Wave PE4 Series (Mini-Wave)

Pool/Spa Combination Systems
Pool Systems
Spa Systems

PE1541RC
PE1501RC

INTERMATIC®
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Installation and User Guide

INTERMATIC®
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158PE12842

Important Safety Instructions

All electrical work must be performed by a licensed electrician and conform to all national, state, and local codes. When installing and using this electrical equipment, basic safety precautions should always be followed, including the following:

⚠ **DANGER:** To reduce the risk of injury, do not remove the suction fittings of your spa or hot tub. Never operate a spa or hot tub if the suction fittings are broken or missing. Never replace a suction fitting with one rated less than the flow rate marked on the equipment assembly.

⚠ **WARNING:** Prolonged immersion in hot water may induce hyperthermia. Hyperthermia occurs when the internal temperature of the body reaches a level several degrees above the normal body temperature of 98.6°F. The symptoms of hyperthermia include dizziness, fainting, drowsiness, lethargy, and an increase in the internal temperature of the body. The effects of hyperthermia include: 1) unawareness of impending danger; 2) failure to perceive heat; 3) failure to recognize the need to exit spa; 4) physical inability to exit spa; 5) fetal damage in pregnant women; 6) unconsciousness resulting in a danger of drowning.

⚠ **WARNING:** To Reduce the Risk of Injury —

- The water in a spa should never exceed 104°F (40°C). Water temperatures between 100°F (38°C) and 104°F (40°C) are considered safe for a healthy adult. Lower water temperatures are recommended for young children and when spa use exceeds 10 minutes.

- Since excessive water temperatures have a high potential for causing fetal damage during the early months of pregnancy, pregnant or possibly pregnant women should limit spa water temperatures to 100°F (38°C).

- Before entering a spa or hot tub, the user should measure the water temperature with an accurate thermometer since the tolerance of water temperature-regulating devices varies.

- The use of alcohol, drugs, or medication before or during spa or hot tub use may lead to unconsciousness with the possibility of drowning.

- Obese persons and persons with history of heart disease, low or high blood pressure, circulatory system problems, or diabetes should consult a physician before using a spa.

- Persons using medication should consult a physician before using a spa or hot tub. Some medication may induce drowsiness while other medication may affect heart rate, blood pressure, and circulation.

⚠ **WARNING:** Risk of electric shock – Install the control center at least five (5) feet (152.4cm) from the inside wall of the pool and/or hot tub using non-metallic plumbing. Canadian installations must be at least three (3) meters from the water.

Installation Notes

Installation Notes

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• Children should not use spas or hot tubs without adult supervision.

• Do not use spas or hot tubs unless all suction guards are installed to prevent body and hair entrapment.

• People using medications and/or having an adverse medical history should consult a physician before using a spa or hot tub.

• People with infectious diseases should not use a spa or hot tub.

• To avoid injury, exercise care when entering or exiting the spa or hot tub.

• Do not use drugs or alcohol before or during the use of a spa or hot tub to avoid unconsciousness and possible drowning

• Pregnant or possibly pregnant women should consult a physician before using a spa or hot tub.

• Water temperature in excess of 100°F (38°C) may be injurious to your health.

• Before entering a spa or hot tub measure the water temperature with an accurate thermometer.

• Do nut use a spa or hot tub immediately following strenuous exercise.

• Prolonged immersion in a spa or hot tub may be injurious to your health.

• Do not permit any electric appliance (such as a light, telephone, radio, or television) within 5 feet (1.5m) of a spa or hot tub.

• The use of alcohol, drugs or medication can greatly increase the risk of fatal hyperthermia in hot tubs and spas.

• Water temperature in excess of 100°F (38°C) may be hazardous to your health.

WARNING: A terminal bar marked "GROUND" is provided with the control center. To reduce the risk of electrical shock, connect this terminal bar to the grounding terminal of your electric service or supply panel with a continuous copper conductor having green insulation and one that is equivalent in size to the circuit conductors supplying this equipment, not smaller than no. 12 AWG (3.3mm). In addition, a second wire connector should be bonded with a no. 8 AWG (4.115mm) copper wire to any metal ladders, water pipes, or other metal within five (5) feet (1.52m) of the tub.

WARNING: A ground-fault circuit-interrupter must be provided if this device is used to control underwater lighting fixtures. The conductors on the load side of the ground-fault circuit-interrupter shall not occupy conduit, boxes or enclosures containing other conductors unless the additional conductors are also protected by a ground-fault circuit-interrupter. Refer to local codes for complete details.

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Section 8:

Warranty

ONE YEAR LIMITED WARRANTY

If, within one (1) year from the date of purchase, this product fails due to defect in material or workmanship, Intermatic Incorporated will repair or replace it, as its sole option, free of charge. This warranty is extended to the original household purchaser only and is not transferable. This warranty does not apply to: (a) damage to units caused by accident, dropping, or abuse in handling, acts of God, or any negligent use; (b) units which have been subject to unauthorized repair, opened, taken apart, or otherwise modified; (c) units not used in accordance with instructions; (d) damages exceeding the cost of the product; (e) sealed lamps and/or lamp bulbs, LEDs, and batteries; (f) the finish on any portion of the product, such as surface and/or weathering, as this is considered normal wear and tear; (g) transit damage, initial installation costs, removal costs, or reinstallation costs.

INTERMATIC INCORPORATED WILL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES. ALL IMPLIED WARRANTIES, INCLUDING THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY MODIFIED TO EXIST ONLY AS CONTAINED IN THIS LIMITED WARRANTY, AND SHALL BE OF THE SAME DURATION AS THE WARRANTY PERIOD STATE ABOVE. SOME STATES DO NOT ALLOW LIMITATIONS ON THE DURATION OF AN IMPLIED WARRANTY, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

This warranty service is available by either (a) returning the product to the dealer from whom the unit was purchased, or (b) mailing the product, along with proof of purchase, postage prepaid, to the authorized service center listed below. This warranty is made by: Intermatic Incorporated/After Sales Service/7777 Winn Rd., Spring Grove, IL 60081-7000 <http://intermatic.com>. Please be sure to wrap the product securely to avoid shipping damage.

Because of our commitment to continuing research and improvements, Intermatic Incorporated reserves the right to make changes, without notice, in the specifications and material contained herein, and shall not be responsible for any damages, direct or consequential, caused by reliance on the material presented.

WARRANTY REGISTRATION

Owner's Name_____   Signature_____

Street Address_____   Date of Purchase _____

City_____   State_____   Zip _____   Phone _____

Authorized Dealer _____   Sales Rep _____

City_____   State_____   Zip _____   Phone _____

How did you hear about our product? (Please check all that apply.)

___Pool Store Employee   ___Pool Builder   ___Pool Service   ___Direct Mail Ad   ___In-Store Display

___Friend/Relative   ___Magazine   ___Newspaper   ___Radio   ___TV   ___Catalog   ___Other: _____

To activate your warranty, please return this portion to:

INTERMATIC®
Providing a Brighter Solution™

Intermatic, Inc.
7777 Winn Road
Spring Grove, IL 60081
or by FAX: 815-675-7055

Check that protection for the pool cleaner pump is working (if installed)

What to do	If it doesn't work	Reference/Procedure
1. Make sure all equipment is OFF but power is present at the panel.	Verify that the Membrane Pad is working properly.	Review the What To Do suggestions for the "Check all circuits using the membrane pad and wireless remote" troubleshooting information on page **39**.
2. Make sure the water valves and actuators are in the Pool position and the P/S light on the membrane pad is OFF.	Verify that the cleaner pump relay is installed, set up to work with button **<3>**, and wired to the cleaner pump.	Review the wiring diagram and instructions on page **23**.
3. Push Circuit **#1** ON to turn on the filter pump.	Verify on the Hand-Held remote Transceiver that BOOSTER protection has been turned ON.	Review "Programming to Protect a Pool Cleaner Pump" on page **36**.
4. Push Circuit **#3** ON to turn on the cleaner pump.		
5. Push the **<P/S>** button on the control to change the valves over to the SPA. The cleaner pump should turn off within five seconds of pushing the **<P/S>** button.		
6. Wake up the Hand-Held Remote Transceiver by pressing any button.		
7. Push button **<3>** to turn ON the cleaner pump. The cleaner pump should NOT come on because the valves are in the spa position.		
8. Push the **<P/S>** button on the Hand-Held Remote Transceiver to change the valves back to the pool position.		
9. Push button **<3>** to turn on the cleaner pump. The cleaner pump should now come ON.		
10. Push the **<P/S>** button on the Hand-Held Remote Transceiver as to change the valves back to the spa position.		
11. The cleaner should shut OFF automatically.		
If you can't complete this procedure successfully, follow the steps in the next column to troubleshoot.		

Section 1:

System Overview

The Intermatic Mini-Wave Pool/Spa PE4 Wireless Control System brings wireless control to a new level of simplicity and affordability. What makes the system distinctive is that it is:

- **Easy to Use** — with simple, push button controls and a clear, easy-to-read display panel
- **Everything You Need** — providing, in its standard configuration, the functionality and control called for in nearly every installation.
- **Dependable** — with Z-Wave® technology that lets you plug inexpensive repeaters into an electrical outlet to relay signals in any part of the site with dead spots. Z-Wave® technology eliminates intermittant signal problems experienced with many other systems.
- **Cost Efficiency** — a superior system, easier to install and maintain, with better dependability, and at a cost that's competitive with any other system available.

The standard configuration for the Mini-Wave Pool/Spa PE4 Wireless Control System configuration is shown in Figure 1-1. You can order individual components for a custom configuration or system as indicated.
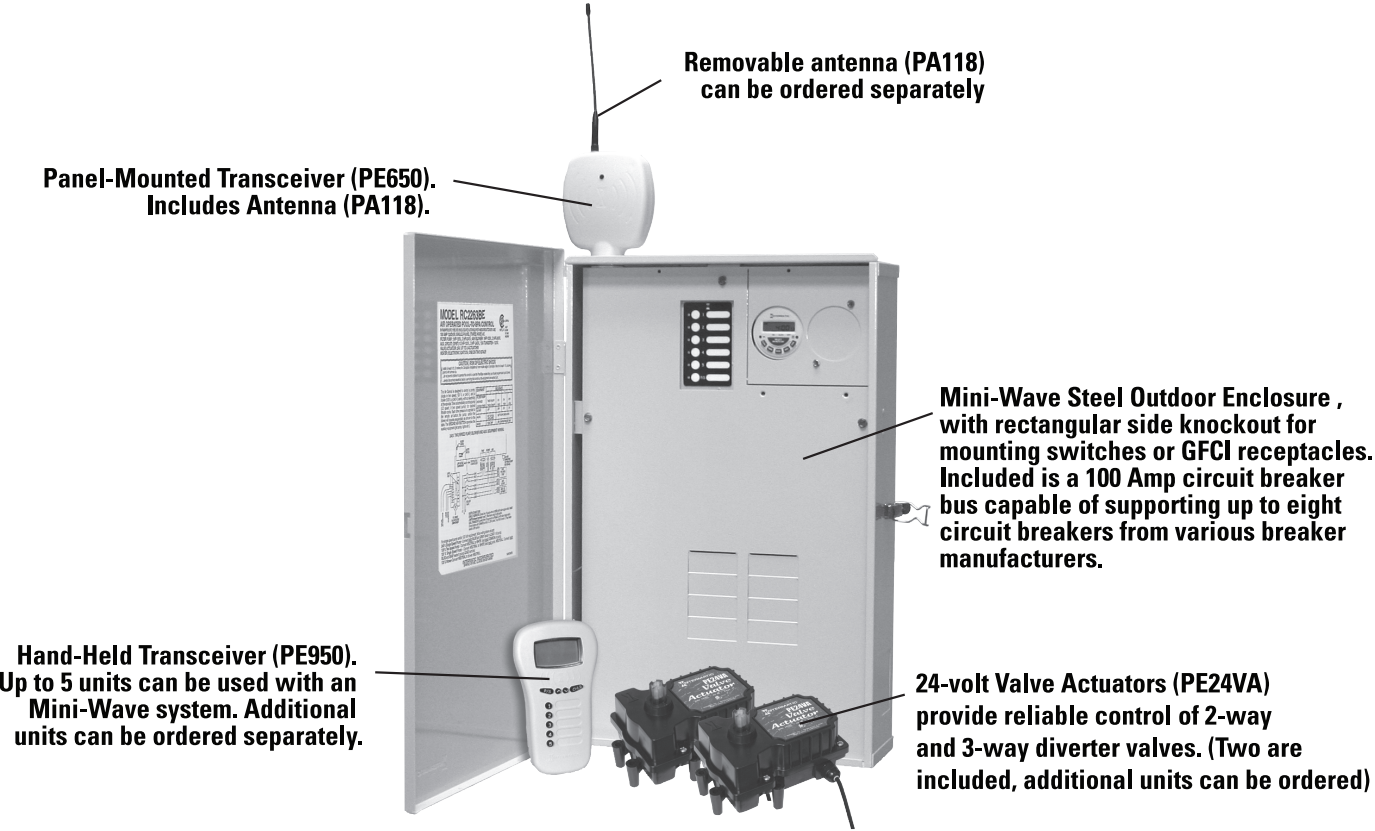

Removable antenna (PA118) can be ordered separately

Panel-Mounted Transceiver (PE650). Includes Antenna (PA118).

Mini-Wave Steel Outdoor Enclosure , with rectangular side knockout for mounting switches or GFCI receptacles. Included is a 100 Amp circuit breaker bus capable of supporting up to eight circuit breakers from various breaker manufacturers.

Hand-Held Transceiver (PE950). Up to 5 units can be used with an Mini-Wave system. Additional units can be ordered separately.

24-volt Valve Actuators (PE24VA) provide reliable control of 2-way and 3-way diverter valves. (Two are included, additional units can be ordered)

Figure 1-1

Check for successful wireless reception all around the yard

What to do	If it doesn't work	Reference/Procedure
1. Wake up the Hand-Held Remote by pressing any button. 2. Identify and walk to the areas where you intend to use the Hand-Held Remote, and make sure you see **STAT OK** in the upper left corner of the display at all times in these areas. 3. If the word **OK** disappears and the display reads only **STAT**, follow the procedures in the next column.	Verify that the Hand- Held Remote is working properly.	Follow the troubleshooting procedures on page *41*.
	Verify that the Hand-Held Remote is successfully communicating with the Panel-mounted Transceiver.	1. Stand next to the control box with the Hand-Held Remote. 2. Verify that the unit works by locating and following the "What to do" procedures detailed in *Check all circuits using the Membrane Pad and Wireless Remote* on page 39.
	Install Transceiver Repeater Modules *(HA04C)* where necessary to improve or broaden range.	1. Locate a 120 Volt outlet someplace between the Panel Mount Transceiver and the area the Hand Held Transceiver lost communication. 2. Install a Transceiver Repeater Module *(HA04C)* in this outlet and program the Repeater Module by following the instructions on page **31**. 3. See page **9** for Transceiver Repeater Module ordering information.
	Install the Intermatic 35-ft. Antenna Extension Cable Assembly *(PA121)* to improve or broaden range.	1. If a 120 Volt outlet is not strategically located or the Transceiver Repeater Module doesn't work, you may have to remote the antenna on the Panel Mount Transceiver located on the top of the enclosure. **NOTE:** *Only an Intermatic 35-ft. Antenna Extension Cable Assembly (PA121) will work with the Mini-Wave Control. Ordering information is located on page 8.* 2. Remove the antenna located at the top of the Panel-Mounted Transceiver by turning the antenna counter clockwise. 3. Install the female end of the cable where the antenna was previously connected. 4. Install the antenna on the other end of the cable. 5. Route the cable to a location where the antenna will be in the direct Line of Sight of the area where the Hand-Held Remote will be most frequently used. 6. Mount the cable and antenna with the mounting kit that comes with the Intermatic 35-ft. Antenna Extension Cable Assembly *(PA121)*. 7. Repeat the "What to do" procedure to verify that your installation was successful.

Verify that the Hand-Held Remote is controlling pool and spa temperature

What to do	If it doesn't work	Reference/Procedure
1. Wake up the Hand-Held Remote by pressing any button. 2. Depending on how your suction and discharge valves are turned, the display should show the actual water temperature of either the pool or spa. 3. On the right hand side of the display there should be a **P** and **S** indicating the pool and spa set temperatures. Press the **<ARROW>** buttons to adjust the set point so that it is higher then the actual water temperature. 4. Verify that the word **HEATING** appears at the bottom of the display. This indicates that the heater should be heating, if it is working properly and the system is wired and plumbed properly. 5. Verify that the heater is actually heating. 6. Press the **<ARROW>** buttons to lower the set temperature below the actual water temperature. 7. Verify that the word **HEATING** goes out at the bottom of the display. This indicates that the heater should not be heating, if the heater is working properly and the system is wired and plumbed properly. 8. Verify that heater has stopped heating. If you can't complete these procedures successfully, follow the steps in the next column to troubleshoot.	Verify that filter pump is turned ON and running.	Turn ON the circuit that controls the filter pump. Verify that the filter pump is running and that there is adequate flow through the heater.
	Verify that power is turned ON to the heater.	Verify that the heater circuit breaker is ON and the heater actually has power.
	Verify that the heater thermostat at the Heater is turned up fully for both pool and spa settings.	All thermostats on the heater must be set to their maximum setting.
	Verify that the Pool and Spa Set point on the Hand-Held Remote is set higher than the actual water temperature shown on its display.	1. On the right hand side of the display there should be a **P** and **S** indicating the pool and spa set temperatures. Press the **<ARROW>** buttons to adjust the set point so that it is higher then the actual water temperature. 2. Verify that the word **HEATING** appears at the bottom of the display. This indicates that the heater should be heating, if it is working properly and the system is wired and plumbed properly.
	Verify heater works independently of the control system.	1. Remove all wires from the control to the heater and hook up the heater system as a stand-alone unit. 2. Verify that the heater works with its own thermostat.
	Results of troubleshooting:	1. If the heater does not work independently of the control, repair the heater. 2. If the heater does work independently of the control, replace the Panel-Mounted Transceiver. See page **7** for ordering information.

The standard system *(PE1541RC)* is shipped with the panel-mounted transceiver attached to the top of the enclosure, with antenna to be attached. Components are already interconnected and are ready for wiring.

You can order most system components individually to assemble a custom Mini-Wave system as desired.

Additional Detail on Key Components

24-Volt Valve Actuator *(PE24VA)*

Designed with quality in mind, Intermatic's 24-volt valve actuators provide reliable control of 2-way and 3-way diverter valves for pool/spa combinations and water features. The water flow can be altered for specific applications through the adjustable cam, which rotates diverter valves to multiple degree settings. The cam settings can be easily adjusted by simply removing the lid. These valve actuators are compatible with all pool/spa valves currently offered in the industry and will retrofit into all pool/spa control systems.

- 24VAC Input Voltage
- Automates compatible diverter valves for pool/spa combos
- Adjustable cam rotates diverter valves to multiple degree settings
- Designed to operate most 2-way and 3-way diverter valves
- Shipping Weight - 3 lbs. (1.4 kg)
- Agency Approval - CSA/C-US

Panel-Mounted Transceiver *(PE650)* Includes Antenna *(PA118)*

The main function of the Panel-Mounted Transceiver is to take commands from the Wireless Hand-Held Transceiver *(PE950)* and hand them off to the two circuit boards in the Mini-Wave enclosure.

In cases where the two devices are too far apart for direct communication, a Transceiver Repeater Module *(HA04C)* will relay commands between the two devices. Shown here with its removable antenna *(PA118)*.

Wireless Hand-Held Transceiver *(PE950)*

The main function of the Wireless Hand-Held Transceiver is to transmit user commands to the Panel-Mounted Transceiver *(PE650)* and display the status of the equipment. The device can control up to five loads, typically:

- Four or five relay loads depending on the configuration
- The actuator for a water feature
- The actuators that switch between pool and spa

The unit floats if thrown in the pool or spa, is water-submersible, shock resistant, and requires three (3) AA batteries. Expected battery life is about one year in typical use.

The Wireless Hand-Held Transceiver can only communicate with the Panel-Mounted Transceiver (*PE650*) and Transceiver Repeater Module (*HA04C*), and is compatible with no other hardware. In addition, when the components of a specific system are linked together into a network, communication with another neighboring system cannot occur. Up to five PE950 units can be used in a single installation.

Eight-Setting ON/OFF Clock *(PB313EK)*

The Eight-Setting ON/OFF Clock *(PB313EK)* that accompanies the Mini-Wave PE4 system provides timer control of Relay 1 or Relay 2, depending on the version, for one of the Pump/Valve Control mechanisms. An additional clock can be installed in the steel enclosure if desired, providing timer control of a second circuit.

The clock can be programmed for up to eight ON/OFF settings.

35-ft. Antenna Extension Cable Assembly *(PA121)*

When a structure impedes transmission between the Panel-Mounted Transceiver and Hand-held Transceiver(s), you can use the 35-ft. Antenna Extension Cable Assembly *(PA121)* to relocate the antenna from the Panel-Mounted Transceiver to the area of operation, ensuring that communication between the Hand-held unit and the control center is successful. The Mini-Wave includes this antenna extension cable assembly.

OMRON Relay w/24VDC Coil & 2-pin Connector *(143T145A)*

There are four OMRON Relay Assemblies (*143T135A*) in the Mini-Wave PE4 Control System which switch either 120V or 240V loads. These relays are replaceable and can be ordered separately.

CONTACT RATINGS – EACH CIRCUIT
- 30A Resistive, 120/240VAC., 50/60 Hz
- 1.5 HP @ 120VAC., 50/60 Hz
- 3.0 HP @ 240VAC., 50/60 Hz
- 10 Amp Tungsten, 120/240VAC, 50/60 Hz

OMRON Relay w/24VAC Coil & 3-pin Connector *(PA120)*

When an additional relay is desired for circuit #3 it must be plugged into any of the two-actuator ports on the upper control board. Since you will be using the actuator circuit to power this new relay, the relay must have a 24VAC coil and a three-pin connector. The PA120 supports this installation and **must be used** for this application.

CONTACT RATINGS – EACH CIRCUIT
- 30A Resistive, 120/240VAC., 50/60 Hz
- 1.5 HP @ 120VAC., 50/60 Hz
- 3.0 HP @ 240VAC., 50/60 Hz
- 10 Amp Tungsten, 120/240VAC, 50/60 Hz

NOTE: *DO NOT USE A RELAY WITH A 24VDC COIL FOR CIRCUIT #3. The relay will chatter and possibly damage the equipment it controls.*

Verify that the Hand-Held Remote is working properly

What to do	If it doesn't work	Reference/Procedure
1. Wake up the Hand-Held Remote by pressing any button. 2. On the right hand side of the display there should be a "P" and "S" indicating the pool and spa set temperatures. Use the arrow keys to increase or decrease these set points. The display will change back in five seconds. 3. Pushing the **<CHLR>** button should change the display to "CHLORINATOR NOT AVAILABLE". This display will change back in five seconds. 4. Holding down the **<P/S>** and **<CHLR>** buttons simultaneously for five seconds should enter you into the programming screen. Use the number keys to navigate these menus. Press the **<CHLR>** button to exit the programming screen. If you can't complete this procedure successfully, follow the steps in the next column to troubleshoot.	Verify that batteries are installed properly and fully charged.	1. The Hand-Held Remote takes 3 AAA batteries. Make sure the batteries are installed and are properly aligned according to the polarity markings in the battery compartment. 2. Do not mix fully charged batteries with partially charged batteries in the Hand-Held Remote. 3. Do not use rechargeable batteries in the Hand-Held Remote. 4. If the **Low Bat** indicator is visible in the display, the Hand-Held Remote will function intermittently. Replace batteries immediately.
	Verify that the Hand-Held Remote has successfully awakened from its sleep state.	1. Push any button on the Hand-Held Remote to wake it from its sleep state. Failure to awaken means there will be nothing visible on the display! 2. If the Hand-Held Remote is awake and none of its buttons are pressed, it should go back into its sleep state after one minute.
	Verify that the Hand-Held Remote is successfully linked up to the Panel-mounted Transceiver.	1. Check that the display panel on the Hand-Held Remote says **STAT OK**, not just **STAT**. 2. If not, reprogram the Hand-Held Remote. See pages **28-30**. 3. Replace the Hand-Held Remote if unable to successfully program. 4. Replace the Panel-Mounted Transceiver if still not able to establish communication with the replacement Hand-Held Remote.

Check that actuator valves correctly switch between pool and spa

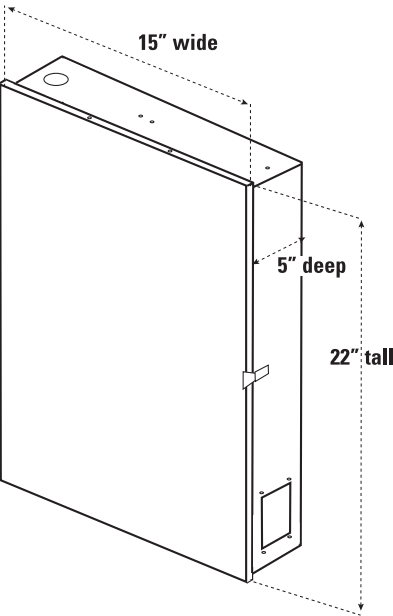| What to do	If it doesn't work	Reference/Procedure
1. Press the **\<P/S\>** button on the membrane pad so the green light beside the button is illuminated. 2. Wake up the Hand-Held Remote Transceiver by pushing any button. Verify that the Hand-Held Receiver shows "Spa" on the LCD screen. 3. Verify that the Actuators and Valves are in the SPA position. 4. Press the **\<P/S\>** button on the Hand-Held Receiver and verify that the receiver shows "Pool" on the LCD screen. 5. Verify that the green light beside the **\<P/S\>** button on the membrane pad has gone out and the Actuators and Valves are in the Pool position. If you can't complete this procedure successfully, follow the steps in the next column to troubleshoot.	Verify that power is ON to the panel	1. Turn the main circuit breaker that feeds the panel to the ON position. 2. Use a voltmeter to verify voltage is present at the buss terminals. See page **12**.
	Verify that the Actuator cable is plugged into the lower control board.	Retrace your wiring and verify each actuator is plugged in properly. See page **17**.
	Verify that the Actuator shaft is engaged in the valve it controls.	1. Tighten the screw located on the top of the actuator. 2. Turn the valve handle until actuator engages. • If the actuator IS NOT engaged, the handle will turn and then engage. • If the actuator IS engaged, the handle will not turn. **DO NOT FORCE THE HANDLE TO TURN.**
	Verify that the ON/OFF switch on the Actuator is powered ON.	The Intermatic actuator has an ON/OFF switch located on the back of the actuator. Make sure this switch is in the AUTO ON 1 or AUTO ON 2 position, depending on your plumbing configuration.
	Verify that the Membrane Pad works independently of the Panel-Mounted Transceiver.	1. Remove power from the system by turning off the main breaker. 2. Disconnect the Panel-Mounted Transceiver from both of the Chassis upper and lower control boards. 3. Reapply power. Do the Actuators work now? • If yes, reconnect Panel-Mount Transceiver and synchronize the Hand-Held Transceiver. • If no, proceed to next step.
	Verify that the Membrane Pad is connected to both the upper and lower control boards.	Remove System Chassis and verify that both ribbon cables from the membrane pad are plugged into each control board.
	Verify that the 24VAC power is connected and present at both upper and lower control boards.	With a voltmeter, verify that the secondary of the transformer is producing 24VAC to each of the upper and lower control boards. See page **26**, Fig **5-9**. If not, replace transformer.

Water Temperature Sensor (PA122)

The Intermatic Water Sensor (PA122) monitors both pool and spa water temperature, depending on the position of the diverter valves. Installation is necessary for the thermostatic control to work. The sensor can be ordered separately.

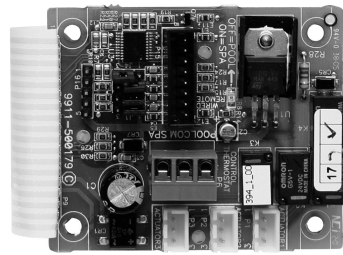## Optional Transceiver Repeater Module (HA04C)

The Transceiver Repeater Modules (HA04C) ensure that no problems in reception occur between the Hand-Held Controller(s) (PE950) and the Panel-Mounted Transceiver (PE650). Reception is affected by distance (about 100 feet, direct line of sight) and by physical obstacles (like brick walls or structures). However, by plugging in a Transceiver Repeater Module where necessary, long distances or physical obstructions can be overcome.

Steel Outdoor Enclosure

15" wide

5" deep

22" tall

| Suitable listed breakers (purchase locally)						
	CIRCUIT BREAKER					FILLER PLATE
MFR	SINGLE	DOUBLE	TWIN	QUAD	GFCB	
Cutler-Hammer	BR	BR	BRD	BRD	GFCB	BRFP
Murray	MP-T	MP-T	MH-T	MH-T	MP-GT	LX100FP
Siemens	QP	QP	QT	QT	QPF	QF3
Square-D	HOM	HOM	HOMT	HOMT	HOM	HOMFP
Thomas & Betts	TB	TB	TBBD	TBBD	GFB	FP-1C-TB

Upper or Lower Control Board (PA125)

There are two Control Boards in your Mini-Wave Control System. Each board is identical and capable of taking commands from both the Panel Mount Transceiver and Control Pad and relaying this information to the Pool/Spa equipment relays.
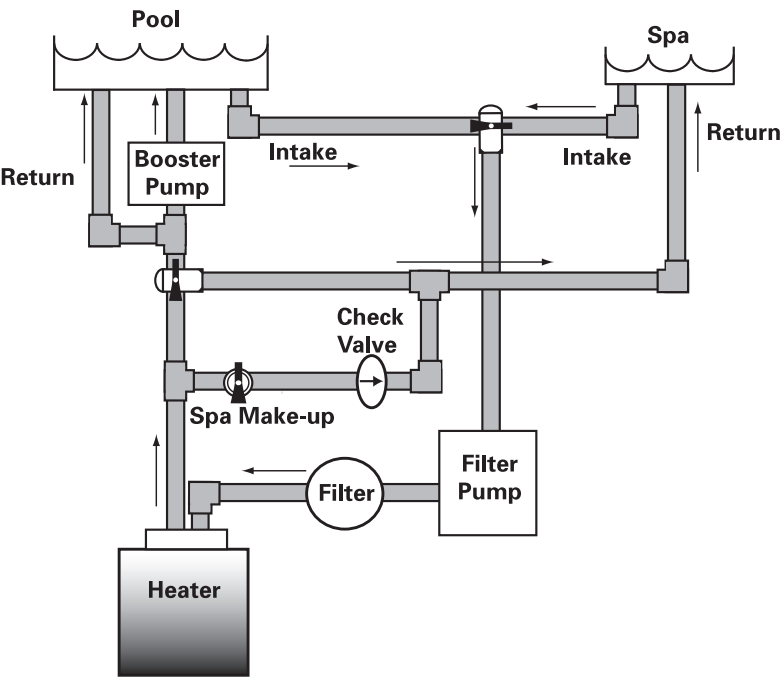
Section 2:

Plumbing Examples

The following diagrams show several plumbing and wiring examples of installations for pool and spa that share a single filter pump, filter, and heater. If you are installing a pool only or spa only, these diagrams will not apply.

For Pool and Spa Combo Installations
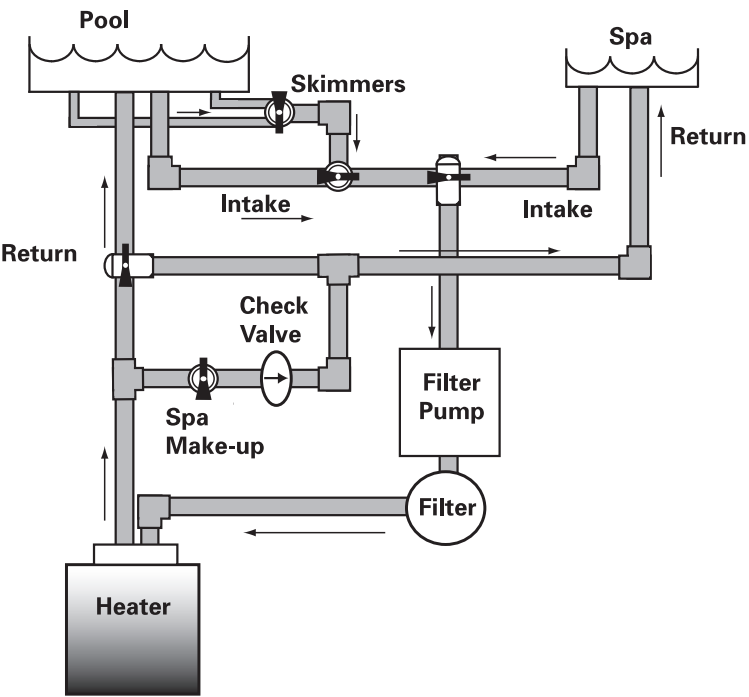
For Booster Pump Pool Cleaner Installations

Check all circuits using the membrane pad and wireless remote

| What to do	If it doesn't work	Reference/Procedure
Run this procedure for checking each circuit on the Membrane Pad and Hand-Held Transceiver. 1. Press <1> thru <5> buttons on the face of the membrane pad. Each LED should illuminate next to each button and each corresponding load should come on. 2. Wake up the Hand-Held Transceiver by pushing any button. Verify that the Hand-Held Receiver shows circuits 1 thru 5 have powered ON. [Numbers 1 thru 5 will illuminate at the top of the screen, indicating these circuits have powered ON.] 3. Verify the wired load that corresponds to each circuit pushed has activated properly (e.g., pump, light, etc.). 4. Turn Circuits 1 thru 5 OFF using the ON/OFF buttons on the Hand-Held Remote Transceiver. 5. Verify that the Hand-Held Transceiver shows Circuit 1 thru 5 are powered OFF. Numbers 1 thru 5 will disappear on the screen and all the LED's will turn off on the membrane pad indicating they have all turned OFF. 6. Verify that all five loads have now been powered off.	Verify that power is ON to the panel.	1. Turn the main circuit breaker that feeds the panel to the ON position. 2. Use a voltmeter to verify that voltage is present at the buss terminals. See page 12.
	Verify that the breaker is turned ON for each wired load.	Use a voltmeter to verify that voltage is present at each individual breaker. See page 14.
	Verify that 120VAC power is wired to the Upper Control Chassis and the circuit breaker is ON.	Reference page 14 for Chassis wiring and voltage requirements.
	Verify that the wiring is correct to each equipment load.	Retrace your wiring and verify all lines and loads are wired properly. See pages 14.
	Verify that the relay associated with the circuit is closing when turned ON.	Below the Load and Line terminals of each relay is a black boss that indicates the state of the relay. 1. Turn ON Circuit 1 and verify that the black boss on the #1 relay is recessed into the relay. 2. Turn OFF Circuit 1 and verify that the black boss on the #1 relay is exposed outside the relay.
	Verify that the Hand-Held Remote Transceiver is working.	See "Verify that the hand-Held Remote Transceiver is working properly" troubleshooting on page 41. NOTE: You must push any button on the Hand-Held Remote Transceiver to wake it from its sleep state. Failure to do so will result in no display!
	Verify that the Hand-Held Remote Transceiver is linked up to the Panel-Mounted Transceiver	1. Check that the display panel on the Hand-Held Remote Transceiver says STAT OK, not just STAT. If not, reprogram the Hand-Held Remote Transceiver. See pages 28-30. 2. Replace the Hand-Held Remote Transceiver if unable to successfully program. 3. Replace the Panel-Mounted Transceiver if still not able to establish communication with the replacement Hand-Held Remote Transceiver.
	Verify that the Membrane Pad works independently of the Panel-Mounted Transceiver.	1. Remove power from the system by turning off the main breaker. 2. Disconnect the Panel-Mounted Transceiver from both of the Chassis upper and lower control boards. 3. Verify that all line and load wires are connected properly. See page 14. 4. Reapply power. Does the Membrane Pad work now? • If yes, reconnect Panel-Mount Transceiver and synchronize the Hand-Held Transceiver. • If no, proceed to next step.
	Verify that the membrane pad is connected to both the upper and lower control boards.	Remove System Chassis and verify that both ribbon cables from the membrane pad are plugged into each control board.
	Verify that the 24VAC power is connected and present at both upper and lower control boards.	With a voltmeter, verify that the secondary of the transformer is producing 24VAC to each of the upper and lower control boards. See page 26, Fig 5-9. If not, replace transformer.

Section 7:

Checking Out and Troubleshooting the System

After you have completed installation and programming, make sure the system is working OK by completing the procedures listed below. Later on, if problems develop in using the system, going over these same procedures will help you troubleshoot the problem.

Check time of day setting

What to do	If it doesn't work	Reference/Procedure
Verify that the display on the Pump Timer is showing the correct time of day.	Verify that power is ON to the panel.	1. Turn the main circuit breaker that feeds the panel to the ON position. 2. Use a voltmeter to verify that voltage is present at the buss terminals. See page **12**.
	Verify that the breaker is turned on and 120VAC is wired to the upper chassis and Pump Timer.	Use a voltmeter to verify that voltage is present at the breaker and Pump Timer Power terminals. See pages **14**.
	Verify the condition of the Pump Timer battery.	Remove the clock and verify the battery in the rear of the clock is good. See page **22**.
	Follow instructions for setting the correct time.	See page **21** for setting time.
	Replace Pump Timer if unsuccessful.	See page **8** for ordering a new Timer Clock.

For Non-Booster Pump Pool Cleaner Installations
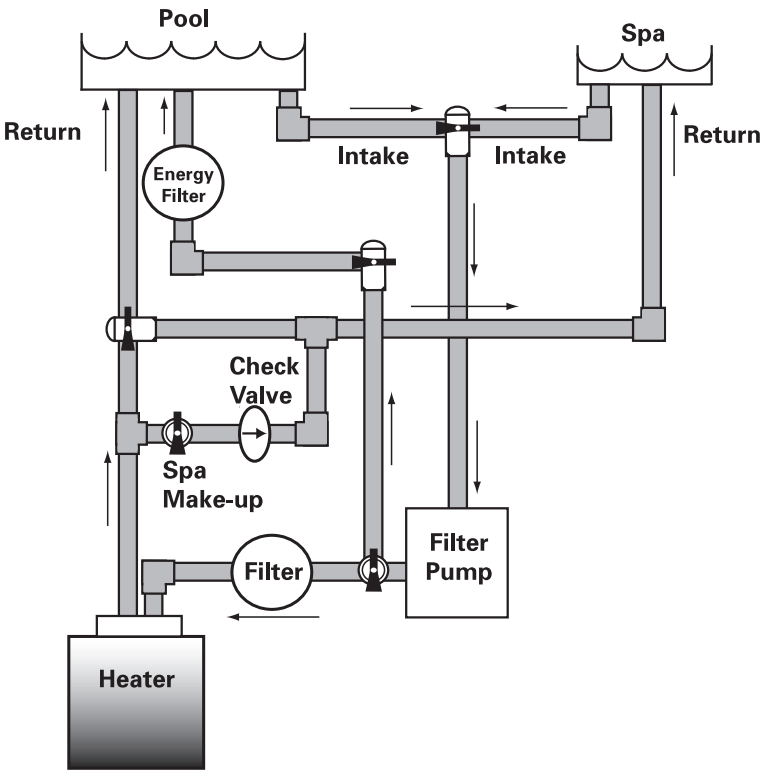
Section 3:

Control Center Installation

Mounting the Control Center

Special code requirements apply to your Mini-Wave Control System. To ensure safe installation, please follow all applicable national state, and local codes when installing the Control Center.

Locate your Control Center near the pool/spa equipment pad at least five feet or more away from either the pool or spa equipment and at least five feet off the ground.

Mounting brackets have been provided to assist you in your installation.

NOTE: The Control Center is not to be considered as suitable for use as Service Equipment. Therefore, it is required to have the appropriate means of disconnection, circuit isolation, and/or branch circuit protection installed at the Main Power Panel.
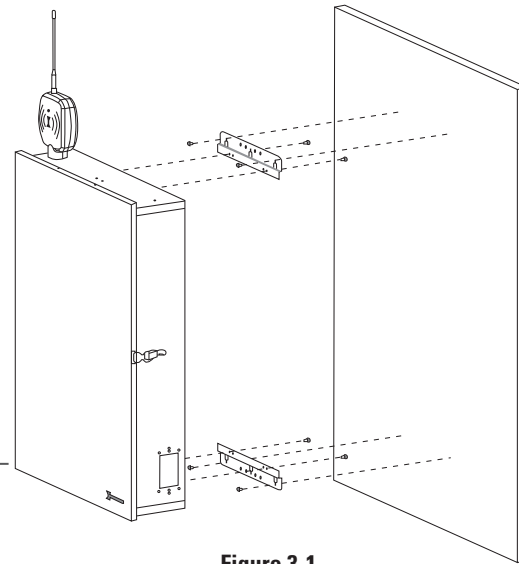
Figure 3-1

Wiring the System Power

Run wire from the Main Power Panel to your Control Center and connect the leads to the Control Center Breaker Base. See detail in Figure 3-2 at the right.

The breaker base of your Control Center is capable of handling up to 100 amps. You must comply with the applicable local codes and use the proper gauge wiring from your Main Power panel to your control center breaker base. The proper gauge wire will be determined by the length of wire required and the 100 Max Amp rating.

⚠️ **WARNING: Potentially high voltages in the Control Center can create dangerous electrical hazards, possibly causing death, serious injury, or property damage. Turn off the Main Power to the Control Center to disconnect or service the Mini-Wave Control Center.**
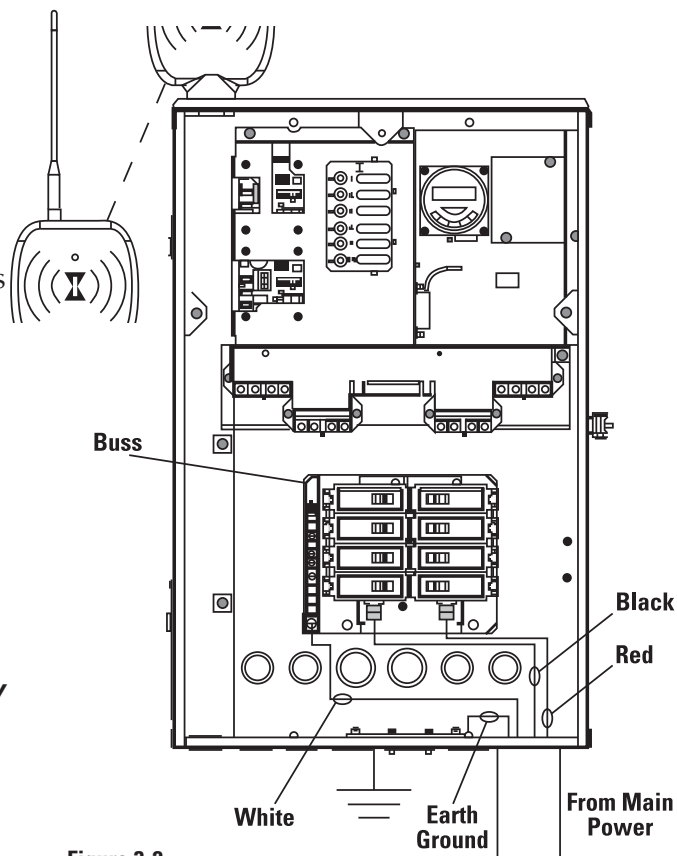
Buss

Black

Red

White

Earth Ground

From Main Power

Figure 3-2

Using Two Hand-Held Controllers to Operate the System

When two or more Hand-Held Controllers are being used to operate a system, each will synchronize itself to the other according to whatever function the other controller has activated.

For example, if you press the **<1>** button on one controller, the following will happen:

- **Circuit 1** at the control center will toggle on or off, depending on its current state.
- The number **1** will appear along the top of the Hand-Held Controller's screen.
- Then, a few seconds later, the number **1** will also appear along the top of the second Hand-Held Controller's screen.

The owner can add up to five Hand-Held Controllers to a system.

Adjusting the display temperature on the Wireless Hand-Held Transceiver

There are many variables that can affect the temperature displayed on your Wireless Hand-Held Transceiver. These can range from where the water temperature sensor is located, the difference in water temperature at the top vs. the bottom of your pool or spa, or even another temperature you are referencing. Whatever the case, you can adjust your temperature display on your Wireless Hand-Held Transceiver to compensate for these different variables.

1. It's best to adjust this value while standing close to the panel to ensure good communication between the Hand-Held Remote and Panel Mount Receiver.

2. Press and release any button on the Hand-Held Remote to wake it from sleep. (The unit goes to sleep to conserve battery life when it has been idle for 30 seconds).

3. Press and hold the **<P/S>** and **<CHLR>** buttons at the same time for about 5 seconds. This will put the device in programming mode.

4. Press and release the **<5>** button to select **MORE OPTIONS**. A new screen will appear.

5. Press and release the **<3>** button on the new screen to select **ADJUST TEMP 0**.

6. Press and release the **<UP>** or **<DOWN>** arrow buttons to raise or lower the desired value that should be added or subtracted to the temperature display.

7. Press and release the **<3>** button to save your desired value. The word **SUCCESS** should display at the bottom of the screen.

   NOTE: If the word SUCCESS does not display at the bottom of the screen after saving your new value then the new value did not save and the setting will default to the previously saved value. This is due to miscommunication between your Hand Held Remote and Panel Mount Receiver. Refer to page 28 for instructions on Synchronizing the Hand-Held with the Panel-Mounted Receiver.

8. Press and release the <CHLR> button to exit programming mode.

The temperature display should now show a new value based on your programmed adjustment level.

b. Press the **<2>** button on the new screen to select **READY TO ADD**. The screen refreshes and displays only the line **2 READY TO ADD**.

```
LEARN      VER x

2  ADD NEW CONTROLLER
```

4. Promptly, on the EXISTING or PRIMARY Hand-Held that is <u>already part of the network</u>, press the **<1>** button to select **INCLUDE NODE**. After a few seconds, the word **SUCCESS** should appear on the screens of both units.

```
LEARN      VER x
1  INCLUDE NODE
2  ADD TO GROUP
3  RESET NODE
4  RESET CONTROLLER
5  MORE OPTIONS
C  EXIT
      SUCCESS
```

5. Press the **<CHLR>** button on both Hand-Held Controllers to exit programming mode. The left side of the screen of both Controllers will say **STAT OK**, indicating that the procedure has been successful.
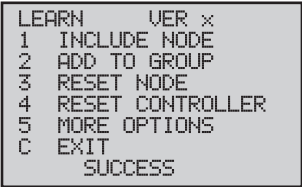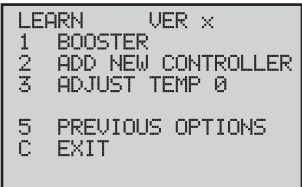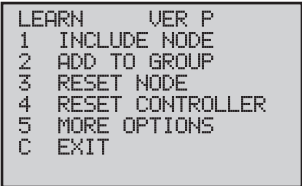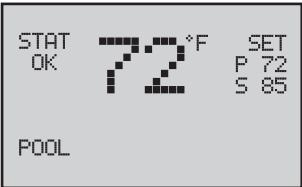
Programming to Protect a Pool Cleaner Pump

When you installed and wired the system, you may have elected to install optional relay #3 (PA120) for a Booster/Cleaner Pump.

You will want to make sure this pump is never powered on when the system is in spa mode.

The system can accommodate this scenario.

1. Press any button on the Hand-Held Remote to wake it from sleep. (The unit goes to sleep to conserve battery life when it has been idle for 30 seconds.)

```
STAT          °F    SET
 OK   72          P 72
                   S 85


POOL
```

2. Press and hold the **<P/S>** and **<CHLR>** buttons at the same time for about 5 seconds. This will put the device in programming mode, as shown at the right.

```
LEARN      VER P
1  INCLUDE NODE
2  ADD TO GROUP
3  RESET NODE
4  RESET CONTROLLER
5  MORE OPTIONS
C  EXIT
```

3. Press the **<5>** button to select **MORE OPTIONS**. A new screen will appear, as shown at the right.

```
LEARN      VER x
1  BOOSTER
2  ADD NEW CONTROLLER
3  ADJUST TEMP 0

5  PREVIOUS OPTIONS
C  EXIT
```

4. Press the **<1>** button on the new screen to change **BOOSTER OFF** to **BOOSTER ON**.


NOTE: This button toggles between ON and OFF.

That's all there is to it. When BOOSTER is set to **ON**:

- The system will automatically turn the booster/cleaner pump **OFF** any time the spa mode is activated, protecting the booster/cleaner pump.

Bonding the Control Center

Some state local codes require bonding the control center to the bonding grid. If this is required, install a bonding lug *(156T11047A)* to the Control Center enclosure and connect a #8 solid copper core wire, to an approved earth ground, (i.e. approved ground stake, or conducting metal water pipe buried to a sufficient depth, etc.). See detail in Figure 3-3 at the right.

Part Number 156T11047A

Figure 3-3
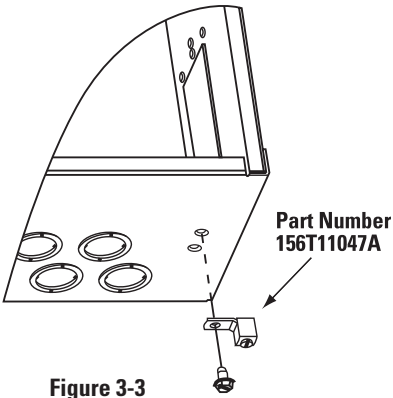
Wiring the Individual Equipment

Each piece of pool or spa equipment requires its own high voltage relay and associated circuit breaker branch protection. Each circuit breaker should be sized according to your load and the appropriate local codes.

The Mini-Wave PE4 Control System consists of:

- Four Omron relays, each providing an on-demand circuit, one on a timer.
- One Intermatic clock *(PB313EK)*, capable of controlling the Relay 1 or Relay 2 circuit, depending on the version, with up to eight ON/OFF settings.

Equipment that requires programmed ON/OFF times is already wired to the first or second relay (i.e., filter pumps, booster pumps, etc.). On-demand equipment (i.e., blowers, lights, etc.) should be wired to the remaining three relays.

All circuits are independent contacts. Therefore you can mix and match 120-Volt and 240-Volt loads within the enclosure. Refer to the following illustrations for sample wiring diagrams.

High-Voltage Equipment Wiring

Your Mini-Wave PE4 control system is capable of handling both 120VAC and 240VAC equipment loads. For 240VAC equipment loads, connect the power to the two (2) line terminals and connect equipment power to the two (2) load terminals on the same relay. For 120VAC equipment loads, connect power to a line terminal and connect equipment to a load terminal on the same relay.

CONTACT RATINGS – EACH CIRCUIT *(DO NOT exceed any ratings)*

- 30A Resistive, 120/240VAC., 50/60 Hz
- 1.5 HP @ 120VAC., 50/60 Hz
- 3.0 HP @ 240VAC., 50/60 Hz
- 10 Amp Tungsten, 120/240VAC, 50/60 Hz
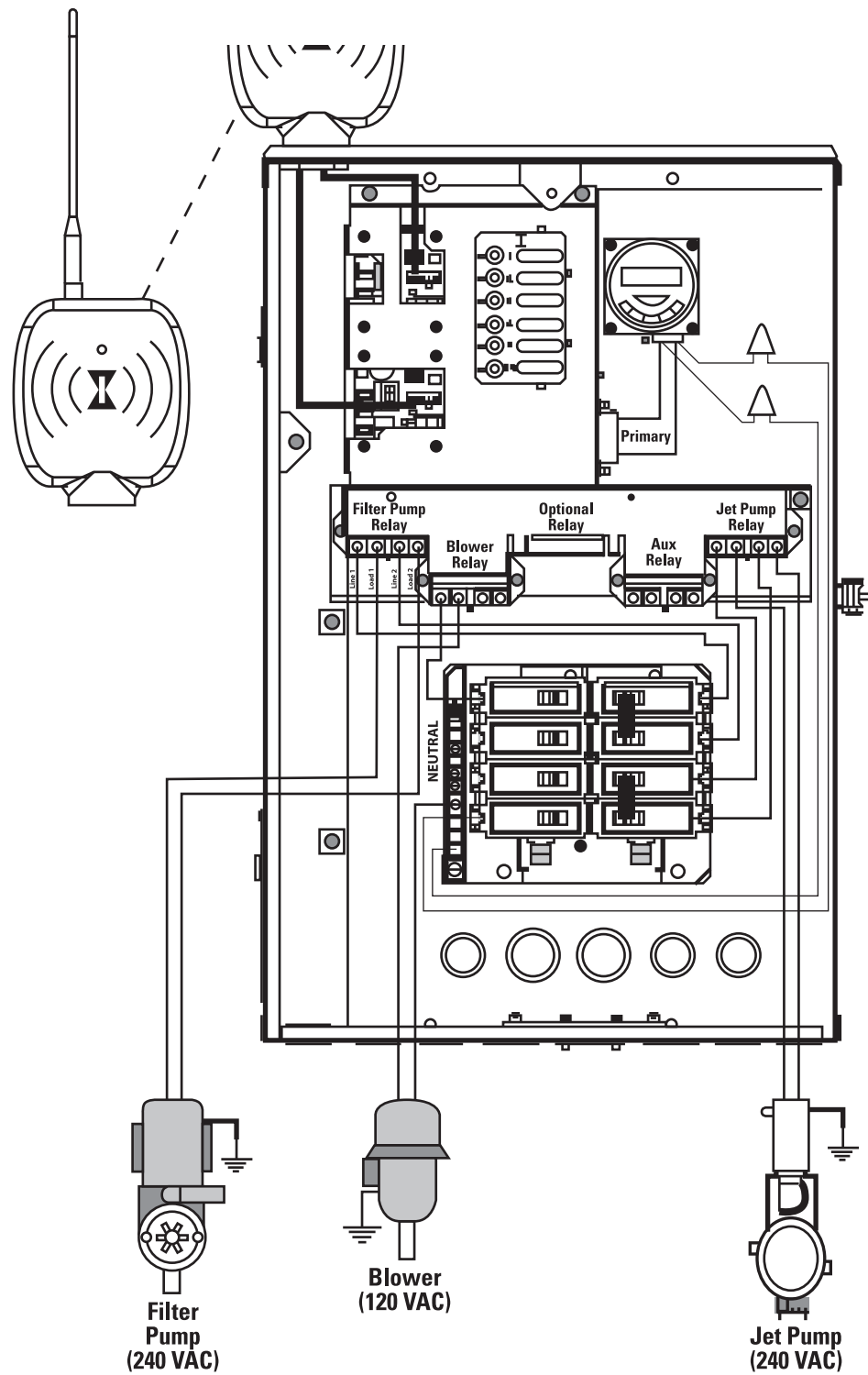
Wiring Combination 120VAC and 240VAC Equipment Loads

Figure 3-4

Manually Turning Equipment On and Off

At the Control Center

For service purposes, the five circuits and the pool/spa actuators can be operated manually at the Control Center.

Simply press any of the circuit buttons on the control pad to toggle between ON and OFF.

Any manual OFF/ON controlling will be reflected on the screen of the Hand-Held Controller.

Advanced Features

Configuring Two or More Hand-Held Remote Controllers

Many installations will find it convenient to use two Hand-Held Remote Controllers. Once you have linked one Hand-Held to the Control Center, it's easy to add a additional controllers.

NOTES: The first Hand-Held you link to the Control Center is considered the PRIMARY controller and all other units are SECONDARY. You can tell the status of a controller from the **VER** (version) code at the top of the display: the letter "**P**" = **PRIMARY**; the letter "**S**" = **SECONDARY**.
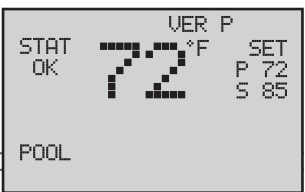
The PRIMARY controller must be used to "introduce" or link any additional (SECONDARY) Hand-Held units to the Control Center.

If the PRIMARY controller must be replaced (due to loss, damage, etc.,), you must reprogram from scratch to create a new PRIMARY controller, then reprogram any additional controllers as SECONDARY controllers.

1. Press any button on the Hand-Held Remote to wake it from sleep. (The unit goes to sleep to conserve battery life when it has been idle for 60 seconds.) The screen display on the Hand-Held should look generally like the example on the right.
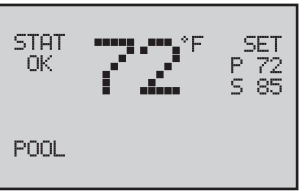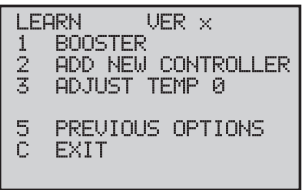
2. On both Hand-Held units, press and hold the **<P/S>** and **<CHLR>** buttons at the same time for about 5 seconds to put them into programming mode, as shown at the right.
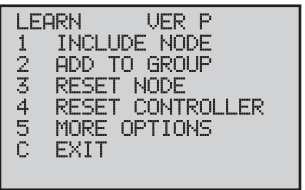
3. On the NEW Hand-Held you are adding to the network:

   a. Press the **<5>** button to select **MORE OPTIONS**. A new screen will appear, as shown at the right.

Operating Programmed Functions

Depending on how you have wired the system, the five function buttons on the Hand-Held Remote control the five circuits in the Control Center. You should apply the appropriate label to the five buttons — describing the appropriate equipment according to your installation — from the assortment of labels supplied.

- Buttons **<1>** and **<2>** control **Relay 1** and **Relay 2**.
- Buttons **<4>** and **<5>** control **Relay 4** and **Relay 5**.
- Button **<3>** controls the Valve Actuators operating the booster pump, a water feature, or whatever else you might have installed..
- Button **<P/S>** controls the Valve Actuators.

When you press any of these buttons, the appropriate circuit toggles ON or OFF. In addition, when the circuit is ON, the Hand-Held Controller's display shows the circuit number along the top of the screen.

Changing Batteries

The Hand-Held Remote Transceiver requires three (3) AA batteries. Battery life is about one year in typical use.

To change batteries:

1. Use a small Phillips screwdriver to remove the three screws on the back of the unit, as indicated.

MODEL: PE950
HAND HELD TRANSMITTER
FCC ID DGZ_____

This device complies with part 15 of the FCC rules. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference, including interference that may cause undesired operation.

SUITABLE FOR INDOOR AND OUTDOOR USE.

INTERMATIC INC., Spring Grove, IL 60081-9698
www.intermatic.com

154PE25112

Remove 3 screws

2. Place three new batteries in the unit, making sure to observe "**+**" and "**–**" polarity.

MODEL: PE950
HAND HELD TRANSMITTER
FCC ID DGZ_____

This device complies with part 15 of the FCC rules. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference, including interference that may cause undesired operation.

SUITABLE FOR INDOOR AND OUTDOOR USE.

INTERMATIC INC., Spring Grove, IL 60081-9698
www.intermatic.com

154PE25112

Wiring Underwater Lights

⚠ *CAUTION: A Ground Fault Circuit Interrupter (GFCI) must be provided for high voltage pool/spa lights. Do not use a GFCI circuit breaker.*
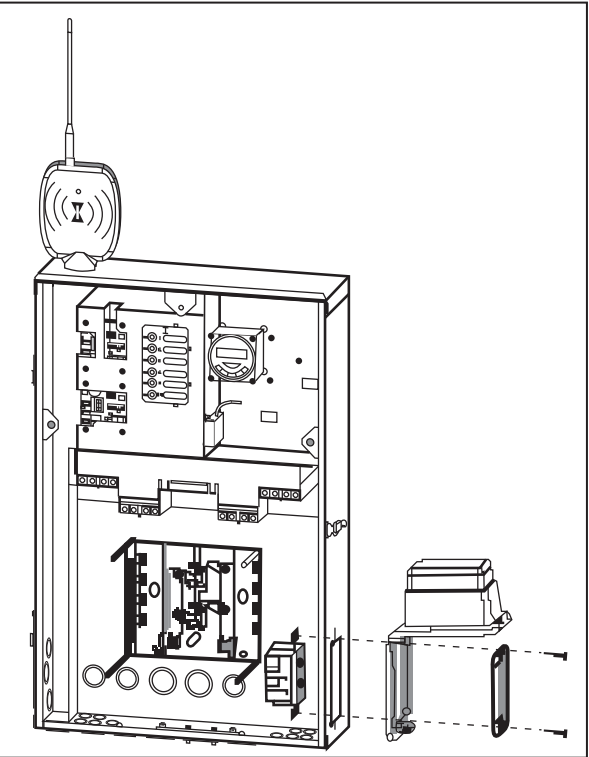
High/Low-Voltage Underwater Lights
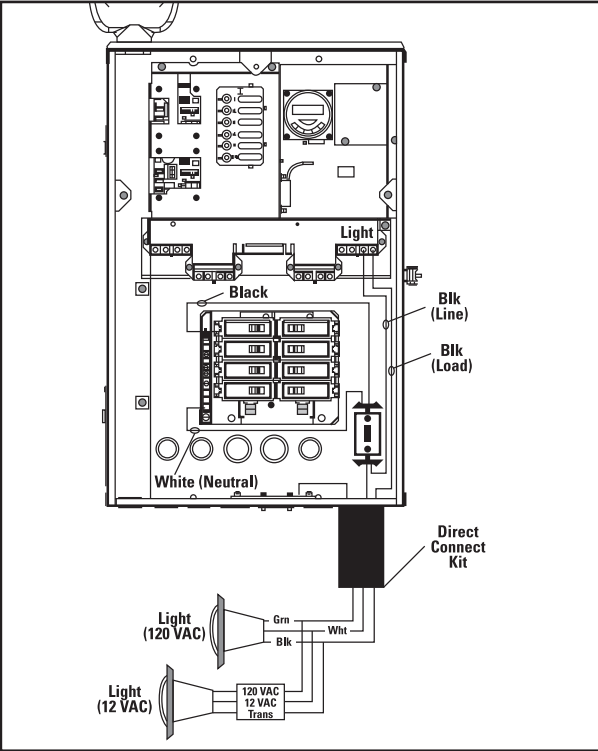

Figure 3-5

Figure 3-6

The Mini-Wave PE4 Control Center comes equipped with one side knockout for installation of the GFCI receptacle. (See Figure 3-5.)

1. Install a GFCI receptacle and connect the neutral and hot wire, from the circuit breaker, to the LINE side of the GFCI. (See Figure 3-6.)

2. Connect the neutral (white) from the LOAD side of the GFCI to either the 120-Volt light (for a 120VAC light connection) or the primary of the transformer (for a 12VAC light connection). For a 12VAC light connection, finish by connecting the neutral wire from the secondary of the transformer to the 12VAC light. (See Figure 3-6.)

3. Connect the hot (black) as follows from the LOAD side of the GFCI to the line side of the appropriate relay. (See Figure 3-6.)

   a. For a 120VAC light connection, connect the black wire from the LOAD side of the appropriate relay directly to the light.

   b. For a 12VAC light connection, connect the black wire from the LOAD side of the appropriate relay to the primary of the transformer. Finish by connecting the black wire from the secondary of the transformer to the 12VAC light.

4. Connect the ground (green) from the light to the grounding bar inside the Control Center.

Low-Voltage Wiring

⚠️ *CAUTION: Your Mini-Wave Control Center is equipped with a Low Voltage Raceway. You must use this raceway for all low voltage wiring. You cannot mix high and low voltages in the high voltage compartment.*

Low-Voltage Raceway

In order to comply with the National Electric Code, you must use the Low-Voltage Raceway when connecting any low-voltage connection to the Mini-Wave Control Center. Your Mini-Wave Control Center comes equipped with this Low-Voltage Raceway, allowing you to isolate high and low-voltage wiring. This raceway is most typically used for running the Fireman's switch wires, Water Temperature Sensor Lines, and actuator connections. (See Figure 3-7.)

Low Voltage Raceway

Low Voltage Wire/Cable

Heyco fittings for low voltage wires

High Voltage knockouts for Conduit (DO NOT run any Low Voltage wires through these knockouts
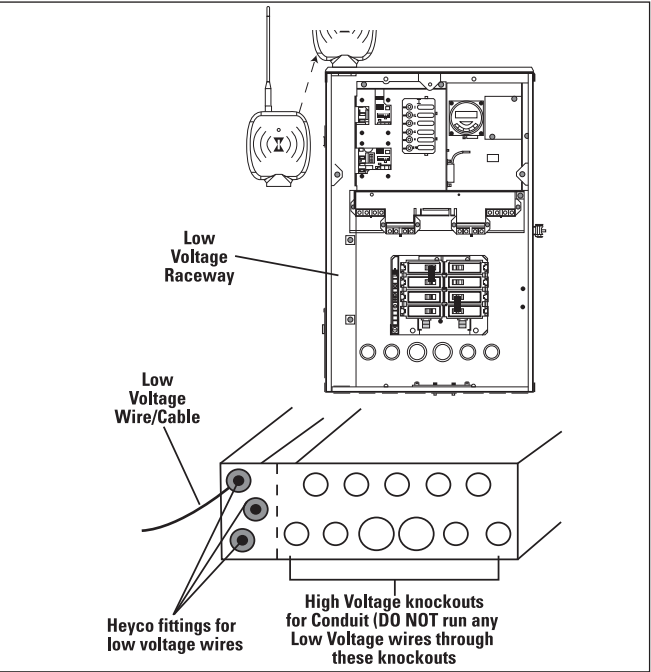
Figure 3-7

Water Temperature Sensor

The Mini-Wave Control System comes equipped with a Water Temperature Sensor. This sensor is needed to monitor and maintain both the pool and spa water temperature depending on the position of the diverter valves. It needs to be installed in order for the thermostat control to work. Power needs to be disconnected when connecting the temp sensor. *Only an Intermatic Sensor will work with this controller.* Follow the directions below to install and mount your water temperature sensor.

1. Drill a 3/8" hole in the pipe between the filter pump and filter and install the Water Temperature Sensor with hose clamp (not provided). Ensure the O-ring is in place.

2. Run the wire to the Control Center, through the low voltage raceway. Connect both wires to the Panel Mount Receiver. (See Figure 3-8.)
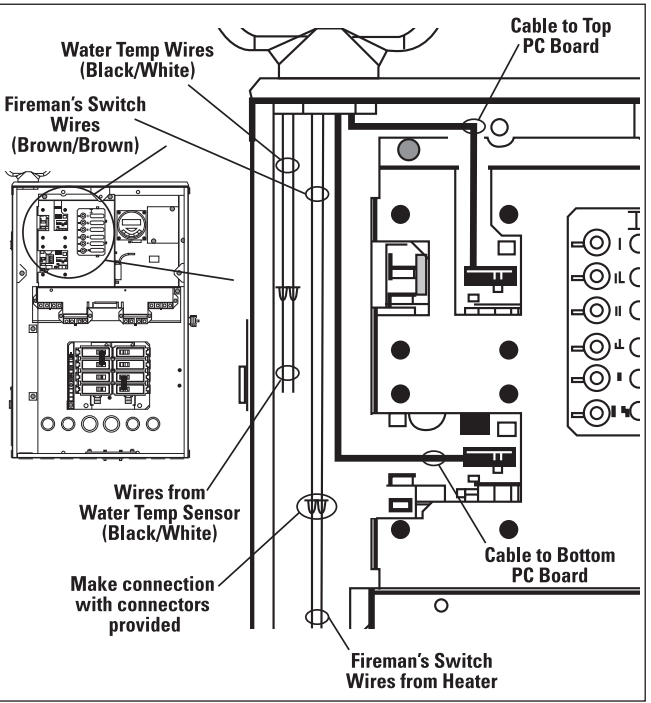

Water Temp Wires (Black/White)

Cable to Top PC Board

Fireman's Switch Wires (Brown/Brown)

Wires from Water Temp Sensor (Black/White)

Make connection with connectors provided

Cable to Bottom PC Board

Fireman's Switch Wires from Heater

Figure 3-8

Everyday Use of the Hand-Held Controller

The complete everyday functionality of the pool/spa system you have installed can be conveniently controlled using the Hand-Held Remote.

Changing between Pool and Spa

The Valve Actuator *(PE24VA)* that you have installed in the system directs water either to the pool or the spa. To use the hand-Held Controller to control this valve:

1. Press any button on the Hand-Held Remote to wake it from sleep. (The unit goes to sleep to conserve battery life when it has been idle for 60 seconds.) The screen display on the Hand-Held should look generally like the example on the right.

2. Note on the Hand-Held Remote Screen the current mode for the system:

   • POOL on the left side of the screen indicates the pool temperature setting (shown in the example).

   • SPA on the right side of the screen indicates the spa temperature setting.

3. Press the **<P/S>** button. The system will change to the opposite mode from its current setting.

4. Note the change on the Hand-Held Remote Screen. In the example at the right, the mode is now changed to Spa, and the temperature shown is the water temperature of the Spa.
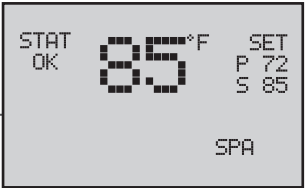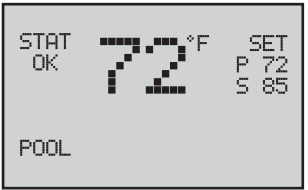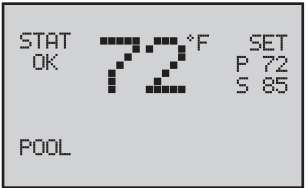
NOTE: The large temperature display shown on the Hand-Held Remote Screen reflects the current water temperature of the Pool or Spa, depending on which mode is active.

Setting Pool and Spa Temperatures

If connected and linked, the Hand-Held Remote controls the independent water temperatures of both the pool and spa.

1. View the current temperature on the right side of the Hand-Held Remote Screen under the word SET.

   • **P** = current pool water set temperature

   • **S** = current spa water set temperature

2. Press the **<P/S>** button if necessary to change the system between Pool and Spa mode. Depending on which mode is selected, the word POOL (lower left) or SPA (lower right) appears on the screen

3. Press the **<UP>** or **<DOWN>** arrow buttons to raise or lower the setting to the desired temperature. You can hold the button down and the value will automatically change.

4. Release the arrow button when the setting reaches the temperature you want. After a few seconds, the display returns to the current temperature of the pool or spa, depending on which mode you select.

STAT OK · 72 °F · SET P 72 S 85 · POOL

STAT OK · 85 °F · SET P 72 S 85 · SPA

STAT OK · 72 °F · SET P 72 S 85 · POOL

5. Push the black button on the Repeater. The word **SUCCESS** appears at the bottom of the Hand-Held's screen as shown.

```
LEARN     VER x
1  INCLUDE NODE
2  ADD TO GROUP
3  RESET NODE
4  RESET CONTROLLER
5  MORE OPTIONS
C  EXIT
        SUCCESS
```

6. Press the **<1>** function button to select **INCLUDE NODE**. The screen refreshes and displays only the line **1 INCLUDE NODE**, as shown.

```
LEARN     VER x
1  INCLUDE NODE
```

7. Push the black button on the Repeater. The word **SUCCESS** appears at the bottom of the Hand-Held's screen as shown.

```
LEARN     VER x
1  INCLUDE NODE
2  ADD TO GROUP
3  RESET NODE
4  RESET CONTROLLER
5  MORE OPTIONS
C  EXIT
        SUCCESS
```

8. Press the **<2>** function button on the Hand-Held to select **ADD TO GROUP**. The screen refreshes and displays only the line **2 ADD TO GROUP.**

```
LEARN     VER x

2  ADD TO GROUP
```

9. Push the black button on the base of the Panel-Mounted Transceiver. The screen returns to the full screen with the word **SUCCESS** at the bottom, as shown.

10. Press the **<CHLR>** button on the Hand-Held Remote to exit programming mode. When you now carry the Hand-Held Remote in the problem area, you will now see the words **STAT OK** on the left side of the screen.

```
LEARN     VER x
1  INCLUDE NODE
2  ADD TO GROUP
3  RESET NODE
4  RESET CONTROLLER
5  MORE OPTIONS
C  EXIT
        SUCCESS
```

The repeater is now part of the network. You can add more repeaters as necessary.

REMEMBER: When you have one or more repeaters installed in a network, you increase the response time: the time between when you press a button on the Hand-Held Remote and when the reaction takes place.

Motorized Valve Actuator Connection and Synchronizing

The Mini-Wave Control System is capable of controlling up to three Motorized Valve Actuators on the Pool/Spa (P/S) circuit, and up to two additional Motorized Valve Actuators on circuit number three. Two Intermatic Motorized Valve Actuators *(PE24VA)* are included with your Mini-Wave system. Refer to page **7** for ordering information.

The actuators must be installed to automatically rotate your valves between pool and spa plumbing. Power must be disconnected when connecting the actuator connectors to your Mini-Wave Control Center. Refer to the directions below prior to installing your PE24VA actuators. Refer to Figure 3-9 for detail.

Figure 3-9
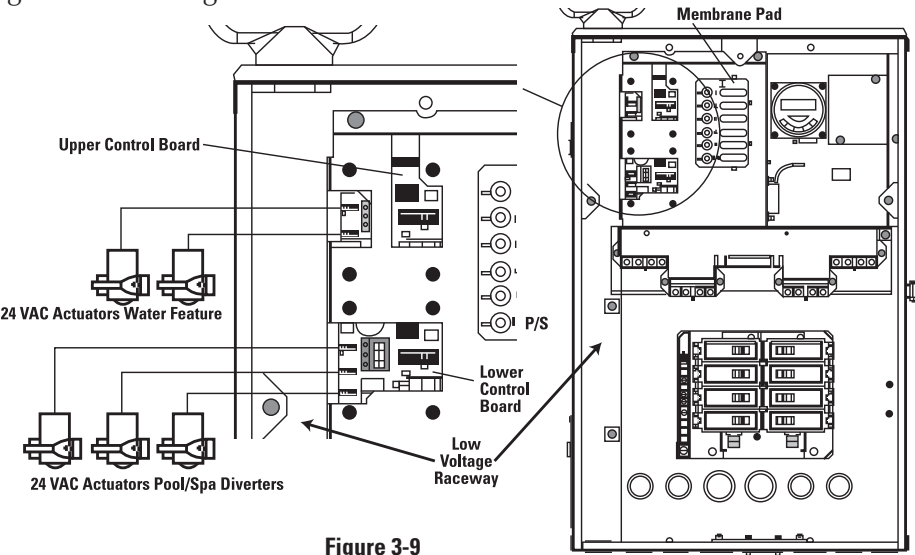
1. Remove power from the Mini-Wave control center.

2. Attach the valve actuators *(PE24VA)* to the water valves. (See instructions included.)

3. Run the actuator cable to the Control Center, and through the low voltage raceway.

4. Insert the three-pin connector of the motorized valve actuator to any of the three available connectors on the Lower Control Board.

5. Apply power to the Mini-Wave Control Center and synchronize the actuators as follows:

   a. Push and release the P/S button located on the Membrane pad to illuminate the green light beside the P/S button. This indicates that the control and actuators are in the SPA mode.

   b. Use the switch located on your motorized valve actuator to ensure the valves are in the SPA position.

   > **NOTE:** If either of the Actuators is positioned backwards, flip the switch on the back to reverse position.

   c. Verify that the Actuators are correctly synchronized with your installation.

6. If installing an actuator for a separate water feature or cleaner pump is required, insert the three-pin connector of the motorized valve actuator to any of the two available connectors on the Upper Control Board.

   a. Push and release the #3 button located on the Membrane pad to illuminate the light beside the #3 button. This indicates that the control and actuator have activated the additional water feature.

   b. Use the switch located on your motorized valve actuator to ensure the valves are in the water feature position.

   > **NOTE:** If the actuator is positioned backwards, flip the switch on the back to reverse position.

Fireman Switch Connection

The Mini-Wave Control System is capable of controlling most heaters or heat pumps in the market today, using thermostatic circuitry of 24VAC @ 2A or less. Locate your heater on the following pages and follow the instructions for proper installation with your Mini-Wave Control Center.

NOTE: Your Mini-Wave Control System can be modified to provide a cool-down period for your heater. Consult your heater owner's manual for specifics concerning a cool-down period requirement.
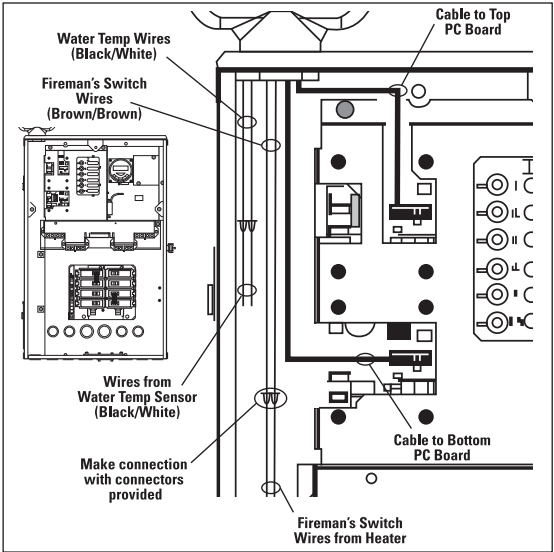

Figure 3-10

Connection for Teledyne Laars Heater

1. Connect two #14 gauge wires, designed for use in hot environments, to the two brown wires, marked heater connection, on the panel mount receiver.

2. Connect the other ends of the #14 gauge wires from Step 1 to the Fireman's Switch terminal bar in place of the factory installed wire loop.

3. Do not disconnect high limit or pressure switches.

4. Turn the heater thermostat(s) to maximum setting.

5. Turn the heater switch to the ON position. For dual thermostat heaters turn switch to Spa position.
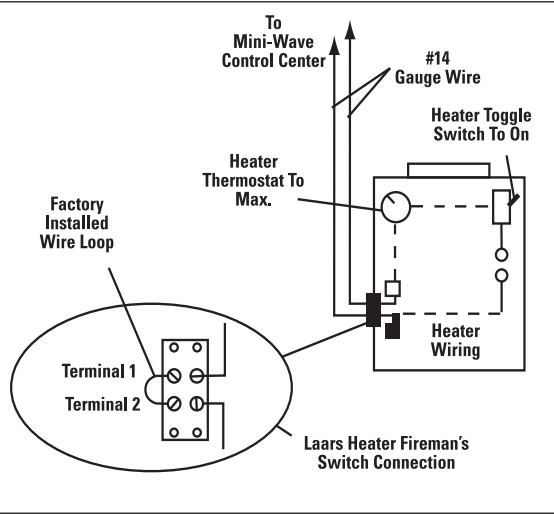
Figure 3-11

Connection for Raypak Heaters

The following connection procedure is for the two wire-one function configuration Raypak heater.

1. Connect two #14 gauge wires, designed for use in hot environments, to the two brown wires on the panel-mounted receiver.

2. Connect one end of either #14 gauge wires from Step 1 to both the orange/black and black/orange wires on the Raypak heater.

3. Connect the remaining #14 gauge wire from Step 1 to the yellow/black wire on the Raypak heater.
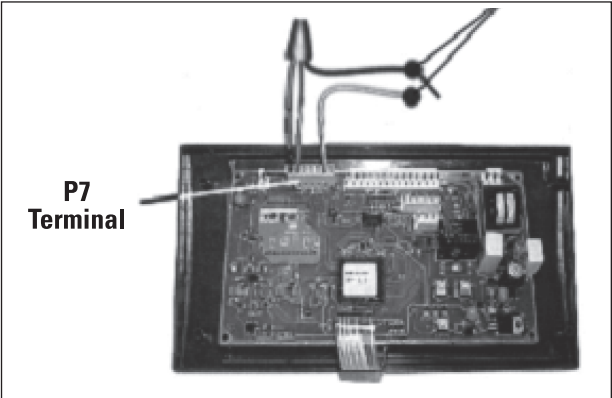

Figure 3-12

Installing the 35-ft. Antenna Extension Cable *(PA121)*

Choose a location for the antenna within 35 feet of the Control Center that will be in direct line of sight from the area of operation — where the home owner will be using the Hand-Held Remote.

Antenna Extension Cable Assembly (PA121)

1. Unscrew the antenna from the top of the Panel-Mounted Transceiver.

2. Screw the male end of the 35-ft. Antenna Extension Cable into the top of the Panel-Mounted Transceiver.

3. Run the cable underground from the Control Center to the location that will provide a direct line of sight between the Hand-Held Remote and the area of operation.

4. Screw the antenna into the female end of the 35-ft. Antenna Extension Cable.

5. Securely mount the end of the cable with the antenna in the air.

Installing and Configuring Optional Repeaters

When you have installed the Antenna Extension Cable and are encountering further communications problems, typically if the home owner wants to be able to use the Hand-Held Remote from inside the house, order and install optional Transceiver Repeater Modules *(HA04C)* to the system, plugging them into 120 volt electric outlets where available.

Repeaters can relay signals to bridge between a dead spot and the Control Center.

Transceiver Repeater Module (HA04C)

NOTE: The relay between Repeaters and the rest of the system causes a delay in response time. Wait a few seconds for commands you enter on the Hand-Held Remote to register.

1. Plug a Transceiver Repeater Module *(HA04C)* into any electrical outlet that is located where you have determined a reception problem can be solved.

2. If necessary, press any button on the Hand-Held Remote to wake it from sleep. Because you are at a location in between the control center and the problem area, the screen display on the Hand-Held will look generally like the example on the right.
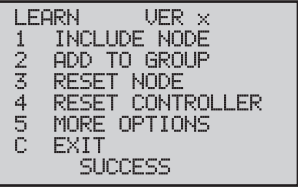

3. Press and hold the **<P/S>** and **<CHLR>** buttons at the same time for about 5 seconds. This will put the device in programming mode, as shown at the right.

   **NOTE:** If you pause in the programming procedure for 30 seconds, the screen automatically returns to Step 2.

4. Press the **<3>** function button to select **RESET NODE**. The screen refreshes and displays only the line **3 RESET NODE**, as shown.
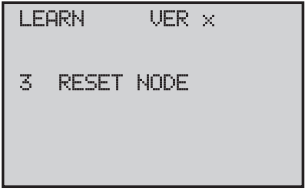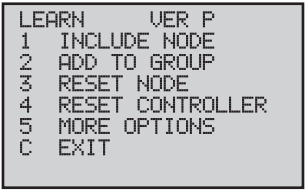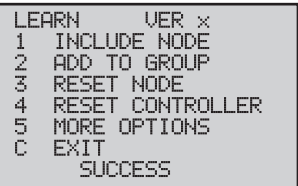
4. Push the black button on the base of the Panel-Mounted Transceiver. The screen returns to the full screen with the word **SUCCESS** at the bottom, as shown.

```
LEARN      VER x
1  INCLUDE NODE
2  ADD TO GROUP
3  RESET NODE
4  RESET CONTROLLER
5  MORE OPTIONS
C  EXIT
        SUCCESS
```

5. Press the **<2>** function button to select **ADD TO GROUP**. The screen refreshes and displays only the line **2 ADD TO GROUP**.
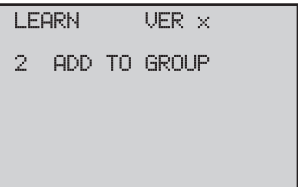
```
LEARN      VER x

2  ADD TO GROUP
```

6. Push the black button on the base of the Panel-Mounted Transceiver. The screen returns to the full screen with the word **SUCCESS** at the bottom, as shown.

```
LEARN      VER x
1  INCLUDE NODE
2  ADD TO GROUP
3  RESET NODE
4  RESET CONTROLLER
5  MORE OPTIONS
C  EXIT
        SUCCESS
```

7. Press the **<CHLR>** button on the Hand-Held Remote to exit programming mode. On the left side of the screen, you will see the words **STAT OK**.
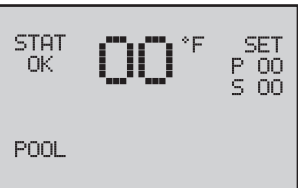
The two devices are now linked together within the network you have installed.

```
STAT          °F   SET
OK    00          P 00
                  S 00


POOL
```

NOTE: If the two devices have not successfully reset or linked together — and you are seeing only the word **STAT** on the left side of the screen — it's likely that old programming still exists in either device. Carefully repeat the two procedures *Deleting Any Existing Programming* (on page **28**) and *Linking the Hand-Held Remote to the Receiver* (on page **29**). If the problem persists, contact Intermatic Customer Service.

Testing Mini-Wave Reception

At the heart of the Mini-Wave system is *Z-wave™* wireless technology. Test reception by walking around the yard with the Hand-Held Remote and look on the screen to see if there are any areas where **STAT OK** changes to **STAT** (which means the Hand-Held and the Control Center are no longer communicating).

Antenna Extension Cable Assembly (PA121)

Signal reception between Hand-Held Controllers and the Control Center is affected by distance (about 100 feet, direct line of sight) and by physical obstacles (like brick, wire lash in walls, or steel structures).

If you identify any locations in the area of operation where communications problems occur — typically when a steel structure blocks the line of sight between the Hand-Held and the Control Center, install the 35-ft. Antenna Extension Cable *(PA121)* to relocate the antenna from the Panel-Mounted Transceiver into the area of operation.

Connection for Hayward Heaters

1. Remove heater service door on your Hayward Heater.

2. Remove factory-installed wire connector between two (2) red wires labeled "CONNECTION FOR FIELD INSTALLED CONTROL SWITCH." (See Figure 3-13.)

3. Connect two #14 gauge wires, designed for use in hot environments, to the two red wires. (See Figure 3-14.)

4. Wire the other end to the two brown wires, marked heater connection, on the panel-mounted receiver in your Mini-Wave Control Center.

5. Do not disconnect high limit or pressure switches.

6. Turn the heater thermostat(s) to maximum setting.

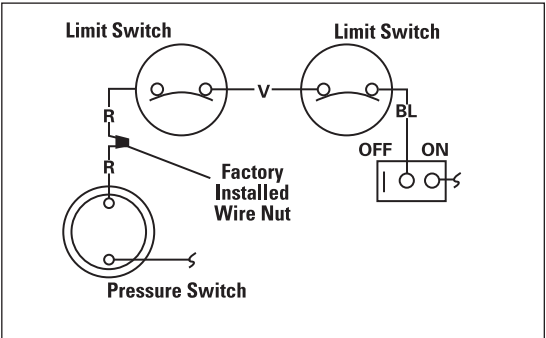7. Turn the thermostat selector switch to the ON, HIGH, or SPA position.

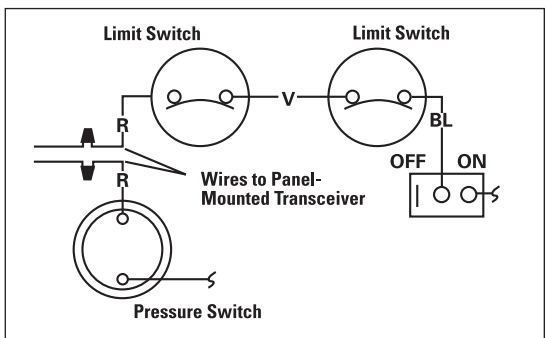**Figure 3-13 — Wiring Before Modification**

Figure 3-14 — Wiring with Panel-Mounted Transceiver

Connection for Pentair Heater

1. Remove heater service door on your Pentair Heater.

2. Separate the black wires (common) from each other. (See Figure 3-15.)

3. Connect two #14 gauge wires, designed for use in hot environments, to the two brown wires, marked heater connection, on the panel-mounted receiver in the Mini-Wave Control Center and attach the other end to the two black wires on the heater. (See Figure 3-16.)

4. Do not disconnect high limit or pressure switches.

5. Turn the heater thermostat(s) to maximum setting.

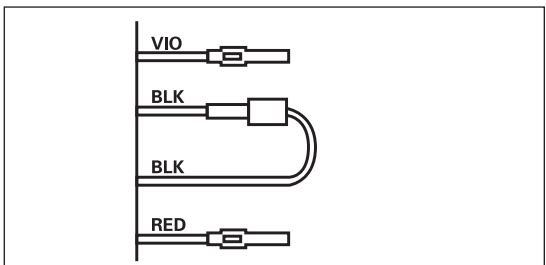6. Turn the heater toggle switch on.
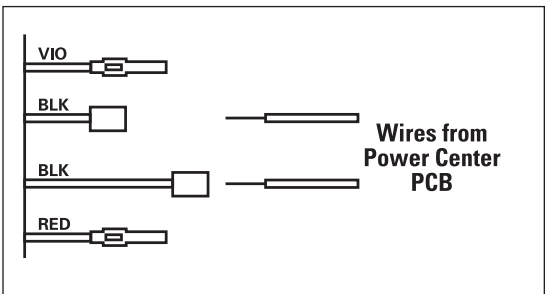
Figure 3-15 — Wiring Before Modification

Figure 3-16 — Wiring with Panel Mounted Transceiver

Connection for Sta-Rite Heaters

Figure 3-18

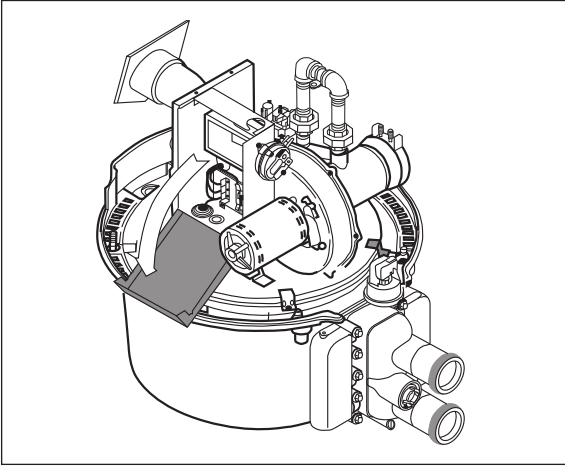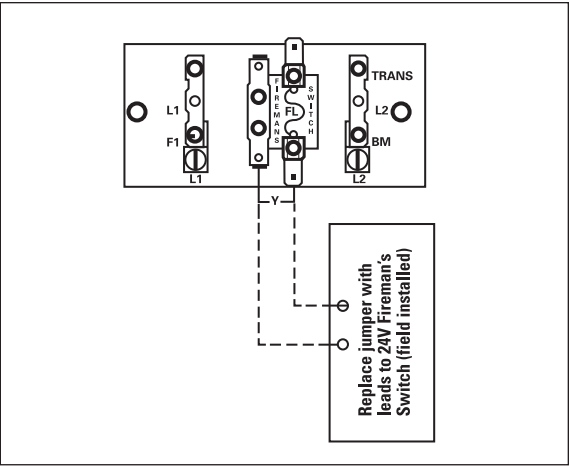Replace jumper with leads to 24V Fireman's Switch (field installed)

Figure 3-19

1. Turn off power to heater at the main circuit breaker panel.

2. Unbolt and remove the upper jacket halves (Refer to heater owners manual).

3. Open control box cover. (See Figure 3-18.)

4. Remove the factory-installed jumper between the Fireman's Switch terminals. (See Figure 3-19.)

5. Connect two #14 gauge wires, designed for use in hot environments, to the two brown wires, marked heater connection, on the panel-mounted receiver in the Mini-Wave Control Center and attach the other end to the two spade terminals at the heater. You can also cut the yellow jumper wire and wire connect the black wires to each yellow wire. (See Figure 3-20.)

6. Route the wires out through the knockout on the bottom of the Control Box.

7. Do not disconnect high limit or pressure switches.

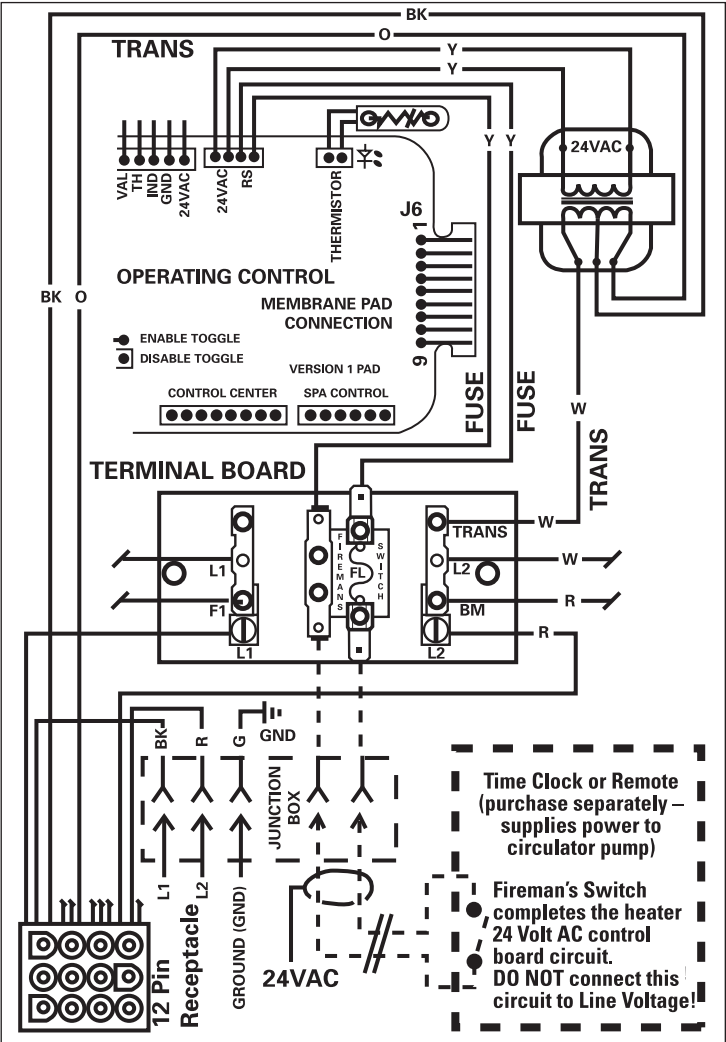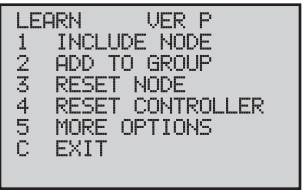8. Turn the heater on and maximize the temperature setting.

Figure 3-20

2. Press and hold the **<P/S>** and **<CHLR>** buttons at the same time for about 5 seconds. This will put the device in programming mode, as shown at the right.

> **NOTE:** If you pause in the programming procedure for 30 seconds or so, the screen automatically returns to Step 1.

3. Press the **<4>** function button to select **RESET CONTROLLER**. The screen refreshes and displays only the line **4 RESET CONTROLLER**, then returns to the full screen with the word **SUCCESS** at the bottom, as shown.
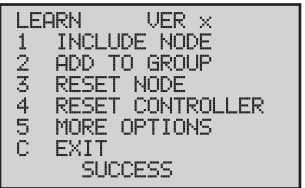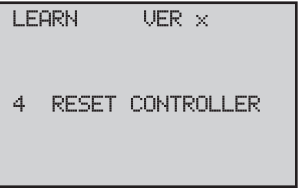
4. Now press the **<3>** function button on the Hand-Held Remote to select **RESET NODE**. The screen refreshes and displays only the line **3 RESET NODE**.
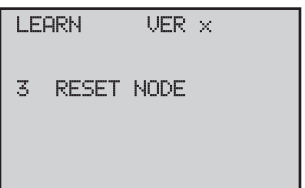
5. Press the black button on the base of the Panel-Mounted Transceiver. The display returns to the full screen with the word **SUCCESS** at the bottom, as shown.
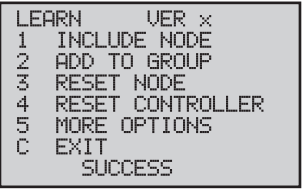
The two devices are now "clean" and are ready to be linked together within the network you have installed.
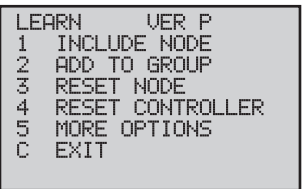
Linking the Hand-Held Remote to the Receiver

1. If necessary, press any button on the Hand-Held Remote to wake it from sleep. (The unit goes to sleep to conserve battery life when it has been idle for 60 seconds.) The screen display on the Hand-Held should look generally like the example on the right, though it may display actual temperatures and settings.
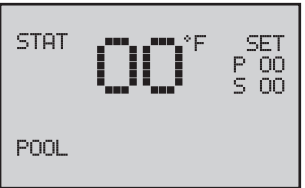
2. Press and hold the **<P/S>** and **<CHLR>** buttons at the same time for about 5 seconds. This will put the device in programming mode, as shown at the right.

> **NOTE:** If you pause in the programming procedure for 30 seconds or so, the screen automatically returns to Step 1.

3. Press the **<1>** function button to select **INCLUDE NODE**. The screen refreshes and displays only the line **1 INCLUDE NODE**, as shown.
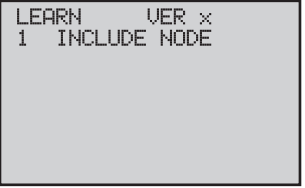
Section 6:
Programming the Hand-Held Remote Transceiver

Overview

The Hand-Held Remote Transceiver *(PE950)* is the focal point of user convenience. It's water-resistant, shock-resistant, and is easy to program for handy remote control of the functions at a specific pool-spa installation. An assortment of self-stick labels are provided to identify the equipment you program into the five control buttons. We suggest that you program the device first, then apply the appropriate label from the assortment supplied.

Detail on Hand-Held Remote Display Screen
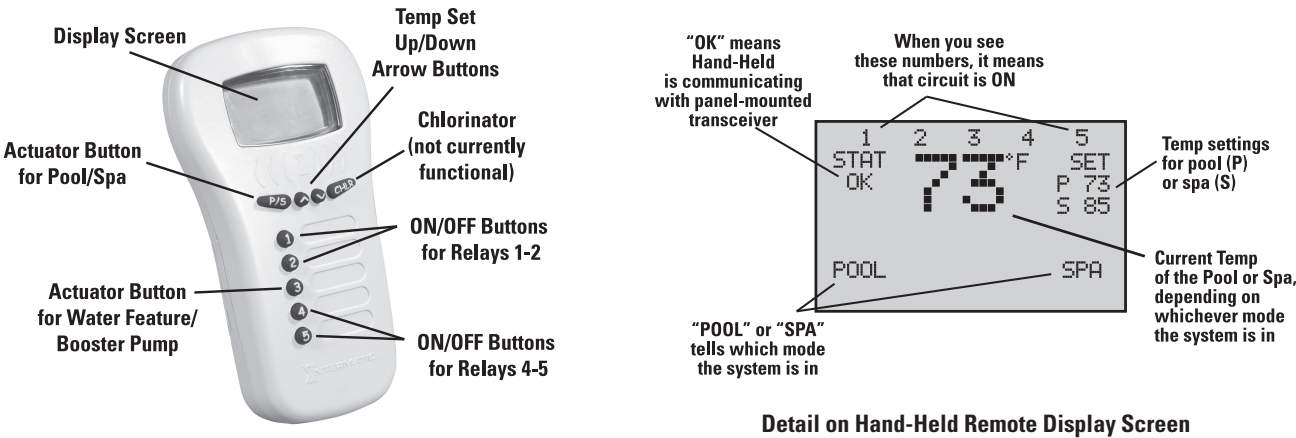
## Synchronizing the Hand-Held with the Panel-Mounted Receiver

When you've finished physical installation and wiring and have **enabled power to the control center**, you need to synchronize the Hand-Held with the Panel-Mounted Transceiver. This is a two step process: first, delete any programming that might exist in the Hand-Held Remote and Receiver, then synchronize the two devices with each other.

Deleting Any Existing Programming

This procedure deletes any existing programming from the Remote and Receiver units so they are ready to be programmed into the network of this installation.

NOTE: If the word **FAILURE** instead of **SUCCESS** appears at the bottom of the screen during any of the following steps, repeat the programming procedure, then try replacing the batteries in the Hand-Held. If the problem persists, contact Intermatic Customer Service.

1. Press any button on the Hand-Held Remote to wake it from sleep. (The unit goes to sleep to conserve battery life when it has been idle for 60 seconds.) The screen display on the Hand-Held should look generally like the example on the right, though it may display actual temperatures and settings.
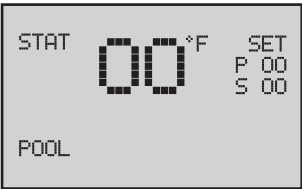
Section 4:
Programming the Clock

Overview

There are two revisions of the upper and lower control boards. The difference between these two revisions is the relay the Pump Timer controls.

- On System Rev. #1, the Pump Timer controls Relay #2.
- On System Rev. #2, the Pump Timer controls Relay #1.

Please check to see which revision you have and connect your pool/spa equipment accordingly. You should connect your Filter Pump to the relay controlled by this timer so that you can program ON and OFF times for your filter pump cycle.

An additional clock can be installed in the steel enclosure if desired, providing timer control of a second relay. The second relay will control relay #5 (System Rev. #1) or Relay #4 (System Rev. #2). See page **8** for ordering and installation procedure.

The clock can be programmed for up to eight ON/OFF settings.

Setting Time of Day

1. Press and hold the CLOCK button.

2. Press the HOUR button to advance the clock to the correct hour of the day. Repeat with the MIN button.

   NOTE: Take care to observe correct AM and PM settings.

3. Release the CLOCK button when finished. The time is now set.

Programming ON/OFF Settings

1. Press the TIMER button to enter the <u>first</u> ON time. The clock screen displays the the number "1" and the word ON, indicating that it is ready for you to set the ON time for the first setting.

   NOTE: If previous ON/OFF settings have been programmed, the clock will display them, and your new programming will revise them. If the clock has not been programmed before, the screen will display "__ __ : __ __" as you begin the programming procedure.

2. Press the HOUR button to advance the clock to the ON time you want to set, followed by the pressing the MIN button to complete the time setting.

   NOTE: Take care to observe correct AM and PM settings.

3. Press the TIMER button a second time to enter the OFF time for the setting. The clock screen displays the number "1" and the word OFF, indicating that it is ready for you to set the OFF time for the first setting.

3. Again, press the HOUR button to advance the clock to the OFF time you want to set, followed by the pressing the MIN key to complete the time setting.

4. Repeat Steps 1-4 to set additional ON/OFF times.

5. When finished, press the CLOCK button to exit programming mode.

Placing the Clock in Timer Mode

Press the SELECT button until the indicator bar, visible at the bottom of the screen, is above the word AUTO. The clock will now turn Relay 1 or Relay 2 ON and OFF according to the ON/OFF settings you have programmed.

Overriding the Timer Settings

You can manually turn Relay 1 or Relay 2 ON or OFF.

Press the SELECT button repeatedly until the indicator bar, visible at the bottom of the screen, is above the word:

- ON — to immediately power Relay 1 ON.
- OFF — to immediately power Relay 1 OFF.

The clock will continue to operate in Manual Mode until you change the clock to Timer Mode.

Changing the Clock Battery

The factory-installed lithium clock battery will last for years in normal service, and will rarely need changing. In addition to this battery, an internal nickel-cadmium battery — which receives its charge from the main battery — maintains clock settings for a limited time when the main battery fails.

Use the following procedure to replace the main battery.

1. Remove the timer from the enclosure, allowing you to gain access to the rear of the timer.

2. Using a small screw driver, pry the battery holder from the back of the clock, as shown.

3. Replace the battery with type CR2032, available wherever batteries are sold.

4. Place the new battery in the holder, then slide the holder back into the slot in the back of the clock.

5. Reinstall the timer and make the connections.
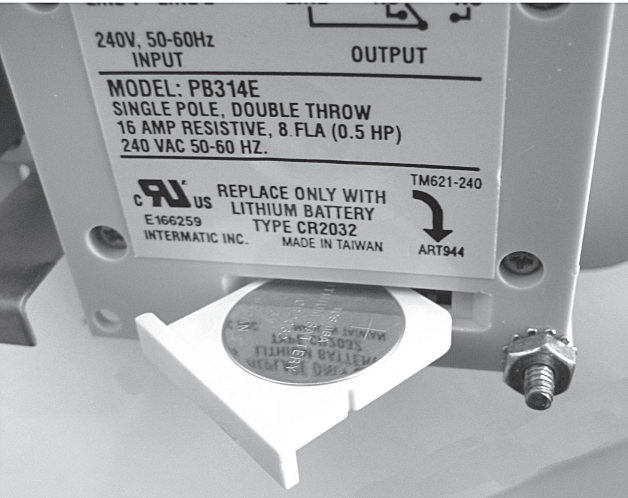
Installing a Fireman's Switch

1. Route wires from the Chassis Wire Access Hole behind the chassis and out to the low volrtage Raceway.

2. Reinstall the Chassis in the enclosure.

3. Connect one of the wires from the New Timer to either of the Fireman's Switch wires from the heater.

4. Connect the remaining Brown wire from the New Timer to either of the Brown Fireman's Switch wires from the *PE650* Receiver.

5. Connect the remaining Brown wire from the *PE650* Receiver to the remaining Fireman's Switch wire from the heater.

6. Refer below to Fireman's Switch Programming Instructions to program the Fireman's Switch Timer.
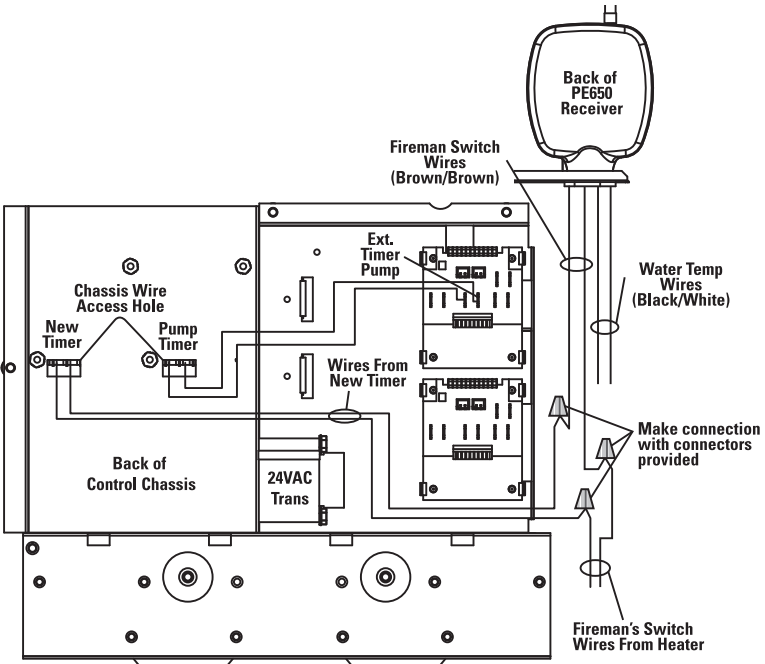
Back view of both the Chassis and PE650 Receiver

Figure 5-10

Programming the Fireman's Switch

NOTE: Please reference the heater owner's manual for for your heat exchanger's recommended cool-down time settings for the Fireman's Switch.

1. Program your desired ON and OFF times on your Pump Timer for your filter pump.

2. Program the same ON time as your Pump Timer for the Fireman's Switch Timer.

EXAMPLE: Assuming the heater owner's manual recommends a five-minute cool-down time for the heat exchanger:

3. Program an OFF time on the Fireman's Switch Timer that is five minutes less than the OFF time programmed on the Pump Timer. This will ensure that the heater is OFF for at least five minutes before the pump shuts down, allowing proper cool down.
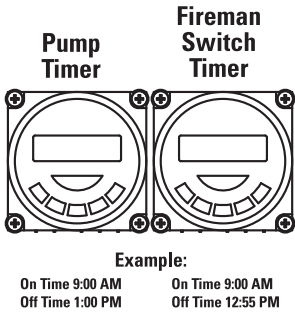
Example:
On Time 9:00 AM   On Time 9:00 AM
Off Time 1:00 PM   Off Time 12:55 PM

Figure 5-11

9. Connect to wires from Terminals 3 and 5 of the newly installed timer and route the wires into the Chassis Wire Access Hole.

NOTE: Depending on your installation, continue to "Installing a Second Timed Function" (immediately below) or jump to "Installing a Fireman's Switch" (following). You cannot have both the Second Timed Function and the Cool-Down Period in the Mini-Wave Control Center at the same time.

Installing a Second Timed Function

Crimp two 1/4" female spade terminals onto both wires.

1. Route wires from the Chassis Wire Access Hole, behind the chassis and connect the terminals to either of the two 1/4" male spade terminals labeled **Ext. Timer** located on the lower Control Board.

NOTE: This connection is a dry contact connection. Any voltage supplied to these two connectors will damage the control board and void the warranty.

3. Reassemble the chassis and low-voltage divider into the panel.

4. Reinstall the Deadfront onto the Control Panel.

Depending on the version of the Control Board, the second timer will now control:

- Relay #5 if you have Control Board Version #1
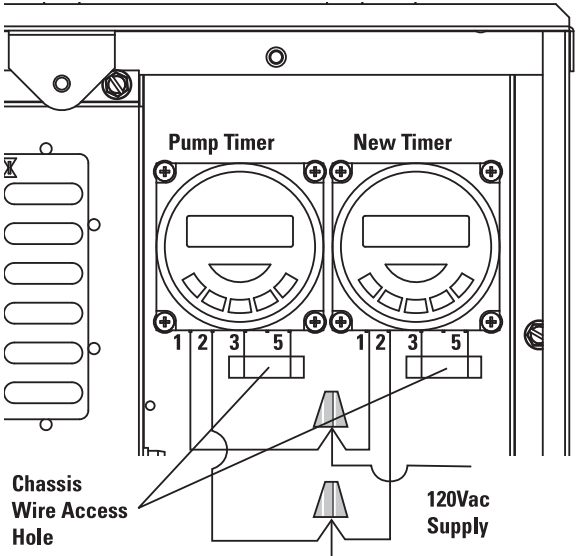- Relay #4 if you have Control Board Version #2
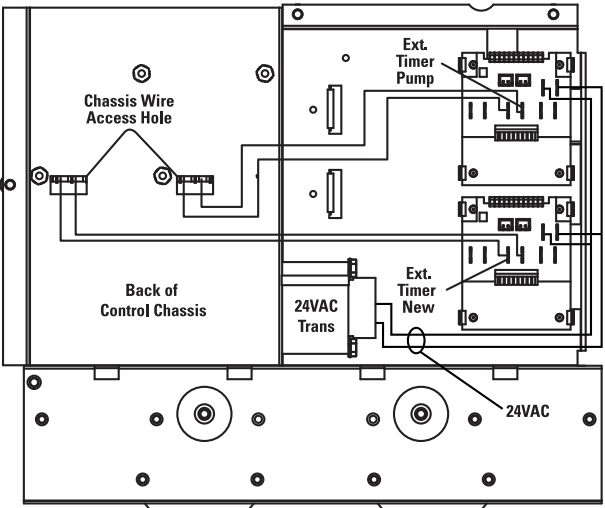

Figure 5-8

Figure 5-9

Section 5:

Installing System Options

Installing a Booster/Cleaner Pump

When a Booster/Cleaner Pump must be controlled, you need to order and install the optional Booster/Cleaner pump relay *(PA120)* in your Mini-Wave Control Center. In addition, you need to program your PE950 Wireless Hand-Held Transceiver to lock out the Booster/Cleaner pump whenever your valve actuators change from the pool position to the spa position. Refer to page **36** for Programming to protect a Pool Cleaner Pump.)

NOTE: When installing the optional relay, you must purchase the PA120 Optional Relay Kit. This relay must have a 24VAC coil, ***NOT A 24VDC COIL*** like the remaining four relays. If the 24VDC coil relay is installed, the relay will chatter and could cause a failure of the pool or spa equipment.

1. Remove the Low Voltage Divider to gain access to the Relay Screws (See Figure 5-1.)

2. Remove the filler plate on the Low Voltage Divider by bending the plate back and forth until the plate breaks off. (See Figure 5-1.)

3. Remove the two screws and install the Relay (PA120) with the same two screws. (See Figure 5-1.)

4. Plug the 24VAC coil wires from the relay to any of the two available three-pin plugs on the upper control board. (See Figure 5-2.)

5. Reinstall the Low Voltage Divider in your Master Control Center (See Figure 5-1.)

6. When installation is complete, button **<3>** on the Hand-Held Remote will operate the pump.

Figure 5-1

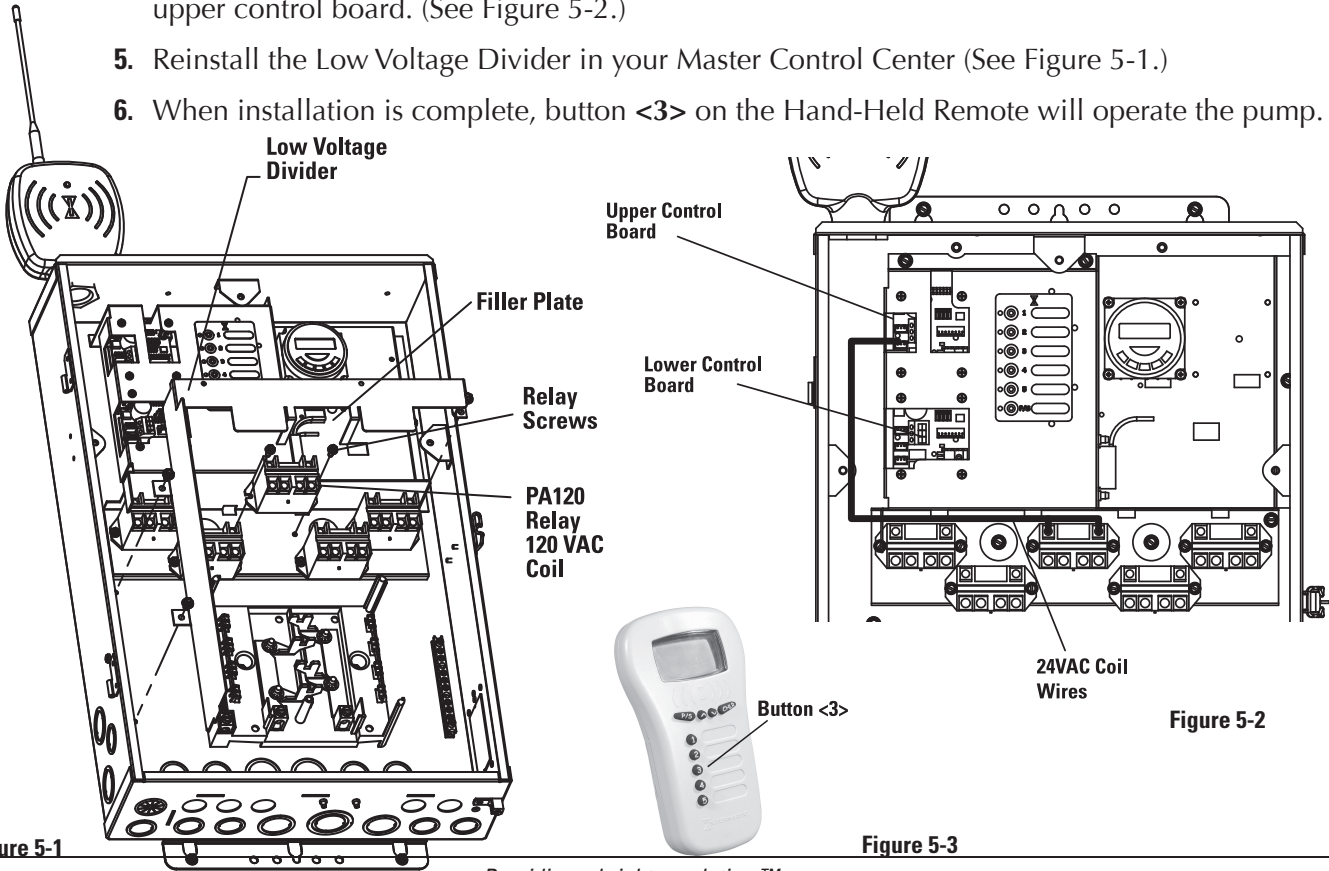**Figure 5-2**

Figure 5-3

Installing a Water Feature

Your Mini-Wave Control System can be configured to control up to two more actuators or one additional actuator and relay that work simultaneously. Either of these two configurations will work with Button **<3>** on both the Wireless Hand-Held Transceiver and Control Panel and work independently of your Pool/Spa Actuators. Refer to pages **7** and **8** for ordering the optional relay and/or actuators.

If installing the optional relay, refer to page **23** for installation procedures.

1. Remove the Control Panel Deadfront to gain access to the Control Boards.

2. Route the low-voltage cable from the actuator through the low-voltage raceway and plug the connector into either of the two available three-pin plugs on the upper Control Board.

3. Refer to the appropriate programming section if special programming is required.

Two Actuator Configuration
Figure 5-4

One Actuator and One Relay Configuration
Figure 5-5
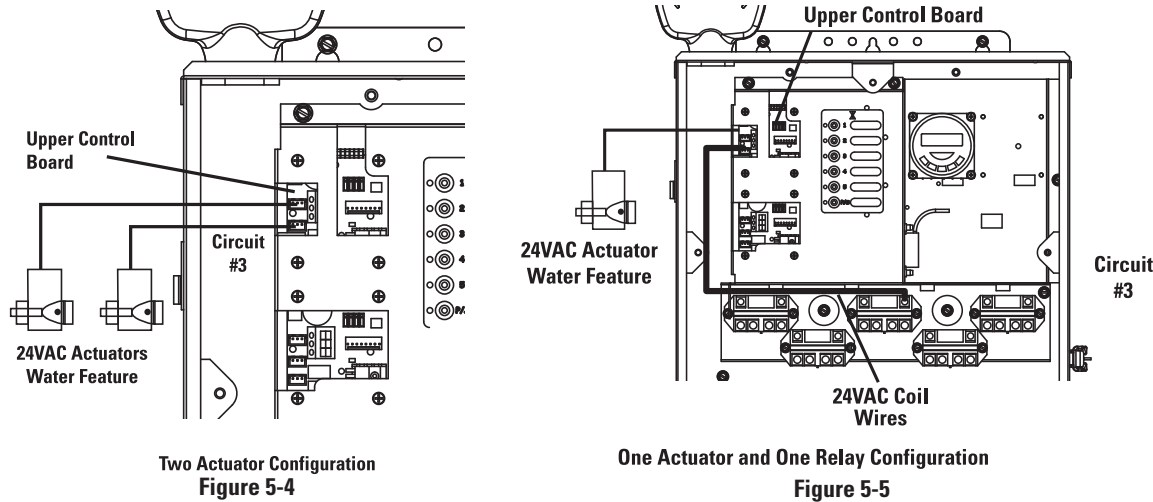
Depending on the configuration above, Button **<3>** will now control this feature. Some examples of this feature are:

- Cleaner Pump and Actuator combination
- Water Fountain (pump and light) and Actuator combination
- Spill-Over Spa Control

NOTE: When installing the optional relay, you must purchase the Optional Relay Kit *(PA120)*. This relay must have a 24VAC coil, **NOT A 24VDC COIL** like the remaining four relays. If the 24VDC coil relay is installed, the relay will chatter and could cause a failure of the pool or spa equipment.

Installing a Fireman's Switch or Second Timed Function

It may be necessary to have a Second Timed Function for a particular piece of pool/spa equipment, or to provide a Cool-Down Period for your heater prior to shutting off the pump. (Consult the heater owner's manual for this requirement.) If any of these two features are desired, you must install a second timer for this feature.
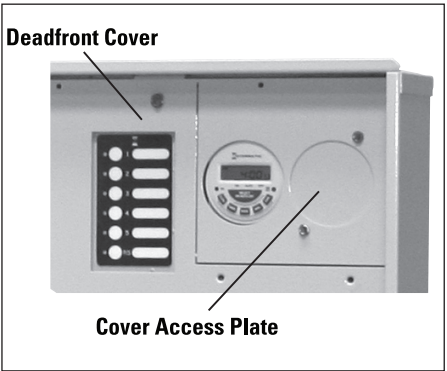
Figure 5-6

Preliminary Installation Steps

1. Order the *PB313EK* Timer Kit. (See page **8** of this manual.)

2. Remove ALL power from the Mini-Wave Control Panel.

3. Remove the Deadfront Cover from the panel. (See Figure 5-6.)

4. Remove the Cover Access Plate from the second timer hole on the Deadfront Cover. (See Figure 5-6.)

5. Remove the Low-Voltage Divider to gain access to the Control Chassis Screws. (See Figure 5-7.)

6. Remove the screws that secure the Control Chassis. (See Figure 5-7.)

7. Install the second timer using the hardware provided with the *PB313EK* timer kit. Reference the timer already installed if not sure how to install the second timer. (See Figure 5-7.)

8. Supply 120VAC to Terminals 1 and 2 of the pump timer. To simplify installation, tap into the power supplying the first timer. (See Figure 5-8.)
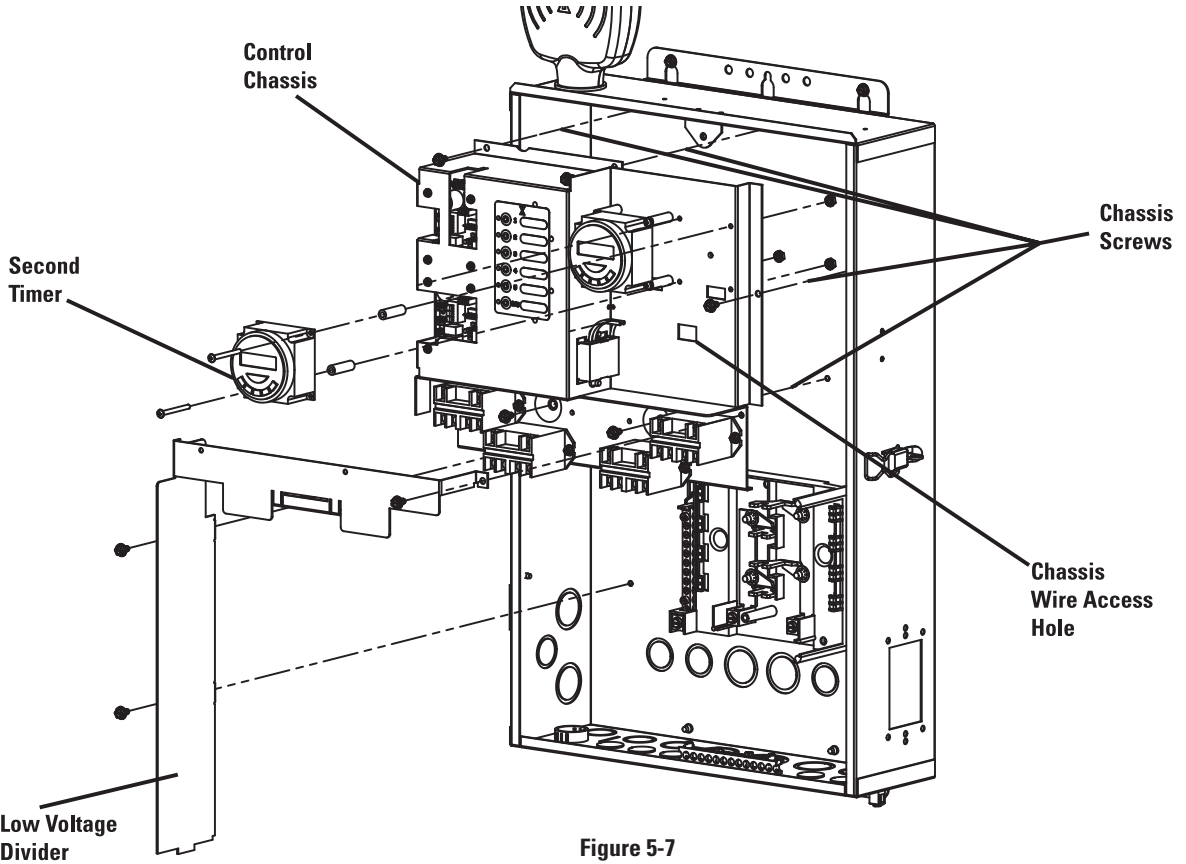
Figure 5-7