

The one-page recall sheet

Three paths: power → protection/regulation → loads; microphone → conversion/processing → network and back → amplifier/speaker; button → firmware event → service → confirmed outcome.

Three instruments: DMM = levels/continuity; scope = waveform/time; logic analyzer = digital transactions. Voltage in parallel; current in series. Resistance/continuity unpowered. Verify scope ground; never lift protective earth.

Power: $V = IR$; $P = VI$; LDO heat $\approx$ voltage drop $\times$ current; battery energy $\approx$ nominal volts $\times$ amp-hours. Measure load transients, not just idle.

Interfaces: GPIO controls; I²C configures; I²S carries audio; SPI carries fast peripheral data; UART gives serial logs; SWD/JTAG supports debug on compatible chips.

Audio: ADC in, DAC out, amplifier drives the load. Codec IC $\neq$ compression codec. Check ports/seals, gain, clipping, clocks and routing. AEC handles playback leakage; AGC cannot undo clipping. Auracast does not imply microphone return.

Bring-up: drawings/revision → inspect → unpowered checks → current-limited correct supply → rails/reset/clock → known firmware → individual functions → combined load → record evidence.

Production: PCB $\neq$ PCBA. DFM/DFA/DFT = manufacture/assembly/test. EVT = engineering; DVT = design requirements; PVT = repeatable production. AOI $\neq$ complete functional coverage. FPY excludes repaired passes. Control alternates and revisions.

Answer pattern: clarify → isolate → measure → interpret → verify. Name the first measurement. Separate demonstrated experience from refreshed theory. Ask who owns schematic/layout, firmware, acoustics and RF.