Errata for Experimental Methods in RF Design

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September 25, 2020

EMRFD, as we like to call it, was first published in 2003 by ARRL of Newington, CT. There have been three major printings, with the third having a modified name, Revised First Edition, which appeared in 2009. Eventually, the book went out of print, but then reappeared as an ARRL *Classic Edition*. This is a form that was offered as-is, without additional corrections. Even the Classic Edition is at it's end.

The book had errors and we have tried to chronicle them in on-line errata. Now that the book is at it's end, we have gathered the errata into one document and offer it here. As of October 1, 2020, we no longer solicit error reports. We have tried to report technical errors and even offer an occasional updated circuit. Errors in grammar and spelling are also listed, although I'm sure that some remain. Some Internet files are listed in EMRFD and some of those have disappeared. These can be found on some of the corners of the Internet where everything persists. These are not listed, an editorial decision on our part.

I'd like to take this opportunity to thank all of you who have taken the time to tell us about these many errors. Hopefully, they have made EMRFD a more useful reference book.

73, Wes
W7ZOI

Errata, Table of Contents for EMRFD

The following corrections should be applied to the contents.
Note: All early errors in the Table of Contents have been fixed in the 3rd printing. (17Apr9)

2.....
..... 2.2 should read Amplifier Design Basics. (5Mar03)

4.....
..... 4.9 A Digital Dial (10Dec03)
4.10 A General Purpose VXO-Extending Frequency Synthesizer (10Dec03)

5..... 5.4 Frequency Multipliers. (5May03)

6. Transmitters and Receivers (7Mar03)
6.0 Signals and the Systems that Process them.
6.1 Receiver Fundamentals
6.2 IF Amplifiers and AGC
6.3 Large Signals in Receivers and Front End Design
6.4 Local Oscillator Systems
6.5 Receivers with Enhanced Dynamic Range
6.6 Transmitter and Transceiver Design
6.7 Frequency Shifts, Offsets, and Incremental Tuning
6.8 Transmit-Receive Antenna Switching
6.9 The Lichen Transceiver: A Case Study
6.10 A Monoband SSB/CW Transceiver
6.11 A Portable DSB/CW 50 MHz Station

7. Measurement Equipment (7Mar03)
7.0 Measurement Basics
7.1 DC Measurements
7.2 The Oscilloscope
7.3 RF Power Measurement
7.4 Attenuators

EMRFD Chapter 1 Errata.

There is a major goof that showed up with the 3rd printing. Evidently it happened at the printer. The error, which is confined to Chapter 1, turns many italicized parts of the text into gibberish. A proper version of the text can be found at the ARRL site by clicking here: http://www.arrl.org/notes/8799/ (17 April 09)
This problem appears to have been fixed with the Classic EMRFD printing. (22jan2017)

p1.3, left col, very top: replace "Reactance is little consequence..." with "Reactance is of little consequence..." (9Dec03)

p1.5, left col, 0.7 inches down from top of text: change "viable" to "important" (26Mar03)

p1.7, right col, 1.8 inches down from top of text: change "know" to "known" (24Feb03)

p1.8, right col, 5.6 inches down from top of text: change "a an inductor" to "an inductor" (24Feb03)

p1.11, middle col, 0.8 inch down from text top. replace "indictor" with "indicator" (9Dec03)

p1.11, Fig. 1.16. In figure, fix spelling. "Course" becomes "Coarse." New figure shown below: (11June03)

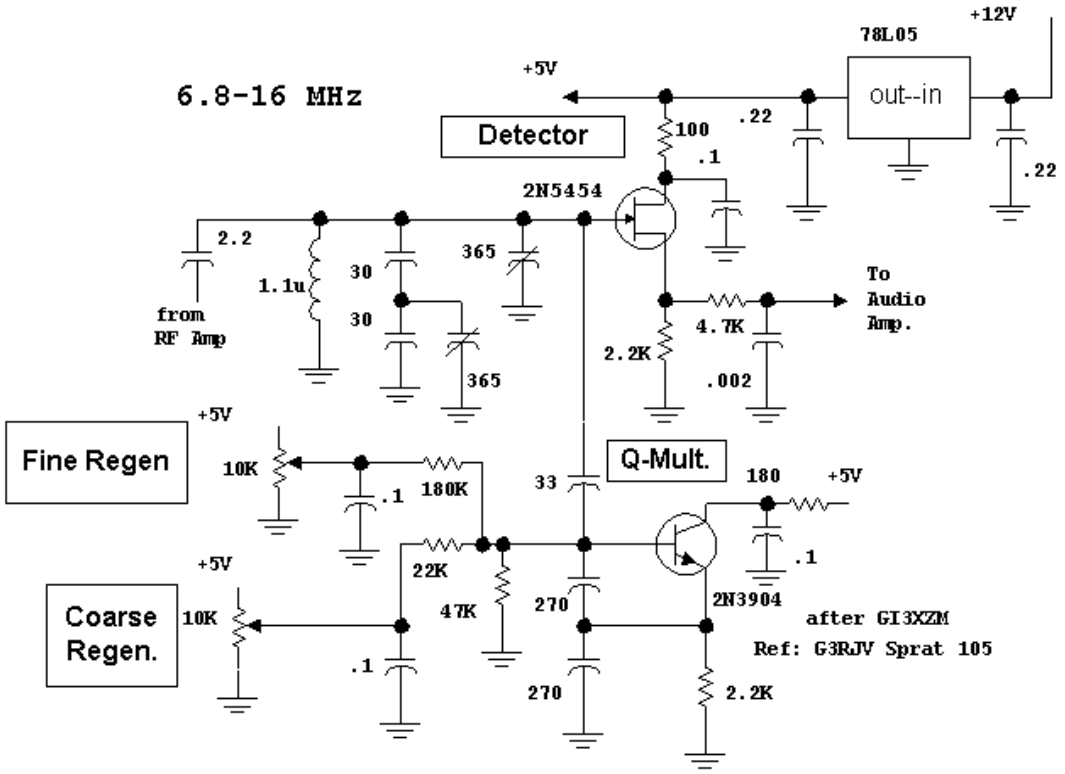


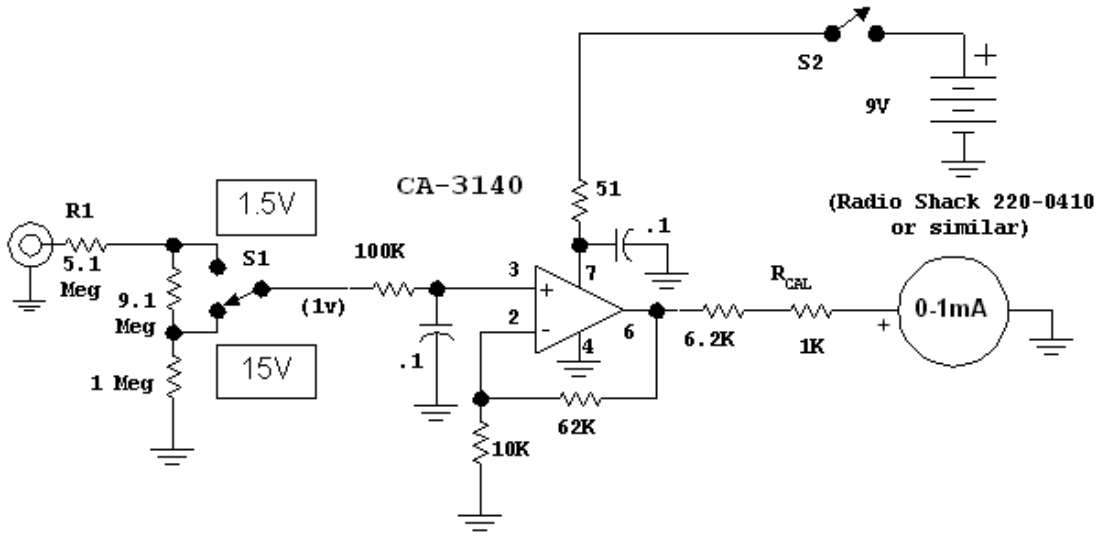
Fig. 1.16.

p1,14, left col, 2.2 inches down from text top. The 7812 has a max I of 1 A and not 0.5 A. (16June03)

p 1.15, top of right column. The word should be "farads" rather than "Farads." (6May13)

p 1.16, caption for Fig 1.26. The caption should read: Fig 1.26 Dual range power meter. The 4 W input uses the formula to calculate power in milliwatts. The 50 mW range uses the curve of Fig 1.27. (6May13)

p1.17, Fig 1.31. There is a missing ground symbol in the figure. It should be:



(5Dec03)

p1.18, Eq 1.2. This *error* was a major surprise, for it appeared in the latest version of EMRFD, the Classic Reprint Edition. This edition was a means to keep the book available for those using it for courses or similar technical situations. This edition was not intended to include any changes of any sort. Yet, an error was discovered that did not appear in ANY of the previous editions. The intended equation, and the form that appeared in the other editions, is shown in the figure.

$$R_L = \frac{(V_{CC} - V_E)^2}{2P_{out}}$$

(31August2020)

p1.18, column 3, 3.6 inches down from text top. Replace the sentence "We measured L1 and set the value that desired." with "The L-network design (see section 3.6) produced values of 1.97 uH and 197 pF. We wound an inductor on a toroid and then measured inductance, spreading or compressing turns slightly to produce the desired value." (19Aug03)

p1.18, modify Fig 1.33 to emphasize R1 discussed in text. Shown below

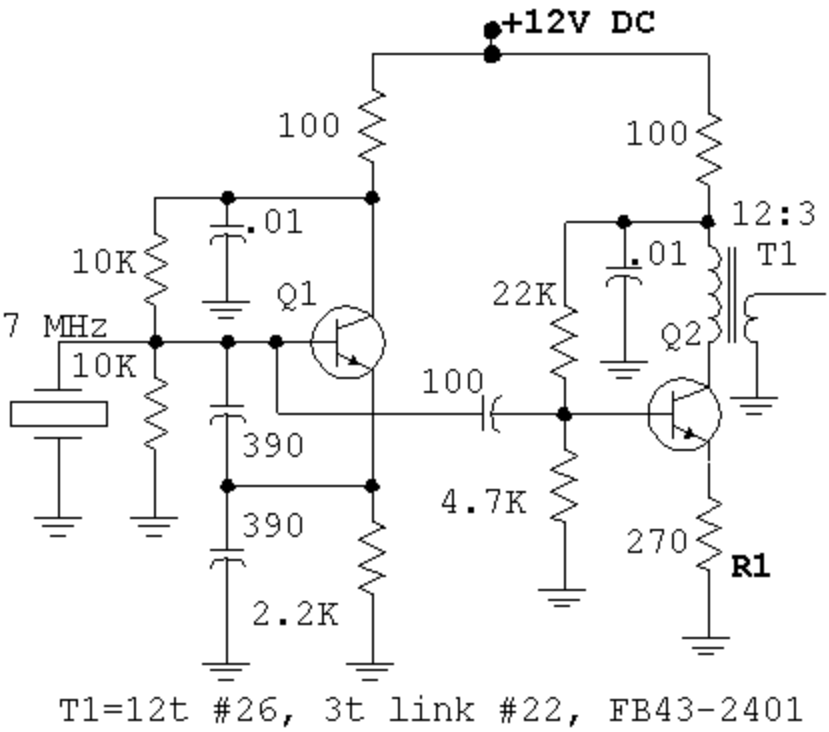


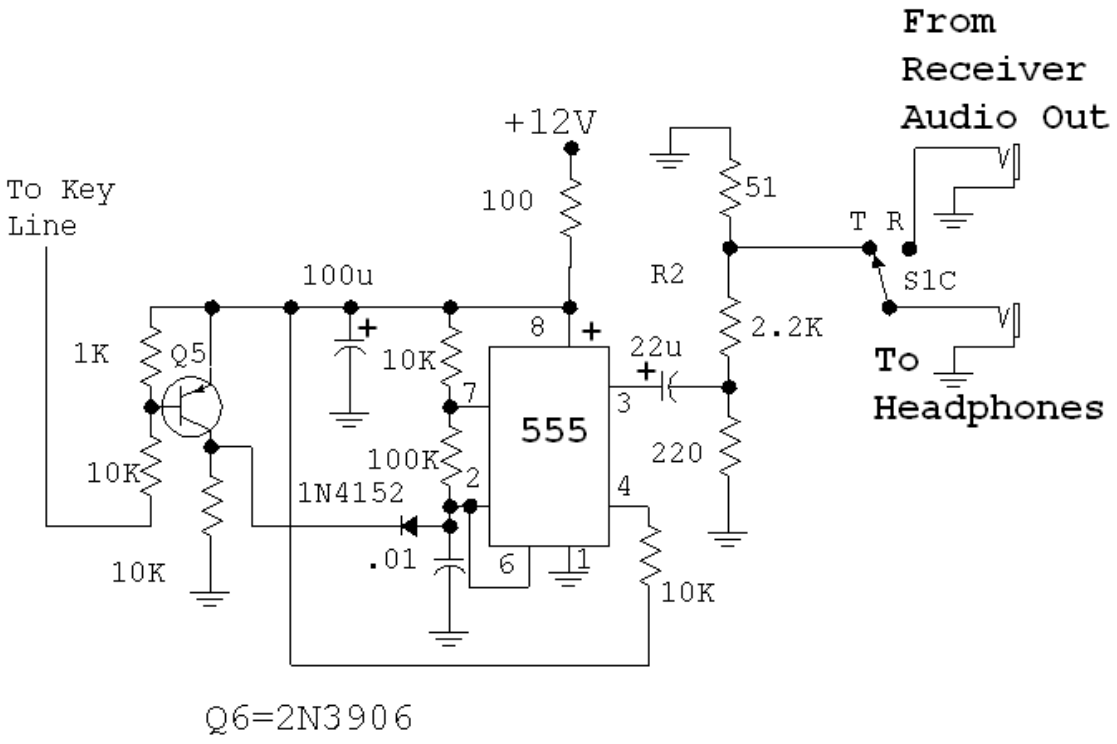
Fig 1.33. (same caption) (24Feb03)

p1.19, left col, 1.8 inches up from bottom of text, should read "...increase power by about 10 dB to ..." (26Mar03)

p 1.19, left col, 3.1 inch up from text bottom. Replace "head sink" with "heat sink" (15Jan10).

p1.19 and 1.21, Fig 1.35 and Fig 1.39. Change Q5 from the discontinued 2N5321 to a MJE181. Mount transistor with an insulated spacer so circuit board serves as a heat sink. (Note: The board alone was not an adequate heat sink and the transistor started to increase in temperature. It was good enough for testing. A small heat sink would be useful. Efficiency is worse with the MJE181 than it was with the 2N5321.) (25Jan05) (29Jan06)

p1.21, Fig 1.40. Pin 6 of the 555 IC should be connected to pin 2. Hence,

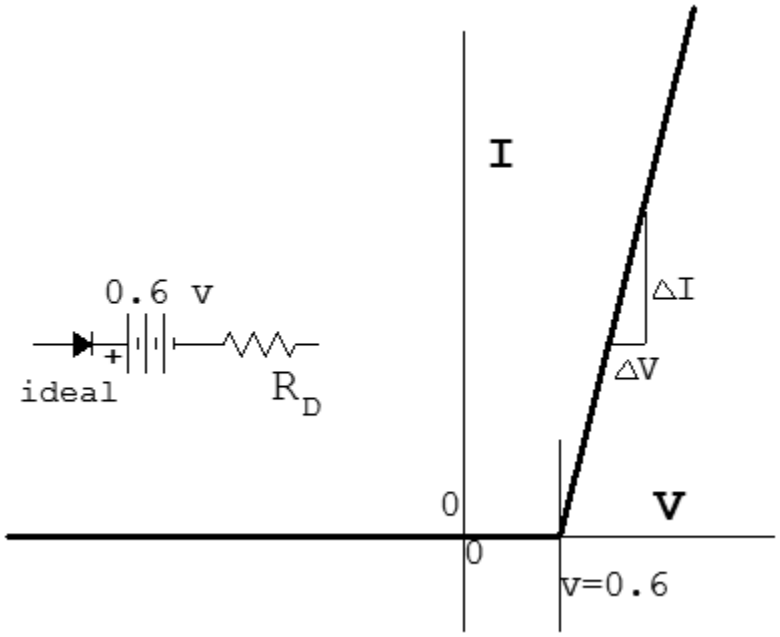


(15Feb04)

p1.23, Ref. 1. This should read: W. Hayward and D. DeMaw, *Solid State Design for the Radio Amateur*, ARRL, 1977.

EMRFD Chapter 2 Errata.

p2.2, Fig 2.3. The diode in the figure has the battery polarity wrong. The correct figure is shown below. (27Sept09)



p2.2, right col, 0.8 inches down from top of text: "collector" becomes "collector" (24Feb03)

p2.4, left col, 2.1 inches down from text top. The bxIb should be (beta)xIb where (beta) is the Greek letter and the b in Ib is a subscript (26Mar03)

p2.4, left col, 3.2 inches down from top of text: This should be ".....11.4 V across 100 k-Ohm, or 114 uA. If transistor beta=100, the collector current is 11.4 mA." Error was in the m and u related to milli and micro amp. (24Feb03)

p2.4, right col, 4 lines up from text bottom. Replace mF with uF. (microfarad) (24Feb03)

p2.5, right col, 0.8 inch down from text top: replace "N-Channel" with "N-channel" (9Dec03)

p2.5, right col, 0.8 inch down from text top. Replace JET with JFET. (15 Jan 10)

p2.6, left col, almost at bottom: That current is 752 uA, not mA. Also, base current is 19 uA, not mA. (24Feb03)

p2.6, Eq 2.13. There should be a minus sign ahead of this equation, for gm is a positive value and Vp is negative. (8May07)

p2.6, JFET analysis, General comments: The equations that describe JFET current contain the term Vsg. This is the source voltage with respect to the gate, or Vs-Vg. Fig 2.19 includes an equation that is called the "Basic FET equation." This has a positive sign within the bracket. If the equation had been written in terms of Vgs (gate voltage with respect to the source) there would be a negative sign. The key points to keep in mind are that Vp is negative (for an N channel depletion mode JFET) and that Vgs=-Vsg. Here's a summary of useful JFET equations. This is clarification info. It is not an errata.

$$I_d = I_{dss} \cdot \left(1 - \frac{V_{gs}}{V_p}\right)^2$$ (Basic FET equation)

$$I_d = I_{dss} \cdot \left(1 + \frac{V_{sg}}{V_p}\right)^2$$ (Basic FET equation, alternative form. This one also works fine.)

$$g_m = \frac{-2 \cdot I_{DSS}}{V_p} \cdot \left(1 + \frac{V_{sg}}{V_p}\right)$$ (Eq 2.13, EMRFD)

$$g_m = \frac{-2 \cdot I_{DSS}}{V_p} \cdot \left(1 + \frac{I_D \cdot R_s}{V_p}\right)$$ (Eq 2.13, EMRFD, alternative form)

$$R_s = \frac{V_p}{I_D} \cdot \left(\sqrt{\frac{I_D}{I_{DSS}}} - 1\right)$$ (FET biasing equation. Rs in source lead yields drain current Id <Idss.)

8May07

p2.7, left col, 0.5 inch down from text top. Change Vbe in the equation to be a simple Vb. Either would work in the case of Fig 2.21A. But Figures 2.21C and D are both models that include the bias current dependent emitter resistance re. Fig 2.21B relates to biasing rather than signal amplification. (6Aug04)

$$G_v = \frac{\alpha \cdot R_L}{r_e}$$

p2.8, Eq. 2.20. Use this in place of that shown. (30Nov15)

p2.8, right col, 1.5 inches down from text top: "effected" becomes "affected" (26Mar03)

p2.9, right col, 2.5 inches up from text bottom: "role" becomes "roll" (24Feb03)

p2.9, Fig 2.28 caption: "hybrid-p" should be "hybrid-pi" where "pi" is the Greek letter. (26Mar03)

p2.11, first word on page: "*reasoning*" becomes "reasoning" without . italics (26Mar03)

p2.12, left col, 1" up from bottom. Change 0.5V to .05V.
Make the same change on bottom line in column. (30Nov15)

p2.15, Fig. 2.42: Those are homebrew and surplus terminators rather than attenuators. (24Feb03)

p2.15, middle column, 1.8 inches down from top of text: change figure ref. Should read "In Fig 2.40 we saw ...." (24Feb03)

p2.16, middle col, equation 2.30. Replace Gamma with the absolute value of Gamma. Hence

$$RL = -20 \cdot \mathrm{Log}(|\Gamma|)$$ (8Feb04)

p2.18, left col, 3.1 inches down from text top: replace "effect" with "affect" (9Dec03)

p2.19, Fig 2.55, caption. Change "grow with increasing..." to "drop with increasing...". (10July2018)

p2.20, middle col, 1.2 inches down from top of text: "some of he" becomes "some of the" (24Feb03)

p2.21, col 1, 3.0 inches down from text top. Replace "the earlier equation" with "equation 2.35" (8Feb04)

p2.21, right col, 1.9 inches up from text bottom: replace "f1, f1, and f2" with "f1, f1 again, and f2" where all of these numbers are subscripts. Analytically, this means is that IMD order is the sum of the exponents in the related equations. (9Dec03)

p2.22, col 3, 3.4 inches down from text top. Remove the word "nonlinear." (12July03)

p2.23, col1, 2.0 inches down from text top. Replace "is a bit stronger" with "has lower IMD" (12July03)

p2.25, caption for Table 2.2: should be "r=1.3 Ohms" not "r=1.3 W" (24Feb03)

p2.27, middle col, 1.0 inch down from text top. Replace sentence beginning with "This IC..." It should become: This IC should not be used without a dropping resistor." (12July03)

p2.27, middle col, 1.6 inches down from text top. Replace Greek Omega with "W" for watt. (12July03)

p2.29, Fig. 2.88. The leaded capacitors have 0.1 inch leads, not 4 inch. Also, the chip cap is a size 0805, not 0905. (24Feb03)

p2.30, top of left col: replace "run" with "printed circuit run or wire" (24Feb03)

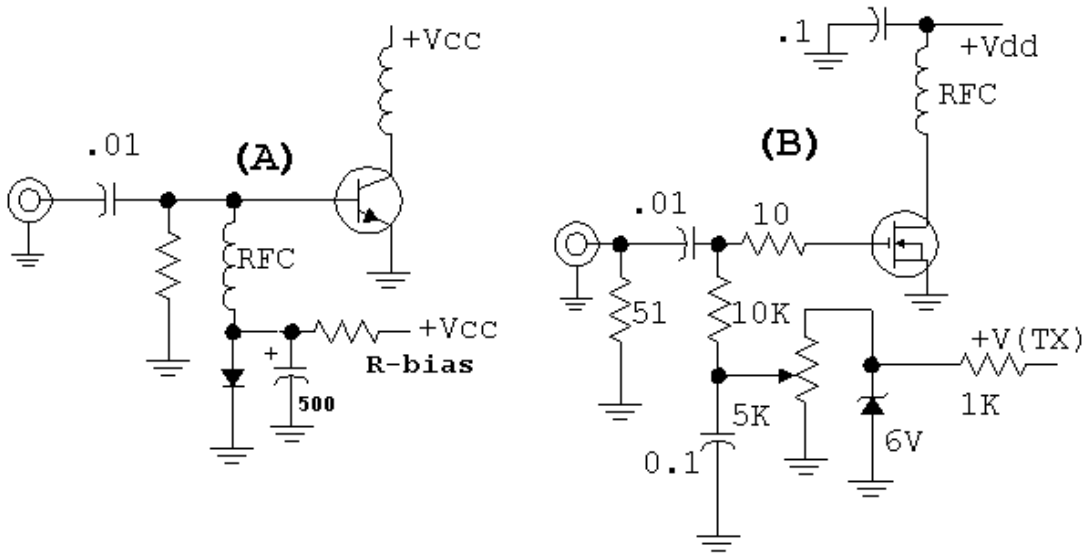
p2.31, Top of middle col. Replace "have Q" with "have low Q". (29Aug9)

p2.33, middle col, 0.4 inches up from text bottom. Change "diode purpose" to "diode's purpose." (12July03)

p2.36, Fig 2.97 Caption. Change the units for L1, L2, and L3 from mH to uH. (While L1 and L2 are correct in the Third Printing, L3 is still shown as 15 mH. It should be 15 microhenry. (17April9)

p2.36, bottom of text and p2.37 text top: The paragraph now reads: "The amplifier is set up for Class-C operation, although it could be modified for class AB linear operation with little other change required. Linear biasing is discussed below." Change the paragraph to become "The amplifier is set up for Class C operation. It is easily modified for AB linear service with the methods outlined below." (9Dec03)

p2.37. Figure 2.100. Alter the figure to include the 500 uF cap in A. Change text in caption, changing mF to uF. (That's microfarad, not millifarad.)



(12July03)

p2.37, right column, 3.7 inches down from text top: replace "thermal communications" with "thermal contact" (9Dec03)

p2.37, right col, 3.8 inches down from text top: Replace "Some designs us a ...." with "Some designs use a ....." (17April09)

p2.39, right column, 0.9 inches up from text bottom: replace "network the Beginner's" with "network for the Beginner's" (9Dec03)

p2.40, Fig 2.105 caption, third line: Change drain to collector. (12July03)

p2.40, col 3, 0.4 inches up from text bottom. Change p-network to pi-network. (12July03)

p2.41, right column, 1.2 inches up from text bottom: replace "This loss of no" with "This loss is of no" (9Dec03)

P2.42, right col, 2.7" down from top. Both "point B" and "plane B" are mentioned. They are the same thing. See section 3.6 in the next chapter for a discussion of directional impedance.

p2.42, Fig 2.112. This schematic describes a CW Power amplifier that has been a major work horse for years at w7zoi. The schematic uses a wide band transmission line transformer, T2, followed by a double pi network. A T/R switch is included in the

amplifier consisting of a series tuned circuit (C4 and L7) with 6 diodes. This scheme has always worked well. However, when the amplifier was built with the alternative output match shown in the schematic, the T/R circuit does not function well. The power amplifier will develop over 50 watts of output, but the signal reaching the receiver in key-up state is severely attenuated. A relay T/R system, or a T/R using PIN diodes is recommended when the alternative output is used. See T/R info in Chapter 6. (18Aug2018)

Errata for Chapter 3

p3.4, middle col, 2.4 inches below top of text. Remove the paren) at the end of the sentence. (15May03)

p3.6, Table 3.2. g(3) for the Wide U. Sp. filter should be 3.352 instead of 2.352. (16 Sept 05)

p3.7, col 3, 2.9 inches up from text bottom. Replace "texts.(ref 6)" with "texts such as Zverev.(ref 6)" Zverev was misspelled in that text.

p3.9, col 3, 1.9 inches up from text top. Add a footnote after "Zverev's text." The note should read "see ref 6. (15Jan04)

p3.10, middle col, 4th line down from top: Change "he" to "the" (24Feb03)

p3.10, left column, 4.2 inches up from text bottom: Note the first few sentences in the paragraph beginning with "The sidebar.." Just past the bold Table 3A that appears in text we find "(see sidebar on page 3.14)" Move this expression to the beginning of the paragraph so that we now have "The sidebar equations (see sidebar on page 3.14) may be used .....This has been done done to form Table 3A . The inductors ....." (9Dec03)

p3.11, Fig 3.22 caption. Change 0.4 mH to 0.4 uH. (15Jan04)

p3.12, sidebar Fig B. It's "scraps" of circuit board material rather than scaps. (16May03)

p3.14, Table 3A. The inductors are all in uH (microhenry) rather than mH (millihenry.) (24Feb03)

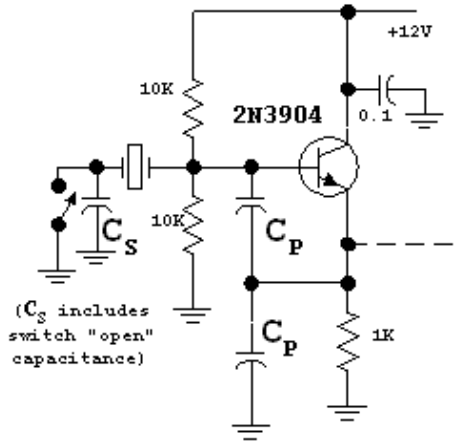
p3.14, Table 3A. The filter with center frequency of 14.2 MHz has a bandwidth of 0.4 MHz rather than the value of 0.2 MHz shown. (10Feb13)

p3.15, middle col, 1.3 inches down from top of text: change "coil" like structure to become "coil-like" structure. (24Feb03)

p3.19, right column, 4 lines up from bottom: Replace the existing text with "Normalized Q is q0=19.2, so..." (4May03)

p3.19, right column, 1.0 inch up from text bottom. Replace k23=0.4512 with k23=0.5412. The filter presented in the example was designed with k23=0.4512 and is a nicely performing filter with a slightly narrower bandwidth than the desired one. (4 Feb 05)

p3.19, Fig 3.35. This is not a report of an error, but rather, a revision to an existing method. Jack Smith, K8ZOA, pointed out a very interesting omission that we made in the formula we use to calculate motional inductance from the frequency shift in the G3UUR type crystal oscillator. The capacitance we had used was just the series C that is inserted by the switch, including the capacitance of the open switch. This value should also include the crystal parallel capacitance, or holder C as it is sometimes described. The figure below summarizes this:

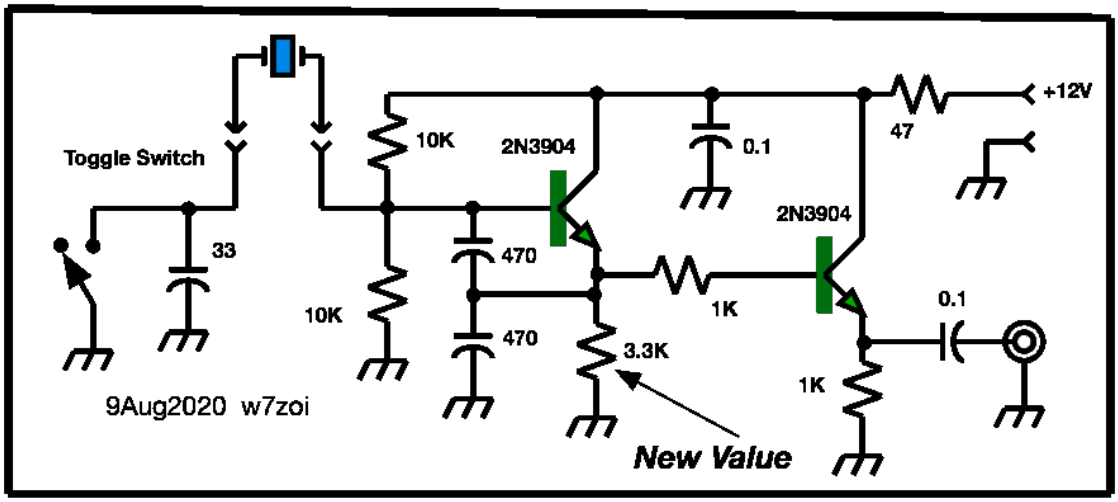


$$C_M = 2 \cdot C_S \cdot \frac{\Delta F}{F}$$ Old Equation, p 3.19.

$$C_M = 2 \cdot (C_S + C_0) \cdot \frac{\Delta F}{F}$$ Updated Equation

The parameter C0 is the parallel capacitance of the crystal. This is measured at low frequency with a device such as the AADE LC Meter. (22may06) (15Nov07)

p3.19, Fig 3.35. This is again an update rather than an error. I discovered that I got better correlation between the g3uur measurements and VNA measurements, including crystal frequency matching, if the drive power to the crystal is reduced. So, the 1K emitter resistor in the oscillator has been replaced with a 3.3K resistor. This is shown in the following schematic. (10Aug2020)



p3.21, middle col, 0.5 inch down from text top. Replace "shape is severely distorted" with " attenuation is markedly increased". (27July03)

p3.23, Fig. 3.44(C) The vertical axis should not be dB, but ms for milliseconds. [That needs to be lower case *ms* and not *mS,* which would be milli-Siemens, a unit of conductance and not time. (corrected, 15Nov07)] (5Mar03) (15Nov07)

p3.23, middle col, 3.6 inches down from top: replace "termina-tion" with "termination" (24Feb03)

P3.23, right col, top. Make it read…"There are numerous phenomena that degrade performance."

p3.23 and 3.24. On these pages we describe the behavior of a "linear phase" crystal filter. The use of the term linear phase is just an approximation here. This filter was designed using the "linear phase with equal ripple error" k and q tables from Zverev. These tables are an approximation, as is often done in network synthesis. (Indeed, the Chebyshev filter is an approximation with ripples emulating a perfect brick wall filter.) Also, the base filter is a low pass design. Here, it undergoes a lowpass to narrow bandpass transformation when a practical filter is designed. The approximations as well as the transformations lead to departure from the ideal of a perfectly flat group delay. (This is more of a comment than an actual errata item.) (29Apr03)

p3.24. Figures 3.46 and 3.47: Exchange the two figures while leaving the captions in place. That is, the Chebyshev filter is the one with a flat passband response and severe "wings" on the group delay. (24Feb03)

p3.24. Fig. 3.48 should be the following:

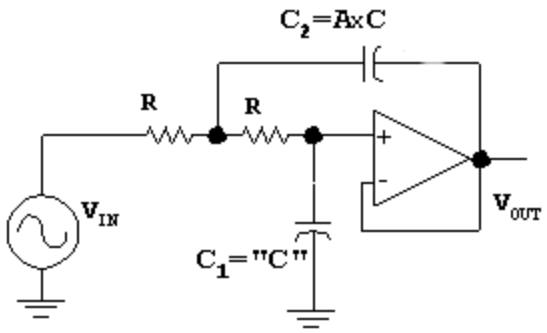


Fig 3.48 (same caption)

(24Feb03)

p3.24 left column, 0.6 inches up from text bottom. Replace the text beginning with "Fig 3.48" and ending in "5, and 10." with "Fig 3.48 is a special version with two equal resistors and a capacitor that is A times the value of the first. Fig 3.49 shows representative responses for R=10K, C=.01 uF, and A=1, 2, 5, and 10. " (10Apr04)

p3.24, middle column, text up 3.5 inches from text bottom. Replace sentence beginning with "For A<=2 and" with "For A=2 and for equal R, the 3 dB cutoff frequency is given by" (10Apr04)

p3.24, middle column. Replace Eq 3.18 with

$$F_{C.O.} = \frac{\sqrt{2}}{4 \cdot \pi \cdot R \cdot C} \qquad \text{Eq 3.18}$$

(10Apr04)

p3.24, middle column, text following Eq 3.18. Eliminate from "where A is the capacitor ratio, C2/C1" to end of paragraph. Replace with the following:
"For example, with R=10K-Ohm, C1=.01 uF, C2=.02 uF, the cutoff is 1125 Hz. Eq 3.18 can be solved for R for any cutoff or capacitor, but is restricted to A=2, which is the Butterworth filter. (10Apr04)

p3.25, Fig 3.49. Add a sentence to the caption: "The solid line corresponds to A=1 while highest peak is for A=10." (27July03)

p3.26, Fig 3.53. Add a sentence to the caption: "The solid line corresponds to A=1 while highest peak is for A=10." (27July03)

p3.26, sidebar in upper left. Another name misspelled. LaPlace should transform to Laplace.

p3.26, left column, line 2 down from text top. Replace "ungrounded" with "grounded" (10Apr04)

p3.26, left column, line 3 down from text top. Replace "grounded" with "ungrounded" (10Apr04)

p3.26, left column, 0.3 inch up from text bottom. Replace "pure high" with "pure N=2 Butterworth" (10Apr04)

$$F_{C.O.} = \frac{\sqrt{2}}{4 \cdot \pi \cdot R \cdot C} \qquad \text{Eq 3.23}$$

p3.26, middle column, replace Eq 3.23 with (10Apr04)

p3.26, add text just below Eq 3.23. "This is identical to Eq 3.18." (10Apr04)

p3.27, left col, 2nd line below equation 3.26. Text should refer to Equation 3.25. (5Mar03)

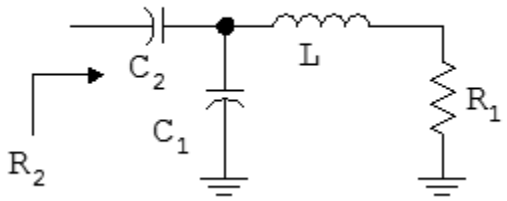
p3.28, left col. 1.3 inches down from top of text: "circ" should be "circuit" (24Feb03)

p3.28, left col. 4.2 inches down from top of text: "generated" should be "generate" (24Feb03)

p3.28. Left column, 1.6 inches down from text top. Says "all all". Should read at all frequencies. (5Mar03, 10Apr09)

p3.29, Fig 3.62. The input is tap #0, so there really are 10 taps.
p3.30. Left column, 1.3 inches up from text bottom. "It's" should be "its". (31July09)

p3.31, Fig 3.67. The capacitors should be switched in the figure. The new figure is



(11Feb08)

3.32, middle column, 2 inches up from bottom. Replace the link with Amidoncorp.com .

p3.33, left column, 3.4 inches up from text bottom: Note the Greek mu followed by i. The "i" should be a subscript, indicating that this is an "initial" permeability. (9Dec03)

p3.34, middle column, 1.1 inches up from text bottom: replace "later is -63" with "latter is -63" (9Dec03)

p3.34, middle col. 2.7 and 3.5 inches down from top of text. Replaced "powder" with "powdered" (24Feb03)

p3.36, left col, 1.7" up. Replace "miss-terminated" with "mis-terminated."

p3.36, left column, 0.7 inches up from text bottom: replace "while Hybrid refers" to "while hybrid refers" (9Dec03)

p3.36, left col, 2.9 inches down from top of text: add a hyphen to make text read "transformer-like" (24Feb03)

p3.38, Ref 4. The title for the paper is "...Using Ultraspherical Polynomials." (27July03)

p3.38, Figure in upper left. This should be Fig 3.88. The caption could be "Diplexer Design." Also, there should be some text regarding the design of Diplexers, perhaps something like the following:
A Diplexer is a three port circuit. One port, the *input*, connects to two filters, each routing to the remaining two ports. The two filters are the complement of each other. Hence, if one filter is a low pass, the other one would be a high pass. A bandpass filter lines up with a bandstop circuit. A filter pair will have an identical cutoff frequency. In the case of a bandpass/bandstop pair, the bandwidth will be the same for each in the pair. The purpose of the diplexer is to present a perfect impedance match at the common port for all frequencies when the output ports are terminated. When using low pass/high pass pair, it is common to pick a cutoff frequency that is the geometric mean of the important output frequencies. For example, if a diplexer was being built to combine transmitters at 10.1 MHz and 28 MHz to drive a single, common antenna, the low pass and high pass cutoff frequency would be 16.8 MHz.
Fig 3.88 shows a low pass/high pass pair with N=3 as well as a bandpass/bandstop pair. Design equations are included in the figure. (25Feb2020)

p3.39, Ref 18. The complete reference is : B. Carver, K6OLG, "High-Performance Crystal Filter Design," Communications Quarterly, Winter, 1993. (27July03)

EMRFD Chapter 4 Errata.

p4.1, caption for Fig 4.1, first line: Should be of an oscillator. (24Feb03)

p4.2, left column, 4.2 inches down from text top: replace "system in the Figure" with "system in Fig 4.1" (9Dec03) It should be Fig 4.1. (17 Apr 9)

p4.2, left column, 1.0 inch up from bottom: replace "Colpitts or a Hartley" with "Colpitts or Hartley" (9Dec03)

p4.3, middle col, 1.3 inches up from text bottom: Eliminate the word "viable" from sentence. (26Mar03)

p4.4, bottom line in sidebar. replace can [produce with can produce. (24Feb03)
(In regard to this sidebar, see the new program Padcap in the design programs. 17April9)

p4.4, middle col, four lines up from bottom: The proper spelling here is squegging rather than squeeging. (24Feb03)

p4.4, right col, 2 inches down from text top: make it read "for overall efficiency." (24Feb03)

p4.6, left col, 2nd line down from top: That should be NP0 rather than NPO (NP Zero rather than NP Oh.) (24Feb03)

p4.6, left col, 4.5 inches down from text top: replace know with known. (24Feb03)

p4.6, Fig 4.7. Add the following to the caption on the figure: The unusually low value of coupling capacitor in the source was chosen to suppress squeeging. This difficulty disappears with the Hartley circuit of Fig 4.4. (8March2014)

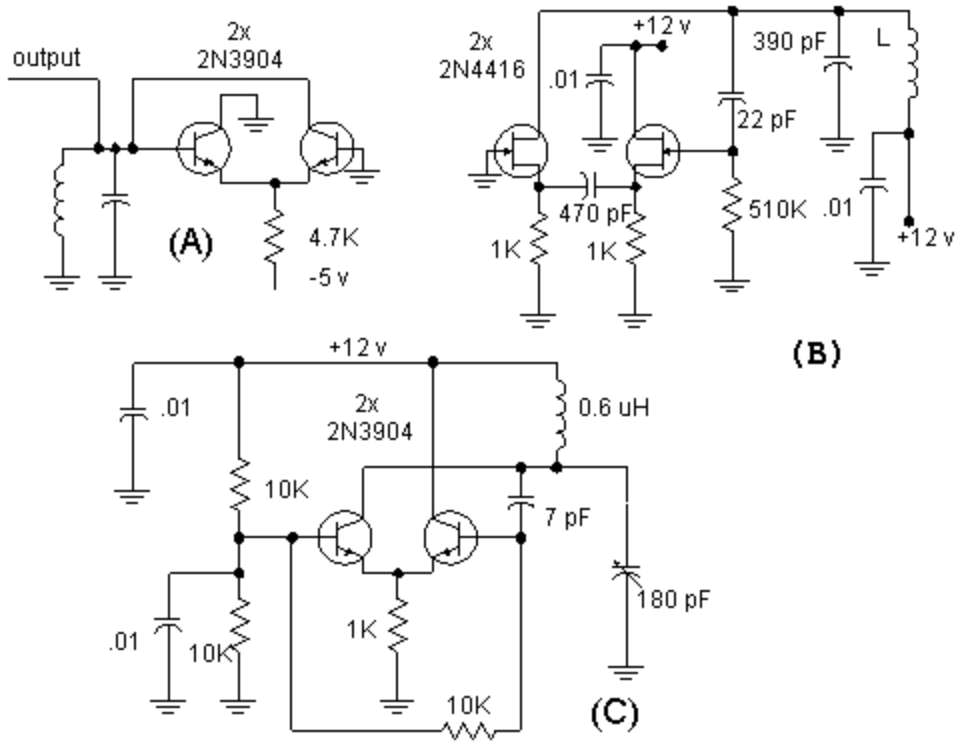
p4.7, middle col, 0.3 inches down from text top: replace "it's own" with "its own." (31 July 09)

P4.8, right col, top. Replace criterion with criteria.

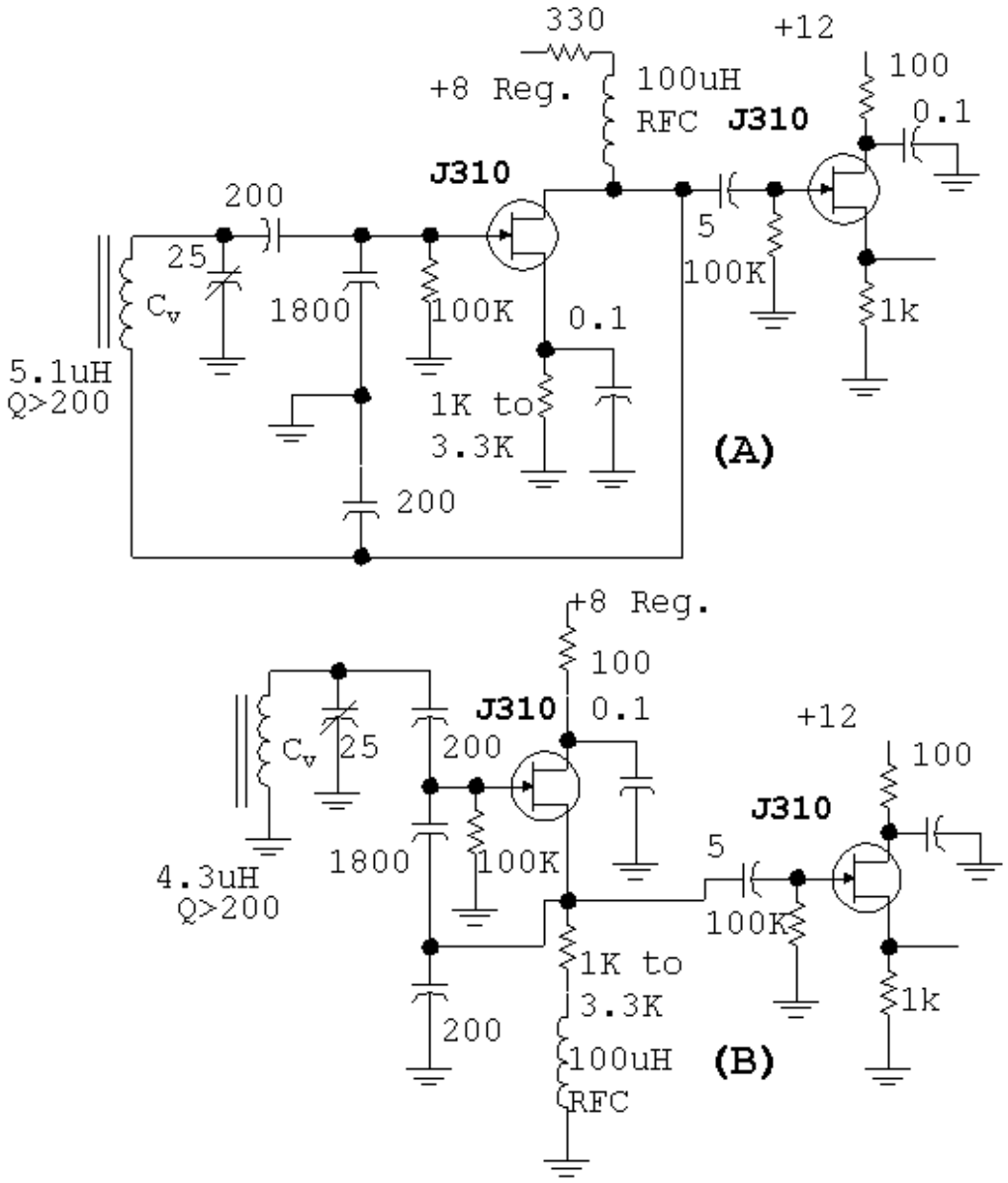
P4.8, Fig 4.11, caption. Replace parenthesis with parentheses.

p4.8, right col, 0.7 inch up from bottom. Replace sentence "Output can be obtained from the cap between Colpitts capacitors." with "Output can be obtained from the junction of the Colpitts capacitors." (22June03)

p4.9. Fig 4.13. Add (B) to upper right circuit.(22June03)



p4.9, Fig. 4.14. Add (B) to the lower schematic in the figure. (24Feb03)



p4.10, 3rd column, 4 inches down from text top. Replace "isolating the tank from the resonator" with "isolating the tank from the active device." (3Dec03)

p4.11, Sidebar dealing with noise spectrum. The equation is given as a carrier to noise ratio, CNR. It should be NCR although both CNR and NCR appear in the literature in this equation. (26Mar03)

p4.11, left column, 2.5 inch up from text bottom. Change "..the circuit nonlinear amplifier" to "..the circuit *nonlinear* amplifier" where the italic emphasizes that it is

circuit nonlinearities that are needed for modulation. (22June03)

p4.11, left column, 0.5 inch up from text bottom. Change "represent" to "represents" (22June03)

p4.12, left column, top of text: replace "like a esoteric" with "like an esoteric" (9Dec03)

p4.12, right column, end of text: replace "emitter R into an" with "emitter R into a" (9Dec03)

p4.13, Right col, 4th line down from text top. "it's" becomes "its" (26Mar03)

p4.13, 1st col., 1 inch down from top. Replace "autotransformer" with "transformer" (3Dec03)

p4.13, right column, 1.0 inch down from text top: replace "Fig 4.1" with "Fig 4.4" (9Dec03)

p4.14, first col, 1.0 inches down from text top: Change that sentence to: A crystal cross-section, a symbol, and an equivalent circuit are shown in Fig. 4.22. (24Feb03)

p4.14, middle col, 1.7 inches down from text top: those are 470 pF capacitors rather than 470 pF inductors. (24Feb03)

p4.15, left col, 4 lines down from text top: change "needed so" to "needed to. (11oct12)

p4.15, left col, 7 lines down from text top: change "dependant" to "dependent". (11oct12)

p4.15, caption for photo: The caption should make reference to Fig. 4.28 rather than 4.22. (24Feb03)

p4.15, Fig 4.27. Caption: Remove the second sentence, for a constant Lm is NOT a good general model for all crystals. (1Aug09)

p4.15, Fig 4.28. The inductor should be 57 nH. This should be replaced in both the figure and in the caption. The caption should also say that the inductor is formed with 3 inches of wire with 5 turns (not 3) wound on the 6-32 screw. (10Nov05)

p4.16, Fig 4.32 caption. Replace "that a C" with "that at C" (3Dec03)

p4.17, Fig. 4.33. D1 is the MV209 varactor diode while D2 is the 1N4152. Both are labeled D1 in the figure. (24Feb03)

p4.18, middle column, 0.8 inch down from text top. Change "course" to "coarse" (22June03)

p4.20, left col, 4th line down. Replace length shows with lengths show (24Feb03)

p4.24, right column, bottom of page: replace the sentence "Assume, for example, that 1-Hz changes the reference at the detector." with "Assume that the reference at the phase detector changes by 1 Hz." (9Dec03)

p4.25, Fig. 4.47. The resistors, top to bottom, are 1K, 10K, and 4.7K. (24Feb03)

p4.25, Fig 4.47. The 74HC193 is shown as having pins 5 and 14 connected to +5 volts. It should be pins 5 and 16 to 5 volts. (8May11)

p4.26, left col, 1.2 inches down from text top: Cross out at the (24Feb03)

p4.26, right col, 1.7 inches below text top: replace generate with generated (24Feb03)

p4.27. Wrong photo. Here's a version of the right photo:

(24Feb03) (The book version has no color!)

p4.27, Fig 4.51. The 3N211 should be labeled as Q2. (24Feb03)

p4.28, right col, 1.2 inches down from text top: Cross out 4511, for that is not in the referenced figure. (24Feb03)

p4.28, header. Replace "A Digital Dial" with "4.9 A Digital Dial" (10Dec03)

p4.28, left column, 1.3 inches up from text bottom: replace "into the later category" with "into the latter "category (9Dec03)

p4.30, Fig 4.55. The input bipolar transistor should be labeled as Q1. (24Feb03)

p4.31, left column, 4.0 inches up from bottom of text. Change "off the shelve" to "off the shelf." (30June03)

p4.31, header at top of page: Replace "4.9 Regarding Counter Accuracy" with "Regarding Counter Accuracy" (10Dec03)

p4.34, very last sentence. …remove tuning becomes removes tuning….

Errata, Chapter 5, EMRFD

p5.1, left column, end of first paragraph. Add a period.

p5.2, left column, 1 inch up from bottom. "mixmath.pdf" should say "mixer_jfet1.pdf". (1May17)

p 5.4, left column 2.5 inch up from text bottom: Replace the word "average" with "mean." **(21March10)**

p5.7, left column, 3 lines up from bottom: replace "extracted form" with "extracted from" (9Dec03)

P5.7, Fig 5.17 caption. Add sentences: "The circuit in C offers good suppression but poor gain. See text." (2June04)

p5.7, middle column. Replace the two paragraphs beginning 0.4 inches down from text top extending to 2.0
inches down from text top with:
"Although suppression has been improved in the circuit of Fig 5.17 C, the topology has canceled the desired
IF output. The designer/builder must exercise care to guarantee that the addition of balance will not
eliminate the mixing action. " (2June04)

p5.7, middle column, 2.1 inches down from text top. Replace "A variation of the ..." with "A working
variation of the ....." (2June04)

p 5.8, left column, 1.8 inch down from text top: Change the difference expression (Frf-Fif) to a product (Frf*Fif). **(21March10)**

p5.11, Fig 5.26, caption: replace Phillips with Philips. (This is an error that must surely be present elsewhere. Our apologies to Philips!) 4 May 04

p5.12, 1st col. second line from top. Replace "to measured DSB" with "to measure DSB" (3Dec03)

p 5.15, middle column, 3.5 inches down from top of text. Add a sentence right after TUF-1 and SBL-1. The sentence should be: "Additional information on mixer operating levels is found in the discussion of phasing transmitters in Chapter 9." (10March11)

p5.17, left column, top of text: replace "there also be" with "there can be" (9Dec03)

p5.18, Fig 5.46 and related discussion: This is informational and there is no error that needs fixing. HC series flip-flops are used in several places throughout EMRFD as frequency dividers to generate square waves that then provide harmonic outputs. In this discussion we used some really old data suggesting that the output impedance of a CMOS part was around 1K. That was the end resistance used for filter design. We recently did some measurements with a HC inverter where a variety of loads were placed on the part. I measured an output R of 39 Ohms for a single gate. This drastic difference means that the bandpass filter will have different components and should be redesigned accordingly. There is no need to change any of the example circuits, for they were all checked with a spectrum analyzer when they were constructed.

There can be a problem with this low impedance: When we see a low value, we might be tempted to think that we can do an impedance match to this value and extract a lot of power. That is probably not true, for there could be stability problems. Heavily loading the HC output could cause high currents to flow internally in the IC, causing it to exceed power ratings. A heat sink would then be required. Loading will usually be light when using the chips for frequency multipliers, for the usual bandpass filter will attach to the IC with a small series capacitor. This will present a low impedance at the harmonic, but a relatively high Z at the fundamental. The IC will not be heavily loaded by such a circuit. An ideal way to design might be to place a 220 Ohm resistor in series with the output. The composite output impedance would then be about 250 Ohms. If this value is used for filter design, the result would be worst case 500 Ohm load on the IC which should not cause problems. (25Oct06)

p5.21. right column, 2.1 inches down from text top. Change subtly to subtlety. (8 July 03)

p5.21. Reference 8. Chris Trask informs us that he did not write this early data sheet for the NE-602. The data sheet in my files has no listed author, but I'm pretty sure it was Bob Zavrel, W7SX, for he did much of the early Signetics applications work on that part. That was an era when application notes just appeared from the mist and didn't need anyone to write them. (24Feb03) **(This has NOT been confirmed with W7SX.)**

EMRFD Chapter 6 Errata.

p6.6, right column 3.3 inches down from text top: "A" becomes "An" instructive .... (2Apr03)

p6.11, left col, 5.6 inches down from text top: change "a" to "an" in ...produced an almost... (2Apr03)

p6.11, left col, 3.3 inches down from text top: change "with" to "without" . (27July03)

p6.11, middle column, 2.0 inches down from text top: replace "An NF of" with "A NF of" (9Dec03)

p6.18, Fig 6.46. The resistor between +12 and L1 should be 47 Ohms. (3April10)

p6.28 Left col, bottom, one line up. "it's own" becomes "its own". (29Aug9) (1 of 2)

p6.14. Fig 6.37. The figure was missing the reference designators used in the caption. The updated figure is shown below. (17Mar03)

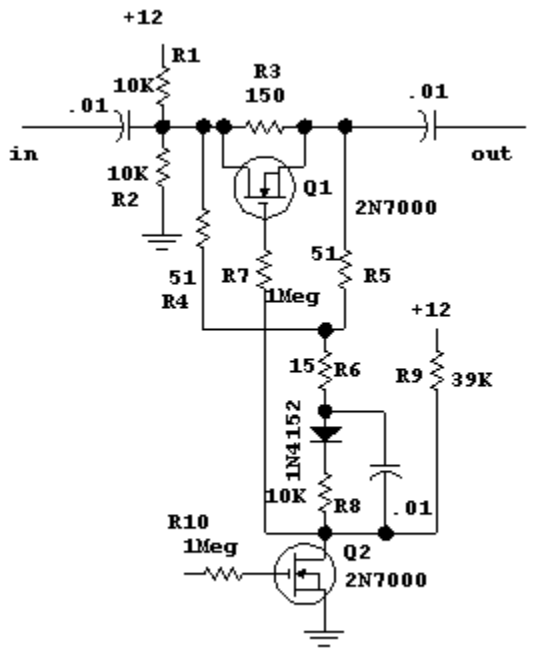


Fig 6.37 (9 Dec 03) Note: The first version of this figure we had on the web was wrong. The "pull-up" resistor to +12 V should go to Q2 rather than to the anode of the diode. The circuit in the 2nd printing of EMRFD is NOT correct. It is still wrong in the

3rd printing. The proper circuit is that shown above where R9 serves to put a positive bias on Q2 and a reverse bias on the diode in the *no attenuation* condition. This resistor also biases the Q1 gate to a positive voltage to turn Q1 on. When Q2 is turned on, it becomes an RF short circuit AND changes the DC conditions to cause Q1 to become an open circuit. (17 April 09)

p6.37, left col, 1.1 inch down from top. "it's" becomes "its". (29Aug9)

p6.20. Fig. 6.49(C). The bottom most Vx should be Vy. (16Mar03)

p6.20. Fig. 6.50. The text line in the lower left corner should use the phrase "designer/ builder." (31July09)

p6.21. Fig. 6.53(D). The line from the emitter marked "V-d" should be marked "V-c" . (16Mar03)

p6.21, left col, 0.9 inches down from text top. Replace "RFCs" with "RFC" (27July03)

p6.25, Fig. 6.57. Mod the drawing by adding a reference designator, C2. This is the 1uF/6 volt capacitor on the gate of Q9. (27July03)

p6.25, Fig 6.57. The 1N4152 diode at the bottom of the drawing should have the direction reversed. The cathode should attach to the 22K resistor. (10Nov05)

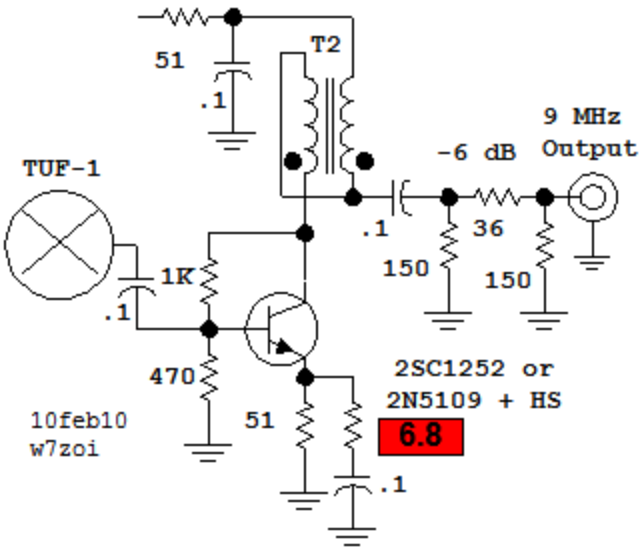
p6.26, col 3, two lines up from text bottom. There is no "t" in Schwarz. (27July03)

p6.29, left col, 2.3 inches up from text bottom: change "ask" to "asked" (2Apr03)

p6.34, Fig 6.70, caption: R10 should be 6.8 Ohms and not 6.8K-Ohms. (26Dec06)

p6.37, col 1, 3.1 inches down from text top. replace "in need for some" with "in need of some" (27July03)

p6.37, Fig 6.75. Change a resistor from 3.6 to 6.8 Ohms.



(10Feb10)

p6.40, Fig. 6.78. The resistor at the base of Q3 is 22K. Fig. shown below. (4june03)

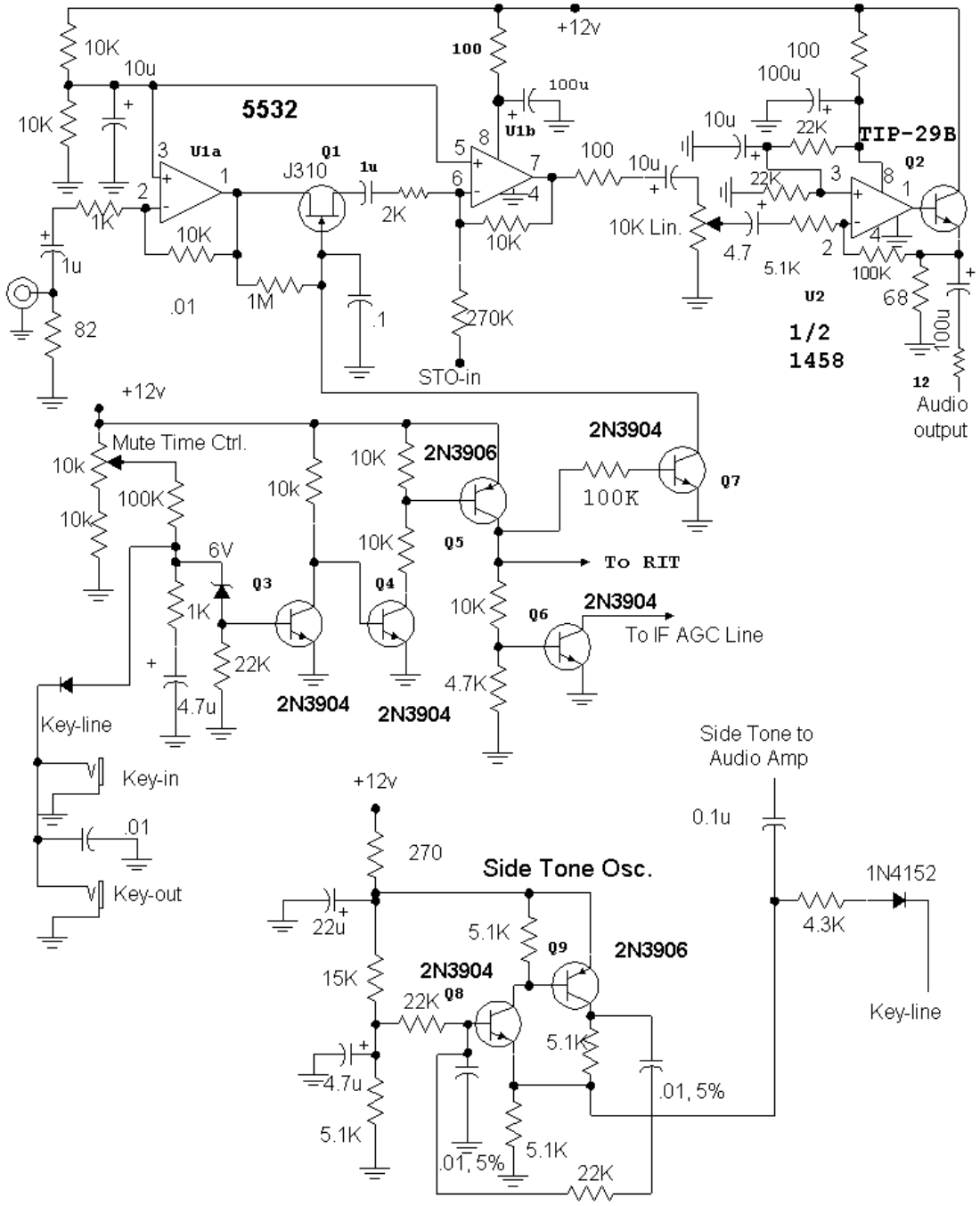


Fig. 6.78.

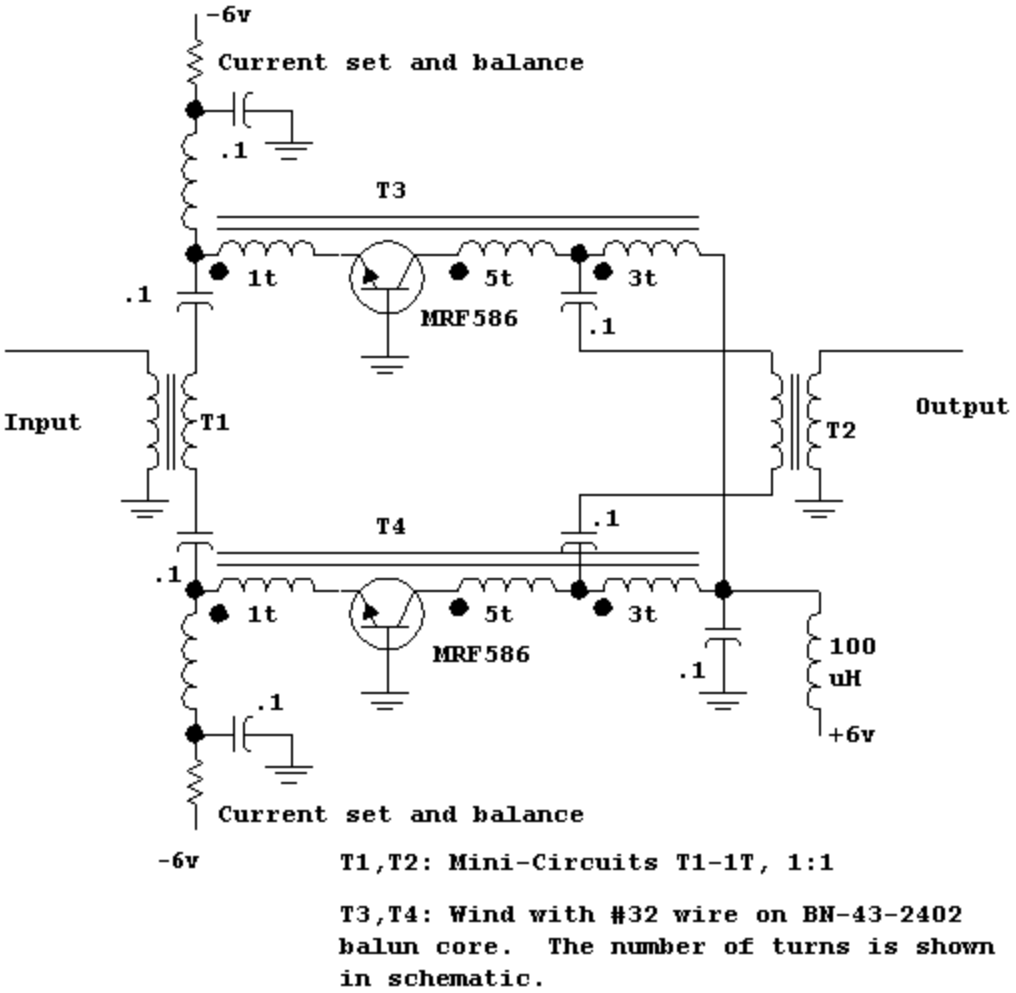
p6.44 , bottom of right text column: replace "Fig. 6.84" with "Fig. 6.81A" (2Apr03)

p6.45, right column, 1 inch up from bottom of text: Replace with "...102 dB and

Receiver factor R=+5 dBm." (4May03)

p6.47, right column, 2.3 inches down from text top: The sentence beginning with "The lower reverse.." is technically confusing. Replace this complete sentence with "The lower second stage reverse isolation generated an input impedance independent of output termination for the two stage design." (2Apr03)

p6.47, Fig 6.87. Add label designating -6V, shown below (10Aug03)



p6.48, col 3, 1.6 inches down from top. Replace sentence "Symmetry is emphasized in the construction method shown in the photographs." with "Symmetry is emphasized in the construction." (10Aug03)

p6.48, Fig 6.88. The output connections were wrong. This drawing shows the proper

connections.

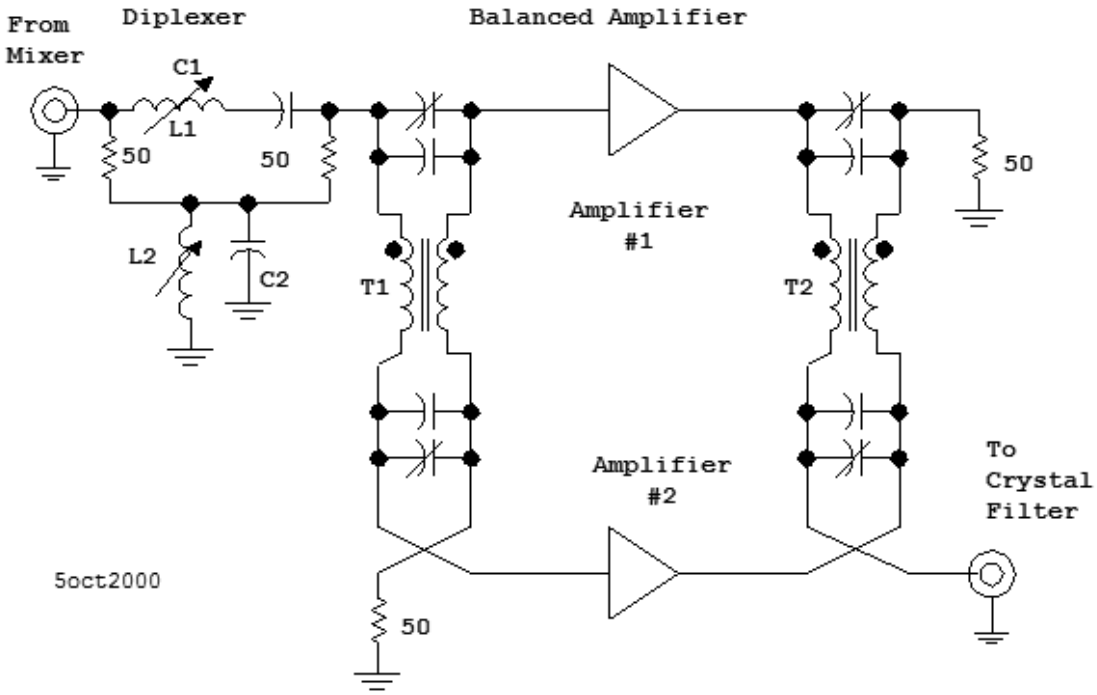
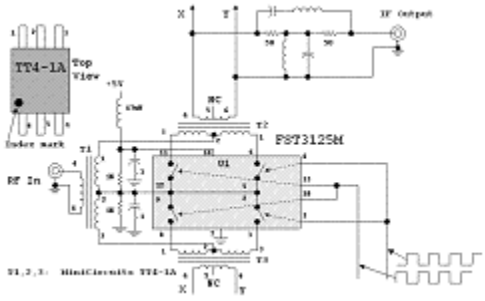


Fig 6.88, Engelbrecht Amp, updated 25May2017, w7zoi/w7pua.

(25May2017)

p6.49, Fig 6.90. The figure had problems with the numbering of the pins on the transformer, resulting in a phasing problem. The proper information is shown in the new figure below. Add the following sentence to the caption for the figure: "Pay particular attention to the pin numbering for transformers T2 and T3."

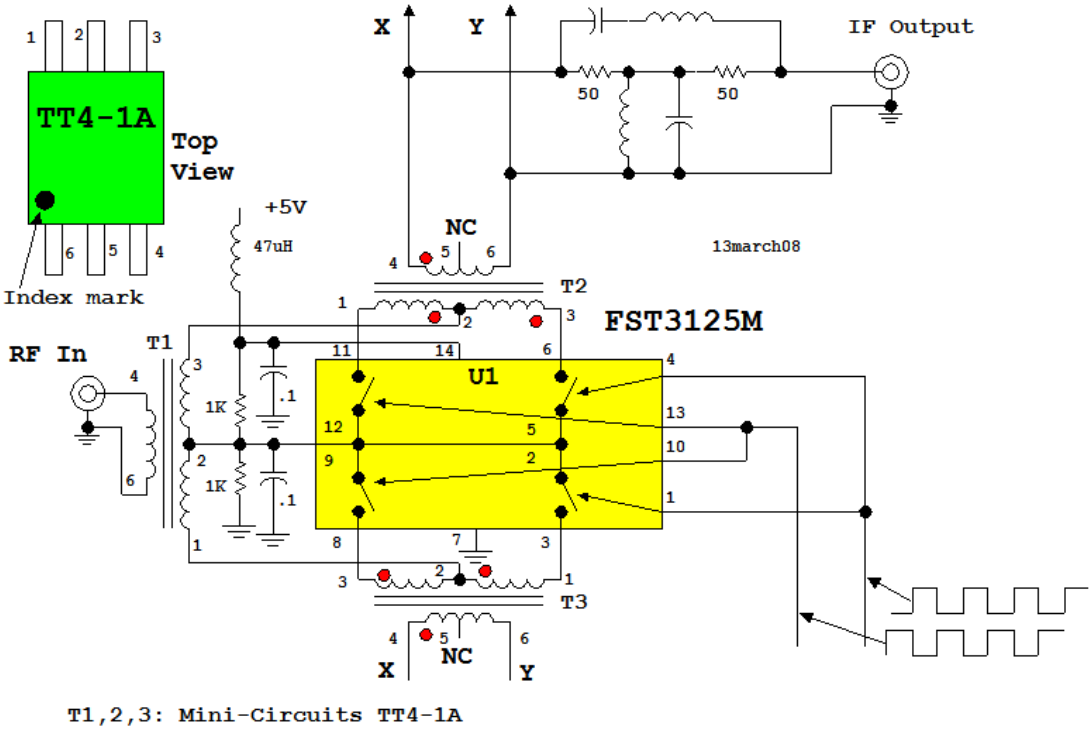


This is the former figure.

It all appears to be fixed in the 3rd printing. (13 April 09)

p6.49, Fig 6.90. This figure continued to have problems in both the first and second printing of the book. Moreover, we didn't get it right in the errata of 17Sept03 shown above. So Bill, W7AAZ, came to our rescue and pulled a board from the early version of his transceiver and traced the circuit. The circuit below is the one that resides

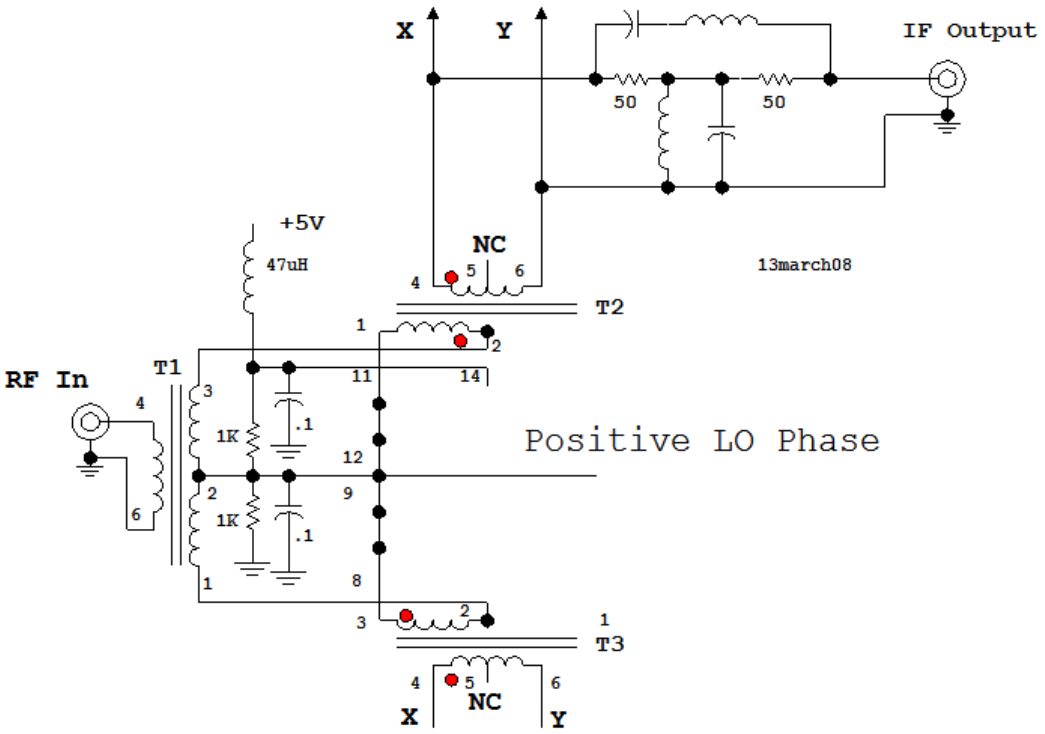
in a working transceiver. Continue to pay particular attention to the pin numbering for transformers T2 and T3.



This shows the configuration. I have added some color to make sure that we differentiate this from the earlier drawings. Red phasing dots have also been added to the drawing to emphasize the relationship, not only between the primary and secondary of transformers T2 and T3, but between the two halves of the secondary.

The following info is offered as a supplement to the text:

Consider a point in time when the LO signal has a positive voltage on pins 10 and 13 of the FST3125M. This means that the two left switches in the mixer IC will be "closed" while the right ones are "open." This is shown below.



The right switches are open, so are not parts of the circuit at this instant in time. Moreover, we have eliminated the transformer halves connected to them, for no current flows in those windings at that point in time. We can now use this diagram to trace the path between the RF transformer and the IF output and show that the phase relationship is additive for the two current components reaching the IF load. A similar diagram for the negative LO phase can also be generated.

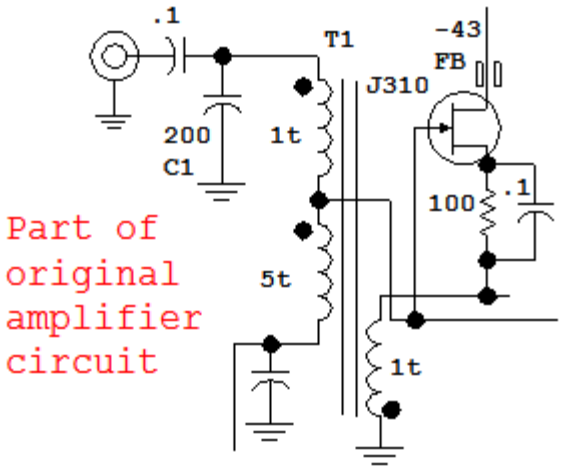
This is not the only way that the transformers can be connected and produce a functioning circuit. However, this is one from a working transceiver. No matter what transformer connections might be used, the boundary conditions must be met. (Many thanks to Bill for pulling a board to answer these questions.) By now, many other analog switching integrated circuits have been used in this application by advanced experimenters. The pin numbering may well be different with them. The fundamental ideas remain the same. The definitive reference is the work of PA3AKE at http://www.xs4all.nl/~martein/pa3ake/hmode/index.html (14March08)

P6.50, left column, last sentence. It should be "…..should, however, extend from near dc to VHF."

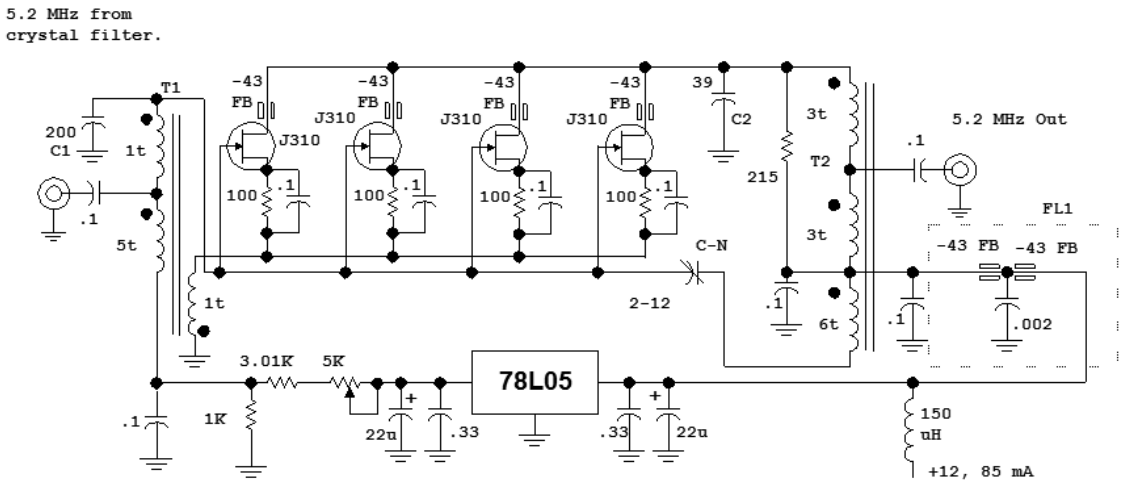
p6.50, Fig 6.93 caption. Alter sentence to become "The variable capacitors with Y3 and Y4 are adjusted to match that filter to the one using Y1 and Y2." (10Aug03)

p6.50, Fig 6.93. There is an error in the output connection of the right hand quadrature coupler. See the errata of p6.48 for the proper connection (3June'17)

p6.51, Fig 6.94. There is an error in the input transformer in the schematic. The



original is partially shown here: This is the WRONG circuit. Only the first FET is shown here, but there are four JFETs in parallel. The original schematic shows the gate as being at the 5th turn on a 6 turn transformer. In reality, the gate is across the full transformer while the input is applied to the tap. The new, correct schematic is below:



Corrected Fig 6.94. The data in the text was obtained from the circuit shown above. That is, the thing was properly built, but the schematic was in error. (22March08) (Still in error in 3rd printing, 13April09)

p6.52, left column, 0.8 inch down from top: replace "effort that anticipated" with "effort

than anticipated." (29Jan06)

p6.53, left col, 0.5 inches down from text top: "obtain" becomes "obtained" (2Apr03)

p6.53, middle col in section 6.6, 0.9 inches up from bottom: Replace "later" with "latter" (2Apr03)

p6.53, 1st col, 1.7 inches down from text top. Replace FMT3125 with FST3125. (3Dec03)

p6.53, 3rd column, 3 inches down from top. Replace "receives" with "receivers" (3Dec03)

p6.54, left column, 0.5 inches up from text bottom: "+17-dBm LO" becomes "+17 dBm LO" (2Apr03)

p6.57, col 3, just above Transmitter IF Systems section. The final sentence should become "A project elsewhere in the book (Fig 6.152) uses this topology with a diode ring balanced modulator." (10Aug03)

p6.60, Fig 6.107. We got into trouble because we pulled this figure in from an earlier QST article. The labels on the input and output don't make sense. So at the input, cross out the two lines, leaving only the "-10 dBm" part. At the output end, cross out the reference to "C, Fig 5" and add "output." (29Jan06)

p6.62. Fig. 6.112 is missing some parts. Here's the proper figure:

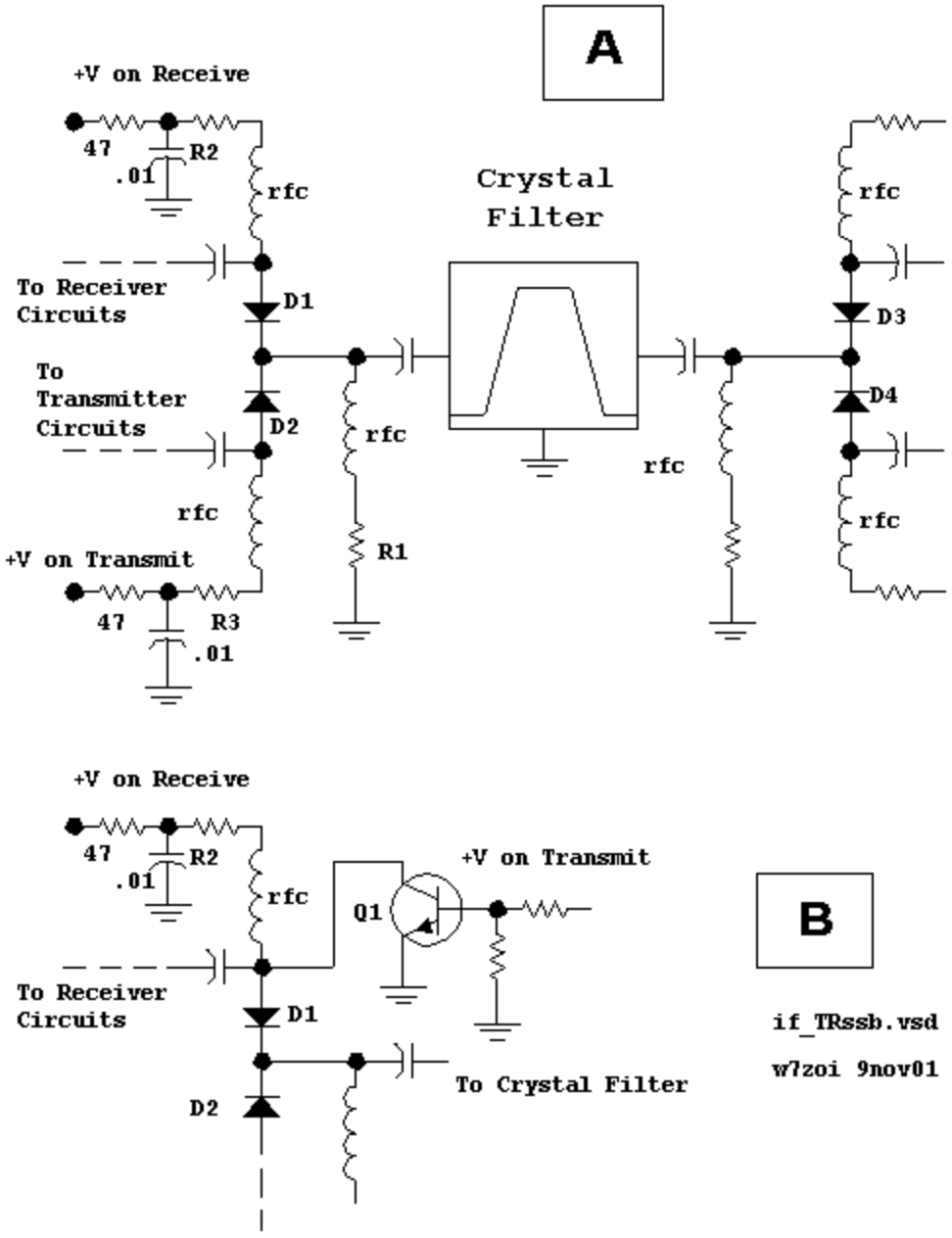


Fig 6.112. (24Feb03)

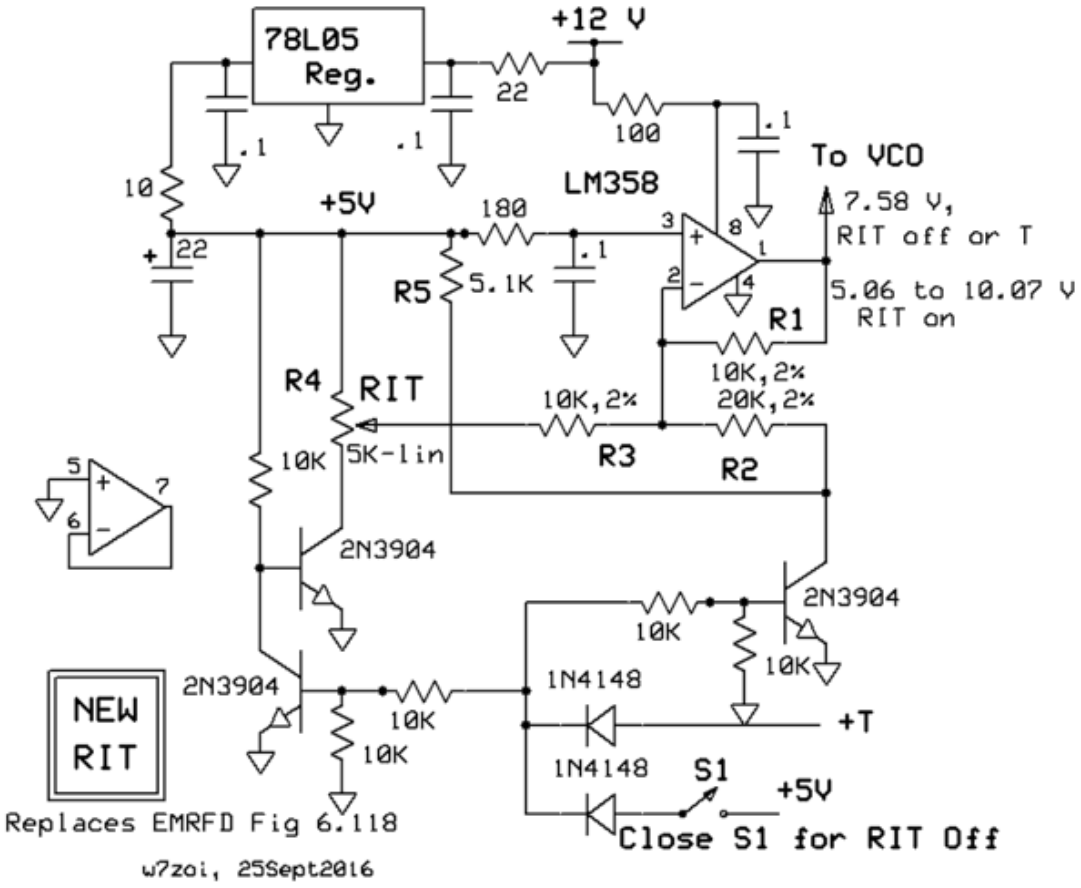
p6.63, Fig. 6.113. Eliminate the "+8V" that is next to the BFO Input label. (2Apr03)

p6.64, col 1, 1.0 inch down from text top. Make sentence become "...in U4 to adjust balance." (10Aug03)

p6.66, Fig 6.118. Change the 10K resistor between R1, the "TX Trim" control and the inverting (-) input of the op-amp to a 5K. (Actually, a 4.7 K would work fine.) This will then allow the circuit to be set up to achieve the voltage levels quoted. With R1 set

to generate 0.75 volt, V-cont will be 7.5 volts during TX or "RIT off." With RIT on, V-cont should vary from 5.5 to 10.5 volts. (3Aug07)

NEW in 2016 p6.66, Fig 6.118. A reader reported difficulty in getting this circuit to function. An experiment showed that the 2N7000 was not switching properly. The diode intrinsic to the MOSFET was getting in the way when there was a moderate voltage across the FET. This caused the voltage at pin 1 of the op-amp to change when in T as the RIT pot was changed. Hence, we did a redesign of the circuit. The suggested circuit is presented here:



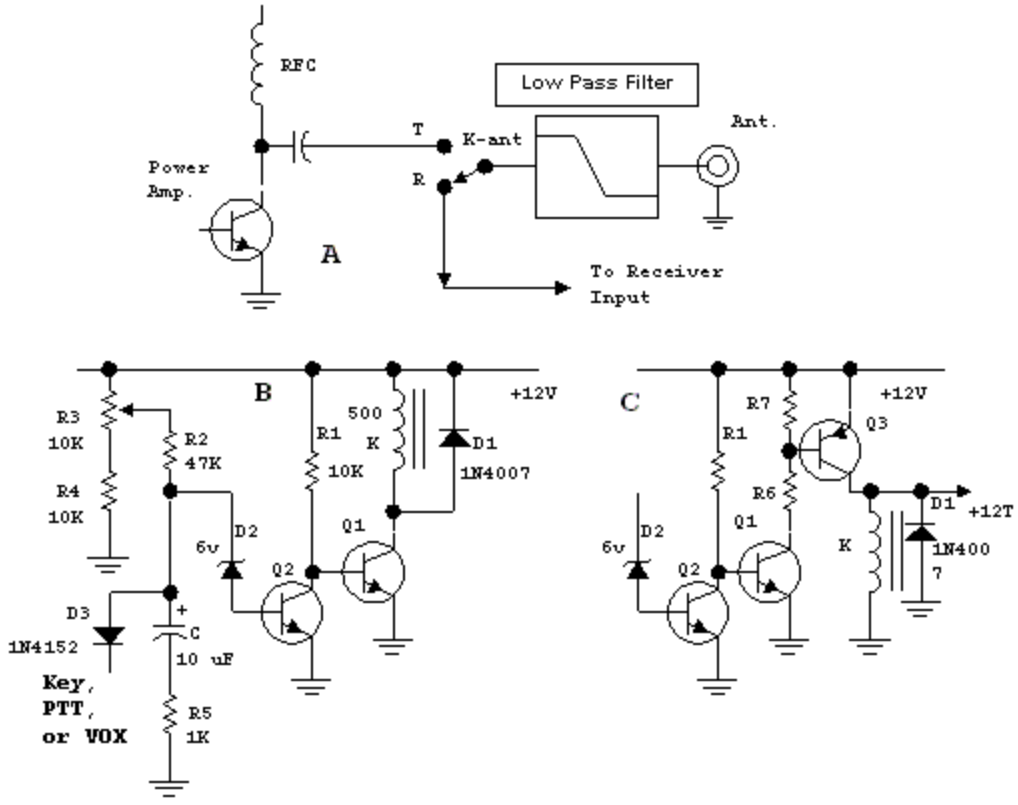
Some resistors (R1, 2, 3) are marked as 2%. These are metal film resistors that establish the output voltages. Many other 10K resistors appear in the circuit, but are not as critical, so junk box things are allowed. Resistor R5, shown as a 5.1K, is switched in during Transmit, or when RIT is off. This fixed R is not critical. It merely places a load on the 5 volt supply that is the same as R4, the RIT pot. If you use a different R4 value, pick R5 to be about the same. This then keeps the load on the 5 volt supply approximately constant. Note that R4 sits on the 5 volt supply with the ground end switched. (25sept2016)

p6.67. left column, 1.5 inches down from top: replace "...stopped tuning and listen to" with "...stopped tuning and listened to"

p6.67, right column, up 1.8 inches from bottom: replace "..is less then" with "..is less than". (29Jan06)

p6.68, right column, 0.4 inch up from bottom: replace "...line go low" with "...line goes low". (29Jan06)

p6.68, Fig 6.122B. The diode as shown in part B of the figure does nothing to protect transistor Q1. Move diode D1 so it is between the collector of Q1 and the +12 volt power supply rail as shown. Now, when a "T" period ends and Q1 stops conducting, the current flowing in the relay will continue to flow for a while in the diode and will not cause a voltage spike that might break Q1. The new figure is shown here:



(7June04)

p6.70, right column, 1.2 inches down from text top. Remove the) from the end of the text. (26Mar03)

p6.71, col 1, 3rd line down from top of text. "600-V" becomes "1000-V" (10Aug03)

p6.74 and 6.75, Fig 6.132. There are several reference designators missing in this schematic that are referenced from the text. Having them in the schematic diagram facilitates the text descriptions. Add the following designators:

J1 The Mic input, upper left corner of diagram.

R1 The 20K pot at the Mic input.

J2 The receiver input labeled RX In, 2.4 inches down from top border of figure, and on left side.

J4 Connector attached to capacitor that then attaches to collector of Q2.

D2 Attached to col of Q2.

D3 Attached to col of Q3.

J5 Connector attached to capacitor that then attaches to collector of Q3.

J16 The connector coming from "CO1" which is above Q15.

J17 The connector coming from "CO2" which is above Q15.

J19 The connector coming from "LO1" which is above Q14.

J20 The connector coming from "LO2" which is above Q14.

(Now we move to the right hand part of the figure, p6.75)

C36 Shunt to ground capacitor attached to L4, the inductor coming from the 6 dB pad, upper left of page.

R58 20K pot attached to source of Q10, 4.0 inch up from bottom border and 5.6 inches left of right border.

R14 20K pot on collector of Q1, 2.3 inches up from bottom border and 4.6 inches in from right border.

J13 Connector from CO2, 2.5 inches up from bottom and 2.7 inches over from right edge of figure.

J14 Connector from LO2, 2.5 inches up from bottom and 1 inch over from right edge of figure.

D6 Diode attached to collector of Q11, bottom right corner of figure.

D7 Diode attached to collector of Q12, bottom right corner of figure. (10Aug03)

p6.76, col 3, 2.2 inches down from text top. Change "D1 and D2" to "D2 and D3" (10August03)

p6.78, Fig 6.136. Add the following line to the caption for this figure: "L401 and 402 are labeled as RF chokes, for the network is formed with molded RF chokes." (29Jan06)

p6.81, Fig 6.142. Remove the sentence “For software, ….” (n0ss was reported as a SK.”

p6.81, Fig 6.142 and related discussion: See errata for page 7.43 for this date (16Aug06)

p6.83, Section Title. This should be section number 6.10 . (7Mar03)

p6.84, Fig 6.148. The MV209 Varactor diode should be labeled D900. (29Jan06)

p6.85, Fig 6.150. The two output labels should be changed from "+6 dBm" to "+6 to +8 dBm" (29Jan06)

p6.86, Fig 6.151. Change the caption. Final sentence should become "The amplifier input resistors, now 6.8K, can be changed to set the output power." (7Mar03)

p6.86, photo on bottom left. Replace the caption with "The RF power chain up through Q3. See Fig 6.154." (3Dec03)

p6.86, Fig 6.151 Caption. Change the sentence to read "T301 and T300 each have a 20-turn primary with a 5-turn secondary on FT-37-43 cores. (12Jan07)

p6.86, right column, 1 inch down from top: replace "filter is build" with "filter is built" (29Jan06)

p6.87, Fig. 6.152. There are missing reference designators on the drawing. Also, change the caption to read "Fig 6.152--SSB Generator. R615 and R624 should be ...." The updated figure is shown below: (15Mar03)

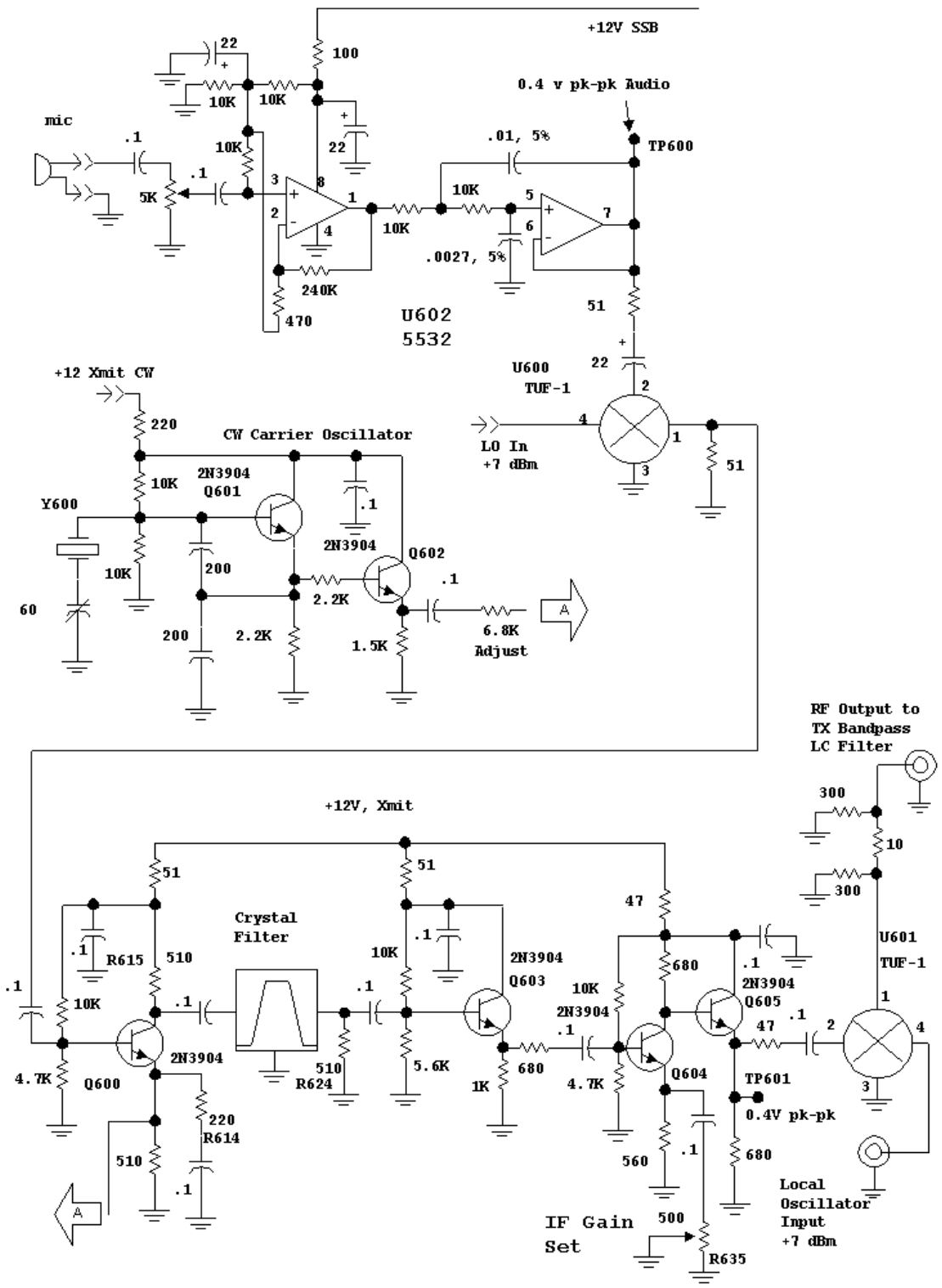


Fig 6.152.

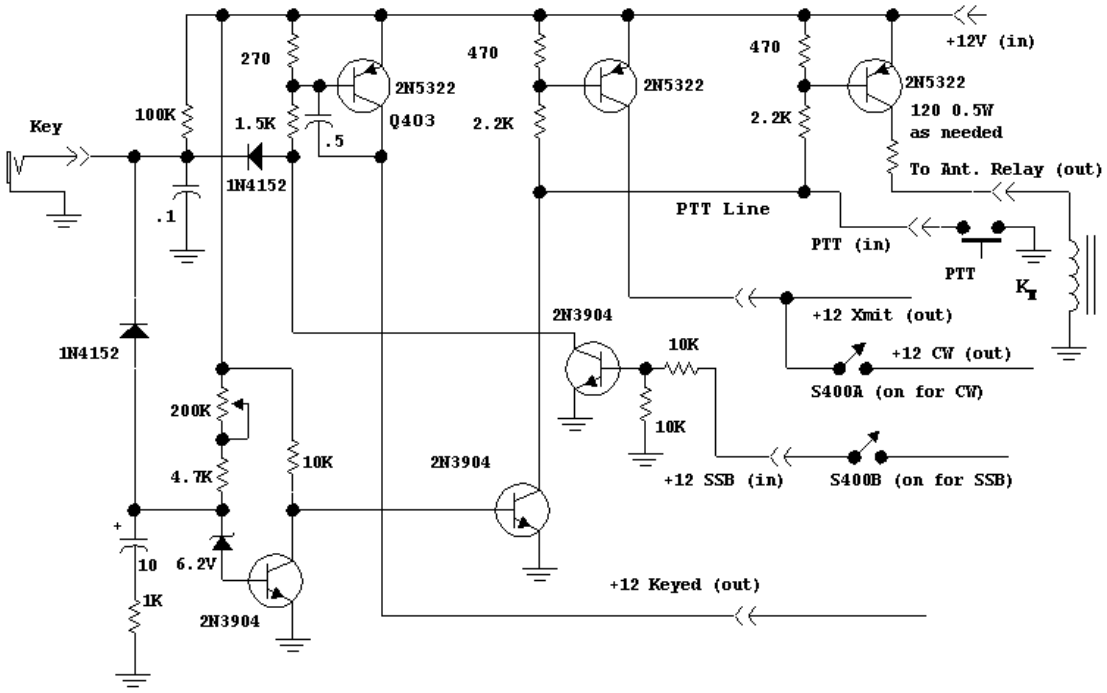
p6.87, Fig 6.152. The figure contains a mixer in the lower right corner. Directly above

that mixer is a network of three resistors leading to a coax connector. The 10 Ohm resistor should be changed to 18 Ohms to make it be a 3 dB pad. (8Nov10)

p6.88, Fig 6.154. The output low pass filter around L3, 4, and 5 contains four capacitors. The output capacitor, shown as a 133 pF, should be a 75 pF capacitor. (1Mar06) .

p6.90, Section Title. This should be section number 6.11 .. (7Mar03)

p6.90, Fig. 6.157. Add reference designator for Q403. (10Aug03)



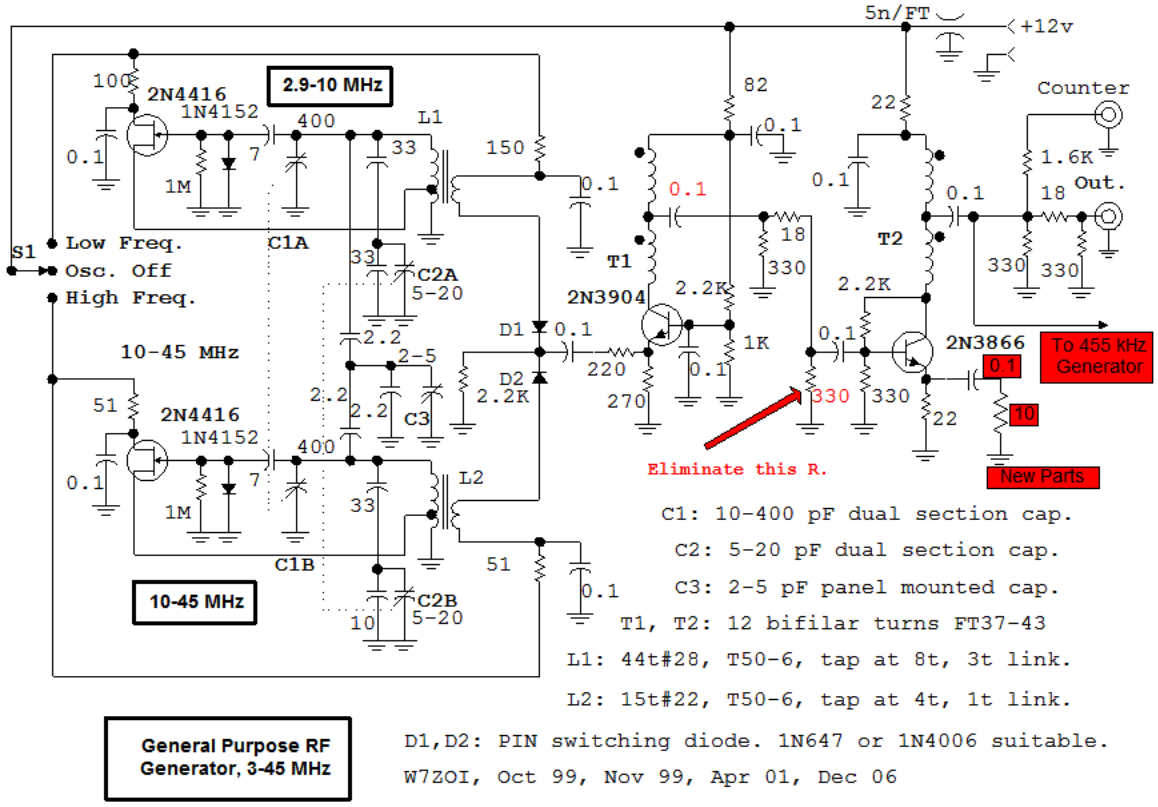
p6.91. Fig. 6.158. L1-L4 are 360 nH, 10 turns #26 on a T30-6. (4Mar03)

Errata, Chapter 7, EMRFD

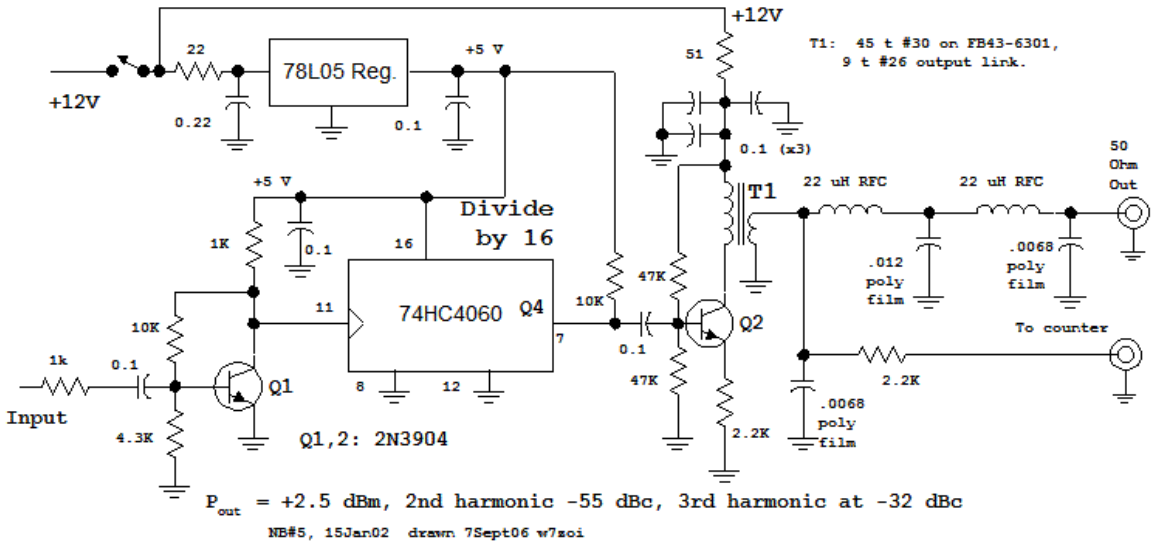
p7.7, Fig. 7.13. The 78L05 regulator has the input and outputs transposed. (30Oct03)

p7.8 and 7.9. Move the "7.4" section heading from p7.8 to p7.9 to become "7.4 Attenuators" Attenuators is a major subject while RF power measurement with an oscilloscope is part of the previous section. (10Dec03)

New in 2016 p7.9, Fig 7.19 caption: The second sentence should read "....pick R in Ohms and A in dB and ....." p7.15, Fig 7.27. I got a question and comment the other day from a reader regarding this general purpose test oscillator. I ended up taking the cover off of the box to check the circuitry against the schematic and noted both an error and some modifications that have been done since the original design. The error was that there is a 330 Ohm resistor in the diagram that is not needed in the design. In reality, the 330 Ohm resistor in the bias network for the output stage will serve as the 2nd R is the 3 dB pad. This is not going to be a major performance change. The changes are minor, but may be of interest to those of you are building a similar generator. Mainly, the output power is increased with higher gain in the output stage. This is realized by adding another emitter resistance that decreases the overall degeneration. The circuit is shown here:



At one point I got some 455 kHz ceramic resonators and wanted to test them. I did this by sampling the output of the low frequency generator, converting it to a logic compatible signal, and then dividing the signal by 16. The output is buffered and low pass filtered and applied to an output connector. Another port provides a port for counting. This generator has proved to be extremely useful for experiments with 455 kHz resonators and monolithic filters. The circuit is shown below, even though this goes beyond being an "errata."



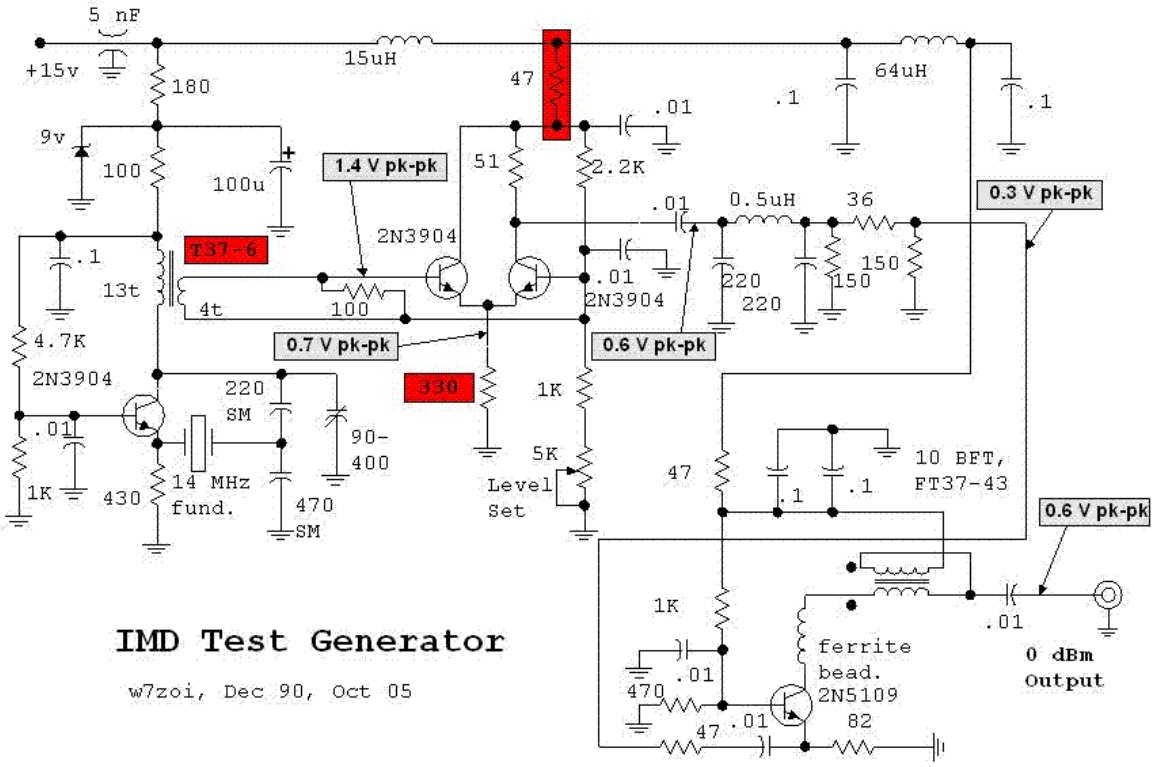
(18dec06)

p7.11, middle column, 2.3 inches up from text bottom: "It has become popular to build counters from single chip microprocessors …." Microprocessors is plural.

P7.12, col 3, www.aade.com reference is no longer valid.

p7.19, Fig 7.32. The toroid core in the collector of the crystal oscillator stage should be a T37-6 rather than FT-37-6. That is, it is a powder iron tuned circuit rather than one with a ferrite. (15 Oct 04)

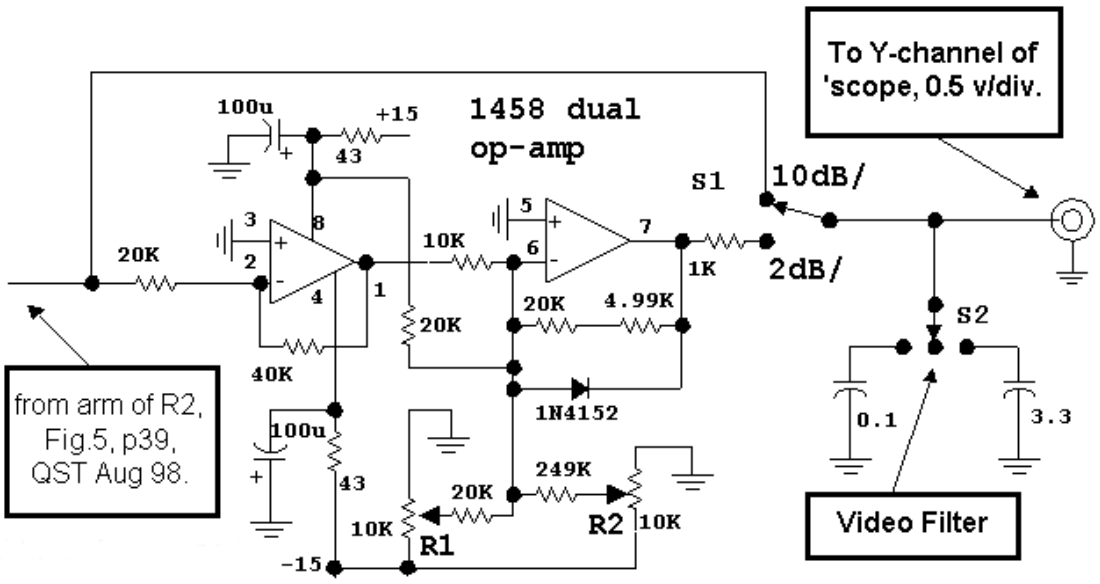
p7.19, Fig 7.32. Errors were discovered in the schematic. The differential amplifier is biased with a 330 Ohm resistor instead of 1K. Further, the differential amplifier runs from the 15 volt supply rather than from the 9 V on-board regulated supply. An updated schematic is presented with the changes shown in red. The red changes include the toroid type error found in 2004. Also included in the drawing are measured signal levels obtained with a Tektronix 465M oscilloscope and 10X probe. The module was terminated with 50 Ohms during measurements. (21 Oct 05) **The third printing still shows a 100 Ohm resistor between the 100 uF on the 9 volt Zener and the collector of the left Q in the differential pair. *Zap that resistor*. (17April 09)**



p7.21, 1st col., 2.7 inches down from top. Replace "some components may required..." with "some components may require..." (3Dec03)

p 7.23, Fig. 7.42. The lower signal generator, V2, should include a ground symbol. (3June03)

p7.29, Fig. 7.54. There is some information missing from the figure. The complete figure is shown below:



(5May03)

p7.30, col 1. 0.9 inches up from text bottom: Replace "question ask" with "question asked" (8Feb03)

p7.39, just above Eq. 7.7 Change "Noise figure is related Y factor by" with "Noise figure is related to Y factor by" (29Jan06)

P7.39, Fig 7.73 caption. Add a link: https://www.noisecom.com/

p7.42, photo caption. Replace "the lid is then place " with "the lid is then placed " (3Dec03)

P7.43, reference 20. The reference shown for Spectrogram is no longer valid. An alternative interesting audio spectrum analysis program is Audiotester. This program can be found at **www.audiotester.de** . There is no charge for Spectrogram. An evaluation version of Audiotester is available on the site. A registered version is also available. (16Aug06)

EMRFD Chapter 8 Errata.

p8.1. The title of the chapter is Direct *Conversion* Receivers rather than Direct *Converstion* Receivers. (24Feb03)

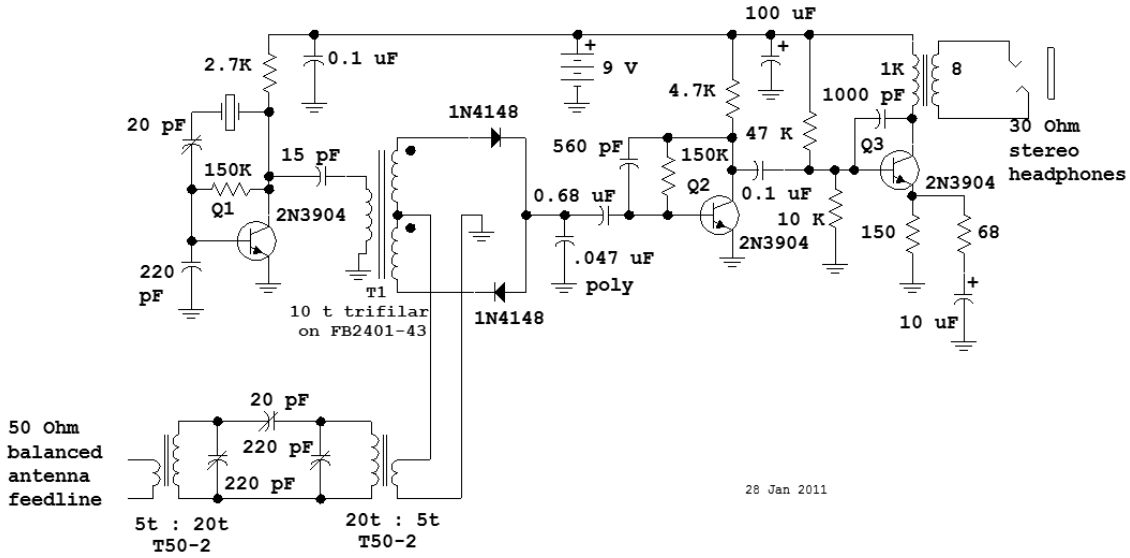
p8.4. left column, bottom line. Replace FB 2410 with FB 2401. Or use a FT-37-43, now available from Mouser. (8June2019)

p8.4, right column, 2.2 inches up from text bottom. The word than should become that.

p8.5. Fig. 8.7. Add a 560 pF capacitor in parallel with the 150 K-Ohm resistor in the first audio amplifier.

p8.5, Fig. 8.7. Mark schematic with transistor reference designators Q1 to Q3, left to right. (22June03)

p8.5, Fig 8.7. A new schematic was generated which should be easier to read.



(28Jan11)

p8.6. left text column, 4.7 inches down from top of text. Replace mV with uV. (20Mar03)

p8.6, column1, 2.1 inch up from bottom. Change "it's ground lead" to "its ground lead.) (21Oct15)

p8.8. Equation 8.3. The units should be watts/meter^2 (watts per meter squared with a superscript) rather than watts per meter. (20Mar03)

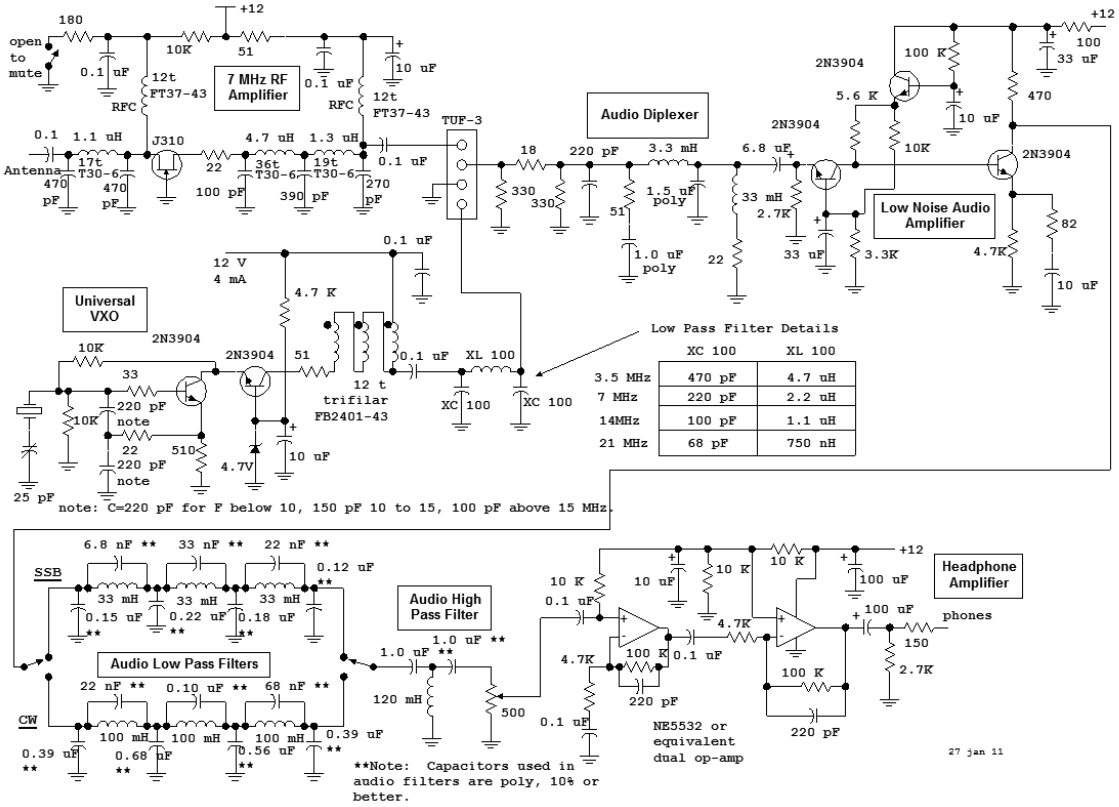
p8.12, left col, 0.6 inch up from text bottom. Change to “designer-builder.” The expression is hyphenated in most of text.

p8.12, middle col, 2.2 inch up from text bottom. change "Rather the attempting..." to "Rather than attempting." (22June03)

p8.12, right col, just above Fig 8.20 in text. Replace 1N4184 with 1N4148. (26Dec05)

p8.14, Fig 8.22. The upper right part of the figure contains the Low Noise Audio Amplifier consisting of a common base stage followed by a common emitter amplifier. A follower operates as a capacitance multiplier to supply low ripple DC to the two LNA stages. The common base stage is shown with a 10K collector R and a 5.6K/3.3K base bias network. The collector R should be 5.6K while the base bias should come from a 10K/3.3K divider. (03Sept06)

p8.14, Fig 8.22: A new schematic was generated which should be easier to read.



p8.15, middle column, 0.3 inch up from text bottom: replace hand full with handful.

p8.16, 3.6 inch up from bottom: Change "in it's second..." to "in its second..." (21Oct15)

EMRFD Chapter 9 Errata.

Chapter 9 figures: (**This applies to the entire chapter**.) Many of the schematics in this chapter are missing the semiconductor types used. The usual NPN is a 2N3904 while the 2N3906 is the PNP. The JFET of choice is the J310, or U310 for RF. The op-amps are LM837N or 5532 with the LM837N preferred for early stages where noise is critical. A 10 pF chip capacitor between op-amp output and the inverting input will usually cure instability. (24Feb03, update 2Mar03, update 17Apr9)

p9.6, Fig 9.7G. There is a corner of the box missing, just above the "G". (20Mar03)

P9.7, third column, 0.1 inch up from text bottom. Replace “because is uses…” with “because it uses…”

p9.10, 2.4 inch up from bottom of text column 3: Replace "and it's transmitted signal..." with "and its transmitted signal..." (21Oct2015)

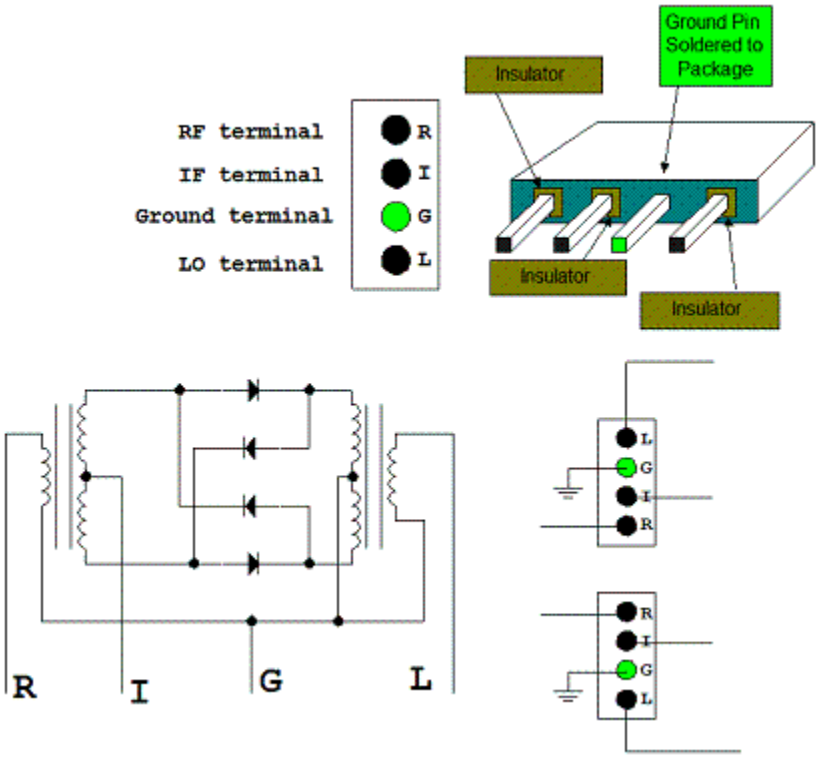
p9.25, Fig 9.38. The oscillator FET is a J310, not a 4310. (24Feb03)

p9.29, Fig 9.49. The caption is not correct. The caption should read "Phase errors of Fig 9.48 network pair." (20Mar03)

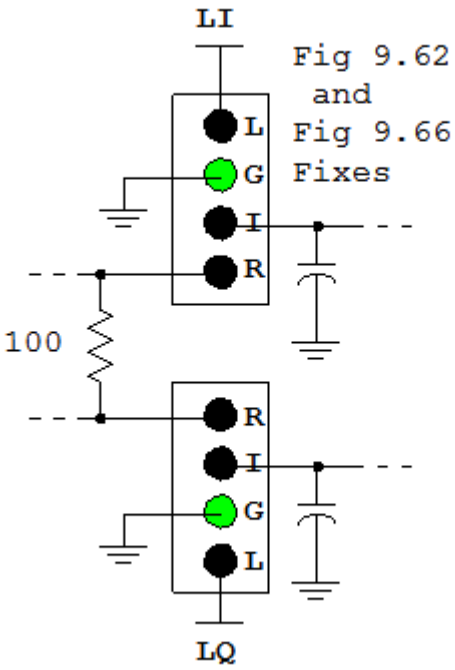
p9.29, Fig. 9.50. The caption is not correct. The caption should read "A pair of all-pass networks that provide at least 21 dB suppression from 360 to 2050 Hz." (20Mar03)

p9.34, Fig 9.62. The caption is not correct. The caption should read "A basic miniR2 schematic. This simplified version uses some different parts values and requires matching of the diplexer components." (20Mar03)

p9.34. Fig 9.62. The problem is still here. The problem has to do with the TUF-1 and TUF-3 mixers which have 4 pins. A PC layout will have 4 holes in a row. But this does not mean that it can be shoved into the board in either possible way. This figure should explain the nature of the mixer. Essentially, the pin that is attached to the mixer can is the grounded one and should go into the PC board hole that attaches to ground. It's not complicated if you look at the package and then the schematic.



The proper circuit is

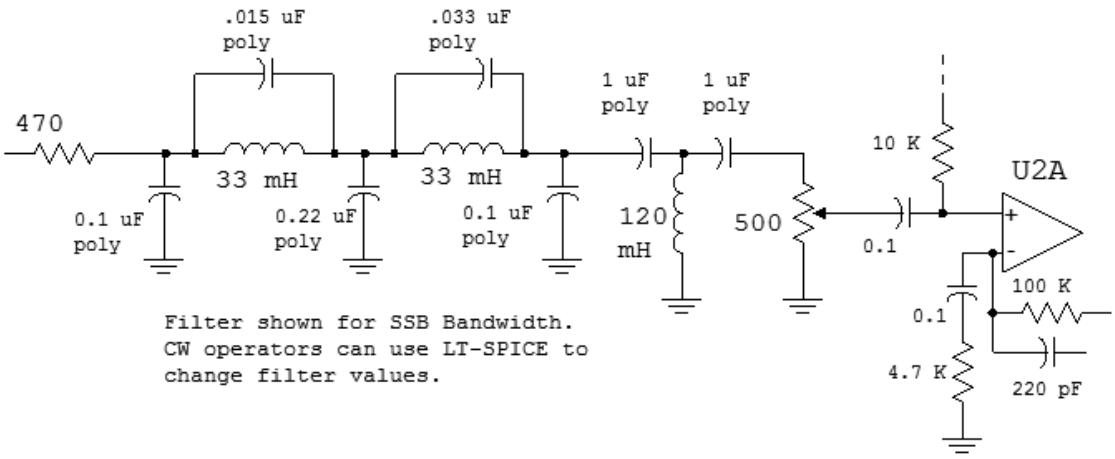


(17April09)

p9.34. Fig 9.62. There are resistor and capacitor values missing for the first op-amp in the signal chain in both channels. Both channels are, of course, identical. The feedback resistor is 100K, the input R is 27K, and the capacitor is 0.12 uF. (These are

the values extracted from Fig 9.66.) The op-amp type used is a 5532 or similar low-noise part. (17 Oct 05)

p9.34, Fig 9.62. There continue to be missing component values related to the filter at the bottom of the figure. A proper schematic is shown here.

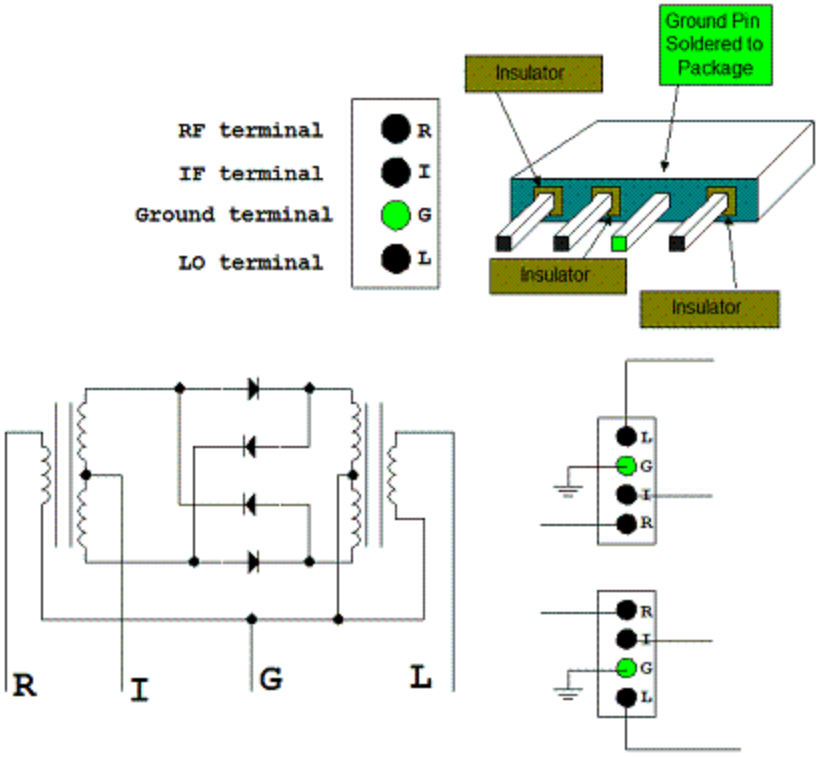


(17Apr9)

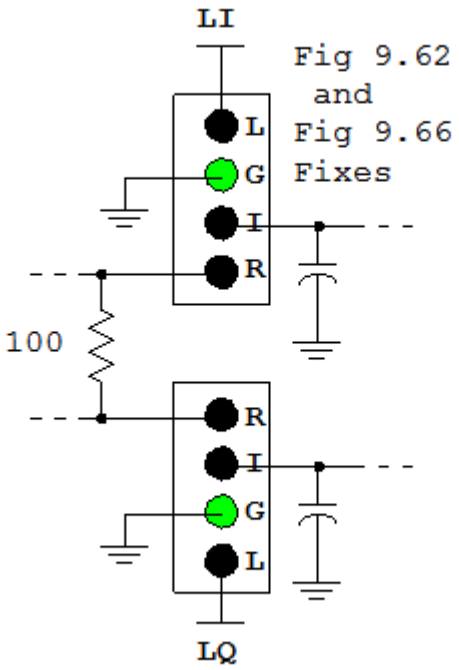
p9.34, Fig 9.62, lower right part of drawing. There is a resistor in the 12 volt supply line without a value. 100 Ohms would probably work fine here. It's a decoupling element. (My personal take on this would be to add another 100 uF capacitor to ground on the left side of this resistor.) (19July17)

p9.35, Fig 9.64. L1 in the figure mentions 36t on a T30-6. This should be ignored; it is a remnant from early drafting and early experiments. The frequency dependent data in the table should be used. (7Jan08)

p9.36. Fig 9.66. This problem remains. The problem has to do with the TUF-1 and TUF-3 mixers which have 4 pins. A PC layout will have 4 holes in a row. But this does not mean that it can be shoved into the board in either possible way. This figure should explain the nature of the mixer.



and the circuit should

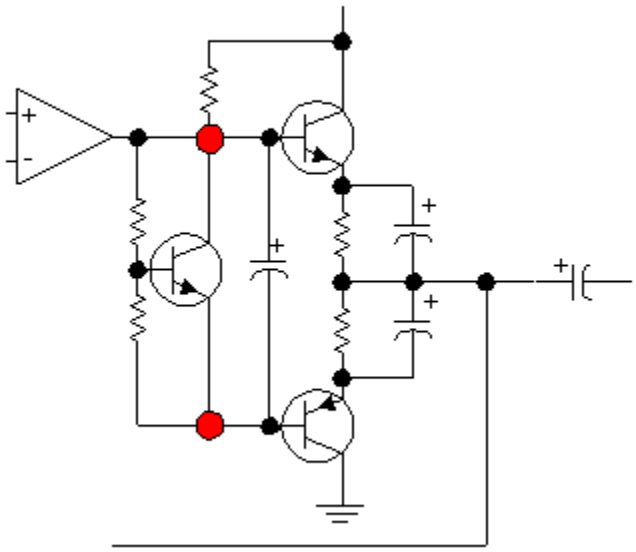


be (17Apr9)

p9.38, Fig 9.69. The two output capacitors at the top of the page, connected between the op-amp outputs and 10k resistors, should be 10 uF electrolytic. The 0.1uF value shown in the schematic is a typographical error. Since these capacitors are after the

summing network in the phasing receiver, they are non critical, but should be near 10 uF for the ASP board to have a wide frequency response when driving medium impedance loads near 500 ohms. They are clearly and correctly shown as electrolytics in both the layout view figure 9.70 and the photograph figure 9.71. (19Feb07)

p9.41, Fig 9.74. Two dots are missing in the schematic. Add the dots as shown in red. (16Aug03)

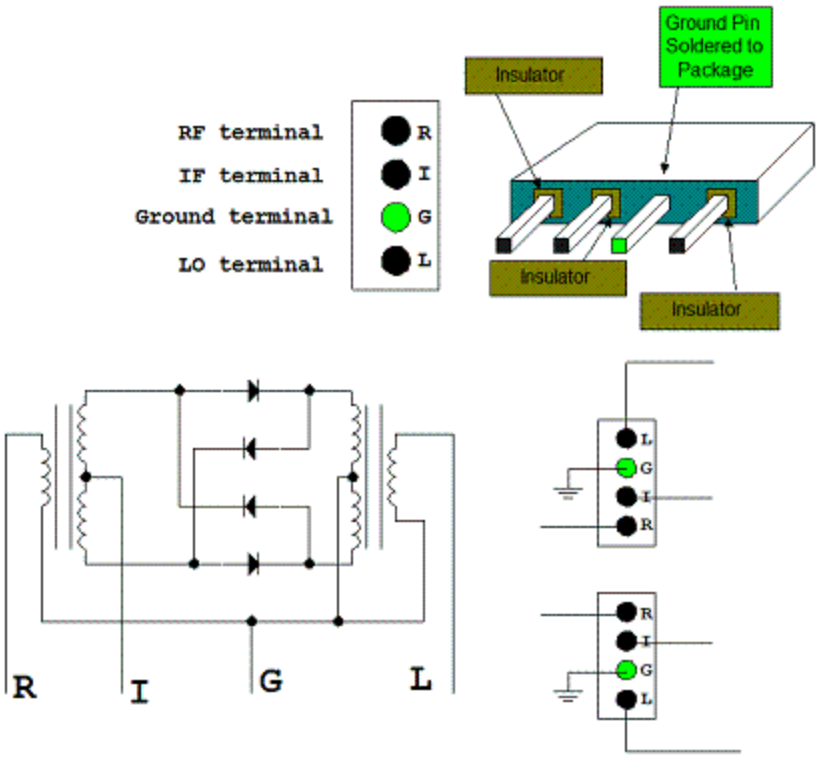


p9.42, middle col., 2.5 inches up from bottom. Replace "needed for to optimize" with "needed to optimize" (16Dec03)

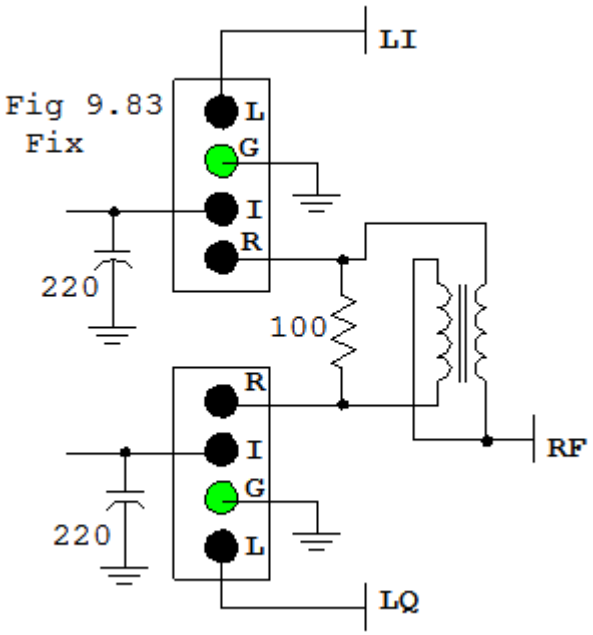
p9.43. Fig 9.78. The power supply decoupling resistor in the lower right corner of the schematic should be 10 Ohms rather than 10K.

p9.45, left column. There is a list of six items. Add a period at the end of items 4 and 5.

p9.46, Fig 9.83. Same problem with TUF mixers. The problem has to do with the TUF-1 and TUF-3 mixers which have 4 pins. A PC layout will have 4 holes in a row. But this does not mean that it can be shoved into the board in either possible way. This figure should explain the nature of the mixer.



and this fix is



(17apr9)

p9.47, right col, 3.0 inches down from text top: Replace "1.414 time" with "1.414 times"

p9.50, third column. The very last sentence in the chapter begins with “In this area…” That sentence has two semicolons. Perhaps they should be commas.

Errata, Chapter 10, EMRFD

P10.4, third column, 5.0 inches below top of text. Replace “never-the-less” with “nevertheless.”

p10.5, middle column, 3.9 inches down from text top: The program listed there as SHLPRG.DSP should be C1SHELL.DSP, which is indeed included on the book CD. The CD also includes the compiled version, C1SHELL.EXE. (3Jan04)

p10.9. Fig. 10.12. We have no idea how that text ended up in the middle of the graph. It is intended to be a footnote. (24Feb03)

p10.10, sidebar, left column, 2.2 inches up from bottom line: Replace "...since it has a leading zero, indicating ..." with "...since it has a leading one, indicating..." (1Aug03) p10.19. Lower right corner, reference. The reference alludes to a paper by C. R. MacCluer, W8MQW, that describes a matched filter for EME applications. The reference states that the paper is on the book CD. We evidently missed it in the compilation, but will try to make it available at a later time.

P10.13, left column, 1.6 inch above text bottom. Replace “Never the less” with “Nevertheless”.

P10.15, left column, 1.0 inch below text top. Replace “page 10.8” with “page 10.9”.

P10.15, middle column, 1 inch below text top. Replace “…instruction to setting….” with “…instructions setting…”

P10.17, left column, 3.0 inches below text top. Replace “Basic” with “BASIC” .

P10.17, middle column, 1.7 inches below text top. Replace “Basic” with “BASIC”.

P10.17, right column, top. “Basic” becomes “BASIC”.

P10.18, left column, 0.7 inch below text top. Replace “as there complexity” with “as their complexity”.

p10.21, right column bottom. Schwartz should be Schwarz. (22June03)

p10.22, Fig 10.31. Term inside a box should be changed. Sinewave should be Sine Wave.

P10.25, Fig 10.37 caption. Change “equivelent” to “equivalent”.

P10.26, 1.8 inches down in left column, text top. Insert a word from to get “as we would get from an A/D converter.”

p10.26. left column, 5.0 inches down from top of text. Replace "1000/1024" by "10,000/1024" (24Feb03)

P10.27, Fig 10.40 caption. Change “was samples at” with “was sampled at”.

P10.29, Fig 10.44. Lower right corner of figure, change “Moise” to “Noise”.

P10.29, left column, 1.7 inches below text top. The sentence should be “A 2500-Hz low pass filter extracts the signal envelope.”

p10.30, footnote. The footnote makes reference to a Matlab file, "predis1.m" that is included on the book CD. We missed that one and it did not make it to the CD. Click here on predis1.txt to read a text file that has all the information. You can save this and change the format to use it in Matlab. (12June07) (1Dec14)

P10.30, Fig 10.46 caption. Move a comma in the last sentence to get “….is not usually the case, and these should be …..”

P10.31, Fig 10.53 caption. Insert an “a” to get “The lower portion of the diagram is a conventional…..”

P10.32, right column, very top. Drop the comma to yield “This easy-to-follow procedure ….”

P10.32, References. See Ref 11. In two places, change Basic to BASIC.

Errata, Chapter 11, EMRFD

p11.12, middle column, 1.5 inches below text top. Change sentence to "The knob could be used to change frequency either in steps of ….."

p11.14, Fig 11.14 lower left corner. U4 is a MSA0385, not a MSA0685. (23Mar06)

p11.19, Fig 11.17. The local oscillator signal is split with a 2 Way 90 degree hybrid rather than the 0 degree splitter shown. The schematic, Fig 11.14 on p 11.14 is correct. (2Feb06)

p11.19, right column, 0.5 inches below text top. The sentence should read "This limits the levels of out-of-band signals that are seen by the A/D converter."

p11.22, left column, top. Replace the sentence beginning with "To understand this…" with the following: "To understand the process one should think of the error between the desired I (or Q) signal and the actual I (or Q) signal as both an amplitude and phase shift."

P11.24, left column, four lines down from the top. This argument is circular, for i0 appears twice. The sentence that begins with "i0 applies if the ….." should be replaced with "l0 applies if the …."

P11.25, Fig 11.25, caption. Add "of." The caption should start with "Schematic diagram of a circuit…"

P11.25, 1.4 inches from top of text. Mention is made of an 800 Hz offset tone. But it was mentioned as 850 on the previous page and looked like 750 Hz in Fig 11.26. These are all the same and the reader can sort through the details as he or she reads.

P11.25, left, 3 lines up from bottom. Change "suppression uses…" to "suppression use…"

P11.29, Fig 11.32 caption. There seems to be a missing word. Add "data". That is, "Diagram showing how the upper spectral data is ….."

P11.29, left column, 2.1 inch below text top. Replace the word "radios". Hence, "….sophistication to the radio's operation….."

P11.29, left column, 3.1 inches up from text bottom. Again, replace "radios" with "radio's".

Errata, Chapter 12, EMRFD

p12.6, left column, 1.2 inches up from text bottom. Replace “show” with “shown”.

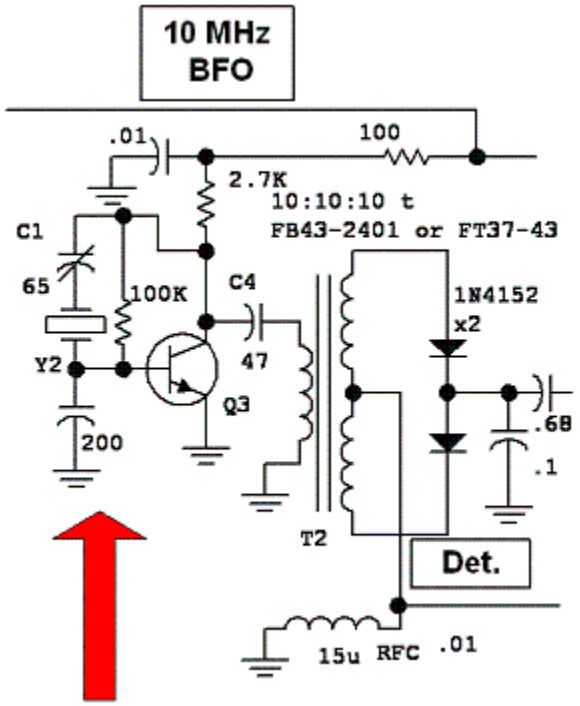
p12.8, text 1.2 inch down from top of text. Replace "see Chapter 4" with "see Chapter 6." (5May11)

p12.8, Fig 12.9. Top-middle of figure. The power supply shown for U3B is marked as +12K, which is the keyed line. This should merely be +12. (16Oct07)

p12.9, Fig 12.10. Place a 1 Meg resistor across the diode that drives the gate of Q14 through a large R. The added resistor will turn the FET off during receive periods, allowing the audio gain to again increase to a high level. Also, reverse the polarity of the 4.7 uF capacitor attached to the 680 resistor leading to pin 2 of U5A. (13March08)

p12.16. Middle column, 1 inch down from top of text. Replace Weinbridge with Wienbridge. (12March08)

p12.17, Fig 12.21 There should be a 200 pF capacitor from the base of Q3 to ground. This part of the schematic is shown below. Also, the blocking capacitor between Q4 output and the input to the product detector is .01 uF, although it is not critical.



p12.19, right column, 0.5 inch down from text top. Change “shelve” to “shelf”.

P12.24, middle column, 1.4 inches down from text top. Add “a”. Hence, “….without the use of a spectrum analyzer…”

p12.29, Fig 12.37. T2 is 10 bifilar turns on a FT-37-43, or similar. (29Jan06)

p12.29, top of right column: That's 1 Ohm rather than 1-W. (24Feb03)

p12.30, Fig 12.39. The inductors in the low pass filter (L1, L2, L3) are respectively 365, 403, and 365 nH. They are 9, 10, and 9 turns #24 on T30-6 toroid cores. The windings are compressed to obtain the required L. (16June14)

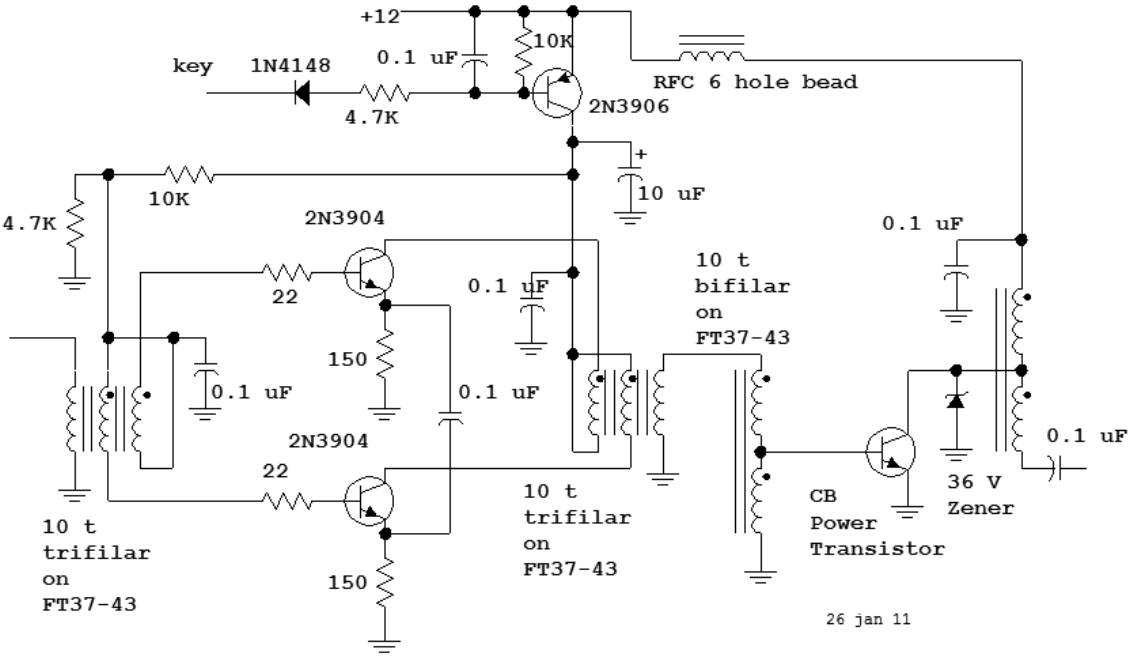
p12.32, Fig 12.43. This is a parts layout for the receiver system of Fig 12.40. Q4 should be rotated by 180 degrees. The correct layout can be seen in the photo of the board in the upper right corner of the page. (13March08)

p12.32, Fig 12.43. Rotate Q1, Q2, and Q3, as well as Q4. Q5 and Q6 are OK. This impacts the figure, but not the layout, for the parts were symmetrical. (22Aug9)

p12.35, Fig 12.48. The first integrated circuit in the signal path from VXO In is U3. (30June03)

p12.35, Fig 12.48. The integrated circuit marked as U3 should be marked as U4. This is the 144 MHz amplifier that follows the triple tuned circuit. A MAV-11 is appropriate, but other parts will also work here. (10Aug07)

p12.43, Fig 12.73. A new schematic was drafted that should be easier to read.


+12
0.1 uF
10K
key
1N4148
4.7K
2N3906
RFC 6 hole bead
+
10 uF
4.7K
10K
2N3904
22
0.1 uF
10 t
bifilar
on
FT37-43
0.1 uF
150
0.1 uF
0.1 uF
2N3904
22
10 t
trifilar
on
FT37-43
10 t
trifilar
on
FT37-43
150
CB
Power
Transistor
36 V
Zener
0.1 uF
26 jan 11

EMRFD Index and Software Errata

p500, index. Add both "IL" and "insertion loss" to the index with "in filters...p3.1, in receiver roofing filters...p6.50" (10Aug03)

p507, index. The correct name of VE7QK (sk) is Derry (not Jerry) Spittle. (24Feb03)

Software Manual.
Some folks tried to run the design programs on the CD without realizing that a manual exists. It is on the CD containing the programs, in the same folder. It's a PDF, so it should be easily read.