Hays Cleveland
Div. of UniControl Inc.

Series F -04632-00-A03/A04
Hydraulic Position Regulator
(Diaphragm-actuated Pilot Valve Type)
Instruction Manual
F-04632-2-379

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REFERENCE DRAWINGS:

F-04632-00

	CUST. NO.	HR NO.	QTY	MODEL NUMBER SELECTION
X				Model F-04632-00-☐☐☐☐☐☐☐☐☐
				Positioner Serial No. F-04632-00-_____

PRODUCT SELECTION DESCRIPTION

(A) Basic Unit

☐	A01	Small case, small pilot valve, direct Actuation, horizontal or vertical motion (H771932)
☐	A02	Large case, large pilot valve, direct actuation, horizontal or vertical motion (H769210)
☐	A03	Small case, small pilot valve, diaphragm actuation, horizontal or vertical motion (H772212)
☐	A04	Large case, large pilot valve, diaphragm actuation, horizontal or vertical motion (H772213)
☐	A05	Large case, large geared pilot valve, direct actuation, vertical return motion only (H772811)
☐	A06	Small case, small geared pilot valve, direct actuation, vertical return motion only (H772812)
☐	A07	Small case, large geared pilot valve, direct actuation, vertical return motion only (H772813)

(B) Stroke

	(A01-A03-A04-Only)	
☐	B01	0 to 7.0 inches
☐	B02	7.1 to 12.0 inches
☐	B03	12.1 to 18.0 inches
	(A02-A04-Only)	
☐	B04	0 to 12.0 inches
☐	B05	12.1 to 18.0 inches
☐	B06	18.1 to 24.0 inches
☐	B07	24.1 to 30.0 inches
☐	B08	30.1 to 36.0 inches
	(A05-Only)	
☐	BZ1	0 to 36.0 inches
☐	B09	36.1 to 72.0 inches
	(A06-A07-Only)	
☐	BZ2	0 to 25.0 inches
☐	B10	25.1 to 48.0 inches

Stroke = _____ inches
"L" Dimension = _____ in.

PRODUCT SELECTION DESCRIPTION

(C) Input (Diaphragm)

(A01-A03-A06-A07-Only)

☐	C01	0-5 PSIG w/o limit stops
☐	C02	0-5 PSIG with limit stops
☐	C03	3-15 PSIG w/o limit stops
☐	C04	3-15 PSIG with limit stops
☐	C05	0-30 PSIG w/o limit stops

(A02-A04-A05-Only)

☐	C06	0-5 PSIG w/o limit stops
☐	C07	0-5 PSIG with limit stops
☐	C08	3-15 PSIG w/o limit stops
☐	C09	3-15 PSIG with limit stops
☐	C10	0-30 PSIG w/o limit stops

(D) Feedback

(A01-A02-A03-A04-Only)

			Right		Left	
			Top	Bot	Top	Bot
☐	DZ1	Horizontal				
☐	DZ2	Vertical				

Moves Right ☐ Left ☐
To Open ☐ Close ☐ Controlled Valve

(E) Pilot Valve

(A01-A06-Only)

☐	E01	30-74 PSIG
☐	E02	75-149 PSIG
☐	E03	150-250 PSIG

(A02-A05-A07-Only)

☐	E04	75-149 PSIG
☐	E05	150-250 PSIG

(A03-Only)

☐	E06	90 cu inches
☐	E07	180 cu inches
☐	E08	350 cu inches
☐	E09	700 cu inches

Operation Pressure
_____PSIG

(F) Position Transmitter

(A01-A03, Horizontal Feedback Only)

☐	F01	Pneu transmitter w/air supply

(A02-A04, Horizontal Feedback Only)

☐	F02	Pneu transmitter w/air supply

Range
__To __PSIG

(G) Cam (All)

☐	GZ1	Blank
☐	GZ2	Cut, linear, sq. rt., or square
☐	GZ3	Special

F - 04632 - 00

		PRODUCT SELECTION DESCRIPTION
	(H)	Dust Boot
		(A01-A03-Only)
		H01 0 to 7.0 inches stroke
		H02 7.1 to 12.0 inches stroke
		H03 12.1 to 18.0 inches stroke
		(A02-A04-Only)
		H04 0 to 12.0 inches stroke
		H05 12.1 to 18.0 inches stroke
		H06 18.1 to 24.0 inches stroke
		H07 24.1 to 30.0 inches stroke
		H08 30.1 to 36.0 inches stroke
	(I)	Pipe Cap
		(A05-A06-A07-Only)
		I01 Return motion down
		I02 Return motion up

REGULATOR

The Model F-46322 (S-72-5 & S-72-5L) Hydraulic Position Regulators consists of a cast iron or welded steel case upon which are mounted a loading diaphragm assembly, a servo-motor diaphragm assembly an oil pilot valve assembly and a return motion assembly. Such a regulator is illustrated by Drawing D-772212.

APPLICATION

Hydraulic Positioner, Model F-46322 (S-72-5 & S-72-5L) is used to regulate the position of a hydraulic piston.

An air loading pressure received either from a controller or a manual air loading station is used to control the action of the regulator hence determining the position of the slide valve.

The attached curve, Figure 72-2, illustrates the relationship between the air pressure applied to the loading diaphragm and the power piston position.

The port areas of the pilot valve of each positioner are designed to accommodate the different sizes of cylinders to provide the required operating speed.

INSTALLATION

The position regulator is shipped packed in a case as a complete unit. Some of the parts are bound with wire to prevent breakage. The wire should be removed after the positioner is completely mounted.

Unpacking

After unpacking the instrument, check the packing list to make sure that all items listed are present.

immediately. If there is damage due to improper handling, notify the transportation firm. Any damage claims concerning items shipped F.O.B. the Factory should be negotiated with the carrier responsible. In such cases it is advisable to retain packing and carton for the claim adjustor's inspection. If shipping blocks tie down certain components, do not remove them until the instrument is securely mounted.

LOCATION

The positioner is to be located either above or not greatly below the sump tank in order to have a minimum back pressure on the drain.

MOUNTING

Mount the unit rigidly to the actuating cylinder which it is controlling, so that movement of the piping in which the device operated by the cylinder is mounted, will not affect the accuracy of positioning.

The unit may be mounted in any position as long as the axis of the sheave is horizontal. A slight shift of the operating range of the control pressure will be obtained in the various positions but this can be adjusted if necessary by changing the length of loading diaphragm post.

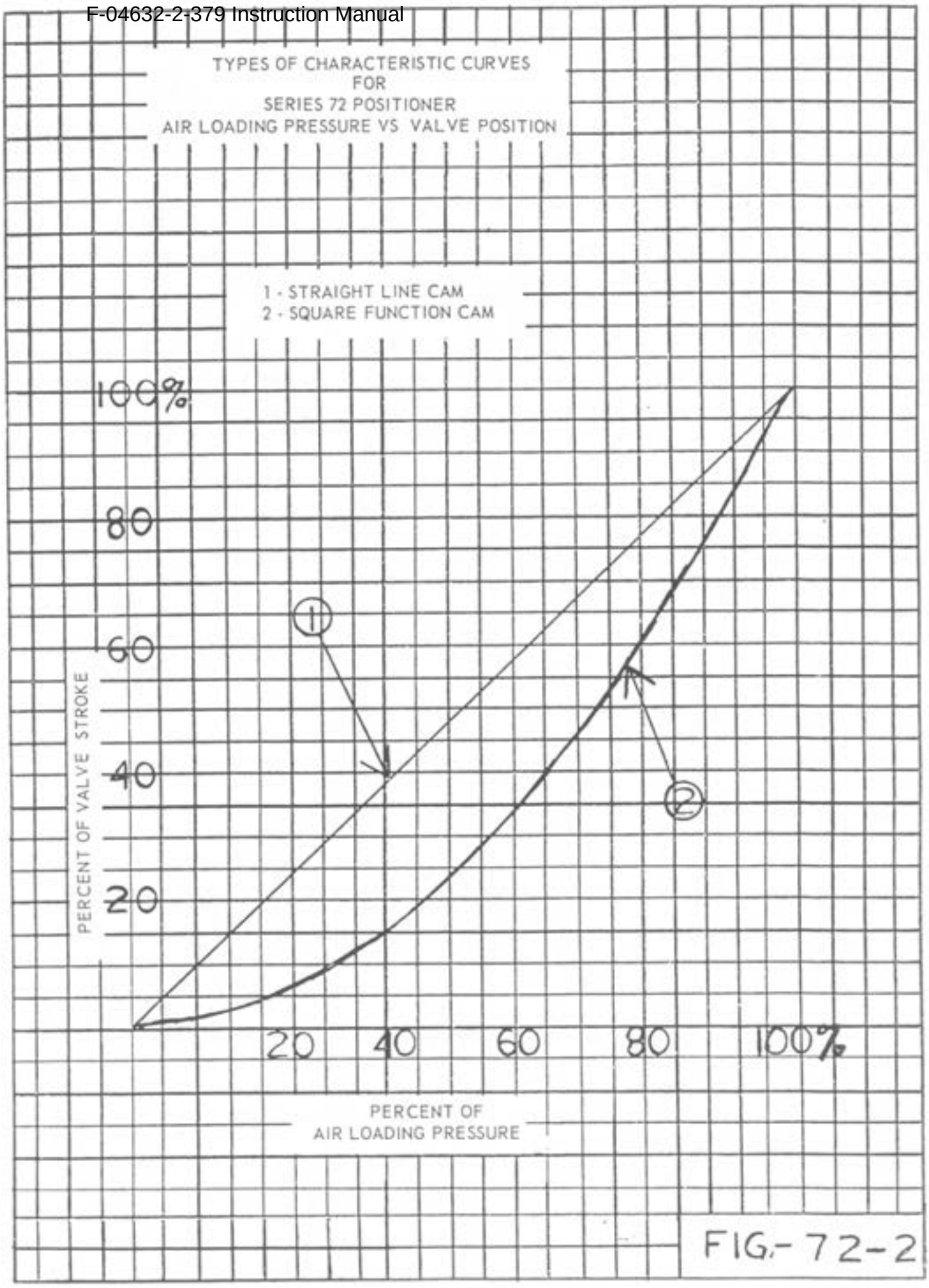

TYPES OF CHARACTERISTIC CURVES
FOR
SERIES 72 POSITIONER
AIR LOADING PRESSURE VS VALVE POSITION
1 - STRAIGHT LINE CAM
2 - SQUARE FUNCTION CAM
100%
80
60
40
20
PERCENT OF VALVE STROKE
1
2
20
40
60
80
100%
PERCENT OF
AIR LOADING PRESSURE

FIG.- 72-2

LINKAGE

All linkage parts furnished with the positioner are made with minimum clearance to assure a perfect fit on the pins. Any additional linkage furnished by the purchaser to connect to the piston rod should be of equal quality. Lost motion and inaccurate positioning will result if this practice is not followed. Likewise, any arms or brackets should be rigid so no springing occurs.

OIL PIPING

On such applications, as will permit its use, it is advisable to use copper tubing for the hydraulic power lines. Steel tubing, iron pipe with screwed fittings and last, welded iron pipe is the succeeding order of preference from the standpoint of freedrom of operating difficulties. Experience with welding indicates that scale and beads incidental to the fabrication washes lose and lodges in the pilot valve unless the piping is thoroughly cleaned before filling the system.

The connecting piping between the pilot valve and cylinder must be at least the size of the connections in the valve, with the exception of the smallest size of cylinder. This point is important if tubing is used. If the positioners are located a considerable distance from the pump or reservoir, the use of larger supply and drain lines is recommended.

Precautions must be taken not to install shut-off or isolating valves which introduce appreciable pressure loses. This may materially reduce the possible speed of the cylinder.

Each positioner should have a good quality filter (88 micron) such as built by Cuno installed in the supply line close to the pilot valve.

Type of filter will depend on the fluid pressure and capacity required. Filter must be fine enough to remove particles larger than .003".

AIR PIPING

The loading line from the controller to the diaphragm on the positioner may be of any material but tubing is preferable. There is less chance of leaks because there are fewer joints The size should be 1/4" or 5/16" O.D. If pipe is used operational difficulties may be experienced if it is larger than 1/8" size.

POWER SOURCE

The positioner will operate successfully on any pressure up to 1500 pounds on the hydraulic system. It requires compressed air at 20 PSI for the relay valve.

The pressure required on the hydraulic fluid is determined by the size of cylinder available to do the required work and also on the speed of motion required. Each model of positioner is available with several pilot valve sleeves of various port areas to suit the requirements of the range of cylinder capacities.

The type of oil should be selected in accordance with the lowest temperatures encountered at the plant site so that the viscosity will not exceed 2000 SSU at that temperature. If the humidity is high, a moisture inhibited oil is preferred.

If an accumulator is used with gas as the pres-

surizing medium it is important that the gas which has been absorbed can readily be removed from the system when it is released by a reduction in pressure. The connections to the power cylinder should be made at the top of the cylinder when in a horizontal position. The absorption of gas by the oil can be kept a minimum if the oil enters the storage tank below the level in the tank.

FUNCTION

The Model F-46322 (S-72-5 & S-72-5L) hydraulic position regulators are intended for positioning the piston of a cylinder in response to an air control pressure. The S72-5 will handle cylinders whose range of stroke is from 2 1/2" to a maximum of 18" and having a volume not greater than 1000 cubic inches. With this size of cylinder the time of full stroke is 15 seconds with a supply pressure of 100 PSI of which 50 PSI are necessary for doing work and the remainder is available for producing velocity of the hydraulic fluid. This speed will vary with changing conditions of supply pressure and work. The S-72-5L will handle cylinders from 10" stroke to 36" and having a volume up to 3000 cubic inches in 32 seconds under the conditions stated above. NOTE: A high speed S-72-5L is available on special order which will actuate a 3000 cubic inch cylinder full stroke in approximately 20 seconds with a supply pressure of 100 psig.

The positioners are available with air loading diaphragms suitable for 0 to 5 PSI range of operation or 3 to 15 PSI range. The intermediate positions of the piston are determined by the shape of a cam. The stroke can also be obtained on less than full pressure range by the shape of this cam.

PRINCIPLE OF OPERATION

The positioner consists essentially of a loading diaphragm assembly, to which is applied an air loading or control pressure. The movement of this diaphragm operates a servo-motor diaphragm through an air relay valve.

A hydraulic valve attached to the servo diaphragm controls the hydraulic fluid to the power piston. The motion of this piston is transmitted through compensating or return motion linkage back to the loading diaphragm. In this manner the motion of the power piston is proportional to the loading pressure.

With zero pressure on the loading diaphragm, it is in the position shown by the assembly Drawing D-772212 and the piston is at one end of the stroke. As the loading pressure is increased the diaphragm moves in proportion to the pressure increase. It is connected to lever (31) which rotates clockwise on the pin at its left end which is secured in the cam follower arm. The right end is connected by link (44) to floating lever (47) which in turn pivots about pin (95) at its left end. This moves the baffle (48), which is connected to (47) by pin (45) and pivots about pin (95) at its left end, toward the nozzle (50).

The baffle restricts the flow of air from the nozzle causing the pressure at the nozzle to increase. The nozzle receives air from a source at 20# through restricting orifice (54). This pressure is conducted by tube (57) to their servo-motor diaphragm (63) causing it to move (66) to move pilot valve stem (81). The diaphragm movement is also transmitted through bellcrank (92) pivoting about pin (59) and link (87) to floating lever (47) which now pivots about its right end and moves the baffle (48) counterclockwise away from the nozzle until the air pressure controlled by the valve is proper to maintain the servo diaphragm

in this position. Thus the pilot valve stem has been moved a distance proportional to the air pressure change applied to the loading diaphragm. Large changes in loading diaphragm motion are not transmitted fully to the relay valve due to a travel limiting pin.

The movement of the pilot valve stem starts a flow fluid to the power cylinder causing the power piston to move. This motion is transmitted through the linkage connected to the horizontal channel shaped bar (28) and a cable (11) whose ends are attached to opposite ends of the bar and wrapped about the sheave (4) to rotate the sheave. Carried by the sheave is a cam (10) upon which rides a follower roller (62) attached to lever (30). The lever rotates counterclockwise about a pivot at its right end. The lever, as stated at the beginning of the description of this cycle of operation, carries the pivot pin for the lever (31) to pivot counterclockwise about pin (32) to return its right end to the original starting position. Consequently link (44), moves upward to reverse all the motions made previously and return the pilot valve stem to neutral position and cut off the fluid flow to the cylinder. Upon a decrease in loading pressure the motion of all parts will be in the opposite direction of that just described and oil pressure will be admitted to the opposite end of the cylinder.

The cam may be shaped to produce most any desired relation between loading pressure and power piston position.

Each positioner is furnished with a "straight line" cam when it leaves the factory. Such a cam will produce equal piston movements for equal changes in loading pressure.

However, after the positioner has been installed it may be found that a different relation of piston position to loading pressure will provide much better regulation.

The last two types of characteristics are indicated by the curves on Figure 72-2.

DIRECTION OF MOTION

The direction of motion of the power piston with respect to an increase in the air loading pressure on the loading diaphragm is set at the Factory in accordance with contract requirements for each positioner. However, should occasion require, each unit may be easily changed to reverse this direction of motion of the power piston of the slide valve. It is only necessary to reverse the connection to the power cylinder from the pilot valve of the positioner and cut a new cam. When making this change, care should be taken before turning on the oil supply to the positioner by checking the relation of the return motion as otherwise damage to the pulley may result.

ADJUSTMENTS

Proper adjustment of the various linkages is necessary to obtain proper operation.

To obtain equal speeds of the piston in both directions, it is necessary for the pilot valve stem to be screwed into connection block (69) the correct amount and that the linkage from the balance lever (31) to the pilot valve be adjusted properly.

First, with the hydraulic pressure on, and some loading pressure on the diaphragm, measure the distance from the disc (74) to the side of the pilot valve mounting bracket when the piston is stationary (81). Disconnect link (44) at its upper end and move it first in one direction and then the other and measure the pilot

valve travel in each direction. If the distance is not equal from the original point measured the stem requires adjusting. After this has been accomplished the link is to be reconnected.

Two points of adjustment exist in the linkage. The link (44) must be correct inlength in order that floating lever (47) will be parallel with baffle (48) and the screw (73) determines stroke of the stem that will be produced.

To make these adjustments convenient a short piece of tubing is furinshed with each positioner to be slipped over stop pin and into the hole in lever (31). The piston should now remain stationary. Screw (73) needs adjustment if it continues to move. With it adjusted observe if lever (47) is parallel with the baffle (48). An adjustment of the length of link (44) is necessary to repeat the adjustment of the screw (73). The centering tube is then to be removed.

The length of the link from the cylinder must be correct if full stroke of the piston is to be obtained. If this is adjusted properly and full stroke is not obtained it may be that the sheave has become displaced from its original relationship to the channel (28). If this is the case the nuts on eye screw (8) are to be screwed off to release the cable. The sheave can then be rotated to the proper position and the nuts replaced and locked.

PLACING REGULATOR IN SERVICE

1. Flush the hydraulic system with kerosene for 78 hours to remove scale, rust and other foreign matter. A free flow of kerosene will be obtained when the valve sleeve is removed. The sleeve is made with an easy push fit into the body so this can be readily accomplished.
2. Check over the unit to see that everything is in proper order.
3. Move piston by hand to see that return motion linkage is adjusted to proper length.
4. Turn on hydraulic pressure and check motion upon application of loading pressure.

MAINTENANCE

A well maintained regulator means trouble free performance.

Whenever, maintenance work is done of a Position Regulator, care must be taken that all lock nuts, holding screws and cotter pins are properly tightened and fastened.

Always replace the housing cover, upon completion of any work or adjustment on the regulator. A regular maintenance inspection of the positioner should be made at leastonce or twice a year, depending on type of service and location. All pin joints should be oiled and replaced if worn. Grease the sheave shaft.

Method of Producing the Cam Shape

The Series S72-5 positioner is a position type regulating device. That is, for a given master pressure on the loading diaphragm the power piston will move to a definite position. The relation of loading pressure to piston position is fixed by the shape of the cam plate. In order to determine the shape of the cam, proceed as follows:

First, determine the desired relationship between the master loading pressure to be put on the loading diaphragm and the position of the power piston. Make up a chart which will

indicate the desired power piston position for each inch of mercury loading pressure from zero to maximum. This relationship may or may not be a straight line; depending on the characteristic of the valve or damper which the power piston is arranged to operate.

A U-shaped cam marker is furnished with each positioner for use in determining the shape of the cam. Loosen the set screw (26) and replace the cam roller (62) with the cam marker. The U shape of the marker permits it to fit over the circular cam blank and to assume different positions for the various loading pressure to be put on the loading diaphragm. Place the centering pin over the pilot valve stop to hold the pilot valve in a neutral position.

Disconnect the cam follower spring (40).

The first position to be marked on the cam blank will be with zero loading pressure on the diaphragm and the piston fully closed. With a fine pencil or steel scriber mark a semi-circle on the cam blank around the end of the U-shape marker. This indicates the position which the cam roller will take on the finished cam. The next position would be that which would correspond to 1" mercury loading pressure. Move the piston by hand to the position indicated on the chart for 1" mercury loading pressure and lock the piston in position. Apply an inch of loading pressure to the diaphragm. Mark a semi-circle on the cam blank as above. Continue this procedure for each inch of mercury loading pressure up to the maximum.

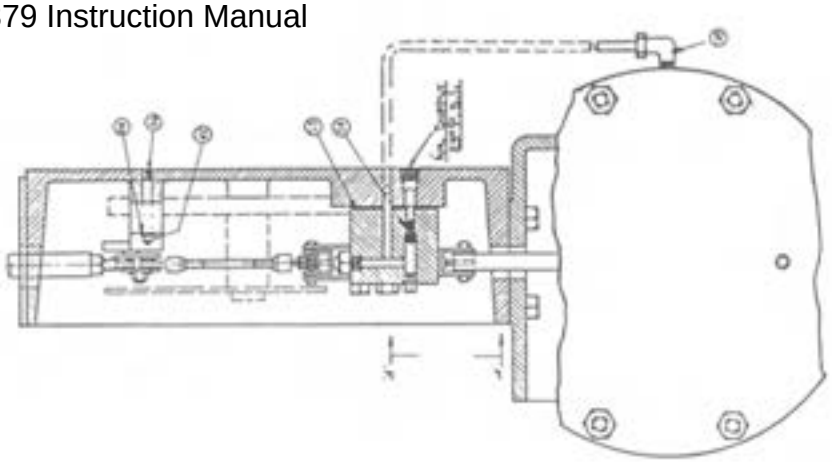
The point so marked on the cam blank indicates the shape of the required cam. Draw a smooth continuous curve through the end point of the various semi-circle and cut the cam blank to this contour.

After the cam has been cut to shape, it may be installed and the positioner placed in service.

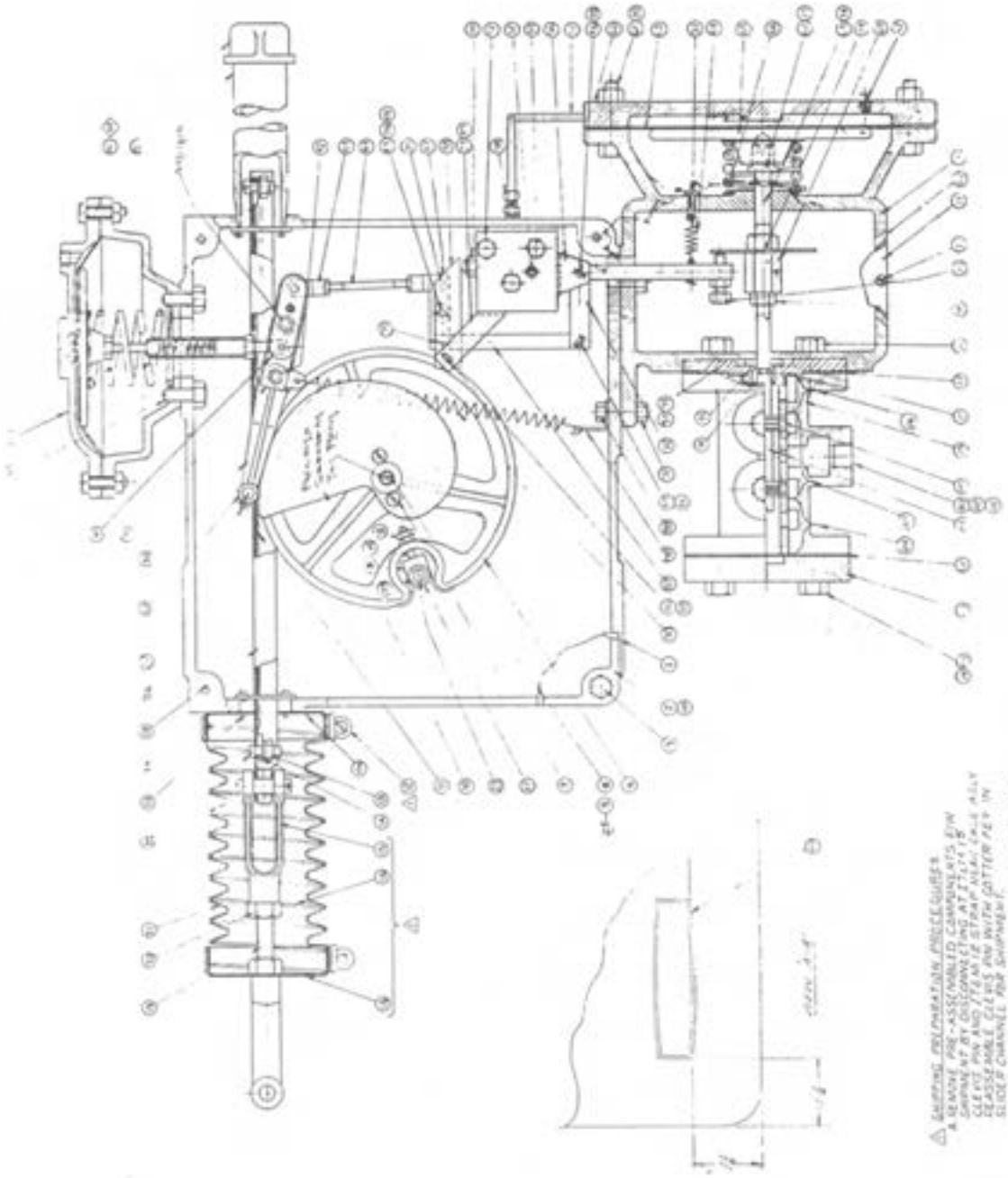
Item	Description	Part Number	T-72 Qty. Rqd. 772212	T-72L Qty. Rqd. 772213
	Regulator Case	H-772214	1	0
1	Regulator Case	H-772212		Sel (1)
	Regulator Case	H-772186	0	Grp 8
	Cover	H-755662	1	0
2	Cover	H-755667	0	1
	Machine Screw 1/4-20 x 1/2	H-816235	4	0
3	Machine Screw 5/16-18 x 1/2	1032-321	0	4
	Pulley	H-755824	1	0
4	Pulley	H-755829	0	1
	Pulley Shaft	H-755394	1	0
5	Pulley Shaft	H-755636	0	1
6	Lubricant Stick	H-862300	AR (1)	AR (1)
7	Machine Screw 10-32 x 3/8	1032-488	2	2
8	Cable Clamp	H-719623	1	2
9	Full Nut 8-32	1034-084	2	4
	Blank Cam	H-755419	1	0
10	Blank Cam	H-755429	0	1
	Return Motion Cable	H-755862		
	Return Motion Cable	H-755863	Sel (1)	
	Return Motion Cable	H-755864	G.P. (1)	
	Return Motion Cable	H-755850		
11	Return Motion Cable	H-755853		Sel (1)
	Return Motion Cable	H-755854		G.P. (1)
	Return Motion Cable	H-755855		
	Return Motion Cable	H-762918		
12	Hose Clamp	H-854205	2	2
13	Full Nut 1/4-20	H-808599	2	2
14	Iron Washer	H-765093	2	2
15	Female Clevis	H-753414	2	2
	Boot Spring	H-758078		
	Boot Spring	H-758079	Sel (1)	
	Boot Spring	H-758080	G.P. (2)	
16	Boot Spring	H-758081		
	Boot Spring	H-758082		Sel (1)
	Boot Spring	H-758083		G.P. (2)
17	Full Nut 10-32	1034-085	1	1
18	Dust Boot End Plate	H-755875	1	1
	Clevis Rod	H-755628		
	Clevis Rod	H-755629	Sel (1)	
19	Clevis Rod	H-755630	G.P. (3)	
	Clevis Rod	H-755631		
	Clevis Rod	H-755632		Sel (1)
	Clevis Rod	H-762632		G.P. (3)
20	Full Nut 3/8-16	H-813525	10	10
	Dust Cover Boot	H-755879		
	Dust Cover Boot	H-755880	Sel (1)	
	Dust Cover Boot	H-755881	G.P. (4)	
21	Dust Cover Boot	H-755882		
	Dust Cover Boot	H-755883		Sel (1)
	Dust Cover Boot	H-755884		G.P. (4)
22	Machine Screw 1/4-20 x 5/8	H-816158	2	2
23	Machine Screw 8-32 x 1/4	1032-428	14	15
24	Plate Seal	H-755426	2	2
25	Set Screw 1/4-20 x 1/4	1032-807	1	1
	Set Screw 10-32 x 1/4	H-813597	1	0
26	Set Screw 8-32 x 3/16	H-829463	0	1
27	Cam Roller Shaft	H-755593	1	1
	Slider Channel	H-755856		
	Slider Channel	H-755857	Sel (1)	
28	Slider Channel	H-755858	G.P. (5)	Sel (1)
	Slider Channel	H-755859		
	Slider Channel	H-755860		G.P. (5)
	Slider Channel	H-755861		
	Cam Follower Lever Assembly	H-755802	1	0
30	Cam Follower Lever Assembly	H-755822	0	1
31	Balancing Lever	H-755807	1	1
32	Linkage Securing Plate	H-757882	1	1
	Loading Diaphragm Assembly	H-753471	Sel (1)	
	Loading Diaphragm Assembly	H-753472	G.P. (6)	
33	Loading Diaphragm Assembly	H-761833		Sel (1)
	Loading Diaphragm Assembly	H-761834		G.P. 6
34	Sleeve	H-758944	1	1
35	"O" Ring	H-008025	1	1
	Pivot Stud	H-758753	1	0
36	Pivot Stud	H-756756	0	1
37	Cable Clamp Washer	H-758312	1	2
38	Set Screw 8-32 x 1	H-837628	1	2
39	Flat Washer No. 8	1036-061	1	2
40	Cam Follower Spring	H-738139	1	1
41	Machine Screw 5/16-18 x 3/4	1032-560	2	2
42	Clinch Nut 10-32	H-838630	2	2
43	Connecting Rod End	H-752915	2	2
	Connecting Rod	H-755856	1	0
44	Connecting Rod	H-762760	0	1
45	Pin	H-764470	2	2

Item	Description	Part Number	T-72 Qty. Rqd. 772212	T-72L Qty. Rqd. 772213
46	Cotter Pin	H-860073	8	8
47	Connecting Link	H-755805	1	1
48	Flapper Link	H-755804	1	1
49	Fulcrum Support	H-755343	1	1
50	Valve Nozzle	H-755678	1	1
51	Valve Chamber	H-755279	1	1
52	Pipe Plug	1138-068	2	2
53	Gasket	H-752884	1	1
54	Orifice Screw	H-755684	1	1
55	Cap Screw 1/4-20 x 2 1/4	1032-540	3	3
56	Fulcrum Support	H-755342	1	1
57	Copper Tubing	20-019-02	AR	AR
58	Pipe Connector	H-854758	1	1
59	Pin	H-764471	1	1
60	Diaphragm Cover	H-754661	1	1
61	Machine Screw 3/8-16 x 1 1/2	1032-590	8	8
62	Cam Roller	H-752982	1	1
63	Diaphragm	H-753641	1	1
64	Spring	H-758086	1	1
65	Diaphragm Plate	H-753703	1	1
66	Spring	H-758005	1	1
67	Conn. Socket	H-753900	1	1
68	Push Rod	H-753901	1	1
69	Push Rod Connector	H-753903	1	1
	Mounting Bracket	H-754555	1	0
70	Mounting Bracket	H-754639	0	1
71	Bracket Cover	H-754662	1	1
72	Machine Screw 8-32 x 3/8	1032-440	4	4
73	Cap Screw 1/4-20 x 1	1032-535	1	1
74	Push Rod Conn Disc	H-753902	1	1
75	Set Screw 6-32 x 1/2	1032-787	1	1
	Machine Screw 3/8-16 x 1 1/4	1032-589	8	0
76	Machine Screw 3/8-16 x 1 3/4	1032-591	0	6
	Cylinder Gasket	H-757259	1	0
77	Cylinder Gasket	H-757258	0	1
78	"O" Ring	H-010177	1	1
	Port Body	H-758874	1	0
79	Port Body	H-772185	0	1
	Sleeve 90 Cu. In.	H-758937		
80	Sleeve 180 Cu. In.	H-758938	Sel (1)	
	Sleeve 350 Cu. In.	H-758939	G.P. (7)	
	Sleeve 700 Cu. In.	H-769529		
81	Pilot Valve Stem	H-758958	1	0
	Pilot Valve Stem	H-758959	0	1
	Gasket Cover	H-757255	1	0
82	Gasket Cover	H-757260	0	1
83	Pilot Valve Cover	H-758980	1	0
	Pilot Valve Cover	H-758981	0	1
84	Machine Screw 1/2-13 x 1 1/2	H-827981	0	8
	Protecting Tube	H-755633		
	Protecting Tube	H-755634	Sel (1)	
	Protecting Tube	H-755635	G.P. (8)	Sel (1)
85	Protecting Tube	H-755636		
	Protecting Tube	H-763635		G.P. (7)
	Protecting Tube	H-763636		
86	Pipe Cap	H-854725	1	1
87	Link	H-755813	1	1
	Anchor Spring Bracket	H-755355	1	0
88	Anchor Spring Bracket	H-755420	0	1
89	Cap Screw 1/4-20 x 3/8	H-817636	1	1
90	Jam Nut 1/4-20	H-801682	3	3
91	Cap Screw 3/8-16 x 7/8	1032-587	4	4
92	Return Motion Lever	H-755812	1	1
	Adaptor Plate	H-754677	1	0
93	Adaptor Plate	H-754678	0	1
	Machine Screw 1/4-20 x 9/16	H-866255	3	0
94	Machine Screw 1/4-20 x 3/4	H-816145	0	4
95	Valve Link Pin	H-757133	3	3
97	Cotter Pin	H-866397	3	3
98	Pipe Elbow	H-854769	1	1
101	Flat Washer No. 10	H-802141	4	4
102	Gasket	H-772187	1	1
103	Trade Mark Emblem	H-095060	1	1
104	Dust Boot End Plate	H-755876	1	1
105	Strip Gasket	33-004-11	AR	AR
109	Protective Closure 1" NPT	H-866751	0	4
110	Protective Closure 3/8 NPT	H-866752	3	0
111	Protective Closure 1/2 NPT	H-866753	1	0
	Indicating Relay	H-769552	A/O	0
	Indicating Relay	H-772551	0	A/O
114	Upper Sleeve	H-758928	0	1
115	Center Sleeve	H-758992	0	1
116	Lower Sleeve	H-758933	0	1
117	Lock Washer #10	1036-067	1	1
	Shipping Kit	H-772156	1	1

3/79



REGULATOR POSITIONING
DIAPHRAGM OPERATED (1-72 & 1-72L)
DATE March, 1979
DRAWING D-777212-g



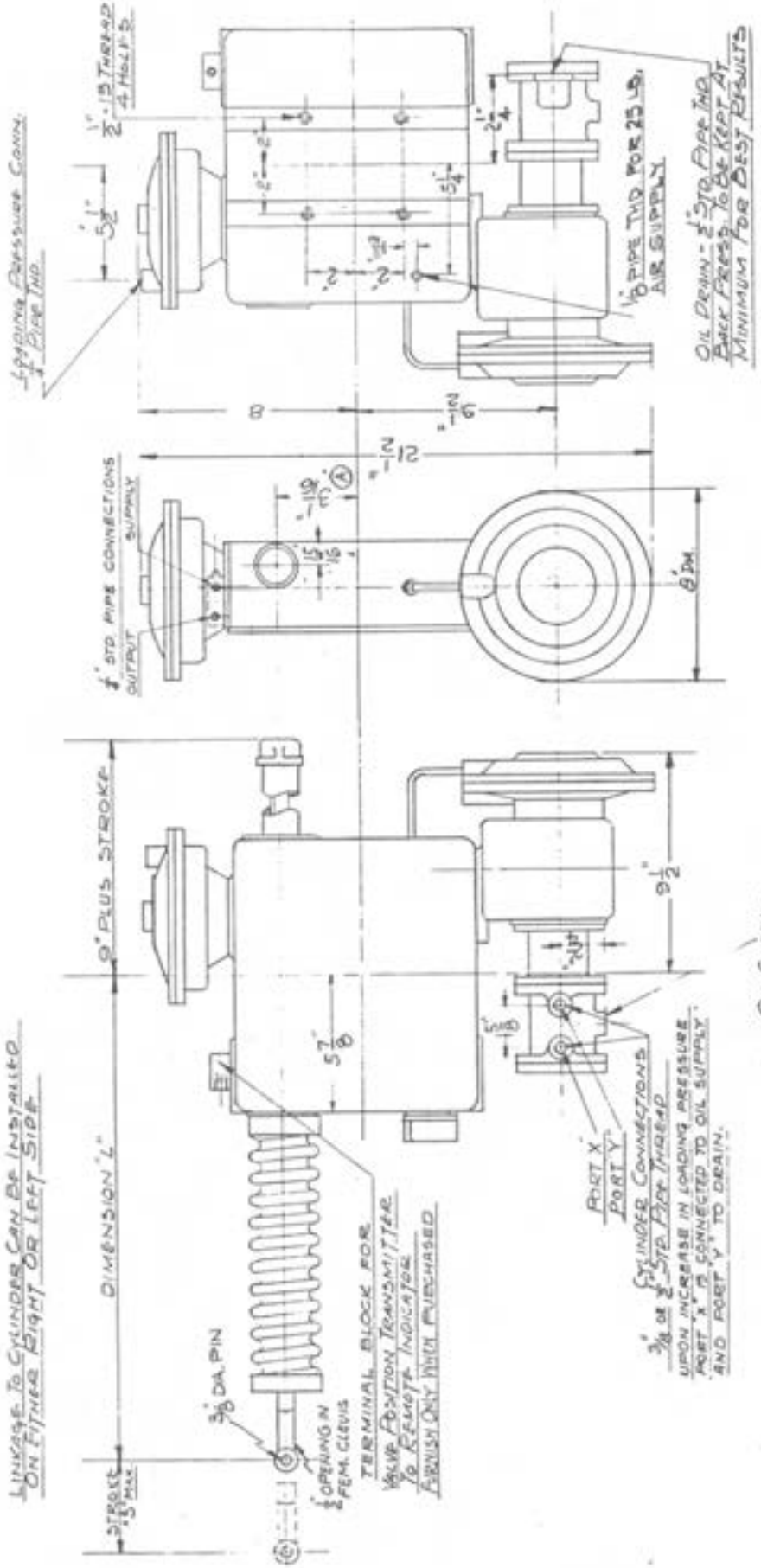


TABLE OF DIMENSIONS		
LINKAGE NO.	"S" MAX.	"L"
1	7"	15" TO 18"
2	12"	18" TO 21"
3	18"	21" TO 24"

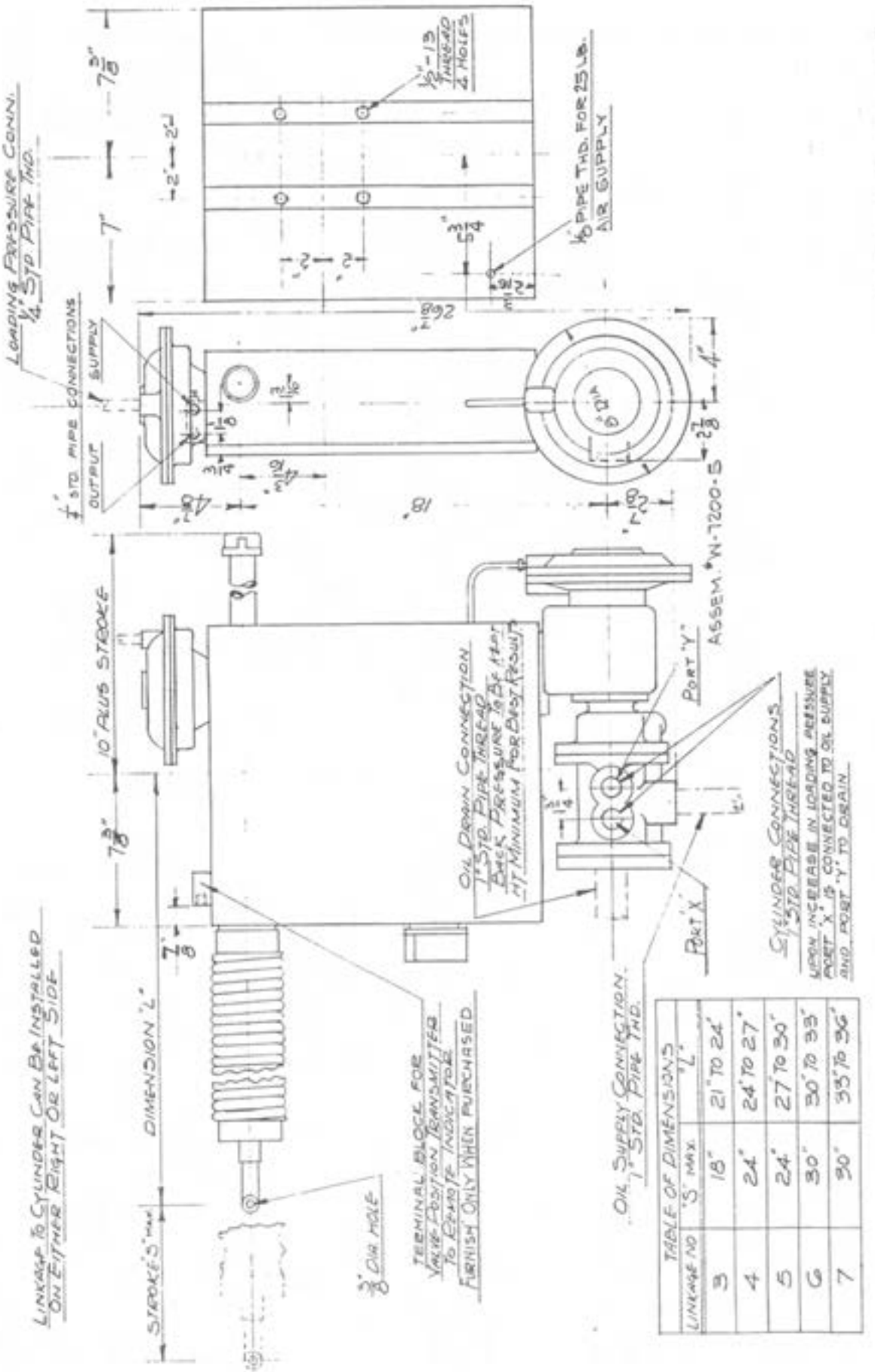


TABLE OF DIMENSIONS		
LINKAGE NO	"S" MAX.	"L"
3	18"	21" TO 24"
4	24"	24" TO 27"
5	24"	27" TO 30"
6	30"	30" TO 33"
7	30"	33" TO 36"

CUSTOMER SERVICE INFORMATION

Contacts

Hays Cleveland Sales Office

1903 South Congress Avenue

Boynton Beach FL 33426

Telephone: 561.734.9400

Fax: 561.734.8060

email: **salescombustion@unicontrolinc.com**

Hays Cleveland Customer Service Department

1111 Brookpark Road

Cleveland OH 44109

Telephone: 216.398.4414

Fax: 216.398.8556

email: **customerservice@unicontrolinc.com**

Visit us on the WEB!

http://www.hayscleveland.com

Repairs

Damaged or defective units may be returned to the factory for repair. However, factory authorization must be obtained before shipping whether warranty or non-warranty service is required, and all units must be shipped prepaid.
A letter of transmittal that includes the following information should accompany the returned instrument:

1. Location, type of service, and length of time in service of the unit.

2. Description of the faulty operation of the device and the circumstances of the failure.

3. Name and telephone number of the person to contact if there are questions about the unit.
4. Indicate whether warranty or non-warranty service is requested.
5. Attach Purchase Order for all out-of-warranty repairs.
6. Complete shipping instructions for the return of the repaired instrument.
7. Original purchase order number and date of purchase.
8. Return Goods Authorization number provided by the factory when you called.

Clearly label the shipping container:

RETURN FOR REPAIR

Model _____

RG # _____

Ship prepaid to:

HAYS CLEVELAND

1111 Brookpark Road

Cleveland OH 44109-5869

216-398-4414

Please follow this procedure. It expedites handling of the returned item, and avoids unnecessary additional charges for inspection and testing to determine the problem before repairing it.

Service

A **Maintenance and Service Contract** can ensure trouble-free, economical operation of **Hays Cleveland** equipment for many years. One-time on-site service by a factory-trained service engineer can also be provided as needed. Contact Hays Cleveland for information on these service options.

Standard Terms and Conditions of Sale

TERMS OF SALE: 1% discount if paid in ten (10) days, net amount due and payable in thirty (30) days.

AGREEMENT OF SALE: Acceptance by Seller of any order placed for goods whether submitted on Buyer's purchase order form or on seller's Sales Order Acknowledgment form, shall be subject to Seller's Standard Terms and Conditions of Sale and is conditioned upon the Buyer's acceptance of these Standard Terms and Conditions.

TERMS OF CONTRACT: Any terms or conditions of the buyer's order which are inconsistent with these terms and conditions shall not be binding on the Seller and shall not be considered applicable to the sale or shipment of goods or materials. Unless buyer shall notify Seller in writing to the contrary within ten (10) days after the mailing of the Sales Contract by Seller, acceptance of the terms and conditions hereof by Buyer shall be indicated and, in the absence of such notification, the sale and shipment by Seller of the goods and materials covered hereby shall be conclusively deemed to be subject to the terms and conditions hereof.

PRICES: All prices and specifications and applicable discounts are subject to change without notice. Sales contracts which call for delivery in the future will be billed at prices in effect at the time of shipment. Shipping weights shown are approximate and subject to change without notice.

SHIPMENT AND PAYMENTS: All prices contained on the Sales Contract are F.O.B. factory in Cleveland, Ohio. No freight is allowed on any shipments. Shipments and deliveries shall at all times be subject to the approval of Seller's Credit Department, and at any time seller may require payment in advance or satisfactory security or guarantee that invoices will be promptly paid when due. If buyer fails to comply with any terms of payment, seller, in addition to its other rights and remedies, but not in limitation thereof, reserves the right to withhold further deliveries or terminate the Agreement, and any unpaid amount thereon shall become due immediately. Terms of payment shall be as set forth on the Sales Contract.

DELAYS AND DEFAULTS: Delays or defaults in delivery by Seller of the goods and materials covered by the Sales Contract shall be excused so far as the same is caused by fire, strikes, accident, governmental regulation, or any delays unavoidable or beyond reasonable control of Seller. In no event shall Seller be liable for any consequential, special, or contingent damages on account of any default or delay in delivery.

NONCANCELLATION: Orders are not subject to suspension, reduction, or cancellation, except on terms that will indemnify Seller against loss.

SPECIFICATIONS: Seller relies on specifications and other data furnished by the Buyer, an architect, contractor, or consulting engineer in all phases of the work covered by the Sales Contract. Seller shall be responsible to check quantities only. Alterations to or changes in specifications, approval of samples, changes in delivery instructions and all other instructions must be submitted in writing to Seller.

In the event Seller performs design or engineering work at the request of Buyer, an architect, contractor, consulting engineer, or representative in any phase of the work covered by the Sales Contract, Seller shall not be responsible for any damages claimed by Buyer as a result of alleged errors or defects in such design or engineering work.

WARRANTY AND LIMITATION OF LIABILITY: Seller warrants that the goods supplied by it have been manufactured in accordance with its standard manufacturing practices and conform to the contract or catalog description set forth in the order. Seller further warrants that the goods supplied by it are fit for the ordinary purpose or purposes specified in its catalog for which such goods are used when installed in accordance with Seller's recommended installation procedures. Except as stated herein, Seller makes no express warranty with respect to goods supplied by it and Seller makes no warranty that the goods are fit for any particular purpose.

When the use of materials not manufactured by Seller is suggested by Seller's recommended installation procedures or otherwise, Seller makes no express warranty with respect to such materials nor that such materials are merchantable or fit for any particular purpose.

Seller will, at its sole option, credit, repair or replace, any goods supplied by it which its examination shall disclose to its satisfaction are defective in workmanship or material and are returned to it within one year from the date of shipment and any claim not made within this period shall conclusively be deemed waived by Buyer. Credit, repair or replacement will be preconditioned upon examination of the goods by Seller, and, if requested by Seller, return of the goods to Seller at its direction and expense. No goods are to be returned to Seller without its written consent. Seller shall not be liable for any expense incurred by Buyer in order to remedy any defect in its goods. Seller shall not be liable for any consequential, special, or contingent damage or expense, arising directly or indirectly from any defect in its goods or from the use of any defective goods. The remedies set forth herein shall constitute the exclusive remedies available to Buyer and are in lieu of all other remedies.

CLAIMS: Claims for shortage of goods or for mistakes or errors in billing must be presented within forty-five (45) days from the date of shipment of goods and must state the packing slip number and container number applicable to the claim. Any claim not so presented will be conclusively deemed waived.

TAXES: Any federal taxes or other government charges on the sale, shipment, or installation of the goods or equipment covered by the Sales Contract shall be added to the price and paid by Buyer, or, in lieu thereof, the Buyer shall furnish the Seller with tax-exemption certificates acceptable to the taxing authority. The procedure also applies to duty and other similar charges on export sales. Seller is not responsible for sales and/or use tax in any state other than Ohio. The purchase made under this Sales Contract must be exempt or paid directly by Buyer. If Seller is required to pay any such tax, there shall be added to the prices quoted herein all such state and local taxes. Buyer agrees to reimburse and save Seller harmless from all such state and local taxes, including interest and penalties thereon, which may at any time be payable to any state or local government unit with respect to the sale of any goods or materials covered by the Sales Contract.

CORRECTIONS: Typographical or clerical errors contained in the Sales Contract, including prices, are subject to correction by the Seller.

FAIR LABOR STANDARDS: All goods covered by the Sales Contract have been produced in conformity with all applicable provisions of the Fair Labor Standards Act of 1938 as amended.

RENEGOTIATION: Unless advised by Buyer in writing, Seller assumes that Buyer's order and the Sales Contract are not renegotiable under the Renegotiation Act of 1951.

APPLICABLE LAW: All questions arising out of the Sales Contract, which shall be deemed an Ohio contract, shall be governed by the laws of the state of Ohio.

EXCLUSIVE TERMS: The Sales Contract shall constitute the complete contract between the parties, and no one has authority to depart from the terms and conditions set forth therein, nor to make any representations or arrangements other than those printed thereon whether in the execution or in the performance of the Sales Contract, unless the same are written on the face of the Sales Contract or are given in writing with it or in pursuance of it, and are fully approved in writing by an officer or authorized employee of the Seller.

LIMITATION FOR SUITS: Any controversy or claim arising out of or relating to this Sales Contract or the breach thereof, must be commenced within one (1) year after the cause of action accrued.

Intentionally Blank

Hays Cleveland
Div. of UniControl Inc.
1111 Brookpark Road
Cleveland OH 44109