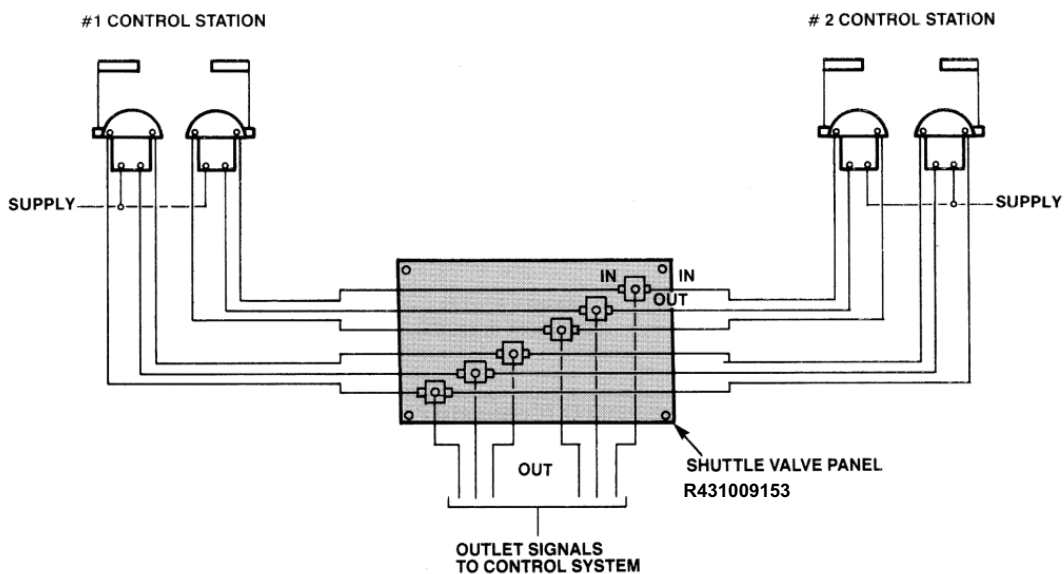
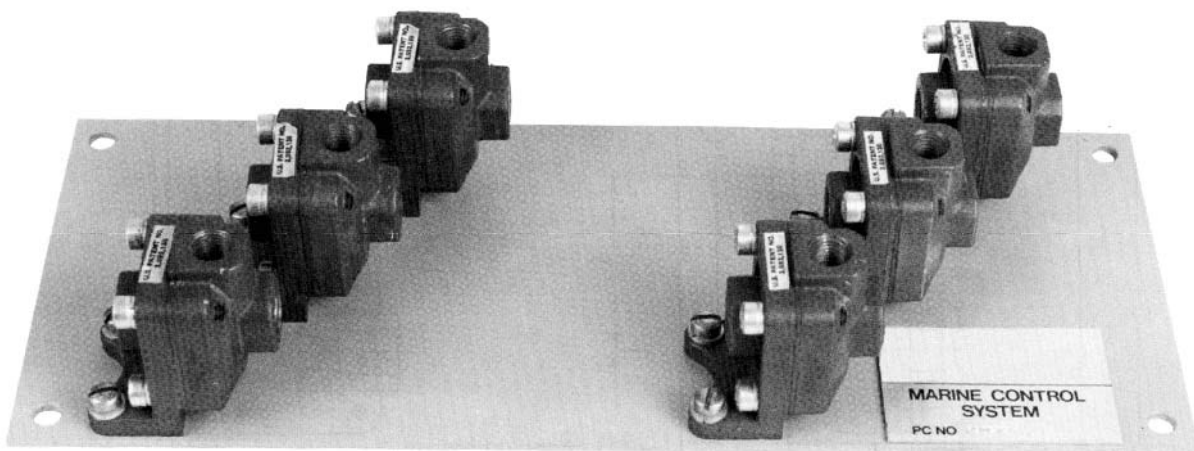
Two Station, Twin Engine

Part Number R431009153 (Old Part No. P -090278-00000)

The Shuttle Valve Panel is designed to mount as a single unit the six Shuttle Valves required for interconnecting two twin engine control stations to simplify shipboard

control system installations. Standard 1/4" NPT Shuttle Valves part number R431002261 as covered by sales catalog SC-400 and service bulletin SM-400.09

are utilized. All operation and maintenance conditions and procedures covered in these publications should be observed.

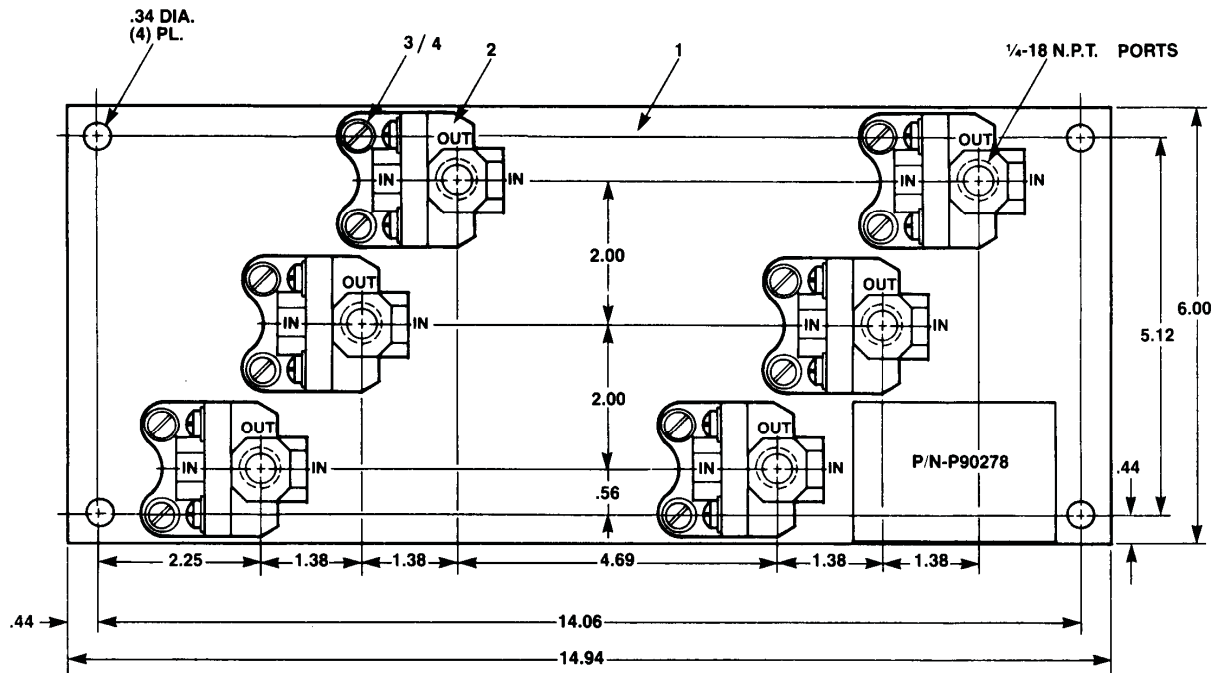


Associated Components

Shuttle Valve Panel
Two Station, Twin Engine

Rexroth
Bosch Group

Outline View Two Station - Twin Engine Shuttle Valve Panel



Weight 7 lbs (3.2 kg)
(Dimensions in inches)

Parts List: R431009153 (Complete Panel)				
Ref. No.	Qty.	Description	Part No.	Old Part No.
1	1	Panel	R431009157	P -066987-00000
2	6	Shuttle Valve, 1/4" NPTF	R431002261	P -054350-00002
3	6	Screws, 1/4 - 20	R431002261	P -049835-00037
4	6	Washer, 1/4 Lock	R431002345	P -049866-00009

Associated Components

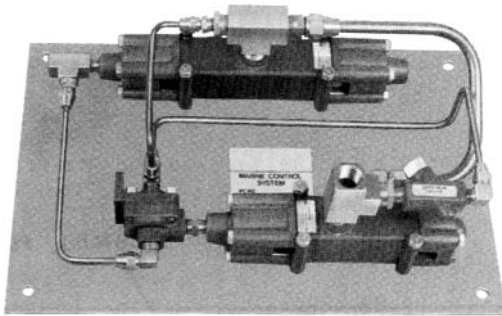
Control Station Transfer Panel

Rexroth
Bosch Group

Control Station Transfer Panel for Two Stations

Attendance Interlock Function

Part Number R431007566 (Old Part Number P -090281-00000)

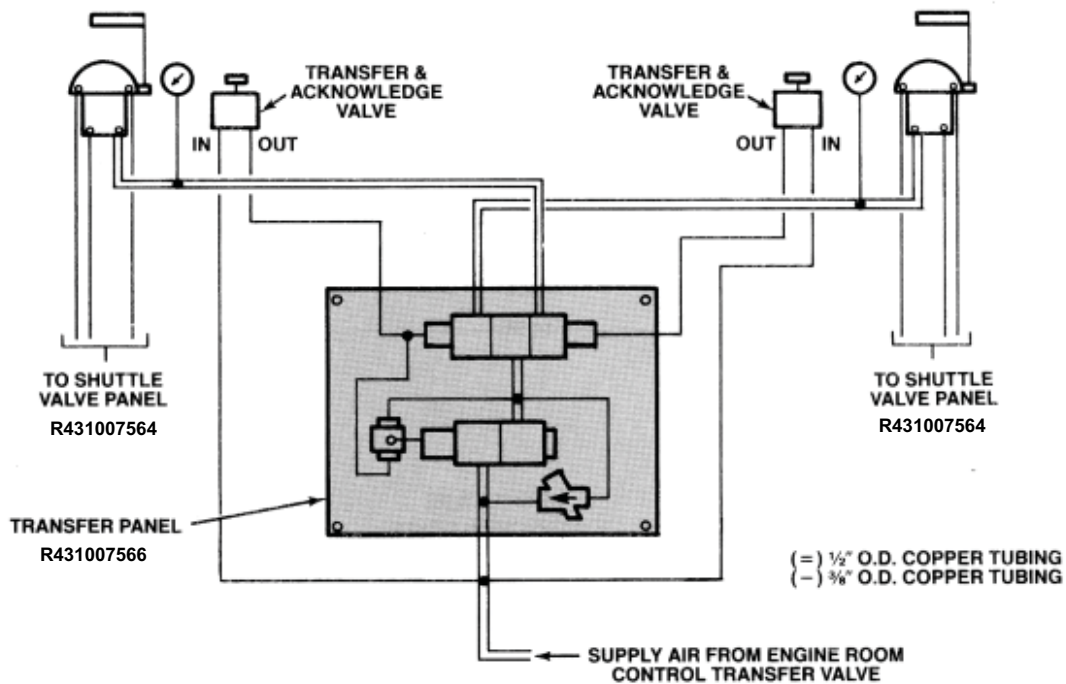


This panel includes the necessary valving mounted as a single unit to provide for attendance interlocked control transfer between the engine room and the above deck control stations. The operation insures that control can not be transferred to the above deck stations unless an operator is in attendance at the receiving station to operate an acknowledge valve and complete the transfer sequence. This insures that control is not inadvertently transferred to an unattended station where the engine control handles may have been left in the operating range. It is the operator's responsibility to check the control handle positions before acknowledging and completing the control transfer operation.

(See page 50 for dimensions.)

1 Pilot House Station (Primary Station)

2 Aft Deck Station

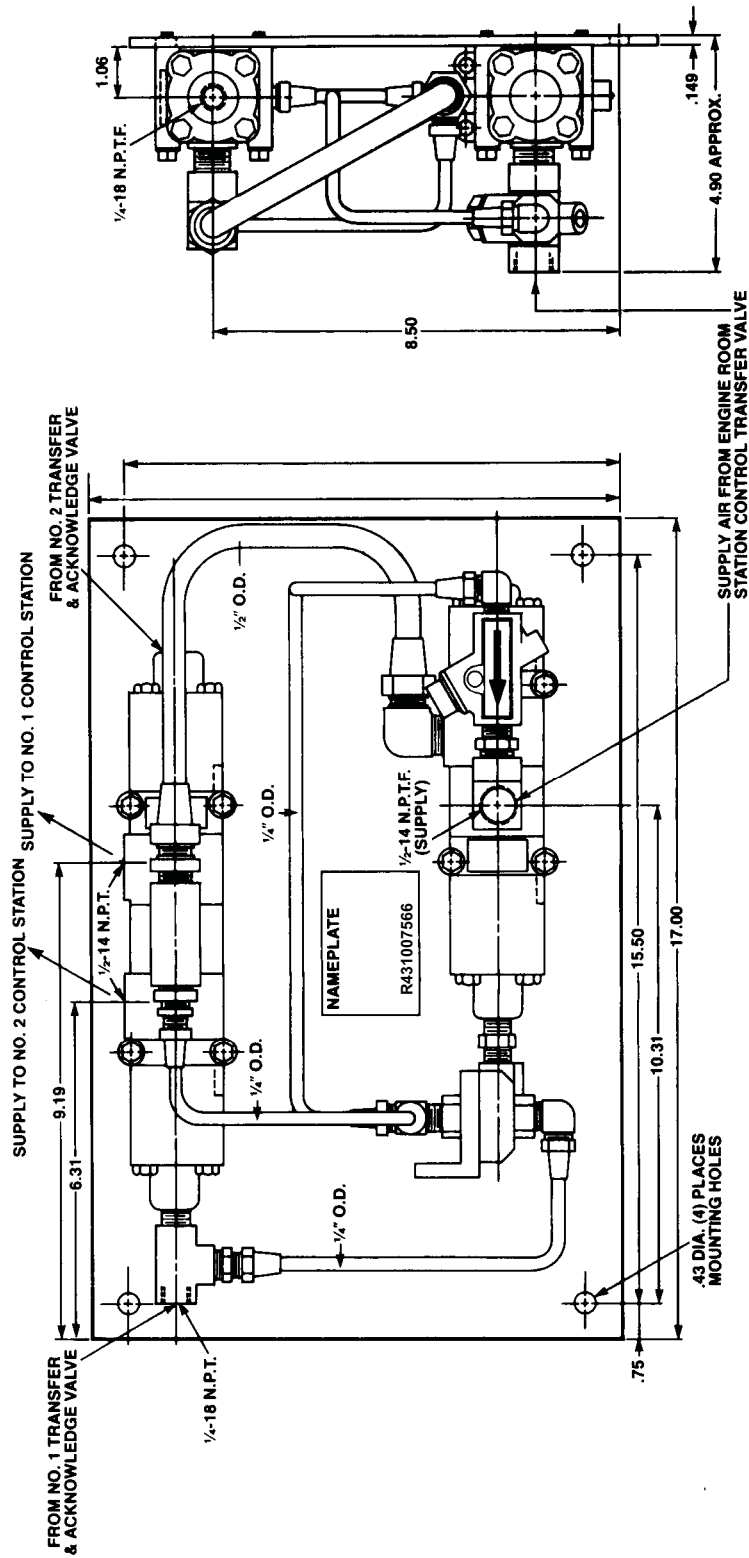


Associated Components

Control Station Transfer Panel



OUTLINE VIEW CONTROL STATION TRANSFER PANEL



Weight 18 3/4 lbs (8.5 kg)
(Dimensions in inches)

Electronic Marine Controls

Overview

Rexroth
Bosch Group

In addition, to pneumatic marine controls, Rexroth has been manufacturing electronic marine controls for many years. The Marex OSII, our most recent control platform, improves upon its predecessors with a compact design, integrated I/O, and expanded propulsion control capabilities.

With minor software variations, Marex OS II can be used for remote control and monitoring of propulsion plants with; reversing gear, controllable pitch (CP) and Voith-Schneider propellers.

The Marex OSII has at its heart, a Marine Propulsion Controller (MPC) that is highly customizable. The MPC gives new meaning to control with full programmability of all time delays, speed curves, trolling, engine synchronization, controlled clutch slip, fault diagnostics and easy integration with auxiliary devices/sensors.

Our electronic controls are our "Open System", employing CAN-bus protocol; allowing maintenance free networking and fault monitoring of quick connect, modular, components.

Our electronic controls are growing increasingly popular with OEMs and also those who are retrofitting ships with older pneumatic technology. An obvious cost benefit of a network interface is its ease in expandability and upgradeability without the need for total system re-wiring.



Type 230 controls



Type 240 controls



Type 250 remote control



MPC - Marine Propulsion Controller



Electric actuator

NOTICES TO PRODUCT USERS

1. WARNING: FLUID MEDIA

Bosch Rexroth pneumatic devices are designed and tested for use with filtered, clean, dry, chemical free air at pressures and temperatures within the specified limits of the device. For use with media other than air or for human life support systems, Bosch Rexroth must be consulted. Hydraulic cylinders are designed for operation with filtered, clean, petroleum based hydraulic fluid; operation using fire-resistant or other special types of fluids may require special packing and seals. Consult the factory.

2. WARNING: MATERIAL COMPATIBILITY

Damage to product seals or other parts caused by the use of non-compatible lubricants, oil additives or synthetic lubricants in the air system compressor or line lubrication devices voids Bosch Rexroth's warranty and can result in product failure or other malfunction. See lubrication recommendations below.

AIR LINE LUBRICANTS! In service higher than 18 cycles per minute or with continuous flow of air through the device, an air line lubricator is recommended. * (Do not use line lubrication with vacuum products.) However, the lubricator must be maintained since the oil will wash out the grease, and lack of lubrication will greatly shorten the life expectancy. The oils used in the lubricator must be compatible with the elastomers in the device. The elastomers are normally BUNA-N, NEOPRENE, VITON, SILICONE and HYTREL. Bosch Rexroth recommends the use of only petroleum-based oils without synthetic additives, and with an aniline point between 180° and 210° F.

COMPRESSOR LUBRICANTS! All compressors (with the exception of special "oil free" units) pass oil mist or vapor from the internal crankcase lubricating system through to the compressed air. Since even small amounts of non-compatible lubricants can cause severe seal deterioration (which could result in component and system failure) special care should be taken in selecting compatible compressor lubricants. It is recommended that users review the National Fluid Power Association "Recommended Guide Lines For Use Of Synthetic Lubricants In Pneumatic Fluid Power Systems" (NFPA T1-1978).

3. WARNING: INSTALLATION AND MOUNTING

The user of these devices must conform to all applicable electrical, mechanical, piping and other codes in the installation, operation or repair of these devices.

INSTALLATION! Do not attempt to install, operate or repair these devices without proper training in the technique of working on pneumatic or hydraulic systems and devices, unless under trained supervision. Compressed air and hydraulic systems contain high levels of stored energy. Do not attempt to connect, disconnect or repair these products when system is under pressure. Always exhaust or drain the pressure from system before performing any service work. Failure to do so can result in serious personal injury.

MOUNTING! Devices should be mounted and positioned in such manner that they cannot be accidentally operated.

4. WARNING: APPLICATION AND USE OF PRODUCTS

The possibility does exist for any device or accessory to fail to operate properly through misuse, wear or malfunction. The user must consider these possibilities and should provide appropriate safe guards in the application or system design to prevent personal injury or property damage in the event of malfunction.

5. WARNING: CONVERSION, MAINTENANCE AND REPAIR

When a device is disassembled for conversion to a different configuration, maintenance or repair, the device must be tested for leakage and proper operation after being reassembled and prior to installation.

MAINTENANCE AND REPAIR! Maintenance periods should be scheduled in accordance with frequency of use and working conditions. All Bosch Rexroth products should provide minimum of 1,000,000 cycles of maintenance free service when used and lubricated as recommended. However, these products should be visually inspected for defects and given an "in system" operating performance and leakage test once a year. Where devices require major repair as result of the one million cycles, one year, or routine inspection, the device must be disassembled, cleaned, inspected, parts replaced as required, rebuilt and tested for leakage and proper operation prior to installation. See individual catalogs for specific cycle life estimates.

6. PRODUCT CHANGES

Product changes including specifications, features, designs and availability are subject to change at any time without notice. For critical dimensions or specifications, contact factory.

*Many Bosch Rexroth pneumatic components can operate with or without air line lubrication; see individual sales catalogs for details.

--Refer to the appropriate service catalog for parts and service information.

LIMITATIONS OF WARRANTIES & REMEDIES

Bosch Rexroth warrants its products sold by it to be free from defects in material and workmanship to the following:

For twelve months after shipment Bosch Rexroth will repair or replace (F.O.B. our works), at its option, any equipment which under normal conditions of use and service proves to be defective in material or workmanship at no charge to the purchaser. No charge will be made for labor with respect to defects covered by this Warranty, provided that the work is done by Bosch Rexroth or any of its authorized service facilities. However, this Warranty does not cover expenses incurred in the removal and reinstallation of any product, nor any downtime incurred, whether or not proved defective.

All repairs and replacement parts provided under this Warranty policy will assume the identity, for warranty purposes, of the part replaced, and the warranty on such replacement parts will expire when the warranty on the original part would have expired. Claims must be submitted within thirty days of the failure or be subject to rejection.

This Warranty is not transferable beyond the first using purchaser. Specifically, excluded from this Warranty are failures caused by misuse, neglect, abuse, improper operation or filtration, extreme temperatures, or unauthorized service or parts. This Warranty also excludes the use of lubricants, fluids or air line additives that are not compatible with seals or diaphragms used in the products. This Warranty sets out the purchaser's exclusive remedies with respect to products covered by it, whether for negligence or otherwise. Neither, Bosch Rexroth nor any of its affiliates will be liable for consequential or incidental damages or other losses or expenses incurred by reason of the use or sale of such products. Our liability (except as to title) arising out of the sale, use or operation of any product or parts, whether on warranty, contract or negligence (including claims for consequential or incidental damage) shall not in any event exceed the cost of replacing the defective products and, upon expiration of the warranted period as herein provided, all such liability is terminated. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER FOR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE. No attempt to alter, amend or extend this Warranty shall be effective unless authorized in writing by an officer of Bosch Rexroth Corporation.

Bosch Rexroth reserves the right to discontinue manufacture of any product, or change product materials, design or specifications without notice.

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Facsimile (704) 583-0523

Further contacts

www.boschrexroth.com/
addresses

The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.