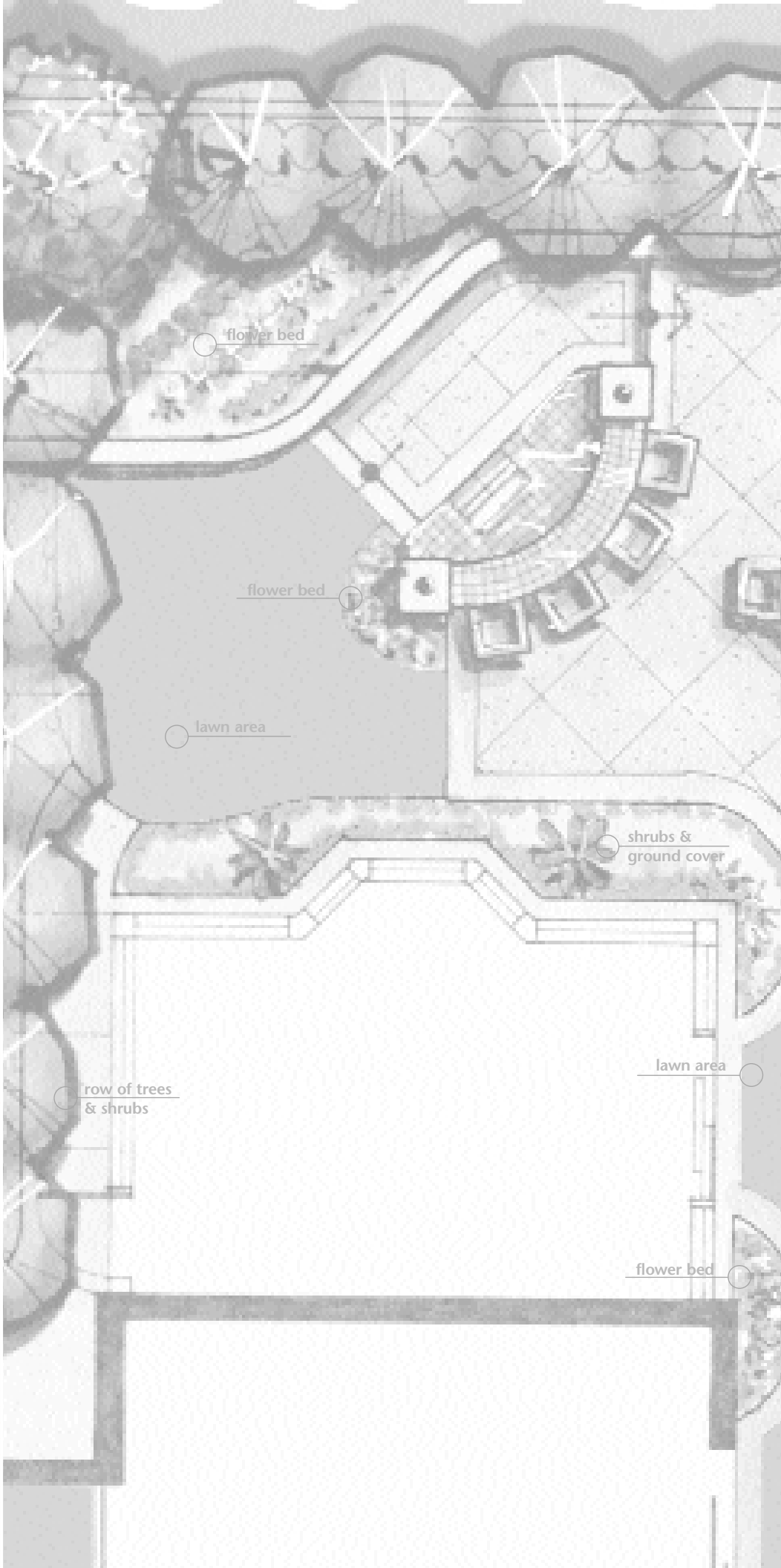
TORO. Count on it.

RESIDENTIAL

Automatic Irrigation Systems

Planning and Installation Guide



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Before you start

Check Local Codes and Permits

Call your local water company or the proper municipal authority for information on building codes or permits required for the installation of underground sprinkler systems. They can also tell you about local codes for backflow prevention required to protect your water supply from contamination, as well as advise on where to locate the backflow device in the system. In addition, check with your local utility companies before you dig to identify any buried cables or natural gas lines.

Installation Accessory Checklist

During installation, you will need several accessories and a variety of pipe fittings. Other materials you may need during installation include:

- ✓ PVC pipe cutter
- ✓ Screwdriver
- ✓ Pipe wrenches
- ✓ Hammer
- ✓ Trenching shovel
- ✓ 1" pipe clamps (poly only)
- ✓ Teflon tape
- ✓ Tape measure
- ✓ Solvent, primer, rags (PVC only—do not use pipe dope on plastic-threaded fittings.)

Terminology

TERMINOLOGY

Atmospheric Vacuum Breaker (AVB)—a backflow prevention device installed between the remote control valve and sprinklers in non-continuous pressure applications.

Backflow Prevention Device—a device, required by law, on an irrigation system that prevents water from re-entering the potable water line once it flows into the irrigation pipes.

Controller—the device that sends timing commands to remote control valves for actuation; same as timer.

Coverage—the pattern of water applied to an area by a sprinkler head.

Designed Operating Pressure—the pressure a designer uses to determine spacing distances and flow for sprinkler heads. The designed operating pressure is determined by subtracting estimated friction losses from the static water pressure.

Dynamic Pressure—the pressure reading in a pipeline system with water flowing.

Evaporation—the change by which any substance is converted from a liquid state to a vapor.

Flow—the movement of water through the irrigation piping system; causing friction loss.

FPS—the abbreviation for "feet per second;" refers to the velocity of water in pipes.

Friction Loss—the loss of pressure (force) as water flows through the piping system.

GPM—the abbreviation for "gallons per minute" (unit of measure for water flow).

Head-to-head Spacing—refers to the spacing distances of sprinklers when they do not exceed the radius of the sprinklers.

In-line Valve—the component in the irrigation system that regulates the On/Off of water from the main line to the sprinkler heads; activated by the controller; same as remote control valve.

Lateral—the pipe in an irrigation system located downstream from the remote control valve. Lateral pipes carry water directly to sprinklers.

Main Line—the pipe in an irrigation system that delivers water from the backflow prevention device to the remote control valves. This is usually the largest pipe on the irrigation system, generally under constant pressure and located upstream from the remote control valves.

Manifold—a group of control valves located together in the same area.

Matched Precipitation Rate (MPR)—the uniform delivery of water across each square foot of an irrigated area. Each sprinkler's coverage provides every blade of grass with no more—and no less water than the next. The result is high-precision application.

psi—the abbreviation for "pounds per square inch" (unit of measure for water pressure).

Notes

PVC Pipe—Poly Vinyl Chloride pipe; the most common pipe used in irrigation systems.

P.O.C.—abbreviation for "point of connection." This is the location on the irrigation system where a tap is made for connection of a backflow prevention device or water meter.

Potable Water—water used for drinking purposes.

Precipitation Rate (PR)—the rate at which sprinkler heads apply water to a specific area of coverage, over a given period of time, measured in inches per hour.

Radius—the circular area extending from the center of a circle to the outside curve.

Remote Control Valve—the component in the irrigation system that regulates the On/Off of water from the main line to the sprinkler heads; activated by the controller; same as in-line valve.

Service Line—the pipe supplying water from the city water main to the water meter.

Shut-off Valve—the component in the irrigation system that allows manual shut-off of water to all components downstream.

Spacing—the distance between sprinklers.

Static Water Pressure—the pressure that exists in a piping system when there is no flow; measured in pounds per square inch (psi).

Station—a group of sprinklers that is controlled by the same remote control valve; same as a zone.

Surge—the build-up of water pressure in a piping system due to certain characteristics of pipe, valves and flow.

Supply Manifold—the pipe connected to the remote control valves that supplies water to the sprinklers.

Timer—the device that sends timing commands to remote control valves for actuation; same as controller.

Velocity—the speed at which water flows through the piping system; measured in feet per second (FPS).

Water Hammer—the impact created by water and air moving through the piping system at high velocities and suddenly stopping.

Water Main—the city water pipe located in the street or right-of-way.

Water Pressure—the force of water that exists in a piping system; measured in pounds per square inch (psi).

Working Pressure—the remaining pressure in an irrigation system when all friction losses are subtracted from the static pressure.

Zone—a group of sprinklers that operate together and are controlled by the same remote control valve.

INTRODUCTION

Toro Automatic Sprinkler Systems

An automatic sprinkler system gives you the landscape you've always wanted. A thicker, greener lawn. Beautiful gardens. It adds beauty and value to your home while saving time and water.

How many times have you forgotten to water your lawn, then over watered—only to end up with brown spots and muddy puddles? Like many homeowners, you could be using up to 50% more water than your landscape needs, which isn't good for your lawn or your pocketbook. The solution isn't to use more water, but to water more precisely. An automatic sprinkler system can give you a healthy, green lawn—and more free time to enjoy the beautiful results.

An automatic sprinkler system takes the work and worry out of watering your lawn. You can forget about tripping over hoses or sprinklers, fixing leaky faucets and hauling hoses around the yard. While you're enjoying the ball game, your lawn enjoys the right amount of water, in the right spots, at the right time.

Your Toro system can be hard at work even before the paper carrier is up, when your grass receives the most benefit. It adjusts for the different needs of new grass, trees and shrubs. And it can even turn itself off when it rains. So go ahead, take an afternoon nap. Your Toro automatic sprinkler system will take care of your beautiful green lawn. Automatically.

Sprinklers installed in a special pattern for complete and even coverage deliver precise coverage without gaps or runoff. Toro lawn sprinklers are available in several specially engineered designs for residential applications. Fixed-spray sprinklers are ideal for small lawns and concentrated areas like ground cover and shrubs. Multi-stream and multi-range rotary sprinklers cover medium-to-large lawn areas very efficiently.

Valves control water flow to the sprinklers. Toro valves are rigorously tested under extreme pressures and the worst possible water conditions. They're made to deliver years of smooth, trouble-free performance.

Timers are the brain of your system, telling your sprinklers what day, what time and exactly how much to water. And Toro controllers are as easy to program as an alarm clock.

Professional Products Require Professional Installation

Notes

The performance of an automatic sprinkler system is only as good as the professional who installs it. Choosing a quality contractor ensures long-lasting, efficient operation. A good contractor will also minimize ground disturbance during installation.

Look for a licensed professional with an established reputation. Expertise in irrigation planning is critical to the initial design and installation of your system. A solid background in irrigation planning helps you avoid common "do-it-yourself" pitfalls like uneven sprinkler coverage, problems with water pressure and other hassles. You can also rely on a professional for annual inspections and winterization, if needed. It's important that your contractor understand regulations and code requirements in your area. Look for the following qualities when choosing a contractor:

- Years of experience
- Licensed
- Warranties all projects for defects in materials and workmanship
- Solid references

DESIGNING A SYSTEM

Sprinkler Selection

No matter how simple or complex the landscape, Toro has the sprinkler family to cover every angle. The basic sprinkler types include: fixed-spray, multi-stream and medium-range rotary sprinklers.

Select sprinklers with a greater spray radius for large areas so you can use fewer sprinklers and valves, which means you also use less pipe with less trenching and fewer timer zones.

570 Series

Fixed-spray Sprinklers

Radius: 0'–17'
Flow: 0.05–4.58 GPM
Recommended operating pressure: 20–75 psi
Maximum operating pressure: 75 psi

Toro 570Z Series fixed-spray sprinklers produce a tight, constant fan of water that's ideal for small lawn, shrub and ground cover areas. Pop-up models pop up above grasses and disappear when not in use. Shrub sprays are mounted above foliage to water ground cover and shrubs. More than 120 different interchangeable, including variable arc, nozzles to choose from give you maximum flexibility.

Featuring an in-riser pressure regulator and X-Flow™ shut-off device, 570Z PRX models are ideal for applications with high or varying operating pressure, including long lines and slopes.

Flood Bubblers

Flow: 2 GPM adjustable flow
0.25, 0.50 and 1.0 GPM fixed flow
Recommended operating pressure: 20–50 psi
Maximum operating pressure: 75 psi

Toro flood bubblers produce a flow of water that soaks the soil, reaching the root zone. They're ideal for tree wells, planters and shrubs. Toro flood bubblers are available in a variety of flows, in both pop-up and riser-mounted models.

Stream Bubblers

Flow: Adjustable
Recommended operating pressure: 20–50 psi
Maximum operating pressure: 75 psi

Toro 570 Series stream bubblers are ideal for efficient watering of small flowerbeds and shrub areas. Stream-bubbler nozzles are available in a variety of patterns, in both pop-up and riser-mounted models.

For detailed performance data, specifications and specifying information, refer to the Toro Irrigation Products Catalog (form no. 490-1809).

Notes

Multi-stream Sprinklers

300 Series Stream Rotor

Radius: 15'–30'
Flow: 0.57–7.51 GPM
Recommended operating pressure: 35–50 psi
Maximum operating pressure: 75 psi

340 Series Stream Rotor

Radius: 15'–33'
Flow: 0.57–7.51 GPM
Recommended operating pressure: 35–50 psi
Maximum operating pressure: 75 psi

XP-300 Series Multi-stream

Radius: 28'–43'
Flow: 1.01–10.81 GPM
Recommended operating pressure: 35–50 psi
Maximum operating pressure: 75 psi

Toro's unique gear-driven, multi-stream sprinklers provide effective matched precipitation rate (MPR) technology. These sprinklers slowly rotate to ensure proper water coverage on medium-sized lawn and shrub areas.

Medium-range Rotary Sprinklers

Super 600 Series Rotor

Radius: 35'–50'
Flow: 1.20–6.71 GPM
Recommended operating pressure: 25–50 psi
Maximum operating pressure: 75 psi

Super 700 Series Rotor

Radius: 21'–52'
Flow: 1.11–9.75 GPM
Recommended operating pressure: 25–75 psi
Maximum operating pressure: 75 psi

Super 800 Series Rotor

Radius: 28'–50'
Flow: 0.50–10 GPM
Recommended operating pressure: 30–50 psi
Maximum operating pressure: 70 psi

V-1550 Series Rotor

Radius: 19'–55'
Flow: 0.85–11.62 GPM
Recommended operating pressure: 25–75 psi
Maximum operating pressure: 75 psi

Toro rotary sprinklers deliver reliable, gear-driven versatility. They provide smooth, even coverage and are ideal for medium-to-large landscape areas.

Notes

Sprinkler Placement Planning

Head-to-head Spacing

For proper coverage, place sprinklers so that the spray from one sprinkler reaches the next, as shown to the right. For windy areas (winds regularly stronger than 8 mph), place sprinklers closer—at 90% of spray radius or more depending on local wind direction and speed.

Determine spacing by sprinkler radius. For example, if you are using Toro 570 Series sprinklers with a radius of 12', place your sprinklers no more than 12' apart; or closer together if you are in a windy area.

How to Begin Designing Your System

The planning worksheet in the center of this guide will help you plan your design. Draw circles to represent sprinklers, as demonstrated on the following pages. When designing your system, we suggest you use the following planning tools: pencil, scratch paper, drawing compass, 50' tape measure, straight edge or ruler, spray paint for marking trenches and a Toro flow & pressure gauge.

If you do not own a flow & pressure gauge, ask your local Toro distributor if they have one that they loan to customers.

1. Draw Your Property From a Bird's Eye View

Each small square on the planning worksheet should represent one square foot of actual property. Using your tape measure, outline and measure your property accurately according to scale, laying out the locations of your home, sidewalks, grass, etc. The drawings on the following pages show a hypothetical example.

- Outline your house, garage and other structures.
- Show walks, drives, slabs, patios and surfaces.
- Locate and identify trees and major obstacles.
- From the outside of your house, measure outward to define your perimeters.
- Locate ground cover, grass, flowerbeds and landscaping.
- Identify the size and location of the water meter (or pump) and main line.
- Re-check your measurements at several different points. Make sure your drawing accurately indicates the true dimensions.

2. Section Your Yard

Divide your yard into areas according to type of plant material (grass versus shrubs) and sun exposure (shade versus full sun). Create as many large rectangles as you can, saving small and odd-shaped areas for last.

Notes

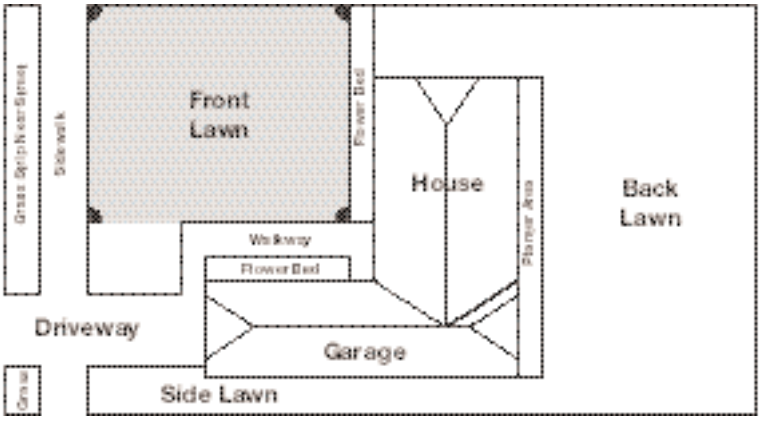
3. Locate Sprinklers in Large, Rectangular Areas First

Locate sprinklers within each area, one area at a time, using sprinklers with a greater radius for larger areas.

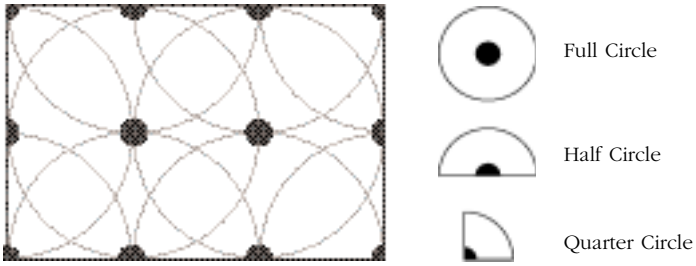
Stay within the allowable spacing range (radius) of sprinkler selected, and remember to space them head-to-head. Spacing sprinklers too far apart will produce dry spots. Always place sprinklers where you'll avoid spraying the side of your house, walls, fences, etc. Also, minimize spraying onto sidewalks, driveways and streets.

Place half-circle sprinklers on sides and borders; quarter-circle sprinklers in corners; and full-circle sprinklers in the middle.

If you use rotary sprinklers in this large, rectangular area (approximately 34' x 34'), only four quarter-circle sprinklers are needed to attain full coverage.



To make sure you have proper head-to-head spacing, use a compass to draw circles, semi-circles and quarter-circles representing sprinkler coverage, as shown below.



Locating sprinklers is not an exact science. You can locate sprinklers without knowing pressure or the gallons per minute (GPM) flow rate of water. These factors will apply later when we divide the system into zones. For now, work on your layout as described in Step 3 above until you've achieved head-to-head coverage for all areas.

Notes

4. Locating Sprinklers in Odd-shaped Areas

After locating your sprinklers in large, rectangular areas, you can now place sprinklers in small, non-rectangular areas. Although each site is different, following are some handy guidelines.

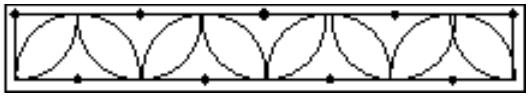
1. Choose the area on the perimeter with the smallest radius.
2. Place a sprinkler with a small radius at that point.
3. Place sprinklers along the border starting from that area.
4. Adjust the radius of each sprinkler according to the size and shape of the area.
5. If coverage is incomplete, adjust sprinkler location.

When you have defined and placed all of your sprinklers, use a compass to double check your layout.

Three Ways to Locate Sprinklers in Small Areas

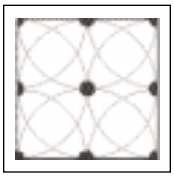
Triangular Spacing

Areas such as narrow strips bordering your driveway or sidewalk can be watered by two offset rows of part-circle sprinklers, as shown here.



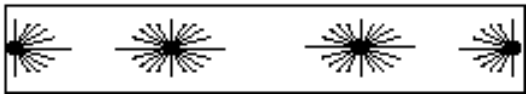
Square Spacing

This layout is best suited for well-defined, geometric spaces such as small, square or rectangle-shaped yards, or sites divided by sidewalks and other paved areas.



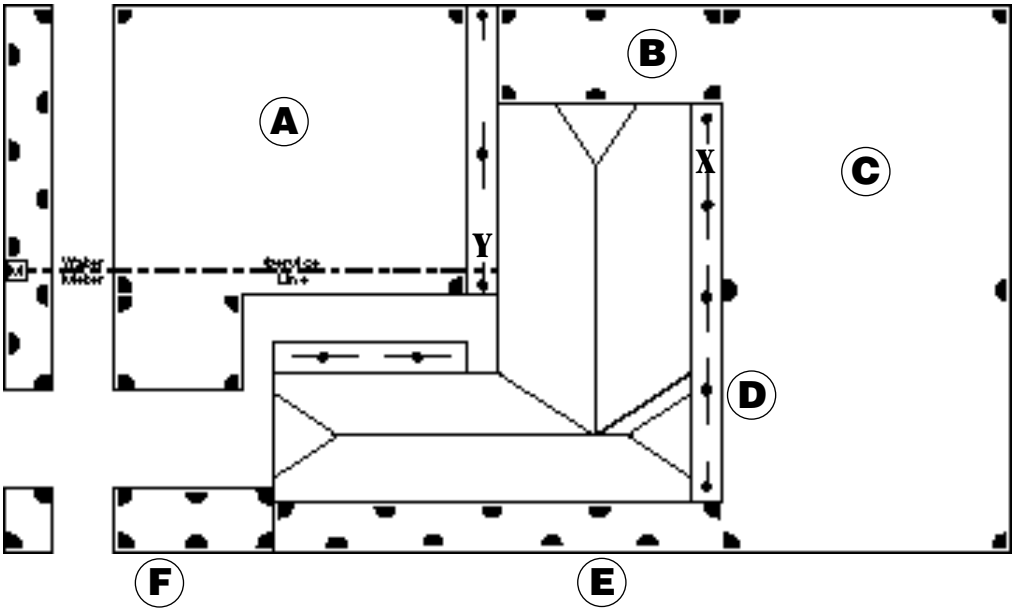
Special-pattern Spacing

You can use special-pattern sprinklers for end-strip and center-strip watering, as shown in the diagram to the right (not recommended for turf applications).



Center-strip sprinklers spray in two directions, end-strip sprinklers spray in one direction only. Both are designed for precise watering of small, rectangular areas.

Completing Your Sprinkler Placement



A Rotary sprinklers, with their large radius range, cover this 34' x 34' lawn area using only four sprinklers, as opposed to needing up to nine smaller-radius fixed-sprays. That means you use a lot less pipe, accessories and trenching.

B 570 Series fixed-spray sprinklers with 12' radius nozzles are used in this area.

C Multi-stream sprinklers with the #03 nozzle provide the most efficient watering pattern for this 30' x 60' area. In addition, the multi-stream delivers even watering to this home's backyard slopes.

D Stream bubblers next to the house and sidewalks keep spray off of surfaces. They are very effective for small flowerbeds and shrub areas too.

E For narrow grass strips, use 570 Series fixed-spray sprinklers with 5' radius nozzles.

F In this area, 570 Series fixed-spray sprinklers with 8' radius nozzles are used.

When designing your system, Toro recommends using an operating pressure of 30 psi for fixed-spray sprinklers, flood bubblers and stream bubblers. Use 50 psi for multi-stream and medium-range rotary sprinklers. If your system capacity does not fall within these ranges, refer to the Toro Irrigation Products Catalog (form no. 490-1809) for specific operating pressure information.

Notes

Notes

Measuring Your Home's Water Capacity

Water pressure can vary from home to home, even on the same street, so it's important that you take a measurement at your own home. If you push your system beyond its capacity, it can create water hammer, which will cause costly damage to your piping system or low pressure, resulting in poor water application. Conversely, sprinklers operating outside of optimum operating pressures can waste water.

Following are two reliable ways to determining your home's water capacity. We recommend using the flow & pressure gauge method (no. 1) because it's fast and easy.

1. Determine Your Water Capacity and Working Pressure Using a Toro Flow & Pressure Gauge

The Toro flow & pressure gauge is a dual-purpose device designed to measure water pressure up to 160 psi and water flow up to 13 GPM. This flow gauge is not intended for use on lines larger than one inch. The gauge will only measure flow through the outside faucet or hose bib—not in the line.

a. Ensure that water is not being used in the house.

b. Attach the gauge to an outside faucet nearest to where the main line enters the house (see Y on diagram, page 13).

c. Make sure the flow gauge is closed by turning the handle clockwise.

d. Open the outside faucet slowly to avoid damage to the gauge.

e. When the outside faucet is fully opened, read the system static pressure (pressure with no water running in the house).

f. Open the flow gauge slowly by turning the handle counter-clockwise. As the flow gauge opens, the pressure will drop from the static reading and the flow reading will rise. Continue to open the flow gauge until the pressure drops to the designed working system pressure.

g. If the pressure does not drop to the working pressure (after opening the flow gauge all the way), take the flow and pressure reading at the full, open position.

If rapid fluctuation occurs on the flow gauge, record the average reading. Additional reading of pressure and flow may be helpful to obtain further design information.

Notes

2. Determine Your Water Capacity and Working Pressure Using a Five-gallon Bucket and a Standard Pressure Gauge

a. Locate the outside faucet closest to the main line (see Y on diagram, page 13).

b. Locate another faucet on your house and attach a pressure gauge (see X on page 13). Open faucet all the way.

c. With faucet Y completely open, check the pressure reading on the gauge at faucet X. If it is less than the working pressure, turn down the water flow from faucet Y until the reading reaches the working pressure. If it is greater than the working pressure, record the pressure reading and go to step d.

d. Place a five-gallon bucket under faucet Y and time how long it takes to fill it with water. This test tells you how much water is available, measured in gallons per minute (GPM).

Time to Fill a Five-gallon Bucket	GPM
15 Seconds	20
20 Seconds	15
25 Seconds	12
30 Seconds	10
40 Seconds	7.5

Double check your GPM using the following formula:

60 seconds ÷ time to fill the bucket x 5 (bucket size) = _____ GPM

This is how much water is available at the designated working pressure or at the higher reading that you recorded.

The working pressure reading determines how far your sprinklers will spray.

Once you have completed either 1 or 2, record the psi and GPM on page 16.

Before you go any further, it is important to make sure you are starting off with the right flow and pressure information. Take a moment to compare your findings with the Flow Rates Chart on page 16. A few minutes now may save you countless headaches later!

Notes

Determining Your Design Capacity

Enter your answers from page 15 here: _____ psi _____ GPM

Now that you've recorded your home's water capacity, let's make sure your water meter and service line can handle it. Complete steps ❶, ❷ and ❸ to determine your actual system design capacity.

❶ Water Meter Size*

_____ = _____ Max. GPM
Size

** Water meter size is stamped or printed on the face of the meter, or shown on your water bill.*

Flow Rates for Water Meters

Meter Size	Max. GPM
⅝"	8
¾"	13
1"	22

❷ Service Line Type/Size

_____ = _____ Max. GPM
Type & Size

Flow Rates for Service Lines and Sprinkler Lines

Maximum Recommended Flow

Pipe Type	Pipe Size	Maximum GPM
PVC (Plastic) Consider using 1" Schedule 40 PVC pipe upstream of zone valves and at least ¾" Class 200 PVC pipe downstream of zone valves.	1" Schedule 40 ¾" Schedule 40 1" Class 200 ¾" Class 200	13 8 15 10
Galvanized	¾" Galvanized Pipe 1" Galvanized Pipe	8 13
Copper	¾" Copper Tube 1" Copper Tube	6 12
Polyethylene (Poly Pipe) In freezing areas, poly pipe may be used downstream of zone valves.	¾" Poly Pipe 1" Poly Pipe	8 13

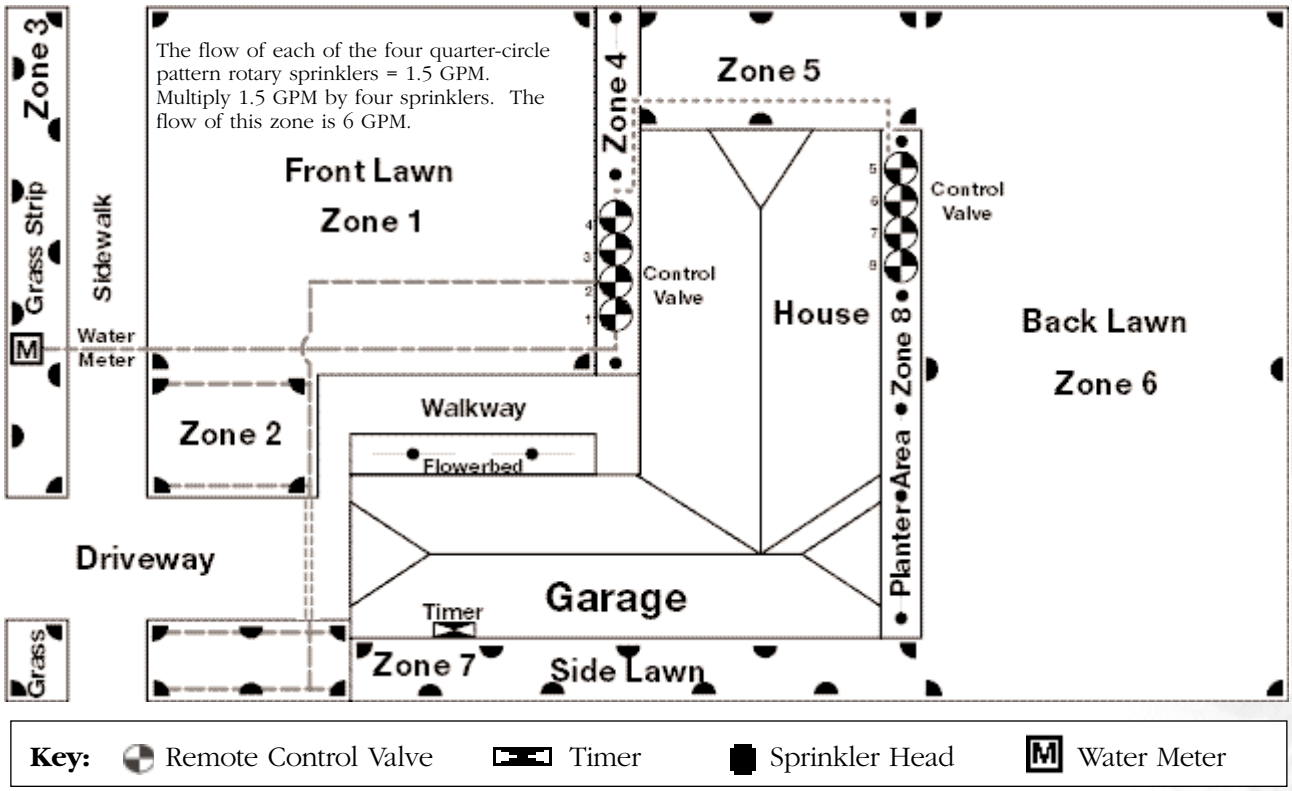
❸ Enter the Lower GPM From Steps ❶ or ❷

_____ Max. GPM (this is your design capacity)

Example:

Water Meter Size	Service Line Type/Size	Enter the Lower GPM
1" = 22 GPM	1" Schedule 40 PVC = 13 GPM	13 GPM = design capacity

Use only 80% of the design capacity to allow for future household water consumption demand for domestic purposes (showers, sinks, washing machines, etc.). Using the example above, 80% of 13 GPM is approximately 10 GPM. No group of sprinklers or zones should exceed this amount.



Zoning Your System

A zone is a group of sprinklers that operate together using a common valve. Your system timer controls zones independently of one another.

The capacity of any zone must not exceed the safe design capacity of your home's water system (see page 16).

Divide Your System Into Zones

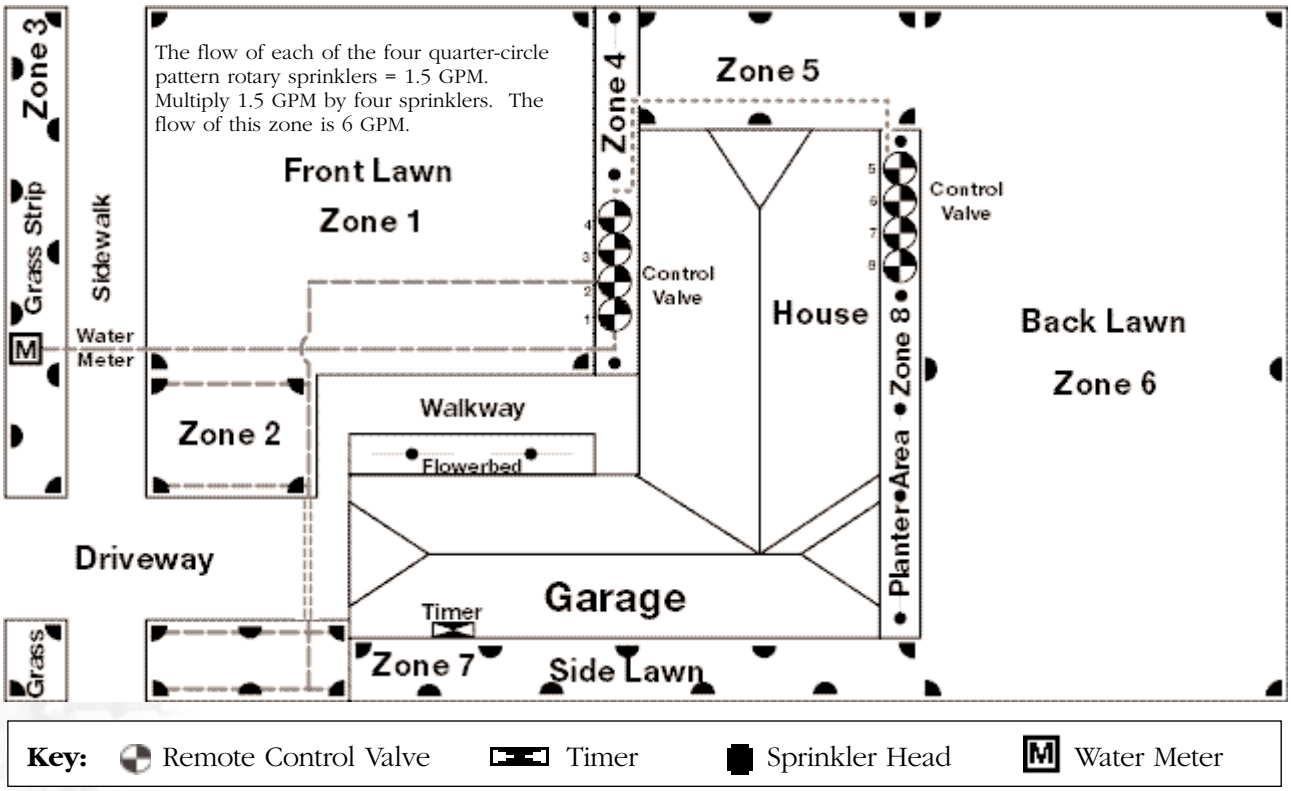
1. Write down the flow capacity (GPM) of each sprinkler on your grid layout.
2. Next, divide similar sprinklers into groups as shown.
3. Add up the sprinkler flow (GPM) for each zone. If the total flow exceeds the safe design capacity, you must split the zone into more zones or put some of the sprinklers into another zone with available capacity. Remember to split zones based on slope, sun or shade.

- *Don't mix sprinkler types within a zone. For example, fixed-spray sprinklers should not be grouped with rotary sprinklers.*
- *Separate lawn and shrub areas.*
- *Separate shady and sunny areas.*

Count Your Zones

Determine the number of valves that you will need, based on the number of zones you have designed. In the example above, we will need eight valves because we have eight zones.

Each small square = one foot
Each large square = ten feet



Group Your Valves

We recommend grouping the valves. For example, one valve location is needed to operate front yard zones, and one to operate the backyard and/or side-yard zones. This symbol represents a valve location.

Locate the first set of valves in a convenient spot near the main water connection. A good location is where the service line enters your house. Also, place valves next to walks or planters for easier access.

In the example above, we show the valve locations. The front location, near the garage, controls zones 1, 2, 3 and 4. The backyard location controls zones 5, 6, 7 and 8.

The number of zones used on your automatic timer should match or exceed the number of zones in your system (plan for potential expansion). The Toro Greenkeeper® 212 timer is ideal to use in this case since it expands up to eight zones.

Notes

Lay Out Your Pipe

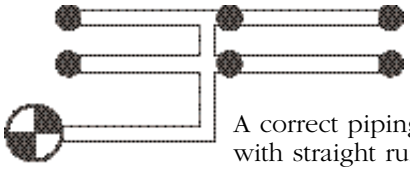
In this system, piping will run:

- From the main line to the first set of valves
- From the first set of valves to the second set
- From the valves to the sprinkler heads (shown only for zone 2)
- Under driveway

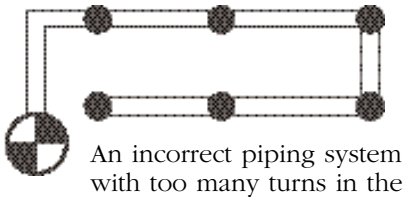
Draw these connecting pipes on your grid layout (as shown in zone 2) and follow these rules:

- Use as many straight runs as possible.
- Try to avoid turns, which result in loss of pressure.
- Avoid runs under sidewalks and driveways whenever possible.
- Make connections perpendicular to each other.

You can include more than one pipe in a trench.



A correct piping system with straight runs.



An incorrect piping system with too many turns in the pipe results in reduced flow and pressure to the last sprinkler on the line.

Consider using 1" Schedule 40 PVC pipe upstream of remote control valves and at least ¾" Class 200 PVC pipe or 1" poly pipe downstream.

Install Your Timer

Install the timer inside your garage or on an outside wall near a 110V outlet. Check local electrical codes for connection to outside plugs.

Place zone or valve wires in the same trenches as the pipe. Remember that valves will be wired to the timer, so locate valve wires where they are easily accessible.

Toro recommends 18-gauge solid, multi-strand, direct-burial wire to connect valves to sprinkler timers. You will need one wire per zone, plus the common wire. This eight-zone system requires nine wires. Be sure to waterproof your connections.

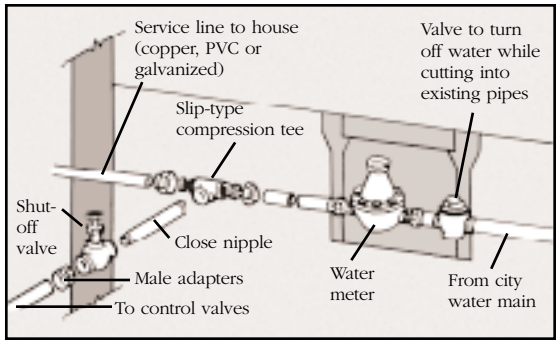
INSTALLING YOUR SYSTEM

Step 1: Use Flags to Indicate Sprinkler and Valve Locations

Use Toro flags to indicate sprinkler locations according to your design. Use line-marking spray paint to locate the lines along the area where you'll trench and install pipe. Check your worksheet to make sure you mark the lines accurately. You will be digging your trenches along these lines (step 3).

Step 2: Tap Into Your Service Line

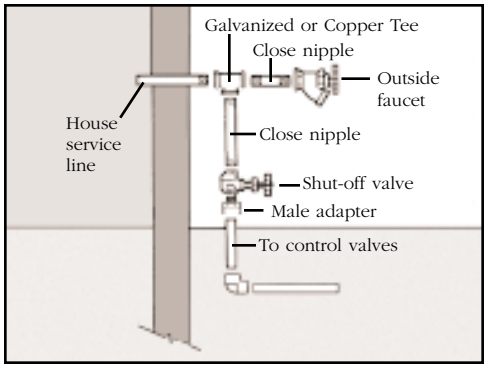
By cutting into your service line and slipping on a compression tee (see illustration to the right), you can connect your sprinkler system to the water supply without soldering. You can avoid cutting the main line by attaching your system to the outside faucet connection (see lower right). In addition, PVC may be substituted for copper in non-freezing areas (check local codes for backflow requirements).



Typical installation using compression tee; PVC pipe and fittings

If the Meter Is in Your Yard:

1. Shut off your water supply at the meter (check with your water department first).
2. Dig to expose the service line.
3. Tie into the service line, between the water meter and the house.
4. Remove a section of pipe, leaving a gap large enough to slide on a compression tee.
5. Slip the tee over each end of the pipe.
6. Tighten the compression nuts. The rubber gasket will compress against the pipe, creating a seal to prevent leakage.



Typical outside faucet connection using galvanized/copper pipe and fittings

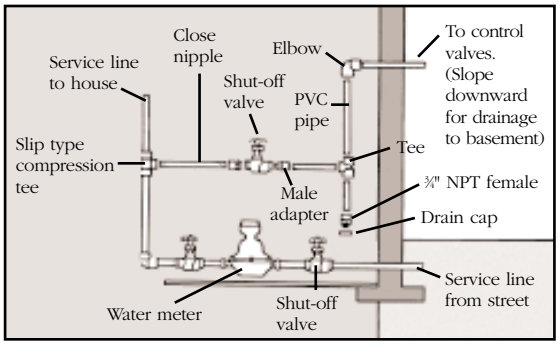
7. Install a close nipple with teflon tape on all threaded connections into the tee.
8. Attach a shut-off valve to this section of pipe. The shut-off valve allows you to turn off the system by hand, if necessary.
9. Keep this connection as clean as possible. This is your tap-water supply.

When sprinklers are running, the layout using an outside faucet connection may result in noise in your house as the water runs through the pipes.

Notes

If the Meter Is in Your Basement:

1. Shut off your water supply at the meter (check with your water department first).
2. Tap into the service line with a compression tee.
3. Drill a hole through the sill above the foundation, or drill or chisel a hole in the basement wall. Make the hole no bigger than needed to run a 1" pipe through it.



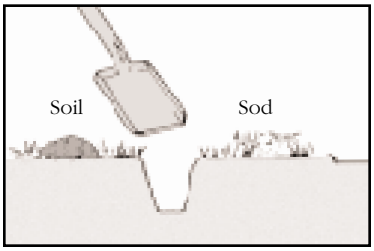
Typical installation using PVC pipe and fittings

4. Install the piping, as shown above. Add a shut-off valve and drain cap. The drain cap should be in a low position to allow system drainage.
5. Run your connecting pipe out of the basement through the hole to the outside. Then run it to where the backflow preventer and first set of valves are on your planning worksheet (see page 26 for more on backflow prevention).
6. To drain water from the system, close the shut-off valve, place a bucket under the drain cap and remove the cap.
7. After the connecting pipe is installed, seal the hole in the wall with caulking compound.

Step 3: Main and Lateral Line Trenching

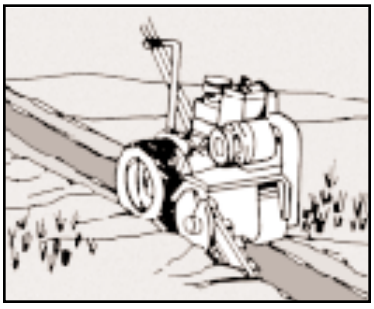
Trenching by Hand

To soften the soil, water the ground approximately two days before you dig. Dig trenches 8" to 12" deep or below the frost line in freezing climates. Put sod on one side of the trench and soil on the other.



Trenching With a Trencher

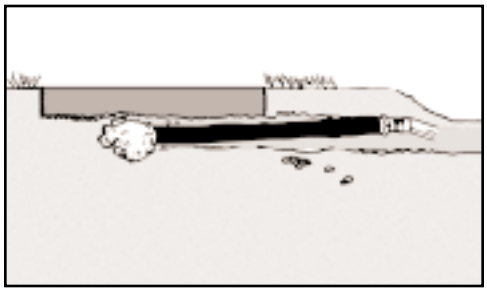
Trenching machines are an easier, faster alternative to digging with a shovel. They can be rented by the hour, day or week, usually from a lawn supply store or rental equipment dealer. The person you rent from can show you how to operate the machine properly and safely. Trenchers should not be used to dig through ground cover, flowerbeds, on steep slopes or near buildings. Be sure to verify all underground utilities before trenching.



Notes

Step 3: Main and Lateral Line Trenching (cont.)

Going Under Obstacles



To tunnel under brick and concrete walks, attach a piece of Schedule 40 PVC pipe to a hose with a hose-to-pipe adapter. Cap the end with a PVC cap and drill a ⅛" hole in the end of the cap. Point the end of the pipe to where you want to tunnel. Turn on the water and push the pipe under the concrete. The force of water will blast away the soil in front of it to form a tunnel. Tunneling requires care to avoid damage to walks and driveways.

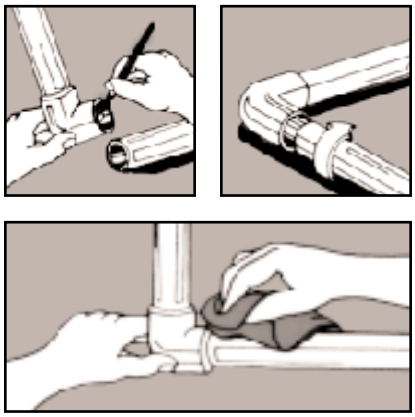
Step 4: Install the Sprinkler System Main Line

Attach your sprinkler system main line to the service line. Run it along the bottom of the trench from the house to the first set of valves and if required, to the second set. Place your valve wire next to the pipe whenever possible.

Tips on Working With Different Pipes

PVC Pipe

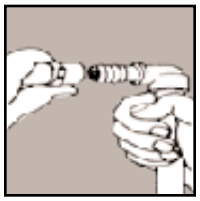
1. Cut pipe with a PVC pipe cutter.
2. Brush on a primer to clean the pipe surface and the inside of the fitting.
3. Brush solvent (cement) on the outside end of the pipe and lightly inside the fitting.
4. Slip the pipe into the fitting and give it a quarter turn.
5. Hold in place for about 20 seconds so the solvent can set.
6. Wipe off excess solvent with a rag.

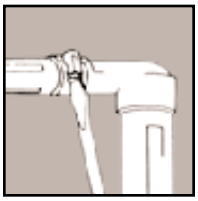


Wait one hour before running water through the system.

Notes

Poly Pipe





1. Cut pipe with a PVC pipe cutter or sharp knife.
2. Slip a stainless steel clamp over the end of the pipe.
3. Insert the fitting into the end of the pipe, past the barbs.
4. Slide the clamp over the barbs of the fitting.
5. Tighten the clamp.

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

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

Step 5: Connect Zone Valves to the Main Line

A group of valves is called a manifold. Use flags to mark the location of the valves, as indicated on your worksheet.

Atmospheric vacuum breakers (AVBs) are always installed above ground. With an AVB, dig out an area large enough to accommodate your inlet and outlet pipes.

In-line valves are installed below ground. Protect valves below ground by sheltering them in boxes (see diagram on next page). Dig out the area where below-ground valves are to be installed. Install valve boxes at or near grade level. When you buy boxes, be sure to find out how many valves fit in each box so you can buy the sufficient amount.

Notes

Select the Right Valves

EZ-Flo® Plus Series Atmospheric Vacuum Breaker (AVB) Valve

Above-ground installation
with built-in backflow prevention.

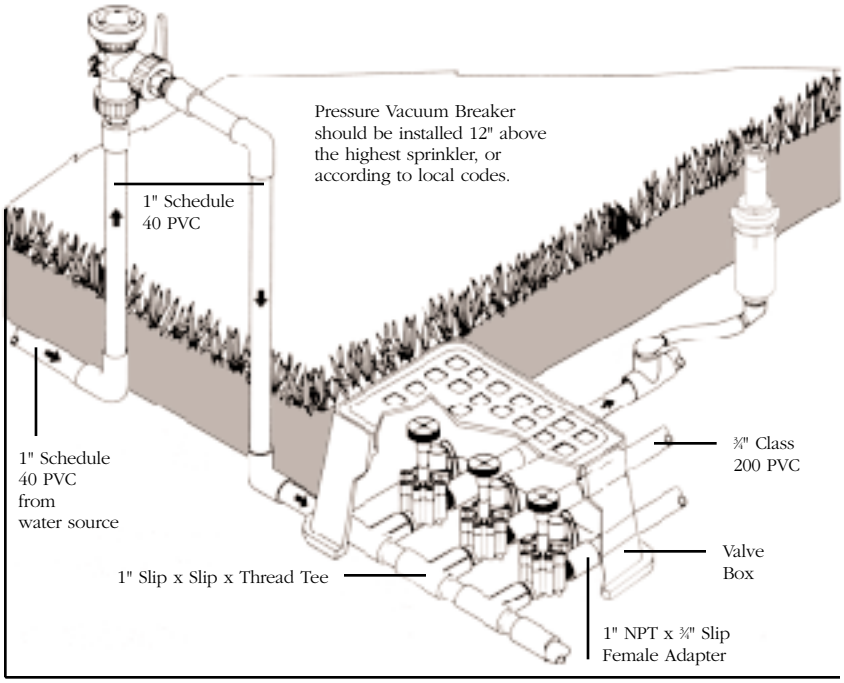
250/260 Series Plastic Valve

Below-ground installation requires
separate backflow prevention.

Backflow Prevention

Call your water company or the proper municipal authority to find out about any building codes or permits required for the installation of underground sprinkler systems. They can tell you about local codes for backflow prevention to protect your household water supply from contamination. They can also advise you on where in the system it should be located (see illustration below for general placement). In addition, check with your local utility companies before digging to identify any buried cables or natural gas lines.

Electric In-line Valve Assembly (1" Valves Shown)



Notes

Shut-off Valves

In systems with pressure vacuum breakers (PVBs), the PVB may be used as a shut-off valve.

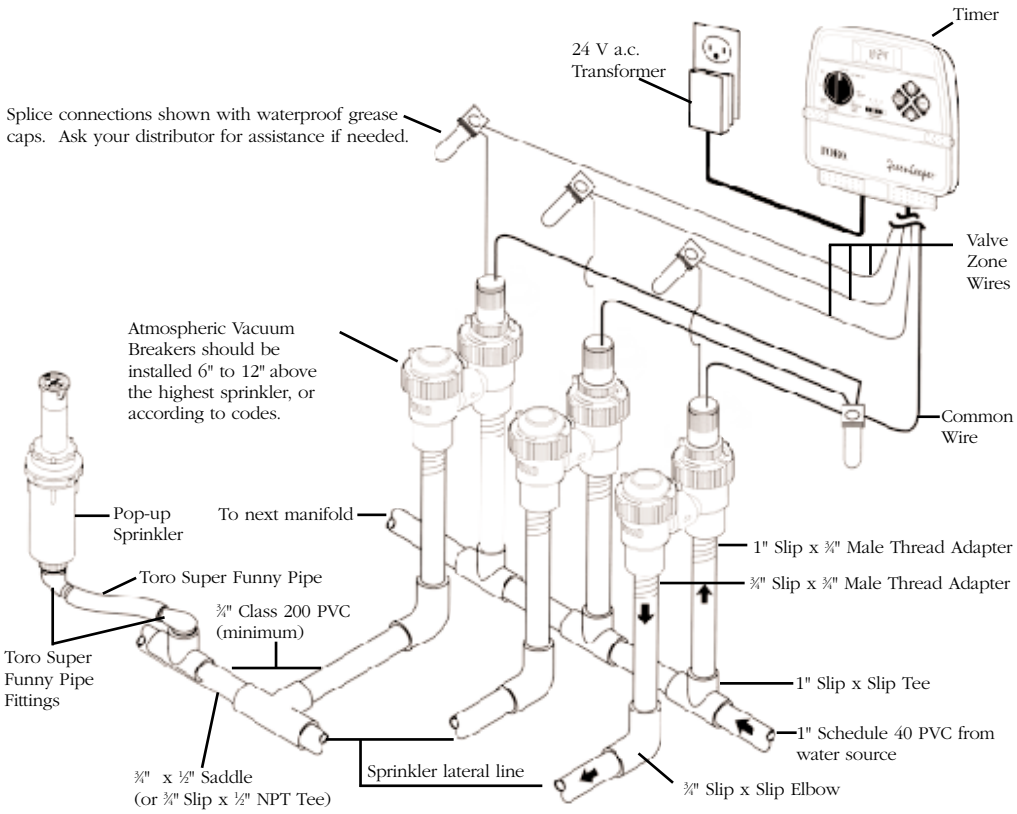
In systems where PVBs are not used, we recommend installing a shut-off valve between the zone valves and the service line. Check local codes for the type of shut-off valve recommended.

PVBs should be installed 12" above the highest sprinkler, or according to local codes.

When you install your sprinkler system in the front yard with plans to install the backyard later, run your sprinkler main line and wire to an accessible location in the backyard and cap it off. Leave extra wire (more strands) to handle more valves as you expand in the future.

PVC pipe is shown in these illustrations. However, in areas where freezing occurs, poly pipe may be used downstream of valves instead of PVC. Always check local codes for proper pipe recommendations and before installing backflow prevention devices.

Electric Atmospheric Vacuum Breaker Valve Assembly



Notes

Step 6: Install the Automatic Timer

1. Install the timer in your garage or another convenient place. If an outdoor location is desired, plan to use an outdoor cabinet to protect the timer against the effects of weather. Make sure an adequate power supply is available. Toro timers require only a standard AC outlet (see instructions included with the timer for details).
2. Run wires along the trench, underneath the pipe and from the valves to the system timer.
3. Take one wire from each valve and connect them to a common wire (for ease of identification, use the white wire as the common). Connect the common wires of valves that are located together. Connect the common wire to the common terminal on the timer (see illustration, page 27).
4. Take the other wire from each valve and connect to the timer terminals in sequence.
5. Plug in the timer.

All outdoor connections and splices must be waterproofed.

Select the Right Size Timer

GreenKeeper® 212 Indoor or Outdoor Timer

2, 4, 6, 8, 10 or 12 Stations

This is an easy-to-use timer that expands as your landscaping needs grow.

Turf Pro™ Indoor or Outdoor Timer

6, 9 or 12 Stations

Offers an easy-to-use interface with reliable SurgePro™ surge protection.

EZ-Remote™

An option with the Greenkeeper 212 timer, EZ-Remote offers convenient remote capability for easy installation and servicing.

Rain Switch®

Attaches easily to roof eaves or ¾" PVC pipe. Conserves water by interrupting watering during rainfall.

Notes

Step 7: Install Downstream Pipe

Start from the valves and move outward, laying the connecting pipe along the bottom of the trench. At each flag, install an appropriate fitting for sprinkler attachment (see pages 24–25 for tips on working with different pipes).

Step 8: Flush the System to Clear Debris

After the pipe has been connected and the glue has dried (PVC pipe only), turn on the water, open valves one zone at a time and flush until the water runs clear.

Don't backfill your trenches until your final system operation check is complete (see page 30).

Step 9: Install Your Sprinklers, Zone by Zone

Install one sprinkler zone at a time, using Toro Super Funny Pipe®. Remember to refer to your planning worksheet.

1. Placing a sprinkler in a trench as a guide, measure from the connecting pipe fitting to the bottom of the sprinkler and cut a length of Super Funny Pipe to fit. Place sprinklers at least 3" from sidewalks, curbs and buildings.
2. Install the appropriate Super Funny Pipe elbow into the sprinkler and into the PVC or poly pipe fitting.
3. Connect one end of Super Funny Pipe to the sprinkler and the other end to the connecting pipe fitting.
4. Position the sprinkler in the trench so that the top of the sprinkler is flush with ground level. Stabilize the sprinkler with soil without filling the entire trench.
5. Verify that the sprinkler is straight for optimum performance.

Toro Super Funny Pipe

One of the most useful and time-saving sprinkler installation aids is Toro Super Funny Pipe. Whether you are installing a new system or replacing an old sprinkler, Super Funny Pipe can make your job faster and easier.

What is Super Funny Pipe?

Super Funny Pipe is a high-strength poly tubing that solves tough sprinkler installation and replacement problems. Simply put, Super Funny Pipe acts as a flexible extension cord between the sprinkler line and the sprinkler, allowing you to position sprinklers easily where you need them, even in hard-to-reach areas!

Notes

Step 10: Check System Operation, Zone by Zone

1. Slowly turn on the water and manually open the control valve.
2. Adjust the sprinkler to ensure proper coverage (see sprinkler installation instructions for details).
3. If your coverage is incomplete, follow the steps below:
   a. Make sure the control valve and shut-off valve are fully open.
   b. Turn off any water being used in the house (washers, showers, faucets, etc.).
   c. Fine-tune sprinkler spray patterns to match your coverage area.
   d. If coverage is still not complete, go back and check your system layout against the plans.
   e. When you see that the coverage is satisfactory, fill in the trench with dirt and cover with sod.

Congratulations!

When properly installed, your Toro automatic sprinkler system will help keep your landscape green and healthy for years of recreation and enjoyment.

Water Conservation

Your new Toro underground sprinkler system is now installed and ready to water your lawn automatically. Following are some tips to conserve water:

- ✓ Water in the early morning (before sunrise) when water pressure is greatest, evaporation is minimal and the lawn drinks in the most water.
- ✓ Do not water at night because water will sit on the lawn and may cause disease.
- ✓ Do not water in the heat of the day because the sun will evaporate water before it can soak in.
- ✓ Give lawns more water than plants, placing plants on a separate watering schedule. Some timers provide multiple watering programs, which allow you to schedule lawns, shrubs and flowerbeds separately.
- ✓ Reduce run times for zones in the shade.

Water Scheduling

Using the formula and chart below, determine your weekly watering requirements per zone. Then divide the number of minutes per week into days. For example, if you need to water 65 minutes a week, you could water 9–10 minutes daily or 16–17 minutes every other day. If you have sandy soil, you can apply your daily requirement all at once. With clay soils, you will need to apply water more slowly and may have to use more daily start times.

Minutes Per Week ÷ Starts Per Week = _____ Minutes Per Start

	Minutes Per Week		
Average Daily Temperature	Fixed-spray Sprinklers	Multi-stream Sprinklers	Medium-range Rotary Sprinklers
60° and 79°	45	100	120
80° and 99°	65	150	180
100° and 110°	85	200	240

WATERING TIPS

WINTERIZATION TIPS

Recommended Winterization Procedures for Freezing Climates

Manual Drain Valves

1. Close the main water supply valve.
2. Open all manual drain valves upstream of the automatic valves to allow drainage of the main line and valve manifold.
3. Open all manual drain valves downstream of the automatic valves to allow drainage of the lines.
4. Follow recommended winterizing instructions included with your specific sprinkler timer.

Automatic Drain Valves

If the system is installed with automatic drain valves, the lines downstream of the valves will drain automatically when the valve closes.

1. Close the main water supply valve.
2. Open all the manual drain valves upstream of the automatic valves to allow drainage of the main line and valve manifold.
3. Follow recommended winterizing instructions included with your specific sprinkler timer.

Automatic Control Valves

This procedure should be followed if adequate control valve drainage cannot be achieved through the use of manual or automatic drain valves.

1. Close water supply valve.
2. Complete manual drain valve, automatic drain valve and sprinkler timer winterization procedures.
3. Disassemble the automatic control valve and drain all water.
4. Reassemble the automatic control valve.

Notes

Winterization with Compressed Air

1. Connect the air compressor (25 CFM or larger with the pressure regulator adjusted to 30–50 psi) to the fitting downstream of the water supply drive.
2. Activate each automatic valve from the timer, allowing each valve to remain open until all water has been expelled from the zone.
3. After all valves have been activated and all water has been expelled, disconnect the air compressor.
4. Turn off the timer.
5. Open all the manual drain valves upstream of the automatic valves to allow drainage of the main line and valve manifold.

WARNING
TO PREVENT PERSONAL INJURY, DO NOT ATTEMPT TO DISASSEMBLE THE SYSTEM WHILE UNDER PRESSURE.

Do not exceed 50 psi of air pressure in any system. Exceeding 50 psi can result in equipment damage.

Refer to the Toro Irrigation System Start-up and Winterization Procedures Guide for more information.

Notes

The Toro Company ▸ Irrigation Division ▸ An ISO 9000-Certified Company
▸ PO Box 489 ▸ Riverside, CA ▸ 92502 ▸ (800) 664-4740 ▸ www.toro.com

Form No. 490-2948