Installation and Operation Guide

AccuRain, Inc.
6140 Lincoln Blvd
Oroville, CA 95966
Toll Free: 1-800-862-5010
E-mail: support@accurain.com
www.accurain.com

FCC DECLARATION OF CONFORMITY
The equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. The equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

  • Reorient or relocate the receiving antenna.

  • Increase the separation between the equipment and the receiver.

  • Connect the equipment into an outlet on a circuit different to from that to which the receiver is connected.

  • Consultant the dealer or an experienced radio/TV technician for help.

This equipment has been certified to comply with the limits for a Class B digital device, pursuant to FCC rules. In order to maintain compliance with FCC regulations, this equipment should only be used with approved equipment. Operation with non-approved equipment is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

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Welcome to the Watering System of the Future

Congratulations on your purchase of AccuRain, the next-generation watering system you can use today.

Most watering systems—even sophisticated, automated systems—take a very general approach. Watering is done by time, and everything gets treated the same. Zones, if there are any, consist of a fixed set of sprinklers attached to a valve.

That's the old way. The AccuRain way is very different. Watering is done by precise amount, and you decide what quantity of water gets applied to specific areas that you define, from an entire lawn to a few isolated plants. Zones are created electronically, not by a fixed set of sprinklers, meaning anything can be changed at any time. This unprecedented combination of accuracy and flexibility lets your AccuRain watering system deliver optimal irrigation.

The landscaping in an average yard is worth thousands to tens of thousands of dollars (sometimes more!). AccuRain is the best way to protect that investment. No more hit-and-miss watering, based on when you have time to do it. No more begging the neighbors to water for you when you're away on a trip. And no more wasted water. AccuRain makes every drop count.

AccuRain is "set it and forget it" easy. Whether you're home or away, awake or asleep, each landscaping area you've defined will get the precise amount of water you decide on, without further effort on your part. You can water some plants once a day, the lawn three times a week, and the cactus once every other week. For each zone, choose any (or every) day within any two-week span. Never on Sunday, or always on Monday. It's up to you.

All this can be accomplished from a single watering head that covers a circular area up to 60 feet (18m) in diameter. To cover more area, just add more heads. There's no need for complex plumbing or costly electrical installation. The AccuRain system plugs into any wall socket, and uses easy-to-handle plastic piping. In fact, installing an Accurain system is so easy that most people do it themselves once they discover there are no complicated valves or plumbing to understand, no soldering of metal pipe, and no high voltage electrical to handle

AccuRain really is different. It waters naturally, much as a rain shower would. Traditional systems simply pour on as much water as they can, as quickly as possible, which is why much of the watering you do winds up running off into driveways, patios, and gutters where it isn't doing you or your landscaping much good.

When you water with AccuRain, you make every drop count because each type of landscaping receives the precise amount of water it really needs—no more, and no less. And you water at a rate that permits the water to be fully absorbed.

Let's get started installing your AccuRain watering system.

Planning Your System

The first step in installing an AccuRain watering system is determining how many watering heads you will need and where they will be placed. You may see the watering heads referred to as robots on the controller screen and in other places.

Each watering head is capable of placing water anywhere within a 30 foot (9m) radius, over a full 360 degree circle. You might choose to use more than the minimum number of watering heads in order to permit installation along the yard perimeter, or make pipe installation easier.

To see the possibilities, create a sketch (to scale) of your yard. It doesn't have to be highly precise. If you let 1/8 inch= one foot then you can easily represent a 65x85 foot area on a single sheet of paper, and each mark on the ruler conveniently equals one foot on the ground.

Then, cut (from a separate piece of paper) circles that are 60 feet across (to scale, or 7 inches if you're using 1/8 inch=1 foot as the scale). Each circle represents the coverage area of one watering head. Be aware that if there are major obstructions (a large tree, greenhouse) you might need a second watering head to cover the area that's shadowed by the obstruction. Move the circles around on your yard sketch until you have full coverage, placement of the watering heads in locations where you want them, and the watering heads are located where it's easiest to run the required plastic water pipe and signaling cable. See Figure A.
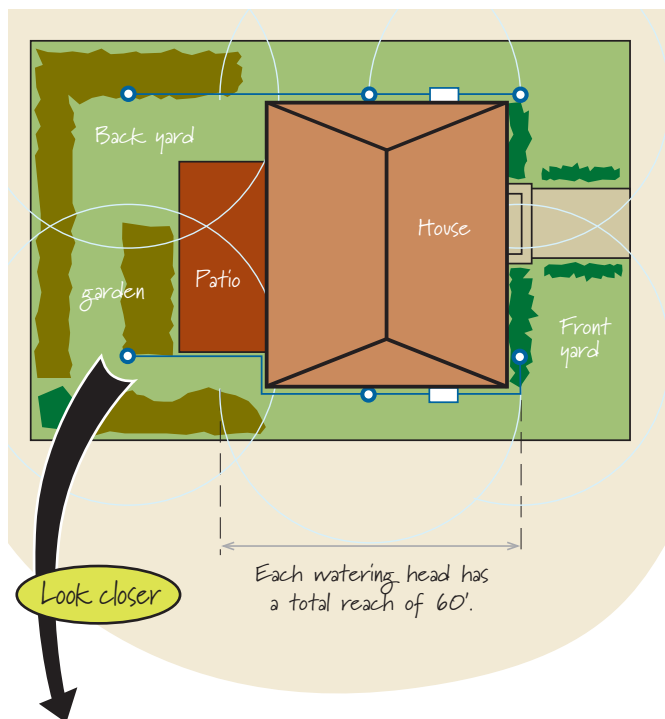
Figure A1
A Typical AccuRain System Layout
- Each head can cover a 60' diameter circle – 2800 square feet of coverage!
- As few as 6 heads can cover this 80' x 120' lot.
- Fewer heads, less pipe, easier to install!

Watering head ○ ──── Pipe ──── ▭ Water source

Back yard

House

garden

Patio

Front yard

Look closer

Each watering head has a total reach of 60'.

Area within 30' radius of the watering head.

Each watering head waters as many as 15 different zones. In this case, 2 flower beds and 4 pots in a herb garden.

zone 5

zone 1

zone 6

zone 7

zone 8

3 different zones in a vegetable garden.

zone 2

zone 9

Patio

zone 10

Figure A2
One Watering Head - Up to 15 Zones
- Each watering head can have as many as 15 separate zones.
- Zones can be almost any shape or any size.
- Each zone can have an independent schedule of watering days, and each can receive a different amount of water.

zone 3

Watering head

zone 11

zone 4

zone 12

A zone can be almost any shape.

Look closer

dot 8

dot 9

dot 7

dot 10

dot 6

dot 1

dot 5

dot 2

Figure A3
Defining a Zone
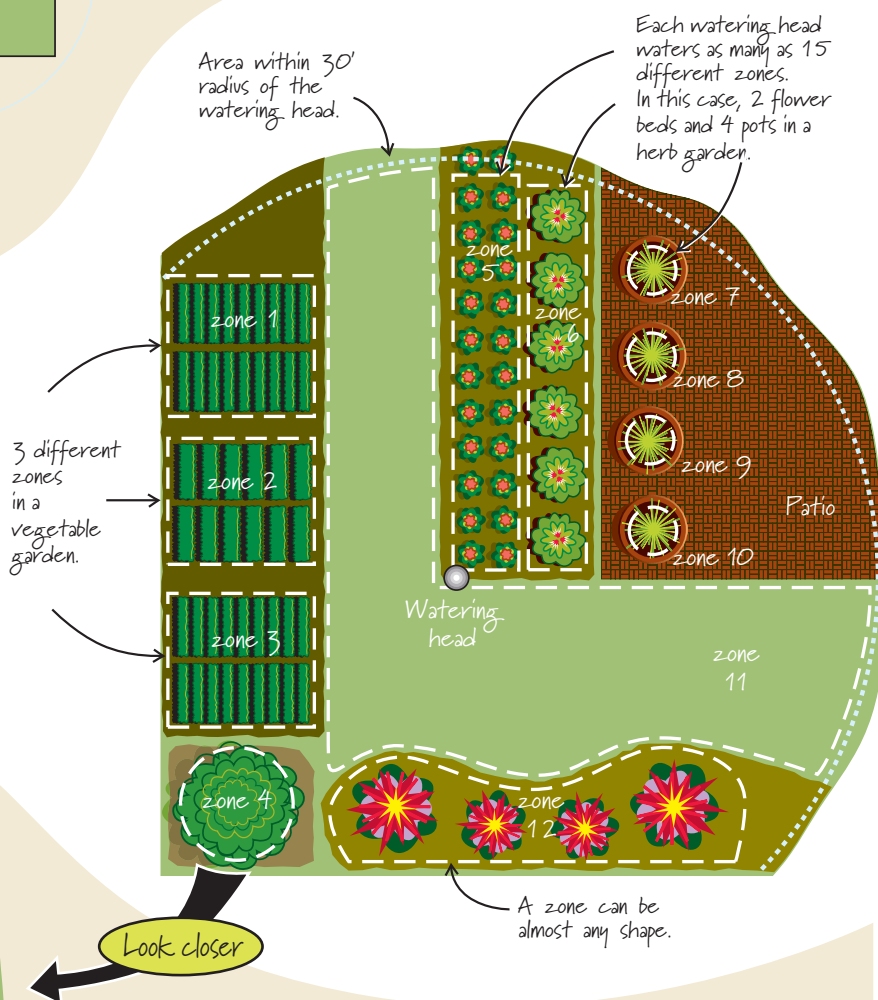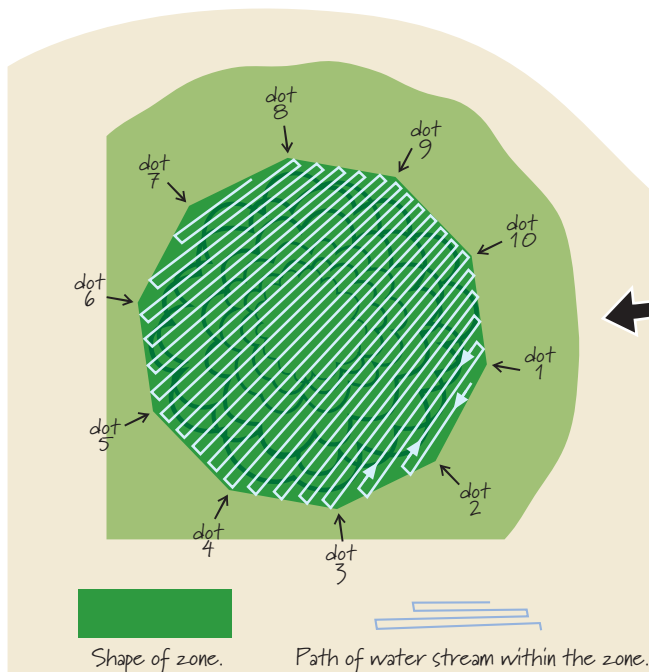- The zone is set by using the AccuRain Controller to outline the area you want to water by setting from 3-24 reference points.
- AccuRain fills in the outlined area, applying a stream of water evenly throughout the zone.
- Zones can be added, deleted, or modified at any time.

dot 4

dot 3

Shape of zone.

Path of water stream within the zone.

Figure A: A Typical AccuRain System Layout

Installation

The AccuRain watering system consists of the following major components:
• Controller
• Junction box
• Transformer
• One or more watering heads

The first three components must be installed indoors, or in a weather-protected outdoor enclosure.

To complete the installation, you will add four-conductor sprinkler cable, plastic pipe, and any necessary mounting hardware, all of which are available at most hardware and home-and-garden stores. Though there are some possible variations, a basic AccuRain system consists of a transformer plugged into a wall socket and connected to the junction box, which also serves as the terminus for a run of four-conductor sprinkler cable. This cable, which carries signals and low-voltage electricity, runs from the junction box to the first watering head, from the first watering head to the second, and so on. For an illustration of a typical system please refer to Figure B.

The Controller

The controller is the master overseer of your AccuRain system. Through its keypad and two-line display, the controller is used to program each of the watering heads with specific watering patterns at the time of installation, or any time you want to add, modify, or delete an area's watering pattern.

The controller then plugs into the junction box. At the times you've chosen, the controller signals each watering head to begin its work.

Please refer to appendices 1-3 for further information about programming and operating the AccuRain system using the controller. The topics covered in these appendices are as follows:

> Appendix 1: The System Operating Modes
> Appendix 2: The Controller System Menu
> (controller connected to junction box)
> Appendix 3: The Controller Watering Head Menu
> (controller to watering head)

Junction Box and Transformer

The transformer "brick" connects to an ordinary 120V wall socket. This provides the 24V DC power needed by the AccuRain system.

This power is delivered to the junction box, which serves as the power and communications center for your system. The controller plugs into the junction box, and the junction box serves as the connection point for the cable that carries power and instructions to each of the watering heads.
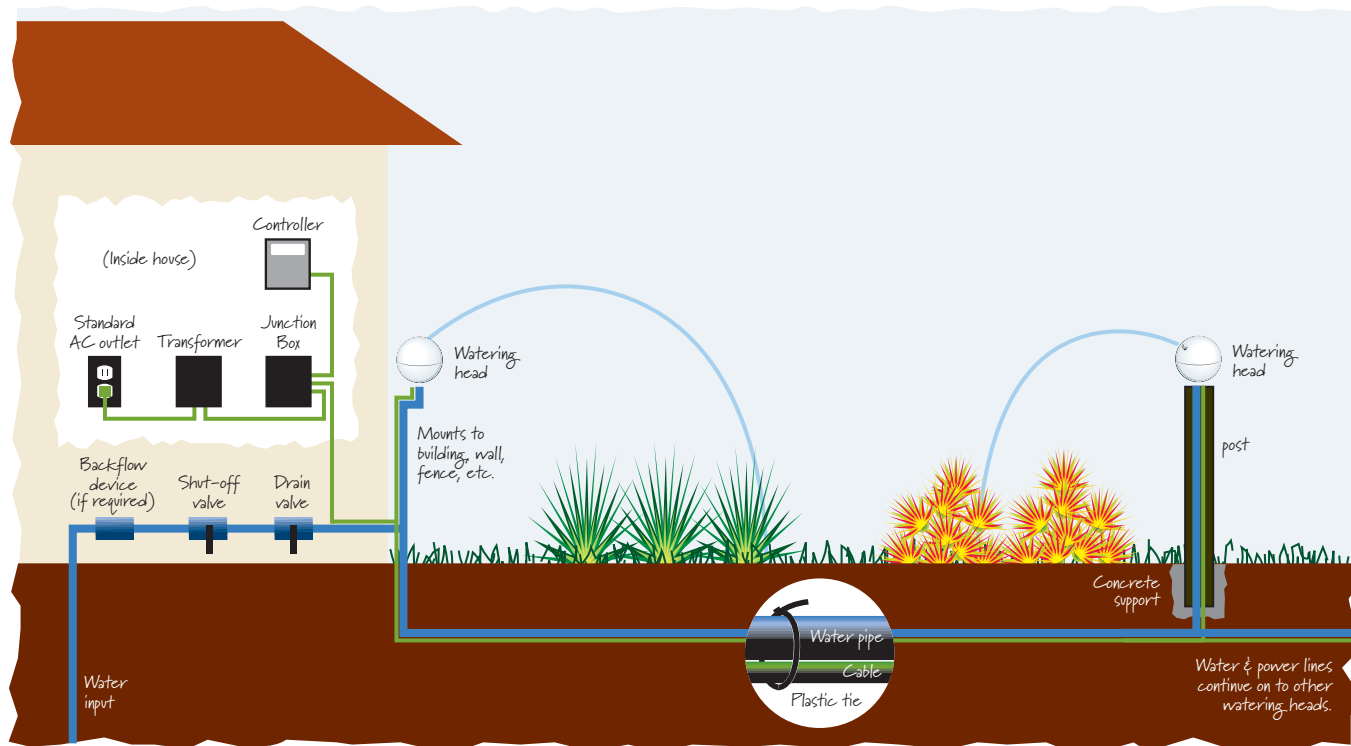
The Watering Head

The unique AccuRain watering heads have onboard intelligence that permits them to be programmed via the controller with up to 15 zones each. A zone is an area you define electronically with a series of dots (from 3 to as many as 24 to define a zone), and which receives an amount of water you select, on the schedule you set.

A watering head can rotate through a full 360 degrees, and project a stream of water up to 30 feet in any direction. This means a single watering head can water an area of up to 2800 square feet. A zone can be of virtually any shape and size that's within the watering head's reach. Each zone is independently controllable for size, shape, amount of water, and schedule, and a zone can be added, deleted, reshaped, rescheduled, or otherwise changed at any time and as often as the need arises.

When you enter the amount of water (in inches) you want at each watering, and select the watering days, the watering head automatically waters the plants to your instructions The watering head sends a stream of water up and down the zone in stripes, until the right amount of water is supplied evenly. Each pass, from one side of the zone to the other, puts down 0.05" of water. This gentle, rain-like application avoids the waste and expense of unnecessary runoff.

Because the watering head turns the water on and off, each watering head requires a single water pipe at a water pressure of between 45 and 75 PSI. By avoiding the need for multiple circuits common to conventional systems, the length of buried pipe is reduced to a minimum. You can limit the number of watering heads working at the same time in order to maintain water pressure, if necessary. There is no need for the electric valves or pressure regulators that add complexity to other systems.

Water is provided via pipe to the watering head at normal system water pressure (about 45-65 PSI for most residential systems). When the watering head turns the water on, it regulates the pressure to control the distance of throw, continuously

Controller

(Inside house)

Standard
AC outlet   Transformer   Junction
                          Box

Watering
head

Watering
head

Mounts to
building, wall,
fence, etc.

post

Backflow
device
(if required)   Shut-off
                 valve   Drain
                            valve

Concrete
support

Water pipe

Cable

Water
input

Plastic tie

Water & power lines
continue on to other
watering heads.

• The controller, junction box, and transformer are installed indoors (e.g., garage), or in a weather resistance box outdoors.

• The water line and cable can be run from one head to the next making installation easier. Separate water and cable runs for each head are fine as well.

• The watering heads are installed in your landscape within reach of all areas to be watered. The watering heads may be mounted on an existing structure (e.g., house, fence, or deck), or on a free-standing structure (e.g., composite post).

• Each head requires a water line and a 4 conductor - 18 AWG sprinkler cable.

• The water line and cable can be run together as in this illustration, or they can be separate.

• Place the backflow device (if applicable), shut-off valve, and drain valve (if your area is subject to freeze), close to the water source.

Figure B: AccuRain System Cross Section

lengthening and shortening the stream to "connect the dots" and water each zone as you have specified.

As the water flows through the watering head, most of it goes through the main valve at the side of the unit. The membrane in this valve can be removed and cleaned or replaced if sand or gravel in the water obstructs the valve. A very small amount of water is diverted through a separate channel and serves as a reference to control the water pressure at the nozzle. If this path becomes blocked, the unit must be returned to AccuRain for repair.

Piping

The watering heads obviously need water. Unlike most systems, the AccuRain system is under continuous pressure. You will connect to your main water system with plastic PVC pipe, and then run this pipe (along with the cabling) from one watering head to another. The pipe may, depending on your

installation, be either above ground, mounted on the side of your house or other structure, or placed in a trench with a vertical riser to each watering head. Many installations combine all three methods.

You may use one or multiple water sources for your AccuRain installation. The simplest installation usually involves one water source and one run of PVC pipe that goes from head-to-head. However, in some cases, it may make more sense to use multiple water sources. If multiple water sources are used, be sure that each includes the necessary backflow prevention device, shutoff valve, and drain valve as required.

A particular run of piping can be almost any shape. You can create the circuit that best fits your installation using different combinations of fittings, creating branches to supply your watering heads. The important thing to remember is to always follow good plumbing practices and your local codes for irrigation systems.

Installation Considerations

> Irrigation systems are subject, in varying degrees, to local building codes. Check your local code for regulations relating to the type of piping permitted, minimum trench depth, required backflow regulators, and other considerations. Some jurisdictions mandate that the actual connection to the main water system be made by a licensed plumber.

> Most jurisdictions allow the use of plastic pipe, which is easier to work with than metal. Half-inch pipe is sufficient. Schedule 40 is suitable for buried pipes, but Schedule 80 pipe should be used for above-ground piping.

> The watering head comes with a 1/2" female pipe thread and connects to a riser with a 1/2" male thread. Use plastic wire ties to attach the electrical cable underneath the water pipe for protection and support, and a tidier appearance. If you are in a location where rodents are likely to chew through the cable, place it in a separate PVC pipe.

> Watering heads should be mounted at least four feet high, to take advantage of their maximum 30-foot watering radius.

> Each head must be securely mounted, to prevent vibration when the system is operating. If the pipe is in a trench, you will use a riser pipe, which must be fixed to a post or other sturdy support. We recommend a metal, redwood, or composite fencepost.

> If the watering head is being placed on a house or other structure, it must be firmly mounted to eliminate vibration, and not be impeded by the roof or other overhang.

> If you're going to be trenching, check for a local number that gives utilities an opportunity to come out and mark the placement of their underground pipes and cables. There is no cost for this service, and in many jurisdictions if you don't take advantage of it and wind up disrupting service, you are responsible for all the costs and a fine! Be sure and do this enough in advance to allow the utility time to come out and provide this service. For a list of numbers, ask your local building department.

Figure C: Tee on a PVC Pipe

Getting Started

The installation process consists of
• Installing the pipe
• Installing the cable
• Mounting the watering heads
• Installing the junction box
• Connecting the wiring

Installing the Pipe

The AccuRain system requires that water be supplied via half-inch pipe. There are many types of pipe for buried and above-ground applications, including metal and various grades of plastic. Each local government agency has building codes that specify the type of materials that can be used. Always follow your local codes.

If permitted, we recommend using plastic (PVC) pipe. It is easy to work with, requiring only a tool designed for cutting plastic pipe and a special PVC glue for joining pieces. You will find the necessary materials, and a wide range of fittings, at any hardware or home improvement center. If you would like more information about working with PVC pipe or basic plumbing, consult one or more of the following sources: home improvement/hardware store sales consultants; books on basic plumbing; plumbing/irrigation system resources on the Internet. Please check our website for useful links.

Any below-ground portions of your system can consist of Schedule 40 PVC pipe. This is generally white. Any above-ground portions of the system should use Schedule 80 PVC. This is generally gray in color.

We recommend that you buy a pipe cutter to cut the plastic pipe to length. A saw leaves burrs and slivers of plastic inside the pipe that may get into the main valve and cause the watering head to leak.

Each point at which your AccuRain system connects to the main water source should have a shutoff valve, a backflow valve (if required by local ordinance) and a drain valve. The drain valve should be installed at the low point of the system. (see Figure B).

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Now you're on your way. Just attach additional sections of pipe using slip joints and PVC glue, until you come to the first place where there will be a watering head. At this spot, you will in most cases add a 90 degree elbox or tee fitting and a riser pipe (see Figure C). The riser, which should be threaded with a male thread on the end where the watering head will go, must be firmly attached to a structure or post so the riser does not vibrate excessively when the system is operating. If you are using a post, we recommend either a chainlink fence post, or a hollow redwood fencepost, secured in concrete. While a riser is the most frequent installation, there are many possibilities for placement of the watering head, and how you get the pipe to it. You may want to skip ahead and read the "Mounting the Watering Heads" section for more information on your options.

Use a bubble level to make certain the riser is truly vertical before fixing it in place.

If your installation requires long runs of pipe placed below ground, it may be worthwhile renting a powered trench digger from a local tool rental depot. The cost will be repaid in saved time, and a consistent trench that makes laying the pipe easier.

Make certain that pipe in a trench is not resting on a rock or anything else anywhere along its course. Such an obstruction could cause the pipe to bend when the trench is backfilled, weakening the pipe and eventually causing it to break.

Continue placing the pipe until you've covered the area as planned. While the most common pipe plan is one continuous circuit, alternatives are possible, including multiple connections to the main water system.

When all the pipe is in place, but before any of the watering heads are attached, it is extremely important that you flush the entire system. Open the shutoff valve and let the water run for at least 30 seconds, to force any soil, rocks, plastic shavings, or other contaminants from the system.

Figure D: Junction Box Installation

Installing the Cable

The four-conductor cable starts at the junction box and runs to the nearest watering head, from there to the next watering head, and so on. As with the pipe, the most common arrangement is a single daisy-chained circuit, but alternatives are possible.

You can use multiple cables to supply the heads in your system. For example, if you have two heads in the front and two in the back of your house, it may make sense to run a cable to each location. The important thing to remember is that you will need to splice the two (or more) cables together before entering the junction box, which has only one cable entry. We recommend that any splice points be accessible for troubleshooting purposes.

The four-conductor cable is conventional sprinkler system cable, available anywhere that sells sprinkler supplies. It is rated for underground burial. There is no problem with using cable that has more than the required number of wires; just ignore the unneeded wires. The wire in any cable should be 18AWG or larger. This is a fairly heavy wire, so do not plan on making any extremely sharp turns in the cable run, or you risk weakening and eventually breaking one or more of the wires.

Leaving a foot or two of extra cable at the junction box end, start your run to the first watering head. Using wire ties every couple of feet, secure the cable to the pipe or whatever structure is available. This creates a neat installation, and minimizes the chance of damage from torn cable.

Follow these installation practices when placing your cable:

• Make certain the cable is placed so that it isn't a hazard to passersby.

• Place the cable so it is not subject to damage from mowing or other activities.

• Wherever the cable passes through or around a structure or other object, make certain it is protected from abrasion that would wear through the insulation over time

• If placing cable in a trench with pipe, use wire ties to secure the cable to the pipe.

• If squirrels or other rodents are prevalent in your area, consider laying a second set of PVC pipe or electrical conduit to protect the cable from being gnawed through by these pests.

• Where the cable leaves the junction box, use clamps (available at any hardware store) every couple of feet to attach the cable to the wall so it is not sticking out. This creates a neat and safe installation. See Figure D.

• It is desirable to avoid underground splices when installing the cable if possible. Splices make troubleshooting more difficult. If you do opt to splice, use waterproof wire nuts made specifically for such purposes. Above-ground splices must also be made with waterproof wire nuts.

As you come to the place where each watering head will be placed, measure out an additional two feet or so of cable and cut the cable. Then, allowing another foot or two of slack, start the next cable run. These "loose ends" will soon be wired to connection terminals inside the watering head.

Continue to run the cable in this way, connecting one watering head position to the next.

No special considerations are needed for a system where the farthest sprinkler is less than 500 feet of wire away. If distances greater than 500 feet are involved, you need to maintain at least 18 volts DC between the red and black wires at the most distant sprinkler. You could use a heavier gauge wire, or use 7-conductor cable, using the extra wires to cut the voltage drop on the red and black wires.

Mounting the Watering Heads

Now that your pipe, cable, and risers are in place, and your system has been flushed, it's time to install the watering heads.

There are many ways the watering heads can be installed, including on risers attached to newly-installed posts (metal or wood), attached directly to light or other existing posts, attached directly to buildings or other structures, placed atop topiaries (wire-framed animals and other decorations over which plants grow to form a living structure), and many we haven't even thought of yet. The main requirement is that the watering head be firmly attached and supported so it can't vibrate excessively when operating.

Figures E show some of the ways a watering head can be mounted. Any and all work fine, as long as you follow the basic principle of making sure the watering head is firmly attached to something that can't shake easily when the unit is watering.

Each watering head has a short stub of PVC pipe with a female adapter that is threaded, ready to connect to the pipe riser's male thread. Wrap the male thread with a few turns of Teflon tape, then attach the watering head.
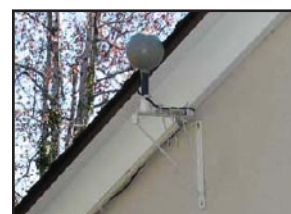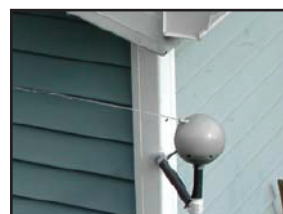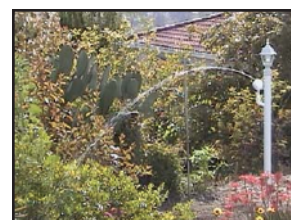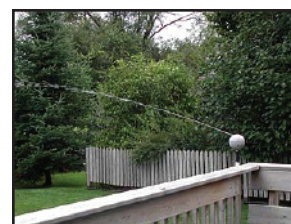
Figure E: Various installation options

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Hand-tighten only. The watering head should be firmly screwed onto the pipe, but not over tightened, in order to avoid damaging the plastic pipe and creating a leak in the system.

Installing the Junction Box

The junction box and transformer, as previously noted, must be installed where there is electricity and in an area protected from weather. This can be either indoors (inside a garage or in the house) or in a weatherproof outdoor box.

The controller will eventually plug in and be placed on the junction box, and you want to be able to easily read the controller's display.

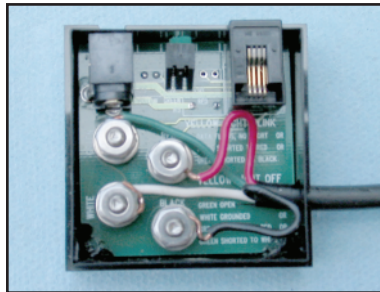The junction box can be mounted to a wall with the provided double-faced tape.

Figure F: Junction Box wiring connections

Connecting the Wiring

It's time to put it all together. At this point, you have the junction box mounted in a protected area, with one end of the cable nearby, and cable and pipe running to each mounted watering head. All that remains is to hook up the wires, program the watering heads, and start watering!

Let's start at the junction box. Cut the cable so it easily reaches to the junction box, then strip the insulation from about a half-inch length at the end of the four wires. Note that each wire is a different color. Open the junction box. As shown in Figure F, you will see four terminals, each clearly marked for the appropriate wire color. Simply loosen each screw, slip the bare wire end into the appropriate terminal, and tighten the screw firmly but not excessively. The junction box is now wired! Leave the cover off for now. We'll later be testing to make certain the unit is working correctly. You're now ready to start wiring the watering heads.[Fig. G: Above]

Each watering head has a two-piece cover, held together with two long screws. Go to the first watering head and remove the bottom cover with several counter-clockwise turns, using a Phillips head screwdriver. There is no need to remove these screws completely, as they will remain in place unless unscrewed too far. This cover will remain off while you wire

and program the watering head, and until you've confirmed that the system is working correctly.

Take the end of the wire that is coming IN to the watering head from the junction box and put one loop in it; this provides some extra wire in case repairs are necessary at a later date. Then cut any excess, and strip the insulation from the four wires, as you did at the junction box. Use a pair of needle nose pliers to put a U-shaped turn in each wire, and attach it to the appropriate color-coded terminal, as shown in Figure G.

Repeat this process with the outbound piece of wire (unless this is the final head in the run). That's it! Your first watering head is wired. Leave the cover off so you can program the watering head and test for correct operation.

Wire any remaining watering heads in the same way. At the last watering head in the system, you will have only the incoming wires to attach to the terminals.

That's all there is to it. You've just installed an AccuRain watering system, and are about to achieve optimal irrigation. All that remains is the system startup, which includes programming each watering head for the first time, testing, and backfilling any trenches.
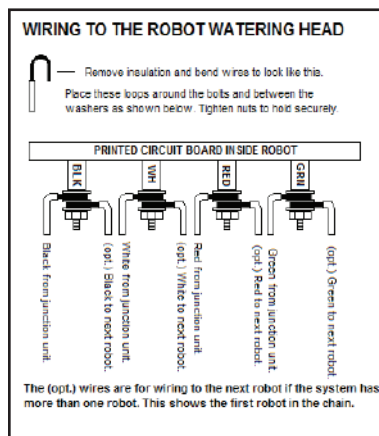

Figure G: Watering Head Wiring

Startup

It's time to start up your AccuRain system. The basic steps here are
- Connecting the transformer and junction box
- Programming the watering heads
- Backfilling any trenches

Connecting the Transformer and Junction Box

Let's start at the junction box. Plug the transformer into the wall socket and connect it to the junction box, as shown in Figure H. Plug the controller into the junction box. You should see, an AccuRain screen, and then a screen that tells you the system is in System Mode and the number of robots found in the system. It should match the number you installed if the wiring is correct.

Note that the standard power supply transformer that comes with the AccuRain system is sufficient to handle six watering heads. If your system is larger, you will need to order the larger transformer.

Programming the Watering heads

Now you get to the heart of the AccuRain watering system. You are ready to program each watering head, creating zones configured in any way you want and set for whatever watering schedule you feel is correct.

Unplug the controller from the junction box and carry it to the first watering head. The controller is plugged into the watering head (as shown in Figure I) only to program the head for the first time or when you want to change zone configurations. At all other times, the controller will be plugged into the junction box, from which it controls all the watering heads in your system, notifying them of when it is time to get to work.

First, let's take a closer look at the controller. See Figure J as we visit the various control inputs.

Figure H: Connections to Junction Box (Controller, Transformer)
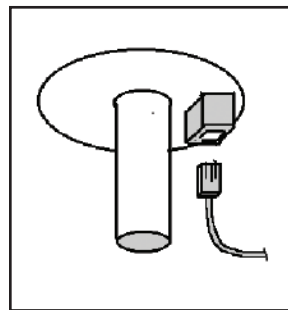
Figure I: Controller connection to Watering Head

Figure J: Controller

You will be telling the watering head what to do by using these buttons to either select items from a list displayed on the two-line display, display a different list, or control the water stream.

Every watering head must first be given a unique name (which can be as simple as a number, or something more memorable such as "House West.") You can enter a maximum of 16 letters and numbers for a watering head name. Zones (of which you can have up to 15 for each watering head) are named in the same way.

There are two windows in the watering head menu used to give names: one window where you name (or rename) the watering head, and a second window for naming the zone.
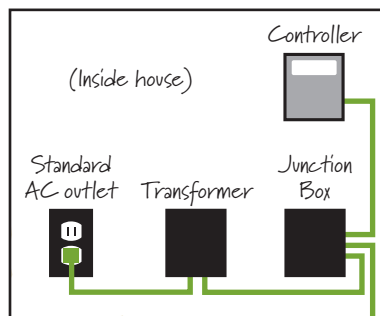
Names are entered much as they are in a cell phone. The first character of the name or the new name flashes, indicating that you can enter or change a letter. Press the Up or Down arrow key to scroll through the alphabet, numerals 0-9, and a space. Press and hold the key to fast forward or reverse through the character list. When the letter or number you want to enter is showing, press the Right arrow key. This takes you to the next character position. Continue selecting characters until the name is complete. Then press NEXT>, which takes you to the zone naming window.

You can designate each zone by number, or enter a name that will help remind you what it is watering, such as "rose bushes" or "east lawn." Creating a real name is usually the better strategy, unless you only have a single watering head with one or two zones, because a year or two later "Robot 01, Zone 03" doesn't necessarily have a lot of meaning.

After you are done entering a zone name, the watering head goes to its home position and begins to emit water. In many cases, there will be a short burst of water as the valve opens and then a slight dribble from the nozzle. This

occurs because the water flow is at its lowest possible point. Use the Up and Down arrows on the controller to increase the stream intensity. It is waiting for you to define the limits of the zone by setting "dots" around the area. Use the Up, Down, Left and Right arrows to steer the water to the closest position on the boundary. The four buttons act as a joystick, allowing you to position the stream anywhere within its range. You will quickly see how pushing these buttons steers the stream, making it longer or shorter and turning it left or right. Simply steer it to the spot that is closest to the watering head and farthest to the left of the home position, so you can set dots in a generally clockwise fashion. When you have placed the stream at the correct location of Dot 1, press NEXT>.

The next window now prompts you for Dot 2. Simply repeat the dot placement process described above. Each time you set a dot, you are prompted to go to the next Dot.

The screens you will see while creating a new zone are shown in Appendix 3.

While placing the dots, examine the quality of the water stream coming from the watering head nozzle. The stream is tight as it leaves the nozzle and for targets close to the watering head. As the stream gets farther from the watering head, it tends to spread out. At full range, the stream may cover an area about two feet in diameter.

Here are some guidelines to follow in placing the dots:
> Place the dots where you want the zone boundary to be. You can easily make minor adjustments later, if needed.
> Set the first dot at the left side of the zone boundary.
> Set the remaining dots in a clockwise direction.
> Keep the dots a few feet apart
> Put in more rather than fewer dots, for better accuracy.
> Do not close the zone polygon by placing a dot on top of the first dot. The system will do this. A square has 4 dots, not 5.
> A minimum of three dots is required to define a zone; there can be a maximum of 24 dots.

When you have set the last dot, press NEXT> twice, without pressing any of the arrow keys. The system recognizes two consecutive NEXT> keys as the last dot.

There are three additional things the watering head needs to know in order to water a zone, and you will now set these.
• **Amount to water.** This is the amount of water delivered at each watering. The default is 0.1 inch. You can set the value anywhere from .1 to 2 inches in .1 inch increments. How much should you water? This is a complex question with no single,

easy answer. For some general guidance, see Appendix 4, How Much Water is Enough? There you will find some general guidelines, and some resources to which you can refer for more detailed information.

• **Days to water.** The window shows a two-week sequence of days, from Sunday to Saturday. The default setting for this screen is every day. It looks like this: SMTWTFS SMTWTFS. This means that this zone is scheduled to be watered every day. Press the UP or DOWN arrows to delete a day, and the zone will not be watered on that day. Use the LEFT and RIGHT arrows to move from day to day in the two-week scheduling window. If you choose to water a particular zone only on Mondays, Wednesdays, and Fridays, this screen should look like this: M W F M W F .

If you select a particular day or days to water a zone, then the corresponding letter (e.g. M W F) will be visible. If you do not wish to water, the corresponding letter for the particular day of the week will not be visible.

• **ENABLE the zone.** The zone must be enabled (activated) or it will not be watered. You can use this control to temporarily skip a zone, perhaps because you are changing plantings or doing construction. When a zone is disabled, its shape definition remains stored and can be reactivated at any time. The screens for these are shown in Appendix 3.

At this point, the watering head gives you the option of watering the zone according to the instructions you have entered, or returning to the first window. Press NEXT> to water the zone, or Home to skip watering and return to the top window.

Program any additional zones on this watering head, then do the same for any remaining watering heads, moving the controller from one to another.

When all the watering heads are programmed, return the controller to the junction box, plug it in, and check for the following:

All values are shown in a list. Use the Up or Down key to select a value and press the NEXT> key to store that value in the watering head memory. When you reach the last item, the list wraps to the first item. Items selectable from a list include:
• Weather
• Day and Time
• Starting Hour
• Maximum No. of Robots (watering heads)

- Amount to Water
- Robot (watering head) Name
- Zone Name
- Zone Enabled/Disabled

Refer to Appendix 2 for more detail.
- Are the day and time set correctly? If not, use the appropriate screen to set them.
- Have you set a start time? This is the time the system will activate each day, putting to work any watering heads due to water that day. You can set this time from the Starting Hour screen.
- Is the junction box functioning properly (green light illuminated, and blinking)?
- Does the controller screen say "X robots ON" where "X" equals the number of robots in your system?

If all of this is at it should be, complete your AccuRain system installation by:
- Reattaching the bottom covers to all the watering heads.
- Reattaching the cover to the junction box.
- Backfilling any trenches.

If any of the indications are not correct, see Appendix 5, Troubleshooting.

Routine Operation

From this point on, your AccuRain watering system requires little if any action on your part. When the system is installed and set up, and all the zones have been created, you can put the system into AUTO mode and the watering heads will water the yard automatically. At the start time you selected, the AccuRain system will begin watering the zones scheduled to water that day. The AccuRain controller constantly monitors the system for activity. At the scheduled start time, the system may begin at any one of the zones scheduled for that day. Likewise, the starting zone and the order may vary from day to day.

There are two other operational modes, DELAY and MANUAL.

The DELAY mode, when engaged, skips watering for the current day. Watering resumes the next day. DELAY mode is useful for skipping a rainy day (see also Rain Switch, below), or when you have something to do in the yard on a day when irrigation is scheduled.

MANUAL mode essentially turns the system off. It will remain inactive until you manually return it to AUTO mode. While in manual mode, you may water individual zones one at a time.

Special Settings/Options

There are a few special settings you should know about that affect day-to-day operations.

Weather Modifications. Whatever amount you set for each zone will probably be too much during periods of prolonged cold or wet weather, and perhaps too little for periods of prolonged heat or drought. But it's not necessary to reprogram every zone for each change in the weather. Remember, AccuRain is all about optimal irrigation.

The "Weather" screen on the controller enables you to modify every zone on every watering head by a fixed factor at the push of a button. If the weather is hot and dry, set the weather to HOT. This multiples the amount of water programmed for each zone by two. Cool outside? Set the weather factor to COOL and each zone receives half the programmed amount of water. If it's cold and wet, setting the weather to COLD reduces the watering to one-quarter of what was originally programmed (but a minimum of .1 inch).

Zone Adjustments. Once a watering head has been programmed for the first time by direct attachment of the controller, you can make changes to the amount of the water or the days to water a zone from the controller at the junction box,

without having to plug the controller directly into a watering head. Access any watering head from the Robot menu, and make whatever changes you want to the schedule or amount of water. The only action that requires reattaching the controller directly to the watering head is if you wish to create a new zone, modify the shape of a zone by moving or adding dots, or delete a zone.

Rain Sensor. A rain sensor (available at most sources of sprinkler supplies) can be wired into the junction box of an AccuRain system. When the Rain sensor gets wet, it interrupts power (red wire) to all watering heads and the controller displays the error message "MISSING ROBOTS". When the rain sensor dries out, completing the circuit, the system automatically resumes operation from the point where it was interrupted.

Follow the instructions supplied with the sensor you purchase. Install the rain sensor so it is exposed to the rain but not to water from any watering head. Run the sensor's cable to the

Figure L: How to connect a rain sensor

junction box. Figure L shows wiring details. When you strip the wires from the regular cable for the junction box connection, cut the red wire so that it is long enough to connect to the rain sensor cable. Select the two wires that connect to the rain sensor. Connect one wire to the red wire using a twist connector. Connect the other side of the sensor to the red terminal in the junction box.
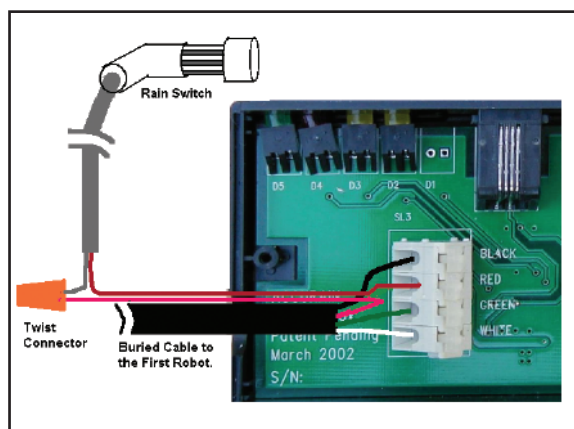
Maintenance

The AccuRain watering system requires very little maintenance on a routine basis, and will provide many years of reliable service.

Power Outage. If you experience a power outage, you will need to re-enter the system's day and time settings. The system time will be off by the amount of time the power remained off. All zone settings remain in memory and there is no need to reprogram the zones. When power is restored, the system will resume its watering schedule where it left off. If frequent power outages are a problem, installing an uninterruptible power supply of the type used to protect computer systems can help avoid the need to reset your AccuRain system.

Winterizing the System

If freezing conditions are anticipated, drain the system using the drain valve(s) you installed. This will keep the watering heads' internal mechanisms from being damaged by the expansion of freezing water.

A frost will not normally damage the watering head. A freeze warning, however, requires that you drain the system of water. The watering head will not be damaged by cold temperatures if it is completely drained.

It is not necessary to remove the watering heads and store them inside during winter.

Appendix 1

The System Operating Modes

Select one of these three modes using the AUTO/MANUAL/DELAY key (_), in the upper right-hand side of the controller keypad.

No Robots On AUTO Next>	AUTO Mode. Operating (HOME) idle. This window shows the system is set up to perform the daily watering schedule, but no heads are watering. Press NEXT> to make changes. Refer to Appendix 2.
01 Robots On AUTO Next>	AUTO Mode. Operating (HOME) watering. The system is performing the daily watering program. The window shows you how many watering heads are actively watering zones. Pressing Next> to go to the system windows interrupts watering. Watering resumes when you return to AUTO.
No Robots On DELAY NEXT>	DELAY Mode. Press DELAY(_) to stop watering for the day. Watering automatically resumes next day with the delayed watering program, and the new day's program. Refer to Appendix 2.
No Robots On MANUAL NEXT>	MANUAL Mode. Press(_)to turn the system OFF. Press(_) to turn the system ON and return to AUTO. To water a zone manually, press Next> to select the zone.

Appendix 2

The Controller System Menu

This menu allows you to change the system settings and look for a fault. You may select a watering head and zone to make changes in the zone watering amounts or frequency, and see the next watering day. You can manually water a zone.

Operating Mode Window

No Robots On
AUTO Next >

AUTO, DELAY, or MANUAL Operating Mode Window. Press NEXT> to make system settings. System Settings

System Settings

Weather ⬍ Next>
water NORMAL 1X

Weather. Change the frequency of watering for hot and dry, or cold and wet conditions. Select from the list: NORMAL 1X, COOL .5X, COLD .25X, HOT 2X.

Clock ◄► Next>
MON A.M. 8:00:05

Clock (Day and Time). Press the Up/Down arrows to set the day of the week. Press the Right arrow to save. Press the Up/Down arrows to set the hour (AM or PM). Press the Right arrow and the Up/Down arrows to set the minutes and then the seconds. Press NEXT>.

Starting Hour ⬍
7 A.M. Next>

Start Watering Time. Use the Up/Down arrows to set the time of day that you want watering to begin. Press NEXT>.

Max # of Robots on
at once: 06 Next>

Maximum # of Robots. Limit the number of watering heads watering at the same time. Too many will lower the water flow to each watering head.

Searching for Robots...

Identifies all available watering heads (robots).

Select a Watering Head; Select a Zone.

(Robot NAME)
Select Robot ⬍ >

Select a watering head (robot) from the list of active heads. You can change the watering head's name at any time if the Controller is plugged into the head directly.

(ZONE NAME)
Choose Zone 01 ⬍ >

Select the zone from the list to make a change to a value or water the zone manually. If the zone is not ENABLED, the display shows "ZONE IS DISABLED."

(Zone 01 Name)
Zone ENABLED ⬍ >

You can enable or disable a zone using the Up arrow. A disabled zone remains in memory and can be enabled later. Press Next> to continue.

Enter Watering Amount and Frequency. Check That the Zone is Enabled.

Days to Water ⬍
SMTWTFS SMTWTFS

Select the days of the two-week scheduling window that you want to water the selected zone. Select (or deselect) a day using the Up/Down arrows. Move from day to day with the Left/Right arrows.

Amount to Water
0.3" of water

Using the Up/Down arrows, select from a range of 0.1 to 2.0 inches in 0.1 steps. Press Next> to continue.

Appendix 2 (count)

Water the Zone Manually or Return to the Top Window.

Water Zone Now?
Yes:Next> No:Home

Water the zone now or return to the top window (Home). This does not affect the daily watering program.

Wait…Finding Home
Position

The watering head moves to the zone and begins watering.

Watering Zone
(ZONE NAME)

The screen indicates which zone is currently being watered.

(Head Name)
(Zone Name)

This screen indicates the robot and zone currently being watered.

(Zone Name)
Watering 01/03

This screen indicates where the system is in watering the current zone. The units are in tenths of an inch of water. In this example, the robot is watering the first tenth (0.1" = 01), and it is programmed to water three tenths of an inch (0.3" = 03).

Appendix 3

The Controller Watering Head (Robot) Menu

   This is the menu you see when the Controller is plugged into the watering head, which on the menus is referred to as a Robot. It must be used to name and program the watering head, and set the dots that define a zone.

First Window. Name a New Watering Head, or Select a Head by Name.

(Robot NAME)
Robot Name ◄♦►

You must assign a name to the watering head so that you can return to it later to add or change zones. Naming the head also puts it into the system memory. Choose a name that tells you the head's location or otherwise identifies it as unique.

New Head: Select a NEW zone and press the Up/Down arrows to enter a letter of the name, and the Right arrow to go to the next letter. Press Next> when the name is complete.

Existing Head: The display shows the watering head name. Press Next>. You may also change the name of the Robot using this window.

Name a New Zone; Select or Delete an Existing Zone.

(ZONE NAME)
Choose Zone 01 ♦ > Next>

New Zone: Press the Up/Down arrows to select NEW. Go to the Zone Name window. Existing Zone: Press the Up/Down arrows to select the zone from the list. Press Next>.

(ZONE NAME)
To Delete ◄ Next>

(Existing zone only). To Delete a zone, press the Left arrow. To keep the zone, press Next> for the next window.

(ZONE NAME)
Edit ZoneName ◄♦►

Press the Up/Down arrows to select each letter of the name, and the Right arrow to go to the next letter. Press Next> when the zone name is complete.

Create the Zone Dots. Enter Three (3) to 24 Dots.

Wait...Finding Home
Position (ZONE NAME)

New Zone. (Wait) The watering head turns to its home position, and then squirts water.

Existing Zone: (Wait) The water stream goes directly to Dot 01 of the zone boundary.

Move Water ◄♦► 001
Set Dot 01>Next> Next>

New Zone: Use the Up, Down, Left, and Right arrows to move the water stream to where you want Dot 01 to be.

Existing zone: The water stream goes to Dot 01. Modify the water stream to refine your dot, or press Next> to accept the dot. Moves to Dot 02.

The three-digit number in the top right of the screen is the water flow indicator. The range is 0 (min) to 255 (max).

18

Appendix 3 (count)

Move water ◄♦► 080 Set Dot 02>Next> Next>	New Zone: Use the arrows to move the water to where you want Dot 02 to be. Existing Zone: The water jet goes to Dot 02. Move the water, or accept the location. Press Next>; Dot 02 changes to Dot 03.
Move water ◄♦►255 Set Dot 03>Next>	New Zone: Using the arrows, move the water to where you want Dot 03 to be. Existing Zone: The water jet goes to Dot 03. Move the water, or accept the location. Press Next>; moves to Dot 04. After the last Dot (3-24) when the zone is complete, press Next> Next>. Remember DO NOT CLOSE THE POLYGON. The system takes you to the Amount to Water window.

Enter Watering Amount and Frequency, Enable the Zone.

Amount to Water 0.1" of water ♦	This enables you to select the amount of water given to the zone at each watering. Press the Up/Down arrows to select a value from 0.1" to 2.0" in 0.1" steps. Press Next> to continue.
Days to Water ♦ SMTWTFS SMTWTFS	Select the days of the two-week scheduling window that you want to water the selected zone. Select (or deselect) a day using the Up/Down arrows. Move from day to day with the left/right arrows.
(ZONE NAME) Zone ENABLED ♦ >	New Zone: A new zone shows DISABLED and must be ENABLED by pressing the Up key. Existing Zone: You can DISABLE an active zone; the zone values remain in memory and the zone can be ENABLED later. Press Next>
Water Zone Now? Yes:NEXT> No:HOME	Press Y to water the zone according to your instructions. Press Home to go to the Top Window. The zone is included in the next watering program.

Water the Zone Manually or Return to the Top Window.

Wait…Finding Home Position	The watering head moves to the zone and begins watering.
Watering Zone (ZONE NAME)	The watering head moves to the zone and begins watering.
(Head Name) (Zone Name)	This screen indicates the head and zone currently being watered.
(Zone Name) Watering 01/03	This screen indicates where the system is in watering the current zone. The units are in tenths of an inch of water. In this example, the watering head is watering the first tenth (0.1" = 01), and it is programmed to water three tenths of an inch (0.3" = 03).

Appendix 4

How Much Water is Enough?

One of the things that makes traditional watering systems so wasteful is that they apply water for a fixed period of time, rather than delivering a specific amount, and they water everything in an area the same amount, without regard to its actual requirements.

AccuRain offers optimal irrigation, the ability to water each type of planting from cactus to tropical fern according to its specific needs. This is accomplished with the electronically-created zones for each watering head. Each zone can be programmed to deliver a specific amount of water on a specific schedule from once a day to once every two weeks.

But how much water is enough? You aren't used to thinking of your landscape's water requirements in terms of tenths of an inch of water per day or week, so here are some guidelines to get you started. Then the best indicator is how your plants are doing. If the soil never dries out between waterings, cut back; if plants start to show signs of stress, such as browning leaves, increase the amount.

- Many people using conventional systems water everything for a fixed amount of time two or three times a week. For every 10 minutes of time, substitute .1 inch of water with the AccuRain system (at the same frequency per week).
- Consult your local agricultural research station, arboretum, botanical garden, or nursery for their recommendations on each specific lawn and other plant type you have. Remember, one of the great advantages of the AccuRain system is that you can create a zone to water just a few plants that have exceptional requirements.
- Check the AccuRain website for useful links regarding watering.

Appendix 5

Troubleshooting

If you should have problems either during setup or later, here's how to track down the issue.

Problems You Can't See—Fault Indications

The AccuRain system tries to anticipate and document any obvious system failures and communicate that information to you via the Fault window in the controller screen. The Fault window in the system menu helps you identify a problem in the system. This window displays a letter for the type of problem present. The Fault window may also show a "Missing Robots" message if the controller cannot contact any of the watering heads installed in the system. The display identifies the missing watering head by name, and the red "CHECK SYSTEM" light on the controller illuminates.

The first thing to do is to try to clear the fault indication by pressing the LEFT arrow key. If the error message remains, then follow these steps to identify and fix the problem.

The possible fault indications are as follows:

Data Error (D)—This occurs when a watering head processor detects bad data but the rest of the system is not affected. This happens if the system detects data in the memory that is outside of accepted limits. The watering head will continue operating where it can process the information. You should step through all the parameters for the indicated zone to make sure they are correct, and watch it go through a scan to make sure the dots are correct. The watering head will not water the zone if it finds bad data for that zone, so you must check and correct the data. Examples of bad data could be dots that are too close together or overlapping.

Rotation Error (R)—This message indicates that a watering head's top cap is not rotating properly during operation. This is usually a mechanical problem. Examine the watering head and check that the top rotates properly and is not obstructed in any way (wire, fallen limb or other debris, etc.). The watering head should rotate a small amount each time the water stream reaches the minimum and maximum range for whatever stripe it is laying down. Also check the accuracy of the stream direction to make sure that it has not shifted from the original settings.

Water Error (W)–This message indicates that the watering head does not have a supply of water to use. In most cases, this indicates the water supply is not turned on. If you have a filter on your water line, the filter may be clogged. In either case,

check the water supply line and filter if applicable. If you still have a problem, please contact AccuRain for technical assistance.

Parameter Error (P)—"P" error. This error indicates one of two possibilities. Either water is flowing when it shouldn't, or there is a loss of calibration data in the robot. If you see this error message, first try to clear it by pressing the left arrow key. If the message remains, please follow the procedure for calibrating the watering head, as described in Appendix 6.

Missing Robots—All missing watering heads are listed in the Fault window. Use the Up or Down arrow keys to see all watering heads listed. Because most systems are wired in series (daisychained), all watering heads beyond any wiring fault will show up as missing. There is usually just one problem spot.

A missing watering head hasn't actually gone anywhere. This fault usually results from a wiring problem, and the location of the first missing watering head indicates the location of the fault. Start by checking the wires at the missing watering head to make certain they're all securely connected to the circuit board and not touching another wire or anything else other than the correct colored terminal. Look for any breaks in the wire.

Next, check the wires where they connect to the prior watering head in the system. The fault can be anywhere from there to the watering head that's showing up missing.

If the problem isn't at either end, you may have a problem with the wiring in between. But before digging up any buried cable, run a temporary jumper wire from the last functioning watering head to the first missing watering head. If this solves the problem, then you've confirmed that the issue is the wiring in between. If this does not solve the problem, there is the possibility of an internal failure of the missing watering head's circuit board. Contact AccuRain to discuss the issue. Please note that if you have a rain sensor installed in your system, this message most likely indicates that the system was interrupted due to rain. No action is necessary. Once the rain sensor dries out, the system will operate normally. Check to make certain the sensor isn't sitting in a puddle or otherwise giving a false indication.

Problems You Can See

These are the problems that can be detected visually.

System is watering at incorrect times or not at all----If the watering head waters when you think it shouldn't, check the following:

• **System Time**– Check the system time to make sure it is correct. A power outage could have modified the time, delaying the start time.

• **Zone Enabled/Disabled**– If a zone is disabled, it will not water. You can check this with the controller plugged into the

junction box or the watering head.

• **Auto/Delay/Manual Mode–** Review the Mode descriptions in Appendix 1. If you switch from Auto to Manual during a watering cycle, the system creates a backlog of jobs to complete. When you switch back to Auto Mode, the system immediately begins to complete this backlog. In this case, let the system complete the open jobs, and it will get back on schedule, usually within 24 hours.

• **System Calibration–** If the unit not watering at all, the calibration data may have been lost. Follow the procedure in Appendix 6 to check the calibration.

Short Range of Water Stream—If the watering head fails to send water the expected distance, check the following items in the order given.

Too many watering heads operating at the same time. The number of watering heads that can be operated simultaneously with each watering head having full range capability depends on your local water pressure. Check the number in the "Maximum # of Robots" window on the system menu. Set to 1 and increase by 1 until you see a dropoff in range.

If you have more than six watering heads operating, you must install the larger capacity transformer.

A leak in the water pipe. The location of a leak must be established visually.

Reduced pressure at the water supply. Check the input pressure and flow.

Sediment in the main valve. See below.

Repairing a leak in the watering head—This procedure describes how to disassemble the main valve and filter, permitting cleaning or replacement of the valve and cleaning of the filter.

Remove the lower cover by loosening the two screws. These screws do not need to be completely removed from the cover. If the watering head is installed in a high or otherwise difficult location, it may be easier to unwire it and remove it from its riser or other pipe connection so you can work on the head at ground level.

Kink into a V shape the longer of the black tubes exposed when the cover has been removed. If the leak is not affected, continue as described below. If the leak stops, contact AccuRain.

Figure M: Location of 6 Screws

Figure N: Membrane

The main valve and filter cover—Remove the six screws holding the main valve cover and membrane cover (See Figure M) Remove the lower watering head covers.

Carefully pull off the main valve, which is the black membrane. Check to see if there is any contamination or a foreign object around the spherical section (See Figure N). Clean the area on both sides of the spherical section thoroughly. Re-install the parts and the watering head should function properly.

If there was no contamination around the cone, this indicates that the leak is a result of an improperly functioning water gasket. Contact AccuRain.

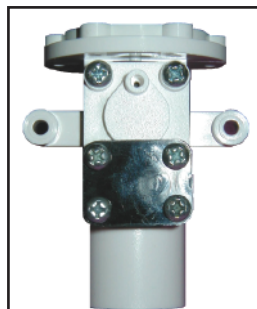—Replace the parts in the reverse order of disassembly.

Appendix 6

AccuRain Calibration Procedure for the Watering Head

- Plug the controller into the watering head.

- Turn top to point the stream 180 degrees away from phone jack connector.

- Press the BACK and HOME keys simultaneously and hold for 1 sec. Repeat if necessary, until the factory screen appears.

- Press AUTO/DELAY/MANUAL key and wait for 15 beeps to clear all zone data from the head. (Optional) NEXT to exit.

- Hold down the Up arrow key until water is at maximum flow.

- Hold down the Down arrow key until water is near the unit.

- Step the same key to get the water just dribbling off of the edge.

- Press the Left arrow key to set the minimum and set sensor threshold.

- Hold down the Up arrow key and watch the "rad" and "flo" numbers. As the rad increases the flo will follow a couple of numbers behind the rad. Keep increasing until the stream is at 30 feet.

[Note: to maximize the range of the head, continue increasing the rad until the flo no longer follows. At this point back up slightly until it is following again.]

- Press the Right arrow key to establish the maximum.

- Press NEXT to exit the factory screen.

The sequence of these steps in important. Follow the directions explicitly.

Appendix 7

AccuRain Watering System Specifications

System Overview	
Number of watering heads	From 1-30 heads per system. 30 heads cover approximately 1.5 acres.
Operating modes	AUTO operates according to the user-programmed schedule. DELAY stops the current day s schedule, resumes the schedule the next day. MANUAL mode skips all scheduled watering. All data is retained when the power is off.

Watering Head	
Maximum number of zones	15 zones per watering head.
Number of dots to define a zone	3 to 24 dots per zone.
Water applied per zone	.1 to 2 inches per watering (default, .1).
Watering frequency per zone	Each zone is entirely user selected based on a two-week programming window.
Watering head size	4.5 inches.
Connecting pipe	Half-inch PVC Schedule 40 (below ground) or Schedule 80 (above ground).
Recommended height	48 inches or more above ground level to achieve maximum range; attached to a firm support.
Maximum range	30 feet at a minimum water pressure of 45 PSI.
Range of direction	360 degrees (full circle).
Coverage	Up to 2800 square feet.
Water flow	1 gallon per minute per watering head.
Heads operating simultaneously	1-10 heads, depending on available water pressure.
Electrical	24 volts DC; max 0.8 amps for 1-6 heads; 25 watts max, 7-30 heads 60 watts max power.
Water pressure range	45-75 PSI. Works with well pressure tank, but not a direct pressure pump.

Controller	
Description	Plugs into the junction box for normal operation. Also used to name and program each watering head. The two-line display shows the current function and allows entry of values.
Weather adjustment	Increase or decrease the frequency of watering for all zones to allow for abnormally cool, wet, hot, or dry weather. Settings are normal (1X), hot (2X), cool (0.5X) and cold (0.25X).
Day and time	Maintains the current day and time, to permit correct scheduling.
Start time	User settable to any value in one-hour increments.
Watering days	Choose any day(s) within a two-week period.
Error indication	Signaled by a beep (data error) or a flashing red SYSTEM FAULT lamp for all others.
Errors reported	Water error, rotation error, data error.

Junction Box and Transformer	
Wall transformer	Requires connection to a standard 120 volt electrical outlet. Standard transformer powers 1-6 watering heads. Large transformer available for >6 heads. Must be mounted indoors or in a weather-protected box outdoors.
Voltage input/output	120 volts AC/24 volts DC. Large transformer supports international power standards with an IEC cord.

User-Supplied Materials	
Water pipe	Half-inch Schedule 40 PVC (buried) or Schedule 80 PVC (exposed). Other types may be used, but NOT Schedule 20 PVC.
Cable	Four-conductor 18 AWG or heavier, rated for direct burial.
Valves	Input water valve, drain valve/backflow valve.

Appendix 8

Warranty and Return Information
AccuRain, Inc. - Limited Warranty

AccuRain Inc. ("AccuRain") provides this limited warranty for its robotic watering system only to the person or entity that originally purchased the product from AccuRain or its authorized reseller or distributor.

AccuRain warrants the watering head, the controller, the junction box and the transformer (henceforth known as the Product) to be free from material defects in workmanship and materials for a period of one year from the date of purchase. AccuRain's sole obligation shall be to repair or replace the defective Product at no charge to the original owner. The replacement Product need not be new or an identical make, model or part. AccuRain, Inc. may at its discretion replace the defective Product with one that is substantially equivalent or superior in all material respects to the defective Product.

This Limited Warranty extends only to defects in materials and/or workmanship as limited above. This limited warranty extends only to defects which occur during normal use and does not extend to damage to products or parts which results from alteration, repair, modification, faulty installation or service by anyone other than an AccuRain or its authorized reseller or distributor; damage to products or parts caused by accident, abuse, or misuse, or maintenance, mishandling, misapplication, or use in violation of instructions furnished by AccuRain; damage which occurs in shipment or any damage caused by acts of God, such as lightening or line surges.

The warranty period shall extend for an additional ninety (90) days after any repaired or replaced part is delivered. The original Product owner must obtain a return material authorization (RMA) from AccuRain. After an RMA number is issued, the defective product must be securely packaged such that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. The packaged product shall be insured and shipped to AccuRain, with all shipping costs prepaid.

AccuRain specifically disclaims any implied warranties of merchantability and fitness for a particular purpose with respect to the Product. AccuRain shall not be liable for any direct, indirect, incidental or consequential, or other damage alleged in connection with the furnishing or use of its Product.

AccuRain, Inc. Return Policy

If you are not completely satisfied with your purchase, simply contact us within 30 days of your invoice date for a no-hassle return.

Please follow these instructions to qualify for a return or exchange:

1. Send an e-mail request to service@accurain.com, OR call 1-800-862-5010 with the following information:
2. Full name, phone number, e-mail address, order number, name of the product you are returning and reason for the return.

NOTE: To expedite your return request, please be sure to include all information above in your e-mail. Otherwise, your refund/exchange could be delayed.

3. Within 3 business days, a customer service representative will email you instructions for returning your item along with the return address and RMA Number.

RETURN POLICIES
- Request for returning an item must be submitted within 30 days of the invoice date.
- Upon receiving your request for a return, a customer service representative will e-mail you an RMA number and the address to which the return should be shipped.
- Except in the case of a manufacturer's defect, return shipping charges are not refundable and initial shipping fees are not refundable.
- A 15% restocking fee will be charged if the product is returned unclean.
- All return items must be in "re-sellable condition" ** to qualify for a return or exchange.
- Once we receive your returned item, it will be examined to determine if it is in re-sellable condition. Please allow up to 7 business days for inspection and processing of the returned item.
- If the item is re-sellable, a refund will be issued to your credit card (minus the original shipping fees) within 30 days of receiving your returned item.

- If the item is found not to be in re-sellable condition, a customer service representative will contact you to notify you of the inspection. Items that are not re-sellable will be shipped back to you, at your request.

** Note about "re-sellable condition": Items must be clean, undamaged and returned in the original packaging. Items displaying excessive wear are not eligible for a refund.

RETURN PROCEDURES

To prevent any delays in your refund, please follow these instructions:
- Returns must include a copy of the original invoice with the RMA number and reason for return written on the invoice.
- Returns must include all components of the original manufacturer's package.
- The RMA number must appear on the outside of the box, in the lower left-hand corner.
- For your protection, we strongly suggest that you insure your package for shipment. AccuRain, Inc. cannot be responsible for returned packages that are lost in the mail.

If you have any questions or would like to check the status of a return, please e-mail us at service@accurain.com.