

Planning and installation guide

***For the ultimate
do-it-yourself
sprinkler system***

- ***Install it yourself and
save hundreds of dollars.***
- ***Used in golf courses,
parks, stadiums, and
millions of commercial
and residential
installations nationwide.***
- ***Rugged, high-
performance
sprinklers, valves,
and system timers.***

Introduction

Install your own Toro sprinkler system – quickly and with confidence.

With this planning guide you can put in your own Toro underground sprinkler system.

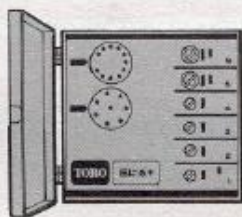
The booklet will guide you through the same planning and installation process the pros use. Only we've simplified some steps to smooth the way.

In just a few weekends – depending on the size of your lawn and your skills – you can enjoy the benefits of Toro's underground sprinkler system. You'll save **hundreds** of dollars by doing it yourself.

Enjoy the many advantages of owning a Toro system.

Convenience.

The Toro underground sprinkler system is completely automatic. Just set the system timer and let Toro do the rest. The system waters your lawn automatically, when you want it to and according to what it needs.



Toro's easy to use, state-of-the-art EL-6 electronic system timer.

Greener lawns.

Toro's system waters your lawn exactly when it needs it. What's more, Toro's adjustable sprinklers allow you to fine-tune coverage and minimize waste. The result: a beautiful, green lawn you'll be proud of.

Easy to install.

You can put in the system yourself over the next few weekends – and save a lot of money. We've simplified the same installation process the pros use to make it easier for you.

A system tailored to fit your property.

Toro offers a complete line of scientifically engineered sprinklers, system timers, valves, and accessories for lawns of all types, shapes, and sizes.

More efficient watering.

The Toro system delivers gentle, even watering for a more thorough soaking. There's less run-off and water wasted. The system can be programmed to water at the best time, early in the morning.

Attractive.

Toro makes the smallest sprinkler heads on the market today. Toro pop-up heads stay out of sight and out of the way when not in use. All you need to do is enjoy your lawn. And, Toro heads operate quietly, because they're gear-driven.



Long life.

Toro sprinkler systems stand up to sun and weather, ensuring long life and reliable performance. Toro systems have withstood the severest environments in millions of installations worldwide, from the blazing heat of Saudi Arabia to Canada's frigid temperatures. Rugged, durable construction has made Toro the choice of the pros for golf courses, sports fields, stadiums, and other heavy-duty installations.

Improves your home.

Installing a Toro sprinkler system immediately adds value to your home. It also protects your gardening and landscaping investment and keeps it growing.

The first step in installing the sprinklers is to design your system. Let's get started

Designing your system

Suggested planning tools:

- Pencil and scratch paper
- Drawing compass
- 50-foot tape measure
- String
- Straight edge or ruler
- Pressure gauge (purchase or borrow it from your local Toro dealer or hardware store).

Size of Water Meter

Measure your home's water capacity.

"Water capacity," measured in gallons per minute (gpm), is the maximum flow of water your home can deliver to the sprinkler system.

Find out the size of your water meter.

Most meters are either 5/8, 3/4 or 1 inch. The size is stamped on the side of the meter. Write this number in the space to the left.

Note: If the size is not stamped on the meter, call your water company. They can provide you with much of the information you'll need to design your Toro sprinkler system, including:

- The size and location of your water meter.
- The static water pressure in your home.
- Local codes and permits concerning the installation of underground sprinkler systems. These codes may include:
 - pipe material
 - type and location of back-flow prevention
 - method of tie-in to the water main
 - other procedures and materials of construction.

Write down this information for later reference.

Measure the diameter of your service line.

Measure the pipe running immediately after the meter.

If you don't have a meter, measure the pipe running from the street into your home.

To determine pipe diameter, wrap a string around the pipe, measure the length of the string circling the pipe, and look up the diameter in Table I. Jot down this figure in the space to the left.

Service Line

Table I: Determine the diameter of the service line.

Length of string	2 3/4"	3 1/4"	3 1/2"	4"	4 3/4"	5"
Size of service line – Copper	3/4"		1"		1 1/4"	
Size of service line – Galvanized		3/4"		1"		1 1/4"

Measure your static water pressure.

Static water pressure, measured in pounds per square inch (psi), is the pressure at the outside water faucet when no water is running in the house.

To measure static water pressure:

1. Make sure all water is off.
2. Attach a pressure gauge to the outside faucet and open the valve.
3. Read the number indicated on the dial and write it down in the space below.

Static Water Pressure

- If you can't obtain a pressure gauge, get the static pressure from your water company.
- If your water is supplied by a pump, call your pump service company to find out the flow rate (in gpm) and the pressure (in psi). The company may need to know the serial number and model number written on the side of the pump.
- If you have a pressure tank, contact your Toro dealer or a professional installer for advice and assistance.

Determine your water capacity.

Use Table II to determine your water capacity based on the size of your meter, the diameter of your service line, and your static water pressure. Write the capacity in the space below.

Water Capacity

Note: Subtract 5 gpm from the figures in Table II if your pipe is galvanized. Galvanized pipe is greyish in color, and the joints are threaded.

Table II: Determine capacity in gallons per minute.

Size of		Static Water Pressure (PSI)					
Water Meter	Service Line (Copper)	30	35	40	45	50	55
		Gallons Per Minute (GPM) Subtract 5GPM for Galvanized					
5/8"	1/2"	2.0	3.5	5.0	6.0	6.5	7.0
5/8"	3/4"	3.5	5.0	7.0	8.5	9.5	10.0
3/4"	3/4"	6.0	7.5	9.0	10.0	12.0	13.0
3/4"	1"	7.5	10.0	11.5	13.5	15.0	16.0
3/4"	1 1/4"	10.0	12.0	13.0	15.0	17.0	18.0
1"	3/4"	6.0	7.5	9.0	10.0	12.0	13.0
1"	1"	10.0	12.0	13.5	17.0	19.5	22.0
1"	1 1/4"	12.0	15.5	17.5	21.0	23.5	26.0

Size of		Static Water Pressure (PSI)					
Water Meter	Service Line (Copper)	60	65	70	75	80	
		Gallons Per Minute (GPM) Subtract 5GPM for Galvanized					
5/8"	1/2"	7.5	8.0	9.0			
5/8"	3/4"	11.0	11.5	13.0			
3/4"	3/4"	14.0	15.0	16.0	17.5	18.5	
3/4"	1"	17.5	18.5	20.0	21.0	22.0	
3/4"	1 1/4"	19.0	21.0	23.0	24.5	26.0	
1"	3/4"	14.0	15.0	16.0	17.5	18.5	
1"	1"	23.5	25.0	26.0	28.0	29.0	
1"	1 1/4"	28.5	30.5	32.5	34.0	35.0	

Note: Pressures in new neighborhoods are usually greater than the planned future. We advise you contact your local water authority for the planned pressures.

Here are some tips for making an accurate diagram. Check each step when completed.

- ☐ Start from the outer perimeter and work inward.
- ☐ Outline your house, garage, and any other buildings.
- ☐ Show walks, drives, slabs, patios, and other artificial surfaces.
- ☐ Locate trees, flagpoles, and other major obstacles.
- ☐ Locate ground cover, grass, and flower beds.
- ☐ Identify the water meter (or pump) and service line locations.
- ☐ Re-check your measurements at several different points. Make sure your drawing accurately indicates the true dimensions.

Draw a plot of your property.

Measure your property with a tape measure and draw a diagram of it on the grid sheet. (First make a few copies of the blank grid sheet so you'll have extras in case you need them.) Use each square on the grid sheet to represent one foot of actual property.

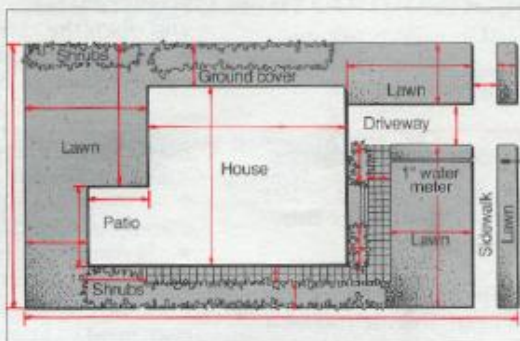


Figure 1: Sample plot diagram.

Accurately outline your property according to scale, laying out the locations of your home, sidewalk, grass, etc. This sketch is critical to planning your system, so it's important that the sketch be as accurate as possible. Figure 1 shows a typical property diagram.

Check local codes and permits.

Call your water company or the proper municipal authority to find out any building codes or permits required for the installation of underground sprinkler systems in your town.

Many local codes require installation of a **back-flow preventer** to protect your water system from contamination. Your Toro dealer can give you advice on how to select and install this device.

Know your equipment.

Toro offers you the most complete line of sprinkler heads, system timers, and valves for lawns of all shapes and sizes.



570 Series Sprays

The 570 Series Sprays produce a tight, constant fan of water ideal for covering small lawn and shrub areas (6 to 15 feet).

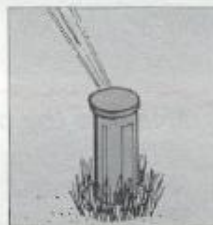
- **Pop-up lawn sprays** pop up when the water is turned on.
- **Shrub sprays** are mounted above the top of foliage to water ground cover and shrubs.
- **Flood bubblers** produce a flow of water to soak the soil without wetting leaves. Ideal for tree wells, planters, and ground cover, such as ivy.



Stream rotor

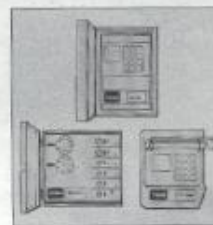
Toro's unique stream rotors produce attractive thin streams or "fingers" of water that slowly rotate to ensure proper penetration for medium-size lawn and shrub areas of

up to 30 feet. Two models are available: **pop-up lawn sprinklers** and **shrub rotors** (which are excellent for ground cover – especially on slopes).



Super 600

Super 600 Series sprinklers spray a single stream of water that rotates to cover large lawn areas. Produces a circular or semi-circular pattern with a radius of up to 50 feet.



System timers

Toro's new EL-6+ system timer gives you flexible, dependable programming at an affordable cost. The EL-6+ controls as many as six watering stations. In addition to the EL-6+, Toro offers a

complete line of 4-, 6-, and 8-circuit system timers.



Valves

Toro's valves are easy to use, convenient, reliable, and simple to install. Toro's 1-inch valves are designed to save fittings, time, and money. Toro's special "flow-control" valves allow you to manually

fine-tune the flow of water to the sprinkler heads.

Table III provides complete information on Toro sprinkler heads including:

- Uses
- Recommended minimum and maximum spacing between the heads
- Spray pattern
- Water consumption (gpm)
- Water pressure required for operation (psi)

Table III: Toro sprinkler heads.

Type	Uses	Spacing Range		Distance of Throw	Model No.	GPM
Flood Bubbler	Rose Beds, Shrubs, Trees, Ground Cover	Flooding Type			514-FB	2.4
Shrub Spray, 570 Standard Gallonage	Ground Cover, Flower Beds, Garden Areas, Shrub Areas	6'-16.5'		15'	570S-Q	1.0
					570S-H	2.0
					570S-3Q	3.0
					570S-F	4.0
	Adjustable - Adjusts from 0°-360° arc	6'-16.5'		15'	570S-A	1.1 @ 90°
					570S-A	1.9 @ 180°
					570S-A	2.7 @ 270°
					570S-A	3.5 @ 360°
	Rectangular Bed Areas	Wetted Width	Distance between Sprinklers			
		4' -	15'-16.5'	4' x 30'	570S-CST	1.2
		4' -	15'-16.5'	4' x 15'	570S-EST	.6
		9' -	9'-10'	9' x 18'	570S-SST	1.2
Shrub ¹¹ Spray, 570 Low Gallonage	Ground Cover, Flower Beds, Garden Areas, Shrub Areas	6'-13'		12'	570SL-Q	.7
					570SL-H	1.0
					570SL-3Q	1.5
					570SL-F	2.0
	Lawn Areas	6'-16.5'		15'	570P-Q	1.0
					570P-H	2.0
					570P-3Q	3.0
					570P-F	4.0
	Adjustable - Adjusts from 0°-360° arc	6'-16.5'		15'	570P-A	1.1 @ 90°
					570P-A	1.9 @ 180°
Pop-Up Lawn Spray, 570 Standard Gallonage	Rectangular Lawn Areas	Wetted Width	Distance between Sprinklers			
		4' -	15'-16.5'	4' x 30'	570P-CST	1.2
		4' -	15'-16.5'	4' x 15'	570P-EST	.6
		9' -	9'-10'	9' x 18'	570P-SST	1.2
	Lawn Areas	6'-13'		12'	570PL-Q	.7
					570PL-H	1.0
					570PL-3Q	1.5
					570PL-F	2.0
Pop-Up ¹¹ Lawn Spray, 570 Low Gallonage	Rotary Shrub Sprinklers	16' ¹² -18'		16'	SRS-20-Q	.6
					SRS-20-H	1.2
					SRS-20-F	2.4
		21' ¹² -24'		21'	SRS-25-Q	.7
	Rotary Pop-Up Lawn Sprinklers				SRS-25-H	1.4
					SRS-25-F	2.8
		28' ¹² -31'		28'	SRS-30-Q	1.4
					SRS-30-H	2.8
					SRS-30-F	5.6
Super 600 Shrub Sprinkler	Rotary Pop-Up Lawn Sprinklers	16' ¹² -18'		16'	SRP-20-Q	.6
					SRP-20-H	1.2
					SRP-20-F	2.4
		21' ¹² -24'		21'	SRP-25-Q	.7
	Super 600 Pop-Up Lawn Sprinkler				SRP-25-H	1.4
					SRP-25-F	2.8
		28' ¹² -31'		28'	SRP-30-Q	1.4
					SRP-30-H	2.8
					SRP-30-F	5.6
	Super 600 Shrub Sprinkler	31'-46'		42'	S600S-F-2.5	2.5
					S600S-F-5.0	5.0
		28'-41'		37'	S600S-A-1.3	1.3
					S600S-A-2.5	2.5
	Super 600 Pop-Up Lawn Sprinkler	31'-46'		42'	S600P-F-2.5	2.5
					S600P-F-5.0	5.0
		28'-41'		37'	S600P-A-1.3	1.3
					S600P-A-2.5	2.5

Select and position sprinkler heads.

With Toro sprinklers, you can precisely control water coverage, avoiding flooding and dry spots.

Select the right type of sprinkler heads for your yard:

1. Divide the lawn into areas.
2. Create as many large squares and rectangles as you can. This will make it easier to design your system.
3. Label each lawn area according to its surface: grass, shrubs, flowers, ground cover (Figure 2).

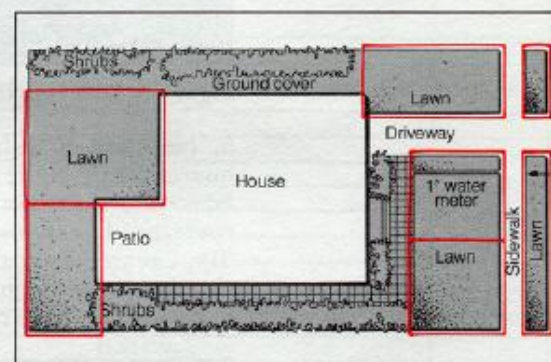


Figure 2: Label lawn area.

4. Use Table III to select the right type of heads for each area. Pop-up lawn rotors, for example, should be used to cover a large grassy area; shrub rotors are best for large shrub and garden areas. **Note:** To assure even watering when using S600 sprinklers, use 1.3-gpm nozzles for quarter-circle heads, 2.5-gpm for half-circle, and 5.0-gpm for full-circle.
5. For economical and efficient watering, the same type of head must be used throughout an area.

Position the heads:

Positioning sprinkler heads is an art, not an exact science. Work on your layout until you've achieved full coverage for all areas. These suggestions can help:

1. Position sprinkler heads within each area of your lawn, one area at a time.
2. Start with the largest square and rectangular areas. Save small and odd-shaped areas for last.
3. First try the sprinkler with the largest spray area, following the spacing range guide in Table III.

- (1) Do not mix low gallonage sprinklers with standard gallonage sprinklers. Low gallonage sprinklers may be useful in homes of limited water flow.
- (2) Spacing less than minimum distance is okay, but sprinkler will throw further and may wet house, street, sidewalk or some other area.

4. Position the sprinkler heads, staying within the allowable spacing range as shown in Table III and Figure 3. Going below the minimum results in flooding; exceeding the maximum produces dry spots.

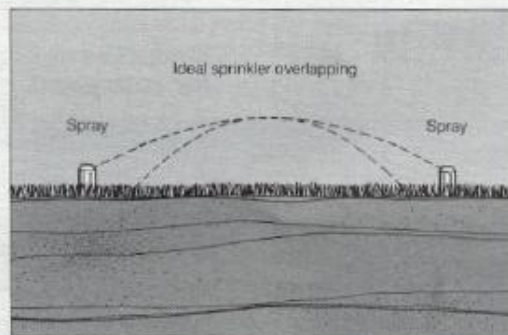


Figure 3: Ideal sprinkler overlapping.

5. Place half-circle heads on the borders; quarter-circle in the corners; and full-circle heads within the perimeter. Make sure the coverage of heads overlaps (Figure 4).
Tip: Use your compass to draw in the coverage of circular and semi-circular heads. Adjust spacing to ensure complete coverage.

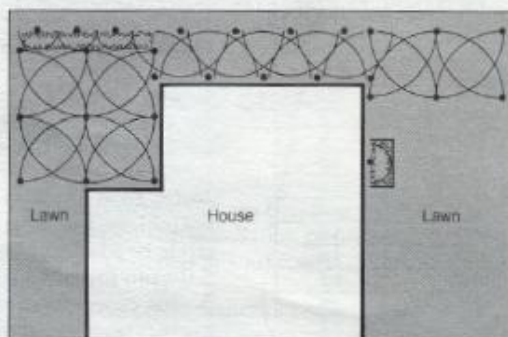


Figure 4: Proper sprinkler spacing.

6. Small areas, such as strips bordering your driveway or sidewalk, can be watered by one or two rows of part-circle heads Figure 5a or with Toro's special heads for end-strip and center-strip watering (models EST and CST in Table III). Figure 5b shows the coverage provided by these special heads.



Figure 5a



Figure 5b: Center-strip heads spray in two directions; end-strip heads spray in one direction only. Both are designed for precise watering of small rectangular areas.

To position heads in nonrectangular areas:

1. Pick the spot on the perimeter with the smallest radius as shown in Figure 6.

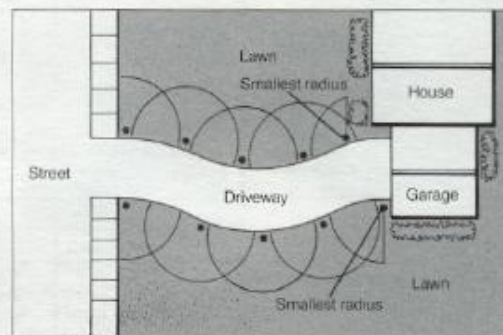


Figure 6: Non rectangular areas.

2. Place a head with a small spray radius at that point.
3. Then place heads along the border starting from that point.
4. Adjust the radius of each head according to the size and shape of the area.
5. If coverage is incomplete, adjust sprinkler location.
6. If it is still incomplete, start again using a head with a larger radius.
Tip: Use your compass to determine the coverage provided by these sprinklers.

If there are obstructions on your property:

In areas where there are trees, flagpoles, or other major obstructions, try locating your first head at the obstruction instead of on the perimeter. Then design outward from there.

When you've positioned all the sprinkler heads:

1. Use your compass to check the layout. Be sure coverage is complete.
2. Minimize spraying onto sidewalks while ensuring full coverage.
3. Make sure water does not hit the side of your house.

Order components, materials, and tools.

Using the order form (Table IV) to guide you, make a list of the Toro components and accessories required to install your system. Table IV contains everything you need.

Table IV: Order Materials




Type	Spacing Range	Model No.	Pattern/Description	Quantity
Spray				
Flood Bubbler	Flood	514-FB	Full Circle	
Shrub Spray, 570 Standard Gallonage	6'-16.5'	570S-Q	Quarter Circle	
	6'-16.5'	570S-H	Half Circle	
	6'-16.5'	570S-3Q	3/4 Circle	
	6'-16.5'	570S-F	Full Circle	
	6'-16.5'	570S-A	Adjustable	
Shrub Spray, 570 Low Gallonage	6'-12'	570SL-Q	Quarter Circle	
	6'-12'	570SL-H	Half Circle	
	6'-12'	570SL-3Q	3/4 Circle	
	6'-12'	570SL-F	Full Circle	
Shrub Spray, 570 Special – Rectangular	4' x 30'	570S-CST	Center Strip	
	4' x 15'	570S-EST	End Strip	
	4' x 30'	570S-ST	Side Strip	
	9' x 18'	570S-SST	Side Strip	
Pop-Up Lawn Spray, 570 Standard Gallonage	6'-16.5'	570P-Q	Quarter Circle	
	6'-16.5'	570P-H	Half Circle	
	6'-16.5'	570P-3Q	3/4 Circle	
	6'-16.5'	570P-F	Full Circle	
Pop-Up Lawn Spray, 570 Low Gallonage	6'-16.5'	570P-A	Adjustable	
	6'-12'	570PL-Q	Quarter Circle	
	6'-12'	570PL-H	Half Circle	
	6'-12'	570PL-3Q	3/4 Circle	
Pop-Up Lawn Spray, 570 Special Rectangular	6'-12'	570PL-F	Full Circle	
	4' x 30'	570P-CST	Center Strip	
	4' x 15'	570P-EST	End Strip	
	4' x 30'	570P-ST	Side Strip	
9' x 18'	570P-SST	Side Strip		
Stream Rotor				
Stream Rotor Shrub Sprinkler	16'-18'	SRS-20	Each Sprinkler Package Contains 1/4, 1/2 and Full Circle Options	
	21'-24'	SRS-25		
	28'-31'	SRS-30		
Stream Rotor Pop-Up Lawn Sprinkler	16'-18'	SRP-20	Each Sprinkler Package Contains 1/4, 1/2 and Full Circle Options	
	21'-24'	SRP-25		
	28'-31'	SRP-30		
Super 600				
Super 600 Shrub Sprinkler	31'-46'	S600S-40A-2.5	Part Circle 2.5 GPM	
	28'-41'	S600S-40A-1.3	Part Circle 1.3 GPM	
	31'-46'	S600S-40F-5.0	Full Circle 5.0 GPM	
	31'-46'	S600S-40F-2.5	Full Circle 2.5 GPM	
Super 600 Pop-Up Lawn Sprinkler	31'-46'	S600P-40A-2.5	Part Circle 2.5 GPM	
	28'-41'	S600P-40A-1.3	Part Circle 1.3 GPM	
	31'-46'	S600P-40F-5.0	Full Circle 5.0 GPM	
	31'-46'	S600P-40F-2.5	Full Circle 2.5 GPM	
Replacement Spray Nozzle Kits				
570 Sprinkler Nozzle Kits Standard Gallonage	6'-16.5'	2N-570S-Q	Quarter Circle (two per kit)	
	6'-16.5'	2N-570S-H	Half Circle (two per kit)	
	6'-16.5'	2N-570S-3Q	3/4 Circle (two per kit)	
	6'-16.5'	2N-570S-F	Full Circle (two per kit)	
	6'-16.5'	2N-570S-120	1/3 Circle (two per kit)	
	6'-16.5'	2N-570S-240	2/3 Circle (two per kit)	
	6'-16.5'	2N-570SL-Q	Quarter Circle (two per kit)	
570 Sprinkler Nozzle Kits – Low Gallonage	6'-13'	2N-570SL-H	Half Circle (two per kit)	
	6'-13'	2N-570SL-3Q	3/4 Circle (two per kit)	
	6'-13'	2N-570SL-F	Full Circle (two per kit)	
	6'-13'	2N-570SL-120	1/3 Circle (two per kit)	
	6'-13'	2N-570SL-240	2/3 Circle (two per kit)	
	4' x 30'	2N-570S-CST	Center Strip (two per kit)	
	4' x 15'	2N-570S-EST	End Strip (two per kit)	
570 Sprinkler Nozzle Kits – Special Rectangular	4' x 30'	2N-570S-ST	Side Strip (two per kit)	
	9' x 18'	2N-570S-ST	Side Strip (two per kit)	
	9' x 18'	2N-570S-ST	Side Strip (two per kit)	
Stream Rotor Arc Discs		2-SR-112	112° Arc (two per kit)	
		2-SR-135	135° Arc (two per kit)	
		2-SR-157	157° Arc (two per kit)	
		2-SR-202	202° Arc (two per kit)	
		2-SR-225	225° Arc (two per kit)	

Sprinkler heads.

Be sure to specify Toro model number according to spray pattern, application, and spacing requirements.



System timers.

Toro 4-, 6-, and 8-circuit system timers are available. Determine the number of circuits in your system and purchase the right size timer.

Type	Model No.	Pattern/Description	Quantity
Four Station 	IC-4/IND	4 Sta. Indoor Mount Elec. Controller	
Six Station 	EL-6+	6 Sta. Auto Controller	
Eight Station 	IC-8	8 Sta. Elec. Controller	

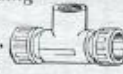




Electric valves.

Toro valves are easy to use, convenient, reliable, and simple to install. Choose regular or special "flow control valves" that allow you to manually fine-tune the flow.

Type	Model No.	Pattern/Description	Quantity
Valves for PVC 	ELV-1	1" Electric Male by Male Non-Flow Control Valve	
	ELV-1F	1" Electric Male by Male with Flow Control Valve	
Valves for Poly pipe 	ELV-1B	1" Electric Male by Barb Non-Flow Control Valve	
	ELV-1FB	1" Electric Male by Barb with Flow Control Valve	

Accessories and other materials

You will also need these other accessories including a compression tee for the water main tie-in, back-flow preventer like the PVB and PVC solvent/cement if you are using PVC pipe, and clamps if you use poly pipe. Teflon tape can also be useful.

Type	Model No.	Description	Quantity
Compressing Tee 1" Slip Type, threaded 			
1" Pressure Vacuum Breaker 	80-0560	Back-Flow Preventer Check Local Codes	
Solvent Primer for PVC 			
Clamps for Poly 			
Teflon Tape 			

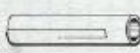






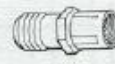

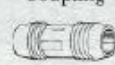
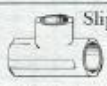
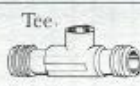





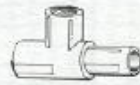

Other materials you will need:

- Hacksaw
- Knife
- Screwdriver
- Pipe wrench
- Solvent, primer, rags, small paint brush (PVC only)
- 1-inch pipe clamps (poly only)
- Pipe plugs
- Wooden stakes
- Hammer
- String
- Shovel

Pipe and fittings.

You need a reducer tee for each sprinkler head in the system (except the heads at the end of each line, which require one reducing elbow apiece). Specify PVC or poly. Check local codes for required pressure ratings. You will also need a cutoff riser for each sprinkler and we recommend drain valves particularly in frost areas.

Note: There are two different types of pipe used in different parts of the country. Following are samples of each. Consult your dealer for proper choice.

PVC	Poly	Description/Size	Quantity
Pipe 		1"	
Check local codes for required pressure rating			
90° Elbow 	90° Elbow 	1" x 1"	
To form 90° angle with same size pipe			
Male Adapter Outside thread 	by insert 	1" x 1"	
For adapting a threaded outlet to a socket joint for pipe			
Female Adapter Inside thread 	by insert 	1" x 1"	
For adapting a threaded outlet to a socket joint for pipe			
Socket Coupling 	Coupling 	1" to 1"	
For coupling to pieces of pipe			
Slip Tee 	Tee 	1" x 1" x 1"	
To couple same size pipe at 90° from main line			
Reducer Tee 	Combination and Reducing Tee 	1" socket x 1" socket by 1/2" thread 1" socket x 1" socket by 3/4" thread	
For attaching a thread riser between same size sprinkler			
Reducer Elbow 	Reducer Elbow 	1" socket x 3/4" female thread 1" socket x 1/2" female thread	
Drain Valves 			
Manifold T 		Model No. 850-70 Size 1" Manifold T	
Cutoff Risers 		850-40 1/2" x 6" 850-46 1/2" x 6" 850-62 3/4" x 2"	

Here are some helpful rules of thumb for designing circuits:

1. Don't mix sprinkler types within a circuit.
2. Separate lawn sprinklers from shrub sprinklers.
3. Don't mix low gallonage and standard gallonage sprinklers.
4. Group shaded areas separate from sunny areas.
5. All circuits should have similar capacities.

Divide your system into circuits.

A **circuit** is a group of sprinkler heads that operate together off a common valve. Your system timer operates circuits independently of one another. Toro's state-of-the-art-system timers provide accurate, reliable control of each circuit and are extremely easy to install.

The capacity of any circuit cannot exceed the total capacity of your home's water system. If it does, the circuit will not operate properly.

To divide your system into circuits: Write down the capacity (in gpm) of each head next to where it is located on your grid layout. These capacities are listed in Table III. Next, draw lines that divide your sprinkler heads into groups as shown in Figure 7. Remember: The sum of the water consumed by the sprinklers in each group cannot exceed your total capacity.

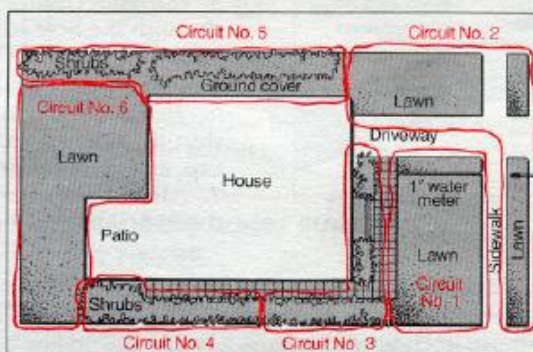


Figure 7: System divided into circuits.

Pipe size.

To simplify the design and installation of the system, we recommend that you use one-inch piping and valves throughout your system.

Locate valves.

1. We recommend grouping the control valves – usually one group controlling circuits in the front yard, and one controlling the back yard and side areas.
2. Locate the first set of valves in a convenient spot near the main water connection. A good location is the place where the service line enters your house or is connected to your water meter.
3. The number of valves in each location depends on the number of circuits. Use one valve per circuit (Figure 8).

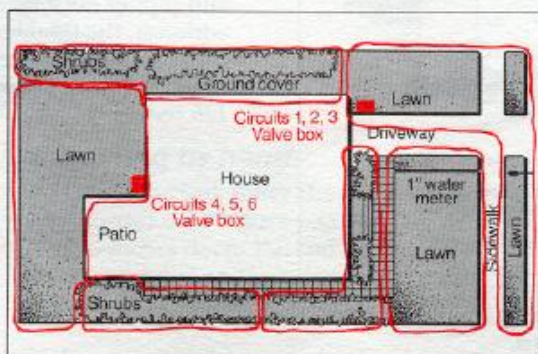


Figure 8: Suggested valve box locations.

Lay out the piping.

In your system piping will run:

- From the service line to the first set of valves
- From the first set of valves to the second set
- From the valves to the sprinkler heads.

Draw in these connecting pipes on your grid layout, and follow these rules.

1. Use as many straight runs as possible.
2. Avoid turns which result in friction and loss of pressure.
3. Avoid going under sidewalks and driveways whenever possible.

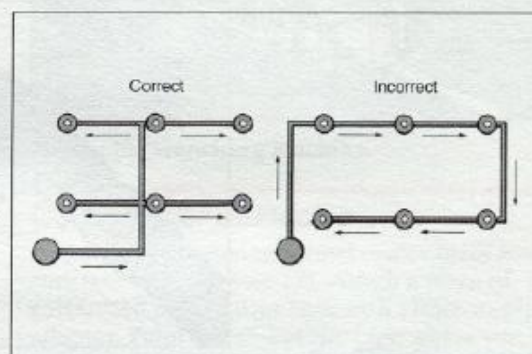


Figure 9: Pipe layout.

To avoid forcing water to travel through too many turns (right), design connecting pipe so that several lines branch from the first head in the circuit (left) (Figure 9).

Construction materials.

In all locations – those that experience freezing temperatures as well as those that don't – we recommend you use the following piping (be sure to check local codes):

- Copper pipe from your water meter to the first set of valves.
- PVC from the first set of valves to the second set. In freezing areas, this pipe must be well-drained.
- Polyethylene from the valves to the sprinkler heads (poly is easier to work with than PVC or copper).

Note: In areas where freezing does not occur, PVC piping may be used throughout the entire system.

Congratulations – you've finished designing your system! Take your shopping list to your Toro dealer and buy what you need.

To connect your system to the outside faucet:

1. Remove the faucet.
2. Install a 1-inch galvanized or copper tee.
3. Re-attach the faucet with a close nipple as shown in Figure 13.
4. Attach a male adapter to the tee, install shut-off valve, and run pipe from the valve to the sprinkler system.

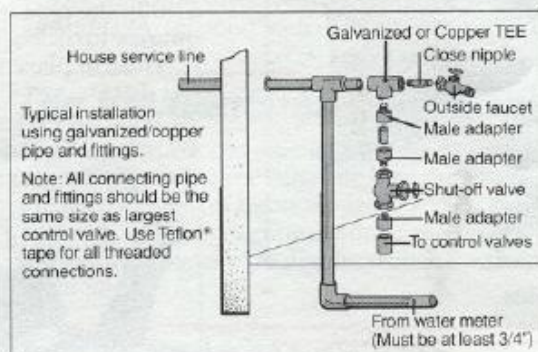


Figure 13: In nonfreezing areas you can avoid cutting the main line by attaching your system to the outside faucet connection.

Connect the water supply to the valves.

Run copper pipe from where you've tapped into the service line to where the first set of valves will be located. Determine this location by referring to your grid diagram. In nonfreezing areas, PVC may be substituted for copper.

Dig a trench for the main line.

Use stakes and string to locate the lines along which you'll lay pipe from the house to the valves as shown in Figure 14. Check your grid layout to make sure you mark the lines accurately. Dig your trench along these lines, either by hand or with a trenching machine.

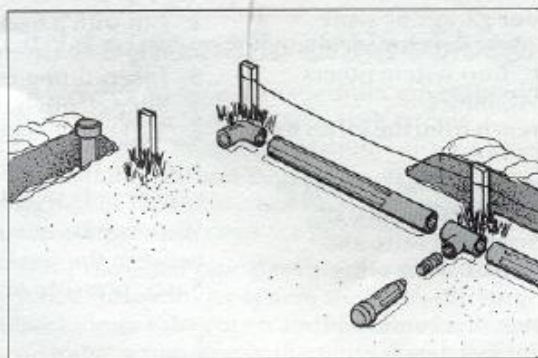


Figure 14: Use stakes and strings as a guide

Trenching by hand

To soften the soil, water the ground approximately two days before you dig. Dig trenches 6 to 10 inches deep. Put sod on one side of the trench and dirt on the other (Figure 15).

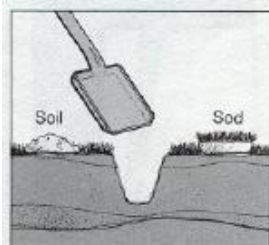


Figure 15: Trenching with a shovel.

Trenching with a trencher

Trenching machines are an easier, faster alternative to digging with a spade (Figure 16). They can be rented by the hour, day, or week – usually from a lawn-supply store or rental equipment dealer. The person you rent from can show you how to operate the machine properly and safely. Trenchers should **not** be used to dig through ground cover, flower beds, on steep slopes, or near buildings.

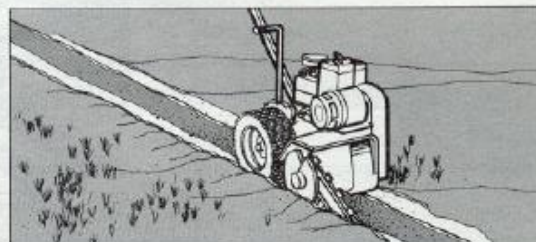


Figure 16: Trenching machine.

Going under obstacles

A hose may be used to tunnel under brick and concrete walks (Figure 17). Attach a piece of galvanized pipe to your hose with a hose-to-pipe adapter. Point the end of the pipe where you want to tunnel. Then turn on the water. Push the pipe under the concrete; the force of the water will blast away soil to form a tunnel. **Tunneling requires care to avoid damage to walks and driveways.**

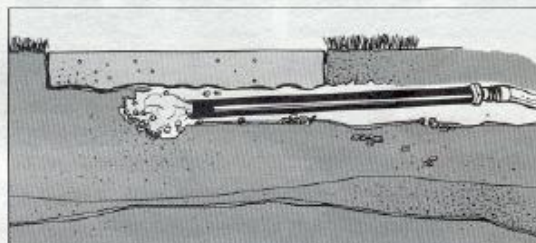


Figure 17: Tunneling under concrete with hose and pipe.

Locate valves.

Valves can be located above ground – or, to keep them out of sight, below ground. Use stakes to mark the locations of the valves as indicated on your grid diagram.

Protect valves by sheltering them in boxes. You can buy boxes or build them yourself. If you buy boxes, check to see how many valves each box holds. If you build the boxes, we recommend using high-quality redwood because it resists rot.

Lay your main line.

Attach your main line to the service line. Run it along the bottom of the trench from the house to the first set of valves, and then on to the second set.

Connect control valves to the main line.

1. Place the valves in their proper locations.
2. Use valve manifold "tees" to connect the valves to the main line, as shown in Figure 18.

To connect copper pipe to PVC pipe:

1. Connect the copper pipe to a male or female copper connect.
2. Attach the connect to a male or female PVC adapter.
3. Attach the adapter to a manifold tee.

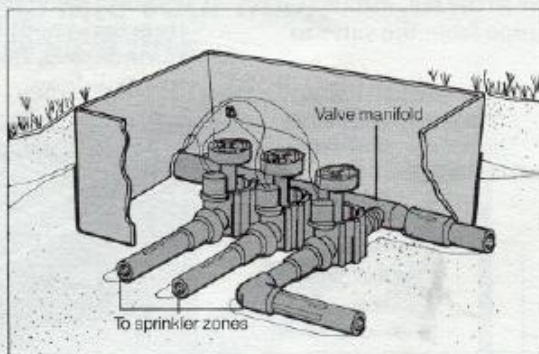


Figure 18: Valve manifolds.

Flush the main line.

1. Wait for the solvent to dry (about one hour).
2. Close all valves except the one at the end of the line.
3. Turn on the water. Flush until the water runs clear.
4. Shut off the last valve and check for leaks.

Flush the valves.

This removes any dirt or soil that may have gotten trapped in the valves during installation.

1. Open the valves using manual bleed finger screws.

2. Turn on the water and flush valves until the water runs clear.
3. Check for leaks and proper operation.

Install the automatic system timer.

1. Locate the timer in your garage or some other convenient place. Make sure an adequate power supply is available. Toro system timers require only a standard AC outlet.
2. Run wires along the trench from the valves to the system timer.
3. Take one wire from each valve and connect to a common terminal on the timer (Figure 19).
4. Take the other wire from each valve and connect one wire per terminal to the other terminals in sequence (Figure 19).
5. See the instruction sheet that comes with your Toro system timer for full details.
6. Plug in the timer.
7. Test the system by electronically opening and shutting each valve in sequence.
8. When the controller has been installed and fully tested, fill in the trench with dirt; then replace the sod.

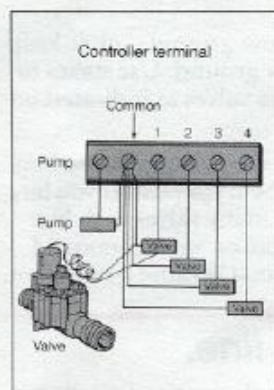


Figure 19: Wires from valves are connected to terminals on the timer.

You have completed the automatic portion of your system. Now, begin installing circuits, one at a time. Make sure each circuit is properly installed before you go on to the next one.

Tips on working with pipe

PVC pipe

1. Cut the pipe with a hacksaw.
 2. Use a file to clean off burrs. Or cut with PVC pipe cutter.
 3. Brush on primer to clean the pipe surface. Wipe with a rag.
 4. Brush solvent (cement) on the outside end of the pipe and inside the fitting.
 5. Slip the pipe into the fitting and give it a quarter turn.
 6. Hold in place about 20 seconds so solvent can dry.
 7. Wipe off excess solvent with a rag.
- Warning: Wait one hour before running water through the system.

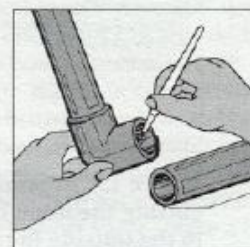


Figure 20

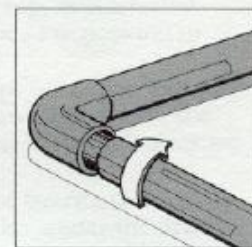


Figure 21

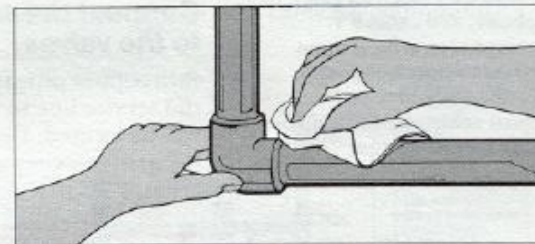


Figure 22

To connect PVC pipe to a fitting: (Figure 20) Apply solvent, (Figure 21) insert pipe and twist a quarter turn, and (Figure 22) hold in place until dry and wipe off excess solvent.

Poly pipe

1. Cut with a hacksaw or knife.
2. Slip stainless steel clamp over end of pipe.
3. Insert fitting into end of pipe.
4. Slide clamp over the ridges of the fitting.
5. Tighten clamp.

Note: To relax pipe, expose to sunlight. Never expose poly pipe to open flame.

Warning: Do not use poly as the connecting pipe between the service line and control valves. Surge pressure may rupture poly pipe.

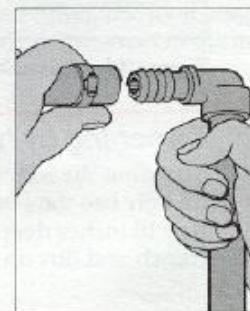


Figure 23

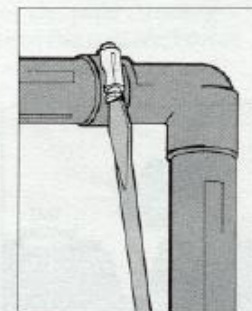


Figure 24

To connect poly pipe to fitting: (Figure 23) Insert fitting, (Figure 24) tighten clamp with screwdriver.

The main is now set. Congratulations!

Completing your system

Locate your sprinkler heads.

Use your grid diagram to find the location of each sprinkler head. Mark these locations with stakes. Measure distances to make sure actual locations correspond with the diagram.

Dig the trenches.

Dig trenches for the pipe connecting the sprinkler heads to the valve. Be sure the trenches are deep enough to accommodate the sprinklers. Follow your grid diagram, and use the same techniques you used to dig the trench for the main line.

Install connecting pipe.

Start from the valves and move outward, laying the connecting pipe along the bottom of the trenches.

Insert risers.

At each stake, put a tee or elbow in the line and attach a riser to the tee (see Figure 25). The sprinkler heads will sit atop these risers.

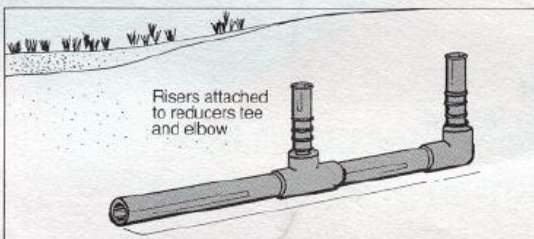


Figure 25: Riser extending from a tee in the connecting pipeline.

Add automatic drain valves.

In freezing areas, automatic drain valves should be installed at low points in each circuit (Figure 26). The automatic drain valve attaches to a reducer tee and empties through a short section of pipe into a bed of packed gravel (to allow for proper drainage).

Slope the drain pipe downward at a 45° angle. When the sprinkler system shuts off, the automatic drain valves open and release water so that no water is standing in the pipes at any time.

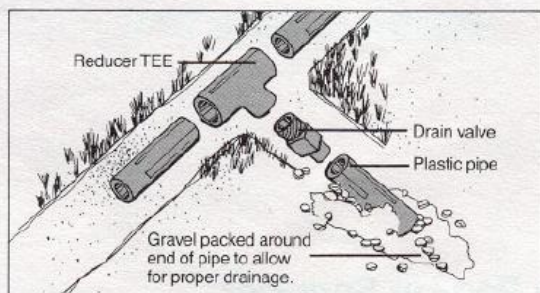


Figure 26: Install automatic drain valves at low points in the circuit.

Flush the system.

1. Seal risers with pipe plugs. Leave the riser at the end of the line unplugged.
2. Turn on the water, open the valves, and flush until the water runs clear.
3. Remove the pipe plugs.

Install sprinkler heads.

1. Attach sprinkler heads to risers. Check your grid diagram to make sure you attach the right head to each riser.
2. Check the height of the heads.
3. If necessary, cut risers to adjust head height. The top of the sprinkler should be just above ground level.
4. Re-install the sprinkler heads.

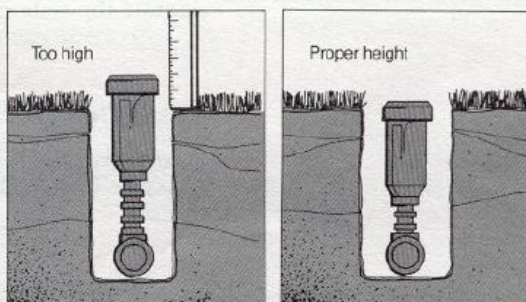


Figure 27

Figure 29

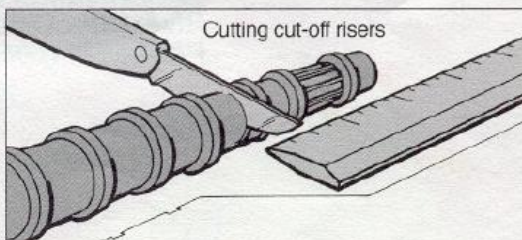


Figure 28

When installing sprinklers: (Figure 27) Check height, (Figure 28) cut riser if necessary, and (Figure 29) re-install so that the top of the sprinkler head is flush with ground-level.

Check system operation.

Turn on the water and open the control valve. If coverage is incomplete:

1. Make sure the control valve, main valve, and shut-off valve are open all the way.
2. Turn off any water being used in the house (washers, showers, sinks).
3. Adjust the screws on the sprinkler heads to fine-tune the spray pattern.
4. If coverage is still not complete, go back and check your system layout against the plans.
5. When coverage is satisfactory, fill in the trench with dirt and cover with sod.
6. You've just installed a working circuit. To finish the job, repeat these steps for all circuits in the system. Relax and install the system **one circuit at a time**.

Using your sprinkler system

Congratulations!

Your new Toro underground sprinkler system is now installed and ready to water your lawn for you – automatically. Here are some tips for operating it successfully:

1. Water in the early morning when water pressure is greatest, evaporation minimal, and the lawn drinks in the most water.
2. Do not water at night because water will sit on the lawn, causing disease.
3. Do not water in the heat of day because the sun will evaporate water before it can soak in.
4. Give lawns more water than plants.
5. Water lawns thoroughly.
6. In freezing areas, drain the system of water, blow control valves clear, and close the shut-off valve before the first freezing weather. Do not operate the system again until Spring.
7. Check and clean the system periodically.

For more information....

If you have questions, or need more information, ask your Toro dealer. Or call or write Toro directly – today.

***The Toro Company
Department RM
5825 Jasmine Street
Riverside, California 92504
Phone (714) 688-9221***



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