760/780 Series Rotary Sprinklers
Installation & Service Instructions

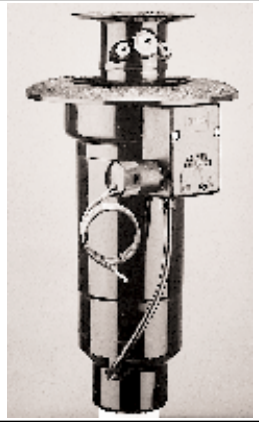
Introduction

The 760/780 Series Full-Circle and Adjustable Part-Circle Rotary 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.

760 Electric Valve-In-Head



780 Electric Valve-In-Head

Features

- Adjustable part-circle: 30°–330° and full circle models available
- Arc adjustment from top of sprinkler
- Standard stainless-steel riser resists scoring from embedded debris
- Full 3" (7.6 cm) pop-up clears tall grasses
- Nozzles color-coded by radius and gallonage
- Caps serve as yardage markers or effluent water indicators
- Variable stator
- 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)
- All internal components serviceable from the top of the sprinkler
- Large selection of color-coded nozzles available
- Durable plastic and stainless-steel construction

Specifications

760 Series

- Radius: 55–78' (16.8 m–23.8 m)
- Flow Rate:
  - 11.7–41.2 GPM
  - 44.3–155.9 l/mn
  - 2.7 – 9.4 m^3/hr
- Arc: Full Circle or Adj. Part Circle (30° – 330°)
- Maximum Pressure:
  - Electric VIH: 150 PSI (10.5 kg/cm^2) (1034.5 kPa)
  - NO Hyd. VIH: 100 PSI (7.0 kg/cm^2) (689.7 kPa)
  - NC Hyd. VIH: 150 PSI (10.5 kg/cm^2) (1034.5 kPa)
  - Check-O-Matic: 100 PSI (7.0 kg/cm^2) (689.7 kPa)
- Body Height: 10" (25.4 cm)
- Pop-Up Height: 3" (7.6 cm)
- 1" 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.
- Color-Coded Nozzles: See chart on page 3.

780 Series

- Radius: 55'–87' (16.8 m – 26.5 m)
- Flow Rate:
  - 12.3–50.1 GPM
  - 46.6–189.6 l/mn
  - 2.8–11.4 m^3/hr
- Arc: Full-Circle or Adj. Part-Circle (30°–330°)
- Maximum Pressure:
  - Electric VIH: 150 PSI (10.5 kg/cm^2) (1034.5 kPa)
  - NO Hyd. VIH: 100 PSI (7.0 kg/cm^2) (689.7 kPa)
  - NC Hyd. VIH: 150 PSI (10.5 kg/cm^2) (1034.5 kPa)
  - Check-O-Matic: 100 PSI (7.0 kg/cm^2) (689.7 kPa)
- Body Height: 11" (27.9 cm)
- Pop-Up Height: 3" (7.6 cm)
- 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.
- Color-Coded Nozzles: See chart on page 3.

760 Series Sprinkler Performance Data

NOZZLE PERFORMANCE — U.S.

BASE PRES.	NOZZLE SET 62		NOZZLE SET 63		NOZZLE SET 64		NOZZLE SET 65		NOZZLE SET 66		NOZZLE SET 67		NOZZLE SET 68	
PSI	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM
50	55	11.7	58	13.2	61	16.8	63	20.2	65	23.0	67	26.8	68	28.6
55	56	12.3	60	13.7	63	17.5	65	21.2	67	24.2	69	28.1	70	30.1
60	57	12.7	62	14.3	64	18.1	66	22.1	69	25.4	70	29.4	71	31.5
65	58	13.4	64	14.8	66	18.8	68	23.1	71	26.6	72	30.7	73	33.0
70	59	13.9	64	15.3	67	19.6	69	23.9	72	27.5	73	31.9	74	34.2
75	60	14.4	65	15.9	68	20.3	71	24.8	73	28.4	74	33.1	75	35.3
80	61	14.9	65	16.4	69	21.1	72	25.6	74	29.4	75	34.4	76	36.5
85	62	15.3	65	17.0	69	21.8	73	26.3	75	30.3	76	35.4	77	37.7
90	62	15.6	66	17.5	70	22.6	73	27.0	75	31.2	76	36.4	77	38.9
95	63	16.0	66	18.1	70	23.3	74	27.6	76	32.0	77	37.4	78	40.0
100	63	16.3	66	18.6	70	24.0	74	28.3	76	32.9	77	38.4	78	41.2

Rad = feet GPM = gallons per minute = Pressure regulation

NOZZLE PERFORMANCE — METRIC

BASE PRESSURE		NOZZLE SET 62			NOZZLE SET 63			NOZZLE SET 64			NOZZLE SET 65			NOZZLE SET 66			NOZZLE SET 67			NOZZLE SET 68		
kg/cm²	kPa	Rad	l/mn	m³/hr	Rad	l/mn	m³/hr	Rad	l/mn	m³/hr	Rad	l/mn	m³/hr	Rad	l/mn	m³/hr	Rad	l/mn	m³/hr	Rad	l/mn	m³/hr
3.5	342.4	16.8	44.3	2.7	17.7	50.0	3.0	18.6	63.6	3.8	19.2	76.5	4.6	19.8	87.1	5.2	20.4	101.4	6.1	20.7	108.3	6.5
4.0	386.4	17.2	47.1	2.8	18.4	52.5	3.1	19.3	67.0	4.0	19.9	81.1	4.9	20.5	92.7	5.6	21.2	107.7	6.5	21.5	115.3	6.9
4.5	440.2	17.6	49.9	3.0	19.1	55.8	3.3	19.7	70.8	4.2	20.4	86.3	5.2	21.4	99.3	6.0	21.7	115.1	6.9	22.0	123.3	7.4
4.6	445.1	17.7	50.7	3.0	19.5	56.0	3.4	20.1	71.2	4.3	20.7	86.4	5.3	21.7	100.7	6.0	22.0	116.2	7.0	22.3	124.9	7.5
5.0	489.2	18.1	53.1	3.2	19.6	58.5	3.5	20.5	75.0	4.5	21.2	91.4	5.5	22.1	105.2	6.3	22.4	122.0	7.3	22.7	130.8	7.9
5.5	533.2	18.4	55.5	3.4	19.8	61.4	3.7	20.9	78.4	4.7	21.9	95.6	5.7	22.5	109.6	6.6	22.8	127.8	7.6	23.1	136.3	8.2
5.6	547.8	18.6	56.4	3.4	19.8	62.1	3.7	21.1	79.9	4.8	22.0	96.9	5.8	22.6	111.3	6.7	22.9	130.2	7.8	23.2	138.2	8.3
6.0	582.1	18.9	57.9	3.5	19.8	64.3	3.9	21.1	82.5	5.0	22.3	99.6	6.0	22.9	114.7	6.9	23.2	134.0	8.0	23.5	142.7	8.6
6.5	635.9	19.0	60.0	3.6	20.1	67.4	4.1	21.4	87.1	5.2	22.5	103.9	6.2	23.1	120.2	7.2	23.4	140.3	8.4	23.7	149.9	9.0
7.0	684.8	19.2	61.7	3.7	20.1	70.4	4.2	21.4	90.8	5.5	22.6	107.1	6.4	23.2	124.5	7.5	23.5	145.3	8.7	23.8	155.9	9.4

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

780 Series Sprinkler Performance Data

BASE PRES.	NOZZLE SET 82		NOZZLE SET 83		NOZZLE SET 84		NOZZLE SET 85		NOZZLE SET 86		NOZZLE SET 87		NOZZLE SET 88		NOZZLE SET 89	
PSI	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad	GPM
50	55	12.3	58	13.2	61	17.2	63	20.8	65	24.4	69	28.8	72	32.2	74	35.7
55	57	12.7	60	13.8	63	18.1	65	21.7	67	25.6	70	30.2	73	33.7	75	37.3
60	58	13.0	62	14.4	65	18.9	66	22.6	69	26.8	72	31.5	74	35.2	76	38.9
65	60	13.4	64	15.0	67	19.8	68	23.6	71	28.1	73	32.9	75	36.8	77	40.6
70	61	13.9	65	15.5	68	20.6	70	24.4	73	29.0	75	34.2	77	38.3	79	42.1
75	63	14.4	67	15.9	70	21.3	72	25.1	76	29.9	78	35.5	79	39.8	80	43.6
80	64	14.9	68	16.4	71	22.1	74	25.9	78	30.9	80	36.9	81	41.4	82	45.2
85	65	15.4	68	17.0	71	22.7	75	26.8	79	31.8	81	37.9	82	42.4	83	46.4
90	66	15.6	69	17.5	72	23.3	75	27.7	79	32.7	82	38.9	84	43.4	85	47.7
95	66	16.0	69	18.1	72	23.9	76	28.5	80	33.6	83	39.9	85	44.4	86	48.9
100	67	16.3	69	18.6	72	24.5	76	29.4	80	34.5	84	40.9	86	45.4	87	50.1

Rad = Feet GPM = Gallons Per Minute = Pressure Regulation Models

BASE PRESSURE		NOZZLE SET 82			NOZZLE SET 83			NOZZLE SET 84			NOZZLE SET 85			NOZZLE SET 86			NOZZLE SET 87			NOZZLE SET 88			NOZZLE SET 89		
kg/cm²	kPa	Rad	l/m	m³/hr	Rad	l/m	m³/hr	Rad	l/m	m³/hr	Rad	l/m	m³/hr	Rad	l/m	m³/hr	Rad	l/m	m³/hr	Rad	l/m	m³/hr	Rad	l/m	m³/hr
3.5	342.4	16.9	46.6	2.7	17.7	50.0	3.0	18.6	65.1	3.9	19.2	78.7	4.7	19.8	92.4	5.5	21.1	109.0	6.5	22.0	121.9	7.3	22.6	135.1	8.1
4.0	386.4	17.5	48.5	2.8	18.4	52.8	3.1	19.3	69.3	4.1	19.9	83.0	5.0	20.5	98.0	5.9	21.5	115.6	7.0	22.7	129.0	7.8	23.0	142.8	8.6
4.5	440.2	18.0	50.5	3.0	19.2	56.2	3.4	20.1	73.9	4.4	20.4	88.3	5.3	21.5	104.7	6.3	22.1	123.1	7.4	23.0	137.5	8.3	23.5	151.9	9.1
4.6	445.1	18.3	50.7	3.0	19.5	56.8	3.4	20.4	74.9	4.5	20.7	89.3	5.4	21.7	106.4	6.4	22.3	124.5	7.5	22.9	139.3	8.4	23.5	153.7	9.2
5.0	489.2	18.7	53.0	3.1	19.9	59.3	3.5	20.8	78.8	4.7	21.5	93.3	5.6	22.4	110.9	6.7	23.0	130.7	7.9	23.6	146.4	8.8	24.2	160.9	9.7
5.5	533.2	19.4	55.4	3.3	20.6	61.4	3.7	21.6	82.2	4.9	22.2	96.9	5.8	23.5	115.4	6.9	24.1	137.0	8.3	24.3	153.5	9.2	24.6	168.1	10.1
5.6	547.8	19.5	56.4	3.3	20.7	62.1	3.7	21.7	83.6	5.0	22.6	98.0	5.9	23.8	117.0	7.0	24.4	139.7	8.4	24.7	156.7	9.4	25.0	171.1	10.3
6.0	582.1	19.8	58.3	3.4	20.7	64.3	3.9	21.7	85.9	5.2	22.9	101.4	6.1	24.1	120.4	7.2	24.7	143.5	8.6	25.0	160.5	9.6	25.3	175.6	10.5
6.5	635.9	20.3	59.9	3.6	21.1	67.4	4.1	22.0	89.8	5.4	23.1	106.7	6.4	24.4	126.0	7.5	25.3	149.8	9.0	25.8	167.2	10.1	26.1	183.6	11.0
7.0	684.8	20.4	61.7	3.6	21.1	70.4	4.2	22.0	92.7	5.6	23.2	111.3	6.7	24.4	130.6	7.8	25.6	154.8	9.3	26.2	171.8	10.3	26.5	189.6	11.4

kg/cm² = bars kPa = kilo Pascals Rad = meters l/m = liters per minute m³/hr - cubic meters per hour = Pressure Regulation Models

Nozzle Color Coding Guide			
Nozzle	**Main**	**Inner**	**Restrictor ***
82	Yellow	Yellow	Black
83	Blue	Blue	Black
84	Brown	Brown	White
85	Orange	Orange	White
86	Green	Green	White
87	Gray	Gray	White
88	Black	Black	White
89	Red	Red	White
90			

** Only one restrictor required per two inner nozzles. Refer to Toro Illustrated Parts Breakout Book, Form No. 368-0044.*

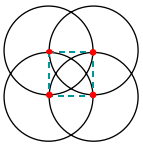
Sprinkler Spacing

- The Toro Company does not recommend designing for zero (0) mph wind conditions. Design in consideration of the worst wind conditions.
- Square Spacing
  - No wind - 55% of diameter
  - 4 mph wind - 50% of diameter
  - 8 mph wind - 45% of diameter
- Triangular Spacing
  - No wind - 60% of diameter
  - 4 mph wind - 55% of diameter
  - 8 mph wind - 50% of diameter
- Single-Row Spacing
  - No wind - 50% of diameter
  - 4 mph wind - 50% of diameter
  - 8 mph wind - 45% of diameter

Precipitation Rate Formulas

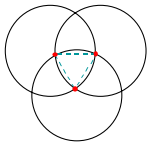
- Square-spaced sprinklers in pattern:

$$\frac{\text{GPM of full circle x 96.3}}{(\text{Spacing})^2}$$



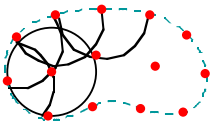
- Triangular-spaced sprinklers in pattern:

$$\frac{\text{GPM of full circle x 96.3}}{(\text{Spacing})^2\ (0.866)}$$



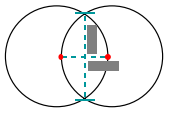
- Area and flow:

$$\frac{\text{Total GPM of zone x 96.3}}{\text{Total irrigated square feet of zone}}$$



- Single row:

$$\frac{\text{GPM of full circle x 96.3}}{(\text{Spacing})\ (\text{Scallop})}$$



For additional information, refer to Toro Form No. 490-1737.

Installation Procedure

To assure maximum performance from your 760/780 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.

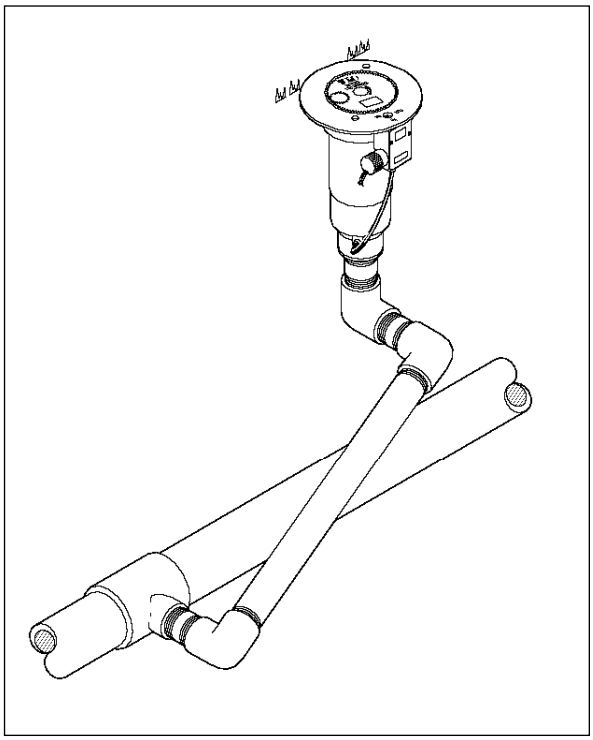


Figure 1: Triple Swing Joints

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 wires must be waterproofed to prevent short circuit to ground and subsequent controller damage.

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

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. Refer to **Table 2** for tubing run length information.*

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 2: Control Systems

Type of System*	Maximum Distance From Controller	Elevation Restrictions
Pin-type£ (00) Hydraulic* with 2/16" Control Tubing	100'	
Pin-type£ (00) Hydraulic* with ¼" Control Tubing	200'	
Normally Open (01) with 2/16" Control Tubing	500'	Valve elevation should not exceed 25' ABOVE controller elevation or 70' BELOW controller elevation.
Normally Closed (08) with 2/16" Control Tubing	500'	Valve elevation should not exceed 0' ABOVE controller elevation or 70' BELOW controller elevation.
Normally Open (01) with ¼" Control Tubing	1000'	Valve elevation should not exceed 25' ABOVE controller elevation or 70' BELOW controller elevation.
Normally Closed (08) with ¼" Control Tubing	1000'	Valve elevation should not exceed 0' ABOVE controller elevation or 70' BELOW controller elevation.
Electric (06)**	Depends on variables • Voltage available • Wire Size	None

* - All hydraulic connections on Toro valves are ¼" insert type.
- Control line pressure must be equal to or greater than mainline pressure.
- Control line pressure range is 40 to 150 PSI

** - Minimum solenoid voltage required for reliable electric VIH operation is 19.5 VAC.

£ NOTE: Maximum of one (1) valve pr station on pin-type systems.

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' (.61 m) per second. See **Table 3** below.

WARNING

TO PREVENT PERSONAL INJURY DO NOT STAND DIRECTLY OVER ANY COMMERCIAL OR LARGE TURF SPRINKLER WHEN FILLING SYSTEM OR WHEN ACTIVATING MANUALLY AT THE SPRINKLER

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 3: Recommended System Fill Rate

Pipe Size		Flow		Velocity		Pipe Size		Flow		Velocity	
in.	cm	GPM	LPM	ft/sec	m/sec	in.	cm	GPM	LPM	ft/sec	m/sec
1/2	1.3	2	7.6	1.60	0.49	3	7.6	45	170.3	1.86	0.57
3/4	1.9	3	11.4	1.92	0.59	4	10.1	75	283.9	1.87	0.57
1	2.5	5	18.9	1.50	0.46	6	15.2	150	567.8	1.73	0.53
1-1/4	3.1	10	37.9	1.86	0.57	8	20.2	250	946.3	1.70	0.52
1-1/2	3.8	10	37.9	1.41	0.43	10	25.4	450	1703.0	1.97	0.60
2	5.0	20	75.7	1.80	0.55	12	30.5	500	1893.0	1.55	0.47
2-1/2	6.4	30	113.6	1.84	0.56						

Arc Adjustment Procedure

The 765/785 sprinkler models have an adjustable watering arc from 30°–330° and are set at 180° when shipped from the factory. The left side of the arc, located at the end of counterclockwise rotation, is non-adjustable (fixed). Therefore, all arc adjustments, whether increasing or decreasing, will change the right side of the arc, located at the end of clockwise rotation.

Although the sprinkler arc can be adjusted dry (sprinkler shut off), the best results are obtained during operation. The tools required for this procedure include a small pocket knife and an arc adjustment tool P/N 995-82 (or a 3/32" x 6" hex wrench).

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. Using a small knife blade, pry up and remove adjustment plug from center of cap as shown in **Figure 2**.
2. Using arc adjustment tool (P/N 995-82) or 3/32" x 6" hex wrench, remove set screw from center of threaded shaft as shown in **Figure 3.**
3. Operate sprinkler. See WARNING above.

   NOTE: *During this procedure, water will discharge continuously from threaded shaft.*
4. To check current arc setting, rotate cap by hand **in direction of current travel** to end of arc. Immediately rotate cap in reverse direction to opposite end of arc.
5. Rotate cap to left side of arc. Align spray with left watering border by turning sprinkler body on its pipe fitting.

   NOTE: *Aligning arc with left border may require removing and turning sprinkler assembly in body. See Service Procedures p. 9 for disassembly instructions.*
6. Insert hex wrench into threaded shaft. Turn wrench slowly **counterclockwise** to **decrease** or **clockwise** to **increase** arc as shown in **Figure 4**.

   NOTE: *Each "click" equals 1° of arc change. One complete revolution of the hex wrench results in a 75° change.*
7. Repeat steps 4 and 6 as necessary, making small adjustments until exact arc is set.
8. Install set screw and adjustment plug.

Figure 2

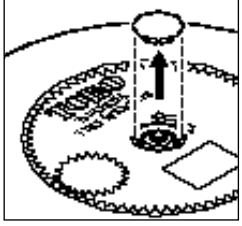


Figure 3

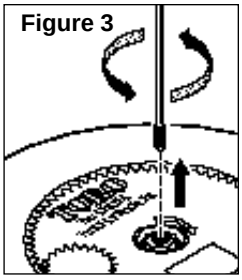
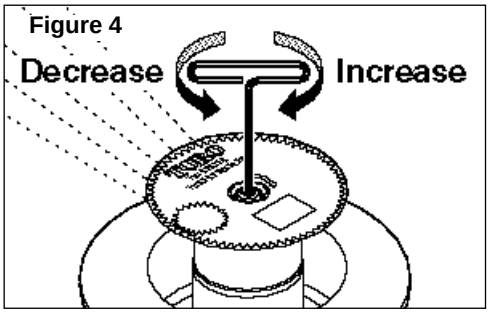


Figure 4



Pilot Valve Operation (Models 7XX-X6-XXX and 7XX-X8-XXX Only)

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/cm^2), 65 psi (4.6 kg/cm^2), 80 psi (6.0 kg/cm^2) or 100 PSI (7.0 kg/cm^2).

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.

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.

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**	(a) No 24 VAC to coil assembly. (Electric Models) *– Measure voltage with a Digital Volt Meter (DVM). Check wiring and controller program.* *– Refer to Controller Operating Instructions.* (b) Selector cam in "OFF" position. *– Set to "AUTO" position.* (c) Debris in pilot valve assembly. *– Disassemble and remove all debris. (See Servicing Pilot Valve page 11.)* (d) Insufficient pressure in controller supply line and/or sprinkler control tube. (N.C. Models) *– Check pressure.*
2.	**SPRINKLER WILL NOT SHUT OFF**	(a) Constant 24 VAC from controller. (Electric Models) *– Check for voltage using a DVM. If voltage is present, disconnect wire. If sprinkler closes, service controller. Refer to Controller Service Manual.* (b) Selector cam in manual "ON" position. *– Set to "AUTO" or "OFF" position.* (c) Debris in pilot valve assembly. *– Disassemble and remove all debris. (See Servicing Pilot Valve page 11.)* (d) Constant pressure from controller. (N.C. Models) *– Check pilot valve at controller for constant flow.* *– Check elevation differential. Valve elevation should not exceed 0' above controller elevation or 70' (21.3 m) below controller elevation.*

System Troubleshooting — Sprinklers

	PROBLEM	POSSIBLE CAUSE – *CORRECTIVE ACTION*
1.	**SPRINKLER WON'T ROTATE**	(a) Debris wedged between stator and turbine. *– Remove obstruction.* (b) Drive assembly defective. *– Replace drive assembly.* (c) Nozzle base assembly defective. *– Replace nozzle base assembly.*
2.	**HEAD STICKS UP**	(a) Dirt in riser assembly. *– Flush out. (See Flushing Procedure on page 11.)* (b) Damaged or missing return spring. *– Replace.* (c) Damaged riser. *– Replace.*
3.	**POOR DISTRIBUTION PATTERN**	(a) Nozzle plugged with debris. *– Clean or replace nozzle.* (b) Nozzle orifice damaged. *– Replace nozzle.* (c) Low operating pressure. *– Determine why system overloaded and correct.*
4.	**VALVE WON'T CLOSE (Electric 7XX-X6-XXX)**	(a) Continuous 24 VAC to sprinkler. *– Check controller for voltage source.* (b) Leak in pilot valve assembly. *– Replace pilot valve assembly.* (c) Plugged supply screen on piston. *– Clean or replace screen.* (d) Manual control selector on pilot valve assembly turned to "ON" position. *– Turn to "AUTO" position.* (e) Plunger movement restricted. *– Inspect and clean or replace.* (f) Valve cylinder misaligned with sprinkler body communication tube. *– Remove valve assembly and install correctly.* (g) Foreign object keeping valve from seating. *– Remove, clean and check valve for damage. Replace if necessary.* (h) Damaged piston seal or piston assembly. *– Replace valve assembly.*
	VALVE WON'T CLOSE (Hyd. Normally Open 7XX-X1-XX)	(a) Leak in control tubing. *– Isolate and repair.* (b) Pilot valve leak in controller. *– Confirm by observing constant dripping from discharge line of controller. Refer to Controller Service Manual.* (c) Valve cylinder misaligned with sprinkler body communication tube. *– Remove valve assembly and install correctly.* (d) Foreign object keeping valve from seating. *– Remove, clean and check valve for damage. Replace if necessary.* (e) Damaged piston seal or piston assembly. *– Replace valve assembly.*
	VALVE WON'T CLOSE (Hyd. Normally Closed 7XX-X8-XXX)	(a) Constant pressure to sprinkler. *– Check controller for water source.* (b) Elevation differential between sprinkler and controller exceeds tolerance. *– Check elevation differential. Valve elevation should not exceed 0' above controller elevation or 70' (21.3 m) below controller elevation.* (c) Restriction in controller discharge line. *– Inspect and clean.* (d) Valve cylinder misaligned with sprinkler body communication tube. *– Remove valve assembly and install correctly.* (e) Foreign object keeping valve from seating. *– Remove, clean and check valve for damage. Replace if necessary.* (f) Damaged piston seal or piston assembly. *– Replace valve assembly.*

System Troubleshooting — Sprinklers (continued)

	PROBLEM	POSSIBLE CAUSE – *CORRECTIVE ACTION*
5.	**VALVE WON'T OPEN (Electric 7XX-X6-XXX)**	(a) Control (field) wires severed. *– Isolate and repair.* (b) No power to controller. *– Establish controller power.* (c) No power from controller to solenoid. *– Check for blown fuse and replace.* (d) Manual control selector on pilot valve assembly turned to "OFF" position. *– Turn to "AUTO" position.* (e) Pilot valve solenoid inoperative. *– Remove and replace.* (f) Pilot valve plunger movement restricted. *– Inspect, clean and/or replace.* (g) No supply from main valve. *– Debris in control tube, main valve assembly and/or communication passages in body. Flush thoroughly.*
	VALVE WON'T OPEN (Hyd. Normally Open 7XX-X1-XX)	(a) Plugged controller discharge line or discharge port in pilot valve. *– Verify by checking for discharge at discharge line when station is activated. If no discharge, refer to Controller Service Manual.*
	VALVE WON'T OPEN (Hyd. Normally Closed 7XX-X8-XXX)	(a) Insufficient pressure in controller supply line and/or sprinkler control tube. *– Check pressure.* (b) Pilot valve hydraulic adapter inoperative. *– Remove and replace.* (c) Manual control selector on pilot valve assembly turned to "OFF" position. *– Turn to "AUTO" position.* (d) Pilot valve plunger movement restricted. *– Inspect, clean and/or replace.* (e) No supply from main valve. *– Debris in control tube, main valve assembly and/or communication passages in body. Flush thoroughly.*
6.	**SPRINKLER WEEPING (Slow leak in valve)**	(a) Damaged or blocked valve seat. *– Remove blockage and, if necessary, replace valve assembly.* (b) Damaged piston seal or piston assembly. *– Replace valve assembly.* (c) Low pressure on supply line on hydraulic NO sprinklers. *– Check for low pressure reason and correct.* (d) Elevation of normally closed sprinkler exceeds 75' (22.9 m) differential.
7.	**SEVERAL VALVES ON DIFFERENT STATIONS FAIL TO CLOSE (Hyd. Normally Open 7XX-X1-XX)**	(a) Control tubing leak which lowers supply pressure to other stations. *– 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.* (b) Leak in supply line to controller. *– Verify by checking pressure in all control lines.* (c) Leak in controller pilot valve. *– Verify by constant discharge on controller. Refer to Controller Service Manual.* (d) Plugged supply line filter. *– Replace filter if more than 3 PSI (0.21 kg/cm^2) differential exists.*

Servicing Procedures

Introduction

The 760/780 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 Procedure 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 Toro Illustrated Parts Breakout Book, Form No. 368-0044 for parts identification.

1. Using a small screwdriver or pocket knife, carefully pry up and remove adjustment plug from center of cap.
2. Using ½" nut driver (P/N 995-80), unscrew jam nut and remove cap.

   NOTE: *Cap is keyed to nozzle base assembly. During reassembly, position tab on bottom of cap with notch in top of nozzle base.*
3. Insert hooked end of snap ring removal tool (P/N 996-06) into slot in snap ring. Pull snap ring inward toward sprinkler assembly, then upward to remove from snap ring groove in body.

   NOTE: *During reassembly, ensure snap ring is correctly installed and fully seated in snap ring groove.*
4. Pull sprinkler assembly out of body.
5. While pushing seal/retainer assembly downward to slightly compress return spring, unscrew and remove nozzle base assembly from shaft of drive assembly.
6. Carefully release tension from return spring. Remove seal/retainer assembly and return spring from riser assembly.
7. Remove O-ring from seal/retainer assembly.
8. Remove O-ring from shaft of drive assembly or from O-ring counterbore inside of nozzle assembly.
9. Using tips of needle nose pliers inserted into screen, remove screen by turning it counterclockwise while holding plastic base of riser assembly.
10. Remove variable stator and stator support from riser assembly.

    NOTE: *Stator support is keyed to riser assembly. During reassembly, position stator support keyways over alignment tabs of riser assembly. Refer to* ***Figure 6*** *for location of alignment tabs.*
11. Pressing **only on ribbed area** of drive assembly, push drive assembly out of riser assembly as shown in **Figure 5**.

    CAUTION

    When removing or installing drive assembly, DO NOT press or pull on threaded shaft or attempt to pull drive assembly out of riser assembly. Push on ribbed areas only! Failure to comply may cause separation of drive assembly components.

    NOTE: *Drive assembly is keyed to riser assembly. During reassembly, position extra rib of drive assembly to the right of either alignment tab of riser assembly as shown in* ***Figure 6****.*
12. Using 9/16" nut driver (P/N 995-81), unscrew main nozzle from nozzle base assembly.
13. Using 7/16" nut driver (P/N 995-79), unscrew two inner nozzles from nozzle base assembly. Remove restrictor from one inner nozzle.
14. Thoroughly clean and inspect all parts; replace as necessary. Reassemble in reverse order.

Figure 5

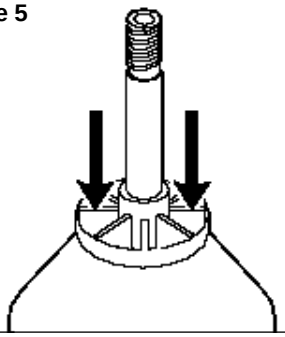
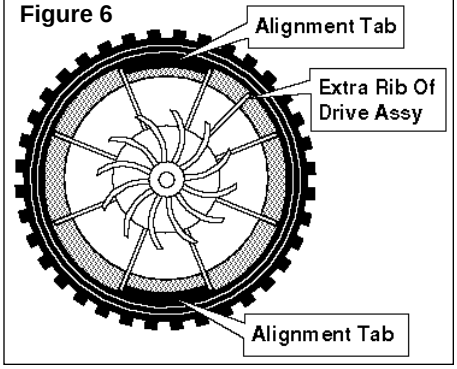


Figure 6



Valve Removal and Replacement

Refer to Toro Illustrated Parts Breakout Book, Form No. 368-0044 for parts identification.

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 6**.)

   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 995-08, 1" models or 995-09, 1.5") 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 7**.)

   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 995-76, 1" or 995-10, 1.5"). Valve insertion tool will automatically line up valve assembly with sprinkler body communication tube and correctly seat the snap ring. (See **Figure 8**.)

   NOTE: *It is possible to install the snap ring backwards (upside down). See inset in* ***Figure 8*** *to insure that snap ring is placed on the insertion tool in the correct manner.*

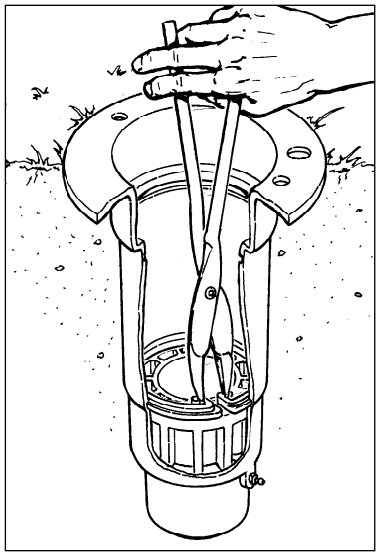


Figure 6
Using Snap Ring Pliers to Remove Snap Ring
(780 Series Shown)

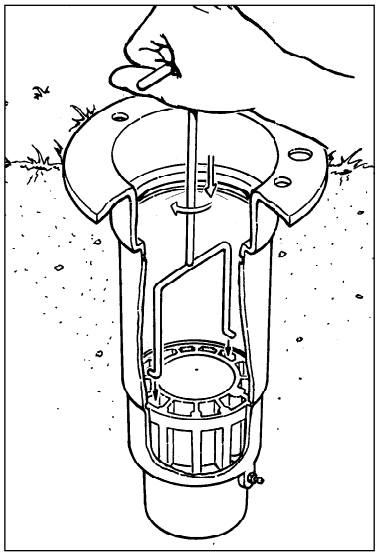


Figure 7
Using Valve Removal Tool to Remove Valve Assembly
(780 Series Shown)

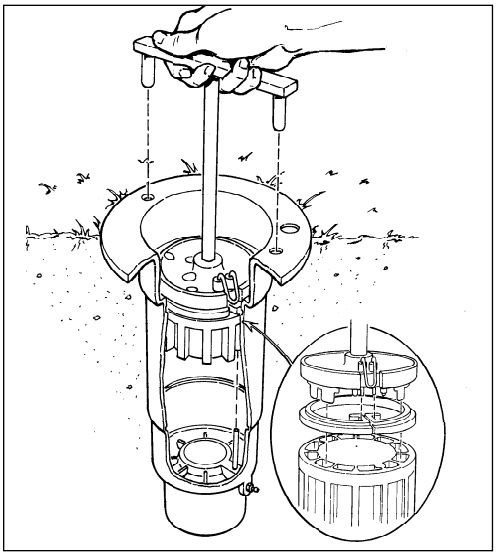


Figure 8
Using Valve Insertion Tool to Install Valve Assembly with Snap Ring
(780 Series Shown)

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

Refer to Toro Illustrated Parts Breakout Book, Form No. 368-0044 for parts identification.

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.
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 or NC pilot valve adapter by turning it counterclockwise.
7. Pull pilot valve body assembly out of housing.
8. Remove diaphragm assembly, piston and spring.
9. Remove selector and plunger assembly. *Selector retains plunger in body.*
10. Thoroughly clean and inspect all parts. Replace damaged parts as necessary and reassemble in reverse order.

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