Count on it.

TORO® SENTINEL®
APPLICATION NOTE

AN01: ET-BASED PROGRAMMING

Version: 12-17-2010

ET-BASED IRRIGATION IN SENTINEL

Irrigating by ET:

In order to irrigate by ET in Sentinel, the user has to perform a number of key steps:

1. Assign Unit to use ET-Based Irrigation to a System
2. Create a Weather Station
3. Designate System with Unit to be Updated with Weather Data by Weather Station
4. Ensure Proper Settings in Unit

Unit Settings

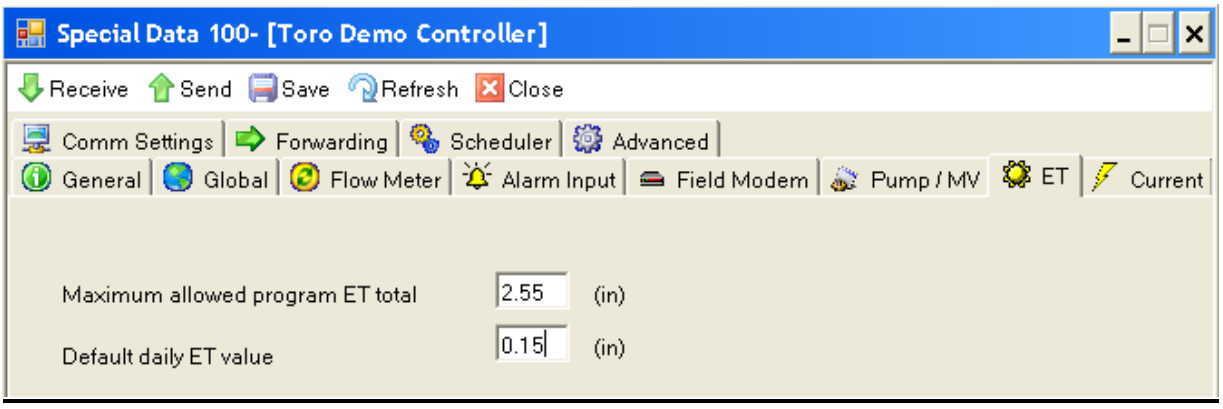
Sentinel has a number of settings in Automatic Operations and Zone Data that allow the user to up their system to irrigate based on ET and/or compensate for the irrigation requirements and restrictions of varying soil and plant types. Descriptions of these different settings are detailed below along with guidelines to help the user determine the proper system settings.

Location	**Automatic Operations**	**Satellite Special Data** **ET Tab**	**Station Information in Slot Editor (in Automatic Operations) or Zone Data**
Settings	***ET-Based Runtimes (Yes / No)**** Cycle Delay (minutes) Repeats (Number)	***Max Allowed ET (in.)**** ***Default Daily ET (in.)****	Run Time (Per Cycle) ***Precipitation Rate**** ***Plant Factor (0-999%)**** Water Holding Capacity (inches) Soil Infiltration Rate (inches/hr)

**** Required for ET-Based Irrigation***

When working with ET, the individual programs accumulate the daily ET values until they run (and then they reset to zero), or until they reach the value designated as the maximum allowed program ET total. At that point they stick at the maximum value. The default daily ET value is used if the satellite does not receive a communication from the central with the daily ET value. This insures that irrigation will still take place.

Satellite > Special Data > ET:



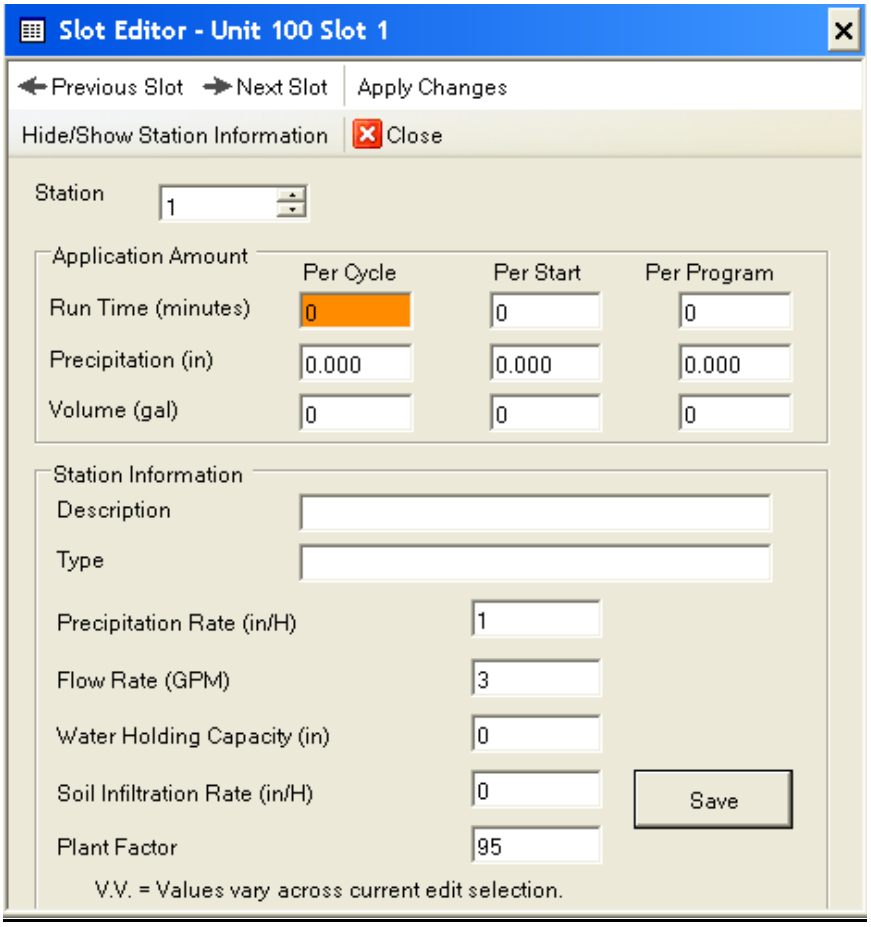
Max Allowed Program ET Total
Max Allowed Program ET is the maximum ET value, in inches, a program will irrigate at one time. If daily ET is greater than this amount, the extra will be carried over to the next irrigation cycle. Range of setpoint is 0.00 to 2.55 inches.

Default Daily ET
Default Daily ET is the ET value the satellite will use to adjust programs in the absence of daily ET Data (weather station maintenance, etc). Range of setpoint is 0.00 to 2.55 inches.

Satellite > Automatic Operations > Individual Program

For programs that will have ET-adjusted runtimes, Check (select) ET Based Runtimes in the applicable Programs.

Satellite > Automatic Operations > Individual Program > Slot Editor:



Precipitation Rate
Precipitation rate is the rate at which the sprinklers in a zone apply water at (inches/hour). This rate can be determined most accurately by water audit using catch cans. Estimated values can be or be found in manufacturers catalogs for individual sprinkler types.

Plant Factor

The Plant Factor is the evapotranspiration (ET) adjustment factor for the type of plant at the site. The evapotranspiration rate of different plants varies considerably. Some transpire (sweat out) large amounts of water while others transpire very little. A factor can be related to various plant species to estimate water requirements of each plant type. This adjustment factor is necessary because certain types of plants require more water than other types. The default Plant Factor is 100%. A higher percentage (150%) means that the plant type for that zone transpires more water. If plants are stressed, raising the Plant Factor increases the amount of water they receive. Enter value from 0-255 (= 0% - 255%).

Estimate of Plant Factor:

The following are thumbrules only. More exact calculations can be found online or from local or government agricultural resources.

Plant Factor (%) = Species Factor * Density Factor * Microclimate Factor * 100

Plant Type	Species Factor (k_s)
Annuals	0.7
Cool Season Turf	0.8
Groundcovers	0.5
Mixed	0.5
Other	0.5
Perrenials	0.5
Shrubs	0.5
Trees	0.5
Warm Season Turf	0.6

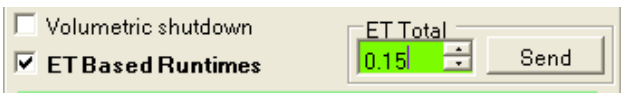
Plant Density	(k_d)
High (densely packed)	1.1
Moderate	1.0
Sparse	0.9

Microclimate	(k_{mc})
Shady 100%	0.75
Shady 75%	0.88
Sunny 50%	1.00
Sunny 75%	1.13
Sunny 100%	1.25

MANUAL ET ENTRY

If you do not have a weather station or other system-connected ET source, you can manually enter a daily ET Value for individual programs and send it to the Satellite Controller.

1. Go to the **Left Side Navigation Tree**, **Satellites Tab**.
2. **Click on the Satellite Unit** you want to send Manual ET Data to. This should expand the unit menu tree.
3. Under the **Programming** Directory, click on **Automatic Operations**.
4. Select the tab of the program you want to ET Adjust.
5. Verify ET Based Runtimes is selected.
6. Enter the Daily ET Value (or Total Accumulated ET Value) you want to send to the controller in the box labeled **ET Total**. Once entered, you can "CTRL-Click" on this box to see updated runtimes in the slots.
7. Click **SEND** to send this ET Value to the Satellite for this program.
8. Repeat for all remaining ET Programs.

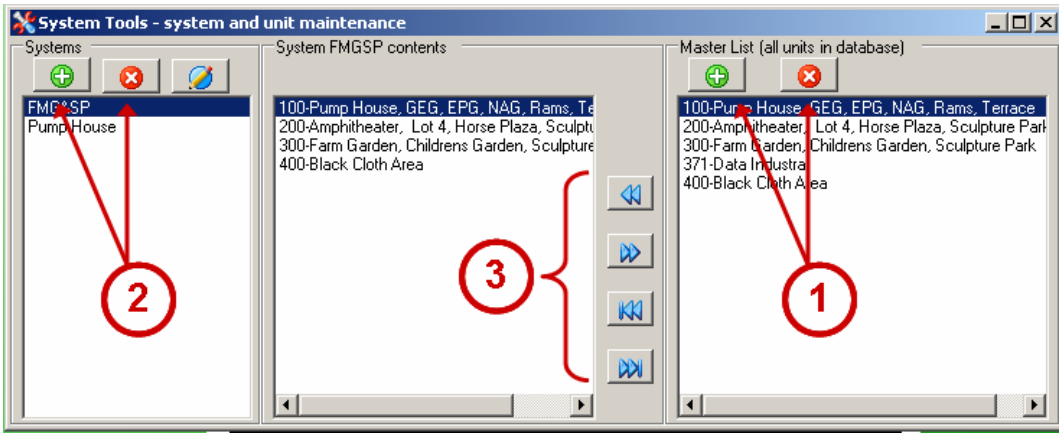


WEATHER STATION SETUP

System Creation

In Sentinel, most irrigation functions are conducted on the Unit (Satellite) level. However, Sentinel also provides the flexibility to group Units into Systems for the purpose of performing a shared action on a group of Units. This enables the user to group Units to receive Weather Data from a shared Weather Source. Individual Units may be assigned to none, one, or multiple Systems.

Setting up Systems is conducted via the **MANAGE** icon on the main toolbar  . When the user clicks the MANAGE icon, the following screen appears:



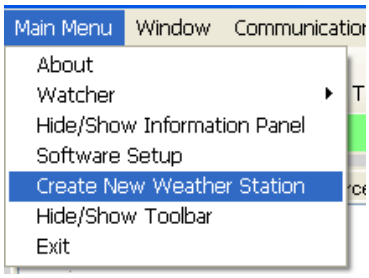
This screen allows the user to perform three basic functions when managing Sentinel:

- Create new Units (assign Unit Number and provide description) or delete (Remove) Units
- Create Systems (name) or delete/remove Systems
- Assign Existing Units to a System, or Remove Units from a System

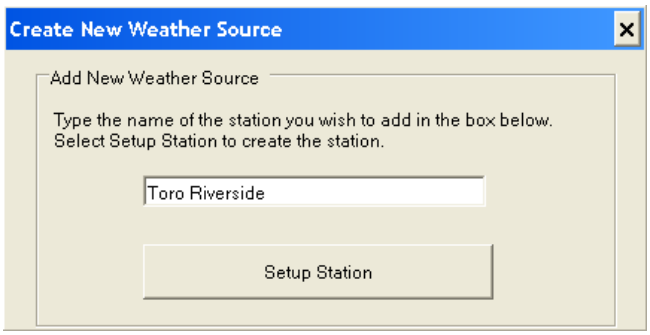
1. Create a System for ET Adjustment and Assign Units to that System

Weather Station Creation

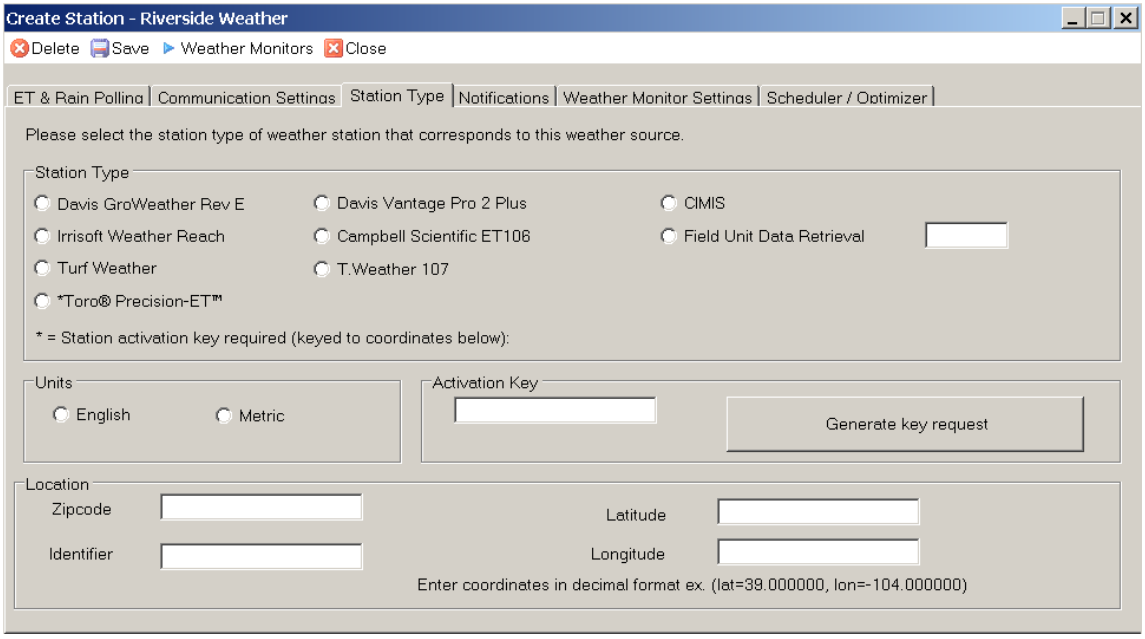
1. Select **Main Menu** in Upper Left of Sentinel Main Screen
2. Select **Create New Weather Station**



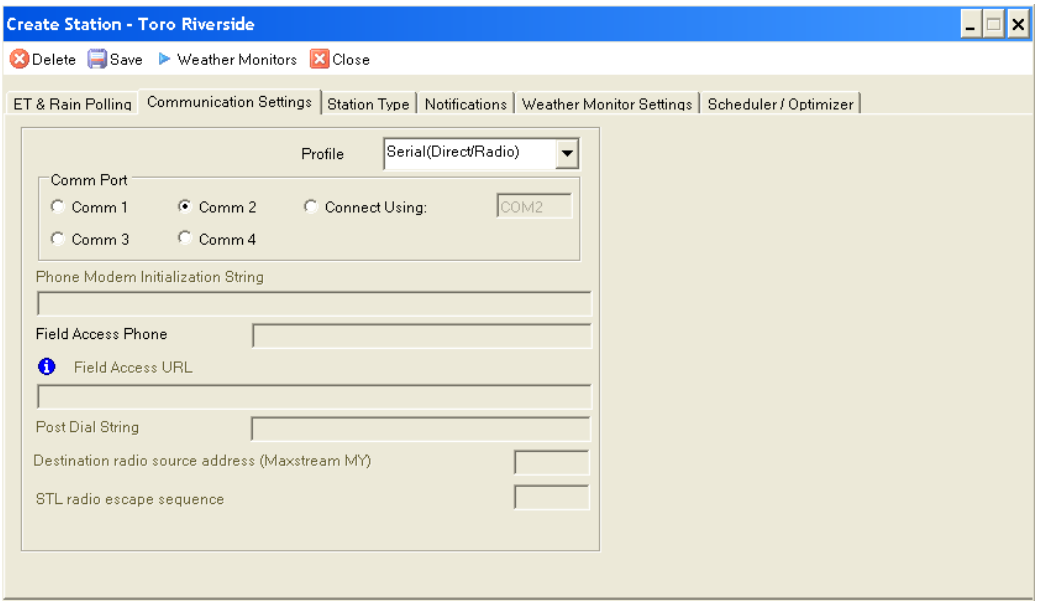
3. Enter Name for New Weather Station
4. Click **Setup Station** button



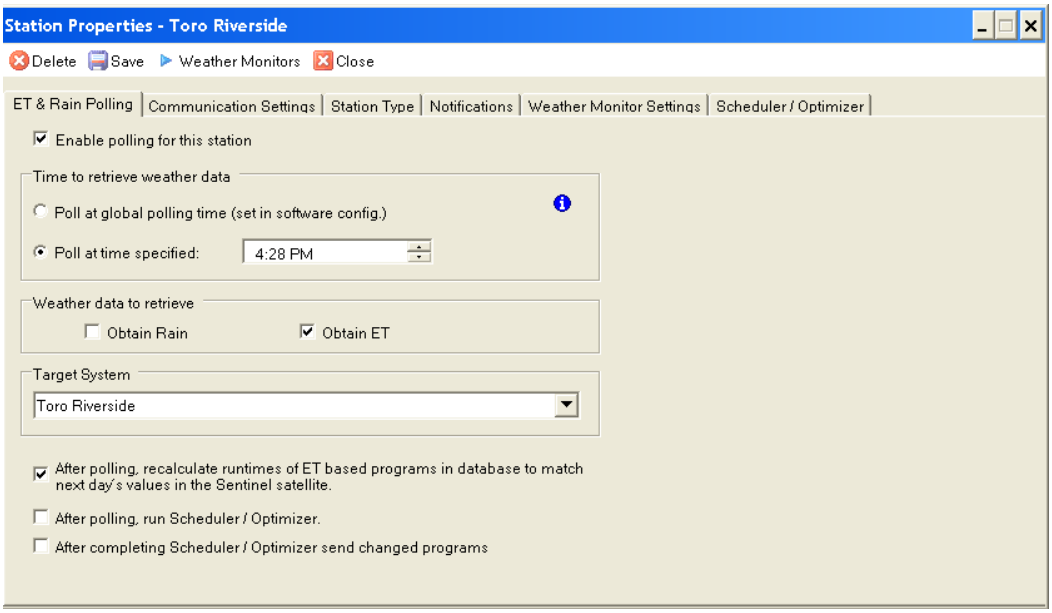
5. Select **Station Type** Tab
6. Choose Weather Station Model
7. Set Units (English or Metric)
8. Click **Save** to save changes



9. Select **Communication Settings** tab
10. Select Communication Method (**Profile**)
11. Enter Comm Port for communications & Phone Number or URL if required.
12. Click **Save** to save changes



13. Select **ET & Rain Polling** tab
14. Check (select) **Enable Polling**
15. Set Polling Time (before first irrigation start)
16. Check (select) to **Obtain Rain** & **Obtain ET** in Weather data to retrieve
17. Select **Target System** (previously setup)
18. Check (select) to Recalculate Runtimes of ET based Programs
19. Click **Save** to save changes
20. **Close** Station Properties



This Completes Basic ET-Based Programming.