System Controller
SC-201-6M-EXT(-OD, -DVC)

Installation Manual

Potential dangers from accidents during installation and use are divided into the following two categories. Closely observe these warnings, they are critical to your safety.

⚠ WARNING	Denotes content that may result in fire,serious bodily injury and even death when ignored.
⚠ NOTICE	Denotes content that may result in bodily injury and physical damage when ignored.

Requests to Installers

⚠ WARNING	In order to use this product safely, read this installation manual carefully and follow the installation instructions.

- Failures and damage caused by erroneous work or work not as instructed in this manual are not covered by the warranty.
- Refer to installation manual attached to the appliance as well.
- Check that installation was done in accordance with this Installation Manual upon completion.
- After completion of installation, be sure to hand this Installation Manual to the customer.

1. Included Accessories

The following accessories are included with this product. Check for missing items before installing.

Part	Shape	Q'ty	Part	Shape	Q'ty
Installation Manual (this document)		1	Tapping Screw		3
Insulated Cords (for -OD and -DVC models)		2	*1 Vinyl Tie		3
Wall Anchor		3	Wire Connectors (for -DVC models only)		10

*1 Use the vinyl ties for loose electrical wiring inside the unit.

Mounting the System Controller

(1) Remove the Sub-Plate by removing the six (6) screws as shown in Figure 1. Pull the Sub-Plate out of the box.
(2) Three (3) mounting holes can be found once the Sub-Plate is removed (Figure 2). Hold the box in position and use the three (3) included mounting screws to secure the System Controller to a wall.
(3) If mounting the box to drywall or masonry, use the provided wall anchors to secure the System Controller to a wall.
(4) After the box has been properly mounted, use the removed screws to reattach the Sub-Plate back onto the box.
(5) Take waterproofing measures so that water does not enter the building from the screws used to mount the device.

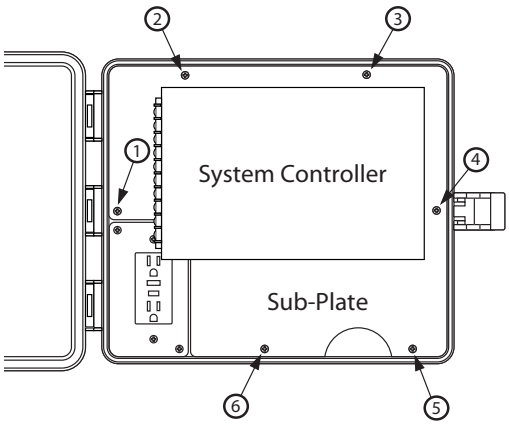


Figure 1: Removing the Sub-Plate

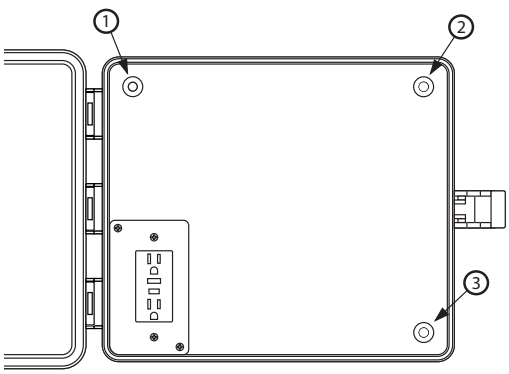
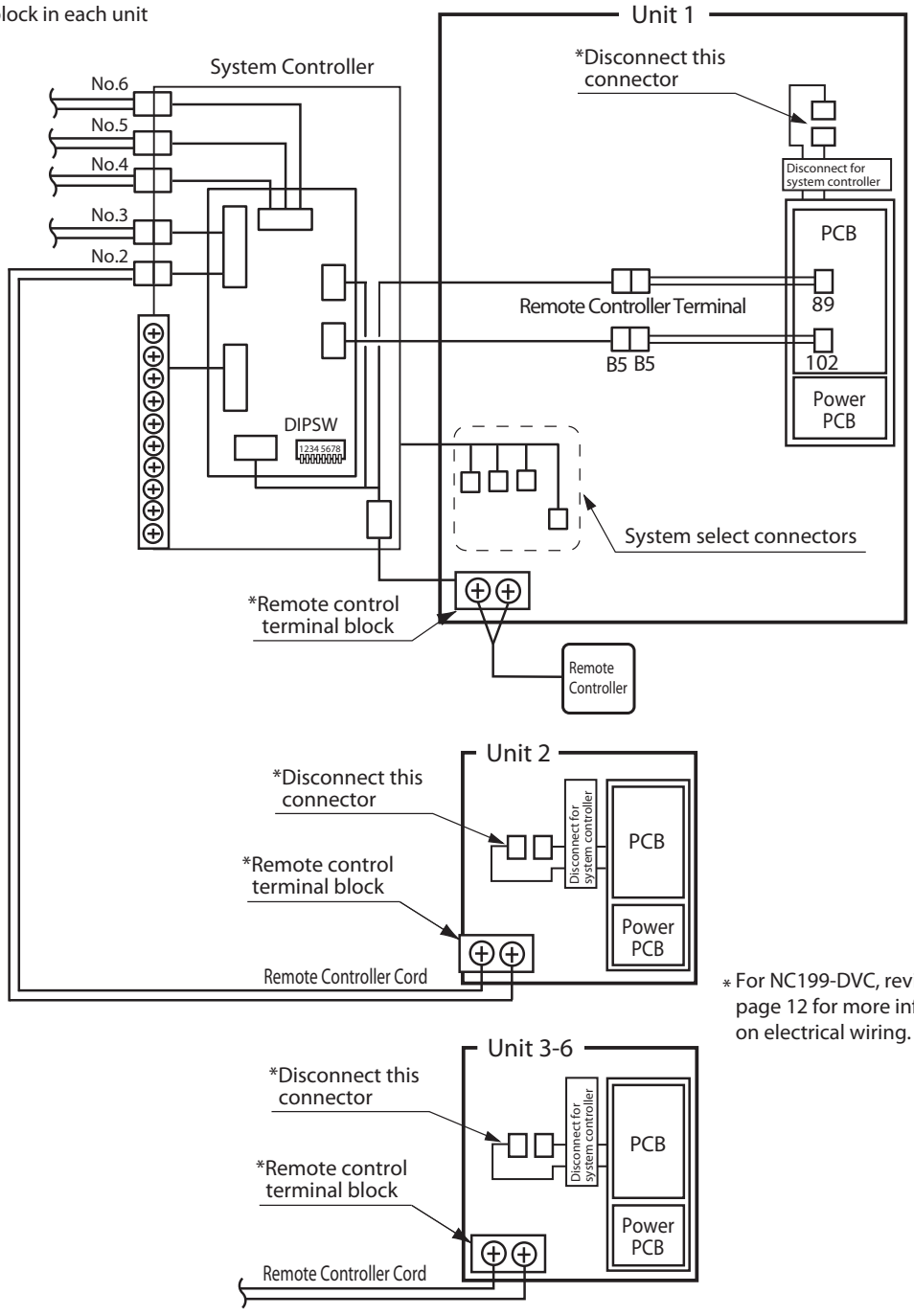


Figure 2: Provided Mounting Holes

Multi-System Wiring

* Connect these to the remote control terminal block in each unit



* For NC199-DVC, review page 12 for more information on electrical wiring.

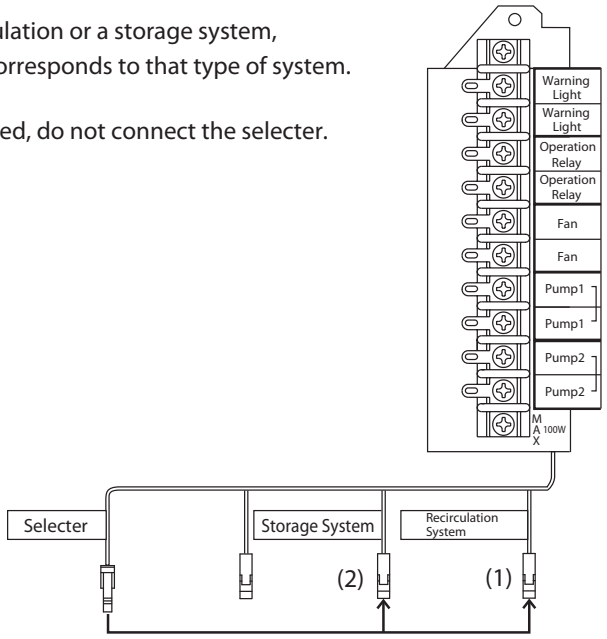
System Select Connectors

If this system will be installed with a recirculation or a storage system, plug the selecter into the connector that corresponds to that type of system.

* If a circulating or storage system is not used, do not connect the selecter.

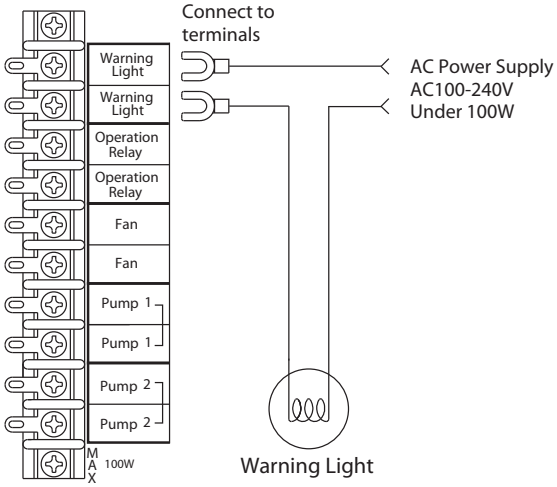
(1) If the units will be installed in a recirculation system:
Connect the selecter to the connector labeled "Recirculation System" (1).

(2) If the units will be installed with a storage tank:
Connect the selecter to the connector labeled “Storage System” (2).



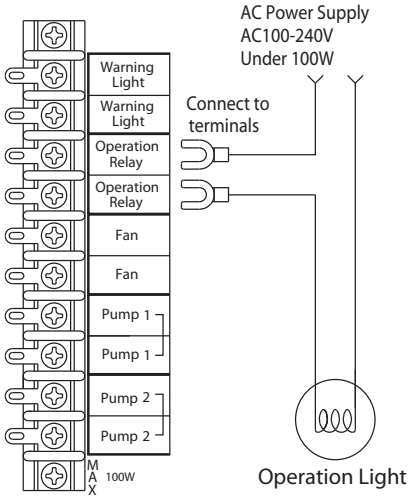
System Controller Terminals (Optional Connections)

Warning Light



- A warning light can be connected to the system as above to warn of any abnormal operation.
  When this light flashes, check for an error code on the remote controller and diagnose accordingly.

Operation Light

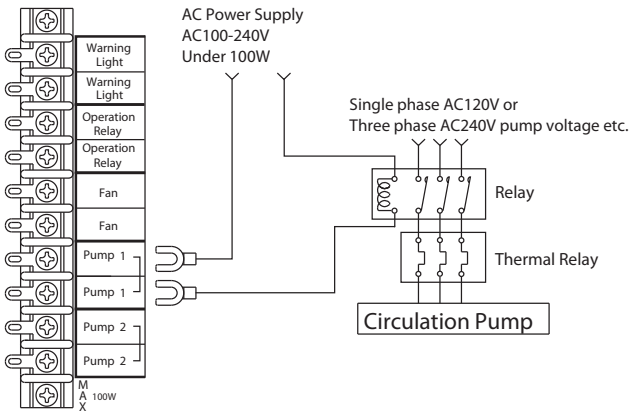


- An operation light can be connected to the system controller as above in order to indicate when power has been turned on to the system.

Circulation Pump Terminals

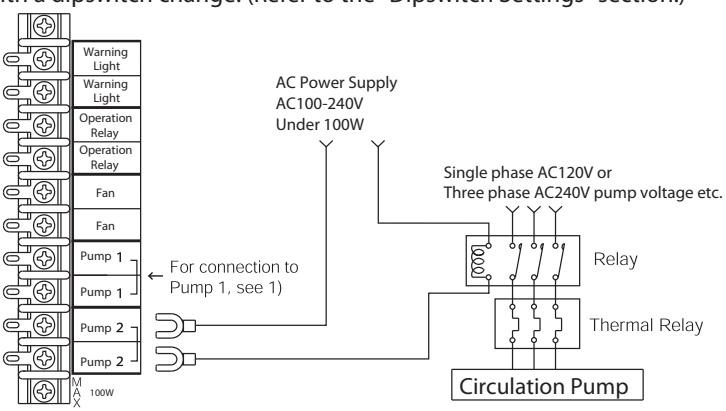
• Use these terminals to control the pump in any circulating system.
Connected this way, the system controller will control the function of the pump.
• Use a normally open relay to supply power to the pump. Use a thermal relay if necessary.

(1) When operating with 1 circulation pump



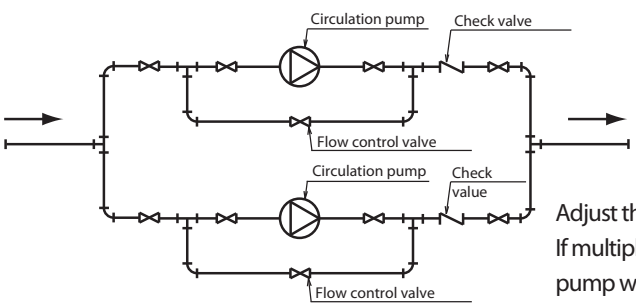
* If there is only one pump, connect to "Pump 1" terminals.

(2) If two circulating pumps will be used:
Connect as below if two circulating pumps will be used. The two pumps can be set to alternate with a dipswitch change. (Refer to the "Dipswitch Settings" section.)



* Do not connect both Pump 1 and Pump 2 to the same terminal block.
* After connecting as shown above, set dipswitch 3 to "OFF".
(Refer to the "Dipswitch Settings" section.)

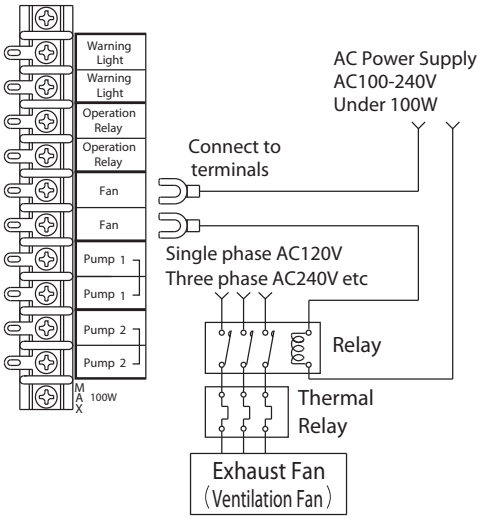
• Piping diagram for parallel pipe installation



Adjust the pump flow with the flow control valves.
If multiple pumps are used, control the flow of each pump with separate valves.

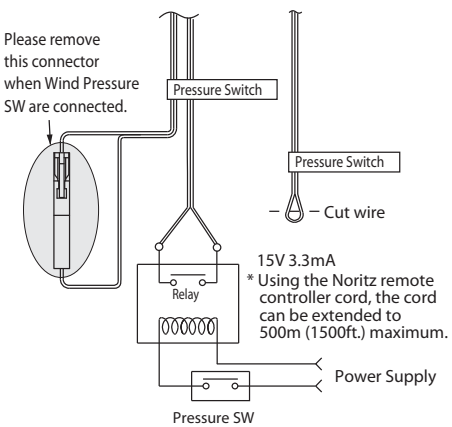
Exhaust Fan Terminal

- These terminals will close when any of the units are heating or when the fan on any of the units is blowing. These terminals can be used to control an exhaust fan or damper in this way.
- Use a relay to provide power to the fan or damper. Use an additional thermal relay if necessary.



Pressure Switch/Safety Shutoff Switch and External Operation Switch Connections

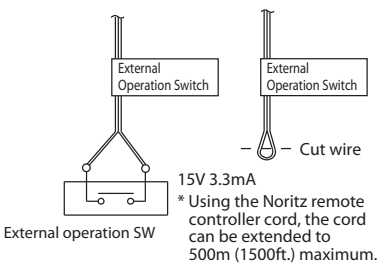
Pressure Switch/Safety Shutoff Switch Connection



- A pressure switch or other safety device can be installed to shut down the system under unsafe or improper operation.
- Please use a low voltage (15V) junction, normally open relay.
- This terminal is short circuited at time of shipment.

  In order to use this feature, cut the wire labeled "Pressure Switch", connect it to the relay, and disconnect the connector

Connecting the External Operation Switch



- Follow this procedure to use an external switch to turn power on and off to the unit instead of the remote controller.

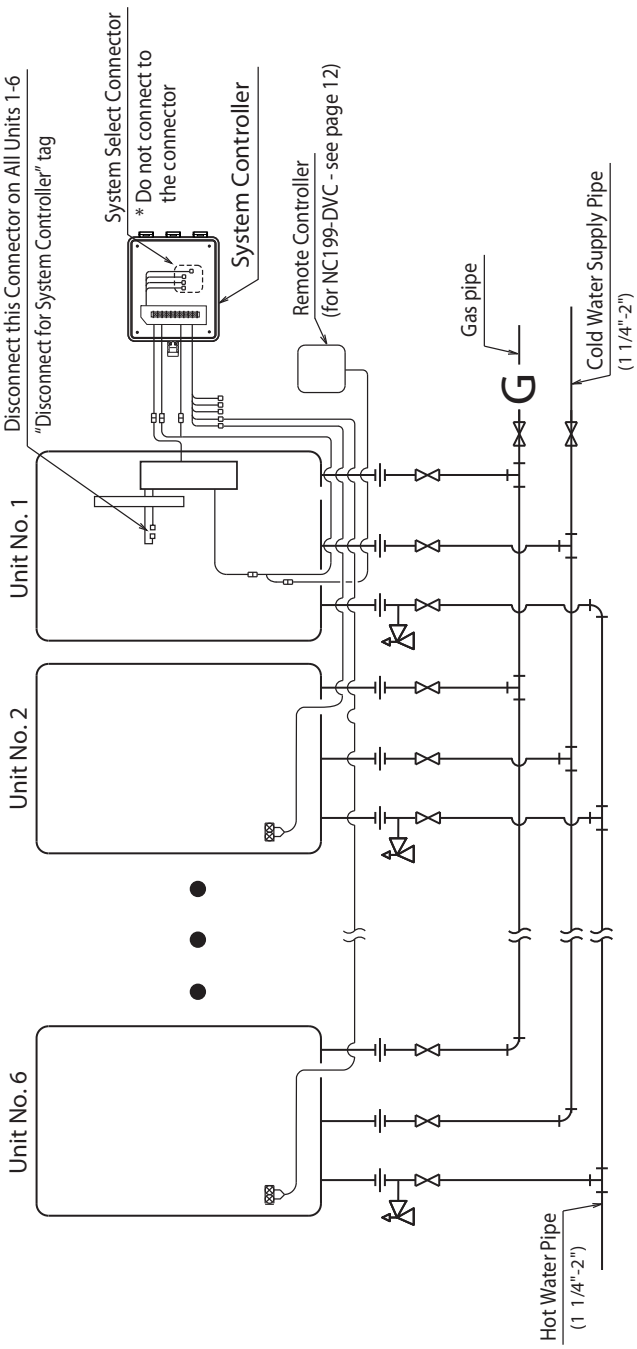
  (1) The power to the units will be on when the external switch is turned on (closed).

  (2) The power to the units will be off when the external switch is turned off (open).

- Use a low voltage (15V) junction.

* If the units are installed with a recirculation system, a storage tank or a filtration system, the pump will also turn on or off with this switch.

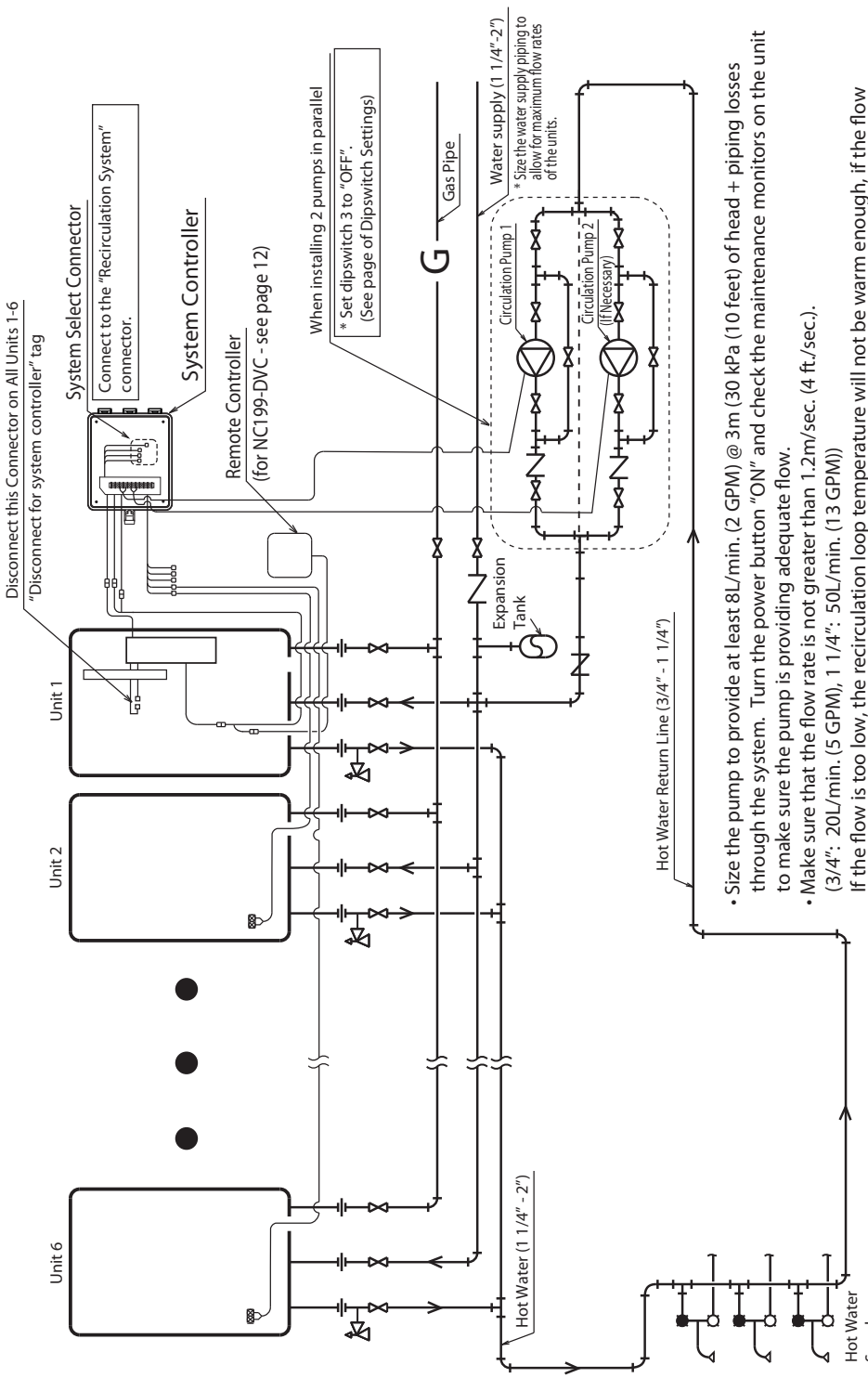
A. Installation without a recirculation system



• Insulate or apply heating materials to both the cold water supply piping and the hot water piping to prevent freezing during cold weather and to prevent heat loss through the piping.

B-1. Example of Recirculation with a Multi-System

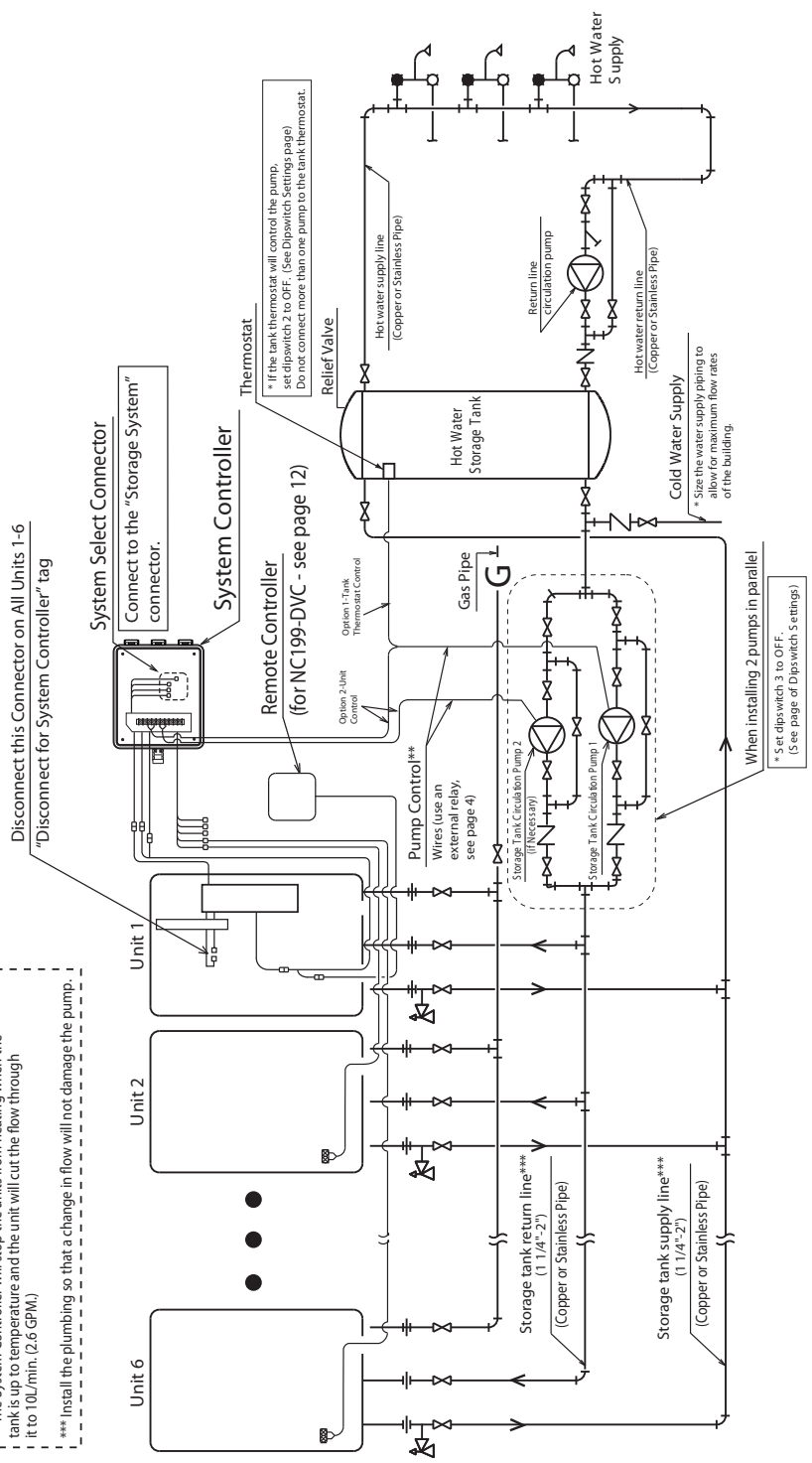
This system will make hot water more quickly available to remote fixtures.
The pump will circulate water through the loop until the entire loop is warm, and then the system controller will turn off the pump until the loop cools down.



- Size the pump to provide at least 8L/min. (2 GPM) @ 3m (30 kPa (10 feet) of head + piping losses through the system. Turn the power button "ON" and check the maintenance monitors on the unit to make sure the pump is providing adequate flow.
- Make sure that the flow rate is not greater than 1.2m/sec. (4 ft./sec.).
(3/4": 20L/min. (5 GPM), 1 1/4": 50L/min. (13 GPM))
If the flow is too low, the recirculation loop temperature will not be warm enough, if the flow is too high, the lifetime of the unit will be reduced.
- If there are multiple circulation loops, try to make the flow rate 3 - 5L/min. (.75 - 1.25 GPM) in each loop.
- Use copper or stainless water piping for the entire system.

B-2. Example of Installation with a Storage Tank and Recirculation System

The pump will push water through the Multi-System to heat up the tank.
When the return temperature is high, the flow within the device will be limited to 10L/min. (2.6 GPM)**.



* For the set temperature of the remote control, use the set temperature (of the thermostat) + about 6°C (10°F).

* To achieve the highest recovery, size the storage tank circulation pump for maximum capacity:
7 GPM (each) @ 35 ft. of head (160°F setting or less) + piping losses through the system.
Verify that the supply pressure to the units is at least 30 PSI.

2. Gas Piping

Follow the instructions from the gas supplier.

Gas Connection

- Gas flex lines are not recommended unless they are sized for the maximum input kW (Btu/h · MJ) of each unit.
- Do not use piping with a diameter smaller than the size of the gas inlet to each unit
- After installation, check the gas line for any leaks before using.

Gas Valve

Install a gas shutoff valve for every unit installed.

Gas Meter

Select a gas meter capable of supplying the entire kW (Btu/h · MJ) demand of all gas appliances that the meter serves. Size the gas line for the entire kW (Btu/h · MJ) demand also.

3. Water Piping

Ask a qualified plumber to perform the installation. Observe all applicable codes.

- The plumbing should be installed by a qualified plumbing contractor according to all applicable codes and regulations.
- Insulate or apply heating materials to the supply and hot water piping to prevent freezing during cold weather and to prevent heat loss through the piping.
- Use a union coupling or flexible pipe for connecting the units to ease service and maintenance.
- Refer to the system diagrams for supply and hot water pipe sizing. Do not install piping that is smaller than the inlet or outlet water connections on the units.
- If using an expansion tank, make sure it is correctly sized for the system.
- Use only copper or stainless steel pipe for all plumbing.
- Keep the plumbing as simple as possible.
- Avoid using pipes in which air can accumulate.
- Use only approved materials, and have the installation inspected upon completion.

4. Electrical Wiring (for NC199-OD only)

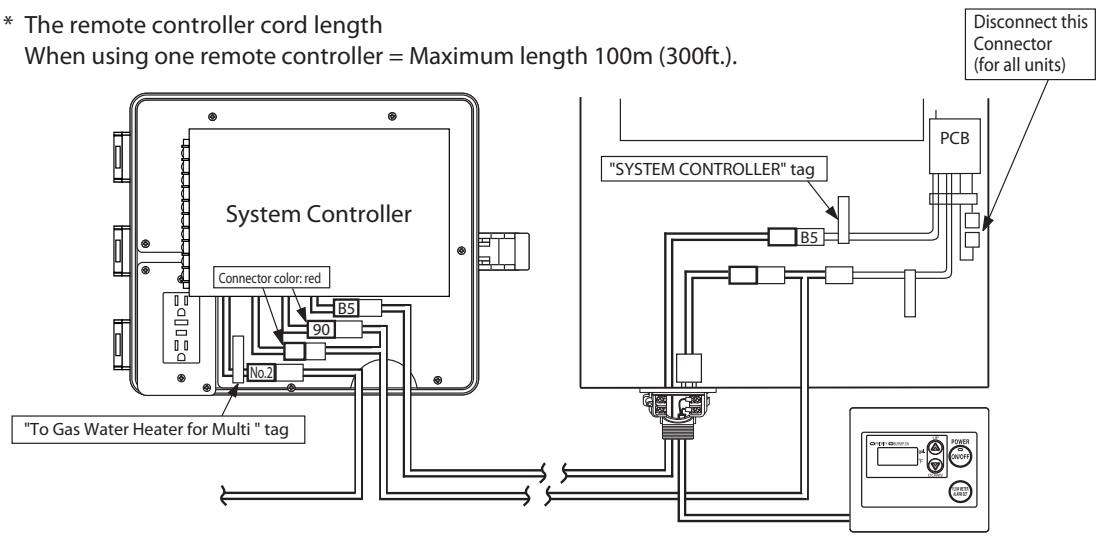
NOTICE

- Do not connect electrical power to the unit until all electrical wiring has been completed.
- If the remote controller is not connected to the system, the unit will default to a 60℃ (140°F) temperature setting.

(1) When installing the System Controller, take care not to damage the internal electrical components in the unit and tie off loose electrical cords with the included vinyl ties.
(2) Use the insulated cord labeled "-OD" and attach the connectors with the labeled end to the System Controller. The green/red wire is attached to the red connector on the System Controller labeled "90" while the black/white wire is attached to the red connector labeled "To Remote Controller Terminal".
(3) Install the other end of the cord to the water heater by connecting the green/red wire to the blue Remote Controller Terminal wires from the Circuit Board. The black/white wire is connected to the blue wire attached to the clip on the External Remote Controller Terminal.
(4) Connect the B5 connector from the System Controller to the B5 connector from Unit 1 using the remaining insulated cord.
(5) Use the Remote Controller cord included with each water heater to connect the other units to the System Controller.

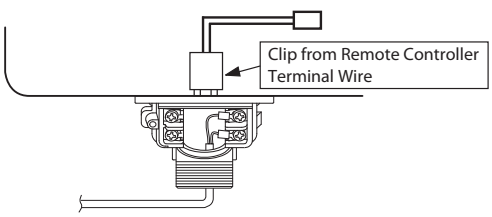
Unit 1 (The Unit with the System Controller)

* The remote controller cord length
When using one remote controller = Maximum length 100m (300ft.).



Units 2-6 (Connect each unit to corresponding wires labeled 2-6 from the System Controller)

Remote Controller Cord
No.2 → To Unit 2
⋮
No.6 → To Unit 6



External Remote Controller Terminal

When installing 2 or more units

Install one Remote Controller cord from each of the numbered System Controller multi-system connectors to the External Remote Controller Terminal block on each unit. Wire each unit independently to the System Controller keeping the overall length of the Remote Controller cord less than 15m (45 ft.).

4. Electrical Wiring (for NC199-DVC only)

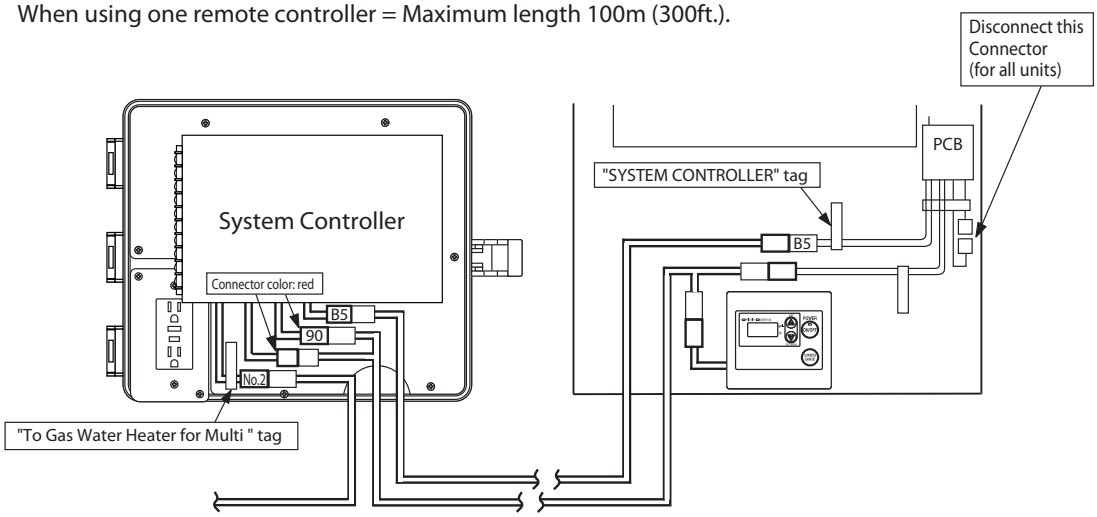
NOTICE

- Do not connect electrical power to the unit until all electrical wiring has been completed.
- If the remote controller is not connected to the system, the unit will default to a 60℃ (140°F) temperature setting.

(1) When installing the System Controller, take care not to damage the internal electrical components in the unit and tie off loose electrical cords with the included vinyl ties.
(2) Use the insulated cord labeled "-DVC" and attach the connectors with the labeled end to the System Controller. The green/red wire is attached to the red connector on the System Controller labeled "90" while the black/white wire is attached to the red connector labeled "To Remote Controller Terminal".
(3) Install the other end of the cord to the water heater by connecting the green/red wire to the blue Remote Controller Terminal wires from the Circuit Board. The black/white wire is installed directly to the connector on the Remote Controller.
(4) Connect the B5 connector from the System Controller to the B5 connector from Unit 1 using the remaining insulated cord.
(5) Additional Remote Controller cords are available for purchase when connecting the subsequent units to the System Controller. The RC-CORD10 can be used for distances of up to 10 ft while the RC-CORD26 can accommodate for up to 26 ft.

Unit 1 (The Unit with the System Controller)

* The remote controller cord length
When using one remote controller = Maximum length 100m (300ft.).



Units 2-6 (Connect each unit to corresponding wires labeled 2-6 from the System Controller)

Remote Controller Cord

No.2 → To Unit 2
⋮
No.6 → To Unit 6

When installing 2 or more units

Disconnect the Remote Controller from the blue Remote Controller Terminal wiring connections internally from Units 2-6. Install one Remote Controller cord from each of the numbered System Controller connectors to the Remote Controller Terminal wire by splicing the cord and wires together. Wire each unit independently to the System Controller keeping the overall length of the Remote Controller cord less than 15m (45 ft.). For more information on splicing, refer to the following page for more details.

Remote Controller Cord Installation for NC199-DVC Multi-Systems

To splice additional Remote Controller Cords to the Remote Controller Terminal wiring connections located inside the unit, please review the following procedure.

1) Turn off all power to the system before installation.
2) Disconnect the Remote Controller from the Remote Controller Terminal wires that is connected to the circuit board (Figure 1).
3) Cut the end of the Remote Controller cord to remove the U-shaped connectors as shown in Figure 2. Do not strip the blue insulation from the wiring.
4) Using the provided red Wire Connectors (Figure 3), tap the wires from the Remote Controller cord into the Remote Controller Terminal wires from the Circuit Board as shown in Figure 4. When splicing, insert one of the two Remote Controller Terminal Wires into the hollow side on a connector. Insert the other wire into the hollow side of the second connector. The wires from the Remote Controller cord are inserted completely into the remaining ports with the internal stop.
5) Once all the wires are in position, use a pair of slip joint pliers to squeeze the metal tap through both wires to complete the connection. Snap the retaining clip into place finish the splice.
6) Ensure that all wiring connections from the System Controller to the water heater are secure before powering the system on.

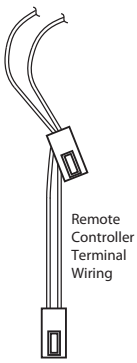


Figure 1: Remote Controller Terminal Wires

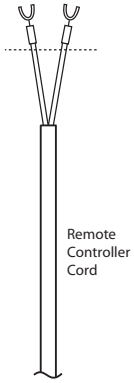


Figure 2: Remote Controller Cord

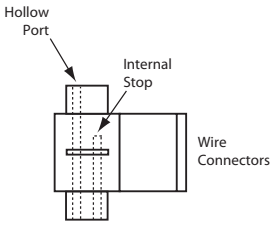


Figure 3: Wire Connector

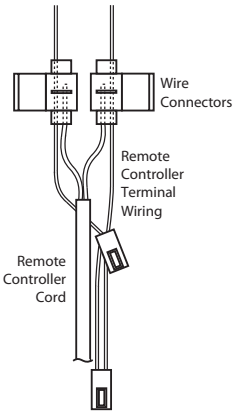


Figure 4: Remote Controller Cord Spliced to Terminal Wiring Using Wire Connectors

5. Trial Operation

The installer should test operate the system, explain to the customer how to use the units, and give the owner the Installation and Operation Manual before leaving the installation.

(1) Connect electrical power to each of the units.
(2) Open the gas shutoff valve, the main water valve, and the water shutoff valves on all of the units.
(3) Turn the power ON with the remote controller. (The Operation Lamp will light up.)
(4) Slowly open a hot water fixture and confirm that the units ignite in sequence and that the Burner On Lamp on the remote controller lights.

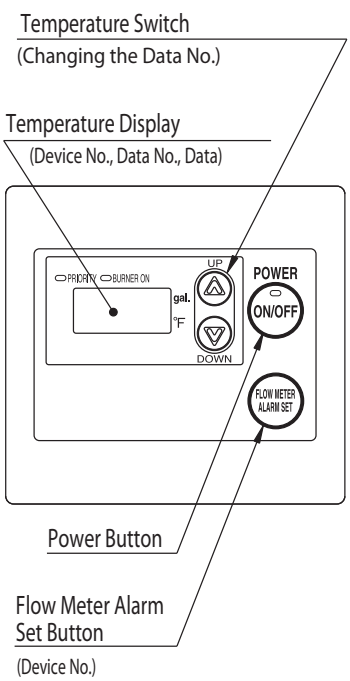
- If an "11" or "12" error code flashes on the remote controller, there may be air in the gas line. Hit the Power Button ON and OFF a few times and then open the fixture again to try igniting the unit again.
- If this fixture does not cause all of the units to ignite, test the rest of the units by switching which is the primary unit by pressing either the Maximum or Minimum Manifold Pressure Set Button on the circuit board of the unit.
- Operate all of the units and confirm that the water temperature corresponds to the temperature set on the remote controller. Set the remote to the lowest temperature to maximize water flow. If the water temperature is hotter than the set temperature, check to make sure that the remote is connected to the system controller, and that the system controller is connected to the other units.
- If the units do not operate properly, refer to the Troubleshooting section of the Owner's Manual.

* After the test operation, clean any debris off of the filter on the water inlet.

Checking Water Flow (Maintenance Monitors)

Necessary only for recirculation systems

(1) Turn the Power button "ON".
(2) Press the temperature up and down buttons △ and ▽ simultaneously for more than 2 seconds.
(The remote control will display the maintenance monitors.)
* "Unit No.", "Data No." and "Data" are displayed on the remote controller temperature display.
(3) Press the "FLOW METER ALARM SET" button to change which unit's information in being displayed.
(The combustion lamp of the selected unit will flash twice.)
* When switching "Unit No.", the display will change from "5C → 01 → Data No." → "01 → 02 → Data No." → "02 → 03 → Data No." • • • "(Last Unit)No. → 5C → OFF" when the "FLOW METER ALARM SET" button is pressed.
If the "FLOW METER ALARM SET" button is not pushed to change the Unit No., the Data No. for that Unit will then be displayed on the remote controller.
(4) Press the temperature up or down buttons △ or ▽ to select Data No.14. The water flow through that heater will be displayed.
(5) Repeat (2) - (3) for all water heaters. Adjust so that the total water flow of all devices is 2 GPM or more.
(6) Press the temperature up and down buttons △ and ▽ simultaneously for over 2 sec. to return to the temperature display.



Dipswitch Settings

Disconnect the power to the units before changing the dipswitches.
(Otherwise, settings will not take effect.)

○ : ON ● : OFF

Dipswitch	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
		Pump abnormality detection	Pump rotation	125°F recovery during high-temperature setting				
		○ Yes	○ No	○ Set temperature				
		● No	● Yes	● 125°F				

* All dipswitches are set to ON from the factory.

SW2: Pump abnormality detection
Set to OFF if the pump will not be connected to the system controller, but instead the pump will be controlled by an external control device.

SW3: Pump rotation
Set to OFF if using 2 pumps.

SW4: If the switch is set to OFF, and the Power Button is turned OFF and ON, the unit will accept 125°F return water (if the unit is set at that temperature or higher).

When the dipswitch is ON, the unit will allow the standard return temperature.

* Do not change any other dipswitches.