Errata for the **1st** Edition, **Chinese Version**
of "*Understanding Digital Signal Processing*"
by Richard Lyons

These are mostly minor typographical errors, but a
few corrections are significant. I must mention that
I told the publisher's typesetter about the missing
curves in Figures 3-16 and 5-25, and was *assured*
that he would correct this. Be that as it may, I'll
take the blame for a good many of the typographical
errors in the book, and for this I really do beg your
pardon. At least we have the consolation that, unlike
many books, a list of corrections is available.
(Although the following list looks long, it only takes a
few minutes to go through the book and make these
corrections.)

I realize now, that the "review process" by my
colleagues (bless their souls) at work, and the subsequent
review procedures of the publisher (the publisher had
three reviewers for each Chapter) were not nearly as
thorough as they should have been. (It appears that
reviewers essentially "skimmed over" the material
instead of reading it.)

Not that it helps you any, but most of these
corrections have been made in the "Third Printing"
of the book.

Page: Correction:

17 In the middle of Eq. (1-22) there should be a right
      parenthesis as:
              $-(2\cos(2pi.1.nt(sub\ s) + 2pi.3.nt(sub\ s))/2$.
----
34 The frequency axis labels in Part (c) of Figure 2-8 are
      "fouled-up". The tick marks for integer multiples of
      f(sub s'') offset. The tick marks for the multiples
      of the f(sub s'') sample rate should lie in between
      the shaded "barn door" spectral shapes. For example:
      the correct location for +f(sub s'') should be exactly
      in the middle of where the existing (incorrect) +f(sub s'')
      and +2f(sub s'') are now. Likewise, the correct location
      for -f(sub s'') should be exactly in the middle of where
      the existing (incorrect) -f(sub s'')and -2f(sub s'') are
      now. Etc. [Please pardon this miserable error.]
----
44 At the top of the last paragraph: the text: "R(sub int)
      in Eq. (2-13) as" should be:
              R(sub int) in Eq. (2-16) as ...
----
52 The incorrect letter "*v*" in the third line of Eq. (3-4d)
       should be replaced with a "·" multiplication symbol.
----
64 At top of page, text: "Figures 3-3(b) and 3-3(d)" should
      be:
              Figures 3-4(b) and 3-4(d) .
----
69 In equation (3-20) the second "x(3)" should be "x(5)".
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71 In the list of x(n)'s in the middle of the page, the
     second "x(3)" should be "x(5)".
----
80 At top of page, text: "Figures 3-6 and 3-7." should be:
               Figures 3-7 and 3-8.
----
82 In equations (3-29) and (3-30), change the angles
     "2*pi*n/N" to "2*pi*n/(N-1)". The original equations
     were valid larger-sized FFTs, but the change makes the
     equations valid for all FFT lengths.
----
83 At beginning of last paragraph, text: "is the most
        narrow, 2f(sub s)/N." should be:
                is the most narrow, f(sub s)/N.
----
84 The Rectangular window response curves are missing
        in Figure 3-16. The dots didn't show up in the
        "dash-dot" Hamming curves.
----
102 At the top of the page, delete that derivative:
        d[X(m)]/dm. It shouldn't be there.
----
105 In Figure 3-28, the label has a missing minus sign in
        front of the n(sub o). The "n(sub o) = -(K-1)/2"
        should be:
                -n(sub o)=-(K-1)/2   .
----
108 In Figure 3-31, the label "n(sub o) = -N/2+1" should be:
                -n(sub o) = -(N-1)/2   .
        The n-axis point labeled "N/2" should be labeled:
                (N-1)/2   .
----
110 Title for Figure 3-33, Greek typeface missing. Should be:
        Relationships between an angle alpha, line a =
        sin(alpha), and alpha's chord b: (a) Large angle
        alpha; (b) Small angle alpha.
----
124 Missing minus sign in the exponent of the 2nd term of
        Eq. (3-73). Should be:
                ... + e^-j[pi(k+m)-pi(k+m)/N]...

On page 139, In Figure 4-2, the lower right four twiddle factors:

W_8^4, W_8^5, W_8^6, W_8^7

should be

$-W_8^0$, $-W_8^1$, $-W_8^2$, $-W_8^3$

Page 140: Replace everything thing from the top of the
page down to, and including, Eq. (4-24) with the following:

$$A(m) = \sum_{n=0}^{(N/2)-1} x(2n)W_{N/2}^{nm} = \sum_{n=0}^{(N/4)-1} x(4n)W_{N/2}^{2nm} + \sum_{n=0}^{(N/4)-1} x(4n+2)W_{N/2}^{(2n+1)m} . \tag{4-22}$$

Because $W_{N/2}^{2nm} = W_{N/4}^{nm}$ we can express $A(m)$ in the form of two $N/4$-point DFTs, as

$$A(m) = \sum_{n=0}^{(N/4)-1} x(4n)W_{N/4}^{nm} + W_{N/2}^{m} \sum_{n=0}^{(N/4)-1} x(4n+2)W_{N/4}^{nm} \tag{4-23}$$

Notice the similarity between Eq. (4-23) and Eq. (4-20). This capability to subdivide an $N/2$-point DFT into two $N/4$-point DFTs gives the FFT its capacity to greatly reduce the number of necessary multiplications to implement DFTs. (We're going to demonstrate this shortly.) Following the same steps we used to obtained $A(m)$, we can show that Eq.(4-21)'s $B(m)$ is

$$B(m) = \sum_{n=0}^{(N/4)-1} x(4n+1)W_{N/4}^{nm} + W_{N/2}^{m} \sum_{n=0}^{(N/4)-1} x(4n+3)W_{N/4}^{nm} \tag{4-24}$$

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176     In Item #3, replace "n" with "k".  Text should be:
            "as a function of time index k."
------------------------------
186  The Rectangular window curves are missing in Figure 5-24.
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188  In Figure 5-25, the dots are missing in the "dash-
        dot" Chebyshev curves.
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202  There's a major "foul up" on this page.
        Eq. (5-23) defines the group delay REGARDLESS of the
        number of taps in a FIR filter (having symmetrical
        coefficients).  So the correction is to completely
        delete Eq. (5-23'), equation 5-23prime!  Also delete
        the "odd" subscript after the "G" in Eq. (5-23).
        Delete the text "when S is odd, and" following
        Eq. (5-23) and delete the text "when S is even,"
        following Eq. (5-23'). I beg your pardon for this error.
------------------------------------------------------------------
206    The upper limit of the summation in Eq. (5-26)
        is printed as:

          "P + Q - 2"

        It should be:

          "P + Q - 1"
------------------------------
221  The last term in Eq. (6-1), h(4)x(n-4), should be deleted
        making Eq. (6-1) look as follows:

        y(n) = h(0)x(n) + h(1)x(n-1) + h(2)x(n-2) + h(3)x(n-3).  (6-1)
------------------------------
257  The first term in the denominator of Eq. (6-44) has an
        exponent of M. It should be a minus M (-M).
------------------------------
269  Figure 6-27: The "zero" should be located at the origin
        of the z-plane, and not at point z = 0.7005.
------------------------------
299  Two "+" to "-" changes in Figure 7-2.  At the top and
        bottom of the figure, both "i(n) + q(n)" expressions
        should be:
                        i(n) - q(n).
------------------------------
300  Two "+" to "-" changes.  On the 7th line of the 2nd
        paragraph, and the 9th line of the 3rd paragraph, both
        "i(n) + q(n)" expressions should be:
                        i(n) - q(n).
```

Also in the 2nd paragraph, the text "Eq. (7-2)" should
        be "Eq. (7-1)".
----
301 Sixth line of second paragraph, the "f"s should be
     replaced with "x"s. The text: "mixers in the
     f(sub i)(t) and f(sub q)(t) signals ..." should be:
          mixers in the x(sub i)(t) and x(sub q)(t) signals ...
----
302 There's a significant error in Figure 7-3(d)! The spectral
         replications at -3f(sub c), -f(sub c), +f(sub c)=f(sub s)/4,
         and +3f(sub c) should NOT be there. There should only be
         five spectral replications in Figure 7-3(d).
----
302 In the last paragraph of this page, the sentence,

       "If we implement this digital mixing process we'll
        find that the spectral replication period in Figure
        7-3(d) is half what is was in Figure 7-3(c)."

    is incorrect and should be deleted from the text.
----
307 The "6" in the denominator of the first ratio in Eq. (7-7)
         should have been a "4". Thus the result of Eq. (7-7)
         should be 665 stages. In Figure 7-5(c), those two
         diagonal "transition region" lines should not overlap
         each other, they should meet on the horizontal axis
         at the Freq = 4 kHz point.
----
314 On second line of last paragraph, text: "by 4/3 or
     1.25, ..."   should be:
               by 4/3 or 1.333, ...
----
340 In Section 8.4, 1st paragraph, in the 4th line down
     the text:

   "... (N-1)-tap FIR filter ..."

should be

   "... N-tap FIR filter ..."
----
340 In Section 8.4, 2nd paragraph, in the 5th line down
     the text:

   "... b(N) coefficient ..."

should be

   "... b(N-1) coefficient ..."
----
355 The line "+20 in two's complement -->0 0 0 1 0 1 0 0"
         should be:
                 +28 in two's complement -->0 0 0 1 1 1 0 0
----
369 The top line of Eq. (9-19), "x' = x(sub real) + jx(sub imag)
         + [cos(alpha) - jsin(alpha) . (y(sub real) + jy(sub imag))",
         has a missing right bracket, it should be:
                 x' = x(sub real) + jx(sub imag) + [cos(alpha)
                 - jsin(alpha)] . (y(sub real) + jy(sub imag)) .

372, in the middle of the page: it is stated that "...the value of T
bits, all ones, to the right of the binary point is 1-2^T." It should
read: "... of the binary point is 1-2^-T."

392, Fig. 10-6: the plots in part (b) should be relabeled as:
"Magnitude of 1, 1, -1, -1" and "Phase of 1, 1, -1, -1".

394, Figure 10-7: In part (b), the negative spectral component should
be located at an index value of m = -8, not m = -9.
----
422 The "F(m)" in the middle Fig. 10-19 should be "X(m)".
----
424 Third line from the top of page, text: "same process
        as the above 2N-Point Real FFTs algorithm analysis,"
        should be:
                "same process as the above Two N-Point Real FFTs
                algorithm analysis,"
----
427 Eq. (10-74): In the right-hand side of the first line,
        the conjugation symbol ("*") is missing over the
        (e^j2pinm/N) term. It should show: (e^j2pinm/N)^*.
----
430 Eleventh line from the bottom of page, text: "Figure
        10-23(b)." should be:
                Figure 10-23(a).
----
449 Missing parenthesis in Eq. (A-19'). Angle variables
        should both be enclosed in parenthesis. "phi(sub 1)
        - phi(sub 2)" should be:
                (phi(sub 1) - phi(sub 2)) .
----
449 In Eq. (A-20), improper "j" in first numerator term
        "(R(sub 1)R(sub 2) + jI(sub 1)I(sub 2))". Should be:
                (R(sub 1)R(sub 2) + I(sub 1)I(sub 2)) .
----
450 In Eq. (A-24), the right parenthesis should not be
        superscripted. Should be:
                3 cubed(e raised to the j3 times 125 degrees) .
----
452 Text in first line of Eq. (A-37) has missing "j". Term
        "(ln(12) + pi/4)" should be:
                (ln(12) + jpi/4) .
----
459   The footnote at the bottom of page 459 corresponds
        to the first footnote marker at the end of the first
        paragraph on pp. 460.
----
464 Missing minus sign in second line up from the second
        paragraph. Text: "twelve o'clock, the e raised to the
        jwt phasor" should be:
                twelve o'clock, the e raised to the -jwt phasor.
----
467 The last two sentences on this page are a jumble of nonsense.
        Please cross out the bottom five lines of the
        text on pp. 467 starting with "If we say that the ...".
----
468 There are two missing "j"s in front of the w(sub o)
        terms in the exponents of the "sin(w(sub o)t)"
        expression in the title to Figure C-9. Text in the
        title should be:
                sin(w(sub o)t) = (e raised to the jw(sub o)t -

e raised to the -jw(sub o)t) divided by j2 =
                    (-je raised to the jw(sub o)t + je raised to the
                    -jw(sub o)t) divided by 2 . (Whew!)
----
470 Reference [6] at the bottom of the page, should be [5].
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471 Wrong Figure reference in second line. Text: "in
        Figure C-11." should be:
                    in Figure C-12(b).
----
474 Reference [8] at the bottom of the page, should be [7].
----
484 Missing minus sign in numerator of the 2nd term in
        the 2nd line of Eq. (D-12). Numerator "(b + a)^2
        over 4" should be:

                    (b - a)^2 over 4.

    The final ratio at the end of Eq. (D-12) is printed as
    "(b - a)^2 over 4". It should be "(b + a)^2 over 4"
----
487 In the sentence just following Eq. (E-2), there is a missing
    "P(sub 1)/P(sub 2)" ratio. That sentence should read as:

        "The logarithmic function 10log(sub 10)[P(sub 1)/P(sub 2)],
        plotted in ..."
----
496 Under the "Chebyshev Function": the fifth line down is
    printed as:

        "...ripples in the passband and flat passbands..."

    It should be printed as:

        "...ripples in the passband and a flat stopband..."
----
498 Missing minus sign on the second line of last paragraph.
        Text: "G = delta_phi/delta_f,..." should be:
                    G = -delta_phi/delta_f,...
----
499 On page 499, there are both missing, and inappropriate
    minus signs.
  a. In the two numerators of Eq. (F-2), there should
    be a minus sign on front of the "delta_phi" terms.
  b. Likewise, in the two numerators of Eq. (F-3), there
    should be a minus sign on front of the "delta_phi" terms.
  c. On the next to the last line of the 2nd paragraph,
    (near the middle of the page) there should be a
    minus sign in front of the "0.25 radians/Hz,",
    making it "-0.25 radians/Hz,"
  d. That same change should be made on the 1st line of
    last paragraph (i.e., "0.25 radians/Hz," should be
    "-0.25 radians/Hz,").
  e. In the first ratio of Eq. (F-5), there should be a
    minus sign on front of the "delta_phi" term.
----
500 Figure F-4(b) vertical axis label "Filter Input" should
        be:
                    "Linear phase filter output".
----
504 The figure references in the definition of "Relative

Attenuation" are incorrect. Text: "Figures F-2 and F-5"
        should be:
                Figures F-3 and F-6.