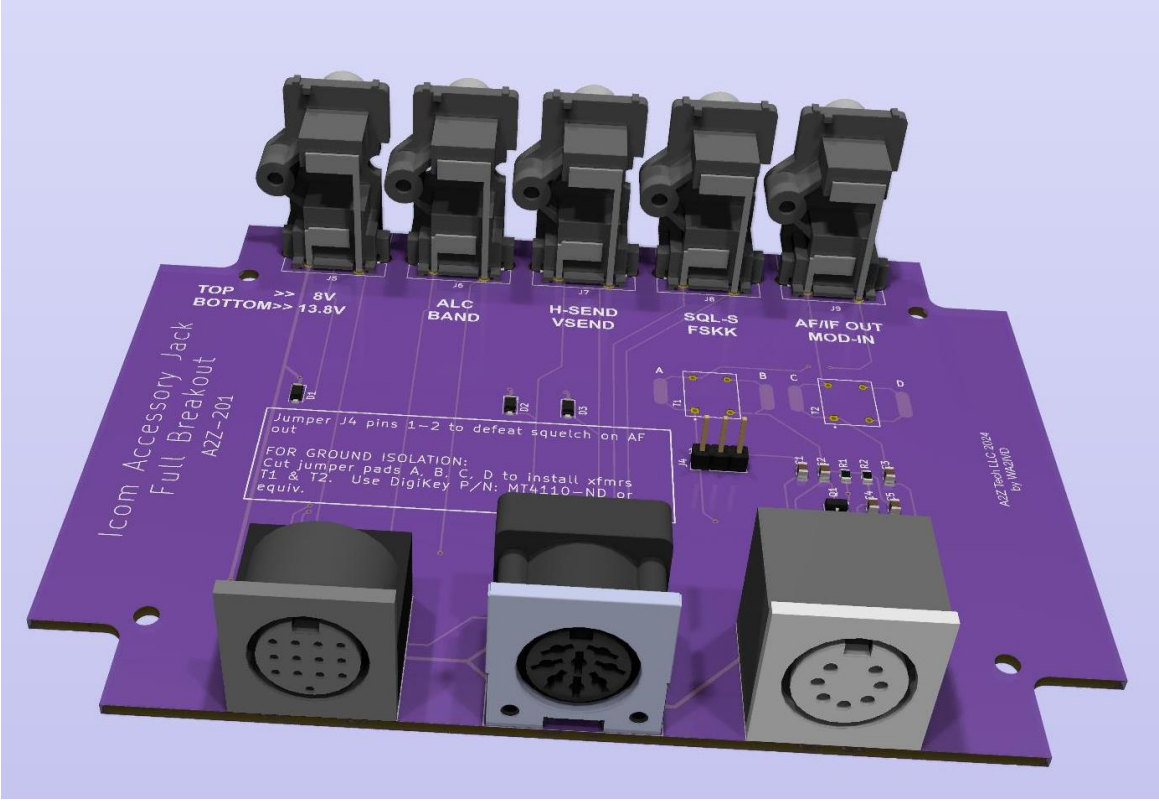
Icom Radio Accessory Connector Breakout Board

A2Z Tech LLC 2024

A2Z-201



https://store.a-2-z.tech/

Overview

The Icom Accessory Connector Breakout Board (IACBB) breaks out all of the documented signals for Icom radios that have either a single 13 pin Accessory Connector or dual 7 pin and 8 pin accessory connectors. A list of known compatible radios is shown in Table 1. There may be other compatible models. Appropriate male-to-male 7, 8, or 13 pin DIN cables are required to connect the breakout board to a radio.

The basic circuit is very simple. Each signal is just routed from the appropriate Din connector pins to an RCA jack. Some additional DC isolation provisions are provided for the audio signals and some protection is added to signals that might have relays connected.

The 7 pin and 8 pin connectors carry the same signals as the 13 pin connector. The 7 and 8 pin connectors are typically found on larger format radios with more rear panel space. The single 13 pin connector is used on more compact radios with limited rear panel space.

The IACBB includes provisions for adding 600 ohm isolation transformers to completely ground isolate that MOD-IN and AF OUT audio signals.

Some Icom models do not apply squelch to the audio coming out of the Accessory connector. The IACBB includes a circuit to mute the audio output based on squelch status. This is useful when using a mixer and external speakers for long term monitoring of a channel for activity.

The HSEND, VSEND and 13.8 volt signals include 100V 1A Schottky diodes to protect the radio if relays are connected directly to these outputs.

OPC-599 Functionality

All signals are connected between the 13 pin, 7 pin, and 8 pin connectors on the circuit board. This means that the IACBB replaces the functionality of the Icom OPC-599 adapter cable when it is connected to a radio with a 13 pin Accessory Connector. This allows you to use accessories compatible with Icom 7 and 8 pin connectors through the IACBB. All the signals are also available at the RCA jacks. However, when using the 7 or 8-pin Din connectors for Icom-compatible accessories, you must be sure that any additional use of signals at the RCA jacks doesn't interfere with the other accessory.

CAUTION:

Never connect more than 1 radio to the DIN connectors on the IACBB. You may damage one or both radios.

Output Connectors

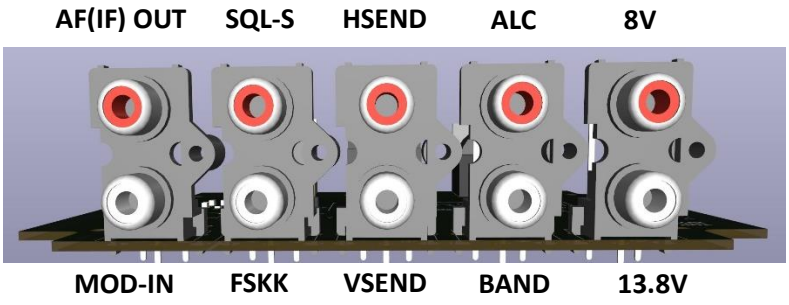


Table 1 Known Compatible Icom Radios

Radio	Connector	Notes
IC-703	13-pin	
IC-706 + mkiig	13-pin	Hsend + Vsend
IC-718	13-pin	
IC-746	7-pin, 8-pin	
IC-756 & 756PRO	7-pin, 8-pin	
IC-756PRO +II+III	7-pin, 8-pin	
IC-775	7-pin, 8-pin	
IC-775DSP	7-pin, 8-pin	
IC-7000	13-pin	Hsend + Vsend
IC-7100	13-pin	Hsend + Vsend
IC-7200	13-pin	
IC-7300	13-pin	
IC-7410	13-pin	
IC-7600	7-pin, 8-pin	
IC-7610	7-pin, 8-pin	
IC-7700	7-pin, 8-pin	
IC-7800	7-pin, 8-pin	
IC-7850	7-pin, 8-pin	
IC-7851	7-pin, 8-pin	
IC-9700	8-pin only	

DIN Cables

You will need to purchase or make male-to-male DIN cables to connect the ICABB to your radio. You will need either a 13 pin DIN cable or both 7 and 8 pin DIN cables depending on which Icom radio you have. If you have a radio with 7 and 8 pin Accessory connectors, you do not have to use both cables if you only intend to use signals that are all on one connector or the other.

A2Z Tech is looking to source DIN cables in the online store. However, at the time this manual is being written, Summer 2024, we have been unable to locate a wholesale source of quality, bulk cables that can be sold at a reasonable price.

Suitable 7 and 8 pin DIN cables are readily available from multiple online sources including Amazon, Ebay and others.

13 Pin DIN Cable Considerations

A2Z Tech has purchased a number of different 13 pin DIN cables for testing.

Some of the 13 pin cables purchased have been found to have pin 13 connected to the connector shield, rather than being a separate conductor. Pin 13 is the Squelch signal. When this pin is grounded, it defeats that audio mute circuit on the ICABB. All other signals in these cables are unaffected. If you do not require the audio mute functionality for your project, then these cables are fine to use. If you need the audio mute function, then you must be sure to get a cable with pin 13 wired separately.

The following cable types are known to have all 13 pins wired separately from the shield:

- Cables labeled as Icom AT-180 Tuner data cables
- Cables labeled as compatible with Roland Guitar Synthesizer

If you require the Squelch signal or audio mute functionality, it is recommended that you avoid cables that do not specifically state one of the above compatibilities.

Signal Descriptions

13.8 V

Power is provided to this pin when the radio is powered on. Current is limited to approximately 1 amp. Using more current will result in blowing an internal fuse in the radio and/or possibly damaging the radio.

This signal can be used directly for low-power accessories, such as meter backlights in external RF wattmeters or SWR meters.

It can be used with external relays to have any number of DC or AC-powered accessories automatically power on and off with the radio. Some examples include linear amplifiers, rotator controllers or automatic antenna switches that connect antennas when the radio is powered on.

Although not strictly necessary, a 100V, 1A, reverse Schottky diode is included on the interface to provide additional protection to the radio if an external relay is connected directly to the phono jack.

8V

This is a bias voltage supplied by the radio. It is current limited to approximately 10ma.

ALC

This is the Automatic Limiter Control input from an external amplifier. This signal is expected to be between (-)4 and zero volts. This is a duplicate of the signal on the ALC jack for radios equipped with a separate ALC connector.

BAND

This is a variable output voltage from the radio that changes based on the current operating band. It can be used to control the band setting on an external amplifier or to control an automatic antenna switch. Below are the typical output voltages.

BAND	VOLTAGE
30m	0V
6m	1.5V
10m & 12m	2.5V
15m & 17m	3.5V
20m	4.5V
40m	5.5V
80m	6.5V
160m	7.5V

NOTE: For radios that include VHF/UHF capability, there are no defined BAND voltage outputs for VHF/UHF frequencies.

VSEND

This signal only exists on radio models that include HF and VHF/UHF capabilities. See (H)SEND signal description for operation details.

NOTE: The default is for this signal to operate only when the radio is on a VHF/UHF band, typically 2 meters or 70 cm. Some Icom models include Menu setting options to select which band(s) this signal is active on. Refer to the radio instruction manual for more details.

(H)SEND

On HF only or HF and 6-meter radios, this signal is labeled SEND. On radios with both HF and VHF/UHF capability, this signal is labeled HSEND.

This signal can be used as both an Input and Output. When the radio is put into transmit (by microphone PTT, for example), this signal is pulled to ground by the radio. In this mode, the signal can key an external amplifier or an automatic antenna switch for separate receive and transmit antennas.

The ICABB includes a reverse, Schottky diode for this signal (and for VSEND). So a small relay can be directly connected to the RCA phono jack without any additional circuitry.. Use caution when selecting a relay as this signal can typically only sink approximately 200ma, maximum. Refer to your radio's instruction manual for specific details.

NOTE: This signal does not include any high voltage protection. So an external relay must be used when keying a tube-type amplifier with a high-voltage keying circuit.

This signal can also be used as an input to key the radio. If an external source pulls this signal to ground, it will key the radio transmitter. This feature can be used with an external PTT footswitch, an external digital mode encoder/decoder device, or other appropriate accessories.

NOTE: On HF + VHF/UHF radios only one of the HSEND or VSEND signals will be active for both input and output at any one time. This is based on the current operating band and associated menu setting options.

Why do you need both HSEND and VSEND Signals?

One reason would be in a setup that included separate, external high-power amplifiers for HF and VHF/UHF. In this case, the HF amplifier must be keyed only when the radio operates on an HF band. The VHF/UHF amplifier must be keyed only when the radio operates on a VHF/UHF band. Having both the HSEND and VSEND signals available allows this to be accomplished with a minimum of external logic and circuitry.

SQL_S

This is the squelch output from the radio. The signal is grounded when the squelch is open (signal present). This signal is used by the on-board audio mute circuit. It can also be used by external equipment to detect the presence of a received signal, typically in FM applications.

FSKK

This is the Frequency Shift Keying – Key input. It operates when the radio is operating in the RTTY mode. In this mode, the radio transmits a steady carrier on the MARK frequency when this input is open. The radio shifts the carrier to the SPACE frequency when this input is grounded.

This signal is typically used when operating the radio with a legacy RTTY interface and/or with legacy mechanical RTTY equipment.

NOTE: Vintage RTTY equipment often operates with high-voltage current loops. This input does not provide any high-voltage protection for the radio. When operating with any high-voltage current loop or similar signal, an appropriate isolation interface must be provided.

AF Out

This is a fixed, line-level (100-300mV) audio output from the radio. It does not change regardless of the setting of the AF-GAIN knob on the radio. Some radios have a SET Menu option to adjust the output level from 0% to 100%. The signal brought out to the phono connector is DC isolated from the radio by 1.1uf of capacitance. The capacitance is large enough that it does not have an appreciable effect on the audio frequency response.

Ground Isolation

The capacitive isolation does not provide full ground isolation of the audio signal. If full ground isolation is desired/required, the circuit board has provisions for 600 ohm audio transformers (T1 & T2). T1 isolates the AF Out audio. T2 Isolates the Mod In audio.
To implement ground isolation, both audio transformers must be installed. Cut Net Tie traces A, B, C, and D on the PC board and install transformers T1 and T2. The board layout supports Tamura MET-46 (DigiKey p/n MT4110-ND) or equivalent audio transformers.

Audio Mute Circuit

The AF Out signal is routed through a mute circuit that mutes the audio whenever the radio squelch (SQL_S) is closed. The mute function can be bypassed by installing a jumper between pins 1 and 2 of J4.

Some examples of how the muted audio may be used:

- Input to a mixer to combine audio from multiple radios into a common ham shack speaker system.
- Input to a separate audio amplifier or amplified speaker, or input to a vehicle audio system auxiliary input.

Newer Icom radios have a SET Menu function to select whether the Accessory connector audio output follows the squelch signal or not. For these radios, the audio mute circuit is not necessary.

In some older Icom radios, the audio from the Accessory Connector always follows the squelch signal. The mute circuit is not needed in these radios either.

NOTE: On more recent Icom radios, this signal can be changed to a 12kHz IF output through a settings menu. If the IF output option is being used, the on-board mute circuit should be bypassed.

Mod_In

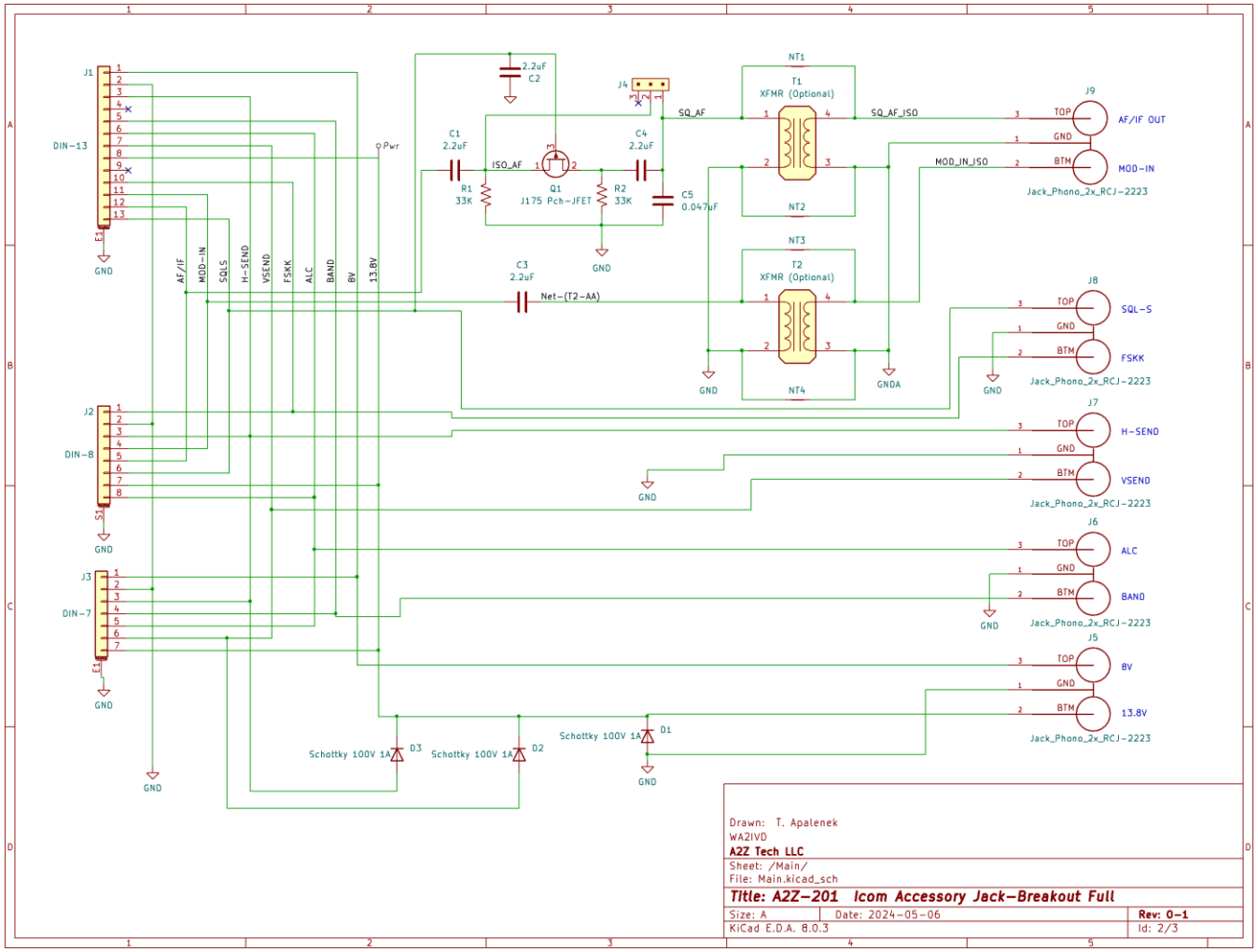
This is a line-level (100mV) Modulation Input to the radio. The audio input at the phono jack is DC isolated from the radio by a 2.2uF capacitor.

NOTE: Some Icom radio models may require the radio to be in a specific mode and/or have the appropriate Menu settings in order for this audio to feed into the transmitter.

Ground Isolation

See notes on ground isolation under **AF Out**

Schematic


J1
DIN-13
F1
GND
AF/IF
MOD-IN
SQLS
H-SEND
VSEND
FSKK
ALC
BAND
8V
13.8V
Pwr
J2
DIN-8
S1
J3
DIN-7
E1
C1
2.2uF
C2
2.2uF
C3
2.2uF
C4
2.2uF
C5
0.047uF
R1
33K
R2
33K
Q1
J175 Pch-JFET
ISO_AF
SQ_AF
Net-(T2-AA)
J4
NT1
T1
XFMR (Optional)
NT2
NT3
T2
XFMR (Optional)
NT4
SQ_AF_ISO
MOD_IN_ISO
GNDA
J9
TOP
GND
BTM
AF/IF OUT
MOD-IN
Jack_Phono_2x_RCJ-2223
J8
SQL-S
FSKK
J7
H-SEND
VSEND
J6
ALC
BAND
J5
8V
13.8V
Schottky 100V 1A
D1
D2
D3
Drawn: T. Apalenek
WA2IVD
A2Z Tech LLC
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Size: A
Date: 2024-05-06
Rev: 0-1
KiCad E.D.A. 8.0.3
Id: 2/3

Circuit Board