

MULTI WAVE™

PE653RC Pool/Spa Control System



INTERMATIC®
Providing a brighter solution.™



Installation and User Guide

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 people and people with history of heart disease, low or high blood pressure, circulatory system problems, or diabetes should consult a physician before using a spa.
- People using medication should consult a physician before using a spa or hot tub since 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.*



- 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 not 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: *To reduce the risk of electrical shock, connect the grounding terminal in the metal enclosure 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. 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 1:

System Overview

The Intermatic Multi-Wave Pool/Spa PE653RC Wireless Control System brings wireless control to a new level of simplicity and affordability. The following features make the system distinctive:

- Easy to Use — with simple, push button controls and a clear, easy-to-read display panel
- Everything You Need — includes the functionality and control called for in nearly every installation.
- Dependable — with Z-Wave® technology that lets you expand your system with inexpensive repeaters that plug into available electrical outlets to help extend the RF signal range of the entire system. Z-Wave technology eliminates intermittent 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 Multi-Wave PE653RC Pool/Spa Wireless Control System configuration is shown in Figure 1-1. You can order individual components for a custom configuration or system as indicated.

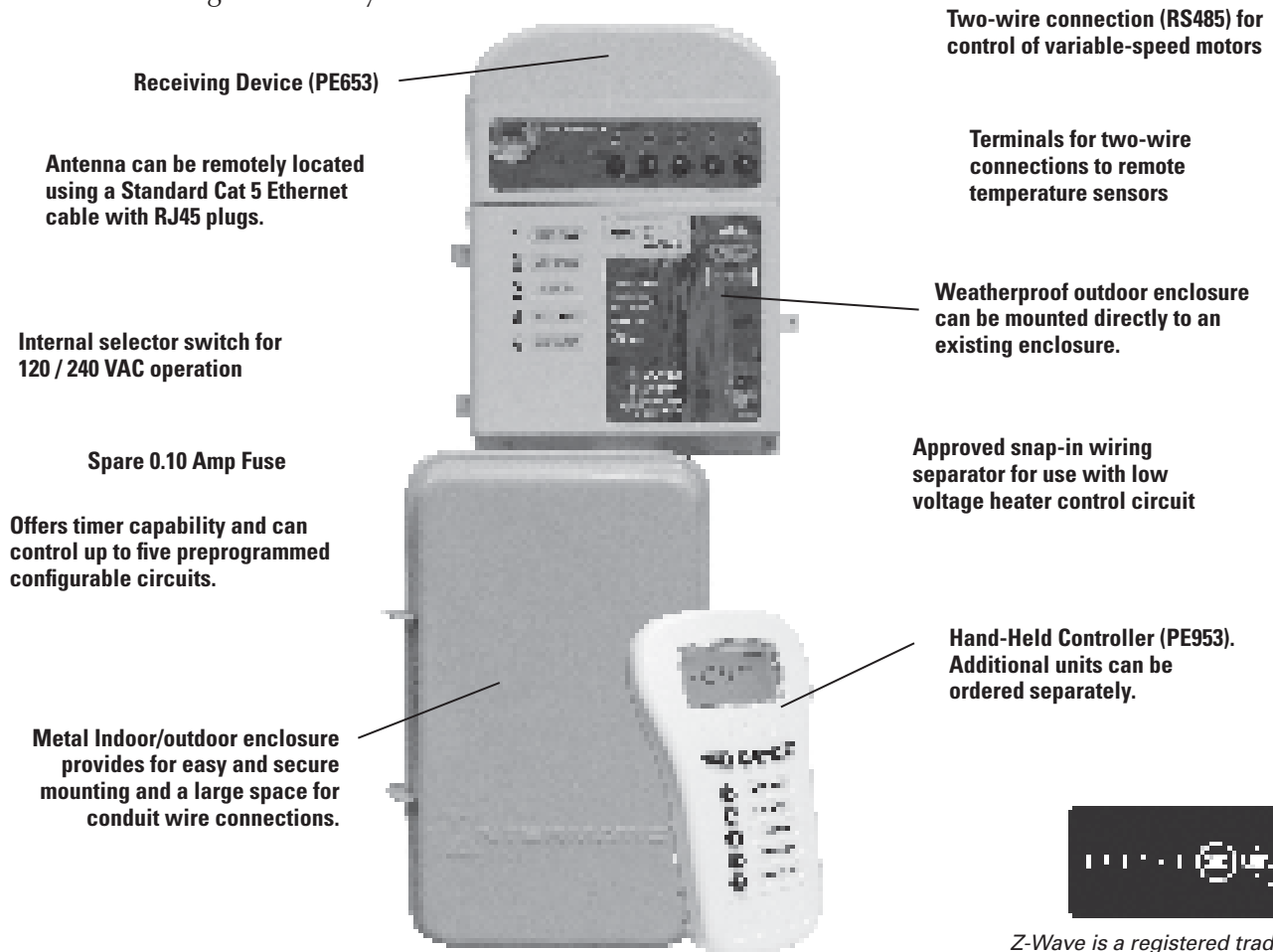
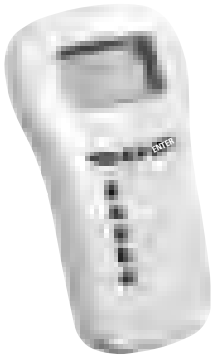


Figure 1-1

Z-Wave is a registered trademark of Sigma Designs and/or its subsidiaries.

Additional Detail on Key Components

Hand-Held Controller (*PE953*)

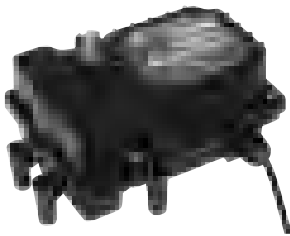


The main function of the Hand-Held Controller is to transmit user commands to the PE653 Receiving Device, PE650 Receiving Device, and/or Z-Wave home control devices, and to display the status of the installed equipment.

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.

When the components of a specific system are linked together into a network, unique network ID codes supplied by the PE953 prevent unauthorized use of the system by neighboring systems.

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.

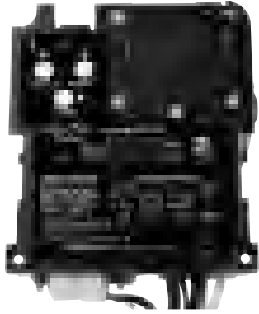
- 24VAC Input Voltage
- Automates compatible diverter valves for pool/spa combos
- Adjustable cam rotates diverter valves to multiple degree settings
- Designed to operate most 2-way and 3-way diverter valves
- Shipping Weight - 3 lbs. (1.4 kg)
- Agency Approval - CSA/C-US

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.

24-Volt Valve/Pump Switch (*P4243ME*)



Designed as part of the Multi-Wave system and for aftermarket and retrofit applications, the P4243ME is most suited for controlling up to two different circuits associated with pool/spa combinations, but can also be used to control all the equipment typically needed in connection with water features, water gardening, solar heating, and other similar applications. This unit snaps into almost any Intermatic enclosure and controls pumps up to 3HP, 24 volt supply for up to three valve actuators, automated HIGH/LOW water temperature selector, heater connection circuit, and push-button control for each load with indicator lights on the face of the switch. In addition, the unit has connections for a hard-wired or wireless remote and a master switch controller. For this installation, if an enclosure must be added, we recommend Intermatic 2T2485GA.

- 120 or 208-240 input voltage
- Controls up to three valve actuators
- Controls two circuits
- Switches heater thermostat
- Remote control capabilities
- Shipping weight – 3 lb. (1.4 kg)
- Agency approval – CSA/C-US

Contact Ratings — Each Circuit

- 17A Resistive, 120/240 VAC., 50/60 Hz
- 1.5 HP @ 120 VAC., 50/60 Hz
- 3.0 HP @ 240 VAC., 50/60 Hz
- 10 Amp Tungsten, 120/240 VAC., 50/60 Hz
- Valve Actuator Supply: 24VAC 40VA

Optional — Freeze (Air Temperature) Sensor (*178PA28A*)



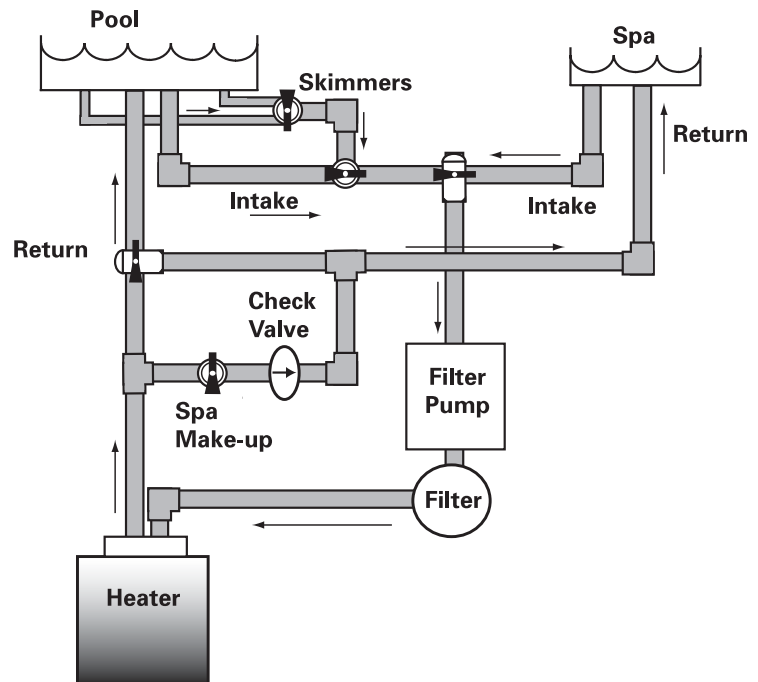
Add the Intermatic Freeze or Air Temperature Sensor (*178PA28A*) to installations where below-freezing outdoor temperatures are a concern.

Section 2:

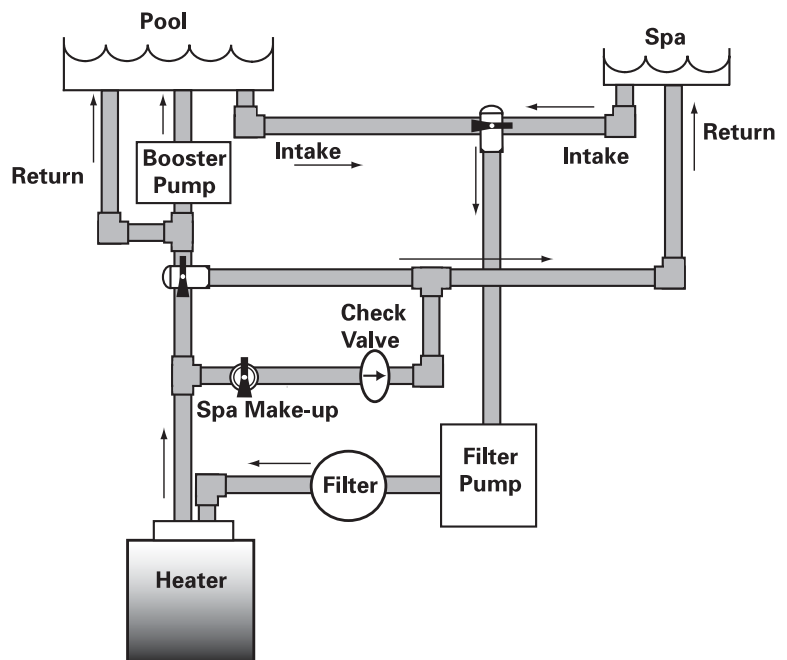
Plumbing Examples

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.

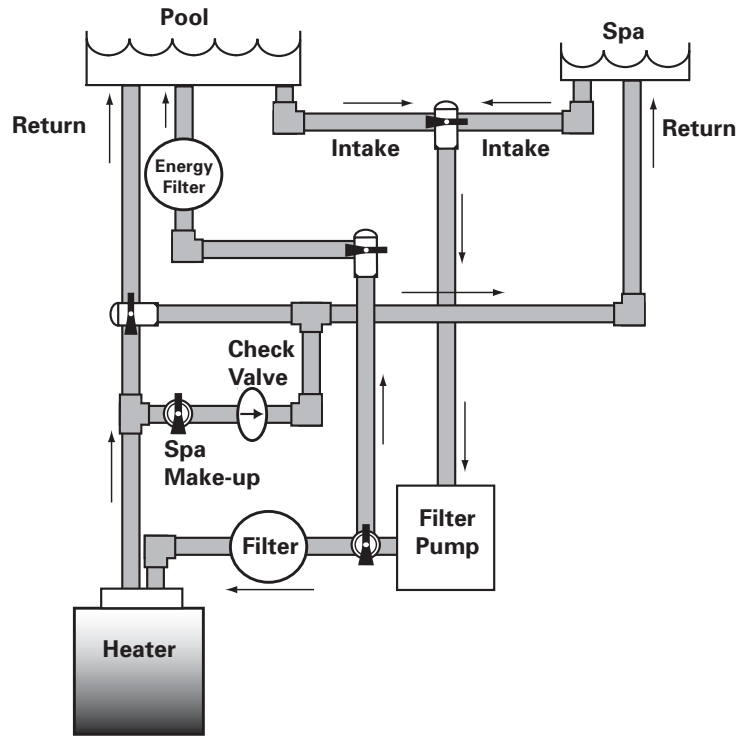
For Pool and Spa Combo Installations



For Booster Pump Pool Cleaner Installations



For Non-Booster Pump Pool Cleaner Installations



Section 3:

Installing and Wiring the PE653 Receiving Device

WARNING

- To avoid fire, shock, or death, turn off power at circuit breaker and test that power is off before wiring.
- Read instructions completely before installation and retain for future reference.
- Observe all national and local electrical and safety codes.
- Disconnect power when servicing or changing loads.
- Alterations or modifications to the device will void the warranty.
- For outdoor locations, rain-tight or wet location conduit hubs that comply with the requirements of UL 514B Conduit, Tubing, and Cable Fittings, must be used.

Ratings

Controller Power In:

- 120/240VAC, 50/60Hz - 5W MAX.

Contact Ratings:

Load 1

- 120/240 VAC
- 20A Resistive
- 17 Full load A, 80 Lock Rotor A
- 5A Tungsten or Ballast

Loads 2-5

- 120/240 VAC
- 15A Resistive
- 10 Full load A, 60 Lock Rotor A
- 5A Tungsten or Ballast

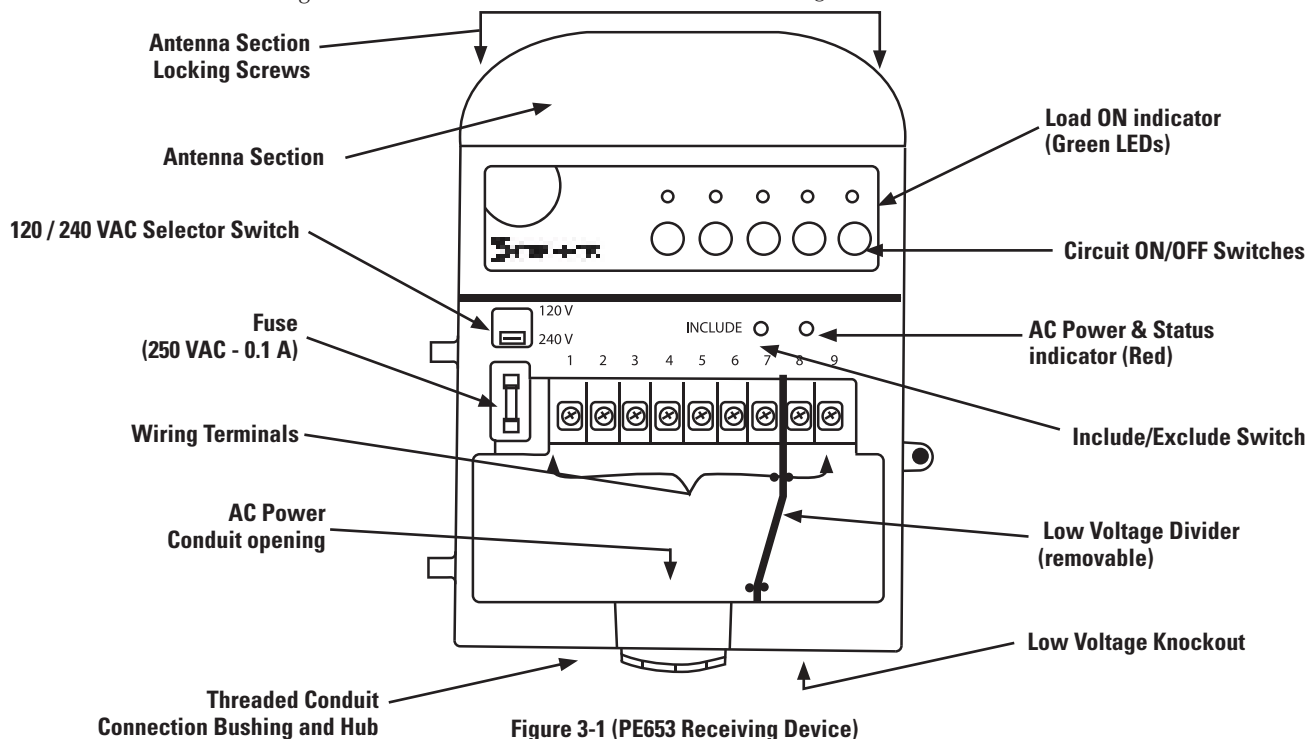


Figure 3-1 (PE653 Receiving Device)

Wiring Instructions

Power Connections

- 1-Speed Pump: Must be powered from Terminal 3.
- 2-Speed Pump: Must be powered from Terminal 3 for High-Speed and Terminal 4 for Low-Speed.
- Booster Pump: Must be powered from Terminal 6.
- Actuator Control: Must be powered from Terminal 7.
- Heater Control: Must be Terminals 8 & 9.
- The metal enclosure must be ground bonded in compliance with national, state and local codes.

Terminal 1 must always be Neutral when using 120 VAC power.

Terminal 1 must be L2 when using 240 VAC.

Terminal 2 must always be Hot or L1 for both 120 VAC and 240 VAC.

Terminal 3 must always be connected to the Hot terminal of the pump.

Terminal 3 must always be connected to the HIGH SPEED terminal of a 2-speed pump.

Terminal 4 must always be connected to the LOW SPEED terminal of a 2-speed pump when using a 2-speed motor.

Terminal 5 is the input supply for both terminals 6 & 7. This terminal is rated at 15 A. maximum.

Terminals 6 & 7 are function selectable with a maximum combined rating of 15 A.

Terminal 8 is the input supply for terminal 9. The load is rated at 15 A. maximum.

Terminals 8 & 9 can be used for low voltage provided the Low Voltage Divider is used to separate the Low Voltage conductors from Line Voltage conductors. Low voltage conductors must exit the cabinet through a separate opening. (See Figure 3-1)

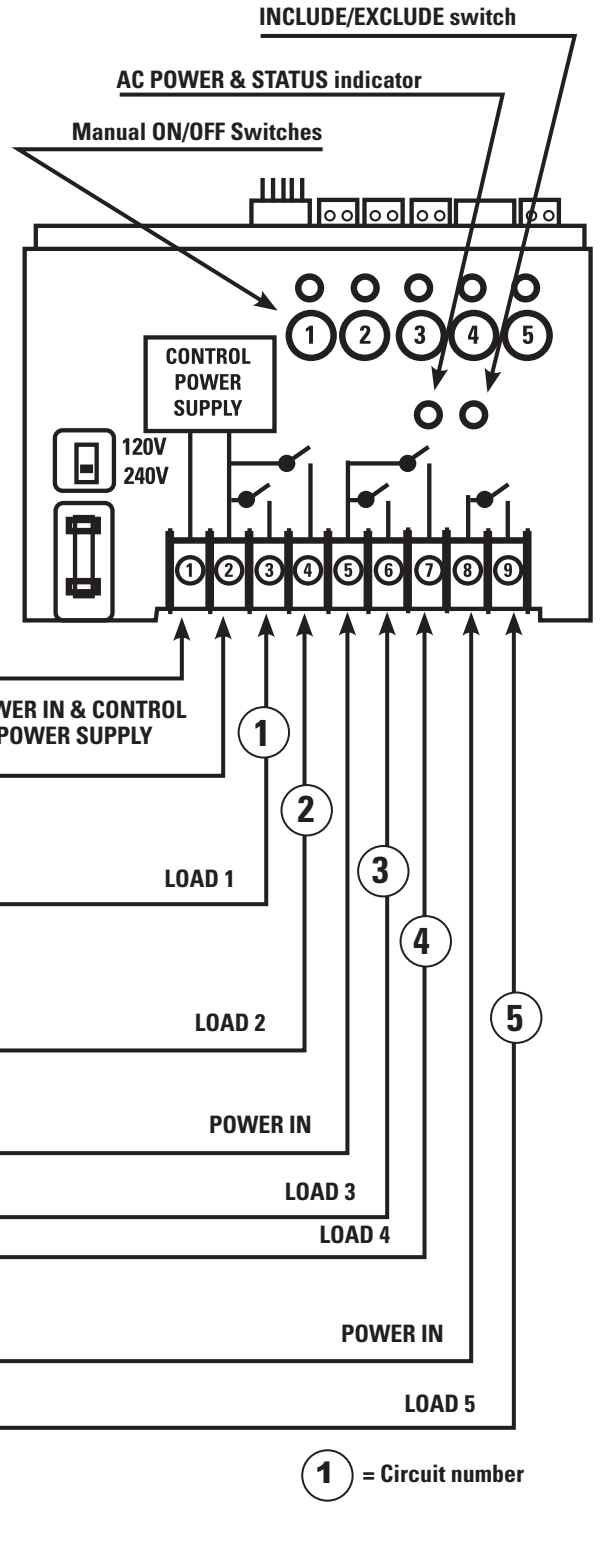
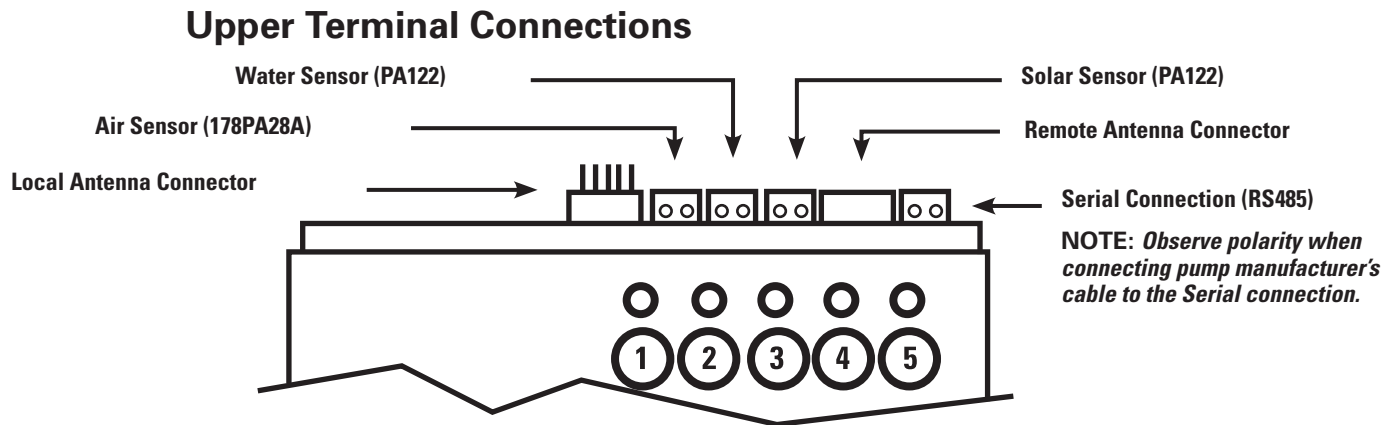


Figure 3-2 PE653 Master Control Center Power Terminal identification



CAUTION: The PE653 is a control device and NOT a safety disconnect. A proper sized fused disconnect or breaker of no more than 125 Amp capacity must be provided in the power supply circuit. Proper gauge wire should be based on local code requirements of amperage and wire length.



Installation Instructions

1. To avoid fire, shock, or death, turn off power at circuit breaker and test that power is off before wiring.
2. Select a location for the installation that is near the pool/spa equipment; at least five (5) feet distance or more from either the pool or spa and at least five (5) feet above ground level. The PE653 must be mounted in a vertical (upright) position on the top of the enclosure.
3. Select the knockouts to be used. Remove the inner 1/2" knockout by inserting a flathead screw driver in the slot and carefully punch the knockout loose and remove the slug. If a 3/4" knockout is required, remove the outer ring with pliers after removing the 1/2" knockout. Smooth the edge with a file if required.
4. Place the metal enclosure in the desired mounting location and mark the three mounting holes. Install the top screw first and then hang the enclosure by the keyhole. Then install the bottom screws, tightening all screws for a secure mounting.
5. Install electrical conduit as needed to comply with all national and local electrical and safety codes.
6. If a low voltage circuit or a heater control circuit is to be used, remove the low voltage knockout from the PE653 enclosure.
7. Install electrical conduit as required by national, state and local codes.
8. Bond the enclosure in accordance with your state and local codes. Where required, connect a No. 8 AWG solid copper wire to the enclosure using Bonding Lug (part number 156T11047A). Connect the bonding wire to an approved earth ground.
9. Identify and install all wires necessary to complete the installation. Allow a length of approximately 18" of each wire at the metal enclosure for required connections of junctions.
10. Connect wiring for circuits as required. Refer to the diagrams in this section for wiring suggestions for specific equipment combinations. All splices and wire nut connections should be in the metal enclosure, **not** in the PE653 enclosure.
11. Check and tighten all connections and circuits.
12. Apply power.



THE METAL ENCLOSURE MUST BE CLOSED AND SECURED WITH A LOCK OR TY-WRAP.

List of Wiring Diagrams

Variable-Speed Pumps

240V Variable-Speed Pump Figure 3-4

One-Speed Pumps

120V 1-Speed Pump Figure 3- 5

120V 1-Speed pump + any 4 120 VAC auxiliary equipment Figure 3- 6

120V 1-Speed pump + 120V Blower or Lights + 120V Booster Pump + 120V Actuator + Heater Figure 3-7

120V 1-Speed pump + 120V Lights + 120V Blower + 120V Actuator + Heater Figure 3-8

240V 1-Speed Pump Figure 3-9

240V 1-Speed pump + any 4 240 VAC auxiliary equipment Figure 3-10

240V 1-Speed pump + 240V Blower + 240V Booster Pump + 240V Actuator + Heater..... Figure 3-11

240V 1-Speed pump + 120V Lights + 120V Blower + 240V Actuator + Heater Figure 3-12

Two-Speed Pumps

240V 2-Speed Pump Figure 3-13

240V 2-Speed pump + any 3 240 VAC auxiliary equipment Figure 3-14

240V 2-Speed pump + any 3 120 VAC auxiliary equipment Figure 3-15

240V 2-Speed pump + 240V Booster Pump + 240V Actuator + Heater Figure 3-16

240V 2-Speed pump + 120V Lights + 240V Blower + Heater..... Figure 3-17

240V 2-Speed pump + 240V Blower + 240V Actuator + Heater..... Figure 3-18

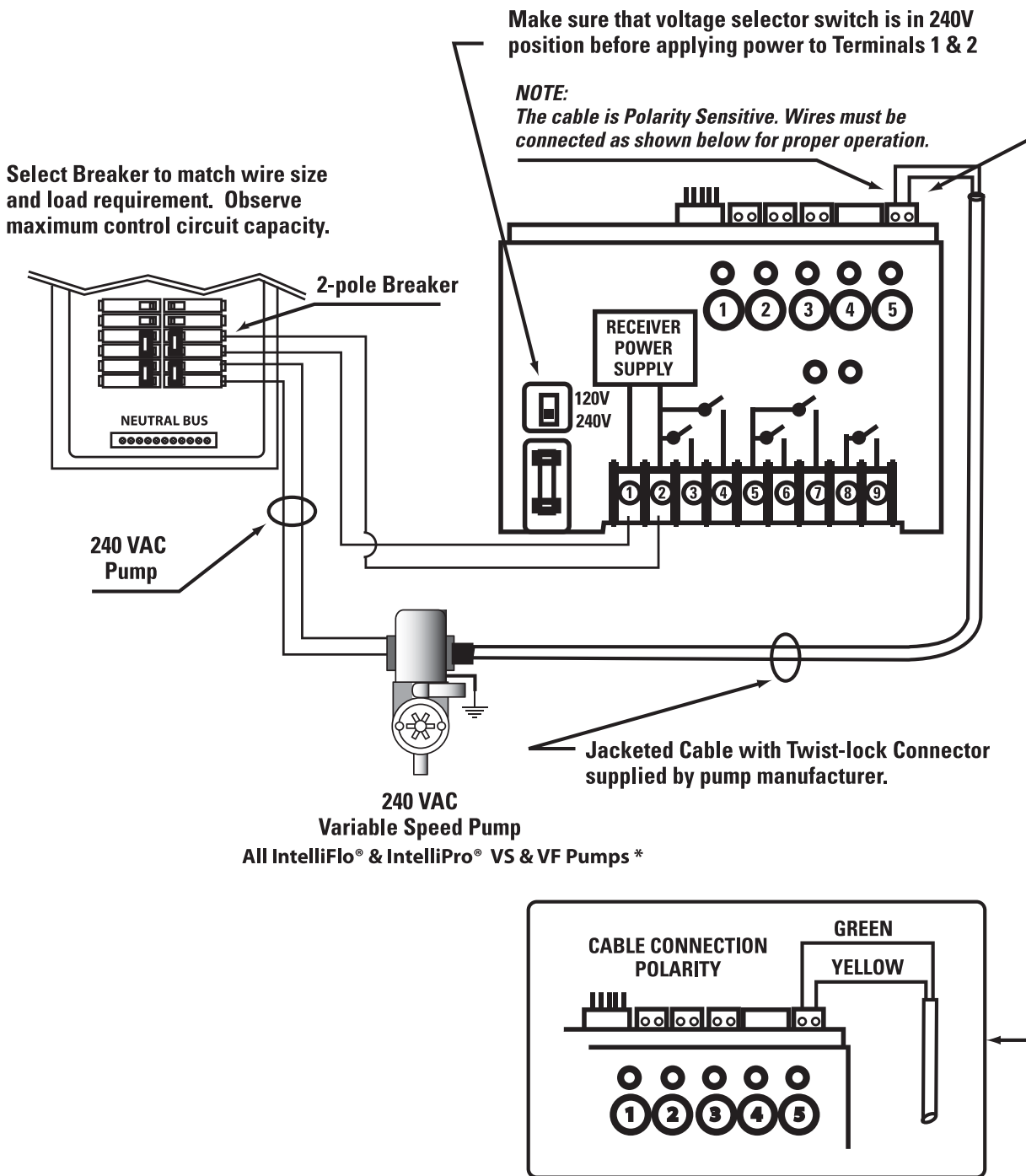
240V 2-Speed pump + 240V Booster pump + 240V Blower + Heater Figure 3-19

240V 2-Speed pump + 240V Booster pump + 120V Light + Heater..... Figure 3-20

240V 2-Speed pump + 240V Booster pump + other 120 VAC equipment + Heater Figure 3-21

Variable-Speed Pumps

240V Variable-Speed Pump



* IntelliFlo and IntelliPro are registered trademarks of Pentair Water Pool and Spa, Inc.

Figure 3-4

1-Speed Pumps

120V 1-speed pump

Select Breaker to match wire size and load requirement. Observe maximum control circuit capacity.

Make sure that voltage selector switch is in 120V position before applying power to Terminals 1 & 2

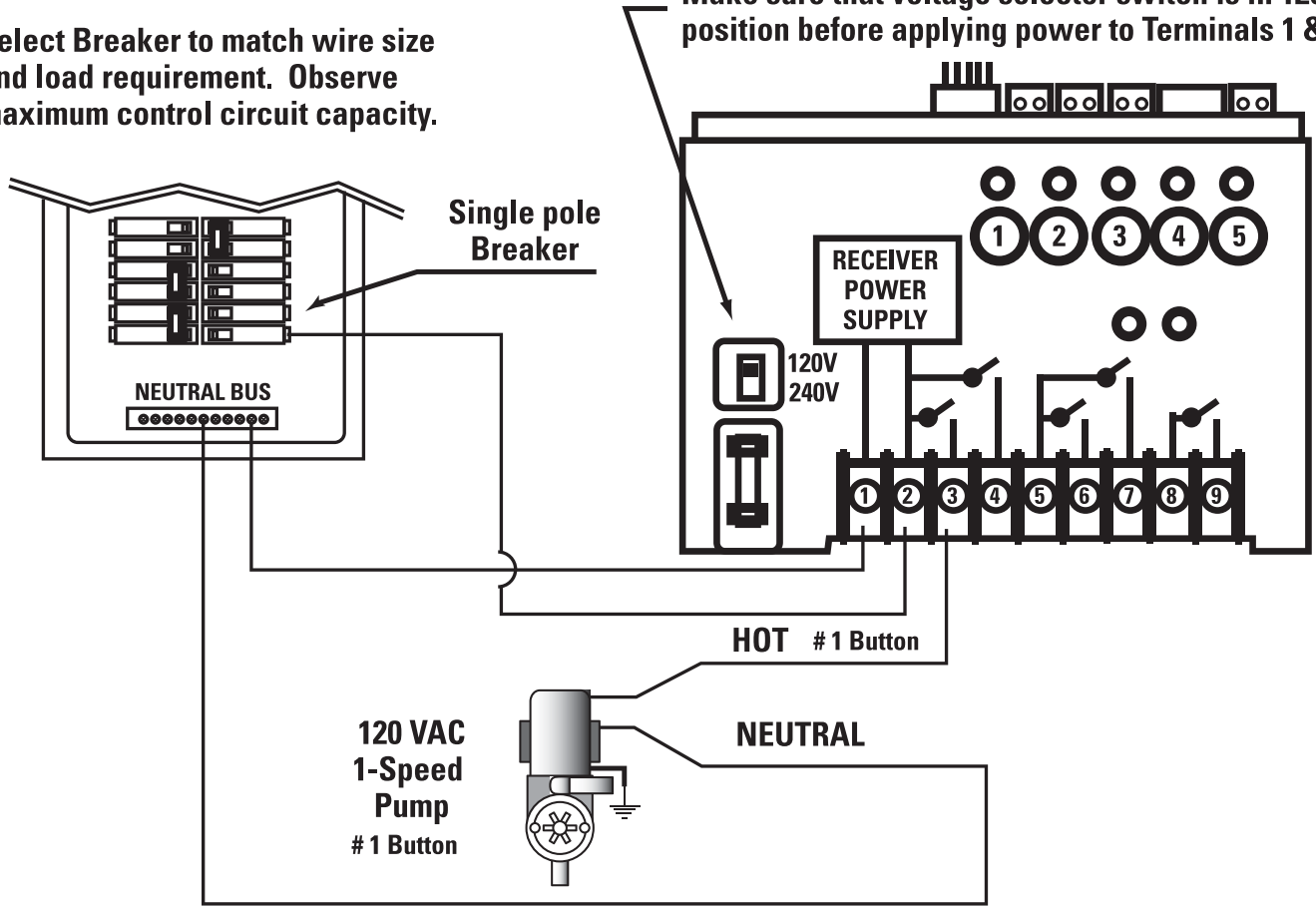


Figure 3-5

120V 1-speed pump + any four 120 VAC auxiliary equipment

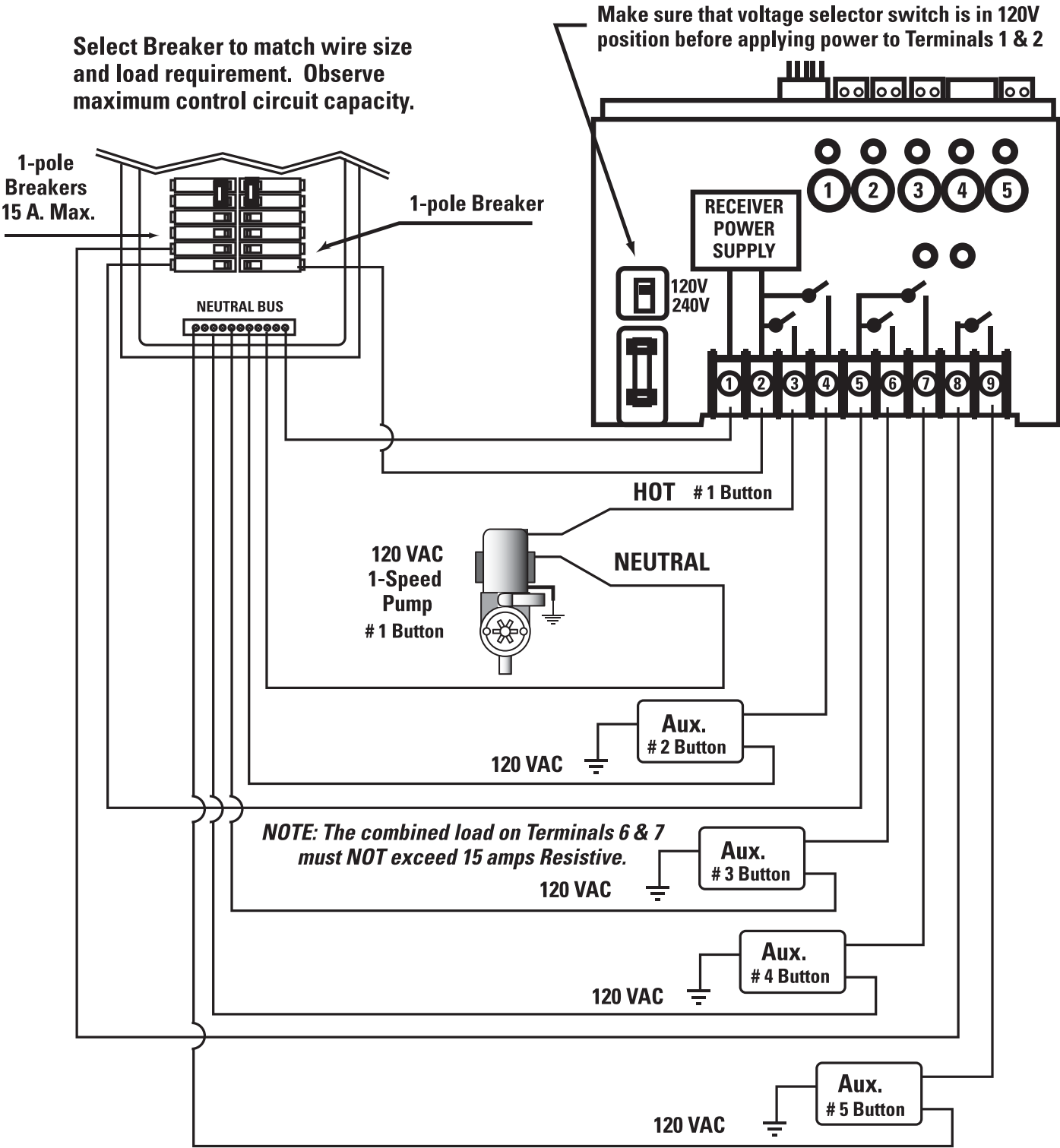


Figure 3-6

120V 1-speed pump + 120 VAC blower or lights + 120V booster pump + 120V actuator + heater

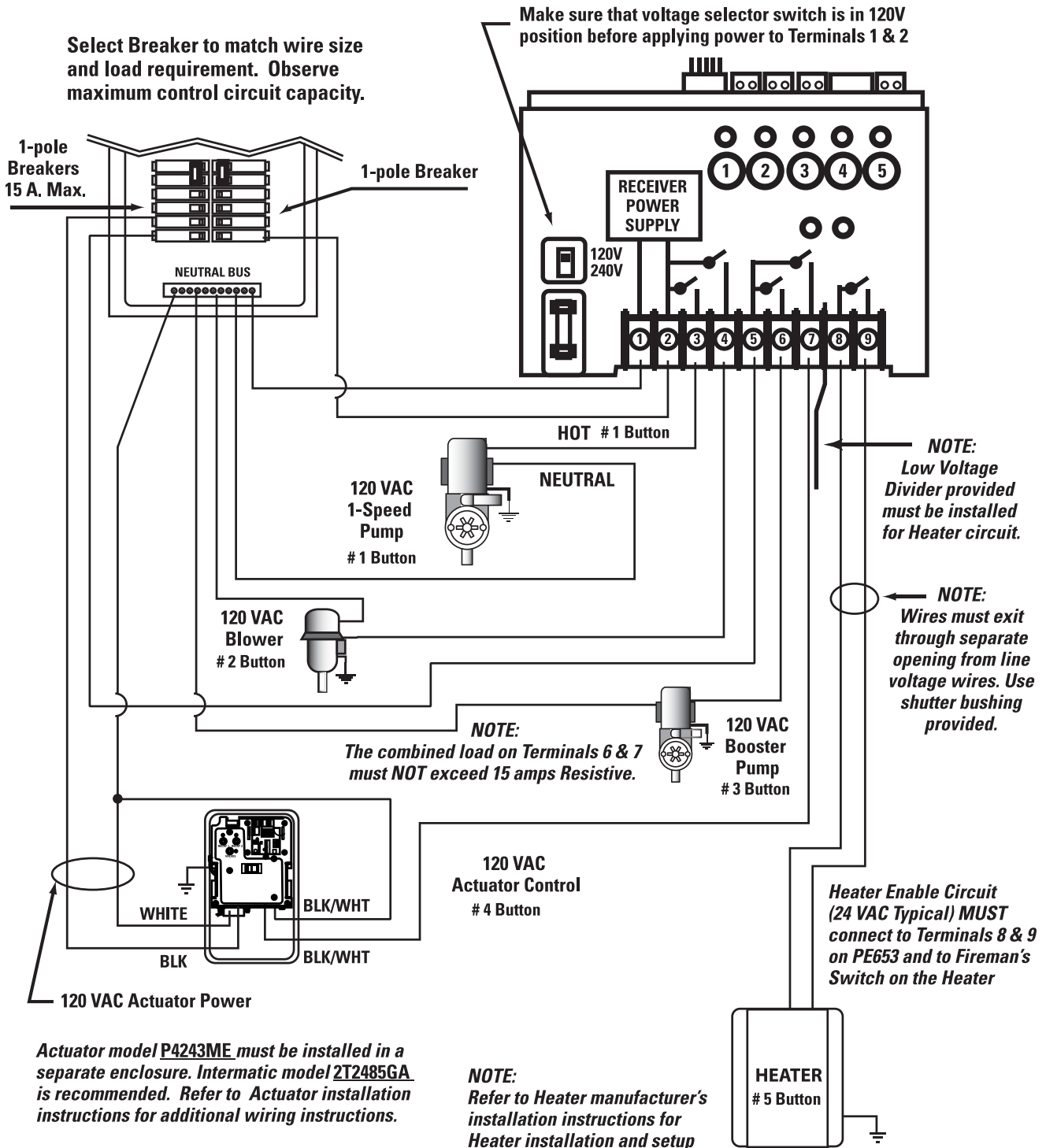


Figure 3-7

120V 1-speed pump + 120V blower + 120V lights + 120V actuator + heater

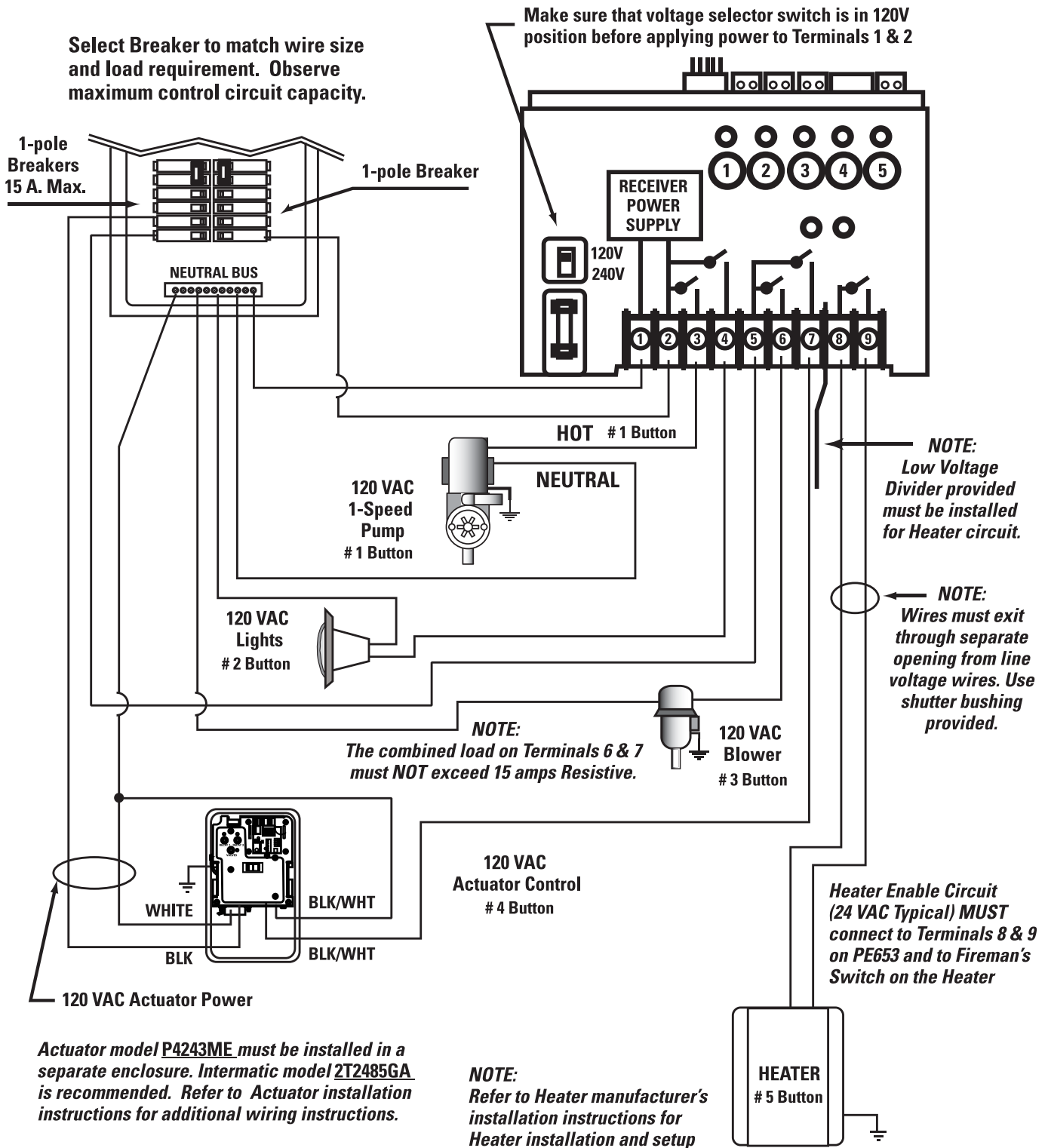


Figure 3-8

240V Pumps

240V 1-speed pump

Select Breaker to match wire size and load requirement. Observe maximum control circuit capacity.

Make sure that voltage selector switch is in 240V position before applying power to Terminals 1 & 2

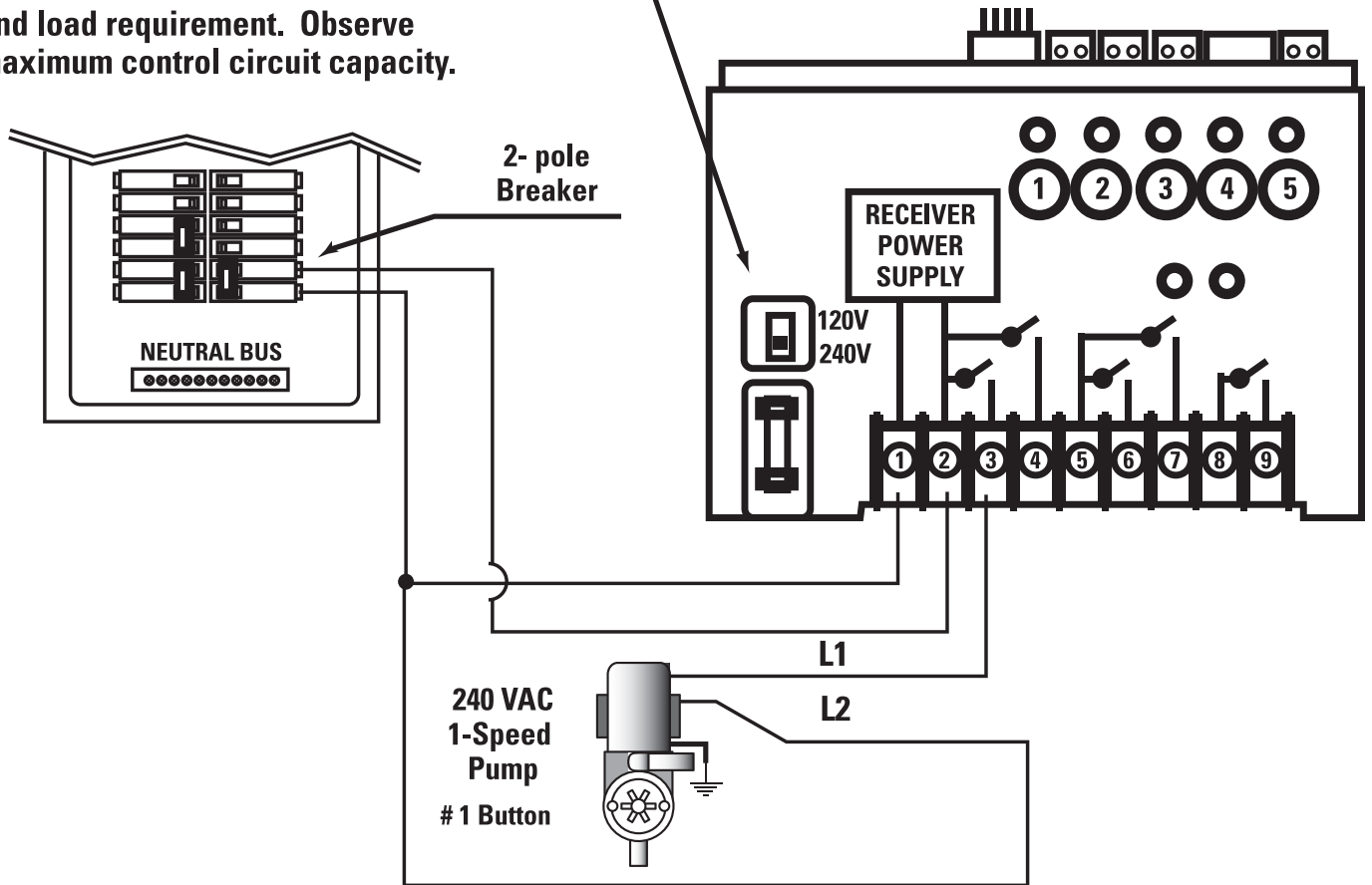


Figure 3-9

240V 1-speed pump + any four 240 VAC auxiliary equipment

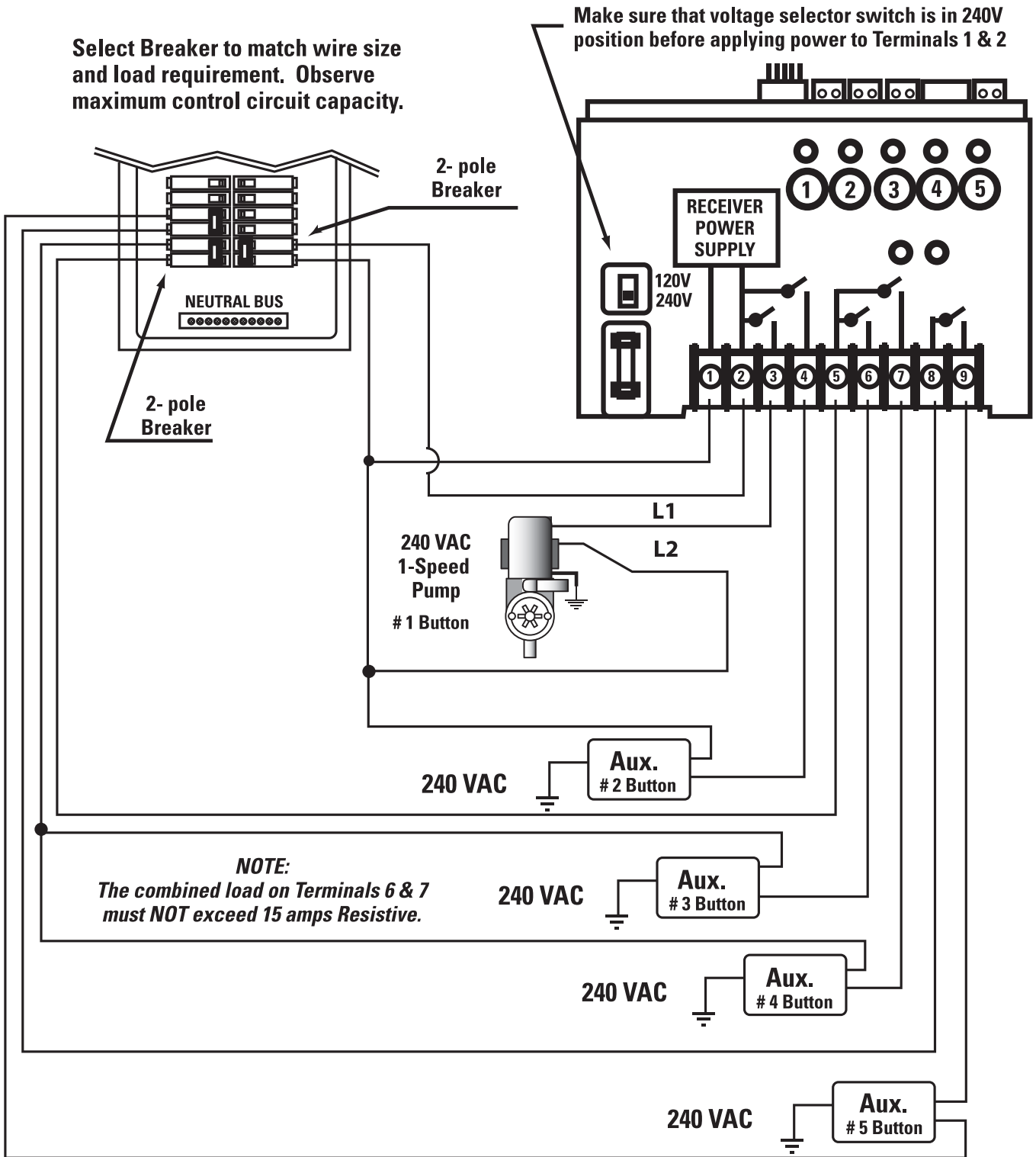
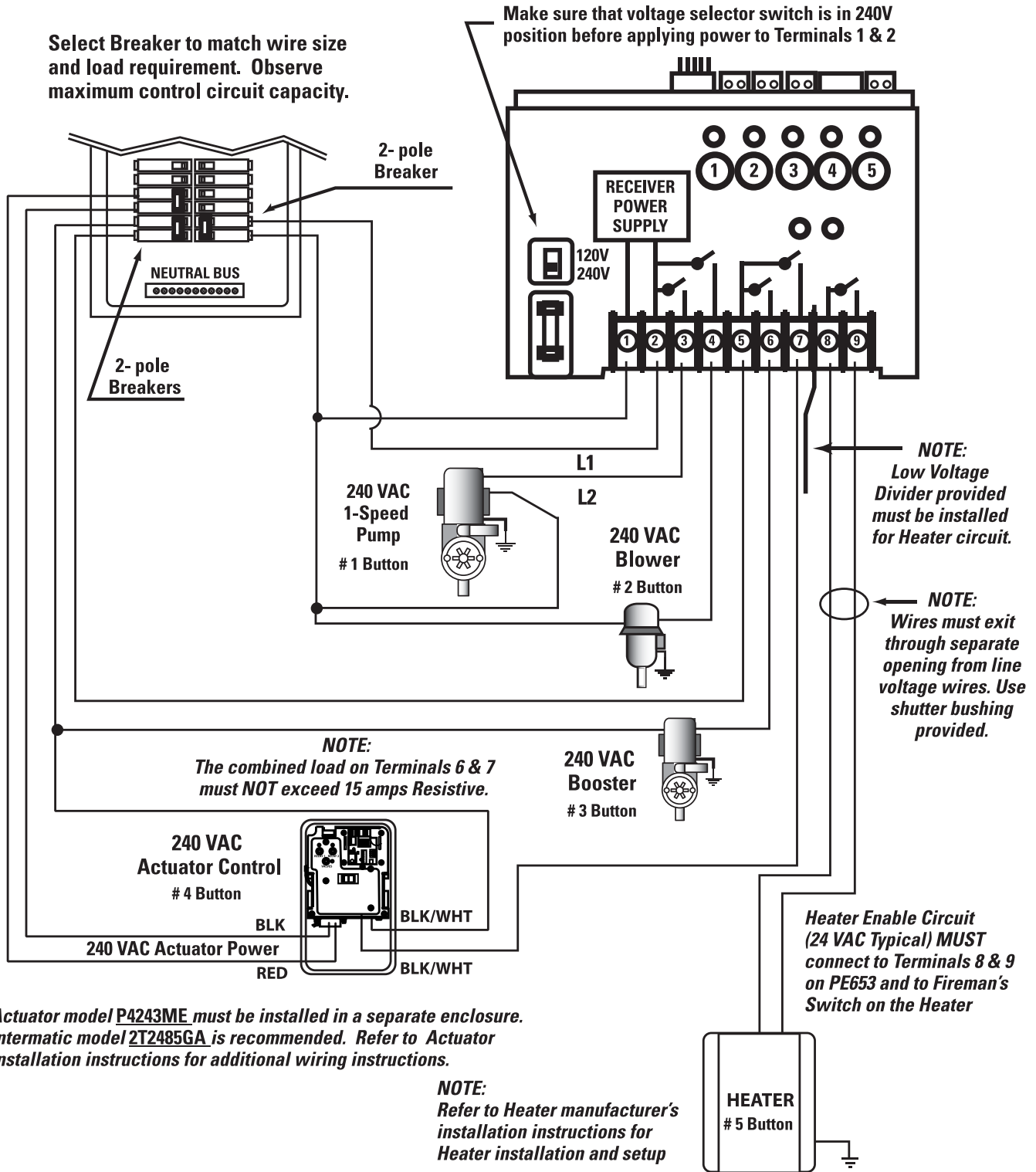


Figure 3-10

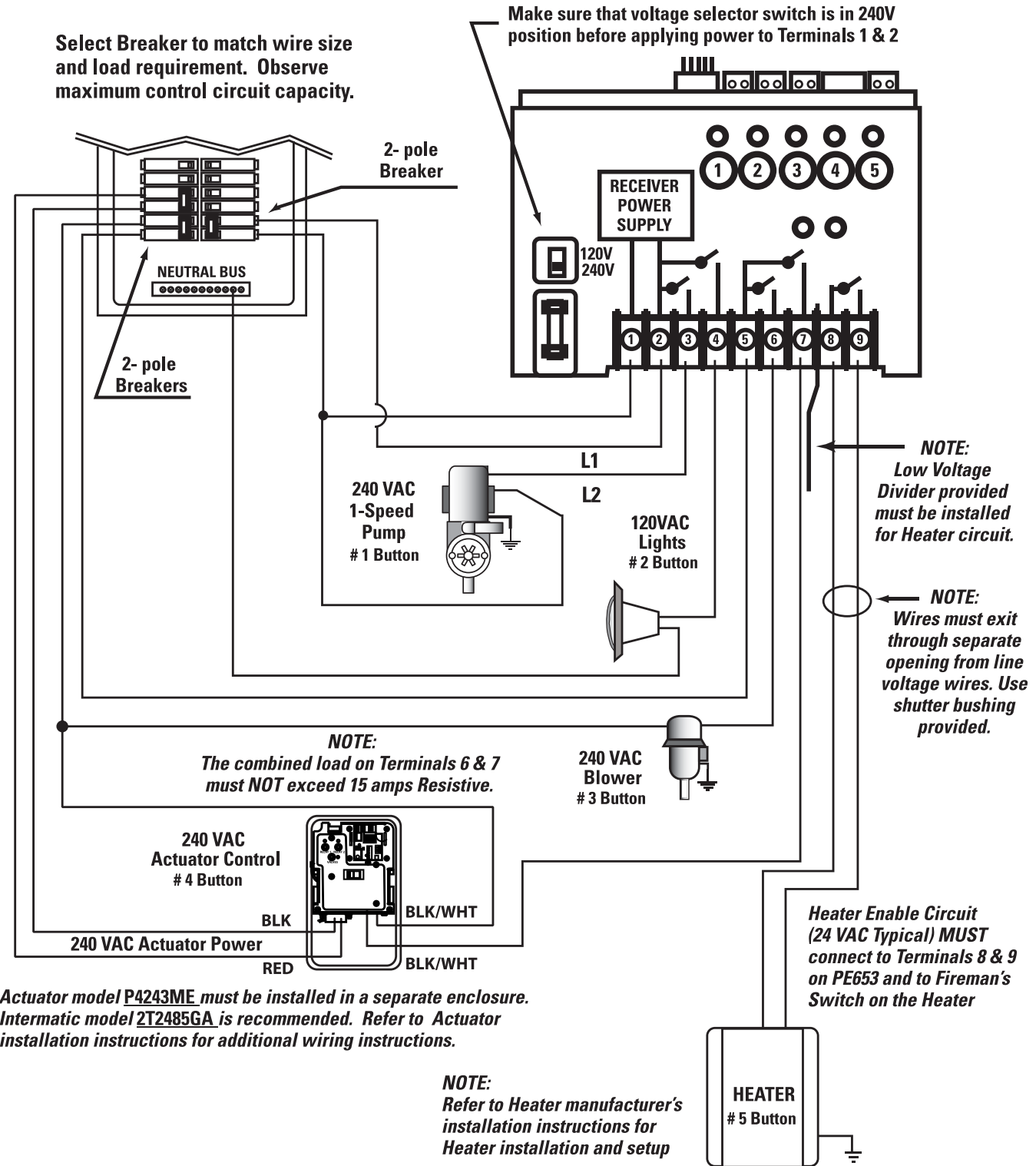
240V 1-speed pump + 240V blower + 240V booster pump + 240V actuator + heater



Actuator model **P4243ME** must be installed in a separate enclosure. Intermatic model **2T2485GA** is recommended. Refer to Actuator installation instructions for additional wiring instructions.

Figure 3-11

240V 1-speed pump + 120V lights + 120V blower + 240V actuator + heater



Actuator model **P4243ME** must be installed in a separate enclosure. Intermatic model **2T2485GA** is recommended. Refer to Actuator installation instructions for additional wiring instructions.

Figure 3-12

240V 2-Speed Pump

Select Breaker to match wire size and load requirement. Observe maximum control circuit capacity.

Make sure that voltage selector switch is in 240V position before applying power to Terminals 1 & 2

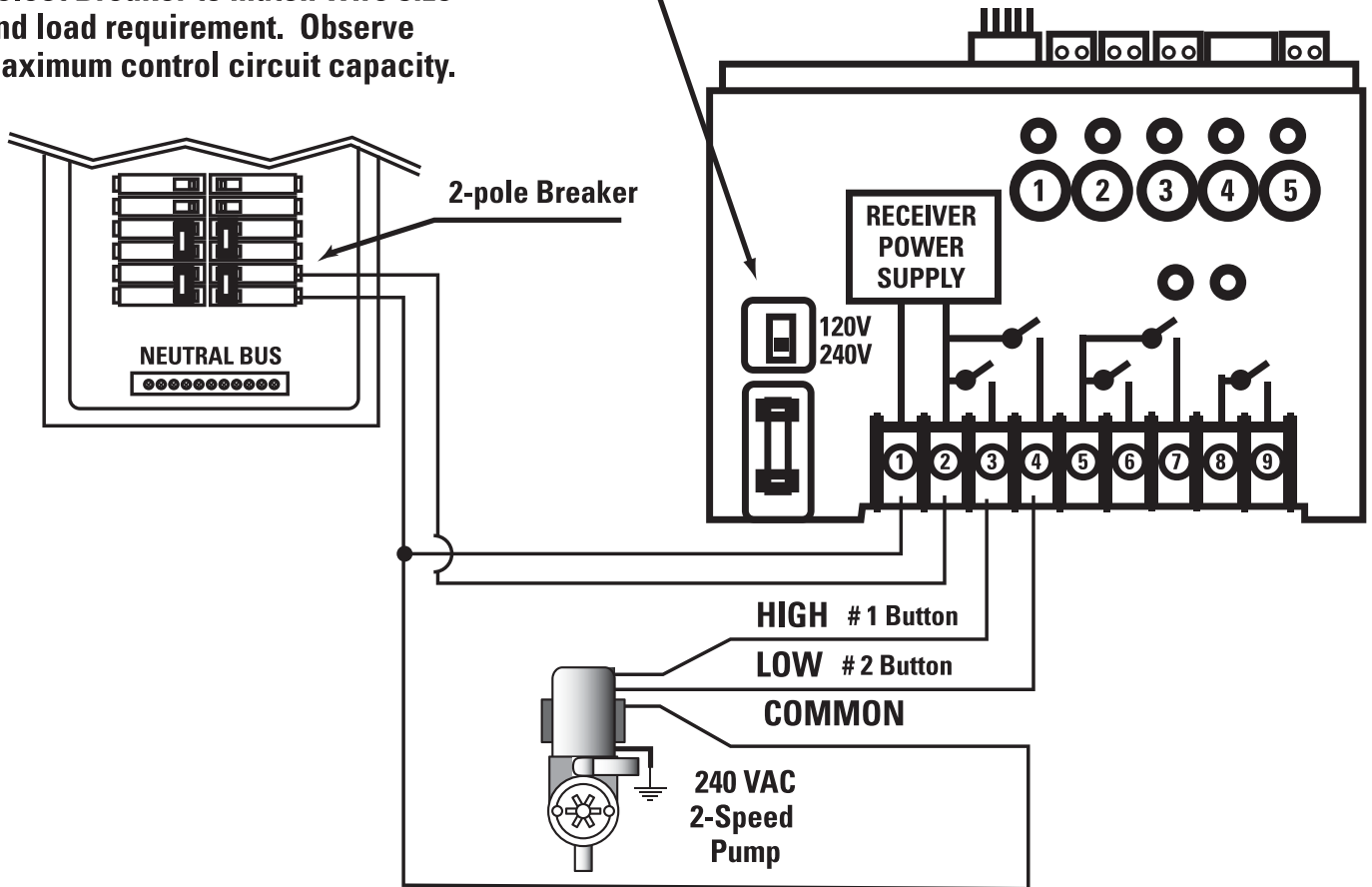


Figure 3-13

240V 2-speed pump + any three 240VAC auxiliary equipment

Select Breaker to match wire size and load requirement. Observe maximum control circuit capacity.

Make sure that voltage selector switch is in 240V position before applying power to Terminals 1 & 2

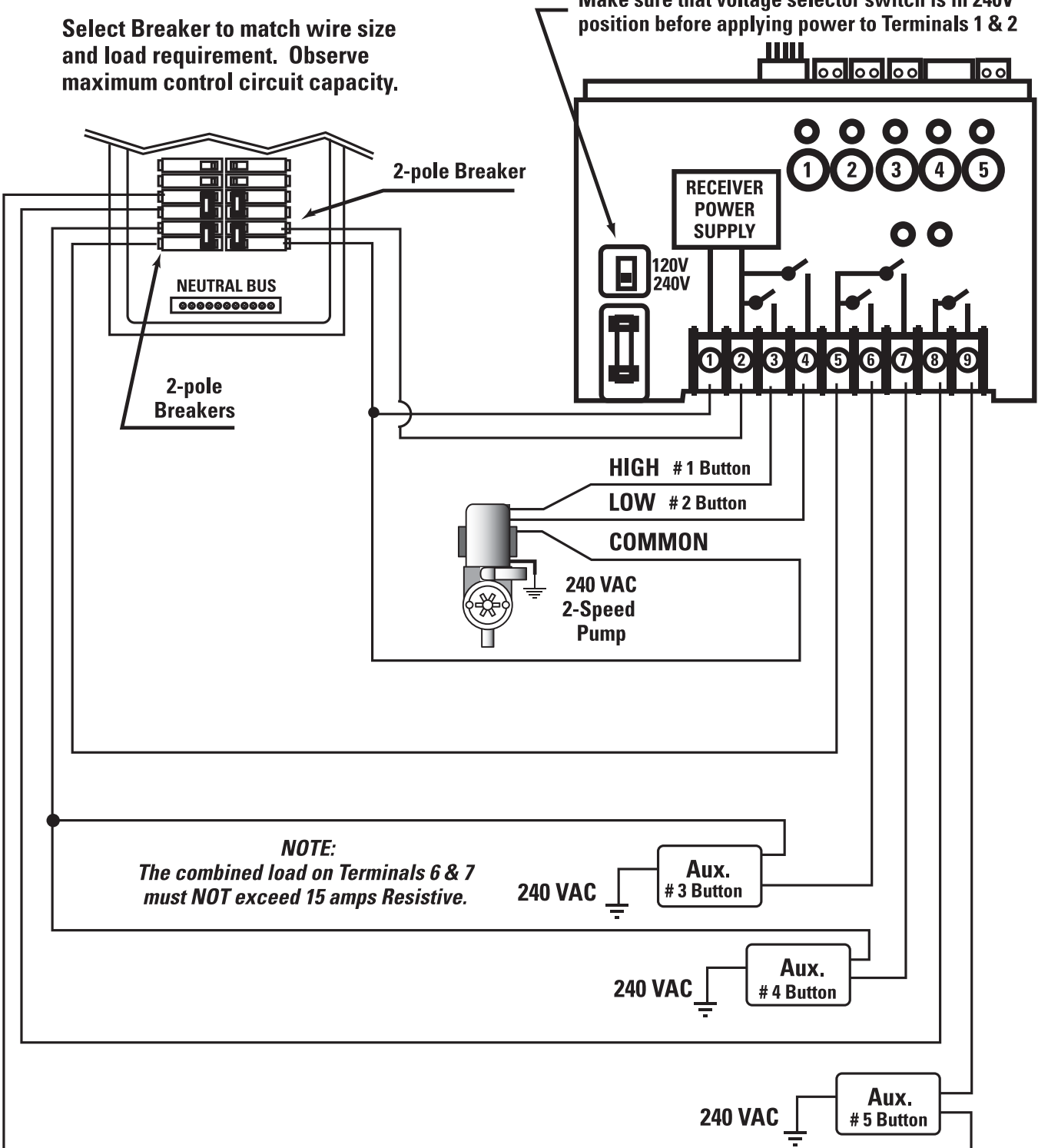


Figure 3-14

240V 2-Speed pump + any 3 120 VAC auxiliary equipment

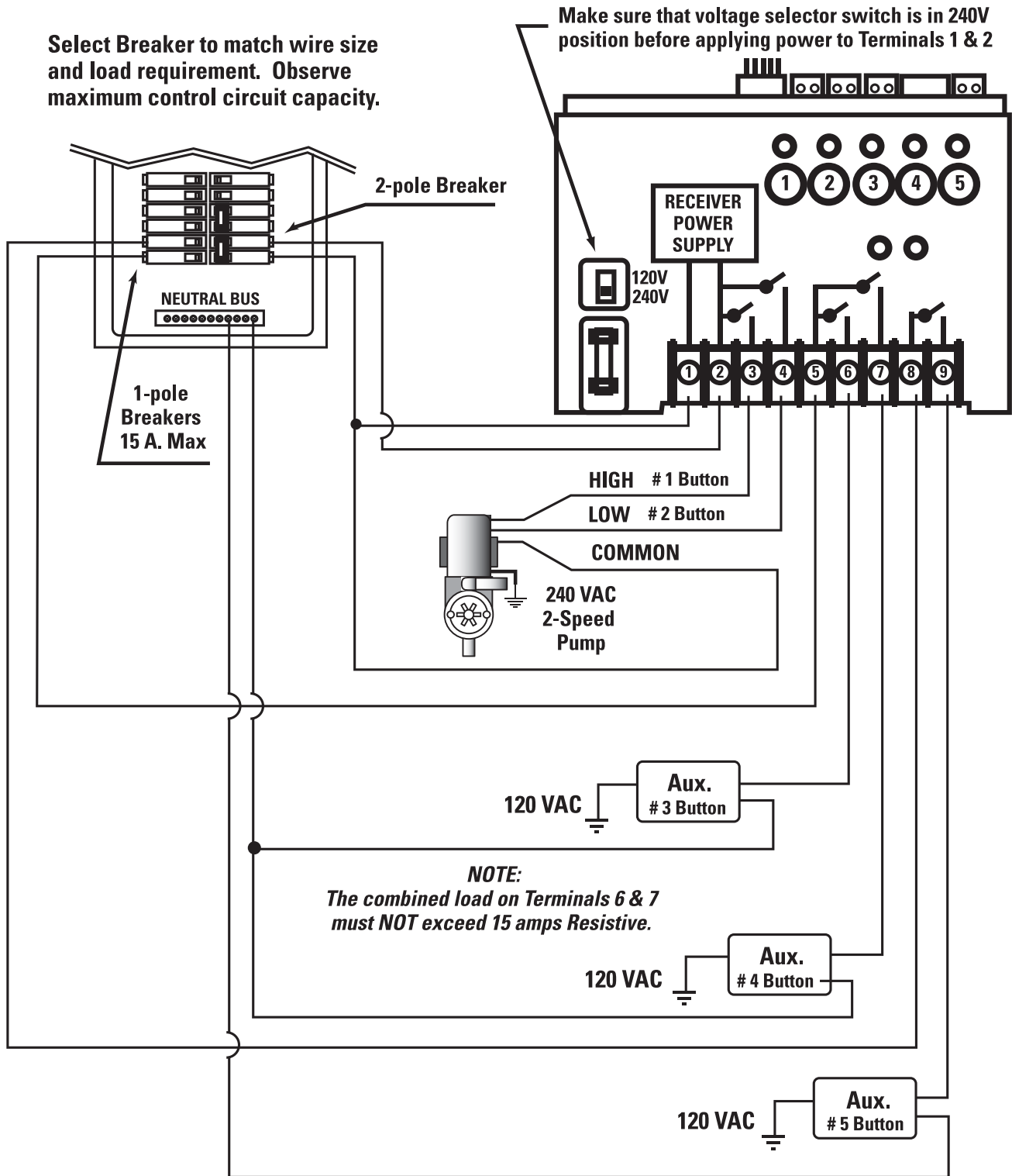


Figure 3-15