

AE4NY Guppy-WaTTa-PiG + Active Audio CW Filter Unit With added Sidetone and Relay Board Ted Bruce, KX4OM

Summary of functions

This unit provides the following functions:

1. **Guppy** – Provides Transmit/Receive switching of the station antenna between a transmitter and separate receiver. The T/R switching is accomplished automatically, when the transmitter connected to the Guppy is keyed, either with a straight key or paddles (see K8 Keyer for use with paddles). The Transmit/Receive delay, or “hang” time, is adjustable via a front panel control. A red LED indicates when the T/R relay is in the energized (Transmit) state. A transceiver may use the NoGaWaTT, Sidetone, and AF filter by placing the G-W-P’s front panel MODE switch in the XCVR position. This feature is enabled by a PC board-mounted relay attached to a standoff for the Guppy board. This allows bypassing the TR features of the Guppy for use with a transceiver. When used with separate transmitter and receiver, the MODE switch must be placed in the XMTR-RCVR position. **Important: See Note 8 regarding current drawn by this relay.**
2. **NoGaWaTT** – Measures Forward and Reverse power between the transmitter and the load. The AE4NY NoGaWaTT is set for the 0 to 6 Watt range. The AE4NY NoGaWaTT has been calibrated against W4JHR’s WM-2 Wattmeter at 1.5 Watts output, driven by KX4OM’s SW20+.
3. **NoGaPiG** – The Power Indicator and Guard provides protection reverse power connection, overvoltage and undervoltage. The overvoltage protection is provided by an SCR in the circuit. The undervoltage protection is sensed by an LM311 integrated circuit, and provides a visual indication by a front panel yellow LED of low voltage when the station battery is lower than approximately 11 volts. The undervoltage protection will also protect against a short circuit condition by dumping the current through an automatically resetting PolySwitch fuse device. A test circuit is provided for the undervoltage feature. See K8 Keyer for additional functions.
4. **Active Audio CW Filter** – A Vectronics 820K/MFJ CWF2 integrated circuit active audio CW filter can receive the audio output of a receiver or transceiver via a rear panel “Audio In” mono jack. Output is provided through a front panel headphones jack. The filter audio bandwidth is selectable using a front panel rotary switch. The switch positions are OUT (bypassing the filter), 180 Hz, 110 Hz and 80 Hz.
5. **K8 Keyer** – A K8 Keyer designed by K1EL is built onto the circuit board of the NoGaPiG. The keyer is actuated through paddles connected to a front panel jack. The keyer commands are accessed via software control of the PIC microcontroller chip. A PIC Cmd button on the front panel places the keyer into the configuration mode when

the button is pressed and held until the “R” is heard from the keyer’s annunciator after about 2 seconds. Refer to the keyer manual for configuration options. Configuration is achieved by sending Morse code characters to the PIC microcontroller.

If the PIC Cmd button is pressed and quickly released, the keyer will send a pre-programmed standard message. Several standard messages are programmed into the PIC and cannot be changed via configuration; however, the particular message to be loaded into the keyer and sent can be selected via configuration.

Transmitter keying is achieved by connecting the transmitter or transceiver key input to the Key Out 1/8” jack on the rear panel.

6. **Sidetone and Relay Board** – A sidetone oscillator based on Chapter 1 of EMRFD, along with a relay has been added to the unit. Connected to the Key line, the sidetone oscillator actuates, as does the relay. The relay performs following two functions:
 - It switches the input to the front panel Headphones jack from the output of the AF Filter switch to the output of the sidetone. Therefore, when not keying, the audio heard comes from the receiver; when keying, the sidetone is heard in the earphones. A 2 k ohm adjustable pot is installed in place of a fixed resistor to match the desired sidetone volume to the headphones being used.
 - It provides for two RCA-jack connections on the rear panel to mute a receiver or perform other functions, such as shorting the input to a receiver’s antenna. The two jacks are simply Normally Open (NO) and Normally Closed (NC) relay contacts for the center conductor of the respective jack to ground.

Rear Panel Connections

1. **XMTR** – A BNC female jack provides the connection point for the transmitter or transceiver. The Antenna jack on the transmitting unit should be connected to the XMTR jack via coaxial cable.
2. **RCVR** – A BNC female jack provides the connection point for the receiver (or transceiver, if a separate transceiver is being used as a receiver).
3. **Ant** – A BNC female jack provides the connection point to the station antenna, or antenna tuning unit, if one is used.
4. **Dummy Load** – A BNC female jack is provided for connecting an external 50 ohm dummy load to the Guppy-WaTTa-PiG.
5. **DL/Ant Switch** – A toggle switch connects the output of the transmitter (via the NoGaWaTT) to either the antenna or the external dummy load. Facing the unit from the front, as it would be used in normal operation, reaching over the top of the unit and flipping the switch to the RIGHT selects the Dummy Load; flipping the switch to the LEFT selects the station antenna.

6. **Key Out** jack – A 1/8” mono jack provides the connection point between the Guppy-WaTTa-PiG and the key jack on the transmitting unit. **See Note 9 regarding 1/8” inch jacks and plugs used in this unit and also in connected equipment.**
7. **Key In** jack - A 1/8” mono jack is provided for connection of a straight key. This connection point bypasses the K8 keyer circuit, so a straight key can be connected to the jack while leaving the keyer paddles connected to the front panel Paddles jack. The straight key or the paddles can be used interchangeably.
8. **Audio In** jack - A 1/8” mono jack is provided for connection of the output from the receiving unit’s headphones jack via a shielded cable. This jack is internally connected to the active Audio Filter unit.
9. **DC In** jack – A 2.1 mm coaxial jack, tip positive, is the connection point for power to the NoGaPiG.
10. **DC Out** jack - A 2.1 mm coaxial jack, tip positive, is the connection point for power to the transmitter or transceiver being used with the Guppy-WaTTa-PiG. Note that all internal modules requiring DC power inside the Guppy-WaTTa-PiG are connected inside the unit to the DC Out jack, thus providing protection for the modules. This includes the DC power for the Guppy and the active Audio Filter.
11. **Normally Open (NO)** RCA jack – This feature provides the ability to mute a receiver, or to connect the receiver’s antenna input to ground during key-down periods. It may also be used to energize an external relay for other switching purposes.
12. **Normally Closed (NC)** RCA jack – This feature provides the ability to mute a receiver such as the Drake 4-Line receivers, which have a shorted RCA plug installed on their back panel for connection of a mute cable to a transmitter. By connecting a cable with RCA plugs at both ends to a Drake 4-Line receiver’s Mute jack, the receiver will be muted in key-down periods of the connected transmitter (through the Guppy-WaTTa-PiG). It may also be used to deenergize an external relay for other switching purposes.

Notes

1. The standard Vectronics 820K Active Audio Filter unit circuit was modified by the addition of an on-board +9VDC regulator and filter capacitors. Several “Manhattan” pads were glued to the circuit board to accomplish this modification. This unit is design to operate from 9 volts, either from a 9 volt battery or DC power supply. The circuit board was also modified with an additional ground connection adjacent to the input connection point so that shielded audio cable could be used to connect the Active Audio Filter circuit board to the rear panel Audio In jack.

2. The custom decals for the unit were produced using Adobe Photoshop, and they were printed on special Testors Decal Paper using an ink jet printer. The decals were sprayed with Testors fixative so that the ink would not run when the decals were soaked in water for removal of the backing paper. While applying the decals, the panel surface was coated with Future brand premium floor finish in order to improve the adhesion and durability of the decals. Once all decals for the unit had been applied, a coating of the Future product was brushed over the entire surface of the back and front panels to achieve a fairly consistent level of gloss, and to provide a second protective coating over the decals.
3. The 4-position Audio Filter selector switch was donated by Mike Boatright, KO4WX. The switch was modified by removal of the front wafer and using only the second wafer. The necessary switch connections and contact arrangement were determined to be more easily accomplished using the second wafer alone.
4. As pointed out in the manual for the NoGaPiG, the undervoltage protection circuit creates a constant 4 to 7 mA drain on the power source as long as the power source is plugged in to the DC In jack. Over a period of several days or a few weeks, depending on the initial state of charge and capacity, a 12 volt battery connected to the DC In jack will be drained down to the point where the Low V LED on the front panel is lit. At this point, the battery should be disconnected and recharged.
5. The sidetone/annunciator for the K8 keyer is a Radio Shack 2700 Hz piezotransducer, driven directly from the keyer PIC chip's pin 3 output for this purpose. The transducer is muted somewhat by being in the completely enclosed case of the unit. If using the Guppy-WaTTa-PiG with a transceiver that has a built in sidetone, such as the SW40+, and if dual sidetones are objectionable, the piezotransducer sidetone can be disabled temporarily via a K8 keyer configuration command. Refer to the K8 manual.
6. The K8 keyer provides for another type of audio sidetone as an alternative to the piezotransducer. A low level audio sidetone is produced that can be routed to the audio stages of a receiver, for example if separate transmitter and receiver units are used, rather than a transceiver. At present, two unterminated wires are connected to the NoGaPiG/K8 circuit board and taped to the bottom of the chassis. If this sidetone is to be enabled, two resistors and a capacitor need to be added to the NoGaPiG/K8 board, and a sidetone output jack needs to be added to the rear panel. The value of the added components must be determined experimentally to drive the receiver's audio stage at the correct volume. Refer to the manual. Incidentally, several combinations of resistors were tried, and none were found that would directly drive a pair of earphones to sufficient listening volume.
7. The Guppy's Omron G6A234 T/R relay has one additional set of contacts that are currently unused. Steve Hudson has proposed in the Guppy documentation a modification to use the spare normally-open contacts to short the receiver antenna on transmit. Other potential uses of these contacts are for receiver muting. The Drake R-

4B receiver, for example, has an external muting RCA female jack on the rear panel that normally is occupied by a shorted RCA plug. To use the Guppy to provide a muting function for a normally-closed mute circuit on this receiver, the unused normally-closed contacts of the T/R relay could be routed via an additional rear panel jack and cable to the receiver for muting. Similarly, a receiver that can be muted by closing an external contact could use the normally-open unused contact pair on the Guppy relay, assuming that the pair had not been used to ground the receiver antenna terminals. Some receivers, for example, the Hammarlund SP-600, can be muted on transmit via rear panel terminal connections to external relay contacts to achieve a "Send" condition (in Hammarlund's "Send/Receive" vernacular). Obviously, an additional relay could be added off-board, controlled by the Guppy, to achieve all of these functions, providing flexibility for the Guppy-WaTTa-PiG to be used with a wide variety of receiver-transmitter control situations.

Note: The addition of the Sidetone – Relay board provides the same function and more flexibility in switching via the relay and two rear panel RCA jacks. Therefore, the extra normally-open contacts of the Guppy relay are still available for use in added features at a later date.

8. The front panel "MODE" switch has two positions, XCVR (up position) and RCVR/XMTR (down position). The relay that this switch controls is deenergized in the XCVR (up) position of the switch. The relay draws about 13 mA when energized. **When the Guppy-WaTTa-PiG multifunction unit is not being used, but is left connected to a power supply via the rear panel jack, the MODE switch should be kept in the XCVR (up) position to prevent constant current drain, especially if the unit is powered from a battery.**
9. There is considerable variation in the application and use of nominal 1/8" "phone" jacks and plugs in the industry. Stereo plugs, which have an isolated sleeve ring just before the isolated tip, are designed to mate with stereo jacks. Stereo jacks can be modified to use mono plugs, which do not have the additional sleeve ring. The stereo sleeve connection is thus typically shorted to the ground connection on the jack. Some of these jacks are used in the AE4NY Guppy-WaTTa-PiG multifunction unit. Occasionally, this may cause some problems. For example, on two Small Wonder Labs units tried, an SW40+ and an SW20+, an audio cable with a mono plug connected to the AUDIO IN jack (on the G-W-P) or Phones jack (on the SWxx transceiver) **had to be pulled out very slightly from the fully-inserted position in order for the proper connection to be made.** This also can cause problems with the KEY jacks on the G-W-P when using a mono plug connected to a straight key, on either the G-W-P or the SWxx rigs.