

QST



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AMATEUR RADIO

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DIGITAL EDITION

The Truth About Trees and Antenna Gain

QST Reviews

TYT MD-2017

Dual-Band Analog and DMR Handheld Transceiver

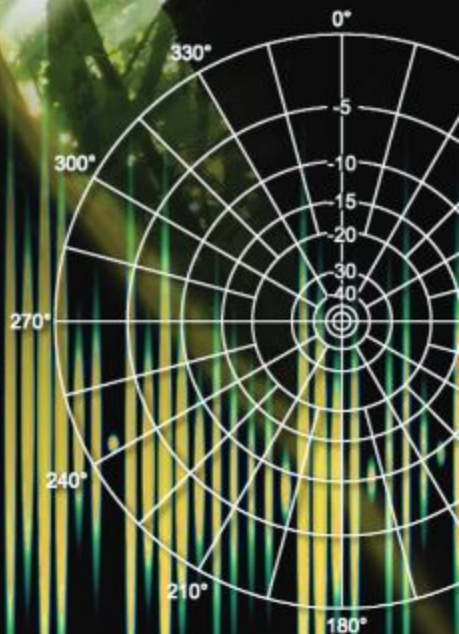
Heil PR 10 Home-Station Microphone Package

Elenco DT-100 Diode/Transistor Tester Kit

HamGadgets Universal Keying Adapter 3+ Kit

AlexMic Speaker/Microphone for the
Elecraft KX2 and KX3

SOTABEAMS Click2Tune
Accessory for Icom Transceivers



DIGITAL FEATURE



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TYT MD-2017 Dual-Band Analog
and DMR Handheld Transceiver

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An Audio Switching Unit

Easily switch between speakers and headsets for control and guest operators.



Gene Hinkle, K5PA

For casual contacts and listening, my external speakers are fine, but when I work more demanding DX, a headset with its attached boom microphone is more convenient. However, unplugging and plugging cables to switch between the two modes of audio output is irksome. I needed a way to conveniently switch and also provide for an occasional guest operator to participate in a contact using their own headset. The audio switching unit described below fits the bill perfectly.

Circuit

The audio switching unit was designed to work with my Elecraft KX3 transceiver. However, the unit can easily be adapted to work with other transceivers by using adapter cables, which will be illustrated later. The schematic is shown in Figure 1.

Toggle switch S1 (HP / SPKR) connects the stereo audio from the radio (J6) to either the headphones (J3, J5) or the speakers (J7). The headphones are disabled when the speakers are selected. I am using stereo connections to support the KX3's independent audio (right/left ears) for dual-watch receiver functions used during split frequency operations.

Pushbutton S2 (PTT) is a momentary, normally open switch used for push-to-talk on the transceiver. The KX3 is wired so that the two rings on the microphone connector, R1 and R2, enable push-to-talk when connected. Although a PTT switch is included in this design, voice-operated transmit (VOX) can still be used for transmit control.

Also included is an audio input from a computer sound card to support digital modes such as PSK, JT65, and AFSK. The input signal level from the computer sound card passes through an internal 20 dB pad (resistors R1, R2, and R3) with stereo input support and dc isolation provided by capacitor C1. Direct current isolation is necessary due to the bias voltage present on the microphone input. Toggle switch S3 (VOICE / DATA) selects either the DIGI audio (J2) or MIC-1 audio from the control operator (MAIN, J1) headset boom microphone.

External stereo isolators (e.g., PAC SNI-1/3.5) provide ground loop isolation in both the digital input (DIGI, J2) and speaker (SPKR, J7) audio paths. This keeps the low-level audio signals free of extraneous noise due to ground loops.

The guest operator audio jacks (GUEST J4 and GUEST J5) are in parallel with the control operator jacks (MAIN J1 and MAIN J3), with the exception that the microphone line from the guest operator (MIC-2 J4) is selected through toggle switch S4. This allows the guest operator microphone input to be easily muted from the front panel — an important and highly recommended feature when working with young children during their first exposure to Amateur Radio.

Features of this Audio Switching Unit

- Small size for desktop use
- Bias voltage pass-through required for electret mic elements
- Pushbutton for push-to-talk transmit control while still supporting voice-operated transmit control
- Speaker/headset toggle switch for monitoring in the shack when not using a headset
- Control and guest operator boom microphone headset connections
- Ability to mute the guest operator microphone input
- Audio input that is switch-selectable for digital signals

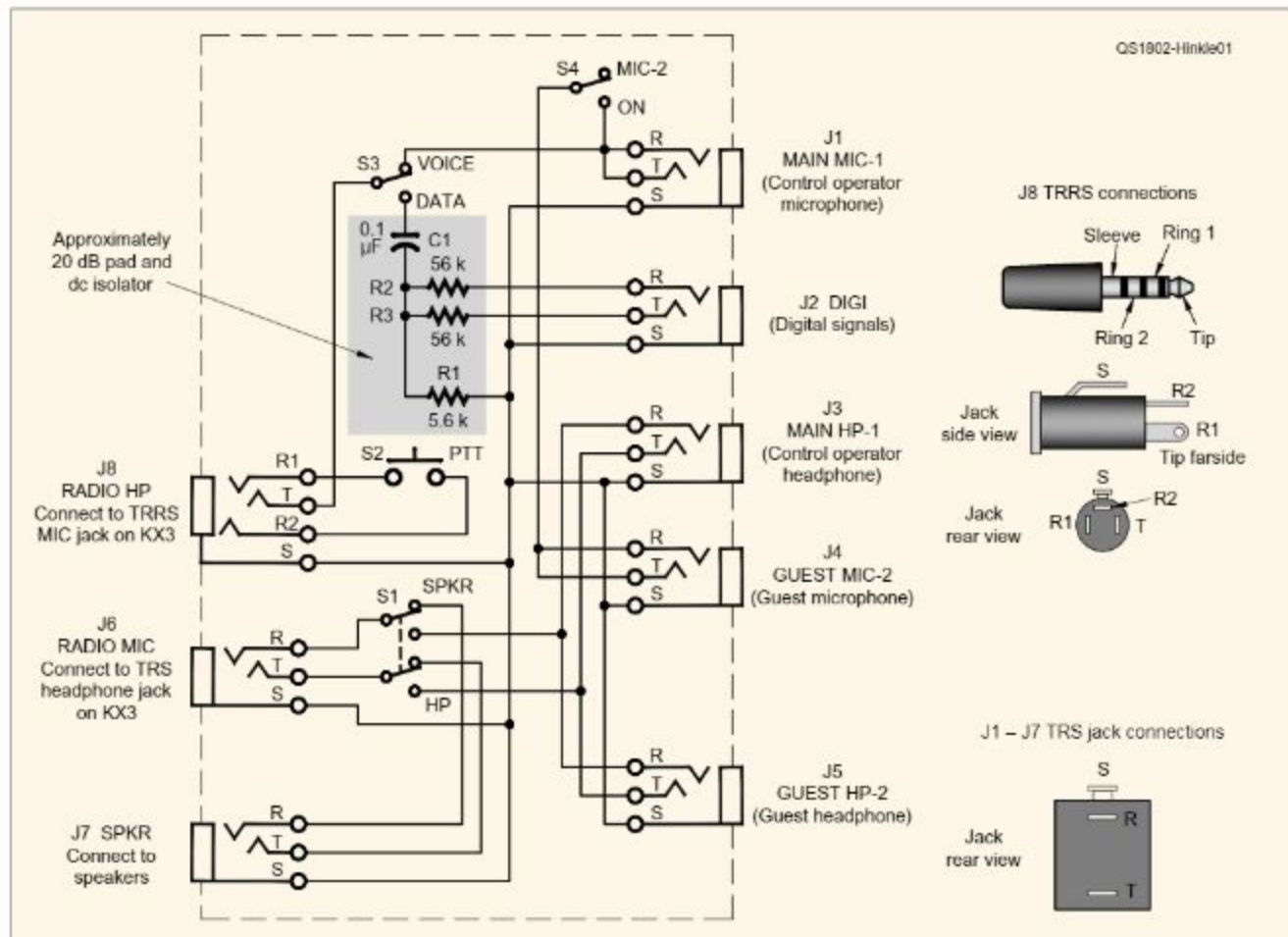


Figure 1 — Schematic diagram of the audio switching unit.

C1 — 0.1 µF capacitor

J1 – J7 — 3.5-millimeter panel-mount audio jack, three connector, TRS (Mouser STPX-3501-3C)

J8 — 3.5-millimeter panel-mount audio jack, four connector, TRRS (Mouser SJ5-43502PM)

R1 — 5.6 kΩ resistor, ¼ W

R2, R3 — 56 kΩ resistor, ¼ W

S1 — DPDT toggle switch (Mouser 7201SYZQE)

S2 — SPDT momentary contact push-button switch (Digi-Key CKN4031-ND); red pushbutton cap (Digi-Key CKN1105-ND); dress nut (Digi-Key CKN1184-ND)

S3, S4 — SPDT toggle switch

(Mouser 7101SYZQE)

Box — ABS gray box 5.25 × 3 × 2 inches, Bud Industries CU-1874-G (Digi-Key 377-1166-ND)

Ground loop noise isolator — PAC SNI-1/3.5 (available from Amazon)

Labels — Brother TZe-121 9-millimeter black on clear tape for P-Touch labelers

Transceiver Audio Interface Cables

This unit was designed to use a four-wire connection with a TRRS 3.5-millimeter plug to connect the headset's boom microphone to an Elecraft KX3-style or similar transceiver (Figure 1, J8). The microphone cord requires TRRS 3.5-millimeter plugs on each end. For the headphone (HP) connection (Figure 1, J6), a three-wire cable with 3.5-millimeter TRS plugs at each end is needed. This is your standard miniature stereo headphone cord (plugs on both ends). See P2 and P3 in the

Plug and Jack Terminology

The terms *tip* and *ring* have been around since the early days of the Bell System and they refer to the extreme tip and the insulated metallic ring just behind it on the quarter-inch phone plugs, originally used by operators to complete telephone connections. Modern plugs take advantage of the area just behind the ring (termed the *sleeve*) to provide an additional connection. Tip, ring, and sleeve are typically abbreviated T, R, and S. To provide even more connections, additional rings are added and are identified by a numerical suffix, with R1 being the ring closest to the tip. For example, a plug capable of making four connections would be a TRRS plug, with the two rings identified as R1 and R2 on a schematic.

The original Bell System ¼-inch diameter plug is far too clunky for today's compact electronic devices, and a reduced diameter standard — confusingly multi-termed *mini*, *miniature*, *¼ inch*, and *3.5 millimeter* (all the same size) — is used for making almost all audio and low-frequency control connections.

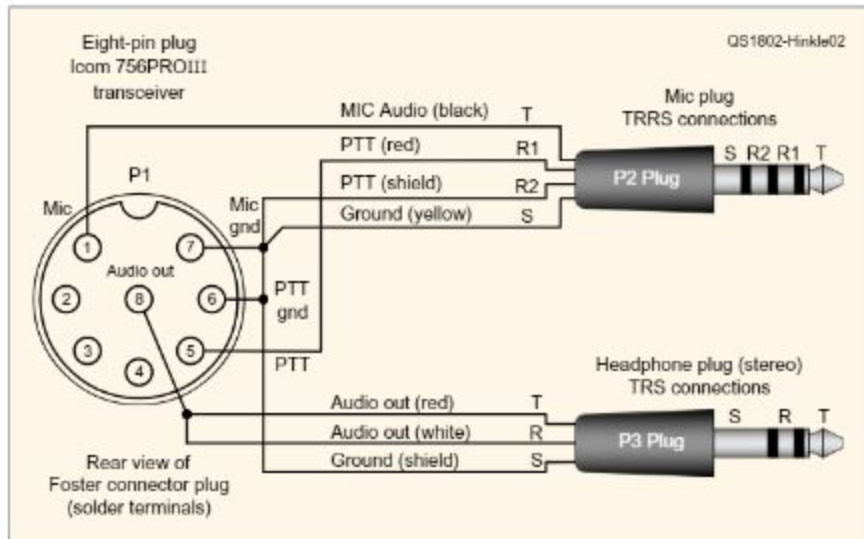


Figure 2 — Schematic diagram for an Icom eight-pin plug to TRRS/TRS microphone and headphone plugs.

- P1 — Foster eight-pin plug connector for Icom (Universal Radio #2112)
 P2 — Philmore #44-470, 3-foot, 3.5-millimeter shielded four-conductor audio cable with right angle male-to-male connectors (Universal Radio #3624)

- P3 — Philmore #44-468, 6-foot, 3.5-millimeter three-conductor stereo cable with right angle male-to-male connectors (Universal Radio #4103)

parts list of Figure 2 for typical examples.

If the unit is to be used with an Icom transceiver, such as an IC-756PROIII, then an adapter cable to convert the TRRS and TRS jacks to the Foster-style (eight-pin) plug is necessary. Figure 2 shows the schematic to connect the TRRS and TRS plugs to an Icom eight-pin Foster-style microphone jack. Note that if your microphone jack does not include the radio audio output signal, a connection to the speaker or audio headphone output can be made directly without the need for this adapter for the headphone channel.

Construction

The unit is housed in an ABS lidded box made by Bud Industries (see parts list). All labels were created using a Brother P-Touch label maker and TZ tape with laminated black lettering on a clear background (see parts list). This provided a durable yet inexpensive method of labeling the unit. All wiring is point-to-point. I find that it is helpful to work out the placement of jacks and switches on a full-size drill template, which is then taped directly to the box for marking the hole positions.

New Products

Volt Tattler 2 Kit from Progress Direct Systems

The Volt Tattler 2 kit is designed to help protect equipment by sounding an alert if the dc supply voltage wanders too high or too low. Volt Tattler works from 5 to 28 V and draws about 1 mA in normal "silent" operation, so it is appropriate for operating low power, portable, and field work. A simple kit using through-hole components, Volt Tattler 2 is suitable for beginners learning to solder. Price: \$25 and available exclusively from www.qrpkits.com. For more information, visit www.progressdirectsystemsllc.com.



Wrap-Up

The audio switching unit has proved to be an extremely useful shack accessory, enabling me to easily switch between external speakers and my headset with the flick of a switch and still have the convenience of push-to-talk, voice-actuated, and digital operational modes. Moreover, it has made it possible for my grandchildren to talk on the radio as third-party participants with their inexpensive boom microphone headsets, while still giving me the control to mute the occasional excited outburst.

Photo by the author.

Amateur Extra-class license holder and ARRL Life Member Gene Hinkle, K5PA, is also a Volunteer Examiner. He earned an MSEE from the University of Texas at Austin and is an IEEE Life Senior Member, as well as a retired professional engineer in Texas. Gene has been involved with Amateur Radio from a very early age and enjoys working CW and low-bandwidth digital, and making DX contacts. You can find out more about Gene from his website at www.k5pa.com, or reach him via e-mail at k5pa@arrl.net.

For updates to this article, see the QST Feedback page at www.arrl.org/feedback.



Strays

The 2018 AM Rally February 3 – 5

The AM Rally is designed to encourage the use of amplitude modulation on the 160-, 80-, 40-, 20-, 15-, 10-, and 6-meter bands, and to highlight various types of AM equipment in use today. The event is open to all radio amateurs who are running full-carrier amplitude modulation (standard AM), using any type of radio equipment. The AM Rally begins at 0000 UTC on Saturday, February 3, and runs through 0700 UTC on Monday, February 5. Visit www.amrally.com for more information.

Errata on Figure 1

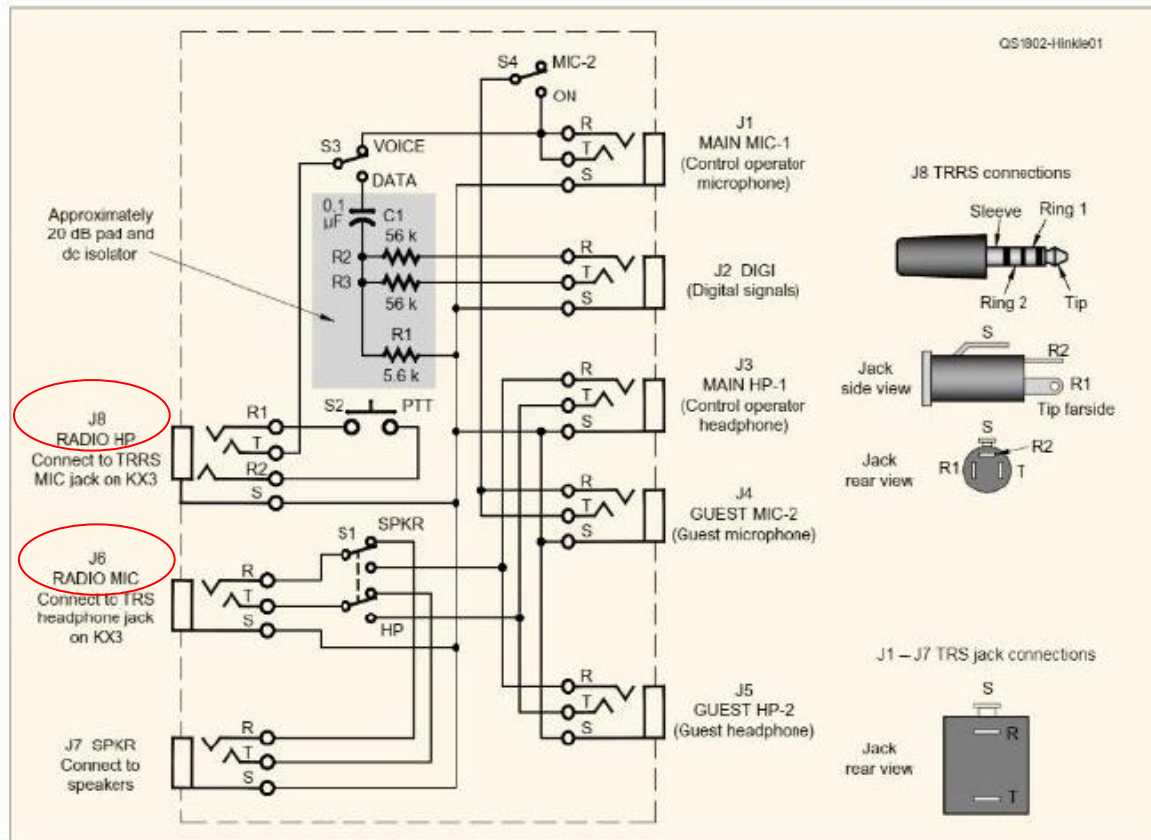


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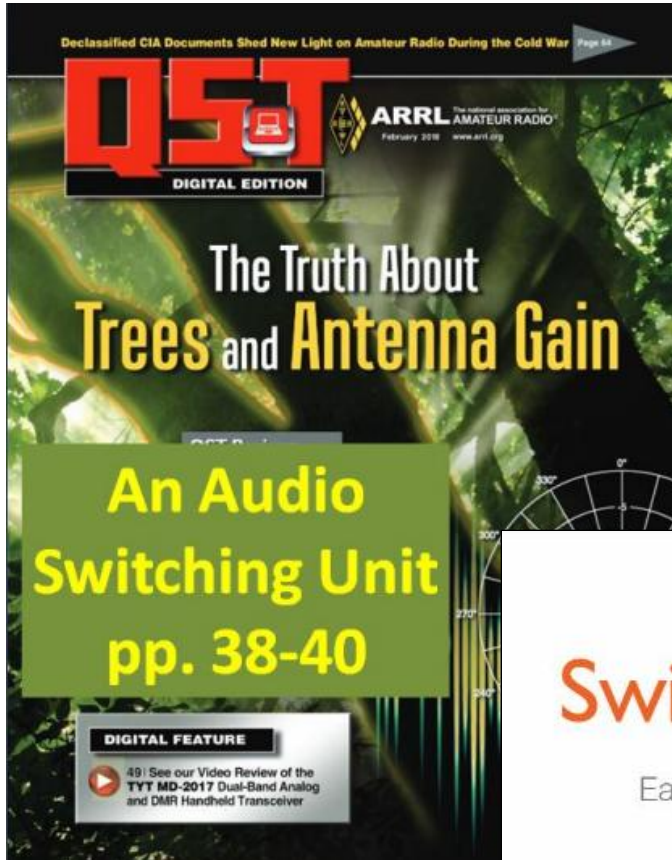
On **J8**, change the words **RADIO HP** to **RADIO MIC**.

On **J6**, change the words **RADIO MIC** to **RADIO HP**.

The other word descriptions under these ALL CAP words are correct as shown.

Supplemental Materials

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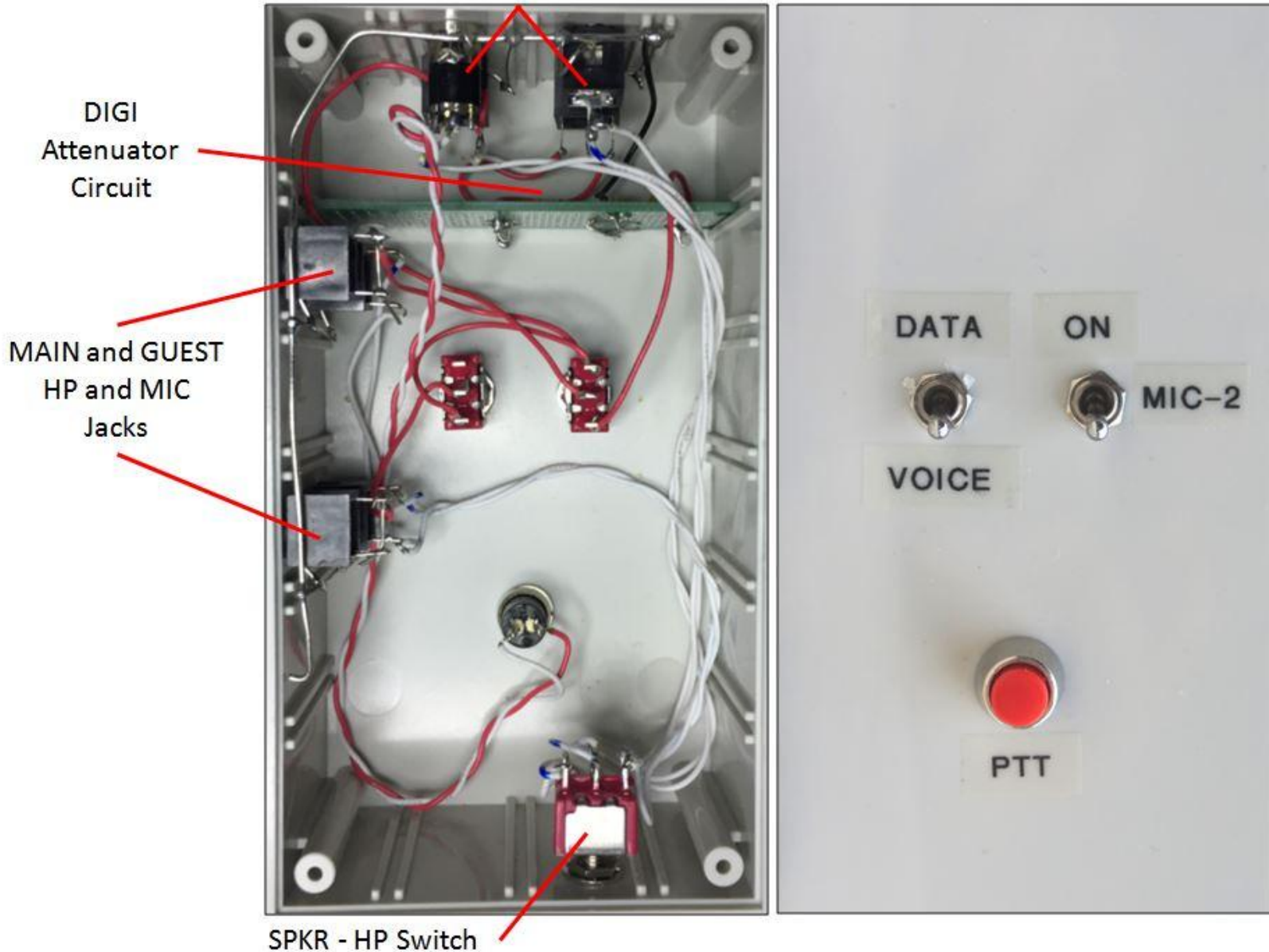


Perspectives



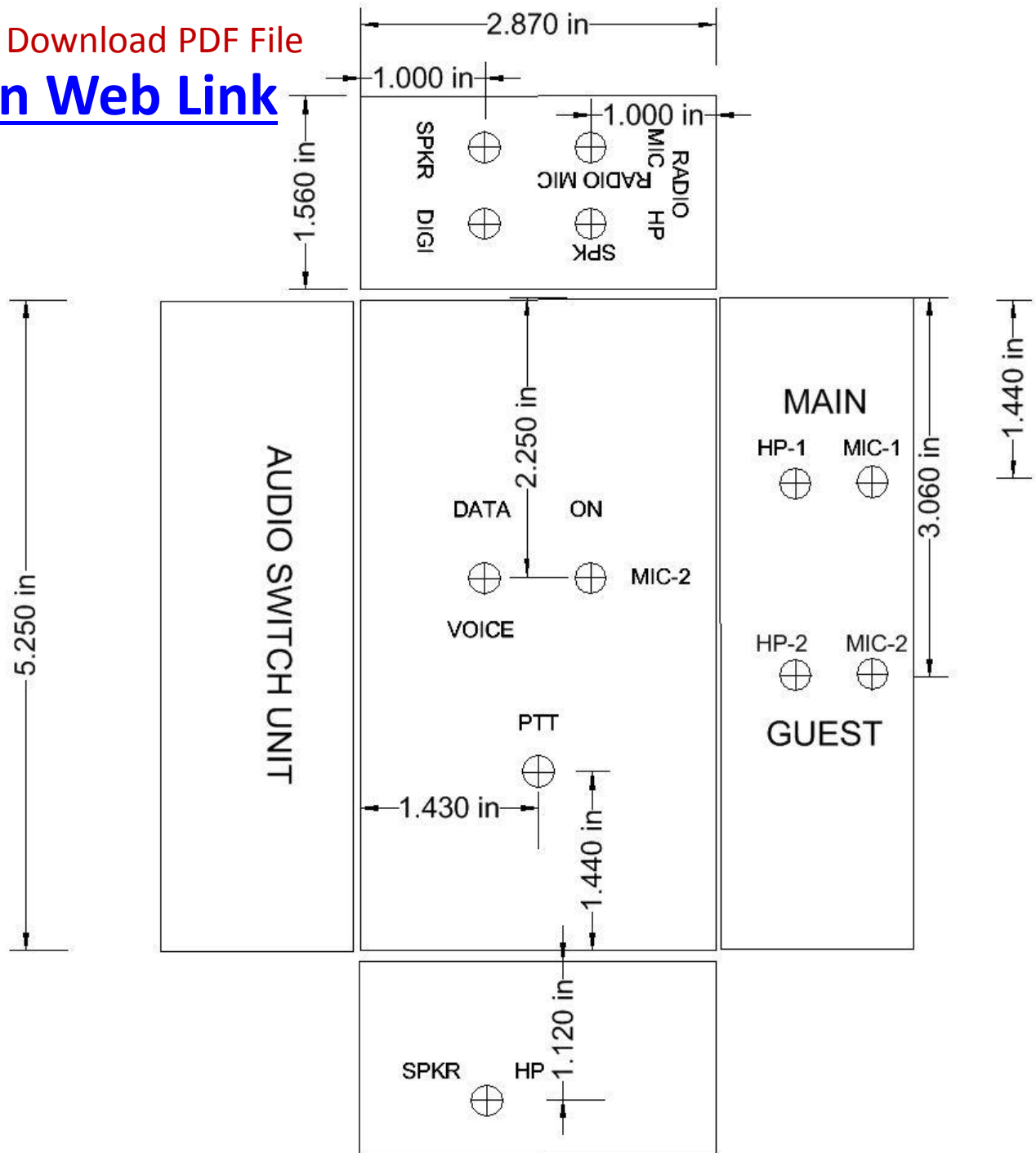
Point-to-Point Wiring

Radio, DIGI, SPKR Connections



Click Link Below to Download PDF File

[Drill Pattern Web Link](#)



Audio Isolator Example

SNI – 1/3.5

www.pac-audio.com

