

Drip Irrigation Installation Instructions

IMPORTANT: Your drip irrigation system should be **installed prior to, or immediately after, planting** so that water may be applied to your newly planted trees as soon as possible.

Please read **ALL** the instructions before you start. To install your drip irrigation system you will need a pair of gloves, a sharp utility knife, and a measuring tape or yard stick. It is easiest to install your drip system tubing on a warm day when the tubing will be flexible. However, the emitters are best installed into the tubing when it is cool and the tubing is stiff.

STEP 1: First, decide which type of layout design you will use. Will you be planting a few long rows or will you use a block pattern? There is 500 feet of tubing to work with in the 30 tree kit and 1500 feet of tubing in the 100 tree kit. Remember to account for your manifold length and laterals. You might have just one long manifold with the emitters in it or any number of laterals off a manifold depending on their length.

STEP 2: Once you have decided on your basic design and the number of rows, you will need to determine the length of your rows. This will depend on the spacing between your trees and the total number of trees to be irrigated by your system. Remember, your package is designed for a maximum of either 30 or 100 trees but you may use it to irrigate less trees. Always add about 10 percent extra to the length of your rows, to allow for "snaking" or zig-zagging the tubing between the trees. This extra length allows for expansion and contraction of the drip tubing and prevents the drip emitter from creeping away from the tree.

You can be as creative as you want with your drip system. Although evenly spaced systems are the easiest to design and install, you can also design a drip system for a random planting. Whatever design you choose, be sure to draw it out on paper. Include all your measurements. When planning, don't forget about the manifold (the tube at the head of all your rows). The manifold must be long enough to stretch between all the rows and should include the extra 10 percent for the expansion and contraction "snake." Make sure your system design does not include more tubing or other drip components than you have available. Order more fittings, if necessary. See Exhibit 1 (List of Components) on page 6 for what your package contains.

STEP 3: Now that you have decided on a design and drawn out your plan, grab your gloves, utility knife, measuring tape, and drip package and head to the planting site. First, you need to lay out your manifold tubing and cut it to the correct length. There are two ways to lay out the tubing from the roll: the "stationary" roll and the "mobile" roll methods.

Stationary roll: Lay the roll on the ground and pull the free end from the inside of the roll, continuously untwisting it as you pull it out to avoid kinks.

Mobile roll: Take the free end from the outside of the roll, anchor it to the ground (e.g. using a large rock), and unroll the tubing by rolling the entire roll across the ground.

Pull the tubing to the correct length (adding the extra 10 percent) and cut the tubing using your utility knife. Try to keep as clean and as straight a cut as possible. Bending the tubing in half, over the knife, will make it easier to cut.

STEP 4: Once you have cut your manifold to length you will need to cut it at the required distance between rows. Starting at the end of the manifold, measure out the distance between your rows, add 10 percent, and cut the tubing. Continue this until you have cut the manifold at each spot where there will be a row.

STEP 5: Attach your tee and elbow fittings at each of the spots where the manifold was cut and a row will be. The elbow fitting in the 30-tree package should go on the row that is the furthest from the end of the manifold where you will connect your garden hose. The two elbows in the 100-tree package should be used on the first and last rows. Your garden hose will be connected near the middle of the manifold.

The two long arms of the tee fittings should run with the manifold and the short arm should point down the row. The tee fitting is twisted on to the manifold tubing until the tubing is inserted about $\frac{1}{2}$ inch. **DO NOT** insert the tubing too far or it will prevent the proper flow of water! These are compression type fittings that require no adhesives or clamps and are reusable.

STEP 6: Lay out the tubing for each of the rows. Starting at the tee or elbow on the manifold where the first row will begin measure out the necessary amount of tubing, plus the extra 10 percent, and cut it to length. Repeat this at each of the tees along the manifold until all your rows are laid out.

STEP 7: Attach each of the row tubes to its respective tee or elbow fitting on the manifold. Do not insert the tube too far.

STEP 8: You are now ready to install your emitters. Use your plan to find the spacing to use between the trees in each individual row. Add the extra 10 percent; this total distance is the interval between each emitter.

For the first emitter measure half this distance from the manifold. By measuring half the distance on the first emitter, you will leave a section of tubing this same length at the other end of the row to act as a sediment trap.

Emitters can be installed by simply pressing the pointed ends into the drip tubing. This will be easier on a cool day or early in the morning when the tubing is stiff. The emitter will make a small "clicking" noise when fully seated and should not pull out easily. Measure the full distance to the next emitter or tree location and repeat the procedure. Continue until you finish the row. Your last emitter should be close to half the emitter spacing distance from the end of the tubing. This extra tubing acts as a sediment trap, and helps prevent clogging of the emitters.

Continue installing the emitters on the other rows starting with the first emitter only half the distance from the manifold. This may vary if you plan to stagger the tree position in the rows. If you accidentally put an emitter in the wrong spot or make a bad hole, simply pull out the bad emitter and insert a "goof" plug. Either end of the "goof" plug may be used. The size of the hole you are plugging will determine the proper end to use. We have included extra emitters should one be broken or lost.

STEP 9: Attach the filter to the system. For the 30-tree package you will need to take a piece of left over tubing or cut a one-foot piece of tubing from the end of one of the rows. Twist this piece of tubing into the open end of the first tee fitting and then twist the straight hose attachment onto the other end of the tubing.

For the 100-tree package, you cut the manifold tubing at the spot where you wish to attach the hose; near the middle is best. Twist each of the newly cut ends into the tee hose attachment.

Attach the filter to the hose attachment fitting. Notice the arrow inscribed on the filter; this arrow should point toward the drip system and away from your garden hose. If your filter has no arrow the filter element section should point toward the system and away from your garden hose. Once the filter is oriented properly screw it onto the hose attachment.

STEP 10: Attach your garden hose and flush the system. This will remove any dirt or pieces of plastic in the tubing which could plug the emitters. Simply turn your hose on high and let the water run. Turn the system off after you get a good stream coming out the end of each row.

STEP 11: To complete your system install the "figure-8" end plugs. Place one loop of the end plug on the tube and slide it down a short distance. Next, fold over the end of the tubing and slide the end plug back so the second loop goes over the cut end. Your system is now complete. Turn on the system and inspect it as in Step D, described on page 4.

Use, Maintenance, Hints, and Inspection:

A) If you have a high pressure water system, or there is a considerable drop in elevation from the water source to the planting, you may need to get a pressure reducing valve. Since these emitters drip one gallon per hour (gph) at pressures between 15 and 50 PSI, a pressure reducing valve is rarely needed.

B) Clean the filter before each watering; an old toothbrush works well. Opening the valve at the bottom of the filter will flush out the big stuff. You will usually need to unscrew the filter housing and use a small soft brush on the filter itself. If you are using city or well water you will not need to clean each time.

C) Flush your system at the beginning and end of each growing season.

D) Check the system periodically to see if water is dripping from each emitter. If an emitter appears clogged or squirts, simply hold your finger on the end of its outlet for a few seconds. If the emitter still does not work properly, try gently cleaning it by inserting a dry piece of grass or broom bristle. If this does not unclog the emitter, replace it with a new one.

If an emitter is leaking or spraying, check to see if the emitter is broken or if water is leaking around the insertion hole. If the emitter is broken, replace it. If the hole leaks, try twisting and pulling out on the emitter. If it continues to spray, remove the emitter, plug the hole with a "goof" plug and reinsert the emitter in another location.

E) To winterize your system: flush it, disconnect your garden hose, let it thoroughly drain, and replace the end plugs to keep insects out.

F) Installing drip systems on slopes: drip irrigation is a great way to irrigate on sloped land because you are applying the water precisely and slowly enough to prevent runoff erosion. It is a good idea to install your laterals across the slope, because the weight of the water will tend to pull the tubing down the hill. You should also anchor your manifold (running down the slope) and your laterals to the ground by using heavy wire "staples" (available from CSFS or you can make your own) and/or by piling soil over the tubing.

G) Spaghetti tubing: This small tubing slips over the outlet end of the emitter and is very useful in several situations:

- Allows moving the "drip spot" to various locations around the plant to prevent saturation of the same location.
- Allows burial of the drip laterals and manifolds in high vandalism locations or for mechanical cultivation (only the spaghetti tubing will be above ground).
- If you didn't allow enough "snake" in your tubing for expansion and contraction, you can make an "off" spacing of emitters problem work. Spaghetti tubing will get the drip back to the plant.
- As your trees grow, you can install more emitters in the manifold and use spaghetti tubing to distribute the water to multiple points around the root zone.
- Allows you to use one manifold line to water multiple rows by distributing the water with spaghetti tubing.

H) Using ditch water: it is possible to use ditch water with these systems because the emitters are self cleaning; cleaner water is better. It is usually fine sediment, and particularly algae, that clog the filter quickly. Early season ditch water may contain a lot of sediment. If you are pulling out of a long, slow moving lateral ditch, much of the sediment may settle out. Running your ditch water into a settling pond or tank, and pumping out of the pond (pump inlet off the bottom) works well if sediment is allowed time to settle. Extreme cases may require a larger filter, multiple filter systems and/or frequent cleaning. An important drip system advantage is that the water is applied so precisely that the system doesn't have to be run for a long time.

The filter supplied with your system is oversized at 13 gpm - theoretically able to flow 780 gph or 780 emitters which deliver one-gallon per hour. We allow for considerable friction loss through the filter and tubing. You should be able to run up to 300 emitters from one filter in most applications depending on elevation changes, source water pressure, and length of pipe.

Exhibit 1: List of Components:

30 Tree Drip Irrigation Package

½ inch tubing	500 feet
13 gpm Filter	1
Straight Hose Attachment	1
Coupler	1
Tee fittings	2
Elbow fittings	1
Emitters	32
"Goof" plugs	2
"Figure 8" end plugs	3

100 Tree Drip Irrigation Package

½ inch tubing	1500 feet
13 gpm Filter	1
Straight Hose Attachment	1
Coupler	3
Tee fittings	8
Elbow fittings	2
Emitters	105
"Goof" plugs	5
"Figure 8" end plugs	10