APRS PC INTERFACE AND HEADPHONE ADAPTER

OPERATION & TECHNICAL MANUAL

09/23/07

APRS PC INTERFACE AND HEADPHONE ADAPTER

DECSRIPTION

1. The **APRS PC INTERFACE AND HEADPHONE ADAPTER** is designed to facilitate selectively splitting and combining the audio output from up to four receivers for simultaneous application to:
   - an individual headphone or speaker per radio with volume control
   - a *MIXER* channel with a separate input level control for each radio, a master volume control, and headphone output
   - a second independent MIXER channel as above
   - a low level output for an external amplified speaker ("PC" style speakers) derived from the second mixer channel with a separate master volume control for the speaker
   - a line level (1VPP) output channel from each of the four receivers intended for input to two PC sound card line inputs and APRS software (two stereo jacks)
   - if APRS traffic were very low (low probability of collisions) and only limited sound card resources available one of the mixer channels could be used to feed the sound card
   - The level of each output may be independently adjusted.
2. Each radio is isolated from the others and the PC by line transformers to minimize ground loops and interference.
3. Indicators are provided to show when each receiver is actually producing audio.
4. Operation of the unit is relatively intuitive such that this manual should only be needed for initial training or maintenance.
5. Additional mixer or radio channels can be easily added if desired

CAUTIONS

1. The phone jacks used in this unit are plastic and glued in place in order to isolate the ground from the case to minimize RF interference and ground loops.
2. Please be careful when inserting plugs to not exert undue force as the glue may pop loose or the jack may crack if the front panel flexes. Using a gentle twisting motion while inserting may help. After a little use they should operate freely.
3. For operator safety the radios and PC are already grounded to a common single point ground under the floor so it should not matter that the interface box case is grounded only to the PC.
4. The headphone amplifier chips (LM386-4) used in the mixer outputs of this unit are only rated at 200mW for 8-Ohm headphones, 400mW for 16-Ohm headphones and 300mW for 32-Ohm headphones. This 200-400mW of power is typically enough to be quite loud given good headphones and good ears. Running very high volume or trying to drive speakers or 4-Ohm headphones from the mixer headphone jacks may blow the chips. If you have 8-Ohm headphones and the volume is insufficient it may be possible to rewire them for 16-Ohm operation by running the two phones in series rather than parallel. (The circuit parallels the left and right earpieces resulting in a 4-Ohm load from an 8-Ohm stereo headset.)
5. The restrictions in 4., above only apply to the two mixer outputs. The individual channel outputs (ONE-FOUR) are driven directly by the receiver external speaker output through a 100-Ohm potentiometer.
6. The *EXTERNAL AMPLIFIED SPEAKER* output is designed to be connect to "PC style" amplified speakers and drive two channels (L & R) of approximately 200 Ohms each connected in parallel for a resulting load of 100 Ohms. Loads much less than this may result in reduced and/or distorted output.

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OPERATION

1. For setup before first time operation and for subsequent adjustments see **INITIAL SETUP**, below.
2. Once the volume controls on the radios have been adjusted properly in the setup procedure they should not be changed without readjusting the APRS output levels. A small tag or piece of colored tape might be affixed to the radios or the knobs removed as a reminder to the operators.
3. To monitor an individual transceiver, plug headphones into front panel jack ONE through FOUR corresponding to the XCVR you wish to monitor. Use the knob immediately above the jack for volume control. There are provisions for four radios and four operators. You can also plug a normal speaker into one of these four jacks. Connecting two sets of headphones to one of these four jacks using a splitter is also possible
4. For one person to monitor multiple radios use one of the MIXERS. Plug headphones (preferably 16 or 32 Ohm) into either the MIXER A or MIXER B phone jack. Use the horizontal row of red knobs to set the relative volume of each radio you wish to monitor. Set the red knob fully CCW for any radio that you don't want to hear. Control the overall volume of all radios being monitored with the rightmost gray MIXER A/B PHONE VOLUME control. Mixers A and B are identical so two operators can pick and choose between the four radios or monitor some or all of the same radios.
5. For normal operation with one operator using speaker audio use MIXER B as described above except use the bottom rightmost MIXER B SPEAKER VOLUME to control the volume of the external amplified speaker(s) connected to the rear panel jack. The single operator can also use MIXER B PHONES if the ambient noise level is high or speaker operation would interfere with other activities in the area. Note that phones and the speaker(s) can be used simultaneously and the volumes adjusted independently.
6. The row of ACTIVITY lights across the top of the unit indicates which radios are receiving a signal at any given time. It might otherwise be more difficult to determine which of several radios to respond on with all sound coming from a single speaker.

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INITIAL SETUP

1. Equipment needed:
    - An amplified external speaker (PC speakers, nominal input impedance 200Ohm per channel will do). Note that an ordinary low impedance speaker will not work.
    - A Digital Voltmeter (DVM) capable of measuring AC voltage (preferably RMS) down to approximately 0.1V. Note a cheap analog meter with a 5V or 10V minimum AC scale is not suitable for this measurement.
    - Several (up to 4) shielded stereo cables with a 1/8" stereo male phone plug on each end to run from the EXT. SPKR. jack on each transceiver to the interface box.
    - 2 more cables as above to run from the interface box to the PC sound card LINE IN jacks.
2. On the interface box set all the front and rear panel controls fully CCW. Connect an amplified speaker to the jack on the rear panel. Plug the power module ("Wall Wart") into a power strip, plug the cable from the module into the jack on the rear panel, and turn the front panel power switch to on. The 4 red channel lights should blink and the green power indicator should stay on
3. Plug one end of a stereo cable into one of the transceiver's external speaker jack. It is recommended that the radios be connected in the same order as they are physically arranged so that the leftmost rig goes to the "One" input, etc.
4. Connect the DVM to the other end of the cable between the tip and sleeve (ground). Open the squelch and set the XCVR volume control for 0.7 to 0.8 Volts AC RMS. This establishes about a 2V Peak-Peak output from the XCVR. The XCVR volume control should not be changed after this level is established.
5. Plug the free end of the cable into the XCVR 1 jack on the rear panel of the interface box and verify that the ACTIVE LED for channel ONE comes on.
6. Close the squelch.
7. Repeat steps 3-6 for the remaining XCVRs (TWO through FOUR).
8. Setting up the best audio level for a sound card depends on what line level input it expects. You usually want the level (voltage) near the max the card will accept without overloading or distorting to get the best signal to noise ratio. That level in turn depends on the software you're running and where the "Recording Controls", primarily the "Line Input Volume" is set. For my sound card the absolute max level turns out to be about 2V P-P or about 0.7VRMS

    Connect cables to the interface box rear panel SOUND CARD jacks (2). Open the XCVR squelch or, preferably, use an actual packet signal. Adjust the rear panel level controls by connecting the DVM on AC Volts between the specified cable pin and the sleeve (ground) for a reading of 0.3VRMS. This is approx. 1V Peak-Peak. Plug the free ends of the cables into the PC sound card LINE INPUT jacks. The sound card levels may be readjusted based on APRS software indications.

SOUND CARD LEVEL ADJUSTMENT			
XCVR	**SOUND CARD**	**TIP/RING**	**ADJUSTMENT**
One	1	Tip	XCVR 1
Two	1	Ring	XCVR 2
Three	2	Tip	XCVR 3
Four	2	Ring	XCVR 4

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ABBREVIATED SETUP

- Set all transceiver volume controls to 10:00 and verify corresponding activity LED on when receiving audio or noise
- Set all front panel red knobs to 12:00, all gray to 10:00
- Set all APRS level controls on rear panel to ¼ to ½ of maximum.
- Set volume control located on amplified speaker to 3:00

SPECIFICATIONS

Nominal receiver input audio level	0.7VRMS (2.0VP-P)
Headphone power output from MIXER channels	200mW
Nominal output level to PC sound card	0.3VRMS (0.84VP-P)
Amplified Speaker drive requirements	200mVP-P, 200 Ohms/channel
Power requirements	14-20VDC@250mA average, 500mA, peak

ADDITIONAL INFORMATION

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