PROJECT ABSTRACT

Wireless RTD Temperature Logger with Cloud Dashboard

A battery-friendly wireless temperature logger built around a PT100 RTD probe and the MAX31865 RTD-to-digital converter, with an ESP32 node uploading timestamped readings to a cloud dashboard featuring live charts, min/max statistics, configurable alarms and a sample table. Delivered built-to-order with working prototype, firmware, cloud dashboard, wiring documentation, report, PPT and viva kit.

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Project type: Hardware + cloud dashboard (hybrid)

Availability: Built to order

Suitable branches: Electronics / E&TC;

Technologies: ESP32, PT100 RTD, MAX31865, MQTT, Cloud dashboard, Wi-Fi, Low-power design

Price: Request a quotation

1. Title

Wireless RTD Temperature Logger with Cloud Dashboard

2. Introduction / Background

RTDs (resistance temperature detectors) are the standard for accurate industrial temperature measurement: a PT100 element's resistance varies almost linearly with temperature and, in a 4-wire connection, lead resistance is cancelled for high accuracy. The MAX31865 converts RTD resistance directly to digital with 15-bit resolution and built-in fault detection. This project pairs a PT100 probe and MAX31865 with an ESP32 that samples on a schedule, sleeps between samples to save battery, and uploads to a cloud dashboard with charts, statistics and alarms — a complete wireless logging chain students can build and explain.

3. Problem Statement

Cold-chain boxes, laboratories, server rooms and greenhouses need continuous temperature records, but manual thermometer readings are sparse, error-prone and provide no alerts. Commercial data loggers are closed boxes that teach nothing. There is a need for an open, buildable wireless logger that demonstrates precision RTD interfacing, low-power design and cloud visualization at a final-year project scale.

4. Objectives

- Interface a 4-wire PT100 probe via MAX31865 (15-bit, SPI) with open/short fault detection.
- Achieve ±0.5 °C measurement accuracy (design target, PT100 Class A element + 4-wire).
- Implement deep-sleep sampling (60 s interval, design target) for multi-day battery operation.
- Upload timestamped readings over Wi-Fi/MQTT to a cloud dashboard.
- Provide live chart, 24-h min/max/avg, configurable high/low alarms and a downloadable sample log.

5. Proposed Methodology

The ESP32 wakes on a timer, powers the MAX31865, reads the RTD resistance over SPI, converts to temperature using the Callendar–Van Dusen linearization, checks the converter's fault register, and publishes the reading with battery voltage and RSSI over MQTT before returning to deep sleep. The cloud side stores the time series and serves the dashboard: live value, 24-hour chart with alarm bands, statistics cards and a recent-samples table. Alarm breaches trigger dashboard and push notifications.

6. System Architecture / Working

- Sensing: 4-wire PT100 probe (Class A) + MAX31865 RTD-to-digital converter.
- Node: ESP32 with deep-sleep scheduler, SPI readout, Wi-Fi MQTT uplink, Li-ion battery.
- Cloud: MQTT broker + time-series store serving the web dashboard.
- Dashboard: current/min/max cards, 24-h chart with threshold bands, alarm config, sample table.
- Local UI: OLED showing last reading and battery at the node (optional).

7. Hardware / Software Requirements

- Hardware: ESP32 dev board, MAX31865 module, 4-wire PT100 probe, 0.96" OLED, Li-ion battery + charger module, enclosure.
- Software: Arduino/ESP-IDF firmware (deep sleep, SPI, MQTT), cloud dashboard (HTML/CSS/JS + broker).

- Calibration: ice-point check procedure included in the build guide for the report.

8. Expected Outcomes

A logger that records temperature every 60 s, survives multi-day battery operation (design target, verified by the buyer during the build), and shows a continuous 24-hour trace on the dashboard. Alarm thresholds trigger visible alerts when crossed in testing (e.g. a heat-gun event). Ice-point and room-temperature checks document the accuracy claim in the report.

9. Applications

- Cold-chain and vaccine-box temperature monitoring.
- Server-room and lab environmental logging.
- Greenhouse and food-storage monitoring.
- Teaching platform for RTD interfacing and low-power IoT.

10. Future Scope

- Multi-probe nodes and mesh networking for large spaces.
- NB-IoT/LoRa uplink for areas without Wi-Fi.
- On-device SD-card backup logging.
- Predictive alerts from temperature trend analysis.