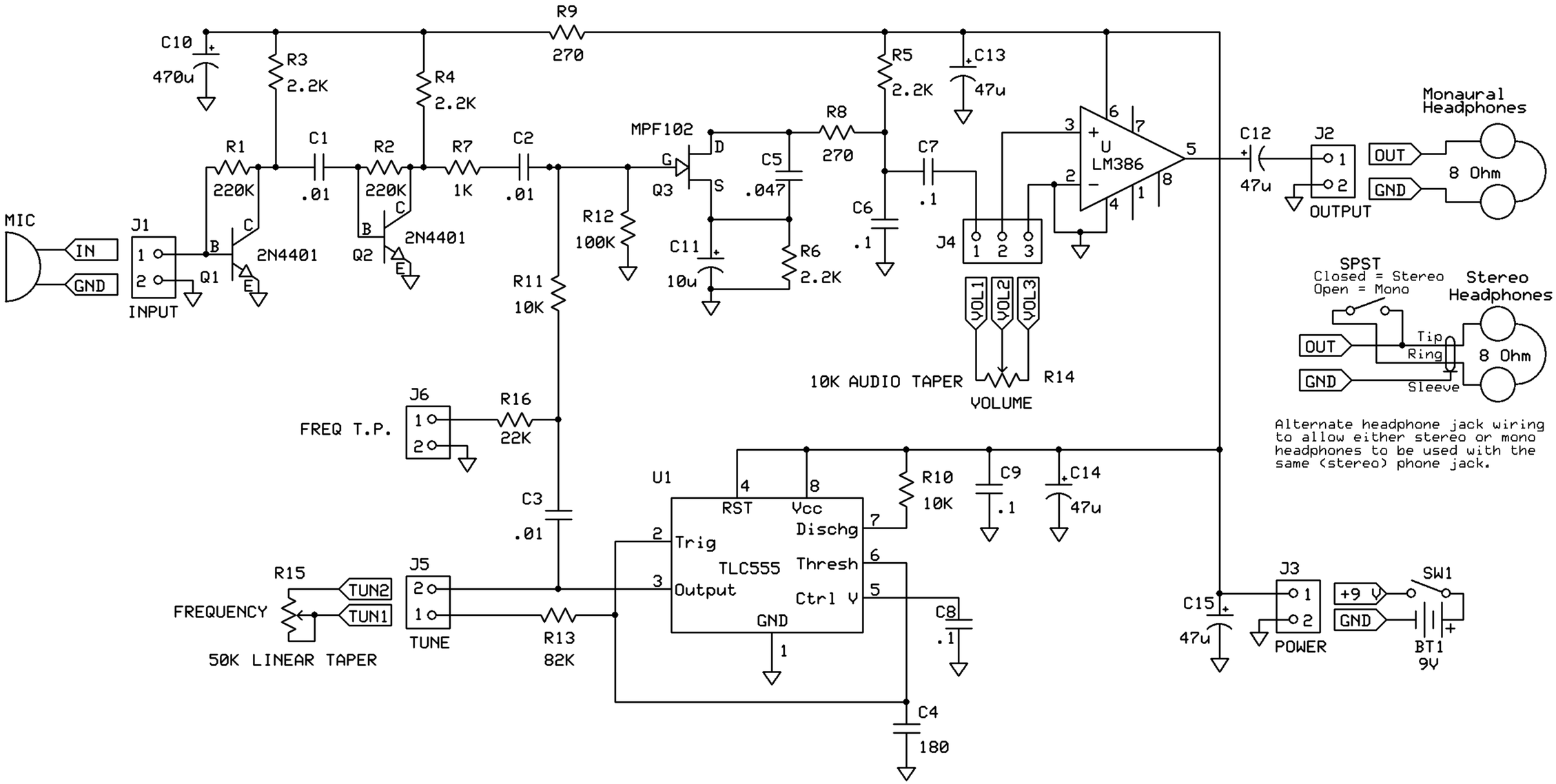
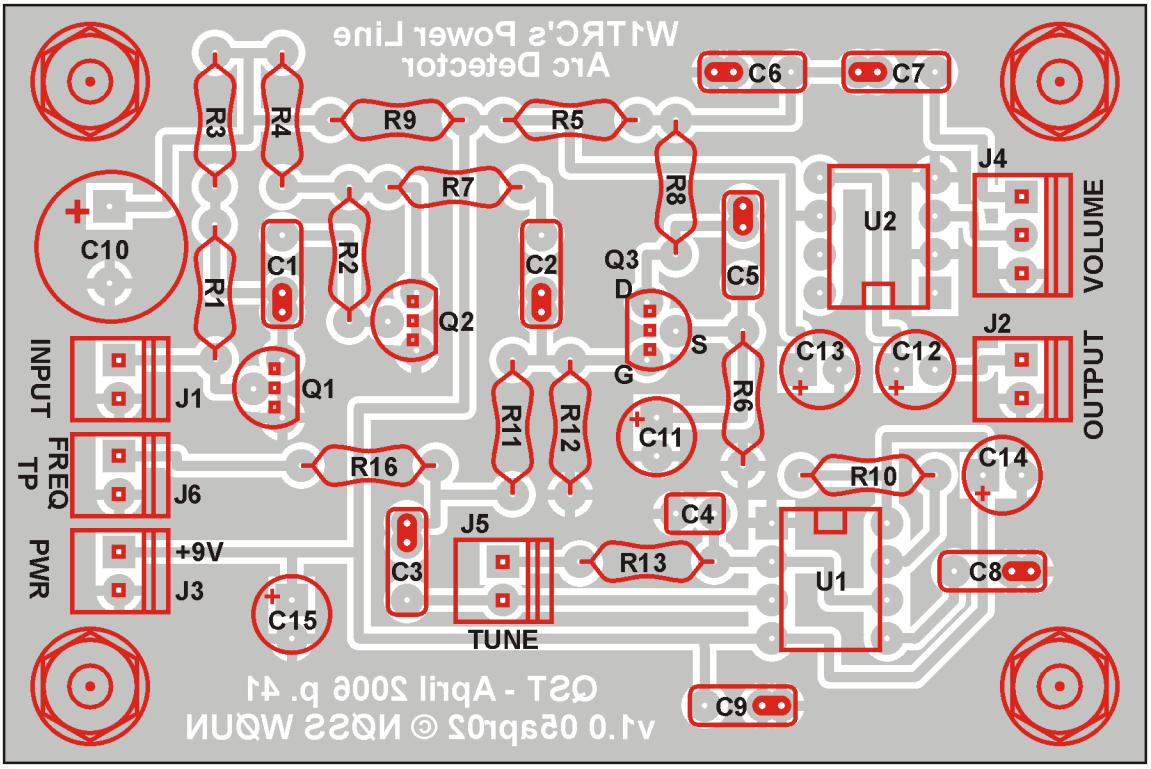


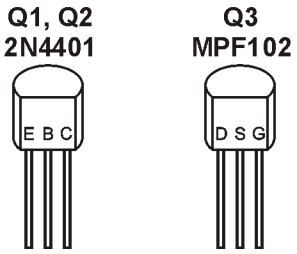
Ultrasonic Pwr Line Arc Detector

QST - April 2006 pg. 41

W1TRC	Rel. Rev 1.0 7 APR 2006	Page 1 of 1

W1TRC's
ULTRASONIC POWER LINE ARC DETECTOR





W1TRC's Ultrasonic Power Line Arc Detector

Suggested Parts List (not including the parabolic dish)

The following parts are available from: **www.mouser.com**

Part#	Description	Mouser Pt #
C1-C3	0.01 uF, 100V Polyester Film cap.	140-PM2A103K
C4	180 pF COG (NPO) multilayer ceramic	80-C315C181J1G
C5	0.047 uF, 100V Polyester Film cap.	140-PM2A473K
C6-C9	0.1 uF, 100V Polyester film cap.	140-PM2A104K
C10	470 uF, 25 V capacitor	140-XRL25V470-RC
C11	10 uF, 25 V capacitor	140-XRL25V10
C12	47 uF, 25 V capacitor	140-XRL25V47
J1	Panel mount RCA jack	161-1002
J2	1/4 inch panel mount phone jack	161-1804
P1	Small RCA plug	17PP050
Q1, Q2	2N4401	610-2N4401
Q3	MPF102	512-MPF102
R1, R2	220k 1/4W	660-CF1/4C224J
R3-R6	2.2k 1/4W	660-CF1/4C222J
R7	1k 1/4W	660-CF1/4C102J
R8, R9	270 Ohms 1/4W	660-CF1/4C271J
R10, R11	10k 1/4W	660-CF1/4C103J
R12	100k 1/4W	660-CF1/4C104J
R13	82k, 1/4W	660-CF1/4C823J
R14	10k, audio control with SPST switch	31XP401
R15	50k, linear taper potentiometer	31VA405
S1	Part of R14	
U1	TLC555 CMOS 555 timer	511-TS555CN
U2	LM386 audio amplifier	513-NJM386BD
	Ultrasonic transducer, Kobitone	255-400ER18-RO
	(alternate device) Kobitone	255-400SR12
	(alternate device) Kobitone	255-400SR12-RO (RoHS)
(New)	**9V Battery Socket**	**123-7016**
	(Alternate, if back-ordered)	**123-7020**
(New)	**9V Battery Holder (vert., single hole)**	**12BH980**
	(Alternate, vert., 2-hole)	**12BH080 or 12BH095**
	(Alternate, horiz., 2-hole)	**12BH071 or 12BH079**

NOTES:

The following JACKS were added to the PC board to allow ease of connection to the PC board. The J1 & J2 jacks in the list below are **NOT** the same as J1 & J2 in the original article. You should still order J1 & J2 from the article.

If you do not wish to install these 'access' jacks, you may solder your connecting wires directly to the pads which would have been used for the added jacks.

A jack (J6) and a resistor (R16) have been added to allow you to conveniently access the oscillator output, in order to allow you to connect a frequency counter (FREQ. TP) for setting oscillator frequency.

Part#	Description	Mouser Pt #
J1, J2, J3, J5 & J6	2-Pin Vert Hdr w/locking ramp	538-22-23-2021
J4	3-Pin Vert Hdr w/locking ramp	538-22-23-2031
R16	22k 1/4w (FREQ TP resistor)	660-CF1/4C223J

(continued on next page)

(Suggested UPLAD Parts List, continued)

And… don't forget to order **KNOBS** for your **[VOL]** and **[FREQ]** controls!!! Consider…

Pointer Knob, .937" O.D. skirt 45KN013

The following plugs mate with the jacks (above) to allow the off-board components to be easily attached.

Part#	Description	Mouser Pt #
P1, P2, P3, P5 & P6	2-pin Crimp Term Hsg w/locking ramp	538-22-01-2027
P4	3-pin Crimp Term Hsg w/locking ramp	538-22-01-2037
Crimp terms. for receptacles above (phosphor bronze, 13 req. suggest you order several spares, say 16 or so)		538-08-52-0123

The following capacitors were added subsequent to the original article as a result of feedback from a builder who experienced some distortion in the audio output when the volume was turned up all the way. These components are NOT REQUIRED, but you may add them if you wish. The PC board **does** include pads for their installation.

Part#	Description	Mouser Pt #
C13-C15	47 uF, 25 V capacitor	140-XRL25V47

Comments from Jim Hanson, W1TRC, the author:

1) I made a minor error in the parts list for C11 and C12. I listed these capacitors as having a 35V rating but the Mouser part number is for 25V capacitors. The list has now been corrected and lists 25V capacitors with the corresponding Mouser part numbers. As far as the functioning of the circuit is concerned, either will work. In fact C11, the 10ufd 35V capacitor, has the same footprint as the 25V capacitor. The case sizes for the two versions of C12 are different. To get around this problem with the new printed circuit card, the board has been designed with extra pads and enough clearance so either capacitor can be used on the board, so if you have already purchased the parts, there will be no problem.

2) You will notice a slightly different part number for some of the resistors. For example, R7 is listed in the original article as R7 1k, 1/4W (Mouser P/N 660-CF1/4L102J) and in the part list it is listed as R7 1k, 1/4W Mouser P/N 660-CF1/4C102J. Notice that the "**L**" in the original part number has changed to a "**C**". This is a change by Mouser since I generated the original parts list for the article. It came about because Mouser is converting over their parts to be RoHS: (Reduction of Hazardous Substances) Compliant. They are getting away from lead. The old part numbers are apparently still available but there is a huge minimum order, so order using the new number or equivalent 1/4W resistors from another source.

3) Notice that a new resistor R16, 22k 1/4w (FREQ TP resistor) 660-CF1/4C223J has been added. This has been added to provide isolation for a frequency test point that has been included in the PC board. It ties to the junction of R11 and C3 which can be used as a point to measure the oscillator frequency when you are setting up the frequency adjustment. Its value is not critical.

4) Regarding the PVC hardware: My local hardware and plumbing supply stores did not have all of the PVC fittings that I needed, particularly the 3/4" Combination T (Slip x Slip x FPT). I ended up buying the fittings at a "Home Depot". If you choose what strength PVC pipe to buy, schedule 40 is probably the best choice.

FINALLY… Mouser, as well as other venders, are converting many of their parts to be RoHS: (Reduction of Hazardous Substances) compliant. For this reason, part numbers are in a state of flux and you may find that a part number on this list is either no longer available or has been replaced by a RoHS equivalent. This has already affected some of the parts on the QST parts list. The builder will have to use his own judgement when selecting final equivalent parts to use if a part on this list is no longer available or is only available in large quantities or long lead times. In general, since this is going to be a soldered circuit board, either compliant or non-compliant parts can be used.

Additional Notes From Builders:

15 Apr 2006

- We've just been advised that Mouser Electronics has BACKORDERED the following two 1/4w 5% carbon film resistor values (with a ship date of 14 Jun 2006):

R3–R6	2.2k 1/4w Carbon Film	660-CF1/4C222J
R12	100k 1/4w Carbon Film	660-CF1/4C104J

- The following 1/4w 1% carbon film resistors are available from Mouser, but at a slightly higher price, and may be substituted for the backordered 1/4w 5% devices listed above:

R3–R6	2.2K 1/4w Carbon Film	660-MF1/4CC2201F
R12	100k 1/4w Carbon Film	660-MF1/4CC1003F

- Mouser has also backordered P1 (the RCA plug, 17PP050), but there are any number of available replacements for this device… 171-8114, 17PP058, 17PP051, all come to mind, but at slightly higher cost.

- There was a typographical error in the Mouser part number for R13. Somehow, an upper case "I" (instead of the number "1") crept into the part number. The correct part number should be:

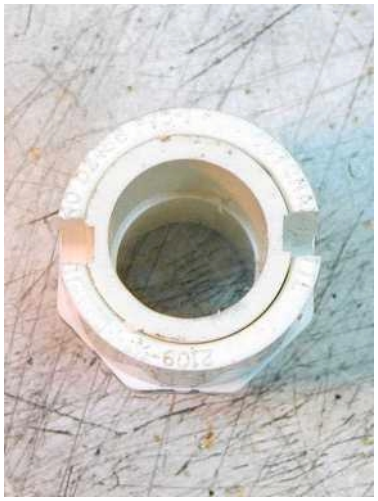
R13	82k 1/4w Carbon Film	660-CF1/4C823J

2 May 2006

- PC BOARDS for this project are now available from FAR Circuits http://www.farcircuits.net/ for $5.00 (US) plus postage.

At the author's request, I'm adding my byline (Tom Hammond, NØSS) to the following comments… This will absolve Jim from any problems my comments may create…

- After thinking about mounting the 10-24 all-thread rods into the ¾" Male Thread to ¾" PVC adapter, I wasn't terribly confident about my abilities to hold the rods (laterally) securely in the 3/16" slots I'd cut to accept them. So I cut a 1" long piece of my 3/4" PVC tubing and inserted it into the adapter. See pictures below.



I routed a small channel into the inner ring, to allow the 3/16" diameter all-thread to drop down into the ring just a bit.

Following the author's lead, I made a small plate (from junk PC board) to support the far ends of the all-thread while they are being set and molded into the PVC adapter. See pix on next page.

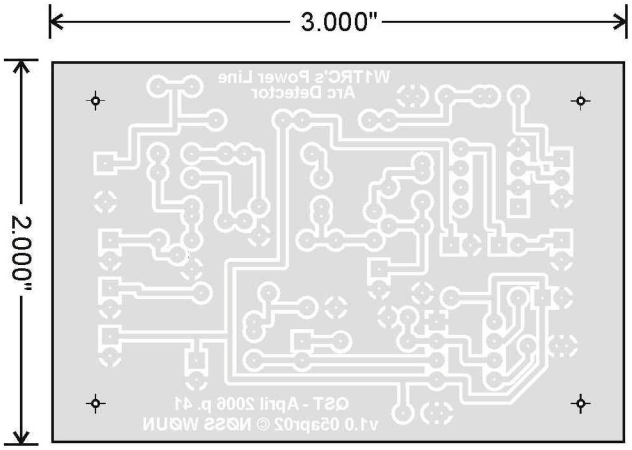
I then filled the channel with J-B Weld epoxy (Jim has had equally successful results with 5-Minute Epoxy as well), inserted the all-thread rods, and added a single-layer outer wrap of plastic tape to 'contain' the epoxy while it set up. J-B Weld (available in the automotive department of most hardware stores) fully cures in 24 hours, but you can handle it after 4 hours.

About 5-6 hours later, while the epoxy was still just a bit ‘plastic’, I removed the plastic tape and did a bit of ‘clean-up’ on the over-fill of the epoxy with a single-edges razor blade.

¾” PVC Adapter with All-Thread Set in Place
Note the support plate for the All-Thread

¾” Adapter with All-Thread Epoxied in Place

- The PC board, controls and connectors all fit nicely into a Radio Shack project box (270-1803).
- I mounted the project box to the ¾” PVC tubing with two 10-32 X 1-1/2” screws (spaced 3-1/2” apart) run through the PVC tubing and secured with 10-32 nuts. Then a 3/16” fender washer, slipped over the 10-32 screws, acts as a ‘backing plate’ for the project box which is slipped over the 10-32 screws and secured inside the box with #10 flat washers and 10-32 nuts. This combination of components allows the 1-1/2” screw to just fit flush with the top of the inner nut so nothing it sticking up.
- The PC board was installed (centered) inside the project box with four (4) 4-40 X ¾” screws through the bottom of the box. Two (2) 4-40 nuts on each screw (one to secure the screw to the box, and one nut run up on the screw to act as a stand-off for the PC board to support it just above the two screws and nuts mounting the box to the PVC tubing.) Then finally, 4-40 nuts on top of the PC board to secure it to the screws.
- Shown at right, is a full-size drilling template for drilling mounting holes for the PC board. You may print this illustration (set print to AS-IS, and DO NOT allow the printer to “FIT TO PAGE”), and then measure the distance between the PRINTED horizontal and vertical measurement marks. They should measure 3” X 2”.



PC Board Mounting Hole Drill Template

(Once printed, measure the distance between the MEASUREMENT MARKS, to confirm that the template has printed full-size. DO NOT measure the PC board itself as it may vary slightly in size.)

If the measurement marks were printed accurately, cut out the template and use it for marking your drill points. If the holes are accurately marked and drilled, 4-40 screws should fit easily through the 1/8" holes in the PC board.

4 May 2006

- Here are a few pics of a completed UPLAD enclosure, mounted to the 10" top piece of PVC. I used some 3/8" fender washers for 'backing' supports for the box, mounting everything with a couple 10-32 X 1/-1/2" screws through the PVC tubing. The fender washers REALLY add a lot of physical stability to the assembly. Center-to-center spacing of the two 10-32 screws should be NO LESS THAN 3-3/8", otherwise they will interfere with the heads of the PC board mounting screws. The PC board was mounted in the center of the bottom of the project box.

  The first pic shows a method of mounting the box, the 2nd pic shows how the 9V battery as attached for easy (external) access, and the 3rd pic shows the laminated front panel label waiting for the knobs to be installed.

Box mounted with 10-32 X ½" Screws & Fender Washers

9V Battery Mounted Externally

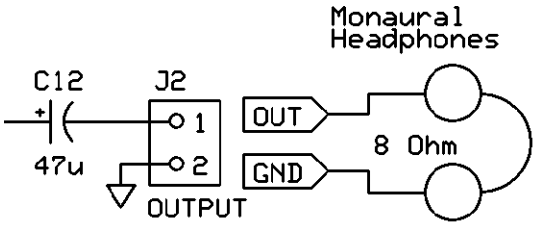
Laminated Front Panel Label

16 May 2006

- Mouser is temporarily OUT OF STOCK of the Kobitone 255-400ER18 transducer. More are on order, but they are projecting a 10-12 week delay in receipt of the new devices. Fortunately a suitable alternative transducer IS currently available at Mouser. That device is the Kobitone 255-400SR12 (and 255-400SR12-RO, RoHS compliant) transducer. Note however, that the Kobitone 255-400SR12 transducer is not waterproof (as is the 255-400ER18). Other than that difference, the alternate device appears to be as sensitive as the original. Jim Hanson, the author, suggests however that even if you order the alternate transducer, since the transducer prices are not terribly high, you might **not** want to cancel your backordered transducer.

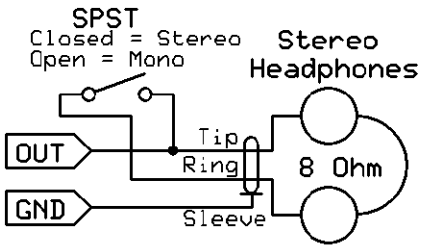
- Edmund Scientifics is also temporarily out of stock of the 18" parabolic reflector. However, they anticipate receipt of additional dishes on May 19th and May 27th, so the wait should not be too long.

- Some builders may wish to use stereo headphones, instead of the originally-specified monaural phones. In order to allow a stereo jack to serve as a monaural jack as well, consider adding a SPST switch to the line going to the RING terminal of the stereo jack. Disconnecting the RING terminal will allow the TIP and SLEEVE (shield) terminals of the stereo jack to function as a monaural jack without shorting the audio to ground as would be the case if a monaural plug was inserted into the stereo jack.



11 June 2006

- Although it was CORRECTLY SHOWN in the April 2006 QST article, the value of R5 (2.2k) was inadvertently shown as 22k in the re-drawn schematic which originally began this set of Builder's Notes. That error has now been corrected and R5's value is correctly reflected in the schematic which is included with this set of notes.



Alternate headphone jack wiring to allow either stereo or mono headphones to be used with the same (stereo) phone jack.

- A couple builders have been a bit dismayed when they completed their UPLADs, only to find that the FREQUENCY TUNE control had little effect on the tuning of the BFO oscillator. Upon further checking they found that they'd connected the TUNE pot (R15) to the wrong 2-pin header! **The correct 2-pin header connection for the TUNE POT is labeled J5 TUNE**, NOT J6 FREQ TP. J6 FREQ TP is the pick-off point for connecting a frequency counter to check the BFO frequency.