



Turf Guard®

Wireless Soil Monitoring System



GOLF CONTROL SYSTEMS

Toro® Turf Guard Wireless Soil Monitoring System helps you improve your turf, soil and water efficiency. The Turf Guard system is a revolutionary technology that lets you know what's going on beneath the surface of your course, so you can make timely, more-informed adjustments.

Turf Guard uses small, dual-layer sensors buried under a putting green, fairway or tee box. Installation is quick and easy without any wires or trenches, and golfers never know the sensors are there. Once in the ground, each sensor accurately measures moisture, temperature and salinity levels of your soil at two depths, in real time. That data is then collected and compiled into easy to view and understand tables, graphs and dashboards. This information can then be accessed from any Internet-connected computer by connecting to the system's Web-based interface. You can even access your sensor information from a Web-enabled cell phone.



Water Management Highlight

Know what's happening in your soil, so that you can make better decisions on how to irrigate and conduct other turf management activities. Don't guess at how much water to apply for flushing an area, let Turf Guard tell you when enough water has been applied to push the salts out of the root zone. Don't wonder if you need to irrigate an area tonight, let Turf Guard tell you if the area is in an acceptable moisture level range.

Features & Benefits



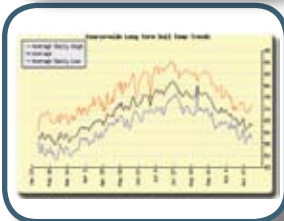
MONITOR MOISTURE LEVELS AND ADJUST IRRIGATION

Reduce water usage and improve playability without risking turf quality. Promote root growth by avoiding over watering. Detect dry areas before it impacts the turf's health.



TRACK SALT BUILD-UP AND SCHEDULE FLUSHING

Take the guesswork out of monitoring and managing salinity levels. Get positive confirmation that your flushing reduced soil salts. Know when and how much water to flush with.



MONITOR DAILY SOIL TEMPERATURES

Predict peak soil temperatures early in the day to start remediation activities before an emergency. Schedule fungicide applications and pesticides for optimal effectiveness. Understand evaporation rates and syringing needs.



WIRELESS NETWORK

No wires between the repeaters and the sensors, or the sensor and the probes means that sensors can be installed anywhere on the course without disrupting play. Install sensors in greens, fairways, tees and other areas without having to trench or pull wires.

How it works:



Wireless Sensor Measures Moisture, Temperature and Salinity Levels

- Three to five sensors buried in each green at critical root zone levels
- Additional sensors buried in fairways, tee boxes and planters
- Above-ground relays installed on or in existing irrigation pedestals
- Wireless MESH networking links all sensors to central control system.
- Moisture, Temperature and Salinity readings displayed in your office



Sensor



- Measures soil moisture, temperature, and salinity.
- Two distinct depths in the soil profile—Critical root zone level and a second 4.5 inches lower
- Independent measurements from each depth.

Pedestal Repeater



- Mounts in most Toro irrigation satellite pedestals.
- External mount available for other models including non-Toro pedestals.

Base Station



Connects to Internet in the office.

Electrical Specifications

- Input Power:
 - Repeater: <.02A @ 6 VDC
 - Base Station: <.1A @ 120 VAC, 50/60 Hz
- Dimensions:
 - Body: 2 in. x 3 in. x 5 in. (5 X 7,6 x 12,7 cm)
 - Spikes: 2.5 in. x 3/16 in. (6,4 x ,48 cm)
 - Installation Hole Diameter: 4.25 in. (10,8 cm)
- Temperature:
 - Operating: 0°C to 60°C (32°F to 140°F)
 - Storage: -30°C to 82°C (-22°F to 180°F)
- Sensing:
 - 0.1°F Temperature resolution
 - 0.1 % Volumetric soil moisture content resolution
 - 0.1 dS/m Soil conductivity resolution (Salinity)
- Communication:
 - Repeater Range: 5,000' (1524m) line-of-sight
 - Buried Sensor Range: 500' (152m) line-of-sight
 - 900 MHz ISM Band FHSS Communication
 - Additional licensing not required

Operational Features

- Immediately ready for play after installation
- Even remote canyon courses have complete coverage due to advanced MESH routing technology
- Repeater mounts in most Toro irrigation satellite pedestals
- External repeater available for other models including non Toro pedestals
- Supports up to 500 sensors per course
- Expected sensor battery life of 3 years
- Sensor reading sent every 5 minutes
- Measures two distinct depths in the soil profile
- Automatic network configuration and failure recovery
- Graphical course overview displays sensor data at-a-glance
- Plots trends and compares historical and current readings
- Move quickly from course-wide averages to individual sensor readings

Warranty

- 1 Year (NSN plans available)

Specifying Information—Turf Guard

Model	Description
TG-S2	Turf Guard Sensor
TG-R-INT	Repeater-Internal Mount
TG-R-EXT	Repeater-External Mount
TG-B	Base Station