WENDY LABS INC. · TECHNICAL SPECIFICATION

Wendy Box

Edge AI Vision Unit — Technical Reference

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The Wendy Box is a self-contained edge-AI vision unit for remote monitoring of critical infrastructure. It pairs a long-wave infrared thermal camera with a visible / near-infrared day-night camera, runs a vision-language model locally on an NVIDIA Jetson Orin Nano, and operates from either a portable USB-C PD battery or hardwired plant power inside a rugged sealed enclosure. This document is the public technical reference for engineers evaluating, integrating, or certifying the device.

DOCUMENT CONTROL

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00 Contents

01 Device Overview

The Wendy Box is a fixed perception node. Both cameras connect over USB to the Jetson Orin Nano, which performs inference on-device — the core detection workload does not depend on network connectivity. Results are transmitted over the selected network path, and the on-board NVMe SSD holds the operating system, model weights, and a rolling local buffer of imagery and event logs.

The unit ships in two power configurations that share a common DC input to the compute module: a portable USB-C Power Delivery battery build for demonstration and short-duration field use, and a hardwired plant-power build inside a rugged sealed enclosure for permanent installation.

CONFIGURATION AT A GLANCE

SUBSYSTEM	SELECTED COMPONENT
Thermal camera	TOPDON TC001 — 256×192 LWIR, USB-C
Day / night camera	Arducam 1080P Day/Night USB — 2 MP, auto IR-cut + IR LEDs
Compute	NVIDIA Jetson Orin Nano 8GB (Super Developer Kit)
Storage	Crucial P310 1TB — PCIe Gen4 NVMe M.2 2280
Power — portable	100 W USB-C PD battery, 20 V fixed PD trigger
Power — plant	Eaton ENP5151 inlet + MEAN WELL HDR-60-15 DIN-rail PSU
Connectivity — default	On-board Wi-Fi and Bluetooth (pair to phone)
Connectivity — LTE option	MikroTik KNOT LTE4 Global (EG25-G&KNe)
Enclosure — portable	Clear waterproof outdoor box, 8.7 × 6.7 × 4.3 in
Enclosure — plant	Pelican 1200 Protector case — IP67, crushproof

1.1 Signal and power flow

- **Imaging** Thermal camera → USB-C → Jetson; day/night camera → USB 2.0 → Jetson. Both enumerate as UVC devices.
- **Compute** Jetson Orin Nano runs the vision-language model and thermal analytics; the NVMe SSD sits on the M.2 Key-M (PCIe Gen4) slot.
- **Power** A single 20 V DC rail feeds the Jetson barrel input — from the USB-C PD battery (portable) or the DIN-rail supply fed by plant power (fixed).
- **Connectivity** On-board Wi-Fi / Bluetooth by default; an optional LTE gateway provides cellular backhaul over Gigabit Ethernet.

02 Imaging Subsystem — Cameras

The Wendy Box carries two co-located cameras with complementary spectral coverage: a long-wave infrared (thermal) sensor for temperature and heat-signature detection, and a visible / near-infrared day-and-night camera for scene context in all lighting conditions.

2.1 Thermal camera — TOPDON TC001

TOPDON TC001 · LONG-WAVE INFRARED (LWIR) THERMAL CAMERA	
Type	Uncooled LWIR microbolometer thermal imager
IR resolution	256 × 192 px (49,152 thermal pixels)
Spectral band	Long-wave infrared, approx. 8–14 µm
Frame rate	25 Hz
Temperature range	−20 °C to +550 °C (−4 °F to +1022 °F)
Thermal sensitivity	Resolves surface ΔT as small as 0.1 °C
Measurement accuracy	±2 °C or ±2 % of reading (greater applies)
Interface	USB-C, UVC-class thermal stream (plug-and-play)
Host support	Linux / Android / Windows (Jetson Linux here)
Role	Heat-signature & thermal-anomaly detection (hot spots, thermal runaway, leaks)

2.2 Day / night camera — Arducam 1080P Day & Night Vision USB

ARDUCAM 1080P DAY/NIGHT USB · VISIBLE + NEAR-IR CAMERA	
Type	Colour CMOS USB camera, auto IR-cut + on-board IR LEDs
Sensor	1/2.7" 2 MP CMOS (OV2710-class)
Resolution	1920 × 1080 (Full HD, 2 MP)
Frame rate / format	MJPEG ≤30 fps @ 1920×1080; YUY2 ≤30 fps @ 640×480
Day/night switching	Motorised IR-cut filter, photoresistor-triggered
IR illumination	Integrated 850 nm IR LEDs for zero-light operation
Lens	M12 mount; focus ~1 m to ∞; wide FOV (~95–100°)
Interface	USB 2.0, UVC-compliant (driver-free)
Host support	Windows / Linux / Android / macOS (Jetson Linux here)
Role	All-day visible context; feeds the vision-language model

2.3 Working distance and coverage

The cameras are specified for fixed standoff monitoring of an equipment area. Effective range is governed by lens field of view, target size, and — at night — IR illuminator reach.

PARAMETER	ARDUCAM (VISIBLE / NEAR-IR)	TOPDON TC001 (THERMAL)
Field of view	~95–100° wide angle	Narrow / standard LWIR FOV
Focus / standoff	~1 m to ∞ (fixed beyond ~1 m)	Near-field to long range (fixed)
Night operation	IR-cut opens + 850 nm LEDs light near field	Passive — unaffected by lighting
Primary use	Area/asset framing at ~1–10 m installs	Thermal detection across the framed scene

NOTE *Field-of-view and detection-range figures depend on the final lens variant and mounting geometry; values reflect manufacturer specifications for the selected models and should be confirmed against the as-built installation.*

03 Detection Abilities

The Wendy Box performs on-device inference combining both camera streams. The Jetson Orin Nano runs a vision-language model (VLM) together with thermal analytics on the TC001 stream.

3.1 Capabilities

- **Thermal anomaly detection** hot spots, abnormal heating, and thermal-runaway signatures across the −20 °C to +550 °C field, resolving differences down to 0.1 °C.
- **Day & night monitoring** continuous coverage via automatic IR-cut switching and integrated 850 nm illumination, giving usable imagery in full darkness.
- **Vision-language understanding** the VLM interprets the visible stream for object/state recognition and natural-language event description, executed locally on the 8 GB module.
- **Sensor fusion** co-registered thermal and visible views correlate a thermal event with its visual context.
- **Edge-first operation** core detection runs without network connectivity; connectivity is used for alerting, telemetry, and remote access.

3.2 Inference performance envelope

AI throughput	Up to 67 TOPS (INT8), Super profile — 40 TOPS baseline
Model class	Vision-language model + thermal analytics (8 GB memory budget)
Video decode	≤ 1× 4K60 / 5× 1080p60 / 11× 1080p30 (H.265)
Video encode	1080p30 (buffered capture / streaming)

04 Compute — NVIDIA Jetson Orin Nano 8GB

The compute core is the NVIDIA Jetson Orin Nano 8GB, deployed as the Super Developer Kit. The 8 GB variant is required to host the vision-language models used by the workload.

NVIDIA JETSON ORIN NANO 8GB · SUPER DEVELOPER KIT	
GPU	NVIDIA Ampere, 1024 CUDA cores + 32 Tensor cores
AI performance	67 TOPS (Super profile); 40 TOPS baseline
CPU	6-core Arm Cortex-A78AE v8.2, 1.5 MB L2 + 4 MB L3
Memory	8 GB 128-bit LPDDR5, 102 GB/s
Storage interface	M.2 Key-M (PCIe Gen4) NVMe; microSD slot
USB / camera	USB 3.2 Gen2 + USB 2.0 (hosts both cameras as UVC)
Networking	Gigabit Ethernet; on-board Wi-Fi + Bluetooth
Power input	DC barrel jack, 20 V nominal (5.5 × 2.5 mm)
Power modes	Configurable 7 W – 25 W profiles

05 Storage — Crucial P310 1TB NVMe

Non-volatile storage is provided by the Crucial P310 1TB (M.2 2280). It holds the OS, model weights, and a rolling buffer of imagery and event data.

CRUCIAL P310 1TB · CT1000P310SSD8	
Capacity	1 TB
Form factor	M.2 2280
Interface	PCIe Gen4 x4, NVMe
NAND	Micron 232-layer 3D QLC
Sequential read	Up to 7,100 MB/s
Sequential write	Up to 6,000 MB/s
Random performance	Up to 1.0 M IOPS read / 1.2 M IOPS write
Endurance (TBW)	Up to 220 TB written
MTTF	1.5 million hours
Warranty	Limited 5-year

06 Power Subsystem

The Wendy Box supports two power configurations sharing the same 20 V DC input to the Jetson. Configuration A (portable) is used for demonstrations and short-duration field trials; Configuration B (plant power) is the permanent hazardous-area installation.

6.1 Configuration A — Portable USB-C PD battery

CONFIGURATION A · PORTABLE (DEMO / FIELD)	
Source	100 W USB-C Power Delivery battery (20 V output capable)
Delivery cable	USB-C PD → 5.5 × 2.5 mm barrel; fixed 20 V PD trigger (short)
Output to Jetson	20 V DC nominal via barrel jack
Interconnect	USB-C to USB-C, 10 Gbps rated minimum (USB 3.2 Gen2)
Notes	Battery selected for compact size to minimise enclosure volume

6.2 Configuration B — Plant / hardwired power

For permanent installation the unit is fed from site power through an inlet plug and a DIN-rail power supply, both mounted inside the sealed Pelican enclosure.

CONFIGURATION B · PLANT POWER (PERMANENT INSTALL)	
Inlet / connector	Eaton ENP5151 plug, 115 V AC
Power supply	MEAN WELL HDR-60-15 — DIN-rail, ultra-slim, ~60 W class

Power cable	14 AWG, 3-conductor SOOW/SOW-A, 90 °C+, oil/weather/UV resistant
Distribution	Terminal blocks on internal DIN rail / mounting plate
Output to Jetson	Regulated DC to the Jetson input rail
Notes	DC-rail conditioning to the Jetson's 20 V nominal input to be confirmed at build

CERT *For Configuration B the AC inlet, internal wiring, terminals, and cable-gland arrangement are the primary items for electrical and hazardous-location review. Field connector type and plant-outlet standard are finalised with the site electrical authority.*

07 Connectivity Subsystem

Connectivity is selectable per site. By default the Wendy Box uses the Jetson's on-board Wi-Fi or Bluetooth — including Bluetooth pairing to a phone for local configuration and readout. For remote sites without local network access, an optional LTE gateway provides cellular backhaul.

7.1 Default — Wi-Fi / Bluetooth

Wi-Fi	On-board Jetson Wi-Fi (site wireless association)
Bluetooth	On-board Bluetooth — pair to a phone for setup / status / readout
Use case	Sites with existing wireless coverage or local phone-based operation

7.2 Option — LTE cellular gateway

Where cellular backhaul is required, a MikroTik KNOT LTE4 Global gateway is added and connects to the Jetson over Gigabit Ethernet.

MIKROTIK KNOT EMBEDDED LTE4 GLOBAL · EG25-G&KNe	
Class	Industrial LTE Cat 4 gateway, RouterOS v7 (L3), pre-licensed
Cellular throughput	LTE Cat 4 — up to 150 Mbps down / 50 Mbps up
LTE FDD bands	B1/2/3/4/5/7/8/12/13/18/19/20/25/26/28
LTE TDD bands	B38 / B39
SIM	Nano-SIM and eSIM
GNSS	GPS / Galileo / GLONASS / BeiDou / QZSS (active antenna)
Bluetooth	Bluetooth 5.1 with Long Range
Wired	1× Gigabit Ethernet, 802.3af/at PoE-in

7.2.1 Antenna and assembly

LTE antenna	L-Com HG63807U — 617–960 / 1710–3800 MHz, 6/7 dBi MIMO omni, Type-N female, polycarbonate radome
GPS antenna	Active GPS antenna
Mounting	Antennas on/outside enclosure; cabling passed through gland

08 Enclosure & Environmental

The enclosure varies with the power configuration. The portable build uses a clear waterproof outdoor box; the permanent build uses a rugged, sealed Pelican Protector case.

8.1 Portable enclosure

Type	Clear waterproof outdoor electrical box
Dimensions	8.7 × 6.7 × 4.3 in (221 × 170 × 109 mm)
Use	Demonstration and short-duration field deployment

8.2 Plant / permanent enclosure — Pelican 1200

PELICAN 1200 · PROTECTOR CASE	
Material	HPX high-impact copolymer, solid-wall construction
Exterior dimensions	10.62 × 9.68 × 4.87 in (270 × 246 × 124 mm)
Interior dimensions	9.25 × 7.12 × 4.12 in (235 × 181 × 105 mm)
Internal volume	0.16 ft³ (0.005 m³)
Weight	2.87 lb (1.3 kg) with foam
Ingress protection	IP67 — watertight & dustproof (O-ring seal)
Ruggedness	Crushproof; automatic purge valve for pressure equalisation
Closure	Double-throw latches; O-ring lid seal
Cable entry	Sealed bulkhead penetration / gland fitted to case wall
Internal mounting	Terminal blocks / components on DIN rail or mounting plate

CERT *The Pelican 1200 is an IP67-rated, watertight, crushproof case — it is NOT certified for explosive / hazardous atmospheres (ATEX / IECEx). Deployment in classified (hazardous) areas requires a separately certified Ex enclosure. Cable penetrations must be sealed to preserve the IP67 rating, and the internal heat load of the powered components must be assessed for the sealed volume.*

09 Integration & Compliance Checklist

Principal points for engineering, integration, and certification review of the Wendy Box.

AREA	ITEM TO VERIFY
Electrical	AC inlet (Eaton ENP5151, 115 V), internal wiring, terminal ratings, DC rail to Jetson
Power supply	MEAN WELL HDR-60-15 output vs Jetson 20 V input requirement; conditioning
Thermal	Internal heat load (Jetson 7–25 W + peripherals) vs sealed-enclosure dissipation
Enclosure / ingress	Pelican 1200 IP67 integrity, sealed cable penetrations, purge valve — note: not Ex/ATEX rated; classified areas require a certified Ex enclosure

AREA	ITEM TO VERIFY
Cabling	14 AWG SOOW rating, bulkhead gland sealing, strain relief, field connector standard
Cameras	USB cable retention, sealed pass-throughs, lens aperture / window sealing
RF (LTE option)	Antenna mounting, cable-entry sealing, regional carrier / band compliance
Storage / compute	M.2 SSD seating, thermal contact, secure mounting under vibration

10 References — Manufacturer Documentation

External datasheets and product pages for the components specified in this document.

COMPONENT	DOCUMENT
TOPDON TC001	topdon.us/products/tc001
Arducam 1080P Day/Night USB	arducam.com — product page
NVIDIA Jetson Orin Nano (dev kit)	nvidia.com — product page
NVIDIA Jetson Orin Nano (module)	Module datasheet DS-11105-001
Crucial P310 1TB	crucial.com — CT1000P310SSD8
MikroTik KNOT LTE4 Global	mikrotik.com — product page
MEAN WELL HDR-60	meanwell.com — HDR-60 series
Pelican 1200 Protector Case	pelican.com — 1200 product page