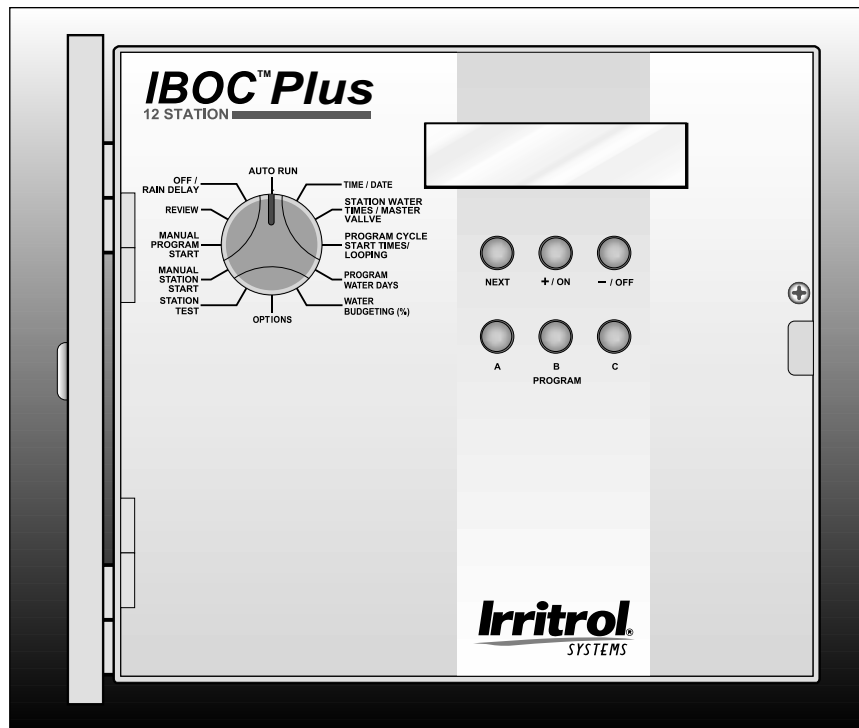




IBOC™ Plus

IRRIGATION CONTROLLER



User's Guide

CONTROLLER FEATURES

Thank you for purchasing the Irritrol Systems IBOC Plus battery operated controller. Listed below are some of the standard IBOC Plus features:

- Operates on one 6-volt alkaline lantern battery. Can be optionally powered by solar panel converter (SPC-2).
- Easy-to-read, self-prompting display information.
- English/Spanish display option.
- Operates standard 24 V d.c. latching solenoid valves (E2002).
- Three independent watering programs.
- Concurrent operation of up to three watering stations (one station per program) and a master valve.
- Station watering time adjustable from one minute to 23 hours and 59 minutes in 1-minute increments.
- Up to 8 start times per program for a total of 24 starts per day.
- Program cycle looping enables repeat program operation within a selectable watering window.
- Watering day scheduling by Weekday, one to 62-day Skip routine, or Odd/Even days.
- Master valve operation selectable by program.
- Manual operations by program or station.
- Station Test mode.
- Program Review mode.
- Rain Delay mode – postpones automatic operation from one to 30 days.
- Battery or solar power (if using SPC-2) capacity displayed in % remaining.
- Rain Sensor ready – sensor input selectable by program.
- Water Budgeting 10–200% in 10% increments.
- Non-volatile memory – retains program information without power.
- Electronic circuit breaker automatically detects short and open circuit conditions on station output – allows remaining stations to operate as programmed.

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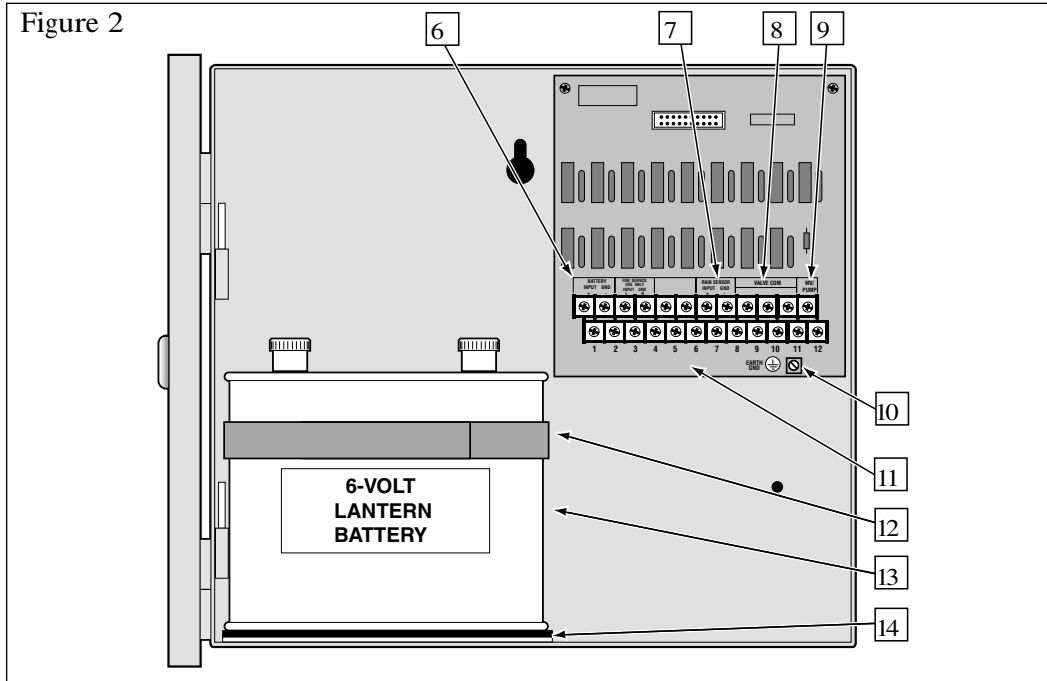
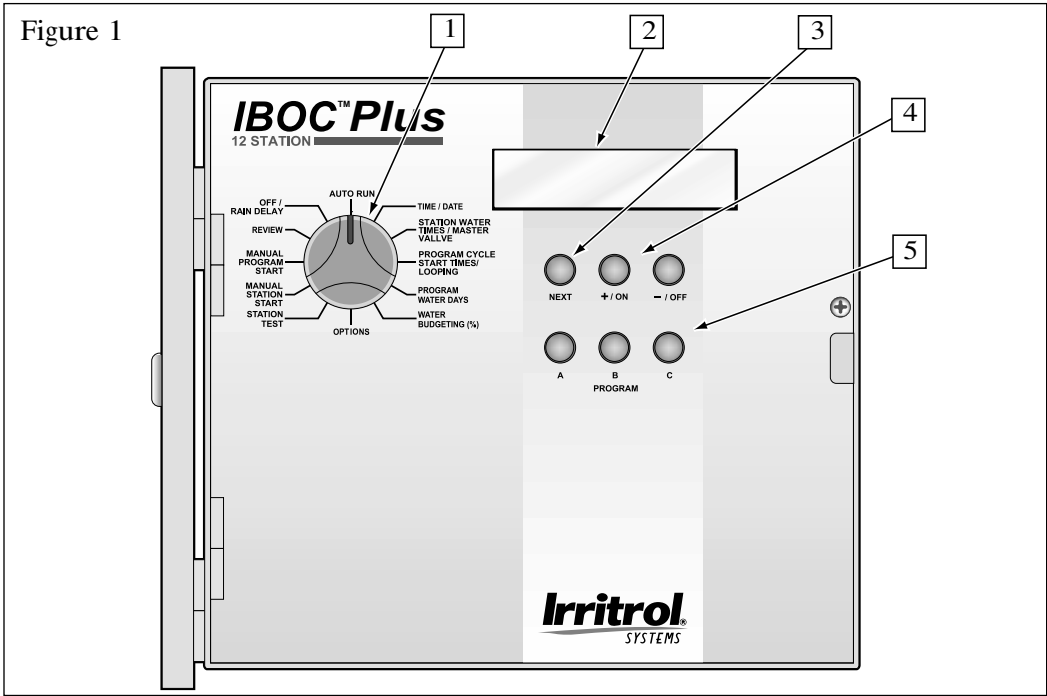
CONTROLLER COMPONENTS

▲ Figure 1

- 1 Function Dial: For selecting the programming and operating functions.
- 2 LCD Display: For viewing time, program and status information.
- 3 Next Button: For selection of information to be programmed or reviewed.
- 4 + /On and – /Off Buttons: For adjustment or entry of program data.
- 5 Program Buttons: For selection of Program A, B and C to be programmed or reviewed.

▲ Figure 2

- 6 Battery or Solar Panel Converter Connection Terminals
- 7 Rain Sensor Connection Terminals
- 8 Valve Common Connection Terminals
- 9 Master Valve Output Connection Terminal
- 10 Earth Ground Lug
- 11 Valve Power Connection Terminals
- 12 Battery Retainer Strap
- 13 6-Volt Alkaline Lantern Battery (not included)
- 14 Battery Insulator Plate



Controller Components

GENERAL INFORMATION

HOW THE BACKUP SYSTEM WORKS

The IBOC Plus utilizes non-volatile memory storage to prevent watering program information from becoming lost in the event of a power failure. Even the time and date will be retained for the first 10 minutes without power.

A fully charged 6-volt alkaline lantern battery will operate the controller for more than a year. The SPC-2 (Solar Power Converter) module will operate the IBOC Plus controller for up to six years, assuming it receives sunlight for an average of two hours per day. Once a power source is applied, the controller can be fully programmed for operation.

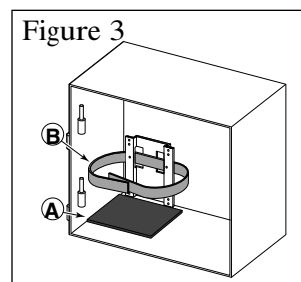
Note: If you wish to program the controller prior to installation, connect the battery at this time. Battery removal will be necessary prior to installing the controller cabinet. The program memory will be retained with the battery disconnected.

INSTALLING THE BATTERY

Note: A battery is not provided with the controller. A common 6-volt alkaline lantern battery (type: NEDA 918A) with screw-type terminals is required. Use an Energizer type #521, Duracell MN 918 or equivalent.

▲ Caution: Batteries contain hazardous material. Always handle and discard batteries properly in accordance with the battery manufacturer's recommendations.

1. Remove the phillips screw from the right edge of the control panel enabling the panel to swing outward.
2. Install the battery insulator plate (A) and retainer strap (B) as shown in Figure 3.
3. Install the battery and secure with the retainer strap.
4. Using the wires provided, connect the positive (+) battery terminal to the terminal board terminal labeled "Battery Input." Connect the negative (-) battery terminal post to "Battery Gnd."



Note: The battery condition is displayed as a percentage of capacity remaining while the controller is idle. The battery should be replaced when the capacity drops below 40%.

HOW THE ELECTRONIC CIRCUIT BREAKER WORKS

The controller is equipped with an electronic circuit breaker. If the controller detects a short or open circuit, the affected station (valve) will be turned off automatically. The display will then show information for the station or stations regarding the problem condition. The controller continues to automatically water the other stations. Each automatic start will attempt another cycle and retest the short-circuited valve.

Listed below are the most common conditions which will activate the electronic circuit breaker.

Condition: The word “Short” displays with one or more station numbers.

Diagnosis: One or more stations are shorted.

Solution: Check the wiring of the displayed stations for the cause of the shorted condition. Repair valve(s) and/or wiring as needed.

Diagnosis: Overload condition caused by more than one valve connected to the same station terminal.

Solution: Ensure only one valve is connected to each station terminal. Three valves may be operated concurrently, but they must be on separate stations operating on separate programs.

Condition: The word “Open” displays with one or more station numbers.

Diagnosis: An open circuit condition exists at one or more valve solenoids.

Solution: Check wiring of the reported station(s) for loose or broken connections.

Note: If a master valve is not installed, ensure that master valve operation is disabled. See Master Valve Operation on page 12 for details.

After correcting the problem, return the controller to normal operation as follows:

1. Set the dial to the following **AUTO RUN** positions.
2. Press the **-OFF** button to clear the display and return the controller to the normal operating mode.

HOW THE SENSOR FEATURE WORKS

The IBOC Plus is equipped to operate with an optional rain sensing device, commonly called a “Rain Switch,” to prevent automatic watering during rain.

The rain switch is a simple device, typically installed on a roof overhang or stationary structure exposed to rainfall and full sun, and shielded from irrigation spray. The rain switch wiring is connected to the sensor terminals provided on the controller terminal board.

Rain sensor operation is selectable by program, enabling sensor control to be allocated to specific watering programs as needed.

When rain occurs, the switch senses the moisture and causes the controller to terminate all output to the field. The electronic programming portion of the controller is isolated from the rain sensor switch, and continues to operate as programmed. When rain stops and the rain switch returns to its normal state, field output is restored, enabling watering to resume as scheduled.

CONTROL OPTIONS

This dial position provides access to the following features: Program Erase, Language Option Select and Sensor Enable.

PROGRAM ERASE

Use this feature to clear the memory of a selected program and reset it to default values (no active days, start times or station run times and 100% water budgeting).

To erase and reset a program:

1. Turn the function dial to the **OPTIONS** position.
2. Select the program to be reset by pressing **PROGRAM** button **A, B** or **C**.
3. Press the + /**ON** button. A prompt will be displayed confirming program erasure.
4. Repeat steps 2 and 3 for remaining programs as required.
5. Return the function dial to the **AUTO RUN** position if finished, or press the **NEXT** button to continue.

DISPLAY LANGUAGE OPTION

Use this feature to select either Spanish or English display prompts.

By default, English display prompts will be shown.

To change the display language:

1. Ensure the function dial is in the **OPTIONS** position.
2. Press the **NEXT** button to display “Language”.
3. Press the + **/ON** button to select the desired language.
4. Return the function dial to the **AUTO RUN** position if finished or press the next button to continue.

RAIN SENSOR OPERATION

Use this feature to enable/disable rain sensor operation mode for each program.



Important: A rain sensor device must be properly connected to the controller Rain Sensor terminals before sensor operation is enabled for an automatic watering program. If a rain sensor is not installed and the rain sensor operation is enabled, automatic watering for the program will **NOT** occur. By default, rain sensor operation is disabled for all programs.

To select the rain sensor mode:

1. Ensure the function dial is in the **OPTIONS** position.
2. Press the **NEXT** button as required to display “Rain Sensor.”
3. Select the program by pressing Program button **A**, **B** or **C**.
4. Press the + **/ON** button to enable or –**OFF** button to disable sensor operation for the selected program.
5. Repeat steps 3 and 4 as required to set rain sensor operation for additional programs.
6. Return the function dial to the **AUTO RUN** position when finished.

PROGRAMMING THE CONTROLLER

This section covers the following topics:

- Getting Started
- Setting the Current Time and Date
- Setting the Station Run Time
- Master Valve Operation
- Setting Program Start Times
- Program Looping Feature
- Selecting the Days to Water
- Reviewing Program Information

GETTING STARTED

WHAT IS A WATERING PROGRAM?

In basic terms, a watering program is a small set of instructions which tells the controller when to start a watering cycle, which stations will operate during the cycle, which days the cycle will be active and how long each station will operate during the cycle. The IBOC Plus has three independent watering programs for your use. Separate programs are usually used to group stations with similar watering requirements. For example, you might use one program to water lawns in full sun every day. Another program could be used to water lawns in partial shade only on Monday, Wednesday and Friday. Trees and shrubs using drip irrigation could run on a separate program once every two weeks. The garden area requirements might include watering every other day. As you can see, the availability of three programs allows you to have unique watering programs for your varied landscape needs.

WHAT IS A PROGRAM WATERING CYCLE?

When a watering start time is selected, that time becomes the beginning of an automatic watering cycle. A watering cycle operates each station assigned to the program, one by one, in numerical order.

In the following example, (also shown on the sample watering plan on page 10) we have set up Program A to start at 2:00 a.m. and again at 3:00 a.m. on a 1-day interval (every day). Stations 1, 2, 4 and 5 are front and back yard lawn areas which get full sun throughout the day. These stations will run for 10 minutes each for a total of 20 minutes run time per day. Stations 3, 6 and 7 are lawn areas which are shaded during the afternoon hours. These areas require less water, so we have assigned them to Program B and set them to run for 20 minutes on a 2-day interval (every other day).

At 2:00 a.m., Program A watering cycle starts. Station 1 turns on, runs for 10 minutes, and shuts off. Station 2 turns on, runs for 10 minutes, and turns off. Stations 4 and 5 operate sequentially in the same manner, each running for their set run time. When Station 5 shuts off, the watering cycle is completed for the first start time. At 3:00 a.m., the watering cycle starts again and repeats the same station-by-station watering sequence.

Note that we have 40 minutes total watering time per cycle in Program A. If we had set the next start time at 2:30 a.m., the start time would have been delayed until 2:40 a.m., enabling the first cycle to finish as programmed. This function is called “start time stacking”, and can occur within each program.

Watering programs, however, operate independently, which means that two or more programs can run simultaneously. In our example, Program B will also start at 2:00 a.m. Therefore, Stations 1 and 3 will turn on at the same time, and Station 2 will turn on while Station 3 is running. This feature enables more watering to be completed within the prime “watering window”, which is generally between Midnight and 6:00 a.m.

Note: When scheduling watering programs to run simultaneously, it is important to ensure the water supply has sufficient pressure and volume to maintain optimum sprinkler performance.

WATERING SCHEDULE FORM (SAMPLE)

For your convenience, a Watering Schedule Form / Programming and Operating Quick Reference card is provided. Use the form to plan and record your automatic watering activities. Use the convenient quick reference instructions as a memory jogger after you familiarized yourself with the programming and operation of the controller by reading the User's Guide. Keep the card with the controller by attaching it to the inside front cover.

Watering Schedule Form		Program A	Program B	Program C
Watering Day Schedule	Week Days			
	Odd/Even Days			
	Skip Days	1 day	2 day	
Program Cycle Start Times		2 am 3 am	2 am	
Program Looping Start/Stop Time		/	/	/
Station	Station Description	Station Run Time		
1	Front Lawn (sun)	10 min		
2	Front Lawn (sun)	10 min		
3	Side Lawn (shade)		20 min	
4	Back Lawn (sun)	10 min		
5	Back Lawn (sun)	10 min		
6	Back Lawn (shade)		20 min	
7	Back Lawn (shade)		20 min	
8				
9				
10				
11				
12				

SETTING THE CURRENT TIME AND DATE

Before you can program the controller for automatic watering, you must set the controller clock to the current time and date. This controller features a 365-day calendar with automatic leap year compensation and is year 2000 (Y2K) compliant. Once the date is set, the controller keeps track of the date and enables trouble-free, odd-even day of the month watering required in some locations. The time and date apply to all programs. To set the time and date, follow the steps below.

1. Turn the function dial to the **TIME / DATE** position. The hour digits will begin flashing.
2. Press the **+ON** and/or **-OFF** button(s) to display to the current hour and a.m./p.m. designation.

Note: Continuous pressure on the **+ON** or **-OFF** button causes the display to change rapidly.

3. Press the **NEXT** button to select the minutes digits. Press the **+ON** and/or **-OFF** button(s) to display to the current minute.
4. Press the **NEXT** button to select the month. Press the **+ON** and/or **-OFF** button(s) to display the current month.
5. Press the **NEXT** button to select the day digit(s). Press the **+ON** and/or **-OFF** button(s) to display the current calendar day.
6. Press the **NEXT** button to select the year digits. Press the **+ON** and/or **-OFF** button(s) to display the current year.
7. Return the function dial to the **AUTO RUN** position when the current time and date have been set.

SETTING THE STATION RUN TIME

A station is assigned to a program when it is given a run time (from one minute to 23 hours and 59 minutes) in that program. Each station is limited to one run time assignment per program. However, stations can be assigned to one, two or three programs and have a different run time assignment in each.

To set the run time for each station:

1. Turn the function dial to **STATION WATER TIMES/MASTER VALVE**.
2. Select Program **A**, **B** or **C** with the **PROGRAM** button.
3. Press the **NEXT** button to select the station number you wish to set (if other than the one displayed).
4. Use the **+ON** and/or **-OFF** button(s) to display the desired station run time minutes (0–59).
5. Press the **NEXT** button select hours.
6. Use the **+ON** and/or **-OFF** button(s) to display the desired station run time hours (0–23).

Note: The factory setting for each station is “Off.” If the station has a run time and you wish to remove it from this program, use the **+ON** and/or **-OFF** button(s) to select 0 minutes and 0 hours .

7. Repeat steps 3 through 6 to set a run time for each station you wish to assign to the selected program.
8. Repeat steps 2 through 5 for each program as necessary.
9. When finished, return the function dial to **AUTO RUN**.

MASTER VALVE OPERATION

The IBOC Plus enables master valve operation to be selected independently for each watering program. By default, the master valve circuit is activated for each watering program.

Note: If a master valve is not installed, its operation must be disabled to prevent an “Open MV” fault from occurring.

To select master valve operation:

1. Turn the function dial to **STATION WATER TIMES/MASTER VALVE**.
2. Select Program **A**, **B** or **C** with the **PROGRAM** button.
3. Press the **NEXT** button repeatedly until “Master Valve” is displayed.
4. Press the **+ON** or **-OFF** button to display the operation of the master valve for the selected program.
5. Repeat steps 2 through 4 for each program as necessary.
6. When finished, return the function dial to **AUTO RUN**.

SETTING PROGRAM START TIME(S)

This procedure is used to set the watering cycle start time(s) for each program. A maximum of eight start times per program can be assigned. Each start time will initiate a sequential watering cycle of all stations with an assigned run time in the program.

Note: It is important to remember that a start time initiates the entire watering program cycle, not an individual station.

PROGRAM LOOPING

The Program Looping feature enables a watering program to start and run consecutive repeat cycles until a predetermined stop time is reached. Each program can have one loop operating cycle assigned in addition to eight regular start time assignments. If a program loop is not assigned, the display shows “Loop Strt Off.”

To set program cycle start times and/or program loop time:

1. Turn the function dial to the **PROGRAM CYCLE START TIMES/ LOOPING** position.
2. Select Program **A**, **B** or **C** with the **PROGRAM** button.
3. Use the **+ON** or **-OFF** button to adjust the start time hour.
4. Press the **NEXT** button to select the minutes digits.
5. Use the **+ON** and/or **-OFF** button to adjust the start time minutes.
Note: To remove a start time, adjust the time to display “Off” which is located between 11:59 p.m. and 12:00 a.m.
6. Press the **NEXT** button and repeat steps 3 through 5 to assign up to eight start times for the selected program.
7. Press the **NEXT** button to display “Loop Strt.”
8. Use the **+ON** and/or **-OFF** button(s) to adjust the loop time hour.
9. Press the **NEXT** button.
10. Use the **+ON** and/or **-OFF** button(s) to adjust the loop time minutes.
11. Press the **NEXT** button to display “Loop Stop” and repeat steps 8 through 10 to set the loop stop time.
12. Repeat steps 2 through 11 for each program as necessary.
13. When finished, return the function dial to **AUTO RUN**.

SELECTING THE DAYS TO WATER

Several watering day scheduling options are available. Each watering program can utilize any ONE of the following schedules:

- Days of the week

Use this type of schedule to water on specific days of the week. The days are displayed as three-letter abbreviations. For example, Sunday is Sun, Monday is Mon, etc. Only the days you select to water will remain on the display.

- Odd or Even Days

To select every odd or even number calendar day, use this option. Because the 31st and the 1st are both odd number days, the 31st is automatically removed from the schedule. This watering day option also enables selected days of the week to be removed from the schedule.

- Skip Days

Selecting watering days by Skip Days enables a specific number of days between watering to be selected. For example, selecting Skip 1-day schedules watering for every day. Skip 2-days schedules watering for every other day. Skip day scheduling is selectable from 1 to 62 days.

Another setting within the Skip Days schedule is the Day # or current day of the schedule. The Day # can be set for any day within the Skip Days schedule. When the Day # equals the Skip Days number, a watering day occurs. The Day number automatically increases by one every day. For example, to water today then every third day, a Skip 3 would be set with DAY # 3. Or, to water every 5 days starting tomorrow, a Skip 5 would be selected with DAY # 4.

To set a watering day schedule for each program:

1. Turn the function dial to the **PROGRAM WATER DAYS** position. The display will show the current watering day schedule for the selected program.
2. Select Program **A**, **B** or **C** with the **PROGRAM** button.
3. Set the watering day schedule for the program using one of three procedures provided on page 15: Weekdays, Odd/Even Days or Skip Days.
4. Repeat steps 2 and 3 as necessary for each program.
5. When finished, return the function dial to **AUTO RUN**.

Weekdays

- A. Press the **NEXT** button until the “Weekdays” is displayed.
- B. Press the **+ON** button, “Sun” will begin flashing.
- C. To select the day, press the **+ON** button. To remove the day from the schedule, press the **-OFF** button. The next day abbreviation will begin flashing.
- D. Repeat step C for the remaining days of the week.

Odd or Even Days

- A. Press the **NEXT** button until “Odd/Even” is displayed.
- B. Press the **+ON** button to select an Even day schedule or **-OFF** to select an Odd day schedule.
Optional: To remove selected days of the week from the Odd/Even watering schedule:
 1. Press the **NEXT** button until “OK to water on:” is displayed.
 2. Press the **+ON** button. “Sun” will begin flashing.
 3. To exclude the day from the schedule, press the **-OFF** button. To keep the day in the schedule, **+ON** button. The next day abbreviation will begin flashing.
 4. Repeat Step 3 for all weekdays.

Skip Days

- A. Press the **NEXT** button until the “Skip Days” option is displayed.
- B. Press the **+ON** button to select this option. The current skip day number (1–62) will begin flashing.
- C. Use the **+ON** or **-OFF** button to select the number of days to skip between watering (1–62 days).
- E. Press the **NEXT** button.
- F. Use the **+ON** or **-OFF** button to select the current day in the skip cycle.

PROGRAM REVIEW

This controller feature enables the various operational settings and status conditions of each program to be easily reviewed. Within the review sequence, the following program settings are displayed: Master Valve On/Off, Rain Sensor On/Off, Watering Days, Start Time(s) and Water Budget percent factor.

Note: Program changes cannot be made while in the review mode.

To review a program, use the following procedure:

1. Turn the function dial to the **PROGRAM REVIEW** position.
2. Select the program to be reviewed by pressing the **PROGRAM** button **A, B** or **C**.
3. Press the **NEXT** button to step through the various review displays. Press and hold the button to automatically advance through the displays, briefly pausing at each program element.
4. Repeat steps 2 and 3 to review remaining programs.
5. When finished, return the function dial to **AUTO RUN**.

INSTALLATION PROCEDURES

This section includes instructions for mounting the controller cabinet and making the necessary wiring connections. To ensure safe operation, it is important to follow the instructions carefully.

SELECTING AN INSTALLATION SITE

Selecting the proper installation site for the controller is essential to safe and reliable operation. The IBOC Plus features a weather-resistant cabinet enabling outdoor installation.

The controller should be installed on a vertical wall or other sturdy structure with the display at approximately eye level. An optional pedestal mount, model # P2B is available for stand-alone installation. It is important to select a location that shades the controller during the hottest hours of the day and provides as much protection from rain, wind and snow as possible. Never install the controller where it will be exposed to direct spray from the sprinklers.

Note: When mounting the IBOC Plus controller with a SPC-2 Solar Power Converter, it is important to select a location that provides maximum protection from rain, snow and direct irrigation spray while providing the SPC-2 exposure to sunlight for a minimum of two hours per day.

MOUNTING THE CONTROLLER

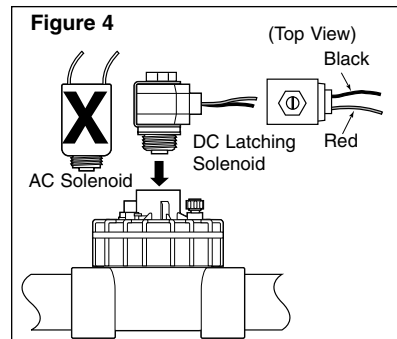
1. Position the mounting template (provided) on the wall at approximately eye level. Using a small punch or nail, mark the locations of the top and bottom centerline mounting holes and the additional lower holes if extra cabinet support is desired.
2. Drill pilot holes at least 1-1/4" (32mm) deep using a 3/32" (2.5mm) drill for wall stud application, or 1/4" (6.5mm) drill for masonry.
3. For the masonry wall installation only, insert the plastic screw anchors (provided) into the pilot holes.
4. Place a small plastic washer and a rubber washer (provided) on each screw. Install the #10 screws into the top and bottom locations leaving the screw head about 1/2" (13mm) from the wall.
Note: If installing additional lower mounting screws, remove plastic hole plugs at this time.
5. Unlock and open the cabinet cover. Remove the cover by sliding it toward the top of the cabinet.
6. Remove the phillips screw from the right edge of the control panel enabling the panel to swing outward.
7. To remove the control panel from the cabinet, first disconnect the ribbon cable from the terminal board. With the panel in the fully opened position, slide it toward the top of the cabinet.
8. Hang the cabinet on the screws using the keyhole slots. Ensure the screws engage the slotted portion of the keyhole with the plastic washer positioned between the screw head and the inner cabinet wall. Tighten the screws securely. Install additional screws in the lower left and/or right mounting holes as required.
9. Reinstall the control panel and cover.

CONVERTING THE SOLENOIDS

The IBOC Plus controller activates valves by means of an electric pulse, which latches and releases the solenoid position rather than providing continuous power to the solenoids. This requires a DC latching solenoid for each irrigation control valve.

The DC latching solenoid is designed as a direct replacement for the standard 24 V a.c. solenoid (which will not work with the IBOC Plus controller). No additional adapting is required for solenoid installation.

Note: When connecting the DC latching solenoid to the controller, unlike an AC solenoid which has no specific wiring polarity, the DC latching solenoid has a power and a common wire. To enable valve operation, the black wire must be connected to the valve common and the red wire to a valve output terminal. Ensure the solenoid is assembled with the red and black wires oriented as shown in Figure 4.



CONNECTING THE FIELD WIRING

Note: Refer to the recommended wire size information on page 25.

1. To provide a field common wire, splice one wire to the black wire of each valve solenoid and optional master valve.
2. Attach a separate control wire to each red valve solenoid wire. Label the control wires with the intended station number for identification at the controller.
 - ▲ Caution: All wiring splices must be waterproofed to prevent short circuits and corrosion.
3. Route all field wires into the controller cabinet through the 2" (52mm) access opening. Remove approximately 1/2" (13mm) insulation from the ends of each wire.
4. Attach the field common wire to one of the three valve common terminals labeled "Valve Com." See Figure 5.
5. Connect each valve control wire to a separate station number terminal (1-12) and tighten securely. See Figure 5.
6. Connect the Master Valve wire to the terminal labeled MV/Pump.

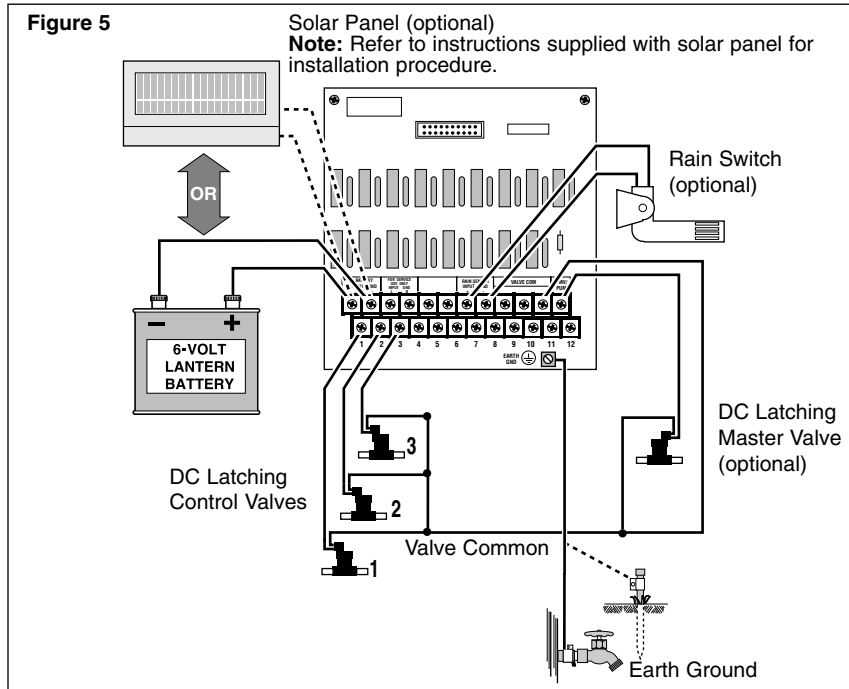
CONNECTING A RAIN SWITCH SENSOR

The IBOC Plus is designed for use with a normally closed rain sensor or "Rain Switch."

Connect a rain switch sensor as follows:

1. Route the two wires from the sensor into the cabinet through the field wire access opening.
2. Connect the wires to the terminals labeled "Rain Sensor." See Figure 5.

Note: Although the battery and the SPC-2 share the same input terminals, only one power source can be connected to the IBOC Plus at any given time. If using the SPC-2, connect the Orange 6-Volt (+) wire and Black negative (-) wire to the IBOC's battery input terminals.



- By default, sensor operation is disabled for all automatic watering programs. To enable operation of the sensor, refer to the “Rain Sensor Operation” on page 7.

Note: Do not connect the rain switch directly to the valve common wire. Refer to the installation instructions provided with the rain sensor for additional information.

CONNECTING AN EARTH GROUND

A power surge is a sudden rise in voltage on the power main line. It is then often followed by a drop in voltage as the power line equipment tries to protect area users. A lightning strike on the power grid is the most common cause of power surges and can be damaging to the controller. Surge protection is built into the IBOC Plus terminal board to help protect the controller from surge damage by shunting the voltage to earth ground.

Therefore, an important step in the installation process is to properly connect the controller to an earth ground source, especially if the controller is located in a lightning-prone area.

▲ Caution: The built-in surge protection components cannot effectively protect the controller circuitry from power surge unless properly connected to an earth ground source.

To connect an earth ground:

1. Route a #12 (2mm²) solid copper wire in the shortest and most direct path from the “Earth Gnd” lug, located on the terminal board, to an earth ground source such as metal water pipe or copper-clad ground rod.
2. Clamp the end of the ground wire securely to the pipe or ground rod. Make sure the wire contact area is free of dirt and corrosion.

OPERATING THE CONTROLLER

This section includes instructions for the following controller operations:

- Testing Station Operation
- Water Budget
- Off and Rain Delay Modes
- Manual Operations

TESTING STATION OPERATION

This feature enables you to quickly check system operation by running each station for a selectable test duration from 1 to 10 minutes. Once started, each station will run in numerical order for the selected test run time.

To perform the station test operation, use the following procedure:

1. Turn the function dial to the **STATION TEST** position. The display will prompt you to set a watering run time.
2. Use the **+ON** and/or **-OFF** button(s) to set the station water time from 1–10 minutes.
3. Press the **NEXT** button, “Station 1 –Off–” will be displayed.

4. Press the **+ON** button to begin operation. Allow station 1 to continue operating for the set run time or change the run time by using the **+ON** or **-OFF** button(s). (Decreasing the run time to less than one minute will turn off the station.) Each station will run automatically in numerical sequence or may be manually advanced to another station by pressing the **NEXT** button until that station is displayed. Each time the station is advanced (either automatically or manually) the previous operating station will turn off, enabling only one station to run at a time.

Note: To stop the test operation at any time, simply turn the function dial to the **OFF/RAIN DELAY** position and press the **-OFF** button.

5. When finished, return the function dial to the **AUTO RUN** position.

WATER BUDGETING

The Water Budgeting feature enables you to easily increase or decrease the station run time (by percentage) of all stations assigned to a selected program. This is handy for making temporary overall station run time adjustments without changing the original run time settings. Water Budgeting % values range from 10% to 200% in 10% increments, with 100% being the normal setting.

For example, as the fall season approaches and the temperature decreases, you may want to reduce the water time for the stations in program A by 30%. Later you can return station times to their original values by setting the Water Budgeting % value back to 100%.

Note: It is possible to inadvertently cause start time stacking when increasing station run time. Careful use of Water Budgeting % will help prevent this from occurring.

To change the Water Budgeting % values:

1. Turn the function dial to the **WATER BUDGETING (%)** position.
2. Select Program **A**, **B** or **C** with the **Program** button.
3. Use the **+ON** and/or **-OFF** button(s) to increase or decrease the percentage value (10–200%).
4. Repeat steps 2 and 3 for other programs as required.
5. Turn the function dial to the **AUTO RUN** position.

OFF AND RAIN DELAY MODES

Use these function modes to immediately stop all current watering activity, suspend watering indefinitely or delay automatic watering programs for a selected number of days (Rain Delay mode).

Turning Off Current Watering Activity

When the function dial is turned to the the **OFF / RAIN DELAY** position while any station is active, the “Press –/Off to stop all watering” prompt to be shown. Pressing the –/OFF button immediately shuts off all active stations and suspends all watering activity until the function dial is turned to another position.

Using the Rain Delay Mode

When the function dial is turned to the **OFF / RAIN DELAY** position while the controller is inactive, the display prompt “Rain Off Press +/- for OFF days” will be shown. A number from 1–30 days is entered and the controller will delay all automatic watering programs until the delay period lapses. Once the controller is placed in the Rain Delay mode, the function dial can be turned to other positions for programming, reviewing and manual operations. The display will show the number of days remaining in the delay period. The number will automatically decrease by one digit each day. Automatic operation will resume when the display shows no delay days remaining.

To select the Rain Delay mode:

1. Turn the function dial to the **OFF / RAIN DELAY** position.
2. Use the +/ON or –/OFF button(s) to select the number of days (1–30) to delay operation.
3. Turn the function dial to the **AUTO RUN** position.

To cancel the Rain Delay mode:

1. Turn the function dial to the **OFF / RAIN DELAY** position.
2. Press the –/OFF button until the display shows no delay days remaining.
3. Turn the function dial to the **AUTO RUN** position.

MANUAL OPERATIONS

Manual operation allows you to run individual stations or start automatic watering programs as needed. Separate dial positions are provided for both types of manual operation: Manual Station Start and Manual Program Start.

MANUAL STATION START

This option enables individual stations to be operated for a selectable duration from 1–59 minutes. Each station selected to operate is given a temporary run time. As one station finishes operation, the next station in sequence begins operation.

1. Turn the function dial to the **MANUAL STATION START** position.
2. Select the Master Valve On or Off for this operation by pressing the **+ / ON** or **- / OFF** button.
3. Press the **NEXT** button to select the first station you wish to run.
4. Press the **+ / ON** or **- / OFF** button to select a run time (1–59 minutes).
5. Repeat steps 3 and 4 for each station you wish to operate.
Note: Once a station is running, selecting 0 minutes will terminate the current station activity and advance to the next station with a manual run time assigned.
6. When the manual operation is complete, return the dial to the **AUTO RUN** position.

MANUAL PROGRAM START

Use this feature to manually operate a selected watering program. You can run the entire program or start anywhere within the station sequence of the program.

Note: Only the stations with an assigned run time in the program will operate during the program watering cycle.

1. Turn the function dial to the **MANUAL STATION START** position.
2. Select program **A**, **B** or **C** with the **PROGRAM** button.
3. Press the **NEXT** button to select the first station of the watering sequence (if other than the station number displayed).
4. Press the **+ / ON** button to start the watering cycle. Watering will start with the selected station and will be followed by all subsequent stations with an assigned run time in the program. The display will show the run time remaining for the operating station.
5. When the manual operation is complete, return the dial to the **AUTO RUN** position.

Appendix A

TROUBLESHOOTING

❖ Problem	Possible Solution
❖ Controller will not run automatically	<ol style="list-style-type: none"> 1. Check for active Rain Delay mode. 2. Rain sensor operation enabled without sensor installed. Refer to Rain Sensor Operation on page 7.
❖ No display	<ol style="list-style-type: none"> 1. Dead battery or disconnected power source. Correct as necessary. 2. Ensure control panel module is connected to the terminal board.
❖ Valve remains on	<ol style="list-style-type: none"> 1. Check station run time and water budgeting setting. 2. Turn function dial to Off/Rain Delay position and press –/OFF button. 3. Solenoid may be stuck or malfunctioning control unit. Replace as necessary. 4. Check for leakage at valve manual bleed and/or solenoid. Repair as necessary.
❖ Valve will not turn on	<ol style="list-style-type: none"> 1. Check for proper valve wiring. Black to common, Red to power. Refer to page 16. 2. Possible valve or solenoid malfunction. Repair as necessary. Check for “Open” or “Short” condition on display. 3. Solenoid may be assembled incorrectly. Check solenoid wires for correct orientation. Refer to Figure 3 on page 18. 4. Check for low battery condition. If less than 40%, replace battery.
❖ “Short” or “Open” is displayed	<ol style="list-style-type: none"> 1. See “How the Electronic Circuit Breaker Works” on page 5 for troubleshooting these conditions.
❖ Waters too often	<ol style="list-style-type: none"> 1. Too many program start times set. Check each program to determine the number of start times assigned and remove as necessary. Refer to “Setting Program Start Time(s)” on page 13. 2. Possible program loop set. Refer to page 13.

Note: For Irritrol Systems product assistance, phone 1-800-634-8873.

Appendix B

SPECIFICATIONS

Cabinet:

Metal, weather-resistant, indoor/outdoor, wall mount with key-actuated locking cover

Dimensions:

10.75" W x 9.5" H x 5.75" D
(27.3cm W x 24.1cm H x 14.6cm D)

Wiring/Conduit Provision:

Field Wiring - 2" (51mm) dia. conduit access

Power Input:

6V alkaline lantern battery or 6 V d.c. solar panel (SPC-2)

Sensor Input: Normally closed rain switch

Temperature Limit Specifications:

Operating - +32°F to +140°F (0°C to 60°C)

Storage - -22°F to +149°F (-30°C to +65°C)

Fuse:

250V, 2A (not user replaceable)

Recommended Valve Wire Size (single-strand copper)

Wire Size (AWG)	20	18	16	14	12
Length (Feet)	400	600	1000	1600	2400

Wire Size (mm ²)	0,5	0,8	1,5	2,5	3,5
Length (Meters)	120	180	300	244	720

Electromagnetic Compatibility

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

- Reorient the receiving antenna.
- Relocate the irrigation controller with respect to the receiver.
- Move the irrigation controller away from the receiver.
- Plug the irrigation controller into a different outlet so that the irrigation controller and receiver are on different branch circuits.

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

"How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

International: This is a CISPR 22 Class B product

Technical Assistance:

U.S A.

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