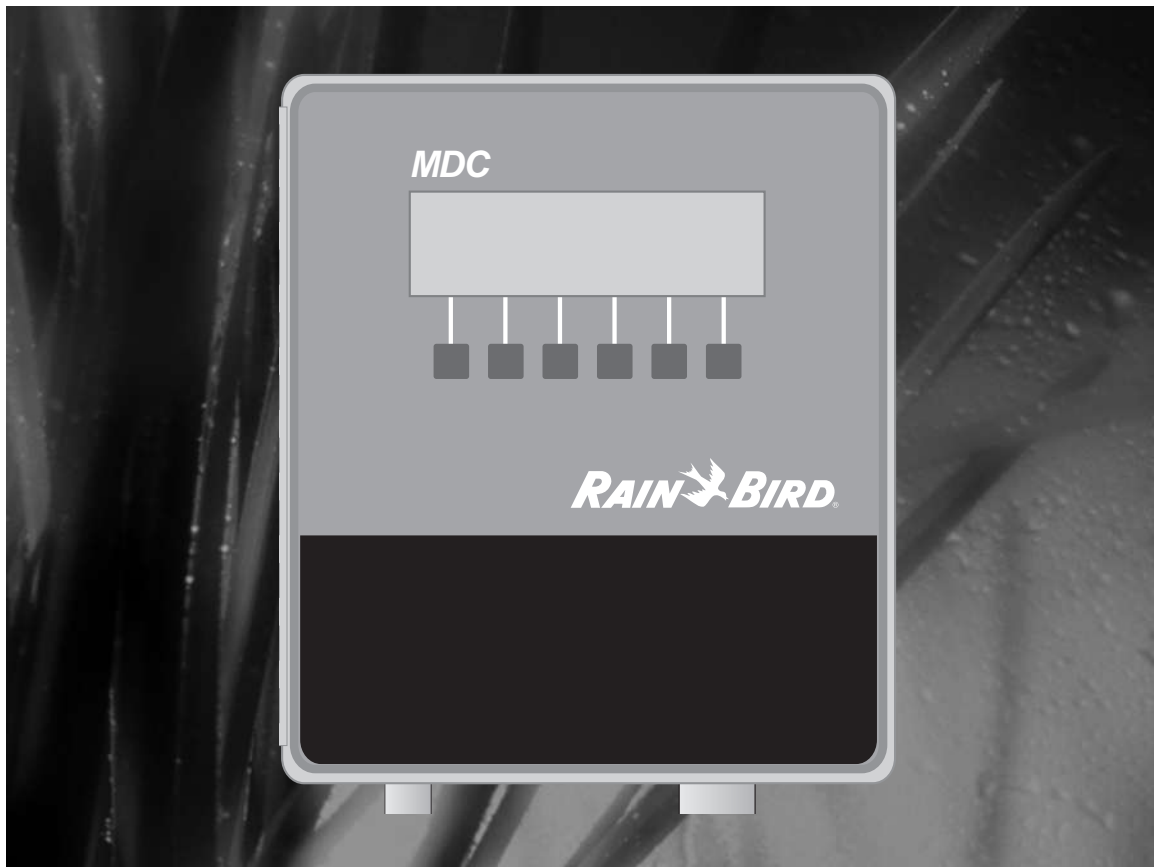




Controller Unit MDC2



Safety Information

Warning!

Important safety information, including caution and warning messages, appear throughout this manual. To ensure correct operation and to avoid additional expense, read this manual thoroughly before you begin installing or operating the controller.

Operating this equipment in a residential area can cause interference to radio and television reception. The radio frequency energy emitted by this device complies with limits for a Class B computing device, described in FCC Rules Part 15, Subpart J.

Safety Information and Icons Used in This Manual:

To quickly help you find, identify and understand important information, this manual uses the following icons and notations:



This icon indicates critical information. This specific icon alerts you to an electrical **CAUTION** telling the installer or operator that he or she may be exposed to dangerous high voltages.



This icon indicates non-electrical but critical information. This specific icon alerts you to a general **CAUTION** that if you do not follow, may result in severe personal injury or death.

Warning! This designates a **Warning** indicating actions that may damage the equipment.

Note: This designates a **Note**, which helps clarify a specific instruction.

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Introduction

Welcome to Rain Bird®

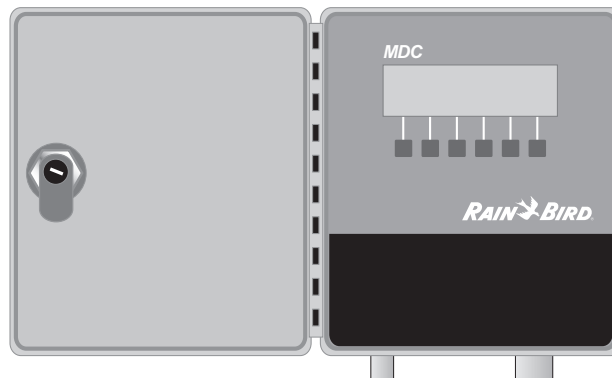
Thank you for purchasing your new, state-of-the-art Rain Bird® Controller. For more than six decades, Rain Bird® has led the irrigation industry in meeting all of your water management needs by providing the highest quality products and services available. Your new Rain Bird® Controller is designed to give you a lifetime of on-site watering control.

The MDC Controllers

The MDC line of controllers are systems that completely manage your landscape and turf needs by letting you control all your irrigation functions from one central location. MDC Controllers use **Schedules** to control the days, times and length of time each valve operates.

Once you program and store irrigation **Schedules** and other instructions, the MDC communicates this information, through a two-wire (MAXI cable) communication path, to numerous decoders located throughout the irrigation system. The decoders act on command from the controller, activating solenoids on various valves, master valves and pumps.

The MDC2 Controller uses a program module, which supports up to 50 (decoder) outputs. The controller also has slots to hold three expansion modules. Each expansion module supports an additional 50 outputs. This means you can configure your MDC2 Controller to support 50, 100, 150 and 200 outputs.



Introduction, continued

Special Features

The MDC2 Controller mounts to a wall and has the following special features:

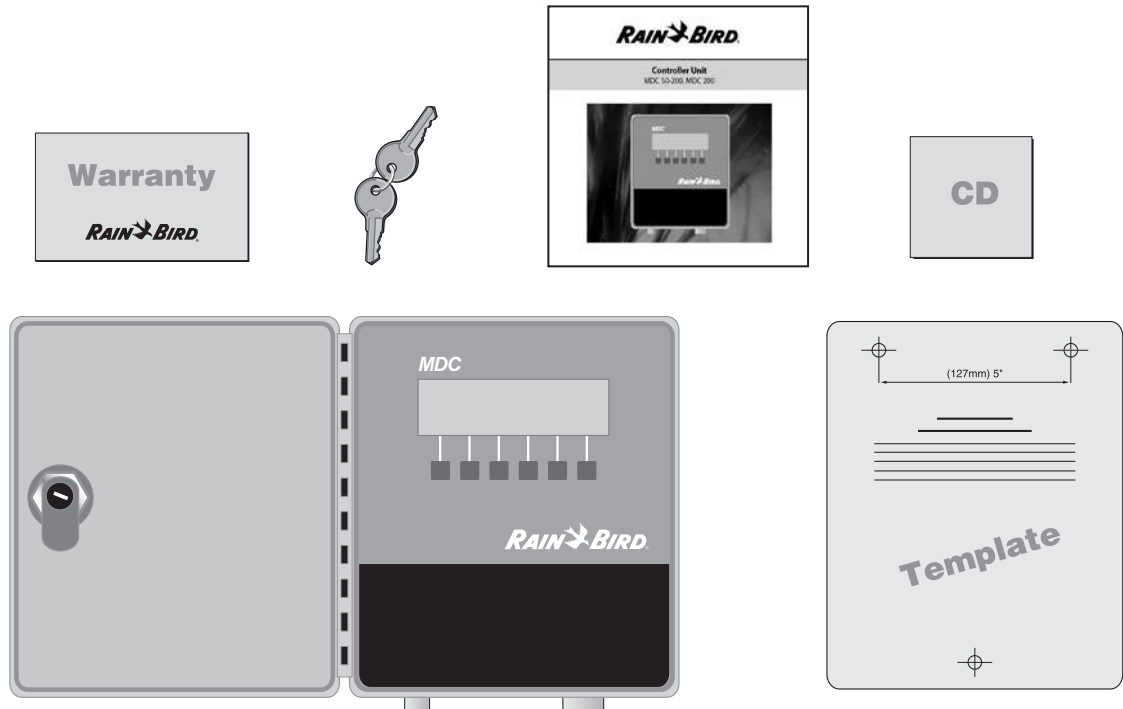
- ✓ Anti-rust, corrosion-resistant design
- ✓ Weather-resistant cabinet allowing you to mount the controller inside or outside
- ✓ Stores up to 10 separate irrigation **Programs** and 1 auxiliary (non-irrigation) **Program** (which does not start pumps)
- ✓ Each **Program** supports up to 100 Steps (individual commands that complete a **Program**)
- ✓ Each **Program** can start up to 6 times a day
- ✓ Each **Program** runs on a 14-day **Schedule**
- ✓ Input terminal connections for rain or alarm sensor
- ✓ Output terminals for 3 communications cables
- ✓ Communications cables to support flow and auxiliary sensors
- ✓ Slots provided for 3 expansion modules supporting up to 200 single-output decoders (MDC2)
- ✓ Easy-to-use menu tree system
- ✓ Diagnostics to test decoders, schedules and short findings
- ✓ The option to choose between 5 languages (U.S. English, British English, Spanish, French and German)
- ✓ Backlighting that makes the liquid crystal display (LCD) easy to read
- ✓ A serial communication port and modem allowing you to program the controller from a PC
- ✓ Software to allow for remote programming and monitoring from a PC

Introduction, continued

Packing List

Please check to make sure that you have all the items on the list. If any item is missing or damaged, contact your Rain Bird® distributor.

- 1 Pre-assembled Controller in a Plastic Wall Cabinet
- 2 Keys
- 1 Installation and Operating Instructions Manual
- 1 Mounting Template
- 1 Three-year Warranty Card
- 1 MDC Software CD



Installation

This chapter of the manual explains how to mount your new MDC2 Controller on the wall, how to connect the wiring, install program and expansion modules and replace the battery.

Mounting the Controller

Before You Begin

Warning! Before installing your controller, make sure that the area around you is free from dirt and dust and that your hands and arms are clean. This will avoid contaminating the controller's internal parts.

Warning! Do not let water or other liquids come in contact with any part inside the cabinet.

Choosing a location

When choosing the best location to install your wall-mounted controller, please consider the following:



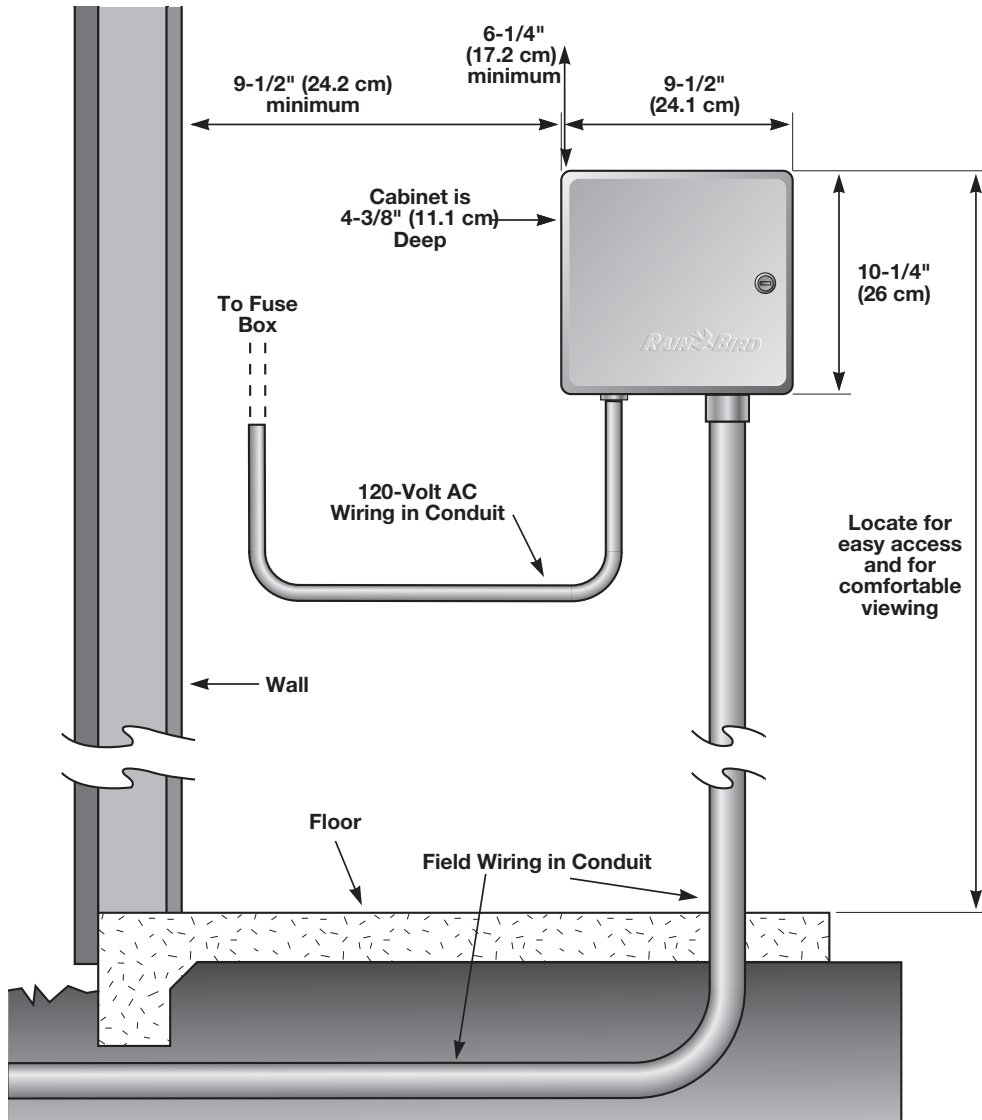
You must install this controller in compliance with local electrical codes.

- ✓ The MDC2 Controller cabinet is water-resistant, so you can mount it inside or outside.
- ✓ Select an area, protected from vandalism, where the user can easily reach the controller. Rain Bird® recommends placing the controller at eye level, in a utility room.

Warning! To minimize electromagnetic interference, select a location that is at least 15' (4.6 m) away from high-draw motors, such as air conditioners, refrigerators or pool pumps.

- ✓ Select a location that has access to 120-Volt AC electrical power (or the proper electrical supply voltage outside the United States).
- ✓ Mount the controller on a flat, stable, vertical surface. Allow sufficient conduit clearance for the electrical connections at the bottom of the cabinet.
- ✓ Allow 9 1/2" (24.2 cm) minimum clearance for the hinged cabinet door to swing fully to the left.
- ✓ Allow at least 6 1/4" (17.2 cm) minimum clearance above the cabinet door so you can easily remove the hinge pin to service the controller.

Installation, continued



Typical Wall-mount Installation



Installation, continued

What you will need

Before you begin installation, you may need the following tools and materials:

- ✓ Slotted Head Screwdriver
- ✓ Phillips Head Screwdriver
- ✓ Thin Blade Screwdriver
- ✓ Lineman's Pliers
- ✓ DBY Connectors
- ✓ Hammer
- ✓ Grounding Strap
- ✓ Two-wire MAXI Cable (#14 AWG wire)
- ✓ Two-wire MAXI Cable (#18 AWG wire)
- ✓ #8 AWG or #10 AWG Bare Ground Wire
- ✓ Tape Measure
- ✓ Wire Stripper
- ✓ Wire Nuts
- ✓ Marking Pencil
- ✓ Electric Drill (or Hammer Drill if installing in masonry or concrete wall)

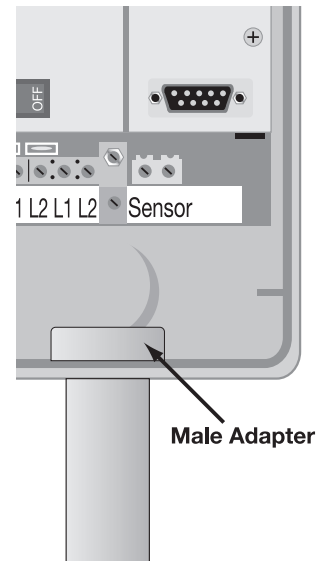
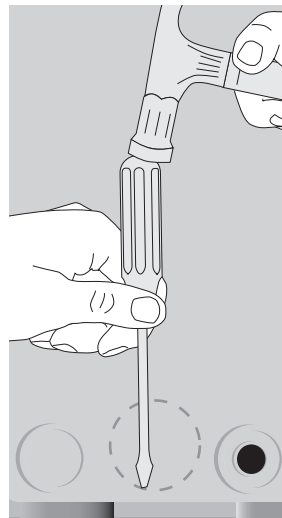
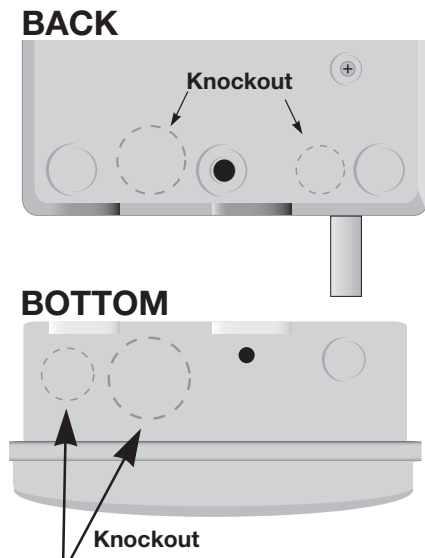
Installation, continued

Preparing the Controller Cabinet for the Power and Field Wires

Note: You can remove four knockouts from the controller cabinet making it easy to route the wires. You will find two of these knockouts on the back (for routing wires through a wall) and two on the underside (for feeding wires through the cabinet's bottom).

To tap out a knockout, place the cabinet on a firm surface with the groove facing you. Work your way around the groove with a slotted screwdriver, firmly tapping out the knockout.

A hole on the underside of the cabinet fits a 1" (2.6 cm) PVC male adapter for installing PVC conduit. You can increase its size to 1 1/4" (3.2 cm) by tapping out the knockout around the hole. If you are using #14 AWG wire, or larger, you may need the larger hole. If you run the wires through the bottom holes, you will need to install conduits. Slip the conduit through the hole and secure it with a male adapter or other conduit fittings.



Installation, continued

Mounting the Controller on the Wall

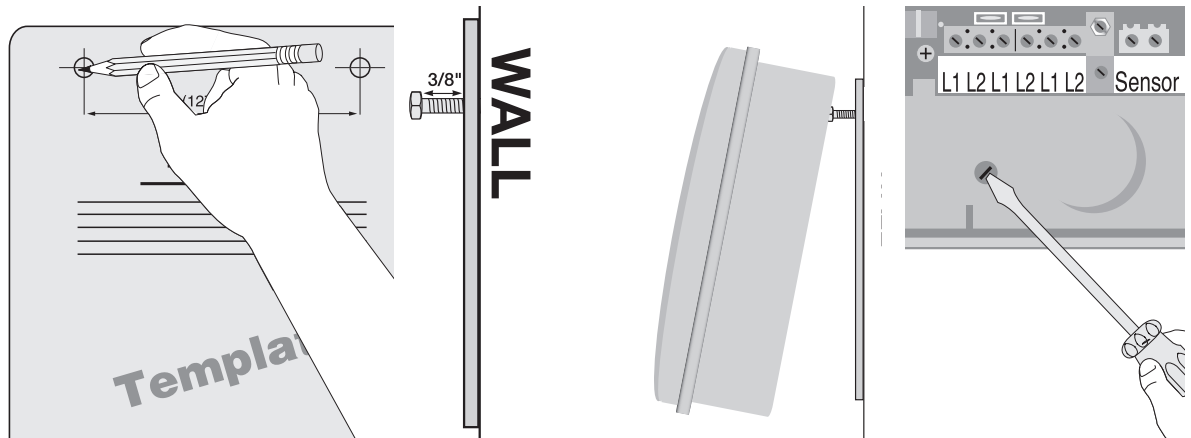
Note: The MDC2 Controller has four mounting holes on the back on the cabinet—three keyhole slots near the top and one circular hole at the bottom.

Note: To install the controller on a flat wall surface, use the left and right keyhole slots at the top of the cabinet. To install the controller on a narrow stud, use the center keyhole slot.

1. Place the mounting template onto your mounting surface. Make sure it is level and mark the top drill holes. If mounting to a stud, mark the drill hole in the center of the stud.
2. Drill the holes and use the appropriate plugs or fasteners.
3. Screw in the appropriate mounting screws, leaving about 3/8" between the screw heads and wall.

Note: The mounting materials and specific screws you need will vary according to the mounting surface (i.e., wood, cement, masonry, drywall, etc.)

4. Slide the MDC cabinet over the top screws.
5. If mounting to a stud, swing open the cabinet door and faceplate. Mark the position of the bottom drill hole and then lift off the controller. Do not attempt to drill the bottom hole through the cabinet.
6. Drill the bottom hole and remount the cabinet.
7. Secure the bottom of the cabinet with a screw, tightening it all the way.



Installation, continued

Connecting the Controller

There are three types of connections you must make to your MDC2 Controller. They include:

- Connecting to the Two-wire Communications Cable,
- Grounding the Controller, and
- Connecting to the Main Power Source.

Note: You may also connect an optional sensor, which prevents irrigation during rainfall or when the soil is moist.

This section of the manual contains instructions for all three types of basic connections, and the optional sensor connection.

Note: If you are installing a field or sensor decoder, please see the **MDC2 and Decoder Installation** poster for more information.



All wiring must be installed and connected in accordance with local electrical codes.

Note: You can run wires through the holes at the bottom of the cabinet or through the knockout holes at the back of the cabinet. If you use the knockout holes, make sure you seal the unused bottom holes. If you run the wires through the bottom holes, you will need to install conduits. Slip the conduit through the hole and secure it with a male adapter or other conduit fittings.

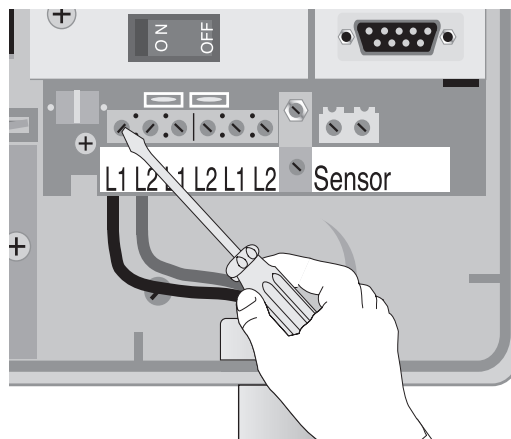
Connecting to the Two-wire Communications Cable

Note: You can connect up to three separate two-wire communications cables (paths). The communications cable you use must be approved for underground use. Rain Bird® recommends you use MAXI Cable, #14 AWG as your two-wire communications cable.

Warning! Do not install the communications cables in the same conduit as the wires to the Main power source.

To connect the cable,

1. Feed the two-wire communications cable through the conduit and into the controller.
2. Remove about 6" of the cable's outer sheathing and strip about 5/8" of the insulation from the ends of the two wires.
3. Using a thin blade screwdriver, connect the wire ends to a set of L1 and L2 terminals. Tug on the wires to make sure the connections are tight.



Installation, continued

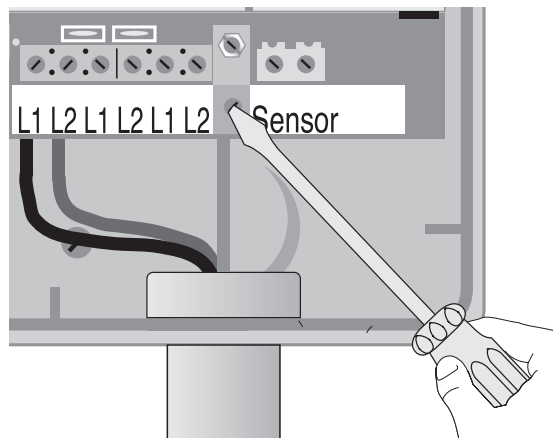
Grounding the Controller

The MDC2 Controller is equipped with built-in electrical surge protection. For this system to function, you must properly ground the controller.

Warning! Connect the controller to the grounding grid using at least a #8 AWG (10 mm) or #10 AWG (6 mm) bare wire. The wire should be as short and as straight as possible. You will void the warranty if you do not ground the controller to a maximum reading of five ohms.

To connect the ground wire,

1. Loosen the screw on the copper earth ground terminal and slide the end of the ground wire into the terminal. Tighten the screw to secure the wire.
2. Feed the ground wire through the same conduit you used for the communications cable and connect it to ground.



Connecting to the Main Power Source

The three Main power input wires for a standard 120-Volt AC transformer are black, white and green. You will find these wires in the high voltage compartment in the lower left corner of the controller cabinet.



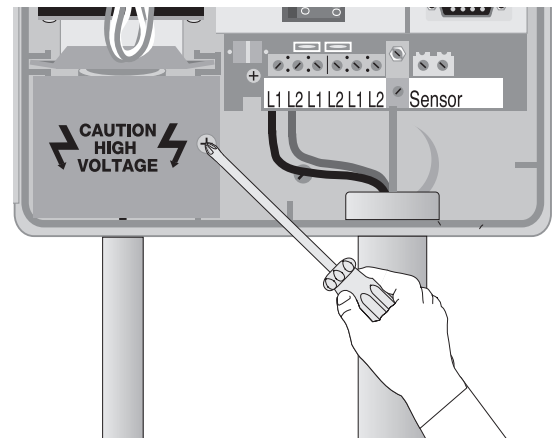
To prevent electrical shock, make sure all supply power is **OFF** before connecting these wires. Electrical shock can cause severe injury or death.



All electrical connections and wiring runs must be made according to local electrical building codes.

To feed the power wires,

1. Locate the high voltage compartment cover, remove the screw and swing open the cover.



Installation, continued

2. Feed the Mains 120-Volt AC power wires into the high voltage compartment through a separate conduit.

Note: You can also connect the Mains 120-Volt AC power and transformer wires inside a junction box located outside the controller cabinet.

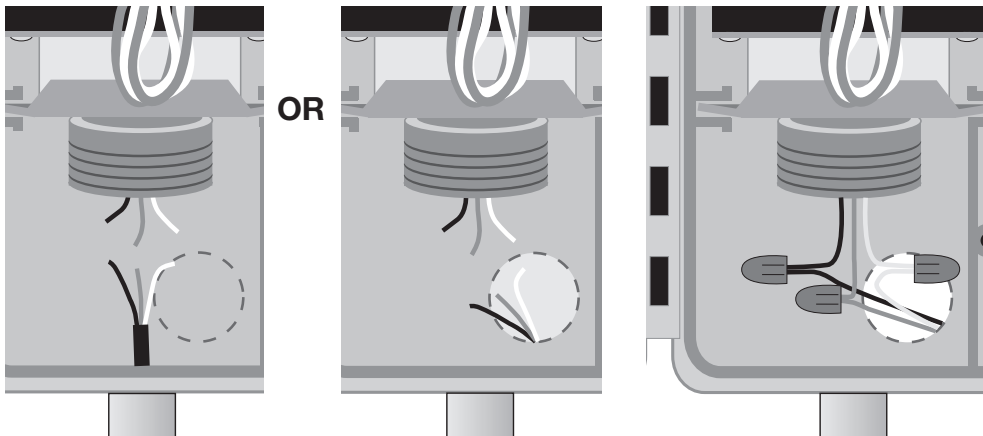
OR

Feed the Mains 120-Volt AC power wires through the 1/4" knockout hole on the back of the cabinet. You also need to cut out the scored hole in the high voltage compartment's fiberboard liner.

To connect to the Main power source,

1. Strip about 1/2" of the insulation off the ends of the power wires.

2. Using code-approved wire nuts, connect the black (HOT) wire to the black transformer wire, the white (neutral) wire to the white transformer wire and the green (ground) wire to the green transformer wire.
3. Tug on the connections to make sure they are tight, then close the high voltage compartment cover and replace the screw.



Installation, continued

Connecting an Optional Sensor

The MDC2 Controller allows you to connect an optional sensor. The controller works with any open or closed switch sensor.

Warning! The wires you use to connect the controller to the sensor must be approved for underground use. Rain Bird® recommends using a two-wire #18 AWG (maximum gauge) cable long enough to easily reach the controller.

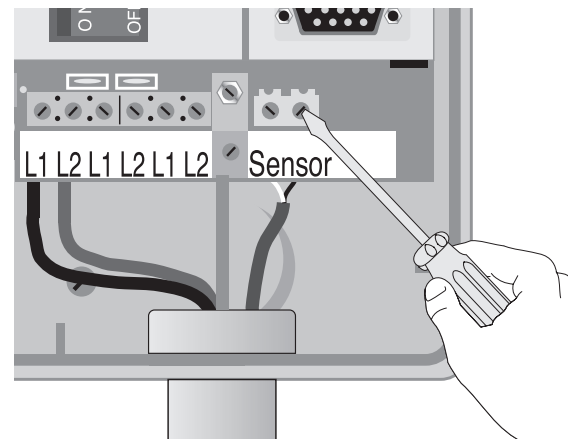
Warning! Install the sensor wire in the same conduit you use for the two-wire communications cable and ground wire. The conduit for the power wires should only contain the power wires.

To connect the sensor's wires to the controller,

1. Remove about 6" of the cable's outer sheathing and strip about 5/8" of the insulation from the ends of the two wires.

2. Using wire nuts, connect the two-wire cable to the sensor wires inside a valve box.
3. Protect all underground splices with DBY connections. Insert the wire nuts into the DBY connectors and close the gap tightly. Place the connectors inside the valve box.
4. Run the two-wire cable leading from the sensor wires through a conduit and into the controller cabinet. Use the same conduit you used for the communications cable.
5. Using a thin blade screwdriver, connect the sensor cable wires to SENSOR terminal 1 and SENSOR terminal 2 inside the controller.

You have now completed mounting and wiring your new MDC2 Controller.



Installation, continued

Installing Program and Expansion Modules

The MDC2 Controller uses a program module that controls 50 (decoder) outputs. The controller also supports up to three expansion modules (MDC/M50D), each controlling an additional 50 outputs. So, by adding expansion modules, you can configure the MDC2 Controller to control 50, 100, 150, or 200 outputs. 200 is the maximum number of outputs the controller can manage in any combination over one, two or three separate two-wire communications lines.

Warning! When working with any program or expansion module, always use a grounding strap to avoid electrostatic discharge, which can damage the modules.

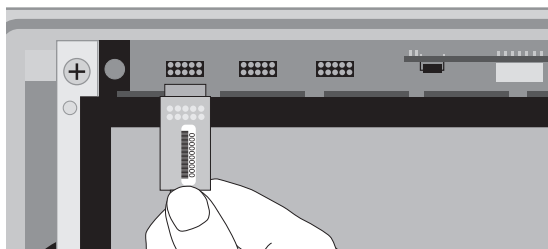
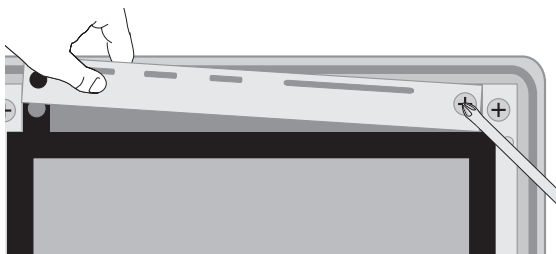
Warning! Always turn off the controller before you add or remove any module.

To add or replace a program or expansion module,

1. Use a Phillips head screwdriver to remove the two screws and lock washers holding the guide rail. Be careful not to lose the lock washers.
2. To remove a worn out module, grasp it by its tab and wiggle it back and forth while pulling up.
3. Hold the new module by its tab, so the back of the module faces the top of the cabinet.
4. Firmly plug a 10-pin expansion module into one of the three corresponding sockets on the circuit board. The program module is larger and fits only in one socket.

Warning! When plugging a program or expansion module into an MDC socket, please note its orientation. Make sure the back of the module's mini circuit board is facing the top of the cabinet and not the display screen. Plugging the modules in backwards will not damage the controller, but the controller will not work properly.

5. Once you install the modules, replace the guide rail.



Installation, continued

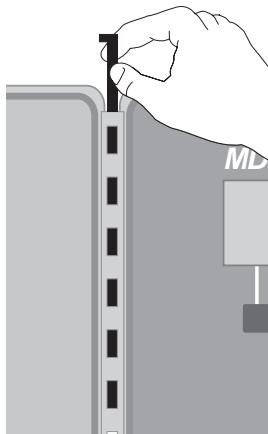
Replacing the Battery

The MDC2 Controller has a built-in lithium battery to backup and store the program memory. During normal use, the battery should last for 10 years. Replace the battery when the MDC2 Controller no longer holds the programmed information.

Warning! The components inside the MDC2 Controller are sensitive to electrostatic discharge. By using a grounding strap, you can help avoid electrostatic discharge, which can damage the units.

To replace the battery,

1. Remove the controller cabinet door from its hinges by opening the door, then pushing the metal pin up and out of the hinge. Set the door and pin aside.

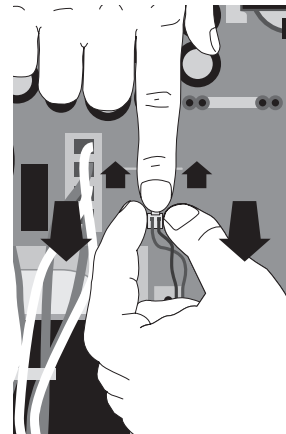


2. Unscrew and remove the faceplate. Set the faceplate aside. Set the faceplate aside.



To prevent electrical shock, turn off the controller and shut **OFF** all supply power to the unit at the Main power before proceeding. Electrical shock can cause severe injury or death.

3. Using a Phillips head screwdriver, remove the five screws, lock washers and metal clip. Carefully lift the display and control module as far as the connecting wires allow.
4. Disconnect the two-wire harness from the board by grasping the connector and pulling straight up.



Installation, continued

5. Open the locking tabs on the three ribbon cables by pushing the tabs away from the cables. Disconnect the ribbon cables by grasping the wide sides of the connectors and gently pulling the connector away from the board. Set the module aside.
6. Using a thin blade screwdriver, gently pry the lithium battery out of its compartment and replace it with a new battery, positive side facing up.

Warning! Dispose of the depleted battery in accordance with local regulations.

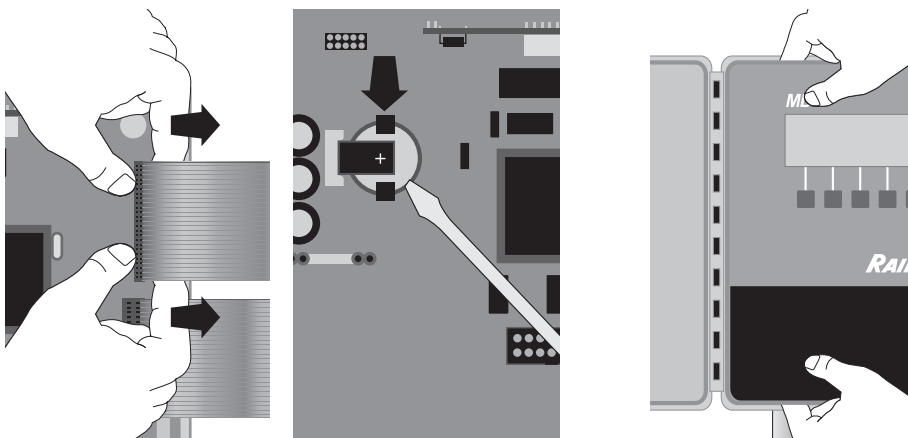


If you mistreat the battery, it may explode. Do not recharge, disassemble or dispose of in fire.

To reassemble the controller,

1. Reconnect the three ribbon cables by firmly pushing each connector into their slots on the board. A small tab on the side of the connector slides into a slot on the socket, so each connector fits only one way. Firmly push to engage the locking tabs.
2. Plug in the two-wire harness into its corresponding slot on the board. It fits only one way.
3. Reposition the display and control module and replace the screws, lock washers and clip.
4. Replace the controller's faceplate.
5. Screw on the faceplate.
6. Turn on the Main power supply to the controller and turn on the controller.

Note: When you change the battery, you will need to reprogram the MDC2 Controller.



Programming and Operation

Using the buttons on the controller, you can set up the MDC2 Controller to operate automatically. You can also run the controller manually without changing the **Programs** you have set.

This chapter shows you how to use the controller's buttons and gives you step-by-step instructions for setting up the controller to suit your needs.

Programming and Operation, continued

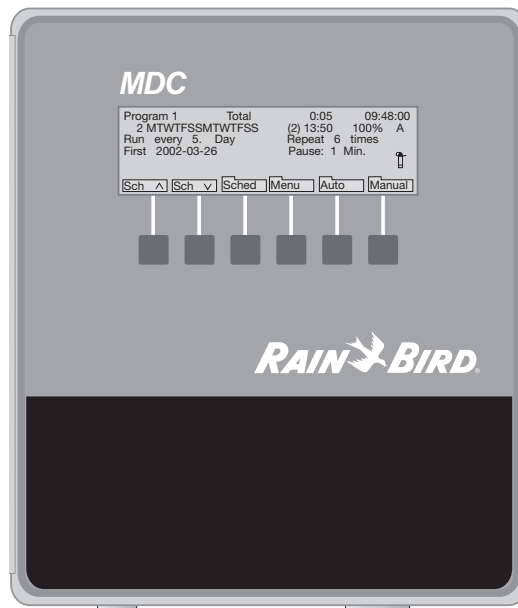
Familiarizing Yourself with the MDC2 Controller

Before beginning to program or operate your MDC2 Controller, take a moment to familiarize yourself with the controller. Note that the location of the ON/OFF switch is behind the removable panel. Once you turn the controller on, you can use the buttons to guide you through different display screens and functions on the (Liquid Crystal Display) LCD.

Most screens show a row of labels at the bottom. These labels indicate the specific function of the buttons under each label. As the labels change from one screen to the next, so does the function of the buttons. Labels with tabs contain submenus.

A backlight lights the display while you operate the buttons. Once you stop, the backlight remains on for about 70 seconds then turns off. The information is still on the display, but the display is not lit. Pressing any button turns the backlight on again.

Note: You must first turn on the backlight (press a button) before you can operate the controller.



Programming and Operation, continued

Getting Started

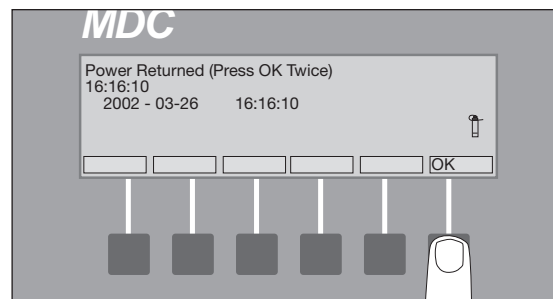
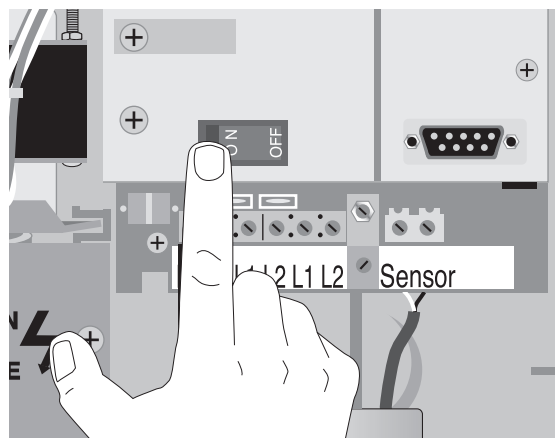
Remove the lower panel. Turn on the controller and replace the panel.

The display briefly shows the software version and controller type (MDC2).

A **Power Returned** message displays along with the current **date** and **time** (24 hour military time). Please see **Appendix I: Conversion Chart from Standard to Military Time** on page 91.

The message prompts you to **Press OK** (the button pointing to the **OK** label). This message also appears when power returns after a power failure.

Note: You need to press the button pointing to the **OK** label **twice**, to reach the **Main Operating Screen**.



Programming and Operation, continued

Main Operating Screen

1. Program

indicates the current **Program** being displayed. The MDC2 Controller can store up to 10 irrigation **Programs** (which start pumps) and 1 auxiliary or non-irrigation **Program**.

2. Total

indicates the total irrigation time, in hours and minutes, you scheduled for that **Program**.

3. Current Time

shows in 24-hour military time.

4. Step Number

each **Program** supports up to 100 **Steps**. Each **Step** contains specific programmed information for the decoders and the run time for each decoder and valve.

5. MTWTFSSMTWTFSS

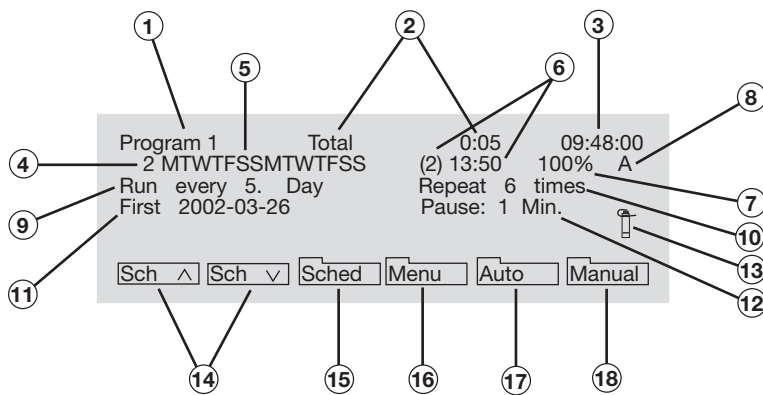
shows a 14-day display **Schedule** of the programmed days, starting with the current day (this example assumes the current day is Monday).

6. Start Time Indicator

shows the time of day you want the **Program** to start. You can have up to six start times for each **Program**.

7. Water Budget Indicator

shows the water budget setting, which you can adjust from 0-250%. Water budget lets you adjust the water application or run times in a **Schedule** without reprogramming the **Schedule**.



Programming and Operation, continued

8. **Active/Passive**

indicates whether a current **Program** is **Active (A)** or **Passive (P)**.

9. **Run Every**

shows the selected irrigation days, from 1-14.

10. **Repeat**

shows how many times (up to 99 times) irrigation **Programs Repeat**.

11. **First**

shows the year, month and day a **Schedule** begins.

12. **Pause**

shows how many minutes you want a **Program** to **Pause** between **Repeat Programs**, before resuming with the next **Program**.

13. **Sprinkler Icon**

“sprinkles” when an irrigation **Schedule** is running.

14. (**Search**) **Labels**

use the buttons associated with the **Sch** labels to move up and down through the 11 stored **Programs**.

15. (**Schedule**) **Label**

use the button associated with the **Sched** label to set up specific irrigation **Schedules**.

16. **Label**

use the button associated with the **Menu** label to enter the **Main Menu**.

17. **Label**

use the button associated with the **Auto** label to set the controller to the **Auto** mode. A menu displays allowing you to **Pause** the irrigation **Schedule** and manually start the decoders.

18. **Label**

use the button associated with the **Manual** label to enter a menu where you can manually start irrigation programs or decoders and **Pause** a running **Program**.

Programming and Operation, continued

Setting Up Your System

The first time you turn on the MDC2 Controller, you must program into your system specific set-up information (decoder and solenoid numbers, sensors, etc.) about your irrigation system.

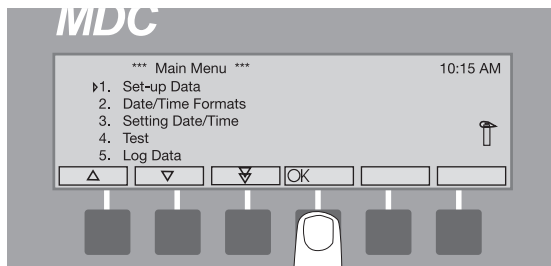
Before you begin, you may need to **Select a Country** (indicating language and unit of measure) to read on the display screen.

Note: Pressing the button pointing to the **minus (-)** label returns you to the previous menu.

Selecting a Language

The default language is **English (US)**. However, you can choose between **English (UK)** (British spelling and m^3/h —cubic meters per hour setting), **English (US)** (American spelling and GPM—gallons per minute setting), **German** (m^3/h), **Spanish** (m^3/h) or **French** (m^3/h).

1. From the **Main Operating Screen**, press the button pointing to the **Menu** label to reach the **Main Menu**. An **indicating arrow** points to the menu category. You control the **indicating arrow** with the buttons pointing to the **up** and **down arrow** labels.

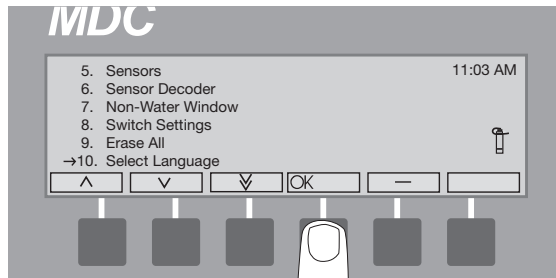


2. Move the **indicating arrow** to **1. Set-up Data** and press the button pointing to the **OK** label.

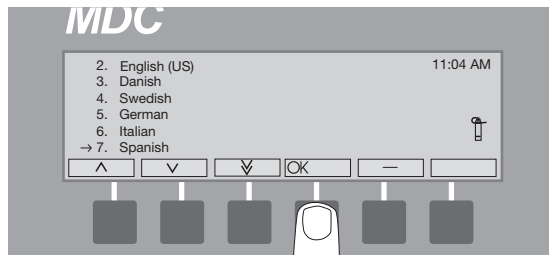
Note: Pressing the button pointing to either the **up** or **down arrow** labels changes the direction of the **double arrow** label. The **double arrow** label lets you quickly scroll through the categories.

Programming and Operation, continued

3. Move the **indicating arrow** to **10. Select Language** and press the button pointing to the **OK** label.



4. Using the buttons pointing to the up or down arrow labels, scroll to the language you want to read on the display and press the button pointing to the OK label.



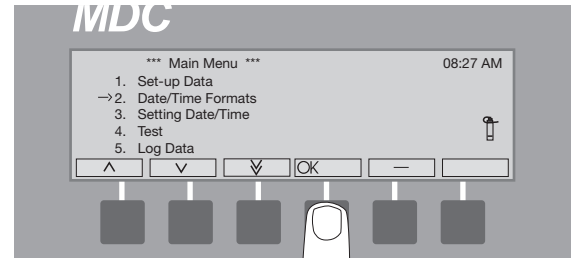
Note: It takes about five seconds for the controller to change the text to the new language before returning to the **Set-up Data** menu, displayed in the language you selected.

Note: Wait until the new country is updated before pressing any buttons. Otherwise, the country may not update.

5. Using the button pointing to the **Up arrow** label, scroll to **11. Return** and press the button pointing to the **OK** label, or select **minus(-)** to return to the **Main Menu**.

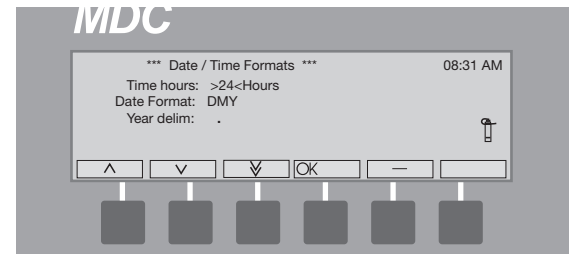
Setting the Date/Time Formats

1. From the **Main Menu**, navigate to **2. Date/Time Formats** and select **OK**.



You will be taken to the **Date/Time Formats** menu.

2. Select **OK** again. The first active field is the **Time Hours**, which is indicated by alternating blinking arrow markers.



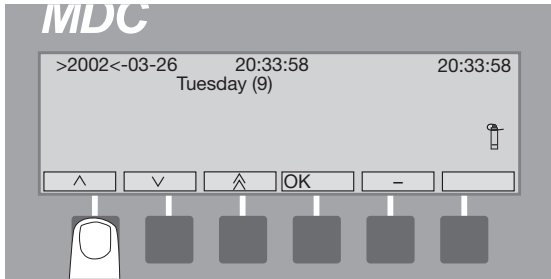
3. Use the up and down arrows to change the **Hours** format to be either **Standard** (12) or **Military Time** (24) and select **OK**.
4. Use the down arrow to move to the **Date Format**. The active field is the **Date Format**, which is indicated by alternating blinking arrow markers.
5. Use the **up** and **down arrows** to change the **Date Format** and select **OK**.

Programming and Operation, continued

6. Use the **down arrow** to move to the **Year Delimited**.
7. Use the **up** and **down arrows** to change the **Year Delimited** format and select **OK**.
8. Press **-** to exit **Date/Time Formats** screen.

Setting the Date and Time

1. From the **Main Menu**, move the indicating arrow to **2. Setting Date/Time** and select **OK**. The first active field is the **year**, which is indicated by alternating blinking arrow **markers**.



2. Use the **up** and **down arrows** to change the **year**.

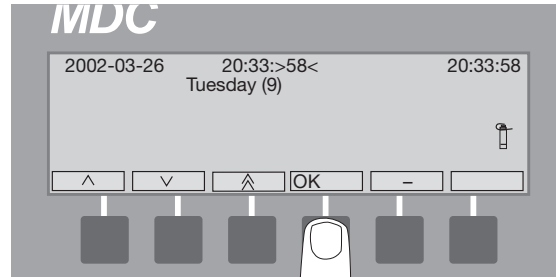
Note: The **double arrow** label lets you move through the **date** and **time** quickly. Pressing the button pointing to the **double arrow** label once increases or decreases the **date** and **time** by five digits. To switch the direction of the **double arrow** label, press the button pointing to the **up** and **down arrow** labels. Holding in the button pointing to the **double arrows** lets you scroll through the numbers quickly.

3. **OK** moves the blinking **markers** to the **month**. Scroll to the correct **month** and select **OK** to move the **markers** to the **day**.

4. Scroll **up** or **down** to the correct **day**. **OK** accepts the change and moves the **markers** to the **hour**, which reads in 24-hour military time. Please see **Appendix I: Conversion Chart from Standard to Military Time** on page 91.

Note: The **year**, **month** and **day** you choose directly affects the **day** of the week (**Monday-Sunday**). Changing any of those variables also changes the **day** of the week. The number next to the **day** of the week represents the specific **day** in the 14-day calendar.

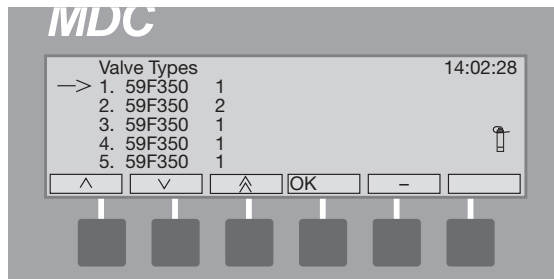
5. Scroll **up** or **down** to the correct **hour**. **OK** moves the **markers** to the **minutes**. Change the **minutes** the same way then move to the **seconds**. **OK** locks in the new **date** and **time** and returns you to the **Main Menu**.



Programming and Operation, continued

Selecting Valve Types

Valve types refer to the electric requirements of magnetic solenoids. There are 10 Valve Types already programmed into the MDC2 Controller. The first five Valve Types are used by decoders controlling irrigation **Programs** and will start master valves and pumps. The last five control non-irrigation **Programs** (such as activating auxiliary alarms, etc.) and will not start pumps. Irrigation **Valve Types** use **switch code** 59F350. If setting up a normally open master valve that needs to close on an alarm, the switch code is 39F350. Non-irrigation **Valve Types** use a **switch code** of 3FFA20 when using a relay. These default **switch codes** are used for Rain Bird® 24 VAC solenoids.



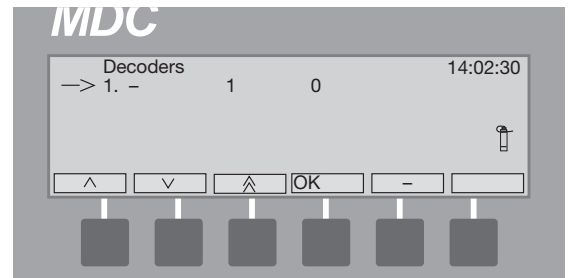
Note: The number of solenoid (valve) outputs varies with the Rain Bird® Decoders in your system. For example, FD-102TURF and FD-202TURF can operate one or two solenoids on each output. Whereas FD-401TURF and FD-601TURF can only operate one solenoid on each output.

Note: If your system uses **Standard** Rain Bird® 24 VAC solenoids, do not change any of these settings. For the **New** Rain Bird® 24 VAC (White strip wires) solenoids the recommended settings are 59F370. Please move to the next section, **Naming the Field Decoders**.

Note: If your system operates solenoids that are not Rain Bird®, do not change the default **switch codes** before verifying if the solenoids open. If the solenoids do not open, you may need to change the **Activation Time** and/or **Holding Voltage**. Please see **Appendix II: Selecting Electrical Codes for Solenoids** on page 93.

Naming the Field Decoders

You must give each field decoder in your system a name (up to six characters) so that you can easily identify that decoder and pinpoint its location. For example, MAPLE1 (or the shorter M1) could represent the first decoder facing Maple Street and ELM5 (or E5) could identify the 5th decoder on Elm Street. It is easier if you make the name as short and descriptive as possible.

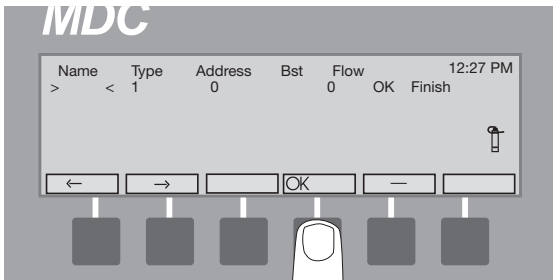


1. From the **Main Menu**, move the **indicating arrow** to **1. Set-up Data** and select **OK** to reach the **Set-up Data Menu**.
2. Move the **indicating arrow** to **2. Decoders** and select **OK** to reach the list of decoders.

Note: The **indicating arrow** points to the first available space. If you want to change information about a specific decoder already programmed, move the **indicating arrow** to the decoder you want to change.

Programming and Operation, continued

3. Select **OK** to add or change a decoder. The screen now shows four columns or fields with the titles: **Name**; **Type**; **Address**; **Booster** and **Flow**. A pair of **markers** points to the **Name** field. Use the buttons pointing to the **left** and **right arrow** labels to move the **markers** from one field to the next and back again.



4. Position the **markers** under **Name** and select **OK** to activate the **Name** field. The **left** and **right arrow** labels now switch to **up** and **down arrows** and the two **markers** alternate blinking, indicating the field is active.
5. Use the **up** and **down arrows** to change each character one at a time, from left to right. A blinking **box** shows the position of the first character you are changing. The **box** disappears when you begin scrolling through the characters. An **arrow** then, points to the character you are changing.

Note: The **double arrow** label lets you move through the alphanumeric characters quickly. Pressing the button pointing to the **double arrow** label one time increases or decreases the characters by five numbers or letters. To switch the direction of the **double arrow**, press the button pointing to the **up** and **down arrows**. Holding in the button pointing to the **double arrows** quickly scrolls through the characters.

6. Change each character one at a time. **OK** accepts the change and moves to the next space. Continue to select **OK** until the **markers** stop blinking, deactivating the field. The **up** and **down arrow** labels will also switch to **left** and **right arrow** labels.

Note: The controller will not allow you to enter a duplicate name. If you do, the message **Decoder already exists** appears briefly and the controller returns you to the beginning of the field.

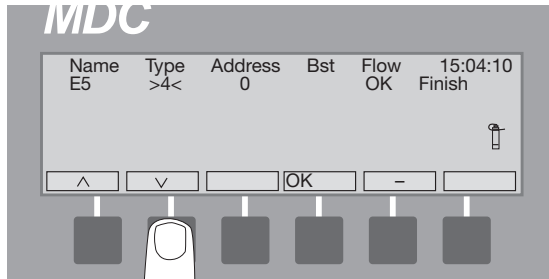
Note: Selecting **minus (-)** while you are still in an active field cancels the changes you made and returns the field to non-active.

7. Move the **markers** to the **Type** field. Here, you will select the type of valve (solenoid) connecting to the decoder.

Note: The decoder's **Type** correlates directly to the valve type used to set the **switch codes**.

Programming and Operation, continued

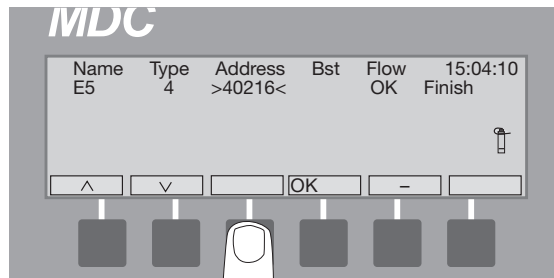
8. Select **OK** to activate the field, and then scroll through the choices to either an **irrigation valve**—values **1-5**—or a **non-irrigation valve**—values **A-E**. **OK** accepts the valve **Type**.



9. Select **OK** to deactivate the **Type** field and move the **markers** to the **Address** field. **OK** activates the **Address** field.

Note: The **Address** is the **REC. No. (Record Number)** for each decoder and solenoid connection in your system. You will find this number on the decoder, which should also be recorded on the irrigation drawings.

10. Scroll **up** or **down** to enter the complete 3-, 4- or 5-digit **Address (REC. NO.)**. **OK** accepts the number.

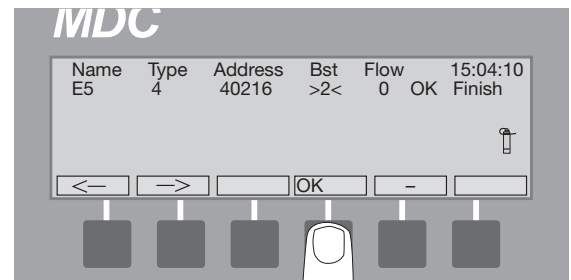


Note: The controller will not allow you to enter a duplicate **Address**. If you try, the message **Address already used** appears briefly and the controller returns you to the beginning of the field.

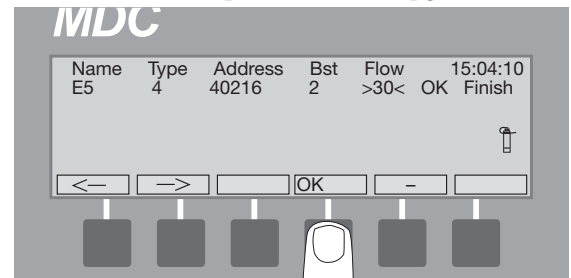
11. Select **OK** to select the **Address** and move the markers to the **Booster (Pump)** field.

Note: If the solenoids connected to the decoder use **Booster** pumps to start irrigation, you must associate the **Booster** pump number to the decoder.

12. Select **OK** to scroll between **Booster Numbers**. Once the desired **Booster** is selected, move the markers to the **Flow** field.



13. Select **OK** to activate the **Flow** field and then scroll **up** or **down**. The feature lets you assign flow values that are used for SEUF (Seek and Eliminate Unexpected Flow) (see pg. 65).



14. Select **OK** once the flow has been set and then move the markers to the **OK** field to return to the decoder listing and continue naming decoders.

Programming and Operation, continued

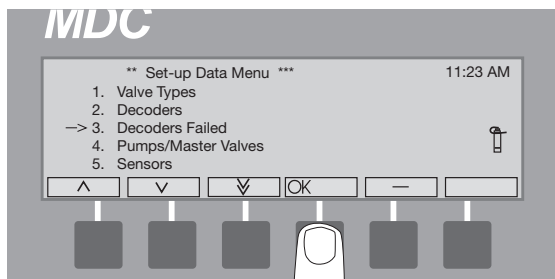
Note: Rain Bird® decoders that have more than one output, (FD-202TURF, FD-401TURF and FD-601TURF) are considered multiple decoders. You must list the separate **Address (REC. NO.)** for each solenoid/master valve connection (i.e., brown 40216, red 40217, etc.) Treat each **Address (REC. NO.)** as a separate decoder and give each a separate name.

15. Once you identify each decoder in your irrigation system, move the **markers** to **Finish** and select **OK** to return to the **Set-up Data** menu.

Decoders Failed

This is a list of valve decoders that have failed due to triggering SEUF (Seek and Eliminated Unexpected Flow) and have been blacklisted. A decoder on the list will not be activated during irrigation.

1. From the **Main Menu**, select **1. Setup Data** and then select **OK**. The **Setup Data Menu** appears.
2. Select **3. Decoders Failed** to conduct an audit of your valves.

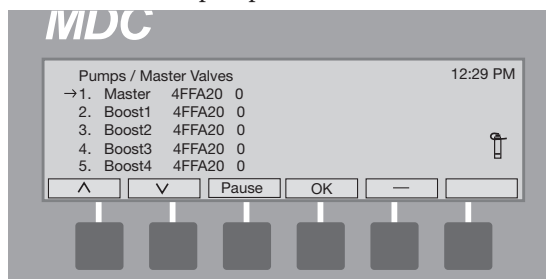


Any valve decoders that have caused SEUF and are blacklisted shall be listed on the display window. If any of them have been found to be working properly or have been fixed, the user must take them off of the black list for the valves to run again.

Entering the Pump/Master Valve Information

The MDC2 Controller supports master valves, master pumps and up to nine booster valves or pumps. Rain Bird® recommends you use one Relay-100 pump start relay for each pump in your system. However, in place of a pump start relay, your irrigation system may start pumps using a field decoder plus an external pressure switch, or use a master valve with a field decoder. For the controller to recognize and associate a field decoder to the master valve and pumps your system uses, you must program in the decoder's **Address** and verify or change the switch code.

1. From the **Main Menu**, move the indicating arrow to **1. Set-up Data** and select **OK**.
2. Move the indicating arrow to **4. Pumps/Master Valves** and select **OK** to reach the **Pumps** screen. It lists one **Master** pump or valve and nine **Booster** pumps and their switch codes.



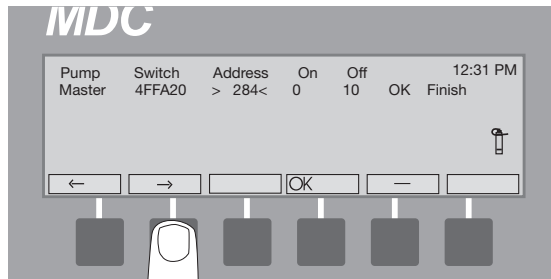
3. Move the indicating arrow to **1. Master**, and select **OK**. The screen now shows 3 fields with the titles: **Pump**; **Switch**; **Address** and **On and Off**. A pair of **markers** points to the **Switch** field.

Programming and Operation, continued

Note: If your system uses Rain Bird® Decoders and Relay-100, change the Switch Code to 49F390.

Note: If your system's water supply feeds directly to a master valve, or if the system uses field decoders or pressure switches to start pumps, you may need to change the switch code. Please see **Appendix III: Master Valve and Pump Set-up Tips** on page 97.

4. Move the **markers** to the **Address** field and select **OK**. The **left** and **right** arrow labels now switch to **up** and **down** and the two **markers** alternate blinking, indicating an active field.
5. Use the **up** and **down arrows** to enter the field decoder **Address** marked on the irrigation drawings.



6. **OK** accepts the **Address** and the **markers** stop blinking. The **up** and **down arrow** labels also change to **right** and **left arrows**. The next set of options let you enter **On and Off** delays for a **MV/Booster** activation or deactivation. The **On Delay** means that the start will be delayed XX seconds after decoder activation. The **Off Delay** means the **MV/Booster** will remain activated XX seconds after deactivation of the decoder. This prevents the **MV/Booster** from stopping between two steps. To enter additional **Booster pump Addresses**, move the **markers** to the **OK** field and select **OK** to return to the **Pumps** screen.

7. Move the **markers** to **Finish** and select **OK** to return to the **Set-up Data Menu**.

Note: To deactivate a pump/master valve for repair or maintenance procedures, change the address to zero (0).

Activating Rain or Alarm Sensors

The Rain Bird® MDC2 Controller has one sensor input allowing you to install an optional rain or alarm sensor. Once you install the sensor, you must change the sensor status from **Passive** to **Active**.

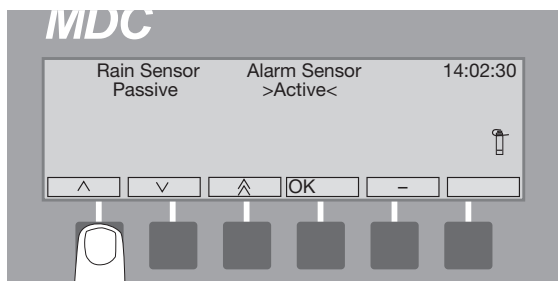
Note: The MDC Controller supports only one **Rain Sensor** or one **Alarm Sensor**. Activate only one sensor leaving the other **Passive**. Setting both sensors as **Active** actually changes the status of both to **Passive**.

1. From the **Main Menu**, move the **indicating arrow** to **1. Set-up Data** and select **OK**.
2. Move the **indicating arrow** to **5. Sensors** and select **OK** to reach the **Rain and Alarm Sensor** screen.
3. If your system uses a **Rain Sensor**, press the buttons pointing to the **arrow labels** and change sensor status from **Passive** to **Active**.

Note: If your system does not use a **Rain Sensor**, keep the status **Passive**.

Programming and Operation, continued

4. Select **OK** to move the **markers** to the **Alarm Sensor** field.
5. If your system uses an **Alarm Sensor**, change the status from **Passive** to **Active**.



6. Select **OK** to lock in your setting and return to the **Set-up Data** menu.

Setting Up a Sensor Decoder

The MDC2 Controller can control a variety of sensors (Flow, On/Off, Generic), which are powered by a Sensor Decoder through the two-wire communications cable.

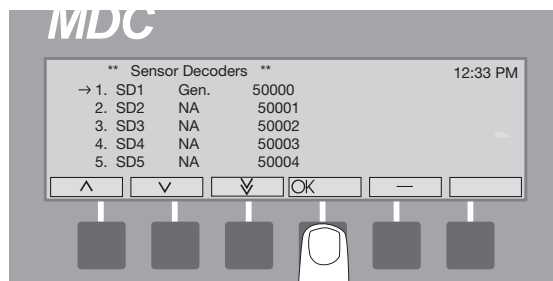
Note: Please refer to Appendix IV for detailed information about the terms and units of measure mentioned in this section.

Programming a Sensor Decoder

1. From the **Main Menu**, select **1. Set-up Data** and select **OK**.

The **Set-up Data Menu** appears.

2. Move the indicating arrow to **6. Sensor Decoder** and select **OK** to reach **Sensor Decoders** screen.

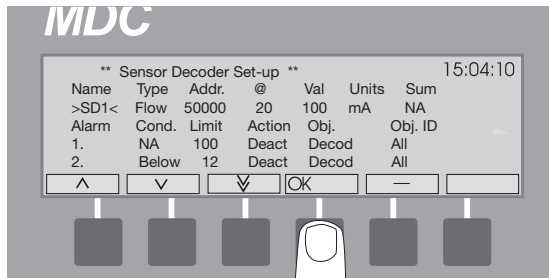


3. Move the indicating arrow to any desired sensor row and select **OK**.

The **Sensor Decoder Set-up** screen appears.

Programming and Operation, continued

4. Select **OK** and the blinking **markers** are positioned under **Name**.



5. Select **OK** to activate the **Name** field. Use the **up** and **down arrows** to change the default decoder name. Select **OK** to store the name.

You will notice that the **up** and **down arrows** switch to the **left** and **right arrows** to facilitate the navigation through the configuration parameters.

6. Move the markers to the **Type** field and activate. Use the **up** and **down arrows** to set the decoder type and select **OK** to save it.

Note: For **Flow Sensor Decoders**, **Flow Definition** allows you to program a Rain Bird® SD-210TURF Sensor Decoder to the type of flow sensor your system uses - either digital (pulse output) or analog (4-20 milliamps). To establish a conversion ratio, the controller uses to calculate the flow, you only need to program the flow output and sensor output. Rain Bird® recommends you enter the maximum flow, which determines the pulse type.

Note: **Digital** (pulse output) flow sensors are most common. Please see the manufacturers' specifications to determine the **sensor type**, **maximum flow** and **sensor output**.

7. Move the markers to the **Address** field and activate. Use the **up** and **down arrows** to set the decoder address and select **OK** to save it.
8. Move the markers to the **@** field and activate. Use the **up** and **down arrows** to set the **@** value and select **OK** to save it.
9. Move the markers to the **Value** field and activate. Use the **up** and **down arrows** to set the value and select **OK** to save it.
10. Move the markers to the **Units** field and activate. Use the **up** and **down arrows** to choose the units and select **OK** to save it.

Note: Choose **Pulse/10s** if your **digital** flow sensor uses a higher pulse rate (30-200 pulses per second) and counts the number of pulses in 10-second intervals. Choose **mA** if you are using an analog flow sensor.

11. Move the markers to the **Sum** field and activate. Use the **up** and **down arrows** to choose either **Yes** or **No** and select **OK** to save it.

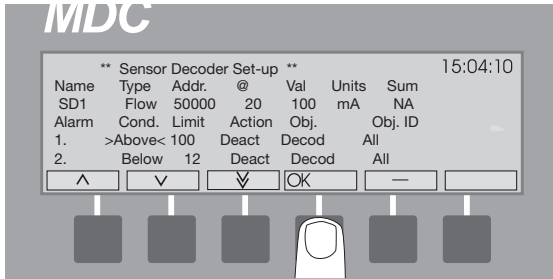
Now, it is time to define the **alarm conditions**. This feature allows you to set specific **alarm limits** when the controller is in the **Auto** mode. Once input from the sensor decoder goes beyond the set limit (which can occur if a valve opens to a broken pipe), the controller turns off all active decoders, displays and logs an alarm.

Note: For **Flow Control** set as below condition and alarms management the following should be considered:

1. When the flow has a transition from a value above the limit to below an alarm will trigger.
2. If no decoders are running for a period of time the MDC will be in non-irrigation mode and thus look for leak flow if set up to do so.

Programming and Operation, continued

- When decoders are started again it will then look again for a transition from above the limit to below and an alarm will trigger.

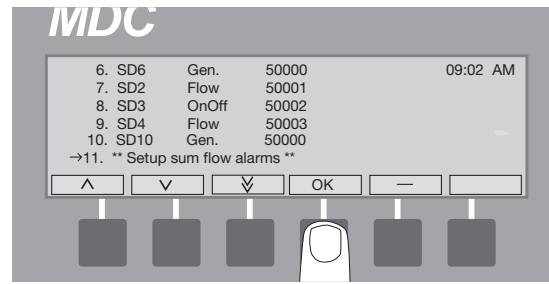


- Move the markers to the **Condition** field and activate. Use the **up** and **down** arrows to choose a threshold and select **OK** to save it.
- Move the markers to the **Limit** and activate. Use the **up** and **down** arrows to set the numeric limit value and select **OK** to save it.
- Move the markers to the **Action** and activate. Use the **up** and **down** arrows to decide what shall happen when the alarm occurs and select **OK** to save it.
- Move the markers to the **Condition** field for the second alarm definition and repeat steps 12 to 14, skipping the **Obj.** and **Obj. Id** fields (for now).

Note: Choosing a decoder that operates a **Normally open** Master Valve shuts off the complete water supply to the system.

Setting Up Sum Flow Alarms

- From the **Main Menu**, choose **Set-up Data** and select **OK**.
You will be taken to the **Set-up Data Menu**.
- Navigate to **6. Sensor Decoders** and select **OK**. The **Sensor Decoders** list appears.
- Navigate to **11. ** Setup sum flow alarms **** and select **OK**.



The **Setup sum flow alarms** screen appears.

- Use the **up** and **down** arrows to enable **Master Pump Flow (MPF)** and select **OK**.
- Use the **right** arrow to move to the **Min flow when pump active** field and select **OK** to activate it.
- Use the **up** and **down** arrows to set the flow rate and select **OK**.
Now, you are going to define alarms for your irrigation system.
- Use the **right** arrow to move to the **Alarm Type** field and select **OK** to activate it.
- Use the **up** and **down** arrows to choose the **Alarm Type** and select **OK**.

Programming and Operation, continued

9. Use the **right arrow** to move to the **Limit** field and select **OK** to activate it.
10. Use the **up** and **down arrows** to set the limit and select **OK**.
11. Use the **right arrow** to move to the **second alarm** field and select **OK** to activate it.
12. Use the **up** and **down arrows** to choose between the **Leak** and **Disable** and select **OK**.

Note: If you choose **Disable**, select **OK** and then select - to exit the screen.

13. If you choose **Leak**, select **OK**.
14. Use the **right arrow** to move to the **Limit** field and select **OK** to activate it.
15. Use the **up** and **down arrows** to set the limit and select **OK**.
16. Use the **right arrow** to move to the **Action** field and select **OK** to activate it.
17. Use the **up** and **down arrows** to decide what action you want to take place if the leak threshold is reached and select **OK**.
18. Use the **right arrow** to move to the **Object** field and select **OK** to activate it.
19. Use the **up** and **down arrows** to choose amongst Decoder, Schedule or Pump to be affected by the defined alarm condition and select **OK**.
20. Use the **right arrow** to move to the **Object ID** field and select **OK** to activate it.
21. Use the **up** and **down arrows** to choose the specific Decoder, Schedule or Pump to be affected by the defined alarm condition and select **OK**.
22. Select - to return to the Main Menu.

Setting up an auxiliary sensor

An auxiliary sensor works with rain or alarm sensors. If the rain sensor is installed far from the controller or if your system uses a pump alarm, you will also need an auxiliary sensor activated by a sensor decoder. Remember, auxiliary sensors can only tell if a switch is **open** or **closed**. Once an auxiliary sensor activates, irrigation stops.

1. From the **Sensor Decoder** menu, move the **indicating arrow** to **5. Aux. Sensor Decoder Address** and select **OK**. The two alternating blinking **markers** indicate the **Sensor Decoder Address** field is ready for you to program in the **Address**.
2. Use the **up** and **down arrows** to match the **Decoder** your system is using for the **Auxiliary Sensor**.

Note: The **Address** should be recorded on the irrigation drawings.

3. Select **OK** to store the **Address** and move the **markers** to the **Active** field. A blinking black **box** indicates the field is ready for you to program. **Not Install** is the default setting.
4. Use the **up** and **down arrows** to select either **Normally open** or **Normally closed**.

Note: Select **Normally open** if the auxiliary sensor is open all the time. Select **Normally closed** if the auxiliary sensor opens only when it receives a signal.

5. Select **OK** to return to the **Sensor Decoder** menu.
6. Moving the **indicating arrow** to **6. Return**, and selecting **OK**, or selecting **minus (-)** returns you to the **Set-up Data** menu.

Programming and Operation, continued

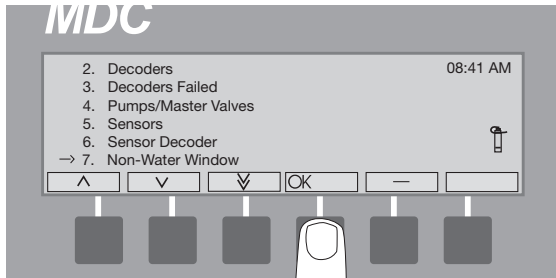
Non-Water Window

It is possible to enter a “Non-Water Window” where irrigation is inhibited. This means the schedules will run but the decoders will not activate. To select a specific time frame that does not allow irrigation:

1. From the **Main Menu**, choose **Set-up Data** and select **OK**.

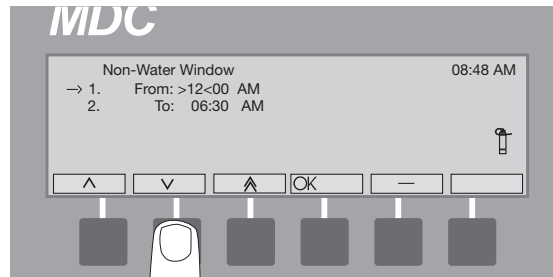
You will be taken to the **Set-up Data Menu**.

2. Navigate to **7. Non-Water Window** and select **OK**. The **Non-Water Window** appears.



3. Select **OK** to activate non-watering starting time.

The active field is the **hour**, which is indicated by alternating blinking arrow markers.



4. Use the up and down arrows to change the hour and select OK. The alternating blinking arrow markers move to the minutes.
5. Use the up and down arrows to change the minutes and select OK.

Now, you need to set the non-water window ending time.

6. Repeat steps 4 and 5 to set the ending time.
7. Select - to exit.

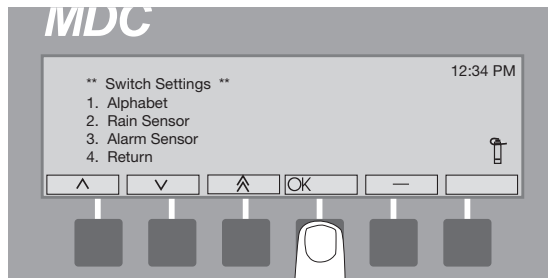
Programming and Operation, continued

Setting the Switch Settings

Switch Settings lets you change from using the **Full** range of alphanumeric characters to using **limited** characters (to name field decoders.) The **limited** characters match the sixteen character keyboard on FT-210 Field Transmitters. You also use the **Switch Setting** to define the rain and alarm sensors.

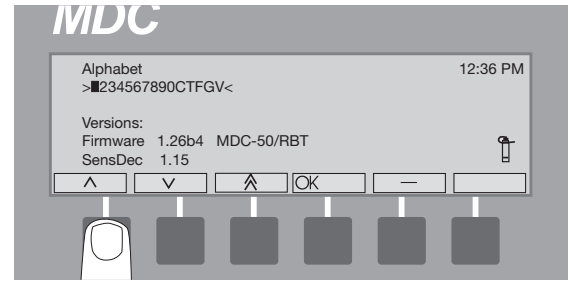
Switching the alphabet

1. From the **Main Menu**, move the **indicating arrow** to **1. Set-up Data** and select **OK**.
2. Move the **indicating arrow** to **8. Switch Settings** and select **OK** to reach the **Switch Settings** menu.



3. With the **indicating arrow** at **1. Alphabet**, select **OK**. The current setting appears between the two **markers**. A blinking black **box** in the first character position shows the field is active. The current controller **Software Firmware Versions** also appear on the display screen.

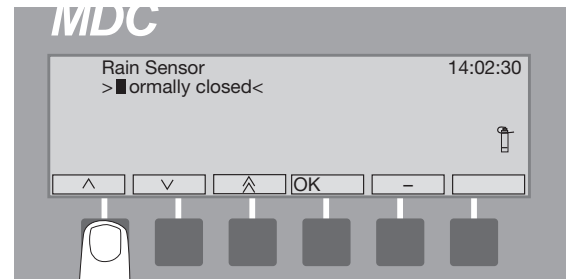
4. Use the **up** and **down** arrows to select either the **Full** or **1234567890CTFGV** (the **limited** alphabet setting).



5. Select **OK** to return to the **Switch Settings** menu. Selecting **minus (-)** cancels the **Alphabet** change and returns to its previous setting.

Turning on an installed rain sensor

1. From the **Switch Setting** menu, move the **indicating arrow** to **2. Rain Sensor** and select **OK**. The current setting appears between the two **markers**. A blinking black **box** in the first character position shows the field is active.
2. Use the **up** and **down** arrows to select between **Normally open** or **Normally closed**.



Programming and Operation, continued

Note: Select **Normally open** if the **Rain Sensor** is open all the time. Select **Normally closed** if the sensor opens only when it rains.

3. Select **OK** to return to the **Switch Setting** menu.

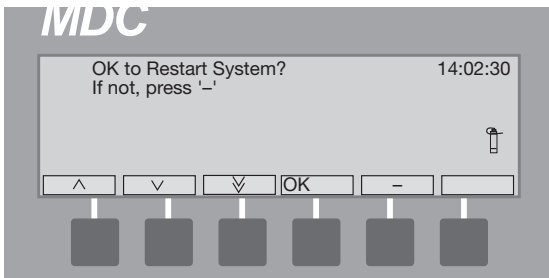
Turning on an installed alarm sensor

1. From the **Switch Setting** menu, move the **indicating arrow** to **3. Alarm Sensor** and select **OK**. The current setting appears between the two **markers**. A blinking black **box** in the first character position shows the field is active.
2. Use the **up** and **down arrows** to select between **Normally open** or **Normally closed**.

Note: Use **Normally open** if the **Alarm Sensor** is open all the time. Select **Normally closed** if the **Alarm Sensor** opens only when it receives a specific signal.

3. Select **OK** to return to the **Switch Setting** menu.
4. Move the **indicating arrow** to **4. Return** to return to the **Set-up Data** menu.

Note: If you press the button pointing to the **minus (-)** label after you change the **Switch Settings**, a screen appears asking if it is **OK to Restart System? If not, Press '-'**. Select **OK** to restart the system or **'-'** to cancel.

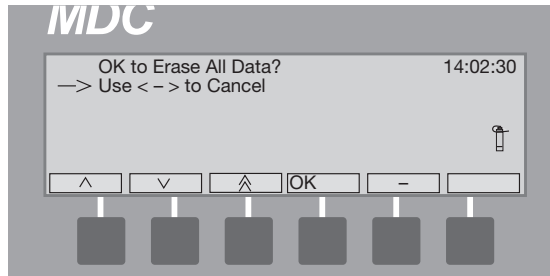


Erasing All the Data

If you wish to delete all the data, such as testing or demo data, from the MDC Controller before you install the actual values, you can do so quickly and easily.

Note: Be careful when you erase data. Once erased, you cannot retrieve it again.

1. From the **Main Menu**, move the **indicating arrow** to **1. Set-up Data** and select **OK**.
2. Move the **indicating arrow** to **9. Erase All** and select **OK**. The display screen now reads, **OK to Erase All Data? Use '-'** to cancel.



3. Select **OK** to **Erase the Data** and return to the **Set-up Data** menu. The **minus (-)** label cancels the action and returns to the **Set-up Data** menu without **erasing any data**.

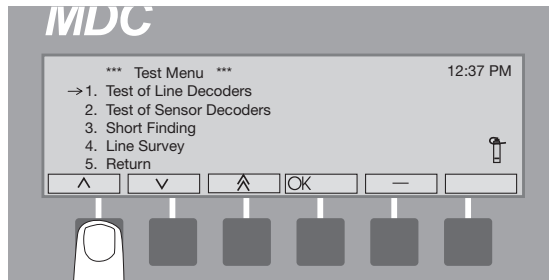
Programming and Operation, continued

Testing of Line Decoders

Once you install and program the line (field) decoders into your system, you can then test to make sure they are working properly. The MDC2 Controllers have a built-in decoder test that tries each decoder in sequence.

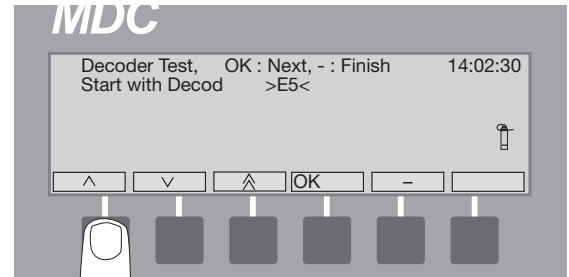
Testing the operation of the decoders

1. From the **Main Menu**, move the **indicating arrow** to **4. Test** and select **OK**.
2. Move the **indicating arrow** to **1. Test of Line Decoders** and select **OK** to reach the **Decoder Test Test** screen.

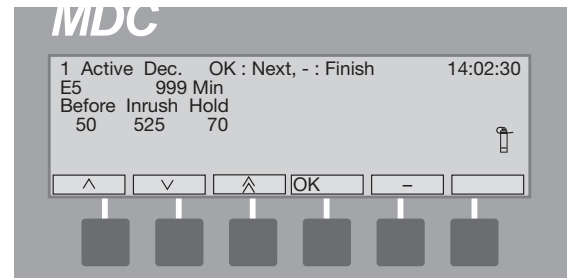


Note: The controller tests the decoders in the order you entered them into the system. The blinking **markers** and **box** show the field is active.

3. Scroll **up** or **down** until you reach the decoder you want to start the test and select **OK** to setup the test. The controller will not test any decoder that is listed before the one you select to start the test.



4. Select **OK** to start the test. After a few seconds, the screen displays the test results in three current measurements (mA).



Note: The **Before** current refers to the standby current, **Inrush** is the current the solenoid needs to open and **Hold** is the holding current the solenoid needs to stay open. The **Before** value depends on the number and type of decoders your system uses, **Inrush** should fall between 290 to 700 and **Hold** should be 15 to 20 milliamps higher than the **Before** value. If the decoder is connected to two or more solenoids, the **Inrush** will be slightly higher and **Hold** currents will be double in proportion (30-40 mA).

Programming and Operation, continued

Example: If your system uses 100 FD102TURF Field Decoders (each operating one solenoid output), then test results should show a **Before** reading of about 50 mA, **Inrush** of 525 mA (which is within the 290-700 range), and a **Hold** of 70 mA (which is 20 mA higher than the **Before** reading).

Note: If the **Before**, **Inrush** and **Hold** values are close, the decoder is not responding. Locate the decoder in the field and make sure that it is wired properly to the solenoid and communications cable. You should also make sure you programmed in the right **Decoder Addresses (REC. NO.)**.

5. Press the button pointing to the **OK** label **twice** to activate and test the next decoder in line.
6. The **minus (-)** label cancels the **test** at any time, returning to the **Test** menu.

Note: To set up the MDC2 Controller to automatically activate and test each decoder in sequence, please see **Setting Up an Automatic Test Program** on page 48.

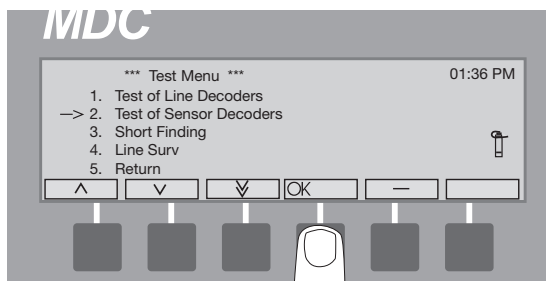
Testing the Sensor Decoders

Once you install and program the sensor decoders into your system, you can then test to make sure they are working properly. The MDC2 Controller has a built-in sensor decoder test that enables you to test each sensor decoder.

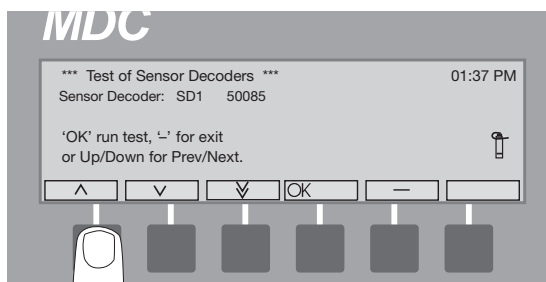
1. From the **Main Menu**, select **4. Test** and select **OK**.

The **Test Menu** screen appears.

2. Select **2. Test of Sensor Decoders** and select **OK**.



The **Test of Sensor Decoders** screen appears.

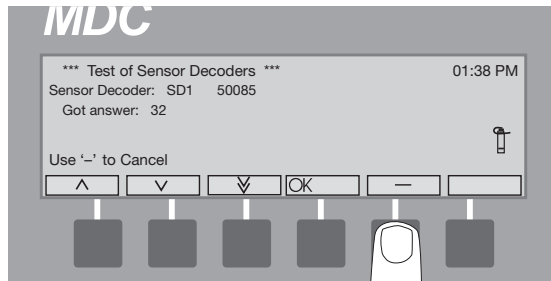


3. Use the **up** and **down arrows** to choose the sensor decoder to be tested and select **OK**.

The **“Communicating with the SD, please wait”** message appears.

Programming and Operation, continued

After a few seconds the screen displays the test result as seen below. This is a raw reading that verifies the sensor decoder is working.



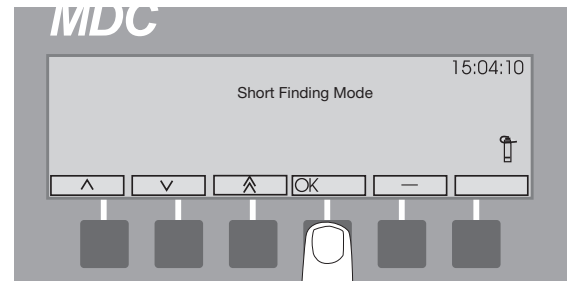
4. Click **OK** to return to the **Test of Sensor Decoders** screen and use the **up** and **down arrows** to choose another sensor decoder to test and select **OK**.
5. Repeat **Step 4**, as necessary to test all the sensor decoders or select '-' to return to the **Main Menu**.

Finding a short in the system

You can use the MDC2 Controller to help trace and locate **shorts** in the lines.

1. Attach a clamp from a Clamp Amperemeter to one of the communications wires connected to either L1 or L2 terminals in the controller.
2. Turn on the controller and navigate to the **Test** menu.

3. Move the **indicating arrow** to **3. Short Finding** and select **OK** to reach the **Short Finding** screen. In **Short Finding Mode**, the MDC changes the frequency of the line voltage from 1 to 50 Hertz (Hz).



4. Check that the Clamp Amperemeter reads the current supplied by the controller. If the reading is higher than you expected, you have either a **short** or an **overload** in the system.

Note: If the **short** takes a high current, the MDC2 Controller automatically limits the current to a safe value of 200 mA. When this happens, the controller will go into the 50 Hz mode and a **Short Circuit Warning** shows on the display. Please see **Sensing a Short Circuit** on page 55.

5. To locate the **short**, “follow” the current from the controller to the decoders in the field.
6. Watch the reading on the Clamp Amperemeter closely. The reading disappears the moment you pass the **short**.
7. Once you locate the **short**, press any button on the controller to return to the **Test** menu.

Programming and Operation, continued

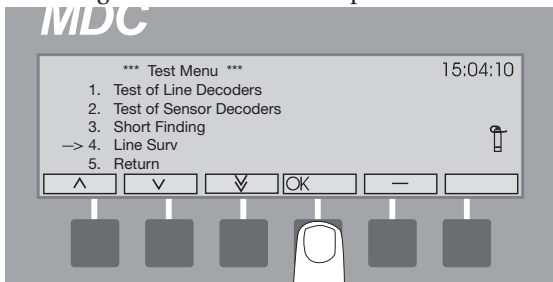
Line Survey

Line survey allows the user to perform an amperage draw and display those values on the main screen.

1. From Main Menu screen, navigate to **4. Test** and press **OK**.

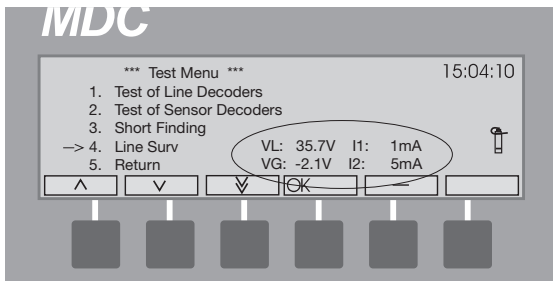
You will be taken to the **Test Menu**.

2. Navigate to **4. Line Surv** and press **OK**.



3. Press **OK** when you are asked **Activate Line Survey?**

You will observe the **VL** and **VG** values on the display.



Note: VL indicates voltage on line and normally ranges between 34 - 37 V. VG indicates voltage to ground and should be slightly negative. I₁ and I₂ indicate currents in each of the lines in the two-wire path and should be nearly identical. If these measurements deviate much from each other this could indicate that

one of the two wires has a ground leakage. There may be slight variations between values indicated on the **Line Surv** screen and those that appear on the **Test Menu**.

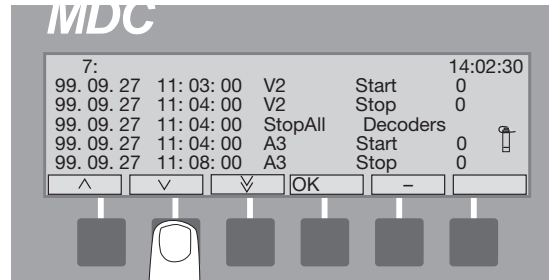
Viewing the Log Data

The **Log Data** shows you a complete list of the controller's activity. The memory holds a 1500 line **log**. Adding a new line after you reach the maximum erases the first line in the **log**.

1. From the **Main Menu**, move the **indicating arrow** to **5. Log Data** and select **OK**.

Note: The display shows five lines at a time (a page). The page number is on the top of the page.

2. Use the **up** and **down arrows** to scroll from page to page.



3. Select **OK** or select **minus (-)** to return to the **Main Menu**.

Creating Irrigation Schedules

Once you customize the MCD2 Controller to the specific equipment and options in your system, the next step is to create irrigation **Schedules** to best suit your turf needs. A **Schedule** is a series of events you wish to have happen in the field at specific times. It is a watering plan that includes the **days** to water, **times** to begin and **end** watering, the various decoders you wish to operate and how long you want them to operate.

You can set up 10 standard irrigation **Programs**, which will start pumps, and one auxiliary **Program (Program 11)**, which does not start pumps. **Programs 1-9** only run one at a time. You cannot run them together. However, you can run **Programs 10 and 11** simultaneously with any one of the other 9 **Programs**.

Creating Irrigation Schedules, continued

Setting the Steps for Each Program

You can set between 1 to 100 individual **Steps** for each **Program**. Each **Step** contains decoders (which operate valves) and **run times**. You can have up to 10 decoders running at the same time, as long as the hydraulics in your system can handle it. The controller prevents you from including more than 10 decoders for each **Step**.

Completed **Steps** could look like this:

Step	Decoders	Run Time
1	T1, T2, T3	10
2	T4, T5, T6	10
3	T7, T8, T9	10
4	T10, T11, T12	10
5	T13, T14, T15	10
6	T16, T17, T18	10

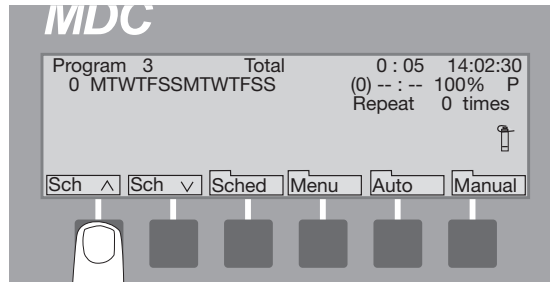
In this example, the **Program** begins with **Step 1**, activating **Decoders T1, T2 and T3** and running the valves (**run time**) for 10 minutes. After 10 minutes, **Decoders T1, T2 and T3** switch off and **Step 2** begins. It continues until all the **Steps** are done.

Note: You may include the same decoder in as many **Steps** as you want.

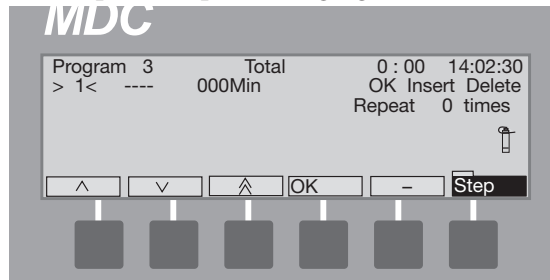
Note: If you want to stop irrigation between **Steps**, you can set up a **Step** without naming a decoder. To do this, simply program in a **Run Time**, or how long you wish to **Pause** the irrigation **Schedule**.

Setting Up Steps

1. From the **Main Operating Screen**, select **Sch** to reach the **Program** you want (1, 2, 3, etc.)



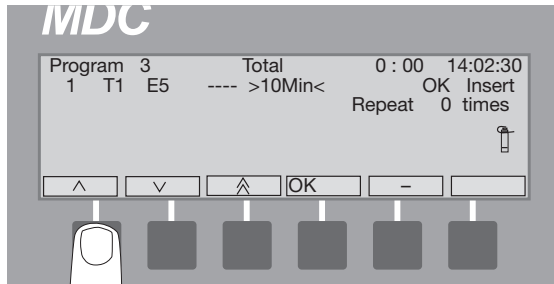
2. Select **Sched.** then **Step** to activate the **Step** number. Alternating blinking **markers** show the field is active. If you have already programmed other **Steps**, you can use the **up** and **down** arrows to scroll through each programmed **Step**. The **Step** label is highlighted.



3. Select **OK** and **OK** again to activate the **Decoder** field.
4. Scroll **up** and **down** through the list of programmed decoders. Select **OK** to choose the first decoder you want to include in this **Step**.

Creating Irrigation Schedules, continued

5. Move to the next field and continue until you select all the **Step 1** decoders. You can select up to 10 decoders for each **Step**.

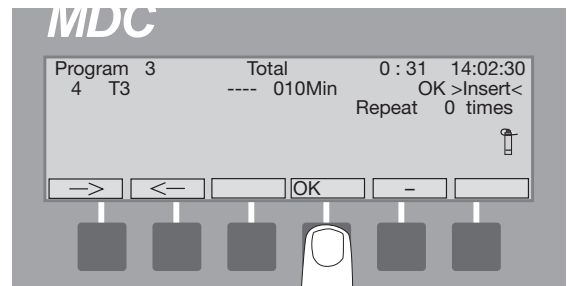


Note: Selecting the **minus (-)** label while in a non-active decoder field (indicated with **right** and **left arrow** labels) or an active **Minute's** field (indicated with **up** and **down arrow** labels) deletes the information you programmed into that field.

6. Move to the **Min** field and select **OK** to activate it.
7. Scroll **up** and **down** to select a run time or how long (up to 999 minutes) you want the decoders to open each valve.
8. Select **OK** to accept the minutes.
9. Move the **markers** to the **OK** field and select **OK** to enter the **Step** into the **Schedule**. The **Step** label is highlighted and the blinking **markers** return to the beginning (**Step 1**) showing you the complete **Step** on the display screen.
10. Scroll to the next **Step** (**Step 2**) and program it the same way. You can program up to 100 **Steps**.
11. Once you finish setting each **Step**, press the button pointing to the highlighted **Step** label to return to the **Schedule Set-up Screen**.

Inserting a Step Between Two Steps

1. From the **Main Operating Screen**, select **Sched** then **Step**.
2. Scroll **up** or **down** to the point you wish to insert the **Step**. If you want to insert a **Step** between **Steps 3** and **4**, scroll to **Step 4**.
3. Move the **marker** to the **Insert** field and select **OK**.



4. Program the **Step** as you normally would and select **OK** to enter the new **Step** into the **Schedule**. The inserted **Step** moved **Step 4**, and all successive **Steps**, up one. So **Step 4** is now **5**, **Step 5** is **6**, and so on.

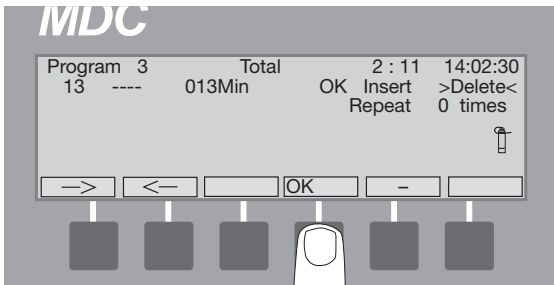
Note: Selecting the **minus (-)** label while in a non-active **Decoder** field (indicated with **right** and **left arrow** labels) or an active **Minute's** field (indicated with **up** and **down arrow** labels) deletes the information you programmed into that field.

5. Select **Step** to return to the **Schedule Set-up Screen**.

Creating Irrigation Schedules, continued

Deleting Steps

1. From the **Main Operating Screen**, select **Sched.** then **Step**.
2. Scroll **up** or **down** to the **Step(s)** you want to delete.
3. Move the **marker** to the **Delete** field and select **OK**. The previous **Step** now shows on the display screen and all the successive **Steps** move back one.



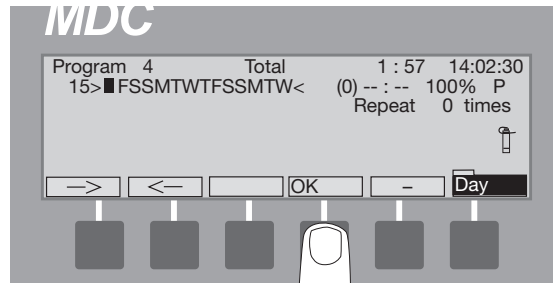
Note: Selecting the **minus (-)** label while in a non-active **Decoder** field (indicated with **right** and **left arrow** labels) or an active **Minute's** field (indicated with **up** and **down arrow** labels) deletes the information you programmed into that field.

4. Select **Step** to return to the **Schedule Set-up Screen**.

Selecting the Days

Each **Program** runs on a 14-day cycle. You can set each individual **Program** (or **Schedule**) to run on any day in the cycle. The programming repeats itself after 14 days.

1. From the **Main Operating Screen**, scroll to the **Program** you want.
2. Select **Sched.** then **Day** to activate the 14-day **Schedule**. The blinking **markers** and **box** show the field is active. The **Day** label is highlighted.
3. Move the blinking **box** to each day you want to irrigate and select **OK** to schedule that day.



Example: If you want to irrigate every **Monday**, **Wednesday**, **Friday** and **Sunday**, move the box to those days in the 14-day **Schedule** and select the days you want or delete the days you do not want to include in the **Schedule**. Select the **minus (-)** labels to delete days (not water on those days) or use the **right** and **left arrow** labels to move to each day you want to water and select **OK** to program those days.

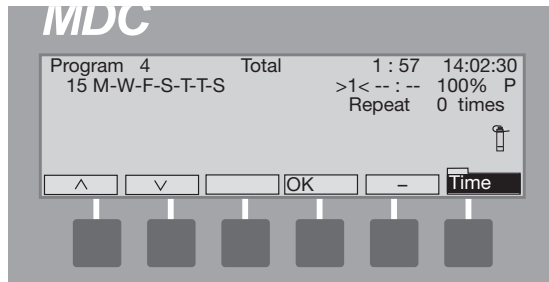
4. When you are finished, select **Day** to return to the **Schedule Set-up Screen**.

Creating Irrigation Schedules, continued

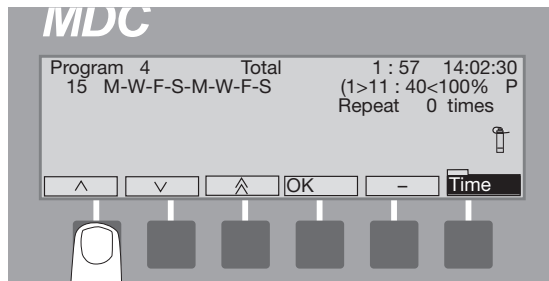
Selecting a Start Time

You must select at least one start time for each **Program**. You can have up to six start times for each **Program** for each day.

1. From the **Main Operating Screen**, scroll to the **Program** you want.
2. Select **Sched.** then **Time** to activate the **Start Time** indicator (1-6) field. The blinking marker shows the field is active. The **Time** label is highlighted.



3. Scroll **up** or **down** to the first **Start Time** indicator (1) and select **OK**.



4. Use the **up** and **down** arrows to set the first **Start Time**.
5. Select **OK** to enter the **Start Time** into the **Schedule**.
6. Scroll to the second **Start Time** indicator (2), select **OK** and enter a second **Start Time** into the **Schedule**. Continue until you are finished (up to six).
7. Select **Time** to return to the **Schedule Set-up Screen**.

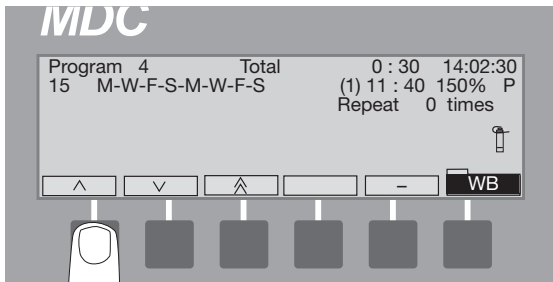
Note: Start times must be separated by a minimum of two minutes.

Creating Irrigation Schedules, continued

Setting the Water Budget (WB)

Water budget lets you increase or decrease the operating time for each decoder in your **Schedule** from 0 to 250%. The water budget default setting is 100%. The total run time also changes when you change the water budget.

1. From the **Main Operating Screen**, scroll to the **Program** you want.
2. Select **Sched.** then **WB** to activate the water budget field. Alternating blinking markers show the field is active. The **WB** label is highlighted.
3. Use the **up** and **down arrows** to set the **WB** between 0 and 250%.

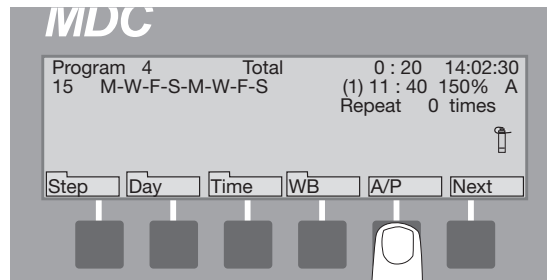


4. Select **WB** to return to the **Schedule Set-up Screen**.

Setting the Programs for Active or Passive (A/P)

You can set each **Program** to be active (A) or passive (P). Active means the **Program** (1-11) responds to all automatic starts and stops if the controller is in the Active Mode. Passive means it will not respond to any automatic settings. If you do not wish to use a **Program** at this time, (but may in the future) set it to **Passive**.

1. From the **Main Operating Screen**, scroll to the **Program** you want to set as **Active** or **Passive** and select **Sched**.
2. Press the button pointing to the **A/P** label to switch the **Program** between **Passive** and **Active**.



3. Select **Next** twice to return to the **Main Operating Screen**.

Creating Irrigation Schedules, continued

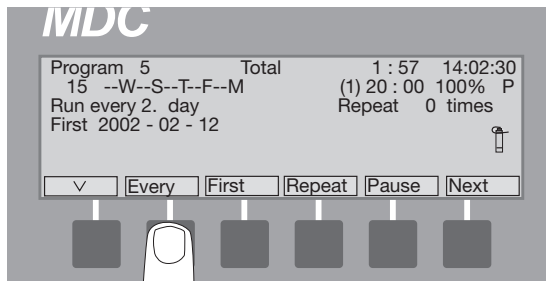
Scheduling to Run on Specific Days and Dates

You can program your controller to irrigate on a selected day(s) and date(s) in a 14-day period, instead of on the 14-day cycle (which begins on the day you initially program the controller). You can also set the first date you want to begin irrigating.

1. From the **Main Operating Screen**, scroll to the **Program** you want.
2. Select **Sched.** then **Next** to reach the **Run every** and **First** labels.

Note: **Run every** refers to which days you want a specific **Program** to run (**Run every 1st day; Run every 2nd day;** etc). **First** (which shows the year, month and day) refers to the date you want the sequence to begin.

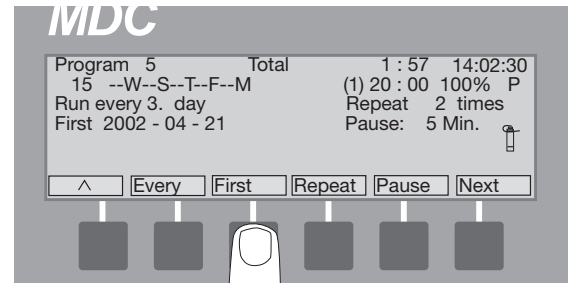
3. To change the **Run every** day, press the button pointing to the **Every** label. Each time you press the button, the day increases by one, up to **Run every 14th day** (in the 14-day **Schedule**).



Note: You can see the 14-day **Schedule** change each time you press the button.

Note: An **arrow** label next to **Every** shows the direction you are scrolling. Pressing the button pointing to the **arrow** label changes the direction you are scrolling.

4. To change the date you want to start the sequence, press the button pointing to the **First** label. Continue to press the button to reach the start date you want.



Note: An **arrow** label next to **Every** shows the direction you are scrolling. Pressing the button pointing to the **arrow** label changes the direction you are scrolling.

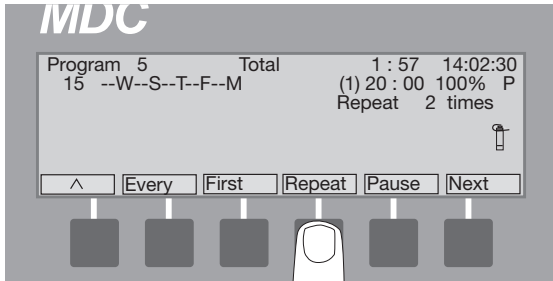
Repeating and Pausing Programs

Once you set-up a **Program**, you can repeat it up to 99 times and set timed pauses (in minutes) between each repeated **Program**.

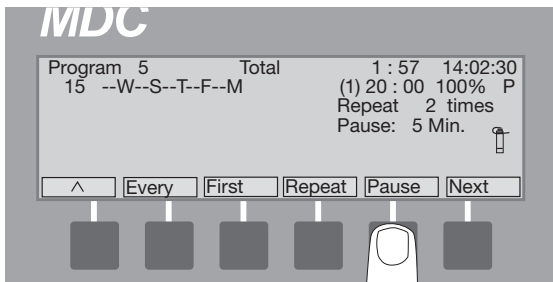
1. From the **Main Operating Screen**, scroll to the **Program** you want to repeat.
2. Select **Sched.** and **Next** to reach the **Repeat** label.

Creating Irrigation Schedules, continued

3. Press the button pointing to the **Repeat** label to set the number of times you want the **Program** to repeat. Holding down the button lets you scroll quickly up to 99 repeat times.



4. Select **Pause** to set a timed pause between each repeated **Program**.



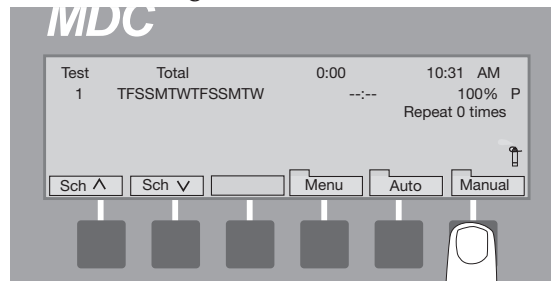
Note: An **arrow** label next to **Every** shows the direction you are scrolling. Press the button pointing to the **arrow** label to change the direction you are scrolling.

5. Select **Next** to return to the **Main Operating Screen**.

Setting Up an Automatic Test Program

The MDC2 Controller allows you to set up a Test Program to automatically activate and test all decoders (from the first one you installed to the last), one by one. You can adjust the Decoder Activation Time between 10 and 240 seconds. 240 seconds is especially useful if you wish to walk through and visually inspect each decoder as they activate.

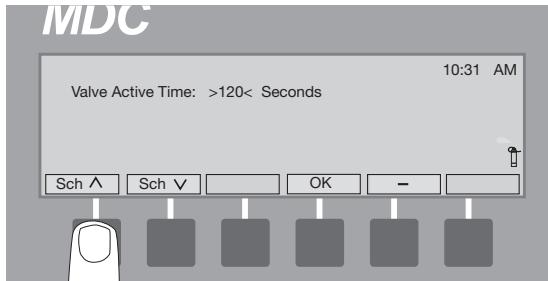
1. From the **Main Operating Screen**, press the button pointing to the **Sch down** label to reach the **Test Program**.



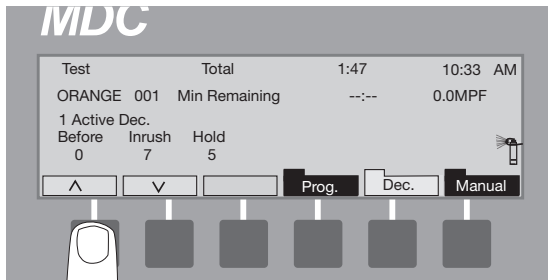
2. Select **Manual** to reach the **Select Program or Decoder** screen. The **Manual** label is highlighted.

Creating Irrigation Schedules, continued

3. Select **Prog.** to reach the test screen and select **OK**. **Valve Active Time 120 Seconds** appears on the display screen.



4. Use the **Sch up** and **Sch down** arrows to set the valve active time. Change the **Valve Active Time** anywhere between 10-240 seconds.
5. Select **OK**. The **Testing Display Screen** appears and the Program and Manual labels are highlighted.



Note: The controller is now testing all active decoders. The screen displays the three current measurements (**Before**, **Inrush** and **Hold**) for each decoder it tests.

6. You can cancel the test at anytime by selecting **Prog.**

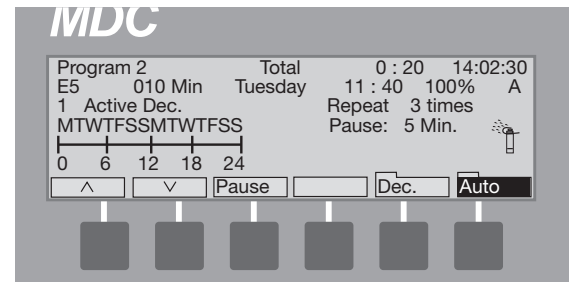
Operating the Irrigation Programs

You can operate the MDC2 Controller completely automatically, completely manually or by a combination of both.

Starting Automatic Irrigation Programs

When you start **Automatic Irrigation**, all **Active Programs** will run according to the **Schedule** you set up. The controller only runs **Active Programs**, not **Passive**.

1. From the **Main Operating Screen**, scroll to the **Automatic Program** you want to start and select **Auto**.



Creating Irrigation Schedules, continued

The **Auto Display Screen** shows:

- the **Program**,
- the **Total** run time,
- the **current time**,
- the name of the **Active Decoder(s)** (during a **Schedule**),
- the number of **minutes** the decoder is active (during a **Schedule**),
- the day and time of the first **Scheduled** start time,
- the **WB** setting,
- the number of **Active Dec.** (during a **Schedule**),
- the number of times this **Schedule Repeats**,
- the length of **Pauses** between repeats,
- the **Scheduled** irrigation days in the 14-day cycle,
- a **time line**, separated in six-hour increments, showing the **Active** time period of the **Program** (indicated by a black block),
- a **sprinkler** icon that “sprinkles” during irrigation and,
- the **Auto** label is highlighted.

Note: If none of the 11 **Programs** are **Active**, the message, ****No Active Programs**** appears on the display screen.

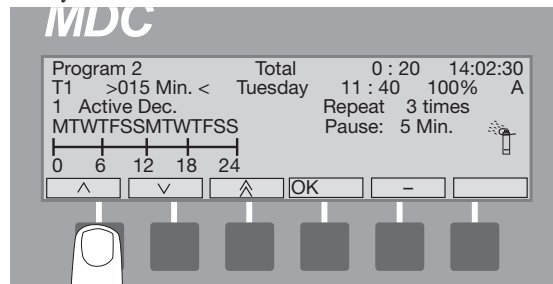
Note: If no irrigation **Schedule** is currently running while the controller is set in **Automatic**, **0 active Decoders** shows, until the first **Schedule** starts. The **Dec.** and **Auto** labels are highlighted and the **sprinkler** icon “sprinkles” when a **Schedule** starts.

2. Selecting **Pause** temporarily stops the **Automatic** irrigation **Schedule**. Select **Pause** again to return to **Automatic**.
3. Pressing the button pointing to the **Auto** label stops the irrigation **Program** and returns you to the **Main Operating Screen**.

Activating a Decoder in Auto Mode

While the controller is set in **Automatic**, you can (manually) activate decoders before or in-between programmed irrigation **Schedules**.

1. Select **Dec.** and scroll through the list of installed decoders to find the one you want to activate and select **OK**.
2. Scroll **up** and **down** to select how many minutes you want the decoder to be active.



3. Select **OK** to lock the decoder in memory and return to the **Automatic Display Screen**. Both **Dec.** and **Auto** labels are highlighted and the **sprinkler** icon “sprinkles.”

Creating Irrigation Schedules, continued

4. Follow steps (1-3) to activate additional decoders.
5. You can now use the **up** and **down arrow** labels to scroll through all the **Active Decoders**.

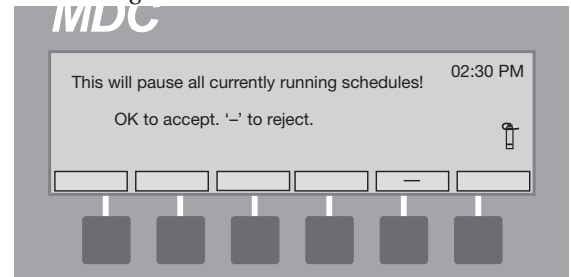
Note: When the time you set for each **Active Decoder** runs out, the **sprinkler** icon stops and the controller returns to the **Automatic** mode with only the **Auto** label highlighted.

Activating an Irrigation Schedule in Auto Mode

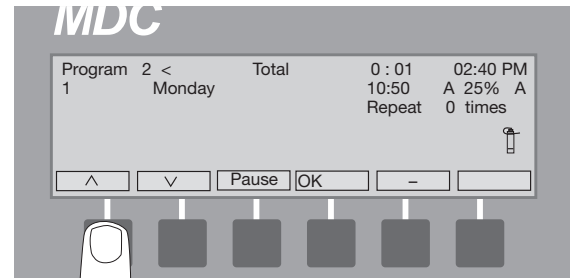
Just like starting a schedule manually by switching the controller to the **Manual** mode, it is also possible to start an irrigation schedule manually when your controller is in **Auto** mode. When you manually start an irrigation schedule, the running programs are paused and the remaining parts are stacked to run after the manually started schedule(s) finish. It is possible to start up to three (3) schedules manually and they will all be stacked in the order that they are entered, but all prior to the stacked auto-schedules. Unlike in the **Manual** mode, you do not need to switch the controller's operating mode.

To start a schedule manually when the controller is in **Auto** mode:

1. Select **Program**. You will see the following message:



2. Select **OK**.



3. Use the **up** and **down arrows** to choose the program that you wish to run manually and select **OK**.

The number of active decoders as well as the remaining run time will be displayed and the sprinkler icon will “sprinkle”.

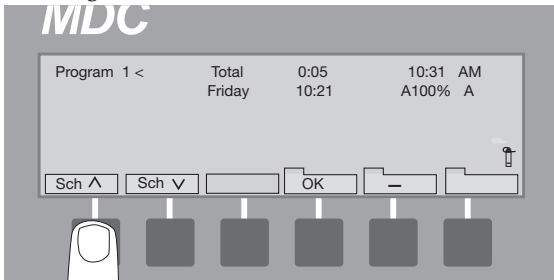
Note: Your controller remains in **Auto** mode during the manually run irrigation schedule and resumes its normal course of the stacked irrigation schedules once the manually run schedule is over. Please note that it is not possible to pause a manually activated irrigation schedule.

Creating Irrigation Schedules, continued

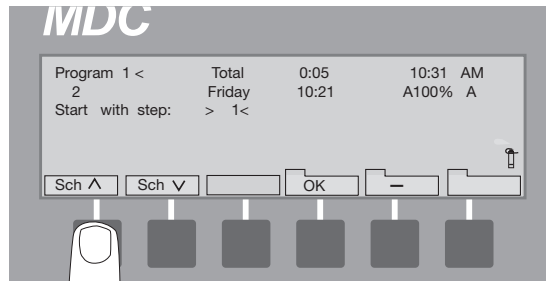
Manually Starting an Irrigation Schedule

Operating the irrigation **Programs Manually** overrides all **Automatic Programs**. When you manually start an irrigation schedule, the running programs are paused and the remaining parts are stacked to run after the manually started schedule(s) finish. It is possible to start up to three (3) schedules manually and they will all be stacked in the order that they are entered, but all prior to the stacked auto-schedules.

1. From the **Main Operating Screen**, select **Manual**. The **Manual** label is highlighted and you are asked to **Select Program or Decoder**.
2. Use the **up** and **down arrows** to select an Active Program.



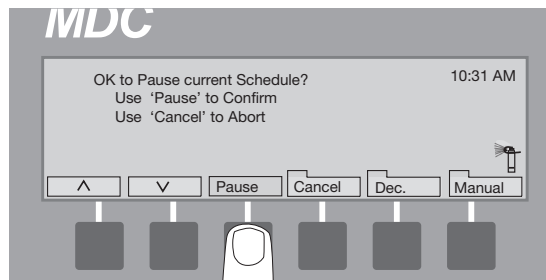
3. Select **OK**. The display will show the number of the steps in that program and will ask you **which step** you would like to start the irrigation with.



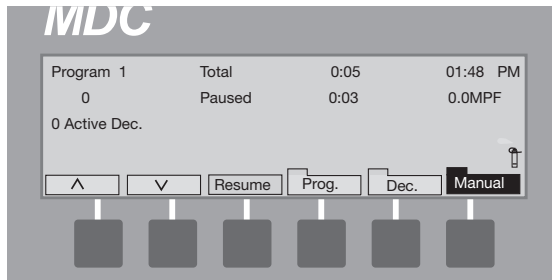
4. Use the **up** and **down arrows** to change the step number.
5. Select **OK**.

Note: The **Manual Program** starts at the first full minute. The **Program** starts by displaying the first decoder in the **Step** along with the **Remaining run time** for that **Step**. You will also see the **Total Remaining Time** for the complete **Program**. The **sprinkler** icon starts to “sprinkle.” Please note that it is not possible to pause a manually activated irrigation schedule.

6. Select **Pause** to pause the current **Program Schedule**. The display asks if it is **OK to Pause Current Schedule**. If you select **Cancel to Abort**, you will return to the Use Manual Display Screen.



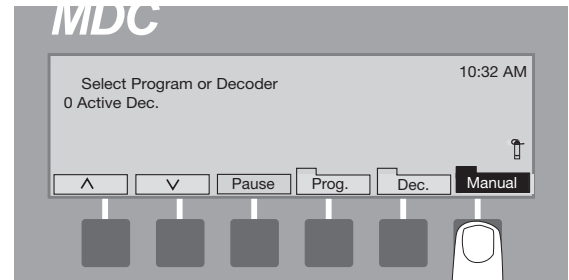
Creating Irrigation Schedules, continued



7. Select **Pause**. **Pausing** appears on the display, showing the command registered. Irrigation continues until the next full minute. At the full minute mark, all activated sprinklers stop and the display reads **Paused**.
8. Select **Resume** to continue irrigating. The display asks if it is **OK to Resume Current Schedule**. **Cancel** returns the controller to the **Pause** state.
9. Select **Resume** to return to the **Manual Display Screen** and continue with the scheduled irrigation **Program**.

Once the irrigation is over, the screen again asks you to **Select a Program or Decoder** for manual activation.

To resume the normal automatic mode after the manual irrigation is over:



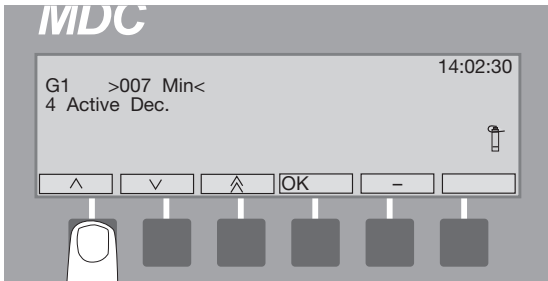
10. Press **Manual** to return to the **Main Operating Screen**.
11. Press **Auto** to put the controller back in the Auto mode.

Creating Irrigation Schedules, continued

Manually Activating a Decoder

The MDC2 Controller allows you to activate programmed decoders manually.

1. From the **Main Operating Screen**, select **Manual**. The **Manual** label is highlighted and you are asked to **Select Program or Decoder**. The display also shows the number of **Active Decoders**.
2. Select **Dec.**
3. Scroll through the list of programmed decoders. Choose a decoder and select **OK**.
4. Use the **up** and **down arrows** to program how long you want the decoder to be active and select **OK**.

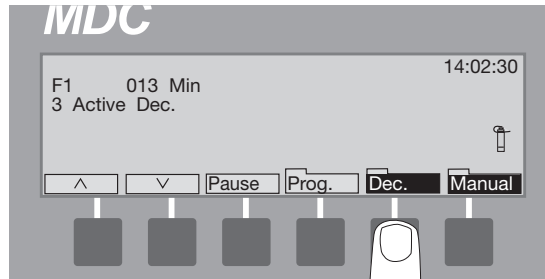


Note: The display now shows the number of **Active Dec.**, displaying only one at a time. The **sprinkler** icon starts to “sprinkle.”

5. Follow steps (2-4) to manually activate more decoders.
6. Use the **up** and **down arrows** to scroll through each **Active Decoder**.

Manually Stopping an Active Decoder

1. From the **Active Decoder Screen**, select **Dec.**
2. Scroll through the list of **Active Decoders** to reach the one you want to stop and select the **minus(-)** label. The **Active Decoder Screen** now shows one less decoder.



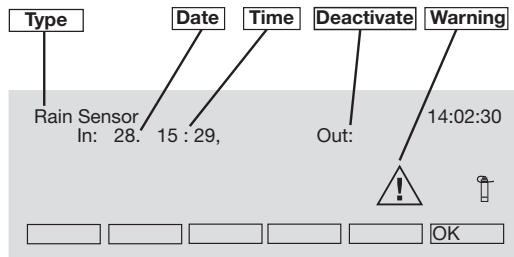
3. Select **Manual** to stop all the manually activated decoders and return to the **Main Operating Screen**.

Note: Please note that you do not need to perform **Step 3.** if your controller is in **Auto** mode.

Creating Irrigation Schedules, continued

Understanding Sensor Warning Signs

If a rain or auxiliary sensor shows an alarm or warning condition, a message like this appears on the display.



- **Type of Sensor**
- **Date** and **time** the **Sensor** activated (**In:**)
- **Date** and **time** the **Sensor** became deactive (**Out:**)
{If it is still active, there is no **Out** time}
- **Warning** sign—displays as long as **Alarm** condition exists

Note: If a rain sensor activates, irrigation stops, but the **Program** keeps running. If the rain sensor is the self-emptying type, irrigation continues as programmed once the sensor changes to **Non-Active**. Selecting **OK** removes the message. As long as the sensor is **Active**, the message will appear again every time you select an **Automatic** or **Manual** function.

Following are key warning indications that will appear on the screen and in logs:

AL# (where # is from 1 to 10) is alarm 1 (occurs while irrigation is in process) for flow sensors. This can also be set up to provide a flow alarm, or as a generic or on/off alarm.

al# (where # is from 1 to 10) is alarm 2 (occurs while not irrigating). This can be set up as a flow alarm, or as a generic or on/off alarm.

ALS indicates a flow SUM alarm that occurs while irrigation is in process.

als indicates a flow SUM alarm that occurs while not irrigating.

SEF indicates SEUF (Seek and Eliminate Unexpected Flow) overflow.

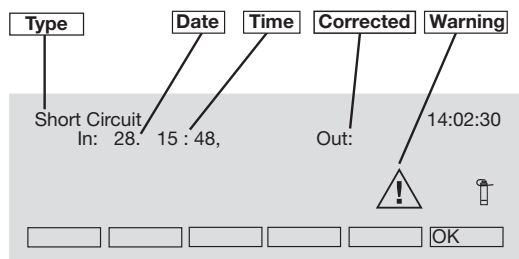
seF indicates SEUF underflow.

MPF is master pump failure. If this is detected, currently running programs will be automatically stopped.

Creating Irrigation Schedules, continued

Sensing a Short Circuit

If the MDC2 Controller senses a short circuit on the lines, it will automatically limit the current to a safe value, change the line frequency from 1 to 50 Hz (making it easier to trace the short circuit) and display this message.



- **Type** of problem (**Short Circuit**)
- **Date** and **time** of problem (**In:**)
- **Date** and **time** problem was corrected (**Out:**) {If it still exists, there is no **Out** time}
- **Warning** sign—displays as long as problem exists

Select **OK** to remove the message. As long as the problem exists, the message will appear again every time you select an **Automatic** or **Manual** function.

Using the Controller with a PC

The MDC comes with its own programming and monitoring software. System set-up data and programs can be entered in the software. They can then be downloaded to the controller. The software can also be used to upload data and programs from the controller. Additionally, it can retrieve log data from the controller, and manually run stations and programs.

You can attach the MDC controller to a PC directly, using a nine-pin serial cable, or through a modem/telephone line. Both connections are easy to find under the faceplate.

Using the Controller with a PC, continued

Linking your PC and Controller

To link your PC using the serial communication port,

1. Open the MDC cabinet and remove the lower panel.

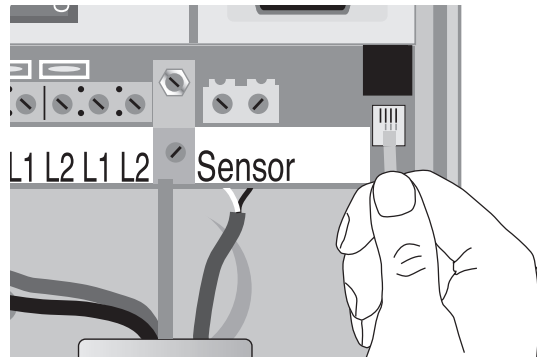
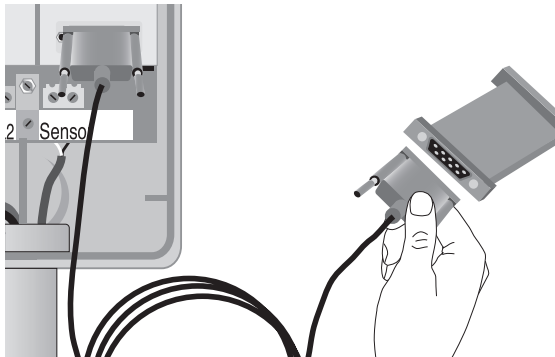
Note: For serial communications, you will need two nine-pin serial cables and an OLK-400 Optocoupler connection.

2. Attach one end of the first serial cable to the MDC serial communication port and attach the other end to the Optocoupler.
3. Attach one end of the second serial cable to the Optocoupler and the other end to your PC serial communication port.

Note: Rain Bird® recommends using the OLK-400 Optocoupler to protect your system against lightning surges. However, you may use a Null-modem cable as a temporary device.

To link your PC using the modem/telephone line connection,

1. Open the MDC cabinet and swing open the faceplate.
2. Feed a modem/telephone line through the two-wire communications conduit or through a separate access hole in the MDC cabinet.
3. Plug the phone clip into the corresponding jack.



Using the Controller with a PC, continued

Installing the Rain Bird® MDC PC Software

Your minimum PC requirements for the Rain Bird® MDC PC Software are:

- Windows 2000, XP/Pro required
- Pentium 3
- 900 MHz
- 256 MB RAM
- 25 MB hard disk space
- 1024 x 768 screen resolution
- CD-ROM
- External modem may be necessary if the internal modem in the PC is not set up to work at lower speeds (2400 bps)

Insert the MDC PC Software CD into your PC's CD-ROM Drive. The CD-ROM software is set to install automatically. However, if your PC does not support this feature, you must then install it manually. Please see your PC Operations Manual to learn how to add new software to your PC. It is recommended to back up the database (rbt.1db) before upgrading from previous versions of the MDC software.

Setting Up a Communications Link

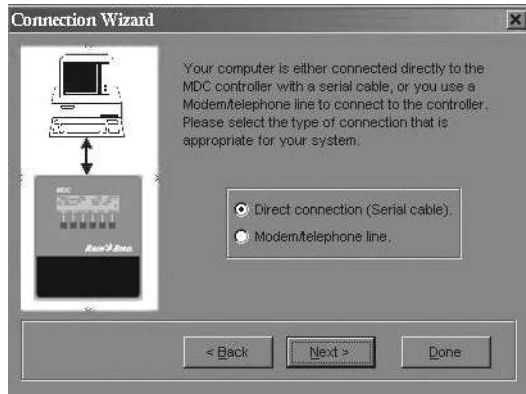
1. At the desktop, select **Start, Programs, RainBird Turf**, and **Turf** from the pull-up menus to open the **Rain Bird Remote Access** window.
2. From **Rain Bird Remote Access**, select **File**, then **Connection wizard** from the pull-down menu.



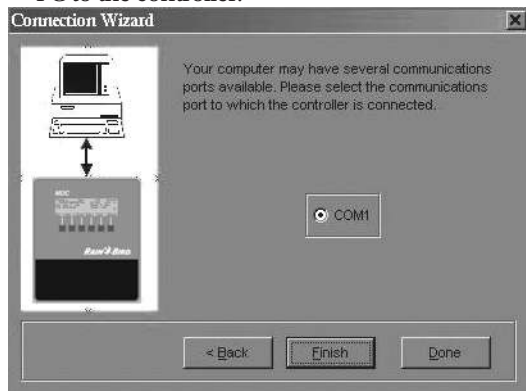
3. The first **Connection wizard** pop-up window gives you the option to name the installation. **Direct** (for direct connection) is the default name. Change the name, if you wish, and select **Next** to advance to the next window. **Done** exits you from **Connection wizard** while saving any changes you made to the default settings.

Using the Controller with a PC, continued

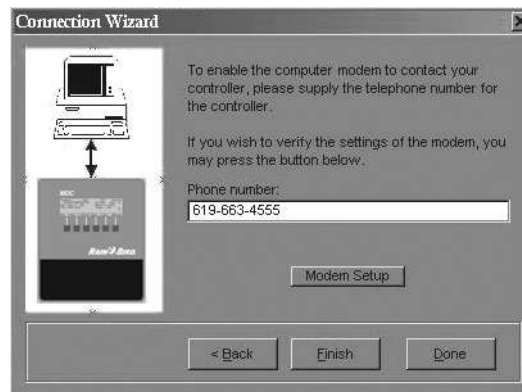
4. The **Connection wizard** now asks you to pick the type of connection your system uses, either a **Direct connection (Serial cable)** or a **Modem/telephone line**. Choose the connection and select **Next**. **Done** exits you from **Connection wizard** and **Back** returns you to the previous window.



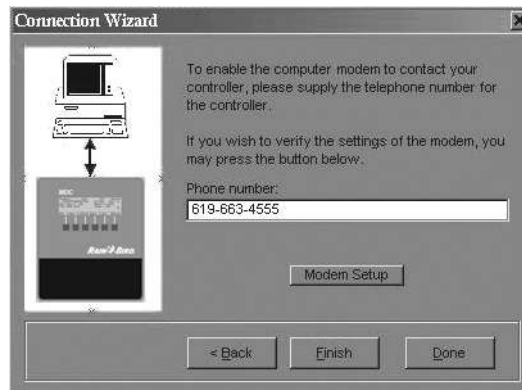
5. If you selected **Direct connection (Serial cable)** you are then asked to select the **Com Port** (Communications Port) you used to connect the PC to the controller.



6. Select **Finish**. **Done** exits you from **Connection wizard** and **Back** returns you to the previous window.
7. If you selected **Modem/telephone line** as your PC/controller connection, you are then asked to supply the telephone number for the controller. At this point, you can also verify the modem settings by selecting **Modem Setup**.



8. Select **Finish**. Use **Modem Setup** to install and setup a new modem. **Done** exits you from **Connection wizard** and **Back** returns you to the previous window.

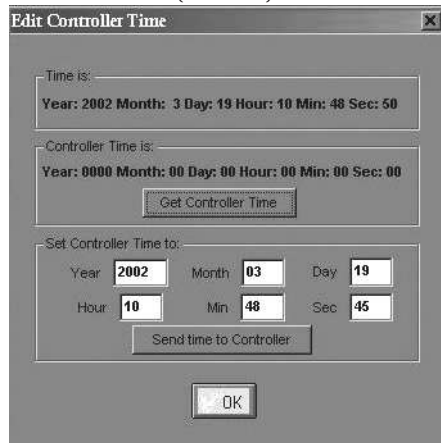


Using the Controller with a PC, continued

Verifying the Time and Date

Once you establish a communication link between the controller and PC, you then need to verify the controller's time and date. Time and date directly affect irrigation **Schedules**. If either is incorrect, the irrigation **Schedules** are also incorrect.

1. From the **Rain Bird Remote Access** window, select **Controller**.
2. Select **Get Set Time/Date** from the pull-down menu to reach the **Edit Controller Time** pop-up window. This can be set up for either US or international (24-hour) time formats.



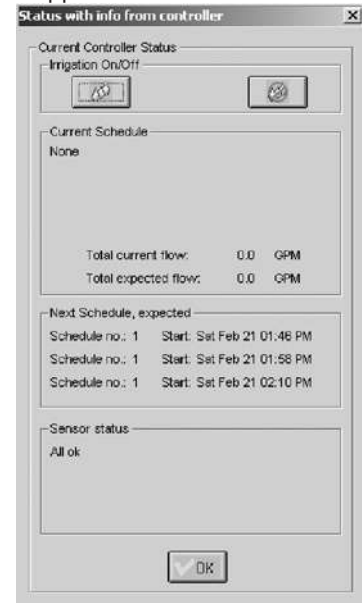
3. Select **Get Controller Time** and verify that the **Controller Time** matches **Time is** (PC time).
4. If necessary, adjust the date and time and select **Send time to Controller**.
5. Select **OK** once the two times match.

Controller Status Observation

You can get information about the current status of the controller, including the **Start** and **Stop** times of the **Current** and **Next Schedule**, **Total Current Flow**, **Total Expected Flow**, and **Sensor Status**.

1. From the **Rain Bird Remote Access** window, select **Controller** and then **Controller Status**. You will be presented with the status information retrieved from the controller as seen below.

Note: While the PC is retrieving status data from the controller, the Communications Status pop-up window appears visually showing the progress. The window disappears once the status data is retrieved.



Selecting **Disconnect** from the **Controller** pull-down menu disconnects the PC connection to the Controller.

Using the Controller with a PC, continued

Using the MDC PC Software

The MDC PC Software lets you retrieve installation and irrigation data—information about **decoders**, **valve types**, **pumps**, **sensors** and irrigation **programs**—from the controller. You can then edit the data and send it back to the controller.

Retrieving the Data

1. From the **Rain Bird Remote Access** window, select **Retrieve data**.
2. Select **Retrieve all data** from the pull-down menu. All data includes installation and irrigation data (schedules). **Retrieve irrigation data (schedules)** retrieves only the irrigation data from the controller. **Retrieve monitor information** retrieves the monitoring information, which is covered in detail on page 72.

Note: While the PC is retrieving data from the controller a **Communications Status** pop-up window appears visually showing the progress. The window disappears once the data is retrieved. If the PC is unable to establish communications with the controller, an Error message appears, asking to make sure the Connection Information is correct.

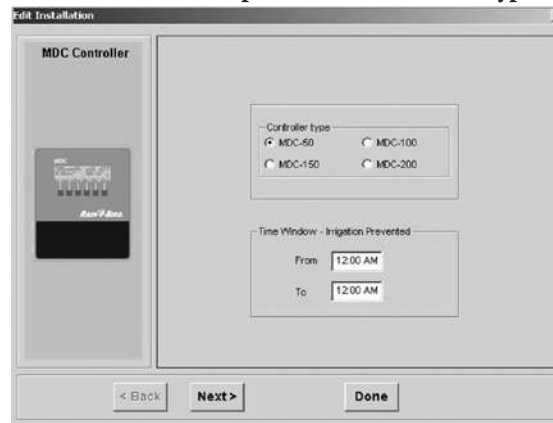
Note: When retrieving data from the controller, the following steps should be followed:

1. Back up data in the PC.
2. Clear all data in PC.
3. Retrieve data from the controller.

Editing Set-Up Data

You can edit the installation data you retrieved from the controller or set up all installation data using your MDC PC software and send it to the controller. Both editing or setting up brand new information are done on the Edit Installation screen. The **Edit Installation** screen acts as a wizard walking you through the installation steps and lets you set up data specific to each component. To edit installation data:

1. From **Rain Bird Remote Access** window, select **Edit Data**.
2. Select **Edit Set-up Data** and **Controller Type**.

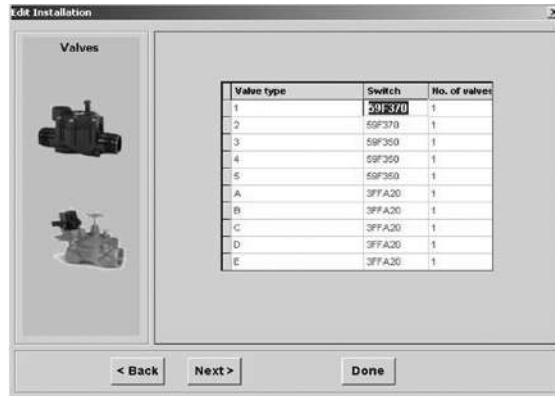


3. Choose **Controller Type**.

Note: The controller type depends on the number of expansion modules installed inside the controller. If your MDC2 Controller is not using any expansion modules, then select RBT-50. Select RBT-100 if it is using one expansion module, RBT-150 for two modules and RBT-200 for three expansion modules.

Using the Controller with a PC, continued

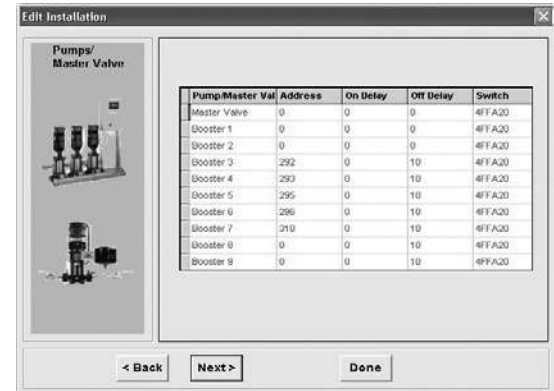
- If you wish for irrigation not to take place for a certain period of time on your site (**Non-Water Window**), specify this timeframe on the **Time Window - Irrigation Prevented** area. During the Non-Water Window, schedules will continue, but with no decoders being turned on.



- Hit **Next** to reach **Valves** configuration information.
- Confirm **Valve Type**, **Valve Switch Code** and **No. of Valves** and edit them as necessary (the software will allow you only to select 1 or 2 for the number of valves).

Note: Valve types refer to the electric requirements of magnetic solenoids. The default **Switch Code** settings are 59F350 for irrigation **Valve types** and 3FFA20 for non-irrigation **Valve types**. If your system uses Rain Bird® 24 VAC solenoids, do not change any of these settings. If your system operates solenoids that are not Rain Bird®, do not change the default **Switch Codes** before verifying if the solenoids open. If the solenoids do not open, you may need to change the **Activation Time** and/or **Holding Voltage**. Please see **Appendix II: Selecting Electrical Codes for Solenoids**.

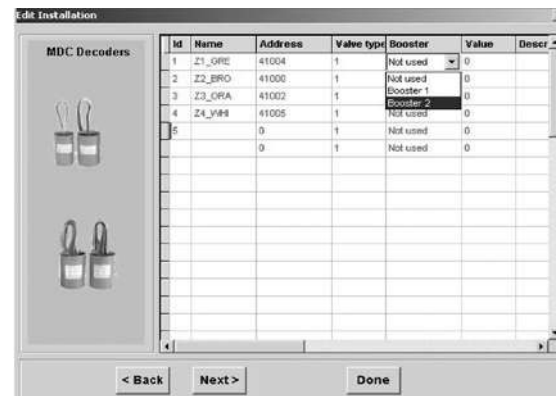
- Hit **Next** to reach **Pumps/Master Valve** configuration information.



- Edit information specific to each **Pump/Master Valve** as necessary, including **Address**, **On Delay**, **Off Delay**, and **Switch Code**.

Note: **On Delay** means that the **MV/Booster** start will be delayed XX seconds after activation of the decoder. **Off Delay** means that the **MV/Booster** will remain activated XX seconds after deactivation of the decoder.

- Hit **Next** to reach **MDC Decoders** configuration information.

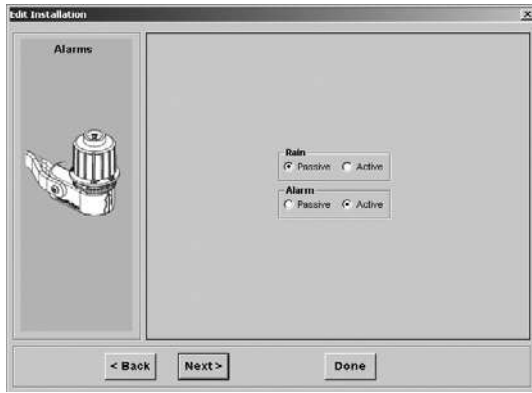


information.

Note: The MDC software does not allow deleting decoders. Alternatives are to either erase or change decoder data.

Using the Controller with a PC, continued

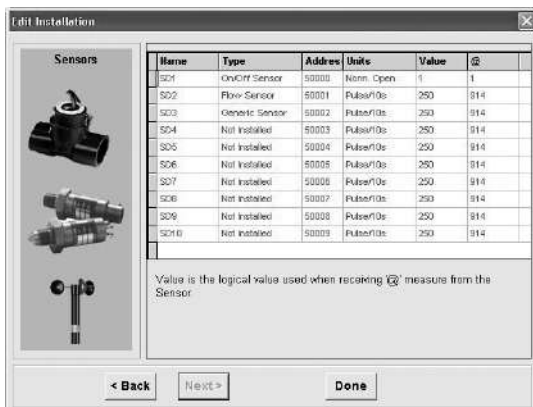
10. Edit information specific to each MDC decoder, including **Name, Address, Valve Type, Flow Value** and **Description**. Value lets you assign a **Flow Value** that is used for SEUF calculation.
11. Hit **Next** to reach **Alarms** configuration information.



12. Choose to make rain or alarm sensors passive or active as necessary.

Note: The software will allow only one rain or alarm sensor to be active.

13. Hit **Next** to reach **Sensors** configuration information.



14. Edit information specific to each **Sensor Decoder**, including **Name, Type, Address, Units, Value**, and **@ measure**.

Note: **Digital** (pulse output) flow sensors are most common. Please see the manufacturers' specifications to determine the **sensor type, maximum flow** and **sensor output**. Choose **Pulse/10s** if your **digital** flow sensor uses a higher pulse rate (30-200 pulses per second) and counts the number of pulses in 10-second intervals. Choose **mA** if you are using an **analog** flow sensor.

To establish a conversion ratio the controller uses to calculate the flow, you only need to program the **(Value) flow output** and **sensor output**. Rain Bird® recommends you enter the maximum flow, which determines the pulse type.

15. Click **Done** when you complete your installation set-up process.

Note: Edit Installation Wizard is particularly important when you are setting up your MDC system for the first time. It helps you go through the installation data and guides you through the setup process making sure all the possibly applicable components of your MDC system are covered. However, anytime you need to change setup information for a particular component of your MDC system, you can directly jump into the setup screen for that specific component. For instance, **Edit Data>Edit Set-up Data>Decoders**, as shown in the figure below, will take you to the Decoders Edit Installation Screen.



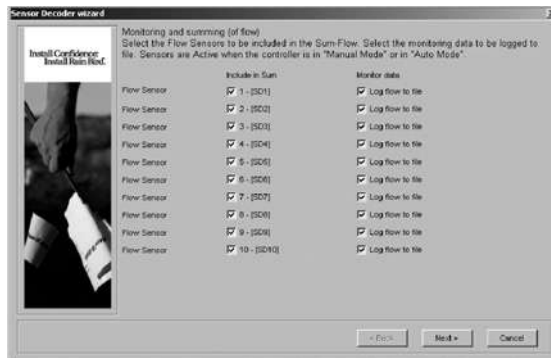
Using the Controller with a PC, continued

Configuring Sensor Decoder Settings

Sensor Decoders monitor dry contact switches (e.g., moisture sensor, pressure switch, and security systems) for open or closed conditions and inform the MDC system of switch status. Your MDC system supports up to 10 sensor decoders. Sensor decoders can be **Flow Sensors**, **On/Off Sensors** or **Generic Sensors** (Please note that the type of sensor decoders are set up on the **Edit Installation >Sensor Decoders** screen).

After you decide what type of sensors you have in your MDC system in the Edit Installation Wizard, you can now do the Sensor Decoder Type-specific settings through the **Sensor Decoder Wizard**.

1. From the **Rain Bird Remote Access** window, select **Sensor Decoder Wizard**. You are presented with a list of all the sensors in your MDC system. Please note that this first screen in the Sensor Decoder Wizard also asks you if you want to include any of the Flow Sensors in the Sum-Flow.



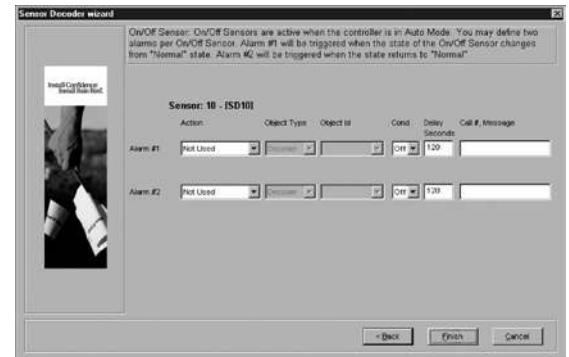
2. Click on the applicable button (either **On/Off**, **Generic** or **Flow**) to set up the alarm condition for each sensor decoder.

Note: Specific definitions for sensors, units of measure and alarm triggers (Actions) are contained in Appendix IV.

Configuring On/Off Sensor Decoders Alarm Condition

On/Off Sensor Decoders act as switches that indicate whether an on or off condition exists. These sensors are useful for indicating thresholds such as the opening and closure of devices such as valves and for alarms.

1. On **Sensor Decoder Wizard**, click on **On/Off**.



2. Set up the alarm information, including **Action**, **Object Type**, **Object ID**, **Flow Limit**, **Conditions**, **Delay** and **Call Setup** for outbound paging. Please note that you can define two (2) alarm conditions per On/Off Sensor Decoder.
3. Click **Next** to define alarms for another On/Off Sensor Decoder or **Finish** if you are done.

Note: When setting up an action to activate a decoder, please note the duration of this action will default to 999 minutes. Also, setting up an action to deactivate a pump or master valve will not deactivate decoders associated with it.

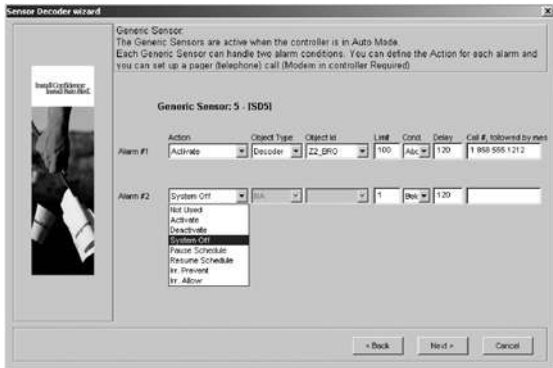
Note: When setting up “Irrigation Prevent” as an action, please note that this will be applied to schedules in **Auto Mode** but not those that are manually started.

Using the Controller with a PC, continued

Configuring Generic Sensor Decoders

Generic sensors refer to analog sensors other than flow sensors. The Sensor Wizard also gives you the option to have sensor data in the MDC's log. To select this option, click on "Log to File" in the Monitor Data column.

1. On **Sensor Decoder Wizard**, click on **Generic**.



2. Set up the alarm information, including **Action, Object Type, Object ID, Absolute Limit, Conditions, Delay** and **Call Setup**. Please note that you can define two (2) alarm conditions per Generic Sensor Decoder.

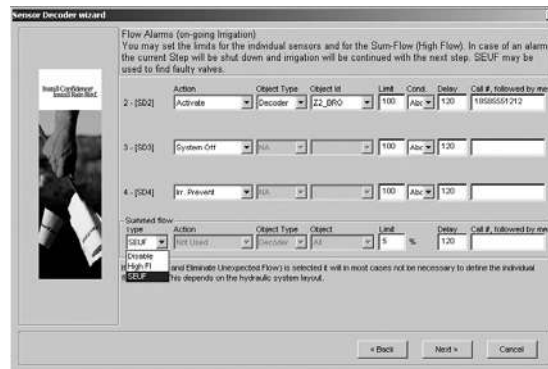
3. Click **Next** to define alarms for another Generic Sensor Decoder or **Finish** if you are done.

Configuring Flow Sensor Decoders

The measurement of flow rate in the mainline is one of the most important measurements in an irrigation system. Flows that are out of range, either high or low, can be reported and acted upon. Flow sensors can be read remotely by your MDC system hardware designed with this feature.

Your MDC control system can continually check on the flow rate in the system and compare it to pre-defined acceptable levels. It can also be set up to make an outgoing page if the MDC is connected to a phone line. You can define the flow alarm thresholds as follows:

1. The **Sensor Decoder Wizard** provides an option to include individual sensor flow readings in a summed flow. To select this option, click on the box next to the sensor decoder number (SD_) in the Include in Sum column. To have data from individual flow sensors recorded in the MDC log, click on "Log to file" in the Monitor Data column. Summed flow is always recorded.
2. On **Sensor Decoder Wizard**, click on **Flow**.



3. Set up the alarm information, including **Action, Object Type, Object ID, Flow Limit, Conditions, Delay** and **Call Setup**. Please note that you can define only one alarm condition per Flow Sensor Decoder. These options can also be set up for summed flow if that was previously selected in the **Sensor Decoder Wizard**.

4. On the **Sensor Decoder Wizard**, click on **Next**.

Using the Controller with a PC, continued

5. If desired, alarms can also be set up to operate when not irrigating to detect unexpected flow or leaks.



6. Set up the alarm information, including **Action, Object Type, Object ID, Flow Limit, Conditions, Delay and Call Setup**. Please note that you can define only one alarm condition per Flow Sensor Decoder. These options can also be set up for summed flow if that was previously selected in the **Sensor Decoder Wizard**.

Note: For **Flow Control** set as below condition and alarms management the following should be considered:

1. When the flow has a transition from a value above the limit to below an alarm will trigger.
2. If no decoders are running for a period of time the MDC will be in non-irrigation mode and thus look for leak flow if set up to do so.
3. When decoders are started again it will then look again for a transition from above the limit to below and an alarm will trigger.
7. Click **Next** to define alarms for Main Pump Failure.

Note: Flow limits can be set up to a maximum of $\pm 50\%$.

Note: See Appendix IV for information on sensor decoder alarm parameters and values.

Main Pump Failure Alarm

In case irrigation does not start, you can protect your pump by setting a minimum flow limit. The MPF alarm will stop currently running schedules, but not new schedules.

1. Specify this **Limit** (minimum flow) and (if desired) call setup information for outbound paging on the **Main Pump Failure Alarm** screen shown below.



2. Click **Finish**.

Erasing the set-up data

You can erase **ALL SET-UP DATA** and **IRRIGATION SCHEDULE CONTENTS** stored on the PC.

1. From the **Rain Bird Remote Access** window, select **Edit Setup data**.
2. Select **Edit set-up data** and **Erase all** from the pull-down menus to reach the **Erase set-up Data** pop-up window.

Using the Controller with a PC, continued



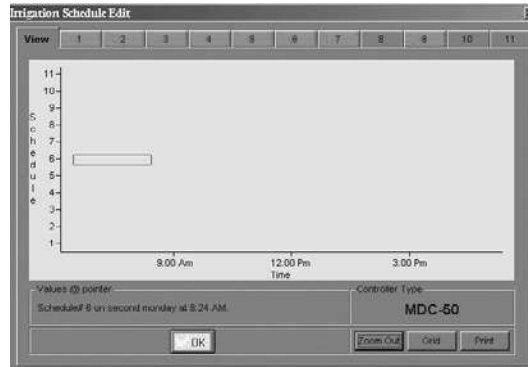
3. Select **Yes** to erase the information. Select **No** to cancel the action.

Editing irrigation schedules

1. From the **Rain Bird Remote Access** window, select **Edit data**.
2. Select **Edit irrigation data** and **Irrigation schedules** from the pull-down menus to reach the **Irrigation Schedule Edit View** pop-up window.

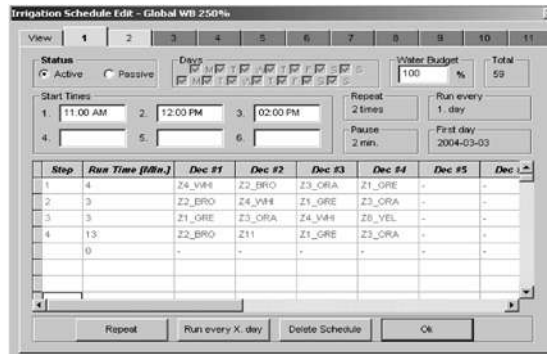
Note: The **Irrigation Schedule Edit View** window shows you an overview of each **Program** schedule. Use the numbered tabs on top (1-11) to reach the actual edit windows for each of the 11 **Programs**. The **View** window features three additional control buttons. The **Zoom Out** control restores the full view of all schedules after zooming in on a particular schedule on the bar graph; **Grid** places grid lines over the **Schedule**; and **Print** prints the **Schedule**.

To view a detailed section (i.e., **Schedule 5**, Monday, between 6:10 am and 6:45 am) click on the graph. With the left mouse button pressed, drag the cursor across the section of the **Schedule** you want to view. Dragging the cursor forms a rectangle showing the area of the **Schedule** you want to detail. Release the mouse button to **Zoom In**. The **Schedule** now shows only the detailed area you selected. To return the screen back to normal, select the **Zoom Out** button again.



Note: When you move the cursor to a section on the **View** window, a **Values @ pointer** shows you the corresponding **Schedule**, **day** and **time** for the section where the cursor points.

3. Select the tab of the **Schedule** you want to change to reach the **Irrigation Schedule Edit** window.



Note: The **Irrigation Schedule Edit** windows let you add **Schedules** or change information in current **Schedules**. For example, use these windows to change **Schedules** from **Active** to **Passive**, change the **days**, adjust the **water budget**, **start** and **repeat** times, add **pauses** to **Schedules** and **run times**, add **steps** and select different **decoders**.

Using the Controller with a PC, continued

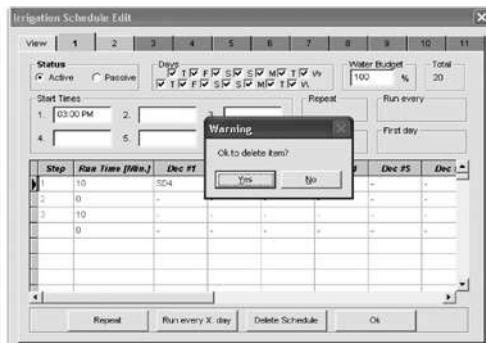
Note: Start times must be separated by a minimum of two minutes.

Note: A drop-down box appears when you select the **Decoder** columns. Use the drop-down boxes to make your selections from the **decoders** you already programmed into the controller.

4. Select **OK** to save the irrigation **Schedule** changes.

Note: Please see **Creating Irrigation Schedules** on page 41.

Note: To insert or delete a line in a schedule, click on the column immediately to the left of the step number. An arrow pointing to the right will appear. Then press the insert or delete key on the computer keyboard. Pressing the insert key will immediately insert a blank line above the step selected. Pressing the delete key will cause a warning box to appear. To confirm deletion of that line, click on “Yes”. Using this method will ensure that the database is properly updated.



Deleting a Schedule

When you delete a schedule, all irrigation programming information is erased from that schedule. You can return to the schedule at a later time and create a new program under the same irrigation schedule number. The **Irrigation Schedule Edit** screen employs color coding to

indicate the status of irrigation schedules. The tab of each Schedule will be one of these colors:

Green - indicates the Schedule is Active

Red - indicates the Schedule is Passive

Gray - indicates the schedule has no information in it.

To erase all data for a particular schedule:

1. On the **Irrigation Schedule Edit** window, click on the tab of the Schedule you want to view.
2. Click **Delete Schedule**. You will be asked to confirm the deletion of the schedule (**MDC Notice**).
3. Click **OK**. Note that the color of the tab of the deleted schedule changes to gray.

Erasing all irrigation schedules

You can erase **ALL IRRIGATION SCHEDULES** and **IRRIGATION SCHEDULE CONTENTS** stored on the PC.

1. From the **Rain Bird Remote Access** window, select **Edit data**.
2. Select **Edit irrigation data** and **Erase all** from the pull-down menus to reach the **Erase Irrigation Schedules** window.
3. Select **Yes** to erase the information. Select **No** to cancel the action.

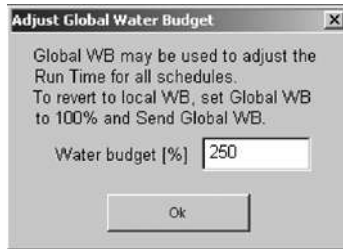
Editing the global water budget

Editing global water budget lets you adjust all the Schedules quickly and easily. If you design individual Schedules with a nominal run time for each decoder and valve, and set the water budget at 100%, you can easily adjust to changes in weather conditions.

1. From the **Rain Bird Remote Access** window, select **Edit data**.

Using the Controller with a PC, continued

2. Select **Edit Global Water Budget** and an **Adjust Global Water Budget** pop-up window appears.



3. Change the **Water budget percentage** and select **OK**.

Note: You must send the **water budget** changes to the controller before updates to the **Global Water Budget** can take affect.

Sending Data to the Controller

Once you edit the controller information, you must then transmit or send the new information to the controller. From the **Send data** pull-down menu, you can **Send all data** (which includes set-up and irrigation data), **Send irrigation data** only, or **Send water budget** data. The sending procedures are identical.

1. From the **Rain Bird Remote Access** window, select **Send data**.
2. Select **Send all data** from the pull-down menu.



3. If you have changed the **Global Water Budget**, **Send the water budget** data to the controller.

Note: While the PC is sending data from the PC to the controller a **Communications Status** pop-up window appears visually showing the progress. The window disappears once the data is sent.

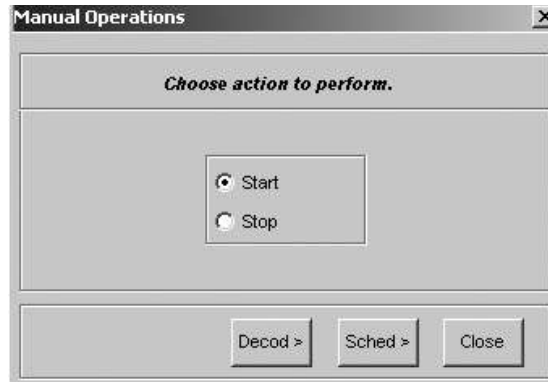
Note: If the PC loses communications with the controller, an Error message appears, asking to make sure the Connection Information is correct.

Note: If an irrigation **Schedule** is running or the controller is set in the **Automatic** mode when you send data, you will be asked if you want to: **Take the controller out of manual or auto mode to send set-up data?** Select **Yes** to send the data or **No** to continue the irrigation **Schedule**. If you select **No**, no data will be sent.

Manual Operations

You can start any schedule or activate any decoder manually when your MDC2 controller is in **Auto** mode.

From the **Rain Bird Remote Access** window, select **Controller** and then **Manual Operations**. The Manual Operations screen appears.



Using the Controller with a PC, continued

Starting a Decoder Manually

1. Choose **Decod**> from the **Manual Operations** window.

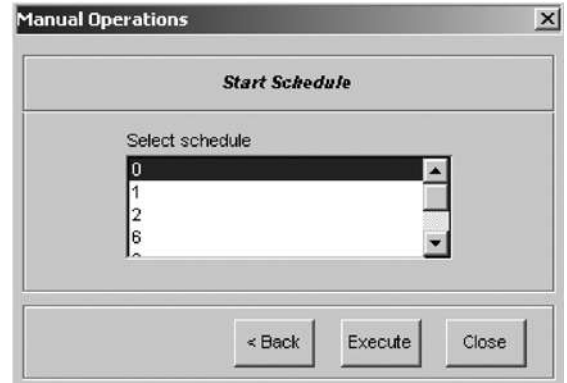


2. Select a decoder that you want to start manually from the pull-down menu.
3. Set **Run Time**. Please note that a station can be set up to run from 1 minute to 999 minutes.
4. Hit **Execute**.
5. Repeat for other decoders as necessary.

Starting a Schedule Manually

When you manually start a schedule, running schedules will be paused and the remaining steps of the schedule will be stacked to run after the manually started schedule(s) finish. Your MDC2 PC Software allows you to start up to three schedules manually and they will be stacked in the order that they are entered, but all will take place prior to the stacked auto-schedules. To start a schedule manually:

1. Choose **Sched**> from the **Manual Operations** window.



2. Select the schedule that you want to start manually.
3. Click **Execute**. Communication status will be displayed.



4. Click **Another** to manually start another schedule or **Close** to exit the **Manual Operations** window.

Retrieving Monitoring Information

The controller stores information about every irrigation event that occurs. These events include every time a valve or pump starts or stops, flow measurements, etc. You can retrieve and store this information on your PC.

1. From the **Rain Bird Remote Access** window, select **Retrieve data**.
2. Select **Retrieve monitor information** from the pull-down menu.

Note: While the PC is retrieving data from the controller a **Communications Status** pop-up window appears visually showing the progress. The window disappears once the data is retrieved.

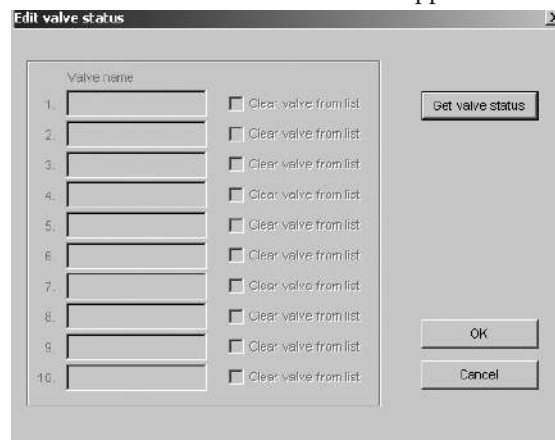
Note: If the PC has lost or is unable to establish communications with the controller, an Error message appears, asking to make sure the Connection Information is correct.

Note: The data stored on your PC is in a binary format. To set up a monitoring information data file (stored in an ASCII file format) you need to **Create a Log File**.

Failed Decoder List

This is a list of valve decoders that have failed due to triggering SEUF (Seek and Eliminate Unexpected Flow) and have been blacklisted.

1. From the **Rain Bird Remote Access** window, select **Controller** and then **Identify Failed Valves**. **Edit Valve Status** screen appears.

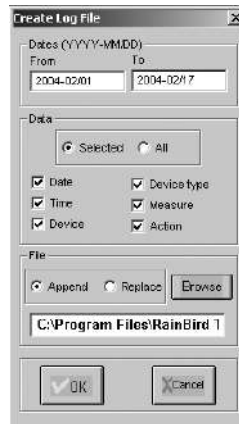


2. Click on **Get Valve Status** to conduct an audit of your valves. Any valves that have malfunctioned and blacklisted shall be listed on this window. If any of them have been found to be working properly or have been fixed, the user must take them off of the black list for the valves to run again. This is done by checking the **Clear Valve From the List** box. If you do that and then click OK, all checked decoders will be sent to the MDC and cleared from the list.
3. Click **OK**.
4. From the **Rain Bird Remote Access** screen, select **Send Data** and **Send All Data** to send the updated information back to the controller.

Operating the Controller, continued

Creating a Log File

1. From the **Rain Bird Remote Access** window, select **File**.
2. Select **Create Log File** from the pull-down menu to reach the **Create Log File** pop-up window.



3. Enter the **From** and **To** dates you want to use.
4. Select the type of **Data** you want to include.
5. Select the location of the file and whether you want this data to **Append** (add to) or **Replace** a current file. To save the file in spreadsheet format, change the file extension from “.mon” to “.csv”.
6. Select **OK** to create the file.

Example: Below is an example of how the information appears in the **Log File**. Each line represents an event. We selected the event information to include the Date (YYYYMMDD), Time, Device, Device Type and Action.

20010919, 085000, 1, I,,Started

20010919, 085000, T1, D,,Started

20010919, 085000, 1, P,,Started

Line 1 tells us that

I (Irrigation Schedule) #1 started on **Sept. 19th, 2001 at 8:50 AM**

Line 2 tells us that

D (Decoder) T1 started on **Sept. 19th, 2001 at 8:50 AM**

Line 3 tells us that

P (Pump) #1 started on **Sept. 19th, 2001 at 8:50 AM**

Note: You can import the file into a spreadsheet or to a database program. To import the file into a spreadsheet, save it using the file extension “.csv”.

Note: Specific device abbreviations include:

P = Pump

B = Power

I = Schedule

D = Decoder

S = Sensor

Operating the Controller, continued

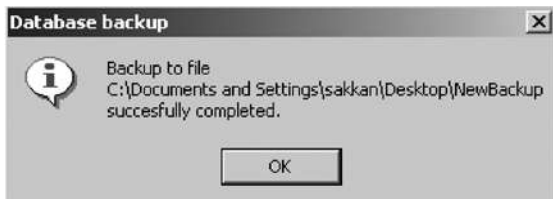
Backing Up MDC Database

1. From the **Rain Bird Remote Access** window, select **Setup** and then **Backup database**. The **Select File for the Database Backup** window appears for you to name the backup database file and decide on its location in your system.



2. Give file a name.
3. Choose a location to save it.
4. Click on Open.

You will be presented with the message below confirming your successful saving of the backup file.



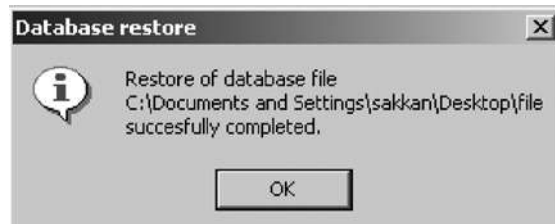
5. Click **OK**.

Restoring Database

1. From the **Rain Bird Remote Access** window, select **Setup** and then **Restore database**. The **Select File for Database Restore** window appears for you to locate the backup database file to be restored into your MDC system.



2. Choose the file and click **Open**. Database restore pop-up shall appear confirming the successful restoration of your backup file.



Operating the Controller, continued

Printing Set-Up and Irrigation Data

1. From the **Rain Bird Remote Access** window, select **File**.
2. Select **Print** from the pull-down menu.
3. Select either **Print set-up data** or **Print irrigation schedules**.
4. Select **OK** at the **Print** pop-up window for your PC.

Exiting the Remote Access Window

1. From the **Rain Bird Remote Access** window, select **File**.
2. Select **Exit** from the pull-down menu or select **X** in the top corner of the window.

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Troubleshooting

Understanding Faults

Faults are error conditions that can occur in any electronic system or equipment, no matter how well designed and built. Many factors can contribute to faults, such as the system's age, natural occurrences (i.e., lightning, floods, frost or heat), or human errors.

When installing the MDC2 Controller and irrigation system, human errors can and do occur. They happen by overloading cables and sockets, adding excessive pressure to decoders, solenoids, or cables with heavy equipment (tractors or cultivators), or not taking the necessary care when connecting the systems cables and decoders. Fortunately, the MDC2 Controller and irrigation system features built-in test diagnostics to help pinpoint specific faults and to aid in troubleshooting.

Finding the Cause

This chapter of the manual is written for you, the Service Technician in the field. It is your responsibility to localize problems with the Rain Bird® MDC2 Controller and Rain Bird® Decoder Irrigation System and determine their cause. You should always find the fault and correct it in the field at the “box” level. In other words, if you find the fault in a field decoder, replace the field decoder. If you find a fault inside the controller, replace the controller. Only highly qualified Rain Bird® Service Technician Specialists should find and correct problems inside a “box” (replace worn out or defective components inside a controller, decoder, solenoid, etc.).

The purpose of this chapter is to teach you basic troubleshooting techniques that you can easily do in the field. This chapter does not cover faults that were caused by using the wrong size cable (wires that are too thin or cable lengths that are too long) or faults caused by entering incorrect data into the controller.

Troubleshooting, continued

Understanding Basic Troubleshooting Techniques

Using a systematic approach is perhaps the best way to troubleshoot any MDC Controller system. In other words, start at one end, test and replace components one at a time until you find and fix the problem. Understand too, that a set of troubleshooting procedures cannot cover every conceivable situation. It is you, the technician, responsible for finding and repairing the faults, who must mold these procedures to the situation. Also, when a fault occurs, try to learn the circumstances that led to the fault. This can often times lead you to a good starting point.

Before you attempt to troubleshoot a system, it is important for you to have a good understanding of:

- how the complete MDC Controller system works,
- electrical terms, such as current, voltage and resistance,
- how to use the right tools, and
- the actual installation.

First, familiarize yourself with the installation of the complete system. Review and study the as-built irrigation drawings of the system. These drawings should show you the locations of each field decoder, solenoid, master valve and pump. You should be able to use these drawings to trace the exact course of the two-wire cables, their connections and termination points.

Next, gather your tools and equipment. Specific tools you may need to troubleshoot and repair an MDC Controller system may include:

- an instrument, such as a Fluke 10 (digital) Multimeter, that measures minimum AC/DC voltages from 0 – 50 V (Volts), with a 0 – 1M (meter) ohm resistance,
- a Clamp Amperemeter, such as a Kyoritsu 8112 Clamp Meter, that measures 0 – 2A (amps), with a minimum resolution of 5mA (milliamps),
- a cable finder (if you do not know the exact location of the two-wire cable),
- an extra MDC2 Controller, and
- standard tools, such as screwdrivers, lineman's pliers, wire stripper, wire nuts and DBY connectors.

Troubleshooting, continued

Troubleshooting the System

Problem **A fault occurs the first time the system was started.**

Solution You will probably find the fault in the cabling between the different units (i.e., two-wire cable and field decoder, field decoder and solenoid, pump decoder and pump, etc.) Check that the hook up from unit to unit is done properly.

Problem **A fault occurs after the system is serviced.**

Solution You will probably find the fault around the serviced area. It is rare for two faults to occur at the same time.

Problem **A strong smell, heat buildup or smoke develops in the controller during a fault.**

Solution Switch the controller off immediately and replace the unit. The fault is probably in the controller.

Problem **Nothing works when you turn on the controller; the system is dead.**

Solution The controller is either defective or there is no power reaching the controller.



Check the Mains 120-Volt AC power line leading into the controller. Make sure the Mains power is turned on.

Check the Mains cabling. Make sure it isn't severed, kinked or showing a short.

Check for burned out fuses or tripped circuit breakers in the Mains cabling line (if applicable). There are no fuses inside the MDC Controller, except for a non field-replaceable thermal fuse, which automatically resets once a short circuit is cleared.

If the system uses a power disconnect switch, make sure it is not engaged.

Measure the supply voltage (in the AC range) in the wire nuts. The voltage should be around 120 V. (The controller should work, with no problems, at a nominal voltage of 80% of the Mains.) If the voltage you read is lower, the fault is in the controller and you should replace the controller.

Troubleshooting, continued

Problem **Diagnostics indicate there is a fault with the field decoders.**

Solution There is a break in the two-wire communications cable, the connections are loose, the decoders are supplying too much or too little voltage, or the controller is defective. To check the line voltage and decoders, you will need a voltmeter and Clamp Ampmeter.

Navigate the MDC Controller to the **Short Finding Screen** (this switches the controller to the 50 Hz mode). Please see **Finding a short in the system** on page 40. This enables you to measure line voltage (in the AC mode) and currents with the Clamp Ampmeter.

Start by measuring the line voltage between L1 and L2 on the terminal strip. Nominal voltage is 34 V, but because the voltage form is non-standard (standard=sine), your reading will probably be higher. Acceptable values are from 33 – 40 V.

If the value is too low, disconnect the line wires (L1 and L2) and measure again. If the voltage is still too low, the controller is defective and you will need to replace it.

If the voltage is within the acceptable range, there is a problem with the field installation. Please see the problem, **The field decoders are not responding** on page 81.

With the lines (L1 and L2) connected, use the Clamp Ampmeter to measure the line current. Standby current for the **FD-102TURF** and **FD-202TURF Decoder** is 0.5 mA.

Standby current for the **FD-401TURF** and **FD-601TURF Decoder** is 1 mA. Based on these values, compute the expected line current for your system. If the actual current differs more than 20 mA from the value you computed, the problem is in the field.

Voltages or current readings that are too high indicate that something is overloading the two-wire communications cable. Please see the problem, **Overloading the two-wire communications cable caused a short circuit** on page 84.

Current reading too low may indicate that there is a break in the two-wire communications cable. Please see the problem, **Finding a break in the two-wire communications cable** on page 83.

Troubleshooting, continued

Problem **Finding a fault by measuring line voltages in the field.**

Solution When searching for a fault, you may need to measure the voltage on the two-wire communications cable in the field. Set the voltmeter in the DC range and measure the voltage at the L1 and L2 terminal strip. If the DC readings are erratic (changing every half second) navigate the MDC Controller to the 50 Hz mode and switch the voltmeter to AC. Please see **Finding a short in the system** on page 40. In the AC range, the voltmeter typically reads on the high side, from 33 – 40 V. This is acceptable.

With the voltmeter set, go into the field and measure the two-wire communications cable (line) at easy access points, either at a branch or inside a valve box where decoders connect. Remove the DBY connectors and measure the cable.

If you need to measure in the middle of a cable, use a sharp knife to cut the insulation off the cable and measure between the bare wires. Use DBY connectors to repair any cuts in the cable.

Problem **The field decoders are not responding.**

Solution If several field decoders are not responding, and they are located on the same branch, the fault is probably with the cable. Please see the problem, **Finding a break in the two-wire communications cable** on page 83.

If a single field decoder (or field decoders on separate branches) is not responding, you should first test the field decoder to determine if the fault is in the decoder or the valve. Please see **Testing the operation of the decoders** on page 37.

If the test results show the field decoder is not responding, (all three current readings are the same, or very close), check the following reasons.

There is a fault in the cable leading to the unresponsive field decoder. Measure the voltage on the decoder's input wires. If the voltage is in the acceptable range (33 – 40 VAC), then check the input connection to the decoder.

There is a fault in the field decoder. Check that the decoder address was entered correctly. Please see **Naming the Field Decoders** on page 25.

There is a break in the solenoid. Measure the resistance in the solenoid. Standard Rain Bird® solenoids measure about 28 Ohms. If the resistance is low, replace the solenoid.

If the field decoder still does not respond, replace the field decoder.

Troubleshooting, continued

Problem **One or more field decoders does not always activate the valve.**

Solution To open a valve, a field decoder supplies the valve with energy (electricity) for a short time. If the valve's hydraulic pressure is high, then it needs more energy to open. There are many factors contributing to the amount of energy available to open a valve. These factors include the length of the two-wire communications cable to the field decoder and the number of field decoders operating at one time. The switch code setting controls these factors.

The field decoder's valve type defines the solenoid's switch code. The switch code tells the field decoder how to operate the solenoid. The switch code must be specified correctly for the field decoder to operate the solenoid. If the solenoids you are using are not made by Rain Bird®, you may need to change the switch code settings. Please see **Appendix II: Selecting Electrical Codes for Solenoids** on page 93.

If the two-wire communications cable was installed as a ring cable, a break in the ring can cause a fault. Because the controller sends the voltage in both directions on the ring, field decoders can still operate, one at a time, even with a break. However, a break in the ring increases the cable's resistance and there may not be enough available energy to open more valves. To eliminate the fault, you must connect both ends of the ring cable to the L1 and L2 terminals inside the controller.

Disconnect the ring cable at one end and measure the resistance of both wires from one end of the cable to the other. If the cable measures 2.5 square millimeters, the resistance should be about 7.0 Ohms per kilometer of cable.

In other words, if your ring cable measures 6 kilometers, you should be able to measure about 42 Ohms for each wire in the cable. The resistance is inversely proportional to the square. A cable measuring 3.1 square millimeters will have a resistance of:

$7 \times 2.5/3.1 = 5.6$ Ohms per kilometer.

If the resistance you measure is too high, then the cable is defective. Please see the problem **Finding a break in the two-wire communications cable** on page 83.

Troubleshooting, continued

Problem

Finding a break in the two-wire communications cable.

Solution

Measure the line voltage on the L1 and L2 terminals inside the controller. If the voltage is correct, then the fault is a result of a break in the two-wire communications cable. To locate the break, you will need an as-built irrigation drawing showing the complete installation and tracking of the two-wire communications cable, including each field decoder connection point.

If the break is in a ring cable, disconnect one end of the cable from the controller.

You can now find the approximate location of the break by testing each field decoder to determine which decoders are not responding. Please see **Testing the operation of the decoders** on page 37. If, during the test, a field decoder activates, you will know the break in the cable must be beyond that decoder. Field decoders will not respond if there is a break in the cable.

Before testing, you may want to depressurize any pressure-controlled pumps and deactivate any pump decoders in your system. Please see **Entering the Pump/Master Valve Information** on page 28. This will stop the pumps from activating during the test, conserving water.

Once you localize a break between two decoders, you then need to find the exact location of the break manually by measuring its voltage.

A cable's voltage after a break is not always zero (0). In fact, it may only be 10 V lower than the reading before the break.

First, check connections at the two decoders and between the two decoders. Measure the voltage on the cable from the last decoder that is working. Then measure the voltage on the cable at the non-working decoder connection.

If you cannot find the fault in any of the field decoder connections and there is no specific hint as to where the fault may be, you can try using a cable tracer to locate any irregularities along the cable.

If you do not have access to a cable tracer, you can either replace the complete length of the questionable cable or follow the systematic approach we will outline next.

Troubleshooting, continued

Problem **Using a systematic method to find a break in the two-wire communications cable.**

Solution There is a systematic method to find a cable break, but it can be time-consuming. Measure the voltage midway between the field decoder that is working and the one that is not.

If the voltage is out of the acceptable range (33 – 40 VAC), you can locate the break between the field decoder that works and the point where you measured the line voltage. Measure the line voltage again at the middle of this section of cable. If the voltage is still out of the acceptable range, you have narrowed the area of the break even further. Continue to narrow the sections this way until you find the break.

Problem **Overloading the two-wire communications cable caused a short circuit.**

Solution If the two-wire cable is damaged or a field decoder develops a defect, a short circuit can occur on the cable. A short circuit can mean that nothing in the system works or only parts of the system work.

If the MDC Controller senses a short circuit on the lines, it will automatically limit the current to a safe value by changing the line frequency from 1 to 50 Hz. and display a **Short Circuit** message. Please see **Sensing a Short Circuit** on page 55. When this happens, you must check the line voltage.

If the line voltage reading is between 24 and 34 V, a field decoder, using too much power, is probably causing the fault. If the system is still operational, you should test all the decoders. If all the decoders pass the test, please see the problem, **A two-wire communications cable shows signs of corrosion** on page 85.

If the line voltage reading is less than 24 V, you will not be able to use the field decoders to locate the fault. This type of short circuit affects all parts of the cable by dropping the voltage below the controller's minimum operating voltage. Here, you will need to use a Clamp Ampmeter to locate the short circuit.

A Clamp Ampmeter allows you to measure the current running in a cable without cutting the cable. Attach the clamp to one of the two communications wires and measure the resistance. If you clamp both wires, the reading will be zero (0).

Troubleshooting, continued

Clamp Ampmeters normally measure only rapidly alternating currents. Navigate the MDC Controller to the 50 Hz mode, causing the Controller to send 50 Hz voltage and current through the two-wire cable. Please see **Finding a short in the system** on page 40. You can measure this current directly on the Clamp Ampmeter.

If the two-wire communications cable is installed as a ring, you must disconnect one end of the ring from the controller before measuring the current.

If the controller is using more than one two-wire communications cable, you can use the Clamp Ampmeter to find the two-wire cable that is using too much current. When measuring the cables, pay close attention to the magnitude of the current. If you learn that none of the communications wires are using too much current, then the short circuit may be in the controller's lighting protection. To check this, disconnect all the communications cables and test the terminals. If the condition remains after you disconnect the lines, the short is in the lighting protection and you will need to replace the controller.

To locate the short, use the Clamp Ampmeter to "follow" the current from the controller to the decoders in the field. The large current will run out from the controller on one wire to the short circuit and back again to the controller on the other. The current running beyond the short circuit in the cable will read zero (0) or have a very low reading.

If the cable splits into two or more branches, the current will only continue in the branch where you will locate the short circuit.

If the fault is in a field decoder, you can measure the current in the decoder's connecting (blue) input wires.

Problem

A two-wire communications cable shows signs of corrosion.

Solution

To safeguard the two-wire cables against corrosion, their mean voltage relative to the surrounding ground must be slightly negative. The controller initially determines this voltage. A ground fault means that a current is running from the system's two-wires through the ground and back to the ground rod. If the mean cable-to-ground voltage were positive, a defect in the cable's insulation would result in a very destructive corrosion of the cable.

This ground current will not affect the mean voltage of the two-wires but it may overload the controller if it gets too high.

Troubleshooting, continued

You can measure the ground current with a Clamp Ampmeter (set in the 50 Hz mode) on the wire to the ground rod. If the current is 20 mA or less there is no reason to worry. But, if the current is above 20 mA, you can locate the ground fault with a Clamp Ampmeter.

Turn off any running **Programs** or **Schedules**. Please see **Operating the Irrigation Programs** on page 49. Connect both communications wires to the L1 terminal inside the controller. Attach the clamp from a Clamp Ampmeter to the L1 terminal. With no decoders using power, the line voltage should read zero (0). Any reading other than zero (0) is ground current. If the reading is above 20 mA, track it along the cable until the current disappears. Once the current disappears, you have passed the leakage point. This procedure only works for one or two shorts. If there are several minor shorts you will not be able to see the sudden drop in the leakage current when you pass the fault.

Problem **The clock shows an incorrect time after a power outage.**

Solution When the power goes out, a back-up battery powers the controller's clock. The battery is in a battery holder on the main board. The clock and the memory use the battery only when the controller is turned off or without power. The battery life is normally around 10 years. If the time is incorrect, replace the battery. Please see **Replacing the Battery** on page 15.

If the fault is not in the battery, either the main board or the power supply is defective. Replace the controller.

Problem **The controller is losing installation data and irrigation schedules.**

Solution The controller's installation data and irrigation schedules are stored in S-RAM, which needs power to hold data. When the Mains power is off, the battery supplies the power for the memory. If it can no longer do this, replace the battery. Please see **Replacing the Battery** on page 15.

If you replace the controller, you will need to retrieve the installation and irrigation data from the old board. Please see **Replacing the Controller** on page 89.

Troubleshooting, continued

Problem **The optional (rain or alarm) sensor is not responding.**

Solution Disconnect the two-wire sensor connection from the terminals inside the controller. After a few seconds, a message should appear on the controller's display screen reading, **Rain** (or **Alarm**) **Sensor In:<time>**. Next, connect a piece of wire between the terminals. The message should change to **Out:<time>**. This sequence is based on a correct set up and a **rain (alarm) sensor** that is Normally closed (NC). (**ON, open = NC; ON, closed = NO**—Normally open). If this sequence does not occur, check to make sure the **rain (alarm) sensor** is properly installed. Please see **Connecting an Optional Sensor** on page 13.

Troubleshooting a Field Transmitter (Optional)

The Field Transmitter is a separate, small, handheld computer, which uses special connectors to connect to the two-wire communications cable in the field. You use Field Transmitters to manually operate field decoders. In the following, it is assumed that the MDC Controller and field decoder system is working properly.

Problem **The Field Transmitter's display is dead.**

Solution Check that there is line voltage on the connection sockets inside the Field Transmitter Connection Box. Various connection boxes may be located in the field at specific points along the two-wire communications line. Use the irrigation drawings to find the location of each box.

Open the Connection Box and measure the line voltage between terminals 1 and 2. Make sure the wires leading into the rear terminals are not corroded. If they are, cut away the corroded wires and reconnect the wires.

Check the connection points. If the pins of the socket are corroded (which can happen if the protective cap is missing) replace the socket.

Problem **The Field Transmitter reads No Contact.**

Solution A **No Contact** message indicates the Field Transmitter cannot contact the controller. Heavy leakage currents may cause this in the system. Check the line voltage. If the line voltage is acceptable, there is probably a fault in the Field Transmitter, or in rare cases, the controller. Check the Field Transmitter's installation data. Make sure **PULSE TIME** is set to 0 and **INT. DELAY** is set to 40. Please see the **Field Transmitter User Manual** on page 43. If these settings are correct, replace the Field Transmitter.

Troubleshooting, continued

If the **No Contact** message appears only when a specific field decoder or pump decoder is active, the fault is in this decoder.

Problem **The Field Transmitter reads Try Again.**

Solution This message can appear if the controller is very busy, for example, if an irrigation **Schedule** is running or about to start. If the message appears frequently, please see **The Field Transmitter reads No Contact** on page 87.

Problem **The Field Transmitter reads Unknown Decoder to an existing field decoder.**

Solution The fault is probably in the character string installed in the Field Transmitter. If this is not identical with the character string installed in the controller, the field decoder's letters will be switched around. Check and correct the Field Transmitter's installation. Please see the **Field Transmitter User Manual** on page 43.

Problem **The Field Transmitter uses the wrong language.**

Solution Select the correct language in the Field Transmitter's installation menu. Please see the **Field Transmitter User Manual** on page 43.

Troubleshooting the Controller's Internal Parts

The MDC2 Controller does have a thermal fuse that resets itself after a **Short Circuit** message disappears. You should not try to replace the thermal fuse. In general it is better to substitute the controller as a whole than try to replace various internal parts that may be interconnected with cables and plugs. However, there are a few procedures you may try to troubleshoot the controller.

Problem **The display will not come on when the controller receives power.**

Solution Check that the cable connector from the transformer to the main board is correctly inserted in the connector on the board. Check also the cable/connector from the **ON/OFF** switch.

Problem **The contrast on the display screen is too high/low.**

Solution If the contrast is too high/low, try adjusting the potentiometer in the uppermost left corner of the main board. To get access, remove the display and control module. Please see **Replacing the Battery** on page 15.

Troubleshooting, continued

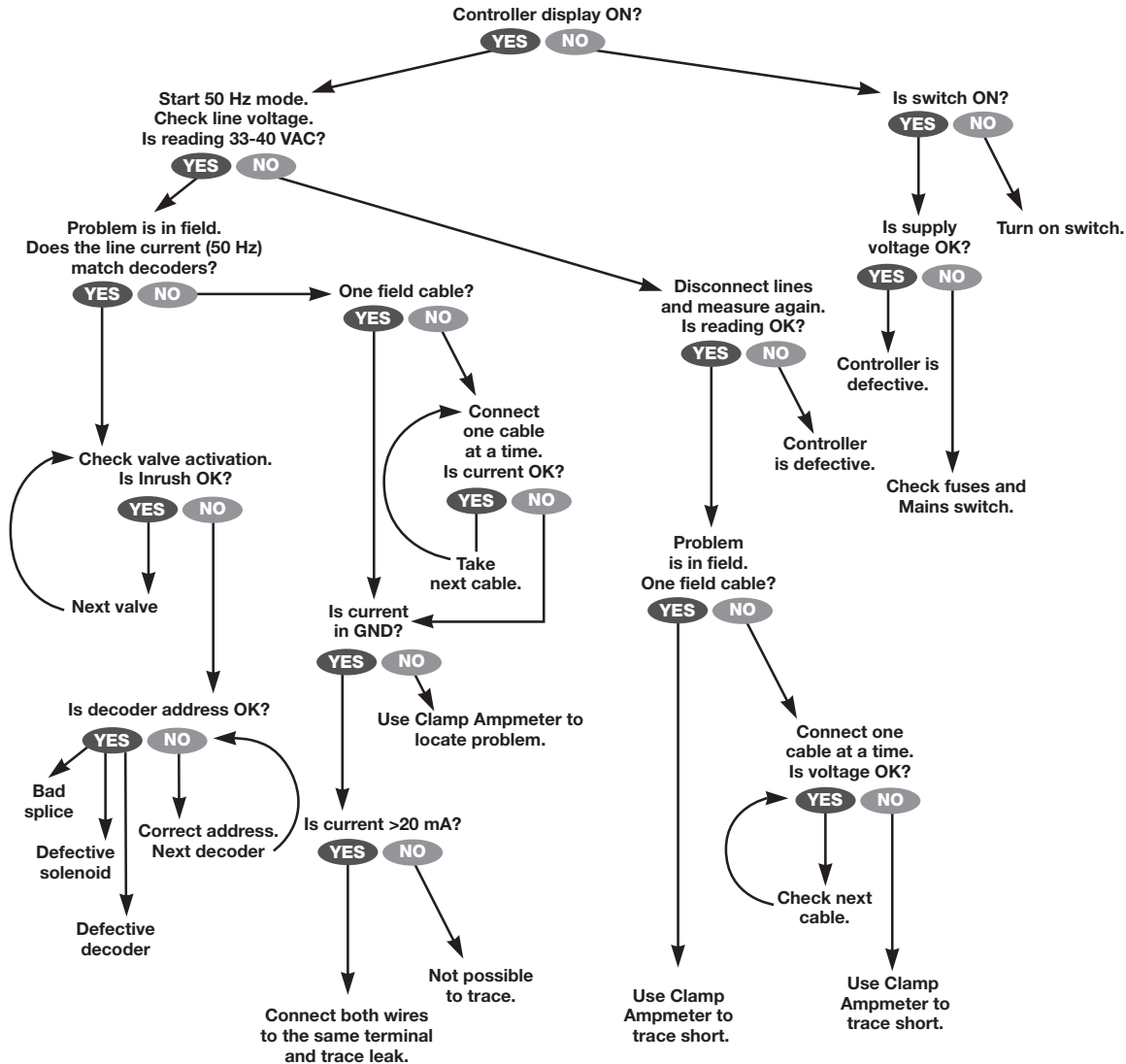
Problem	The controller is functioning but acting oddly.
Solution	If the controller is acting oddly, try downloading the Firmware to the program module in the controller. Please see the Firmware Upgrade Instructions included with the Firmware Upgrade package.

Replacing The Controller

The MDC2 Controller contains set-up and irrigation data that is stored in a chip soldered to the main board. When you need to replace the controller, the data will stay in the defective controller. However, you can use the PC program to transfer data from the controller to the PC. If the controller is still able to communicate, you can retrieve and transfer the data to the replacement unit. Please see **Retrieving the Data** on page 62. If the controller cannot communicate you must rely on the current PC data or backup disk you made the last time you updated the data.

Troubleshooting, continued

Troubleshooting Guide for the Decoder System



Appendix I

Conversion Chart from Standard to Military Time

Standard Time	Military Time	Standard Time	Military Time
1:00 am	01:00	1:00 pm	13:00
2:00 am	02:00	2:00 pm	14:00
3:00 am	03:00	3:00 pm	15:00
4:00 am	04:00	4:00 pm	16:00
5:00 am	05:00	5:00 pm	17:00
6:00 am	06:00	6:00 pm	18:00
7:00 am	07:00	7:00 pm	19:00
8:00 am	08:00	8:00 pm	20:00
9:00 am	09:00	9:00 pm	21:00
10:00 am	10:00	10:00 pm	22:00
11:00 am	11:00	11:00 pm	23:00
12:00 pm	12:00	12:00 am	00:00

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Appendix II

Selecting Electrical Codes for Solenoids

If your system uses solenoids (valves) that do not open, you may need to extend the switch code activation time. To do this, change the 4th digit of the code according to the following chart.

Appendix II, continued

Electrical Requirement Code of Magnetic Solenoid

SWITCH CODE DEFINITION 5 9 F, X, Y, 0

Activation Time [ms]	X	Y	Holding Voltage [Volts]
30	3	3	1.2
40 →	4	4	1.7
50	5	5 ←	2.3
60	6	6	2.9
70	7	7	3.5
80	8	8	4.0
90	9	9	4.6
100	A	A	5.2
110	B	B	5.8
120	C	C	6.3
130	D	D	6.9
140	E	E	7.5
150	F	F	8.1

Use the chart above to select a suitable electrical code for special solenoid (valve) types.

Note: To find a switch code that works with your valve, you may need to use the trial and error method.

Example: Activation Time = **40** ms. (milliseconds)
Arrows in chart show: Holding Voltage = **2.3** volts
 Switch Code = **59F450**

If the solenoid opens but will not stay open, the holding voltage may be too low. Here, you would change the fifth digit of the code.

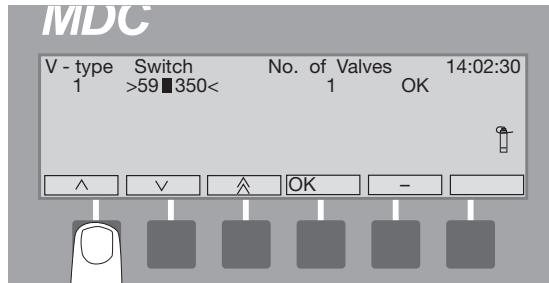
Example: Activation Time = **50** ms.
 Holding Voltage = **5.2** Volts
 Switch Code = **59F5A0**

If the solenoids are still not operating properly after repeated attempts, contact your Rain Bird® Distributor to guide you in adjusting this number for proper operation.

Appendix II, continued

Changing the Switching Codes

1. From the **Main Menu**, move the **indicating arrow** to **1. Set-up** and select **OK**.
2. Move the **indicating arrow** to **1. Valve Types** and select **OK**.
3. Scroll to the **Valve type** you need to change.
4. Select **OK** and **OK** again to activate the **Switch** field. A blinking **box** shows the position of the first character you are changing.
5. Select **OK** to move to the next character. The **box** is replaced with an **arrow** pointing to the character you can change.



Note: Change only the numbers and letters you need to change.

Note: You need to continue selecting **OK** until the **up** and **down arrow** labels switch to **left** and **right arrows**. Only then is the **Switch** field no longer active.

6. Use the **right arrow** to select **OK**, to return to the **Set-up** menu. Selecting **minus (-)** cancels the change and returns to its previous setting.

Appendix II, continued

Default Switch Codes

Standard Rain Bird 24 VAC solenoids.

- Switch Code 59F350

New Rain Bird 24 VAC solenoids

- Switch Code 59F370

Normally open Master Valve (Close on alarm)

- Switch Code 39F350

Municipal Water Supply: Master Valve Normally Open or Closed

- Switch Code 49F350

Non-Irrigation Valve Types

- Switch Code 3FFA20

Relay 100: Master Valves and Pumps

- Switch Code 4FFA20

Note: Recommended default switch codes are provided for general guidance purposes under normal operating parameters only. Due to the potential uniqueness of your MDC2 installation, functional operation of the MDC2 switch code settings must be verified by the end-user to ensure the system is functioning as desired.

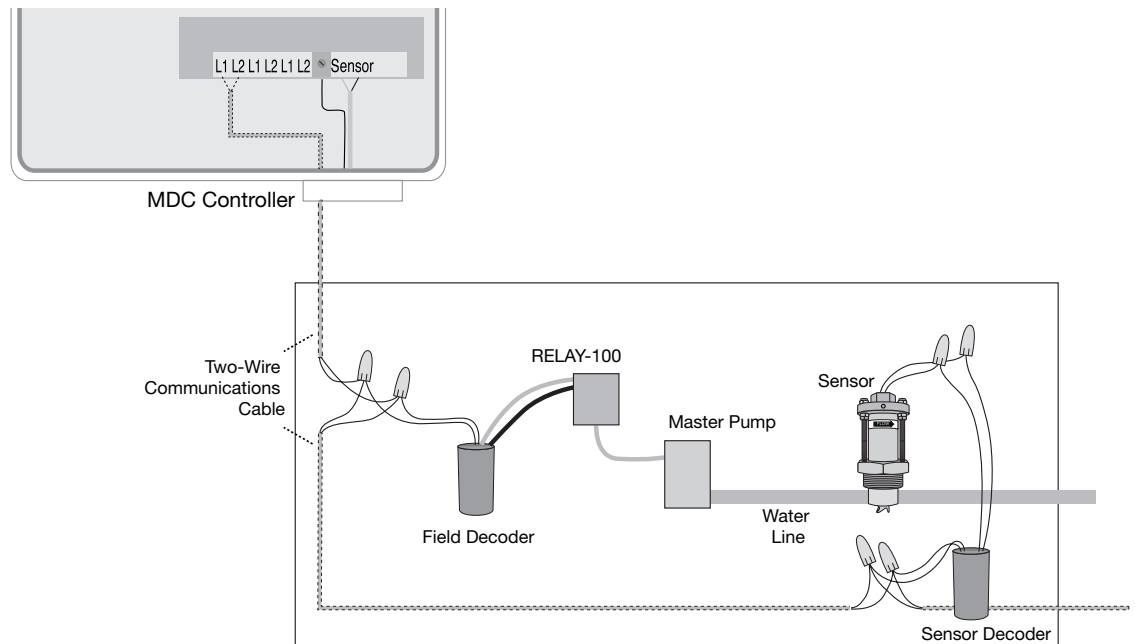
Appendix III

Master Valve and Pump Set-up Tips

To supply water to the various valves located throughout an irrigation area, systems use either a master valve or master pump. By recognizing a specific **Address** and switch code, the controller sends a signal telling the decoder when to activate the valve or pump. The switch code can vary depending on how your system was installed. Below, we will cover some of the more common installations.

Using a Field Decoder With a Pump

In this installation, a field decoder attaches to a pump using a relay. Rain Bird® recommends you use **Relay-100**. Please see the illustration below. When setting up the controller, enter the field decoder **Address** in the pump **Address** field. The switch code for the above **Relay-100** is **4FFA20**.

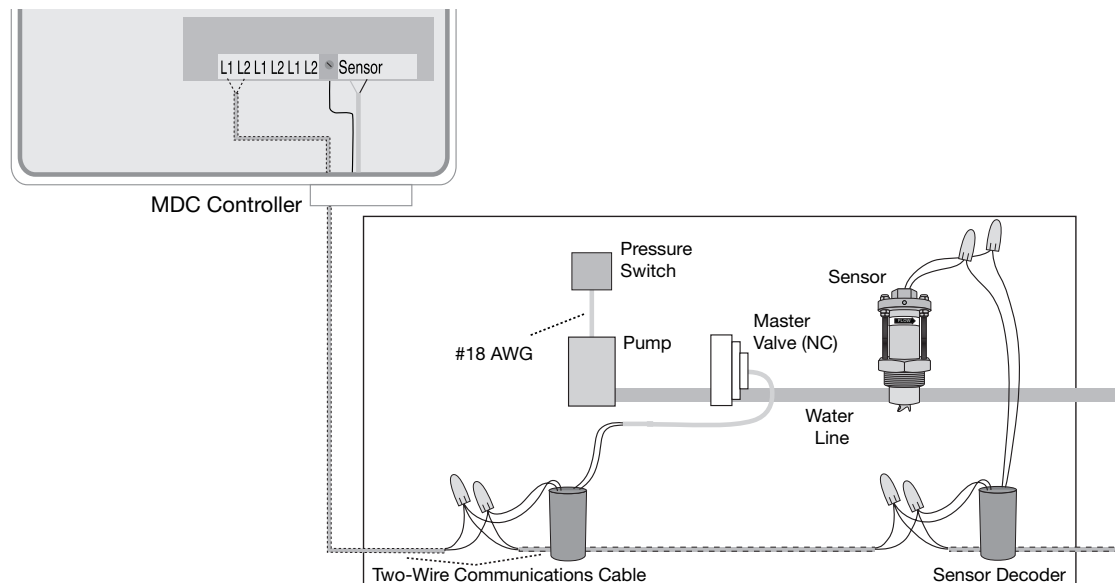


With the above setup, the flow sensor monitors the flow rate, sending the information to the controller. Once the flow exceeds the maximum rate during irrigation, and an alarm flow or leakage schedule is set, the controller will automatically shut off the pump and all the decoders and valves.

Appendix III, continued

Using a Decoder With a Normally Closed (NC) Master Valve

In this installation, a decoder controls a Normally closed master valve with a pressure switch controlling the operation of the pump. Please see the illustration below. When setting up the controller, enter the decoder **Address**. If the master valve is Normally open, please see **Using the Municipal Water Supply With a Master Valve (NC or NO)** on page 100.



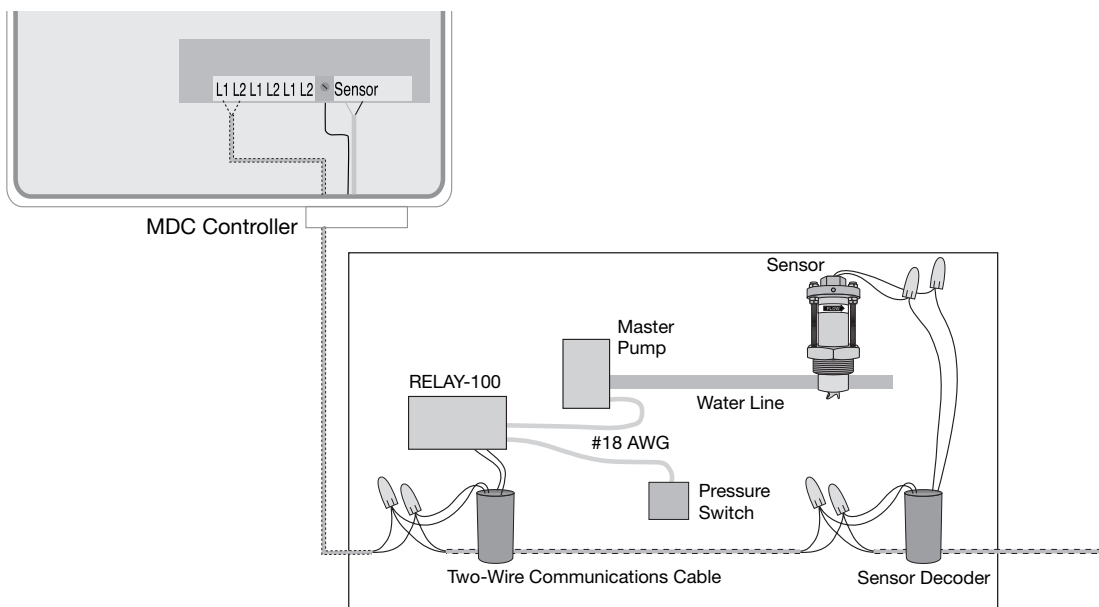
With the above setup, both the master valve and flow sensor monitor the flow rate. Once the flow exceeds the maximum rate, the controller sends a signal to the pump decoder shutting off the master valve and all other decoders and valves in the system. When the water pressure builds up inside the pump, due to the pressure switch, the pump also stops. There cannot be a leak in the system because when no Programs or decoders are active, the Normally closed master valve is closed.

Appendix III, continued

Using a Decoder and Relay-100 With a Pressure Switch

In this installation, the pressure switch attaches directly to the decoder and Relay-100, and the decoder and Relay-100 to the pump. Please see the illustration below.

Please see **Naming the Field Decoders** on page 25. You will also need to define a separate valve type with the switch code of **4FFA20**. The controller circuit from the pressure switch runs through the contacts on the Relay-100.

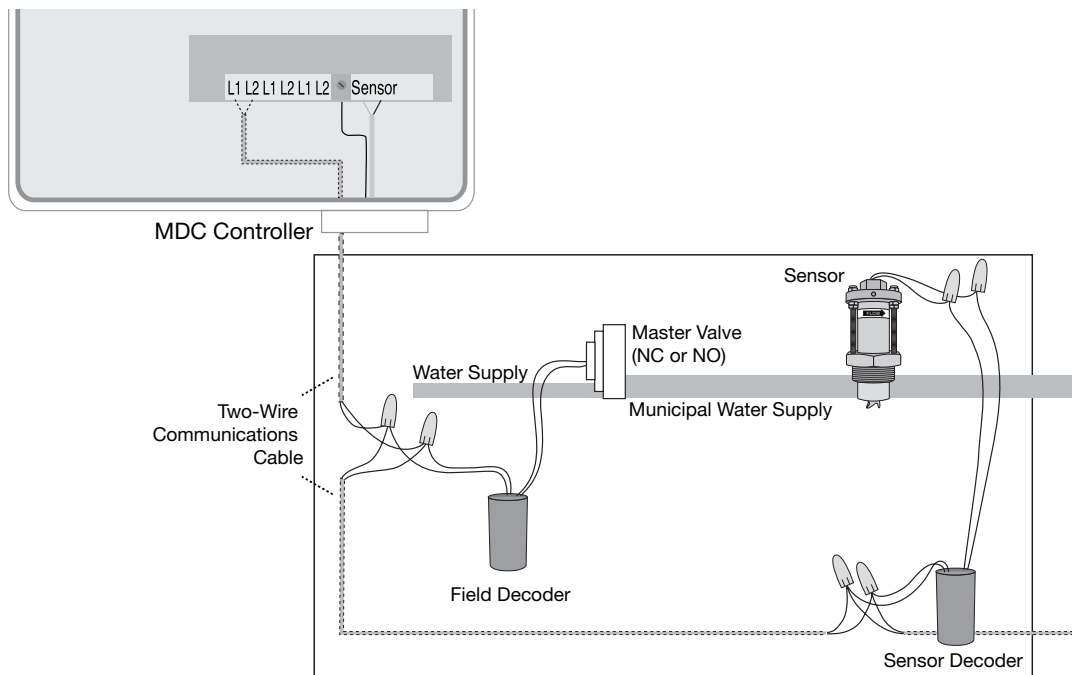


With the above setup, the pressure switch will provide power to the pump, or if the flow exceeds the maximum rate, the controller sends a signal to the field decoder stopping the pump and shutting off the valves in the system. If the pressure is too high, the pressure switch will cut off power to the pump and shut it off. With the valves closed, any flow in the system is considered a leak.

Appendix III, continued

Using the Municipal Water Supply With a Master Valve (NC or NO)

In this installation, a field decoder attaches to a Normally closed or Normally open master valve installed as a pump. Please see the illustration below. When setting up the controller, enter the decoder address in the pump **Address** field and change the switch code to **49F350**, which is the setting for a standard 24 VAC/2-3 W irrigation valve.



With the above setup, the flow sensor monitors the flow rate. If, during irrigation, the flow exceeds its maximum rate, the controller sends a signal shutting off a Normally closed master valve. A Normally closed master valve is open when a Program is running.

If the master valve is Normally open, exceeding the maximum flow will shut off all valves. Because none of the valves are open, any additional flow detected is considered a leak in the system. Once the flow surpasses the alarm leakage schedule, the field decoder activates, closing the Normally open master valve.

Appendix IV

Sensors and Alarms

Your MDC2 Controller can work with the following type of sensors:

- Flow Sensor:** Defines an analog sensor on the logical level. The input can be analog or digital. Flow can be summed.
- Generic Sensor:** Defines an analog sensor on the logical level. The input can be analog or digital.
- On/Off Sensor:** Defines a sensor on the logical level. The input can only be digital.

Sensor Unit of Measures

Depending on the type of sensors listed above, your sensor will be using one of the following unit of measures:

- Pulse/10sec:** A digital input in terms of pulses counted per 10 seconds.
- mA:** An analog current measurement (4-20 mA)

Alarm Triggers

Alarm triggers define what will happen when a pre-defined alarm condition is realized. These are independent of the sensor type. Your MDC system shall take one of the following actions in an alarm situation:

- Pause:** Pauses the schedule specified by alarm action ID or all schedules. The pause shall take effect immediately. This feature works only if a schedule(s) is running.
- Resume:** Resumes the schedule specified by alarm action ID or all schedules. The resume will take effect immediately. This feature works only if a schedule(s) is running.
- Irr. Prevent:** Prevents all irrigation. The schedules will continue within the controller, but no decoders will be activated. Currently active decoders will be stopped.
- Irr. Allow:** Allows previously prevented irrigation. The decoders will be activated on the next schedule/step start. Decoders that were active on the time of “cancel inhibited irrigation” will not be reactivated.
- Irrigation Off (IrrOff):** Sets the controller out of *auto* mode. Any running schedules will stop. Once the “irrigation of period” is over, the controller needs to be manually put back to *auto* mode.
- System Off:** Turns the system off by taking the MDC out of Auto.

Appendix IV, continued

- Activate (Activ):** Turns on a decoder, pump or schedule, depending on the specified alarm action type and ID. The schedule will start on next full minute if possible or else it will be stacked.
- Deactivate (Deact):** Turns off a decoder, pump or schedule, depending on the specified *Alarm Action Type* and *Alarm ID*. Deactivation can apply to all decoders, pumps and schedules. The schedule shall stop immediately and its active decoders will be deactivated.

Object ID

Defines the ID of what to activate/deactivate depending on the alarm action and alarm action type.

Appendix V

Freedom System Interface

Your MDC2 Controller can work with the FREEDOM™ System - a member of Rain Bird's family of irrigation products. The FREEDOM System uses the available COM port on your MDC Controller to access command-based functions like:

- Turn On
- Turn Off
- Advance
- Pause
- Resume
- Customized schedule-based functions

The tables below list the commands and their actions that are understood by the MDC2 Freedom driver.

System Mode Commands

##Command##

Command	Outcome	Beep Answers		
		OK		Err
		USA	Europe	
00	Stops All Decoders	2	4	1

Command	Action	Outcome	Beep Answers		
			OK		Err
			USA	Europe	
20	0	Auto or Manual OFF	2	4	1
20	1	Auto ON	2	4	1
21	0	Manual or Auto OFF	2	4	1
21	1	Manual ON	2	4	1

Appendix V, continued

##Command#Action##

Decoder Commands

Command	Decoder	Time	Outcome	Beep Answers		
				OK		Err
				USA	Europe	
1	1-200	1-999	Activate Decoder	2	4	1
2	1-200	0	Deactivate Decoder	2	4	1

##Command#Decoder#Time##

Schedule Commands

Command	Schedule	Outcome	Beep Answers		
			OK		Err
			USA	Europe	
71	1-10	Activate Schedule	2	4	1
72	1-10	Deactivate Schedule	2	4	1
73	1-10, 0	Pause schedule, or all if 0	2	4	1
74	1-10, 0	Resume schedule, or all if 0	2	4	1

##Command#Schedule##

Notes:

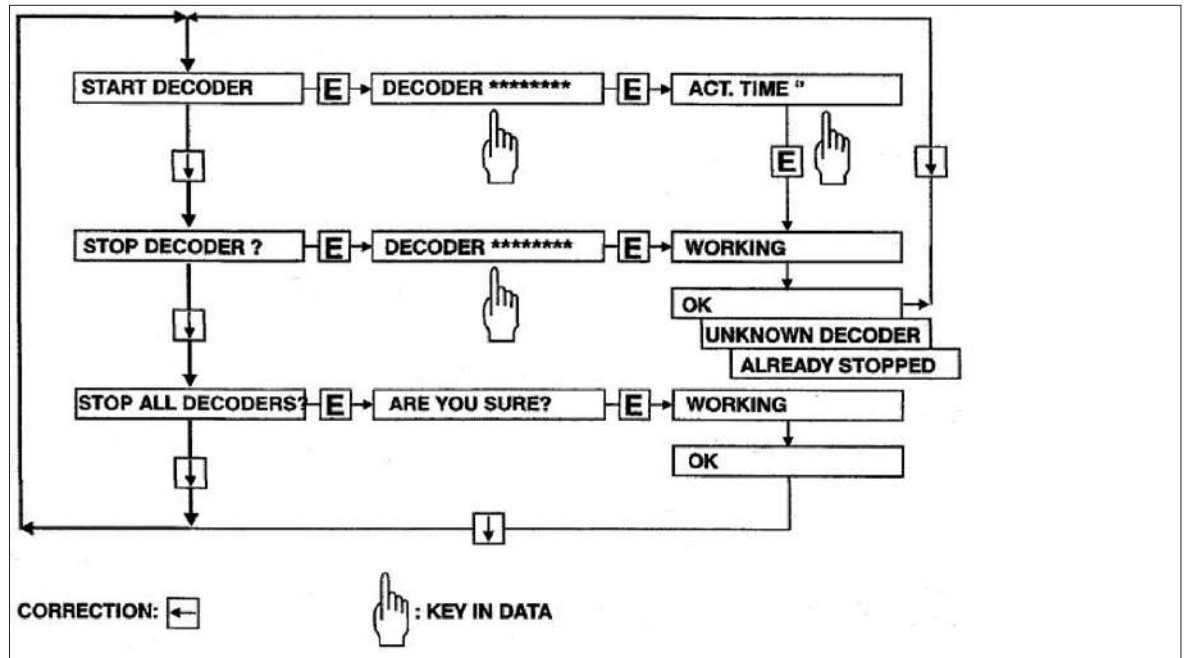
- Entering any command other than those listed in tables above result in an audible error message (in the form of a long beep).
- Pause and Resume are not immediate actions. Both Pause and Resume commands take effect with the next full minute.
- Entering #* anytime during a session will, for both FREEDOM interface types will result in reset of the received command string, and for the US FREEDOM will also hang-up the line.

Appendix VI

Legacy Field Transmitter Interface

Your MDC system can accommodate the use of a field transmitter to start valves regardless which state the MDC controller is in. If the MDC is in Standby state, usage of the Field Transmitter will make it change to Manual state.

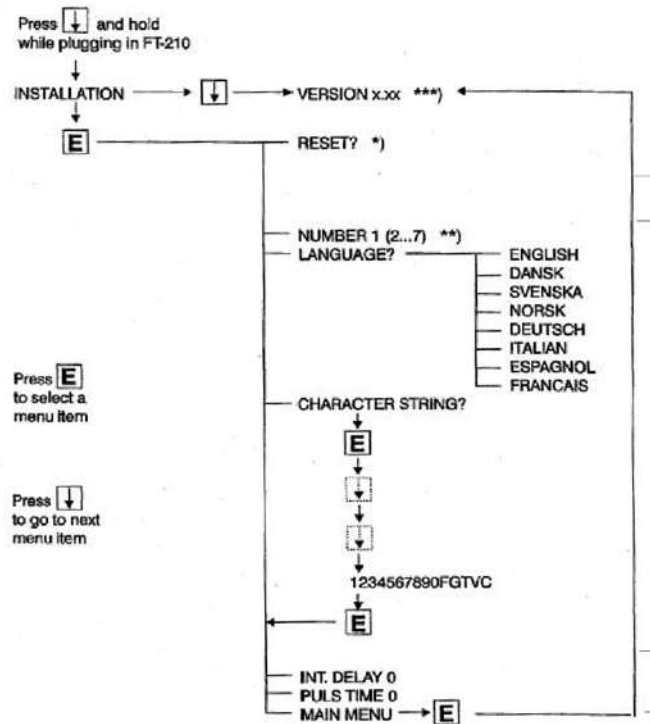
When the Field Transmitter is plugged in, it first shows the version of the built-in software. After that, it enters the menu system shown below:



Appendix VI, continued

Field Transmitter Installation

The following figure illustrates the Field Transmitter installation process:



* Reset will set all values to factory default.

** If more than one Field Transmitter is used, each must be set to its own number. Up to 10 Field Transmitters may be used simultaneously.

*** After a delay, the menu on the previous page is active.

Please refer to your Field Transmitter User Manual for more information on the use of the field transmitter.

Appendix VII

Instructions for Upgrading Existing MDC's to Version 2.0

1. Prior to installing the new software, ensure that the existing data and schedules in the existing software are up to date and have been synchronized with the controller.
2. As a backup, print out existing set up data and schedules via the “Print” functions in the “File.” Ensure this includes Sensor Decoder data as well as all data on Pumps/MVs and boosters.
3. Install software, per the following:
 - i. Install the 2.0 SW in a new directory
 - ii. Copy the rbt.ldb and monitor.ldb files from the old directory to the new directory
 - iii. Run the upgradedatabase.bat and this will do the update.
 - iv. Delete the old directory once the update is complete.
4. Verify that all set-up data and schedules are correct. Make any changes if needed.
5. On the controller, change out the existing memory card with the new Version 2.0 card.
6. Connect to the controller via serial cable or phone line
7. Under the “Send data” menu on the top tool bar, select “Send all set up and irrigation data. This will send all configuration data and schedules from the PC software to the controller.
8. At the controller verify that all setup and schedule information has been correctly received.

Note: For running more than one version of the MDC software after installing Version 2.0, ensure that the versions remain in separate directories. You may have a conflict using the un-installer to remove MDC software when the MDC software is installed more than one time. This is just because of the shared DLL. Just remove the directory instead of using the remove software function under Windows. Finally, you can only run one the MDC software at the time. Make sure all programs are closed before you start another. Watch the two icons in the task bar.

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Appendix VIII

MDC Controller Information Sheet Descriptions

Below you will find helpful information about the MDC Controller, decoders, and programming information sheets to follow. Please refer to the programming sheet when reading the descriptions below.

- 1. Column 1 – “Order”**

This column is for inputting the order you would like the valves to turn on. When programming the MDC Controller, this will help determine the order of stations to be assigned to the steps of various programs.
- 2. Column 2 – “Decoder Number”**

This is for inputting the decoder addresses printed on the side of the decoders installed in the valve boxes. Decoders are essential in two wire systems since they allow the controller to “talk” to individual valves even though there is not a dedicated wire path to each valve. The decoder number is a five digit address that should not repeat on the same controller. The purpose of writing these numbers down is to make programming quick and easy and to save decoder information in case of loss of data.
- 3. Column 3 – “Valve ID”**

This is for inputting the valve number from the plans so that they are easy to find in the field from the plan or as built after the system has been installed.
- 4. Column 4 – “Station Location / Description”**

As valves are wired to the decoders the column should be used to write a short description of what and where the valve irrigates. This needs to be done in order to make the walk through of the system quick and simple. It also provides a great reference to the irrigation system when the system is turned over.
- 5. Column 5 – “Plant Type”**

This is used to distinguish turf zones from plant zones or any other specialty needs zones. This helps when programming the controller so that proper run times can be assigned to various irrigation zones.
- 6. Column 6 – “Irrigation Types”**

This column helps further refine the input of proper run times by describing the type of irrigation equipment on each valve. Since each type has significantly differently precipitation rates, it is important to develop specific run times to maximize efficiency.
- 7. Column 7 – “MDC Valve Name”**

This is the user generated name for each valve. A good valve name would be a name that describes the irrigation zone. Each valve must have its own valve name. When operating and programming the controller you will be prompted to enter commands for the valves based on these valve names. This is also why this sheet is important as a whole, so you do not have to rack you brain trying to remember what irrigates what when operating and programming the controller.
- 8. Column 8 – “Run Time”**

This is used to enter the run times for each irrigation zone per watering day.
- 9. Column 9 – “P#”**

This is the program number that each valve will operate in as programmed into the controller. Each valve can be on several programs. There are 10 programs per controller, six start times per program, and several repeats per start time. Repeats should be used to eliminate runoff with shorter run times and more repetition of each zone.

Appendix VIII, continued

MDC Controller - Edit Set-Up Data

I	Controller Type	(Check One)				
	MDC 50	<input type="checkbox"/>	()			
	MDC 50-100	<input type="checkbox"/>	()			
	MDC 100-150	<input type="checkbox"/>	()			
	MDC-150-200	<input type="checkbox"/>	()			
II	Time Window	(Irrigation Prevented)				
	From					
	To					
III	Valve Type	Switch	No of Valves			
	1					
	2					
	3					
	4					
	5					
	A					
	B					
	C					
	D					
E						
IV (1.3 and 2.0)	Pump Master Valve	Address	On Delay	Off Delay	Switch	
	Master Valve					
	Booster 1					
	Booster 2					
	Booster 3					
	Booster 4					
	Booster 5					
	Booster 6					
	Booster 7					
	Booster 8					
Booster 9						
V Sensor Setup	Rain Alarm	Passive ()	Active ()			
	Check One	Passive ()	Active ()			
VI	Sensor Decoders: Name	Type	Address	Units	Value	@
	SD1					
	SD2					
	SD3					
	SD4					
	SD5					
	SD6					
	SD7					
	SD8					
	SD9					
	SD10					

VII	Software	Version	
	(Check One)	1.3	()
		2	()

VIII	Water Budget	%
	Enter #	

Appendix VIII, continued

MDC Controllers

	ID	Name	Address	Valve Type	Booster	Value (2.0 Only)	Description
	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
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	31						
	32						
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	34						
	35						
	36						
	37						
	38						
	39						
	40						
	41						
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	45						
	46						
	47						
	48						
	49						
	50						

Glossary

booster pump

activates when the demand for water pressure exceeds the capabilities of the master pump.

circuit board

one of the etched, copper clad sheets of insulating material onto which electronic components and terminals are assembled. Controllers contain circuit boards.

controller

a device that sends a 24 VAC power signal to the field solenoid valves controlling when they open and close.

CPU board

the central processing unit circuit board inside the controller.

default setting

the start-up settings for the controller.

GPH (used in USA)

gallons per hour.

hardwire

communications cable used to transmit data between devices.

irrigation schedule

the watering **Schedule** for one of the **Programs** controlled by the controller.

liquid crystal display (LCD)

the illuminated display used on most controllers.

manual

requires user input, rather than being automatically performed.

master pump

main irrigation pump, controlled electronically, that supplies water pressure to the system. Not all systems require a master pump.

master valve (MV)

an electrically operated valve located on the system's main line that controls the flow of water to all other electric and manual valves downstream of it.

Glossary, continued

M3/h (used outside USA)

cubic meters per hour.

monitor

to observe conditions in and around the irrigation system and send the information to the different components in the system for appropriate action.

sensor

an optional addition to the controller that can disable watering.

solenoid

a coil of copper wire that receives a 24 VAC electrical current from the controller, causing a plunger to open a control port in a valve allowing the valve to open and operate the sprinklers.

valve

a manual or electrically operated device used to control flow of water in an irrigation system.

water budget

allows the adjustment of water application times without reprogramming each irrigation **Schedule**.

watering cycle

the complete cycle of watering for all **Programs** controlled by the controller.

Service Information

In the unlikely event this equipment should malfunction, all repairs should be performed by an Authorized Rain Bird® MDC2 Controller Service Center.

For information on Authorized Rain Bird® MDC2 Controller Service Centers, contact Rain Bird® at:

Rain Bird® Corporation
Contractor Division
970 W. Sierra Madre Avenue
Azusa, CA 91702
Phone: (626) 812-3400

Rain Bird® Corporation
Commercial Division
6991 E. Southpoint Rd. Bldg. #1
Tucson, AZ 85706
Phone: (520) 741-6100

Rain Bird® International, Inc.
145 N. Grand Ave.
Glendora, CA 91741-2469
Phone: (626) 852-7313

Rain Bird® Technical Services
1-866-GSP-XPRT (1-866-477-9778)

Specifications Hotline
1-800-458-3005

www.rainbird.com



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Warranty

This product is covered by Rain Bird®'s Three-year Trade Warranty. For details, see the Rain Bird Landscape Irrigation Products Catalog.



Rain Bird Corporation

6991 E. Southpoint Road
Tucson, AZ 85706
Phone: (520) 741-6100
Fax: (520) 741-6522

Rain Bird Technical Services

(800) RAINBIRD (U.S. and Canada)

Rain Bird Corporation

970 West Sierra Madre Avenue
Azusa, CA 91702
Phone: (626) 812-3400
Fax: (626) 812-3411

Specification Hotline

800-458-3005 (U.S. and Canada)

Rain Bird International, Inc.

P.O. Box 37
Glendora, CA 91740-0037
Phone: (626) 963-9311
Fax: (626) 852-7343

www.rainbird.com