

12V nominal (10.8–13.2V); external limited–power adapter. VM is protected bus, not a 24V input.

Q1 drain faces input; body diode starts conduction; source is VM. F1 before Q1. D1 clamps [VGS].

Regeneration energy and TVS/fuse coordination require bench verification. No motor power approval from schematic alone.

Litter Controller

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File: 01\_input.kicad\_sch

Title: 01\_input

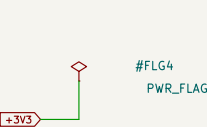
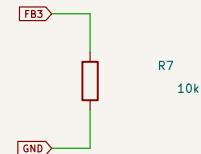
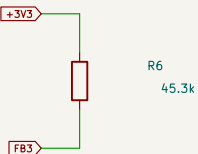
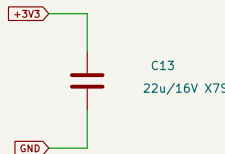
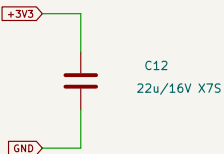
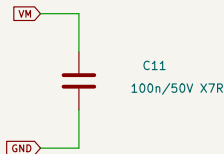
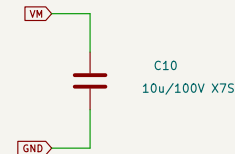
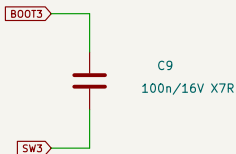
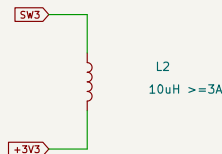
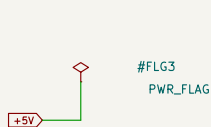
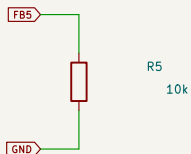
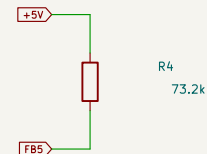
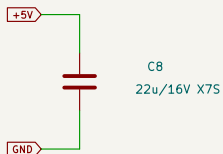
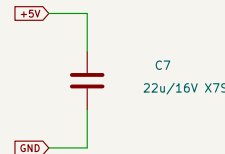
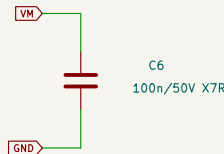
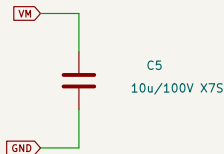
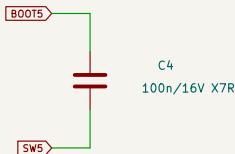
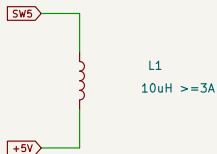
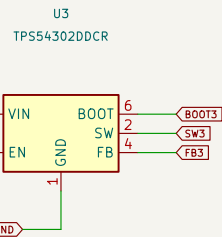
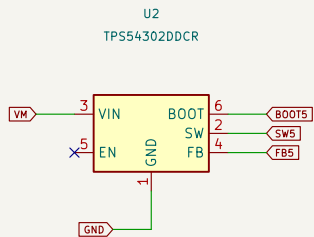
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KiCad E.D.A. 10.0.6

Date: 2026–09–26

Rev: A1 DRAFT

Id: 2/12

02 POWER



U2/U3 pin 5 EN intentionally open (internal pull-up). NEVER tie EN directly to 12V.

Target budgets: +5V 0.5A; +3V3 0.8A. FB nominal 0.596V gives 4.959V and 3.296V.

Layout: minimize input/switch loop; bootstrap next to pins; Kelvin FB return. Check effective MLCC capacitance under bias.

Litter Controller

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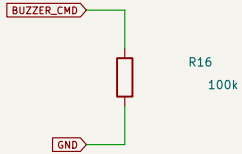
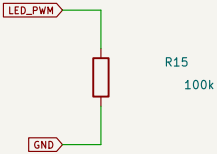
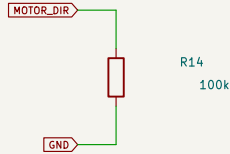
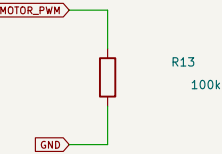
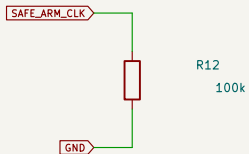
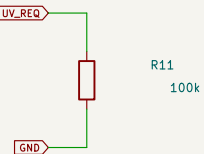
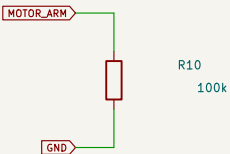
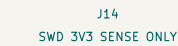
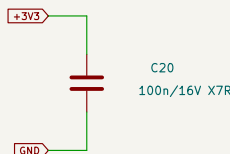
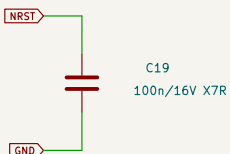
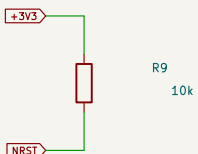
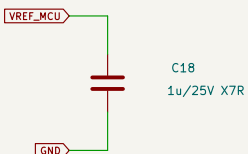
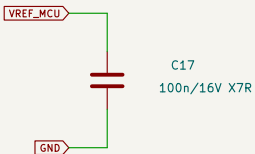
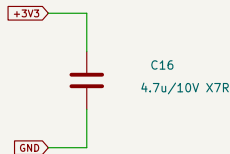
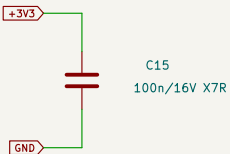
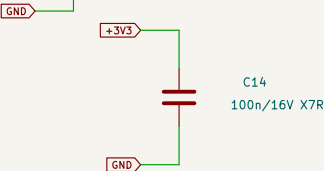
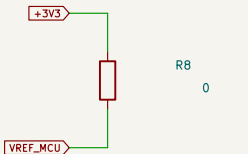
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Date: 2026-09-26

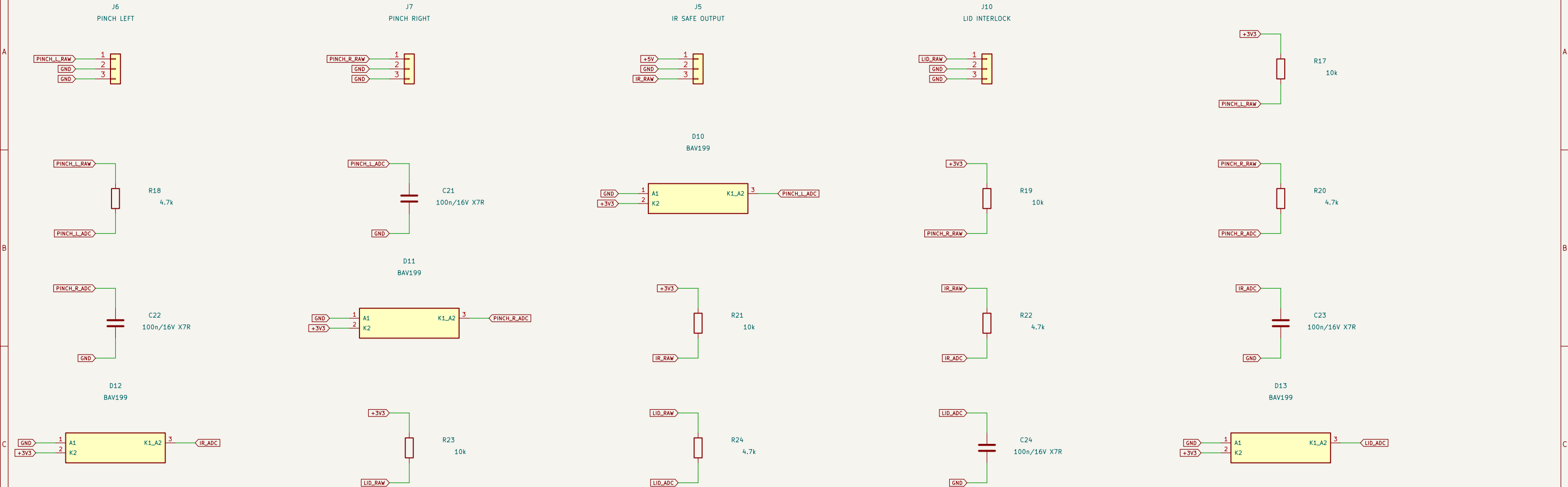
Rev: A1 DRAFT

Id: 3/12



HSI internal clock; do not populate an unverified crystal. Keep PA13/PA14 as SWD.  
USART1 uses PA9/PA10 on pads 33/34 after pin remap. USART2 uses PA2/PA3. Check firmware SYSCFG mapping.  
IWDG + brownout must be enabled. Set all actuator outputs low before GPIO mode changes. No automatic re-arm after reset.

04 SENSOR LOOPS



NC contact + 1k series EOL at the far end; healthy about 0.30V; open 3.3V; short 0V.

IR receiver must sink when clear and release on obstruction/power loss. Do not substitute opposite-polarity IR modules.

4.7k/100n input RC. External connector surge/ESD and ADC clamp currents require bench validation.

Litter Controller

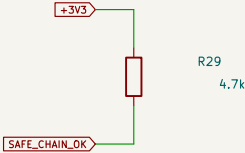
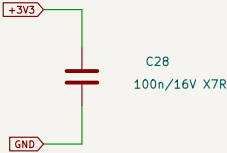
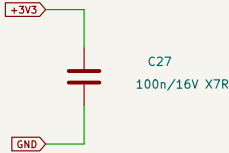
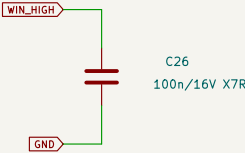
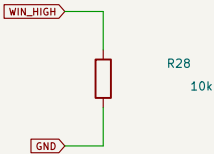
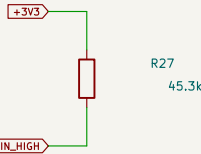
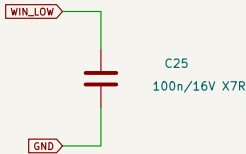
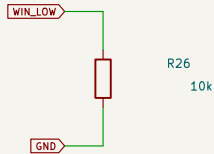
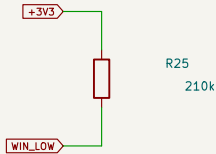
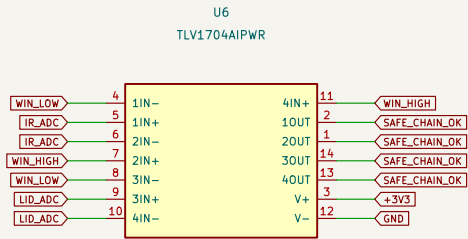
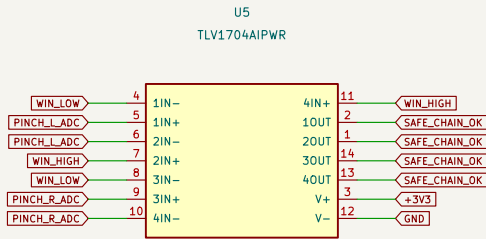
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Title: 04\_sensor\_loops

Size: A3  
Date: 2026-09-26

Rev: A1 DRAFT  
Id: 5/12

04B WINDOWS



External NC switch + 1k 1% SERIES EOL resistor at sensor end: healthy about 0.30V; open 3.3V; short 0V.  
IR needs a receiver with healthy/clear sinking output through 1k EOL; obstruction or power loss must release it.  
Window thresholds about 0.15V / 0.597V. ALL four loops required. Do not bridge unused safety loops on production units.  
BAV199 clamps protect ADC-side nodes. Short-to-12V survival and ESD remain bench tests, not certified by this drawing.

Litter Controller

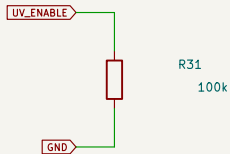
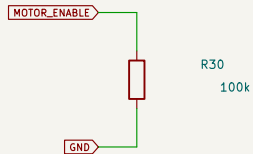
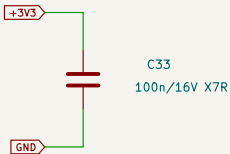
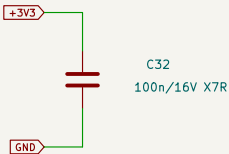
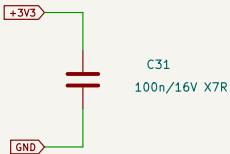
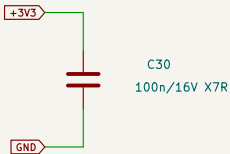
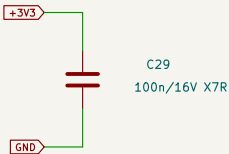
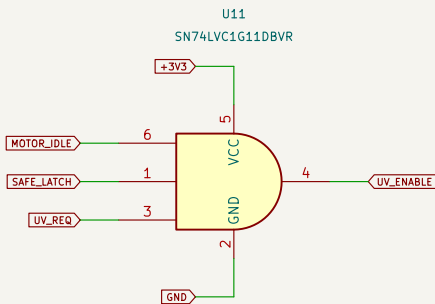
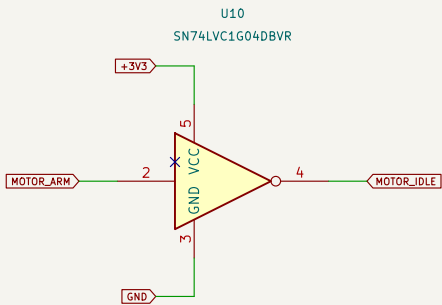
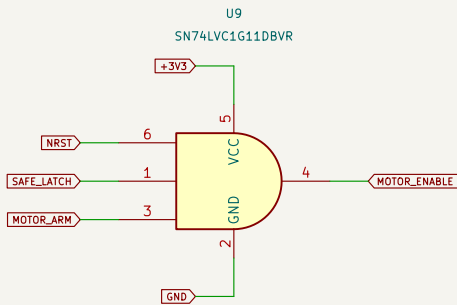
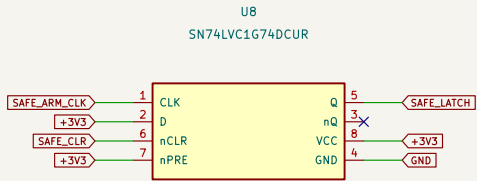
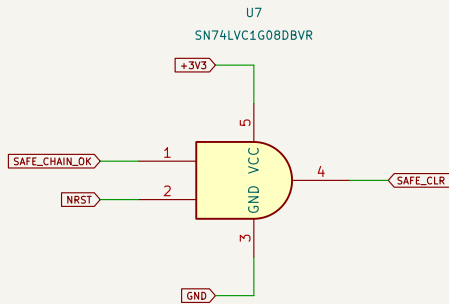
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Date: 2026-09-26  
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Rev: A1 DRAFT  
Id: 6/12

05 INTERLOCK



Any window violation asynchronously clears U8. Recovering the sensor alone cannot restart the motor.  
Re-arm only with a NEW MCU rising edge on SAFE\_ARM\_CLK after a deliberate safe-state check.  
MOTOR\_ENABLE = SAFE\_LATCH & MOTOR\_ARM & NRST. UV\_ENABLE = SAFE\_LATCH & UV\_REQ & !MOTOR\_ARM.  
Electrical disable coasts the motor; stopping distance and containment need mechanical validation. This is not a certified safety controller.

Litter Controller

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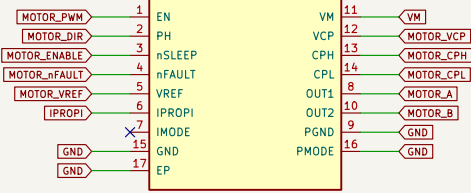
Date: 2026-09-26

Rev: A1 DRAFT

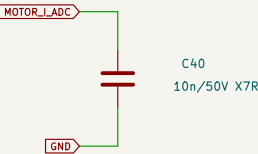
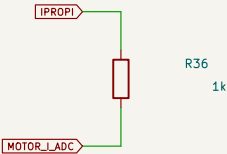
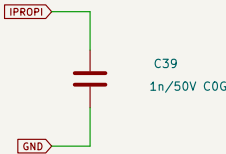
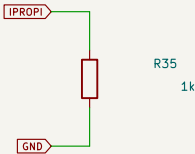
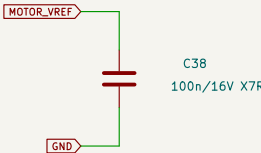
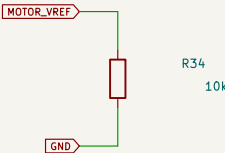
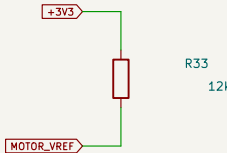
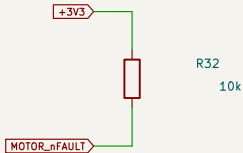
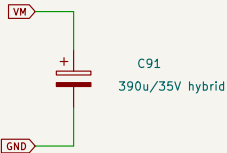
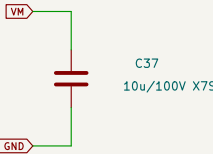
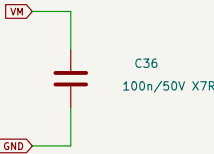
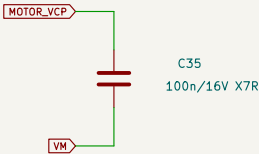
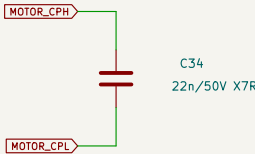
Id: 7/12

06 MOTOR

U12  
DRV8876PWPR



J2  
12V BRUSHED MOTOR



PMODE grounded; PH/EN control. IMODE intentionally open; fixed off-time current regulation, latched OCP.  
Nominal current regulation 1.50A from VREF=1.50V and RIPROPI=1k. 1A continuous target needs thermal verification.  
Fit exposed pad to GND copper with thermal vias. Do not route sense-return through motor return current.  
Motor cable suppression and bus regeneration clamp must be checked with the selected motor and mechanism.

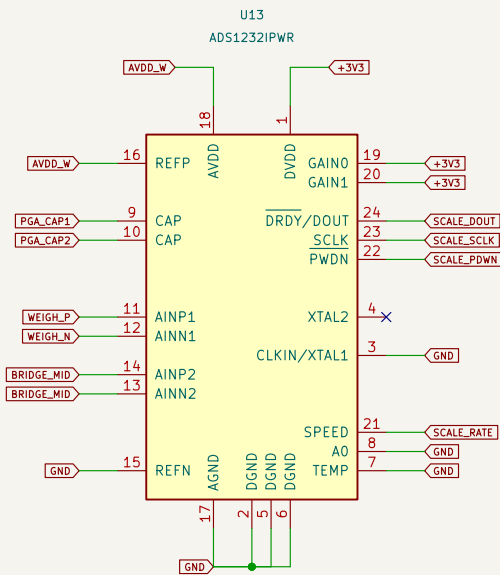
Litter Controller

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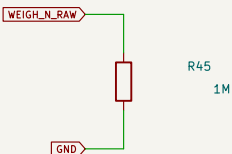
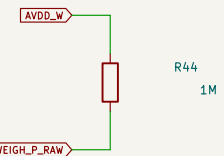
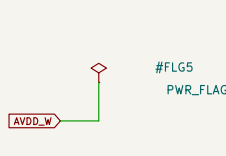
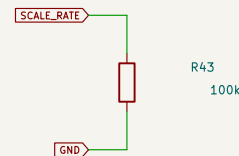
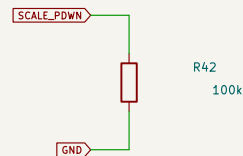
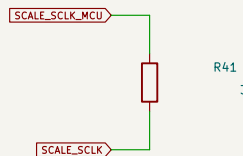
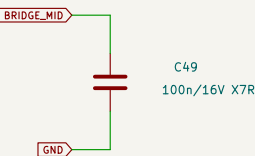
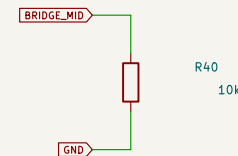
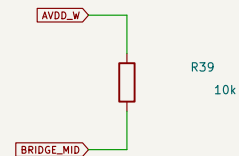
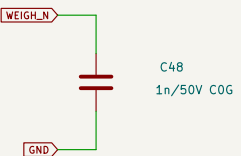
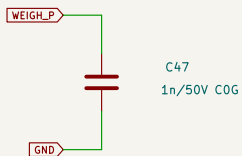
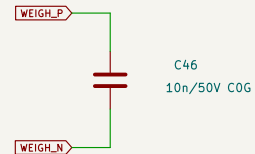
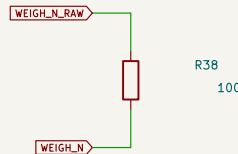
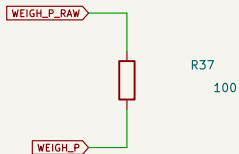
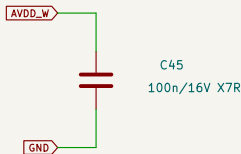
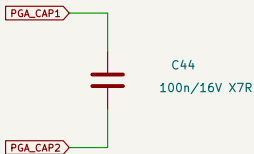
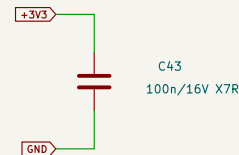
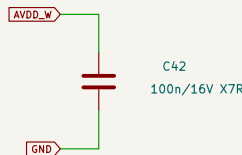
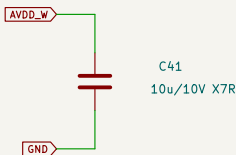
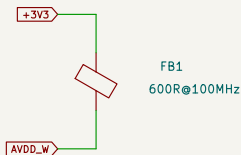
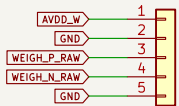
Title: 06\_motor

Size: A3  
Date: 2026-09-26  
KiCad E.D.A. 10.0.6

Rev: A1 DRAFT  
Id: 8/12



J9  
350 OHM BRIDGE



Full bridge, nominal 350 ohm, sensitivity <=2mV/V. Four half-bridge feet require an EXTERNAL combining harness.

Gain 128. Ratiometric REFP at excitation AVDD\_W, REFN at return. 3.3V excitation gives about +/-12.9mV input range.

Firmware must pulse PDWN low at power-up, calibrate offset, detect stale/saturated data and prevent motion on invalid weight.

Absolute mass accuracy requires calibrated mechanical load path. ADC resolution is not a stated weighing accuracy.

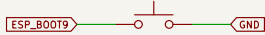
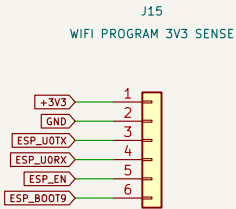
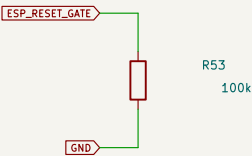
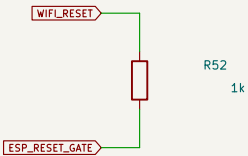
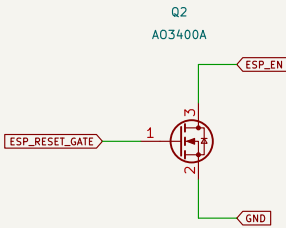
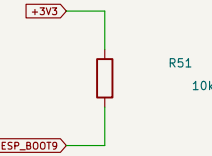
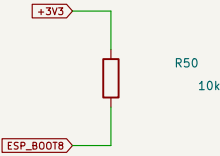
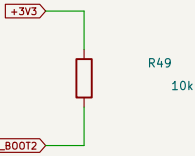
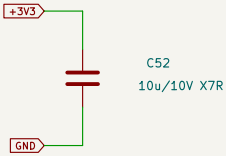
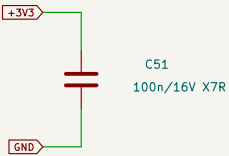
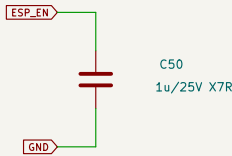
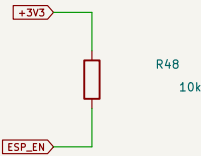
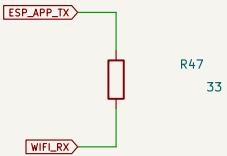
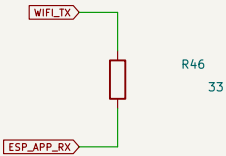
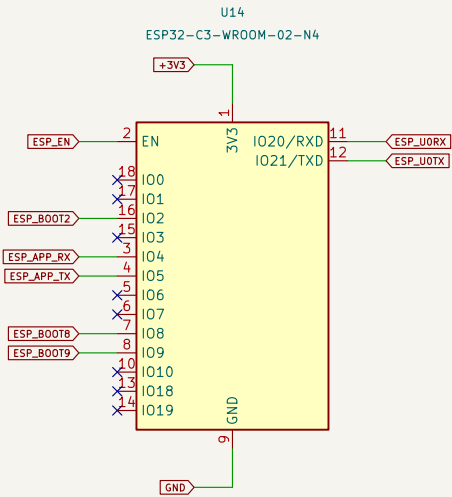
### Litter Controller

Sheet: /07\_weigh/  
File: 07\_weigh.kicad\_sch

**Title: 07\_weigh**

Size: A3  
Date: 2026-09-26

Rev: A1 DRAFT  
Id: 9/12



WROOM-02 chosen instead of MINI-1 for accessible pads and a library footprint; footprint still needs drawing cross-check.  
UART0 on IO20/IO21 is programming only. App UART routes to IO4/IO5 to prevent programmer/MCU contention.  
Use local configuration/status interface. MCU alone owns actuator state. Do not route copper/components under antenna keepout.

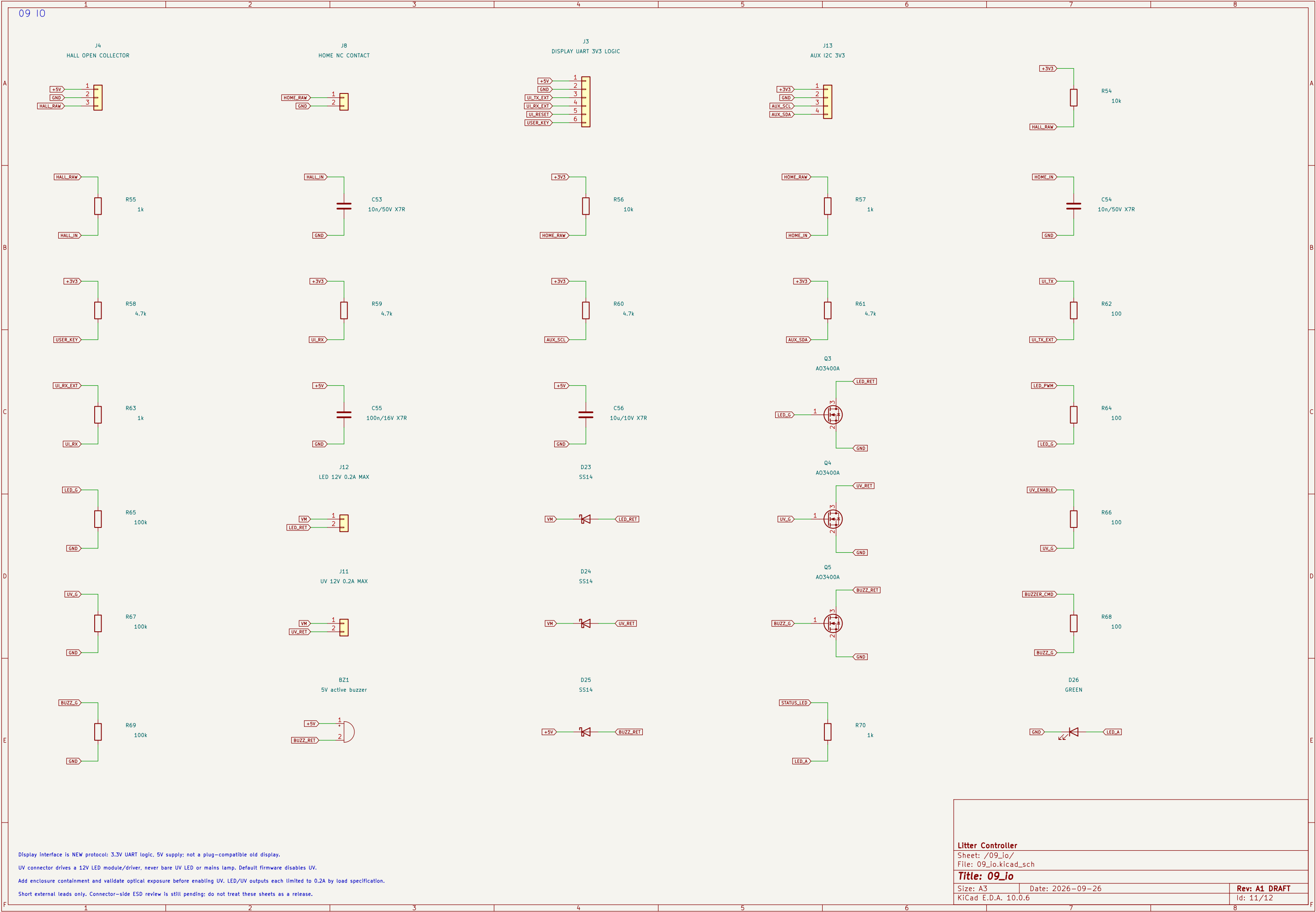
Litter Controller

Sheet: /08\_wifi/  
File: 08\_wifi.kicad\_sch

Title: 08\_wifi

Size: A3 Date: 2026-09-26  
KiCad E.D.A. 10.0.6

Rev: A1 DRAFT  
Id: 10/12



|                                         |                  |               |
|-----------------------------------------|------------------|---------------|
| Litter Controller                       |                  |               |
| Sheet: /09_io/<br>File: 09_io.kicad_sch |                  |               |
| Title: 09_io                            |                  |               |
| Size: A3                                | Date: 2026-09-26 | Rev: A1 DRAFT |
| KiCad E.D.A. 10.0.6                     |                  | Id: 11/12     |

