

### RESISTOR $\Omega$ REFRESHER

Multiply both digits of first 2 bands by 3rd Band:

black	0	0	X 1
brown	1	1	X 10
red	2	2	X 100
orange	3	3	X 1000
yellow	4	4	X 10,000
green	5	5	X 100,000
blue	6	6	X 1,000,000
violet	7	7	
gray	8	8	
white	9	9	
gold	--	--	X 0.1

✓ Examples . . .  
red-red-gold = 2.2  $\Omega$   
red-red-black = 22  $\Omega$   
red-red-brown = 220  $\Omega$   
red-red-red = 2200  $\Omega$  (2.2K)  
red-red-orange = 22K  
4th Band = mfr's tolerance.  
Gold = 5% Silver = 10%

### Some Ham Band Highlights

✓ WARC Bands  
10.100 - 10.150  
18.068 - 18.168  
24.890 - 24.990

✓ National Calling Frequencies (Simplex):

29.600 FM  
50.110 SSB DX  
50.200 USA SSB  
51.700 Packet  
52.525 FM  
144.20 SSB  
146.52 FM  
222.10 CW-SSB  
273.50 FM  
432.10 CW  
446.00 FM

✓ Easy QRP CW  
7.040  
10.106  
14.060

✓ Easy Space to Earth  
29.357 RS-10 Series  
Satellite CW beacon  
145.55 FM SAREX & MIR  
space-earth downlinks

### MOLDED $\mu$ H INDUCTORS

look very much like resistors, but don't "resist" much -- just check them out on your meter to read less than 1-2  $\Omega$ , much lower than resistors in your kit. Values are in  $\mu$ H (micronhenries), to 1000  $\mu$ H per resistor code, with 3rd silver band = X .01.  
✓ Examples:  
red-red-silver (22X.01) = 0.22  $\mu$ H  
red-red-gold (X 0.1) = 2.2  $\mu$ H  
red-red-black (X 1) = 22  $\mu$ H  
red-red-brown (X 10) = 220  $\mu$ H  
brown-black-red = 1000  $\mu$ H

### ALL ABOUT THOSE Disc Cap Numbers!

101 = 100 pF  
102 = .001  $\mu$ F  
103 = .01  $\mu$ F  
104 = .1  $\mu$ F  
✓ Want more?  
221 = 220 pF  
222 = .0022  $\mu$ F  
223 = .022  $\mu$ F  
331 = 330 pF  
332 = .0033  $\mu$ F  
471 = 470 pF  
472 = .0047  $\mu$ F  
473 = .047  $\mu$ F  
474 = ?  
Got the idea ?!

### FOR SURE!

We ALL know this . . .  
 $E \text{ volts} = I \text{ amps} \times R \text{ ohms}$   
 $R = E / I$   
 $I = E / R$   
 $P \text{ watts} = E \times I$

### They used to make BULLETS

by dropping melted lead way down into cold water. That's how some folks make excellent cold solder joints . . . by melting solder with the iron so it blobs onto the board, looking like deformed buckshot.

PLEASE . . . heat the connection itself so IT does all the melting, forming a shiny cone, not a dirty blob!

### A Super SOLDER BRIDGE

is built with that extra solder clinging to the iron's tip that we didn't need anyway. Just jiggle the soldering iron, and we can build nifty bridges across 2, 3, 4 or more PC-board soldering points, especially DIP IC's or sockets. Don't try it: you'll hate it!

### MAKE your Antennas!

1/4 Wavelength (in FEET)  
=  $234 \div \text{FREQ in MHz}$   
\*use 238 for radials  
\* FOR VHF, you can use 2808 to get 1/4  $\lambda$  in INCHES !!!

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74306

## No. 1056 T-KIT Module Board

## CW-SSB RECEIVER

"ANY BAND" NE612 Direct-Conversion design with all parts for choice of 160-10 meter ham bands, plus variable bandpass & fine-tuning controls

**TOKIT**  
by TEN-TEC

## INSTRUCTION MANUAL

**America's Best!**

Kit Assembly and Instruction Manual  
for T-KIT Module Board Kit  
Model No. 1056

**Direct-Conversion Receiver**  
with Parts for choice of 160 to 10 Meter Ham Bands

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***IMPORTANT: Please read Warranty Terms  
BEFORE starting kit assembly.***

... a quality electronics kit project from

**T-KIT**

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## Introduction

The T-KIT 1056 Direct-Conversion Receiver Module Board is the result of our looking over what's on the kit market and in magazine construction articles and asking ourselves if we can offer something better at an attractive price. Our goal was a simple receiver *which is genuinely useable*. The 1056 Module Board may be finished as a stand-alone receiver for travel, den or office, or incorporated into you own back-to-the-basics transceiver or "trans-receiver" project.

The simpleness of NE602/NE612 direct-conversion receiver design contributes to the novel way we chose to package this kit. Instead of stocking numerous one-band versions, pushing you to make band choices which you may not be ready to make, we offer ONE model plus ALL the parts needed to put it on (or change it to) any HF ham band of interest to you. This is good for both T-KIT and you: our inventory is much simpler, and you have everything in hand to explore the reasonable capabilities of your Model 1056 receiver board.

All frequency-determining parts are packed in a clearly-marked packet. **SAVE your unused coils and capacitors in this packet, T-KIT No. 1056-LC.** Doing so will help later, whether for your own new application or for giving or selling.

While designed to be a single band receiver for casual monitoring of a ham band, the Model 1056 permits experimenting with both frequency coverage and transmit/receive applications. Please remember that *experimenting is something we all do on our own or with friends for fun*. As nice as TEN-TEC tries to be to our valued customers, kit experimenting is NOT a process which our staff can coach you through!

As you plan your use of this receiver module board, keep in mind that the performance of ultra-simple receiver circuits deteriorates as the frequency goes up, particularly above 15 MHz. While this kit includes all parts to try ham bands up to 28 MHz (we also tried 6 Meters, but Engineering said "forget it"), please do not expect the same stability on 12 or 10 meters as you will enjoy on 160 through 30 meters.

## T-KIT Model 1056 Receiver Design Features:

- Signetics NE612 mixer-oscillator
- True varactor tuning (MV209)
- Zener diode regulation
- LM358 op amp bandpass filter
- Front-panel bandpass control
- Signetics TDA2611A audio amplifier IC
- Stereo jack for economical "Walkman" headphones
- Plenty of speaker audio
- Separate "Bandset" and "Bandspread" tuning controls
- RF gain control
- Provision for TX sidetone injection
- Provision for receiver audio muting during transmit
- Frequency Counter output line from local oscillator
- Efficient 6" WX 2 1/4" D board layout:  
take your favorite ham band ANYWHERE!
- Jumper provision for separate DC supply to audio IC
- Operates on 12-15 VDC

Use this space (and page 4) to plan your use of  
the T-KIT 1056 Direct Conversion Receiver Module Board

## Installing Parts on the Circuit Board:

When we say "INSTALL" a part, we mean:

- Choose correct part value
- Insert in correct PC Board location
- Insert *correctly*, if there is a right way and wrong way  
such as for the transistor and LED
- Solder all wires or pins
- Trim or "nip" excess wire lengths

## Model 1056 Circuit Description

The Schematic Diagram is printed on pages 12-13.

The efficient simplicity of this and similar receivers is made possible by the Signetics NE612AN mixer-oscillator, functionally identical to the well-known NE602. The NE612AN is used because it is standard TEN-TEC inventory. L1, C1 and C2 form a tuned RF input circuit coupling the antenna to pins 1 and 2. The dissimilar values of C1 and C2 are selected for proper impedance matching. Potentiometer R1 is an attenuator to minimize overload by strong signals and nearby AM broadcasts, therefore serving as RF gain control. The local oscillator frequency is determined by C3, C4, L2 (plus L3 on 80/75 and 160 meters), plus the varactor tuning network coupled through C5. Voltage applied through tuning pot R2 and R4 (100K) to the MV209 varactor (D1) provides coarse tuning or "band set." The fine-tuning or "band spread" by R3 is done by coupling the control voltage to D1 through R5, 1 megohm. As desired, changing the value of R5 will increase or decrease the fine-tuning rate.

Zener diode D2 (6.2V) regulates the voltage to the oscillator's varactor circuit, supporting U1's never-exceed Vcc limit of 8V.

The output from pins 4 and 5 of U1 is low-level audio, the direct-conversion result of mixing antenna RF input with the variable local oscillator frequency. This audio output is coupled through the filter network formed by R6-R9 and C10 to the inputs of op-amp U2a. The LM358 IC (U2a,b) is a dual op-amp. The voltage gain from antenna input to U1 to U2a output is typically 68 dB. The other LM358 op-amp (U2b) and its associated components serve as an elementary bandpass filter, with front-panel filter tuning done by potentiometer R16.

The output of U2b is coupled through C18 and Volume/AF Gain Control R18 to the input of U3, the Signetics TDA2611A audio amplifier IC, using the same general circuitry already proven in TEN-TEC HF transceivers.

# Model 1056 Direct Conversion Receiver KIT PARTS LIST

Before you begin construction, please take the time to sort your parts and check them per the following list. Please review the Limited Warranty terms regarding any suspected parts shortage.

Quantity	Description and Value	Schematic	Part No.
<b>Fixed Resistors</b>			
The 3 color bands denote resistance value. The 4th band (gold) denotes 5% tolerance.			
2	3.3 ohm (orange-orange-gold)	R20,R22	30109
1	220 ohm (red-red-brown)	R21	30130
1	680 ohm (blue-gray-brown)	R15	30136
2	3.3K (orange-orange-red)	R12,R17	30144
4	4.7K (yellow-violet-red)	R6,R7,R8,R9	30146
1	10K (brown-black-orange)	R19	30150
2	100K (brown-black-yellow)	R4,R13	30161
3	220K (red-red-yellow)	R10,R11,R14	30077
2	1 megohm (brown-black-green)	R5,R23	30173
<b>Fixed Capacitors (common to all bands)</b>			
1	3 pF disc capacitor	C25	23248
2	150 pF disc capacitor	C11,C13	23388
1	.001 $\mu$ F (marked 102)	C20	23245
1	.0033 $\mu$ F mylar film (marked 332)	C10	23288
3	.01 $\mu$ F mylar film (marked 103)	C14,C15,C16	23340
4	.1 $\mu$ F disc (marked 104)	C6,7,8,23	23261
4	10 $\mu$ F electrolytic	C12,17,18,19	23266
2	33 $\mu$ F electrolytic	C9,C21	23308
2	470 $\mu$ F electrolytic	C22,C24	23228
<b>Integrated Circuits, Diodes:</b>			
1	NE612AN or NE/SA-602 8-pin DIP IC	U1	25319
1	LM358 op-amp 8-pin DIP IC	U2	25117
1	TDA2611A, 9-pin SIP audio amplifier IC	U3	25299
1	MV209 varactor diode	D1	28050
1	6.2V zener diode, type 1N753A	D2	28055
<b>Other Components, Hardware:</b>			
1	Circuit Board for Model 1056		78249
5	10K front-panel potentiometer controls	R1-3,16,18	30267
1	Miniature stereo jack	J1	35252
1	Model 1056 instruction manual		74306

### REQUIRED, NOT SUPPLIED:

- Battery or regulated, well-filtered 8-15 Volts DC
- Antenna for band of interest, or 10-20' random wire
- Stereo headphones or speaker

### T-KIT Model 1056 Receiver Parts List, cont.

#### Capacitors (C1-C5) per Band Chart for 160-10 Meters:

1	10 pF	See Chart	23371
1	15 pF	"	23372
2	22 pF	"	23374
1	27 pF	"	23375
3	33 pF	"	23376
3	47 pF	"	23378
1	56 pF	"	23379
1	68 pF	"	23381
1	91 pF	"	23384
2	100 pF (marked 100 or 101)	"	23385
2	150 pF (marked 151)	"	23388
2	180 pF (marked 181)	"	23389
1	220 pF (marked 221)	"	23396
1	270 pF (marked 271)	"	23397
1	470 pF (marked 471)	"	23400
1	680 pF (marked 681)	"	23402
1	1000 pF (-.001 $\mu$ F, marked 102)	"	23282
1	4700 pF (-.0047 $\mu$ F, marked 472)	"	23293
1	.01 $\mu$ F	C5 80/160	23260

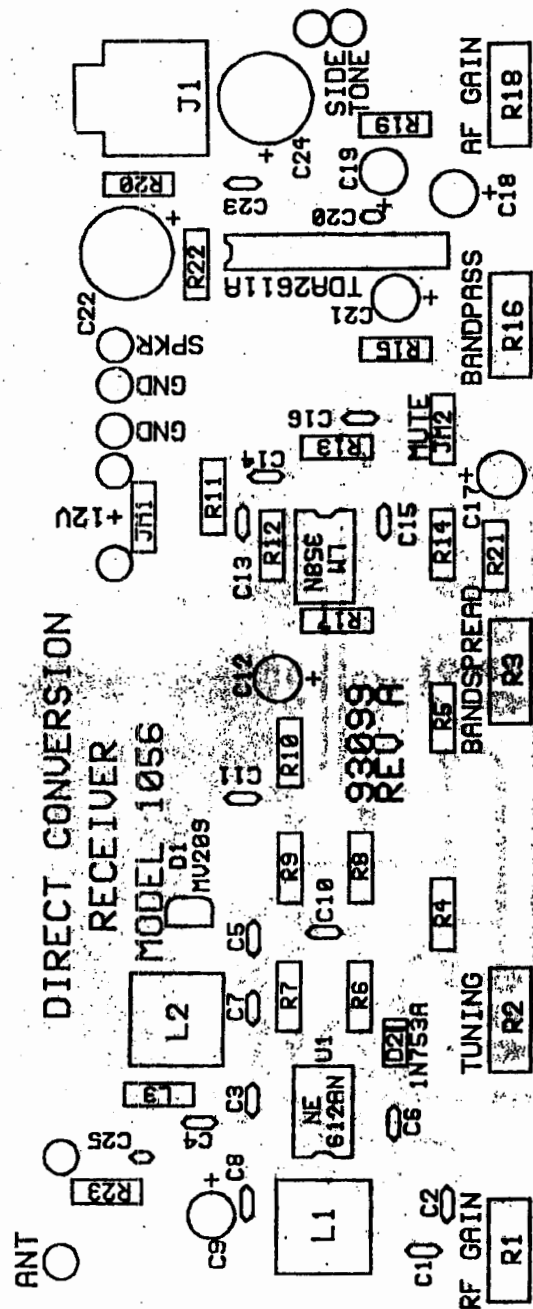
#### Inductors (L1, L2, L3) per Band Chart for 160-10 Meters:

2	8.0 $\mu$ H shielded, tuneable coil (marked 30-32)	L1,L2	21055
2	5.8 $\mu$ H shielded, tuneable coil (marked 30-33)	L1,L2	21056
2	2.8 $\mu$ H shielded, tuneable coil (marked 30-34)	L1,L2	21057
2	1.3 $\mu$ H shielded, tuneable coil (marked 30-35)	L1,L2	21058
1	8.2 $\mu$ H molded inductor (gray-red-gold-gold)	L3, 80M	21123
1	47 $\mu$ H molded inductor (yellow-violet-black-gold)	L3, 160M	21160

#### MINIMUM TOOLS AND TEST EQUIPMENT:

- 15 to 35 watt soldering iron
- Diagonal cutters or wire "nippers"
- Needle-nose pliers
- Non-metallic alignment blade (for L1, L2)
- RF signal source or receiver/transceiver for initial alignment

**USE ROSIN-CORE SOLDER ONLY,**  
of a type intended for electronic PC-board assembly.  
(Available at electronics distributors or Radio Shack stores.)  
**DO NOT use hardware store solder, paste or flux.**  
**Solder contains LEAD: wash hands before eating!**



T-KIT Model 1056  
X-RAY View of Circuit Board

NOTE: Your T-KIT circuit board is quality glass epoxy, etched, cleaned and screen-printed in the TEN-TEC plant to the high standards required by our transceiver assembly lines and modernized wave-soldering system.

## Circuit Board Assembly Steps

The basic assembly procedure will be to install all parts common to all bands first, leaving the frequency-determining parts for last. The component outlines silkscreened on the top side of the board make the location of parts reasonably obvious with minimal need for written explanations. There is no "wrong" order to "stuffing the board," as many electronics buffs like to do it, but it is quite common even for very experienced builders to make mistakes in parts values or in orienting one-way-only parts. Therefore, we encourage you to take advantage of the check blocks, parts descriptions and other information in these construction steps.

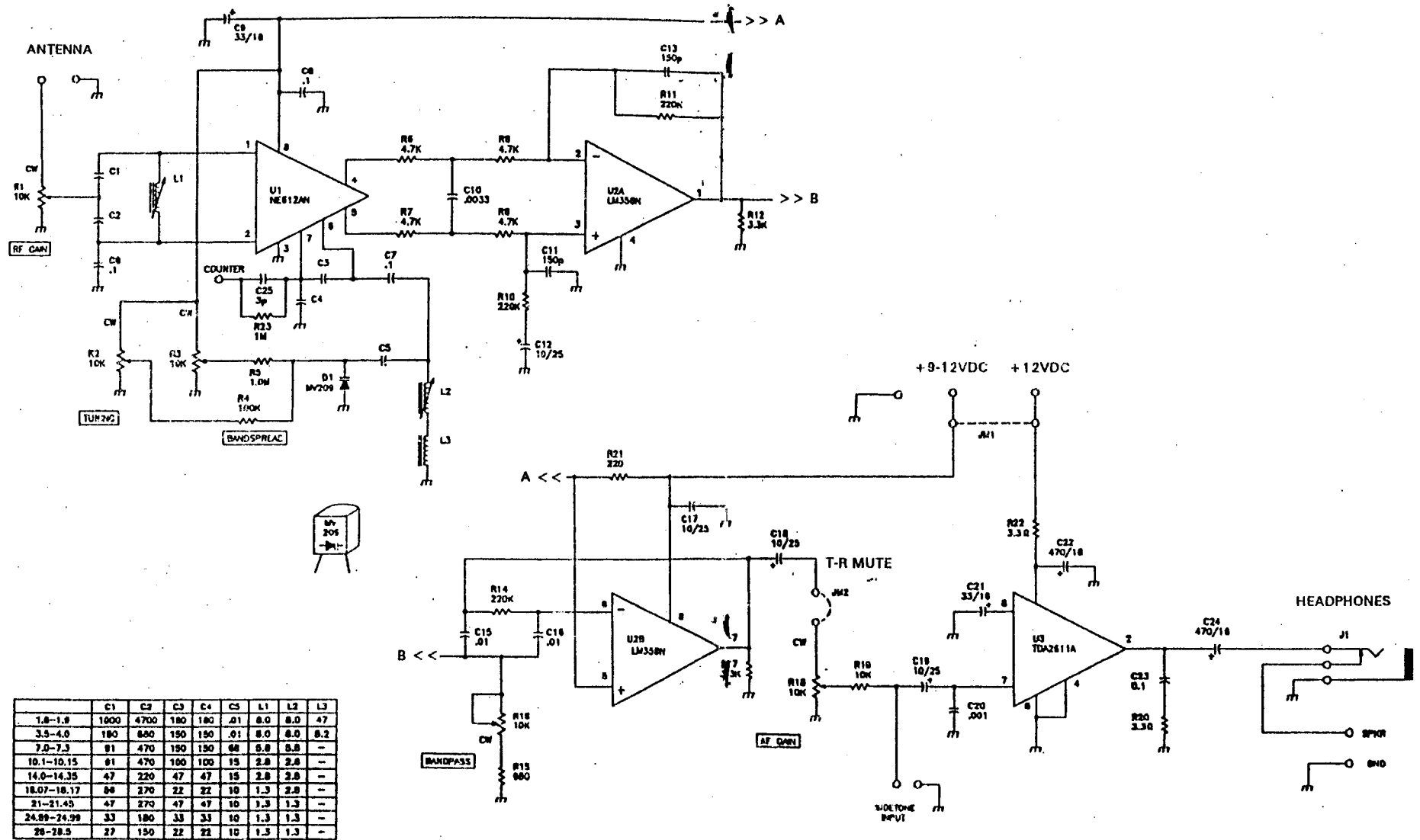
- □ 1. Install C21, a 33  $\mu$ F electrolytic capacitor. This is your one detailed reminder that all 8 of the electrolytics used in this circuit MUST be installed with correct polarity. The (+) side is clearly marked on the top of the circuit board. The (+) side of the capacitor itself is the longer of the two wires, and the (-) side is designated by the dark stripe.
- □ 2a. Insert U3, the TDA2611A SIP audio IC. **Before soldering**, make sure that the front (imprinted) side faces C21 just installed, and that the IC pins are pressed into their board holes as far as they can go. (Notice also that the banded end of the imprinted side of the IC corresponds to the notch on the board silkscreen.)
- □ 2b. Solder the 9 pins of U3 per 2a, taking care not to form solder bridges across the IC's pads.
- □ 3. Install C20, .001  $\mu$ F (marked 102).
- □ 4. Install C22, 470  $\mu$ F electrolytic, with correct polarity.
- □ 5. Install C24, 470  $\mu$ F electrolytic, with correct polarity.
- □ 6. Install C19, 10  $\mu$ F electrolytic, with correct polarity.
- □ 7. Install C18, 10  $\mu$ F electrolytic, with correct polarity.

To complete the audio output section of the receiver, install the following parts:

- □ 8. Stereo Jack J1.
- □ 9. AF Gain (Volume) 10K potentiometer R18.
- □ 10. R19, 10K (brown-black-orange).
- □ 11. R20, 3.3 ohms (orange-orange-gold).
- □ 12. R22, 3.3 ohms (orange-orange-gold).
- □ 13. C23, .1  $\mu$ F (marked 104).

♦ Pp. 12-13: Schematic. Assembly steps continue on page 14.

# T-KIT No. 1056 Direct Conversion Receiver



	C1	C2	C3	C4	C5	L1	L2	L3
1.8-1.9	1000	4700	180	180	.01	8.0	8.0	47
3.5-4.0	180	800	150	150	.01	8.0	8.0	8.2
7.0-7.5	91	470	190	190	.04	5.8	5.8	-
10.1-10.15	91	470	100	100	.15	2.8	2.8	-
14.0-14.35	47	220	47	47	.15	2.8	2.8	-
18.07-18.17	94	270	22	22	.10	1.3	2.8	-
21-21.45	47	270	47	47	.10	1.3	1.3	-
24.89-24.99	33	180	33	33	.10	1.3	1.3	-
28-28.5	27	150	22	22	.10	1.3	1.3	-

## PROGRESS NOTE

At this point, the audio output stage works, if all parts have been installed correctly per steps 1-13. If you enjoy keeping track of progress, use a highlight marker to color the portions of the schematic now completed.

- 14. Install U2, the LM358 op-amp IC, making sure that its band, notch or dot is aligned per the board drawing, facing toward U3.

Install the remaining electrolytic capacitors, being attentive to correct polarity as explained in Step 1.

- 15. C17, 10  $\mu$ F
- 16. C12, 10  $\mu$ F
- 17. C9, 33  $\mu$ F

Install these components of the LM358 dual op-amp circuitry:

- 18. R10, 220K (red-red-yellow)
- 19. R11, also 220K
- 20. R14, also 220K
- 21. C11, 150 pF (marked 151)
- 22. C13, also 150 pF.
- 23. R12, 3.3K (orange-orange-red)
- 24. R17, also 3.3K
- 25. R21, 220 ohms (red-red-brown)
- 26. R13, 100K (brown-black-yellow)
- 27. C14, .01  $\mu$ F film capacitor (marked 103)
- 28. C15, also .01  $\mu$ F film
- 29. C16, also .01  $\mu$ F film
- 30. R15, 680 ohms (blue-gray-brown)

**NOTE:** *The installation of jumper wires in steps 31 and 32 presume you are setting up the board for use as a receiver only, not part of a transmit-receive combination, and that you will use a single 12-volt DC power source. The JM2 "MUTE" jumper wire would be replaced by a shielded line to the T-R switching system of a transceiver or transmitter. The jumper "JM1" at +12V provides flexibility in battery or power supply connections, which are discussed later in "Power Supply Considerations."*

- 31. Using bare wire nipped from a resistor already installed, make a staple-shaped jumper wire; install it at "JM2" (MUTE).
- 32. As in Step 31, install a jumper at "JM1" (+12V).
- 33. Install Bandpass Control R16, 10K potentiometer.

## Progress Test (Optional):

With all parts now installed except the NE612 with its RF input, oscillator, and AF output circuits, this is a logical point to check the operation of the full U2/U3 audio circuit, if you wish. To do so, follow this procedure:

- Check first that Steps 1-33 have been completed correctly.
- Connect stereo headphones or speaker
- Turn the Bandpass and AF Gain controls fully clockwise
- Temporarily connect 12 volts DC, being careful about polarity.
- Holding the shaft of a screwdriver (or a length of bare wire), touch the end of R19 nearest C19: you should hear a distinct 60 Hz AC buzz.
- Rotate the Bandpass control: you should hear a distinct change in the pitch of the background hiss.
- Disconnect the 12 volts DC wires.

If you do not observe these results, or if you get extra noises such as a howl, squeal or putt-putt, please double-check all parts installed before proceeding further.

Install the remaining 10K front panel controls:

- 34. R1, RF Gain
- 35. R2, Tuning
- 36. R3, Bandspeed

37. Install U1, the NE612AN IC, making sure that its banded, notched end is oriented per the outline on the board. If you choose to use an 8-pin DIP socket for U1, use the same care in soldering the socket as you would for the IC itself.

Install the R-C network between U1 and U2:

- 38. R6, 4.7K (yellow-violet-red)
- 39. R7, 4.7K
- 40. R8, 4.7K
- 41. R9, 4.7K
- 42. C10, .0033 film capacitor (marked 332)

43. Install D1, the MV209 varactor diode. Let the diode body seat firmly against the board before soldering, and be sure to orient the flat side of this transistor-shaped component per the outline on the board.

44. Install the zener diode, D2, making sure that the banded cathode end is oriented with the stripe on the board outline.



Install these remaining parts common to all bands:

- 45. C6, .1  $\mu$ F disc capacitor (marked 104)
- 46. C7, also .1  $\mu$ F
- 47. C8, also .1  $\mu$ F
- 48. R4, 100K (brown-black-yellow)
- 49. R5, 1 megohm (brown-black-green)
- 50. R23, also 1 megohm
- 51. C25, 3 pF

This completes installation of parts common to all bands. If there is no question in your mind about which band you wish to set up, final parts installation is only a matter of selecting the correct values for C1-C5, L1-L3, and installing them in the normal way. If you plan to "tinker" with several bands before making a final choice, you can make desoldering a bit easier on yourself by leaving an extra 1/8" or so of lead length between capacitors and the board, and soldering only one of the two legs on the coil shields. If you do change parts, be gentle so as not to damage the copper traces of the board, or the parts themselves.

#### T-KIT 1056 Direct-Conversion Receiver GUIDE TO FREQUENCY-DETERMINING PARTS

	C1	C2	C3	C4	C5	L1	L2	L3
160	.001	.0047	180	180	.01	8.0 $\mu$ H	8.0 $\mu$ H	47 $\mu$ H
80	180	680	150	150	.01	8.0	8.0	8.2
40	91	470	150	150	68	5.8	5.8	jumper
30	91	470	100	100	15	2.8	2.8	jumper
20	47	220	47	47	15	2.8	2.8	jumper
17	56	270	22	22	10	1.3	2.8	jumper
15	47	270	47	47	10	1.3	1.3	jumper
12	33	180	33	33	10	1.3	1.3	jumper
10	27	150	22	22	10	1.3	1.3	jumper

Complete identification data for the 1056-LC Band Change Parts Kit is provided in the Kit Parts List on page 9. Before soldering the parts in Steps 52 through 59, write the correct value in the blanks provided on the following page.

Install the following parts for the \_\_\_\_\_ Meter Band:

- 52. C1, value \_\_\_\_\_
- 53. C2, value \_\_\_\_\_
- 54. C3, value \_\_\_\_\_
- 55. C4, value \_\_\_\_\_
- 56. C5, value \_\_\_\_\_
- 57. L1, value \_\_\_\_\_ marking \_\_\_\_\_
- 58. L2, value \_\_\_\_\_ marking \_\_\_\_\_
- 59. L3, value \_\_\_\_\_ color code \_\_\_\_\_

▶ A wire jumper **MUST** be installed at L3 if a coil is not required.

### First Connections

The minimum connections needed to test the receiver are wires for DC power, an antenna or random wire, plus headphones or speaker. The normal color code for DC power is red for positive and black for negative. We recommend using stranded hookup wire rather than the solid type: solid wire is prone to breaking easily. Before connecting 12VDC, it is worth the effort to go back over your work, checking for:

- Quality of solder points
- Completeness of soldering work (it's easy to miss one)
- All excess wire leads trimmed
- No wire scraps lodged between solder points

### Initial Tests, Adjustments

Before applying DC voltage, place the finished and double-checked board on a clean, non-metallic work surface. If you are ready to do so, oscillator alignment will go more smoothly if the board is already mounted to its intended chassis or panel, or clamped in a small vise. This is true especially for frequencies above 14 MHz, which can be affected by tiny capacitance changes of the board being moved around on another surface.

Set the controls as follows: RF Gain - maximum (clockwise); Tuning, Bandspread, Bandpass - mid scale; AF Gain - as desired.

Adjustment of coils L1 and L2 must be made with a non-metallic alignment tool. If necessary, such a tool can be made easily from a plastic shaft, wood dowel, etc.

The oscillator coil (L2) is adjusted to the desired frequency either by listening for the oscillator signal in a nearby receiver, or by tuning the coil until you hear a desired reference signal with the 1056 receiver itself. That signal can be from a signal generator, VFO, QRP transmitter, or familiar activity on your favorite band. After getting L2 "in the ballpark," adjust L1 for maximum signal strength, reducing the RF gain as needed to hear the effect of adjusting L1. Use the Tune control and minor adjustments of L2 to ensure satisfactory coverage of the band.

## Final Assembly

Enclosure, knobs, switching, connectors: selecting these yourself is part of building any T-KIT Module Board. If you want to use a T-KIT *Enclosure-PLUS* hardware/enclosure package, the 1000C pak was designed with this 1056 receiver project in mind.

## DC Power Supply Considerations

The ideal DC voltage source for the receiver is a 12 volt battery. A 12-15 VDC power supply with very good filtering may also be used. Separate DC supply lines, normally connected by the jumper wire, are provided for audio IC U3 and the rest of the circuit, allowing you to experiment with the various power paks or batteries you have on hand. For example, a wall-plug-in DC power module may work fine for audio output but introduces unacceptable hum or ripple to the receiver front end. Solution: try a battery for 12V-A and use the wall supply for 12V-B.

Or, you may want to make the unit ultra-portable, using 8 or 10 "AA" alkaline cells: you may wish to run only the audio amplifier from the 12-volt battery pack, and use a separate 9V battery for the U1/U2 circuitry. The primary advantage of the dual voltage input is to increase the useful life of the batteries. When the batteries are longer prime but still useable, the current demand of the audio IC causes voltage fluctuations which can destabilize the oscillator and tuning circuit.

□ If you prefer a 9V battery for the NE612/LM358 circuitry, change R21 from 220 ohms to 100 ohms.

## Operating and Experimental Features:

The following details are provided for your convenience in experimenting with or adapting the receiver board to ham-band transmit/receive setups.

**DC Power Inputs:** See preceding section.

**Sidetone Input:** Used with the MUTE feature (see below), this direct access to the input of U3 permits injection of a CW sidetone or DSB/SSB audio while transmitting. The level of such audio injection must be controlled BEFORE it reaches this point in the receiver circuit, because the Volume control (R18, AF Gain) will have no effect.

**Mute:** Ordinarily shorted by a jumper wire, this pair of pads on the board makes it easy for you to use a T-R circuit to silence the receiver during transmit (while still permitting sidetone or other audio monitoring).

**Bandspread:** Notice on the schematic that this control functions in parallel with the Tune ("Bandset") control. The rate of frequency change is determined by the value of R5, 1 megohm. The value of R5 may be changed to suit personal operating preferences and the band of interest. Increasing R5 will lower the frequency change rate, and vice versa. Because tuning higher frequency bands requires less change in capacitance, both tuning controls will cover much more spectrum at, say, 15 or 10 meters, than when tuning 160 or 80 meters.

**Frequency Counter Output:** This connection to pin 7 of U1 through R23 and C25 is an option included for experimental hookups of frequency counters to display the oscillator frequency. Some counters may require a buffer amplifier stage. Any counter hookup should use the shortest length possible of mini-coax (RG174), because coax and the counter input circuit adds capacitance to the oscillator circuit. Some counters may introduce unacceptable levels of clock noise.

**Speaker Output:** Connecting headphones interrupts the speaker output line. The best speaker performance will come from good quality speakers in well-designed enclosures. An unenclosed speaker laying on a workbench will not be impressive. The headphone jack also permits use of mini stereo speaker systems available inexpensively for personal radios, CD players, etc.

**Band Parts Kit:** Keep the extra parts together for future use. You may wish to try a different band or experiment with band

switching ideas. Please be aware that we do not sell individual parts or provide technical support for experiments. The 1056 is designed to be a one-band receiver.

Before trying ANY of the experimental features or capabilities of the receiver, make certain that it is functioning as designed.

## Troubleshooting Guide

**General:** This kit project is designed to work as specified if the right parts are selected and installed correctly and all connections are made as explained in this manual. The #1 cause of problems in most kit projects is exactly what we tend to take for granted: a mistake or broken wire in the connection of external items to the circuit board, such as DC power, speaker, switches and so forth. After that comes a mistake on the board itself, such as:

- Incorrect part value
- Reversed orientation of diode, IC, electrolytic capacitor or other part which must be installed in one direction only.
- Bad solder connection (cold joint or bridge)

**Specific Hints:** Be sure to double-check the following:

- Did you install required jumper wires?
- Did you choose correctly from the Band Parts Chart?

**Common Experiences and Remedies:**

- Strong 60 Hz AC hum even when using battery power.  
*Antenna coax shield needs to be grounded to both receiver board and earth ground.*
- Steady high-pitch hum  
*Receiver or antenna is too close to a computer, frequency counter or other microprocessor device. Something has to move!*
- All CW signals are chirpy  
*Weak battery. See "DC Power Supply Considerations."*
- Receiver oscillator seems unstable during first bench tests.  
*Reasonable stability requires secure mounting in enclosure.*

This T-KIT Module Board is designed to encourage and help you to solve problems yourself. If you are stumped after following all our suggestions, please consult the T-KIT Limited Warranty published in this manual.

## Getting to Know the Receiver

If you already are familiar with direct-conversion receiver characteristics, you should find this one to be a good performer. If this kind of receiver is new to you, there are several facts to learn about. First, unlike the typical ham transceiver, you will hear *both* sidebands of a CW or SSB signal. To tune USB (20 meters and above) tune "up" the band to the point where the signal becomes intelligible. To tune LSB (160-40 meters), tune "down" to the point at which the signal becomes intelligible.

The receiver is quite sensitive but uses a very simple RF input circuit. It is possible for strong AM broadcast stations, whether local or shortwave, to overload the circuit. Ordinarily, this problem is minimized by reducing the RF gain slightly. This kind of circuit also is susceptible to power supply hum, which is why battery operation is often preferable.

The variable Bandpass control is a feature rarely found in so simple and inexpensive a receiver. Simply adjust it for the best sound quality of the signal. CW signals are tuned in best with a lower bandpass frequency (counterclockwise), while SSB will sound best with a higher bandpass frequency.

As you react to the performance of your receiver, keep in mind that variable-oscillator stability (susceptibility to temperature change and mechanical vibration) becomes progressively more critical as frequency is increased. From 160 through 30 meters, this receiver will serve as well as many of the simpler superhets of several decades ago. From 20 meters on up, more attention must be given to how you package and handle the receiver.

## What Frequency Am I On?

The most complex and costly single section of ANY receiver, past or present, is the mechanical or electronic system used for displaying the frequency. Of course, there could be a series of T-KIT direct conversion receivers, even multi-band models, with well-calibrated dials or digital displays. And, of course, this would be an entirely different price class of receiver which, for just a few dollars more, would best become microprocessor-controlled dual-conversion circuitry.

The handiest fact about direct-conversion receivers (and also regenerative receivers such as T-KIT 1054 and 1253) is that the oscillator frequency IS the receiving frequency . . . letting you

use any digitally-accurate receiver/transceiver to listen to the oscillator signal for creating a simple tuning scale covering the one frequency range of interest to you. (After all, it is not likely that you bought this receiver in order to use your soldering iron as a bandswitch!) While it can be set up for any band, you want it for ONE band, your favorite, probably one segment of that band. Once you decide how you want to use this receiver, the one-time process of creating a neat dial scale will be easy and rewarding, regardless of whether you use classic or computer-style panel designing.

The option of trying a frequency counter is included on the board strictly as a convenience for experimenters. We make no claims of how satisfactory or successful this will be. For recent information on constructing a counter circuit specifically intended for use with a NE602-type direct conversion receiver, see *Communications Quarterly*, Winter 1994, pages 25-46.

## Concluding Note

First, thanks for your interest in T-KIT by TEN-TEC! We think this Model 1056 Direct Conversion Receiver circuit design sets a new standard for varactor-tuned NE612/602 direct-conversion receiver kits in this price range.

Pick your band, use your creativity to finish up your T-KIT Module Board receiver, and ENJOY it for what it is!

## T-KIT Limited WARRANTY

*Please read carefully BEFORE building your kit.*

This Limited Warranty applies solely to KITS sold by TEN-TEC, Inc. under the trade name "T-KIT." The terms of this Warranty do not apply to other products of any kind manufactured by TEN-TEC, Inc., nor shall any other warranties published by TEN-TEC, Inc., or any TEN-TEC customer service policies for its manufactured products, be construed as applicable to T-KIT products.

1. All components and hardware supplied as parts of a kit are warranted to be free from manufacturing defect for one year from date of purchase.
2. The original purchaser has the option of examining the kit and manual for 30 days. If you choose within this period not to construct the kit, you may return the entire unassembled kit at your own expense for full credit toward any other TEN-TEC product, or a refund, less original shipping/handling charges.
3. This warranty is voided if acid-core solder is used in construction. USE ROSIN-CORE SOLDER ONLY, of a grade designed for electronic PC-board assembly. WARNING: solder contain LEAD, which is known to cause birth defects or other reproductive harm. Avoid breathing solder fumes, which may cause pulmonary irritation or damage. After handling any solder, wash hands with soap and water before eating.
4. TEN-TEC, Inc. warrants this device to function as described in its documentation provided that it is assembled and used correctly in accord with all printed directions. It is your responsibility to follow all directions in the instruction manual, to identify components correctly and to use good workmanship and proper tools in constructing this kit.
5. We do not accept the return of partially-assembled kits for repair or refund.
6. If you believe a kit part is missing, do a thorough sorting of all parts, checking each off on the parts list in the manual. Check all bags, envelopes or boxes carefully. Simply call, fax, or write, and we will promptly replace any missing part. Even if you find an exact replacement parts locally, please notify us so we may assist other customers.
7. If your kit does not work after final assembly, please follow these three steps in order:
  - A. Double-check EVERY step in the assembly manual and any troubleshooting tips provided.
  - B. Ask an experienced ham or hobbyist friend review to your work. A fresh set of eyes can catch a detail which you may have overlooked.
  - C. If necessary, you are welcome to ask for T-KIT Technical Assistance at 453-7172. (Technical Assistance for T-KITs is available ONLY through THIS number.)
8. **Factory Inspection or Service.** If you wish to return a kit for professional inspection or repair, there is a minimum charge of \$20.00, payable by cash, check, money order or credit card charge authorization. There is no need to call or write for authorization; simply send your kit with a note explaining the problem, and provide authorization to make repairs at prevailing hourly shop rates. To minimize extra cost to you we reserve the right simply to send you replacement parts with notes on how to solve your problem. If we find that a part was defective in manufacture, there will be NO CHARGE to repair your kit unit. Our technicians will make the determination whether a part was defective in manufacture or was damaged during installation.
9. TEN-TEC, Inc. reserves the right to revise this Limited Warranty, to change or discontinue any kit product or revise its instruction manual with no liability to previous purchasers. However, if you complete the Kit Registration form supplied with all kits, you will receive periodic technical news from us, including tips, special offers on upgrades. Individual kit manuals may contain Warranty extensions or limitations for that specific kit product.
10. TEN-TEC, Inc., is not liable for any consequences from use or abuse of any T-KIT or part contained therein.

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