

# Fixed Audio Output for the K2

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I have had several requests to provide a fixed audio output from the K2. After looking at the circuits that others have designed, I found that they used single ended audio input and were usually incorporated with some other circuits that were not useful to me. I already have my external Digital Modes Switchbox built to automate digital transmissions, but I still lacked the fixed audio that would allow me to position the K2 audio gain anywhere without disturbing the gain settings on my soundcard.

I choose a LM386N-3 Audio Amplifier IC for its differential inputs, high available gain, small packaging, and low external parts count. The -3 version works well from the 8 volt supply in the K2. It seems not widely known that the LM386 works just fine into a high impedance loads as well as low impedance. The amplifier is directly specified for voltage gain ( $A_v$ ) which then gives rise to the power available once the load resistance is known. The power available increases as the resistance decreases ( $P = V^2/R$ ) but the voltage is independent of the load.

After building a couple of prototypes successfully on perf-board, I talked with Tom Hammond (NØSS) at Dayton 2004 and Tom offered to lay out a small PC board for this application.

This Fixed Audio Output should serve the needs of those who want fixed audio for digital modes as well as those who would like to drive a tape recorder or other audio device.

The following pages provide instructions for assembling and mounting the project.

## **NOTE**

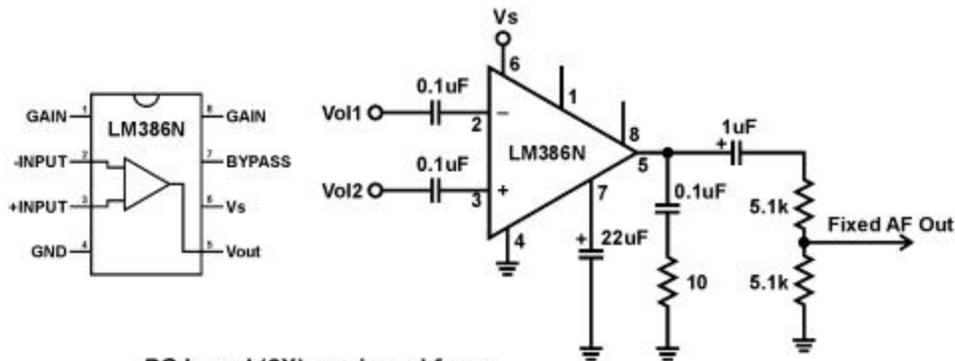
(Refer to schematic on following page)

The two 5.1k resistors in the Fixed AF Output circuit determine the 'fixed' level of AF output. If you wish to change the fixed level from the adapter, you may do so by replacing the bottom 5.1k resistor with a 10k potentiometer, adjusting the potentiometer to the desired level of output, measuring the value of the potentiometer, and then replacing the bottom 5.1k resistor with a fixed resistor of equivalent value to the potentiometer.

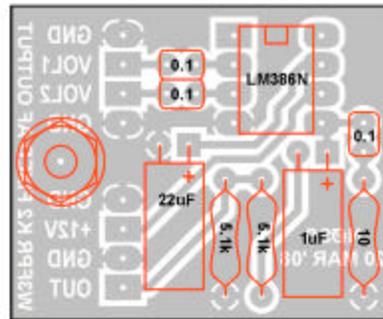
The schematic, parts list and board layout are shown below (Compliments of Tom Hammond).

## W3FPR's Fixed AF Level Output for Elecraft K2 Transceivers

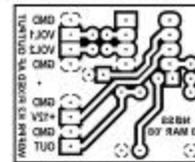
Rev. 6.4, 08/06/2009



PC board (2X) as viewed from  
the COMPONENT SIDE



Finished PC Board Size  
1.30" x 1.075"  
(3.30cm x 2.73cm)



### PARTS LIST - W3FPR's Fixed Level AF Output for the Elecraft K2

| Quan. | Description                        | Mouser Pt. #     |
|-------|------------------------------------|------------------|
| 3     | Capacitor, 0.1uF (104) 25V         | 80-C320C104K1R   |
| 1     | Capacitor, 1uF 25VDC electrolytic  | 140-XRL25V1.0-RC |
| 1     | Capacitor, 22uF 16VDC electrolytic | 140-XRL16V22-RC  |
| 1     | Resistor, 10 Ohms 1/4W             | 660-CF1/4L100J   |
| 2     | Resistor, 5.1k Ohms 1/4W           | 660-CF1/4C512J   |
| 1     | AF Amp, LM386N                     | 513-NJM386BD     |

**Note:** Mouser has many(!) varieties of this IC. You will need to ensure that the device you are ordering is in the **DIP-8** case, rather than in an SMD-style (SIP8 or DMP8) case. The part # shown should give you the right case style, but BE SURE BEFORE YOU ORDER.

These Mouser part numbers have been confirmed to be current as of 06 Aug., 2009.

### Additional Parts Which Will be Required to Mount the PC Board

| Quan. | Description   |
|-------|---|
| 1     | 4-40 X 1/2" machine screw   |
| 2-3   | 4-40 Nuts, additional nuts as 'standoffs' to space PC board away from chassis |
| 2-3   | #4 split or internal-tooth lockwashers  |

## Assembly Instructions

**NOTE: All components lay flat against the PC board as illustrated on the preceding page.**

- [ ] Insert the components into the circuit board and solder. Clip all leads close to the board surface (use flush cutters if available). BUT DO NOT trim so closely that you damage the soldered joint.
- [ ] Drill a 15/64" (6 mm) hole in the rear panel for the RCA jack. This hole should be centered no more than 5/16" (8 mm) below the upper edge of the panel and 3/4" (19 mm) from the left edge (near the key jack). The clearances are close – use care and be certain the jack will clear the 40 meter bandpass filter inductor located nearby.
- [ ] De-burr the hole for the jack.
- [ ] Mount the RCA phone jack with its soldering lug. Orient the solder lug toward the left side panel.
- [ ] Prepare three (3) 2-wire cables (preferably made from colored ribbon wire so you will have color coding available to identify which wire is which). Strip 1/8" (3 mm) of insulation from both ends of each wire, twist and lightly tin the leads:
  - 5-1/2" (14 cm), this is the **DC POWER CABLE**
  - 3.5" (8.9 cm), this is the **AF IN CABLE**
  - 7" (18 mm), this is the **AF OUTPUT CABLE**
- [ ] If you are not using differently-colored wires for your cables, mark one edge of each cable all along its length to identify conductor #1. A permanent marking pen does an excellent job.
- [ ] In the next steps, solder one end of the cables prepared above to the Fixed AF Output PC Board as directed. Flush-trim any excess wire on the bottom side of the PC board.
  - Solder the #1 lead of the DC POWER cable to the "+12V" pad.
  - Solder the #2 lead of the DC POWER cable to the adjacent "GND" pad.
  - Solder the #1 lead of the AF IN cable to the VOL1 pad.
  - Solder the #2 lead of the AF IN cable to the VOL2 pad.
  - Solder the #1 lead of the AF OUTPUT cable to the "OUT" pad.
  - Solder the #2 lead of the AF OUTPUT cable to the adjacent "GND" pad.

### AF OUTPUT CABLE CONNECTIONS

- [ ] Solder the #1 conductor of the AF OUTPUT cable to the center terminal of the RCA jack. NOTE: The output may be attached to the microphone jack instead of a rear RCA jack – choose an unused pin and remove any jumper for that pin from the mic configuration header. You may then attach the output to that mic pin (use a single mating plug to the configuration header so you can disconnect it)
- [ ] Solder the remaining conductor to the grounded solder lug of the RCA jack.
- [ ] Remove the Control Board from the K2 and place it solder side up and with the edge containing the pins that connect to the RF board closest to you.

**Refer to the illustrations on the next two pages for the following steps.**

**DC POWER CABLE CONNECTIONS**

- [ ] Locate P2 pins 5 & 6 (+8 volts) and solder the #1 conductor of the DC POWER cable to this pin.
- [ ] Locate P2 pins 7 & 8 (ground) and solder conductor #2 to it.

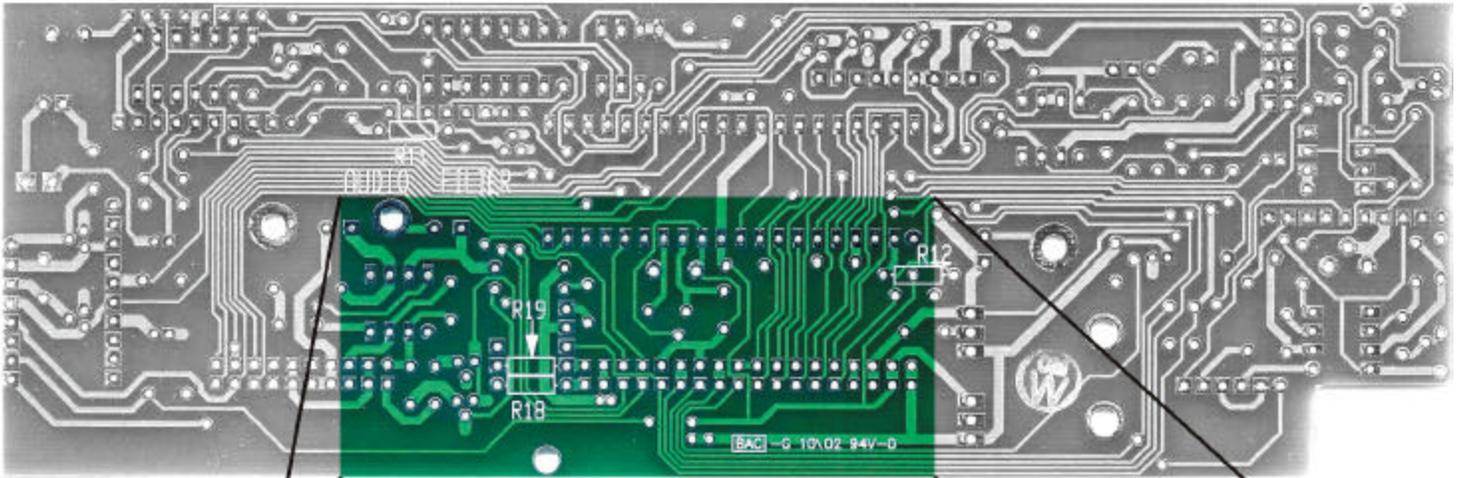
**AF INPUT CABLE CONNECTIONS**

- [ ] Locate P3 pin 1 (VOL1) and solder conductor #1 of the AF INPUT cable to it.
- [ ] Locate P3 pin 2 (VOL2) and solder conductor #2 to it.

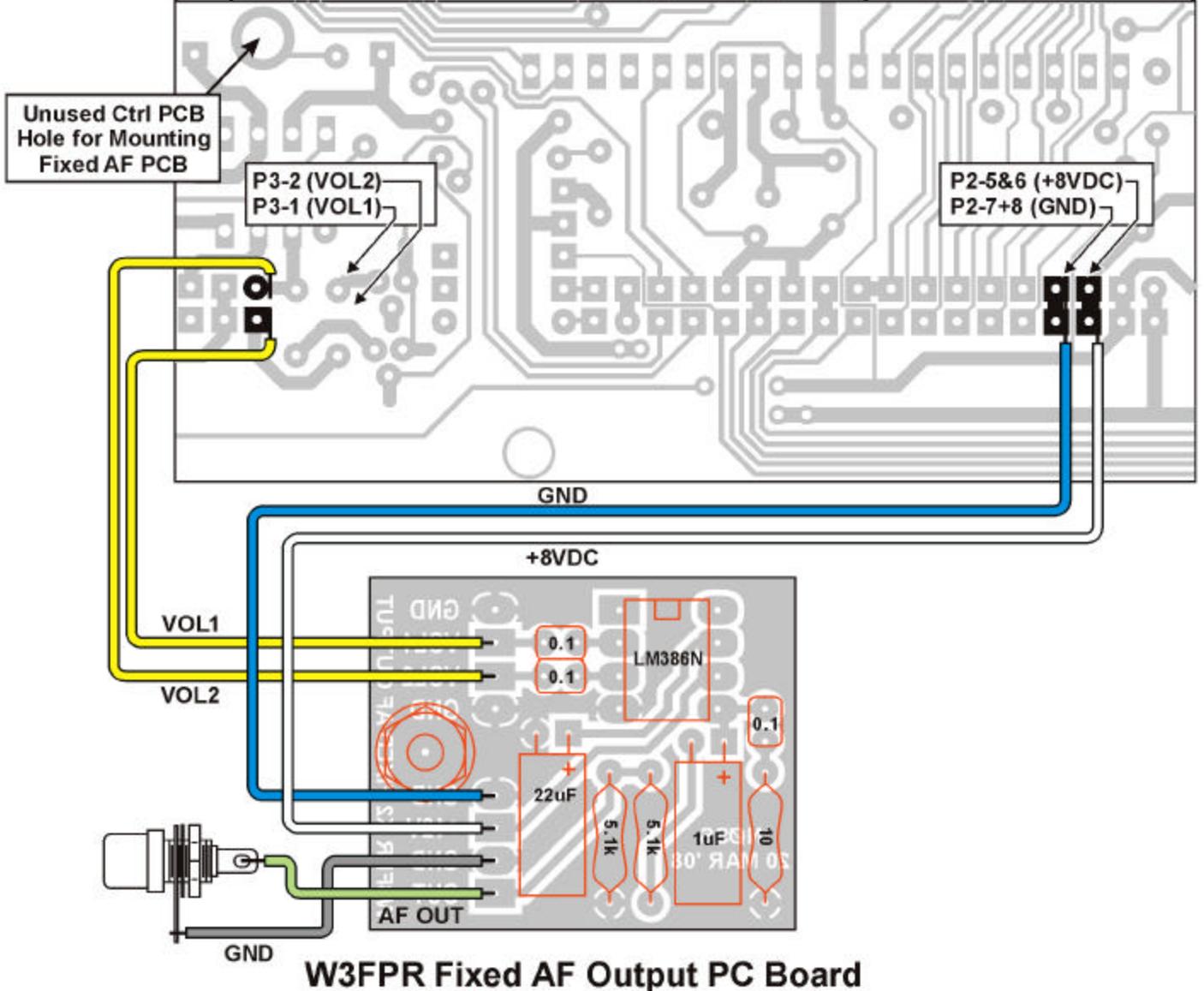
**FINAL ASSEMBLY**

- [ ] Just to the right of the left-hand Control PCB mounting hole is an unused hole which will accept a 4-40 screw. (See illustrations at the end of this document).
- [ ] Insert (from the FRONT side of the CTRL PC board) a 4-40 X 1/2" long screw into the unused mounting hole identified in the step above.
- [ ] From the back side of the CTRL PC board, slip a #4 lock-washer over the screw and secure in place with a 4-40 nut.
- [ ] Install the Fixed AF Output PC board, a #4 lock-washer and a 4-40 nut. Position the Fixed AF PC board as shown in the illustrations at the end of this document and secure the board in place.
- [ ] ENSURE that none of the soldered connections on the back side of the Fixed AF Output PC board can come into contact with any of the component leads on the back side of the CTRL PC board. Trim lead lengths (on either board) if necessary. And consider adding a thin cardboard 'insulator' to the back of the Fixed AF PC board if there continues to be a potential problem. If a potential shorting problem exists, and if space permits, you may add an additional 4-40 nut (or additional lock-washers) between the Fixed AF Output PC board and the CTRL PCB to increase the board-to-board spacing.
- [ ] Carefully route the DC POWER and AF INPUT cables over the edge of and behind the Fixed AF Output PC board and, if the AF OUTPUT cable is to be routed to the back panel, be sure to route it around the END of the CTRL PC board in order to prevent pinching of the AF OUTPUT wires.
- [ ] Reinstall the CTRL PC board, taking care not to catch or pinch any of the newly added wiring.
- [ ] Replace the top cover of the K2 and apply power to confirm normal operation of the radio.
- [ ] Connect a jumper cable from the new Fixed AF Output jack to your digital (or recording) equipment to confirm proper operation of the Fixed AF Output adapter.

# K2 Control Board - Back (Solder) Side



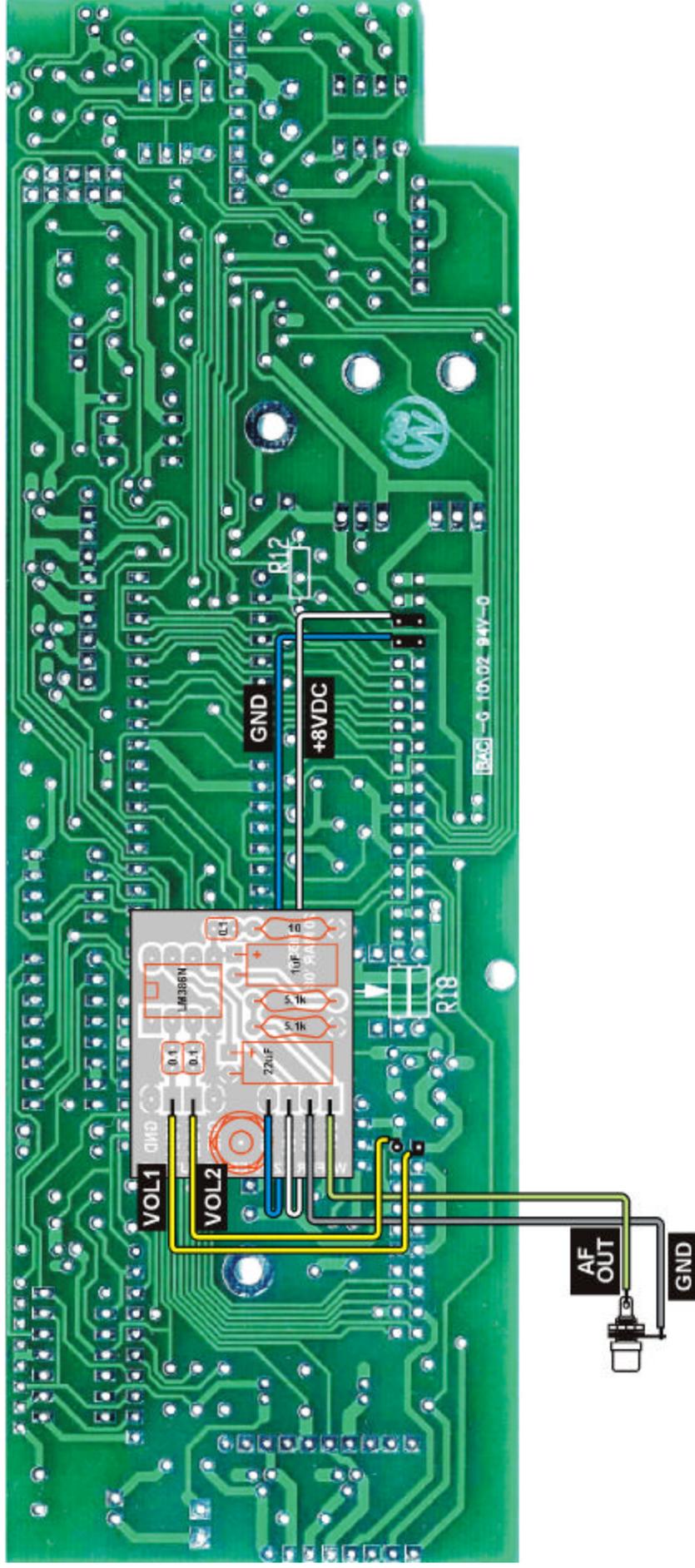
## Enhanced Wiring Diagram

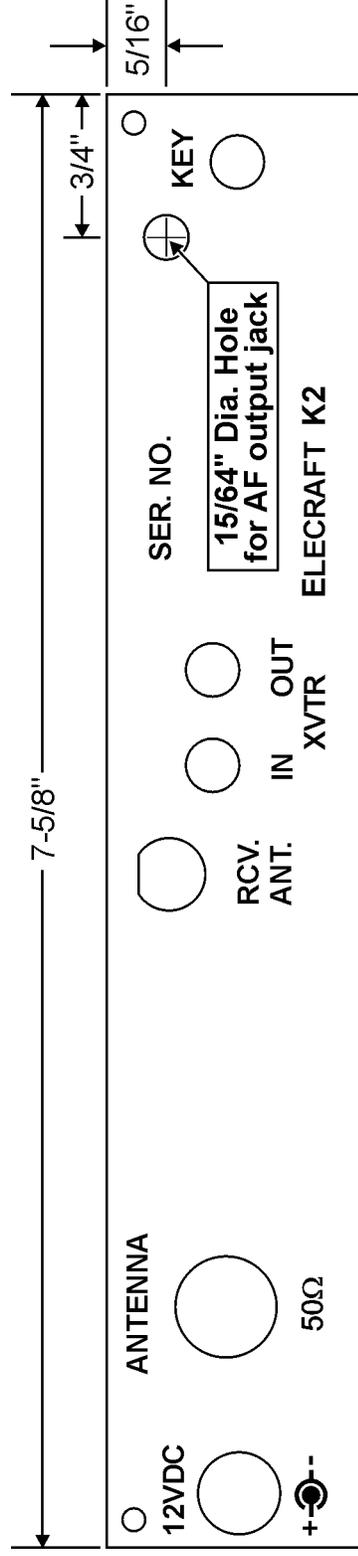


W3FPR Fixed AF Output PC Board

## K2 Control Board - Back (Solder) Side

Showing the physical placement of the Fixed AF Output PC board when attached to the Control PC Board using the unused available mounting hole in the CTRL PCB





**Template (TO SCALE) for Fixed AF Output RCA jack**