

## **Satellite Versus Decoder Control System**

During the irrigation design process a decision must be made whether to choose a satellite or decoder style control system. The decision must be made soon after the irrigation design starts so the design can be completed without delay.

Satellite systems have been the most widely used for several decades and are currently considered the conventional style of control. A satellite is a remotely located electrical control box that can operate multiple sprinklers from a single location. The satellite offers programmability to control what day and time the sprinklers operate and for how long. Grounding of the system is performed at each satellite. One or more satellites are typically installed per hole depending on the number of sprinklers. From the satellite 24-volt wires are installed from each satellite to one or two sprinklers to operate them. Electrical supply wire must be run to each satellite. In most cases communication wire is also run from each satellite back to a central computer. The central computer can then be used to easily control the operation of the satellites rather than operating from each satellite independently.

### **TYPES OF DECODER SYSTEMS**

Decoder systems have been in existence for decades but until recently have been only used in limited areas such as Europe and the Northeastern United States. Enhancements in the systems such as expanded capacity (number of stations) and improved reliability have made their use more compatible in other areas and they are now installed in all regions. There are varying types of decoder systems based on the manufacturer and each have certain nuances. When comparing decoder systems they should not all be assumed to be installed and operated the same. A decoder system may or may not have satellites.

#### Central Only Decoder System



The most common form of decoder system does not utilize satellites. Instead, decoder communication wire is installed throughout the course. The decoders are small coded digital devices that can actuate single or multiple stations from the same decoder. Also different decoders have different capacities for operating multiple sprinklers from the same station. The number of stations per decoder and simultaneous stations can vary by manufacturer. There is no need for power wire since the power and communication are both carried by the same wire. Elimination of the power wire helps reduce some of the total cost of a satellite system. Since there are no

satellites all control of the irrigation system must be performed from the central computer. There are limitations in the number of decoders per wire path from the central and these can vary by manufacturer. Also, since there is no backup form of irrigation the fewer sprinklers per path limits the number of sprinklers that could be out of service at any time. Most decoder systems offer diagnostics to help locate any wire or decoder problems.

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1 of 7

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There are two types of decoder system designs:

- At-Sprinkler
- Off Fairway

## At Sprinkler

In an "At-Sprinkler" design the decoders are either manufactured in or attached to the sprinkler. Communication wire is run from the central computer to the all the decoders (sprinklers) in the system. Since there are no satellites, surge arrestors and ground rods are strategically located along the communication wire spaced to limit the damage from lightning strikes between the ground points. The spacing of the grounding can vary per manufacturer. Any troubleshooting or repairs to the decoders would require the work to be performed at the sprinklers.

## Off Fairway

In an "Off Fairway" design the decoders are located away from the sprinklers, typically in the lateral isolation valve box along the mainline. Smaller decoder to sprinkler wire is then run from the decoders down the lateral pipe to each individual sprinkler. The distance of these wires is limited and varies per manufacturer. The communication wire from the central computer to the all the decoders in the system and grounding requirements are similar . Since the decoders are remotely located away from the sprinklers any troubleshooting or repairs to the decoders would be performed out of the fairway in the valve boxes.

## Satellite Decoder System

In a satellite decoder system the system is identical to a typical satellite system in all every way except that the 24v wire from the satellite is changed to a decoder communication wire and decoders are then located at the sprinkler or off fairway as discussed above.

## **SELECTING THE SYSTEM THAT IS RIGHT FOR YOU**

The several factors that should be evaluated in making the choice of which system is best for you.

- Turf Irrigation Requirement
- Lightning Potential and Frequency
- Contractor Experience and Capability
- Maintenance Staff Experience and Capability
- System Size
- Irrigation System Installation Budget
- Course Quality Desired
- Construction Schedule
- Repair and Service Capability of the Course and Local Distributor

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2 of 7

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We have designed hundreds of irrigation systems worldwide with both satellite and decoder styles. We currently have both decoder and satellite systems in design now so we are completely knowledgeable about their use and application. Both satellite and decoder systems have the applications where they should best be used. The decision is not just a one size fits all. Satellite and decoder systems are offered by all manufacturers so there are no competitive advantages or disadvantages to one or the other. Based on our experience our recommendation as to which system to design can vary based on the criteria listed above. Please contact ATI to help review the criteria so we can help you select the system that is best for you. An option also exists to design and bid both a satellite and decoder the system so the actual costs can be evaluated but additional design fees would apply.

Listed below are some of the advantages and disadvantages to both the satellite and decoder systems.

## **Decoder Advantages**

- Decoder systems are typically less expensive.
- No satellites in view.
- No spare 24v wires are needed since the communication wire can be added to anywhere making adding valves easier.

## **Decoder Disadvantages**

- Decoder systems offer no field backup in case of failure of decoders, communication wire or the central computer.
- Central computer needs to be installed and programmed in the maintenance building prior to planting to operate the sprinklers
- All irrigation must be performed from the central computer unless satellite decoder systems are utilized.
- The Contractor must be highly experienced in the installation of decoder systems
- Operator requires technical experience and training
- Additional grounding is required (+50 Locations).

## **Satellite Advantages**

- Irrigation can be performed from the satellites before the central computer is installed allowing each hole to be operated and planted as it is installed.
- Grounding can be accomplished, measured and maintained at each satellite location (+/-20 Locations).
- Satellites are easily operated by many on a golf course staff.

## **Satellite Disadvantages**

- Need To Be Located Out of Visibility of Players.
- Higher Installation Costs per Station.
- 24v Wires Need To Be Installed From the Satellite To Add Sprinklers at a Later Date

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3 of 7

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The best applications for decoder systems are projects that meet a majority of the following criteria:

- Low Incidence of Lightning
- Limited Irrigation Requirement
- Smaller In Scope
- Renovation of An Existing Golf Course or Irrigation System
- Staff Experienced In Decoder Use and Operation
- Low or Limited Budget
- Daily Manual Operation Is Required On a Limited Basis

## **Low Incidence of Lightning**

Is lightning a factor in your area. Also, the type of soil on the project may increase the difficulty in achieving good grounds and lightning protection. If so, grounding can be more easily improved at satellite locations (20+/-) than at the many surge arrestor locations (50-60+/-) required on a decoder system. Additional ground rods and surge plates can be installed at the satellite locations as well as surge arrestors in the pedestals on the 24v, 220v and communication wire.

Decoder systems offer no backup operation in case of failure of decoders, communication wire to decoders or the central. If lightning strikes and the surge arrestors do their job the damage may be limited to the decoders located between the arrestors. Surge arrestors are recommended every 150 – 300 meters along the communication wire. If they are located every 150 meters then 30 – 40 decoders could be located between arrestors that are at risk of a strike. Rain Bird recommends no more than 10 decoders between surge arrestors so then additional grounding is required. If a damaging strike occurs and the arrestors work many of the decoders between would need to be replaced along with the surge arrestors. Most decoders can withstand 1 – 6 Kv depending on the location and installation. According to The Computer Wizard, *“Lightning current averages 30,000 amps, but ranges from 10,000 to 200,000 amps - 100 To 1,000 times as strong as a steel welder.”* If the arrestors don't work, the damage can spread to other decoders and possibly the central. For more lightning data go to <http://www.thecomputerwizard.biz/lightning.htm>.

If there is little lightning then decoders are a good alternative.

We specify lightning protection for satellite systems as developed by the American Society of Irrigation Consultants utilizing ground rods and ground plates. This grounding can be easily expanded as needed at the 20+/- satellite locations to improve the resistance to ground and inductance. Additional ground rods and ground plates can be added at the satellites and surge arrestors in the pedestals. Ground plates are very helpful to improve the inductance but are not recommended on decoder systems by the manufacturers. This would be difficult on decoder system with 50 – 60 surge arrestor/ground locations and defeat the goal of lowering installation costs. Instead you will replace failed decoders and surge arrestors after storms.

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4 of 7

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Satellites offer a backup at each hole if lightning damage occurs. A satellite can be repaired in an out of the way location. Decoders require digging at each sprinkler interrupting play if an "At Sprinkler" design style is implemented. The backup for decoders is manual key operation at the sprinkler. During grow-in this is difficult due to the wet and muddy conditions. Satellites can offer switches inside the pedestal to operate the sprinklers. If the central is down due to lightning or any other reason the satellites offer automatic operation for each hole.

### **Limited Irrigation Requirement**

When failures occur, and they will, the needs of the turf may be critical depending on the environment. Unfortunately lightning storms typically occur during the hottest times of the year when irrigation is most required. If the problem is significant it can take some time to repair. Repairs of decoder systems, since it requires digging, can take much longer. During the summer irrigation can be critical in many areas. If lost for a few days or a week or more in areas with irrigation demands of 5mm or more turf damage could occur. In areas of low irrigation reliance then the problem is less severe and decoders are more applicable.

### **Small In Scope**

If the irrigation system is small then the damage would be limited. On a small system it is not a bug problem to manually operate the system at each sprinkler if decoder system has failures. The amount of decoders per wire path from the central should be limited to avoid the amount of sprinklers out of operation at a time in case of a wire failure. In order to limit the number of decoders on a wire path longer wire runs must be installed back to the maintenance location/central computer creating additional splices and further places for problems and increasing the cost of wire.

### **Renovation or An Existing Golf Course or Irrigation System**

Decoder systems require the computer to be programmed with the decoder addresses in order to operate. Existing systems offer the ability to begin the installation at the central and are much simpler construction projects. Conversely, a new construction schedule can commence construction at the farthest hole away or anywhere in between. A maintenance facility may not exist during the construction and planting of the course. Also, in new construction holes are usually planted as soon as the sprinklers installed. For a satellite system that is not a problem since the sprinklers can be immediately operated from the satellite to establish the turf. A decoder system requires the computer to be installed and programmed somewhere along the communication wire to operate the sprinklers. If the central computer cannot be initially installed at the maintenance building then the computer must be moved during construction until it can finally be installed at the central computer location, usually in maintenance. The computer requires a secure and air conditioned location with power and grounding. Due to this limitation, the construction and planting schedule should take into account the locations that may be required for the central computer to accomplish the grow-in. In addition, someone capable of operating the computer is required. A satellite is simple to operate by many of the staff involved in the construction process.

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5 of 7

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## **Staff Experienced In Decoder Use and Operation**

Decoder systems are most prevalent in the areas where they are best applied such as the Northeast United States, UK, Scandinavia, Northern Europe or where the turf can survive for 72 hours or more without irrigation. In the rest of the world most of the superintendents, contractors and distributors are familiar with the installation and operation of satellite systems. Both systems are installed and operated much differently. It would be important to hire those who have experience in decoder installation and operation for success. Also, if decoder systems are not prevalent in the market then the distributors will probably keep less repair parts in stock and employ less qualified service personnel. Additional parts should be stocked by the course to prepare for problems when they occur.

## **Low or Limited Installation Budget**

Decoder systems can be installed at a lower per station cost since the amount of 24v and 220v wire can be reduced or eliminated. The costs of the decoders versus satellites is also lower. The total savings can fluctuate based on the level of control and the amount of investment in lightning protection of satellites and decoders. The cost of maintenance would be higher on a decoder system if installed in an area of high lightning incidence.

## **Daily Manual Operation Only Required On a Limited Basis**

Manual operation of a decoder system requires the operation from the central computer or a handheld radio communicating through the central. Both of these require an elevated level of training than that of a satellite system. If the need for daily manual irrigation is limited or the staff is computer literate this will not be an issue. Satellite systems can be operated from a simple to run program in the satellite or with manual switches inside the pedestal.

## **Summary**

A reliable irrigation system with adequate manual and automatic control flexibility is a key building block needed in the turfgrass maintenance program of a golf course to meet these standards. We are not proponents of burying treasure in the ground unnecessarily. We take our clients money and their investment in the irrigation system very seriously. Our Mission *“is to ensure quality turf and irrigation standards that meet or exceed the customer's agronomic, economic and environmental needs while operating in a timely, efficient and cooperative manner.”* Our systems are designed to maximize the money spent to insure the 25 – 30 year investment in the system. This requires the right products designed and specified, properly installed and maintained. Inferior products will not meet the maintenance and operation needs or the test of time.

In making your decision below are some questions you will need to honestly answer in order to purchase the system that is right for you. The answers to these questions will help lead you to the best decision for your course.

- Will the course be at risk to lightning ?
- Based on the grow-in schedule will a decoder system be a limiting factor for the grow-in of the course?

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6 of 7

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- How will the decoder system be programmed during the grow-in and by who?
- Will a decoder system be less flexible to operate after it is installed?
- How critical is irrigation in case it may be out of service for an extended period?
- Are decoder systems the standard in the region?
- Is the additional cost of satellites justified to provide the redundant control?
- Are the contractors available qualified in the installation of decoder systems?
- Is the maintenance staff qualified in the maintenance and troubleshooting of a decoder system.

Once you have answered all these questions and weighed the results against the potential savings then the decision should become more clear. All the manufacturers should provide a full demonstration of their decoder and satellite products so the differences can be evaluated and the right choice made. You will be living with your decision for many years. Please let us know if you have any questions or if we can be of assistance in the process.