



670 Series Rotary Sprinklers

Installation & Service Instructions

Introduction

The 670 Series Full Circle Sprinklers are designed for irrigation of large turf areas such as golf courses, parks, recreational fields and school grounds.

Manufactured from durable, high strength engineering plastic and stainless steel components, these sprinklers incorporate many innovative and time-proven features for lasting, maintenance-free operation.

Prior to installing the sprinkler, read through the recommended installation and start-up procedures. Please observe all **Warnings** and **Cautions** when installing and operating this equipment.

670
Electric Valve-In-Head

Features

- Four standard pressure regulation settings available to ensure consistently accurate nozzle performance regardless of elevation
- Four body styles/activation types available to fit every application: Electric VIH, Normally Open Hydraulic VIH, Normally Closed Hydraulic VIH and Check-O-Matic
- Manual control at the sprinkler, On-Off-Auto (Electric and Normally Closed)
- Bowl-vented discharge (atmospheric) minimizes the differential pressure required for regulation and ensures positive valve closure (Electric and Normally Closed)
- Time-proven gear drive design
- All internal components serviceable from the top of the sprinkler
- Large selection of nozzles available
- Fixed stator (#70 and #71 nozzle)
- Variable stator (#72, #73 and #74 nozzle)
- Durable plastic and stainless steel construction

Specifications

- Radius: 70' – 102' (21.4 m – 31,1 m)
- Flow Rate:
 - 31.9 – 66.8 GPM
 - 120.7 – 252.8 l/mn
 - 7.2 – 15.2 m³/hr
- Arc: Full Circle
- Models:
 - Normally Open Valve-In-Head
 - Check-O-Matic
 - Electric Valve-In-Head
 - Normally Closed Valve-In-Head
- Maximum Pressure:
 - All Models - 150 PSI (10.5 kg/cm²) (1034.5 kPa)
- Body Height: 11" (279.0 mm)
- Pop-Up Height: 1.25" (31.8 cm)
- Pop-Up to Nozzle: 1" (25.4 mm)
- Trajectory: 25°
- 1.5" NPT or BSP Female Thread Inlet
- Solenoid:
 - 24 VAC, 50/60 Hz
 - Inrush Current: 50 Hz, 0.47 Amps (11.3 VA)
60 Hz, 0.40 Amps (9.6 VA)
 - Holding Current: 50 Hz, 0.32 Amps (7.7 VA)
60 Hz, 0.30 Amps (7.2 VA)
- Manual Control: On-Off-Auto
- Check-O-Matic model checks up to 37' (11.3 m) of elevation.

Ordering Information

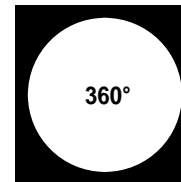
674-XX-XX X			
Arc	Body / Valve	Nozzle	Pres. Reg.
674 = Full Circle	01 = NPT, NO Valve-In-Head	70	5 = 50 PSI
	02 = NPT, Check-O-Matic	71	6 = 65 PSI
	06 = NPT, Electric Valve-In-Head	72	8 = 80 PSI
	08 = NPT, NC Valve-In-Head	73	1 = 100 PSI
	51 = BSP, NO Valve-In-Head	74	
	52 = BSP, Check-O-Matic		
	56 = BSP, Electric Valve-In-Head		
	58 = BSP, NC Valve-In-Head		

Note: Pressure regulation available on Electric and Normally Closed Valve-In-Head models only.

Performance Information

670 NOZZLE PERFORMANCE — U.S.

BASE PRES.	NOZZLE SET 70		NOZZLE SET 71		NOZZLE SET 72		NOZZLE SET 73		NOZZLE SET 74	
	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM
50	70	31.9	70	34.9	71	38.7	72	41.5	72	44.4
55	73	33.6	73	36.9	75	41.2	76	44.6	77	48.7
60	76	35.5	78	39.5	79	43.7	80	47.8	81	53.0
65	78	36.9	80	41.1	83	46.3	84	51.0	86	57.5
70	80	38.4	82	42.7	85	47.9	86	52.6	89	58.2
75	82	39.7	83	44.1	87	49.4	89	54.5	91	58.9
80	84	41.2	86	45.6	89	51.0	92	55.3	94	59.6
85	85	42.5	86	47.0	91	52.6	94	57.9	96	61.4
90	86	43.8	87	48.5	92	54.5	95	59.8	99	63.4
95	87	45.0	89	49.8	94	55.7	97	61.2	100	65.0
100	88	46.2	90	51.2	95	57.3	98	62.8	102	66.8



Rad = feet GPM = gallons per minute

■ = Pressure regulation □ = Nozzles not recommended at this pressure

670 NOZZLE PERFORMANCE — METRIC

BASE PRESSURE	NOZZLE SET 70			NOZZLE SET 71			NOZZLE SET 72			NOZZLE SET 73			NOZZLE SET 74			
	kg/cm ²	kPa	Rad	l/mn	m ³ /hr	Rad	l/mn	m ³ /hr	Rad	l/mn	m ³ /hr	Rad	l/mn	m ³ /hr	Rad	l/mn
3.5	342.4	21.4	120.7	7.2	21.4	132.1	7.9	21.7	146.5	8.8	22.0	157.1	9.4	22.0	168.1	10.1
4.0	386.4	22.5	128.7	7.7	22.5	141.5	8.5	23.1	157.9	9.5	23.4	171.1	10.2	23.8	186.7	11.2
4.5	440.2	23.7	139.0	8.4	24.3	154.8	9.3	24.7	171.4	10.3	25.1	187.8	11.3	25.5	207.9	12.4
4.6	445.1	23.8	139.7	8.4	24.4	155.6	9.3	25.3	175.2	10.5	25.6	193.0	11.6	26.2	217.6	13.1
5.0	479.4	24.4	145.3	8.7	25.0	161.6	9.7	26.1	181.3	10.9	26.2	199.1	11.9	27.1	220.3	13.2
5.5	513.6	25.0	150.3	9.0	25.3	166.9	10.0	26.5	187.0	11.2	27.1	206.3	12.4	27.8	222.9	13.4
5.6	547.8	25.6	155.9	9.4	26.2	172.6	10.4	27.1	193.0	11.6	28.1	209.3	12.6	28.7	225.6	13.5
6.0	582.1	25.9	160.9	9.7	26.7	177.9	10.7	27.8	199.1	11.9	28.7	219.2	13.2	29.3	232.4	13.9
6.5	616.3	26.2	165.8	9.9	27.4	183.6	11.0	28.1	206.3	12.4	29.0	226.3	13.6	30.2	240.0	14.4
7.0	684.8	26.8	174.9	10.5	27.7	193.8	11.6	29.0	216.9	13.0	29.9	237.7	14.3	31.1	252.8	15.2

kPa = kilo Pascals Rad = meters l/mn = liters per minute m³/hr - cubic meters per hour

■ = Pressure Regulation Models □ = Nozzles not recommended at this pressure

Spacing of Sprinklers

Square Spacing

No Wind 55% of diameter
4 m.p.h. 50% of diameter
8 m.p.h. 45% of diameter

Single Row Spacing

No Wind 50% of diameter
4 m.p.h. 50% of diameter
8 m.p.h. 45% of diameter

Triangular Spacing

No Wind 60% of diameter
4 m.p.h. 55% of diameter
8 m.p.h. 50% of diameter

Conversion Information

- All gallons per minute shown are U.S.
- To convert to Imperial gallons per minute, multiply by .833.
- To convert to liters per minute, multiply by 3.78.
- To convert pounds per square inch (PSI) to atmospheres, divide by 14.7.
- To convert pounds per square inch (PSI) to kilograms per square centimeter (kg/cm²) divide by 14.22.
- To convert feet to meters, divide by 3.28.
- To convert inches to millimeters, multiply by 25.4.

Installation Procedure

To assure maximum performance from your 670 Series Rotary Sprinklers, read these instructions completely prior to installation or service.

Construct Swing Joints

1. Construct or provide triple swing joints for each sprinkler as shown in **Figure 1**. Use PVC or ABS pipe nipple for sprinkler connection.

NOTE: On sites where the possibility of heavy equipment rolling over a sprinkler exists, the swing joint will flex preventing damage to the lateral or main lines. On a new installation in raw ground where the sprinklers are to be initially installed above the finished grade and lowered when new turf is established, the swing joint allows sprinkler repositioning without changing risers. This is a common and practical procedure which eliminates the problem of dirt being accidentally introduced into the lateral lines when a riser is changed.

2. Flush lines thoroughly prior to installing sprinkler.
3. Apply Teflon™ tape on riser threads. Install sprinkler to riser and tighten.

CAUTION

Use only Teflon tape on riser threads. Use of pipe dope or other types of sealing compounds can cause deterioration of sprinkler body threads.

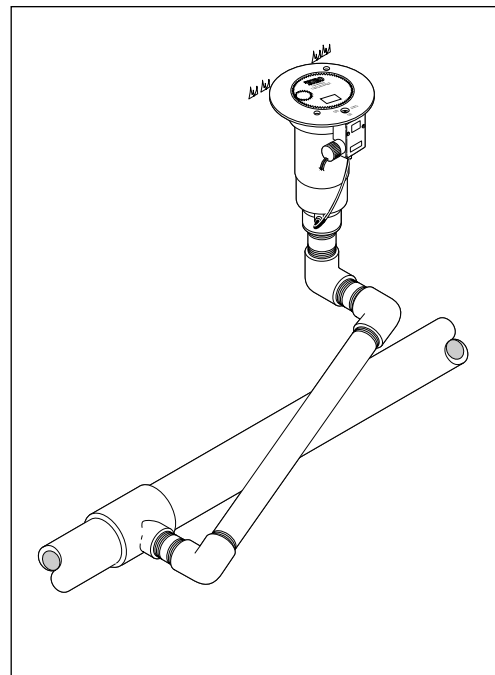


Figure 1 — Triple Swing Joints

Connecting Electric Control Wires

1. Route control wires to sprinkler location(s). Provide enough extra wire at sprinkler to allow for movement of sprinkler without straining wire connections. One common wire and station wire is required for each sprinkler. See Wire Sizing Chart, **Table 1** for proper application.
2. Attach control wires to solenoid leads using an approved waterproof splicing method.

CAUTION

All wire connections must be waterproofed to prevent short circuit to ground and subsequent controller damage.

Connecting Hydraulic Control Tubing

1. Route control tubing from controller to sprinkler location(s).

NOTE:

- Leave an 18" (45,7 cm) service loop of tubing at each sprinkler to facilitate movement of sprinkler and service operations.
- Tubing runs in excess of 1,000' (304,8 m) are not advisable due to delayed response time.
- The valve elevation for normally open valve-in-head systems should not exceed 25' (7,6 m) above controller elevation or 70' (21,3 m) below controller elevation.
- The valve elevation for normally closed valve-in-head systems should not exceed 0' above controller elevation or 70' (21,3 m) below controller elevation.
- If connecting more than one VIH sprinkler per control tubing run, refer to the chart below.

	Recommended	Maximum
1" VIH	3	5
1.5" VIH	2	3

2. Flush tubing thoroughly to remove all air and debris.
3. Remove tube retainer and poly cap from tubing adapter at base of sprinkler.
4. Slide tube retainer over control tubing and attach tubing to adapter.
5. Slide tube retainer over adapter area to secure tubing.

Table 1: Wire Sizing Chart

Maximum allowable length in feet from controller to electric VIH sprinklers.

OUTPUT VOLTAGE AT CONTROLLER TRANSFORMER	WIRE SIZE		NUMBER OF VALVES			
	CONTROL	COMMON	1	2	3	4
23 VAC	14	14	2348	1012	549	353
23 VAC	14	12	2890	1239	673	433
23 VAC	14	10	3378	1448	786	505
23 VAC	12	12	3759	1604	873	561
23 VAC	12	10	4591	1973	1071	688
23 VAC	12	8	5411	2328	1263	812
23 VAC	10	10	5945	2555	1387	892
24 VAC	14	14	2765	1309	846	549
24 VAC	14	12	3393	1608	1039	673
24 VAC	14	10	3962	1877	1213	783
24 VAC	12	12	4394	2082	1346	872
24 VAC	12	10	5397	2557	1652	1071
24 VAC	12	8	6364	3018	1949	1263
24 VAC	10	10	6986	3311	2140	1387

Chart based on the following

- Transformer - 115/230 VAC - 24 VAC, 45 VA
- Coil Assy. - 24 VAC, 60 Hz
- Holding - .30 Amps
- In Rush - .40 Amps

System Start-Up

The following is a recommended procedure that will protect system components during system start-up. The procedure is based on a velocity fill rate of less than 2' (0.6 m) per second. See **Table 2** below.



WARNING
DUE TO HIGH OPERATING PRESSURE, NEVER STAND OR LEAN DIRECTLY OVER TOP OF SPRINKLER OR COME IN CONTACT WITH SPRAY. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY.

1. Use jockey pump only to fill system at velocity fill rate of less than 2' (0.6 m) per second.
2. Use quick coupler keys at all tees and greens with quick coupler valves to bleed air from system lines during filling process. **Do not compress air and then relieve, bleed air while filling system.**
3. After water has filled all lines and all air is removed, remove quick coupler keys.

CAUTION

Failure to comply with recommended fill rate will increase line pressure resulting in a water hammer effect that could damage sprinklers.

Table 2 Recommended System Fill Rate

Pipe Size		Flow		Velocity		Pipe Size		Flow		Velocity	
in.	mm	GPM	LPM	ft/sec	m/sec	in.	mm	GPM	LPM	ft/sec	m/sec
1/2	12.7	2	7.6	1.60	0.49	3	76.2	45	170.3	1.86	0.57
3/4	19.1	3	11.4	1.92	0.59	4	101.6	75	283.9	1.87	0.57
1	25.4	5	18.9	1.50	0.46	6	152.4	150	567.8	1.73	0.53
1-1/4	31.3	10	37.9	1.86	0.57	8	203.2	250	946.3	1.70	0.52
1-1/2	38.1	10	37.9	1.41	0.43	10	254.0	450	1703.0	1.97	0.60
2	50.8	20	75.7	1.80	0.55	12	304.8	500	1893.0	1.55	0.47

Pilot Valve Operation (Models 674-X6-XXX and 674-X8-XXX Only)



WARNING
DUE TO HIGH OPERATING PRESSURE, NEVER STAND OR LEAN DIRECTLY OVER SPRINKLER OR COME IN CONTACT WITH SPRAY WHEN ACTUATING SPRINKLER MANUALLY OR AUTOMATICALLY. PRIOR TO ACTUATION OF SPRINKLER, USE A SLOT HEAD SCREWDRIVER TO LIFT CAP TO OBSERVE DIRECTION OF NOZZLE. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY.

The main function of the pilot valve is to control the operation of the main valve located in the base of the sprinkler body. The main valve is operated by the release of water metered through the pilot valve when it is activated either manually at the sprinkler or by the irrigation system controller.

Another important function of the pilot valve is to regulate the water pressure to the sprinkler nozzle. Pressure regulation compensates for large variations within the system and maintains a constant pressure for optimum sprinkler operation. The pilot valve is factory set to regulate one of four pressure levels 50 PSI (3.5 kg/cm²), 65 PSI (4.6 kg/cm²), 80 PSI (6.0 kg/cm²) or 100 PSI (7.0 kg/cm²).

NOTE: Sprinklers built between 1986 and 1988 utilized an adjustable pilot valve assembly. Although factory-set at 100 PSI (7.0 kg/cm²) regulating pressure, the pilot valve can be set to regulate between 40 – 120 PSI (2.8 – 8.4 kg/cm²) to compensate for various field conditions. See *Adjusting Pressure Regulation* on page 11 for more information.

The sprinkler operation mode is set using a Toro Selector Tool (P/N 995-15) inserted through the body flange onto the pilot valve D-shaped selector cam. The "AUTO" mode permits automatic operation from the system controller. The "ON" mode opens the main valve for manual operation and "OFF" mode prevents the main valve from opening.

System Troubleshooting — Pilot Valve

Possible equipment failures with causes and corrective action are listed below.

PROBLEM	POSSIBLE CAUSE – CORRECTIVE ACTION
1. Sprinkler will not turn on	<ul style="list-style-type: none">(a) No 24 VAC to coil assembly. (Electric Models)<ul style="list-style-type: none">– <i>Measure voltage with a Digital Volt Meter (DVM). Check wiring and controller program.</i>– <i>Refer to Controller Operating Instructions.</i>(b) Selector cam in "OFF" position.<ul style="list-style-type: none">– <i>Set to "AUTO" position.</i>(c) Debris in pilot valve assembly.<ul style="list-style-type: none">– <i>Disassemble and remove all debris. (See Servicing Pilot Valve page 10.)</i>(d) Insufficient pressure in controller supply line and/or sprinkler control tube. (N.C. Models)<ul style="list-style-type: none">– <i>Check pressure.</i>
2. Sprinkler will not shut off	<ul style="list-style-type: none">(a) Constant 24 VAC from controller. (Electric Models)<ul style="list-style-type: none">– <i>Check for voltage using a DVM. If voltage is present, disconnect wire. If sprinkler closes, service controller. Refer to Controller Service Manual.</i>(b) Selector cam in manual "ON" position.<ul style="list-style-type: none">– <i>Set to "AUTO" or "OFF" position.</i>(c) Debris in pilot valve assembly.<ul style="list-style-type: none">– <i>Disassemble and remove all debris. (See Servicing Pilot Valve page 10.)</i>(d) Constant pressure from controller. (N.C. Models)<ul style="list-style-type: none">– <i>Check pilot valve at controller for constant flow.</i>– <i>Check elevation differential. Valve elevation should not exceed 0' above controller elevation or 70' (21,3 m) below controller elevation.</i>

System Troubleshooting — Sprinklers

PROBLEM	POSSIBLE CAUSE – CORRECTIVE ACTION
1. Sprinkler won't rotate	<ul style="list-style-type: none"> (a) Debris wedged between stator and turbine. – <i>Remove obstruction.</i> (b) Drive assembly defective. – <i>Replace drive assembly.</i> (c) Nozzle base assembly defective. – <i>Replace nozzle base assembly.</i>
2. Head sticks up	<ul style="list-style-type: none"> (a) Dirt in riser assembly. – <i>Flush out. (See Flushing Procedure on page 10.)</i> (b) Damaged or missing return spring. – <i>Replace.</i>
3. Poor distribution pattern	<ul style="list-style-type: none"> (a) Nozzle plugged with debris. – <i>Clean or replace nozzle.</i> (b) Nozzle orifice damaged. – <i>Replace nozzle.</i> (c) Low operating pressure. – <i>Determine why system overloaded and correct.</i>
4. Valve won't close (Hyd. Normally Open 674-X1-XX)	<ul style="list-style-type: none"> (a) Leak in control tubing. – <i>Isolate and repair.</i> (b) Pilot valve leak in controller. – <i>Confirm by observing constant dripping from discharge line of controller. Refer to Controller Service Manual.</i> (c) Foreign object keeping valve from seating. – <i>Remove, clean and check valve for damage. Replace if necessary.</i> (d) Damaged piston seal or piston assembly. – <i>Replace valve assembly.</i> (e) Valve not properly communicated to tube in body. – <i>Reassemble if necessary.</i>
Valve won't close (Hyd. Normally Closed 674-X8-XXX)	<ul style="list-style-type: none"> (a) Debris in or around valve assembly preventing complete closure. – <i>Remove and clean valve assembly and valve seat.</i> (b) Damaged valve piston assembly and/or cylinder. – <i>Remove and replace parts as necessary.</i> (c) Valve cylinder misaligned with sprinkler body communication tube. – <i>Remove valve assembly and install correctly.</i> (d) Elevation differential between sprinkler and controller exceeds tolerance. – <i>Check elevation differential. Valve elevation should not exceed 0' above controller elevation or 70' (21.3 m) below controller elevation.</i> (e) Restriction in controller discharge line. – <i>Inspect and clean.</i>
5. Valve won't open (Hyd. Normally Open 674-X1-XX)	<ul style="list-style-type: none"> (a) Plugged controller discharge line or discharge port in pilot valve. – <i>Verify by checking for discharge at discharge line when station is activated. If no discharge, refer to Controller Service Manual.</i>
Valve won't open (Hyd. Normally Closed 674-X8-XXX)	<ul style="list-style-type: none"> (a) Insufficient pressure in controller supply line and/or sprinkler control tube. – <i>Check pressure.</i> (b) Restriction in sprinkler body communication tube. – <i>Remove valve assembly. Inspect and clean communication tube.</i> (c) Pilot valve hydraulic adapter inoperative. – <i>Remove and replace.</i>
6. Valve won't close (Electric 674-X6-XXX)	<ul style="list-style-type: none"> (a) Leak in pilot valve assembly. – <i>Replace pilot valve assembly.</i> (b) Plugged supply screen on piston. – <i>Clean or replace screen.</i> (c) Manual control selector on pilot valve assembly turned to "ON" position. – <i>Turn to "AUTO" position.</i> (d) Pilot Valve solenoid inoperative. – <i>Remove and replace.</i>

System Troubleshooting — Sprinklers (continued)

PROBLEM	POSSIBLE CAUSE – CORRECTIVE ACTION
7. Valve won't open (Electric 674-X6-XXX)	<ul style="list-style-type: none">(a) Control (field) wires severed. – <i>Isolate and repair.</i>(b) Defective solenoid. – <i>Replace solenoid.</i>(c) No power to controller. – <i>Establish controller power.</i>(d) No power from controller to solenoid. – <i>Check for blown fuse and replace.</i>(e) Manual control selector on pilot valve assembly turned to "OFF" position. – <i>Turn to "AUTO" position.</i>(f) No supply from main valve. – <i>Debris in control tube, main valve assembly and/or communication passages in body. Flush thoroughly.</i>(g) Pilot Valve solenoid inoperative. – <i>Remove and replace.</i>
8. Sprinkler Weeping (Slow leak in valve)	<ul style="list-style-type: none">(a) Damaged or blocked valve seat. – <i>Remove blockage and, if necessary, replace valve assembly.</i>(b) Damaged piston seal or piston assembly. – <i>Replace valve assembly.</i>(c) Low pressure on supply line on hydraulic NO sprinklers. – <i>Check for low pressure reason and correct.</i>(d) Elevation of normally closed sprinkler exceeds 75' (22,9 m) differential.
9. Several valves on different stations fail to close (Hyd. Normally Open 674-X1-XX)	<ul style="list-style-type: none">(a) Control tubing leak which lowers supply pressure to other stations. – <i>Turn controller from station to station until a station is reached where only valves on that station stay open. The leak would be in the tubing on that station. Isolate and repair.</i>(b) Leak in supply line to controller. – <i>Verify by checking pressure in all control lines.</i>(c) Leak in controller pilot valve. – <i>Verify by constant discharge on controller. Refer to Controller Service Manual.</i>(d) Plugged supply line filter. – <i>Replace filter if more than 3 PSI (0.21 kg/cm²) differential exists.</i>

Servicing Procedures

Introduction

The 670 series sprinklers are designed to provide the user trouble-free operation for many years without scheduled maintenance. Should it become necessary to disassemble the sprinkler to correct a malfunction or replace a component, all internal parts of the sprinkler are accessible from the top. Refer to the Troubleshooting Procedures in this manual in the event of a malfunction. Some special tools are required for disassembly and/or maintenance of the sprinkler and are available from your Toro dealer.



WARNING

TO PREVENT POSSIBLE INJURY DURING SPRINKLER SERVICING PROCEDURES, CONFIRM THE FOLLOWING CONDITIONS EXIST PRIOR TO STARTING.

- A. WATER SUPPLY TO SPRINKLER IS SHUT OFF AT SOURCE.**
- B. SYSTEM PRESSURE IS BLED FROM SYSTEM, INCLUDING CONTROL TUBES.**
- C. A.C. POWER IS DISCONNECTED AT SOURCE.**

Servicing Sprinkler Mechanism

Refer to illustrated parts breakout in **Figure 7** for parts identification.

1. Using a small screwdriver or pocket knife, carefully pry up and remove cap plugs (24) from top of rubber cover cap (2) (rubber cover option only).
2. Using phillips screwdriver, remove two cap screws (1).
3. Remove cap insert plate (3), two o-rings (4), cap (5), nozzle ring (8), and o-ring (10).
Note: Items 3 and 4 are included in rubber cover cap assembly.
4. To remove intermediate nozzle "O" (6) and inner nozzle "F" (7) from nozzle ring for cleaning or replacement, use a $\frac{7}{16}$ " deep socket or box wrench.
Note: Before removing "F" nozzle, notice alignment of spray diffusion pin. Reinstall nozzle with pin in same position to ensure correct spray pattern.
5. Remove snap ring (13) using needle nose pliers or snap ring pliers (P/N 995-07).
6. To remove drive assembly (18), grasp nozzle base (11) and pull upward out of body.
Note: Some resistance will be felt due to o-ring compression.
7. Drive assembly output shaft utilizes left-hand threads to attach nozzle base. Therefore, to remove nozzle base, grasp drive assembly outer housing (17) and unscrew nozzle base in clockwise direction.
8. Remove spring retainer and plate assembly (14) and return spring (16).
9. Remove debris screen (20) from stator (19).
10. To remove stator from drive assembly outer housing, insert a small screwdriver blade into slot on edge of stator and pry away from housing. Drive assembly can now be removed from outer housing.
11. Clean and inspect all parts for damage and replace as necessary. Reassemble parts in reverse order of disassembly.

Valve Removal and Replacement



WARNING

POSITIVELY SHUT OFF WATER SUPPLY AT SOURCE PRIOR TO DISASSEMBLING SPRINKLER. BLEED ALL PRESSURE FROM SYSTEM INCLUDING CONTROL TUBES. FAILURE TO DEPRESSURIZE SYSTEM PRIOR TO SNAP RING REMOVAL COULD CAUSE VALVE MECHANISM TO EJECT FROM SPRINKLER BODY UNDER PRESSURE RESULTING IN POSSIBLE SERIOUS INJURY TO PERSONNEL.

1. To remove valve assembly, squeeze ears of snap ring together with snap ring pliers (P/N 995-07) and remove snap ring from sprinkler body. (See **Figure 2**.)

CAUTION

If snap ring is difficult to remove, there may be residual water pressure in the system. Recheck the water supply to ensure it is turned off and all pressure has been totally eliminated before removing the snap ring and valve.

2. Use valve removal tool (P/N 995-09) to remove valve assembly from base of sprinkler body. Valve Removal Tool is inserted into sprinkler body and pushed through valve ribs to the underside of valve. A slight twist will lock tool to valve enabling removal by pulling straight up and out. (See **Figure 3**.)

NOTE: If valve removal tool is not available, use snap ring pliers to grasp rib of valve cylinder assembly and pull up and out of sprinkler body.

3. To reinstall valve assembly with snap ring and to prevent damage to the communication tube in sprinkler body, use valve insertion tool (P/N 995-10). Valve insertion tool will automatically line up valve assembly with sprinkler body communication tube and correctly seat the snap ring. (See **Figure 4**.)

NOTE: It is possible to install the snap ring backwards (upside down). See inset in **Figure 4** to insure that snap ring is placed on the insertion tool in the correct manner.

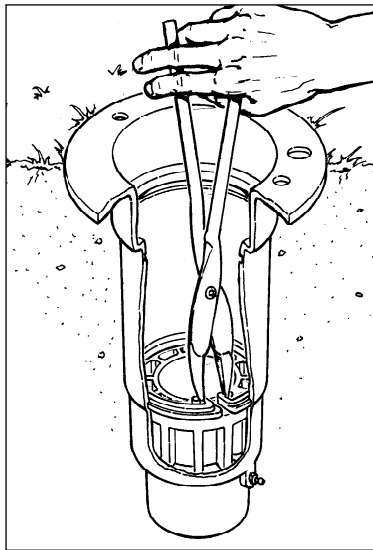


Figure 2
Using Snap Ring Pliers to
Remove Snap Ring

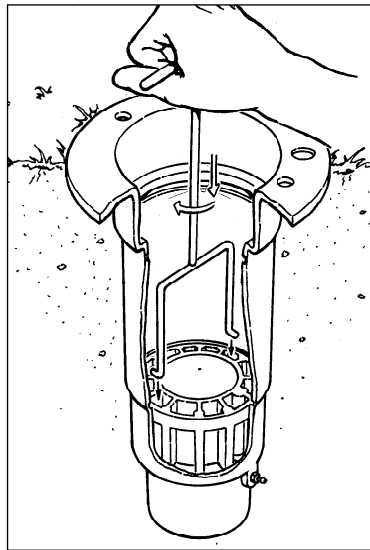


Figure 3
Using Valve Removal Tool to
Remove Valve Assembly

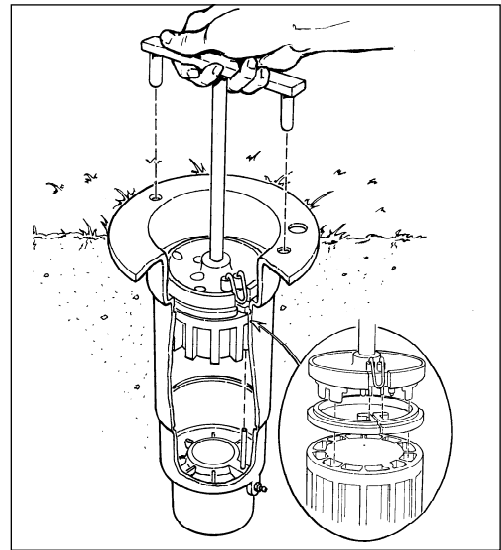


Figure 4
Using Valve Insertion Tool to
Install Valve Assembly with Snap Ring

Flushing Sprinkler Heads



WARNING

DUE TO HIGH OPERATING PRESSURE, NEVER STAND OR LEAN DIRECTLY OVER SPRINKLER OR COME IN CONTACT WITH SPRAY WHEN ACTUATING SPRINKLER MANUALLY OR AUTOMATICALLY. PRIOR TO ACTUATION OF SPRINKLER, USE A SLOT HEAD SCREWDRIVER TO LIFT CAP TO OBSERVE DIRECTION OF NOZZLE. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY.

1. With sprinkler operating, carefully step down on center of cap several times. Water will flow around riser and flush out debris.
2. Cycle sprinkler on and off several times to check for proper retraction. Cap should be even with top of body flange when fully retracted. If riser sticks in up position, check for debris lodged between riser and body. Flush out all debris. Remove sprinkler mechanism if necessary.

Servicing Pilot Valve (Current Production)

(Refer to **Figure 9** for the following procedure)

1. Assure water supply to sprinkler is positively shut off and any residual pressure has been bled. *If sprinkler is pressurized, main valve will open when pilot valve is disconnected from control tube.*
2. Carefully remove turf and soil from side of sprinkler to expose pilot valve and control tubing.
3. Remove two retaining screws from housing (3).
4. Pull pilot valve assembly away from sprinkler body and cut control tubing just below tube retainer. *Unless pilot valve has been previously removed, control tubing length will be sufficient for re-connection.*
5. Remove tube retainer and remaining piece of control tubing from valve body fitting.
6. Remove solenoid assembly (1) or NC pilot valve adapter (2) by turning it counterclockwise.
7. Pull pilot valve body assembly out of housing.
8. Remove diaphragm assembly (12), piston (11) and spring (10).
9. Remove selector (7) and plunger assembly (5 or 6). *Selector retains plunger in body.*
10. Thoroughly clean and inspect all parts. Replace damaged parts as necessary and reassemble in reverse order.

Servicing Adjustable Pilot Valve (Used 1986 – 1988)

(Refer to **Figure 10** for the following procedure)

1. Assure water supply to sprinkler is positively shut off and any residual pressure has been bled. *If sprinkler is pressurized, main valve will open when pilot valve is disconnected from control tube.*
2. Carefully remove turf and soil from side of sprinkler to expose pilot valve and control tubing.
3. Remove two retaining screws from housing (3).
4. Disconnect control tubing from pilot valve at base of sprinkler body.
5. Pull solenoid assembly from pilot valve using care not to lose push rod (15).
6. Remove D-cam retainer (1) and D-cam (2) from valve.
7. Remove shuttle plug (8), shuttle spring (7) and shuttle assembly (5 and 6) from valve.
8. Remove dust cover (11) and remove regulator assembly (9) with o-rings (10).
9. Ensure that all parts of pilot valve and solenoid are thoroughly cleaned. Inspect all parts for damage and replace as necessary.
10. Assemble valve parts in reverse order of disassembly.

CAUTION

When replacing solenoid, leave wire service loop for future servicing of sprinkler assembly. Waterproof all wire splices with approved method to prevent shorting to ground.

Adjusting Pressure Regulation



WARNING

DUE TO HIGH OPERATING PRESSURE, NEVER STAND OR LEAN DIRECTLY OVER SPRINKLER OR COME IN CONTACT WITH SPRAY WHEN ACTUATING SPRINKLER MANUALLY OR AUTOMATICALLY. PRIOR TO ACTUATION OF SPRINKLER, USE A SLOT HEAD SCREWDRIVER TO LIFT CAP TO OBSERVE DIRECTION OF NOZZLE. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY.

Pilot valve P/N 35-7547 is equipped with an adjustable pressure regulator that can be adjusted from 40 – 120 PSI (2.8 – 8.4 kg/cm²) to suit various field conditions. Use the following procedure to adjust regulator.

NOTE: Toro pressure gauge (P/N 995-49), pitot tube (P/N 995-50) and selector tool (P/N 995-15) will be required to perform this procedure.

1. Carefully remove turf and soil from side of sprinkler to expose pilot valve.
2. Remove protective polyethylene cover from pilot valve pressure regulator.
3. Insert selector tool through body flange onto D-cam. See WARNING above. Rotate selector tool to "ON" position.
4. Hold pitot tube in main nozzle flow. Observe pressure on gauge, see **Figure 5**.
5. Using selector tool, rotate adjusting shaft to change pressure setting as follows: Outward (counterclockwise) to raise pressure setting, Inward (clockwise) to lower pressure setting (see **Figure 6**).

NOTE: One complete revolution of the adjustment shaft will change operating pressure setting approximately 10 PSI (.7 kg/cm²).

6. Cycle sprinkler off and on several times and check pressure at nozzle each time to verify correct setting. Repeat step 5 if necessary.
7. Replace protective cover over adjustment shaft. Carefully backfill soil and turf around sprinkler.

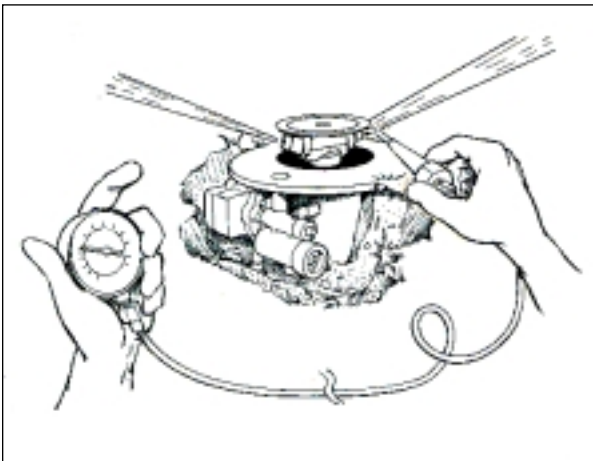


Figure 5

Holding pitot in main nozzle flow

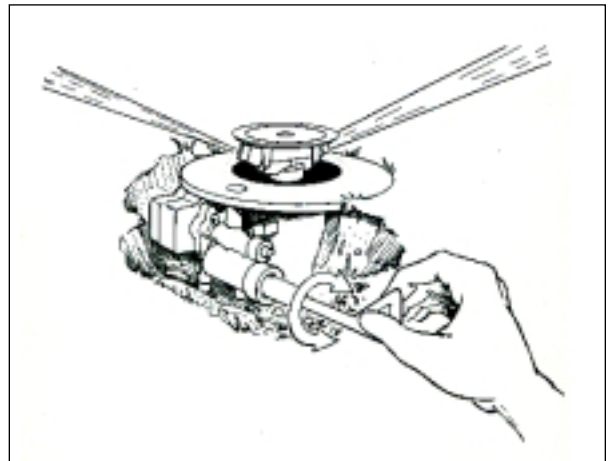
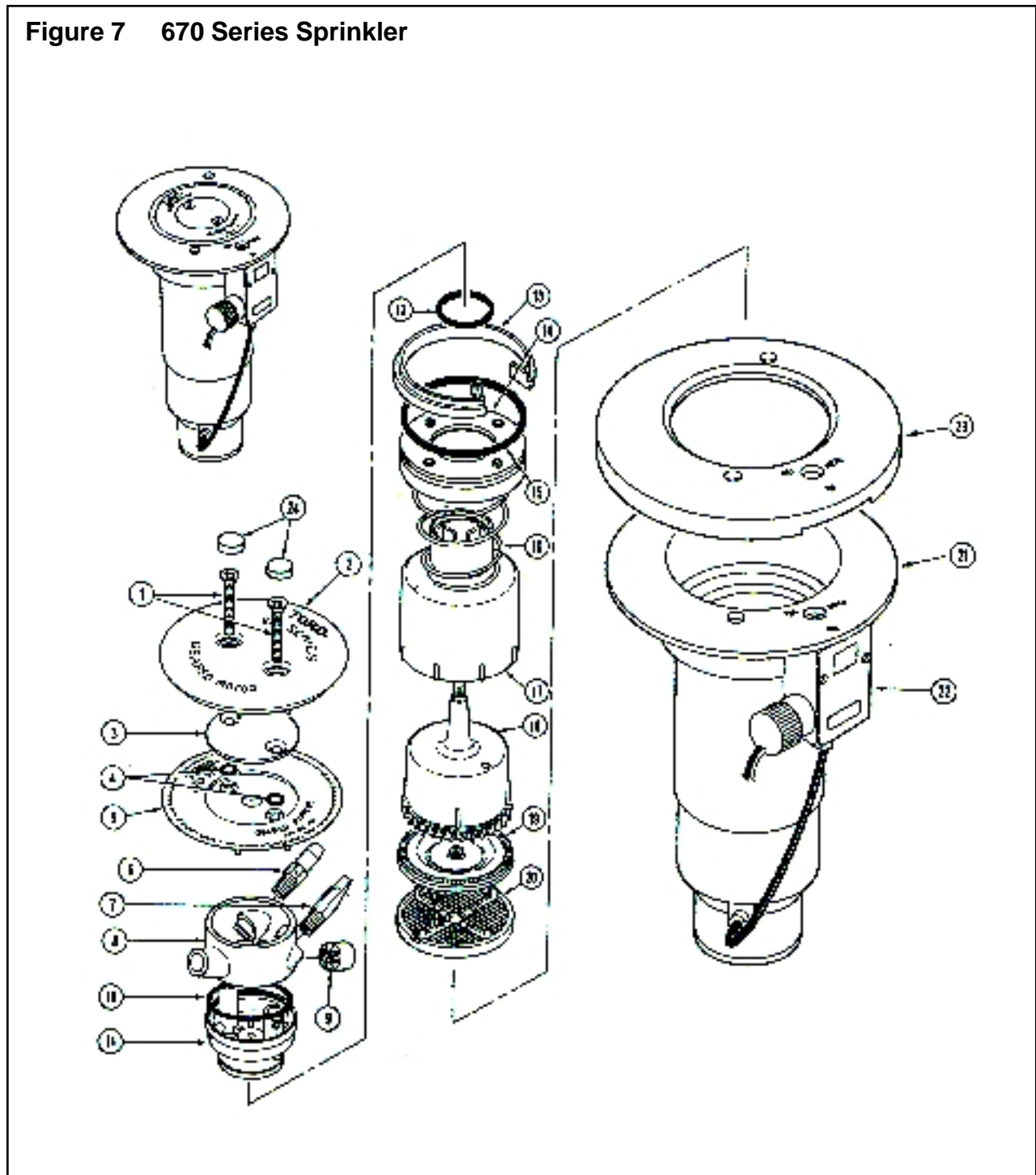


Figure 6

Rotating adjustment shaft with selector tool

Figure 7 670 Series Sprinkler



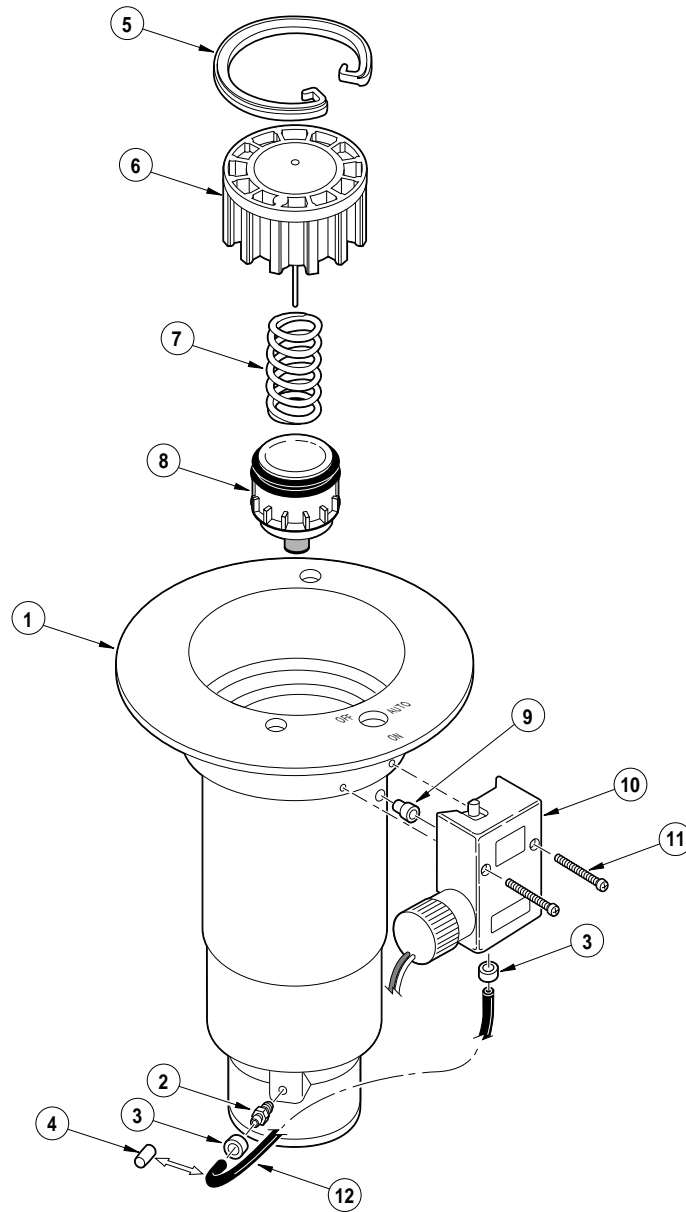
Model Number Information

674-XX-XXX			
Arc	Body	Nozzle	Pressure Regulation *
4 = Full Circle	01 = NPT, NO Valve-in-head 02 = NPT, Check-o-matic 06 = NPT, Electric Valve-in-head 08 = NPT, NC Valve-in-head 51 = BSP, NO Valve-in-head 52 = BSP, Check-o-matic 56 = BSP, Electric Valve-in-head 58 = BSP, NC Valve-in-head	70 71 72 73 74	5 = 50 PSI 6 = 65 PSI 8 = 80 PSI 1 = 100 PSI

* Pressure Regulation available on Electric & NC VIH models only.

Item No.	Part No.	Nomenclature	Quantity Per Assy.
1	363-1571	Screw, Machine, 1/4-20 X 2 in., PHFC, SST	2
2	9-5633	Cap Assy, Rubber Cover (optional)	1
3	9-3735	Plate, Cap, Insert	1
4	360-0107	O-Ring, .070 in. x .301 in. x .441 in.	2
5	35-0530	Cap, Sprinkler, 670	1
6	9-2793	Nozzle, "0" Intermediate	1
7	9-7177	Nozzle, "F" Inner	1
8	9-7962	Ring, Nozzle Assy., #70 (5/16 in.)	1
8	9-7963	Ring, Nozzle Assy., #71 (11/32 in.)	1
8	9-7964	Ring, Nozzle Assy., #72 (3/8 in.)	1
8	9-7965	Ring, Nozzle Assy., #73 (13/32 in.)	1
8	9-7966	Ring, Nozzle Assy., #74 (7/16 in.)	1
9	89-5813	Straightener, Stream	1
10	360-0398	O-Ring, .070 in. x 1.989 in. x 2.129 in.	1
11	9-5054	Kit, Base, Nozzle (Includes Items 1, 10, & 12)	1
12	9-5075	O-Ring, Housing, Outer	1
13	3-3308	Ring, Snap, Head	1
14	9-5055	Spring Retainer & Plate Assembly	1
15	363-3208	O-Ring, .125 in. x 3 in. x 3.250 in.	1
16	9-3737	Spring, Return	1
17	9-3874	Drive Assy., Outer Housing	1
18	9-3908	Drive Assy. (Includes Item 17)	1
19	9-4091	Stator, Fixed (for #70 & #71 Nozzle)	1
19	9-4529	Stator, Variable (for #72, #73 and #74 Nozzle)	1
20	35-3611	Screen, Debris	1
21	See pp. 14-15	Body Assy.	1
22	See pp. 16-17	Pilot Valve Assy.	1
23	9-5355	Cover, Flange, Rubber (optional)	1
24	3-2518	Plug, Cap, Rubber (optional)	1
		SERVICE PARTS AND ASSEMBLIES	
	3-2518	Plug, Cap, Rubber	
	9-6916	Service Assy., 674-70 less Body (Includes Items 1, & 3-19)	
	9-3904	Service Assy., 674-71 less Body (Includes Items 1, & 3-19)	
	9-3901	Service Assy., 674-72 less Body (Includes Items 1, & 3-19)	
	9-3902	Service Assy., 674-73 less Body (Includes Items 1, & 3-19)	
	9-3903	Service Assy., 674-74 less Body (Includes Items 1, & 3-19)	
	89-0475	670 Nozzle Assy., #70 (Includes Items 1, & 3-12)	
	9-7415	670 Nozzle Assy., #71 (Includes Items 1, & 3-12)	
	9-7416	670 Nozzle Assy., #72 (Includes Items 1, & 3-12)	
	9-7417	670 Nozzle Assy., #73 (Includes Items 1, & 3-12)	
	9-7418	670 Nozzle Assy., #74 (Includes Items 1, & 3-12)	
	9-7271	Adapter, Tubing, Oversized	
	35-3599	Straightener, Stream, Debris Resistant	
	670-01	Kit, Cover, Rubber (Includes Items 2, 23 & 24)	
	3-2606	Adapter, Poly, 1/4 in., COM	
		SERVICE TOOLS	
	995-09	Tool, Removal, Valve	
	995-10	Tool, Insertion, Valve	
	995-15	Tool, Selector (Flag Key)	
	995-49	Gauge, Pressure	
	995-50	Tube, Pitot	
		* Order through Finished Goods Distribution System – Minneapolis	

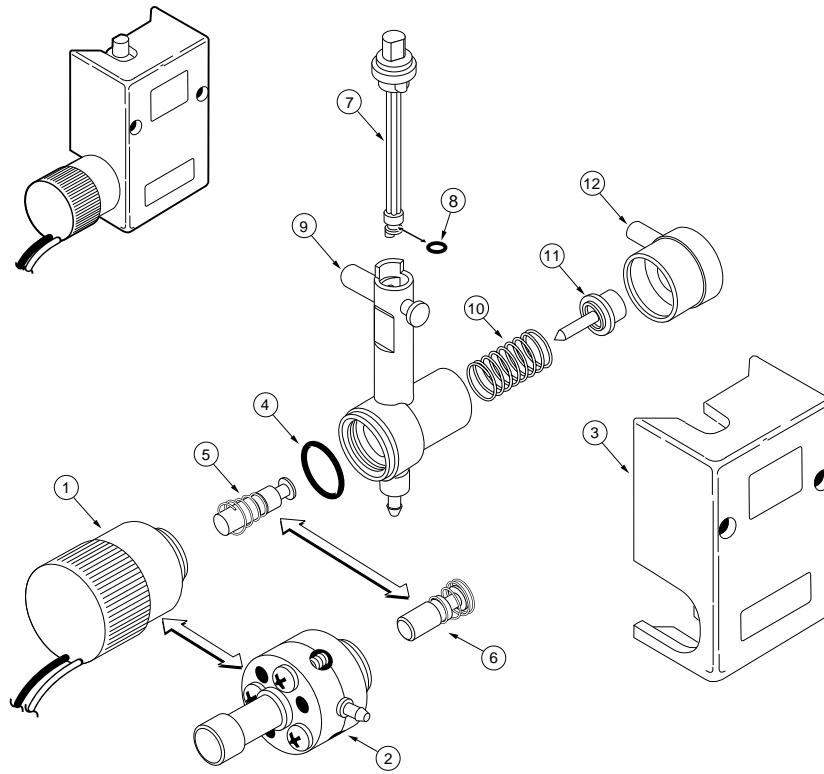
Figure 8 Golf Sprinkler Body — 1.5"



Item No.	Part No.	Nomenclature	Quantity Per Assy.
1	See p. 15	Body Assy.	1
2	9-6002	Adapter, Tubing, Threaded, 1/4"	1
3	900-40	Retainer, Tube	2
4	740-07	Cap, Poly	1
5	3-3304	Ring, Snap, Valve	1
6	9-1479	Cylinder Assy., NO and COM	1
6	9-1486	Cylinder Assy., EL and NC	1
7	3-3323	Spring, Valve, NO, EL and NC	1
7	3-3311	Spring, Valve, COM	1
8	89-1201	Piston Assy., NO and COM	1
8	89-0937	Piston Assy., EL and NC	1
9	35-7663	Adapter, Pilot Valve to Body	1
10	See pp. 16-17	Pilot Valve Assy.	1
11	3-2696	Screw, Tap #8	2
12	9-2623	Tubing, Poly, 1/4", Pilot Valve, 8"	1
12	9-1876	Tubing, Poly, 1/4", COM, 11.5"	1
N/I	3-2606	Adapter, Poly, 1/4" (Used on 02 and 52 models only)	1

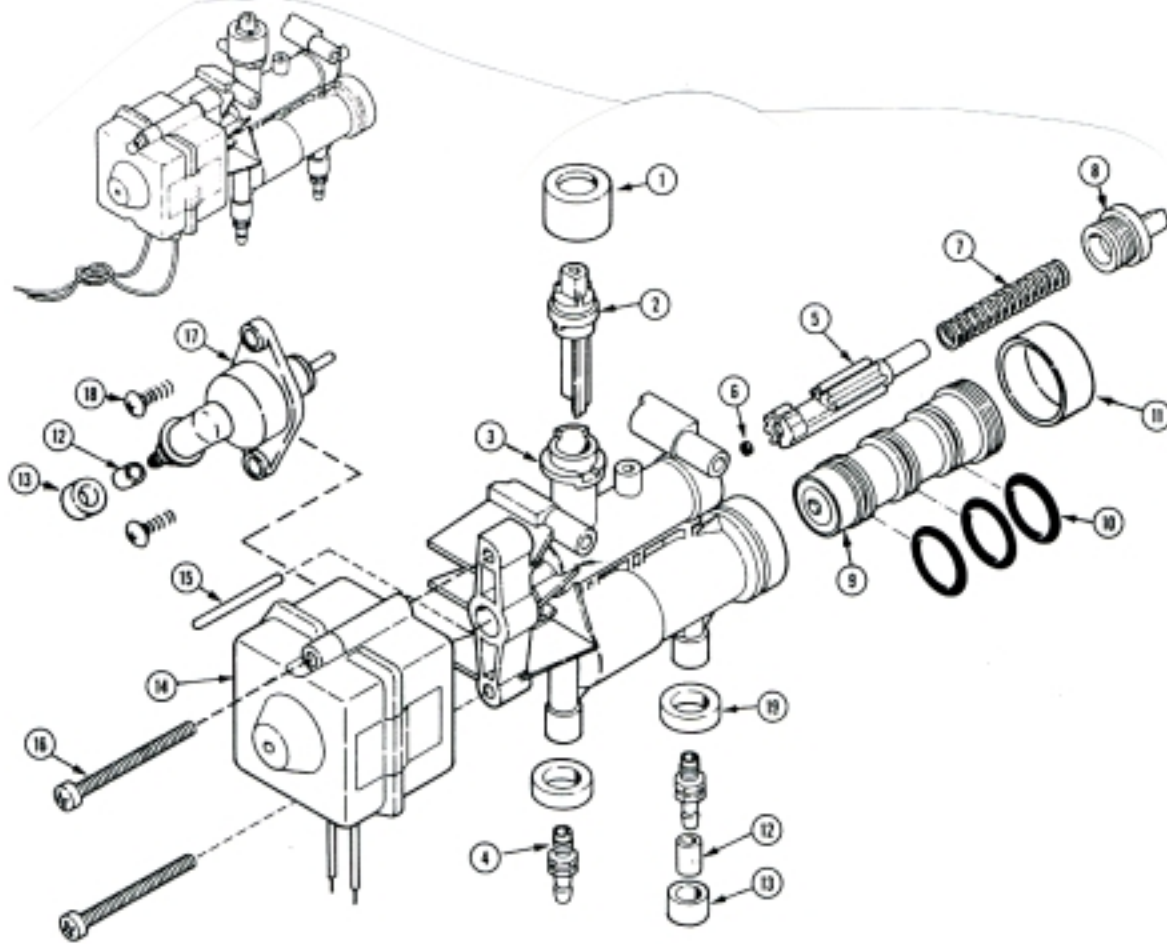
Item No.	Part No.	Nomenclature	Quantity Per Assy.
		1.5 INCH NPT BODY STYLE	
1	3-3389	ELEC wo/VIH (Includes Items 1-4)	1
1	89-1011	ELEC w/VIH (Includes Items 1-8)	1
1	89-4864	ELEC w/VIH, 50 lb. PV (Includes Items 1-12)	1
1	89-1018	ELEC w/VIH, 65 lb. PV (Includes Items 1-12)	1
1	89-1016	ELEC w/VIH, 80 lb. PV (Includes Items 1-12)	1
1	89-1017	ELEC w/VIH, 100 lb. PV (Includes Items 1-12)	1
1	3-3343	HYD NO wo/VIH (Includes Items 1-4)	1
1	89-1040	HYD NO w/VIH (Includes Items 1-8)	1
1	9-1257	COM wo/VIH (Includes Items 1-4)	1
1	89-1043	COM w/VIH (Includes Items 1-8)	1
1	3-3389	HYD NC wo/VIH (Includes Items 1-4)	1
1	89-1011	HYD NC w/VIH (Includes Items 1-8)	1
1	89-5760	HYD NC w/VIH, 50 lb. PV (Includes Items 1-12)	1
1	89-5764	HYD NC w/VIH, 65 lb. PV (Includes Items 1-12)	1
1	89-5768	HYD NC w/VIH, 80 lb. PV (Includes Items 1-12)	1
1	89-5773	HYD NC w/VIH, 100 lb. PV (Includes Items 1-12)	1
		1.5 INCH BSP BODY STYLE	
1	35-5362	ELEC wo/VIH (Includes Items 1-4)	1
1	89-4860	ELEC w/VIH (Includes Items 1-8)	1
1	89-4865	ELEC w/VIH, 50 lb. PV (Includes Items 1-12)	1
1	89-4869	ELEC w/VIH, 65 lb. PV (Includes Items 1-12)	1
1	89-1014	ELEC w/VIH, 80 lb. PV (Includes Items 1-12)	1
1	89-1015	ELEC w/VIH, 100 lb. PV (Includes Items 1-12)	1
1	35-5245	HYD NO wo/VIH (Includes Items 1-4)	1
1	89-1039	HYD NO w/VIH (Includes Items 1-8)	1
1	35-5322	COM wo/VIH (Includes Items 1-4)	1
1	89-1042	COM w/VIH (Includes Items 1-8)	1
1	35-5362	HYD NC wo/VIH (Includes Items 1-4)	1
1	89-4860	HYD NC w/VIH (Includes Items 1-8)	1
1	89-5761	HYD NC w/VIH, 50 lb. PV (Includes Items 1-12)	1
1	89-5765	HYD NC w/VIH, 65 lb. PV (Includes Items 1-12)	1
1	89-5769	HYD NC w/VIH, 80 lb. PV (Includes Items 1-12)	1
1	89-5774	HYD NC w/VIH, 100 lb. PV (Includes Items 1-12)	1
		SERVICE PARTS AND ASSEMBLIES	
	89-1036	Valve Assy., NO	
	89-1010	Valve Assy., EL and NC	
	9-1249	Valve Assy., NO with Drain	
	89-1037	Valve Assy., COM	
	35-9645	Filter Assy., Metering, EL and NC	
	9-7271	Adapter, Oversized Thread	
		SERVICE TOOLS	
	995-09	Tool, Removal, Valve	
	995-10	Tool, Insertion, Valve	
	995-15	Tool, Selector (Flag Key)	
	995-49	Gauge, Pressure	
	995-50	Tube, Pitot	

Figure 9 Pilot Valve, Current Production



Item No.	Part No.	Nomenclature	Quantity Per Assy.
1	89-1905	Solenoid, Pilot Valve & Valve	1
2	89-6005	Adapter, Pilot Valve, NC	1
3	89-0001	Housing, Pilot Valve	1
4	360-0220	O-Ring, .070 in. x .551 in. x .691 in.	1
5	35-9993	Plunger Assy., Elec.	1
6	89-6003	Plunger Assy., NC	1
7	-----	Selector	1
8	1-2035	O-Ring, .070 in. x .114 in. x .254 in.	1
9	89-6004	Body Assy., Pilot Valve	1
10	35-9970	Spring, 50 lbs., Black	1
10	35-9971	Spring, 65 lbs., Green	1
10	35-9972	Spring, 80 lbs., Red	1
10	35-9973	Spring, 100 lbs., Blue	1
11	89-0029	Piston	1
12	89-0005	Diaphragm Assembly	1
		SERVICE PARTS AND ASSEMBLIES	
	89-0009	Pilot Valve Assy., 50 lbs., Elec.	
	89-0010	Pilot Valve Assy., 65 lbs., Elec.	
	89-0011	Pilot Valve Assy., 80 lbs., Elec.	
	89-0012	Pilot Valve Assy., 100 lbs., Elec.	
	89-3918	Pilot Valve Assy., 50 lbs., NC	
	89-3919	Pilot Valve Assy., 65 lbs., NC	
	89-3920	Pilot Valve Assy., 80 lbs., NC	
	89-3921	Pilot Valve Assy., 100 lbs., NC	
	89-0998	Pilot Valve less Solenoid, 50 lbs., Elec.	
	89-0999	Pilot Valve less Solenoid, 65 lbs., Elec.	
	89-1000	Pilot Valve less Solenoid, 80 lbs., Elec.	
	89-1001	Pilot Valve less Solenoid, 100 lbs., Elec.	
	89-0008	Selector Cam Assy. (Includes Items 7-8)	

Figure 10 Pilot Valve, 5/86 – 8/88



Item No.	Part No.	Nomenclature	Quantity Per Assy.
1	35-4698	Retainer, D-Cam	1
2	35-4697	D-Cam	1
3	-----	Body Assy., Pilot Valve	1
4	-----	Connector, Poly	1
-	35-4703	Shuttle Assembly	1
5	-----	Shuttle	1
6	-----	Seat, Rubber	1
7	35-4694	Spring, Shuttle	1
8	35-4996	Plug, Shuttle	1
9	35-4702	Regulator Assy., Welded	1
10	360-0498	O-Ring, .625 in. x .750 in. x .0625 in.	3
11	363-17692	Cover, Dust	1
12	* 740-07	Cap, Poly, 1/4 in.	1
13	* 900-40	Retainer, Tube	1
14	3-2670	Solenoid Assy., EI, VIH	1
15	9-1668	Rod, Push	1
16	2-9647	Screw, Machine, 10-24 x 1-1/2 in.	2
17	9-1030	Actuator, Hyd., NC	1
18	2-9648	Screw, Machine, 10-24 x 1/2 in.	2
19	-----	Ring, Support	2

* Order through Finished Goods Distribution System – Minneapolis



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