PI B BOX · PARTS

Boat 1 · A2 · v10.5 · CXCESNS aluminum, 11.8 x 8.3 x 3.9 in · backup battery, floats: no bond stud

A



Box: CXCESNS cast aluminum
11.8 x 8.3 x 3.9 in, IP66. Sealed, no vent
1 · have

B



Pi B: Raspberry Pi CM5
8 GB, 32 GB. Boots from its own eMMC
1 · have

C



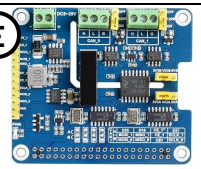
Carrier: CM5 IO Board
6.30 x 3.54 in. 5 V in on USB-C only
1 · check shelf

D



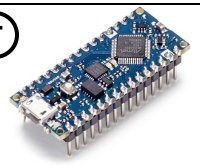
Drive: fanxiang 256 GB NVMe
In the carrier's M.2 slot
1 · have

E



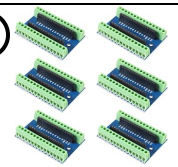
CAN HAT: Waveshare 2-CH CAN FD
Both buses, isolated. Jumpers OFF
1 · have

F



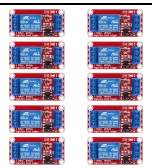
WD-B: Arduino Nano Every
The backup watchdog. 5 V logic
1 · have

G



Nano screw carrier (AITRIP)
WD-B plugs in; wires under screws
1 · have (kit)

H



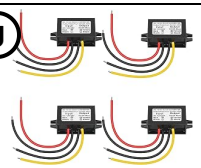
WD-B relay: AEDIKO 5 V, 1 ch
Pi B's 24 V on NC: coil off = Pi B on
1 · have

I



WD-B's 5 V: Pololu D36V6F5
5 V 600 mA. Screw block soldered on
1 · have

J



Pi B's 5 V: Klnuoxj 24 to 5 V 5 A
Potted. Red in, black, yellow out
1 · check shelf

K



Opto board: HiLetgo PC817
Pi A's alive line, channel 1 only
1 · have

L



Surge diodes, divider resistors
1.5KE33CA x2; a 5 V TVS (not picked); 2 resistors (values open)
5 · kit; pick 1

M



GPS B: NEO-7M and its lead
RLECS 4-pin housing on VCC, GND, TX, RX
1 · have

N



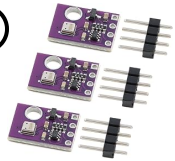
GPS B wall plug: SMA lead
Bulkhead, 3.3 ft RG316. Ferrite outside
1 · buy (B07Z343VH4)

O



IMU B: Adafruit BNO085
Flat, square, arrow forward
1 · check shelf

P



Humidity board AHT30
Reads the sealed box's air
1 · have

Q

small USB dongle

USB isolator: DSD TECH SH-G01A
Iridium B's cable in; into a carrier USB port
1 · check (shipped)

R



Wing adapter: DSD TECH SH-C30G
Pi B's own isolated CAN link to the wing
1 · buy (B0CDGGBZDT)

S



Desiccant pack
Size not named
1 · check shelf

T

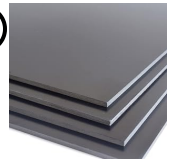


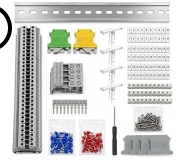
Plate: 1/8 in G10
About 11.2 x 7.6 in, on the ledge holes
1 · have

U



Heat path to the wall
6061 bracket and block (make), gap pad, spring (not named)
1 · make; pick spring

V



DIN rails, screw blocks, bridges
TB1 17 blocks, TB2 8 blocks
25 · have (kits)

W



Glands: PG11, PG7 x5, split
Nylon. Split: Altelix PG25 4-port
7 · count; split have

X



Ethernet coupler and patch cord
Alrhso RJ45; Cat6 UTP only, 6 in to 1 ft
1 · have

Y

nylon spacers, bolts

Standoffs and bolts
Nylon M2.5, M3; 1/4-20 316 x4, nylocs, EPDM washers
1 · kits; EPDM check

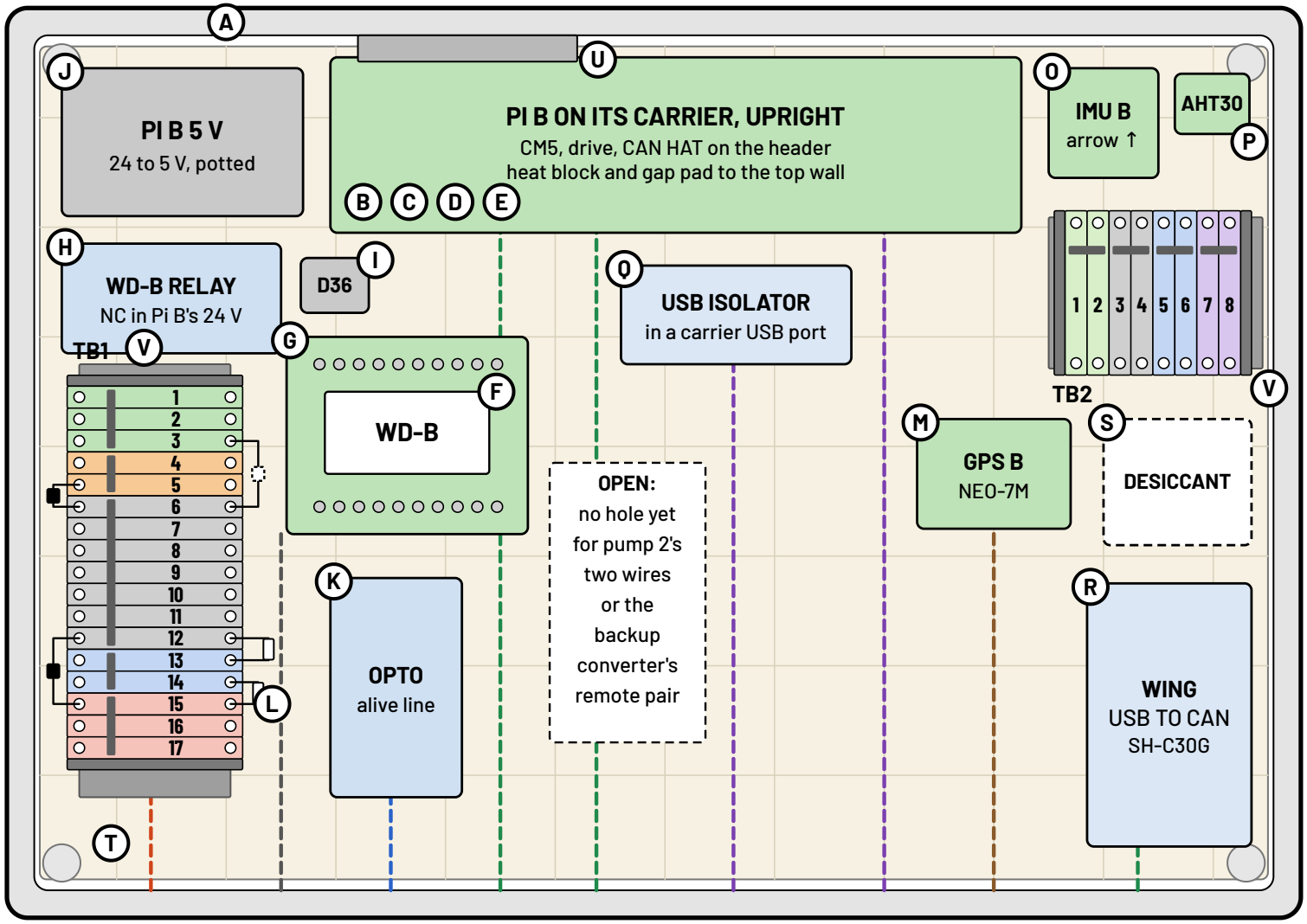
Z

wire, ferrules, heat shrink

Wire and ends
16 and 22 AWG; ferrules, heat shrink, labels, ties
1 · have (kits)

PI B BOX · LAYOUT

lid off, looking in, as mounted · about to scale, 1 grid square = 1 in · arranged as Box Wiring Sheets v10.5, page 12



TB1, LEFT, TOP DOWN

1-3	5 V, WD-B's
4-5	24 V to Pi B
6-12	0 V, floating
13-14	battery reading
15-17	24 V, always on

TB2, RIGHT, LEFT TO RIGHT

1-2	3.3 V
3-4	0 V
5-6	SDA
7-8	SCL

Gray bar = bridged
Black = 1.5KE33CA on the left screws; dashed = 5 V TVS (not picked); open box = divider resistor
Letters = page 1
Dashed lines = cables from their holes

BOTTOM WALL, BELOW

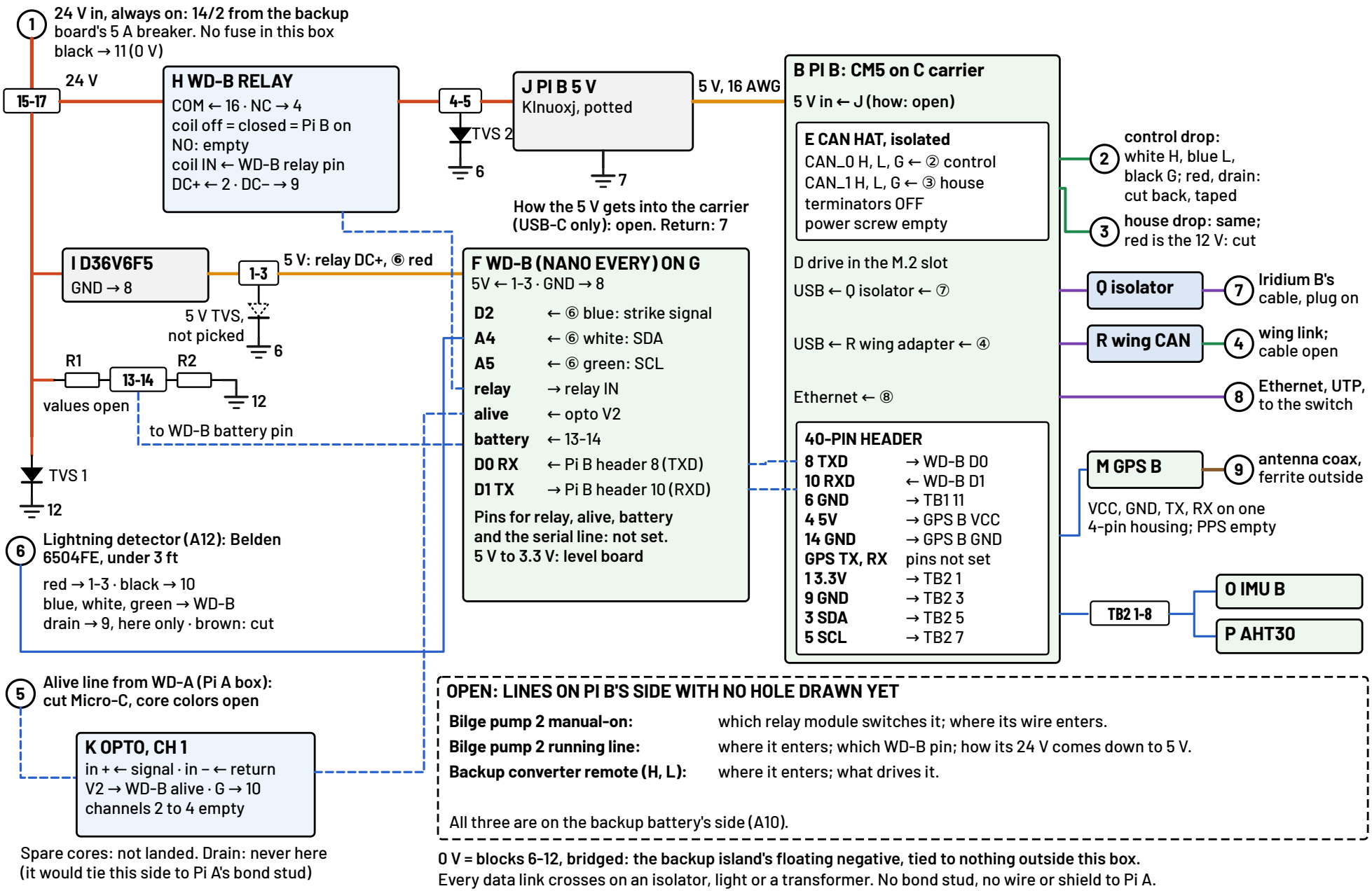
Inches from the left end of the box. Up from the back face: upper row 2-5/8, lower row 1-3/8, the split gland 2-3/16.
Circles to scale: PG11 3/4, PG7 1/2, split 1-3/16, RJ45 7/8, SMA 1/4 in.
Plastic glands only.

BACK FACE

Four 1/4-20 bolt holes from the drilling template (not shown). No bond stud.

PI B BOX · WIRING

how it connects · numbers in boxes = TB1 blocks (TB2 marked), numbers in circles = glands · not to scale



24 V · 5 V, 3.3 V · 0 V · CAN · data, signal · USB, Ethernet · coax · dashed = logic and serial lines

PI B BOX · EVERY WIRE

TB1 and TB2 numbered as on page 2 · ① to ⑨ = glands

TB1, LEFT SIDE, TOP DOWN

l = left screw, r = right screw. One wire per screw. Bridged: 1-3, 4-5, 6-12, 13-14, 15-17.

Block	Job	Left	Right
1	5 V (1-3)	WD-B 5V	D36 VOUT
2	5 V	⑥ red	relay DC+
3	5 V		5 V TVS (to 6r)
4	24 V to Pi B (4-5)		relay NC
5	24 V to Pi B	TVS 2 (to 6l)	J red in
6	0 V (6-12)	TVS 2	5 V TVS
7	0 V	Pi B 5 V return	J black
8	0 V	WD-B GND	D36 GND
9	0 V	⑥ drain	relay DC–
10	0 V	⑥ black	opto G
11	0 V	① black (14 AWG)	header pin 6
12	0 V	TVS 1 (to 15l)	R2 (to 13r)
13	battery (13-14)	WD-B battery pin	R2
14	battery		R1 (to 15r)
15	24 V on (15-17)	TVS 1	R1
16	24 V on		relay COM
17	24 V on	① red (14 AWG)	D36 VIN

TB2, RIGHT SIDE, I2C

Bridged in pairs. Bottom screw from the header, top to the board.

Block	Job	Bottom	Top
1	3.3 V (1-2)	header pin 1	IMU B VIN
2	3.3 V		AHT30 VIN
3	0 V (3-4)	header pin 9	IMU B GND
4	0 V		AHT30 GND
5	SDA (5-6)	header pin 3	IMU B SDA
6	SDA		AHT30 SDA
7	SCL (7-8)	header pin 5	IMU B SCL
8	SCL		AHT30 SCL

WIRE AND ENDS

① cores 14 AWG; 24 V and 5 V jumpers 16 AWG; logic 22 AWG; header leads on Dupont, cut ends ferruled. Ferrule on every core. One wire per screw. Labels at both ends. Every USB plug clamped within 2 in and staked. Drip loop below every hole. Nothing to the lightning copper.

OFF THE RAILS

Part	Wires
Relay H	COM ← 16r. NC → 4r. NO empty. DC+ ← 2r, DC– → 9r. IN ← WD-B relay pin. Trigger jumper: coil off with WD-B pulled out
Converter J	red in ← 5r. black → 7r. yellow 5 V out → the carrier's 5 V (16 AWG), return from 7l: how it enters, open
D36V6F5 I	VIN ← 17r. GND → 8r. VOUT → 1r. SHDN empty
WD-B F on G	5V ← 1l. GND → 8l. D2 ← ⑥ blue. A4 ← ⑥ white. A5 ← ⑥ green. D0 ← header 8, D1 → header 10. Relay pin → relay IN. Alive pin ← opto V2 (pull-up on in its program). Battery pin ← 13l
Opto K, ch 1	in + ← ⑤ signal core, in – ← ⑤ return core. V2 → WD-B alive pin. G → 10r
Diodes, resistors L	TVS 1: 15l to 12l. TVS 2: 5l to 6l. 5 V TVS: 3r to 6r. R1: 15r to 14r. R2: 13r to 12r. Legs short, sleeved
CAN HAT E	CAN_0 H, L, G ← ② white, blue, black. CAN_1 H, L, G ← ③ white, blue, black
Wing adapter R	CAN_H, CAN_L, GND ← ④ (colors open). USB lead → a carrier USB port
Pi B header	8 TXD → WD-B D0. 10 RXD ← WD-B D1. 6 GND → 11r. 4 5V → GPS VCC, 14 GND → GPS GND. GPS TXD → a Pi RX pin, RXD ← a Pi TX pin (pins not set). 1, 9, 3, 5 → TB2 1, 3, 5, 7
Plugs	CM5 on the carrier's two sockets; drive in M.2; HAT on the header. Q: Iridium B's USB plug in, Q into a carrier USB port. Patch cord: coupler ⑧ to the carrier's Ethernet. ⑨'s lead into GPS B's SMA

NEVER FIT

A bond stud, a vent, metal glands, a shielded network cable, a fuse in this box. Bus power from either CAN drop. Any wire to Pi A but the alive line. Iridium B's cable into Pi B without its isolator.

CABLES IN, BY GLAND

Gland	Cable	Cores
1	14/2 feed	red → 17l, black → 11l. Sealant in the PG11
2	control drop	white, blue, black → HAT CAN_0 H, L, G. Red, drain: cut back, taped
3	house drop	white, blue, black → CAN_1 H, L, G. Red (12 V), drain: cut back, taped
4	wing link	CAN H, CAN L, ground → R. Cable, join, terminator: open
5	alive (Micro-C)	signal, return → opto K. Two spares: not landed. Drain: never here
6	detector 6504FE	red 2l, black 10l, drain 9l; blue D2, white A4, green A5. Brown: cut flush
7	split gland	Iridium B's own cable, USB plug on, into isolator Q
8	RJ45 coupler	UTP only. Inside: patch cord to the carrier
9	SMA bulkhead	lead to GPS B. Ferrite outside, glued down

BEFORE WIRING

Fit check on arrival: the upright carrier, HAT and bracket under the lid (Compute Bay Plan 3.7). CM5 on the carrier, drive in, HAT on its standoffs, terminators OFF. Solder a 4-way screw block on the D36V6F5; header pins on IMU B and the AHT30. GPS B: read its pin order, then one 4-pin housing, zip-tied. Relay: set the trigger jumper so a pulled WD-B leaves the coil off. Assemble the whole plate on the bench.

OPEN

Where pump 2's two wires and the backup converter's remote pair enter (page 3). The 5 V TVS part. WD-B's relay, alive and battery pins; the divider values. Which Pi pins carry the two serial lines. WD-B's serial line to Pi B (both wires) runs through one HiLetgo 4-channel logic level converter board (on hand), 5 V side to WD-B, 3.3 V side to Pi B; where it sits in the box: at fit-out. How the 5 V gets into the carrier. Entry 4's cable, join and terminator.

BEFORE CLOSING

Pull WD-B out of its carrier: Pi B stays up (Compute Bay Plan 4.3). Desiccant in; grease on the gland inserts and the lid gasket.