



JAIN

CONTRACTOR DESIGN GUIDE

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Low Volume Irrigation Benefits Water conservation is a key benefit of Jain Irrigation's low volume irrigation systems. Water, our most precious natural resource, can be utilized with unmatched efficiency in a properly designed, installed and maintained low volume system. No other type of irrigation offers better plant health, better soil conditioning or better utilization of resources than a low volume system.

Jain Irrigation's low volume irrigation systems are designed to supply water directly to plants, based on their individual watering requirements. These systems can utilize 70% less water than traditional irrigation systems by applying water at very low application rates with minimal loss from wind, evaporation, sloped terrain and other environmental factors.

Along with the benefits of carefully directed water application, Low Volume Irrigation Systems promote plant health by applying water directly to the root zone, the area from which plants draw a majority of their usable nutrients; a well developed Root Zone results in more stable, vigorous plants. Low volume irrigation keeps water away from high-traffic pedestrian areas, lessening the possibility of slippage or accidents, and it keeps water off fences, buildings or hardscapes which may be damaged by traditional irrigation systems.

Resource conservation, plant health, landscape aesthetics...all good reasons to consider Jain Irrigation's low volume irrigation.

System Considerations Low volume irrigation systems can be designed as 'stand alone' watering systems in new installations, or 'retrofit' into existing sprinkler/sprayhead systems, as part of overall water-conservation efforts. Identification of the system type helps determine the next step in the design process and assists in the appropriate selection of products.

Existing sprinkler/sprayhead systems are designed with higher flow rates and transport water via underground piping, so when 'retrofitting', a bubbler system may be your best solution. Bubblers are also a good choice in new designs as part of an overall low volume system incorporating various components from drip systems or micro-irrigation.

Drip systems and micro-irrigation systems are generally designed as 'stand alone'. They transport water, at lower flow rates, through flexible supply tubing, distribution tubing and apply it with emitters and MicroSprays.

When considering a low volume irrigation system, it is also necessary to determine whether or not pressure compensating and/or flow control devices are needed. There are several factors to consider: terrain, the slope of the land, the size and shape of the drip zone or area, location, and/or the number of points of connection. Systems where the terrain is irregular, has limited points of connection and/or large ground area might be a good application for pressure compensation and/or flow control devices. This is due to the longer lengths of tubing which will be needed to reach all the various areas and/or plants. Longer lengths of tubing usually cause larger pressure variations in the system and pressure compensating devices would be the ideal choice. However, typical residential drip zones/areas are small, and with proper pressure regulation can be irrigated with less expensive turbulent flow devices.

SYSTEM DESIGN & WATERING SCHEDULE

When designing an efficient low volume irrigation system, it's important to take into account available water pressure, filtration requirements, climate, soil type, variations in terrain - as well as - plant type, plant sizes, planting density and Individual plant watering needs. The following guidelines will help to align and operate an efficient landscape irrigation system.

Planning Your Irrigation System

Draw a Plan of Your Landscape A detailed plan of your landscape is essential in designing an efficient watering system. On your plan you should have a rough layout of your yard, planting areas, plant types and sizes, water locations and existing watering system elements, if present. Your plan does not need to be precisely to scale, but should be a fair representation of existing and future plantings. You should also note individual plant or area water requirements as determined later in this section.

Determine Pressure Available for Your System Most bubblers, emitters and spray systems will require about 20-30 PSI at the head. Make sure you have at least 30 PSI available at the source. If available pressure is higher, you may need to have one or more pressure regulators installed, depending on the type of irrigation device selected. A good method to check pressure is to use a Pressure Test Kit. This uses a series of nozzles in conjunction with a pressure gauge. It has a graph to plot the pressures for each nozzle. Once completed, you'll have a nice 'Flow versus Pressure' graph which can aid in the design of the system and help determine if a pressure regulator is needed.



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12070347

Determine Filtration Requirements Systems to catch rust, sand and other particles before they get into the emission devices. In general, the lower the flow rate of the irrigation device, the more sensitive it will be to clogging from small particles. High flow rate bubblers and high flow rate micro-sprinklers are not as sensitive.



4E-3/4A-150
72130071

Determine System Type Bubblers are high application rate systems designed to deliver water in a very short time period; these systems can discharge water directly to individual plants. Bubblers typically meet the plants water requirement within the limited time frame of a typical lawn sprinkler system (15-30 minutes).



JBPC02
72500581



High rate systems used on clay or sloping soils may require containment basins to prevent the water from running off the intended area. Mini-Pepline may be used as a means to provide multiple outlets from a bubbler to spread the water and prevent runoff. On sandy soils where the water does not spread as well, Mini-Pepline can again be used to distribute the water from a single outlet to cover more soil area. The length of 6" Mini-Pepline should be approximately equal to the flow rate. For example, a 6 GPH bubbler port would need about six feet of 6" spaced Mini-Pepline, a 20 GPH bubbler port would need about twenty feet of 6" spaced Mini- Pepline(20 feet is the maximum recommended run for good uniformity).



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71500880



Drip and Micro-Irrigation are low application rate systems designed to deliver water over a long period of time (1-2 hours or more). These systems use polyethylene emitter tubing to discharge water directly to plants or micro-sprinklers to completely cover closely spaced plantings. It is easy to change the number and positions of these devices if there are changes in the landscape.

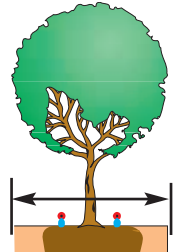
Determine Your Plants Needs A simple method for determining an average plant's daily water needs based on canopy diameter is:

$$(\text{Canopy Diameter} \times \text{Canopy Diameter}) \times .1 = \text{Plant Gallonage Requirement (PGR)}$$

For example, a tree with a 15' canopy has a daily water need of $15 \times 15 \times .1$ or *22.5 Gallons per day*. A 3' diameter shrub has a need of $3 \times 3 \times .1$ or *.9 Gallons per day*.

Note: This formula is based on high density mixed plantings of average water using plants in a hot, dry environment.

Determine Your Watering Schedule It is usually best to irrigate less frequently and more deeply, if possible, to help establish a deeper root structure for plant health and appearance. If you have an existing lawn system you are retrofitting, it may have an optimum summer run time of 10 min. per day, twice a day and the system operates four times per week. This is $20 \text{ min/day} \times 4 \text{ days} = 80 \text{ minutes (total) per week}$, which is the **WRT** or **Weekly Run Time**.



Canopy Diameter



SYSTEM DESIGN & WATERING SCHEDULE

Determine the Flow Rate for each Plant For the canopy size previously mentioned, the flow rate per plant is figured as follows:

$$60 \times \text{PGR} \times 7 / \text{WRT} = \text{GPH}$$

Retrofit System

15' Canopy: $60 \times 22.5 \times 7/80 = 118 \text{ GPH}$
(6 Bubbler outlets, 20 GPH each)

3' Canopy: $60 \times .9 \times 7/360 = 1.05 \text{ GPH}$
(2 Bubbler outlets, 2 GPH each)

Drip System

15' Canopy: $60 \times 22.5 \times 7/360 = 26.25 \text{ GPH}$
(13 Emitters, 2 GPH each or one Micro-Sprinkler 24 GPH each)

3' Canopy: $60 \times .9 \times 7/360 = 1.05 \text{ GPH}$
(1 Emitter, 1 GPH or 2 Emitters, 1/2 GPH each)

Example: 15' Canopy & 3' Canopy

Determine the Zones of Your Irrigation System If possible, the hotter areas, which are in direct sunlight surrounded by pavement, should be separated from cooler shaded areas. Seasonal use garden areas should have their own zones. A grouping of potted plants could be zoned separately. Whatever makes it easier to manage the irrigation scheduling by breaking down the landscape into zones of similar water utilization is always a good idea. These zones are called **Hydrozones**.

Determine the Flow Rate Required in Each Zone Add up the individual flow rates for each emitter or bubbler outlet and for each micro-sprinkler in the zone. Divide this quantity by 60 to get the flow rate in gallons per minute for the zone.

Figure the Amount of Water Available A given supply line will have a limit on the water available. To determine your water requirements, add up the flow rates of all bubbler outlets used, and then divide by 60 to arrive at gallons per minute. The chart to the right will assist you in determining the number of stations or zones needed to service your system.

Size of Manifold or Mainline	Maximum Capacity
1/2"	5 GPM
3/4"	10 GPM
1"	15 GPM

Scheduling Irrigation Using the above methods, your system is designed to handle the maximum irrigation needs during the hottest time of year. You will need to make adjustments to the schedule at different times of the year and during periods of rainfall.

Month	Irrigation Schedule
July	100%
June & August	80% - 90%
May & Sep.	60% - 70%
April & Oct.	30% - 40%



SYSTEM DESIGN & WATERING SCHEDULE

Low Volume Rules of Thumb

Micro-Sprinklers need 1-2 hours run time to be effective. Application rates are low and shallow irrigation is the result if run times are too short. If run times must be short, sprinkler spacing should provide 'head to head' coverage.

Emitters need 1-2 hours run time to be effective except on very small plants or in pots or planters.

Higher flow rate Bubblers (6-20 GPH), only need 15-30 minutes run time to apply adequate water for an irrigation. On sandy soils, the water may not spread out far enough and may result in irrigating too deeply. In this case, more lower flow rate bubblers may be required. On clay soils or slopes, basins may be required to confine water to the plant area if runoff is a problem.

Vari-Rotors and **Rotor Sprays** have very low application rates, ideal for hillside groundcover and other difficult to water planting patterns. Application rates are extremely low and run times of 3-6 hours are needed to be effective.

Vari-Jets™, **Vari-Rotors**, **Vortex Sprayers**, **Mini-Bubblers** and **Shrubblers®** all feature flow adjustment. This is advantageous with growing plants or when changing landscape plantings.

Micro-Sprinklers are useful where there are many smaller plants with little open area, like flowerbeds and groundcover.

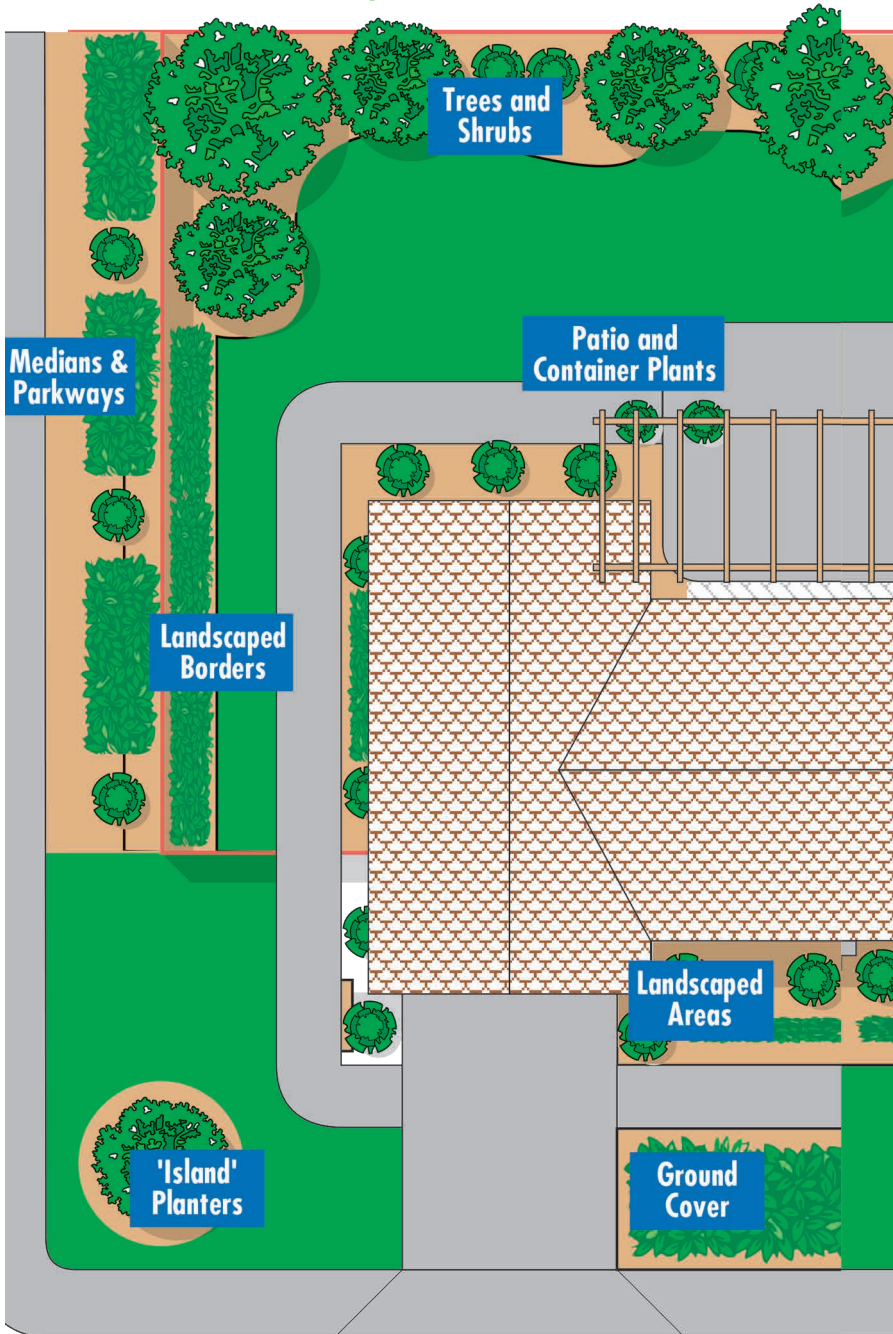
Emitterline and **Bubblers** are used where water is to be confined to prevent weed growth, or to prevent watering where it is not needed or desired.

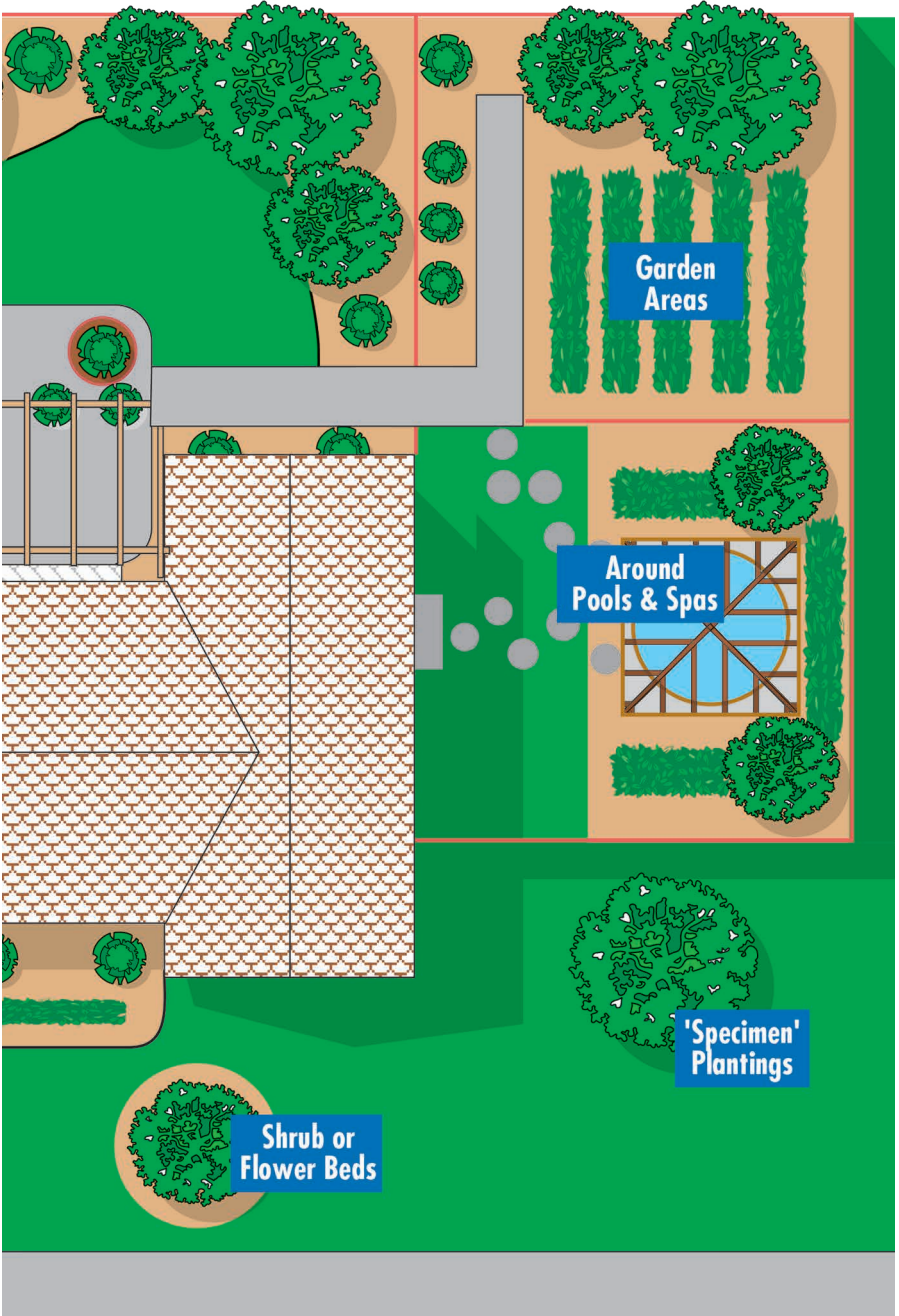
- Small/shallow rooted plants in pots may require more frequent irrigations.
- Larger plants with deeper roots require less frequent but longer irrigations to put water deep into the root zone.
- Schedule irrigations so soil is wetted to the depth of each plant's root zone.
- Sandy soils require more frequent irrigations than loam or clay soils.
- Irrigation cycles should be as infrequent as the plants will allow to maintain health and appearance.
- Generally two to four times a week in hot summer areas depending on soil type and plant size.
- Irrigating too long puts water below the root zone, wasting water. Irrigating too frequently with small applications does not fill the root zone to full depth, limiting plant growth, health and appearance.
- Place emitters and bubblers at, or just inside the emitterline of trees, not directly at the base. Move outlets as canopy gets larger.



SYSTEM DESIGN & WATERING SCHEDULE

Residential Landscape





SYSTEM DESIGN & WATERING SCHEDULE

Connection Examples

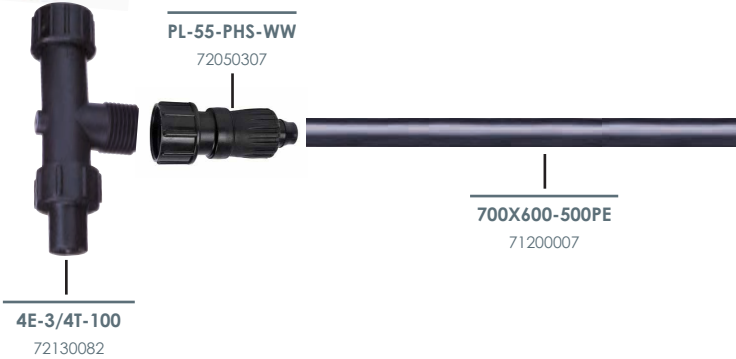
Faucet Conversion



Always check water supply pressure. Low volume irrigation systems operate best at 25-35 PSI, pressure regulation may be required for optimal performance.



PVK-30
12501231

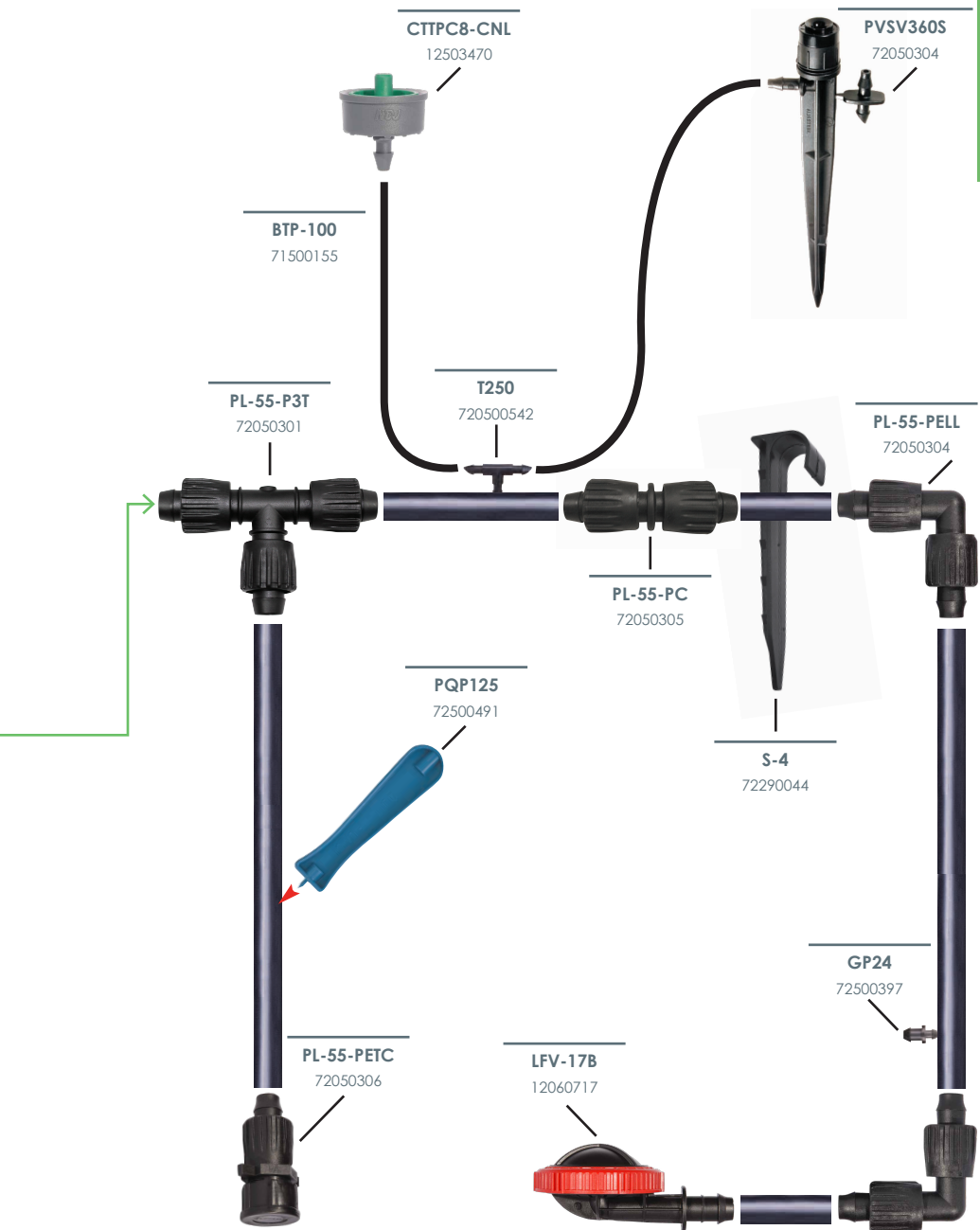


Sprinkler Conversion



If you are converting an underground sprinkler zone that is also watering a grass area with conventional pop-up sprinklers, try to use higher flow irrigation watering devices such as bubblers or adjustable sprays. These have higher flow rates and can water effectively in a shorter period of time. Pressure regulation is also recommended.





SYSTEM BASICS

Every low volume irrigation system has basic requirements in order to function efficiently and effectively. Among these are: a point of connection, backflow prevention, proper filtration and pressure regulation.

Low volume irrigation systems employ very small pathways and discharge ports to apply water at a plant's required rate- usually 1/2 Gallon Per Hour (GPH), 1 GPH or 2 GPH. This varies from standard irrigation/sprayhead systems which have larger flow paths and discharge water in Gallons Per Minute (GPM).

For these reasons, it is very important to keep the system free from debris and to regulate the pressure within the appropriate range of the chosen emission device. Jain Irrigation offers a variety of products to meet these needs and to keep the system operating properly.

Point of Connection

The first component of a drip system is the control valve. There are many makes and styles available. It is best to choose the size of the valve after you have a good idea of the total flow requirement for each zone. A valve that is oversized for the flow rate will have difficulty closing. A 1" valve requires a minimum flow rate of 5 to 10 GPM; 5 GPM represents 300 1-GPH emitters.

Minimum # of Emitters for Valve Sizes			
Valve Size	3/4"	1"	1 1/2"
GPM	1	5	30
0.5	120	600	3600
1.0	60	300	1800
2.0	30	150	900

There are two different standard Points of Connection (POC) in a low volume irrigation system:

1. Hose Bib (outside faucet) or Garden Valve Connection from which an adapter can be attached; initiating the system either electronically or manually.



2. Valve Connection which may have been professionally installed utilizing underground piping to feed various watering zones.



**Reference local code for valve requirements*



Backflow Prevention

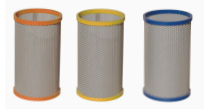
A backflow prevention device is required on all irrigation systems. If the valve you choose does not have a built-in anti-siphon device, or if a hose bib will be the valve controlling your new system, you should install an anti-siphon device on your system. This device is installed just before or after the valve and before the filter and regulator.



PRP-30
72100064

Filters and Filtration

The filter is one of the most important components of a drip system. The filter traps all particles larger than the emitter pathways and prevents serious problems resulting from plugged emitters. A 150 mesh screen will provide the best protection for your investment. Remember to check and clean your filter regularly. There are Filters for different types of connections, depending on whether you are using a Hose Bib, Garden Hose or Professional/Valve connection.



SPIN CLEAN FILTERS

Y-Filters range in size from 3/4" to 2" and are available with flow ranges from 9 GPM to 100 GPM.

Inline Filters are generally used where city water is the main water source and is relatively free from debris. They contain mesh poly screens which can be cleaned easily and removed when not in service.



4E-3/4A-100
72130070

Plastic Hose Thread T-Filters are attached to a hose bib (outside faucet) and are available with a variety of replaceable Stainless Steel Screens (50 mesh to 200 mesh) depending on water quality and levels of debris present. The screen is removable for periodic cleaning, and the T-Filter is available with Auto Flush to reduce maintenance requirements.



4E-3/4T-100
721300082

Pressure Regulation

Pressure Regulators are installed after the filter and are designed to reduce available water pressure to the appropriate operating range of the system. Many water sources have too much pressure for efficient operation of low volume systems. In these cases using a Pressure Test Kit is a good method to evaluate your available water pressure. This evaluation will help determine if a pressure regulator is necessary. Bubblers, drip systems and micro-irrigation systems have different working pressure requirements, be sure to match the regulator with the system pressure and the required flow rate.



PR-100-M-20
12100053

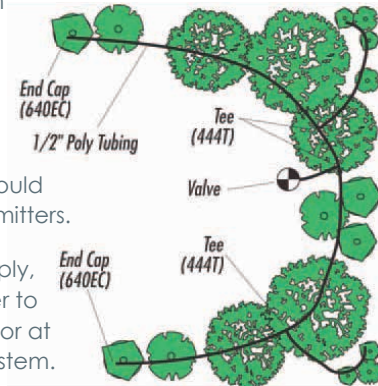


SYSTEM BASICS

Supply Tubing

The most common method of transporting the irrigation water to the planted areas is 17mm polyethylene tubing. This is done by rolling the tubing out and placing it through the planted area. In sparsely planted areas, several sections of tubing can be laid out using tees, elbows and end caps as shown. When all the tubing is laid out, the system should be turned on and flushed before installing emitters.

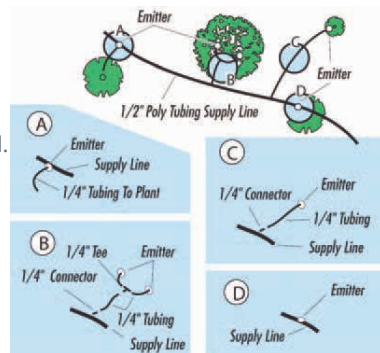
When a drip system is far from the water supply, PVC pipe can be used to transport the water to the planted area. It is best to put the regulator at the end of the PVC line closest to the drip system.



Supply Tubing is manufactured in a variety of sizes, the most prevalent being 620(OD) x 520(ID), 700 x 600 and 710 x 620. All serve the same purpose to act as the main water supply line in an irrigation system - they just vary in their Outer Diameter (OD) and Inner Diameter (ID), each will exhibit different flow characteristics as a result.

Supply Tubing can be installed above ground, below ground, or covered with landscaping material for a less conspicuous installation. It is available in 100', 250', 500' and 1000' coils and can be manufactured to specification. All Jain Irrigation tubing is UV Resistant.

Micro/Distribution Tubing Irrigation water is moved from the main supply tubing to plant locations and emission devices through smaller distribution tubing, typically 1/8" or 1/4" and manufactured from polyethylene or vinyl. Distribution tubing is attached via connectors punched directly into the supply tubing by utilizing a punch tool. From the main supply tubing connection, micro/distribution Tubing is easily run to various plant and emitter locations through a series of Tees, couplings and elbows.



With its small diameter, micro/distribution tubing is very flexible and can be run in difficult locations and inter-spersed among plants, hardscapes or other obstacles.

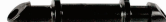
SYSTEM BASICS

Fittings and Connectors

Low volume irrigation fittings and connectors come in a variety of sizes and configurations. The most common fittings for use with micro-distribution tubing are 1/8" or 1/4" barb and 10-32 thread fittings. These small fittings generally come in standard configurations: adapters, tees, elbows, and couplings.



RA250E
72500521



C250
72501964



L250
72015079



T250
72500542

Insert Fittings have been the industry standard for a long time. Priced very economical and easy to use 17mm insert fittings in particular are the go-to fitting of choice for contractors. Dual barb design keeps the emitterline on the fitting after the system becomes pressurized.



ALCOUP
72291013



ALTEE
72291024



ALELB
72291022



AL075MA
72291011

Power-Loc™ Fittings are the latest innovation in fittings - solving the problem of 'multiple fittings for multiple tubing sizes'. The Power-Loc 55 Series is a Multiple Tubing Size Fitting bringing the newest manufacturing technology together with field-proven experience. Power-Loc 55's fit all standard 1/2" Supply Tubing (.520-.620 I.D.), are fully customizable to fit any inlet/outlet requirement, and are reusable for line alteration or replacement. Supply Tubing is placed on the Power-Loc barb and the locking nut is tightened over the supply tubing - providing a secure seal from both inside and outside the tubing.



PL-55-PC
72050305



PL-55-P3T
72050301



PL-55-PELL
72050304



PL-55-P3/4-MA
72050317



SYSTEM BASICS

Emission Devices

Emission Devices are the final stage of every low volume irrigation system. There are several emission devices to choose and the type needed will vary depending on each installation. There are three basic types of Low Volume Irrigation systems: *bubbler*, *drip* and *micro-spray*. All three types of systems are used for different applications and use different emission styles. Bubblers utilize higher flow rates and application rates making bubbler systems a good method to retrofit existing conventional spray systems.

Bubblers are a good choice in new designs as part of an overall low volume system incorporating various components from drip and micro-spray systems. Drip systems should be designed as 'stand alone' systems. Both emitterline and on-line emitters can be pressure compensating or turbulent flow. Drip irrigation will apply water directly to the soil at the root zone of an individual plant. Micro-spray systems are designed as 'stand alone' and for areas that may be too large for traditional drip irrigation. When plants requirements dictate the use of overhead, low-volume watering: areas with extensive root systems or groundcover, large flower beds, plants which need moisture on foliage are but a few examples.



JBAFP
72500583



Total CV



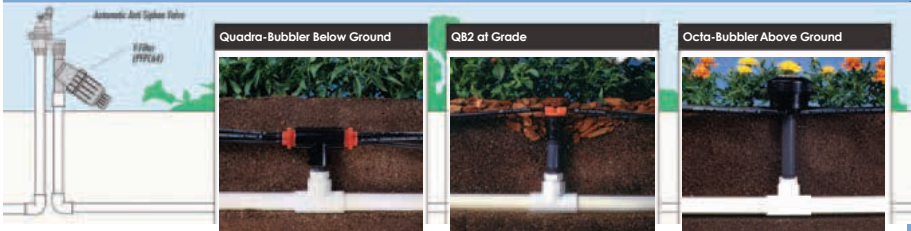
DISTRIBUTION COMPONENTS

Bubbler Systems

Bubblers are developed especially for landscape irrigation, and designed to apply up to 70% less water than a conventional overhead system. This is accomplished by applying water to the root zone of the plants and not the areas where roots do not exist.

A bubbler manifold acting as a flow control device, splits a single water source into four or eight separate pressure compensating water outlets. The water flows from the bubbler port to the plant via Mini-Pepline® or Bubbler Distribution Tubing. These lines are run to groundcover, shrubs or trees, providing water to the exact spot specified. This eliminates unsightly risers, overspray and staining of fences, side-walks and exterior walls, and reduces bark fading and weeds. Jain Bubblers are designed for installation above ground or under mulch with no effect to flow rates or emission points.

Above or Below Ground Installation



Quadra-Bubbler and QB2 Multi-Port Emitters

The **Quadra-Bubbler**® is best known for new installations, but adaptable to existing systems. The Quadra-Bubbler provides precise watering in residential/commercial landscapes and may be used alone or in pairs using a 3/4" FPT adapter (P7550T).

The **QB2** is a convenient retrofit device and offers all the features of the Quadra-Bubbler. The base fits a standard 1/2" riser and comes in flow rates of 2, 6, 10 and 20 GPH.

Installation Steps 1-3



1. Simply remove existing spray head.



2. Replace with bubbler.



3. Attach tubing, run above or below ground plants.



QB416

72500769



QB2-186

72500773

**Allow for a minimum end pressure of 15 PSI.*



DISTRIBUTION COMPONENTS

Octa-Bubbler Multiport Bubbler

The **Octa-Bubbler®** features eight outlet ports for large planting areas. Designed for new or retrofit installation, the Octa-Bubbler fits directly on a standard 1/2" riser. Swivel elbows at each barbed outlet port allow greater flexibility in design and installation. The flow rate of each port may be changed to suit the requirements. Octa-Bubblers are available in 2, 6, 10 and 20 GPH, per port



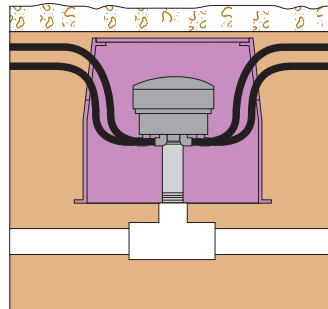
OCT896
72500732



Underground Access Box



BBOX645P
72500622



Keeps bubblers safe and secure below ground. Metal insert in lid makes access box easily detectable.



DISTRIBUTION COMPONENTS

Mini-Pepline

Mini-Pepline is 1/4" tubing with built-in 1/2 GPH inline turbulent flow emitters at 6" or 12" spacings; it is designed for use with pressure-regulated, flow controlling bubbler systems like the Quadra-Bubbler®, QB2® or the Octa-Bubbler®.

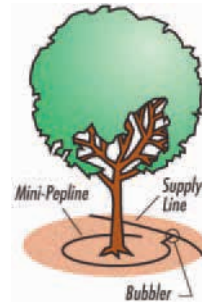


Mini-Pepline offers many advantages over sprinklers and point source emitters in landscape applications. Mini-Pepline is ideal for use in vegetable gardens, densely planted groundcover and for ringing trees and shrubs. Designed to be used with the Jain family of bubblers, you can evenly water every square foot of landscaping at less cost than a conventional system. Mini-Pepline (available in black and brown) can be installed above ground or under mulch, eliminating wet walks, discoloring of decorative bark, fences and windows. Output is approximately 1/2 gallon per outlet, per hour. Mini-Pepline can also be used with a manifold to provide an even application of water over a larger area.

Mini-Pepline when used with any Jain point source emitters, becomes an ideal emission device for gardens, closely spaced plantings and groundcover areas. Up to 30 feet of Mini-Pepline tubing can be used with each lateral line helping to eliminate water waste between planting and to transport water from the manifold to the planting areas. Small size tubing and uniform distribution makes Mini-Pepline ideal for public places.

Note: Jain recommends using an inlet device with flow control.

Recommended Spacing	
Vegetable Gardens	Down each row if rows are more than 12" apart
Groundcover	12" apart or greater if on a slope
Trees	Ring tree at 75% of diameter of canopy or drip zone



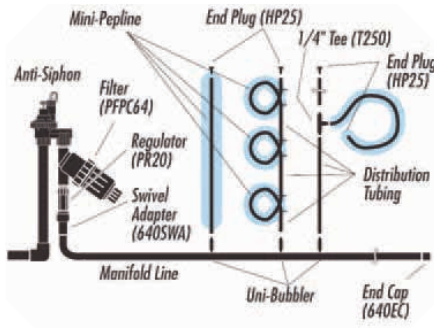
Flow Rates & Operation Time	
Pressure (PSI)	10
Flow Per Outlet (GPH)	0.5
Precipitation Rate (Inches per Hour)	0.8
Minutes per Day for 1" per Week	10

Maximum Length of Laterals			
Emitter Spacing	Bubbler Flow Rate (GPH)		
		6	10
6" Spacing	6'	10'	19'
12" Spacing	10'	16.5'	33'

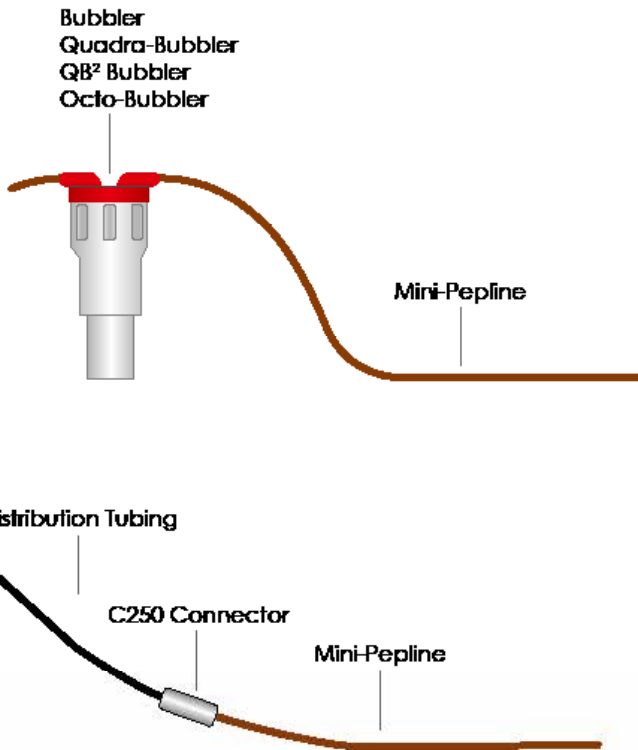


DISTRIBUTION COMPONENTS

Manifold Hookup



Typical Bubbler Hookup

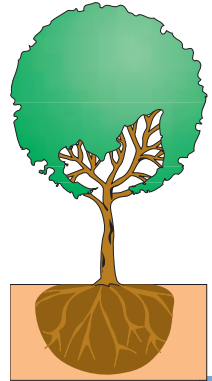


DISTRIBUTION COMPONENTS

Drip Irrigation

Drip irrigation applies water directly to the soil at the root zone of an individual plant. The application rate is very slow and uniform, between 1/2 to 2 GPH. Because of this, the water is applied over a longer period of time, thus allowing maximum lateral movement of water while minimizing deep percolation through the soil beyond the root zone. Once the soil above the root zone reaches its saturation point, gravity will pull the water down through the soil into the root zone where the water is required.

By knowing the water requirement of a specific plant, shrub or tree, the type of soil you are working with (clay, loam, sand, etc.), the proper output for the drip emitter to be used, and the length of time and frequency to water, you can maintain the proper moisture content of the soil and provide near perfect soil moisture for healthy plant growth.



Conventional methods of overhead irrigation do not always provide the uniform coverage plants require. Spraying water on planted areas wets the entire area instead of specific plants, promoting unwanted weed growth, bark fading, disease and nutrient leaching.

Overhead irrigation also promotes higher water consumption because of evaporation and excessive water runoff. Many plants do not flourish in the environment that conventional watering methods produce when used for irrigation. This is due to high levels of soluble minerals and salts that burn and stain sensitive leaves of some plants.

Easy Installation

Jain Total CV and Total AS Emitterline is 17mm polyethylene tubing with built-in pressure compensating emitters (1/4, 1/2, 1 GPH). These emitters are bonded inside the tubing during the extrusion process and are spaced at 12", 18", or 24" intervals.



Emitterline is common in narrow planting areas, under ground-cover, along hedge rows, in vegetable gardens, and on undulating (or uneven) terrain. It is used widely under mulch or landscape bark to maximize water conservation and aesthetics. The pressure compensating feature allows Total CV to be used on slopes, hills or rolling fields - application rates will remain consistent with watering requirements and water will not be lost due to runoff or wind drift which is common in overhead systems.



DISTRIBUTION COMPONENTS

Easy Installation

Jain Emitterline uses standard fitting configurations to make transitions, additions or modifications to irrigation systems. Power-Loc™ fittings, barbed insert fittings and standard compression fittings can be used for customization or to make different system connections. Total CV can also be used with additional drip emitters or micro irrigation sprays for areas needing additional water, or if plants are in areas outside the emitterline placement.

Total CV Features

- multiple raised inlet filter slots to prevent clogging
- turbulent flow path prior to pressure compensating flow control
- dual opposed outlets to prevent back-siphoning

Maximum Recommended Emitterline on Level Ground (ft)

Emitter Flow Rate 1/2 GPH				
Inlet Pressure* PSI	Emitter Spacing (in)			
	12"	18"	24"	36"
20	213	333	426	597
25	266	383	492	690
30	293	423	544	765
35	317	456	588	825
40	337	486	626	882
45	355	513	660	930
50	372	537	692	975

Maximum Recommended Emitterline on Level Ground (ft)

Emitter Flow Rate 1 GPH				
Inlet Pressure* PSI	Emitter Spacing (in)			
	12"	18"	24"	36"
20	151	218	280	395
25	174	251	322	453
30	192	278	356	501
35	207	299	386	543
40	220	318	410	579
45	232	336	432	612
50	243	351	454	642

*Allows for a minimum end pressure of 15 PSI.

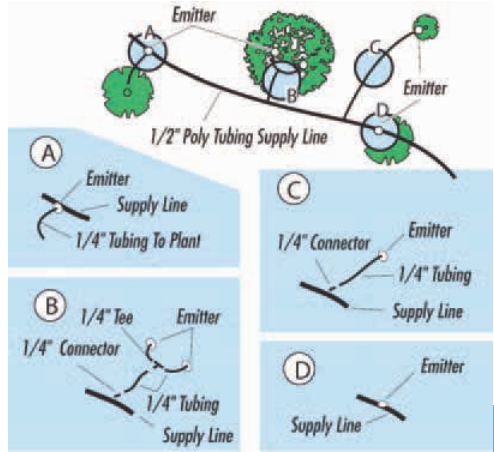


DISTRIBUTION COMPONENTS

Emitter Installation

The emitter should be installed under the canopy of the plant it will irrigate. Place the emitter halfway between the trunk and the edge of the canopy to ensure the plant gets the water it needs and keeps the crown of the plant from getting too wet.

The emitter can be installed directly into the tubing where the tubing passes under a plant. If the tubing does not pass under a plant, a length of 1/4" distribution tubing can be used to extend the emitter to the plant. A connector is punched into the 1/2" tubing, 1/4" tubing is then inserted onto the connector and the emitter is installed at the end of the 1/4" tubing at the plant. If more than one emitter is needed at a larger shrub or tree, simply use a Tee to add emitters as required.



17 mm Total CV



BTP-100
71500155



S-2
72290042



TF-A
72015071



DISTRIBUTION COMPONENTS

Emitter Installation

To install the emitters and connectors into the tubing, a hole punch is used. If an emitter is removed from the tubing for any reason, a goof plug is installed to close the hole. Jain also manufactures a **Quick Action Valve** which may be used to isolate individual lines on a system.



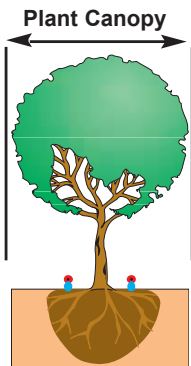
GP24
72500397



PQP125
72500491

How Many Emitters To Use? When planning your drip system, use 1/2, 1 or 2 GPH emitters. To determine the number of emitters needed, find your plant canopy size, follow the table below to find the category closest to your plant type.

Application Rate Table for Jain Irrigation Emitters



Number of Emitters Required for Each Plant or Tree

Canopy Size Diameter in Ft.	Drought Tolerant Native Plants	Vines, Small Shrubs, Evergreens, Fruit Trees	Gardens, Shade Trees, Large Shrubs, Groundcover
2	▲	▲	▲
4	▲	●	▲
6	●	● ▲	■
8	● ▲	■ ●	■ ■
10	■	■ ■	■ ■ ■
12	■ ●	■ ■ ■	■ ■ ■ ■
14	■ ■	■ ■ ■ ■	6 x ■
16	■ ■ ●	5x ■	8 x ■
18	■ ■ ■	6x ■	10 x ■
20	■ ■ ■ ●	7x ■	15 x ■



DISTRIBUTION COMPONENTS

Emitter Installation

Jain Clik-Tif emitters are pressure compensating emitters that use turbulent flow action to provide a regulated flow at a specified pressure. They are available in flow rates of 1/2, 1, 2, 4 and 6 GPH.

Primarily designed for trees, shrubs, & flower pots, button emitters use a 1/4" barb inlet that can be installed on any size drip tubing.

The Micro-Flapper® is an angled configuration and has a very low profile. It is available in 1/2, 3/4, 1 and 2 GPH with a large inlet barb for maximum retention on poly hose, even under sustained high operating temperatures and pressures. It also has a 1/8" outlet barb to use with distribution tubing if necessary.

Refer to the watering table below to find the proper length of daily watering time that applies to your application. Remember that the line the emitters are on must be on a separate station from sprinkler heads or sprinklers.



CTIPC8-CNL

12503470



MF-1

72501105

Drip Watering Schedule (Hours per Day)

Soil Type	Spring		Summer		Year Round	
	Very Cool	Cool	Moderate	Hot	High Desert	Low Desert
Sand	1.5 hrs.	2 hrs.	2.5 hrs.	3 hrs.	3.5 hrs.	4 hrs.
Loam	1 hrs.	1.5 hrs.	2 hrs.	2.5 hrs.	3 hrs.	3.5 hrs.
Clay	.5 hrs.	1 hrs.	1.5 hrs.	2 hrs.	2.5 hrs.	3 hrs.

Micro-Sprays

Jain micro-irrigation products also provide a method for irrigating your landscape with low volume overhead irrigation when required or preferred. Plants such as ferns and various groundcovers do well when water is applied in small amounts from above. Micro-irrigation system installation requirements are virtually the same as drip irrigation, and in most instances can be used with drip systems. Typically, systems should include an anti-siphon valve, a filter and a regulator. Components are designed for best performance at 20 PSI. installation alternatives.



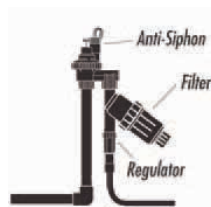
SA24B

72501232



AJ-180-R

12500801



DISTRIBUTION COMPONENTS

Micro-Sprays

Micro-Sprays are designed for areas that may be too large for traditional drip irrigation or in situations where plant requirements dictate the use of overhead, low-volume watering; areas with extensive root systems or groundcover, large flower beds, plants which need moisture on foliage are but a few examples. Micro-Sprays are very efficient if you have closely spaced plants, with similar watering requirements, in an area that may be difficult to irrigate with drip irrigation. Micro-Sprays should be spaced to provide 'head to head' coverage. Micro-Sprays produce a fine, controlled spray that covers areas from 3' to 20' in diameter - various spray patterns are available. Common patterns are: 1/4 Circle, 1/2 Circle and Full Circle.



One Piece Aqua-Jets™ are stationary, fan-type sprays that are screwed into a 10-32 threaded base connection attached to a stake; they do not rotate and are not manually adjustable. Aqua-Jets are available in various outlet sizes (Nozzle or Orifice), have different flow rates (GPH) and different Diameters of Coverage. Performance variables are based on available water pressure.

Aqua-Jets								
Nozzle Size	Pressure PSI	Fow GPH	Model #	Approx. Dia. in Ft.	Model #	Approx. Dia. in Ft.	Model #	Approx. Dia. in Ft.
0.030" Black	5	3.8	AJ-300 BK	4.0	AJ-180 BK	4.0	AJ-090 BK	6.0
	10	4.46		6.0		7.0		
	15	5.07		7.0		8.0		
	20	6.08		8.0		9.0		
	25	6.89		9.0		9.0		
30	7.31	10.0	10.0					
0.040" Blue	5	4.8	AJ-300 BL	5.0	AJ-180 BL	5.0	AJ-090 BL	8.0
	10	7.07		7.0		10.0		
	15	8.98		7.5		12.0		
	20	10.4		10.0		12.5		
	25	11.7		11.5		13.0		
30	12.6	12.5	13.0					
0.050" Green	5	8.9	AJ-300 GR	8.0	AJ-180 GR	6.0	AJ-090 GR	11.0
	10	11.8		9.0		14.0		
	15	15.3		11.0		15.0		
	20	16.7		12.0		16.0		
	25	19.5		14.0		17.0		
30	21.6	16.0	18.0					
0.060" Red	5	15.0	AJ-300 RD	7.0	AJ-180 RD	7.0	AJ-090 RD	16.0
	10	18.2		10.0		18.0		
	15	21.6		12.0		20.0		
	20	24.0		14.0		22.0		
	25	27.4		16.0		24.0		
30	30.5	18.0	26.0					



DISTRIBUTION COMPONENTS

Vari-Jets™

Vari-Jets are a combination base, cap and control valve. The Vari-Jet control valve allows you to change the diameter (or radius) of the spray pattern to best fit the individual needs. The flow control valve can shut off the water completely. Vari-Jets are available in .06 orifice with a 10-32 thread base. The available patterns are full, half, and quarter circle. The full pattern is an 18 hole finger spray.



PVJ06H
72500963

Vari-Jets Performance Chart

Spray Pattern					
Description	Pressure (PSI)	Flow (GPH)	360° x 18 Diameter Ft.	180° Radius Ft.	90° Radius Ft.
Office 0.06"	10	Up to 16.3	Up to 18.4	Up to 6.7	Up to 6.4
	15	Up to 20.1	Up to 22.6	Up to 8.1	Up to 8.1
	20	Up to 23.4	Up to 25.7	Up to 9.5	Up to 9.4
	25	Up to 26.2	Up to 26.7	Up to 10.1	Up to 9.8
	30	Up to 28.8	Up to 26.3	Up to 10.6	Up to 10.3

**Recommended Operating Pressure 20 PSI.*

Rotor-Spray™

A scaled down micro rotary sprinkler, **Rotor Sprays** cover a 360° area at a diameter that is determined by the orifice size of the base.



PMS25
72500955

Rotor Spray Performance Chart

Mini-Sprinklers Performance Chart			
Description	Pressure (PSI)	Flow (GPH)	Diameter (Ft.)
Office 0.06"	15	Up to 16.3	Up to 18.4
	15	Up to 20.1	Up to 22.6
	20	Up to 23.4	Up to 25.7

**Recommended Operating Pressure 20 PSI.*



DISTRIBUTION COMPONENTS

Vari-Rotor Spray™

Incorporating the Vari-Flow® valve into the mini-sprinkler allows diameter adjustments to reach desired coverage. This is only available with the red orifice size of 25 GPH which provides a maximum diameter of 22.7 feet and a minimum diameter of 18.2 feet when operated at 20 PSI. For even distribution of the water droplets, we recommend that you only close the valve to a point where you achieve 80% of the maximum diameter (18.2 ft.). Anything smaller creates a donut effect (a high concentration of water in a circular strip rather than an even coverage of droplets from the center to the outer edge.)



PVMS25
72500965

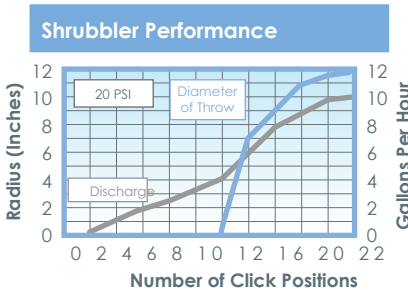
Description	Pressure (PSI)	Flow (GPH)	Diameter (Ft)
PVMS25 .06 Orifice Black	20	Up to 24.8	Up to 24.5

Shrubbler®

The **Shrubbler®** provides the versatility of a dripper, bubbler or sprayer all in a single product. Turning the cap counter clockwise transforms this 1 GPH finger spray dripper into a 3 GPH bubbler with a maximum output of 10 GPH and radius diameter of 2 feet. The Shrubbler can be installed either right side up or upside down, depending on whether the water source is from the ground or overhead. Available with 1/4" barb, 10-32 thread base or ready-mounted on a 5" stake with barbed inlet and snap-off 1/4" connector.



Shrubbler Product Line



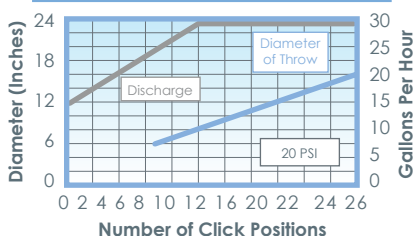
DISTRIBUTION COMPONENTS

Mini-Bubbler

The **Mini-Bubbler** is designed for applications where high volumes of water are required in relatively short run time cycles. The Mini-Bubbler is adjustable from 0-30 GPH with a maximum spray diameter of 1.5 feet. Adjustment is made by turning the cap counter clockwise with the appropriate number of clicks to achieve the required flow. Inlet supply pressure can range from 15-30 PSI, with a recommend pressure of 20 PSI. Available with 1/4" barb, 10-32 thread base or ready-mounted on a 5" stake with barbed inlet and snap-off 1/4" connector.

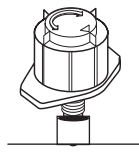


Mini-Bubbler Performance



Mini Bubbler Product Line

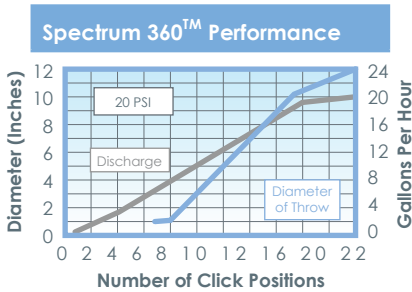
The Mini-Bubbler threads into a Riser or Stake which is easily attached to 1/4" Distribution Tubing.



DISTRIBUTION COMPONENTS

Spectrum 360™ Vortex Sprayer

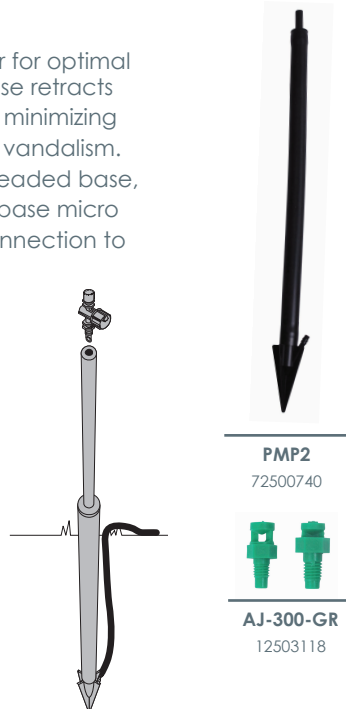
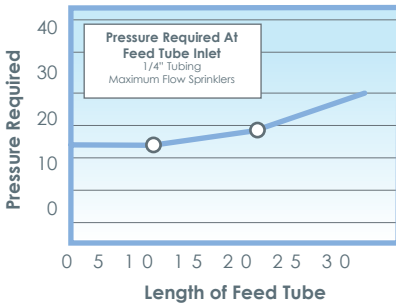
The unique vortex pattern of the **Spectrum 360**, combine with a fully adjustable cap to control the amount of water, providing a useful and practical irrigation tool for water distribution. The Spectrum 360 emitter produces a spiral pattern for rapid watering near a plants root zone. Available with 1/4" barb, 10-32 threaded base, or ready-mounted on a 5" stake with barbed inlet and snap-off 1/4" connector.



Spectrum Vortex Product Line

Micro-Pop™ Retractable Riser

The **Micro-Pop** rises above most groundcover for optimal watering. When not in use, the Micro-Pop base retracts for protection, hidden by plants and foliage, minimizing damage due to landscape maintenance or vandalism. Available with barbed stake base or 1/2" threaded base, the Micro-Pop works with all 10-32 threaded base micro devices, and has a 1/4" barbed fitting for connection to supply line.

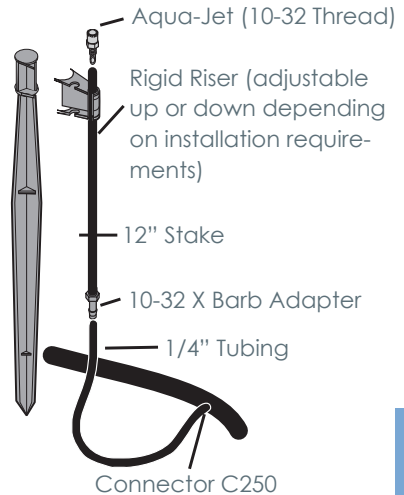


DISTRIBUTION COMPONENTS

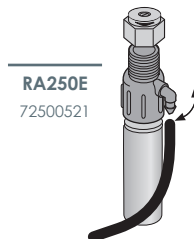
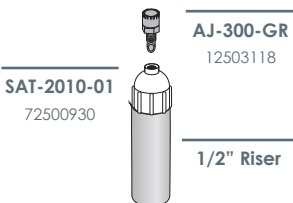
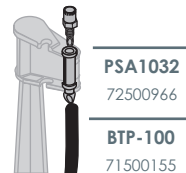
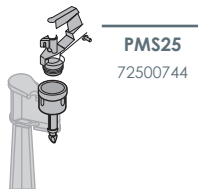
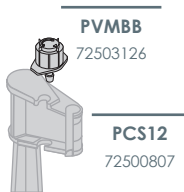
Stake Installation Guide

With Jain parts and adapters, you can create a micro-irrigation system to fit all your needs. Here we show some of the basics of installation.

Jain has designed a 12" stake to allow installation versatility when combined with micro-irrigation products. The stake allows snap-in installation of either .250" heavy walled tubing or .300" O.D. rigid riser. Micro-irrigation items with a 10-32 base can be threaded directly into Rigid risers. The rigid riser comes in a variety of lengths and may be raised or lowered to suit watering requirements.



Below are a variety of ways to install micro-irrigation devices with the Jain 12" stake. If you are using standard 1/4" tubing from your supply line, you will need to use an adapter for products with 10-32 threaded bases. 10-32 threads will not hold in 1/4" tubing.



For systems using existing piping and 1/2" risers, Jain offers a family of adapters that replace sprinkler heads or bubblers on the riser. Available for 10-32 threads, 1/8" or 1/4" barb based micro-irrigation devices.

Jain also makes a riser adapter with a swivel elbow. Installed between the riser and sprinkler head, the riser adapter has a 1/4" swivel barb to attach 1/4" tubing. This allows the use of micro-irrigation products in areas adjacent to existing sprinklers.



ACCESSORIES

End Plug (GP-24) - used to plug the end of Mini-Pepline™, and also be used as a "goof plug."



GP-24
72500397

Insect Plug (BA-BUG) - used to prevent small insects from entering 1/4" tubing causing clogging. This plug does not restrict the flow nor is it a form of emitter.



BA-BUG
72500286

Port Plug (BA-PP-OB) - used to plug unused ports on bubblers. Since each port works independently, there is no performance change in the output of the unplugged ports.



BA-PP-OB
72500619

Clamp Plate (BA-CP-QB) - used to lock tubing to Jain bubbler outlet port. Should be used if Jain Bubbler is installed above ground in high traffic areas.



BA-CP-QB
72500614

Connector (C250) - used to join two pieces of 1/4" or PQB tubing.



C250
72501964

Elbow (L250) - used when 90° bend is required in 1/4" or PQB tubing.



L250
72015079

Tee (T125) - used when it is necessary to tee off from either type of tubing



T125
72500541

El (BA7550E) - used to adapt a Quadra-Bubbler to a 1/2" MPT riser.



BA7550E
72500972

Tee (P7750T) - used to adapt two Quadra-Bubblers to a 1/2" MPT riser.

Hose Barb Adapter (FHA250) - used to connect 1/4" OR PQB tubing to 3/4" MHT (hose thread).

Riser Adapter with Swivel Elbow (RA250E) - threads between 1/2" riser and sprinkler head. Swivel elbow allows connection of 1/4" tubing without disrupting the sprinkler head. Micro-Irrigation device may be attached to run concurrently with sprinkler.



RA250E
72500521

Riser Adapter (REA1032B) - available in three models to adapt 1/2" sprinkler riser to 1/8" barb, 1/4" barb or 10-32 thread for direct placement of Micro-Irrigation component.



REA1032B
72500523



ACCESSORIES

Plastic Stake (RSTAKE) - used with rigid risers to assemble Micro-Sprinklers and extend above vegetation if needed.



RSTAKE
72015046

Plastic Stake (S-2) - used to hold Mini-Pepline, PQB, 1/4" or other 1/8" through 5/16" tubing in place.



S-2
72290042

Wire Stake (S7) - used to hold supply tubing in place.



S-7
72500527

Snap-In Stake Adapter - fits the 12" stake and is available with 10-32 female thread x 1/4" barb.



PSA1032
72500966

Assembled Rigid Riser - same as above with either .170" barbed or 10-32 threaded adapter.



PRRAB12
72500512

Plastic Stake (S-4) - used to hold supply tubing in place.



S-4
7290044

12" Plastic Stake (PCS12) - accepts both 1/4" tubing or .300" O.D. rigid riser, plus snap-in stake adapters listed below.



SA24BB
72501233

Connectors - straight connectors in 10-32 x 10-32 thread, 10-32 x .170" barb and .160" x .160" barb.



PRAB170
72500493



170-TB
72290009



PRA1032
72500492

Rigid Riser - available in 4", 6", 8", 12" and 18" lengths; .160" ID x .300" OD snaps into 12" stake.



PRR12
71195029



ACCESSORIES

Quick Action Valve (440VLBB) - provides positive on-off control as well as flow control to manifold supply tubing. Available to fit a variety of tubing sizes.

Hole Punch and Cap Remover Key (PKP160) - ideal for punching holes in tubing for 10-32 thread and .160" barb based items. Base of unit has socket for installing and removing Jain bases, Vari-Jets, Vari-Flow Valves and similar devices.



PKP160
72501091

Automatic Flush Valve w/ Tattle Tail (FCH-H-FHT) - used at the end of a supply line to flush the system after every use. This helps prevent small particles from settling in the system and ultimately keeps the emitters from clogging.



FCH-L-FHT
12060036

Quick Punch (PQP125) - ideal for punching holes for 1/8" and 1/4" barb fittings. Handle can also be used to insert 1/4" connectors.



POP125
72500491

Valve Box (645VBX, 645VBXP) - used for bubblers for underground installation. Includes washer for metal detection. Available for standard water and reclaimed water.



BBOX645
72500621

Ball Valve (3/4GB) - this is a FHT x MHT full port ball valve. It can be used as an isolation valve or the main valve in a hose bib application.



3/4WYE-BLACK
12060024

Support Clamp (PC250, PC710) - used to hold 1/4" and 1/2" tubing to decks, patios and houses. Ideal to help hide the tubing from sight and make installations more aesthetically appealing.



PC250
72500466



NOTES



TROUBLESHOOTING

In this section we try to help with some common issues in drip irrigation. It's important to keep in mind that most problems are related to incorrect installation or improper usage of particular components. If you have a problem or question you cannot resolve, please call the experts at Jain Irrigation:

(800)531-3595

Bubbler Watering Systems

If Tubing Blows off Bubbler Port:

- Tubing is kinked.
- Insect Plug is inserted too far.
- Emitters have been inserted into the end of the bubbler tubing.
- Tubing is in a high traffic area and requires a clamp plate.
- Tubing has been pulled off bubbler too many times. Cut one inch off end and reinsert.
- Improper tubing size.
- Supply tubing is kinked.
- Filter is clogged.
- Spray head is clogged with debris and needs cleaning.
- Supply tubing is run too far from the point of connection or too many spray heads are used for the size of polyethylene tubing. (Pinch supply tubing at halfway point and check performance).

If Bubbler Ports have Uneven Flows:

- Bubbler flow path is partially clogged with debris. Remove screen and diaphragm to clean flow path notch.
- System's filter is plugged.

Drip Irrigation System

Emitter Distribution is Uneven:

- Wrong emitters being used. Verify color code and flow rate.
- Too many emitters hooked up to supply line.
- Supply pressure less than 5 PSI or more than 45 PSI.
- Emitters are clogged.

Emitters are Blowing off Tubing:

- Hole punch too large.
- System's pressure is too great.

Micro-Irrigation System

Spray Head is Not Performing up to Standards:

- Tubing supply pressure is too low or too great. Pressure should be 10- 20 PSI.

Mini-Pepline

Uneven Distribution of Water:

- Supply pressure incorrect. Should be 6-20 PSI.
- Lateral run length exceeds recommendations.
- Tubing clogged. Clean or replace and add 150 mesh filter .
- Lateral lines running up hill rather than side hill or down hill.
- Lateral lines are greater than 12" apart.

Mini-Pepline is Emitting Water Unevenly:

- Length of line exceeds manufacturers recommendations for bubbler flow rate.
- Mini-Pepline is kinked.
- Tubings clogged; clean or replace and consider adding a 150 mesh filter.



Jain Irrigation Inc.

World Leader in Micro-Irrigation

www.jainsusa.com

Landscape Customer Service

Phone: 1-800-531-3595

Fax: 1-800-777-6162

Western Manufacturing Facility

2851 E. Florence Ave.

Fresno, CA 93721

Eastern Manufacturing Facility

3777 East State Road 544

Haines City, Florida 33845

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