

OSMAC 4.0

User's Manual

DOS Version



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Welcome to the next generation of the OSMAC control system from The Toro Company. OSMAC 4.0 provides a flexible software program that offers you superior control in scheduling your golf course irrigation system. With this easy-to-use control system, you can maximize system efficiency and minimize the water time window, thus saving time and money.

OSMAC 4.0 introduces a new level in system control that allows you to manage the hydraulic flow of your irrigation system, Hydro-Link™. This new feature models your hydraulic system and ensures that water demands in the field created by turning on irrigation programs do not exceed the maximum capacity of the system. With Hydro-Link™, your hydraulic system is utilized with maximum efficiency.

For enhanced control, the OSMAC 4.0 central can connect to a weather station, providing you with current and cumulative weather data. If you choose, daily ET (evapotranspiration) information from the weather station can be used to automatically adjust your irrigation run times. This allows greater flexibility in meeting the water requirements of the turf.

With the OSMAC 4.0 control system and satellites, you can perform cancel and hold operations on all levels (system, program, satellite or station). You can display projected water flow and perform manual percentage adjustments to fine-tune the irrigation system.

The OSMAC 4.0 central manages up to 150 satellites and communicates with them via Motorola paging. Each satellite is capable of supporting up to 48 stations.

You can use up to 99 programs to group stations, and each station can have three repeats with up to 59 minutes of soak time. You can assign the days on which a program is active based on a 14-day calendar or 30-day interval.

The start and run times of each station are calculated by the control system and sent to the satellites via the Motorola paging system. Program sequences can be given absolute start or stop times for greater control over your watering schedule.

User-friendly screens make programming the OSMAC 4.0 central easy. You can program descriptions of your hydraulic system; site, satellite and station information; program schedules and defaults; station assignments; master sequences; holds; and system configurations. You can create several programs that meet varied watering needs throughout the year. This information can be stored on a diskette and retrieved when you need it.



The OSMAC 4.0 software must be running at all times to allow control of the satellites.

Using the Manual

The OSMAC 4.0 User's Manual offers instructions for programming the control system. The manual is designed for you to pick up key elements at a glance and provides detailed, yet understandable, instructions upon further reading.

The names of menu items and screens are set in bold type and the names of pop-up windows, options and buttons are enclosed in quotation marks. Keyboard keys are enclosed in brackets ([]). Screens that are addressed in the current section are followed initially with a location guide. *For example:* When you select the "Normal Program" option in the **Manual Control** screen, a pop-up window lists all defined programs (Menu → Manual Control → Normal

Program).

Key elements of the manual are pulled out and placed in sideboxes highlighted with an icon.



Information following this icon provides step-by-step instructions for entering data into fields or navigating through screens.



Information following this icon includes program highlights, special features or helpful hints.



Information following this icon includes important notes about the control system to help you better understand it or to avoid problems.

A glossary at the end of the manual lists definitions of unique terms associated with the OSMAC 4.0 control system.

Minimum Computer Requirements

To operate the OSMAC 4.0 control system, you need the following computer requirements:

- IBM-compatible personal computer (80386 or better CPU) with MS-DOS version 6.0 or higher.
 - SMARTDRV.EXE loaded.
 - 585k free conventional memory.
- Graphics adapter with respective monitor (VGA).
- 4 MB of RAM.
- 80 MB hard drive minimum.
- Microsoft-compatible bus mouse.
- Two COM ports, minimum.
- Printer (optional).
- An input power conditioner (recommended).

The screens in OSMAC 4.0 have been designed to make navigating through the control system very easy.

You can maneuver through the screens with a mouse and a keyboard, or just a keyboard. If you use the mouse, you will find that you save more time. To enter numbers, you can use the mouse or keyboard, but non-numeric entries can only be done with the keyboard.

Throughout the software program, when you place the cursor on an option box or a button (by using the mouse or the arrow keys), it will highlight that area. To activate or select the operation you highlighted (shown in yellow), click the mouse or press [Enter]. When you activate an operation, you will hear a beep (if the sound option is turned on in the system configuration screen).

Parts of a Screen

All screens have five areas as shown in Figure 2.1:

- *The Option Block:* This is the main section of the screen that changes depending on which option you choose. As you go through the manual, each option block will be explained.
- *A Line of Buttons:* At the bottom of each screen is a row of option buttons. This is the primary way to move through the control system program. These buttons perform the same option from any screen and are explained in detail in this section.

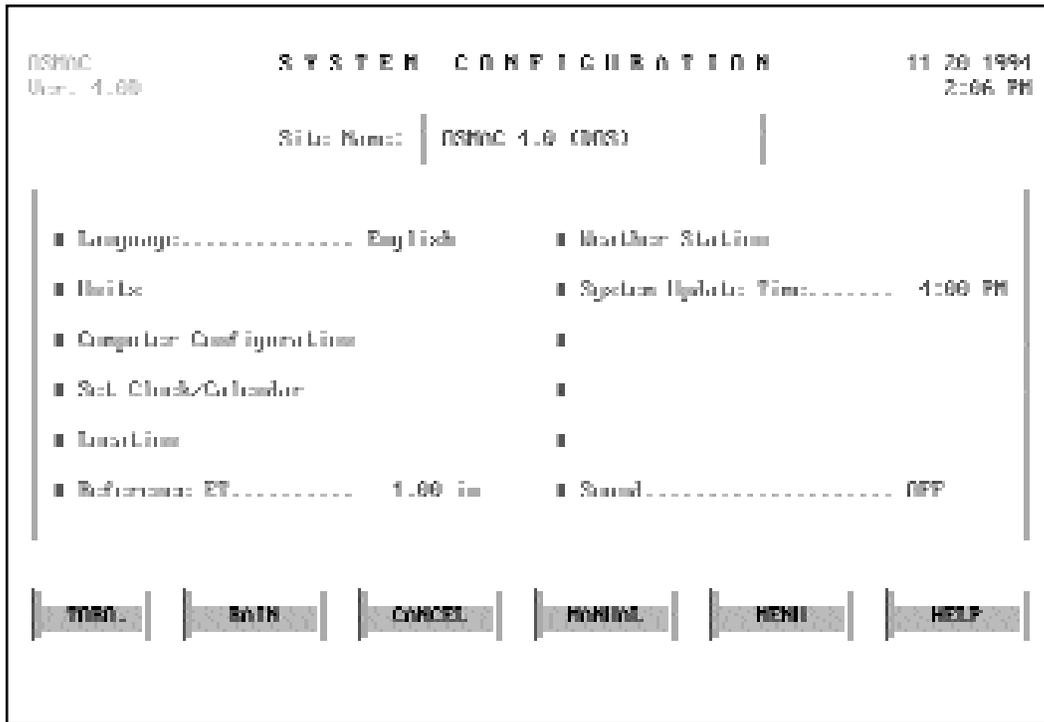


Figure 2.1 - Basic Screen. The System Configuration screen shows areas common

to all screens: the Option Block (the main body of the screen), the Line of

- *Prompt Line:* To guide you through your choices, prompt lines appear on the last line of the screen. The prompt line often tells you what to enter or asks you a question to confirm the operation.
- *Name Block:* In the upper left corner you will see the name of the program (OSMAC) along with the version number (4.0).
- *Time Block:* In the upper right corner, the current date and time are shown.

Option Buttons

There are six option buttons displayed in a row on each screen (see Figure 2.1). The operation of each option

button remains the same no matter where you activate it in the program. Any change you make using these buttons is carried from screen to screen. For example, if the “Rain” button is activated on the logo screen, it appears in the active mode (green) when viewing subsequent screens.

Toro Button

Use this button to return to the start-up **Logo** screen.

Rain Button

Use this button to activate a system-wide hold until it is removed manually. While the system is on hold, the “Rain” button remains green. When the system is taken off hold, only the program with stations scheduled at that time and after will resume. (*For more on system-wide holds, refer to Section 16: Cancel and Hold Operations*).

When you activate the “Rain” button, the computer displays this prompt line:

Activate Rain Hold? YES: NO

If the “Rain” button is already active, this prompt line appears:

Remove Rain Hold? YES: NO

At this point, the cursor only moves between “YES” and “NO.” “NO” is highlighted, indicating that this is the default selection. You can move the cursor to select the “YES” option.

To activate your option, click the mouse or press [Enter]. When you do this, you will notice that the prompt line disappears and the cursor moves freely. You will have either activated or deactivated a system-wide hold. When you activate a hold, the “Rain” button changes from red to green.

Cancel Button

Use this button to activate a system-wide cancel. When this button is activated, OSMAC 4.0 ensures that there is a gradual shutdown of watering to avoid “water hammer.” Like the “Rain” button, “Cancel” is green while

activated. (Refer to Section 16: *Cancel and Hold Operations for more detailed information.*)

To activate the cancel operation, place the cursor on the button and click the mouse or press [Enter]. The computer responds with the following prompt line:

Perform System Cancel? YES: NO

Like the other buttons, at this point the cursor only moves between “YES” and “NO.” “NO” is the default selection. Highlight the choice you want and click the mouse or press [Enter]. The prompt line will disappear and the computer will acknowledge the message with a beep (if the sound is activated in your system configuration). You can now move the cursor freely. The computer either activates or deactivates the cancel operation depending on your selection. If “Cancel” is activated, the button turns green.

While the “Cancel” button is green, you cannot select it again or activate another global command. If you try, you will see this prompt line:

Please wait, cancel operation is in progress
and an error beep will sound.

When the “Cancel” operation is complete, the button



The “Cancel” operation only cancels stations that are currently running. To suspend irrigation, the “Rain” hold should be activated first, followed by the “Cancel” operation.

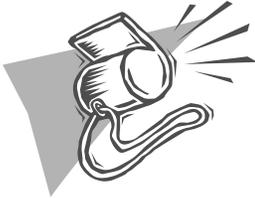
returns to red and you can activate another system-wide operation.

Manual Button

Use this button to select the **Manual Control** screens. (For more information regarding this screen, refer to Section 15: *Manual Control.*)

Menu Button

Use this button to select the **Main Menu** screen which is described later in this section.



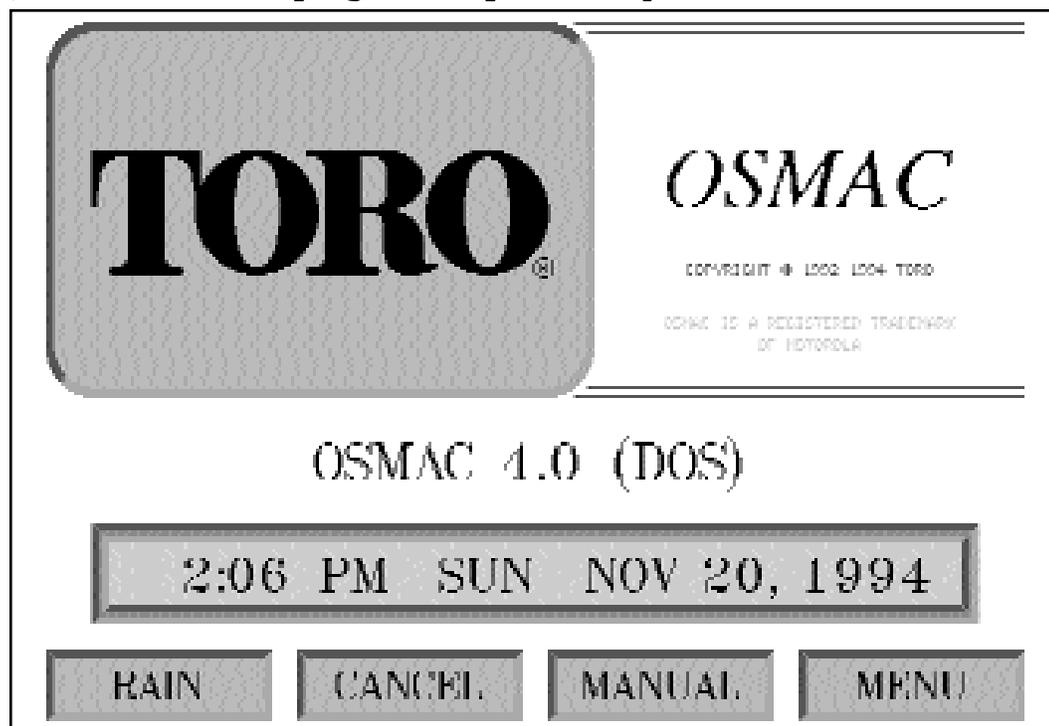
Note: Pressing the [F1] key also activates a "Help" pop-up screen.

Help Button

Use this button to activate a pop-up window designed to help you through the current screen.

The help utility may have several levels. To move between pages on the help screen, select the "Previous" or "Next" buttons. To leave "Help" and return to the current screen, click on "Return" with the mouse or press [Esc].

Figure 2.2 - Logo Screen. Use this start-up screen to access the Main Menu, exit the OSMAC program or perform system-wide commands.



Logo Screen

The first screen you will see when starting the OSMAC 4.0 program is the **Logo** screen (Figure 2.2). From this screen you can go to other parts of the program, or exit OSMAC.

To exit the OSMAC program, click the mouse on the "Toro" block. When you do this, a prompt line displays:

Exit OSMAC Program? YES: NO

At this point, the cursor only moves between "YES" and "NO." "NO" is highlighted yellow indicating the default selection. Move the cursor to the option you want and click the mouse or press [Enter]. When you do this, the prompt line disappears. If you selected "YES," you will exit the program. If you selected "NO," the cursor is free to move to another option.

Figure 2.3 - Main Menu Screen. Use this screen to access the different parts of the OSMAC program. Selecting the "Menu" button returns you to



Main Menu Screen

To go to the **Main Menu** screen (Figure 2.3) from the **Logo** screen, place the cursor on the “Menu” button and click the mouse or press [Enter]. The “Menu” button allows you access to the main menu from any screen in the program.

The **Main Menu** screen shown in Figure 2.3 lists all areas where actual operations are performed. To select a menu item, move the cursor to highlight your selection and click the mouse or press [Enter].



The Editor: Using the

Keyboard

<u>Key</u>	<u>Function</u>
BACKSPACE	Backspace over and erase previously entered information.
DELETE	Delete characters following the cursor.
INSERT	Insert starting before the cursor position.
HOME	Go to the beginning of the line.
END	Go to the end of the line.
CTRL/HOME	Go to the beginning of the line and clear.
CTRL/END	Go the the end of the line and clear.
ENTER	Save entry and exit the Editor or move to the next field.
ESC	Exit the Editor without saving the entry.
F1	Display the help screen for the Editor.
F3	Copy the information for this field only from the line above.
F4	Copy from the line above the current field and all fields to the right. The cursor stays in the highlighted field.
F9	Copy from the line above all fields to the right of the current field. The cursor

The **System Configuration** screen allows you to customize certain elements of the OSMAC 4.0 control system (Figure 3.1). To access this screen, go to the **Main Menu** and highlight **System Configuration** (Menu → System Configuration).

In this section, you can set the language, the units of measure, clock and calendar formats and whether you want the sound on or off. This is also where you input your computer configuration, the location of your site,

Figure 3.1 - System Configuration. Use this screen to set formats, reference ET, weather station data and system update time.

```

OSMAC                               SYSTEM CONFIGURATION                               11 20 1994
Ver. 4.00                                                                    2:07 PM

Site Name: | OSMAC 4.0 (BOS) |

|-----|-----|
| Language..... English          | Weather Station |
| Units.....                     | System Update Time..... 4:00 PM |
| Computer Configuration.....    |                 |
| Set Clock/Calendar.....        |                 |
| Location.....                  |                 |
| Reference ET..... 1.00 in      | Sound..... OFF  |
|-----|-----|

|-----|-----|-----|-----|-----|-----|
|  TOST  | |  BATH  | |  CANCEL  | |  PAUSE  | |  MENU  | |  HELP  |
|-----|-----|-----|-----|-----|-----|

```

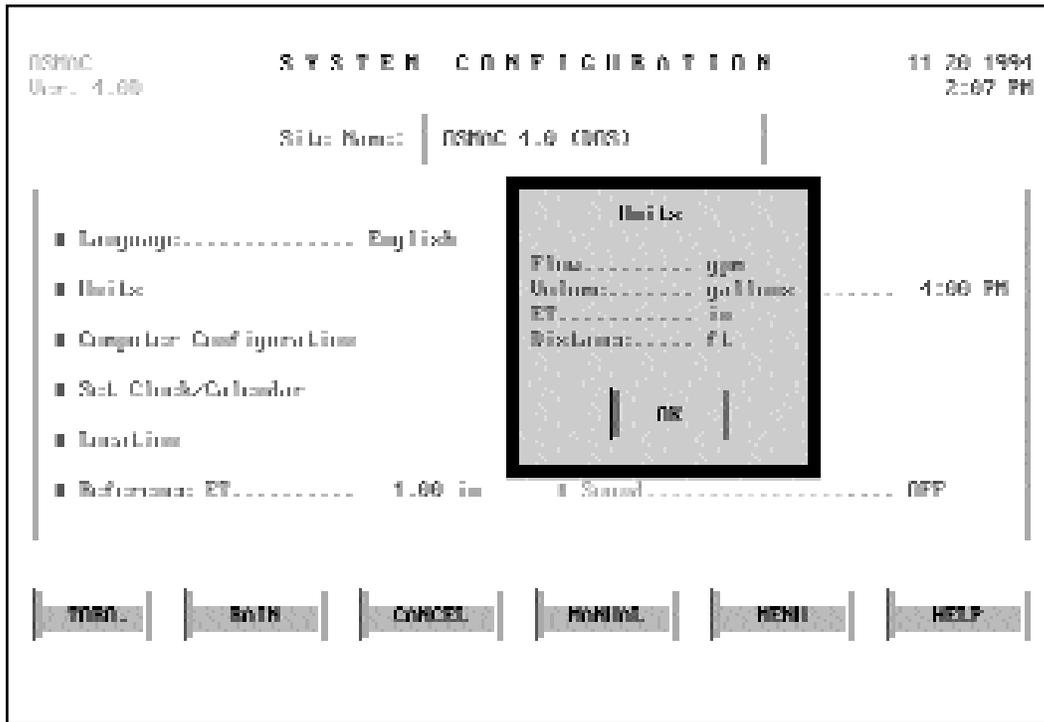


Figure 3.2 - Units Pop-Up Window. Set the units of measure formats in this pop-up window. Click the mouse or press [Enter] to scroll through unit

the reference ET you want to use, information regarding your weather station and what time you want the system to update. You can customize the site name by entering up to 24 characters.

Pop-up windows provide an easy way to enter your system information (Figure 3.2). To activate the pop-up windows, highlight the option you want and click the mouse or press [Enter].

Language

After selecting this option, the pop-up window displays your choices. A white arrow will appear on the left side of the previously selected language. After you make your selection, the screen immediately updates to the new language. Clicking "OK" or pressing [Enter] closes the pop-up window. (Note: The language option will be available in future versions of OSMAC.)

Units

This pop-up window allows you to select your choices for Flow, Volume, ET and Distance (*Figure 3.2*). To make changes, highlight the measurement and click the mouse or press [Enter] to scroll through the following options:

Flow:

- gpm (gallons per minute)
- l/s (liters per second)
- l/m (liters per minute)
- m³/hr (cubic meters per hour)

Volume:

- gallons
- ft³ (cubic feet)
- m³ (cubic meters)

ET:

- in (inches per week)
- mm (millimeters per week)

Distance:

- ft (feet)
- m (meters)

Computer Configuration

This option allows you to configure the paging terminal COM port and the printer port. When you select this option, a pop-up window displays the fields that need to be defined as shown in *Figure 3.3*. To make changes, move the cursor to the appropriate area. Clicking the mouse or pressing [Enter] scrolls through the available parameters.

- *COM Port:* Select the COM port where the paging terminal is connected. The port options are COM1, COM2, COM3 and COM4. Clicking the left-side button on the mouse scrolls upward through the options. Clicking the right-side button scrolls downward. To scroll using the keyboard, press [Enter]. The suggested COM port for the paging terminal is COM2. Selecting a COM port other than COM1 or COM2 may cause conflicts due to the design of personal computers.

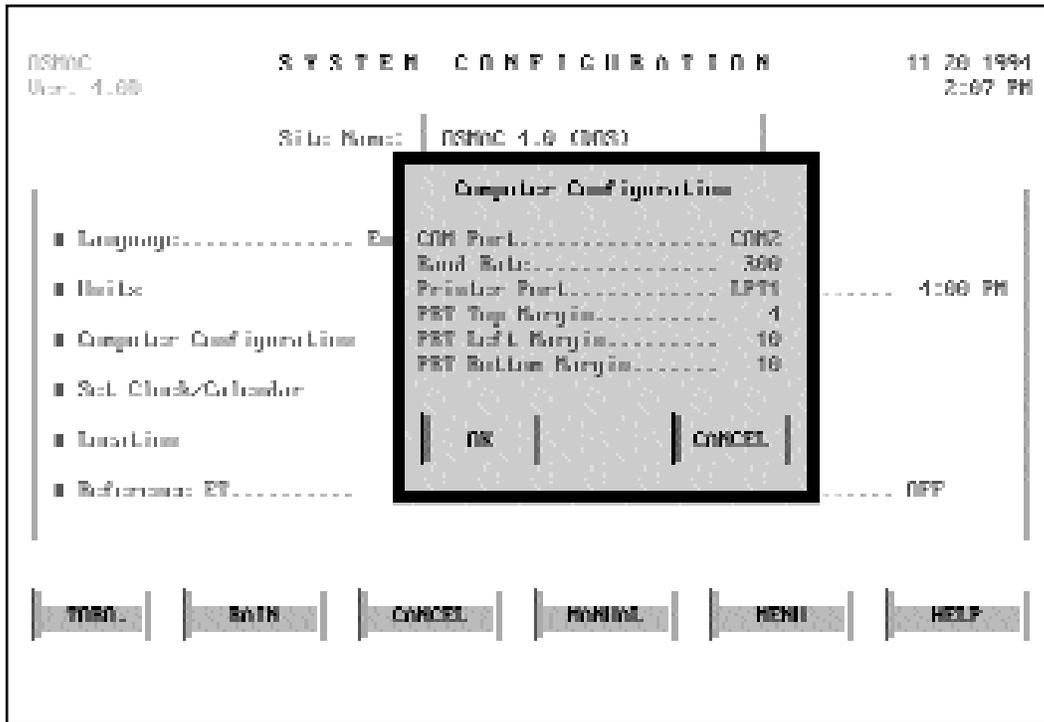


Figure 3.3 - Computer Configuration Pop-Up Window. Use this pop-up window to configure computer information. Click the mouse or press

- **Baud Rate:** Select the baud rate at which the computer communicates with the paging terminal. Clicking the right-side button on the mouse or pressing [Enter] will scroll the rate options: 300, 1200, 4800 and 9600. The paging terminal currently uses 300 baud.
- **Printer Port:** Select the port that connects your computer to the printer. Clicking the right-side button on the mouse or pressing [Enter] causes the LPT port numbers to toggle between LPT1 and LPT2. The suggested printer port is LPT 1.
- **PRT Top Margin, PRT Left Margin, PRT Bottom Margin:** Select the paper margins of printouts from the printer. Margins range from 0-25 lines or spaces. Clicking the left-side button scrolls upward and the right-side button scrolls downward. Pressing [Enter] also scrolls through the options. The default margin settings are 6 lines at the top, 10 lines at the left, and 6 lines at the bottom.

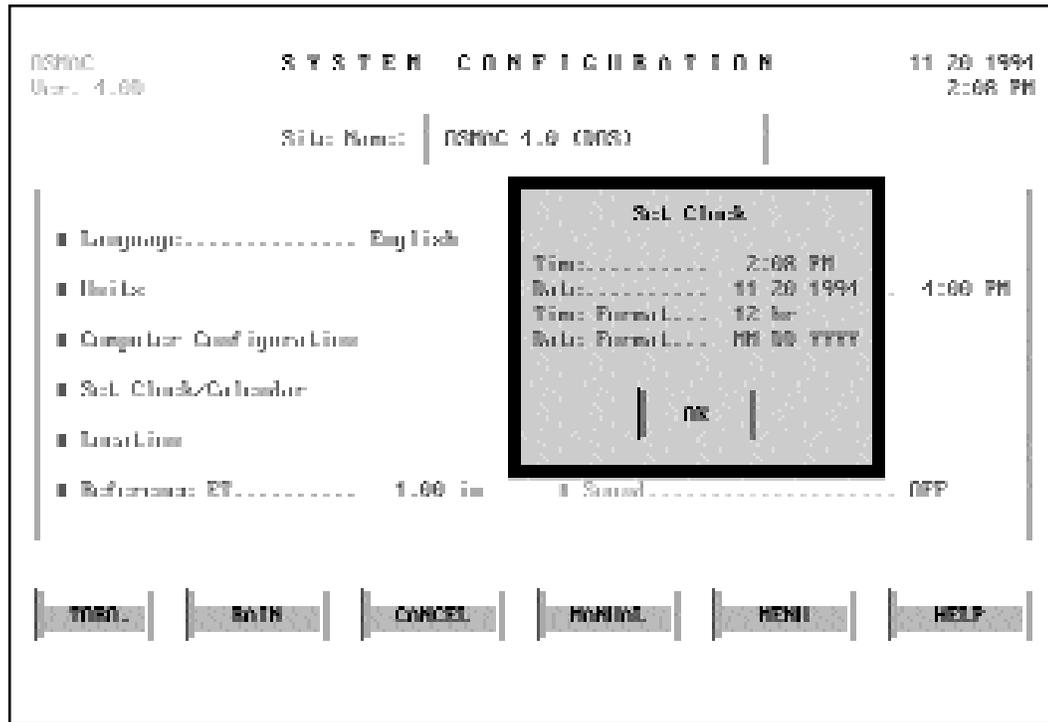


Figure 3.4 - Set Clock Pop-Up Window. Use this pop-up window to set time and

Set Clock/Calendar

When you select this option, the pop-up window displays the current time, date and formats applied (Figure 3.4). To set the clock and calendar, highlight the appropriate area. Click on the mouse or press [Enter] to scroll through the options. You can choose from the following display formats for the clock and calendar:

Clock:

- 12 hours (am/pm)
- 24 hours (military)

Calendar:

- DD.MM.YYYY (day, month, year)
- MM-DD-YYYY (month, day, year)
- YY.MM.DD (year, month, day)

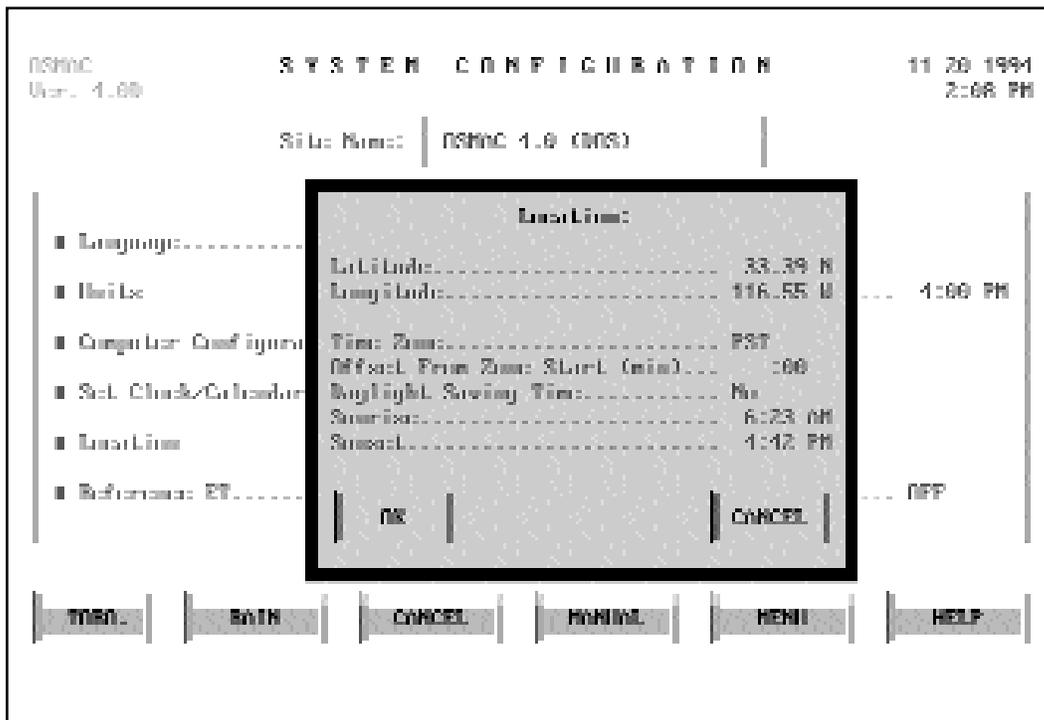
When you select "OK," the pop-up window closes and your changes take place immediately.

Location

Enter data relating to the weather station set up (Figure 3.5). The pop-up window for this option displays the following headings:

- **Latitude:** Enter the latitude for the location of the weather station. The window displays “XXX YY Z” where XXX = degrees; YY = seconds; Z = direction (N, S, E, W). *Note: If you do not know the latitude and longitude for your area, a local airport or the Reference section of the local library may be able to provide this information. You can also refer to a detailed topographical map.*
- **Longitude:** Enter the longitude for the location of the weather station in the same format as the latitude.
- **Time Zone:** Enter the time zone for your area.
- **Offset from Zone Start:** Some locations are off by 15 or 30 minutes from the defined time zone. If this is the case in your area, enter the offset time in this field.

Figure 3.5 - Location Pop-Up Window. Use this window to enter information about the location of the site. Click the mouse or press [Enter] to



- *Sunrise*: This time is calculated for you from the previous information. Notice that it is displayed in the time format chosen in the Unit pop-up window.
- *Sunset*: Like sunrise, this time is calculated for you.

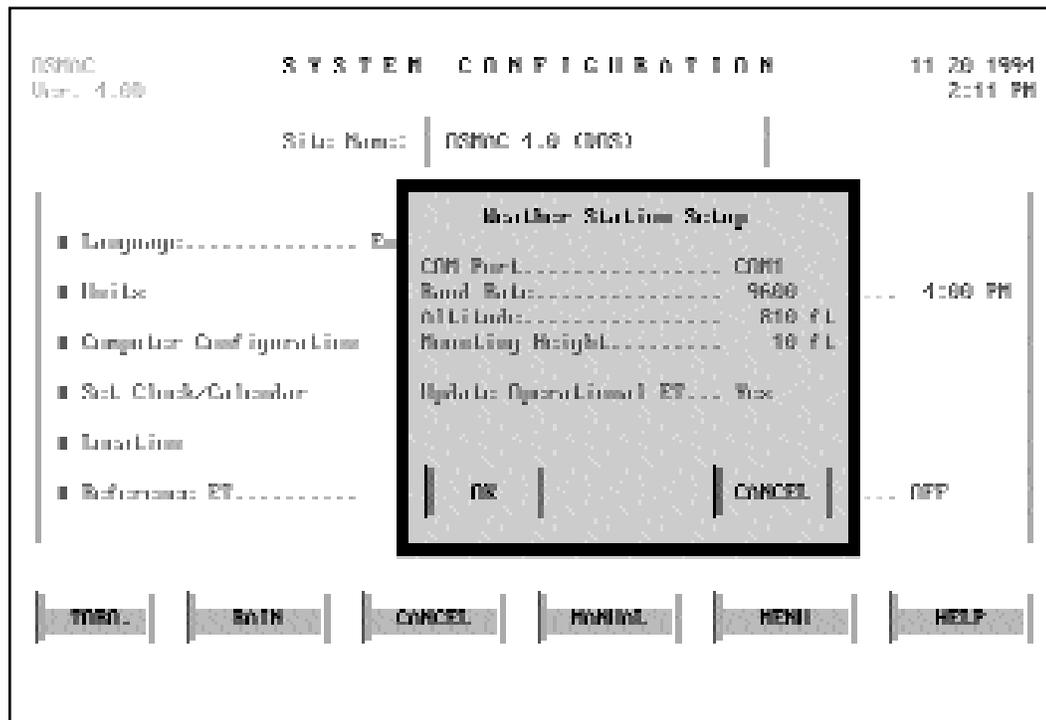
Reference ET

In this field you can set the Reference ET value to be used in basic system programming. Normal run times are based on this value. Reference ET will also be used with the current Operational ET to calculate system percentage adjustments. Click the left button on the mouse to scroll upward through the range options. The right buttons scrolls downward. Pressing [Enter] in this field also scrolls through the options. The range is from .01 to 3.5 inches/week.

Weather Station

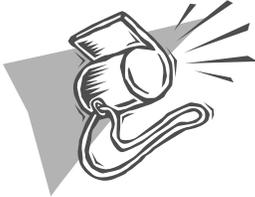
This field lets you define the weather station set up. Clicking the mouse or pressing [Enter] causes the pop-up

Figure 3.6 - Weather Station Pop-Up Window. Use this pop-up window to set the parameters of the weather station. Click the mouse or press



window to appear (Figure 3.6).

- **COM Port:** Select the COM port where the weather station is connected. Click the right button on the mouse or press [Enter] to scroll through the COM port options. The suggested COM port for the weather station is COM1. Selecting a COM port other than



Be careful not to set the weather station COM port

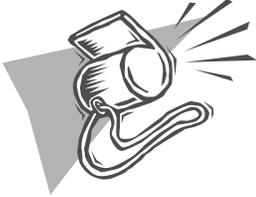
COM1 or COM2 may cause conflicts due to the design of personal computers.

- **Baud Rate:** Select the baud rate at which the computer communicates with the weather station. Click the right button on the mouse or press [Enter] to scroll through the baud rate options. Generally, 9600 is used.
- **Altitude:** Enter the altitude of the location where the weather station is installed. Use the keyboard to type in the altitude. *Note: If you do not know the altitude of your site, the local airport should be able to provide this information.*
- **Mounting Height:** Enter the mounting height of the weather station sensors from the ground. Use the keyboard to type in the height.
- **Update Operational ET:** Select “YES” or “NO” in the field. If you select “YES,” the Operational ET in the computer will be updated automatically and is used to adjust run times. If you select “NO,” the Operational ET is reported, but the run times are not adjusted automatically.

System Update Time

In this field, enter the time of day you want the system to calculate and schedule the water flow for the next 24 hours. If you are using a weather station, the control system contacts it at this time and the weather station downloads the last 24 hours of ET to be used in the calculations.

When this option is chosen, you can change the hour and minute fields in the pop-up window. Click the left



Choose a system update time that occurs prior to the first program start time.

button on the mouse to scroll up through the time options. The right button scrolls down. Press [Enter] to scroll through the options with the keyboard.

Sound

This option lets you turn on or off the sound feature of the computer program. Clicking the mouse or pressing [Enter] toggles between “ON” and “OFF.”

The Flow Management feature in OSMAC 4.0 offers a new level of system control. Flow Management essentially models your hydraulic system using information programmed into the system. First, by defining sources in the **Hydraulics** screens, the maximum flow for the irrigation system is established. The Flow Management feature of OSMAC 4.0 ensures that this maximum flow through any part of the system is not exceeded. Second, by defining maximum flows through mainlines, branches and flow zones, the control system reduces or eliminates undesirable water hammer and low-pressure. Finally, the Flow Management system also insures that each pumping source is activated in an orderly manner by ramping flows at the startup times based on intervals and flow levels. *Note: The **Hydraulics** portion of OSMAC 4.0 should be programmed by someone knowledgeable in hydraulic systems.*

In OSMAC 4.0, stations are assigned Hydro-Links and attached to sources, mainlines, branches and flow zones. Defining Hydro-Links duplicates the flow management of a pumping station. A Hydro-Link™ can be a flow zone, a branch, a mainline or a pumping source. In the hierarchy of a hydraulic system, a flow zone can be connected to a branch, a mainline or directly to a pumping source. A branch can be connected to another branch, a mainline, or a source. A mainline can be connected to another mainline or to a source. A source is a pumping station, a water meter or any other water source.

When all of the hydraulic information has been entered, the OSMAC 4.0 control system automatically regulates flow control. During the flow management process, the task of OSMAC 4.0 is to ensure that water demands created by turning on satellite stations in the field do not exceed the maximum capacity of flow zones, branches, mainlines or water sources. This provides the most effective use of the irrigation system.

Defining Sources

To enter flow management information, go to the **Main Menu** screen and move the cursor to **Hydraulics** (Menu → Hydraulics). This highlights the menu item. To activate the **Hydraulics** screens, click on the mouse or press [Enter]. The first screen that appears is the **Source Definitions** screen shown in Figure 4.1.

There are five fields in the **Source Definition** screen in which you can enter information: S##, Label, Maximum Flow, Steps and Time. A description of the fields is described in the “Step by Step” box below.

To activate each field, highlight the field and click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (refer to Appendix B). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.

Figure 4.1 - Source Definitions. Use the five fields to define your source information. Enter the maximum flow of the source as well as flow

OSMAC Ver. 4.00		HYDRAULICS (Source Definitions)				11 20 1991 2:14 PM	
S##	Label	Max gpm	Steps (gpm)			Time	
1	Main Pump	750.0	150.0	325.0	750.0	:01	

Minus Branches F Source



Step by Step: Source Definition

1. *S##*: Enter the source number you want to define. The maximum number of sources is 10.
2. *Label*: Enter up to 10 characters as a label for the source.
3. *Max. Flow*: Enter the maximum flow for the source. The heading of this field is displayed based on the units format selected in the **System Configuration** screen (i.e., gpm, l/s, etc.).
4. *Steps*: Enter up to five separate flow steps for this source to use when the irrigation cycle starts. When a step size is entered, the computer checks to ensure that the step size is greater than the previous step and less than or equal to the maximum flow. If it is not, then all steps to the right of the current step are set to zero and the current step is set at the maximum flow. The cursor remains in this field in the edit mode.
5. *Time*: Enter the value of the delay time in each step.

When information has been entered in the **Source Definitions** screen, the source numbers and associated information (labels, description, maximum flow) are displayed in ascending order. If the total number of sources is less than 10, the line immediately following the last entry displays dashes in the "Source" field, indicating that this line can be used to enter an additional source. Once the



In OSMAC 4.0 when an irrigation cycle starts, the flow demand is increased in the defined flow steps, with a finite delay between each flow step, until the demand reaches the maximum flow capacity of the source. The time

source number is entered, the dashes appear on the next line.

Mains, Branches and F-Zones Buttons

From the **Source Definitions** screen you can access the screens associated with mainlines, branches and flow zones. These screens can be selected by placing the cursor on the appropriate button and clicking the mouse or pressing [Enter].

Defining Mainlines

To enter or review information for the mainlines in the hydraulic system, access the **Mainline Definitions** screen by selecting the "Mains" button from the **Source Definitions** screen (Menu → Hydraulics → Source Definitions → Mains).

There are four user-defined fields to work with on the

Figure 4.2 - Mainline Definitions. Use the four fields to define the mainlines in the hydraulic system and attach them to sources through the

OSMAC
Ver. 4.00

HYDRAULICS
(Mainline Definitions)

11 20 1991
2:15 PM

Source: 1 | Main Pump | Source: | Branches | F Zone

Main	Label	Max gpm	Nodes
1	R FWT 10"	750.0	5

MAIN | MENU | HELP

Mainline Definitions screen shown in Figure 4.2.

To activate each field, highlight the field and click the mouse or press [F2]. To enter information, follow the Step



Step by Step: Mainline

Definitions

1. *M##*: Enter the mainline number you want to define. The maximum number is 99. (Each mainline must have its own number.)
2. *Label*: Enter up to 10 characters as a label for the mainline (i.e., 6" #1 FRWY).
3. *Max. Flow*: Enter the maximum flow for the mainline. The heading of this field is displayed based on the format selected in the **System Configuration** screen (i.e., gpm, l/s, etc.).

by Step instructions below, using the Editor feature (refer to Appendix B). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.

When information has been entered in the **Mainline Definitions** screen, the mainline numbers along with the associated information (labels, description, maximum flow) are displayed in ascending order. If the total number of mainlines displayed is less than 10, the line immediately



Before defining a mainline, make certain that the appropriate connecting source is displayed in the "Connection" box (located in the upper

following the last entry displays dashes in the “Main” field, indicating that this line can be used to enter an additional main. Once the main number is entered, the dashes appear on the next line.

Up and Down Arrow Buttons

The **Mainline Definitions** screen can display up to 10 mainlines at one time. To scroll additional or previous mainlines, highlight the appropriate arrow button and click the mouse or press [Enter]. Clicking the left button on the mouse scrolls up or down one line. Clicking the right button scrolls up or down one page.

Connection Box

Located in the upper left corner of the screen is a “Connection” box. When this box is selected (by clicking on it or pressing [Enter]), the mainlines for that particular source are displayed. Clicking the mouse on the “Connection” box or pressing [Enter] displays the next source, if one is defined, and its associated mainlines. Mainlines can be edited using this feature. (Clicking the left button on the mouse or pressing [Enter] scrolls in ascending order. The right button scrolls in descending order.)

When all the currently defined sources have been displayed, the next mouse click on the “Connection” box brings up the first defined mainline and displays any mainlines connected to it. Clicking on the box cycles through the other mainlines in ascending order. You can edit mainlines and attach a mainline to another mainline using this feature. When all defined mainlines have been viewed, the “Connection” box returns to the first defined source.

Sources, Branches, and F-Zone buttons

From the **Mainline Definitions** screen you can access



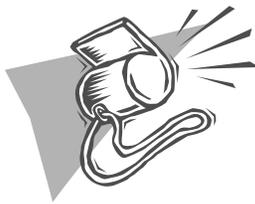
Step by Step: Branch

Definitions

1. *B###*: Enter the branch number you want to define. The maximum number is 999.
2. *Label*: Enter up to 10 characters as a label for the branch (i.e., 4" FWY #6).
3. *Max. Flow*: Enter the maximum flow for the branch. The heading of this field is displayed based on the units format selected in the **System Configuration** screen (i.e., gpm, l/s, etc.).

To activate each field, highlight the field and click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (*refer to Appendix B*). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.

When information has been entered in the **Branch Definitions** screen, the branch numbers along with the associated information (labels, description, maximum flow)



Before defining a branch, make certain that the appropriate connection is displayed in the "Connection" box (located in the upper left

are displayed in ascending order. If the total number of branches displayed is less than 10, the line immediately following the last entry displays dashes in the "Branches" field, indicating that this line can be used for entering an additional branch. Once the branch number is entered, the dashes appear on the next line.

Up and Down Arrow Buttons

The **Branch Definitions** screen can display up to 10 branches at one time. To scroll additional or previous branches, highlight the appropriate arrow button and click the mouse or press [Enter]. Clicking the left button on the mouse or pressing [Enter] scrolls up or down one line. Clicking the right button scrolls up or down one page.

Connection Box

Located in the upper left corner of the screen is a “Connection” box. When this box is selected (by clicking on it or pressing [Enter]), the branches for that particular mainline are displayed. Clicking the mouse on the “Connection” box or pressing [Enter] displays the next mainline, if any, and its associated branches. Branches can be edited using this feature. (Clicking the left button on the mouse or pressing [Enter] scrolls in ascending order. The right button scrolls in descending order.)

When all the currently defined mainlines have been displayed, the next mouse click brings up the defined branches in the “Connection” box in ascending order and the screen displays any branches connected to it. Clicking on the box cycles through the branches. You can edit branches and attach a branch to another branch using this feature.

When all defined branches have been viewed, the “Connection” box returns to the first defined source. You can attach a branch to a source by editing the branch selection fields. When all defined sources have been displayed, the “Connection” box returns to the first defined mainline.

Sources, Mains, and F-Zone buttons

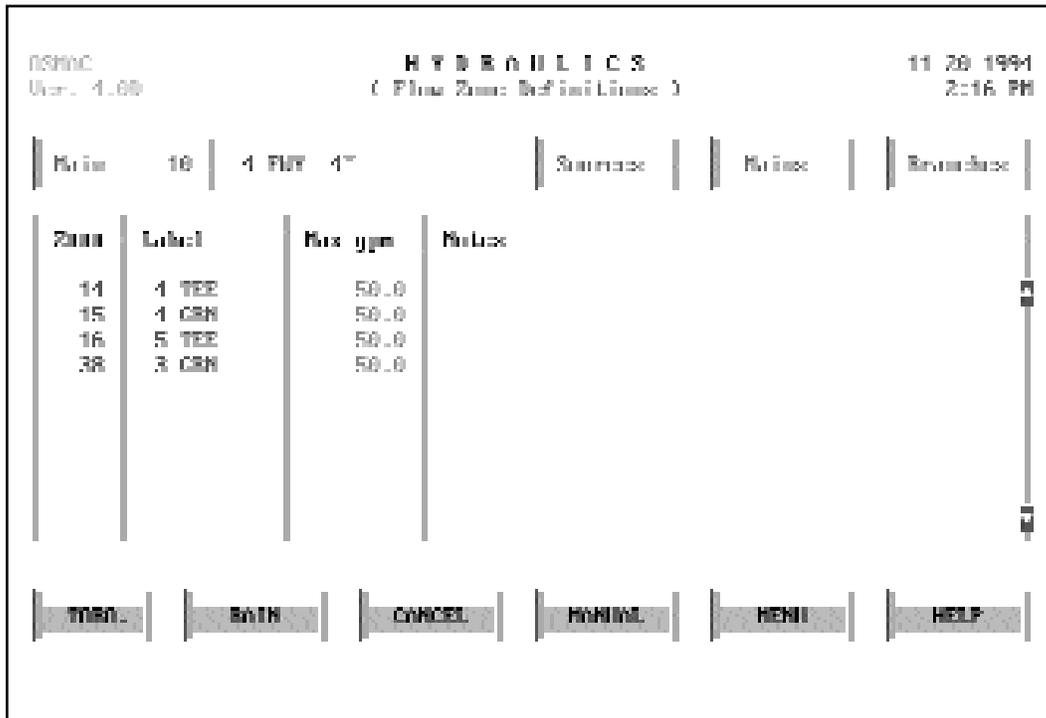
From the **Branches Definitions** screen you can go directly to the screens associated with source, mainline and flow zone definitions. These screens can be selected by placing the cursor on the appropriate button and clicking the mouse or pressing [Enter].

Flow-Zone Definitions

To enter or review information for the flow zones in the hydraulic system, access the **Flow-Zone Definitions** screen by selecting the “F-Zones” button from the **Branch Definitions** screen or any of the **Hydraulic** screens (Menu → Hydraulics → Source Definitions → F-Zones).

There are four user-defined fields to work with on the **Flow-Zone Definitions** screen shown in Figure 4.4.

Figure 4.4 - Flow-Zone Definitions. Use the four fields to define the flow-zone areas and attach them to their connection points through the



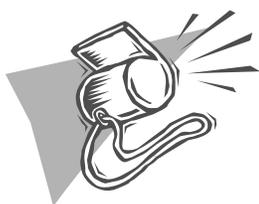


Step by Step: Flow-Zone

Definitions

1. *Z###*: Enter the number for the flow zone you want to define. The maximum number is 999.
2. *Label*: Enter up to 10 characters as a label for the flow zone (i.e., Fairway #12).
3. *Max. Flow*: Enter the maximum flow for the flow zone. The heading of this field is displayed based on the format selected in the **System Configuration** screen (i.e., gpm, l/s, etc.).

To activate each field, highlight the field and click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (refer to Appendix B). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.



Before defining a flow zone, make certain that the appropriate connection is displayed in the "Connection" box (located in the upper left

When information has been entered in the **Flow-Zone Definitions** screen, the flow zone numbers along with the associated information (labels, description, maximum flow) are displayed in ascending order. If the total number of flow zones displayed is less than 10, the line immediately following the last entry displays dashes in the "Flow Zone" field, indicating that this line can be used to enter an additional flow zone. Once the flow zone number is

entered, the dashes appear on the next line.

Up and Down Arrow Buttons

The **Flow-Zone Definitions** screen can display up to 10 zones at one time. To scroll additional or previous flow zones, highlight the appropriate arrow button and click the mouse or press [Enter]. Clicking the left button on the mouse or pressing [Enter] scrolls up or down one line. Clicking the right button scrolls up or down one page.

Connection Box

Located in the upper left corner of the screen is a “Connection” box. When this box is selected (by clicking on it or pressing [Enter]), the flow zones for that particular branch are displayed. Clicking the mouse on the “Connection” box or pressing [Enter] displays the next branch, if any, and its associated flow zones. Flow Zones can be edited using this feature. (Clicking the left button on the mouse or pressing [Enter] scrolls in ascending order. The right button scrolls in descending order.)

When all the currently defined branches have been displayed, the next mouse click brings up the defined mainlines in the “Connection” box in ascending order and displays any flow zones connected to it. Clicking on the box cycles through the mainlines.

When all defined mainlines have been viewed, the “Connection” box returns to the first defined source. You can attach a flow zone to a source by editing the flow zone selection fields. When all defined sources have been displayed, the “Connection” box returns to the first defined branch.

Sources, Mains, and Branches buttons

From the **Flow-Zone Definitions** screen you can go directly to the screens associated with source, mainline and branch definitions. These screens can be selected by placing the the cursor on the appropriate button and clicking the mouse or pressing [Enter].

Once you have completed the system configuration and defined the flow management, the next step is programming the control system.

In the sections ahead, you will input information that defines the sites, satellites and stations of the control system. In addition, you will need to create programs which will initiate watering cycles based on these definitions.

To program the elements of the control system, you will need to be familiar with particular aspects of your irrigation program: your satellites and their associated stations, as well as the function and hydraulic output of each station. You will also need to know the maximum number of stations that one satellite can run concurrently (OSMAC satellites can handle up to 3 amps of electricity), and the Hydro-Link™ for each station.

Auto Programmer

A unique, time-saving feature of OSMAC 4.0 is the Auto Programmer. Used in the **Station Assignments** screen this feature allows the user to assign individual stations quickly to programs. The Auto Programmer finds common station labels and site codes as entered in the **Site Definitions** and **Station Definitions** screens, retrieves the associated stations and assigns them to the program.

To maximize the Auto Programmer feature, some organization of the site code and station labels is necessary. For example, if you are developing a greens program and your station labels have been defined as “Frt9 Green” and “Bck9 Green” you can search the stations in two ways. You

can initiate a search for all station labels with the word “Green” and insert those into your greens program. If you wanted your program to incorporate only back 9 greens, then you can search station labels for “Bck9.” The Auto Programmer is not case sensitive, so you do not need to remember exactly how the labels and site codes were defined (i.e., Bck9 or bck9).

If you carefully define the site codes, you may use the Auto Programmer to quickly select specific areas which you wish to include in your program. For example, if you label site codes for each green (i.e., Site 1 = #1 Green, Site 6 = #6 Green, etc.) you can use the Auto Programmer to select specific greens. If you want to include greens 1, 6 and 12 in a dry greens program, you can use the Auto Programmer pop-up window to select these greens by site code. The Auto Programmer then assigns all stations in these site codes to the dry greens program.

Since each station in the irrigation program will be assigned to a particular site, define site categories that will group similar stations. OSMAC 4.0 allows up to 99 site definitions, so you can be specific in labeling your sites. Grouping stations by sites such as “Dry,” “Back 9 Wet,” “Shaded,” or “Exposed” will give you greater control over the irrigation system by allowing more percentage adjustments.

There are four user-defined fields to work with on the **Site Definition** screen. To activate each field, highlight and click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (refer to *Appendix B*). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.



Step by Step: Site Definitions

1. *Site*: Enter the site number. The maximum number you can assign is 99.
2. *Label*: Enter up to 10 characters as a label for the site (i.e., Wet, Dry, 9 FWY).
3. *%*: You can enter, review or update the percentage adjustment for the site in this field. This number ranges from 0 to 999.
4. *Notes*: Enter up to 50 characters to describe the site, if desired.

Manual Adjustments Button

From the **Site Definition** screen, you can go directly to the **Manual Adjustments** screen by placing your cursor on the “Manl Adj” button and clicking the mouse or pressing [Enter]. You can then return to **Site Definitions** in the same manner. (For more information, refer to *Section 12: Manual Adjustment Factors*.) This feature allows you to move quickly to **Manual Adjustments** without returning to the main menu. This is an easy way to review your system percentage adjustments when you are working with your site definitions.

After you have defined the sites, the next step is defining the satellites in the control system.

To access the **Satellite Definitions** screen shown in Figure 7.1, go to the **Main Menu** and highlight **Control System** (Menu → Control System). Click the mouse or press [Enter] to activate the screen.

Figure 7.1 - Satellite Definitions. Use the six fields on this screen to program

OSMAC
Ver. 4.00

CONTROL SYSTEM
(Satellite Definitions)

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2:17 PM

Satellites

Slot	Label	Az	Pri	Hrs	Name
1	7 FMF	100	0	6	
2	8 FMF	100	0	6	
3	17 FMF	100	0	6	
4	16 FMF	100	0	6	
5	15 FMF	100	0	6	
6	14 TEE	100	0	6	
7	12 FMF	100	0	6	
8	11 GRN	100	0	6	
9	10 FMF	100	0	6	
10	1 FMF	100	0	6	

MENU EXIT CANCEL F1/F2/F3 F4/F5/F6 F7/F8/F9 HELP

There are six user-defined fields to work with on this screen. To activate each field, click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (*refer to Appendix B*). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.



Step by Step: Satellite

Definitions

1. *Sat*: Enter the satellite number. The maximum number of satellites is 150.
2. *Label*: Enter up to 10 characters as a label.
3. *%*: Enter, review or update the percentage adjustment of the satellite. This number ranges from 0 to 999. The normal value is 100%.
4. *Pri*: Enter a priority field for the satellite from A to Z. (A is the highest priority.)
5. *Max*: Enter the maximum stations that a satellite can run at one time. This limit ranges from 1 to 12. The normal value is six.

Up and Down Arrows

The screen can display information for up to 10 satellites at one time. Use the up or down arrow buttons on the right side of the screen to scroll through additional or previous satellites. To activate the arrows, select the direction you want (it will be highlighted in yellow) and click the mouse on it or press [Enter]. The left mouse button moves up or down one line. The right mouse button moves up or down one page.

Stations Button

The “Stations” button on the upper right corner of the screen moves you to the next level of programming the control system, defining the stations, described in the next section.

Once the sites and satellites have been defined, the next step is defining the stations in the control system.

From the **Control Systems (Satellite Definitions)** screen (Main Menu → Control Systems), you can access the **Station Definitions** screen shown in Figure 8.1. To do this, highlight the “Stations” button on the upper right corner of the screen and click the mouse or press [Enter].

Figure 8.1 - Station Definitions. Use the eight fields to enter information about the stations in the control system. Click on the “Satellite” button in the upper left corner to display the groups of stations that the satel-

OSMAC Ver. 4.00		CONTROL SYSTEM (Station Definitions)						11 20 1994 2:17 PM	
Satellite: 1			7 FUY			Site:			
Sta	Label	%	Site Code	upm	Eqts	Swch	Hydra Link		
1	7 CBN LP	100	NORMAL	22.2	0	:00	F002	7 CBN	
2	7 CBN LB	100	NORMAL	22.2	0	:00	F002	7 CBN	
3	7 CBN BB	100	NORMAL	22.2	0	:00	F002	7 CBN	
4	7 CBN BP	100	NORMAL	22.2	0	:00	F002	7 CBN	
5	7 FUY 0	100	NORMAL	22.2	0	:00	F002	7 CBN	
6	7 FUY 0	100	NORMAL	22.2	0	:00	F002	7 CBN	
7	7 FUY 01	100	NORMAL	25.3	0	:00	H07	7 FUY 6"	
8	7 FUY 02	100	NET FUY	25.3	1	:30	H07	7 FUY 6"	
9	7 FUY 03	100	NORMAL	25.3	0	:00	H07	7 FUY 6"	
10	7 FUY 04	100	NET FUY	25.3	0	:00	H07	7 FUY 6"	

Here you will define the stations for each satellite defined on the previous screen. You can associate stations with site codes, as well as enter flow rates, repeat and soak times, and Hydro-Link™ information.

There are eight user-defined fields to work with on this screen. To activate each field, highlight the field and click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (refer to Appendix B). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.



Step by Step: Station

Definitions

1. **“Satellite” Button:** Select the proper satellite by highlighting the “Satellite” button in the upper left corner of the screen and clicking the mouse or pressing [Enter] to scroll through the satellite options.
2. **Sta:** Select the station number. The maximum number of stations per satellite is 48.
3. **Label:** Enter up to 10 characters as a label.
4. **%:** Enter, review or update the percentage adjustment of the station. This number ranges from 0 to 999. The normal value is 100%.
5. **Site Code:** Select a site definition code for the station through the **Choose Site Definition** pop-up window. (Figure 8.2 shows the pop-up window.)
6. **Flow:** Enter the flow for the station.
7. **Rpts:** Assign the number of repeats in this field. The maximum number of a station repeat is three. The run time of a station in a program is divided by the number of repeats plus one (for the start) to compute the time the station will run during each cycle.
8. **Soak:** Enter the minimum soak time between repeats. You can enter a value from 0 to 59 minutes.
9. **Hydro-Link:** Select the Hydro-Link™ for the station

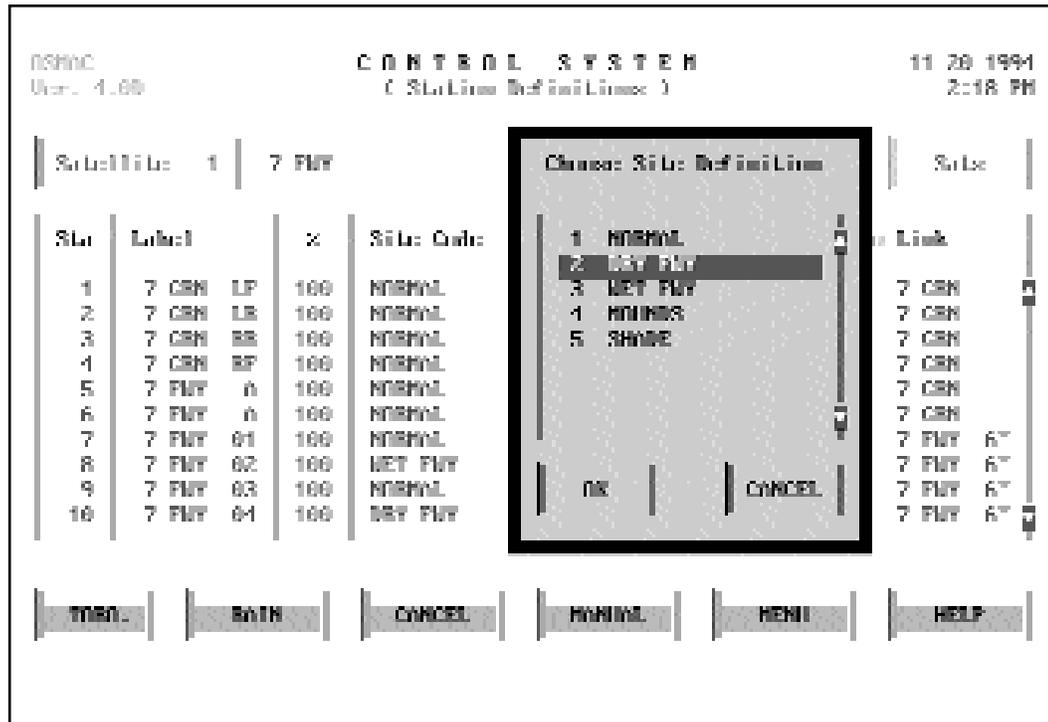


Figure 8.2 - "Choose Site Definition" Pop-Up Window. This window appears when the "Site Code" field is activated, listing all the site codes previously defined. Click on

Pop-Up Window: Choose Site Definition

One of the time-saving features of OSMAC 4.0 is the pop-up windows that help you in defining the stations. When selecting a site code for the station, the pop-up window shown in Figure 8.2 appears. This window lists all the site codes defined previously from the **Site Definition** screen in Section 6. To choose a site code and assign it to a station, click the mouse on the arrows to scroll through the list. Highlight your selection and click "OK." If you want to close the pop-up window without making a selection, click the "Cancel" button.

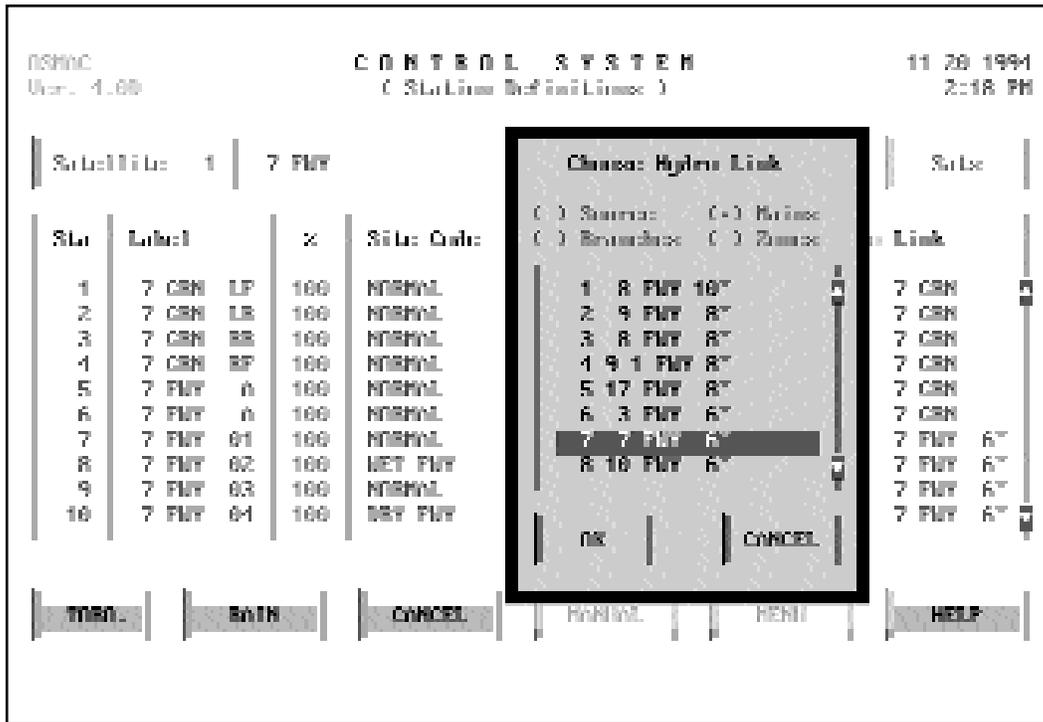
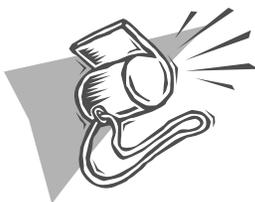


Figure 8.3 - "Choose Hydro-Link" Pop-Up Window. This window appears when the "Hydro-Link" field is activated, listing all the Hydro-Links previously defined. Click on the arrows to scroll through the list. Close the pop-up window and the

Pop-Up Window: Choose Hydro-Link

A Hydro-Link™ is the connection point for a station to the hydraulic system. The pop-up window has check boxes for selecting Source, Main, Branch and Flow Zones. To select the connecting point option, click the mouse on the arrows to scroll through the list. Highlight the connecting point and click "OK." If you want to close the pop-up window without making a selection, click the "Cancel" button.



Stations not assigned to a Hydro-Link™ cannot be run in the irrigation schedule.

Satellite Button

Click the mouse on this button to select the satellite that controls the group of stations you want to define. The satellites are displayed in ascending order.

After stations have been defined, when you click on the "Satellite" button, you can scroll through the satellites previously defined and view the stations assigned to the selected satellite. The stations, along with the associated information, are displayed in ascending order.

The line immediately following the last station entry displays dashes in the station field, indicating that there is room to enter an additional station. Once the additional station is entered, the dashes will move to the next line until the maximum of 48 stations has been entered.

Up and Down Arrows

The **Station Definitions** screen can display information for up to 10 stations at one time. Use the up or down arrow buttons on the right side of the screen to scroll through additional or previous satellites. To activate the arrows, select the direction you want (it will be highlighted in yellow) and click the mouse on it or press [Enter]. The left mouse button moves up or down one line. The right mouse button moves up or down one page.

"Sats" Button

In the upper right of the **Station Definitions** screen is the "Sats" button. Highlight this button and click the mouse or press [Enter] to return to the **Satellite Definitions** screen.

Once you have defined sites, satellites and stations, you are ready to begin defining the irrigation programs. Irrigation programs encompass sets of stations which you want to run at the same time in the irrigation cycle. Programs can be general groupings such as greens, tees, roughs and fairways. Or you might want more specific groupings such as wet greens or dry greens. Programs can also be defined for special areas of the golf course or site, such as the putting area or clubhouse.

Figure 9.1 - Program Definitions (Schedule). Use the fields on this screen to define irrigation programs. Select the percentage adjustments

OSMAC Ver. 4.00		PROGRAM DEFINITIONS (Schedule)										11 20 1994 2:19 PM					
													Default				
Prog	Label	%	Mode	SU	MO	TU	WE	TH	FR	SA	SU	MO	TU	WE	TH	FR	SA
1	GREENS	100	INT	Interval: 1 Day: 1 (On:Low: Low)													
2	TEES	100	INT	Interval: 1 Day: 1 (On:Low: Low)													
3	FAIRWAYS	100	INT	Interval: 1 Day: 1 (On:Low: Low)													
4	ROUGH	100	OnL	20	21	22	23	24	25	26	27	28	29	30	1	2	3
5	HOT SPOTS	100	OFF														

From the **Main Menu** screen, highlight **Program Definitions** and click the mouse or press [Enter] (Menu → Program Definitions). The first screen to appear is **Program Definitions (Schedule)** shown in Figure 9.1.

There are five fields for you to define the irrigation programs: numbers, labels, percentage adjustments, modes and active days.

To activate a field, highlight it and click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (*refer to Appendix B*). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.



Step by Step: Program

Definitions

1. *Pgm*: Enter the number for the irrigation program. The maximum number is 99.
2. *Label*: Enter up to 12 characters as a label for the program.
3. *%*: Enter, review or update the percentage adjustment of the program. This number ranges from 0 to 999. The normal value is 100%.
4. *Mode*: Select active days in the calendar (CAL), choose an interval (INT), or turn off the program (OFF). Select this field and click the mouse or press [Enter] to scroll through the three options.
5. *Activity*: Activate the days you want the program to run. In the calendar mode, active days are

Activity Field

The “Activity” field heading shows abbreviations of the days of the week for the next two weeks. It displays information in Calendar, Interval and OFF modes.

In the Calendar mode, active days are brown, non-active days in blue-green. Each day toggles between active and non-active by clicking the mouse or pressing [Enter]. In a new program, all days default to active.

In the Interval mode, the activity field might display:

Interval = 3 Day = 2.

Select the number of days you want the interval to span. For “Day”, select the current day in the interval (i.e., 1 means the program is active today, 2 means the program is active tomorrow, etc.). When “Day” equals one, the screen will display the following statement:

Interval = 3 Day = 1 (Active Today)

In the OFF mode, the program will remain off until another mode is assigned.

Defaults Button

This button is located in the upper right corner of the screen. Selecting it moves you to the **Program Defaults** screen.

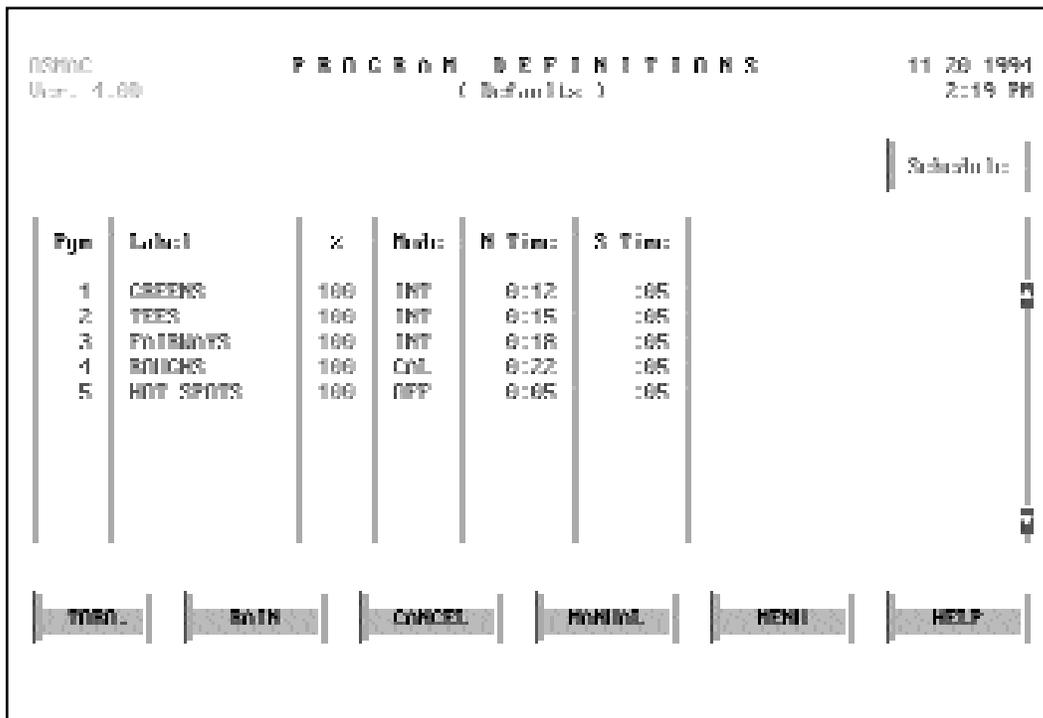
Program Defaults

To set the default run times for the defined irrigation programs, highlight the “Default” button and click the mouse or press [Enter]. The **Program Definitions (Defaults)** screen will appear (Figure 9.2).

There are six fields on this screen. Four are read-only, displaying the information from the **Program Definitions (Schedule)** screen. The other two are user-defined.

To activate the two user-defined fields, highlight each and click the mouse or press [F2]. To enter information, follow the Step by Step instructions below, using the Editor feature (refer to Appendix B). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.

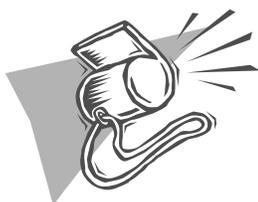
Figure 9.2 - Program Definitions (Defaults). Use this screen to set the program defaults. Enter normal run times and syringe times. Review ET





Step by Step

1. *Pgm*: A read-only field that displays the irrigation programs by number.
2. *Label*: A read-only field that displays the previously defined program labels.
3. *%*: Review percentage adjustment of the programs.
4. *Mode*: A read-only field that displays the mode of the program defined in the **Schedule** screen: calendar (CAL), interval mode (INT), or off.
5. *N-Time (Normal Run Time)*: Enter the default (unadjusted) run times of the program. The default time is used during auto programming of the station assignments. (You can override the default run time in the **Station Assignments** screen, if desired.) Enter a normal run time from 0 hours, 0 minutes to 8 hours, 59 minutes.
6. *S-Time (Syringe Time)*: Enter the default syringe times of the programs. Syringe times are used during manual control. The value ranges for 0-59 minutes.



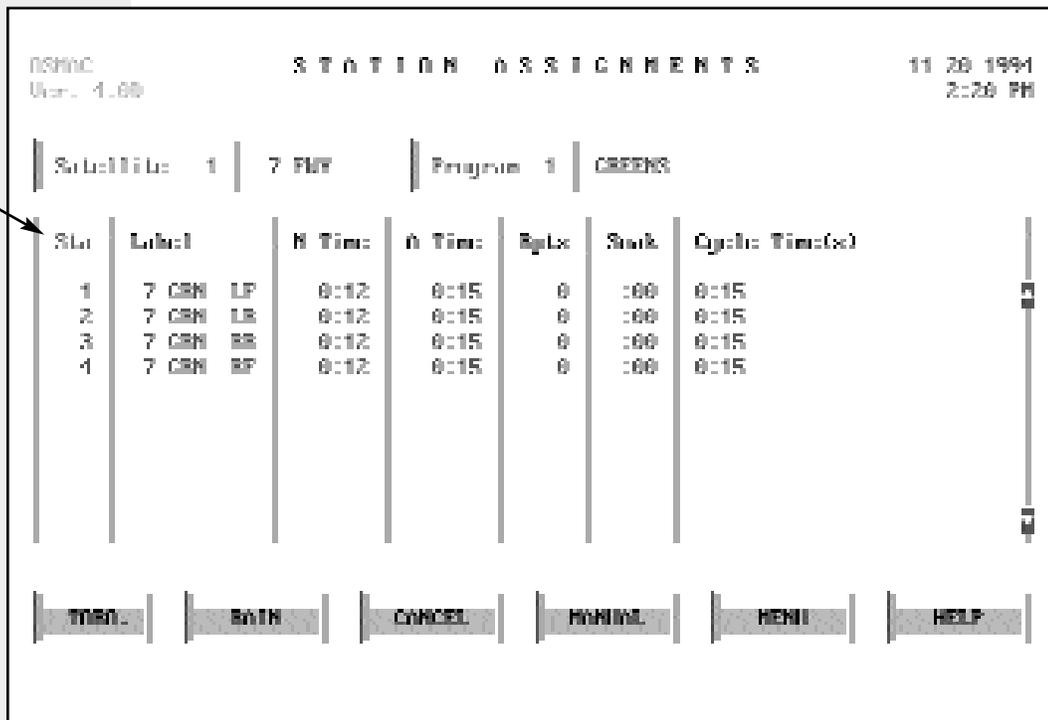
The Defaults screen provides the base information used in auto programming station assignments. For greater control over the irrigation program, the default normal run times

When all the elements of the control system have been defined, the next step is to assign the stations of a satellite to a program.

To access the **Station Assignments** screen shown in Figure 10.1, go to the **Main Menu**, highlight the **Station Assignments** selection and click the mouse or press [Enter] (Menu → Station Assignments).

Figure 10.1 - Station Assignments. Use this screen to assign stations of a satellite to specific programs. Click on the "Satellite" button to list stations. Click on

Select Auto Programmer here.



OSMAC Ver. 4.00 STATION ASSIGNMENTS 11 20 1991 2:20 PM

Satellite: 1 | 7 FWT | Program: 1 | GREENS

Stn	Label	R Time	A Time	Bpts	Stack	Cycle Time(s)
1	7 GRN LP	0:12	0:15	0	:00	0:15
2	7 GRN LB	0:12	0:15	0	:00	0:15
3	7 GRN RB	0:12	0:15	0	:00	0:15
4	7 GRN RP	0:12	0:15	0	:00	0:15

AUTO | BACK | CANCEL | HOME | MENU | HELP

There are seven fields on this screen. To activate each field, highlight the field and click the mouse or press [F2]. You can enter information using the Auto Programmer feature explained below or follow the Step by Step instructions, using the Editor feature (refer to *Appendix B*). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc] to exit without saving the information.



Step by Step: Assigning Stations

1. *Sta*: Enter the station number here, or click on the Station header to activate the Auto Programmer feature. The station must be a member of the satellite shown in the "Connection" box.
2. *Label*: This is a read-only field. The label is automatically displayed for you.
3. *N-Time (Normal Run Time)*: Enter or review the run time of the station. If using Auto Programmer, the default N-Time assigned to the program in the **Program Definitions** screen will be displayed. You can keep this default or assign a new N-Time. A zero N-Time will turn off the station.
4. *A-Time (Adjusted Run Time)*: A read-only field that displays the adjusted run time of a station taking into consideration all percentage adjustments.
5. *Rpts*: A read-only field that displays the number of repeats for the station. The maximum number is three.
6. *Soak*: A read-only field that displays the soak time in minutes for the station. This range is from 0 to 59.
7. *C-Time (Cycle Time)*: A read-only field that displays the run time of a station when the program is activated. This time is calculated by taking into consideration the effect of repeats and the number of start times on the run time of a given station. If the cycle time is not evenly divisible by the number

Satellite Button

The upper left box displays the satellite number from which you are assigning stations. Clicking the mouse or pressing [Enter] will select the next satellite in ascending order. The left button on the mouse or pressing [Enter] scrolls in ascending order. The right buttons scrolls in descending order.

Program Button

The upper middle box displays the programs and their respective labels. Assign the stations associated with the different satellites to the program displayed in the box. By the selecting “Program” button and clicking the mouse or pressing [Enter], you can scroll through the different



Before assigning stations, make certain the correct satellite and program numbers are selected in their appropriate boxes.

defined programs.

Inserting and Deleting Stations

Manually

If you want to manually assign a station number, click the cursor on the dashes at the end of the station list. This activates the field so you can enter your information using the Editor feature (*refer to Appendix B*). If you need to remove a station, click the cursor on the station number and use the Editor feature to delete the information.

Auto Programmer

The Auto Programmer provides an easy way to search through the data you entered previously in the site and station definitions.

To initiate the “Auto Programmer” dialogue box shown

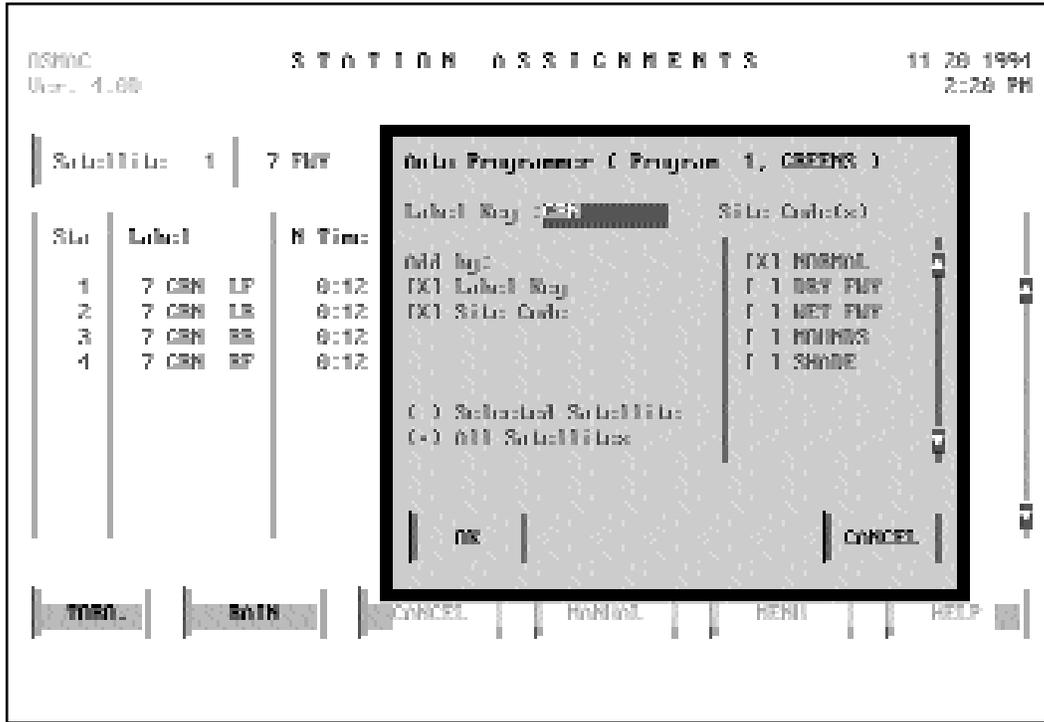


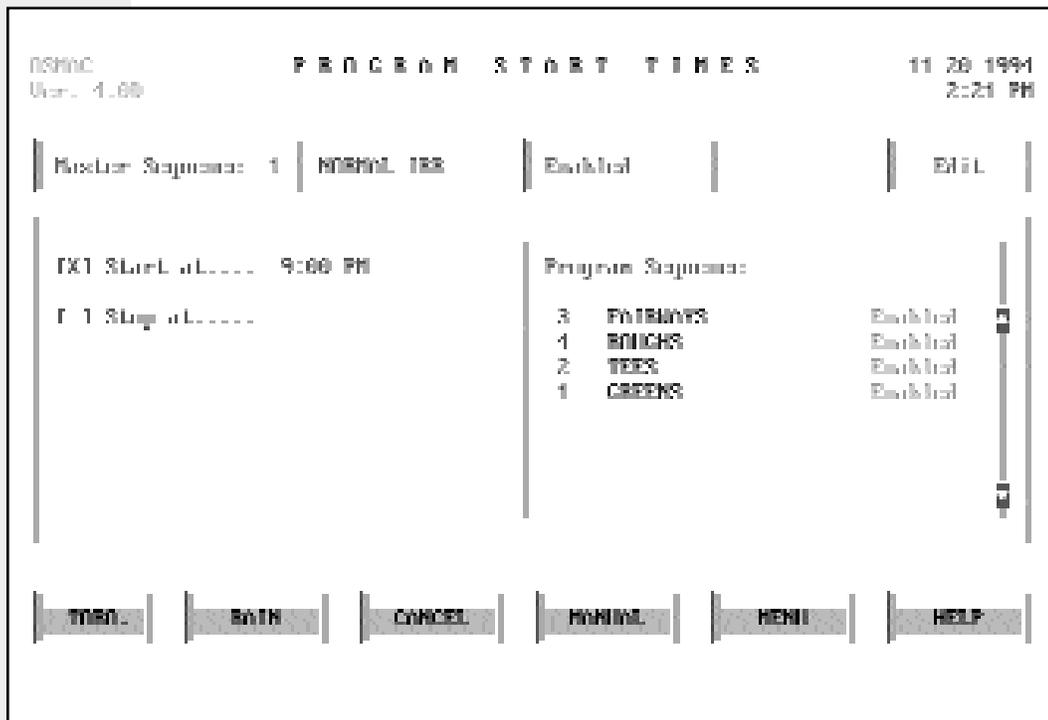
Figure 10.2 - Auto Programmer Dialogue Box. Click on the station number header to open the Auto Programmer. Enter a station label key and/or site code

in Figure 10.2, place the cursor on the station number field heading (“Sta”) and click the mouse or press [Enter]. This pop-up window allows you to search all the stations of the selected satellite by site code and/or station label key.

To initiate a data search by station label only, check the “Add By Label Key” box, type in the station label key (i.e., G, greens, F, fairways, etc.) and press “Enter.” This field is not case sensitive, so you do not need to remember exactly how you defined the labels before. To conduct a search by site code only, check the “Add By Site Code” box and select a site code from the scrolling list. If both boxes under “Add By” are checked, the Auto Programmer conducts a station search using both criteria. If the “OK” button is pressed, all stations of the selected satellite containing the station label key and the selected site code

With OSMAC 4.0, different programs are grouped into master sequences and given a specific “Start at” or “Stop at” time in the **Program Start Times** screen shown in Figure 11.1. To select this screen, go to the **Main Menu** screen, highlight **Program Start Times** and click the mouse or press [Enter] (Menu → Program Start Time).

Figure 11.1 - Program Start Times. Gather information about master sequences.



You can define up to 99 master sequences. This gives you the opportunity to create a selection of master sequences to meet the watering needs of a particular site. Different master sequences could be used for each season of the year, tournament schedules, fertilization, overseeding or other variables that affect your watering plan.

The **Program Start Times** screen displays the programs assigned to the selected master sequence, along with the associated master start information. This screen allows you to gather information quickly about a master sequence. Master sequences are defined and edited in the two screens that follow **Program Start Times: Master Sequence List** and **Edit Master Sequences**.

Enabled/Disabled Button

This button allows you to enable a master program sequence. Click the mouse on this button (or press [Enter]) to change the master sequence to “Enabled” or “Disabled.”

“Start at” Option

Enter the start time for the master sequence in the “Start at” option. An “X” in this box automatically disables the “Stop at” option and allows you to enter a start time. The hour and minute field can be changed by clicking the mouse or pressing [Enter]. The left button on the mouse moves the time upward, the right button moves it downward. The time is displayed in the format chosen in the “Set Clock” pop-up window from the **System Configuration** screen (Menu → System Configuration → Set Clock).

“Stop at” Option

Enter the stop time for the master sequence in the “Start at” option. An “X” in this box automatically deselects the “Start at” option and allows you to enter a stop time. The hour and minute field can be changed by clicking the mouse or pressing [Enter]. The left button on the mouse moves the time upward, the right button moves it downward. The time is displayed in the format chosen in the “Set Clock” pop-up window from the **System Configuration** screen (Menu → System Configuration → Set Clock).



Only one Master Sequence per day can be given a "Stop at" time. However, "Start at" times can be assigned to multiple Master

Program Sequence Box

This box displays the programs assigned to the selected master sequence. Sequences cannot be changed in this box, only the enabled or disabled status of the program. To edit master sequences, refer to the **Edit Master Sequences** screen.

The programs for the selected master sequence are displayed in ascending order. If the total number of sequences is more than eight, use the up or down arrow buttons to review additional or previous programs. Clicking the mouse or pressing [Enter] when one of the arrows is selected will activate them. The left button on the mouse or pressing [Enter] moves the list up or down one line. The right button on the mouse moves the list up or down one page.

From the "Program Sequence" box, you can enable or disable a particular program within the master sequence. A mouse click (or pressing [Enter]) enables or disables only the selected program in the chosen master sequence. If the program is currently scheduled to be on for that day, "Enabled" will be displayed in light brown, otherwise it is blue-green. If the program sequence has been disabled, it is displayed in red.

If a syringe time has been entered for this program sequence, the value is displayed in the "S-Time" field in the "Program Sequence" box. This field is read-only. The value may be modified in the **Master Sequences** screen.

Edit Button

Use the button to go to the **Master Sequence List** screen shown in Figure 11.2. To activate the "Edit" button, select it and click the mouse or press [Enter].

OSMAC Ver. 4.00		MASTER SEQUENCE LIST				11 20 1994 2:22 PM	
				Edit		Start	
Seq	Label	Time	Pri	Status	Index		
1	NORMAL USE	+ 9:00 PM	0	Enabled	1		
2	GREENS ONLY	+ 12:00 AM	0	Disabled	2		

TURN | BATH | CANCEL | NORMAL | MENU | HELP

Figure 11.2 - Master Sequence List. Define and edit master sequences using this screen. Enter "Start at" and "Stop at" times, and sequence priori-

Master Sequence List

Master sequences are defined and edited from the **Master Sequence List** screen shown in Figure 11.2 (Menu → Program Start Times → Edit → Master Sequence List).

There are six user-defined fields on this screen. To activate each field, highlight the field and click the mouse or press [F2]. Enter information following the Step by Step instructions below, using the Editor feature (*refer to Appendix B*). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc]



Step by Step: Master Sequence

Lists

1. *MSeq (Master Sequence Number)*: Enter a master sequence number from 1 to 99.
2. *Label*: Enter up to 12 characters as a label for the master sequence.
3. *Time*: The start/stop time is shown in two fields under this header. The first field is an up/down arrow indicating whether the time is a start or stop time. An up arrow indicates a start time; a down arrow indicates a stop time. To toggle between start and stop, click the mouse or press [Enter] when this field is selected. **Only one stop time a day is accepted during the system update time. All others are ignored.** The hour and minute fields are changed by clicking the mouse or pressing [Enter]. The time moves up with a click of the left button on the mouse and down with a click of the right button.
4. *Pri*: Set a priority for the master sequence from A to Z (A is the highest priority).
5. *Status*: Enable or disable the master sequence in this field. This field changes from “Enabled” to “Disabled” by clicking the mouse or pressing [Enter]. Enabled master sequences are displayed in blue-green. Disabled sequences are light red.

to exit without saving the information.

After master sequences have been defined, a mouse click (or pressing [Enter]) on this field will display the master sequences in ascending order. To indicate the end of the master sequence entries, dashes appear on the line

immediately following the last entry.

Priorities to Run Master Sequences

At system update time, the priority assigned to a Master Sequence is used to determine which master sequence is flow managed first. This allows a master sequence with a high priority the chance to run when the flow limits have not been used by a previous master sequence. The control system will prioritize master sequences in the following manner. The master sequence with a stop time is first. The next priority is by priority field (A-Z). If these are equal, the next priority is start time and the final priority is master sequence number with the lowest number first.

Edit Button

Use the “Edit” button to go to the **Edit Master Sequences** screen shown in Figure 11.3. To activate this button, select it and click the mouse or press [Enter].

Starts Button

Activate the “Starts” button to return to the original **Program Starts** screen shown in Figure 11.1. To do this, select the “Starts” button and click the mouse or press

```

OSMAC                               EDIT MASTER SEQUENCES                               11 29 1994
Ver. 4.00                                                                    2:22 PM

Master Sequence: 1 | NORMAL TB3 | List | Start:

Seq | Pym | Label | S Time | Status | Index
---|---|---|---|---|---
  1 |  3 | FATHOMS |         | Enabled | 1
  2 |  4 | BRIGHS |         | Enabled | 2
  3 |  2 | TEEB |         | Enabled | 3
  4 |  1 | GREENS |         | Enabled | 4

[TAB] [BATH] [CANCEL] [FATHOMS] [MENU] [HELP]

```

Figure 11.3 - Edit Master Sequences. Use the six fields to add programs to master sequences. Enable or disable programs within a sequence. Return to the Master Sequence List screen by clicking on the "List" but-

[Enter].

Edit Master Sequences

The main body of the **Edit Master Sequences** screen shown in Figure 11.3 allows you to add programs to the master sequences.

There are five user-defined fields on this screen. To activate each field, highlight the field and click the mouse or press [F2]. Enter information following the Step by Step instructions below, using the Editor feature (*refer to Appendix B*). The prompt lines at the bottom of the screen will guide you. To exit a field, press [Enter] to save or [Esc]



Step by Step: Editing Master

Sequences

1. *Seq*: Enter the sequence number of the program in the master sequence. This number is used to determine which programs run first. The maximum value is 99. Enter a number up to one greater than the total number of sequences already defined. If a number is less than the total number of sequences, the new sequence is placed at that position and the current and succeeding numbers are moved down. For example, if you already have defined four sequences and assign a new sequence the number three, the current third sequence moves to fourth place and the current fourth sequence moves to fifth place.
2. *Pgm*: Select the program number as defined in Section 9. When this field is activated, a “Choose Program Number” pop-up window is displayed as shown in Figure 11.4. Use the arrows to scroll through the list. Click the left button on the mouse or press [Enter] to scroll one line. Click the right button to scroll one page. Select “OK” after choosing a program number or “Cancel” to close the pop-up window.
3. *Label*: The label of the program number as defined in **Program Definitions** screen is displayed. This field cannot be edited.
4. *S-Time (Syringe Time)*: If a non-zero syringe time is entered in this field, the syringe time will be used as the unadjusted run time for the program. If zero is entered, the program will operate with adjusted station run times.
5. *Status*: Enable or disable the master sequence in this field. This field changes from “Enabled” to “Disabled” by clicking the mouse or pressing [Enter]. Enabled master sequences are displayed in blue-green. Disabled sequences are light red.

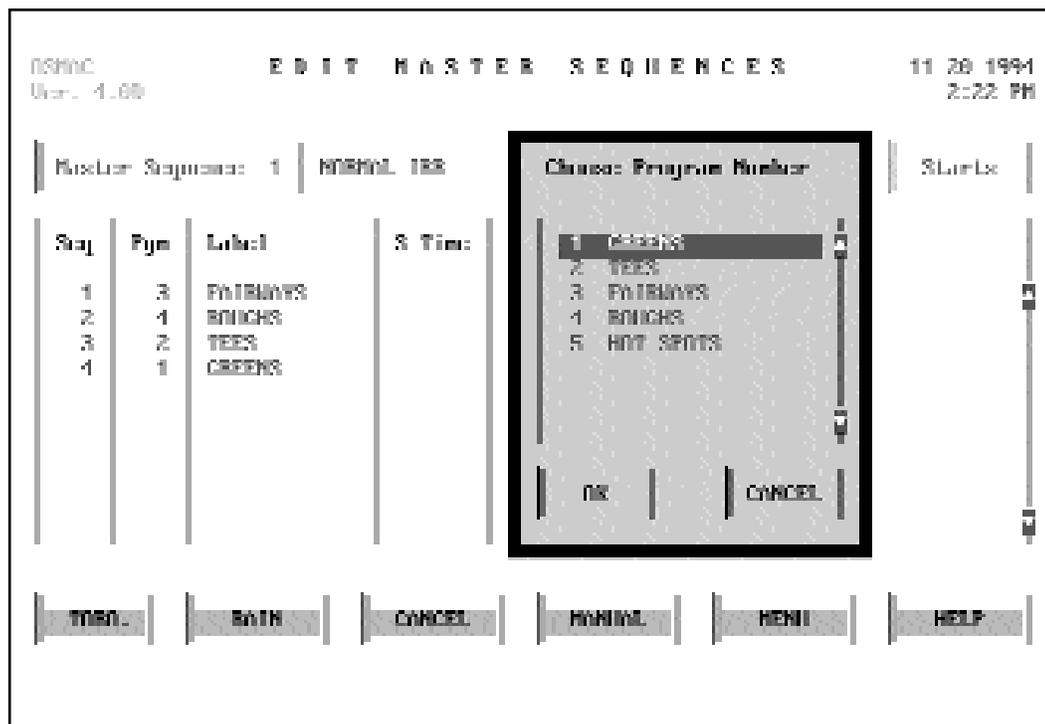


Figure 11.4 - "Choose Program Number" Pop-Up Window. Select program numbers and labels quickly when the "Program" field is activated. Scroll through the list of defined programs and highlight your selection.

to exit without saving the information.

List Button

Use the "List" button to return to the **Master Sequence List** screen shown in Figure 11.2. To activate this button, select it and click the mouse or press [Enter].

Starts Button

Use the "Starts" button to return to the **Program Start Times** screen shown in Figure 11.1. To activate this button, select it and click the mouse or press [Enter].

You can review or assign the system percentage adjustments and Operational ET in the **Manual Adjustments** screen shown in Figure 12.1. This screen also provides a quick way to make daily percentage adjustments to your site codes, programs, satellites and stations without accessing the definitions screens.

To access this screen, go to the **Main Menu** screen and highlight **Manual Adjustments** (Menu → Manual Adjustments). Click the mouse or press [Enter]. If you are in the **Site Definitions** screen, you can access **Manual Adjustments** by selecting the “Manl Adj” button.

Figure 12.1 - Manual Adjustments. Change the Operational ET or Percentage Adjustments. Click on the “Site” button to go directly to the

OSMAC
Ver. 4.00

M A N U A L A D J U S T M E N T S

11 20 1994
2:23 PM

■ System			125%	■ Operational ET	1.25 in
■ Site Code	1	NORMAL	100%		
■ Program	1	GREENS	100%		
■ Satellite	1	7 FUY	100%		
■ Station	1	7 GSM LP	100%		Site

The **Manual Adjustments** screen shows the system percentage and Operational ET, along with the site code, satellite, program and station numbers that were selected previously and their respective labels and percentage adjustments in the appropriate boxes.

The system percentage adjustment and the Operational ET are functions of each other. A change in one will change the other based on the following formula:

$$\text{System \%} = \frac{\text{Operational ET}}{\text{Reference ET}}$$

The Operational ET is user-defined or supplied from the weather station and is displayed in the units of measure selected in the **System Configuration** screen (Section 3). The Reference ET is used as defined in the **System Configuration** screen (Menu → System Configuration → Reference ET).

You can scroll through the site codes, programs, satellites and stations by clicking the mouse or pressing [Enter] on the appropriate box. The left button on the mouse or pressing [Enter] scrolls in ascending order; the right button in descending order. The respective labels are displayed in white.

To edit the percentage adjustment boxes, highlight the box and click the mouse or press [Enter]. The left button on the mouse or pressing [PgUp] scrolls in ascending order; the right button or pressing [PgDn] scrolls in descending order. Inside each percentage box, the total percentage adjustment up to that point is displayed in green.

The OSMAC 4.0 provides the opportunity to review the run times of the stations of a satellite in an irrigation program taking into account the Operational ET and all percentage adjustments.

To access the **Run-Time Review** screen shown in figure 13.1, go to the main menu and select **Run-Time Review** (Menu → Run-Time Review).

Figure 13.1 Run-Time Review. Review station run times after Operational ET and all percentage adjustments have been applied.

OSMAC Ver. 4.00		R U N T I M E R E V I E W						11 20 1991 2:24 PM	
Satellite 1		7 FWT		Program 3		PRTIMERS			
Sta	Label		N Time	A Time	SpLs	Statk	Cycle Time(s)		
5	7 FWT 00		0:18	0:22	0	:00	0:22		
6	7 FWT 01		0:18	0:22	0	:00	0:22		
7	7 FWT 02		0:18	0:22	0	:00	0:22		
8	7 FWT 03		0:18	0:18	1	:30	0:09	0:09	
9	7 FWT 04		0:18	0:22	0	:00	0:22		
10	7 FWT 05		0:18	0:28	0	:00	0:28		
11	7 FWT 06		0:18	0:22	0	:00	0:22		
12	7 FWT 07		0:18	0:22	0	:00	0:22		
13	7 FWT 08		0:18	0:18	1	:30	0:09	0:09	
14	7 FWT 09		0:18	0:22	0	:00	0:22		

TURN	BACK	CANCEL	HOME	MENU	HELP
------	------	--------	------	------	------

There are seven read-only fields on this screen:

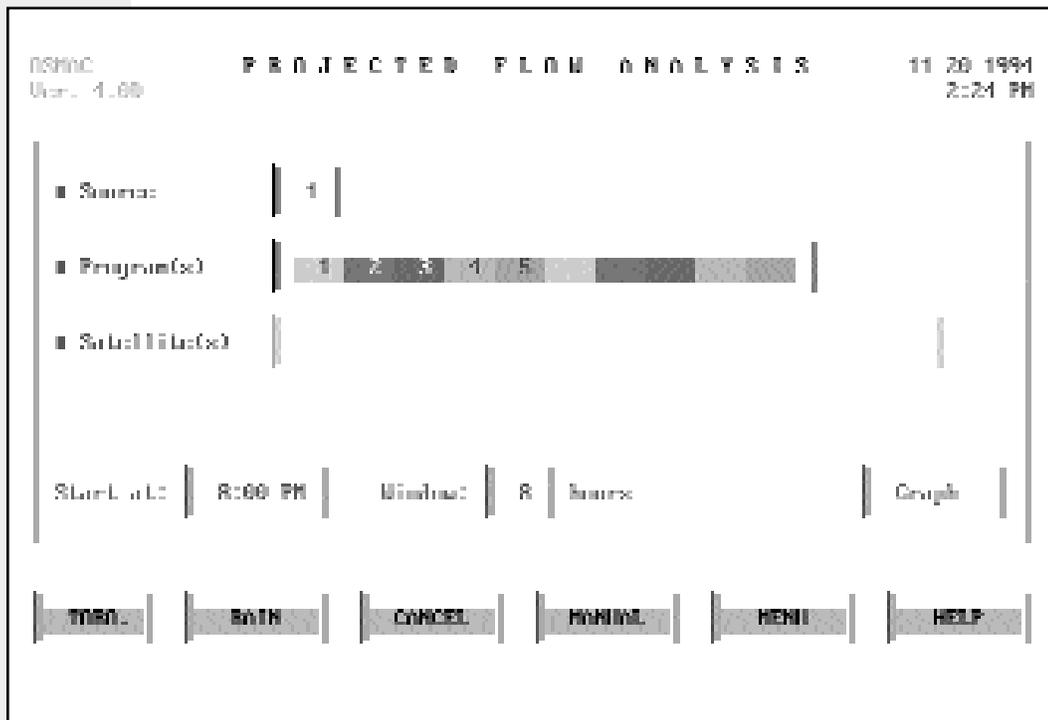
- *Sta*: The station number is displayed in this field.
- *Label*: This field shows the associated station label.
- *N-Time (Normal Run Time)*: Review the normal run times of stations assigned to selected program.
- *A-Time (Adjusted Run Time)*: This field displays the adjusted run time of the station, taking into consideration all percentage adjustments.
- *Rpts*: This field shows the number of repeats. The maximum number is three.
- *Soak*: This field displays the soak time in minutes from 0 to 59.
- *Cycle Time*: This is the run time of a station when a given program is activated. This time is calculated by taking into consideration the effect of repeats and the number of start times on the run time of the station.



The adjusted run time of a station in a given program is divided by the number of starts for that program within a Master Sequence. The cycle time is

The **Projected-Flow Analysis** screen shown in Figure 14.1 allows you to review the projected water flow as a graphic. This gives you the opportunity to verify that the program performs as you expect. The **Projected-Flow Analysis** also provides a second chance to check that you defined the correct start or stop times and that you enabled all the programs you want to run.

Figure 14.1 - Projected-Flow Analysis. Select a source, program(s) or satellites(s) for which you want to view the projected water flow. Click the



When opening this screen, all boxes are displayed in dark gray, indicating they are not active, except for “Start at,” “Window” and “Draw Graph.” The projected-flow analysis can be displayed in several different ways. You can choose the flow of an entire source, program(s) or satellite(s).



Step by Step: Projected-Flow Analysis

1. *Source:* Selecting this item by clicking on it or pressing [Enter] changes the box to white. It is now highlighted and you can enter a source number.
2. *Program:* Selecting this item causes the source and program boxes to be highlighted. The source box displays “Source #.” The program box displays eight programs in different colored backgrounds. You can then enter the source number and select the program number(s) for which you want the flow graphed. To deselect a program, click on a program number. This changes the background to dark and replaces the program number with dashes, indicating that the program is no longer selected. To reselect a program number, highlight the dashes and click the mouse (or press [Enter]) to scroll through the program numbers.
3. *Satellite:* When you select this item, the source, program and satellite boxes are all highlighted. The program box displays the first 10 programs. The satellite box displays the satellite fields in the

After selecting an option (“Source,” “Program” or “Satellite”) you can enter the start time and the hours you want the graph to display in the appropriate boxes.

“Start at”

The “Start at” box contains the start time for the graph time scale. As a default, the box displays the system update time as defined in the **System Configuration** screen (Menu → System Configuration → System Update Time). You can change the hour and minute field by highlighting it and clicking the mouse or pressing [Enter]. Clicking the left button on the mouse moves the time upward; the right button moves it downward.

Window Hours

The “Window” box defines the amount of hours the projected-flow graph is displayed. Eight hours is the default setting. Clicking the left button on the mouse changes the hours incrementally; the right button scrolls the hours decrementally. The maximum time that can be entered is 24 hours.

Graph Button

When you activate the “Graph” button (by clicking the mouse on it or pressing [Enter]), the **Projected Flow** screen appears as shown in Figure 14.2.



Before displaying the projected-flow graph, the computer processes the flow management calculations for the selected schedule. The time and date from the computer is used during calculation to determine active days and start times. Flow management calculations are not made again,

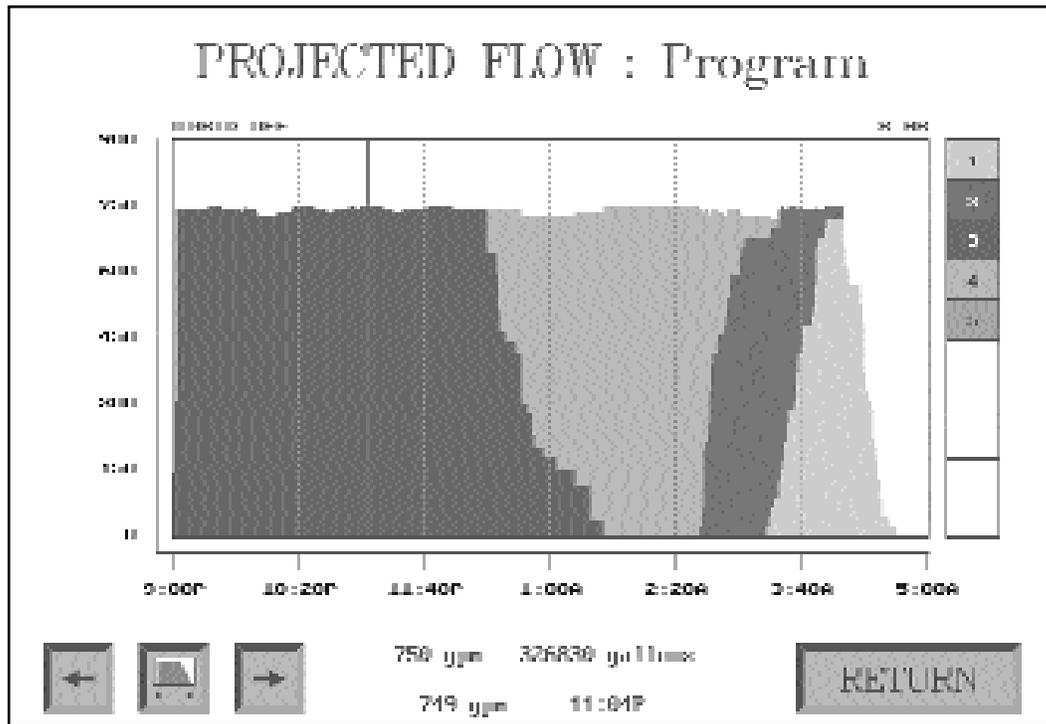


Figure 14.2 - Projected-Flow Graph. View projected flows of sources, programs and satellites in different colors. Use the white vertical bar to highlight incremental flows. Total flow for that watering cycle is displayed at

Projected-Flow Graph

The **Projected Flow** screen shown in Figure 14.2 displays the flow of each selected item (i.e., source, program and satellite) in different colors. For example, if seven programs are selected, each is displayed in a different color. On the right side of this screen, a legend indicates which color corresponds to which item. On the graph, the time of day is displayed in hours on the X-axis. The flow (in appropriate units based on the selection in the **System Configuration** screen) is displayed on the Y-axis.



Step by Step: Projected Flow

- “*Grid On*” button: This button is located on the upper left-side of the screen. Clicking on it displays a reference grid over the flow graph. Clicking it again removes the grid.
- *Flow Graph*: Clicking on the flow graph itself causes a vertical bar to appear. This bar acts like a cursor and can be dragged by the mouse. As the bar is dragged on the flow display, the time and total flow, along with the individual flows, are shown at the bottom of the screen. Individual flows are shown in the colors indicated in the sidebar located next to the graph.
- *Arrow buttons*: Clicking on the left or right arrows moves the graph window forward or backward in time. The left button on the mouse moves the window by 15-minute increments, and the right button moves the window by one hour increments.
- *Graph Time-Scale*: This button, located between the arrows, changes the graph time-scale by one hour. The left button on the mouse or pressing [Enter] increases the time scale and the right button on the mouse decreases the scale.
- *Sidebar*: Clicking on the sidebar alternately adds or removes the selected item from the flow display. This lets you view specific items at one time without returning to the **Projected-Flow Analysis** setup screen and redefining it.

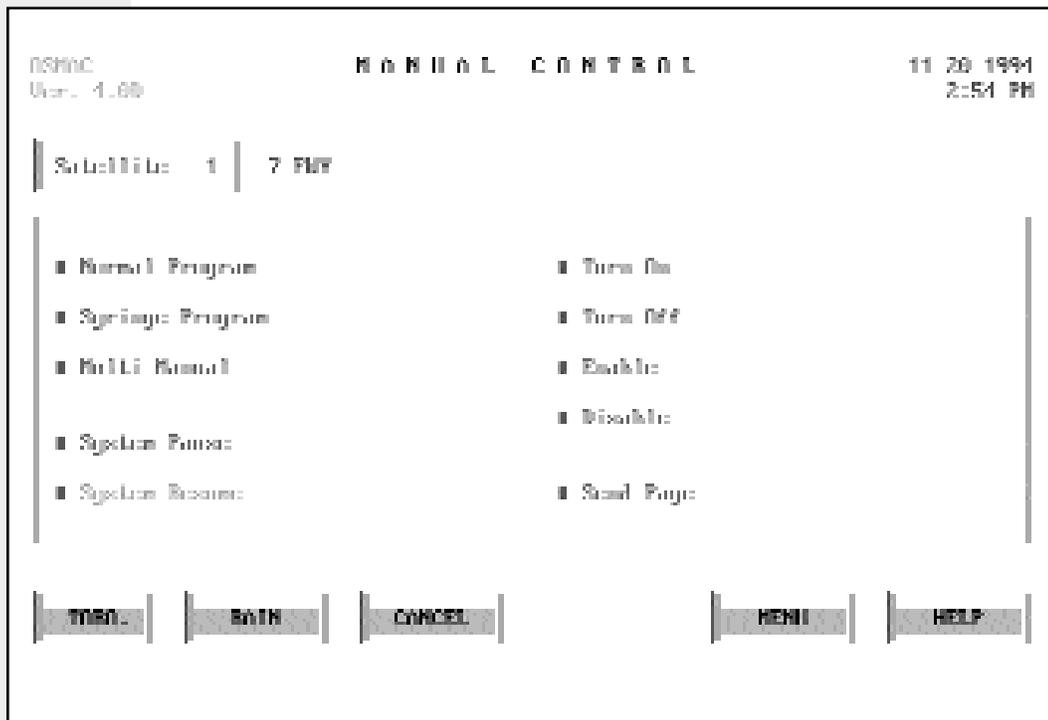
Return Button

Select this button to return to the **Projected-Flow Analysis** setup screen.

There will be times when you want to conduct manual operations. To do so, access the **Manual Control** screen shown in Figure 15.1 (Menu → Manual Control).

To initiate any operation, you must first define the type of manual operation (i.e., normal program, syringe, or multi-manual) and where it needs to be performed (i.e., source and satellite).

Figure 15.1 - Manual Control. Initiate manual control operations by selecting the type of operation and where it needs to be performed.



Satellite Button

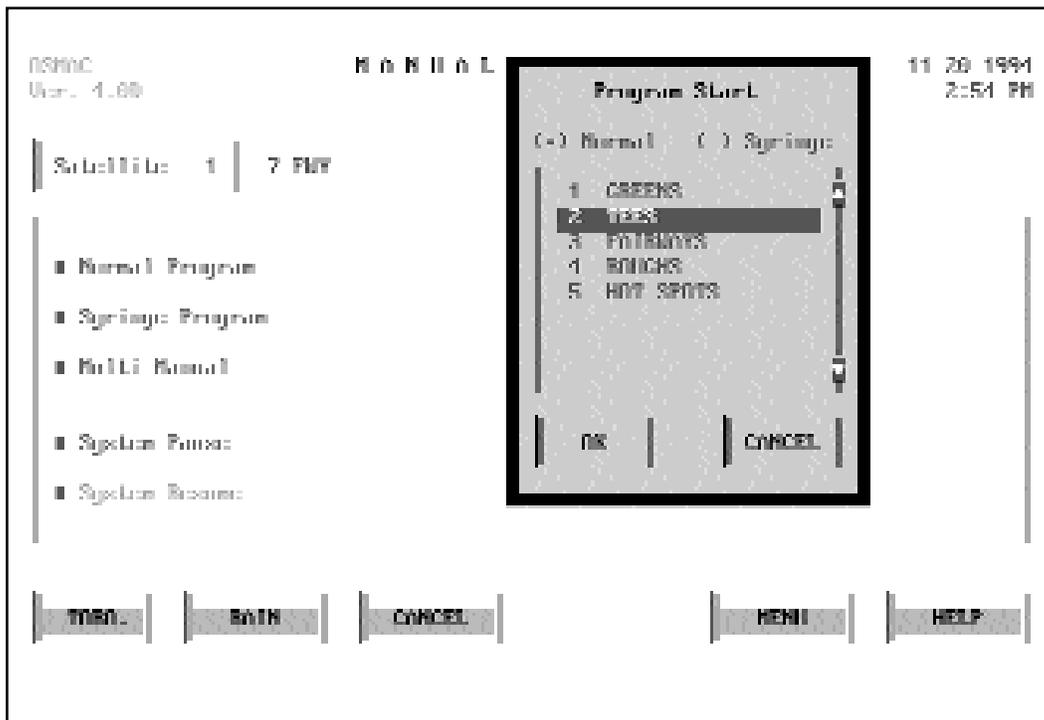
This box displays the currently selected satellite. Clicking the mouse on this box or pressing [Enter] will display the next satellite. The left button on the mouse or pressing [Enter] scrolls in ascending order, the right button in descending order. The stations associated with the selected satellite are available for manual control.

Normal Program

When you select the "Normal Program" option (highlight it and click the mouse or press [Enter]), a pop-up window appears that lists all defined programs (see Figure 15.2). Scroll through the programs by clicking on the arrow buttons and highlight the selected program with the mouse cursor. The highlighted program will change from blue-green to white.

If the "OK" box is clicked, the pop-up window closes and the manual program is initiated within three minutes. To close the pop-up window without choosing a program, click the "Cancel" box.

Figure 15.2 - "Program Start" Pop-Up Window. This window appears when you select "Normal Program." Select from the list a program you want

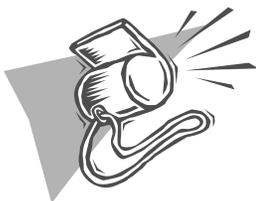


Syringe Program

When you select the “Syringe Program” option (highlight it and click the mouse or press [Enter]), the same pop-up window appears that lists all defined programs, as in Figure 15.2. Scroll through the programs by clicking on the arrow buttons with the mouse or pressing [Enter] and highlight the selected program with the cursor. The highlighted program will change from blue-green to white.

Enter the syringe time in the numeric field next to “Program Start” at the top of the pop-up window. The default syringe time is taken from the **Program Default** screen (Section 9). The maximum syringe time you can enter is 59 minutes.

If the “OK” box is clicked, the manual syringe is initiated within three minutes. To close the pop-up window



Selecting “Normal Program” or “Syringe Program” overrides normally scheduled activity. A Projected-Flow Analysis should be performed when normal activity is resumed.

without choosing a program, click the “Cancel” box.

Multi-Manual

When you select the “Multi-Manual” option (highlight it and click the mouse or press [Enter]), a pop-up window appears that lists all defined stations for the selected satellite (see Figure 15.3). A check box allows you to select individual stations for manual control. You can scroll through the stations by clicking on the arrow buttons on the right side of the box.

A status line in the pop-up window shows the total number of stations selected. The maximum number of stations that can be turned on from the satellite is defined in the **Satellite Definitions** screen.

If the “OK” box is clicked, the operation is initiated. If the “Cancel” box is clicked, no manual operations will

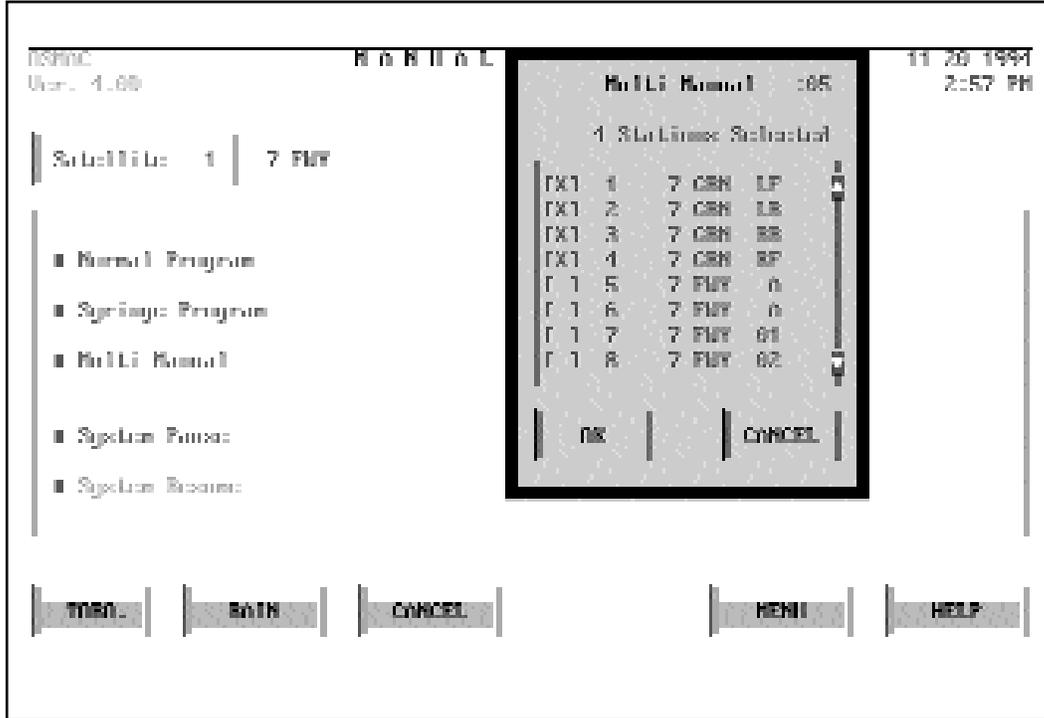


Figure 15.3 - "Multi-Manual" Pop-Up Window. Select individual stations for manual control. A status line shows the number of stations select-

take place. Selecting either box will close the pop-up window.

System Pause

When the "System Pause" option is selected, the block is highlighted and the prompt line reads:

Pause System (Yes or No?)

To select "Yes," highlight "Yes" in the prompt line with the mouse or type "Y" from the keyboard and the system pause mode is activated. The "System Pause" line turns from blue-green to red, indicating that the mode is on. When "No"



In the "System Pause" mode, station run times are interrupted. Stations will finish their run times when a "System Resume" command is issued.

is selected by highlighting "No" in the prompt line with the mouse or typing "N" from the keyboard, the prompt line disappears.

System Resume

When the "System Resume" option is chosen, the block is highlighted if the "System Pause" mode was previously selected. The prompt line reads:

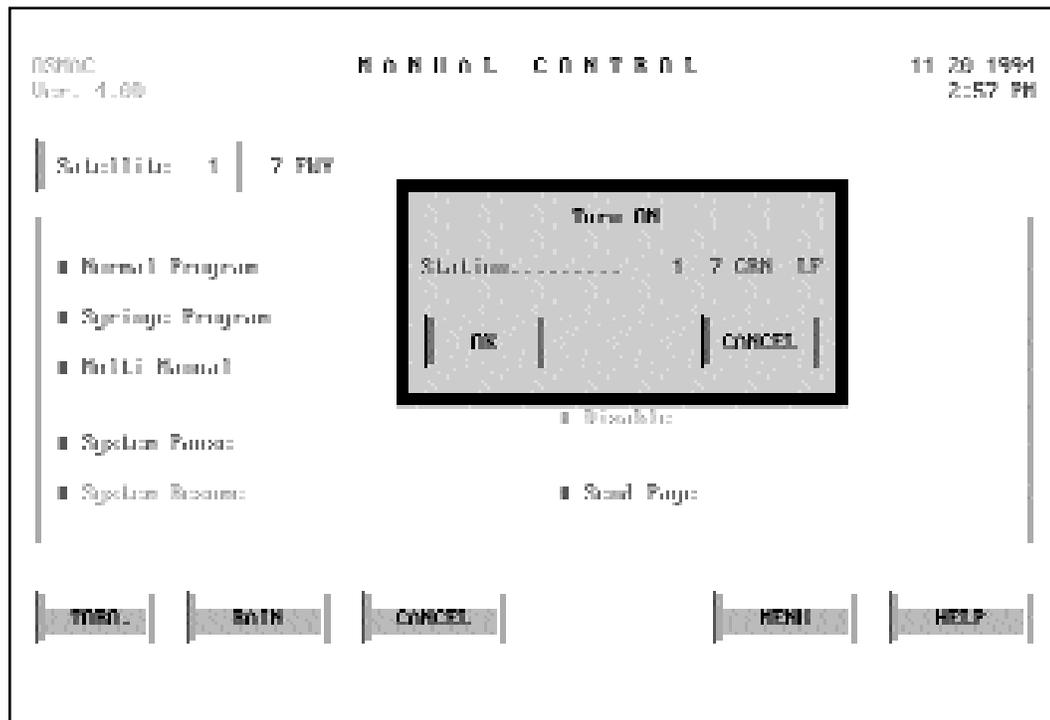
Resume System (Yes or No?)

To select "Yes," highlight "Yes" in the prompt line with the mouse or type "Y" from the keyboard and the system pause mode is exited. The "System Pause" line turns back to blue-green from red. The "System Resume" line goes to dark gray. When "No" is selected by highlighting "No" in the prompt line with the mouse or typing "N" from the keyboard, the prompt line disappears.

Turn On

When the "Turn On" option is selected (by highlighting

Figure 15.4 - "Turn On" Pop-Up Window. Select an individual station to turn on manually. Click "OK" to activate the operation.



it and clicking the mouse or pressing [Enter]), a pop-up window allows you to turn on an individual station of the selected satellite (see *Figure 15.4*). Select the station by

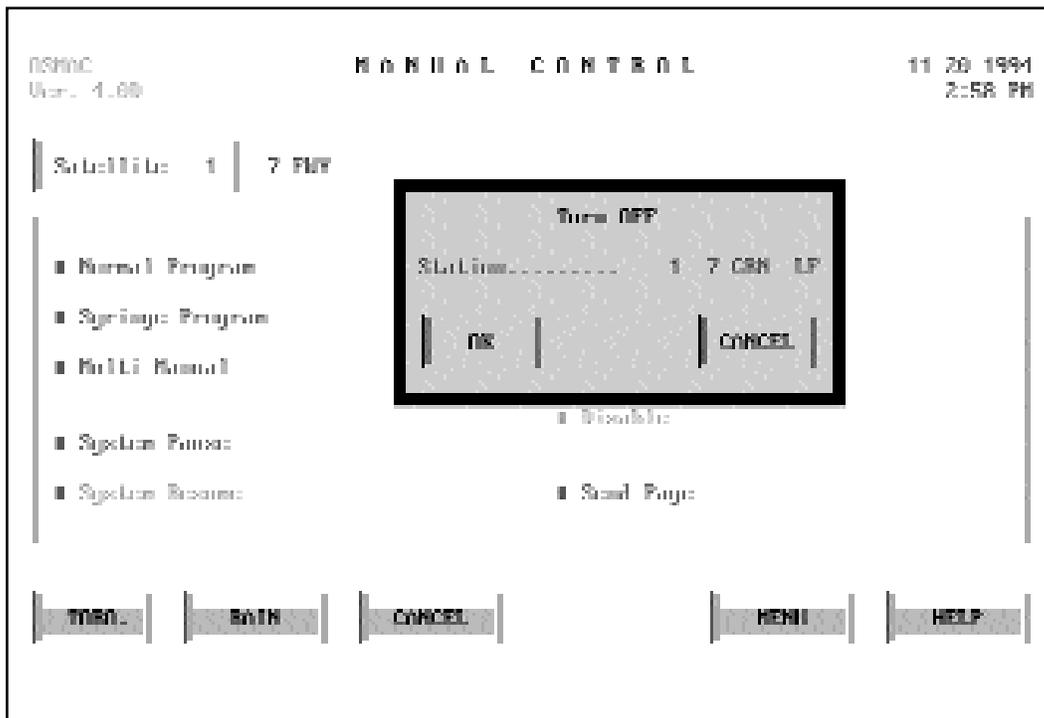
clicking the mouse on the station field or pressing [Enter]. Clicking the left button on the mouse or pressing [Enter] scrolls through the stations in ascending order. The right button scrolls in descending order.

If the "OK" box is selected, the action is initiated. The "Cancel" box closes the pop-up window without choosing a station.

Turn Off

When the "Turn Off" option is selected (by highlighting it and clicking the mouse or pressing [Enter]), a pop-up window allows you to turn off an individual station of the selected satellite (see *Figure 15.5*). Select the station by clicking the mouse on the station field. Clicking the left button on the mouse scrolls through the stations in ascending

Figure 15.5 - "Turn Off" Pop-Up Window. Select an individual station to turn off manually. Click "OK" to activate the operation.



order. The right button scrolls in descending order.

If the "OK" box is selected, the action is initiated. "Cancel" closes the pop-up window without choosing a station.

Enable and Disable

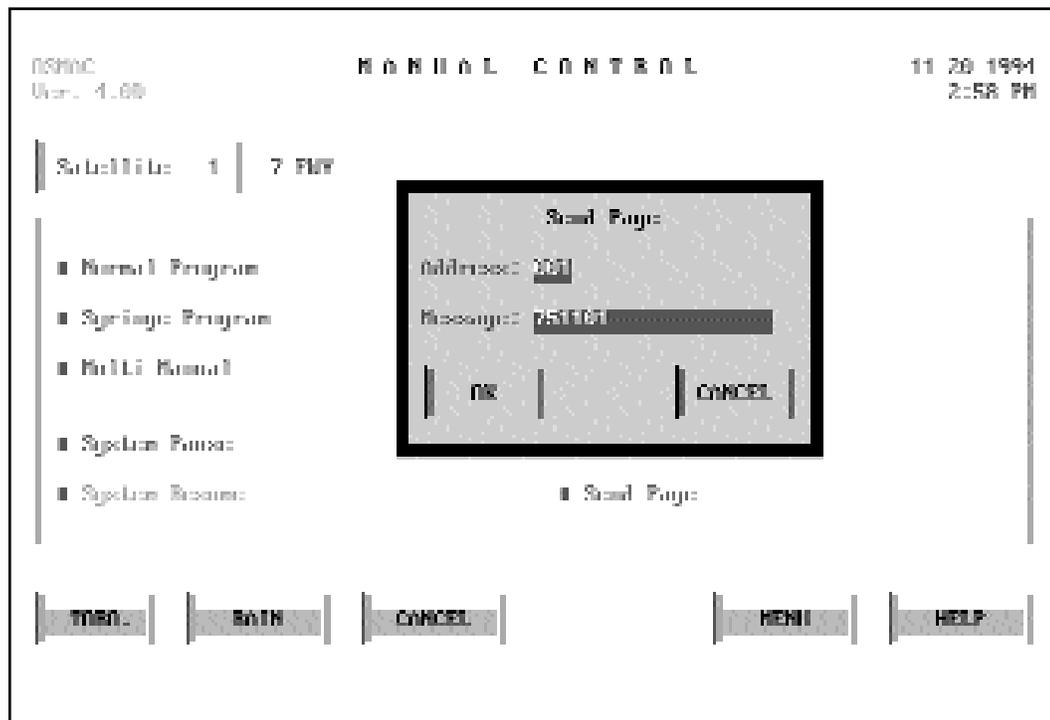
Choose the "Enable" operation to allow the current satellite to run stations. Select the "Disable" operation to prevent the satellite from running stations. Click "OK" in the pop-up window to activate the operation.

Send Page



For the paging terminal to actually send a page address, it must be pre-programmed into the paging terminal. The only pages that will actually broadcast will be addresses already

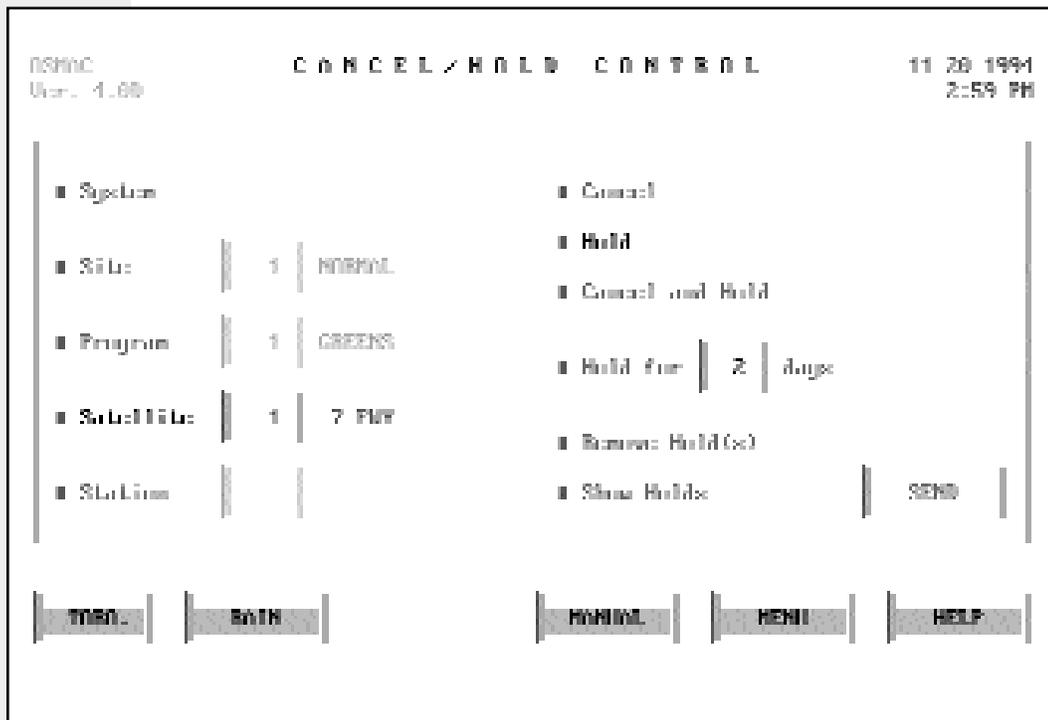
Figure 15.6 - "Send Page" Pop-Up Window. Send a numeric page to the satellite using this pop-up window. Enter the page in the message window



To perform cancel and hold operations in OSMAC 4.0, access the **Cancel/Hold** screen shown in Figure 16.1 from the main menu (Menu → Cancel/Hold). When opening this screen, all the boxes are a dark gray color, indicating that they are not active.

Select what part of the control system (system, site, program, satellite or station) you want to initiate a cancel or hold operation. Choose an item by highlighting it and clicking the mouse or pressing [Enter]. Doing this

Figure 16.1 - Cancel/Hold Control. Define the part of the control system for which you want to perform a "Cancel" or "Hold" operation and





Cancel/Hold Operations

- “Cancel” causes the immediate cancellation of the selected irrigation activity (system, program, satellite or station). The flow management in OSMAC 4.0 ensures the orderly shut down of the irrigation system to avoid “water hammer.”
- “Hold” allows the selected irrigation activity to proceed normally and then holds the activity for the number of assigned days.
- “Cancel and Hold” causes the selected irrigation activity to stop and holds the subsequent activity for the number of assigned days.

changes the option color from blue-green to white and the associated dark gray box changes to white, indicating that you can enter information in it by clicking the mouse or pressing [Enter]. Click the left button on the mouse or press [Enter] to move through the options in ascending order. The right button scrolls through the options in descending order. As the number of the item is selected, the assigned label appears at the right of the box.

After choosing an item, select the type of operation you want to perform: cancel, hold, or cancel and hold. Click the mouse or press [Enter] to select the operation.

If either the “Hold” or “Cancel and Hold” operation is selected, the “Hold for ___ days” box is highlighted. Enter the number of days you want to hold irrigation activity and click the mouse or press [Enter]. The maximum number of days is seven. If seven is selected, a permanent hold is initiated and “PERM” appears in the box.

After selecting the type of operation, click on the “Send” button to initiate it.

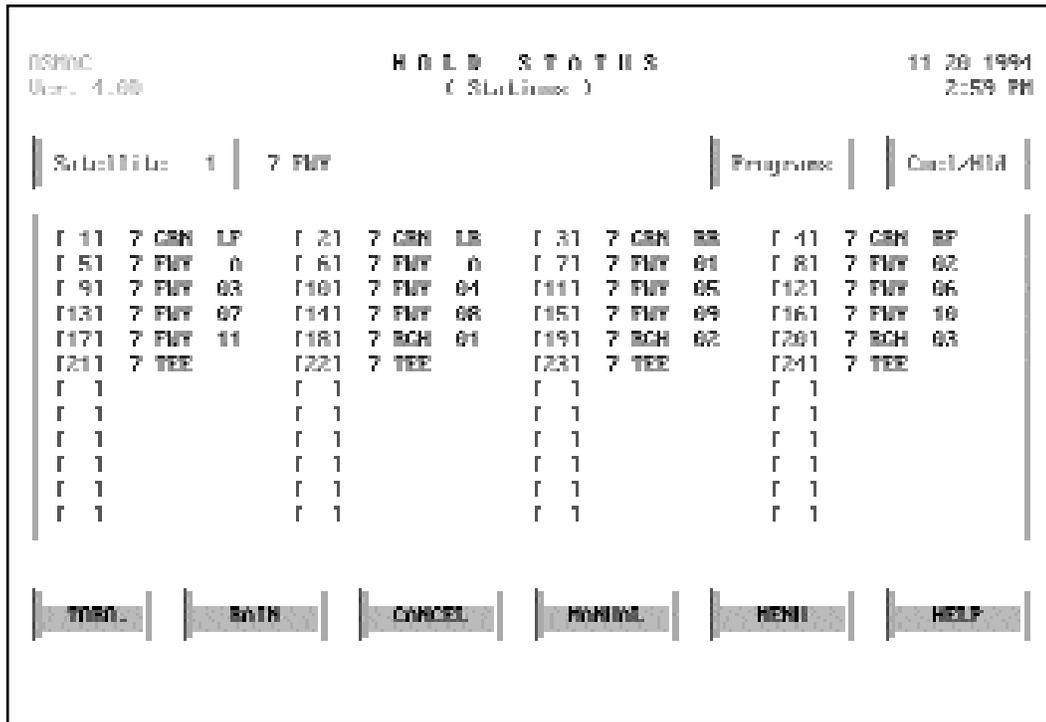


Figure 16.2 - Hold Status. View by satellite which stations are on hold. Active

Show Holds Option

Selecting the “Show Holds” option (by highlighting it and clicking the mouse or pressing [Enter]) causes the **Hold Status** screen for stations to appear (Figure 16.2). Stations are listed by satellite.

Click on the “Program” button to activate the **Hold Status** screen for programs. Green indicates the station or program is active. Red indicates the station or program is on hold.

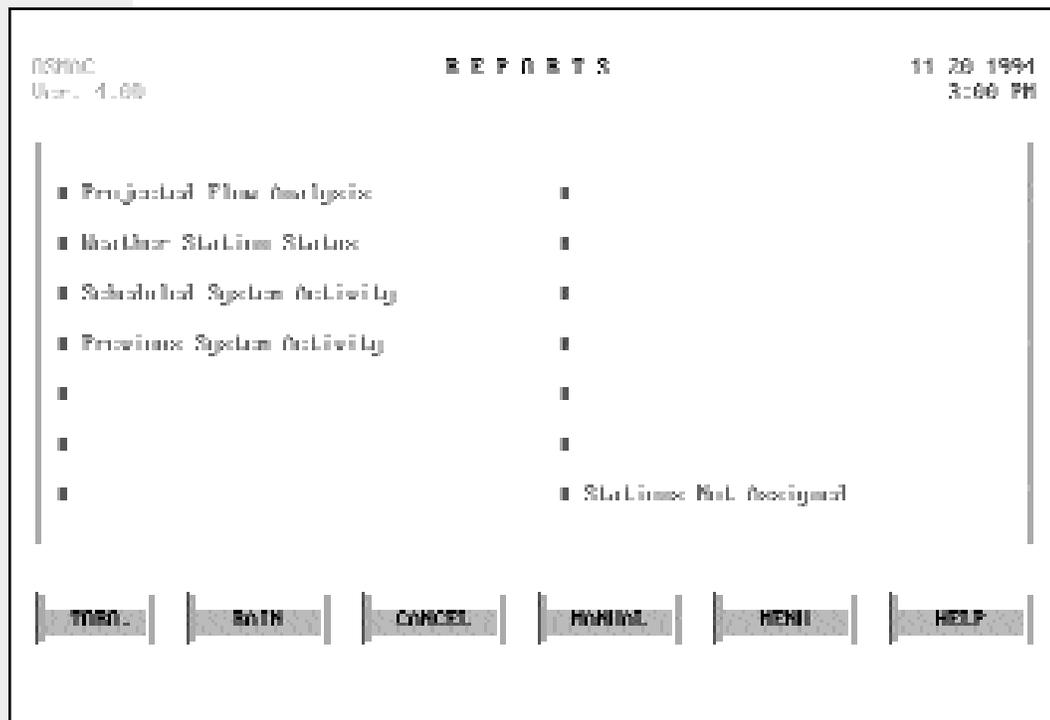
Click on the “Cncl/Hld” button to return to the **Cancel/Hold Control** screen.

The **Reports** section of OSMAC 4.0 allows you to view and printout a variety of reports. To access the **Reports** screen shown in Figure 17.1, go to the **Main Menu** and select **Reports** (Menu → Reports). To select a report, highlight it and click the mouse or press [Enter].

Projected-Flow Analysis

Selecting this report initiates the same screens as described in *Section 14: Projected-Flow Analysis*.

Figure 17.1 - Reports. Select the report which you would like to view.



Weather Station Status

This report provides current, detailed information from the weather station (Figure 17.2).

To activate the **Weather Station Status** report, highlight it and click the mouse or press [Enter]. All fields on this screen are read-only.

The following information is available:

- *ET*: The calculated value of ET is displayed.
- *Temperature*: The current temperature in °F or °C is shown, as well as the minimum, maximum and average temperature over the last 24 hours.
- *Relative Humidity*: View the current relative humidity, as well as the minimum, maximum and average relative humidity over the last 24 hours.
- *Solar Radiation*: The current value of solar radiation in watts/meter² is shown. Also, the total solar radiation

Figure 17.2 - Weather Station Status. Review current and detailed information from your weather station.

OSHC Ver. 4.00		WEATHER STATION STATUS				11 20 1994 3:00 PM	
ET - 1.29"	Now	Maximum	Minimum	Average			
Temperature	59°F	63°F	37°F	50°F			
Relative Humidity	35%	80%	22%	50%			
Solar Radiation	525 W/m ²	Total: 17.2 W/m ²					
Wind Speed	11 mph	14 mph	0 mph	4 mph			
Direction	104° E						
15:00 302/94	Last Hour	24 Hours	7 Days	365 Days			
Windfall	0.00"	0.00"	0.27"	7.35"			
TRSH	BACK	CANCEL	PAUSE	MENU	HELP		

over the last 24 hours is displayed in megajoules per square meter.

- *Wind Speed:* The current value of wind speed in miles per hour or kilometers per hour is shown. The minimum, maximum and average wind speeds are displayed also.
- *Direction:* This field displays the current wind direction in degrees labeled as N, S, E, W, NE, NW, SE, SW, NNE, ENE, NNW, WNW, SSE, ESE, SSW and WSW.
- *Rainfall:* Rainfall over the last hour, 24 hours, seven days and 365 days appears in the appropriate columns.

Scheduled Activity

This report provides an overview of the schedule irrigation activity (Figure 17.3).

Figure 17.3 - Scheduled Activity. Review the currently scheduled irrigation activity.

Set	Station	Fym	Start	Run	Stage	gpm	gallons
1	5 7 FMY 0	3	9:00 PM	N/T		22.0	
1	6 7 FMY 0	3	9:00 PM	N/T		22.0	
1	7 7 FMY 01	3	9:00 PM	N/T		25.0	
1	8 7 FMY 02	3	9:00 PM	N/T		25.0	
1	9 7 FMY 03	3	9:00 PM	N/T		25.0	
1	10 7 FMY 04	3	9:00 PM	N/T		25.0	
2	5 8 FMY 0	3	9:01 PM	N/T		22.0	
2	6 8 FMY 0	3	9:01 PM	N/T		22.0	
2	7 8 FMY 01	3	9:01 PM	N/T		25.0	
2	8 8 FMY 02	3	9:01 PM	N/T		25.0	

To activate the **Schedule Activity** report, highlight it and click the mouse or press [Enter]. All fields on this screen are read-only.

The following information is displayed on the **Scheduled Activity** report screen:

- *Sat*: The satellite number of the scheduled station.
- *Station*: The station number and label of the scheduled station.
- *Pgm*: The program number to which the station is assigned.
- *Start*: The start time of the station run time. If the station has already run, the time is shown in blue-green.
- *Run*: The run time of the station. If the station is on “Hold” or “Rain” hold, this is displayed in red. If a system pause has been initiated, the run time for pending stations is also in red. A serial data error will cause the word “Error” to show instead of a run time. If the station was unable to be transmitted, “N/T” is shown in this field. If the station has already run, the time is displayed in blue-green.
- *Stop*: The stop time of the station. If the station has already run, the time is displayed in blue-green. If the station is pending, it is shown in light gray. If the station is on hold, not transmitted, had a serial error, is in “System pause” or in “Rain” hold mode, no stop time is shown.
- *Flow*: The flow rate of the station is shown using the units format selected in the **System Configuration** screen. If the station has already run, this is displayed in blue-green. If the station is pending, it is shown in light gray.
- *Volume*: The volume of the station is shown using the units format selected in the **System Configuration** screen. If the station is on hold, not transmitted, had a serial error, is in “System pause” or in “Rain” hold mode, no volume is shown. If the station has already run, it is displayed in blue-green. If the station is pending, it is shown in light gray.

Up and Down Arrows

The screen can display information for up to 10 stations at one time. Use the up or down arrow buttons on the right side of the screen to scroll through additional or previous stations. To activate the arrows, select the direction you want (it will be highlighted in yellow) and click the mouse on it or press [Enter]. The left mouse button or pressing [Enter] moves the display up or down one line. The right mouse button moves up or down one page.

"Time" Button

The "Time" button is located in the upper left of the screen. You can adjust the time up or down by selecting this field and clicking the mouse or pressing [Enter]. The time displayed in this box readjusts whenever the screen is scrolled or a "Seek Time" is chosen.

"Go To Time" Button

Located next to the "Time" button, the "Go To Time" button searches for the first station with a start time that is equal to or greater than the time selected and displays the stations in chronological order. To activate this button, highlight it and click the mouse or press [Enter].

"Reports" Button

Use the "Reports" button to return to the **Reports** screen shown in Figure 17.1. To activate this button, select it and click the mouse or press [Enter].

Date

The date of the last system update is shown on the line centered directly below "Scheduled Activity."

Previous Activity

This report provides an overview of the last irrigation schedule.

To activate the **Previous Activity** report, highlight it and click the mouse or press [Enter]. All fields on this screen are read-only. The following information is displayed:

- **Sat:** The satellite number of the station.

- *Station*: The station number and label of the station.
- *Pgm*: The program number to which the station was assigned for the scheduled irrigation activity.
- *Start*: The start time of the station run time.
- *Run*: The run time of the station. If the station is on “Hold” or “Rain” hold, this is displayed in red. A serial data error will cause the word “Error” to show instead of a run time. If the station was unable to be transmitted, “N/T” is shown in this field.
- *Stop*: The stop time of the station. If the station is on hold or was not transmitted, no stop time is shown.
- *Flow*: The flow rate of the station is shown using the units format selected in the **System Configuration** screen.
- *Volume*: The volume of the station is shown using the units format selected in the **System Configuration** screen.

Up and Down Arrows

The screen can display information for up to 10 stations at one time. Use the up or down arrow buttons on the right side of the screen to scroll through additional or previous stations. To activate the arrows, select the direction you want (it will be highlighted in yellow) and click the mouse on it or press [Enter]. The left mouse button or [Enter] moves the display up or down one line. The right mouse button moves up or down one page.

“Time” Button

The “Time” button is located in the upper left of the screen. You can adjust the time up or down by selecting this field and clicking the mouse or pressing [Enter]. The time displayed in this box is readjusted whenever the screen is scrolled or a “Go To Time” is chosen.

“Go To Time” Button

Located next to the “Time” button, the “Go To Time” button searches for the first station with a start time that is equal to or greater than the time selected and displays the stations in chronological order. To activate this button,

highlight and click the mouse or press [Enter].

“Reports” Button

Use the “Reports” button to return to the **Reports** screen shown in Figure 17.1. To activate this button, select it and click the mouse or press [Enter].

Date

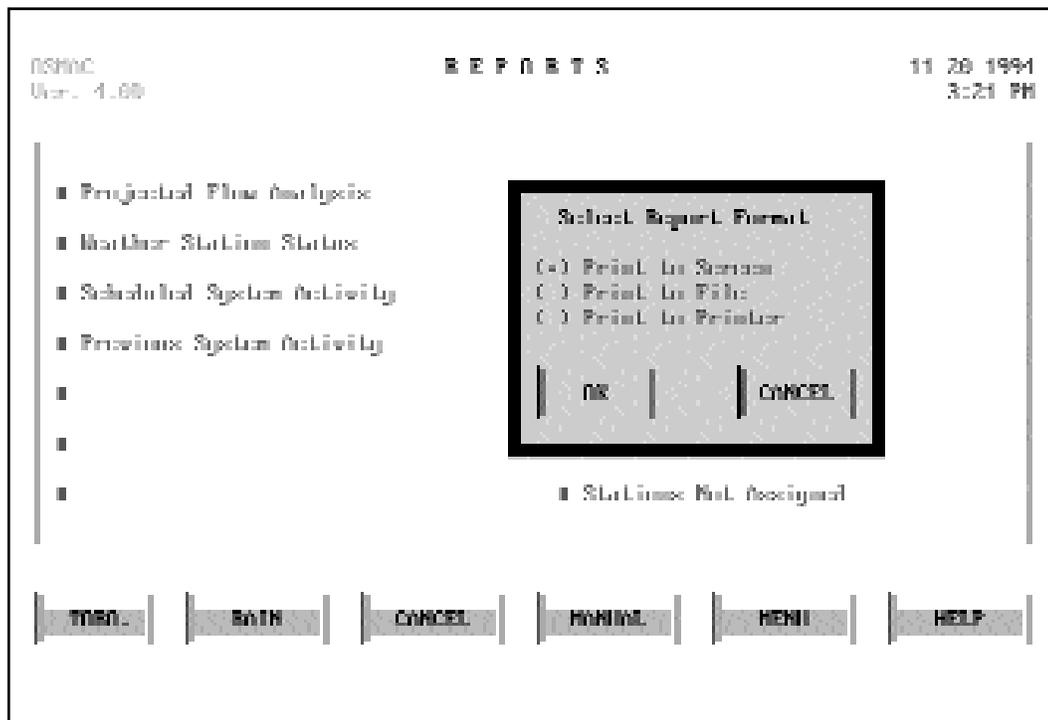
The date of the last system update is shown on the line centered directly below “Previous Activity.”

Stations Not Assigned

This report provides a way to check stations that are not assigned to an irrigation activity.

To activate the **Stations Not Assigned** report screen, highlight it and click the mouse or press [Enter]. All fields on this screen are read-only.

Figure 17.4 - “Select Report Format” Pop-Up Window. Use this pop-up to select the format in which you want the Stations Not



The first screen to appear is a pop-up window shown in Figure 17.4. This window allows you to select “Print to Screen,” “Print to File” or “Print to Printer.” “Print to Screen” is the default selection. To choose a report format, highlight the option and click the mouse or press [Enter]. Selecting the “Cancel” button will return you to the **Reports** screen. Selecting the “OK” button will display the report in the chosen format.

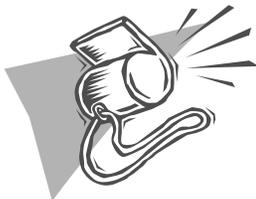
The report will print out all stations defined, but not assigned in the station assignment screen. The report also displays the satellite number, station number and station.

Appendix A: OSMAC 4.0 Technical Specifications

OSMAC 4.0 controls OSMAC satellites via Motorola paging protocol. The control system will run on any computer which meets the following minimum computer requirements:

- IBM-compatible personal computer (80386 or better CPU) with MS-DOS version 6.0 or higher.
 - SMARTDRV.EXE loaded.
 - 585k free conventional memory.
- Graphics adapter with respective monitor (VGA).
- 4 MB of RAM.
- 80 MB hard drive minimum.
- Microsoft-compatible bus mouse.
- Two COM ports, minimum.
- Printer (optional).
- An input power conditioner (recommended).

OSMAC 4.0 will interface with a Motorola pager/encoder paging terminal via an RS-232C port. The paging terminal will signal the remote satellites via the PET protocol. Signaling is unidirectional and contains no feedback from the satellites.



The OSMAC 4.0 software must be running at all times to allow control of the satellites.

OSMAC 4.0 will connect to a weather station via an additional RS-232C port to provide the operator with current and cumulative data.

Once programming is complete, the information can be stored on a diskette. This information is uploaded to the OSMAC system automatically for retrieval and change. The information is stored in DBASE IV format and can be retrieved and displayed with any tool compatible with DBASE "DBF" and "MDX" formats.

To store data you have entered into the OSMAC 4.0 software program, insert a formatted diskette and enter the following commands:

```
COPY*.DBF A: [Enter]
```

```
COPY*.MDX A: [Enter]
```

The example assumes that your data diskette was placed in drive A.

To restore data from a diskette, exit the OSMAC program and change to the OSMAC directory. Then copy the .DBF and .MDX files:

```
CD\OSMAC4D [Enter]
```

```
COPY A:*.DBF [Enter]
```

```
COPY A:*.MDX [Enter]
```

This example assumes that your OSMAC system is loaded on C:\OSMAC4D and that your data diskette is in drive A.

Appendix B: Quick Reference - The Editor

The Editor feature of OSMAC 4.0 provides keyboard controls for working within fields throughout the entire system program.



The Editor: Using the Keyboard

<u>Key</u>	<u>Function</u>
BACKSPACE	Backspace over and erase previously entered information.
DELETE	Delete characters following the cursor.
INSERT	Insert starting before the cursor position.
HOME	Go to the beginning of the line.
END	Go to the end of the line.
CTRL/HOME	Go to the beginning of the line and clear.
CTRL/END	Go to the end of the line and clear.
ENTER	Save entry and exit the Editor or move to the next field.
ESC	Exit the Editor without saving the entry.
F1	Display the help screen for the Editor.
F3	Copy the information for this field only from the line above.
F4	Copy from the line above the current field and all fields to the right. The cursor stays in the highlighted field.
F9	Copy from the line above all fields to the right of the current field. The cursor

Appendix C: Glossary

Adjusted Run Time (A-Time) The calculated station run time which takes into account all percentage adjustments.

Baud Rate The speed at which a modem transmits information.

Branch A term used to define a section of piping in the hydraulic system and its maximum flow. A branch is generally connected to a mainline, but could be connected to another branch or directly to a source. A branch could be a lateral pipe or loop which supplies water to a segment of the system.

Calendar Mode The mode in which the activity of the irrigation program is set for specific days of a two-week (14-day) calendar. After the fourteenth day, the calendar repeats itself. Active days are shown in brown, non-active days in blue-green.

Cancel The command that shuts down the selected irrigation activity (system-wide, or by program, satellite or station).

Cancel/Hold The command that shuts down the selected irrigation activity (system-wide, or by program, satellite or station) and holds subsequent activity for an assigned period of days.

COM Port A port that allows the PC to communicate with external devices (i.e., paging terminal or weather station) via serial communications.

Cycle Time The segmented run times of a station calculated by taking into consideration the number of repeats and start times on the adjusted run time.

Evapotranspiration (ET) The combined loss of water by evaporation from the soil and transpiration from the plant.

Flow Zone A term used to define an area in the hydraulic system that should be restricted to a maximum

flow. A

flow zone is generally connected to a branch, but could be connected to a mainline or directly to a source. A flow zone could be a green, fairway, park or a section thereof.

Hold The command that disables a selected irrigation activity (system-wide, or by program, satellite or station) for an assigned period of days.

Hydro-Link™ Defines a connection point—at the station level—between the control system and the hydraulics system.

Interval Mode Mode in which the active days of the irrigation programs are set to a fixed period of days (1 to 30). Programs can be defined to run every day, every other day, every third day, etc.

Mainline A term used to define a section of piping in the hydraulic system and its maximum flow. A mainline is generally connected to a source, but could be connected to another mainline. A mainline could be defined for main trunk piping lines in an irrigation system.

Manual Adjustment Factor A user-defined number between 0 and 999% which modifies station run times.

Normal Run Time (N-Time) The run time of a station that has not been adjusted by the site code or manual adjustment factors.

Operational ET The ET value at which the system will run. The Operational ET is used to calculate the system manual adjustment factor so that all stations will be adjusted. Operational ET may be entered manually or automatically calculated from weather station data.

Previous Activity Report An overview of all scheduled activity from the previously completed irrigation cycle.

Projected-Flow Analysis A graphic representation of the next scheduled watering cycle that takes into account

the Operational ET, manual adjustments, active programs and master sequences.

Reference ET The ET value at which normal run time (N-Time) is based, in units (inches or millimeters) per week.

Scheduled Activity Report An overview of all scheduled activity for the next irrigation cycle. This report is produced by the Projected-Flow Analysis and at the System Update Time.

Site A group of stations with similar characteristics that affect watering (i.e., dry, wet, shaded, etc.).

Source A term used to define a water source and its maximum flow (i.e., pump station, water meter, well, etc.).

System Pause A manual control that shuts down the irrigation system. Stations complete their run times when a “System Resume” command is issued.

System Resume A manual control that reactivates all stations after a “System Pause” command has been issued.

System Update Time The user-defined time when OSMAC develops the station activity schedule for the next irrigation cycle.

Weather Station Equipment installed in the field to measure and record weather information (temperature, humidity, wind speed and solar radiation) for use in the calculation of evapotranspiration (ET).