

Lee Valley Irrigation Design Guide

for planning a complete watering system

XC000



Planning and Installing a Drip or Low-Flow Irrigation System

Introduction

The most efficient way to water your plants is with drip or low-flow irrigation. Compared to more conventional methods, drip or low-flow uses much less water because smaller amounts are lost to evaporation and wind drift. The water is also placed closer to your plants and not on weeds or walkways. In times of water restrictions it may be one of the few types of irrigation that can be used. Check with your municipality.

If you are putting together your own system by assembling the parts we offer, you will be able to mix and match components, as everything is compatible and extendable. While conventional watering gives the same amount of water to the whole area, here you can pick and choose emitters and jets depending on each type of plant and its need for water.

Calculating the water flow available

Start by calculating how much water flow you have available (and in turn how many drippers and sprayers you can operate at one time). To do this, simply run water from your faucet into a 5-gallon pail and time how long it takes to fill it. If it fills in one minute you know you have a flow of 5 gallons per minute (or 300 gallons per hour); if it takes 2 minutes, it's 2½ gallons per minute flow (150 gallons per hour), etc. Remember that if water is being used elsewhere in the house (a shower or dishwasher, for example), it will significantly affect the flow to your irrigation lines.



By noting the time (in minutes) it takes to fill a 5-gallon pail, gallons per hour (gph) can be calculated:
 $60 \div \text{number of minutes} \times 5 = \text{"x"} \text{ gph.}$

Please note that adding attachments such as pressure regulators, backflow preventers, filters and splitters will reduce the output slightly, so when possible it is best to measure the flow after these are added. Alternatively, you can roughly estimate the flow as 10% less than the unrestricted flow.

Planning and Zoning your Gardens

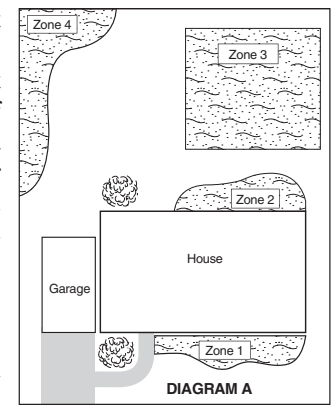
Now that you know how much water flow is available, you can plan the number of emitters to run on each line. Ideally you will be able to water all your plants at once. However, that isn't always the case. If your planned usage is greater than the available water flow, you will need to break your system into separate lines to run at different times.

Planning on Paper

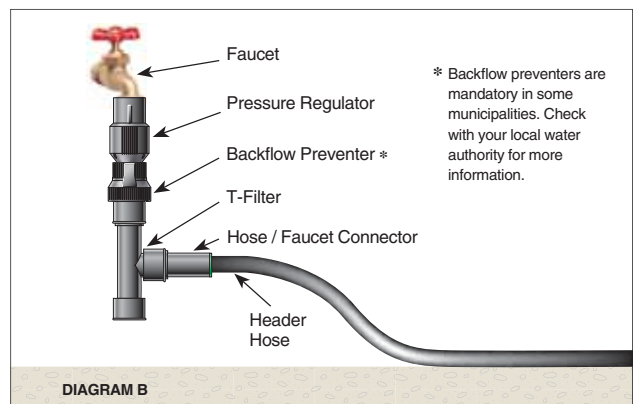
Planning on paper allows you to plan the installation before buying any parts. This lets you make one purchase (instead of having to come back for more parts) and prevents over-buying of any items.

1. Measure and sketch out your gardens and determine which plants or which areas you want to water. We offer graph paper and emitter template guides on page 5 of this booklet to help you plan your irrigation system.
2. Sketch in the plants or areas that you want to water. Choose the emitters you would like to use to water these plants (keeping in mind that different plants may have different water requirements) and mark them in position on your plan. See our catalog or the chart on page 3 for descriptions of each type of emitter, as well as their flow rates to determine the total water flow you will need to run them. The emitters will attach either directly to the header hose or with ¼" feeder line out to the dripper/sprayer.
3. Add up the outputs of all the emitters on your plan. Do they add up to more than the available water flow from your faucet? If they do, you will need to break the watering system into zones. Then, once the system is installed, you must run each zone at a different time so they don't compete for the water flow. A common way to do this is to put your back

yard on one line and front yard on another, and perhaps your vegetable garden on yet another (see diagram A). If you can, it's wise to leave a 25% buffer for other water demands. For instance, if you have 400 gph available at the faucet, plan each zone to consume 300 gph or less.



4. Referring to your sketch, choose the header hose (main line) for each zone. If you need more than 100' you should use the 5/8" hose, which gives better flow over longer distances; otherwise, 1/2" hose is fine. Add the hose to your drawing, including any extra fittings you need, such as elbows or T-connectors. Then plan to add a fitting to attach it to your faucet. Make sure you also plan to add a filter to the system; otherwise, the drippers and sprayers could get blocked. **All drip systems must have filters installed.** It is easier to clean a filter than dozens of blocked drippers. At the very least, you need a fine filter washer; however, they tend to get clogged every few days. A T-filter is a better choice and usually doesn't need frequent cleaning.
5. Add any feeder lines to the drawing. These are ¼" tubes that come off the header hose and are needed to run certain emitters (refer to the catalog to determine which emitters need feeder lines). They are also used to run a line up to a hanging basket or out to a rigid riser.
6. If your water pressure is much over 30 psi (or if you don't know what the pressure is) you should install a pressure regulator to keep the fittings from blowing off.
7. You will need the following as a minimum to set up a dripper/sprayer line (see diagram B):
 - a. a header hose (1/2" for short runs, 5/8" for long runs)
 - b. a faucet connector
 - c. a filter
 - d. a compression end (to keep water from running out the end of the header hose)
 - e. possibly feeder line(s)
 - f. a pressure regulator (if your pressure is over 30 psi)
 - g. your choice of emitters



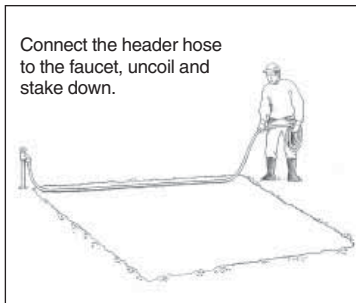
* Backflow preventers are mandatory in some municipalities. Check with your local water authority for more information.

Backflow Preventer:

If water pressure is suddenly lost (as may happen during a power outage), water in the irrigation lines may be drawn back into the house drinking-water supply, assuming the two are connected. A backflow preventer stops this from happening. It is especially important to have one if your emitters are touching the ground (soil bacteria can be pulled in) or if you have an inline fertilizer installed (fertilizer can be pulled in).

Laying Out the Main Header Line for Each Zone

Once all your planning on paper is done and the pieces are purchased, lay out the header hose for each zone in your garden. Laying it in the hot sun for a while will make it easier to work with and less likely to act like a spring coil. Hold the line in place with small rocks or anchor stakes. Snake the



hose through your garden and add T-connectors or elbow connectors as needed to bring the water to your plants.

Both sizes of header hose (1/2" and 5/8") are joined and configured with compression fittings. These fittings accept the hose in the end simply by pressing them in. If the hose seems a bit tight, try re-cutting the end at a slight angle to help ease it into the hole. Using the various types of fittings (T, elbow, straight connectors, etc.), you can configure the header hose to just about any shape you want.

If you want to join 1/2" hose to 5/8" hose, or if you have high-pressure applications (up to 100 psi), use the stretch-and-lock fittings, straight coupler (XC283), T-connector (XC281) and elbow connector (XC285). They make a very secure connection.

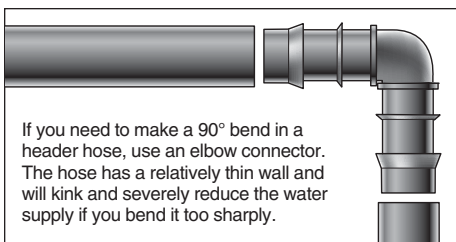
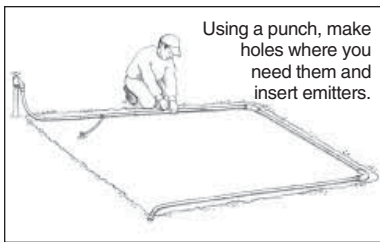
To cut tubing, you can use our tubing cutter (XC261) or simply a pair of hand pruners. Inline shut-offs (1/2" XC405 or 5/8" XC407) are handy, especially when you are far from your faucet and want to make some adjustments. They can also be used to manually zone (break into parts) a watering system. They have barbed connectors that fit inside the tubing.

Garden Watering System Chart (based on 20 psi at emitter)		Pattern	Gallons per Hour	Coverage	Vegetables	Ornamental Beds	Propagation	Pots & Planters	Raised Beds	Trees & Shrubs	Lawns	Cooling	Landscaping	Row Garden Kit	Raised-Bed Kit	Garden Border Kit	Deck Garden Kit	Gravity Feed Kit	Shrubber® Drip System	100' Soaker System	Fence-Mount Sprinkler Kit
Drippers																					
XC257	Drip Pipe, 100'	☹☹	100	1'x100'	✓	✓			✓					100'							
XC323	Soaker Hose, 50'	☹☹☹	10	1'x50'	✓	✓			✓				✓								
XC325	Soaker Hose, 100'	☹☹☹	20	1'x100'	✓	✓			✓											100'	
XC411	1 GPH Drippers	☹	1	1 plant	✓	✓		✓		✓											
XC412	2 GPH Drippers	☹	2	1 plant	✓	✓		✓		✓											
XC408	1 GPH Drip Spikes	☹	1	1 plant	✓	✓		✓		✓							10	20			
XC409	2 GPH Drip Spikes	☹	2	1 plant	✓	✓		✓		✓											
Sprayers																					
XC417	Mini-Bubblers	●	0-30	1' dia.				✓		✓											
XC360	P. C. Shrubber® Spikes	●	7.5	1' dia.		✓			✓	✓			✓								
XC344	Reg. Shrubber® Barbs	●	0-13	0'-3' dia.	✓	✓		✓	✓	✓			✓								
XC346	Reg. Shrubber® Spikes	●	0-13	0'-3' dia.	✓	✓		✓	✓	✓			✓						25		
XC362	In-Line Shrubber® Spikes	●	0-13	0'-3' dia.		✓		✓	✓	✓			✓								
XC421	Spectrum Spikes	●	0-20	0'-12' dia.		✓			✓	✓			✓		5						
XC429	1/4-Circle Spray Jets	◐	11	5'	✓	✓			✓	✓			✓			5					
XC427	1/2-Circle Spray Jets	◑	21	4'x8'	✓	✓			✓	✓			✓			5					
XC425	Full-Circle Spray Jets	●	31	10' dia.	✓	✓			✓	✓			✓			5					
XC415	Misting Jets	●	5	< 3' dia.			✓	✓				✓									
XC423	Variable-Flow Mistlers	●	0-6	0'-3' dia.			✓	✓				✓									
XB823	1/4-Circle Variable Sprayers	◐	0-24	0'-9'	✓	✓			✓	✓			✓								2
XB825	1/2-Circle Variable Sprayers	◑	0-24	0'-9'	✓	✓			✓	✓			✓								5
XC254	Pop-Up Sprinkler	◐◑●	11-31	4'-10' dia.	✓	✓			✓	✓			✓								
Sprinklers																					
XC431	Upside-Down Mini Sprinklers	●	20	20' dia.	✓	✓							✓								
XC433	Variable Mini Sprinklers	●	0-26	0'-23' dia.	✓	✓						✓	✓								
XC438	Rotor Rain Sprinkler	●	20-30	26'-30' dia.	✓	✓						✓									
Kits & Systems																					
XC601	Row Garden Kit	☹☹	100	5 rows of 20'	✓	✓			✓												
XC603	Raised-Bed Kit	●	0-100	30'x6'		✓			✓												
XC605	Garden Border Kit	◐◑●	up to 200	up to 500 sq.ft.	✓	✓			✓	✓											
XC607	Deck Garden Kit	☹	10	10 pots				✓													
XC609	Gravity Feed Kit	☹	20	20 plants	✓	✓		✓		✓											
XC350	Shrubber® Drip System	●	0-300	50'x3'		✓			✓	✓											
XC355	100' Soaker System	☹☹☹	20	100' row	✓				✓												
XB820	Fence-Mount Sprinkler Kit	◐◑	0-70	50'x9'	✓	✓			✓	✓											

☹ Drip ☹☹☹ Drips ◐ Quarter circle ◑ Half circle ● Full circle

Attaching the Drippers

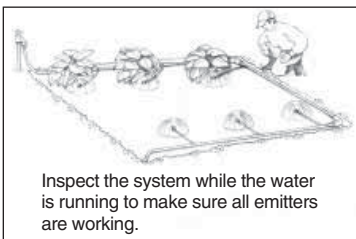
When the main header hose is installed you are ready to attach the drippers, sprayers and sprinklers. Depending on the emitter you choose, you will either attach it directly to the header hose or to a 1/4" feeder line coming from the header hose. You can also run the feeder line to a rigid riser (XC443) and attach the emitter on top of the rigid riser. In any case, you will need to punch a small hole in the header hose to insert the emitter or a 1/4" connector. Use an irrigation hose hole punch, such as our professional punch (XC259) or our manual punches (XC459 or XC339). If you are punching a lot of holes it will be worth your while to get the professional hole punch, which makes a series of holes quickly and easily. The manual punches are used in a push-and-twist motion to puncture the tubing. Try squeezing the sides of the tube near the hole to keep it from collapsing while using the punch. Use the professional punch in a snapping motion to cleanly punch through the tubing. If you make a mistake the holes can easily be filled with hole plugs (XC341). Once you have attached all emitters, add a compression end (also called an end connector) to seal the end of the header hose.



Use the professional punch in a snapping motion to cleanly punch through the tubing. If you make a mistake the holes can easily be filled with hole plugs (XC341). Once you have attached all emitters, add a compression end (also called an end connector) to seal the end of the header hose.

Testing the System and Making Adjustments

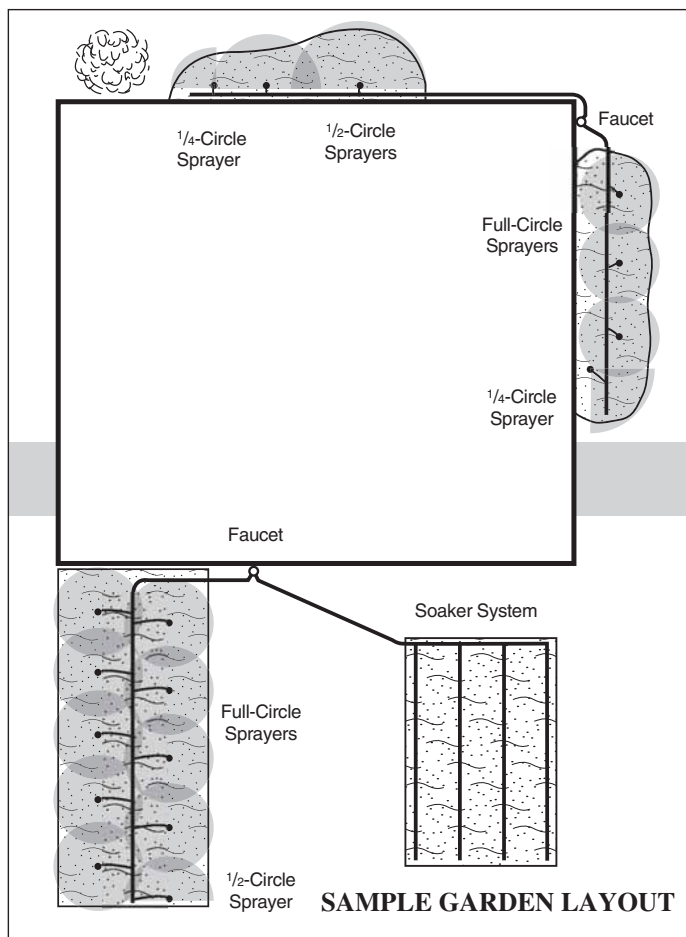
Finally, test your system to make sure everything is working as planned. Zone by zone, turn the water on and walk down the line, examining each emitter. Make sure each one is working and that the adjustable outputs are set to exactly the



range and flow that you want. You may find that you will need to add more emitters here and there and adjust the flow on some emitters to greater or lesser flow.

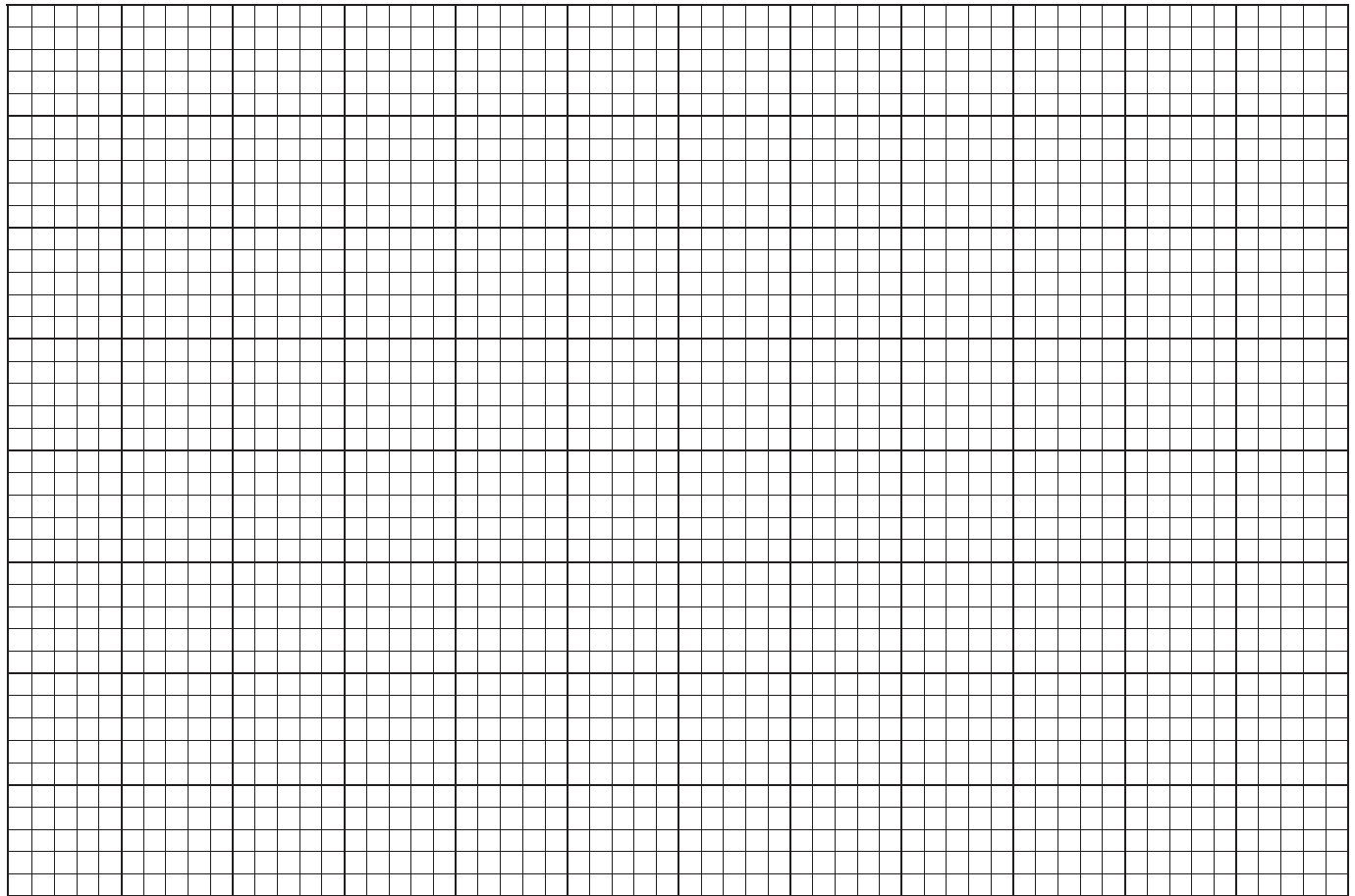
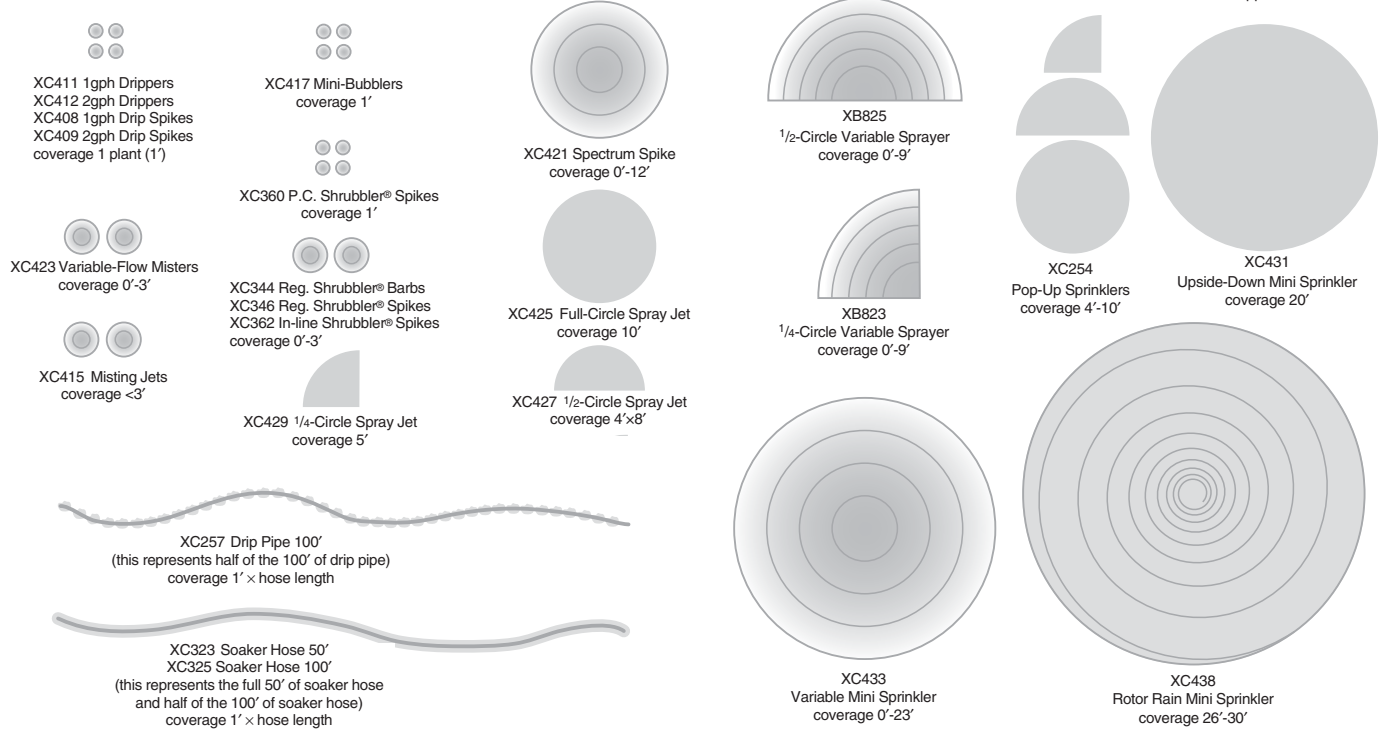
Contrary to popular belief, watering on hot, sunny days will not burn your plants. This idea probably developed from someone thinking that drops of water sitting on leaves would act as tiny magnifying glasses and burn holes in them. But water droplets on leaves are no more a threat than a magnifying glass lying on a piece of paper in the sun: the glass would only burn the paper if it were held a certain distance away to focus the light source. It's the same thing with water drops on leaves. In addition to this, a drop of water is not the right shape to focus the sunlight. And the evaporating water will actually cool the leaf. Besides, when was the last time you saw a garden destroyed by the sun coming out after a rain shower?

Water pressure can vary widely from place to place. Rural homeowners usually know their pressure if they pump their own water. In cities and towns pressures are often higher and may be in excess of 80 psi. Our pressure regulator (XC310) will keep the output regulated at close to 30 psi regardless of the input pressure.



Shopping List:

All templates are sized in maximum applicable diameters.



Use the templates at top to design your irrigation system on the graph paper. See the sample drawing on the previous page. The templates may be cut out (or traced and cut out) to help you to plan the spray patterns and distances for each component. Scale is one

square = two feet. For simplicity, patterns smaller than a couple of feet wide can be shown as small circles or droplets.

On the previous page is a box to record the types and number of components that you will need to complete your irrigation system.

Frequently Asked Questions

Planning & Layout:

How do I calculate my water pressure?

If you pump your own water from a well you probably have a pressure meter on your water tank that will tell you the water pressure. If you are on a municipal supply you can contact your municipal water works and ask them, or attach a pressure meter to your hose faucet. If you don't know what your water pressure is and cannot easily find out, you probably should put a 30 psi pressure regulator on the faucet as a safety measure to prevent your fittings from blowing apart.

How do I know which system to choose for my garden?

Consult the chart on page 3. It will tell you which emitters are best suited to which types of plants.

What are the differences between drippers, sprayers and sprinklers?

These are somewhat arbitrary categories, but basically they are divided as follows: drippers that drip slowly or trickle water; sprayers that put out a spray like a fine rain; and sprinklers that put out water droplets like a heavy rain.

How do I choose a filter for my system?

We offer two types of filters: a filter washer and an inline T-filter. Please make sure you always have a filter on your irrigation system; otherwise, the drippers and sprayers could get blocked. It is easier to clean one filter than dozens of blocked drippers. If you have a small system and a good clean water source, all you need is a filter washer; however, they can get clogged every few days in some situations. A T-filter is a better choice and usually doesn't need as much maintenance. If you use a T-filter, remove the filter washers ahead of it in the water stream, i.e., in the pressure regulator and backflow preventer.

Are the components of the kits all compatible and can I mix and match systems?

Yes, all the parts we sell are compatible. You can expand or add to any system with any of the parts.

How do I break my system into zones?

Zoning is used to share your water resource without overtaxing the supply. For instance, if you need 500 gph to water all your plants but only have 200 gph at the source, you will need to break the total irrigation system into three lines. It really doesn't matter how you divide the water usage, but the most common way is to divide your yard into different watering zones and water these zones at different times. This may be as simple as putting the front yard on one zone, the back yard on another and your vegetable garden on a third. Run a separate header hose to each zone and put each zone on a timer. Use a splitter such as a Y-valve or four-way manifold to split the water flow at the faucet so you can install multiple timers. Make sure each timer is set to run at different times of the day and that the times don't overlap. Otherwise, you will have two or more zones competing for the water flow.

Is it all right to mix different types of sprinklers and sprayers on the same line?

Yes. The only factor that you have to be aware of is the total water flow being used. The water consumption must not exceed the available flow

from your faucet or the system will not operate properly, and if you draw water from a well you could even temporarily run it dry.

How do I install an underground system?

The drip and low-flow irrigation systems we offer can mainly be buried underground and out of sight by burying the header hose and feeder lines under a couple of inches of soil or mulch. However, if you get frost in your area, you will need to empty the header hose of water before freeze-up. Don't bury the emitters (soaker hoses are the exception) under the soil or they may get clogged with soil particles.

Maintenance:

What maintenance do I need to do on my irrigation system?

The most common part that needs attention is the filter. Make sure you keep it clean so the water flow isn't impeded. If you are using a simple filter washer anywhere in the system, it should be checked a couple of times a week to make sure it isn't clogging up. An inline T-filter will usually need less frequent cleaning but it should be checked once a week. You should also walk along the system twice a week to make sure the emitters are all working. If an emitter stops working it should be cleaned or replaced. If an emitter is clogged you can sometimes unclog it with a fine wire, or by blowing into it from the output side. If an emitter gets clogged, you should check your filter to make sure it is filtering properly and then flush the system by opening the end connector and running water through it for a few minutes.

What should I do to shut down my system for the winter?

The best thing is to open the end connector, remove the faucet connector from the faucet and blow all the water out with compressed air. If you have no access to compressed air you should lift the hose and tilt the water out. In any case, don't leave the hose full of water if you have frost in your area. If water freezes in the hose, connectors, or emitters, it will burst them open and ruin them. In the spring, flush the system before reattaching the end caps.

Troubleshooting:

My watering components are not spraying – what should I do?

First, check the water flow at the source. Make sure the water is coming through all the parts at the faucet, such as the timer, water splitter, pressure regulator, filters (including filter washers that may be at any coupling), backflow preventers, etc. Make sure it is coming through at the rate that you estimated when you first set up the system.

If the water is getting to the header hose, check for obstructions in the header hose by opening the end connector. Water should flow freely from the end of the header hose with the end connector removed. Finally, check each component. Many components are adjustable and have a flow-control knob or adjustable cap. If the knobs or caps are turned off they won't work. Adjust the knobs and caps to the flow you want.

My system joints are leaking – what should I do?

Very slow leaks are common around some parts, and are of no concern. Excessive leaks (anything more than a slow drip) should be repaired. Compression joints should not leak at all. If they do they may be damaged, or the pressure may be too high – use a pressure regulator. If you punched a hole by accident you can fill it with a hole plug. Don't use anything to make holes other than proper irrigation hole punches made for our components. Other punches may make holes that are too big and won't seal properly.



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