

Comprehensive Technical Guide to Aube TH115 and TH232 Series Programmable Thermostats: Engineering, Installation, and Optimization

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In the realm of high-precision climate control, Aube Technologies (a brand synonymous with Honeywell's engineering excellence) has established a benchmark with the **TH115** and **TH232** series. These devices are not merely switches; they are sophisticated controllers designed specifically for electric radiant floor heating and baseboard systems. Understanding the technical nuances of these thermostats is essential for HVAC professionals and electrical engineers tasked with maintaining residential comfort and energy efficiency. This guide provides an exhaustive technical breakdown of the Aube TH series, covering everything from internal circuitry logic to field implementation and troubleshooting.

1. Theoretical Framework: Proportional-Integral Control in Radiant Heating

The Aube TH115 and TH232 series utilize a **Proportional-Integral (PI)** control logic, which differs significantly from the standard on/off mechanical thermostats. Traditional thermostats operate on a 'hysteresis' model, where the heat kicks on at a certain temperature drop and off at a certain rise. This often leads to significant temperature swings, especially in high-thermal-mass environments like concrete or tiled floors.

Aube's PI control calculates the 'duty cycle' required to maintain a setpoint. Instead of full-on or full-off based strictly on the current temperature, the device determines what percentage of a **15-minute cycle** the heater should be active. For instance, if the room requires only 50% power to maintain equilibrium, the thermostat will engage the heating element for 7.5 minutes and disengage it for 7.5 minutes. This minimizes thermal expansion stress on the flooring materials and provides a near-constant temperature profile.

The Physics of 15-Minute Cycles

The choice of a 15-minute cycle is an engineering compromise between precision and component longevity. Shorter cycles provide more stable temperatures but can lead to premature wear in mechanical relays. However, many Aube models utilize **Triac-based electronic switching**, which allows for silent operation and virtually unlimited switching cycles, making the 15-minute logic highly efficient for maintaining radiant floor 'warmth' without the floor ever feeling truly cold.

2. Decoding Model Designations: A, F, and AF Modes

One of the most critical aspects of the Aube TH115-AF-120S/240S series is the suffix designation. Selecting the wrong mode during installation can result in either inefficient heating or damage to the flooring material.

- **'A' Mode (Ambient):** The thermostat utilizes an internal thermistor to measure and control the ambient air temperature. This is typically used for baseboard heaters or convectors where the goal is to heat the volume of the room.
- **'F' Mode (Floor):** The thermostat ignores the air temperature and relies exclusively on a remote floor sensor (NTC Thermistor) installed beneath the floor surface. This is ideal for bathrooms where the primary goal is 'toe-kick' comfort rather than whole-room heating.

- 'AF' Mode (Ambient with Floor Limit): This is the most advanced mode. It controls the ambient air temperature while simultaneously monitoring the floor temperature. If the floor exceeds a pre-set safety limit (e.g., 28°C / 82°F for engineered wood), the system throttles back regardless of the air temperature.

3. Technical Specifications and Electrical Requirements

Installers must adhere strictly to the electrical load limits. The **TH115-AF-120S** and **TH115-AF-240S** are designed for specific voltage ranges. Miswiring a 120V unit into a 240V circuit will cause immediate catastrophic failure of the internal varistor and control board.

Feature / Specification	TH115-AF-120S/240S	TH232-AF-230	TH123 Series
Operating Voltage	120/240 VAC, 50/60 Hz	230 VAC, 50 Hz	240 VAC, 60 Hz
Maximum Load	15 A (Resistive)	15 A (Resistive)	12.5 A (Resistive)
Maximum Wattage	1800W @ 120V / 3600W @ 240V	3450 W	3000 W
Switching Element	Triac / Relay Hybrid	Electromechanical Relay	Electronic Triac
GFCI Protection	Class A (5mA) or B	Integrated (model dependent)	Optional External
Control Cycles	15 Minutes	15-20 Minutes	15 Minutes

4. Installation Protocol: Field Engineering Steps

Proper installation of an Aube thermostat involves both high-voltage electrical work and low-voltage sensor placement. The following procedure outlines the technical steps required for a TH115 installation.

Step 1: Power Management

Verify the load. Ensure the total amperage of the heating cables does not exceed 80% of the circuit breaker's capacity, and strictly matches the thermostat's 15A limit. Power must be disconnected at the main electrical panel. Use a non-contact voltage tester to confirm the circuit is dead.

Step 2: Floor Sensor Placement

The floor sensor (thermistor) must be positioned exactly between two runs of the heating cable. It should not touch the cable itself, as this would cause a **'False High'** reading, leading to short-cycling. The sensor lead should be run through a separate conduit from the high-voltage wires to prevent electromagnetic interference (EMI) from distorting the temperature signal.

Step 3: Wiring Connections

Aube thermostats typically use a four-wire or three-wire configuration. For a 240V system:

1. Connect the two 'Line' wires from the panel to the L1 and L2 terminals.
2. Connect the two 'Load' wires (heating cable) to the Load terminals.
3. Connect the ground wire to the junction box ground screw.
4. Insert the floor sensor wires into the designated sensor terminals (usually non-polarized).

Step 4: Initial Configuration

Upon power-up, the TH115 defaults to **Manual Mode**. The installer must enter the configuration menu to select the control mode (A, F, or AF). This is usually done via a series of button combinations or a physical switch located behind the faceplate, depending on the specific sub-generation of the TH115 hardware.

5. Programming Logic and User Interface Analysis

The Aube TH115 series features a 7-day programmable schedule with four distinct periods per day: **Wake, Leave, Return, and Sleep**. The logic is designed to maximize energy savings by reducing the temperature setpoint during unoccupied hours.

Adaptive Recovery (Early Start)

A key feature in the TH115 is the **Adaptive Recovery** system. Unlike basic thermostats that turn the heat on at the scheduled time, the TH115 'learns' how long your specific floor takes to heat up. If you set the 'Wake' period for 6:00 AM at 72°F, and the floor takes 45 minutes to reach that temperature, the thermostat will engage the heater at 5:15 AM. This ensures the environment is at the target temperature exactly when requested.

Manual Overrides and Vacancy Modes

The interface includes a 'Temporary Override' which allows the user to change the temperature until the next scheduled period. For long-term absences, the **Standby Switch** (located on the side) effectively disables the heating element while keeping the internal clock and programming memory active via a supercapacitor or battery backup.

6. Mathematical Modeling of Energy Savings

To understand the value of an Aube TH115, we can look at the thermal energy equation for a standard room: $Q = U \times A \times \Delta T$. Where Q is heat loss, U is the heat transfer coefficient, A is surface area, and ΔT is the temperature difference between inside and outside.

By utilizing the 7-day programming to drop the temperature during the 8 hours of work and 8 hours of sleep, the Aube thermostat reduces Q significantly. In a typical installation, reducing the temperature by 5°C (9°F) for 16 hours a day can result in a theoretical energy reduction of **15% to 25%**, depending on the home's insulation properties.

7. Troubleshooting and Failure Mode Analysis

Technical malfunctions in the TH115/TH232 series are often diagnosed via the LCD display. Below is a diagnostic matrix for common operational errors.

Error Code / Symptom	Probable Cause	Technical Resolution
Display is Blank	No power or blown internal fuse.	Check breaker and L1/L2 voltage. If 240V is present at terminals, the thermostat unit is defective.
'HI' or 'LO' Reading	Sensor reading is out of range.	Verify the floor sensor resistance. A standard Aube sensor should read ~10k ohms at 25°C (77°F).
E1 or E2 Error	Internal or external sensor failure.	Replace the floor probe or check for loose connections at the sensor terminal block.
Rapid Clicking Noise	Relay chattering due to low voltage.	Verify that the line voltage does not drop below 102V (for 120V units) under load.
Heater Always On	Shorted Triac or welded relay.	The switching component has failed. Replace the thermostat power base.

8. Comparison of TH115 vs. TH232 Features

While the **TH115** is the flagship for North American 120V/240V systems, the **TH232** is frequently found in international markets or specific hydronic-to-electric conversion kits. The TH232 often features a slimmer profile and is designed for 230V 50Hz grids. Furthermore, the TH232-AF-230 model is frequently used in **underfloor heating** kits where a high IP (Ingress Protection) rating is required for bathroom installations.

Key Hardware Differences

The TH115 series often utilizes a two-piece design: a **Power Base** and a **Control Module**. This allows for easier upgrades; if a user wants to move from a non-programmable to a programmable model, they can often simply swap the faceplate without rewiring the power base. The TH232 is typically a monolithic unit, requiring full disconnection for replacement.

9. Best Practices for Long-Term Operation

To ensure the longevity of an Aube Technologies thermostat, the following maintenance and operational guidelines should be followed:

- Annual Terminal Tightening:** Thermal cycling (the expansion and contraction of wires as they heat/cool) can loosen screw terminals over time. It is a best practice for an electrician to check terminal torque every 2-3 years to prevent arcing.
- Airflow Clearance:** Do not block the vents on the top or bottom of the thermostat. The internal electronics generate a small amount of heat that must be dissipated to ensure accurate ambient (A-mode) readings.
- Sensor Calibration:** If the floor temperature feels different from the display, use an infrared thermometer to verify. Most Aube models allow for a 'Temperature Offset' in the advanced settings to calibrate the display to the actual floor surface temperature.

10. Integration into the Modern Energy Landscape

As the world shifts toward 'Smart Homes,' the Aube TH115 remains a 'steady-state' reliable choice for those who

prioritize stability over Wi-Fi connectivity. While it lacks an app, its local intelligence—specifically the 15-minute PI control—remains superior to many 'smart' relays that lack the sophisticated duty-cycle logic required for radiant heat. For building managers and homeowners alike, the Aube series represents a high-reliability component that, when installed correctly, provides decades of maintenance-free service while strictly adhering to safety standards like UL and CSA.

Ultimately, the effectiveness of an Aube thermostat depends on the precision of its installation and the technician's understanding of its control modes. By leveraging the AF mode and Adaptive Recovery, users can achieve a perfect balance between luxury (warm floors) and fiscal responsibility (reduced kilowatt-hour consumption). Whether managing a single bathroom renovation or a large-scale residential development, the TH115 and TH232 series offer the technical flexibility required to meet modern building codes and comfort expectations.

Baca Juga (Artikel Terkait)

- [Comprehensive Technical Guide to the Honeywell RTH7500D 7-Day Programmable Thermostat: Engineering, Installation, and Energy Optimization](http://123caramba.com/honeywell-rth7500d-programmable-thermostat-technical-guide.pdf)

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- [Comprehensive Technical Analysis of the Avansa 2003 TX Wireless Room Thermostat](http://123caramba.com/avansa-2003-tx-wireless-thermostat-technical-analysis.pdf)

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