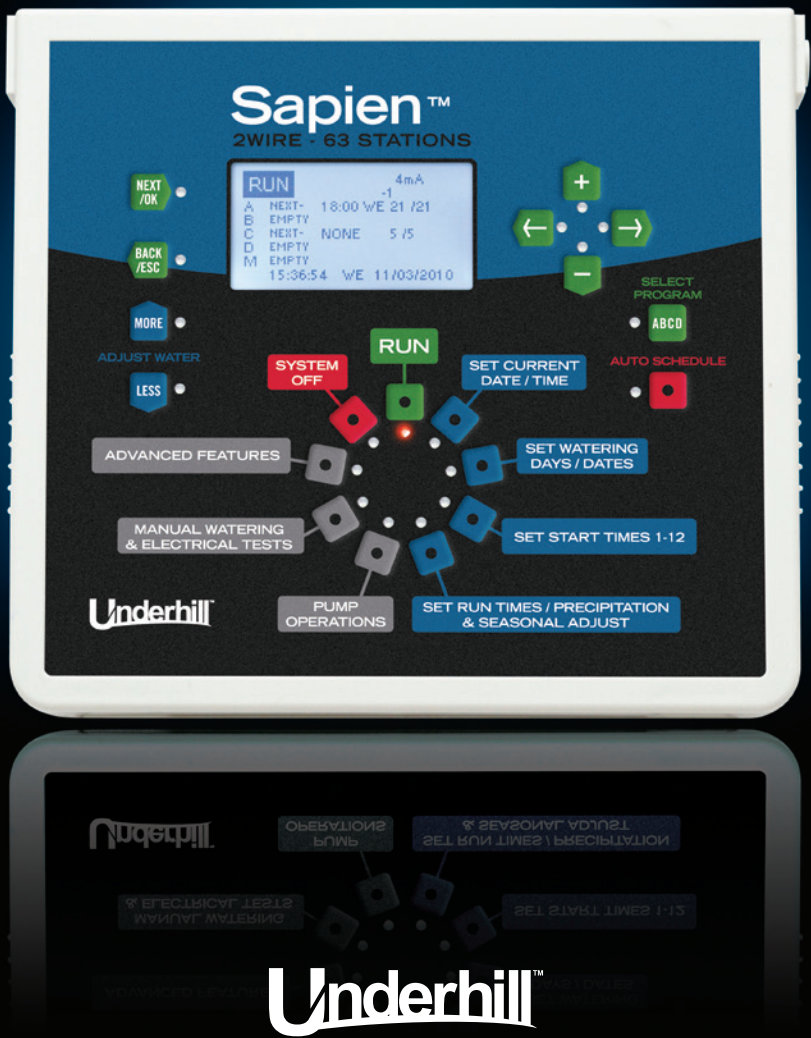
Sapien™

2WIRE 63-Station Controller

OPERATION MANUAL



Underhill™

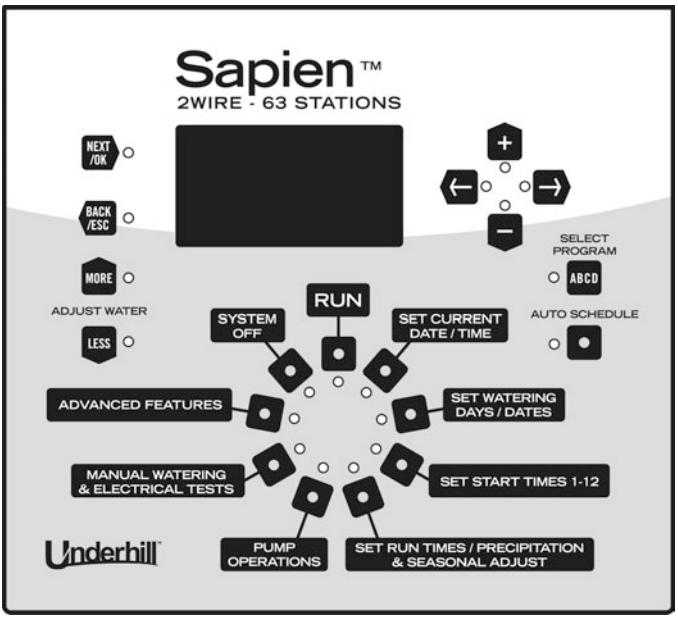
Products that work...smart.™

TABLE OF CONTENTS

OVERVIEW OF FEATURES
Sapien™ 2Wire 63

- Requires only 1 single two wire path.
    - Uses from 1 to 63 **Underhill™ TW-TK-DEC-1 Decoders**
    - No grounding needed along the two wire path.
    - No extra lightning protection modules needed.
    - Single ground only at the controller.
    - Can use normal 18 gage wire, no expensive special cable needed.
    - Old 'leaky' wire is tolerated to a large extent.
    - Can retrofit decoders to existing multi-wire cables.
- Waterproof case.
- Waterproof external transformer. UL Listed/CE conforming.
- Up to 12 starts/program.
- History of decoders run, minutes, inches/mm precipitation and any failures
- History of stations failed.
- Precipitation rate definable for each station.
- Set station run time by minutes seconds *OR* by precipitation.
- 4 programs. Each runs independently of the other, so up to 4 decoders on at once if run times are concurrent. Best thought of as 4 independent controllers in one box.
- Run-times from 30 seconds to over 9 hours.
- Overlapping starts on the same program will stack.
- A program entering a 'No Water' window or, at midnight, a 'watering blackout date', will stop. A running program will however continue into a no watering day until finished.
- Manually run decoders in addition to the above programs, so up to 5 decoders can run at the same time.
- Test electrical wire paths.
- Displays line current.
- Rapid testing of decoders - one at a time.
- Seasonal adjust for each program by month.
- Programming station numbers and testing of 2 wire decoders, using a plug-in test lead with 4 crocodile clips.

KEY FUNCTIONS



NEXT /OK

Saves a change that has been edited
Moves into a highlighted menu
Copies a station's value into the current station's value
Returns to the start of a history log

BACK /ESC

Rejects a change made to a value
Returns from a sub-menu to the previous menu
Rejects any changes edited

Moves highlight to the left or right
Increases or decreases station number

Increases or decreases a highlighted value
Moves up or down a vertical menu
In manual single station, turns a station on (**+**) and off (**-**)
In the Run Log & Failed Log, scrolls back & forth through entries

SELECT PROGRAM
ABCD

Changes the program **A**-**B**-**C**-**D**-**A**... etc. to allow editing

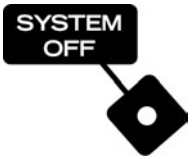
Under **SET RUN TIMES / PRECIPITATION & SEASONAL ADJUST**, increases/decreases irrigated amount by +/- 1mm (0.04”) when pressed. See PR in auto schedule menu.

AUTO SCHEDULE MENU
(Only accessible when in **SYSTEM OFF** dial position).
Used to change an individual station's values.
Precipitation Rate PR (default 1”/hour)
Shows irrigation applied over last 7 days

DIAL POSITIONS

The Sapien™ dial of keys looks much like a mechanical rotary switch with the current position is indicated by the red LED illuminated – yet you can change a selection from any point on the dial to another.

On power-up, the controller will remember its former dial position.



Turns the controller to standby.
All automatic programs are terminated and will not start again if the run position is reselected
Any manually operated stations are terminated
The Master Valve (or Pump) is turned off immediately
The decoder wire path is shut off immediately
Radio remote control will not operate in this dial position
Decoder Programmer/Tester available from this menu
Auto Schedule (menus) key active when dial in this position

Run automatic programs
Displays screen showing:
The current in milliamps (mA) drawn by the decoder wire path
The next program start, if waiting
The station number running and the time left from its run
The progress through a program as [stations done]/[total stations]
Any manually stations operating
Displays FAILURES message if there have been any station failures in a previous automatic or manual program

The failures message may be reset by entering the **STATION FAILED LOG** *history. This is available by pressing the* **NEXT/OK** *key from this* **RUN** *position, or in a sub-menu in the* **ADVANCED FUNCTIONS** *dial position.*

Sets times in 24 hour format - 1pm is 13:00

Sets date as in dd/mm/yy - 20/09/10. Elsewhere displays date in American version mm/dd/yyyy - 09/20/2010.

Sets any day of the week (Sunday-Saturday)
Even days of the month
Odd days of the month. If Odd is set, controller will not water on 31st of a month, or February 29th of a leap year
A sub-menu allows up to 8 'No Watering' dates to be specified.

Set **DAYS TO WATER**
Set **NO WATER DATES**

Sets up to 12 starts per day for each of the 4 programs. Programs start on the ¼ hour, but a manual program can be started at any time. (See **MANUAL WATERING**). A from-to No Water window can also be set, when automatic (but not manual) watering will cease or be prevented from starting.

Set **PROGRAM STARTS**
Set **NO-WATERING WINDOW**

Station run durations can be set to 30 second intervals from zero (station off) to over 9 hours. Also, using the More/Less Water keys, the precipitation can be set in 1mm (0.04") increments, with the runtime adjusted to give this from the station's precipitation rate (PR).

Each of the 4 programs **A**, **B**, **C**, **D** is assigned a monthly seasonal adjust from 10% to 255%. Watering time and precipitation will be adjusted by this figure. e.g. if this month's adjust is 50%, 10 minutes runtime will be adjusted to 5 minutes, and this time and precipitation logged as 5 minutes in the history file. Default adjust entries are 100% for all months of the year.

Set **STATION RUNTIME OR PRECIPITATION**
Set **MONTHLY SEASONAL ADJUST**

Master Valve (or pump) shut off
Pump **PRIMING TIME** (pipe network) can be set from 0-99 minutes. The Master Valve and decoder wire path will be energized for that time prior to the first decoder in the program being operated. Prime Time is not used in Manual operations
OFF-ON DELAY can be set from 0-99 seconds. This affects all programs to cater for slowly closing valves dropping the water pressure too much and causing a pump low pressure trip. Also useful when 'following the water around' during testing, giving the observer time to get to the next station before it turns on.

The most important value to monitor is the current drawn by the decoder wire path - displayed here in mA. Underhill™ decoders take approximately 3mA each, so provided the Master Valve is turned off (see PUMP OPERATIONS) the current taken with no solenoids active is a good indication of line condition. For example, with 40 decoders on the line, the indicated current with neither Master Valve nor solenoids on should be 40 x 3mA=120mA.

DECODER POWER ON/OFF
Manually **RUN ONE STATION**
RUN MANUAL PROGRAM (station x through station y for z minutes)
See **STATION FAILED LOG**

Explore Histories
STATION RUN LOG
STATION RUN LOG
Set up for Weather Station
(or 'Click'-type sensor)
TEST WEATHER STATION
CHOOSE INITIAL SOIL WETNESS
Discard Any Standing Water
Set **LATITUDE TO NEAREST DEGREE**
Set **PEAK SUMMER DAY ET**
SENSOR BYPASS

EXAMPLE SCREENS & THEIR KEYS

SYSTEM OFF

In this screen, all automatic and manual programs, Master Valve and power to the decoders are off.

Figure 9-1 The clock shows the time in 24 hour format, the day of the week, in this example Wednesday and the date are shown in mm/dd/yyyy format.

1. On the main dial, press **SYSTEM OFF**.
2. Highlight **UNITS:ENGLISH/METRIC**.
3. Press **NEXT/OK**.
4. Use the + or − keys to select: **ENGLISH UNITS:F,in** (Fahrenheit/inches) or **METRIC UNITS: C,mm** (Celsius/millimeters).
5. Press **NEXT/OK** to save your changes. Screen will flash **SAVED OK**.
6. Press **BACK/ESC** to return to the previous menu.
7. To enter the **PROGRAMMER/TESTER** menu, use the + or − keys to select, press **NEXT/OK**. From here, decoders may be programmed with a station (zone) address, prior to installation in the field (see **PROGRAM TESTER FOR DECODERS**, page 21).

In this menu position, watering is off, and the **AUTO SCHEDULE** menu key is active.

RUN

The Automatic or **RUN** screen shows current function or scheduled functions on each of the four automatic programs **A**, **B**, **C**, **D** and the Manual Run program **M**.

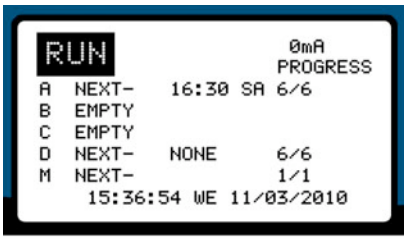


Figure 9-2 Here you can also see the PROGRESS statistic. For *A* this is *6/6*. The first number is stations run followed by total number of stations with run times greater than zero in them. In this example, six stations all ran during the previous start.

On the right of the screen is the decoder **line current** in milliamps (**mA**). Program **A** is awaiting the next start at **16:30** on **Saturday**. Programs **B** & **C** have no run times set for any of their stations. Program **D** has run times in it, but either no starts or no watering days allowed. Program **M** (manual) has nothing in it. If radio remote control were active, this would show which station is running.

In ***Figure 9-3***, program **A, #11** & program **C, #1** are running, the decoder **line current and Master Valve** are drawing **488mA**. This is the sum of all standby currents of the decoders, the Master Valve and the solenoids attached to decoders **1** & **11**.

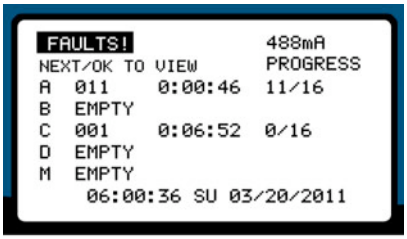


Figure 9-3 In this screen, program C is running station 1, which has 6 minutes 52 seconds left to go. The progress is 0/16 showing that no stations have runout. Program A is running station 11 with 46 seconds to go. 11 out of the 16 stations have finished.

Note: RUN has been replaced with **FAULTS!** meaning some stations have not run properly. Press **NEXT/OK** to display the **STATION FAILED LOG**, also accessible under **ADVANCED FEATURES**. Accessing the log will clear faults, and revert to **RUN**. Faults will remain recorded in the log for future reference.

In this example station **20** is on either by using the radio remote control or by accessing a sub-menu from **MANUAL WATERING & ELECTRICAL TESTS**. There is only one station in manual watering program **M** and if left, will run for 9 hours, 5 minutes & 57 seconds. This could manually be turned off after adjustments were finished.

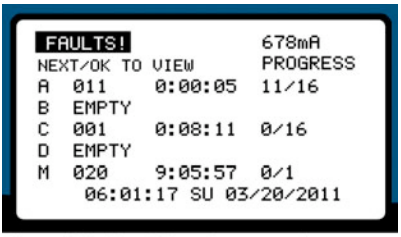


Figure 10-1 Here 3 decoders are running simultaneously with a combined line current of *678mA*. Also, faults have not yet been displayed.

Messages other than NEXT

PRIME

An automatic start has begun and the controller is priming the pipes. The Master Valve & the decoder power are on, but no stations have started. (See **PUMP OPERATIONS**)

The controller has turned off the last station and is signaling the next station to turn on.

PAUSE

An inter-station (Off-On) delay has been programmed and the controller is waiting for the previous station's valve to shut completely before turning on the next. (See **PUMP OPERATIONS**)

RAIN

The 'Click'-type sensor is enabled, as opposed to bypassed and is currently active (the circuit is open). Watering has been suspended.

Regime (program) D is independent of the ‘Click’-type sensor. Place indoor watering here.

Set Current Date / Time

Figure 11-1

DATE

1. Press the **SET CURRENT DATE & TIME** on the dial.
2. To make a selection, use + or −.
3. Highlight **SET DATE DD/MM/YY**.
4. Press **NEXT/OK** to enter the menu selection.
5. Use ← and → to move from digit to digit.
6. Press + to raise the value by 1 and − to lower the value by 1.
7. Press **NEXT/OK** to save changes. **SAVED OK** will flash on the screen.
8. Press **BACK/ESC** to reject changes made. **NOT UPDATED** will flash on the screen.
9. When finished editing, press **BACK/ESC** to return to the previous menu.

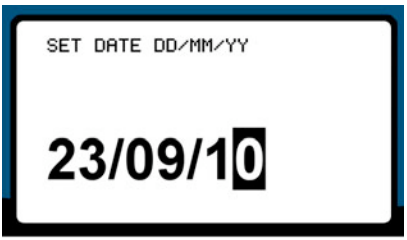


Figure 11-2

***Note**: While editing, the date displays in European format. **Day** is the **left 2 digits**, **month** is the **middle 2 digits** and **year** is the **last 2 digits**. **After editing**, date will display in American format with month first, date, then year in 4 digits.*

TIME

1. In the **SET CURRENT DATE & TIME** menu, select **SET 24 HR TIME HH:MM**.
2. Use ← and → to move from digit to digit.
3. Press + or − will increase/decrease the value by 1.
   Nonsensical times will not be accepted, e.g. **37:99**.
4. As when setting time, ← and → move the highlight from digit to digit, while + or − increase/decrease the highlighted digit by 1.

Figure 11-3 In this example, the highlighted digit under hours will move from 0 to 7 when pressing the right arrow.

***Note:** Nonsensical dates will not be accepted, such as February 29 in a non leap year.*

Set Watering Days / Dates

SET WATERING DAYS

1. On the dial, press **SET WATERING DAYS / DATES**.
2. Select **SET DAYS TO WATER**.
3. Press **NEXT/OK**.

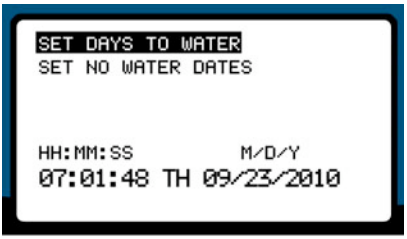


Figure 11-4 The clock shows time in a 24 hour format, the day of the week (in this example Thursday) & the date in American format.

4. **SELECT PROGRAM** button to change the program (see ***Figure 12-1***).
5. Below the program indicator line are the days to be enabled/disabled:
    - **SU**-Sunday
    - **MO**-Monday
    - **TU**-Tuesday
    - **WE**-Wednesday
    - **TH**-Thursday
    - **FR**-Friday
    - **SA**-Saturday
    - **OD**-Odd days
    - **EV**-Even days.

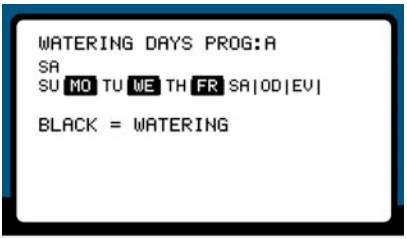


Figure 12-1 In this example, program A is selected, shown in the upper right of the screen.

6. Press ← and → to select the day to be altered. The day selected displays just below the word **WATERING**, in the example of ***Figure12-1***, **SA (**Saturday) is to be edited.
7. ***To enable the day*** for watering, press +.
8. ***To disable the day*** for watering, press −.
9. If **OD**-Odd or **EV**-Even are selected, any days set to water will be overridden.
10. **OD**-Odd days ***will not water*** on 31st of a month, or February 29 of a leap year.
11. Press **NEXT/OK** to save your changes.
12. Press **BACK/ESC** to return to the previous menu.

NO WATER DATES

Up to eight **NO WATER DATES** may be selected to prohibit watering. The format is **DD/MM**.

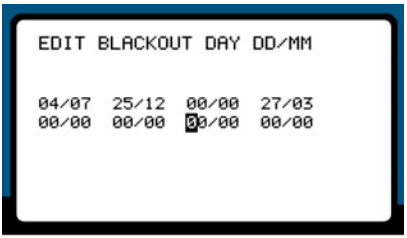


Figure 12-2 When editing black out dates, the format is DD/MM.

1. From the **SET WATERING DAYS / DATES** menu, use + or − to navigate to **SET NO WATER DATES**.
2. Press **NEXT/OK**.
3. Select the digit to be edited using ← and →.
4. **Increase/decrease** the value of the digit using + or −. (***Note:*** *Unlike the clock's date menu, nonsensical dates may be entered, which will invalidate the entry. Values such as* **00/00** *or* **31/02** *are invalid.)*
5. Press **NEXT/OK** to save your changes.
6. Press **BACK/ESC** to return to the previous menu.

Set Start Times 1-12

SET PROGRAM STARTS

1. Press **SET START TIMES 1-12** on the dial.
2. Select **SET PROGRAM STARTS**.
3. Press **NEXT/OK**.

This screen has 2 parts. The upper section is bar graphs - the lower has positions for 12 starts.

At the top of the screen is a 12 hour clock in a straight line. Beginning with **0am** (Midnight) on the left, **6am**, **12Pm** (12:00, noon), **6Pm** (18:00) and finally **12am** (24:00) on the right.

Below this, 4 lines represent programs **A**, **B**, **C** and **D**. The current program is indicated by **<--** (a left-pointing arrow) at the far right of the line.

4. ***To change programs***, press the **SELECT PROGRAM** key.

In ***Figure 13-1***, there is one start in **C** beginning around **6am** (06:00), **lasting a couple of hours**. In **A,** are two starts one around **6am** & another a little after 12Pm (12:00, Noon). With the arrow on the right of the **A** line, the 12 possible starts for **A** are shown below. They are **05:30** (5:30am) and **13:30** (1:30pm).

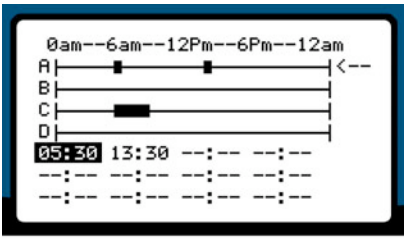


Figure 13-1 The block straddling the line is a program. Its start time and total runtime can be determined from its position on the line relative to the clock above.

The bottom of the screen displays positions for 12 **STARTS**. Those shown as **--:--** when not in use. **STARTS** need not be in any particular order.

5. ***To activate*** a **START**, press & hold down the + key. The **START** time will change from **--:--** (off) to **00:00** (Midnight), then increase in ¼ hour steps.
6. ***To remove*** a **START**, hold down the − key. The start time will decrease in ¼ hour steps to **00:00**. One more press will turn it off, showing **--:--**.

As the **START** time increases or decreases, the program duration block slides along the line. Programs running ***through midnight*** will show blocks at both ends of the line.

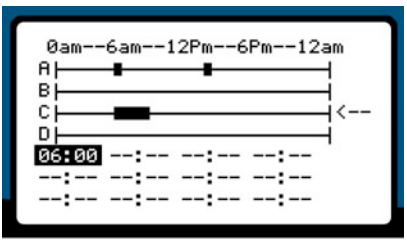


Figure 13-2

In ***Figure 13-2***, the **SELECT PROGRAM** key has been pressed & the arrow is pointing to Program **C**. From the 12 possible **STARTS** below, only one is active, beginning at **6am** (06:00). As indicated by the block, it will last several hours. On line **A**, a program is starting at roughly the same time, in this example it is a 1 minute syringe with the same stations as **C**, starting a few minutes earlier.

7. When finished editing, press **NEXT/OK** to save your changes.
8. **BACK/ESC** will return to the previous menu.

SET NO WATERING WINDOW

The **SET NO WATERING WINDOW** screen allows you to set a period in which no watering may start and any running automatic programs will terminate. It is shown as a black bar below the line. In this example, no watering between **02:00** (2am) and **05:30**. As with **STARTS**, these are set to the nearest ¼ hour.

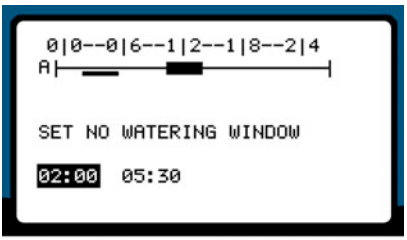


Figure 13-3 Here only program A bar is shown to allow viewing of the position of the no watering window.

NO WATERING WINDOW applies to programs **A**, **B**, **C**, **D**, but not **M**.

Set Run Times / Precipitation & Seasonal Adjust

SET RUNTIME OR PRECIP

Figure 14-1 The clock shows time in a 24 hour format, the day of the week (in this example Thursday) & the date in American format.

1. Press the **SET RUN TIMES / PRECIPITATION & SEASONAL ADJUST** on the dial.
2. Highlight **SET RUNTIME OR PRECIP**.
3. Press **NEXT/OK**.

The line below **SET RUNTIME OR PRECIP** shows program **A**, **B**, **C** or **D** with the total program run-time to the right of this line as a total, **HH:MM:SS**. This includes any off-on delays between stations. (See **PUMP OPERATIONS**).

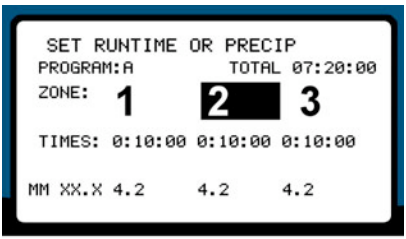


Figure 14-2 The station number to be edited is shown highlighted to the right of the word ZONE.

1. To change programs, press the **SELECT PROGRAM** key.
2. ***To increase or decrease station numbers*** use the ← and → keys.
3. ***To increase the run-time*** by 30 seconds, press the + key.
4. ***To decrease run-time*** by 30 seconds, press the − key.
5. Holding down either key will accelerate the change, so longer run-times can be reached more quickly.
6. ***To turn off a station***, press the − key until the run-time is zero. This station will not then be included in the current program.
7. ***To save changes***, press **NEXT/OK**.
   - ***To copy*** a **RUNTIME** to the adjacent station, highlight the runtime you would like to copy.
   - Press **NEXT/OK**, then ← and → to the next station.
   - Press the **NEXT/OK** key to copy. Pressing either + or − ***before*** pressing **NEXT/OK** will discard the copy.

To set a runtime by **PRECIPITATION**, press the **MORE/LESS WATER** keys. Each press will increase/decrease the precipitation by 1mm (0.04”). The runtime will be automatically adjusted using the station's defined precipitation rate. (See **AUTO SCHEDULE MENUS**)

Unlike the runtime, **PRECIPITATION** can be decreased below zero, to reach the maximum 9+ hours run-time.

MONTHLY SEASONAL ADJUST

MONTHLY SEASONAL ADJUST shows the percentage by which the run-times and precipitations are adjusted. **100%** indicates all of the programmed run-time will be used, **50%**, indicates half that time will be used and so on.

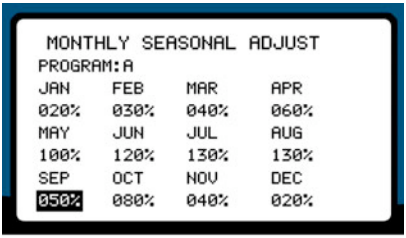


Figure 15-1 When entering this menu, the current month will be highlighted to allow rapid editing of this month.

1. From the **SET RUN TIMES / PRECIPTITATION & SEASONAL ADJUST** menu, highlight **MONTHLY SEASONAL ADJUST**.
2. Press **NEXT/OK.**
3. ***To change programs***, press the **PROGRAM** key.
   Any run-time and precipitation logged will reflect the adjustment made.
4. ***To increase the percentage*** press and hold the + key.
5. ***To decrease the percentage*** press and hold the − key.
6. One press = one percent. Holding down the key will accelerate the changes can be made quickly.
7. The percentage may be adjusted from 10% to 250%.
8. To change month, press ← and →.
9. Press **NEXT/OK** to save any changes.
10. **BACK/ESC** will return to the previous menu.

Pump Operations

1. From the main menu, press **PUMP OPERATIONS**.
2. Use + or − to highlight your menu choices.
3. Press **NEXT/OK** to enter your choice.
4. Press **NEXT/OK** key to save changes.
5. Press **BACK/ESC** to return to the previous menu.

TURN MV / PUMP

6. ***To turn on or off the Master Valve*** select **TURN MV / PUMP**.
7. Use ← to turn it **ON** or →y to turn it **OFF**.
   In the event of a shorted master valve, **FAIL** *will be highlighted and the Master valve turned off. A failed Master Valve entry will be made in the Log Book.*

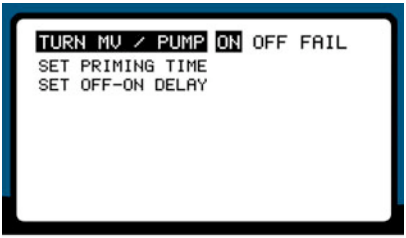


Figure 15-2

The Master Valve turns on automatically before a program runs (see **Priming Time**) and stays on for about one minute after an automatic program finishes, unless manual watering is in progress. In this case it will stay on until the Master Valve On/Off is operated, as above, or the circular key **SYSTEM OFF** is pressed, or the **ABORT** command is received from the remote control.

SET PRIMING TIME

So the pipe network fills with water before stations are operated, a 0-99 minute **PRIMING TIME** can be enabled. If a value greater than zero is selected, the Master Valve and decoder power will come on for the designated minutes ***before*** the first decoder in the automatic program is scheduled to turn on. ***PRIMING TIME is not available in MANUAL mode***.

1. From the **PUMP OPERATIONS** menu, select **SET PRIMING TIME**.
2. Use ← and → to select the digit to be edited.
3. Use + or − increase/decrease the selected digit.
4. **NEXT/OK** will save your changes.
5. **BACK/ESC** will return to the previous menu.

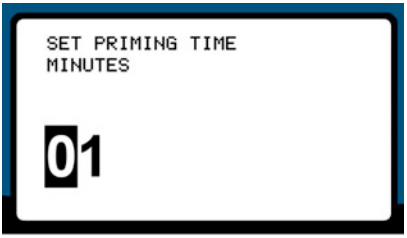


Figure 16-1 The Master Valve and decoder power will come on for the designated minutes before the first decoder in the automatic program is scheduled to turn on.

SET OFF-ON DELAY

To avoid pump low pressure trips caused by slowly closing valves, an inter station **OFF-ON DELAY** of 0-99 seconds can be specified. This will affect ***all programs***, including manual, even if running concurrently. Program ***total run-time*** will be adjusted to include this inter-station delay.

1. From the **PUMP OPERATIONS** menu, select **SET OFF-ON DELAY**.
2. Use ← and → to select the digit to be edited.
3. Use + or − arrows ***to increase/decrease*** the selected digit.
4. Press **NEXT/OK** to save changes. **SAVED OK** will flash on the screen.
5. Press **BACK/ESC** to reject changes made. **NOT UPDATED** will flash on the screen.
6. **BACK/ESC** will return to the previous menu.

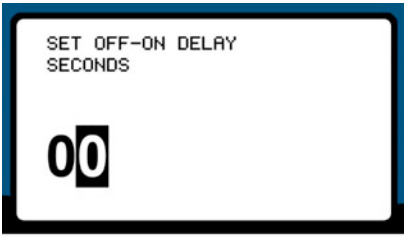


Figure 16-2 An inter station OFF-ON DELAY will affect all programs, including manual, even if running concurrently.

Manual Watering & Electrical Tests

Most often, the important information to monitor is the current drawn on the decoder 2 wire path. This is here displayed in **mA**. **Underhill™ TW-Tk-Dec-1 Decoders** use approximately **3mA each**, so providing the Master Valve is turned off (see **PUMP OPERATIONS**), the current drawn with no solenoids active is a good indication of line condition. For example, with ***40 decoders*** on the line, the indicated current ***with no Master Valve or solenoids*** **ON** should be 40 x 3mA=**120mA**.

Currents substantially below those expected indicate a break in the 2 wire path, similar to losing the common in a multi-wire system.| Currents substantially above that expected indicate:

1. A bad decoder turning its solenoid on,
2. A short circuit on the 2 wire path some distance from the controller, or
3. A decoder taking an excessive current.

Underhill™ publishes a useful booklet on **Fault-finding Field Wiring Problems**. Armed with a Leakage Clamp Meter, such faults are easy to find.

1. From the main menu press **MANUAL WATERING & ELECTRICAL TESTS**
2. To navigate the choices, use the + or −.
3. **NEXT/OK** will enter your selection.
4. **BACK/ESC** will return you to the previous menu.

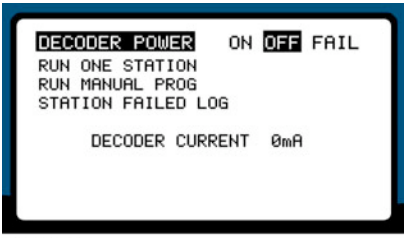


Figure 17-1

When a manual program or station is running, press the **RUN** key to see more information, which may include automatic programs running in parallel with the manual. To stop automatic running programs, press **SYSTEM OFF**. This will turn off all decoders, the decoder power and the master valve. To return to this menu, press **MANUAL WATERING & ELECTRICAL TESTS**.

DECODER POWER

1. To turn the decoder power on and off, select **DECODER POWER** from the **MANUAL WATERING & ELECTRICAL TESTS** menu.
2. → will turn decoder power **OFF** and ← will turn it **ON**. This will not affect the Master Valve. The decoder power current will be displayed to help diagnose any problems. To change the Master Valve state, see **PUMP OPERATIONS**.

RUN ONE STATION

1. From the **MANUAL WATERING & ELECTRICAL TESTS** menu, select **RUN ONE STATION**.
2. Press **NEXT/OK**.
3. To select a station, press ← and →. If the station is **OFF**, hold down the arrow key speed things up.
4. To turn the station **ON**, press +. It will now run the maximum runtime of just over 9 hours.

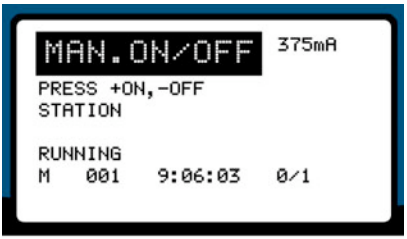


Figure 17-2 Here manual program M is running station *1* with *9 hours, 6 minutes and 3 seconds* left to go. Decoder power, Master Valve & station 1's solenoid are drawing *375mA* total.

5. To turn the station **OFF** press −.
6. To turn the next station turn **ON** and the current one turn **OFF**, press ← or →. Allow 5 - 7 seconds before the next station turns on.
7. A station that fails to turn on/off will display **FAILON** or **FAILOFF**, instead of **RUNNING**.

RUN A MANUAL PROGRAM

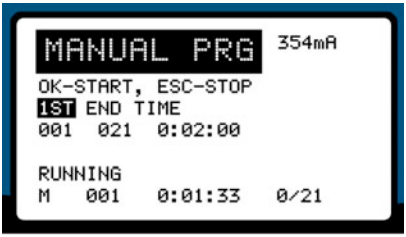


Figure 18-1 Here program M has1 minute 33 seconds left to run. The progress is 0 out of 21 stations. After this station has finished and when no 2 runs, progress will read 1/21.

1. Select a station by highlighting **1ST**.
2. Use the ← or →, then + and − to change the starting station number.
   DO NOT make the first number greater than the last. Software will reverse the order to keep starting less than or equal to finishing.
3. The last station is selected by moving the highlight to **END**, then using ← or →, then + and − to select the end station number.
4. The runtime, common to all stations is adjusted by using → to move the highlight to **TIME**, then + and − to increase or decrease by 10 second intervals. If the shortest on-time is required, set **0:00:00**. Decoders will then be operated for about 1-2 seconds with about 3 seconds pause between each.
5. ***To start the manual program***, press **NEXT/OK**.
6. ***To stop the manual program***, press **BACK/ESC**.

Decoder power and Master Valve will be left on, until manually turned off, (see **SYSTEM OFF**). When the manual program is running, the screen will show **RUNNING**, the station number, time to go and the progress.

STATION FAILED LOG

At the end of the run, you can press **BACK/ESC** to return to the previous menu, where the **STATION FAILED LOG** may be selected using + or −. Press **NEXT/OK** to see the log screen.

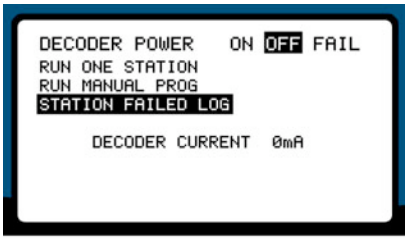


Figure 18-2 BACK/ESC will return you to the MANUAL WATERING & ELECTRICAL TESTS main menu.

- In the event of many stations failed, you may scroll up and down using the + and − keys.
- ***ALL*** past failed stations are held in the **FAILED STATION LOG**. The observer must check to ensure the date and time of a failure matches that of the latest run.
- Time is shown as **HH:MM** and date as **MM/DD**.
- **RAN** refers to the amount of runtime before the failure was logged, normally zero.

Failures include:

1. **FAILON** - Station did not respond to an **ON** command.
2. **FAILOFF** - Station did not respond to a conventional **OFF** command. The software will turn this off using the emergency off command.

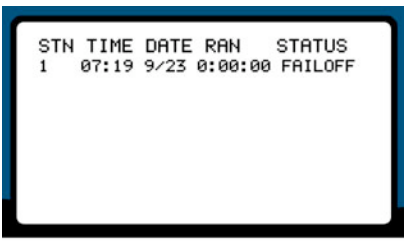


Figure 18-3 All past failed stations are held in the FAILED STATION LOG.

Advanced Features

ADVANCED FEATURES is divided into 2 main functions.

Explore Histories

- **STATION RUN LOG**
- **STATION FAILED LOG**

Setup 'Click'-type sensor or Weather Station (for future use)

- **SENSOR BYPASS**

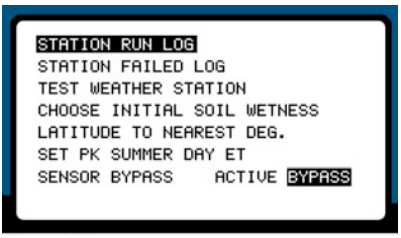


Figure 19-1

1. Press **ADVANCED FEATURES** on the dial.
2. Use + and − to make your menu selection.
3. Press **NEXT/OK** to enter your selection.
4. Press **BACK/ESC** to return to the main menu.

STATION RUN LOG

The **STATION RUN LOG** database is large, as many as 1800 entries. When full, oldest entries are overwritten.

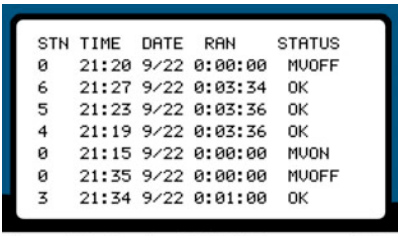


Figure 19-2 Pressing NEXT/OK from any point in the log will return the screen to the most recent 7 entries.

1. From the **ADVANCED FEATURES** menu highlight **STATION RUN LOG**.
2. Navigate through entries using + and −. **NEXT/OK** will return to the most recent 7 entries. Time is shown as **HH**:**MM**, date as **MM**/**MM.** Run-time is displayed as **H**:**MM**:**SS**. Date and time are when it finished,
   - **OK**: Station ran correctly for time indicated
   - **FAILON**: Station did not turn on
   - **FAILOFF**: Station did not turn off as planned. The software took all possible measures to turn this off using the emergency off command
   - The Master Valve is shown as station **0**, with status **MVON**, **MVOFF** or **MVFAIL**.

STATION FAILED LOG

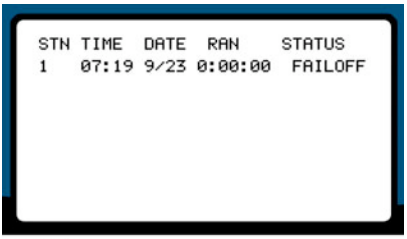


Figure 20-1

In the event many stations failed, the menu may be scrolled up and down using + and −. All failed stations in the past are held in the log. The observer must check to ensure the date and time of the failure entry matches that of the latest run.

1. From the **ADVANCED FEATURES** menu highlight **STATION FAILED LOG**.
   - Time is shown as **HH**:**MM** and date as **MM**/**DD**.
   - **RAN** - refers to the runtime before the failure was logged, normally **0**:**00**:**00**.
   - Failures include:
     FAILON - Station did not respond to **ON** command
     FAILOFF - Station did not respond to conventional 'off' command. The software used the emergency off command to shut off

SENSOR BYPASS ('Click'-Type Sensor)

1. From the **ADVANCED FEATURES** menu highlight **SENSOR BYPASS**.
2. Use ← to make it **ACTIVE** or → arrow key to **BYPASS**.
   Program **D** *is independent of the 'Click'-type sensor & therefore recommended when watering indoor plants or trees.* **A**, **B** *and* **C** *will stop when the sensor disables watering, but* **D** *will continue. Fountains or lighting should be placed in* **D** *if needed to stay on during the value monitored by the sensor.*

LAST 7 DAY IRRIGATION

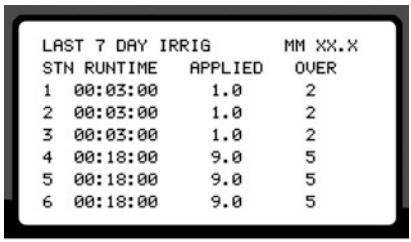


Figure 20-2

For reviewing the last 7 days of watering.

1. While in **SYSTEM OFF** mode, press **AUTO SCHEDULE**.
2. Highlight **LAST 7 DAYS IRRIG**.
3. Press **NEXT/OK**.
4. Use the + and − keys to scroll the log 6 stations at a time.
5. The starting station for this table will be that selected from the previous menu. To start with station 20, select 20 from the menu prior to entering this menu.
   - The total run-time with the seasonal adjust factored in is under **RUNTIME** in **HH**:**MM**:**SS**.
   - The precipitation applied in mm or inches is displayed in the **APPLIED** column.
   - The number of runs in the last 7 days is displayed in the **OVER** column.
   - **NEXT/OK** will return to the starting station.

PROGRAMMER / TESTER for Decoders

1. Open the controller by pressing the two tabs along the bottom face of the case and lift the lid. Use a thumb on each tab and hold the case with fingers on the side of the case.
2. Plug in the programmer/tester lead.

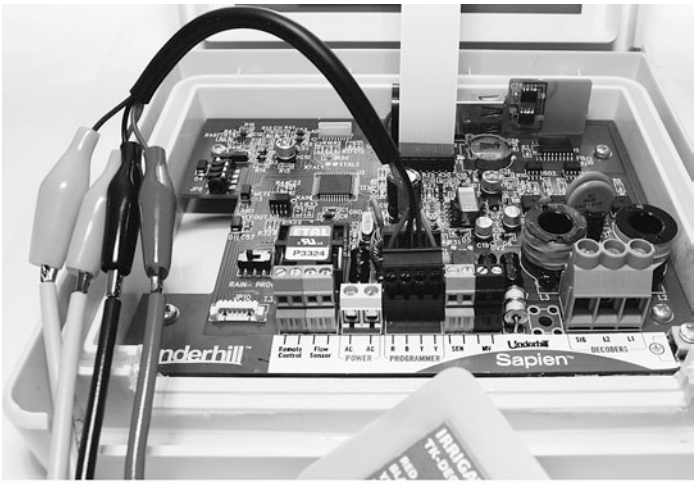


Figure 21-1

3. Slide **RAIN** / **PROG** switch on lower left of circuit board to **PROG**.
4. Hang the short cable out through the case's waterproof seal. Close the lid.
5. Connect the decoder to be tested or programmed to the corresponding color alligator clips.
6. ***To test a decoder***:
   - Press **SYSTEM OFF**, then use + or − to select **PROGRAMMER/TESTER**.
   - Press **NEXT/OK**.
   - With **TEST DECODER** highlighted press **NEXT/OK** again to begin test. The controller will begin to sequence through station numbers & stop on a responding address from a good decoder. **PASS** will highlight on the screen.
   - If there's no response from a decoder, the station number will sequence to 63 and stop, with **FAIL** highlighted.

Figure 21-2

7. ***To Program a decoder:***
   - Select **PROGRAMMER/TESTER** from the **SYSTEM OFF** menu.
   - Press **NEXT/OK**.
   - Select **PROGRAM DECODER** using + or −. Select the station number to be assigned to the decoder using the ← and → keys.
   - Press **NEXT/OK**.
8. When testing/programming is complete, open case and disconnect the programming cable.
9. Slide the switch on the bottom left of the circuit board from **PROG** to **RAIN**. Close lid.
10. To resume automatic watering, press the **RUN** key. *(No watering can be done while in programmer/tester mode). A programmed decoder will be automatically tested to respond to the assigned address.*

MULTIPLE CONCURRENT WATERING PROGRAMS

All 4 programs, A, B, C, D will run concurrently and each has its own 12 starts (and water days). Any station number can be included in each without restriction (unlike many other controllers). Thus, if for example, program A has stations 1 -10 set for 5 minutes and program B has the same 10 stations set to 5 minutes. Then if start #1 on program A is 10:00 and start #1 on program B is 10:15 on the same water day, the following will happen.

Time:	A	B
10:00	1	
10:05	2	
10:10	3	
10:15	4	1
10:20	5	2
10:25	6	3
10:30	7	4

etc.

As you can see, all 10 decoders get run twice, for 5 minutes each run.

If by mistake the user sets up program A decoders 1-3 at 10 minutes and program B decoders 1-3 at 20 minutes, then sets the same start time at 10:00, the following will happen.

Time:	A	B
10:00	1	1
10:10	2	1
10:20	3	2
10:30		2
10:40		3
10:50		3
11:00	all off	

That means decoder 1 will only run for 20 minutes, not 10 + 20 minutes. If the user staggered the start times, this would not happen.

FAILED STATIONS

Previously failed stations will be re-run on each new start. This is a departure from the existing controllers Underhill™ has designed, when failed stations would not be included in successive watering instances until someone told the controller they were 'fixed'. The advantage of re-running is that a transient failure will not affect watering over the medium term. The disadvantage is it will fill up the history log with the same old problems again and again. In the light of experience, this is the lesser of two evils.

Sapien™ will skip over stations that fail and move onto the next immediately. This has a knock-on effect on concurrent stations running together with flow control in mind. Consider the following scenario.

Time:	A	B
10:00	1	30 (1 is small flow, 30 is big)
10:15	2	31 (2 is a big flow, 31 is small)
10:30	3	32 (3 is small flow, 32 is big)

However 31 fails, so the running order now becomes:

Time:	A	B
10:00	1	30 (1 is small flow, 30 is big)
10:15	2	32 (both 2 & 32 are big, pump drops out on low pressure trip!)
10:30	3	33

As a rule, most stations don't fail most of the time and very few people use flow control with concurrent stations that alternate between small/large/small/large on successive stations. The far more usual scenario is running a group of small flow with large. For example:

1, 2, 3, 4 are all large flow. 30, 31, 32, 33 are all small flow.

In this case the user could set up:

Time:	A	B
10:00	1	30
10:15	2	31
10:30	3	32
10:45	4	33

etc.

Then, in this example, 31 fails, the user would get:

Time:	A	B
10:00	1	30
10:15	2	32
10:30	3	33
10:45	4	34

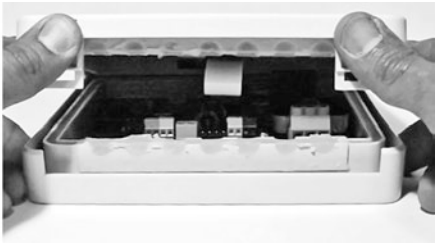
etc.

All are paired A high flow, B low flow, so no low pressure trip!

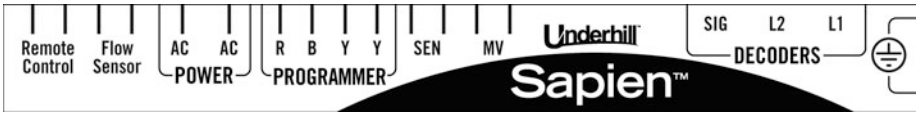
INSTALLATION INSTRUCTIONS

OPENING THE CASE

Press in the two tabs on the bottom of each side of the case using thumbs. With the tabs pressed, swing up the top case.



CONNECTIONS



2 Wire Underhill™ TW-TK-DEC-1 Decoders

Decoder red wires to **L1.**
Decoder black wires to **L2**.
No connection to **SIG**.

Lightning Protection (Ground)

Use 4 mm2, AWG 11 or heavier green/yellow insulated wire and a ring or fork crimp onto JP3, just to the right of L1, marked with the ground symbol. The screw is an M3 x 6mm.

The ground wire must be terminated on a ground stake or plate, separate from the building ground. For details on the stake or plate to use, please consult the Document from the American Society of Irrigation Consultants (ASIC) at their website page link:

http://www.asic.org/uploads/assets/011007_121216_ASIC_GROUNDING_CAD_Files.pdf

No further grounds or external lightning protection modules are required along the 2-wire path.

Master Valve or Pump Start

The MV pair supplies 25VAC, maximum current 0.5A (500mA).

In no circumstances must an external source of power be connected to the MV pair; if volt-free contacts are required an external relay MUST be fitted.

Programmer

When the decoder programmer/tester is not in use the slide switch near the bottom left of the circuit board must be in the **RAIN** position. Unintentionally leaving it in the PROG position during watering will not harm the controller, but will disable the sensor.

When using the plug in programmer/tester cable, connect the appropriate color clip onto the same color wire of the decoder to program/test.

'Click'-type Sensor (SEN)

Connect a normally closed, rain, wind, or freeze sensor to the SEN pair. When watering is permitted, the sensor contacts must be closed - opened to inhibit watering on programs A, B, C. Program D is not affected by the SEN - used for watering under glass or indoors.

Power is provided by an internal 24VAC source. On no account must an external source of power be connected to the SEN pair. Make sure the slide switch near the bottom left hand side of the main PCB is in the **'RAIN'** position.

Controller Power AC/AC

Use the supplied transformer. This is sized to provide coordination of protection against shorts circuits on the decoder 2 wire path.

Use of other transformers will void the warranty and may damage the controller or decoders under certain circumstances.

Connect the output of the transformer into the AC/AC inputs. Polarity is unimportant.

The transformer is waterproof to IP54/NEMA 4X

Two versions are available.

115/120V AC 60Hz for the USA & Japanese markets

230/240V AV, 50Hz for the EU, Australasia markets

Flow Sensor

This is reserved for future use. Will connect to a volt-free contact-type flow sensor

SPECIFICATIONS

Operating Specifications

- Station Run Time: 30 seconds to just over 9 hours (in 30 second increments) on programs A, B, C, & D. PRECIPITATION can be set in 1mm (0.04") increments
- Start Times: 12 per day, per program (A, B, C, D), for up to 48 daily starts.
- Watering Schedule: 7-day calendar, or true odd or even day programming, made possible by the 365-day clock/calendar.

Electrical Specifications

- External Transformer Input: 120 VAC, 60Hz (230 VAC, 50/60 Hz for International Use)
- External Transformer Output: 26 VAC, 1.3 amp
- Station Output: 25 VAC, 0.60 amps per station
- Maximum Output: 25VAC, 1.2 amps (includes Master Valve Circuit)
- Battery Backup: Lithium coin cell battery used only for time keeping during power outages, the nonvolatile memory maintains program information and history/fail logs.
- DTMF Remote Control Input: 10-30mW into 600Ω. Tone duration >60mS, Inter-tone gap >45mS

Dimensions

- Plastic Cabinet
- Waterproof IP54, NEMA 4, (with lid closed & cables channeled in gel cable clamps).
- Height: 6.3" (16 cm)
- Width: 7.33" (18.6 cm)
- Depth: 1.78" (4.5 cm)

External Transformer

- Waterproof to IP54/ NEMA 4X
- Height: 3.6" (9 cm)
- Width: 2.2" (5,5 cm)
- Depth: 2.75" (7 cm)

Default Settings

- Program **A** set to one start at 10am (**10:00**).
- Stations 1-21 set to run for 10 minutes.
- Days set to water - Monday, Wednesday, and Friday.

All other stations are set to **0** run time, no other starts in **B**, **C**, **and D**.
This controller has a non-volatile memory that retains all entered program data even during power outages, without need for a battery.

FCC NOTICE

This controller generates radio frequency energy and may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Sub part J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Move the controller away from the receiver.
- Plug controller into a different outlet so controller & receiver are on different circuits.

If necessary, user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, D.C., Stock No. 004-000-00345-4 (price – $2.00 postpaid).

Certificate of Conformity to European Directives

We certify that the **Sapien™** controller and External Transformer conform to the European EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC.

WARRANTY

Underhill International Corporation (Underhill) warrants to its trade customers that its products will be free from original defects in material and workmanship for a period of two years (commencing on the date of original sale to the trade customer) as follows:

THE SOLE AND EXCLUSIVE REMEDY AGAINST UNDERHILL IS LIMITED TO REPAIR OR REPLACEMENT; UNDERHILL IS NOT LIABLE FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT, OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LABOR TO INSPECT, REMOVE, OR REPLACE PRODUCTS, VEGETATION LOSS, COSTS OF SUBSTITUTE EQUIPMENT OR SERVICES, PROPERTY DAMAGE, LOSS OF USE OR LOSS OF PROFITS; NOR IS UNDERHILL LIABLE FOR ECONOMIC LOSSES, LOST PROFITS, CONSEQUENTIAL DAMAGES OR DAMAGE TO PROPERTY ARISING OUT OF UNDERHILL'S NEGLIGENCE OR BASED ON STRICT LIABILITY IN TORT. THE EXPRESS WARRANTIES SET FORTH HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABLILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL UNDERHILL INTERNATIONAL CORRORATION BE LIABLE TO CUSTOMER OR ANYONE ELSE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, HOWEVER OCCASIONED.

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Irrigation Association™ Member

CLCA MEMBER

ASIC

SportsTurf MANAGERS ASSOCIATION

MEMBER NGF

MEMBER STC Synthetic Turf Council

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