



# INSTRUCTIONS

BULLETIN 947280H

## OILGEAR TYPE "M-M" & "M-Y" ELECTRIC REMOTE

### MULTI-POSITION CONTROLS FOR TYPE "D" & "DC" UNITS

#### REFERENCE INSTRUCTION BULLETINS

Type "D" Variable Delivery Pumps-----947000  
Type "DC" Any-Speed Transmissions----- 967900

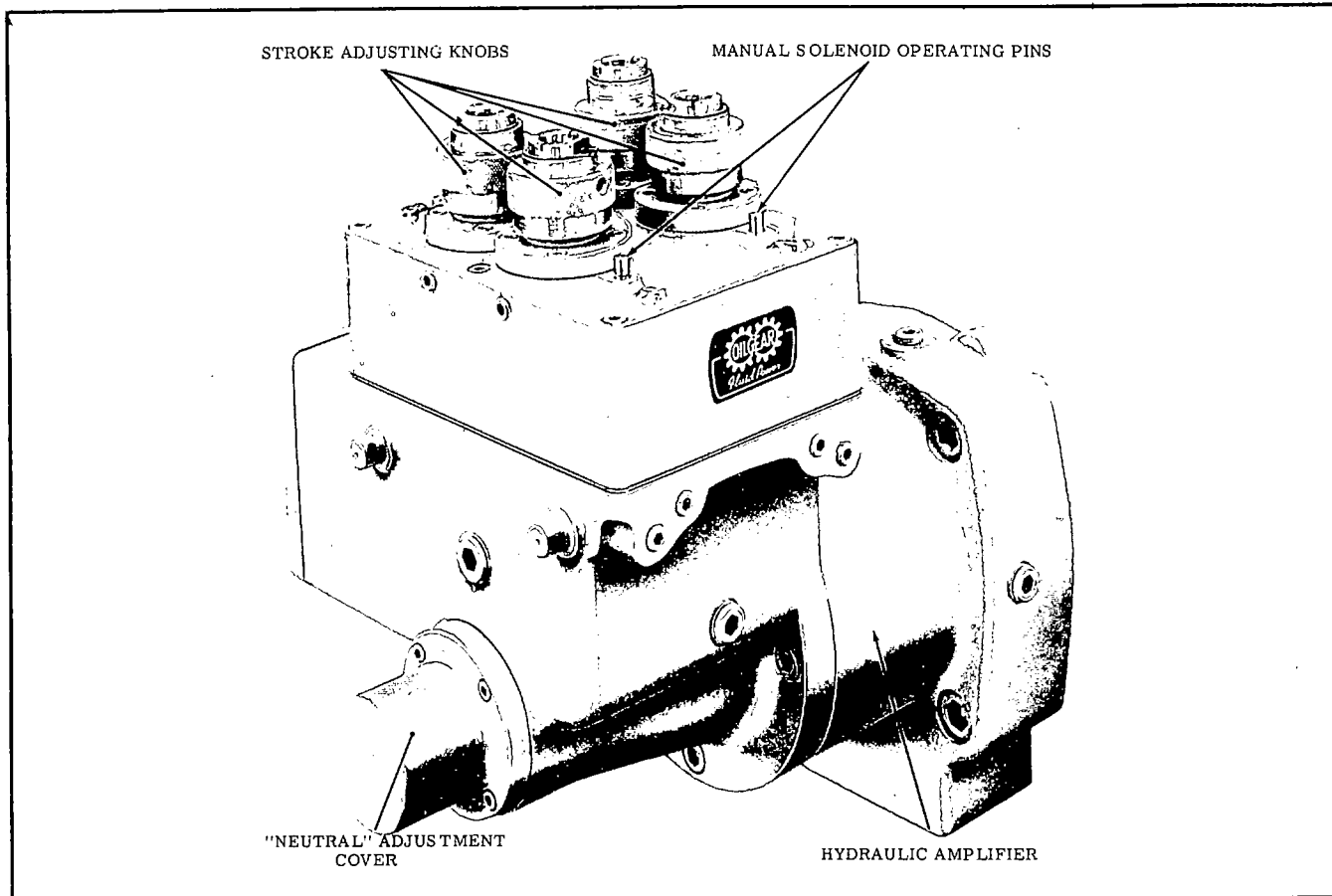


Figure 1. Oilgear Type "M-M" Control (54333-R).

#### TO THE USER AND OPERATOR OF OILGEAR "M" CONTROLLED UNITS:

These instructions are printed to simplify and minimize your work of operating and maintaining Oilgear "M" controlled units. Your acquaintance with the construction, principle of operation and characteristics of these units will assure satisfactory performance, reduce shutdowns and increase service life. We feel confident the unit will operate to your satisfaction if these instructions are adhered to. Some controls have been modified from those described and other changes may be made without notice.

#### I. CONSTRUCTION.

##### A. "M-M" CONTROL.

This control consists basically of four solenoid operated pilot valves (348), four adjustable volume control knobs (322) and control pistons (328), a positioning lever (376), a spring centering device (336) and a connecting rod (338) confined in a housing (340). This mechanism actuates a hydraulic force amplifier consisting of a pilot plunger (305), bushing (304) and a large area control piston (301) confined in a housing (300).

##### B. "M-Y" CONTROL.

This control is similar to the type "M-M" control but it has only two solenoid operated pilot valves and two adjustable volume control knobs.

Units are usually equipped with an opposing non-adjustable hydraulic operator (Type "K"). See "Standard Opposing Operators." Some units may be equipped with other opposing controls or operators to provide additional functions. These units must be equipped with a check valve for free flow out port 9A to 88.

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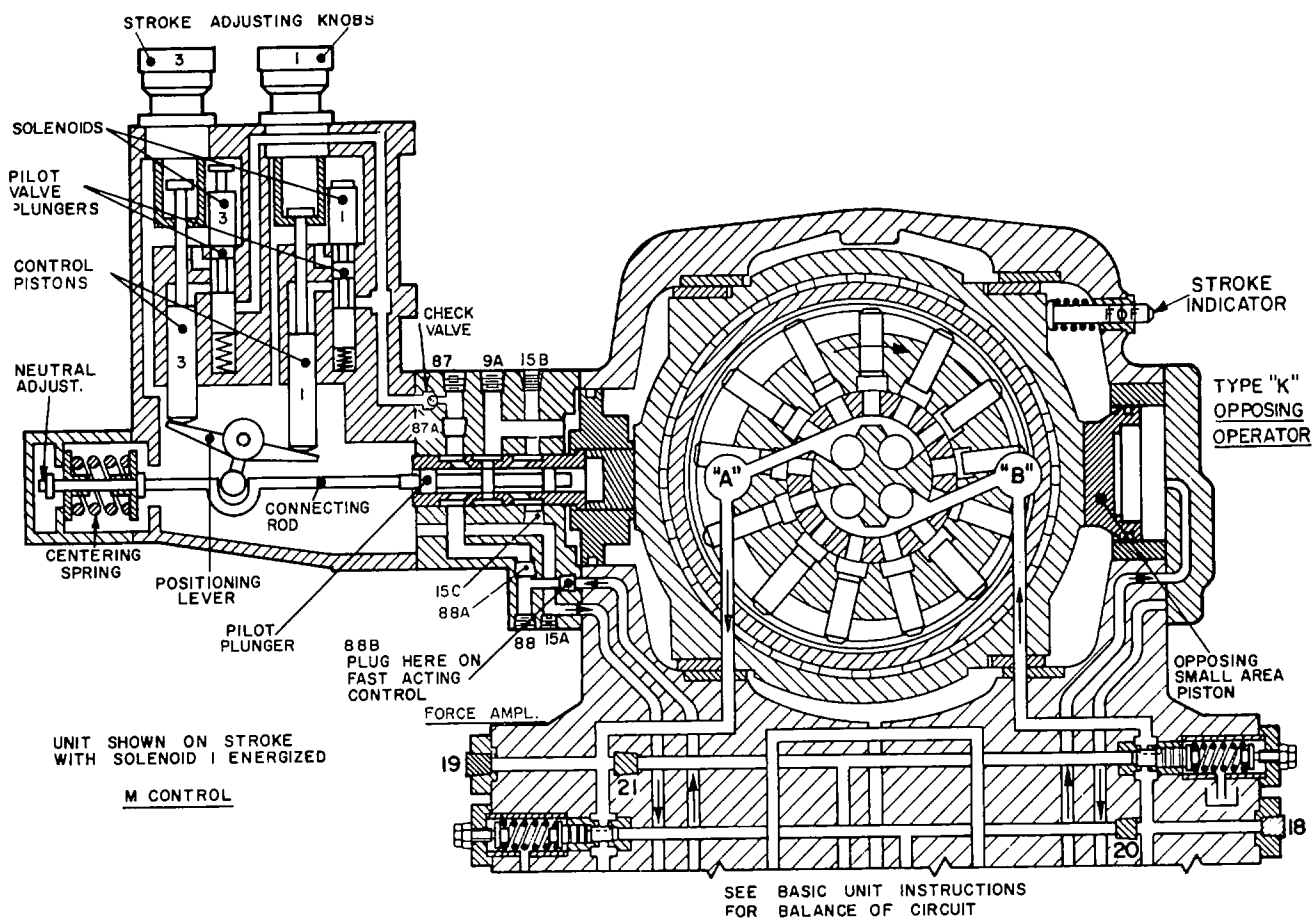


Figure 2. Cutaway Circuit Diagram of Typical "M" Control (5V-10092-LB).

For DMP Circuits, see DS-947283.

## II. PRINCIPLE OF OPERATION.

See Figure 2. See reference bulletin for units principle of operation.

Standard controls on two-way units are designed for an equal number of adjustable slideblock positions on either side of neutral and a neutral position. See figure 4 for some of the special controls.

**Operation of Standard Controls.** Control pressure is directed thru internal coring from the unit, to the control. Energizing solenoid 1 (as illustrated) depresses pilot valve plunger 1 and directs control pressure to control cylinder 1. Control piston 1 is forced downward until the collar of the adjusting screw stops movement (rotating adjusting knob raises or lowers this collar). The downward force tilts the positioning lever, moving the connecting rod and pilot plunger of force amplifier to the left. The pilot plunger directs fluid from behind the large area control piston to drain, the smaller opposing operator piston forces the slideblock and large control piston to the left until the port in the follow-up bushing is sealed by the pilot plunger "land." On standard

units, volume controls 1 and 2 position the slideblock on the control side of neutral. De-energizing solenoid 1 connects control cylinder to drain.

Energizing solenoid 3 directs control pressure to control cylinder 3 and applies a downward force on the control piston. This force tilts the positioning lever in the opposite direction and moves the connecting rod and pilot plunger to the right. The pilot plunger directs control pressure to the area behind the large control piston which overcomes the smaller opposing piston force and moves the slideblock to the right until the follow-up bushing again covers the pilot plunger "land" and seals. On standard units, volume controls 3 and 4 control the slideblock positions on the far side of neutral.

With solenoids de-energized (all control valves connect control cylinders to drain), the spring centering device returns the pilot plunger, hence, the slideblock to neutral position.

Fast action controls operate in the same manner, but use a small area control piston and control fluid is ported to the control from an external gear source at a pressure higher than the integral gear pump.

### III. SPECIFICATIONS.

#### Solenoid Current

AC Voltage	Amperes			
	Inrush		Closing	
	50 hz	60 hz	50 hz	60 hz
115	1.03	1.22	.216	.260
230	.51	.61	.108	.130

### IV. MALFUNCTIONS AND CAUSES.

#### A. ERRATIC CONTROL ACTION.

1. Defective solenoids or electrical system.
2. Low control pressure.
3. Binding pilot valve plungers or pistons.
4. Binding pilot plunger or large control piston.
5. Defective control piston rings.
6. Broken or defective centering spring.
7. Binding positioning lever or connector rod.
8. Improper volume adjusting screw settings.
9. Choke needle (early units only) clogged or screwed in too far.
10. Control check valve not functioning or restricted.
11. Foreign matter in control fluid.
12. See instructions on basic unit.

#### V. TESTING AND ADJUSTING.

##### A. TESTING

1. Filter (when used). Control sluggishness can be caused by a dirty filter element. Inspect periodically and change it when necessary.
2. Electrical. Check each solenoid to see if it is operative by energizing solenoid and pushing down manual pin (359) lightly. When solenoid is de-energized, stem should snap up. Check for loose connections. Check for proper input voltages. Check complete electrical circuit.
3. Hydraulic. Screw gages good for 1000 psi above units rating into auxiliary pressure ports, block main pump pressure ports or lock output shaft of transmission (see unit instructions). Unit is usually set to go to neutral when all control solenoids are de-energized. Start unit with all solenoids de-energized. Both gages should indicate identical pressures. To change or correct neutral setting, remove spring cover (333), loosen jam nut (396) or clamp screw (332A) and turn connector rod (338) until both gages read alike. Tighten jam nut without turning rod or nuts (394 & 395).  
NOTE: Some units are purposely set off neutral.

Calibration of each control knob can be checked by loosening set screw (323) and turning the knobs, one at a time, to indicated neutral (on graduated barrel) and depressing the corresponding manual pin (359). If gages do not read alike, stop unit. Remove retaining ring (354) in top of knob and remove plug (355). Remove screws (320A) and withdraw entire adjusting knob assembly with flange (320). Press out roll pin (383) if used in piston (328) and slide adjusting knob assembly back into bore and secure flange (320). Start unit and energize the solenoid

that corresponds to the knob. Using a screw driver thru the plug hole in the top of the control knob, rotate control piston screw (325) until neutral is attained (knob must also be at neutral). Withdraw the control knob assembly again (do not allow screw (325) or piston (328) to turn). If pin (383) is used, drill a new 0.094" hole in piston and screw and insert spring pin. Other assemblies are secured by "Loctite". Once again slide assembly into bore and fasten to control housing cover, reinstall plug (355) with O'ring (356) and lock in place with retaining ring (354).

#### V. ADJUSTING.

For special controls, see figure 4.

Loosen set screws (323) in control cover before adjusting volume control knobs. Turning the adjusting knob from one index number to the next will move the slideblock 0.0083".

When facing the input shaft, the "M" control is normally on the left side and shaft rotation is clockwise. Rotating the adjusting knobs clockwise increases pump volume or transmission speed.\* Adjusting knobs 1 and 2 adjust the slideblock movement toward the control (normally pump delivery from port "A" or transmission speed in one direction). Adjusting knobs 3 and 4 adjust slideblock movement away from control (normally pump delivery from port "B" or transmission speed in the other direction). However, some special controls are available with as many as four positions on one side of neutral, see figure 4. \*Knobs for special controls are turned counterclockwise (as arrow on control indicates) to increase pump volume or transmission speed.

#### VI. DISASSEMBLY.

When disassembling control, tag all O'rings so they can be returned to their proper place on assembly. Remove terminal box cover (350) and disconnect all electrical leads. Remove filter and/or check valve, assembly and any other piping to control.

Support control housing (340) during removal. Remove 1/2 inch pipe plug (367) and screw (340A) accessible thru plug hole. Remove the three remaining control housing screws (340A), and pull the control housing assembly straight out so the connector rod (338) and pilot plunger (305) do not become deformed or damaged.

Remove the remaining force amplifier assembly (300). Be careful not to allow piston (301) to drop from its bore. The control piston and bushing (304) assembly may come with the force amplifier or may remain in case. Check valve (392) may be removed from amplifier.

To further disassemble the control, loosen jam nut (393) and unscrew pilot plunger (305) from connecting rod (338). On early model controls, drive out roll-pin (308) from pilot plunger (305) and unscrew the plunger from connector rod (338). Remove Tru-Seal nut (387) (if used), set screw (323), and nylon ball (398) (if used). Remove flange screws (320A) and pull up on flange (320). The complete control knob

assembly with control piston (328) will come out with the flange. Mark each assembly by knob number and do not interchange them. Do not disassemble control knob assemblies any further unless absolutely necessary or readjustment of each will be required after assembly. If necessary, drive out pin (†383), unscrew control piston (328) from screw (325), remove retaining ring (354) and plug (355). Remove control cover (319). Solenoids (344) can be dismantled and solenoid pin (345), plungers (348), and springs (349) removed for inspection. Mark plungers with control numbers; do not interchange these plungers

Remove 3/8" pipe plugs (366) from either side of control housing and push out pivot shaft (362). Remove positioning lever (376) with shoes (353) and pin (352) from housing. The connecting rod (338), sleeve (339 or 397) and spring centering device can be removed. Do not disassemble further unless replacement is necessary.

Size 8 thru 35 Force Amplifier. Withdraw follow-up bushing and control piston as a unit. Remove retaining plate (317), thrust plate (306), thrust bearing and ring (307) and snap ring (307A). If necessary, control piston (301) and follow-up bushing (304) can be pressed apart.

Size 60 and larger Force Amplifier. Withdraw follow-up bushing (304) and control piston (301) as a unit. Remove retaining plate (317) and separate the piston and bushing. Remove spacer plate (378).

## VII. INSPECTION.

Clean all parts thoroughly and inspect them for signs of undue wear. Inspect check valve (392). Check fits between pilot plunger (305) and bushing (304), control valve plungers (348) and housing (340), control pistons (328) and housing (340). All fits should be smooth and all mating surfaces free from scratches. Lap if necessary. Inspect all O'rings, gaskets and seals for hardening and signs of deterioration. Be sure to remove chokes (330), (early units only) clean, inspect and return. Lubricate parts with a light film of hydraulic fluid just before reassembling.

## VIII. ASSEMBLY.

Be sure all O'rings and plugs are in their proper positions when assembling.

Size 8 thru 35 Force Amplifier. If bushing (304) was removed from piston (301), press it into place. Place snap ring (307A) in its counterbore and insert bearing and thrust ring assembly (307) in its proper place. Install thrust plate (306) and secure it in place with retaining plate (317). Position control flange gasket, insert control piston (301) with piston ring (302) into units control cylinder bore and secure force amplifier assembly (300) to case. Insert spacer (390), O'ring (391), check valve assembly (392) and O'ring (316).

Size 60 and larger Force Amplifier. Install O'rings (380 and 379) on spacer plate (378). Insert spacer and bushing (304) in control piston (301) and secure with retaining plate (317). Install piston ring (302) on control piston. Slide assembly into amplifier housing. Fit piston into cylinder bore of case and secure assembly to case. Insert spacer (390), O'ring (391), check valve assembly (392) and O'ring (316).

All Sizes. Place spring centering mechanism with sleeve (339 or 397) and connector rod (338) into control housing (340) and secure with retaining ring (335). Insert positioner lever (376) with pins (352) and shoes (353) into housing (340) so it engages the flats on sleeve (339 or 397) and the bore for pivot shaft (362) lines with holes for that shaft. Insert pivot shaft (362). The shaft must slide thru the lever with a minimum of effort. Center shaft in housing and secure with pipe plugs (366). Secure cover (333) with O'ring (331) in place. Slip adapter (313) with O'rings into housing bore. Check connecting rod movement for smoothness of operation. Turn jam nut (393) onto connector rod (338) except on some earlier units, place retaining ring (310) and spacer (309) on rod (338). Screw pilot plunger (305) on rod (338) to dimension shown on parts drawing and screw jam nut (393) down to secure the rod to the plunger. On earlier units, screw pilot plunger (305) on rod until holes align and secure with roll pin (308). Guide this control assembly into hydraulic amplifier carefully without damaging pilot plunger or connecting rod. Secure control assembly to hydraulic amplifier with four screws (340A). Insert and secure one thru 1/2" pipe plug hole and replace pipe plug (367).

Insert control valve springs (349) and plungers (348) into their respective bores. Position solenoid pins (345) and secure solenoid assemblies (344) to housing. Check for free operation. Connect solenoid leads to terminal strip. Solenoid 1 to terminals 1 etc. Secure cover (319), with gasket (318) in place, to housing. Insert each control knob assembly with control piston into its respective bore and secure flange (320) to cover (319). Install nylon ball (398) (if used), set screw (323), and Tru-Seal nut (387) (if used). If control piston (328) was replaced, or control knob assembly disassembled, it may be necessary to test and adjust as outlined in section V.

Connect filter and/or external check valve assembly, if used, and unit to the system, but do not connect electrical power to terminal strip. The unit can be tested and adjusted per Section V. by manual actuation of manual pins (359). Then, connect electrical power to terminal strip and test operation of solenoids.

Parts Drawing on page 6 & 7.

Parts used in this assembly are per Oilgear specifications. Use Oilgear parts to insure compatibility with assembly requirements. When ordering repair parts, be sure to include unit serial number, item number, and bulletin number. Specify type of hydraulic fluid for O'rings and seals.

X. PARTS LIST

Item No.	Description	Item No.	Description	Item No.	Description
300.	Housing, Hyd. Amplifier	336.	Spring, Centering	376.	Lever, Positioning
300A.	Screw, Sock. Hd. Cap	337.	Guide, Spring	377.	Spacer, Inner Ctr. Knob
300B.	Seal, O'ring	338.	Rod, Connector	378.	Spacer
301.	Piston, Control	† 339.	Sleeve, Connecting Rod	379.	Seal, O'ring
301A.	Pin, Locating	340.	Housing, "M" Control	380.	Seal, O'ring
302.	Ring, Control Piston	340A.	Screw, Sock. Hd. Cap	**381.	Adapter, Fast Acting
303.	Cup, Thrust	341.	Ring, Retaining	**381A.	Screw, Sock. Hd. Cap
304.	Bushing, Follow-up	342.	Spacer, Outer Knob	**382.	Seal, O'ring
305.	Plunger, Pilot	343.	Screw, Control Adj.	† 383.	Pin, Spring
306.	Plate, Thrust	#344.	Assembly, Solenoid	384.	Shaft, Stub
307.	Bearing, Thrust	344A.	Screw, Sock. Hd. Cap	385.	Pin, Spring
307A.	Ring, Snap	344B.	Washer, Lock	386.	Plate, Feed Thru
† 308.	Pin, Roll	345.	Pin, Solenoid Push	387.	Nut, Tru-Seal
† 309.	Spacer	#346.	Assembly, Feed-thru	388.	Cover, Blind
† 310.	Ring, Retaining	#346A.	Seal, O'ring	389.	Seal, O'ring
311.	Seal, O'ring	#347.	Ring, Retaining	390.	Spacer, Check Valve
312.	Seal, O'ring	348.	Plunger, Pilot Valve	391.	Seal, O'ring
313.	Adapter, Control	349.	Spring, Pilot Valve	392.	Assembly, Check Valve
314.	Seal, O'ring	350.	Cover, Term. Box	393.	Nut, Jam
315.	Seal, O'ring	350A.	Screw, Sock. Hd. Cap	394.	Nut, Hex.
316.	Seal, O'ring	351.	Gasket, Term. Box	395.	Nut, Jam
317.	Ring, Retainer	352.	Pin, Shoe	396.	Nut, Jam
317A.	Screw, Flt. Hd. Mach.	353.	Shoe, Tilt. Lever	397.	Sleeve, Conn. Rod
318.	Gasket, Control Cover	354.	Ring, Retaining	398.	Ball, Nylon
319.	Cover, Control	355.	Plug, Adj. Knob	399.	Plate, Name
319A.	Screw, Sock. Hd. Cap	356.	Seal, O'ring	401.	Housing, H. P. Limiter
320.	Flange, Adj. Knob	357.	Seal, O'ring	401A.	Screw, Cap
320A.	Screw, Sock. Hd. Cap	358.	Seal, O'ring	402.	Button, H. P. Limiter
321.	Screw, 1/2 Dog. Pt.	359.	Pin, Solenoid Manual	403.	Shims, Button
322.	Knob, Adj. Control (CW)	† 359A.	Protector, Pin	404.	Seal, O'ring
323.	Screw, Set	360.	Plug, Dummy	405.	Piston, H. P. Limiter
324.	Stop, Adj. Screw	361.	Seal, O'ring	406.	Shims, Piston
325.	Screw, Contr. Piston (CW)	362.	Shaft, Pivot	407.	Spring, H. P. Limiter
326.	Seal, O'ring	363.	Plug, 1/16" Pipe	408.	Spacer, Spring
† 327.	Spacer	364.	Plug, 1/8" Pipe	409.	Seal, O'ring
328.	Piston, Control	365.	Plug, 1/4" Pipe	410.	Seal, O'ring
329.	Seal, O'ring	366.	Plug, 3/8" Pipe	411.	Cover, H. P. Limiter
† 330.	Needle, Choke	367.	Plug, 1/2" Pipe	411A.	Screw, Cap
† 330A.	Lock Nut and Seal	368.	Plug, 3/4" Pipe	412.	Plunger, H. P. Limiter
331.	Seal, O'ring	369.	Ring, Retaining		
† 332.	Clamp, Neut. Adj	370.	Pin, Dummy	*	For special counter-clockwise controls only.
† 332A.	Screw, Sock. Hd. Cap	371.	Flange, Blind	**	For fast acting controls only.
333.	Cover, Neut. Adj.	*372.	Knob, Adj. Contr. (CCW)	†	Used only on some early models.
333A.	Screw, Sock. Hd. Cap	*373.	Screw, Contr. Piston (CCW)	#	Items 344, 346, 346A and 347 furnished only as an assembly.
† 334.	Spacer, Connecting Rod	374.	Marker, Terminal Strip		
335.	Ring, Retaining	375.	Strip, Terminal		
		375A.	Screw, Rd. Hd. Mach.		

O'RING SIZES

Cross Section x O.D. Duro ± 5

Item No.	All Sizes
311.	1/16 x 1/2 70
314.	1/8 x 4-1/2 70
315.	1/16 x 9/16 70
316.	3/32 x 3/4 70
326.	1/16 x 3/4 70

Item No.	All Sizes
329.	3/32 x 2-1/8 70
331.	1/8 x 2-1/8 70
356.	3/32 x 5/8 70
357.	1/16 x 1 70
358.	1/16 x 1/4 70

Item No.	All Sizes
361.	3/32 x 1-7/16 70
391.	1/16 x 1/2 70
404.	1/8 x 2-3/8 70
409.	3/32 x 15/16 70
410.	3/32 x 11/16 70

Item No.	UNIT SIZES				
	8 & 12	20 & 35	60	100	150 and larger
300 B.		—	1/8 x 9-1/4 70	1/4 x 11-1/2 70	1/4 x 12 70
312.		—	3/32 x 13/16 70	3/32 x 13/16 70	3/32 x 13/16 70
379.		—	1/8 x 3-1/4 70	1/8 x 3-1/4 70	1/8 x 3-1/4 70
380.		—	1/8 x 3-5/8 70	1/8 x 3-5/8 70	1/8 x 3-5/8 70
382.		3/16 x 5-1/2 70	1/8 x 6-1/4 70	1/8 x 8-1/2 70	1/8 x 7-3/4 70
389.		1/8 x 1-1/4 70	1/8 x 1-5/8 70	1/8 x 1-3/4 70	1/8 x 1-7/8 70

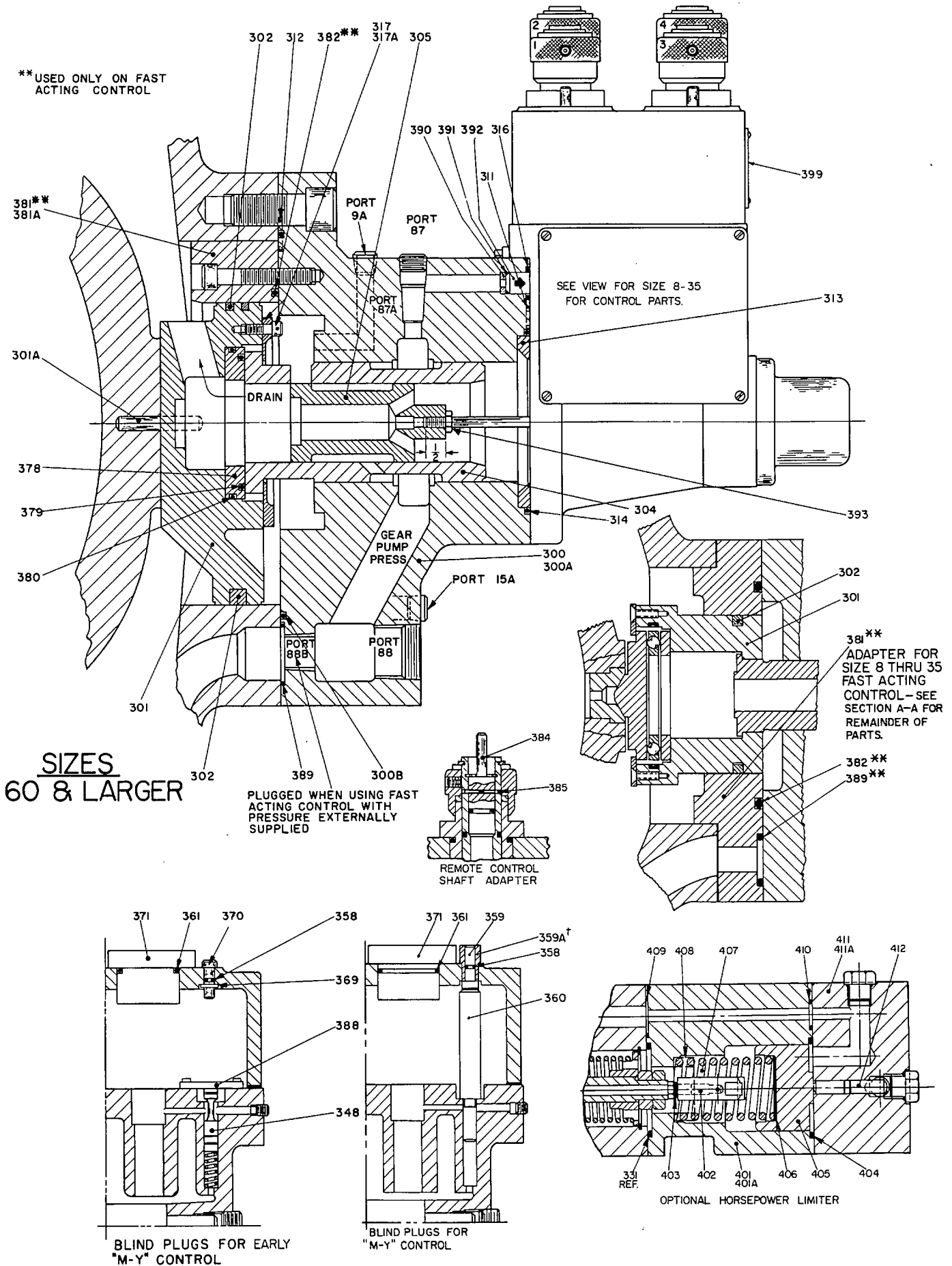
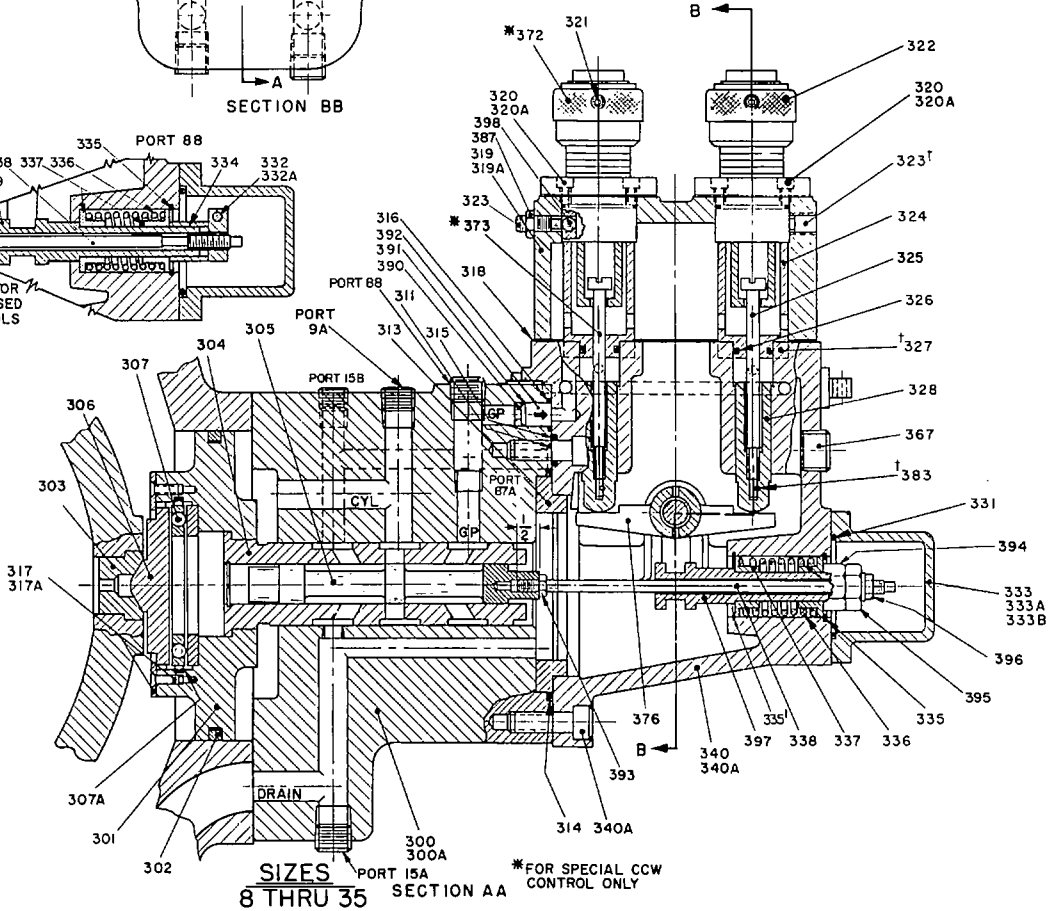
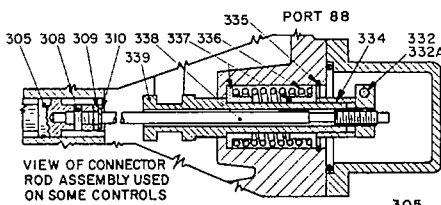
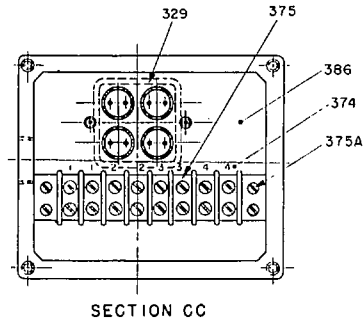
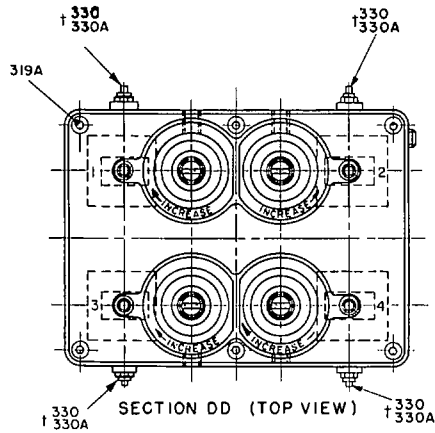
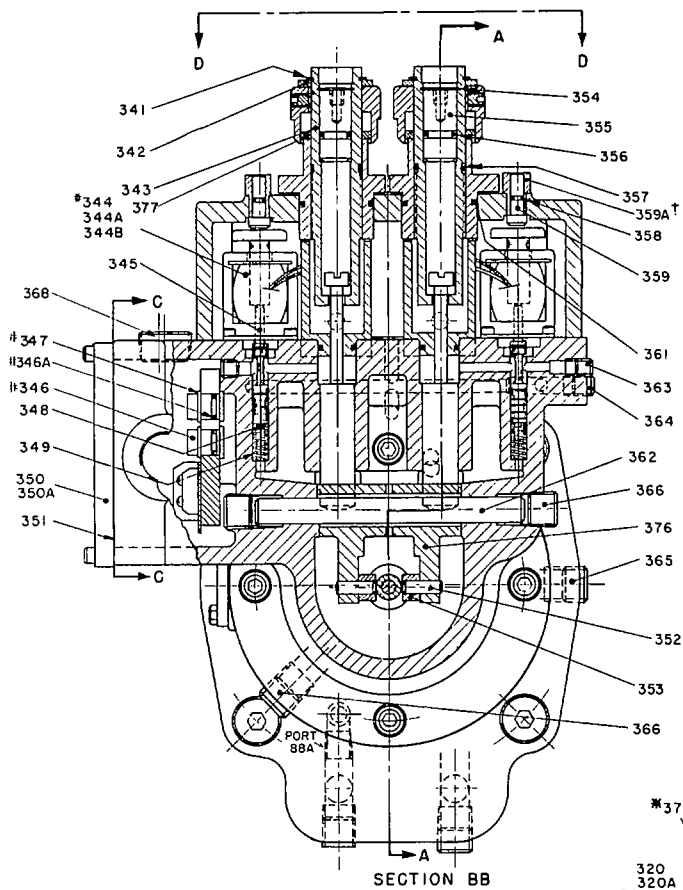


Figure 3. Parts Drawing, Oilgear Type "M" Controls. DS-947280-H (501017-H, Sheet 1 of 2)  
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TYPE "D"



SIZES 8 THRU 35 SECTION AA \*FOR SPECIAL CCW CONTROL ONLY

Figure 3. Parts Drawing, Oilgear Type "M" Controls. DS-947280-H, (501017-H, Sheet 2 of 2)

KEY

Control Is Adjustable Over Range Indicated   
 \*Control Setting (Example) Indicated   
 Standard Adjusting Knob Assemblies Indicated-----STD   
 Special Adjusting Knob Assemblies Indicated-----SPE

\*When two solenoids are energized simultaneously, special adjusting knob setting must be for a shorter stroke setting than the standard knob.

"M-M" CONTROLS (4 DELIVERIES & NEUTRAL)

STYLE	KNOB ADJUST. ASSEMBLIES				SOLENOIDS ENERGIZED (+)				PUMP STROKE		
	1	2	3	4	1	2	3	4	Port "A" Full	Neut.	Port "B" Full
I.	STD	STD	SPE	SPE	+	+	+	+			
II.	STD	STD	STD	SPE	+	+	+	+			
† III. STD.	STD	STD	STD	STD	+	+	+	+			
IV.	STD	SPE	STD	STD	+	+	+	+			
V.	SPE	SPE	STD	STD	+	+	+	+			

† This combination will be furnished unless otherwise ordered.

"M-M" CONTROL (5-POSITION)

Adjustments will be the same as above except when no solenoids are energized the unit will go on stroke rather than neutral. This stroke can be adjusted throughout the range by removing control stem cover and repositioning the neutral adjustment.

"M-Y" CONTROLS (2-DELIVERIES & NEUTRAL)

STYLE NO.	ADJUST. ASSEM.		SOL. ENERG.		PUMP STROKE		
	1	3	1	3	Port "A" Full	Neut.	Port "B" Full
I	STD	SPE	+	+			
† II	STD	STD					
III	SPEC	STD					

† This combination will be furnished unless otherwise ordered.

"M-Y" CONTROLS (3-DELIVERY)

Adjustments will be the same as above except when no solenoids are energized, the unit will go to stroke rather than neutral. This stroke can be adjusted throughout the range by removing control stem cover and repositioning the neutral adjustment.

Figure 4. Knob adjustment and Solenoid Operation for "M" Controls (DS-47290).