Apricity

ARA Load Control Switch

LTE Connected

Installation Instructions – Model: APHW-02A

Introduction

The Apricity ARA Load Control Switch is a utility-connected LTE communication and switch device for energy management of residential hot water heaters.

This manual describes the physical installation of the ARA. Installation is straightforward and can be completed by a qualified homeowner but is typically completed by an agent of the electrical utility. The installer should always consult state and local codes to ensure a compliant installation.

Once the unit is installed and powered on, it will automatically connect over cellular networks and be available for grid power management. Units are pre-configured by Apricity on a client-by-client basis.

Installation

Preparation

Installation will require, at a minimum, the following tools. Some circumstances may require additional tools depending on the conditions around the existing electrical panel and hot water heater.

- Phillips-head and flat-head screwdrivers
- Wire strippers
- Pliers or Wrenches (for cable clamp/conduit connection)
- Recommended: voltage tester or sniffer (to confirm hot water heater is disconnected by circuit breaker panel)

This procedure simply describes the steps for connecting the ARA to the hot water heater circuit and is not an introduction to electrical wiring or safety. If you are not confident that you can proceed safely with this work, contact a licensed electrician to complete the installation for you.

Installation instructions may vary depending on the configuration of your hot water heater, some adjustments may be required.

Installation consists of removing the top plate from the existing water heater junction box, and building the ARA into the circuit with the mains AC power supply connected to the “Line In” terminals, and the water heater load connected to the “Output” terminals. Proceed with the installation as follows:

Existing Junction Disassembly

1. Turn off the electricity to the hot water heater by switching the circuit breaker to the “OFF” position. Confirm that there is no voltage at the hot water heater connection before proceeding.
2. Remove the electrical cover plate from the junction box on top of the water heater. Check voltages to confirm that power is disconnected.

3. Remove the wire nuts from the wires and sepARAte. The panel-side wires (always on) will connect to “Line In,” and the heater load wires will connect to “Output”
4. Loosen and remove the cable clamp from the junction box cover. Remove the cover plate from the wires and set aside.
5. Unscrew the cover of the Apricity ARA and set the cover aside.
6. Check the length of the existing ground, it will need to pass through both conduit ports on the ARA and return to the heater’s bonding screw or post in the same way as it does without the ARA in place. Provide additional length with a junction inside the ARA if necessary.

Mounting the Controller

7. Instructions are provided for mounting the ARA to either the water heater or to the wall. We recommend mounting to the water heater where space permits:

   Heater Mount:

   - Remove one washer and one nut from the conduit fitting leaving the closest to the ARA. Ensure the that the nut closest to the ARA is secure.
   - Mount the cover plate from the water heater onto the conduit fitting at the bottom of the ARA, with the ARA facing into the room. Replace washer and nut, tighten.
   - Thread the load wires from the hot water heater through the cover plate and the connected hole of the ARA. Place the ARA and cover plate back onto the hot water heater and fasten the cover plate in place using the original screws.
     - If the cover plate cannot be refastened to the heater with the ARA in place, then install the supplied conduit fitting on the cover plate with the ARA detached, fasten the conduit plate to the hot water heater, and then install the ARA on the plate, with the load wires threaded through the assembly as above.

   Wall Mount (Alternative):

- If there is insufficient space above the hot water heater for the controller, wall mounting must be used.
- An additional length of flexible conduit, clamps, and wires are required (not included).
- Select a suitable location to mount the controller to the wall, and mount the controller to the wall using the provided mounting holes.
- Attach the additional conduit to the bottom of the controller and attach the other end to the junction box cover. Feed hot water heater wires through the conduit (additional wire, including a ground extension, will likely be needed: use code compliant wire for your jurisdiction as necessary). Finally, secure the junction box cover back to hot water heater.

8. Connect the load wires from the water heater to the terminal block labeled "OUTPUT" inside the ARA. Route the wires to the terminal block and trim to length with ¼" of bare wire exposed on the ends.
9. Open the terminal blocks by turning its screws counterclockwise until the screw threads click. Insert the wire into the opening on the side of the terminal block and tighten the screw until snug. Do not over-tighten, or the ARA may be damaged, and the wires may not hold. Terminal blocks accept 10-30 AWG wire.
10. Install the heater's original cable clamp for the supply wires in the conduit port at the top of the ARA.
11. Thread the supply wires through the Line In conduit port on the ARA, and provide an extension of the ground wire if necessary. The line and neutral wires should be long enough to reach the terminal blocks on the ARA – if not, provide extensions as necessary. Trim, strip, and connect the supply wires to the Line In terminal block on the ARA.
    a. Note: If it is necessary to preserve line and neutral orientation for the model hot water heater you are working on (i.e. a 120v hot water heater), when the ARA's relay is closed the two nearest screw posts are connected (lower Line In to upper Output), and the two furthest screw posts are connected (upper Line In to lower Output).

12. Confirm that no wires contact the printed circuit board or associated components inside the ARA, especially the bare portion of the ground wire. Attach the cover to the Controller using the four screws removed earlier.
13. Turn the electricity on at the circuit breaker. The Green LED will illuminate on the controller indicating that the relay is closed and power is connected to the water heater.

Wireless Communication

LTE-M (Cellular) Connection

The controller will automatically activate and connect with Apricity servers over the available LTE-M cellular network. The asset will be available for grid monitoring and management.

FCC Statements

The ARA contains a cellular transmitter module with the following IDs

FCC ID: 2ANPO00NRF9160, IC: 24529-NRF9160

The ARA optionally may contain a WIFI transmitter module with the following IDs

FCCID: 2AC7Z-ESPWROOM02D, IC: 21098-ESPWROOM02D

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

Changes or modifications not expressly approved by Apricity could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter. The ARA contains an omnidirectional antenna on-board with no external connector and which is not user serviceable. The installer should remain eight inches away from the unit when it is powered on.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

IC Statements / DéclARAtions IC

This device complies with Industry Canada's license-exempt RSS standards. Operation is subject to the following conditions:

1) This device may not cause interference, and

2) This device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme aux normes CNR d'Industrie Canada exemptes de licence. Le fonctionnement est soumis aux conditions suivantes:

1) Cet appareil ne doit pas causer d'interférences, et

2) Cet appareil doit accepter toutes les interférences reçues, y compris celles pouvant entraîner un fonctionnement indésirable.

RF Exposure Warning: This equipment complies with RF exposure limits for an uncontrolled environment. The antenna used for this transmitter must not be co-located with or operated in conjunction with another antenna or transmitter.

Avertissement d'exposition aux RF: Cet équipement est conforme aux limites d'exposition aux RF pour un environnement non contrôlé. L'antenne utilisée pour cet émetteur ne doit pas être co-localisée ou utilisée avec une autre antenne ou un autre émetteur.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Heath Canada's website www.hc-sc.gc.ca/rpb.

Troubleshooting

Status		Remarks	
Color	**Action**	**LTE RSSI**	**Description**
Purple	Slow Flashing		Attempting LTE Connection
Red	Slow Flashing	Low	Connected to LTE, Attempting Connection to Server
Yellow	Slow Flashing	Ok	Connected to LTE, Attempting Connection to Server
Green	Slow Flashing	High	Connected to LTE, Attempting Connection to Server
Red	Solid	Low	Connected to Server, Operating Normally
Yellow	Solid	Ok	Connected to Server, Operating Normally
Green	Solid	High	Connected to Server, Operating Normally
Blue	Slow Flashing		Attempting Local Mesh Network Connection
Blue	Solid		Connected to Local Mesh Network, Operating Normally
Red	Fast Flashing		Device Error, Contact Support

Contact

Email Support: HWControllerSupport@apricitycode.com

Phone Support: (503) 961-9996

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Electrical and Electronics Engineering

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