**LaarsLinc® Pro I/OTM CTA-2045 Tank System Control**

**for Laars E-ThermTM Heat Pump Water Heaters**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 WORK INCLUDED

1. Section includes tank system control to integrate Laars E-Therm heat pump water heater(s) with CTA-2045 systems, various stratified tanks, temperature maintenance tank, back-up heaters and other system components.

1.3 SUBMITTALS

1. Submit shop drawings, mechanical layout, sensor connection schematics, and product data, as specified. Include certifications, installation manual, and electrical wiring.

1.4 QUALITY ASSURANCE AND COMPLIANCE

1. Reference Standards
	1. UL508A, the Standard for Industrial Control Panels
	2. CTA-2045 Modular Communications Interface for Energy Management
	3. International Building Code (IBC)
	4. ANSI/ASHRAE Standard 135 BACnet – A Data Communication Protocol for Building Automation
	5. NEMA Standards
2. Each submittal shall be provided with documentation certifying that all materials, products, components, and test reports comply with the design requirements for this project.
3. Furnish all equipment, materials, and accessories new and free from defects.

1.5 WARRANTY

1. Manufacturer’s Warranty: Manufacturer agrees to repair or replace components of control that fail in materials or workmanship within specified warranty period.
2. Warranty Period: 1-Year limited warranty.

PART 2 – PRODUCTS

2.1 RATINGS

1. Electrical Service: 120 VAC, 15 Amp
2. 4 Amp circuit breaker to protect 24 VDC components
3. Operating Conditions:
	1. -4°F to 131°F (-20°C to 55°C)
	2. 5% to 90% RH
	3. Non-condensing
4. Storage Conditions:
	1. -22°F to 158°F (-30°C to 70°C)
	2. 5% to 90% RH
	3. Non-condensing

2.2 CONSTRUCTION

1. Description: LaarsLinc-I/O CTA-2045 Tank System Control to integrate Laars E-Therm heat pump water heater(s) with CTA-2045 systems, various stratified tanks, temperature maintenance tank, back-up heaters and other system components.
2. Construction:
	1. Control shall be housed in a 24” x 24” x 8” (61cm x 61cm x 20cm) NEMA 4 panel.
	2. Interface shall be via a 7” touchscreen
	3. Control shall be UL508A certified

2.3 COMPONENTS

1. Standard Equipment
	1. Fully-wired control panel
	2. CTA-2045 gateway
	3. DB9 communications cable
	4. DB9 panel interface
	5. Ten (10) RTD temperature sensors
	6. Ten (10) thermal sensor wells
	7. Ten (10) terminal junction boxes
	8. Three (3) 4-20mA inputs for flow meters
	9. Two (2) dry contacts for back-up heaters
	10. Two (2) dry contacts for back-up heater pumps

2.4 CONTROL SYSTEM

1. The control shall control up to 6 heat pumps in a cascaded system – up to 16 heat pumps can be cascaded with additional ethernet switches.
2. Cascade logic shall have redundancy that keeps the system operating if lead heat pump, or any other heat pump, is inoperable.
3. The control shall be able to communicate with building automation systems via BACnet IP, BACnet MSTP, Modbus TCP/IP, and Modbus RTU protocols.
4. Control shall have a CTA-2045 grid utility gateway for remotely-managed utility control with automatic override for DHW security.
5. CTA-2045 screen shall show diagnostic information about the connection between the gateway and the smart grid device.
6. Control homescreen shall visually depict system piping and distribution of tank sensors, based on user input of system configuration.
7. Unit shall control multiple stratified storage tanks with five (5) sensors that are equally distributed among the tank system and one (1) sensor that is placed between the tank system piping between the cold water makeup tank and the heat pump(s).
8. Control shall have the ability to interface with a temperature maintenance (swing) tank by monitoring electrical consumption when a heat pump is built with a power meter that is included with a measurement and verification system.
9. The unit shall be able to control the temperature maintenance (swing) tank temperature and interrupt.
10. Control shall have two (2) separate dry contacts for control of two back-up heaters.
11. Control shall have two (2) separate dry contacts for control of two back-up heater pumps.
12. There shall be three (3) 4-20mA inputs for flow meters, used for cold water makeup, domestic water recirculation return, and heat pump inlet flow.
13. Load shift management shall be via 24/7 fully field-adjustable schedules.
14. Control shall have diagnostic annunciation of each heat pump in the system.
15. Security levels shall be via individual passwords for user and installer levels.
16. The control shall have a service level that shows alarm history, analog inputs, digital inputs and outputs, cascade settings, heat pump details, IP addresses, and CTA-2045 status.
17. With installer access, the service menu shall allow access to more features, including manual control of heat pump components, change mode setpoints, CTA-2045 setup, and factory reset to default values.
18. Alarm history shall be shown in real language, by date and time.
19. Analog inputs shall be shown in real language, in real time.
20. Digital inputs and outputs shall indicate which are present and active.
21. All cascade settings shall be shown, and stage band temperature and stage period shall be able to be modified with installer access.
22. Heat pump detail screen shall show which heat pumps and standby units are connected, and which have active heat demand.
23. The schedule screen shall allow the user to change the operating mode between two user-programmable schedules, and shall show the current operating mode, control sensor setup, and setpoint temperatures of the system’s heat pumps, backup heaters, and temperature maintenance (swing) tank.
24. The setup process shall allow the user to indicate the number of heat pumps, heat pump capacity, storage tank details, and the total kW of backup heaters, if installed. In addition, swing tank kW rating, use of measurement and verification (if used), and any backup heaters that are used can be indicated.