

Charles Zhao

Mechatronics Engineering Student · University of Waterloo

Waterloo, Ontario · d25zhao@uwaterloo.ca · +1 (437) 808-2106 · GitHub: BlueCharlie

EDUCATION

University of Waterloo

Sep 2023 – Expected Apr 2028

Honours Mechatronics Engineering, Co-op · Third year

TECHNICAL SKILLS

Electronics: Altium Designer, KiCad, analog front ends, power regulation, PCB assembly and testing

Embedded: C/C++, STC8/8051, ESP32, STM32, Keil C51, UART/SPI/I²C, RS485, Modbus

Software & tools: TypeScript, React, Electron, Node.js, Python, Git, SolidWorks, 3D printing

EXPERIENCE

Minebea Intec GmbH

Jun 2026 – Jul 2026

Engineering Internship

- Designed or modified more than 20 PCBs across two work periods at Minebea Intec in 2025 and 2026.
- Designed the PR5170 analog acquisition mainboard, digital communications mainboard, and shared power and industrial-interface baseboard.
- Developed standard and Ex ec (gas Zone 2) variants of both analog and digital mainboards.
- Adapted two Embedded C firmware branches for acquisition, calibration, filtering, and RS485 communication on STC8/8051 controllers.
- Developed TConfig with Electron, React, and TypeScript for instrument monitoring, parameter configuration, and calibration workflows.

Charles Tech

Started Jul 2025

Embedded Systems Engineer & Owner

- Delivered PCB design services for global clients, translating requirements into manufacturing-ready schematics and high-speed layouts.
- Established the engineering workflow and shifted the business toward proprietary electronic product development.

Minebea Intec GmbH

Jan 2025 – Apr 2025

PCB Designer

- Designed PR5170 measurement, power, communication, HMI, and protection-board variants.
- Integrated ADC and MCU circuitry, regulated supplies, RS232/RS485 interfaces, and 4–20 mA output functions.

Ningbo Chengzi Network Technology Co., Ltd

May 2024 – Aug 2024

Website Developer

- Developed a WeChat Mini Program prototype that attracted more than 100 early users in its first month.
- Improved LLM workflows through prompt engineering and context management; analyzed more than 10 competing products.

SELECTED UNIVERSITY PROJECT

Geese waste-cleaning robot

Oct–Dec 2023

Programmed motor control and sensor integration in RobotC; iterated a 3D-printed collection mechanism through more than 20 test cycles.

01 / ASSEMBLED HARDWARE

PR5170 hardware assembly example

Selected work from more than 20 PCBs designed or modified across two work periods at Minebea Intec in 2025 and 2026.



Shared baseboard and analog-input mainboard assembled with an industrial Ethernet module purchased by Minebea Intec.

Three-board assembly

Shared baseboard

Provides common power and industrial-interface connections.

Analog-input mainboard

Receives analog sensor signals for measurement and control.

Industrial Ethernet module

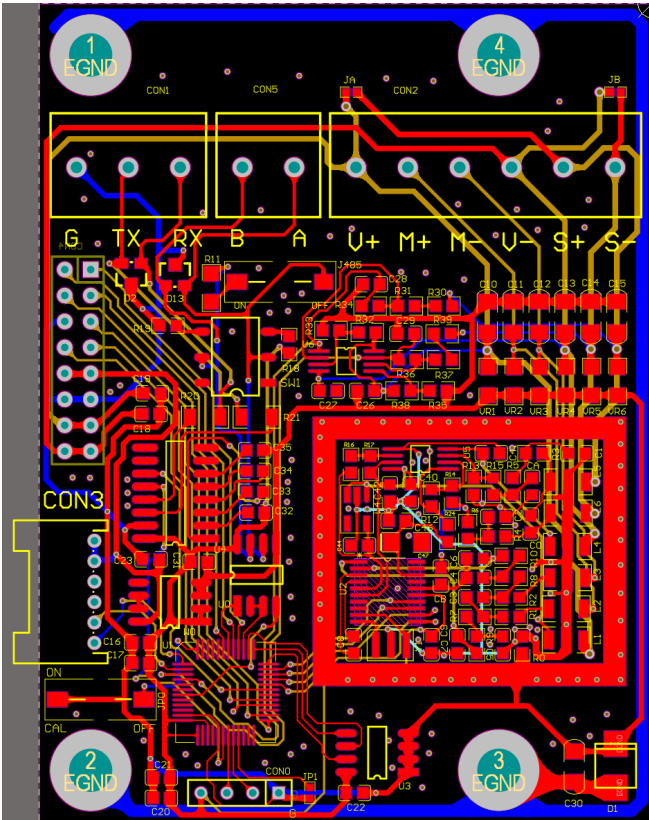
Purchased by Minebea Intec and integrated with the two boards.

Proprietary details have been obfuscated for confidentiality. Selected works displayed with permission.

Analog-input mainboard layouts

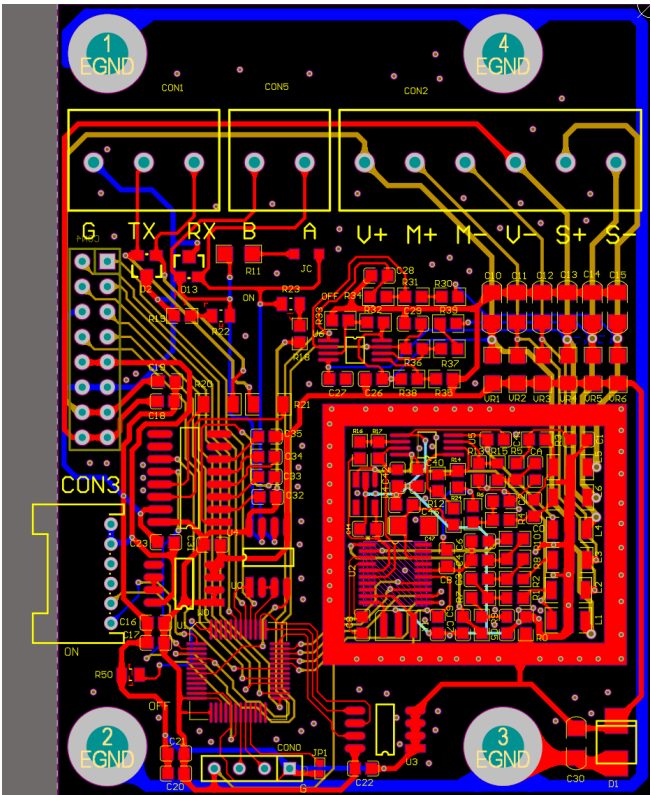
Two analog-input mainboard variants: a standard-environment version and an Ex ec version for gas Zone 2 applications.

Standard-environment version



Standard-environment layout for the analog-input mainboard, combining sensor input, signal acquisition, control, and communication interfaces.

Gas Zone 2 version · Ex ec



Analog-input mainboard layout for Ex ec instrument configurations in gas Zone 2 hazardous areas, providing analog signal acquisition and control.

Protection: Ex ec | EPL: Gc | Application: Gas Zone 2

Role in the instrument

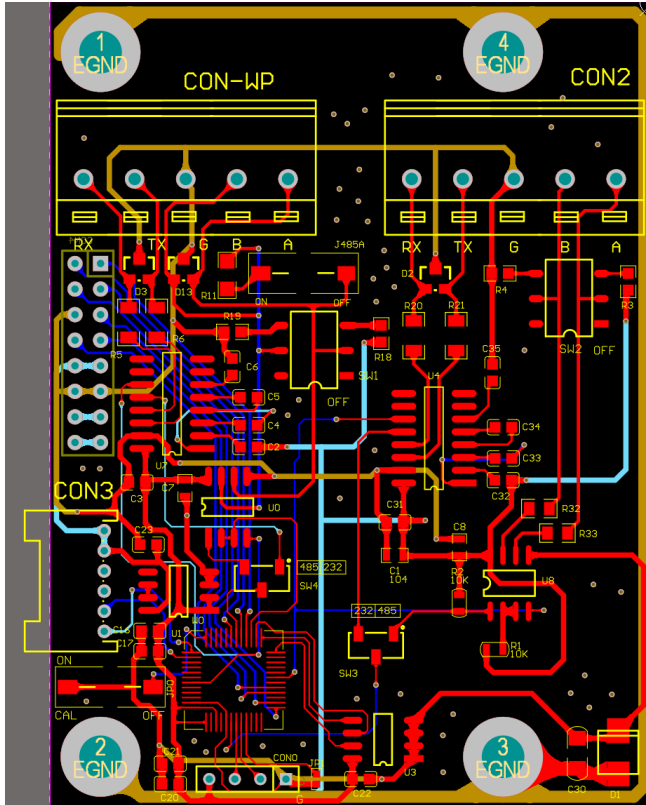
The analog-input mainboard receives sensor signals and brings together acquisition, control, and communication. These PCB layouts show a standard-environment version and an Ex ec version for gas Zone 2 applications.

03 / PCB LAYOUT VARIANTS

Digital mainboard layouts

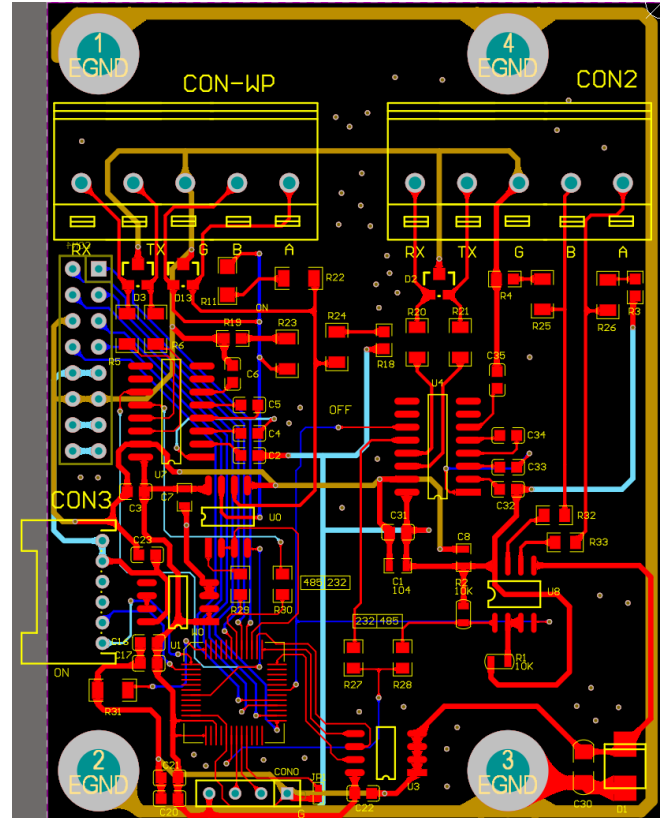
Two mainboard variants for external digital weighing platforms: a standard-environment version and an Ex ec version for gas Zone 2 applications.

Standard-environment version



Standard-environment mainboard layout for external digital weighing platforms, with serial communication interfaces and controller circuitry.

Gas Zone 2 version · Ex ec



Digital mainboard layout for Ex ec instrument configurations in gas Zone 2 hazardous areas, providing controller and serial interfaces for digital weighing platforms.

Protection: Ex ec | **EPL:** Gc | **Application:** Gas Zone 2

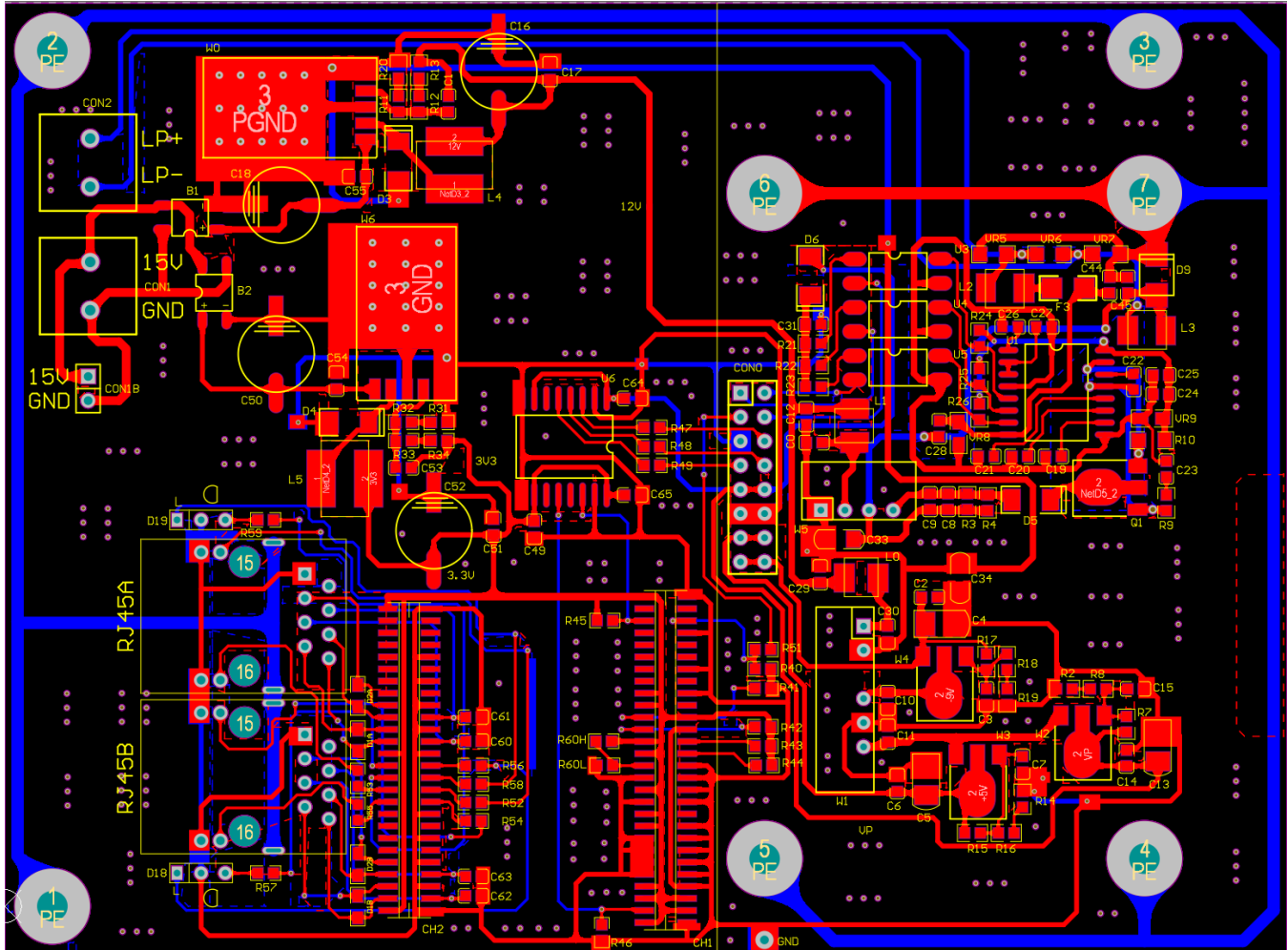
Role in the instrument

The digital mainboard connects to external digital weighing platforms through controller and serial-interface circuitry. These PCB layouts show a standard-environment version and an Ex ec version for gas Zone 2 applications.

04 / POWER AND INDUSTRIAL INTERFACES

Shared baseboard / Type 1

Both layouts provide the same functions. Only component placement changes to suit different mechanical enclosures.



PCB layout - Baseboard Type 1

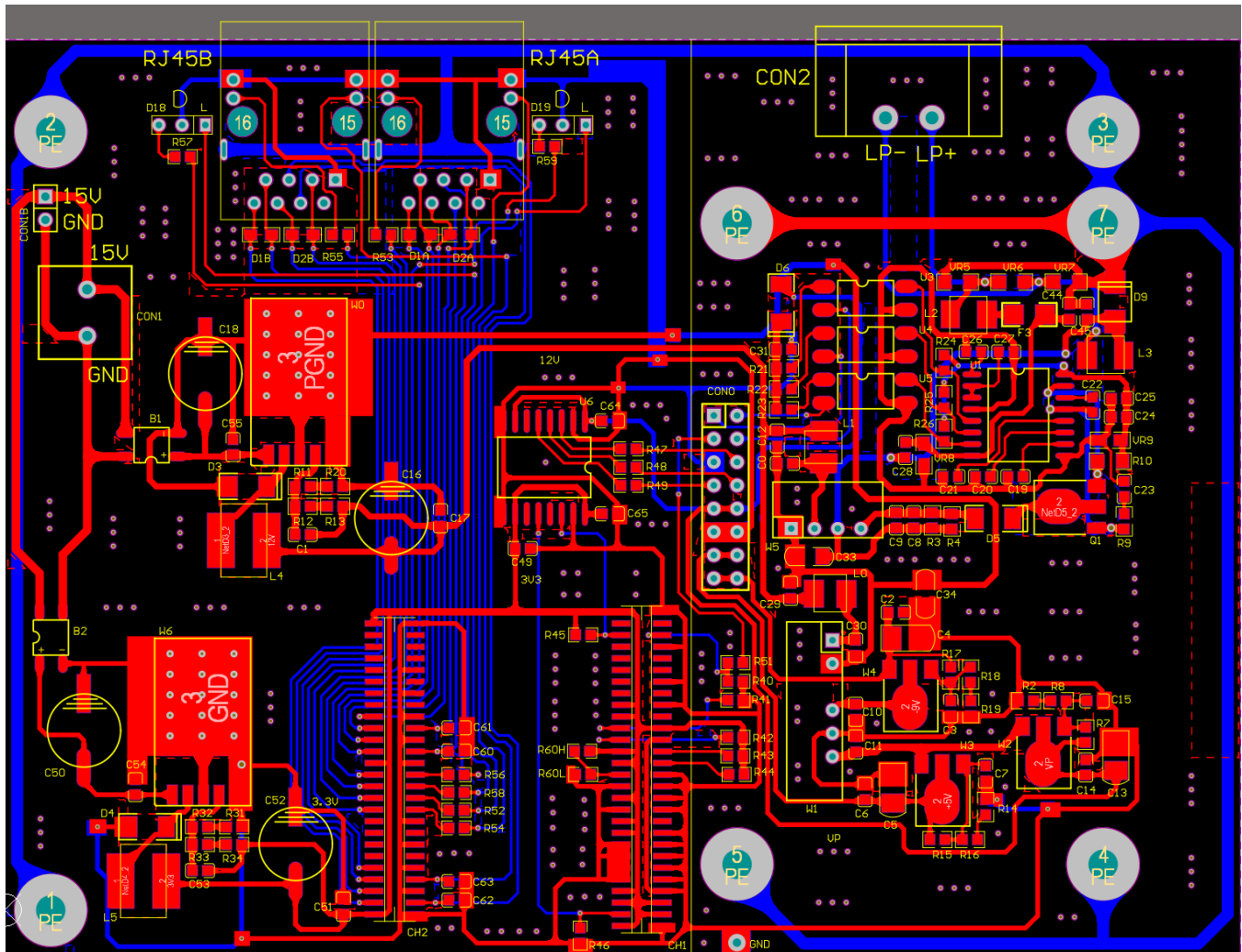
First component-placement arrangement of the shared power and industrial-interface baseboard, for one mechanical enclosure. Functionally identical to Type 2.

Shared function, different placement

Both baseboard types support the same power and industrial-interface functions. Their component placement is arranged for different mechanical enclosures.

Shared baseboard / Type 2

Both layouts provide the same functions. Only component placement changes to suit different mechanical enclosures.



PCB layout - Baseboard Type 2

Alternative component placement for a different mechanical enclosure. The electrical functions are identical to Type 1.

Shared function, different placement

Both baseboard types support the same power and industrial-interface functions. Their component placement is arranged for different mechanical enclosures.