SENTINEL® CENTRAL CONTROL
Product Guide

The Toro Company
Irrigation Division
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Toro NSN® Sentinel Support: 1-800-ASK TORO (275-8676)

Sentinel Central Control System

The dictionary defines Sentinel [sĕn'tə-nəl] as "a soldier stationed as a guard to challenge all comers and prevent a surprise attack: *to stand sentinel."* Its roots are found in the Old Latin word "sentina" which means "vigilance."

Toro defines Sentinel as a product that will watch over your irrigation system and safeguard it against potential problems resulting from excess flow, incorrect programming, varying weather and many other conditions. As a result, the intrinsic value of the landscape is protected, and water waste is minimized or eliminated. The term "Central Control" identifies Sentinel's ability to watch over a single site or multiple sites in a localized area or across a broad geographic area from one location (computer).

Whether it's a stand-alone controller or a large centrally based system, the Sentinel product line offers numerous features that address a broad array of customer needs.

Two words… Reliability & Confidence

Toro customers expect control products to work continually in harsh environmental conditions and to last for many years. Unrelenting sunlight and heat, followed by cool nights and humidity, lightning ground strikes and other electric surges, constant updating of programs dictated by constant weather changes, ants and or vermin who make enclosures their home, dusty conditions, and temporary power are just some of the conditions that can impact controller operation. Customers want a product they can install and depend upon for reliable performance, not one that must be constantly disassembled and sent in for repair.

Toro's development focus for the Sentinel Central Control System was to create the most full-featured, easy-to-use, and reliable product possible. A closed-case controller module design provides protection against many environmental variables that might negatively impact functionality, but allows easy troubleshooting in the field. Options for multiple enclosure types and multiple levels of surge protection ensure regional and customer-specific durability needs are met.

We didn't stop there. We backed this product up with Toro NSN® support to provide your customer with 24/7 telephone support for computer system components or software-related problems. Although competitors may claim to have a similar service, NSN is recognized worldwide as the premier organization for irrigation central control issues. As with other Toro control systems, NSN takes a proactive approach by assembling and configuring the Sentinel central computer and software for maximum performance and reliability in less-than-favorable environments.

Don't forget about Toro distribution. Toro distributors are recognized wherever they operate as being customer-focused companies with well-trained staff members that are there for their customers. Trained and supported by the best Field Service Managers in the industry, Sentinel distributors must be certified to sell and service this product. Their skills are continually enhanced in service schools that are part of the mandatory curriculum at Toro University.

The Challenge: Effective Water Management

Putting together an efficient irrigation system is no small task. Concerns such as watering precision, broken pipes and mainlines, or dealing with electrical shorts and power outages have been problematic for landscape managers for decades. These along with increased competition for water supplies, scarcity of resources, and recent irrigation mandates have left those in irrigation management roles searching for the most efficient, yet simple, way of combating all of these issues.

The Solution: Sentinel Central Control

The Toro Sentinel System was introduced in 2002 and has established itself in the marketplaces as one of the leaders in wireless communication for central control systems. Sentinel allows the user to communicate to up to 999 satellite controllers wirelessly rather than forcing the customer to install lengthy wire runs that tie field controllers together. Sentinel provides a variety of Central Computer to Satellite communication options, including radio, Ethernet, telephone, cellular, and others, so you can choose the one that best meets your site-specific needs or mix-and-match across multiple sites.

Multiple Site Applications: Sentinel provides the ability to program, control, and monitor multiple remote controllers from one location. Whether controlling one large, contiguous site like a sports complex or housing association, or multiple remote sites like a school district or parks & recreation department, a central control system provides easy, rapid access to the irrigation system from a computer.

System Control: Sentinel allows all irrigation control actions to be carried out easily and efficiently from a central location. Control actions such as adjusting runtimes to changing weather conditions or stopping irrigation in the event of rain or high wind can be automatically accomplished without requiring a technician to visit individual controllers. However, if a technician is on-site and sees a need for programming changes, like shortening runtimes after a grow-in period, true two-way communications allow changes to the program at the field controller on-site and can also be uploaded to the central computer.

Sensor Integration: Sentinel can incorporate many different sensors, including flow sensors, tipping rain cans, wind sensors, freeze sensors, and full weather-stations. These sensors and instruments monitor site and climatic conditions and report to the central computer. Runtime adjustments are automatically made based on these inputs and combined with information on plant material and soil types. Sentinel Satellites can react automatically to readings outside of pre-defined limits set by the system operator, like isolating stations when excessive flow indicates a piping break.

Multiple Communication Options: A Sentinel system consists of a central computer, irrigation controllers, sensors, weather stations, and a communication system that ties it all together. No matter whether the central computer is located onsite or at a remote location, communication options like radio, telephone, cellular, and Ethernet can be mixed and matched to meet system needs.

Simplicity

As a Microsoft® Windows-based software, Sentinel is easy-to-use and intuitive, and it's one of the most powerful irrigation control systems ever offered. Information is graphically displayed—so it's easy to see and use. And, all similar functions are grouped together making it simple to find information quickly. Plus, the customer uses only the features they need… Basic features or advanced functionality; the choice is yours.

Sentinel Master Control Panel: Provides easy access to all programming functions—no keystrokes or sequences required, and no need to go searching for functions.

Automatic Operations: Daily operations and scheduling are made quick and easy. All essential programming information is contained in one window so it's easy to understand and manage.
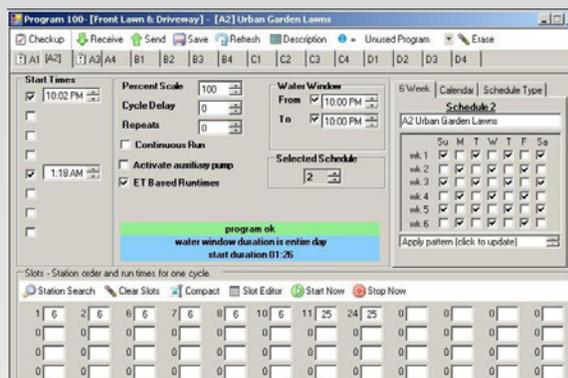

Easy Navigation – Full Featured: Expandable/collapsible navigation tree that puts all the data for individual field controllers one click away. Tabbed Access to what you need to work with:

Satellites (Units): Individual Field Controllers within the Sentinel System. Capable of, up to, 999 individual controllers numbered 001…999.

Systems: Groups of controllers that share operating parameters. Organizing these controllers into Systems enables edits, operational status checks, and reporting (total Water Use) to be performed on multiple satellites simultaneously.

Weather Sources: Weather Sources provide weather-related data to the Sentinel WMS software. This information can be used by the satellites to automatically adjust run times based on ET demand and rainfall activity. Sentinel WMS can also monitor weather parameters and react at preset thresholds. For example, monitoring rainfall to automatically shut down a satellite System when measured rainfall reaches a predefined amount.
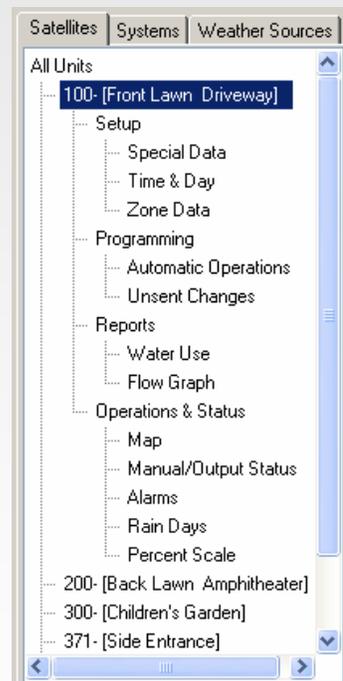
**And, many more customer-driven features that optimize water management…**

- ET-based watering
- Set control parameters for each station
- View water usage and compare to historical

- Extensive alarm and reporting capabilities
- Map-based feedback of system operation
- Intuitive visual cues and operator aids

Effective Water Management

Water Savings

Use of a weather station, providing effective Evapo-Transpiration (ET) based system management can lead to water savings of 25% to 35% per year. Depending on current management practices, water savings may be greater, or in the case of extremely well managed stand alone systems, somewhat lower. As an additional source of savings, pipeline breaks, malfunctioning valves, and missing heads are automatically detected and shut down, preventing excessive water loss.
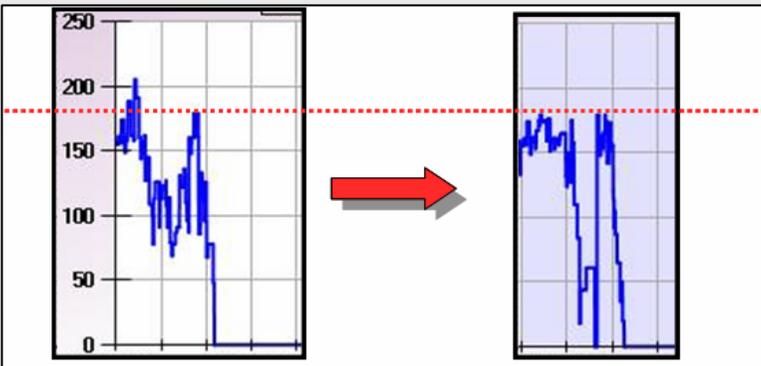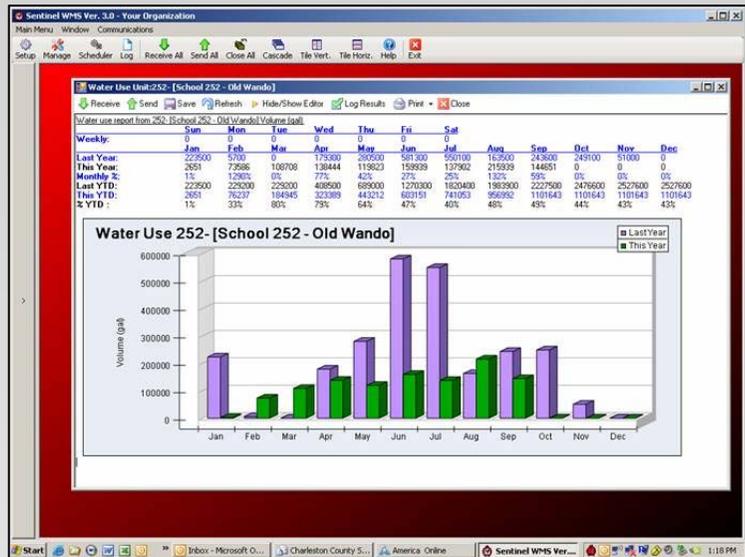
Flow Optimization

Start times of programs can be automatically optimized to maintain system demand at the optimum level, ensuring demand does not exceed preset limits while maximizing efficiency in systems with pumps. Flow optimization also shortens water windows.

And, many more customer-driven features that optimize water management…

Theoretical (predictive) Flow Graphs
Set control parameters for each station
View water usage and compare to historical

Extensive alarm and reporting capabilities
Map-based feedback of system operation
Intuitive visual cues and operator aids

SENTINEL® CENTRAL CONTROL PRODUCT GUIDE

Flexibility - Making Sentinel Work for You

The Toro Sentinel System has established itself in the marketplaces as one of the leaders in wireless communication for central control systems. Sentinel allows the user to communicate to up to 999 satellite controllers wirelessly, rather than forcing the customer to install lengthy wire runs that tie field controllers together. Sentinel provides a variety of Central Computer to Satellite communication options, so you can choose the one that best meets your site-specific needs or mix-and-match across multiple sites including:

Radio Communications - Radio communication from the Central Computer to Sentinel Satellites allows you to install Sentinel at sites with little or no disruption of existing landscapes and is ideal for single-site installations. Sentinel can also utilize radio protocols to communicate with MapTo Satellites, maximizing system capabilities.

Telephone Communications - When reliable communication to multiple geographically-remote satellites is needed, standard telephone communications can meet your needs. Installation can be accomplished anywhere a standard telephone line can be run to a Sentinel Satellite. A standard internal or external phone modem is all that is required at the Central Computer, which communicates to a commercial-grade modem in the Sentinel Satellite.

Cellular Communications - When remote-access benefits of telephone communications are needed, but a phone line is not available at the Satellite location, cellular networks provide a wireless communication option. By installing a cellular IP modem in the Sentinel Satellite, the user can communicate wirelessly from anywhere in the world.

Ethernet Communications - In an increasingly "wired" world, Ethernet/Internet is one of the fastest growing segments of central control communications. The simple combination of an IP address at the computer and an Ethernet adapter in the field can allow for network access and control of your Satellites.

Controller Options - Sentinel also provides the widest array of standard Satellite configurations s in the industry, ensuring system installation meets the requirements of your site. Enclosure options to choose from include:

- Small Metal Wall Mount Cabinet
- Stainless Steel Wall Mount Cabinet
- Stainless Steel Pedestal
- Plastic Pedestal

Also, many existing controllers, like the Irritrol MC can be upgraded with a Sentinel Retro-Link to turn them into a Sentinel Satellite without needing to replace the controller. And, if the standard product doesn't meet your needs, our Eicon Division can custom build what you require, from custom enclosures to non-standard station counts and communications methods, the options are endless.

With communication and enclosure options, modular station counts in 12-station increments, and sensing and flow monitoring inputs that do not require additional interface components, a Sentinel system adapts to meet your specific requirements instead you adapting to the capabilities of the system.

TYPICAL SENTINEL COMMUNICATION OPTIONS

**Narrowband Radio: (450-470 MHz)**

Central Interface Module

Sentinel Wall Mount Satellite

Sentinel Pedestal Satellite
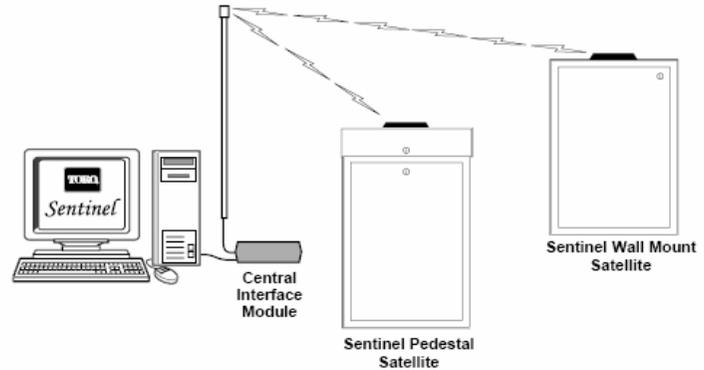
Ethernet:

Phone (Landline):
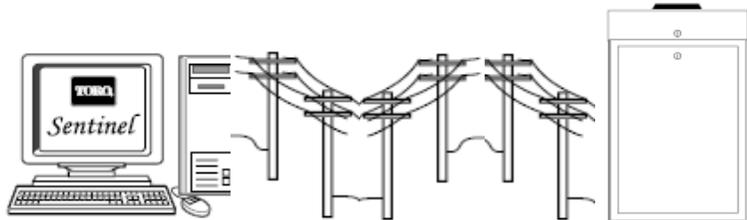
Phone (Cellular):
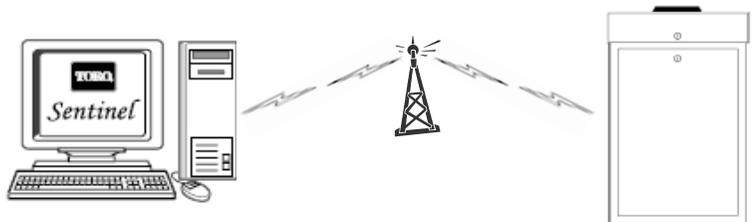
Spread Spectrum: (Radio - 900 MHz)

TORO®

SENTINEL ®

WATER SMART
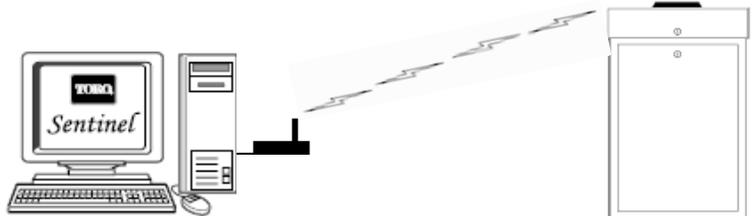
ADVANCED COMMUNICATION OPTIONS

Sentinel Remote Transceiver:
Phone, Cellular, Ethernet, etc.,
to local area,
Narrowband Radio onsite.

Sentinel Wall Mount Satellite

Sentinel Pedestal Satellite

Sentinel Remote Transceiver
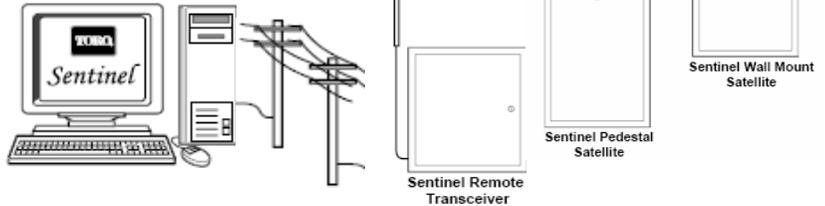
Ethernet to Central Interface:
Minimizes antenna cable length

Sentinel Wall Mount Satellite

Central Interface Module

Sentinel Pedestal Satellite
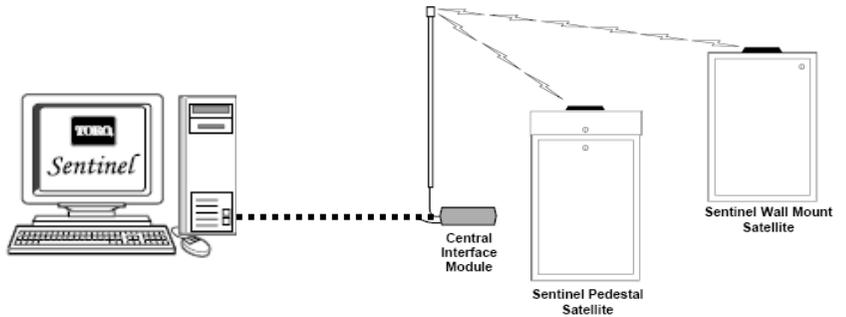
Store & Forward Radio:
Satellites act as radio repeaters
sending data to other satellites
(Requires special firmware)

Central Interface Module

Fiber Optics:

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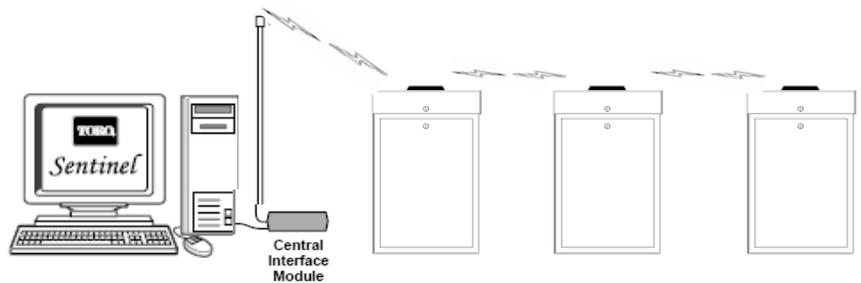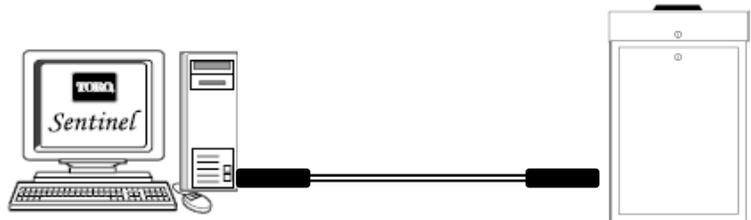
The Sentinel Advantage

Distributed Intelligence

Each field controller in a Sentinel System is a fully intelligent unit. The programming that drives irrigation is resident within each controller, but is also saved within the Central Computer. This provides distinct advantages for users of Sentinel:

- *No loss of irrigation because a computer or a middle manager/master controller fails:* Each Sentinel Controller is responsible for its own irrigation. In other systems, the controller is just a dumb slave to a computer or middle manager telling them when to turn a valve on or off.
- *Redundant Programming:* The controller programming is saved in both the controller and the central computer. If either of those units fails, the programming can be pulled from the other to repopulate (reprogram) the replacement.
- *Two-Way Programming:* Irrigation Programs can either be changed at the central computer and sent to the controller, or changed at the faceplate of the controller and pulled back into the computer.
- *Protection from unauthorized changes:* If someone makes an unauthorized change to the irrigation program in a controller, the program can be easily compared to the program saved in the central computer. If the programming in the controller is incorrect, it can be easily changed back to the program stored in the central computer.

Easy-to-Use Software

Sentinel Software is simple to set up and easy-to-use.

- *Microsoft® Windows-Style Navigation:* The layout of Sentinel software looks familiar to anyone who has used Microsoft® Windows. From easy-to-see Main Menu buttons to an expandable/collapsible navigation tree that puts all the data for individual field controllers one click away.
- *All required programming accomplished in three screens:* Water Managers can utilize as many features as they want, or just the basics. All the programming required for automatic irrigation to occur can be accomplished in three screens. And, to make it even easier, all the primary information for an irrigation program is visible in a single screen, including start times, stations & run times, watering day schedule, water windows, etc., etc.
- *Purchase Software Only or Software + Computer:* For reliability, performance, & support, we recommend you purchase a Toro NSN Sentinel Computer. However, if you already have a computer or an IT department that frowns on outside computers, just purchase the software.
- *The Microsoft® .NET (dot-net) Advantage:* Sentinel software is developed using Microsoft's .NET Platform – the latest and greatest for software development. .NET enables developers to do more with less code, meaning fewer mistakes, higher productivity and a better end product. .NET is Microsoft's latest, and leverages many of Microsoft's development insights and accounts for the many computing changes over the last decade. It also has an army of experts and technicians supporting it in the event that our engineers encounter problems.

SENTINEL® CENTRAL CONTROL PRODUCT GUIDE

Flexibility

No Matter what your system requirements are, from controller enclosure design to communications type, Sentinel can meet your need. If the standard Toro Sentinel Controller won't get the job done, our Eicon Special build (ESB) Team will build custom product to meet your needs, for a fee, of course.

- *Communications:* Not only has Sentinel been at the forefront of narrowband radio technology as an irrigation control and data transmission method, but we also have extensive experience in systems utilizing Ethernet, Internet, Spread Spectrum Radio, Cellular Phone, Landline Phone, Fiber Optics, Radio Repeaters, or a combination of the above. So, if narrowband radios don't work, tell us what will.
- *Enclosures:* Every installation is not the same and one enclosure does not work in every situation. Toro offers four standard enclosures to meet your needs, including Stainless Steel Wall Mount and Pedestal Controllers, Green plastic Pedestal Controllers, and Small Metal wall mount Controllers in 12-, 24-, 36-, and 48-station models. But, if you prefer sandstone-colored plastic, because your landscape is in a semi-Arid environment where green plastic just does not work, or painted metal enclosures, or enclosures with 96 stations, instead of just 48, let us know.
- *Other:* Whether it is solar-powered controllers, a non-standard voltage supply, or other issues you need solved, tell us what you need. We'll tell you if it's possible.

World Class Support

Every Sentinel System sold is backed by the world-class support of Toro NSN®. Whether you have an operational issue that requires quick remedy, you need advice on water conservation and time-saving techniques, or you need education and training for operators and field technicians, Toro NSN is always there for you.

- *24-hour, seven-day, 365 support:* Worldwide, Toro NSN is always available to answer your questions, troubleshoot your system and solve your problems. And if needed, our 24-hour central component replacement service ensures minimal disruption to the operation of your irrigation system (U.S.).
- *Industry-best training — classroom and computer-based*: NSN offers curriculum tailored to meet the range of user experience and proficiency. Classroom instruction is available at regional locations and at the NSN Training Center — where classes feature hands-on computer training and the operation of TORO hardware.
- *The confidence of working with the best in the business:* Toro NSN is a Microsoft® Certified Partner. Our support technicians are licensed irrigators, and our hardware technicians are A+ certified. NSN has a diagnostic lab on-site for each irrigation platform, all field hardware, plus ancillary products. The lab is used to duplicate field issues and investigate causes and solutions as part of Toro's commitment to continuous improvement. NSN is dedicated to irrigation—we know your business and expectations.
- *Total operational confidence:* If your central hardware goes down, our TORO central control component replacements arrive at your facility Toro-tested, ready to keep you up and running.

Sentinel® Central Control

- **Central Control Software**
- **ET-based Watering**
- **PC-based**

Sentinel Central Control from Toro® is a powerful system that literally "stands guard" over large irrigation sites. With the ability to control up to 999 field satellites from one location, users have a water management tool that provides reliability, accuracy and water savings. Sentinel's innovative Distributed Intelligence means all irrigation program data is stored at both the central computer and in field satellites. Programming changes are made easy as true two-way communications allow irrigation programs to be changed in the field and uploaded back to the computer. As a "smart" irrigation system, Sentinel comes standard with flow monitoring and the ability to connect to a weather station and ET-adjust runtimes. When it comes to safeguarding landscapes and streamlining water management practices, Toro's Sentinel System has raised the bar.

Features & Benefits

Simple To Use
Microsoft® Windows-based software – daily operations and scheduling are made quick and easy.

Features For Water Management
ET-based watering, flow sensing and optimization, view water usage and compare to historical.

Multiple Communication Options
Communication options like radio, telephone, cellular, and Ethernet can be mixed and matched to meet system needs.

Distributed Programming
Stores irrigation programs in the computer while allowing irrigation control at the satellite level, ensuring the loss of a component does not result in the loss of irrigation across the system.

Toro NSN® Support
All centrals come with a minimum of two years of NSN support – unlimited 24-hour toll-free support with 24/7/365 emergency paging

Three Choices Of Central Packages
1) Software only; 2) Software and radio communications interface; 3) Central controller, software and radio communications interface.

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Specifications

Central Software/Computer Models

Model	Description
• SGIS-1-T	Software Only w/2 years of NSN Support
• SGIS-0-1	Software, Peripheral Hardware w/2 years of NSN Support
• SGIS-1-0	Software, Computer Equip, Peripheral Hardware w/2 years of NSN Support

NSN Support Extension Models

Model	Description
• SSE-T-1	1-year Extension for SGIS-0-1 of SGIS-1-T
• SSE-T-3	3-year Extension for SGIS-0-1 of SGIS-1-T
• SSE-C-1	1-year Extension for SGIS-1-0 (w/computer warranty)
• SSE-C-3	3-year Extension for SGIS-1-0 (w/computer warranty)

Specifications and Features

- Control up to 999 field satellites
- Group controllers into "systems" for system-wide adjustments:
  - Rain Days
  - Percent Adjust
  - ET-Adjustment from shared weather source
- Field changes to controller programming can be uploaded to computer
- Support for the System Administration
  - Set system, program and satellite descriptions
  - Map valve positions on site maps
  - Mark special dates on on-screen calendar
- Alarm reporting of any communication issues from the central to the satellites such as over- or under-flow conditions or power failures
- Extensive reporting features:
  - Run time reports
  - Water usage
  - Alarms
  - Logging of system changes
- Water use, rain and ET accumulation
- Flow optimizing to maintain optimum flow and shorten water window
- Ability to redefine valve sequence without physically changing wire terminations in field satellite
- Information overview by group and satellite
- System status indications for individual field satellite
- On-line help screens
- Map-based feedback on system status
- Standard telephone modem or internet connection allows for remote access to central software via pcAnywhere™

Warranty

- 2-year extendable by continuous NSN subscription

Specifying Information—
Sentinel Central

| SGIS-X-X	
Description	**Optional**
SGIS	**-X-X**
SGIS—Sentinel Central Control Irrigation System	1-T—Software Only w/2 Year of NSN Telephone Support for Software 0-1—Software, Peripheral Hardware w/2 Years of NSN Telephone Support 1-0—Software, Computer Equipment, Peripheral Hardware w/2 Years of NSN Support

Distributed Intelligence
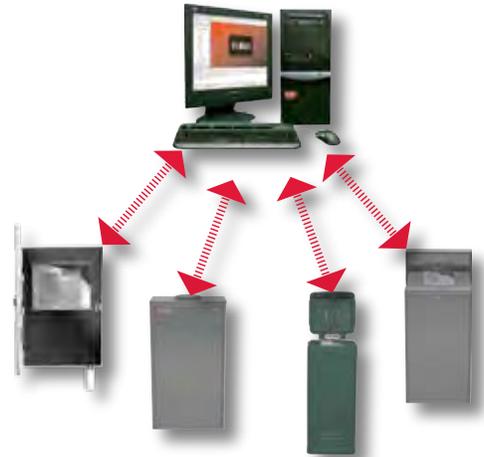
Each Sentinel® controller is a fully intelligent unit with program data stored at both the field satellite and within the central computer. In the event a computer or master controller goes off line, there will be no loss of irrigation. True two-way communication allows programming changes to occur at the on-site field controller and uploaded to the central computer. Protection from unauthorized changes is ensured as the controller program can be easily compared to the program saved in the central computer.

Water Management Highlight

Water savings – ET-based
(multiple weather station options)
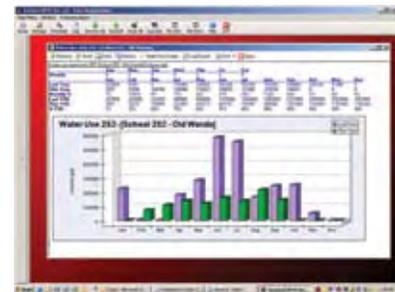
Effective ET-based system management can lead to water savings of 25% to 30% per year. As an additional source of savings, pipeline breaks, malfunctioning valves, and missing heads are automatically detected and shut down, preventing excessive water loss.

Specifying Information—
NSN/Sentinel Support Extensions

SSE-X-X	
Description	**Optional**
SSE	**-X-X**
SSE—Toro NSN Support for Sentinel Subscription Extensions*	T-1— 1-year Extension for SGIS-0-1 of SGIS-1-T T-3— 3-year Extension for SGIS-0-1 of SGIS-1-T C-1— 1-year Extension for SGIS-1-0 (w/computer warranty) C-3— 3-year Extension for SGIS-1-0 (w/computer warranty)

*1- and 3-year NSN extensions can be purchased up-front in conjunction with SGIS packages to provide the end-user with an additional one or three years of NSN support. For example, a customer can order the SGIS-1-0 and the SSE-C-3 which would equal five years of NSN support. These extensions are for original purchases only; existing plan renewals are still purchased through Toro NSN.

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Sentinel® Controllers

- Modular
- ET-based Run Times
- Remote Ready
- Flow Sensor Ready

Toro® Sentinel field satellites are commercial grade, modular units that do the irrigation control work in the field. Designed to operate in both stand-alone and central mode. Sentinel controllers are expandable with modular station counts available from 12 to 48 stations with the use of 12 station output modules. MapTo assemblies increase possible station count to 96 by allowing communication to another field controller within radio reception. A Sentinel system is shipped from the factory hand-held remote and flow sensor ready — no costly add-ons as with competitive systems. Customizable for site specific needs, Sentinel controllers come in any combination of key-locking metal, plastic or stainless steel, wall or pedestal mounted enclosures. For superior performance, expandability and simplicity… you won't find a better system.

Cabinet choices

Powder-coated, wall-mount enclosure

16-gauge stainless steel, front-entry, wall-mount enclosure with backplate and junction box

Double-sided, plastic, top-entry pedestal-mount enclosure with dual backplates and junction box

16-gauge stainless steel, top-entry, pedestal-mount enclosure with backplate and junction box

Features & Benefits

Flow Sensing
Reads, displays and reacts to under and over flow situations and track water usage. No additional circuit boards are required.

High-Surge Options
Options for three levels of surge protection.

Weather Based Irrigation
Sentinel waters according to ET values by using one or a number of onsite weather stations.

Manual Station Outputs
Flip the toggle switch to manually operate stations.

MapTo Capability
Provides the ability to program and communicate to another field controller within radio reception – providing control of 96-stations off of one Sentinel Satellite.

True Two-Way Communication
Allows for changes in the field to be uploaded to the central computer and allows feedback to a hand held radio in stand-alone mode.

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Specifications

Model	Description
• SSAK	Sentinel Satellite Assembly with Keypad
• SSAMN	Sentinel MapTo Assembly

Dimensions

- Small wall-mount: 10 ¼" W x 15 ¼" H X 5 ¼" D
- Wall-mount: 17 1/8" W x 30 ¾" H x 8 5/8" D
- Pedestal-mount: 17 1/8" W x 34 ½" H x 8 5/8" D
- Plastic Pedestal-mount: 17" W x 40" H x 16" D
- Weight:
  - Small Metal Wall-mount: 21 lbs.
  - Wall-mount: 47 lbs.
  - Pedestal-mount: 64 lbs.
  - Plastic Pedestal: 60 lbs.

Electrical Specifications

- Input power:
  - 120 VAC, 60 Hz
  - 0.4A (maximum)
- Station output power:
  - 24 VAC
  - 0.25 amps per station; 2.0 amps maximum
- Station draw: 6 stations and pump maximum (also limited by software)
- Surge protection: Level 4, 24 V output boards, 20 KV @ 10 KVA
- UL Listed

Specifications and Features

- 16 programs
- Eight start times per program
- 6-week or 365-day scheduling calendar
- Station runtimes from one minute to four hours and 15 minutes
- Global adjustment from 0-255%
- Percent adjust by program from 0-255%
- Ability to operate from one to six programs simultaneously
- Flow sensor ready
- Handheld remote ready
- Two sensor inputs included for rain sensors or other switch sensors
- Ability to connect to a laptop to download large station count programs
- Upgrade to a central computer system without additional field satellite hardware or costs
- Program single or multiple stations to operate sequentially or start a program or multiple programs with just a few keystrokes
- Ability to read open- or closed-contact switches in any station count configuration
- Current monitor will disable a station if excessive amp draw is detected
- Non-volatile memory will retain all programming and real-time data for 10 years
- Field-satellite-diagnostics capable when used with a troubleshooting kit reducing downtime and warranty costs
- Multi-language display: English, Spanish, French and Italian
- Operating Temperature: 14° to 140° F

Optional Accessories

- TRS – Wired RainSensor
- TWRS/TWRFS – Wireless RainSensor or Wireless Rain/Freeze Sensor
- TFS – Flow Sensors
- SHHR - Hand Held Remote

Warranty

- Five-years

Modular
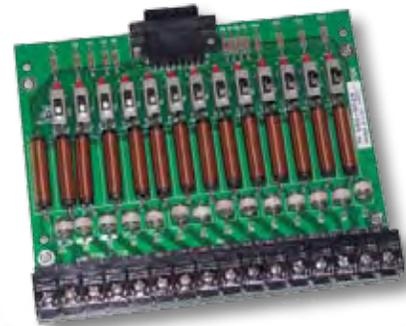
Modular in 12-station increments, up to 48-stations.

Multiple Levels of Surge Protection

Options from Level 1 to Level 4 surge protection offer multiple choices to meet regional lighting protection needs. Level 4 surge rated to 20 KV @ 10 KVA.

Water Management Highlight

Remote and Flow Sensor Ready

Every Sentinel® Controller comes hand held compatible and flow sensor ready right out of the box.

Specifying Information—Sentinel

SSAXX-XX-XXX-6-N-S-X						
Configuration	**Station Count**	**Cabinet Type**	**Output**	**Comm.**	**Sensor Capable**	**Surge Options**
SSAXX	**XX**	**XXX**	**6**	**N**	**S**	**X**
SSAK—Sentinel Satellite Assy. with Keypad SSAMN—Sentinel MapTo	12—12 24—24 36—36 48—48	WS3—Powder-coated Wall Mount (Small) PS1— Plastic Steel Pedestal Mount (Large) WS2—Stainless Steel Wall Mount (Large) PP1— Plastic Pedestal Mount (Large)	6—Electric 24 V ac	N—Narrow-band	S—Sensor	1—Standard Surge Large-capacity Terminal Block w/LEDs 3—Surge on Small Wall Mount 4—Large-capacity Terminal Block w/LEDs Switches Chokes & Add'l Surge
Example: A 24-station Sentinel Satellite in a metal wall-mount cabinet with electric output, narrow-band communication and surge, would be specified as: **SSAK24WS36NS3**						
Example: A 24-station Sentinel MapTo in a wall-mount cabinet with electric output, narrow-band communication and surge, would be specified as: **SSAMN24WS36NS3**						

TORO.

Hand Held Remote

Sentinel® hand held remotes are another example of Toro's desire to cover all the bases. This powerful Hand Held tool offers total convenience. The Sentinel remote gives the ability to conduct irrigation checks, and fully operate the system without opening a field satellite enclosure or needing a second person. Not only a command piece, this remote also serves as a two-way voice radio, allowing easy communication with other crew members. It's all the power and handiness needed in a small remote-controlled unit.

Specifications

Models **Description**

• SHHR   Sentinel Hand Held Radio

Dimensions

• Transmitter size (with antenna): 2 3/8" W x 1 3/4" D x 11" H

Specifications and Features

• Simple command set
• Accesses controller and satellite features from the field
• Direct access to controllers (central control software not required)
• Two-way voice communication capability
• System On and Off command activation
• Five-watt radio
• 120 selectable and programmable channels
• Range – 2 to 3 miles

Warranty

• One-year

Specifying Information

Model No.	Description
SSHR	Sentinel Hand Held Radio

Retro Link

The Sentinel Retro-Link assembly unit allows an existing Irritrol® MC-E or Rain Bird® ESP-MC controller to be upgraded to a Sentinel field satellite. Retro-Link is 100% compatible with the Sentinel central control software. Upgrading is simple and with a 5 year warranty – why wait!

Specifications

Models **Description**

• RLS-IR   Sentinel Retro-Link Assembly (Irritrol)
• RLS-RB   Sentinel Retro-Link Assembly (Rain Bird ESP-MC)

Dimensions

• 5 ½" W x 5 ½" L x 1 ½" H

Specifications and Features

• Flow sensor, ET gauge or rain sensor capabilities
• Non-volatile memory in case of a power outage
• 100% compatibility with the Sentinel central control software
• Optional hand-held control with a Sentinel hand-held unit
• Provides the convenience of remote manual control
• Multiple hand-helds can be used on one-site
• Retro-Link works with: Irritrol MC-E or Rain Bird ESP-MC

Accessories

• SHHR - Sentinel Hand Held Remote

Warranty

• Two-years
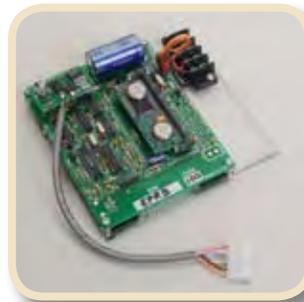
Specifying Information

Model	Description			
	ESB - RLS - U - 2 - XX			
ESB—Eicon Special Build	RLS—Sentinel Retro-Link	U—UHF	2—2-way	IR—Irritrol RB—Rain Bird

For information, ordering, or quotes, contact:

EICON Division
The Toro Company
7304 S. Alton Way, Suite M
Centennial, Colorado 80112
PHONE: (303) 290-1881 FAX: (303) 290-9546

No matter what your central control system requires, from controller enclosures to communications type, Toro's Sentinel® can meet the demand. With EICON Special Build (ESB), if a standard Sentinel controller is unable to do the job, the ESB team can custom-produce exactly what your system needs. ESB has extensive experience in systems utilizing every kind of communications option – just let us know what works for you. Enclosures – not a problem, we understand that every installation is not the same and one enclosure will not fit every situation. Need to retro-fit an existing controller? ESB can help configure the upgrade. Whether it is solar-powered controllers, a non-standard voltage supply, or any other issue, tell us what you need. We'll tell you if it's possible. EICON Special Build is here to build what works for you.

Solar-powered Controller
Retrofit or areas like highway mediums where standard 120 VAC can't be run to.

Features & Benefits

Communication Options
Not only has Sentinel been at the forefront of narrowband radio technology as an irrigation control and data transmission method, but we also have extensive experience in systems utilizing Ethernet, Internet, Spread Spectrum Radio, Cellular Phone, Landline Phone, Fiber Optics, Radio Repeaters, or a combination of the above. So, if narrowband radios don't work, tell us what will.

Enclosures To Meet Your Needs
Every installation is not the same and one enclosure does not work in every situation. If you prefer sandstone-colored plastic, because your landscape is in a semi-arid environment where green plastic just does not work, or if you need painted metal enclosures, or enclosures with 9 or 96 stations, let us know.

Retro-Link Options
Many existing controllers, like the Irritrol® MC-E or a Rain Bird® ESP-MC can be upgraded with a Sentinel Retro-Link to turn them into a Sentinel Satellite without needing to replace the controller.

Tell Us What You Need
Whether it is solar-powered controllers, a non-standard voltage supply, or other issues you need solved, tell us what you need. We'll tell you if it's possible.

Sandstone Plastic Pedestal
For desert / arid locations where a turf-green just does not fit into the landscape.

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TORO

NSN® National Support Network

Isn't it nice to know someone's got your back? Toro's National Support Network (NSN) provides exactly that with 24/7 telephone support to answer questions, advise on water conservation and time-saving techniques or troubleshoot your system. If needed, NSN even has a 24-hour central component replacement service ensuring minimal disruption to the operation of your system. NSN offers the industry's best training options. Through internet-based instruction or training classes held at the NSN Training Center and regional locations, you are provided the added support you might need along the way. Although competitors may claim to have a similar service, NSN is the recognized worldwide leader for irrigation central control support. Available day or night, you can count on the NSN support team for total operational confidence.
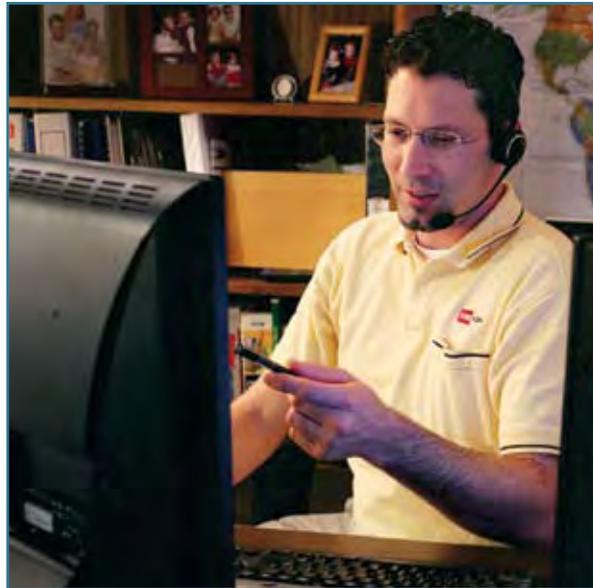
Features & Benefits

24-Hour, Seven-Day, 365 Support
Worldwide, Toro NSN is always available to answer your questions, troubleshoot your system and solve your problems. And if needed, our 24-hour central computer and component replacement service ensures minimal disruption to the operation of your irrigation system (U.S.).

Industry-Best Training – Classroom And Computer Internet- Based
Classroom instruction is available at regional locations and at the NSN Training Center—where classes feature hands-on computer training and the operation of Toro hardware. NSN's new internet-based Training In Ten™ features critical instruction that can be learned in ten minutes or less and quickly applied right on-the-job!

The Confidence Of Working With The Best In The Business
Toro NSN is a Microsoft® Certified Partner. Our support technicians are licensed irrigators. NSN has a diagnostic lab on-site for each irrigation platform, all field hardware, plus ancillary products. The lab is used to duplicate field issues and investigate causes and solutions as part of Toro's commitment to continuous improvement. NSN is dedicated to irrigation—we know your business and expectations.

New System Support, Flexible Options To Renew
Every new Sentinel offering includes Toro NSN support. To protect your Toro investment long-term, choose a renewal option that gives you exactly what you need for continued reliable, cost-effective support and extended warranty, including equipment upgrades to keep your technology current and powerful.

Note: NSN Features vary based on the Sentinel product offering purchased. Contact Toro Sales for details.

Specifications

Support for the Sentinel® Central Control

- Every Sentinel central package comes standard with 2-years NSN support
- Unlimited 24-hour toll-free support with 24/7/365 emergency paging
- Technical assistance by email with next business day response
- Remote PC assistance where connectivity is available
- Support of Microsoft® operating system software when purchased from NSN
- NSN lab for field issue duplication and diagnostics
- Technical bulletins
- Remote data storage for duration of subscription period
- Extended warranty on central hardware components with continuous subscription
- User training both hardware and software
- For more information on products, services or training, contact:

Toro NSN
P.O. Box 3339,
Abilene, TX 79604
Phone: 888-676-8676
Website: toronsn.com

End User Benefits

Customers want this product to work across a wide variety of applications, like temporary power, dusty and hot conditions, and where lightning or electrical surges are commonplace. They don't want to know their field representative on a first-name basis. They want the product to do its job—to watch their irrigation system and safeguard against potential problems over a long period of time. They want all this for a competitive price.

Perhaps they want to start out slowly with maybe just a few stand-alone units. Then maybe someday, they'll want add a central computer. They want to see the benefits of reducing their liability with sensors that work and report field changes. They want something their landscape crews will use, not abuse. It has to be simple yet powerful and it has to change as their needs change. Most of all, it has to be reliable.

Sentinel feature sets allow the customer to expand the product, as their needs change. It offers sensor and hand-held capability as standard features, not the costly add-ons found with competitive products. The user-friendly interface doesn't require a Ph.D. to operate or make changes. Its five-year track record and long list of satisfied customers are testament to its reliability to withstand the rigors of day-to-day operation.

Look at what some of our customers have to say....

> *"Installing the Sentinel is one of the best things we ever did here. It gives us total control of the amount of water being put down."*
>
> Will Schnell, Turf Superintendent, The Rose Bowl

> *"I tell people it's just a great system. It'll do everything they ever wanted it to do, and more."*
>
> Rick Schultz, Higlands Ranch

Who's there to help the customer, if and when it's needed? All control products come with a five-year warranty from the date of installation. For central computer users, two years of NSN offers technical computer hardware and software support as a standard feature. In addition, NSN offers end-users additional coverage in one-, three-, and five-year increments. A toll-free number is available to customers seven days a week, 24 hours a day, with a real-live person to assist them through their product-related questions.

These are the tangibles that the customer can see, but what about those that they can't? What about upgrading with new features? The Sentinel uses flash memory as part of its brain. This enables it to be upgraded from a laptop or via the central computer during non-operational periods with a few keystrokes. If customers are worried about liability from broken sprinklers or irrigating during freezing conditions, Sentinel's sensor capability is a standard feature, allowing the customer to design from the start or add on later with no additional hardware for the control product.

Then there's the hand-held radio feature. The hand-held allows many functions such as mainline repairs to be conducted by one person so that landscape resources, vehicles and personnel can be allocated and prioritized to maintain the value of a property.

When it comes to famous sites for athletics, one of the most well-known is the Rose Bowl in Pasadena, California. Since the first football game played there in 1902, the storied Rose Bowl has hosted thousands of sporting events, from high school to college to the pros, including five Super Bowls.

Literally billions of people around the world have seen the Rose Bowl's field on one occasion or another, so is there added pressure to keep such a high-profile venue looking its best?

"Our expectations here are higher," explains Will Schnell, Turf Superintendent of the Rose Bowl. "We want the best surface in the country, and we want it perfect all the time—like a pool table. Even if we're not on national TV that day, if it's just a Little League game, you always want the surface to be perfect."

Given such high standards, Toro was very honored when the Rose Bowl chose a Toro Sentinel irrigation control system.

The Sentinel is a "smart" system that delivers the ultimate flexibility and performance. With a range of modular components including hand-held radios and satellites, Sentinel allows changes in the field to be uploaded to the central computer.

"It's one of the best things we ever did here," Schnell says enthusiastically. "It gives us total control of the amount of water being put down, and we can keep exact records of it. With that remote control, you'll be out riding on a mower, and if you see a hot spot, you can just turn it on.

The Sentinel central control system helps keep the Rose Bowl looking good.

Things weren't always so rosy before the Sentinel. The facility's previous irrigation system was badly outdated, and required much more work and attention.

"We got a call from the Rose Bowl one day, and when we got there, we found a 20-year-old controller," recalls Don Ghella, Toro's Central Control Manager. "And it was all hand valves, so every day they had to send people out to turn hundreds of valves on and off by hand."

Toro then installed a new Sentinel control system. "We were done in three hours," Ghella says about the installation, "and then because of its simplicity, they were able to operate the controller immediately."

"Even a person who has no computer background can be taught with this," adds Schnell. "It's pretty self-explanatory."

Today the Rose Bowl actually operates on two Sentinel controllers, one on each side of the stadium. In addition to the playing field, Sentinel controls the irrigation for the Rose Bowl's beautiful exterior landscaping and vegetation—even running its famous neon sign over the main gate.

"It's been a tremendous asset to the whole facility," Schnell adds, "and I'm still learning what the system can do."

- True two-way communication

- Fixed station counts from 12 to 48, in 12-station increments

- Drone or "MapTo" units may be controlled from the field satellite assembly

- Field satellites and MapTo controllers have flow monitoring as a standard feature

Sentinel control system

34 Square Miles of Irrigation
Sentinel™: More Control, Less Water

How often have you heard or used the expression, "In a perfect world…"? Well, just 12 miles south of Denver, one community has been taking exciting steps to create the perfect place in which to live.

Highlands Ranch, Colorado, is a 22,000-acre "master planned community"—a residential area specifically conceived and developed to provide an exceptional quality of life. Highlands Ranch features new neighborhoods of beautiful homes and apartments within an outstanding school district, and it offers an unprecedented range of green spaces and facilities that cater to its residents' active lifestyles: parks, ball fields, playgrounds, hiking/biking trails and much more.

"Our residents literally do everything here," says Rick Schultz, "tennis, football, baseball, softball, soccer, lacrosse and even rugby." Schultz is Operations Administrator of the Metro Districts of Highlands Ranch Parks, Recreation and Open Space.

The Sentinel™ Central-Control system allows programming changes to be made in the field using handheld radios.

Photo: Sherry Eppers

Irrigated Greenbelts enhance the roadsides in the Highlands Ranch master-planned community near Denver, Colorado.

"We have 19 parks right now, with a total of 25 planned," Schultz explains, "so we have a few more to be built. It's really quite large."

Relying on Toro

From the earliest days of the Highlands Ranch planned community, the developers anticipated the need for a good integrated irrigation system. However, their original central control system was hard-wired, which posed problems. Bob Claiborne, Parkways Supervisor for the Metro Districts, made the decision to go with a radio control system.

"We had literally miles of wires running from our shop where the computer was located out to these controllers at different points in the field," recalls Schultz. "You can imagine the problems we had. Our community was growing rapidly with a tremendous amount of new

Photo: Jim Cook

Young atheletes enjoy one of the soccer fields at Highlands Ranch, a master planned community that caters to its residents' active lifestyles.

construction work coming in—pipelines, water lines, phone lines, electric lines—so our wires were constantly being dug up and broken. Because of that, the irrigation system never worked the way it was intended to. Finally we said 'let's go with radio control' and Toro came in and made it work."

Since the early '90s, Highlands Ranch has depended on the Toro Sentinel™ System, an advanced central-control system that provides a range of modular options for unparalleled flexibility. Using hand-held radios and field satellites, the Sentinel system allows true two-way communication, so changes in the field can be uploaded to the central computer.

In the stand-alone mode, users are able to program Map-to-Assembly satellites within radio reception to manually turn stations on/off, initiate a program or even perform complete shutdown. The Sentinel system at Highlands Ranch now commands a network of some 160 Field Satellite controllers throughout the community.

"The savings in time and manpower alone are just incredible," says Schultz. "With the remote programming capability, you can easily respond to changing weather conditions to

increase or decrease the amount of water applied. Think of the labor it would take to drive around and adjust and readjust those 160 controllers if we weren't on a central control system. The radio remote is an amazing tool," he adds. "And from a maintenance standpoint, now one technician with a radio can do the same work that two technicians out there used to do."

Since the irrigation system at Highlands Ranch covers several miles, they use 25-watt radios and repeaters to increase their radio communications' range. The standard Sentinel system comes with a 2-watt radio, which has a range of three to five miles depending on topography, population density or manmade structures that can deflect radio signals.

Saving Water

Being able to adjust irrigation controllers so quickly and conveniently naturally pays big dividends in water conservation and cost-savings.

"The system has really helped us decrease the amount of water we use," Schultz explains. "Colorado has been in a fairly significant drought for the last three to five years, and the Sentinel system has allowed us to respond and to apply the most appropriate amounts of water. Even though we've continued to grow here, and we've gotten bigger and bigger over the last five years, we've actually decreased our irrigation."

The Toro Sentinel could be called a "smart" system, because it's designed to help you make critical decisions about your water applications. Special Toro software links the control system directly to an onsite weather station, and it automatically polls the weather station to provide daily updates on rain values and ET (evapotranspiration) values for that day. Optionally, this ET value can be automatically downloaded to the field satellites at a user-designated time.

"We've really come to like that," Schultz says. "The most useful weather information for us are the rain and ET values. We use those values to adjust the system to prevailing weather conditions. And now we don't have to monitor it, because the Sentinel software monitors it for us every day and sends it to us in an e-mail."

Additionally, depending on geography, soil type, plant material, etc., each zone

Highlands Ranch Snapshot

12 Miles south of Denver, Colorado

22,000 Acre Master Planned Community

79,597 Residents

25,882 Single family homes, 3,305 Apartments

19 Parks, 60 miles of trails and 2,000 acres of natural open space areas with a diverse wildlife population

One Toro Sentinel™ Central Control Irrigation System with 160 Field Satellites

can be set to automatically use a little more or a little less water than indicated by the actual ET value. This allows for the maximum in water savings, while still ensuring that all areas get exactly the amount of water they need.

Landscaping enhances the parks, trails and open spaces at Highlands Ranch, where one Sentinel Central Control System with 160 Satellites controls all the irrigation.

Photo: Sherry Eppers

Covering All The Bases

Obviously, Highlands Ranch presents many special challenges simply in its size and complexity. Having the Toro Sentinel is making a dramatic difference in how Schultz and his staff address the many irrigation issues they face.

"As far as the total number of units and the total area served, I can certainly say we're one of the largest users," Schultz adds. Highlands Ranch was also one of the earliest users of the Sentinel system, and the input of Claiborne and Schultz over the years has been extremely valuable in helping make improvements to the system.

"We can look at several of the features, and several things this system does, and point to it and say, 'They have that because of us,'" says Schultz. "We didn't necessarily help develop it, but we were a driving force, and it shows they really listen to their customers."

Because the Toro Sentinel central control system provides significant savings in labor, water, time and trouble,

contractors are using it in a variety of larger installations including sports complexes, parks, school districts, airports and corporate campuses.

"I tell people it's just a great system," Schultz sums up. "It'll do everything they ever wanted it to do, and more."

The Toro Sentinel™ Central Control Irrigation System

- Computerized central control assembly programs your system and gathers data for reporting, but each site is managed at the site level by field satellites. The computer and software are not required for system operation.

- True two-way communications between the controller and the central unit, as well as between the controller and a handheld radio, allows you to make programming changes or stop the program in the field.

- Fixed station counts (from 12 to 48, in 12-station increments) give the commercial customer flexibility to upgrade to meet changing needs.

- Drone or "Mapped To" units may be controlled from the field satellite assembly, with or without a computer. This gives the field satellite one control point for multiple "MapTo" units of various station counts as long as the cumulative total does not exceed 96 stations. This feature provides a great value by giving more control with added watering flexibility.

- Both field satellites and map-to controllers have flow monitoring also as a standard feature. This is just one of the many valued functions as a standard feature— something you'd expect from Toro.

Sentinel® Central Control System
Raising The Bar…Lowering Costs

Finding a more efficient way to lower your irrigation costs and improve landscapes is now easier than ever due to the continuous technological advancements of Toro's Sentinel® central control system. Our engineering team is dedicated to producing a more robust system to help you manage large sites while increasing water savings, and lowering overall system operating costs.

"The reason we save 15-20% on water costs is because of the innovative technology Sentinel provides to our operation," said Russ Ayers, Shoreline School District, Seattle, Washington. "With Sentinel we have the ability to efficiently water our grounds, saving us a total of $77,000 a year on water costs. Sentinel is an invaluable tool that I could not do my job without."

Sentinel will streamline your water management practices and safeguard your landscape against potential problems and unfavorable environmental conditions—it acts like a constant guard over your site.

"With Sentinel the water is supplied at exactly the requirements of the landscape, which saves resources and adds convenience and ease," said Bill Akin, Sacramento International Airport, Sacramento, California. "Because we are continually taking steps to be a leader in environmental issues, Sentinel is a welcome addition to our irrigation management. It's definitely been a benefit to us—in more ways than one."

The easy-to-use Sentinel has station counts of 12, 24, 36 and 48 with more under development. It can be operated in central-mode with 16 programs or independent from the central in stand-alone mode with 8 programs. "It's not uncommon for a beginning user to buy 3 or 4 stand-alone units and as they start to build a stable of products, they will purchase the central," says Greg Parker, Toro's Product Marketing Manager for valves and controls. "Sentinel comes with several standard features that are optional with competitors' products. It has hand-held capability, flow-monitoring, weather station interface—all built right in."

"With all of its capabilities, Sentinel has been a real blessing," said Tracey Soliday, Planned Work Specialist, Disney's Wide World of Sports Complex.

Another astounding feature of Sentinel is the ability of a user to access any Sentinel satellite worldwide by phone.

Uses for the Sentinel range from cities, parks and sports fields to industrial parks and homeowners associations'. The Sentinel system has improved the efficiency and productivity for many sites around the country, including such well-known venues as:

- Disney's Wide World of Sports Complex
- Yankee Stadium
- City of Denver
- Central Park, New York City, NY
- Castle Pines Park District, Castle Pines, CO
- Leisure Village, Camarillo, CA
- Highlands Ranch Parks, Highlands Ranch, CO
- 3M, Saint Paul, MN
- Malmstron AFB, Great Falls, MT
- Shoreline School District, Seattle, WA
- City of Evanston, Evanston, NY
- PGA West, Palm Desert, CA
- Sacramento Airport, Sacramento, CA
- Meijer Gardens, Grand Rapids, MI
- Incline Village Parks Department, Incline Village, NV
- Central Kitsap School District, East Kitsap, WA

For more information on the benefits of a Sentinel Central Control System, contact Toro experts Jim Laiche at 804.270.4696 or Don Ghella at 480.832.8590.

SENTINEL® CENTRAL CONTROL PRODUCT GUIDE

TORO® SENTINEL®

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