



Cascading the

MASCOT® ST

Wall-Mounted, Modulating
Gas, Condensing,
Tankless Water Heater

Model MSTWW
199,000 BTU/hr

- Natural Gas (NG)
Factory Configuration
- Propane Gas (LP)
Field-Convertible



FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water boiler and heater installation and maintenance. Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a nearby phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency, or gas supplier.

⚠ AVERTISSEMENT

Assurez-vous de bien suivre les instructions données dans cette notice pour réduire au minimum le risque d'incendie ou d'explosion ou pour éviter tout dommage matériel, toute blessure ou la mort.

Ne pas entreposer ni utiliser d'essence ou ni d'autres vapeurs ou liquides inflammables dans le à proximité de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareils.
- Ne touchez à aucun interrupteur. Ne pas vous servir des téléphones dans le bâtiment où vous vous trouvez.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur de gaz, appelez le service des incendies.

L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.

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SECTION 1 Piping

Multiple Mascot ST tankless water heaters can be connected via a cascade communication cable to create a bank of boilers that work in tandem. Up to 18 water heaters can be controlled by a “Leader” Mascot ST unit with the others acting as “Followers”.



WARNING

Do not use Mascot ST units on common vents. Each unit must have its own supply and exhaust vents.

A. General Plumbing Connection Guidelines

- Pipe material must be suitable to meet local codes and industry standards.
- The pipe must be cleaned and without blemish before any connections are made.
- Do not apply a torch within 12” of the bottom connections of the water heater. Doing so could damage the water heater. Such damages ARE NOT covered by product warranty.
- The size of the hot water piping should be ¾” diameter.
- Isolation (shutoff valves) should be used to ease future servicing.
- All piping should be insulated.

B. Install a Backflow Preventer

It may be recommended to use a back flow preventer – check local codes. If a back flow preventer or a no return valve is used, a thermal expansion tank must be installed on the cold water supply between the water heater and valve.



WARNING

To control thermal expansion, a thermal expansion tank should be installed in systems with an installed backflow preventer. DO NOT use a closed type expansion tank. Follow expansion tank manufacturer’s specifications to properly size an expansion tank to the installation. Failure to properly accommodate thermal expansion could result in property damage, severe personal injury, or death.

C. Piping Diagrams for Cascaded Systems

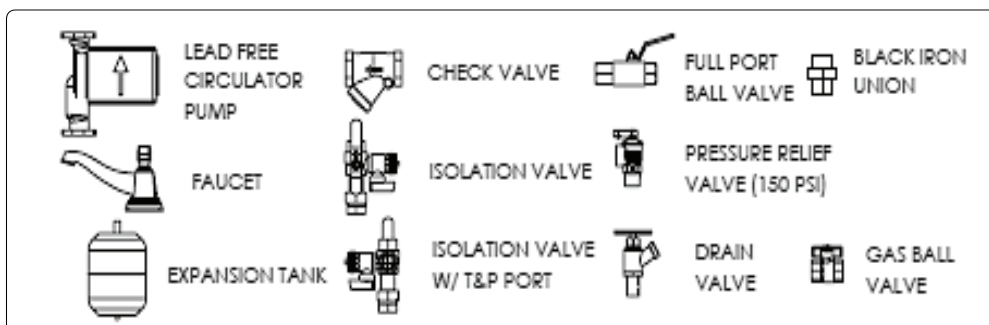
The next two pages give examples of typical cascading water heater piping diagrams.



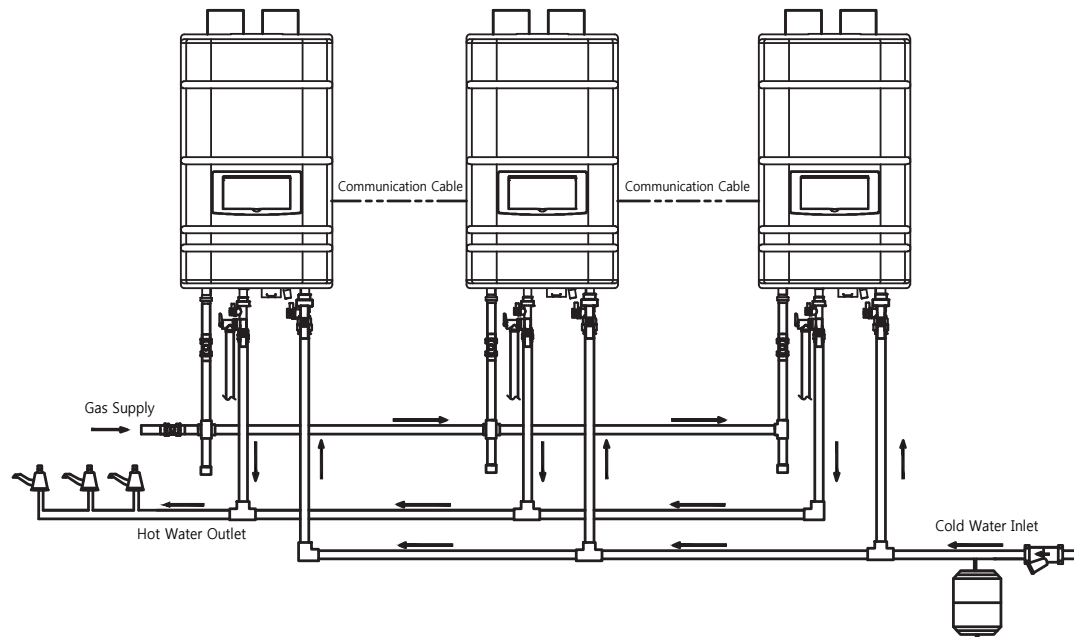
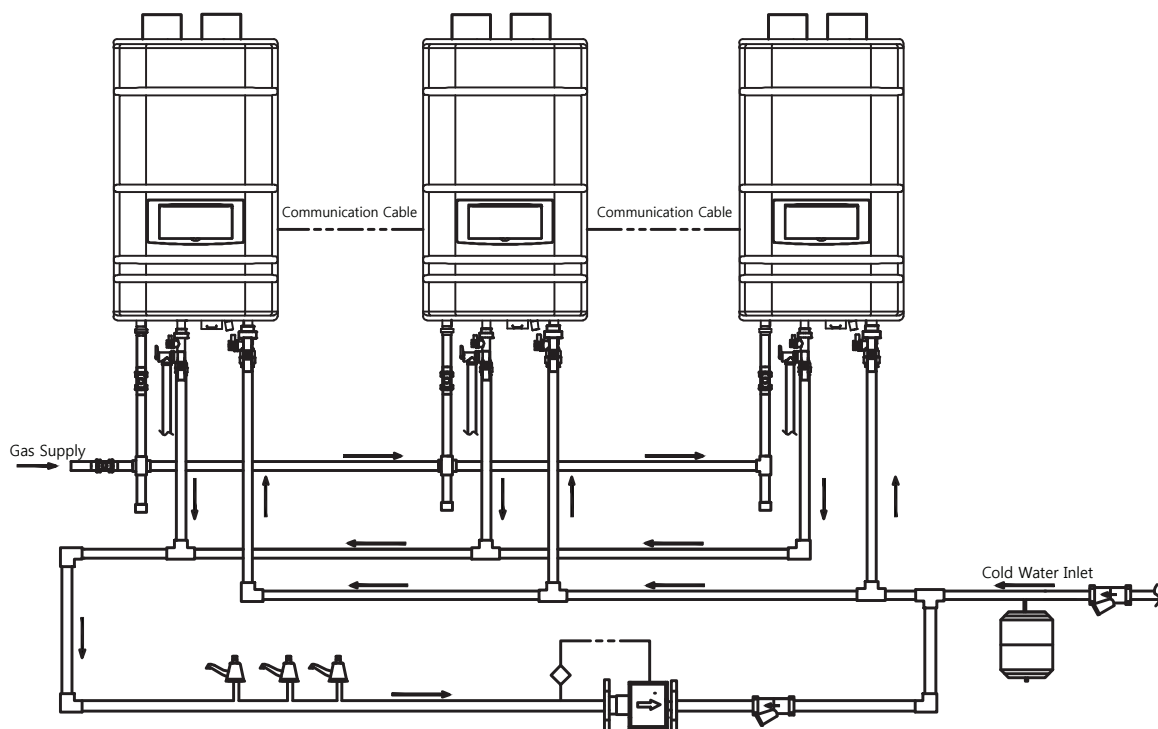
CAUTION

Use at least the MINIMUM pipe size for all water heater loop piping. This is to avoid the possibility of inadequate flow through the water heater. Using less than the required minimum pipe size could result in system problems, property damage, and premature water heater failure. Such problems ARE NOT covered by product warranty.

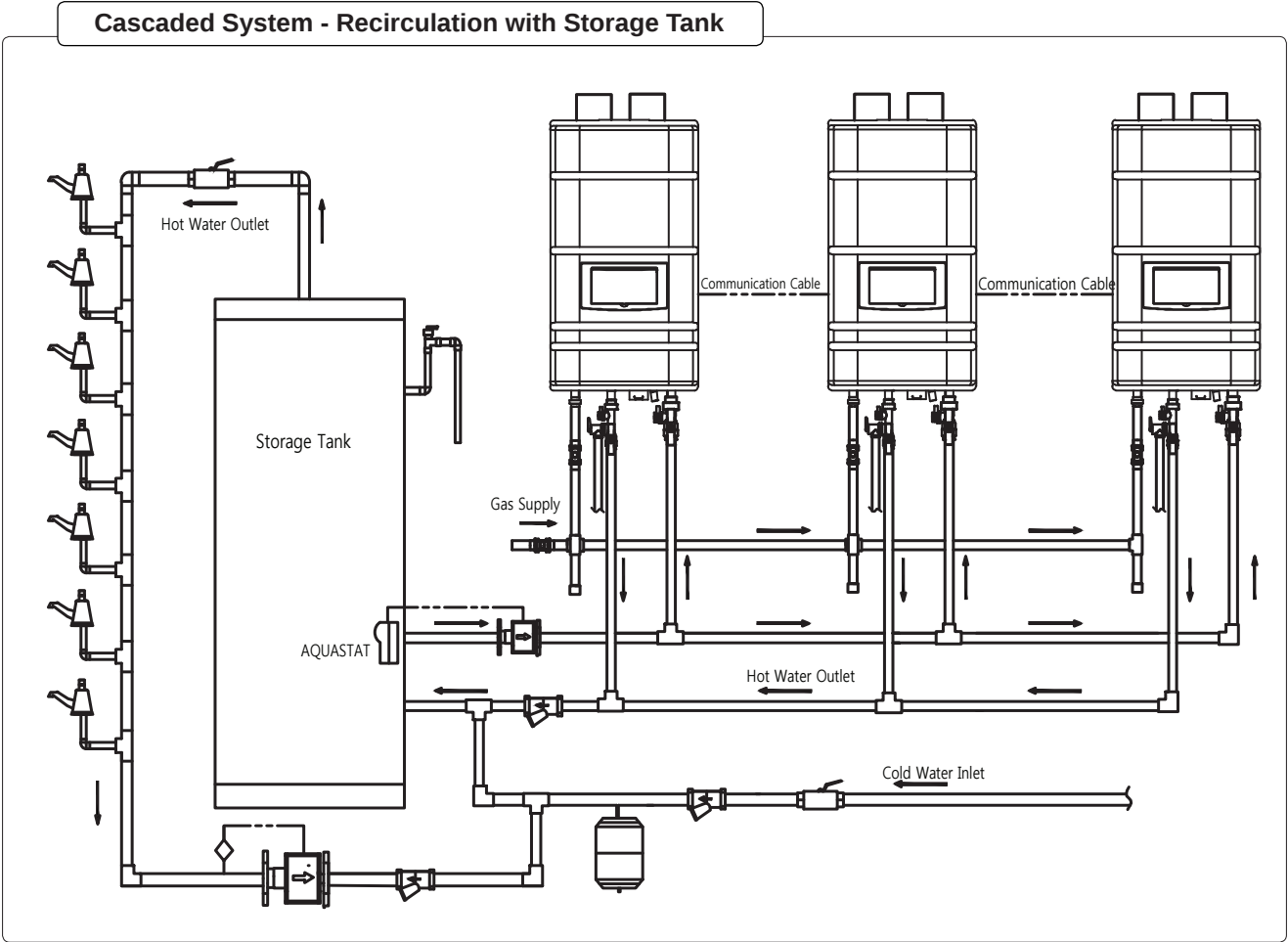
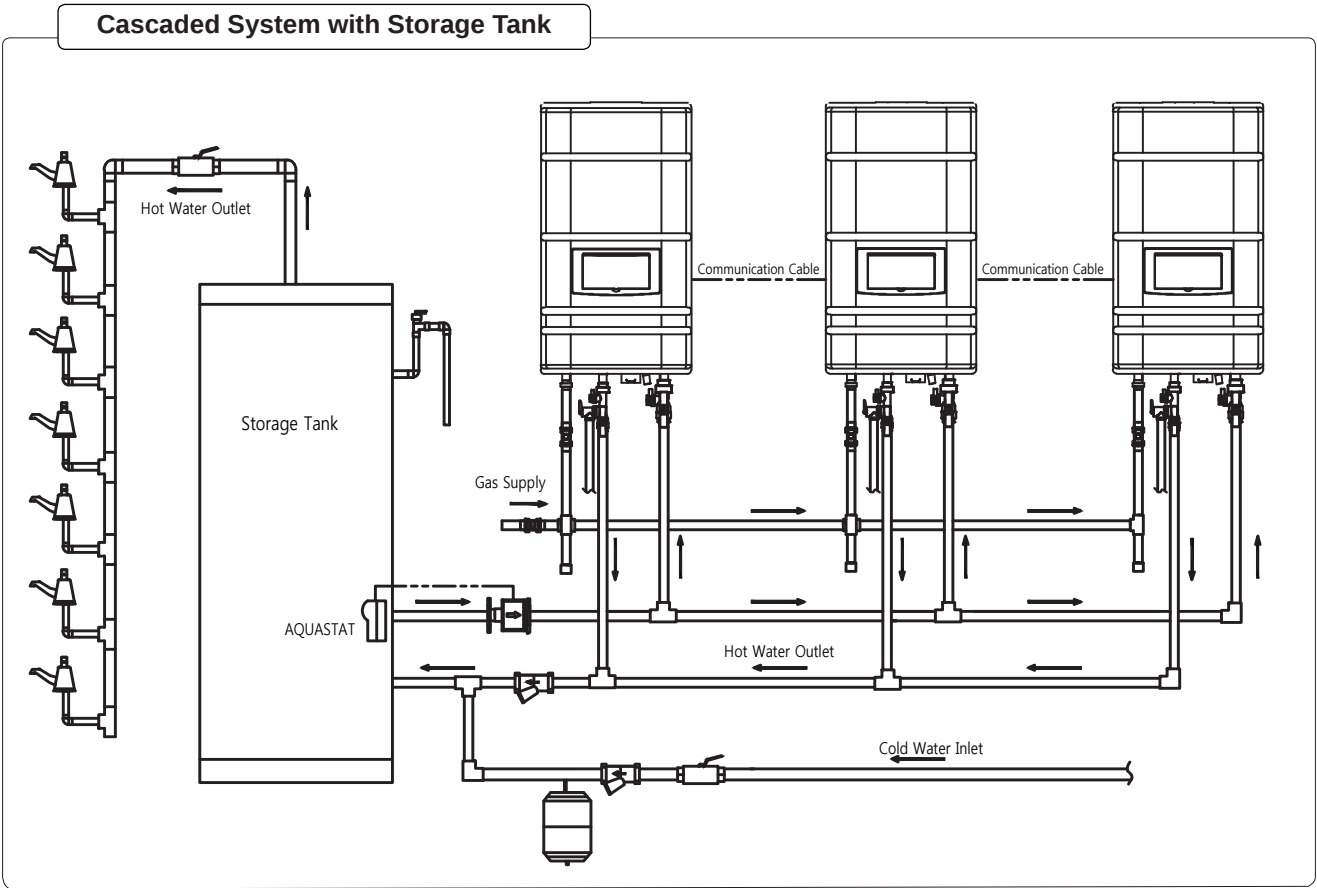
Use both thread tape and pipe dope to connect to the ¾” CH domestic water inlet and outlet. Isolation valves between the city water supply and unit inlet are recommended for ease of service.



Piping Symbol Legend

C. Piping Diagrams for Cascaded Systems (continued)**Cascaded System****Cascaded System - Recirculation**

NOTE: These drawings are meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes

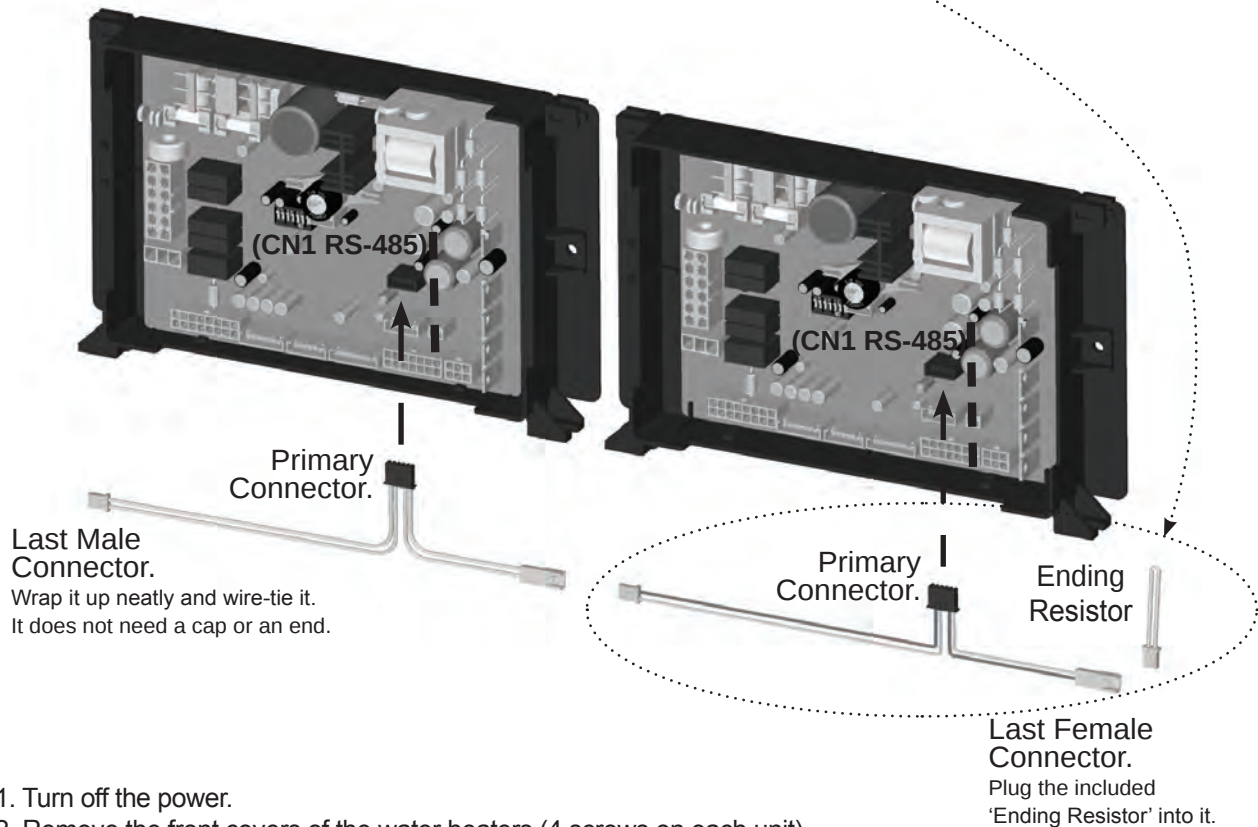


SECTION 2 Electrical**A. Wiring Connections for Cascade.**

Components Needed :

FT1861 : (1 per unit) Mascot FT/ST Cascade Communication Cable with Ending Resistor.

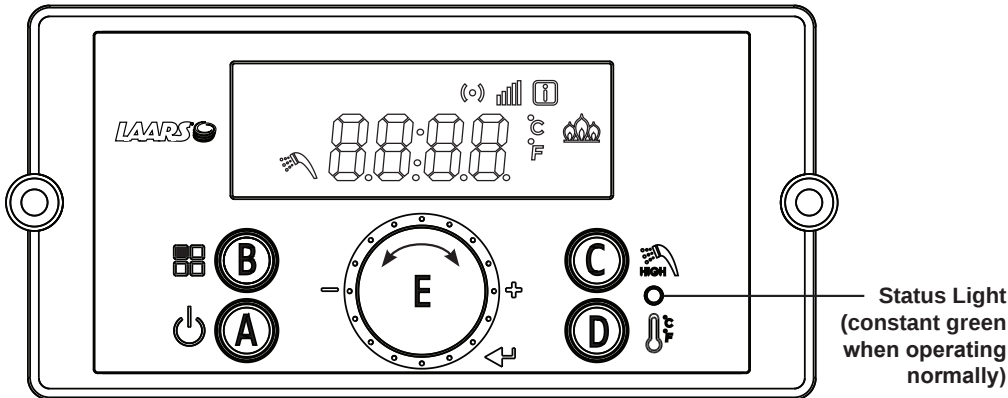
Example. If you are cascading 6 Mascot ST's, you will need **6 X FT1861's** and you will throw away 5 of the resistors.



1. Turn off the power.
2. Remove the front covers of the water heaters (4 screws on each unit).
3. Connect the 'Cascade Communication Cables' to every unit (add the Resistor to the end of the last follower. Use the wiring throughway at the bottom of each unit).
4. Plug the primary connector on the cable (as shown) to the receptacle inside the unit.
5. Replace the front covers.
6. Turn on the power.

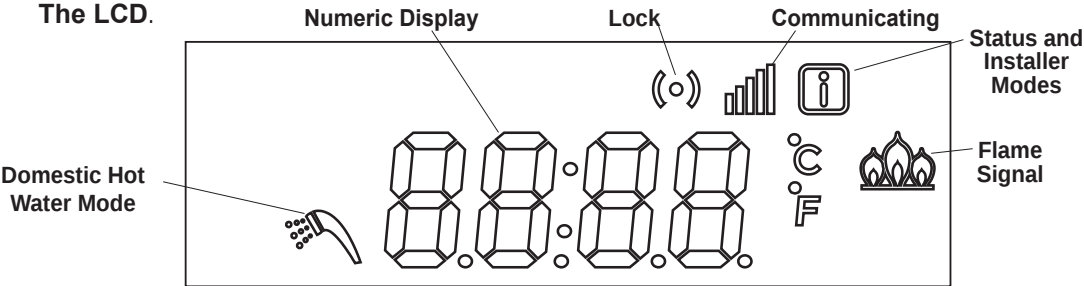
SECTION 3 The Control Display

A. **The Control Display** has a Control Dial (E), 4 buttons (A, B, C, D), and a Liquid Crystal Display (with 72 back-lit segments). Section 3 will show you only a few of the functions of the Mascot ST. For all functions, please reference the Mascot ST Install and Instruction Manual. Doc 1316.



Buttons			Functionality	
			PRESS (Tap)	PRESS and HOLD (5 seconds)
A		Display Power	Turns Control Display ON/OFF	
B		Modes	Tap to return to menu	(If Display Power was On) Status Display Mode (If Display Power was Off) Installer Mode
C		Hot Water	DHW Set-Point LOW Range 95 - 120°F (35 - 49°C)	DHW Set-Point HIGH Range 121 - 140°F (49.5 - 60°C)
D				Toggle (°C / °F)
E		Scroll / Select	Turn to scroll, tap to select (clockwise or counterclockwise)	

B. **The LCD.**



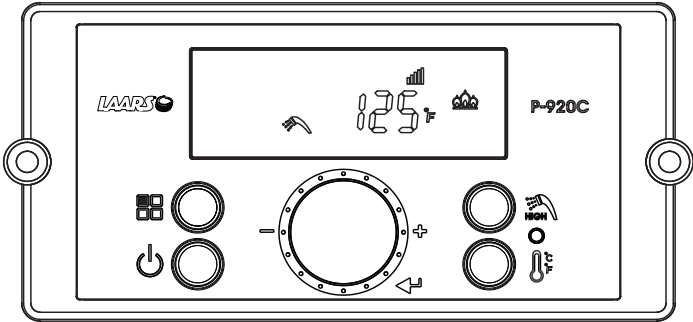
Lock mode	Buttons-locked mode icon
Communication	Communication icon
Status and Installer mode	The Status Mode or the Installer Mode is Active (all parameters)
Flame signal	Flame Signal icon
Numeric Display	Number and character display, to display all parameters
DHW mode	Water heater Set Point, can be adjusted

The LCD will illuminate when a user action is detected (a button is pressed) and will turn back off after 20 seconds.

* NOTE: The display will not allow changes when the lock mode (⌘) is activated.

To exit the Lock mode, press the button.

- C. **Start-Up Sequence.** After the Power is turned on, and/or the Control Display is turned on , the Control Display will go through a 'Start Up' checklist and briefly show a sequence of diagnostic codes before entering into the 'Operating Mode'. It will then display the following information.



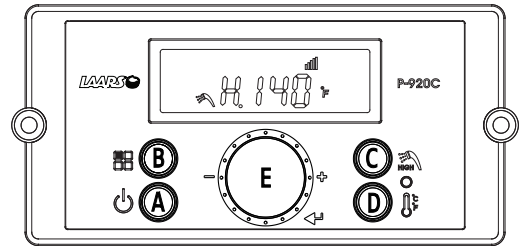
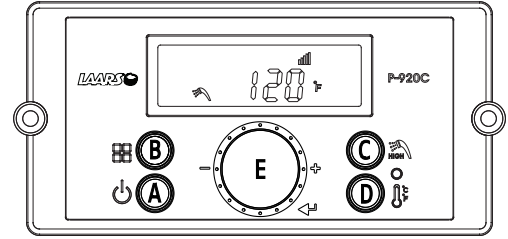
Indicate	Example
Current DHW temperature	125°F
If the flow is present	
If flame detected	
Temperature sign Celsius or Fahrenheit letter	°C or °F
Communication state indicator	

D. Changing the DHW Set-Point

The Mascot ST has a built-in DHW Flow Limiter at the inlet side of the water heater. This will automatically adjust the DHW flow rate up or down based on DHW outlet temperature. If the temperature drops below the DHW setpoint, and the Mascot ST is at full fire, the inlet flow to the heat exchanger will be reduced. Therefore, the DHW outlet temperature will begin to rise to the desired setpoint. If the temperature begins to rise above the setpoint the flow will increase until full flow is reached. This feature ensures that the DHW is always the ideal temperature for the user.

If this feature is not desired, then the 'over-ride' to this feature must be turned ON. To turn ON the over-ride to the INLET DHW Flow Limiter, Refer to Section 4.18 of the Mascot ST Installation Manual (Doc #1316):

1. Turn off the power to the Control Display.
2. Move DIP switch 4 to the ON Position.



■ DHW Set Point Change Modes

The display shows the following information when changing water heating temperature set points.

Indicate	Example
Current DHW set-point temperature	120°F
Temperature sign Celsius or Fahrenheit letter	°C or °F
If water heater display is communicating with the main controller normally, the communication icon will be indicated.	
When DHW set-point range is high : from 123°F (50.5°C) to 140°F (60.0°C)	H . 140°F
When changing DHW setpoint, the DHW icon will flash	

* Default DHW set-point is 120°F (49°C)

Changing between Celsius and Fahrenheit. When the button D is pressed (for more than 5 seconds), temperature unit will toggle between °C and °F.

• DHW 95-120°F (35 - 49°C) LOW range (Default)

-To change LOW range, press the C Button. The DHW icon and current DHW LOW will flash (a flashing value means it can be changed).

- Turn dial E clockwise to increase and counterclockwise to decrease until desired temperature is reached.
- Press dial E to save setpoint changes.

• DHW 121 - 140°F (49.5 - 60°C) HIGH range

-To change HIGH range, press and **HOLD** the C button for more than 5 seconds. The DHW icon and current DHW HIGH will flash (a flashing value means it can be changed).

- Turn dial E clockwise to increase and counterclockwise to decrease until desired temperature is reached.
- Press dial E to save setpoint changes and to Exit.

DANGER

Scalding may occur within 5 seconds at a setting of 140°F (60°C). Water temperatures over 125°F can cause severe burns, or death from scalding. Children, disabled, and elderly are at highest risk of being scalded. Read all instructions before setting temperature at appliance. Feel water before bathing or showering.



SECTION 4 Cascade Programming

A. To Program the Tankless Water Heater Leader:

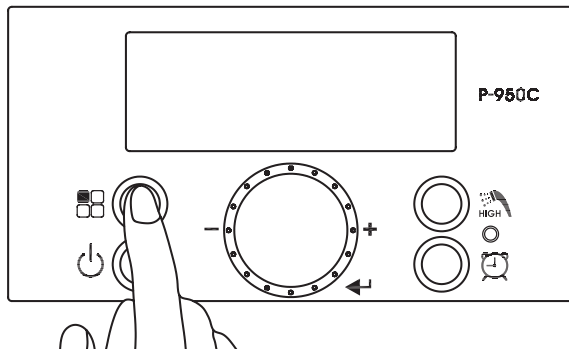
Once all of the 'Connection Wires' are made and all units are powered on, there are 3 items that need to be programmed on the leader before moving on to the following units.

10:Cn – **(NUMBER of THAT UNIT)** Sets Cascade Address. The Leader should always be addressed 01.

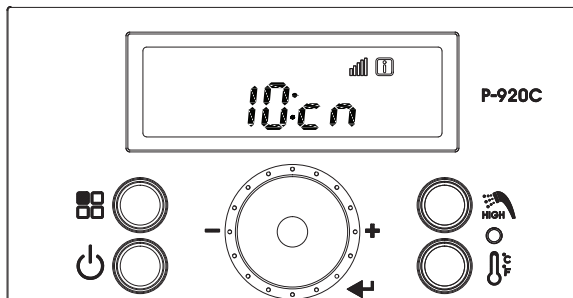
THEN

13:Ct – **(TOTAL)** Choose the total number of units in the cascaded system (if incorrect total number of units is selected on any of the units, an **Er. 78** will occur).

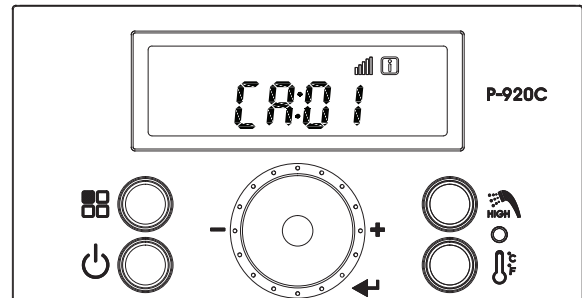
1. **START** by turning OFF the Power  to the Display Control of the LEAD Unit.
2. Then, with the power OFF, Press and HOLD (5 seconds) the  button to get into the Installer Mode.



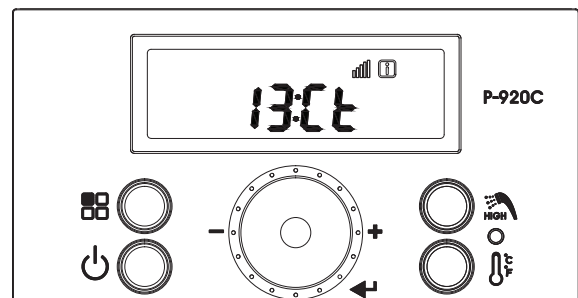
3. Rotate the Dial until you get to 10:Cn. Tap the Dial to enter into that Parameter.



4. Adjust to 01 and then press (tap) the Dial to save and to Exit.



6. Rotate the Dial until you get to 13:Ct. Tap the Dial to enter into that Parameter.



7. Adjust to the TOTAL number of units being Cascaded.

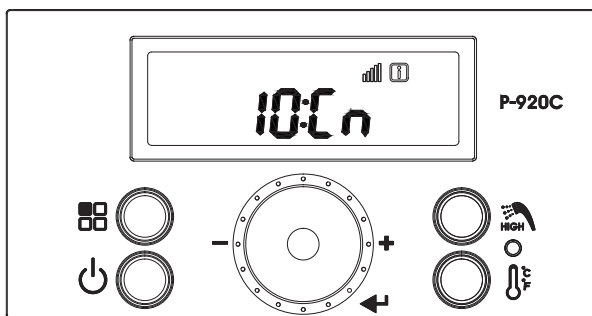
8. Finish by pressing the  button.

B. To Program the Tankless Water heater Followers:

Now move over to the first 'Following' unit and perform only 10:Cn – (**NUMBER of THAT UNIT**) to each of the following units.

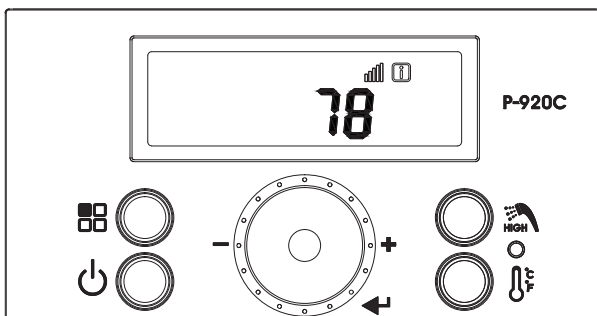
10:Cn - (**NUMBER of THAT UNIT**) Sets the cascade address for each follower (repeat this step for all followers). Range 02 - 18, by selecting Cn:02 through Cn:18

1. Rotate the Dial back to 10Cn. Tap the Dial to enter into that Parameter.



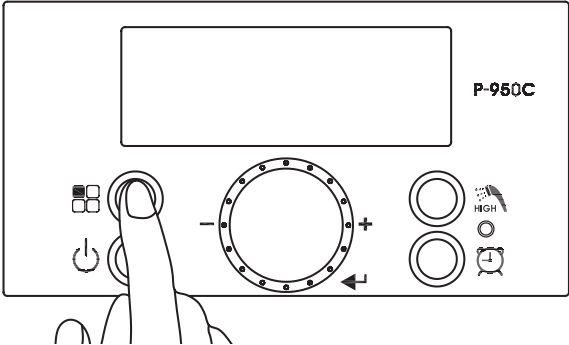
2. Adjust to the TOTAL number of units being Cascaded.

If you make a mistake in this setting mode, the LCD will show a "78" error code.

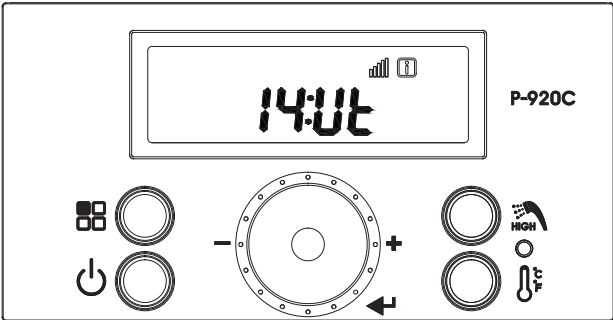


C. Setting the Vent

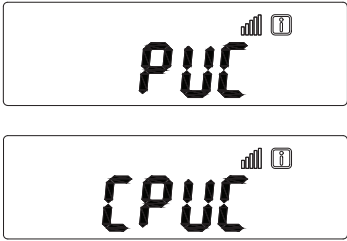
- 1. Turn OFF the Power  to the Display Control of the LEAD Unit.
- 2. Then, with the power OFF, Press and HOLD (5 seconds) the  button to get into the Installer Mode.



- 3. Rotate the Dial until you get to 14Vt. Tap the Dial to enter into that Parameter.



- 4. Turn the Dial to select either PVC or CPVC



* High Hot Water temperature Range

Item	Vent Type	Range (°F)
14:Vt	PVC (Standard temperature Vent)	121°F~140°F
	CPVC (High temperature Vent)	121°F~182°F

- 5. If you have CPVC Venting, set to CPVC and then you can also set to hot water range at 121°F~182°F. If you are not positive as to the type of venting, leave it at the default setting of PVC.
- 6. Finish by pressing the  button.

 CAUTION

- Be cautious when setting hot water temp as there is possible scald injury.
- Manufacturer is not responsible for any damage caused by scale build up from hot temperatures (over 140°F), which might cause malfunction or performance degradation
- If you set high temp (over 140°F) , vent type must be checked prior to installation .

D. Leader and Follower Rotation

Leader Rotation

- The Leader and followers can rotate or back up each other in case of error.
- The Leader water heater rotates after a cumulative combustion of 10 hours.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Sequence Before Rotation	CA 01	CA 02	CA 03	CA 04	CA 05	CA 06
Sequence After Rotation (10 Hours of Operation)	CA 06	CA 01	CA 02	CA 03	CA 04	CA 05

Example: Six unit cascade system rotation.

Follower Rotation

The first unit to turn on during a DHW demand is the unit that ran the least amount of time during previous DHW demand. In order for a follower to rotate it needs to run at least once (based on burner on time).

E. Load Transition Charts

Follower Rotation Example, Five Unit Cascade System

Cascade Transition - Single Unit Fired Up to Maximum Number of Units

Percent Firing Rate per Transition										
	Transition 1		Transition 2		Transition 3		Transition 4		Transition 5	
	Low	High	Low	High	Low	High	Low	High	Low	High
UNIT 1	0%	76%	38%	76%	51%	76%	57%	76%	61%	100%
UNIT 2	-	-	38%	76%	51%	76%	57%	76%	61%	100%
UNIT 3	-	-	-	-	51%	76%	57%	76%	61%	100%
UNIT 4	-	-	-	-	-	-	57%	76%	61%	100%
UNIT 5	-	-	-	-	-	-	-	-	61%	100%

Note: When each transition reaches 76% of firing capacity the next unit in rotation fires and the load is divided evenly amongst the firing units.

Cascade Transition - Maximum Number of Units Fired Down to Single Unit

Percent Firing Rate per Transition										
	Transition 1		Transition 2		Transition 3		Transition 4		Transition 5	
	High	Low	High	Low	High	Low	High	Low	High	Low
UNIT 1	100%	32%	40%	32%	43%	32%	48%	32%	64%	0%
UNIT 2	100%	32%	40%	32%	43%	32%	48%	32%	-	-
UNIT 3	100%	32%	40%	32%	43%	32%	-	-	-	-
UNIT 4	100%	32%	40%	32%	-	-	-	-	-	-
UNIT 5	100%	32%	-	-	-	-	-	-	-	-

Note: As each transition drops to between 20% to 32% of firing capacity the last unit in rotation drops off and the load is divided evenly amongst the remaining firing units.

