GCU FAMILY

LWV IR blaster (RS-485)

Wired IR control for mini-split air conditioners

The LWV IR blaster lets a GCU run a ductless mini-split air conditioner the way its handheld remote does. It is a Modbus RTU device on the GCU's RS-485 bus, takes its power from the same 4-wire cable and sends Carrier, Samsung or Midea infrared frames from eight 940 nm emitters. One blaster is aimed at each indoor unit, and each one also reports the light level and its own case temperature.



Rev C, rendered from the design.

12–24 V DC
supply, on the bus cable

RS-485
Modbus RTU, 19 200 baud

3
IR protocols: Carrier, Samsung, Midea

8 × 940 nm
IR emitters under a clear lid

FEATURES

One blaster per mini-split

Each blaster is aimed at one indoor unit and controls only that unit. A room with two mini-splits takes two blasters, front and back, set apart by Modbus address (41 and 42).

One cable, no Wi-Fi

Power and Modbus RTU arrive on one 4-wire M12 cable from the GCU's RS-485 bus, so there is no network to join. The BUS OUT connector passes the bus on to the next blaster.

Carrier, Samsung and Midea codes

Every command sends the full state: power, mode, setpoint (16–30 °C), fan speed, swing and quiet. The GCU sets the protocol for each blaster.

Light and temperature on board

A VEML7700 light sensor reports lux and a lights-on flag, and a digital sensor reports the case temperature. The GCU adds both readings to its own sensor list.

Sealed case, clear window

The emitters and the light sensor sit 3.5 mm (0.14 in) under a 3 mm (0.12 in) clear polycarbonate lid. A foam gasket, four corner screws and an ePTFE breather seal the printed ASA base.

Firmware updates over RS-485

The GCU loads new firmware into the blaster over the bus, so the case stays closed. Each block and the whole image are CRC-checked, and a power cut during the swap is recovered at the next start.

SPECIFICATIONS

Power

Supply	12–24 V DC nominal, 10–30 V DC design range, on the bus cable
Input protection	1.5 A resettable fuse, reverse-polarity protection, 36 V TVS
Internal supply	5 V buck regulator, 2 A
IR pulse current	≈ 0.9 A on the 5 V rail (8 emitters at ≈ 110 mA each)
Consumption	To be confirmed

RS-485 and Modbus

Interface	RS-485 half duplex (THVD2450 transceiver), SM712 TVS on A and B
Termination	120 Ω, slide switch on the board
Protocol	Modbus RTU slave; function codes 03, 04, 06 and 16
Serial format	19 200 baud, 8N1
Address	41 by default; set at commissioning (odd front, even back), kept through power cycles
Register map	identity 0–6, HVAC state 20–25, command 30–31, result 40–43, light 50–56, temperature 60–63, update 70–115
Handshake	transaction ID echoed in register 40 once the IR frame is sent; status and error in 41–42

Infrared

Emitters	8 × 940 nm SMD (3030), 45° each, 4 × 2 array
Carrier	38 kHz
Protocols	Carrier AC 64-bit, Samsung AC (21-byte), Midea AC (48-bit)
State sent	power, mode, setpoint, fan speed, swing, quiet
Modes	auto, cool, heat, dry, fan
Fan speeds	auto, low, medium, high, turbo
Setpoint	16–30 °C (61–86 °F); Midea 17–30 °C (63–86 °F)
Feedback	none: infrared is one-way; the GCU shows the last state sent
Range	To be confirmed

Sensors

Light	VEML7700 behind the lid: lux and a lights-on flag (20 lux or more)
Light range	To be confirmed
Temperature	TMP102, ±2 °C max, in the first build (in place of the TMP112, ±0.5 °C max); reads case temperature
Reported as	lux; °C × 10, signed

Processor and firmware

Processor	Seeed XIAO RP2350, socketed on the main board
Firmware	LWV IR blaster firmware 1.0.6 (Pico SDK, C)
Updates	over RS-485 (registers 70–115), CRC16 per block and per image; UF2 over USB-C, board out of the case

Enclosure

Size	83 × 70.1 × 39 mm (3.27 × 2.76 × 1.54 in); 101 mm (3.98 in) across the ears
Case	black ASA base, printed by LWV; M3 brass heat-set inserts
Lid	3 mm (0.12 in) clear polycarbonate, vapour-polished: the IR and light-sensor window
Seal	closed-cell silicone foam gasket in a groove; four M3 corner screws with sealing washers
Vent	M12 × 1.5 ePTFE breather
Ingress protection	IP65 (design target)
Operating temperature	To be confirmed
Weight	To be confirmed
Boards	main 56 × 48 mm (2.20 × 1.89 in), connector card 54 × 17 mm (2.13 × 0.67 in), factory-assembled

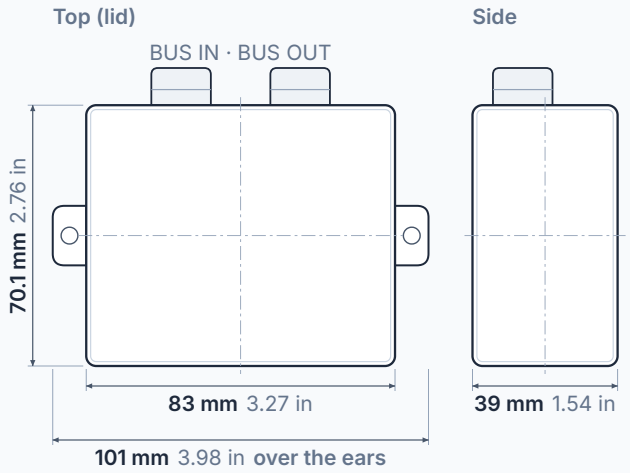
CONNECTORS

PORT	TYPE	USE
BUS IN	M12 A-coded, 4-pin, female	from the GCU or the blaster before: 1 VIN+ (brown), 2 A (white), 3 GND (blue), 4 B (black)
BUS OUT	M12 A-coded, 4-pin, male	to the next blaster; wired in parallel with BUS IN
VENT	M12 × 1.5 ePTFE breather	pressure equalisation; not a cable entry
USB-C (inside)	on the XIAO module	bench flashing and setup only, board out of the case

STATUS LIGHTS

LIGHT	MEANING
PWR	green: the internal 5 V supply is up (hard-wired)
STATUS	RGB, planned for a firmware release after 1.0.6: blue flash per IR send; off or a dim green heartbeat when idle; amber: no Modbus traffic for a while; red: sensor or update fault

DIMENSIONS



Weight	To be confirmed
Mounting	Two external ears with Ø 4.5 mm (0.18 in) holes, 92 mm (3.62 in) apart centre to centre, for #8 or M4 pan-head screws or cable ties. Mount it with the lid facing the mini-split's IR receiver.

WORKS WITH

- LWV GCU, as the Modbus master: two blasters per GCU as standard (address 41 front, 42 back)
- GCU Cloud: power, mode, fan and setpoint per air conditioner, and the day/night temperature profile
- Ductless mini-split indoor units with Carrier AC 64-bit, Samsung AC or Midea AC infrared remotes
- LWV CS-1 canopy sensor, on the same M12 bus
- 4-pin A-coded M12 bus cables

ORDERING

PART	DESCRIPTION
IR blaster	IR blaster (RS-485), Rev C: board, printed case with clear lid, BUS IN and BUS OUT M12 connectors; commissioned as front (address 41) or back (address 42). Ordering code to be confirmed.

1 Figures come from the design files and may change without notice.

2 IR range through the lid has not been measured yet.

3 The temperature sensor sits inside the sealed case and reads case temperature, not room air: use it as a backup or trend reading. Lux is approximate and read through the lid; it is not a PAR or PPFD measurement.

4 Carrier AC 64-bit has heat, cool and fan modes only: Auto and Dry are sent as Cool, and Turbo fan as High.

5 Firmware images are checked with CRC16, not cryptographically signed: keep the RS-485 bus to trusted equipment.