



Nursery & Garden Industry  
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# Installing Irrigation Control Systems

Once an appropriate irrigation controller has been selected, the controller and system components need to be installed correctly to ensure reliable operation. Installation instructions will vary depending on whether two-wire or multi-core wire systems are being used. The following are some guidelines on points to be considered when installing control systems.

As much of the control system is likely to be buried, or be difficult to access, **high quality components** should be used to ensure the reliability of the system. Cheap, unreliable components will result in time lost from repairs and potential loss of stock.

**Mapping and photographs** should be used to pinpoint the location of wires, infrastructure, and station number locations. It may be obvious on the day of installation, but things will look quite different in a few year's time, and it might be difficult to remember some of the detail. Mapping doesn't have to be the latest in GPS technology. A simple hand drawn map backed up with photos can be just as effective. If two-wire decoders are used, record the serial numbers and location for each decoder. Keep the completed map in a safe place for future reference, and ensure you update the map as changes are made to the system.

The **location of components** needs to take into account power sources, location of growing areas and things that can interfere with the components or operation of the system, e.g. vegetation interfering with rain sensors. Consider the location of wind and moisture sensors, pump start relays, rain sensors, where they can be placed to be most effective and how they are to be connected to the control system, e.g. where is the best location for a weather station. Where possible, create access

points where joins are made in wires, or at least record where joins are made to enable easier location for future troubleshooting.

**Locate solenoids and decoders in valve boxes** to protect them from physical damage and to allow easy access. Mount the decoder upside down so the receiver in the bottom of the decoder is easily accessible for hand held programming.

**Protection of components** from insects, animals, environmental, and accidental or intentional damage is important to maintain the reliability of the system. While the wiring used for irrigation control circuits is designed to be buried, positioning wires under the irrigation pipe will

help protect the wires from damage caused through digging. Installing wiring in conduit will also give an additional layer of protection. If you have multiple strands of wire for various sprinkler boxes, it's okay to feed them through the same conduit because

the voltage isn't high enough to cause interference.

**Use the wiring that is recommended by the manufacturer.** Some wires are designed for direct burial without the requirement for conduit, while others should be put into conduit to increase their longevity. Regardless of the type of wire used, if wiring is exposed above ground it should be put into conduit to protect it from physical and environmental damage. The length of wire that the system can carry a signal through effectively depends on the wire diameter. A wire with a diameter of 3.3 mm can transmit a signal 2300 m, whereas a 2 mm diameter wire will only transmit a signal up to 1500 m.



Two-wire systems use double jacketed and insulated solid core copper wire. These wires should be polyethylene not PVC coated (which is more likely to crack). Using pre-existing wire for two-wire systems is strongly discouraged as it is unlikely that the pre-existing wire will meet the specifications for gauge, twist, and solid copper. Pre-existing wire will not be colour-coded correctly for the decoder wires, and pre-existing wire may have invisible problems such as shorts, breaks, increased resistance, or damaged insulation that will be inherited by the new installation.

On two-wire systems **don't scrimp on stripping the outer insulation from the inner wires** to give a long enough length to work outside the box. This will make it easier to ensure the connections are sound. Strip back the outer jacket on two-wire systems to at least 300 mm from the splice point. Use the right tool for stripping decoder wire, as the inner conductors must not be damaged. A knife is not the best tool for this job.

**Take the time to make good connections.** The smallest short circuit can be most frustrating to locate. Make sure all connections are waterproof. If the manufacturer recommends a particular waterproof connection use it. Twitching wires together and soldering is not effective, and cheap grease filled connectors may be little better. Use quality gel filled connectors and ensure all connections are tight. High specification waterproof connectors should be used to connect the decoder to the two-wire path. Conventional waterproof connectors are okay to connect the decoder to the solenoid. Don't be tempted to jam more than one connection into a waterproof connector, as it can cause poor connections and poor waterproofing.

Where splices are made, or where wires are connected to other hardware, **leave plenty of slack to accommodate ground movement.** Loop 1 m of wire at each solenoid, as tight connections may pull apart over time as the ground settles. Pull some extra wire so there is some spare in the event of repairs being required.

**For ease of installation, program two-wire decoders prior to installation.** This process requires a methodical approach to ensure the decoders are installed at the corresponding station. A list of station and decoder reference numbers should be kept, and each decoder marked with the assigned station number.

**Ensure in-line earth grounding** for lightning protection is installed. Techniques and devices vary depending on the controller and site. **Grounding rods** should be installed to 2.4 m deep to ensure sufficient soil contact. Grounding plates need to be installed according to the manufacturers recommendations.

**On two-wire systems install a surge decoder** connected to effective grounding hardware. A surge decoder should be installed every 300m, or every 12th decoder, and at the end of every wire run. Also note that the twist in the wire in two-wire systems gives some added surge protection, as will forming the wire leading to the solenoid into a spring shape ("pig tail coil").

**When building the system, install small sections and test before moving on.** This may save time if problems are found. The cause of a problem may be difficult to track down once the entire system is installed. Make the connections, prop them up out of the ground and test before adding the waterproof connectors.

Also keep in mind that **access may be required for testing equipment** such as clamp or multi-meters when troubleshooting in the future.

**Read the instruction manual** for the controller to get to get the best result. Modern irrigation controllers have a range of functions designed to give flexible control options.

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