



# Resources *and Warranty*



# Technical Data

## VALVE SPECIFICATIONS

CONTROL SYSTEMS		
Type of System	Max. Distance From Controller to Valve	Elevation Restrictions
Pin Type <sup>£</sup> (00) Hydraulic* with 3/8" Control Tubing	100'	
Pin Type <sup>£</sup> (00) Hydraulic* with 1/2" Control Tubing	200'	
Normally Open (01) with 3/8" Control Tubing	500'	Valve elevation should not exceed 25' ABOVE or 70' BELOW controller elevation.
Normally Closed (08) Hydraulic with 3/8" Control Tubing	500'	Valve elevation should not exceed 0' ABOVE or 70' BELOW controller elevation.
Normally Open (01) with 1/2" Control Tubing	1000'	Valve elevation should not exceed 25' ABOVE or 70' BELOW controller elevation.
Normally Closed (08) Hydraulic with 1/2" Control Tubing	1000'	Valve elevation should not exceed 0' ABOVE or 70' BELOW controller elevation.
Electric (06)	Depends on variables <ul style="list-style-type: none"> <li>• Voltage available</li> <li>• Wire size</li> </ul>	NONE

\* - All hydraulic connections on Toro valves are 1/4" insert type.  
 - Control line pressure must be equal to or greater than mainline pressure.  
 - Control line pressure range is 40 to 150 psi.

£ Maximum of one (1) valve per station on pin type systems.

\*\* Minimum solenoid voltage required for reliable electric VIH operation is 19.5 V ac

## CONVERSION INFORMATION

- All gallons per minute are shown in U.S.
- To convert to imperial gallons per minute, multiply by 0.833
- 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/cm<sup>2</sup>), divide by 14.22
- To convert feet to meters, divide by 3.28

## WINTERIZING SPECIFICATIONS

In freezing climates, valves should be properly winterized to prevent freeze-related damage (see Form No. 364-0072).

## SPRINKLER SPACING

The Toro Company does not recommend designing for zero (0) mph wind conditions.

### ■ Square Spacing

- No wind - 55% of diameter
- 4 mph wind - 50% of diameter
- 6,4 kph wind - 50% of diameter
- 8 mph wind - 45% of diameter
- 12,8 kph - 45% of diameter

### ■ Triangular Spacing

- No wind - 60% of diameter
- 4 mph wind - 55% of diameter
- 6,4 kph wind - 55% of diameter
- 8 mph wind - 50% of diameter
- 12,8 kph - 50% of diameter

### ■ Single Row Spacing

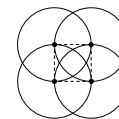
- No wind - 50% of diameter
- 4 mph wind - 50% of diameter
- 6,4 kph wind - 50% of diameter
- 8 mph wind - 45% of diameter
- 12,8 kph - 45% of diameter

Design in consideration of the worst wind conditions.

## PRECIPITATION RATE FORMULAS

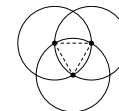
- Square-spaced sprinklers in pattern:

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



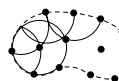
- Triangular-spaced sprinklers in pattern:

$$\frac{\text{GPM of full-circle} \times 96.3}{(\text{Spacing})^2 (.866)}$$



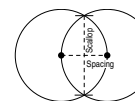
- Area and flow:

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



- Single row:

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



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

## Valve-In-Head Activation Types

### Electric

- Pressure regulation feature available to ensure that all heads operate at the same pressure—regardless of elevation changes
- Manual On-Off-Auto control at the sprinkler
- Individual sprinkler control for more precise watering

### Normally Open

- Individual sprinkler control for more precise watering
- Hydraulic control capability with sophisticated electronic/electric control systems
- Ideal for all dirty water applications—irrigation water is not used for control
- Lightning resistant

### Check-O-Matic

- Maintains 37' elevation change
- Eliminates low-head drainage
- Requires separate remote control valve

# Wire Sizing

## Current Draw (Amperage)

### Standard Wattage Solenoid

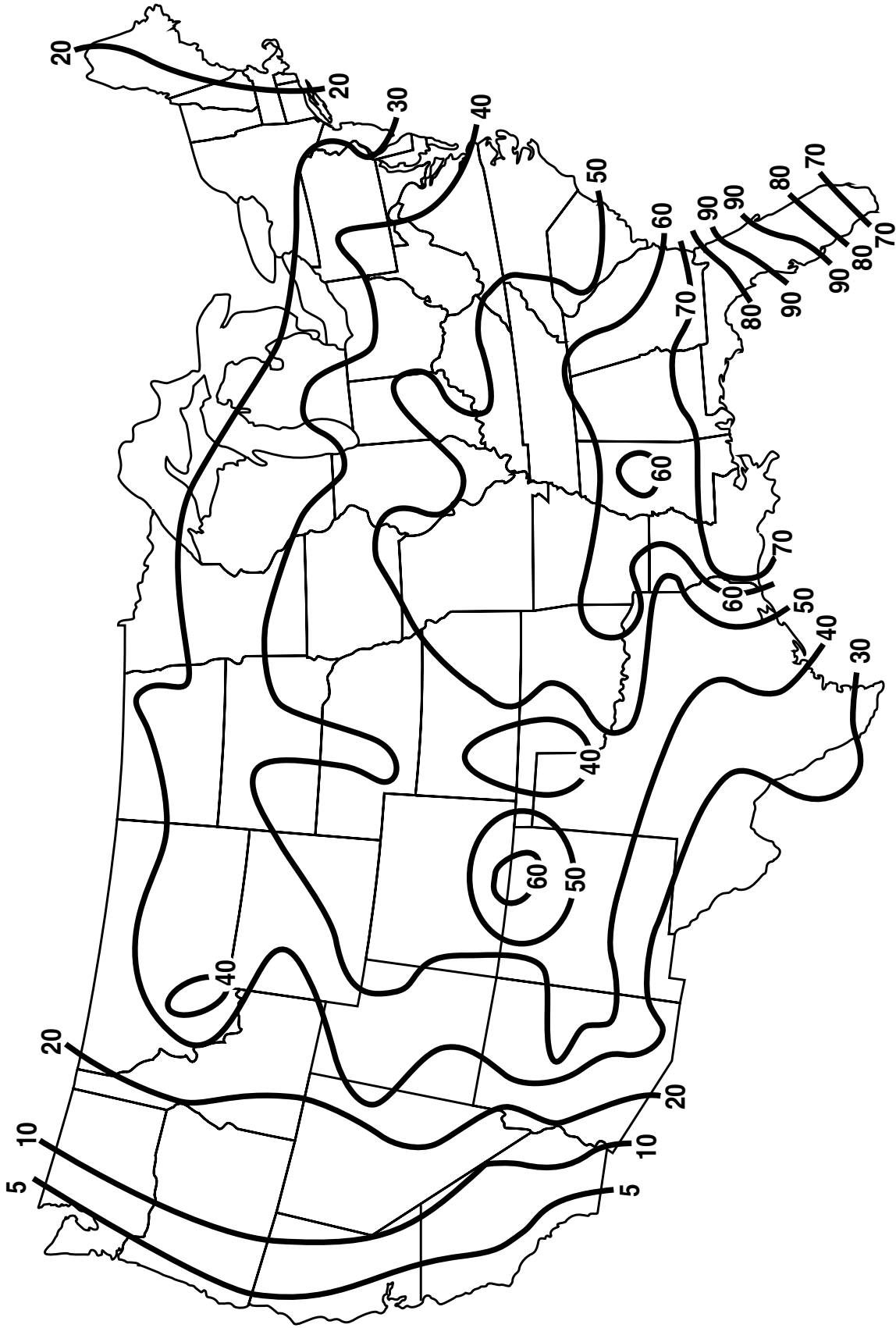
Product	Solenoids	Assumes 24 V ac, 50/60 Hz Output			
		120 V ac, 60 Hz		240 V ac, 50 Hz	
		Inrush	Holding	Inrush	Holding
Network 8000 Satellite	0	0.35	0.35	N/A	N/A
	1	0.43	0.41	N/A	N/A
	2	0.51	0.47	N/A	N/A
	3	0.59	0.53	N/A	N/A
	4	0.67	0.59	N/A	N/A
	5	0.75	0.65	N/A	N/A
	6	0.83	0.71	N/A	N/A
	7	0.91	0.77	N/A	N/A
	8	0.99	0.83	N/A	N/A
	9	1.07	0.89	N/A	N/A
	10	1.15	0.95	N/A	N/A
	11	1.23	1.01	N/A	N/A
	12	1.31	1.07	N/A	N/A
	13	1.39	1.13	N/A	N/A
	14	1.47	1.19	N/A	N/A
	15	1.55	1.25	N/A	N/A
	16	1.63	1.31	N/A	N/A
	17	1.71	1.37	N/A	N/A
18	1.79	1.43	N/A	N/A	
Network LTC Satellite	0	0.15	0.15	0.08	0.08
	1	0.23	0.21	0.12	0.11
	2	0.31	0.27	0.17	0.14
	3	0.39	0.33	0.22	0.17
	4	0.47	0.39	0.26	0.20
	5	0.55	0.45	0.31	0.24
	6	0.63	0.51	0.36	0.27
	7	0.71	0.57	0.40	0.30
	8	0.79	0.63	0.45	0.33
	9	0.87	0.69	0.50	0.36
	10	0.95	0.75	0.55	0.40
	11	1.03	0.81	0.59	0.43
12	1.11	0.87	0.64	0.46	
E-Series OSMAC Satellite	0	0.05	0.05	0.03	0.03
	1	0.13	0.11	0.07	0.06
	2	0.21	0.17	0.12	0.09
	3	0.29	0.23	0.17	0.12
	4	0.37	0.29	0.21	0.15
	5	0.45	0.35	0.26	0.19
	6	0.53	0.41	0.31	0.22
	7	0.61	0.47	0.35	0.25
	8	0.69	0.53	0.40	0.28
	9	0.77	0.59	0.45	0.31
	10	0.85	0.65	0.50	0.35
	11	0.93	0.71	0.54	0.38
	12	1.01	0.77	0.59	0.41
	13	1.09	0.83	0.64	0.44
	14	1.17	0.89	0.68	0.47
	15	1.25	0.95	0.73	0.51
16	1.33	1.01	0.81	0.54	
Vari-Time Satellite	0	0.21	0.21	0.11	0.11
	1	0.29	0.27	0.16	0.14
	2	0.37	0.33	0.21	0.17
	3	0.45	0.39	0.26	0.20
	4	0.53	0.45	0.31	0.21

### Spike-Guard™ Low Wattage Solenoid

Product	Solenoids	Assumes 24 V ac, 50/60 Hz Output			
		120 V ac, 60 Hz		240 V ac, 50 Hz	
		Inrush	Holding	Inrush	Holding
Network 8000 Satellite	0	0.35	0.35	N/A	N/A
	1	0.37	0.37	N/A	N/A
	2	0.40	0.39	N/A	N/A
	3	0.42	0.41	N/A	N/A
	4	0.45	0.43	N/A	N/A
	5	0.47	0.45	N/A	N/A
	6	0.49	0.47	N/A	N/A
	7	0.52	0.49	N/A	N/A
	8	0.54	0.51	N/A	N/A
	9	0.57	0.53	N/A	N/A
	10	0.59	0.55	N/A	N/A
	11	0.61	0.57	N/A	N/A
	12	0.64	0.59	N/A	N/A
	13	0.66	0.61	N/A	N/A
	14	0.69	0.63	N/A	N/A
	15	0.71	0.65	N/A	N/A
	16	0.73	0.67	N/A	N/A
	17	0.76	0.69	N/A	N/A
18	0.78	0.71	N/A	N/A	
Network LTC Satellite and Network LTC Plus	0	0.15	0.15	0.08	0.08
	1	0.17	0.17	0.10	0.10
	2	0.20	0.19	0.11	0.11
	3	0.22	0.21	0.13	0.13
	4	0.25	0.23	0.15	0.14
	5	0.27	0.25	0.17	0.16
	6	0.29	0.27	0.18	0.17
	7	0.32	0.29	0.20	0.19
	8	0.34	0.31	0.22	0.20
	9	0.37	0.33	0.23	0.22
	10	0.39	0.35	0.25	0.23
	11	0.41	0.37	0.27	0.25
12	0.44	0.39	0.28	0.26	
E-Series OSMAC Satellite	0	0.05	0.05	0.03	0.03
	1	0.07	0.07	0.05	0.05
	2	0.10	0.09	0.06	0.06
	3	0.12	0.11	0.08	0.08
	4	0.15	0.13	0.10	0.09
	5	0.17	0.15	0.12	0.11
	6	0.19	0.17	0.13	0.12
	7	0.22	0.19	0.15	0.14
	8	0.24	0.21	0.17	0.15
	9	0.27	0.23	0.18	0.17
	10	0.29	0.25	0.20	0.18
	11	0.31	0.27	0.22	0.20
	12	0.34	0.29	0.23	0.21
	13	0.36	0.31	0.25	0.23
	14	0.39	0.33	0.27	0.24
	15	0.41	0.35	0.29	0.26
16	0.44	0.37	0.30	0.27	
Vari-Time Satellite	0	0.21	0.21	0.11	0.11
	1	0.23	0.23	0.13	0.13
	2	0.26	0.25	0.14	0.14
	3	0.28	0.27	0.16	0.16
	4	0.31	0.29	0.18	0.17

# Mean Number of Thunderstorm Days

From Technical Paper 19, Climatological Services Division, Weather Bureau.



# Maximum Monthly ET Rates— Major Metropolitan Areas

State	Area	Max. ET
Alabama	Northern Valley (Decatur)	7.79
Alabama	Appalachian Mountains (Birmingham)	7.58
Alabama	Gulf (Mobile)	7.86
Arizona	North Central (Prescott)	7.37
Arizona	Southwest (Yuma)	10.69
Arizona	South Central (Phoenix)	10.11
Arizona	Southeast (Tucson)	8.11
Arkansas	Northwest (Fayetteville)	7.69
Arkansas	Northeast (Jonesboro)	8.08
Arkansas	Central (Little Rock)	8.19
California	Sacramento Drainage (Sacramento)	6.51
California	Northeast Interior Basin (Squaw Valley Lodge)	5.11
California	Central Coast Drainage (San Francisco)	4.99
California	San Joaquin Drainage (Fresno)	7.22
California	South Coast Drainage (Los Angeles)	6.13
California	Southeast Desert Basin (Palm Springs)	8.90
Colorado	Colorado Drainage Basin (Durango)	5.11
Colorado	Platte Drainage Basin (Denver)	4.42
Connecticut	Central Coastal (Hartford)	6.37
Delaware	Northern (Wilmington)	7.16
Florida	Northwest (Pensacola)	7.84
Florida	North (Jacksonville)	7.87
Florida	North Central (Orlando)	7.95
Florida	South Central (Tampa)	7.95
Florida	Lower East Coast (Ft. Lauderdale)	7.86
Georgia	North Central (Atlanta)	7.33
Georgia	Central (Macon)	7.90
Georgia	East Central (Augusta)	8.10
Georgia	Southwest (Albany)	4.41
Georgia	Southeast (Savannah)	7.95
Hawaii	Hawaii—West Central (Kailua)	9.90
Hawaii	Hawaii—East Central (Hilo)	6.00
Hawaii	Kauai—North (Princeville)	4.82
Hawaii	Kauai—Southwest (Kekaha)	5.42
Hawaii	Kauai—Southeast (Lihue)	9.14
Hawaii	Lanai—Central (Lanai City)	2.14
Hawaii	Maui—Northwest (Lahaina)	7.98
Hawaii	Maui—Southeast (Kihei)	8.33
Hawaii	Molokai—Central (Kualapuu)	11.20
Hawaii	Oahu—South (Honolulu)	7.18
Idaho	Panhandle (Coeru d'Alene)	5.59
Idaho	Southwestern Valleys (Boise)	6.93
Idaho	Upper Snake River Plains (Idaho Falls)	5.87
Illinois	Northeast (Chicago)	6.99
Illinois	Central (Peoria)	7.37
Illinois	East (Danville)	7.13
Indiana	Central (Indianapolis)	7.12
Indiana	Southwest (Evansville)	7.50
Iowa	West Central (Sioux City)	7.20
Iowa	Central (Des Moines)	7.03
Iowa	East Central (Cedar Rapids)	7.02
Kansas	East Central (Topeka)	7.94
Kansas	South Central (Wichita)	8.38
Kentucky	Central (Louisville)	7.24
Kentucky	Blue Grass (Lexington)	7.26
Kentucky	Eastern (Ashland)	7.03
Louisiana	Northwest (Shreveport)	8.35
Louisiana	Southeast (New Orleans)	8.09
Maine	Coastal (Portland)	5.30
Maryland	North Central (Baltimore)	6.98
Maryland	Appalachian Mountains (Cumberland)	6.74
Massachusetts	Coastal (Boston)	6.18
Michigan	East Upper (Sault Ste. Marie)	5.13
Michigan	Northwest Lower (Traverse City)	5.68
Michigan	South Central Lower (Lansing)	6.42
Michigan	Southeast Lower (Detroit)	6.56
Minnesota	Northeast (Duluth)	5.19
Minnesota	East Central (Minneapolis)	6.66

State	Area	Max. ET
Mississippi	Coastal (Biloxi)	8.02
Mississippi	Central (Canton)	7.99
Missouri	Northwest Prairie (Kansas City)	7.77
Missouri	Northeast Prairie (St. Louis)	7.60
Montana	Western (Missoula)	7.79
Montana	Central (Helena)	5.63
Montana	South Central (Billings)	6.12
Nebraska	Panhandle (Scottsbluff)	6.80
Nebraska	East Central (Omaha)	7.60
Nevada	Northwestern (Reno)	6.21
Nevada	Extreme Southern (Las Vegas)	9.24
New Hampshire	Southern (Concord)	5.89
New Jersey	Coastal (Atlantic City)	6.90
New Mexico	Northern Mountains (Santa Fe)	5.05
New Mexico	Central Valley (Albuquerque)	7.17
New York	Central Lakes (Syracuse)	6.21
New York	Coastal (New York)	6.89
New York	Hudson Valley (Albany)	6.42
New York	Great Lakes (Buffalo)	6.19
North Carolina	Southern Piedmont (Charlotte)	7.67
North Carolina	Southern Coastal Plain (Wilmington)	7.74
North Dakota	East Central (Fargo)	6.45
Ohio	Northwest (Toledo)	6.75
Ohio	Northeast (Cleveland)	6.34
Ohio	Central (Columbus)	6.90
Ohio	Southwest (Dayton)	7.14
Oklahoma	Central (Oklahoma City)	8.51
Oregon	Willamette Valley (Portland)	5.23
Oregon	South Central (Klamath Falls)	5.27
Pennsylvania	Southeastern Piedmont (Philadelphia)	7.13
Pennsylvania	Southwest Plateau (Pittsburgh)	6.32
Rhode Island	Rhode Island (Providence)	6.20
South Carolina	Mountain (Greenville)	6.27
South Carolina	Central (Columbia)	7.99
South Carolina	Southern (Charleston)	7.91
South Dakota	Southwest (Rapid City)	7.28
South Dakota	Southeast (Sioux Falls)	6.81
Tennessee	Eastern (Chattanooga)	7.21
Tennessee	Middle (Nashville)	7.64
Tennessee	Western (Memphis)	7.88
Texas	High Plains (Amarillo)	7.21
Texas	North Central (Dallas)	8.79
Texas	Trans Pecos (El Paso)	7.65
Texas	South Central (San Antonio)	8.70
Texas	Upper Coast (Houston)	8.32
Utah	Dixie (St. George)	8.85
Utah	North Central (Salt Lake City)	6.92
Vermont	Northeastern (Montpelier)	5.48
Virginia	Tidewater (Norfolk)	5.48
Virginia	Eastern Piedmont (Richmond)	7.24
Virginia	Northern (Arlington)	6.89
Virginia	Central Mountains (Roanoke)	6.63
Washington	Puget Sound Lowlands (Seattle)	5.02
Washington	Northeastern (Spokane)	5.62
West Virginia	Southwestern (Charleston)	7.07
Wisconsin	West Central (La Crosse)	6.47
Wisconsin	South Central (Madison)	6.70
Wisconsin	Southeast (Milwaukee)	6.49
Wyoming	Yellowstone Drainage (Lake Yellowstone)	4.22
Wyoming	Platte Drainage (Cheyenne)	5.59
Canada	Vancouver	4.69
Canada	Calgary	4.84
Canada	Edmonton	4.84
Canada	Winnipeg	5.39
Canada	Ottawa	5.43
Canada	Toronto	5.43
Canada	Montreal	5.47
Canada	Quebec	5.20

**Notes:**

Data accumulated by the Commercial Research Department of Toro Manufacturing Corporation, Minneapolis, Minnesota.

- Figures above represent inches of moisture.
- Rainfall is based on 30-year average (1930-1961).
- Potential evaporation calculated from modified Blaney-Criddle formula.
- Consumptive coefficients for lawn grass as developed by Soil Conservation Service in 1960—reported in paper entitled, "A Method for Estimating Irrigation Water Requirements of Lawns" presented by T.H. Quackenbush and J.T. Phelan; 1963 Meeting ASA at Denver, Colorado.



# The Toro Limited Warranty for Irrigation Division Equipment

The Toro Company and its affiliate, Toro Warranty Company, pursuant to an agreement between them, jointly warrants to the owner, each new piece of irrigation equipment (featured in the current catalog at date of installation) against defects in material and workmanship for a period described below, provided they are used for irrigation purposes under manufacturer's recommended specifications.

During the warranty period, we will repair or replace, at our option, any part found to be defective. Your remedy is limited solely to the replacement or repair of defective parts.

This warranty does not apply (i) to Acts of God (e.g., lightning, flooding, etc.) unless specifically listed under the Extended Lightning Protection Warranty provided herein; or (ii) to products not manufactured by Toro when used in conjunction with Toro products; or (iii) where equipment is used, or installation is performed in any manner contrary to Toro's specifications and instructions, nor where equipment is altered or modified.

Return the defective part to your irrigation contractor or installer, or your local distributor who may be listed in your telephone directory Yellow Pages under "Irrigation Supplies" or "Sprinkler Systems," or contact The Toro Warranty Company, P.O. Box 489, Riverside, California 92502, phone (800) 664-4740 for the location of your nearest Toro distributor or outside the U.S., call (951) 688-9221.

Neither Toro nor Toro Warranty Company is liable for indirect, incidental or consequential damages in connection with the use of equipment, including but not limited to: vegetation loss, the cost of substitute equipment or services required during periods of malfunction or resulting non-use, property damage or personal injury resulting from installer's actions, whether negligent or otherwise. Some states do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you.

All implied warranties, including those of merchantability and fitness for use, are limited to the duration of this express warranty.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

This warranty gives you specific legal rights and you may have other rights which vary from state to state.

## **Standard Warranty**

All Toro Irrigation Division products are covered by this warranty for a period of two years from the date of installation except as noted below.

### **Sprinklers and Valves 3-year Warranty**

The golf large geared head sprinklers (690, 720, 720G, 810G, 835S, 855S, 834S, 854S, DT34/DT35 and DT54/DT55 Series) component parts are covered by this warranty for three years from the date of installation.

### **Extended 5-year Warranty**

The 570Z PR and 570Z PRX, Super 700, Super 800, 2001 and 640 Series sprinklers, and the 220G and P-220G Series valves are covered by this warranty for five years from date of installation.

### **Large Turf Controller Warranty**

All large turf central and field satellite controllers, with the exception of centrals covered by the Toro National Support Network, are covered by this warranty for one year from date of installation.