



Product Introduction Manual

IPX1023 Full-Duplex Intercom PCBA

Neural Noise Reduction Anti-Howling 50–100m Differential Transmission

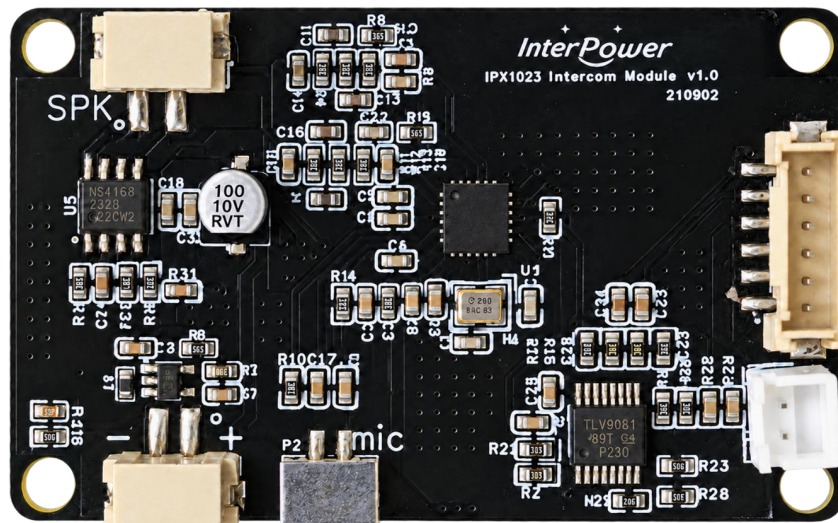


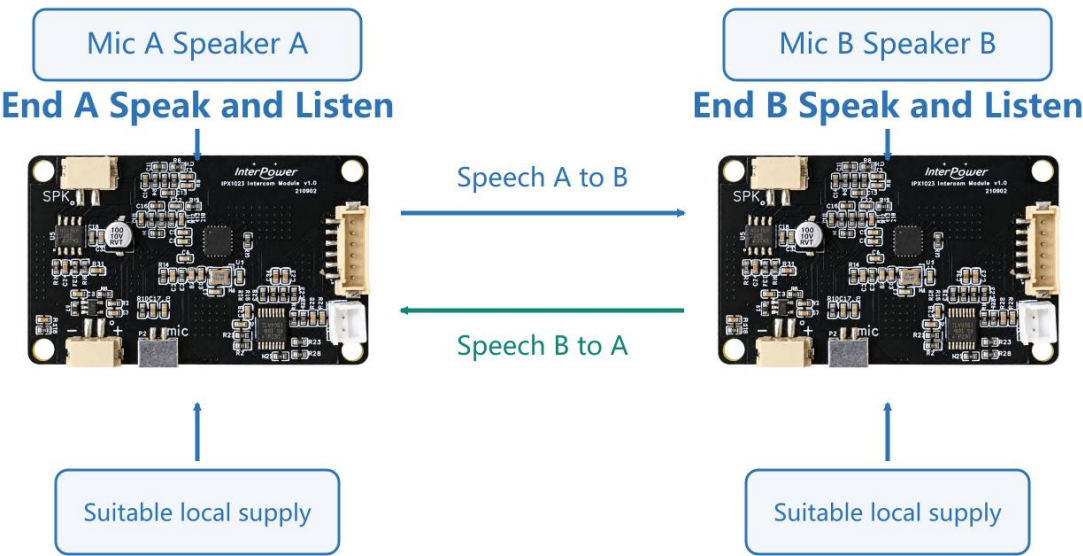
Figure 1 IPX1023 Full-Duplex Intercom PCBA Module

Two modules form a bidirectional wired intercom. This illustrated manual explains operation, interconnection and prototype testing, from short-cable voice checks to 50–100m link validation.

Version V1.1 Illustrated Connection and Test Guide InterPower

1 Building a Two-Module Intercom

Each end, A and B, has one module, microphone and speaker. Sound captured at A plays at B, and sound captured at B plays at A. Both directions can operate simultaneously.



Microphone and speaker at each end; both directions operate simultaneously

Figure 2 Two-Module System and Bidirectional Audio

Before You Start

Item	Quantity and Requirements
IPX1023 PCBA	2 boards with compatible hardware and firmware
Microphones and speakers	One set per end; select types and loads to match the board specification
Power and interconnect	Suitable supplies and dedicated harnesses for the current board
Test equipment	Multimeter, current-limited supply, recorder and noise playback device

2 Identifying Board Connections

The photograph marks identifiable connection areas. Before wiring, check the delivered hardware revision, interface drawing and harness orientation.

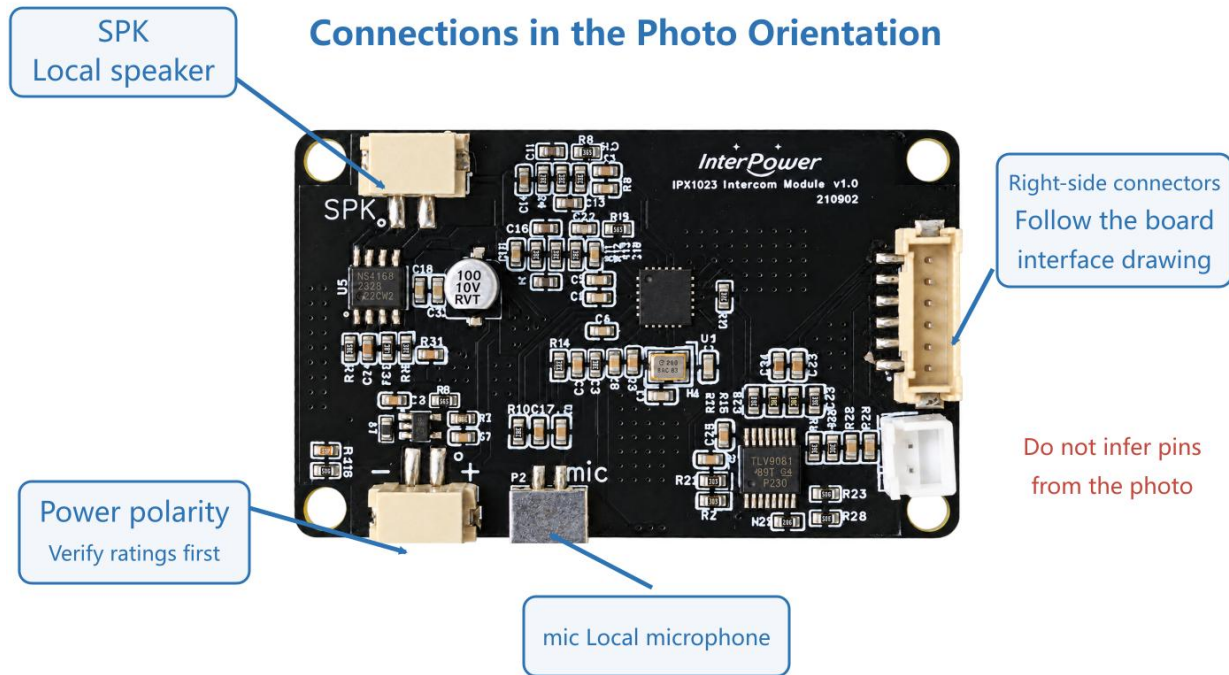


Figure 3 Front-Side Connection Locations

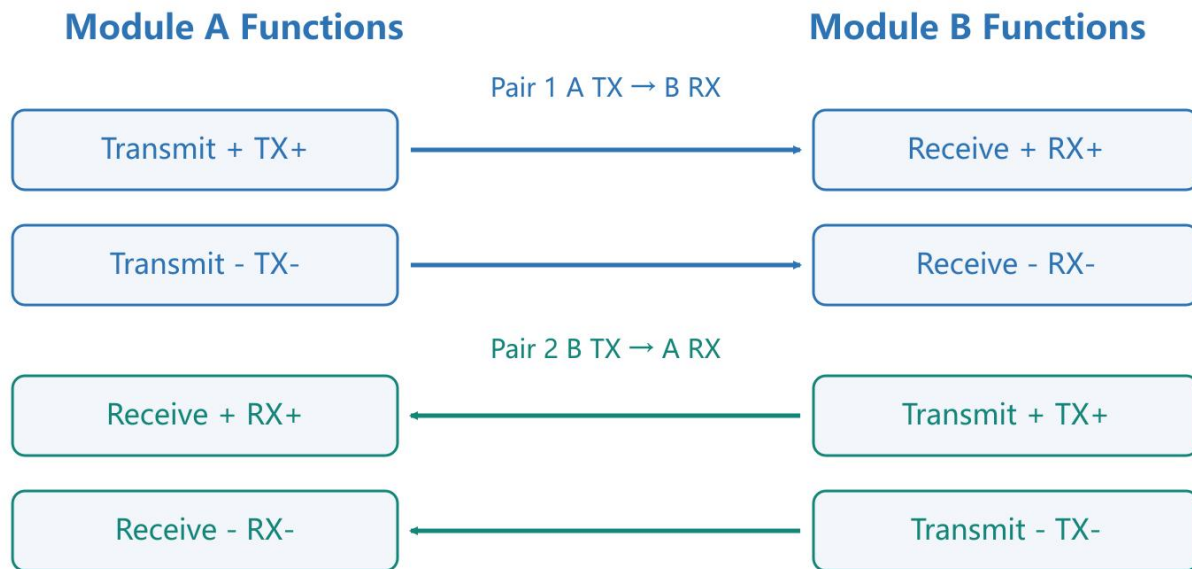
Confirm Before Power-On

Check	What to Confirm
Power	Rated input voltage, current capacity and polarity
Audio components	Microphone type and polarity; speaker impedance and power
Right-side connectors	Interface purpose, pin numbers, signal directions and reference ground
Mechanical insulation	Mounting hardware must not short traces; fully seat all plugs

The photograph is not a pinout. Do not treat an unidentified connector as USB, Ethernet or a general-purpose RS-485 interface.

3 Connecting the Two Modules

Follow the matching wiring drawing to connect each transmitter to the receiver at the other end. The model below explains differential audio directions. TX/RX are functional labels, not board markings or pin numbers.



Functional differential audio model only — not a connector pinout

Follow the current board drawing for reference ground, shielding and power

Figure 4 Functional Model of the Differential Audio Interconnect

Wiring Sequence

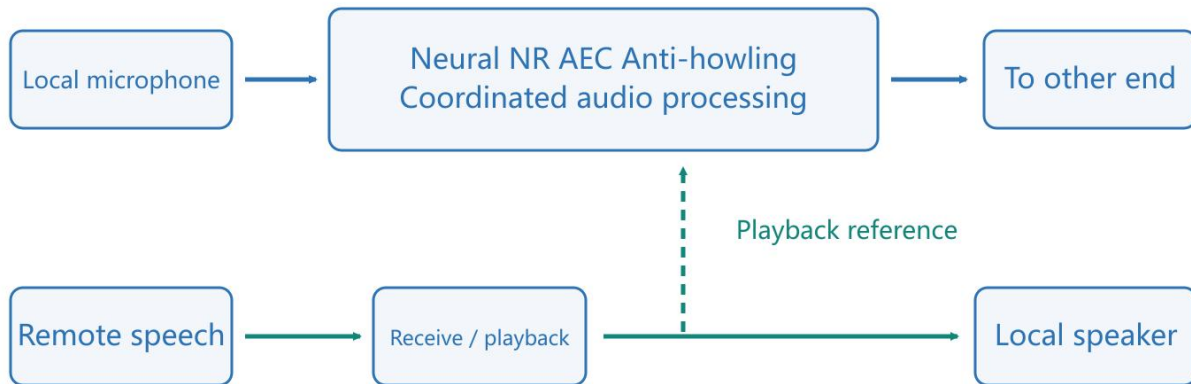
1. With both ends powered off, connect each local microphone, speaker and power lead.
2. Connect the ends using a dedicated harness with a verified pinout. Keep each differential pair together and match signal polarity.
3. Follow the board drawing for reference ground, shielding and power wiring. Check continuity and shorts with a multimeter before applying power.

The model does not specify conductor count, connector pin count or power topology. Use the current board pin-to-pin drawing when making a harness.

4 How the Module Processes Audio

Each end has capture and playback paths. Local speech is processed and sent to the other end; remote speech plays through the local speaker.

Each Module Captures and Plays Audio Simultaneously



NR reduces ambient noise; AEC targets echo; anti-howling limits feedback risk

Functional view only; not a fixed internal algorithm sequence

Figure 5 Algorithms and Audio Capture Playback Paths

Capability	Problem Addressed	Evaluation Focus
Neural noise reduction	Ambient noise masks speech	Preserve speech and word endings; reduce background interference
Acoustic echo cancellation	Playback is picked up and sent back	Check for audible repetitions of the talker's own voice
Anti-howling	Feedback causes a sustained high-pitched tone	Feedback stability at the intended volume and in the enclosure
Full duplex	Two-way simultaneous conversation	Speech continuity at both ends during double-talk

Results depend on microphones, speakers, gain and enclosure. Resolve overload, reversed connections and mechanical resonance before tuning algorithms.

5 Testing the First Conversation

Use a short cable and low volume for the three checks below. Separate ends A and B so direct sound between the testers is not mistaken for a working audio link.

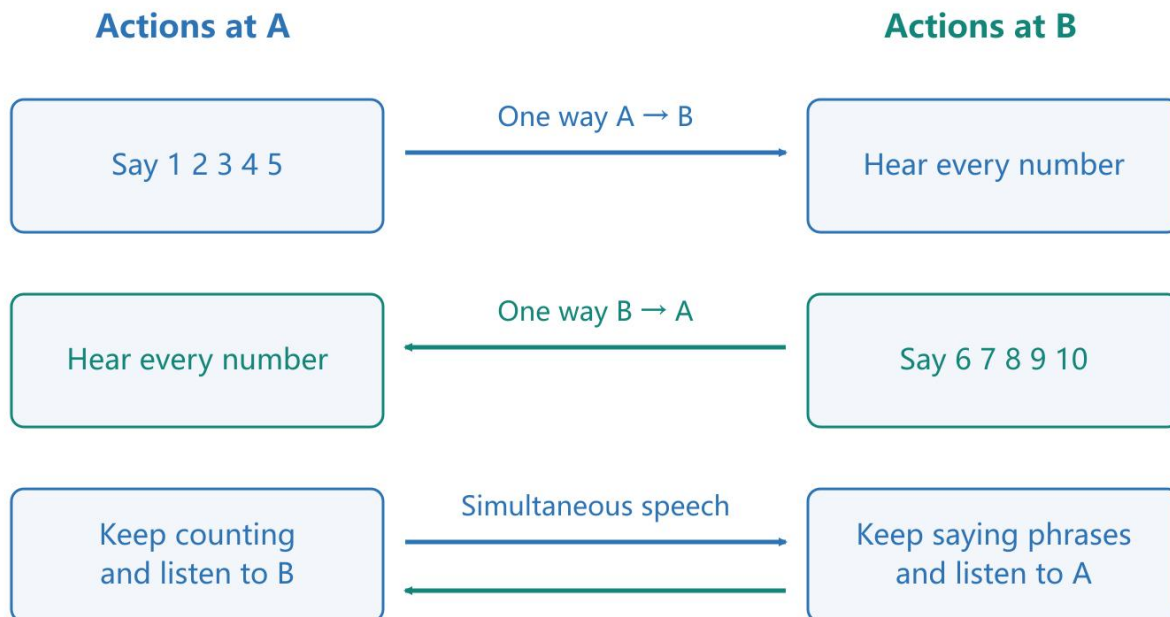


Figure 6 One-Way Listening and Full-Duplex Double-Talk Tests

Pass Criteria

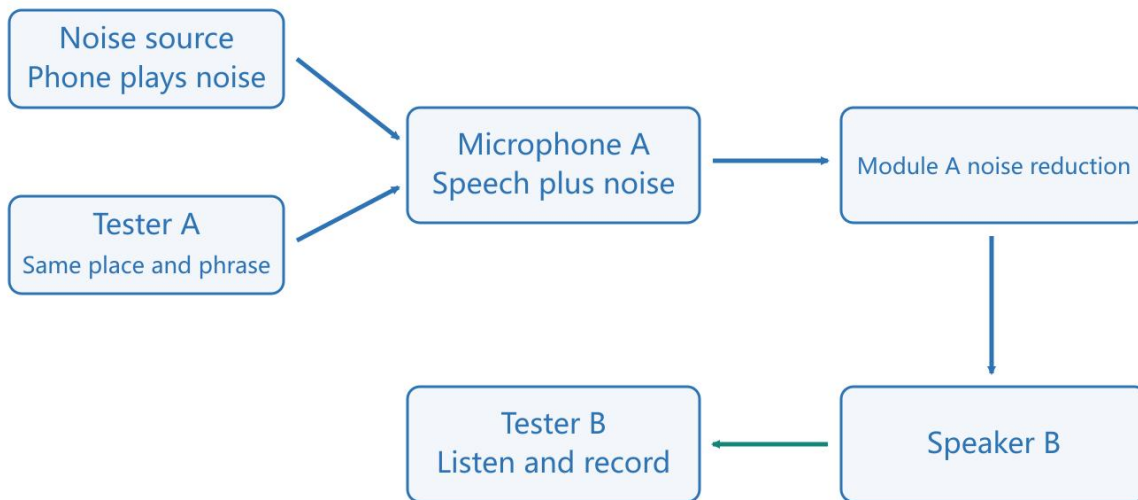
All spoken numbers must be clear in both directions. During simultaneous speech, both parties should hear each other rather than take turns. Also check interruptions, quiet speech and word endings for clipping or prolonged muting.

Recommended Evidence

Keep volume and speaking distance fixed and record both ends. Log hardware revision, firmware and volume settings so the test can be repeated after component changes.

6 Demonstrating Noise Reduction

Place a repeatable noise source at A and listen to A's speech at B. Record a quiet baseline, then play fan or traffic noise without changing the speaking position.



Fix speaking distance, noise level and mic gain; change one variable at a time

Compare noise on/off; also compare NR on/off if the firmware supports it

Figure 7 Noise at One End and Listening at the Other

Test Condition	What to Observe
Noise playing, no speech	Whether background sound significantly disrupts listening
Speech with noise playing	Complete numbers, keywords and word endings; natural voice quality
If firmware has a noise-reduction switch	Compare enabled and disabled recordings with identical input and gain

Switching the noise source on/off checks performance in noise; it does not alone measure noise-reduction gain. Do not mistake a volume change for algorithm performance or report unmeasured reduction in dB.

7 Checking Echo and Anti-Howling

Echo and howling involve acoustic feedback but sound different. Echo repeats your voice; howling is a sustained high-pitched tone. Check both algorithm behavior and microphone/speaker placement.

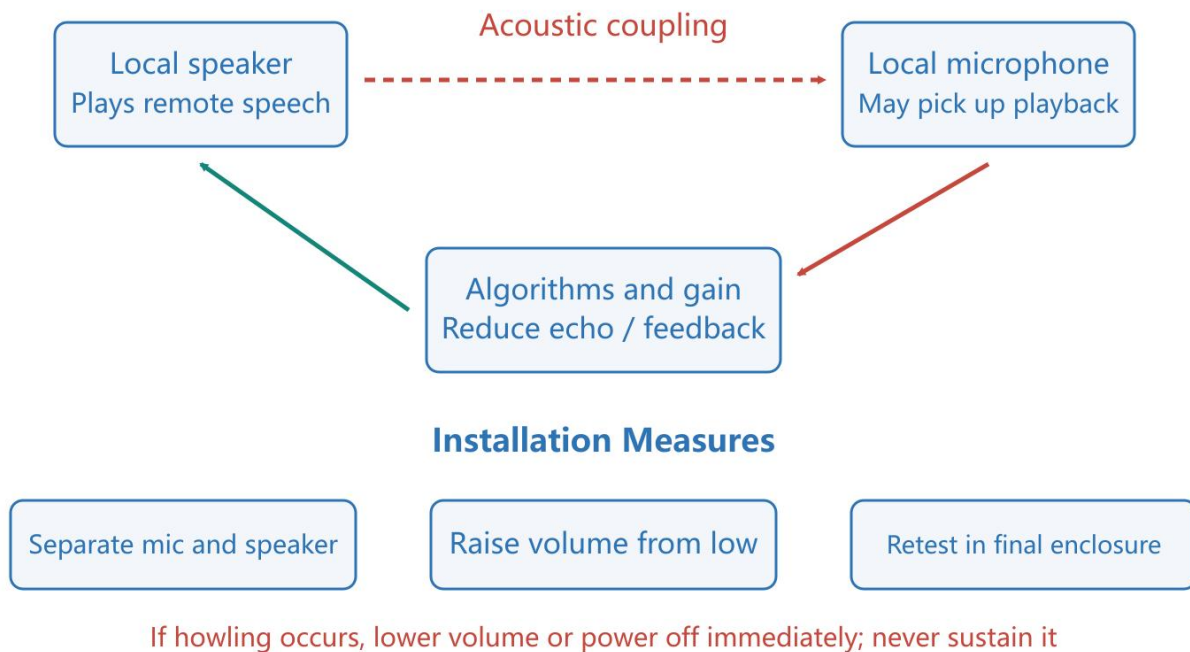


Figure 8 Acoustic Feedback and Its Suppression

Echo Check

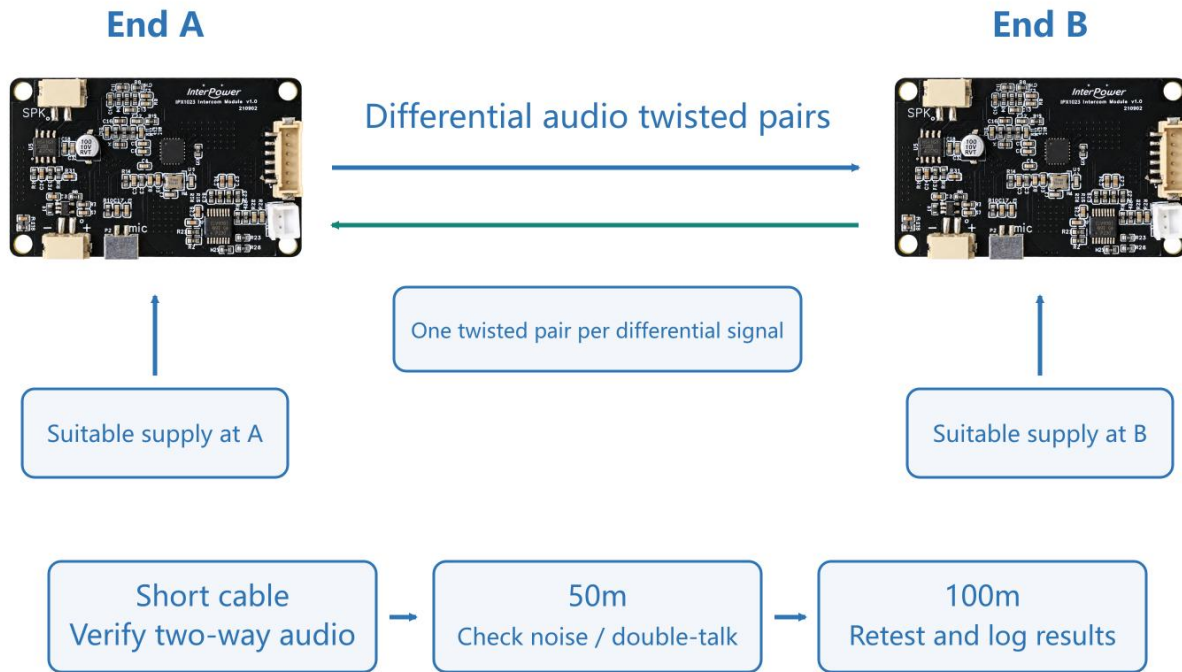
Speak at A while B stays quiet and its speaker plays normally. At A, listen for your own voice being returned. Swap directions, then add double-talk.

Anti-Howling Check

With the final enclosure, raise volume gradually from low to the target level. If a high-pitched tone occurs, lower volume or power off immediately. Check port placement, isolation, mounting and gain before retrying. Do not listen with the speaker close to your ear.

8 Validating the 50 to 100m Link

After passing with a short cable, test 50m and then 100m. Keep components, firmware and volume unchanged. Record cable specification and actual length.



Signal range is not power-delivery range; verify both supplies and reference ground

Figure 9 Long Differential Audio Link and Power at Both Ends

Check at Every Length	Record
Basic audio and double-talk	Complete two-way audio without obvious dropouts, distortion or added noise
Power and stability	Board voltage during playback; resets or abnormal heating
On-site interference	Noise floor and conversation quality while nearby equipment runs

The 50–100m audio-link target must be validated with the intended cable, grounding and site conditions. Power at both ends still requires a verified ground-potential and reference-ground arrangement; do not connect arbitrary supplies together based on this diagram.

9 Power-On and Bring-Up Sequence

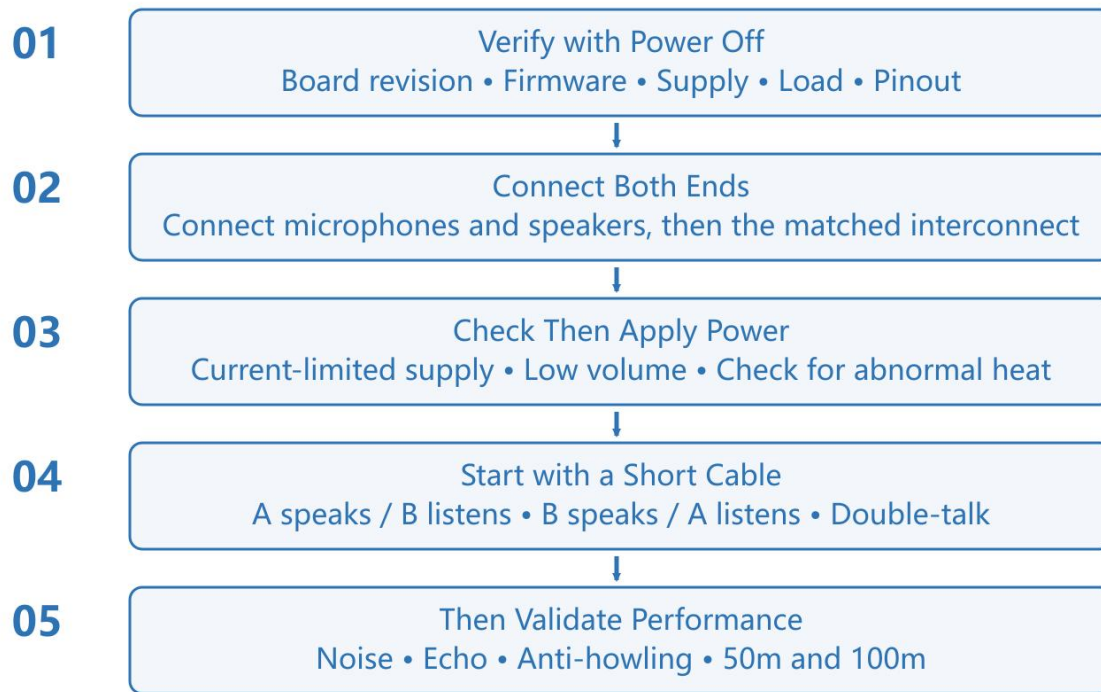


Figure 10 From Power-Off Wiring to Long-Cable Validation

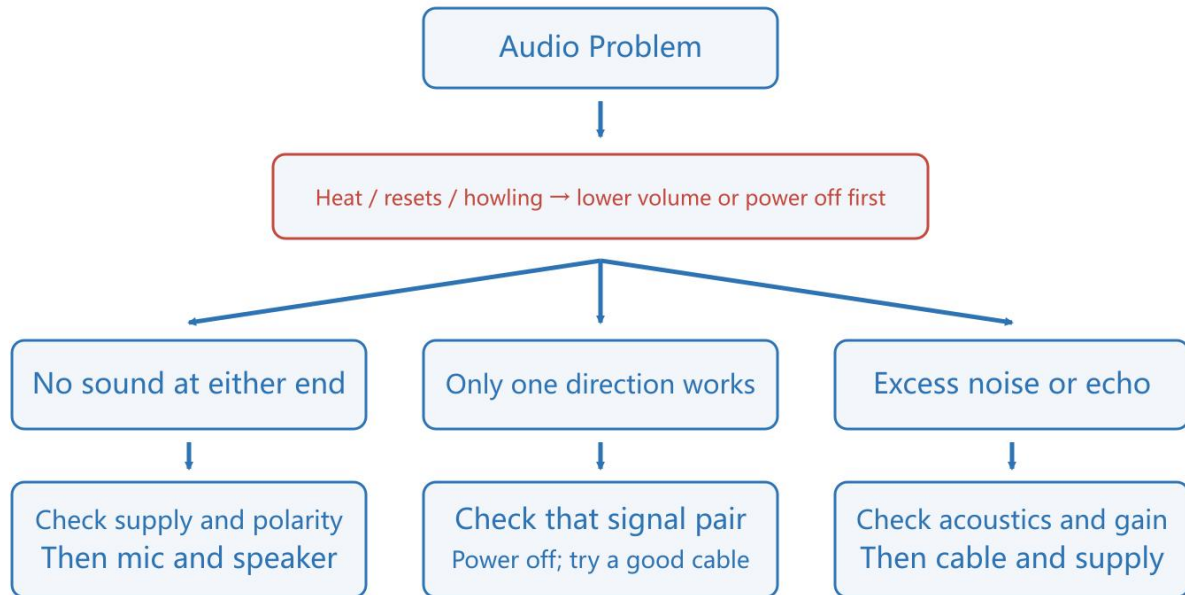
When to Proceed

Proceed only after the previous step passes. Power off immediately if there are signs of a short, abnormal heat, odor or repeated resets. Change wiring, replace components and plug or unplug harnesses only with power off.

Establish a Repeatable Baseline

Record both hardware and firmware versions, power supplies, audio components, harness pinout, cable type, length and volume. Use this proven configuration as the baseline for later tests.

10 Troubleshooting Audio Problems



Change one component or setting at a time; retest both directions

Figure 11 Two-Module Troubleshooting Flow

Symptom	Next Action
Works after replacing the harness	Recheck the original pinout, seating and differential-pair integrity
Fault follows a swapped component	Focus on the exchanged component, harness or board
Short cable works; long cable fails	Check cable, reference ground, interference and board power
More echo or howling after enclosure assembly	Check acoustic ports, isolation, resonance and target volume

11 Test Record and Acceptance

Use this record for prototype bring-up. Both project parties should agree acceptance criteria; one bench listening test is not a production-release conclusion.

Prototype Configuration

Item	Record
Date and tester	_____
A and B revisions	Hardware: _____ Firmware: _____
Power and volume	Supply: _____ Volume: _____
Audio components	Microphone: _____ Speaker: _____
Cable and environment	Cable: _____ Site: _____

Functional Results

Test	Result and Symptoms	Recording or Log ID
A speaks, B listens	_____	_____
B speaks, A listens	_____	_____
Simultaneous speech	_____	_____
Speech in noise	_____	_____
Echo / feedback stability	_____	_____
50m link	_____	_____
100m link	_____	_____

Conclusion and open issues: _____

Single configuration change for next test: _____

12 Contacts and Supporting Documents

Technical and Business Contact

Contact InterPower for samples, pinouts, harness definitions, algorithm settings or system integration support.

WhatsApp

+86 138 2963 2935

WeChat: Scan the QR code on the right

Website: <https://interpower-pcba.com/>



WeChat QR Code

Documents Required for Wiring

Document	Purpose
Current PCBA electrical specification	Confirm supply, audio components and interface levels
Pin-to-pin and harness drawings	Confirm connector orientation, TX/RX pairs, ground and shielding
Hardware and firmware revision records	Confirm compatible configurations and repeatable tests

Use Notice

This manual supports product understanding and prototype evaluation. Functional diagrams do not replace the current board schematic, pinout or installation drawing. Delivery is governed by the agreed specifications and samples.

Validate noise reduction, anti-howling, echo and long-cable operation using the final components, enclosure, power and wiring. A bare board is not a finished system with environmental protection or reliability certification.

Document Revision

V1.1 Added two-module connection, audio processing and test diagrams; shortened repetitive text and added a bring-up record.