PI A BOX · PARTS

Boat 1 · A1 · v10.5 · CXCESNS aluminum 11.8 x 8.3 x 3.9 in, back face glued to the hull · main island

A



Box, CXCESNS aluminum, and 1/8 in G10 plate
11.8 x 8.3 x 3.9 in, IP66. Plate about 11.2 x 7.6 in
1 · have

C



Pi CM5 on a Geekworm X1500 carrier
CM5 8 GB / 32 GB. Carrier: 5.1 V on USB-C
1 · have

D



4 TB drive (WD SN5000) and Hailo-8L
In the carrier's two M.2 slots
1 each · Hailo have; drive check

E



CAN board, Waveshare 2-CH CAN FD HAT
Both buses, isolated. Terminators OFF
1 · have

F



CM5 cooling: L-bracket, block, gap pad
Upright carrier; block and pad to the wall
1 · have

G



5 V converter, Mean Well DDR-60L-5
18 to 75 V in, 5 V 12 A. Set to 5.1 V
1 · coming

H



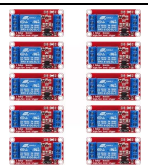
WD-A: Nano Every on a screw carrier
The watchdog. Carrier: AITRIP on the shelf
1 · have; carrier check

I



WD-A's 5 V: Pololu D36V6F5
Fed ahead of the relay. Wires soldered
1 · have

J



WD-A relay, AEDIKO 5 V, 1 ch
Pi A's 24 V through its NC contact
1 · have

K



Opto board, HiLetgo PC817, 4 ch
The kill line on channel 2
1 · have

L

small blue board

INA226 current meter
Went back Sep 8. Drawn dashed
1 · open: Mike's call

M



Surge diode 1.5KE33CA; 15k and 22k
Diode on TB1 2-3. Resistors for pin 37
3 · have; check 15k, 22k

N



3 A inline fuse, sealed holder
On the hub's 5 V lead
1 · count the 3 A fuses

O



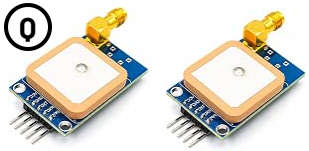
IMU A1, A2: Adafruit BNO085
At the two top corners. 0x4A, 0x4B
2 · check: no delivery mail

P



Humidity board AHT30
I2C, on TB3
1 · have

Q



GPS A: NEO-7M and its 4-pin lead
Dupont plug on VCC, GND, TX, RX
1 · have

R



GPS coax: SMA bulkhead, RG316 lead, ferrite
Entry 11. Ferrite outside
1 · lead: buy B07Z343VH4

T

small blue box, USB at each end

Iridium A's USB isolator, DSD TECH SH-G01A
Iridium cable into it; it into USB 2
1 · have

U



Ethernet wall jack and patch cord
Alrhso IP67, entry 8; short Cat6 inside
1 · have

V



Glands: split 4-port, PG7 x5, PG9
Split: S and 7. PG7: 2, 3, 4, 6, 12. PG9: 1
7 · count

W



Micro-C 6.6 ft cordsets, cut
Two CAN drops, VESC run, alive run
4 · count

X

stud and green wire

Bond stud and spur
1/4-20 316 stud; 6 AWG green spur
1 · count the 6 AWG

Y



DIN terminals and 3 short rails
TB1 10, TB2 16, TB3 12 ways
38 · count the kits

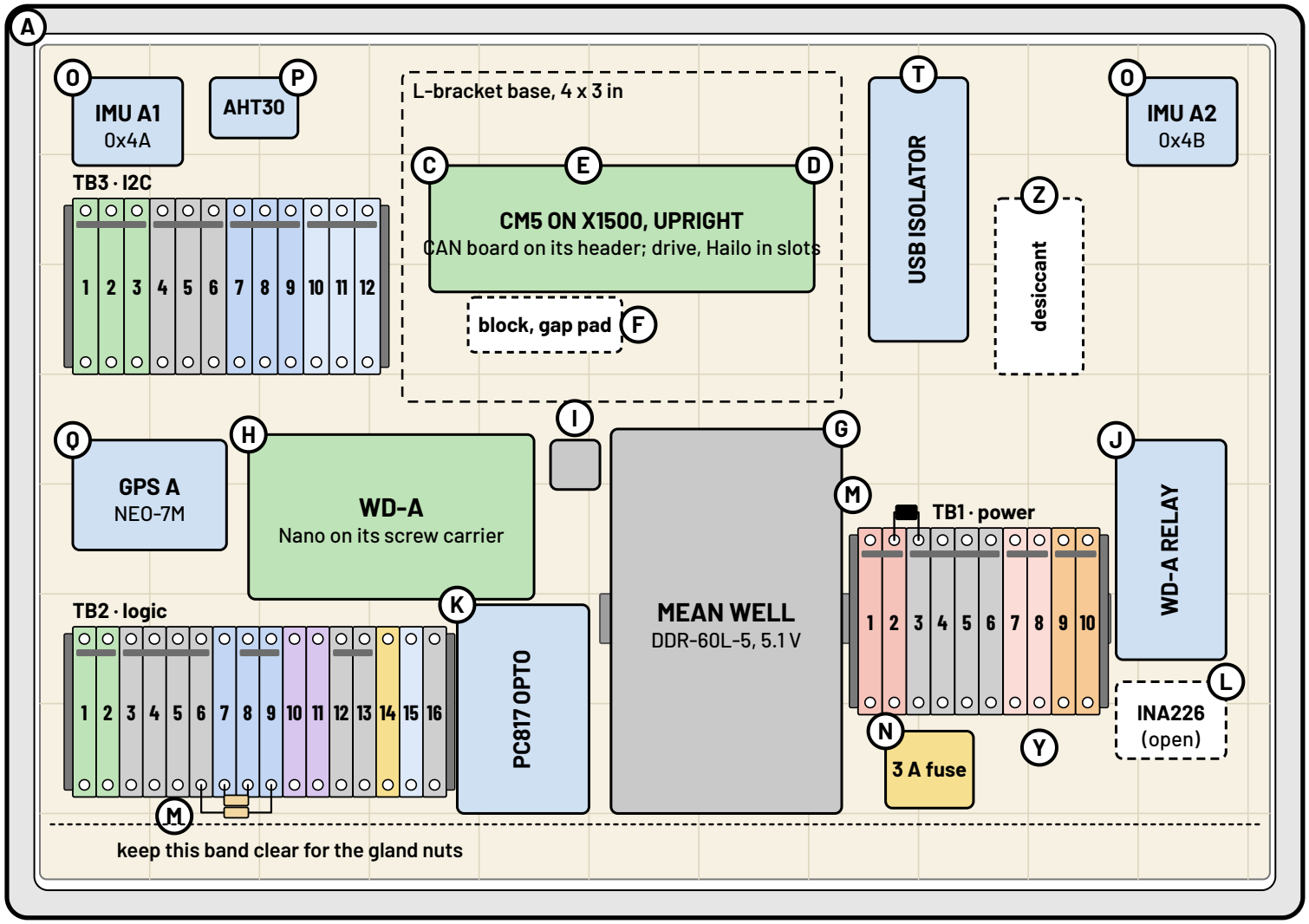
Z

nylon posts, wire, ferrules, tape

Standoffs, wire, ferrules, tape, grease, desiccant
M2.5, M3 nylon. 16 and 22 AWG. Desiccant: open
1 · have

PI A BOX · LAYOUT

lid off, looking in, as glued to the hull · about to scale · Claude's layout, as the long form



BOTTOM WALL, seen from outside: centers in inches from the left end; thick line = back face (glued)

TB1 · POWER, 16 AWG

- 1-2 +24 V in
- 3-6 0 V
- 7-8 +24 V after meter
- 9-10 +24 V switched

TB2 · LOGIC

- 1-2 WD-A 5 V
- 3-6 0 V
- 7 safe mode in
- 8-9 pin 37
- 10-11 VESC TX, RX
- 12-13 UART ground
- 14 kill
- 15 alive
- 16 alive return

TB3 · I2C

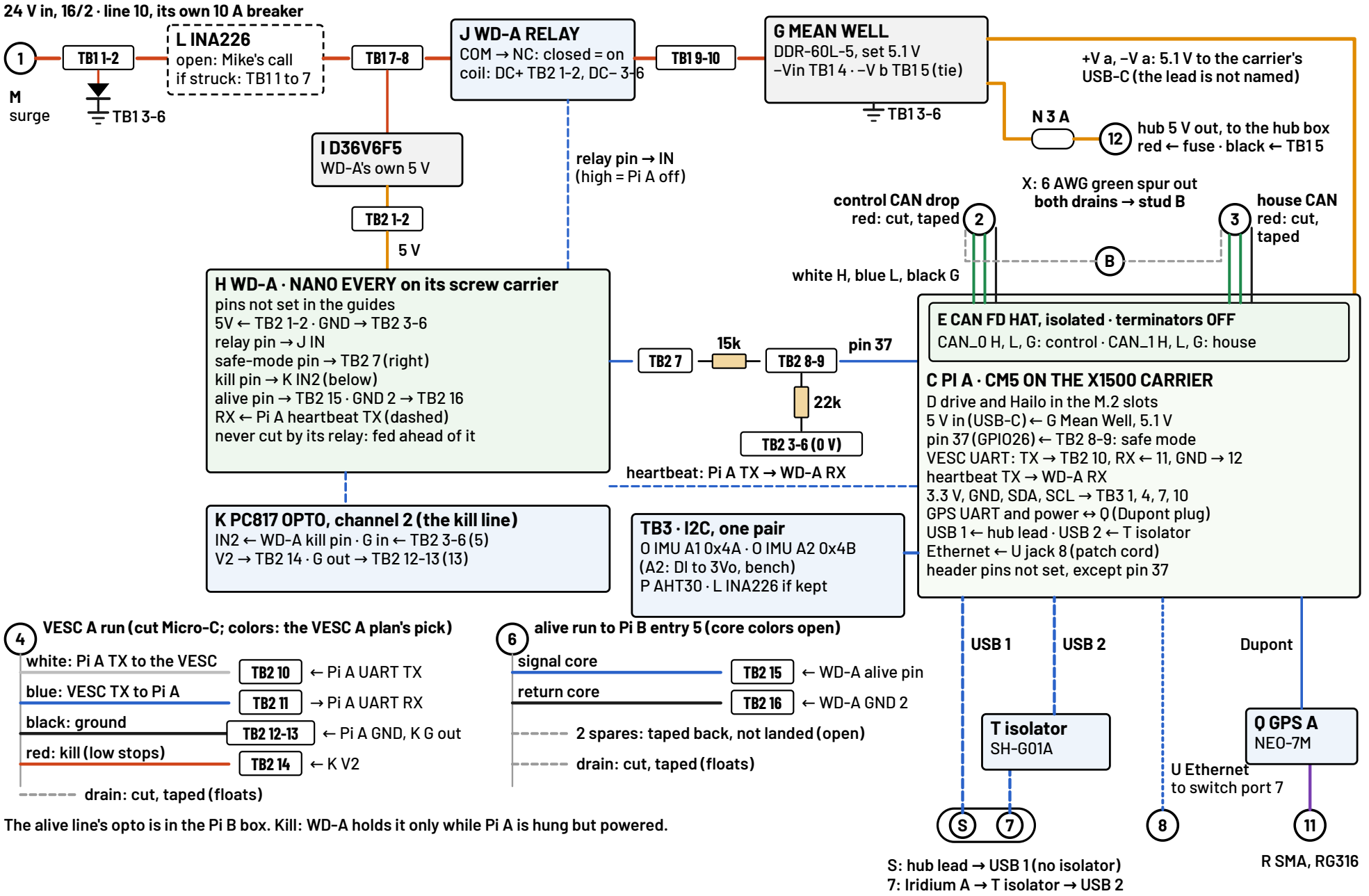
- 1-3 3.3 V
- 4-6 GND
- 7-9 SDA
- 10-12 SCL

Gray bar = bridged
Letters = page 1
Grid square = 1 in

HOLES, bottom wall only
PG7 1/2 in · PG9 5/8 in
split gland 1-3/16 in
RJ45 about 7/8 in
SMA, stud 1/4 in
Up from the back face:
upper row 2.4 in,
lower row 1.6 in,
S 2.0 in, 8 2.1 in

PI A BOX · WIRING

how it connects · boxes = terminal blocks (TB1, TB2, TB3), circles = glands · not to scale



The alive line's opto is in the Pi B box. Kill: WD-A holds it only while Pi A is hung but powered.

24 V · 5 V · 0 V · CAN · logic, serial · USB, network · drain, cut · dashed blue = logic from WD-A or Pi A

PI A BOX · EVERY WIRE

blocks numbered left to right as on page 2

TB1: POWER, 16 AWG

b = bottom screw (gland side), t = top screw. Two wires on one screw share a double ferrule.

Block	Job	Wires
1-2	+24 V in (bridged)	1b: gland 1 red (16 AWG). 1t: INA226 VIN+ (if struck: jumper 1t to 7t). 2t: surge diode leg
3-6	0 V (bridged)	3b: gland 1 black. 3t: surge diode leg. 4t: Mean Well –Vin. 5b: gland 12 black. 5t: Mean Well –V b (the tie). 6t: link to TB2 5b
7-8	+24 V after the meter	7t: INA226 VIN–. 8b: Pololu VIN (22 AWG). 8t: relay COM
9-10	+24 V switched	9t: relay NC. 10t: Mean Well +Vin

TB2: WD-A LOGIC, 22 AWG

Block	Job	Wires
1-2	WD-A 5 V	1b: Pololu VOUT. 1t: Nano 5V. 2b: relay DC+
3-6	0 V (bridged)	3b: Pololu GND. 3t: Nano GND. 4b: relay DC–. 5b: link from TB1 6t. 5t: PC817 G in. 6b: 22k leg
7	safe mode in	b: 15k leg. t: Nano safe-mode pin
8-9	pin 37 (bridged)	8b: 15k leg. 8t: to Pi A pin 37. 9b: 22k leg
10	VESC, Pi TX	b: gland 4 white. t: Pi A UART TX
11	VESC, Pi RX	b: gland 4 blue. t: Pi A UART RX
12-13	UART ground	12b: gland 4 black. 12t: Pi A GND. 13t: PC817 G out
14	kill	b: gland 4 red. t: PC817 V2
15	alive	b: gland 6 signal core. t: Nano alive pin
16	alive return	b: gland 6 return core. t: Nano GND 2

TB3: I2C, 22 AWG (T = SENSORS' SIDE)

Block	Job	Wires
1-3	3.3 V	1t IMU A1, 2t IMU A2, 3t AHT30 (VIN). 1b Pi A 3.3 V. 2b INA226 VCC if kept
4-6	GND	4t IMU A1, 5t IMU A2, 6t AHT30. 4b Pi A GND. 5b INA226 if kept
7-9	SDA	7t IMU A1, 8t IMU A2, 9t AHT30. 7b Pi A SDA. 8b INA226 if kept
10-12	SCL	10t IMU A1, 11t IMU A2, 12t AHT30. 10b Pi A SCL. 11b INA226 if kept

OFF THE RAILS

Part	Wires
Mean Well G	+Vin ← TB1 10t. –Vin → 4t. –V b → 5t. +V a, –V a → carrier 5 V in (USB-C; lead not named). +V b → fuse N
Relay J	COM ← TB1 8t. NC → 9t; NO empty. DC+ ← TB2 2b. DC– → 4b. IN ← Nano relay pin
Pololu I	VIN ← TB1 8b. VOUT → TB2 1b. GND → 3b. SHDN empty
WD-A H	5V ← TB2 1t. GND → 3t. GND 2 → 16t. Safe-mode pin → 7t. Alive pin → 15t. Kill pin → PC817 IN2. Relay pin → relay IN. RX ← Pi A heartbeat TX
PC817 K	IN2 ← Nano kill pin. G in ← TB2 5t. V2 → 14t. G out → 13t
CAN board E	CAN_0 H, L, G ← gland 2 white, blue, black. CAN_1 H, L, G ← gland 3 white, blue, black
Pi A C	pin 37 ← TB2 8t. UART TX, RX, GND → TB2 10t, 11t, 12t. Heartbeat TX → Nano RX. 3.3 V, GND, SDA, SCL → TB3 1b, 4b, 7b, 10b. USB 1 ← hub lead. USB 2 ← isolator T. Ethernet ← patch cord
GPS A Q	SMA ← RG316 lead ← bulkhead 11. VCC, GND, TX, RX ↔ Pi A header (Dupont plug; PPS empty)
IMU A2 O	DI to 3Vo, soldered at the bench (address 0x4B)
INA226 L	VIN+ ← TB1 1t. VIN– → 7t. VCC, GND, SDA, SCL ← TB3 2b, 5b, 8b, 11b. Open
Fuse N	in ← Mean Well +V b. out → gland 12 red
Stud X	inside nut: drains of glands 2 and 3, ring lugs. Outside: 6 AWG green spur

WIRE AND ENDS

Power 16 AWG from 16/2 offcuts; logic 22 AWG. Ferrule on every stranded end; diode and resistor legs short and sleeved. Label both ends. USB plugs clamped within 2 in and staked. Drip loop 3 to 4 in under every gland. CAN drains on the stud only; every other drain floats.

CABLES IN, BY GLAND

Gland	Cable	Cores
1	24 V, 16/2	red → TB1 1b, black → 3b. Sealant round the oval jacket
2	control CAN	white, blue, black → CAN_0 H, L, G. Red cut back, taped. Drain → stud
3	house CAN	white, blue, black → CAN_1 H, L, G. Red cut back, taped. Drain → stud
4	VESC A run	white → TB2 10b, blue → 11b, black → 12b, red (kill) → 14b. Drain cut, taped
6	alive run	signal → TB2 15b, return → 16b. 2 spares taped back. Drain cut, taped
S, 7	split gland	S: hub's USB lead, plug on → USB 1. 7: Iridium A's cable, plug on → isolator. 2 ports plugged
8	Ethernet	jack; Cat6 to switch port 7 outside, patch cord inside
11	GPS coax	SMA bulkhead; RG316 lead in. Ferrite outside, just below
12	hub 5 V lead	red ← fuse N, black ← TB1 5b. To the hub box T
B	bond stud	6 AWG green spur outside. Bare metal under the washers

BEFORE WIRING

CAN board: terminators OFF, logic jumper 3.3 V. Mean Well: set 5.1 V. At the bench: solder the Pololu's four wires and IMU A2's DI to 3Vo. Drive and Hailo in the M.2 slots: bench-prove both first. Read the relay's NO, COM, NC; if it has a trigger jumper, set it so a dead Nano leaves the coil off and Pi A on. Read the PC817's labels: kill core on channel 2's output, ground core on the output ground. Pull the Nano: Pi A must stay up (Compute Bay 4.3).

STILL OPEN

The INA226 (Mike's call). Core colors of the VESC and alive runs. Header pins (all but 37) and the Nano's pins. The lead from the Mean Well to the carrier's USB-C. The hub 5 V lead's cable. Whether the desiccant stays.