Small Wonder Labs

The DSW-II-80
Transceiver Kit

Welcome! The DSW-II manual departs from the traditional Small Wonder Labs instructions. These pages contain the information necessary for a reasonably-experienced builder to complete this kit successfully. If you're new to kit-building, please go on-line and check out:

http://smallwonderlabs.com/DSWhelps.pdf

That URL contains a Supplement document (in .pdf format) with component identification tips, technical description, basic soldering instruction and troubleshooting information. Why this approach? You've seen most of this information in my earlier manuals- print only the portion you need and save a tree!

This document itself is kept current at http://smallwonderlabs.com/DSW80_Manual.pdf

Table of Contents:

The *'DSW-II-80'*

Parts list

(quantities in blue are those items pre-installed by Small Wonder Labs)

Qty.	Ref. Designator	Component	Description
1	C4	10 pF NPO disk cap	'10'
1	C26	15 pF NPO disk cap	'15'
2 (2)	C22,C23	22 pF NPO disk cap	'22', *Pre-installed*
1	C17	27 pF NPO disk cap	'27' or '27J'
1	C5	47 pF NPO disk cap	'47' or '47J'
2	C24,C27	47 pF NPO monolithic cap	'470'
1	C25	100 pF NPO monolithic cap	'101' or '101J'
1	C12	15-70 pF trimmer cap	*Brown*
1	C1	120 pF disk cap	'121' or '121J'
8	C6-C11, C16, C104	150 pF disk cap	'151' or '151J'
1	C2	330 pF disk cap	'331' or '331J'
1	C35	560 pF NPO monolithic cap	'561' or '561J'
1	C19	820 pF poly cap	'821' or 821J'
1	C34	1200 pF NPO monolithic cap	'122' or '122J'
1	C32	1500 pF NPO monolithic cap	'152' or 152J'
1	C33	2200 pF NPO monolithic cap	'222' or '222J'
1	C20	2200 pF (.0022 uF) poly cap	'222' or '222J'
14	C3,C15,C28-30,C101-102, C108-111,C118,121,122	.01 uF disk cap	'103', ceramic
2 (2)	C114,C115	.01 uF 0805 SMT cap	*Pre-installed*
2	C14,C18	.033 uF poly cap	333' or '333K'
7 (1)	C13,C31,C103,C106, C107,116,C120	.1 uF monolithic cap	'104', epoxy case
2 (2)	C112,C113	**.**1 uF 1206 SMT cap	*Pre-installed*
1	C117	10 uF electrolytic cap	
2	C21,C105	47 uF electrolytic cap	
1	C119	220 uF electrolytic cap	
7	D1-D6,D8	1N4148 diode	*glass body*
1	D7	1N5818 diode	
1	D9	1N4751A diode	
1	HS1	TO-220 heat sink	*Black-anodized w/fins*
1	- -	#4-40 x 1/4" machine screw	
1	- -	#4-40 nut	
2	J1,J4	3.5mm stereo conn, PC-mount	*w/ knurled nut*
1	J2	DC power jack, 2.1/5.5mm	
1	J3	BNC conn., PC-mount	*w/ nut, lock washer*
1	J5	10-pin header strip	
1	L1	16 uH- 31 turns #26 on T44-15	Red/white toroid
1	L2	10 uH RF choke	Brown-blk-black
1	L3	22 uH RF choke	Red-red-black
1	L4	5.6 uH SMT Inductor	
1	L5	4.7 uH SMT Inductor	
1	L6	3.3 uH SMT Inductor	*SWL ref: / DN1118*
1	L7	FT37-61 toroid, 14 turns #24	dark grey toroid
1	L8	T37-2, wind w/ 18 turns #26	red toroid
2	L9, L10	T37-2, wind w/ 25 turns #26	red toroid
1	P1	2.1 mm/5.5mm power plug	
1	- -	2' (0.7m) power wire	

2	R7, R14	10 ohm, 1/4W 5% resistor	Brown-blk-blk
2	R2,R22	51 ohm, 1/4W 5% resistor	Green-brwn-blk
1	R26	100 ohm, " " "	Brown-blk-brown
1 (1)	R17	240 ohm , *pre-installed*	Red-yellow-brown
3	R1,R18, R23	470 ohm, 1/4W 5% resistor	Yellow-violet-brn
1	R19	500 ohm trim pot	Blue plastic, 3 leads
1 (1)	R16	3.9K ohm, SMT res., 0805	*pre-installed*
6	R3,R4,R15,R20-21, R25	10K ohm, 1/4W 5% resistor	Brown-blk-orange
2	R10,R24	22K ohm " " "	Red-red-orange
3	R5,R6,R11	510K ohm " " "	Green-brn-yellow
3	R8,R12,R13	1M ohm " " "	Brown-blk-green
1	R9	4.7 M resistor	Yellow-violet-green
1	T1	IF Transformer	'43IF123'
1	Q1	2N5485 or 2N5486 transistor	(TO-92 package)
2	Q2,Q3	2N7000 transistor	(TO-92 package)
1	Q4	2N3906 transistor	(TO-92 package)
1	Q5	2SC1971 transistor	TO-220 package
2	U1,U2	SA602AN or SA612AN IC	8-pin DIP IC
1	U3	TS922 IC, Audio Amplifier	8-pin DIP IC
1 (1)	U4	78L05A	*pre-installed*
1 (1)	U5	25.000 Mhz Oscillator	*pre-installed*
1 (1)	U6	AD9835BRU, DDS IC	*pre-installed*
1 (1)	U7	PIC16C622A microcontroller, preprogrammed	*pre-installed*
1	U8	LT1252 IC, video driver IC	8-pin DIP IC
1	U9	78L06A	TO-92 package
4	Y1-Y4	5.185 Mhz crystal, *series-res*	*matched set, '5.18-S'*
1 (1)	Y5	4.096 Mhz crystal, *20 pF*	*pre-installed*
4	- -	8-pin IC socket	
1 (1)	- -	18-pin IC socket	*pre-installed*
1		12" (30 cm) #24 magnet wire	
1		6' (1.9m) #26 magnet wire	
1	- -	Printed circuit board	'SWL 11/24/03'
1	- -	Enclosure, w/ 2-bezels, 4- black-anodized screws	
1	- -	Front panel	
1	- -	Rear panel	
1	- -	Small knob	
1	- -	Medium knob	

Notes: 1) Items with gray-shaded quantities are in an anti-static envelope.

Front-Panel Daughterboard

2	C1,C2	.01 uF disk cap	'103' or '103M'
1	POT	5K ohm, 9mm PC-mount	*/ DK P3C3502*
1	S1	Subminiature pushbutton sw.	*/ w/ nut, lockwasher*
1	S2	Subminiature. toggle sw.	*/ DK CKN1088*
1	S3	Shaft encoder, rotary	*3 leads, w/ nut, washer*
1	- -	Printed circuit board	
1	LED	Yellow LED	
1	W1	Flex cable	*/ DK A9BAG-1002F*
3	R1-R3	1.5K ohm, 1/4W 5% resistor	Brown-green-red

ANT. J3

C35 560
C34 1200
C33 2200
C32 1500

T37-2 25 turns L10
T37-2 25 turns L9
T37-2 25 turns L8
T37-2 18 turns L8

A

C31 .1
C120 .1
L7
Q5 2SC1971
30V D9
D8
R26 100

J2
D7
V+

C119 + 220 uF
C116 .1
2N3906
Q4
R24 22K
R25 10K
Q3 2N7000
G

C117
C118 .01
10 uF
L6 3.3 uH
U8 LT1252
R20 10K
R23 470
R22 51
C29 .01

C30 .01

C28 .01
R21 10K

H
R18 470
R19 500
C27 47
C26 15
L5 4.7
C25 100
L4 5.6
C24 47
R17 * 240
C115 .01 *

VR1 4V
U5 * 25 Mhz
C114 .01 *
U6 AD9835
R16 3.9K

U4 * 78L04
V+ IN OUT

C112 .1 *
C113 .1 *
SCLK 7
SDATA 8
FSYNC 9
MUTE/10 FSEL

B C D E

5,11, 12,13
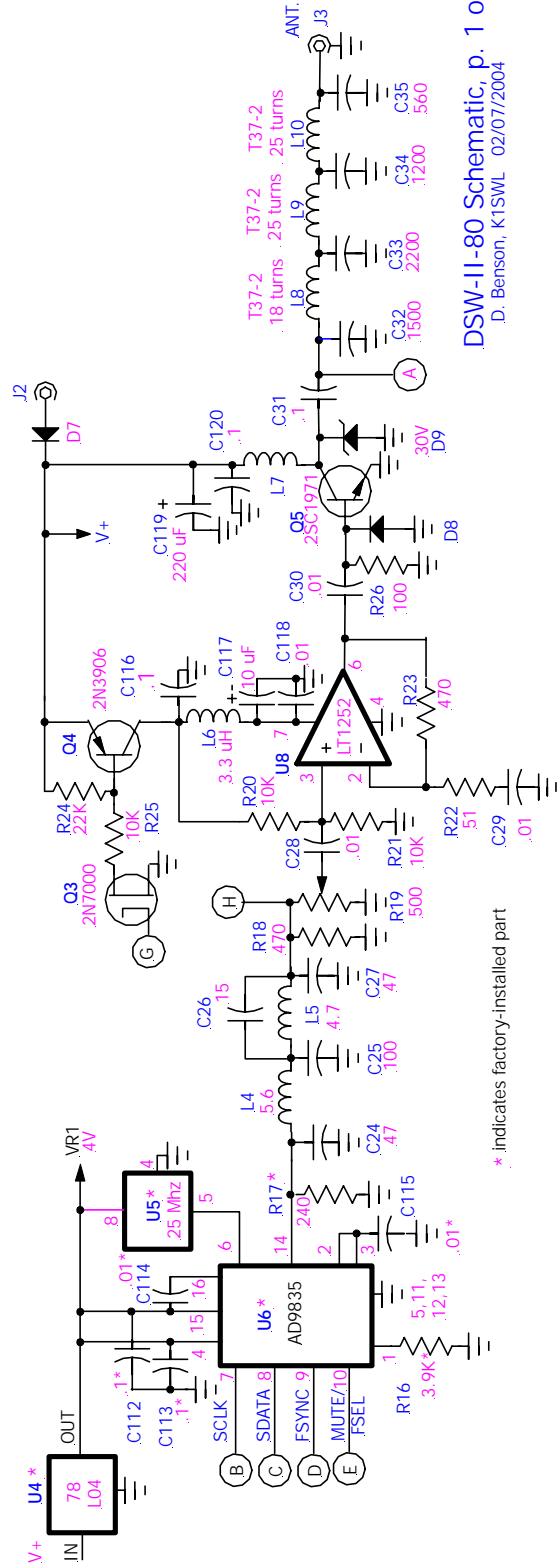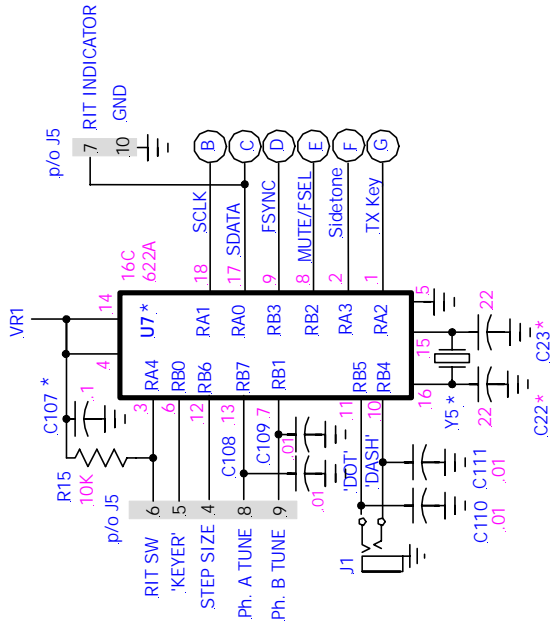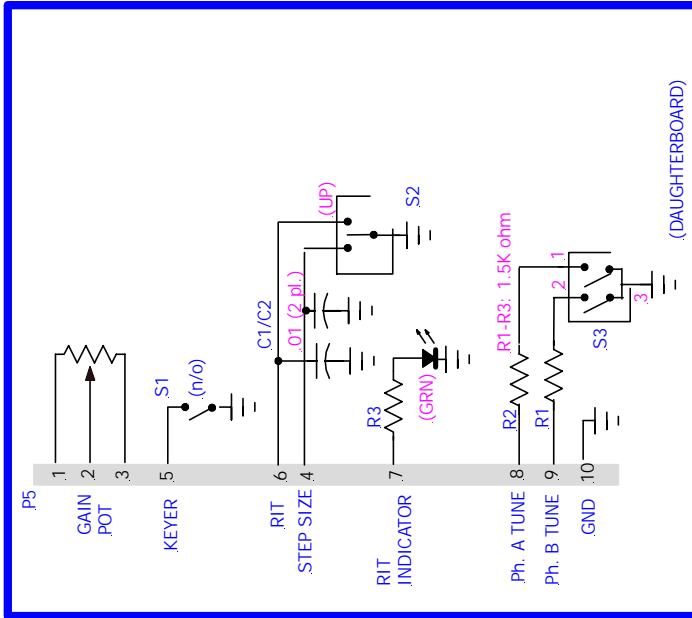
* indicates factory-installed part

(DAUGHTERBOARD)

P5
GAIN POT .1 .2 .3
KEYER .5
RIT .6
STEP SIZE .4
RIT INDICATOR .7
Ph. A TUNE .8
Ph. B TUNE .9
GND .10

S1 (n/o)
C1/C2 .01 (2 pl.)
S2 (UP)
R3 (GRN)
R1-R3: 1.5K ohm
R2 R1
S3

p/o J5 RIT INDICATOR 7 GND 10
B SCLK
C SDATA
D FSYNC
E MUTE/FSEL
F Sidetone
G TX Key

VR1
U7 *
16C 622A
.14
RA4 RB0 RB6 RB7 RB1
RA1 RA0 RB3 RB2 RA3 RA2
RB5 RB4
18 SCLK
17 SDATA
9 FSYNC
8 MUTE/FSEL
2 Sidetone
1 TX Key

C107 *
R15 10K
C108 C109
'DOT' 'DASH'
J1
C110 .01 C111 .01
Y5 *
C22 * C23 * 22

p/o J5
RIT SW 6
'KEYER' 5
STEP SIZE 4
Ph. A TUNE 8
Ph. B TUNE 9
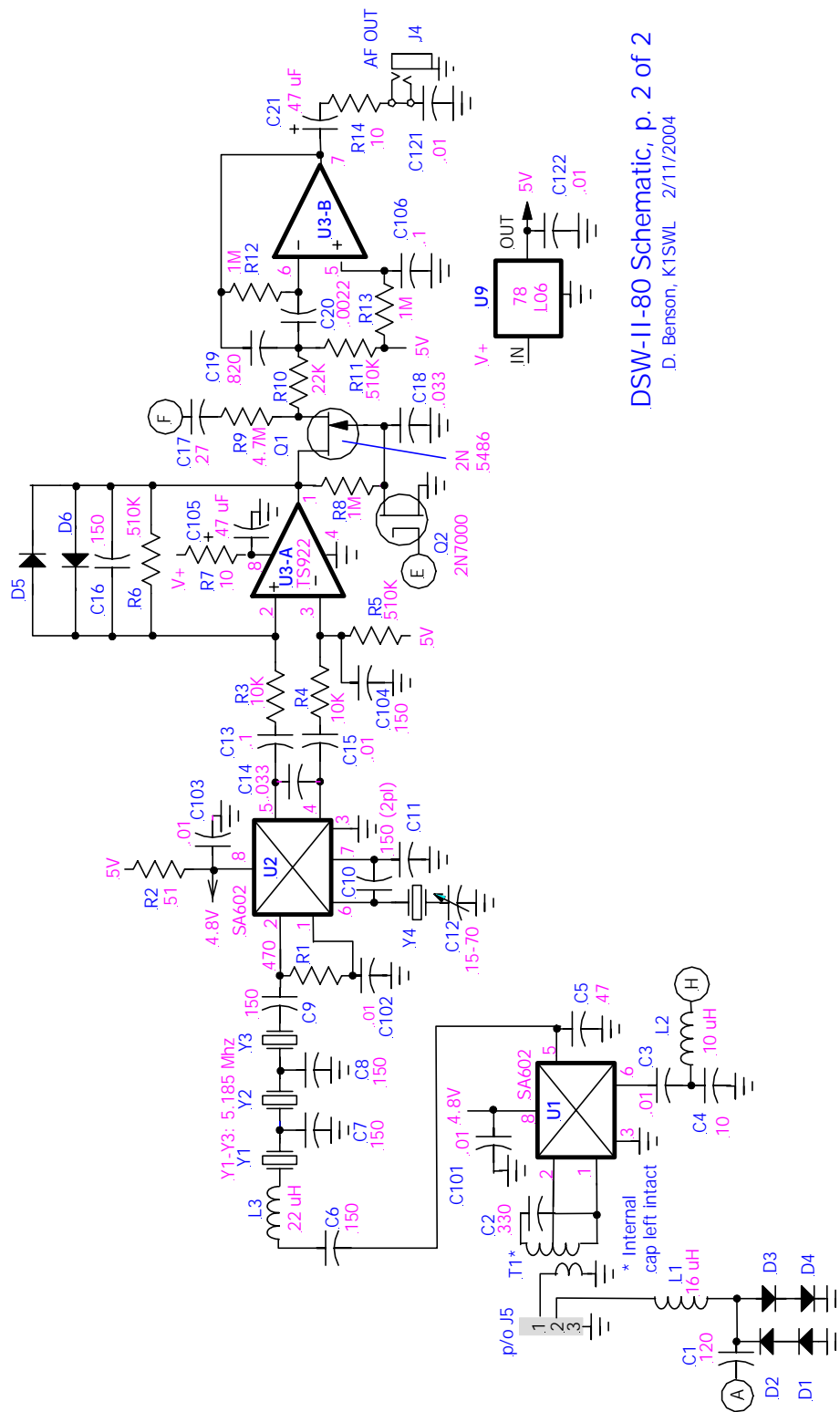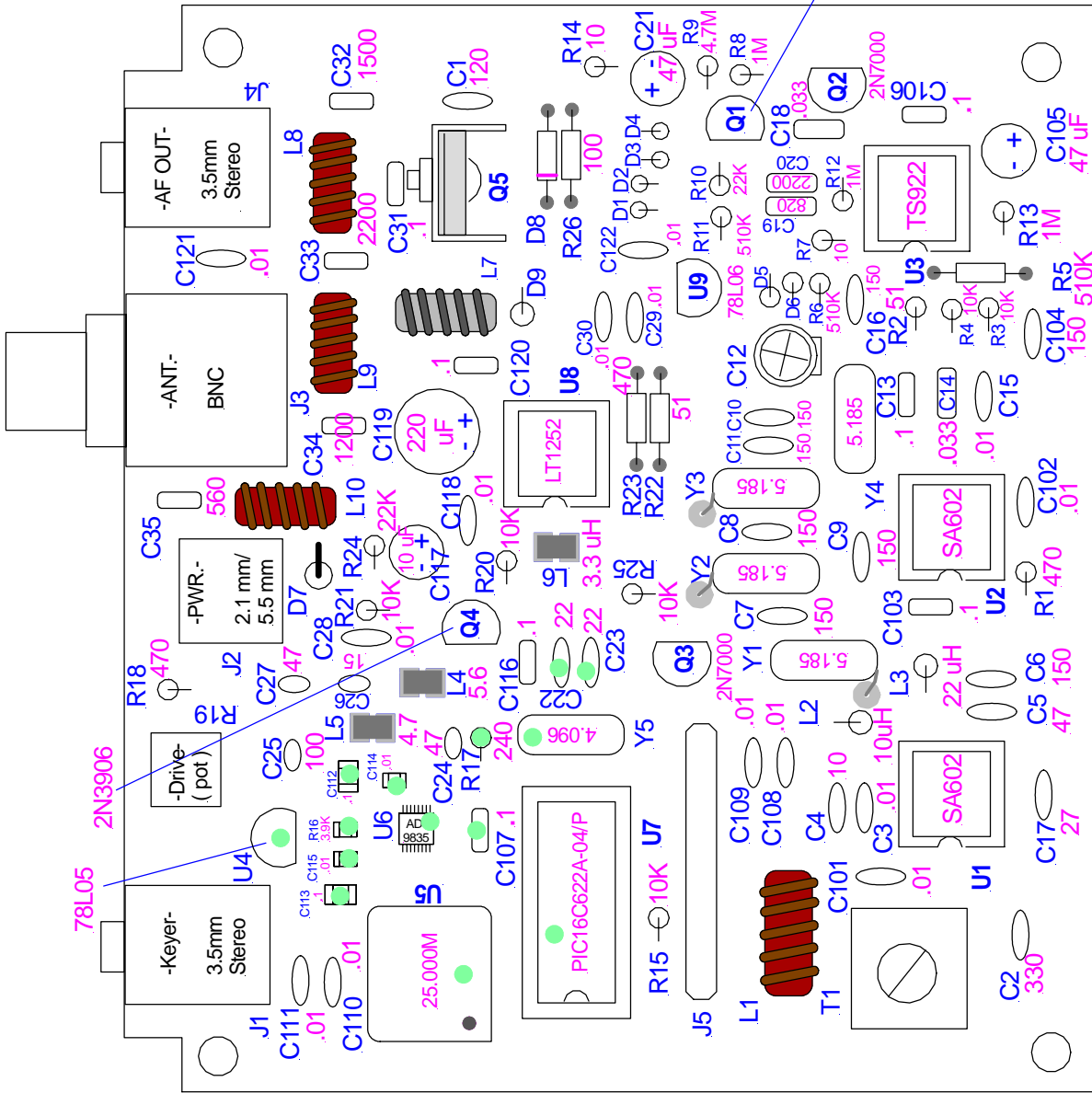
DSW-II-80 - Pictorial
Dave Benson, K1SWL
as of 2/11/2004

Note: Components with green dots are pre-installed by Small Wonder Labs.

Assembling the DSW-II-80

The assembly steps on the following pages are suggested only- they're by no means the only possible assembly sequence- Assembly starts with the local oscillator (upper left corner) and installs components from left to right across the board.

As you proceed through the assembly, each component is installed, soldered, and the leads clipped short on the underside of the board. *I recommend adding 3-4 components between soldering steps- add too many at a time and you may overlook making solder connections!* **Solder only on the bottom side of the board unless the instructions indicate otherwise- the board holes are all plated-though**.

Most resistors and diodes are installed upright, i.e., bent in 'hairpin' fashion. Check the pictorial and/or board silkscreen for guidance.

"Big-Boy Corner"

This is for those of you who don't feel the need to follow instructions:

- [Surface mount components L4-L6 should be installed early on- they're more difficult to install when surrounded by taller components.]

- Crystals should be stood slightly (0.5 to 1mm) above the printed-circuit board to prevent shorts from the crystal cases to any top-side traces.

- Diode Installation:

  Some of the diodes are bent for "upright" installation on the board. Installation polarity is as shown below. Be sure to note the orientation of the silkscreened circle on the board and install the diode body over this hole. The cathode (banded) end of the diode is oriented at the top. For diodes which are installed 'lying down', match the banded end to that shown on the silkscreen

Component
Silkscreen

banded end is cathode

Diode-Schematic

. Installation- Pictorial
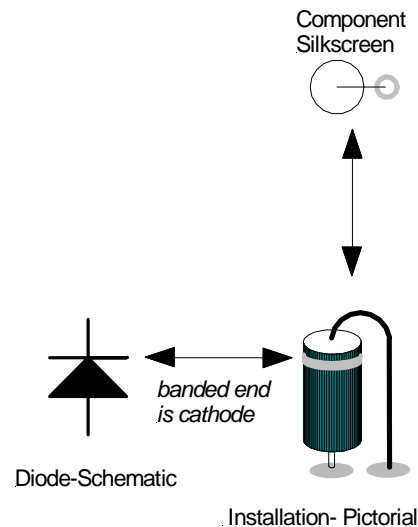
Main Board:

Recommended assembly sequence:

1) C24- 47 pF monolithic cap

2) Install surface-mount inductor L5 (4.7 uH,). *Note: the inductor itself is inside a black plastic carrier.* **Pre-tin the inductor pads on the PC board sparingly with solder before installing the part.** Place this component on the two pad locations and restrain carefully in place with tweezers. Tack one end down with the soldering iron, solder the other end sparingly, and retouch the end originally tacked down. **Good component alignment is important to ensure that there are no short-circuits- check your work carefully for solder bridges.**

3) L4- 5.6 uH SMT inductor (see instructions above).
4) C26- 15 pF disk cap
5) C25- 100 pF monolithic cap
6) C27- 47 pF monolithic cap
7) R18- 470 ohm resistor (ylw-violet-brn)
8) R19- 500 ohm pot (blue/ 3 leads)
9) C28- .01 disk cap
10) C110- .01 disk cap
11) C111- .01 disk cap
12) C116- .1 uF monolithic cap

13)   D7- 1N5818 Install this part as shown on the pictorial drawing, noting the installation polarity.

14)   J2- DC power jack. Once one pin on this jack has been soldered into place, ensure that the jack is aligned at right angles to the board edge and seated firmly before soldering the remaining pins.

15)   J1- 3.5 mm stereo connector.

16)   R15- 10K resistor (brn-blk-orange)

17)   J5- 10-pin header strip. Solder one pin and ensure that the component is firmly seated on the board and upright before soldering remaining pins.

18)   L1- Using a **24"** (60 cm) length of the thinner (#26) magnet wire, wind **31** turns on a **T44-15** (red/white) toroid.

        [Each time the wire passes through the center hole, it counts as a turn. See the DSW Supplement for further discussion.]   Trim the excess wire leads to a length of 3/8" (1 cm) and gently scrape the insulation off the wire ends using a hobby knife or other sharp blade.

        Caution: don't assume your soldering iron will melt the wire insulation off- it probably won't! Failure to strip the lead ends adequately (or at all) is one of the most common difficulties we find when troubleshooting a returned unit.

        (Install and solder L1)

19)   C101- .01 disk cap
20)   C109- .01 disk cap
21)   C108- .01 disk cap
22)   C4- 10 pF disk cap
23)   C3- .01 disk cap

24)   T1 (IF transformer, metal-can)

25)   C2- 330 pF disk cap

26)   U1 socket- Orient with the notched end of the socket matching that of the board silkscreen.

27)   C17- 27 pF disk cap

28)   Y1- 4.00 MHz crystal.

Install this component slightly above the board (0.5 to 1 mm) to prevent the case from shorting to board traces. Using a leftover component lead, install a jumper from the pad below and to the left of Y1 (see pictorial.) The easiest way to do this is to set the board down, stand the wire piece upright and soldering on the top side of the board. Trim to 3-4mm (1/8"+), bend the lead over and solder to the crystal can. Use a minimum of heat. *The crystal case will accept solder readily.*

29)   L2- 10 uH RF choke
30)   L3- 22 uH RF choke
31)   C5- 47 pF disk cap
32)   C6- 150 pF disk cap
33)   C7- 150 pF disk cap
34)   C8- 150 pF disk cap
35)   C9- 150 pF disk cap
36)   C103- .1 uF monolithic cap

37)   U2 socket - Orient with the notched end of the socket matching that of the board silkscreen.

38)   R1- 470 ohm resistor (ylw-violet-brn)
39)   C102- .01 uF disk cap
40)   C11- 150 pF disk cap
41)   C10- 150 pF disk cap
42)   L6- 3.3 uH SMT inductor
43)   **Q3- 2N7000-** *this part is static-sensitive.*

44)   Y2- 4.00 MHz crystal. Install as per step 28, add case ground connection (see pictorial).

45)   R25- 10K resistor (brn-blk-orange)

46)   Y3- 4.00 MHz crystal. Install as per step 28, add case ground connection (see pictorial).

47)   C12- 15-70 pF trimmer cap-- Note the silkscreen orientation- install this part with the flat side as shown on the pictorial.

48)   Y4- 4.00 MHz crystal. Install as per step 28. **Note:** Do not install a ground lead for this case.

49)   C13- .1 uF monolithic cap
50)   C14- .033 uF poly cap
51)   C15- .01 disk cap
52)   R21- 10K resistor (brn-blk-orange)
53)   R24- 22K resistor (red-red-orange)

54) Q4- 2N3906- Orient the flat side of this device to match that of the pictorial and silkscreen.

55) R20 - 10K resistor (brn-blk-orange)

56) C117- 10 uF electrolytic cap. *This part is polarity- sensitive.* Install the longer wire lead on the '+' side of the component silkscreen. The black band on the component case denotes the negative or ' - ' side.

57) C118- .01 disk cap
58) R22- 51 ohm resistor (grn-brown-blk)
59) R23 - 470 ohm resistor (ylw-violet-brn)

60) U8 socket- Orient with the notched end of the socket matching that of the board silkscreen.

61) C119- 220 uF electrolytic cap. *This part is polarity- sensitive.*

62) C120 - .1 uF monolithic cap
63) C29- .01 disk cap
64) C30- .01 disk cap
65) U9- 78L06 IC (3 leads) Orient the flat side of this device to match that of the pictorial and silkscreen.

66) C122 - .01 disk cap

67) D5- 1N4148. *This part is polarity- sensitive.* see the sketch on page 7.

68) D6- 1N4148. *This part is polarity- sensitive.*
69) R6- 510K resistor (grn-brn-yellow)
70) C16- 150 pF disk cap
71) R2- 51 ohm resistor (grn-brn-blk)
72) R4- 10K resistor (brn-blk-orange)
73) R3- 10K resistor (brn-blk-orange)
74) C104- 150 pF disk cap
75) R5- 510K resistor (grn-brn-yellow)

76) U3 socket- Orient with the notched end of the socket matching that of the board silkscreen.

77) R13- 1M resistor (brn-blk-green)
78) C105- 47 uF electrolytic cap. *This part is polarity- sensitive.*
79) C106- .1 uF monolithic cap
80) R7- 10 ohm resistor (brn-black-black)
81) R12- 1M resistor (brn-blk-green)
82) C19- 820 pF poly cap
83) C20- .0022 uF poly cap
84) C18- .033 uF poly cap
85) **Q2- 2N7000** This part is static-sensitive

86) R11- 510K resistor (grn-brn-yellow)
87) R10- 22K resistor (red-red-orange)

88) Q1- 2N5485/6 Orient the flat side of this device to match that of the pictorial and silkscreen.

89) R8- 1M resistor. (brn-blk-green)
90) R9- 4.7M resistor (ylw-violet-green)
91) D1-D4. *These parts are polarity- sensitive.*
92) C21- 47 uF electrolytic cap. *This part is polarity- sensitive.*
93) R14- 10 ohm resistor (brn-black-black)
94) R26- 100 ohm resistor (brn-black-brown)
95) D8- 1N4148 *This part is polarity- sensitive.*
96) D9- 1N4751A *This part is polarity- sensitive.*

97) L7- Using the supplied **12"** (30 cm) length of the thicker (#24) magnet wire, wind **14** turns on an **FT37-61** (grey) toroid. Prepare leads as described earlier and install.

98) C34- 1200 pF monolithic cap
99) C35- 560 pF monolithic cap

100) L10- Cut a **16"** (40 cm) length of the thinner (#26)magnet wire. Wind **25** turns on an **T37-2** (**red**) toroid.. Prepare leads as described earlier and install.

101) C33- 2200 pF monolithic cap
102) C32- 1500 pF monolithic cap

103) L9- Cut a **16"** (40 cm) length of the thinner (#26)magnet wire. Wind **25** turns on an **T37-2** (**red**) toroid.. Prepare leads as described earlier and install.

104) C31- .1 uF monolithic cap

105) L8- Cut a **12"** (30 cm) length of the remaining magnet wire. Wind **18** turns on the **T37-2** (**red**) toroid.. Prepare leads as described earlier and install.

106) C121- .01 disk cap

107) Install Q5 in an upright position. **Make sure that the integral metal tab on this device faces toward the rear of the board** (i.e., towards the connectors).

Using the supplied machine screw and nut, affix the heat sink (finned, black-metal) to the metal tab on the transistor. Select the heat-sink orientation which results in the lower vertical height above the board. Ensure that

the heat sink is lined up vertically and tighten the hardware.

'Thermal compound' is not needed.

108)   C1- 120 pF disk cap

109)   J3- BNC connector. Seat firmly, solder all pins.

110)   J4- 3.5 mm stereo connector

111)   Install the four DIP (Dual-in-Line package) ICs at the locations shown on the pictorial. The components are polarity-sensitive- make sure the 'dot' or 'notch' on each IC is oriented to match the notched end of each socket. [As supplied, the IC leads are usually spread too far apart to allow easy insertion into the sockets. Simply press each row of IC leads gently down on a tabletop to reduce the spacing between the two rows of leads.]

Daughterboard/ Front Panel Assembly:

[The daughterboard is the 1"x3.5" PC board which the front panel controls mount on.]

- *Do <u>not</u> install the LED until instructed to.*

1)   Remove- and set aside- any nuts and lock washers from the front panel controls.

2)   Using a pair of diagonal cutters, snip 5/16" (7mm) off the plastic shaft of the 5K gain pot. Install the pot firmly on the board and solder.

3)   Install R1-R3 (1.5K ohm) and C1,C2 (.01 uF)

4)   **Flex cable W1:**

The 10-pin flex cable is installed from the rear (solder) side of the daughterboard. **The pins must protrude through the front of the daughter-board and are soldered on the front side only**. *Solder only one or two pins and ensure that the cable exits at right angles to the daughterboard before proceeding to solder the rest of the pins.*

5)   Install the subminiature pushbutton switch at S1. **Do not solder this part in place yet.**

6)   Install the subminiature toggle switch at S2. *This part may be installed without regard to 'up/down'*

orientation- either way's fine. **Do not solder this part in place yet.**

7)   Install the rotary shaft encoder at S3. Ensure that this part is firmly and evenly seated on the board. **Do not solder this part in place yet**.

8)   Install the front panel over the controls and secure the keyer and RIT switch hardware. *Note: if a large flat-washer is supplied with the RIT switch, discard it.*

9)   *Solder all remaining connections (Keyer switch, RIT switch and shaft encoder)*

10)   Install lock washers and nuts for the Keyer switch and RIT switch. *A small vise-grip pliers is recommended- take care to avoid scratching the front panel surface.*

11)   Install and secure the lockwasher and nut for the shaft encoder**. *Hand-tighten only*.**

12)   Install the LED. Make sure the longer LED lead goes in the right-hand hole (viewed from the front). This places the 'flat' side of the LED plastic housing on the left - toward the RIT switch. Press-fit the LED until it seats completely on the front panel- it will be quite snug. Solder in place.

13)   Install and secure the small knob on the gain control pot shaft. *It's a matter of personal taste, of course, but I orient the knob so it covers a '7 o'clock' to '5 o'clock' rotation range. There's some 'slop' in the knob-to-shaft fit due to the difference in diameters- the shaft is 6mm (0.236") while the knob-hole is ~ .250". A 1/4" x 5/8" (6mm x 15mm) strip of paper inserted into the knob-hole prior to installation improves the fit considerably.*

14)   Install and secure the larger knob on the shaft encoder shaft.

Alignment:

1) Plug the flex cable into J5, plug in headphones and 50-ohm nominal antenna, and apply power. The receiver should be alive at this point. Advance the gain control to maximum. Rotate the (dangling) front panel assembly upward and using a slot screwdriver, adjust transformer **T1** for maximum received signal.

2) C12 Adjustment

Description: The IF offset between Transmit and Receive is fixed in the DSW-II's firmware. Because the BFO frequency can vary from unit to unit (crystal and other component tolerances), this adjustment provides a way to adjust the BFO. This ensures that you're answering other stations on a frequency matching theirs. This procedure needs to be performed only once.

- Remove power and plug in keyer paddles or straight key.

- Depress and hold the keyer control switch and reapply power while doing so. (Once power has been applied you may release the switch.) The DSW-II will yield a steady beat note in the headphones.

- Grounding either of the keyer inputs will yield an 800 Hz sidetone.

- Release the keyer input and adjust C12 until the beat note pitch matches that of the sidetone. You may tap the keyer / straight key inputs as needed to repeat until the tones match.

- **Remove DC power.** This causes the DSW-II to exit the calibration mode.

Alternate C12 adjustment procedure:

Powering up the DSW-II with the keyer control switch depressed yields a loud audio tone. This tone may be adjusted to 800 Hz using Spectragram or DigiPan software and your computer sound card. [DigiPan: select Configure... Band... and click on "Tone".]

Spectrogram: www.visualizationsoftware.com
DigiPan: see http://psk31.com *, software links*

Final Assembly:

1. Slide the two enclosure halves apart.

2. Slide a plastic bezel (grey) over the flex cable. The deeper recess is oriented forward so that the front panel is surrounded by the bezel. Using a small Phillips screwdriver, secure the front panel firmly to the enclosure base using 2 of the supplied black-anodized self-tapping screws. *Line up the holes in the bezel with those in the front panel before fastening*.

3. Slide the circuit board assembly into the grooved guides in the aluminum enclosure base. Plug the flex cable into J5 and seat firmly.

4. Remove - and set aside- fastening hardware for all rear-panel connectors.

5. Slide the enclosure top cover into the grooves on the enclosure base- slide fully forward

6. Put the remaining grey plastic bezel in place (*screw holes oriented down*)- do not fasten.

7. Install the rear panel over the connectors and seat. This may be a snug fit - you can use the BNC connector barrel as a 'handle' while you perform this step.

8. Secure the rear panel & bezel firmly to the enclosure using the remaining 2 black-anodized screws.

9. Install and secure the rear panel hardware- knurled nuts for the 'AF out' and 'Key' jacks and lockwasher and hex nut for the BNC connector.

/ A small vise-grips pliers is suggested for tightening this hardware. Take care to avoid scratching the anodized finish.

Do you do a lot of kitbuilding or homebrewing? There's a specialty tool for installing the knurled nuts for the 1/8" (3.5mm) jacks. It's supplied by Mouser Electronics [tel. 800-346-6873] or www.mouser.com ; it's their part number 382-0006

Operating the DSW-II-80

DSW-II functional changes are in this color

Tuning Control

The DSW-II powers up in the Coarse tuning mode. Each step of the rotary shaft encoder yields a 200 Hz frequency step. The shaft encoder has 24 steps/revolution for a tuning rate of 4.8 KHz/turn.

Note: The front panel LED flashes briefly with each tuning step. This is because the LED drive signal is functionally shared with the DDS data signal. This was necessary because the microcontroller pinout was already fully used before this new function was added.

Fine tuning selection:

Pushing and holding the **RIT/Freq** toggle switch **down** causes the tuning control to change to 50 Hz/step. This is annunciated with a two-tone 'bee-boop'. Repeating this operation causes the tuning control to revert to the coarser 200 Hz/step rate; this is is annunciated with a two-tone 'boo-beep'.

Initialization:

The DSW-II-80 operating frequency is set to 3560.0 KHz upon power-up. If the RIT switch is held in the 'up' position during power-up, the operating frequency is instead set to 3700.0 KHz.

Band Coverage:

The DSW-II is continuously tuned, there are no limit stops on either Transmit or Receive. Some falloff in receive sensitivity will be seen as the DSW-II is tuned more than several hundred KHz from the frequency at which you've peaked the receiver (T1 adjustment). Transmitter response is essentially flat across the 80M CW band.

Receiver Incremental Tune (RIT)

Pressing the RIT/Freq switch upward turns on RIT, and the front-panel LED illuminates. Pressing the switch upward again turns off RIT and extinguishes the LED. When RIT is ON, the tuning control affects frequency in 50 Hz steps. The transmit frequency does not change when RIT is ON, and frequency readout remains frozen as well. Turning RIT off restores the receive frequency to the value it had before RIT was turned on. Note- the RIT is volatile; when RIT is re-engaged, it starts over with no offset. The RIT excursion is unlimited.

Frequency Readout

The DSW-II annunciates operating frequency in 3-digit KHz (Morse audio) form when the RIT/Freq is momentarily pressed down. If the first digit is a '0', it will be suppressed, forming a 2-digit readout instead. The frequency readout is output at a rate which matches the keyer speed setting. The default (power-up) speed is 20 WPM.

Sidetone:

The DSW-II uses a fixed 800 Hz audio sidetone.

Iambic Keyer Control

Depressing and releasing the keyer control switch yields an audio Morse sequence of character, each separated by approximately 1.5 seconds. The keyer control sequence is:

"S R T SK"

Keyer control functions are described as follows:

"S" (Speed):

Closing the 'Dot' keyer paddle input increases keyer speed; closing the Dash paddle input decreases it. Once no inputs have been received within 1.5 seconds, the DSW-II sends a "bee-boop" sequence and returns to normal operation. If no paddle closures are detected within the original 1.5 second interval, the keyer control sequence proceeds to the next step. The transmitter is not activated when speed is being adjusted. The 'Dot' and 'Dash' conventions are affected by the 'reverse' function (next paragraph).

The default (power-up) keyer speed is 20 WPM.
- Minimum keyer speed is 5 WPM
- Maximum keyer speed is 50 WPM

When the min. and max. speeds are reached; this is annunciated by a 'boop' (slow limit) or 'beep' (fast limit).

"R" (Reverse)

If either of the paddles is tapped within 1.5 seconds of the Morse 'R', the dot and dash paddle functions are transposed. If this closure occurs, the DSW-II sends a 'bee-boop' and returns to normal operation. Repeating this operation on a subsequent keyer control sequence causes the Reverse function to toggle (change to the opposite state).

"T" (Tune)

If either of the paddles is tapped within 1.5 seconds of the Morse 'T', the transmitter and sidetone are activated. The transmitter output is a steady full-power carrier, useful for adjusting an antenna tuner or making power measurements. Tapping either of the paddles again causes the DSW-II to exit 'Tune' mode, issue a 'bee-boop' tone sequence and return to normal operation. Note that if the paddle input is held closed, 'Tune' mode aborts after approximately 0.3 seconds.

"SK" (Straight Key)

If either of the paddles is tapped (or their respective input lines grounded) within 1.5 seconds , the DSW-II uses either input as the keying source. This allows the use of a straight key, external keyer or other keying source such as a computer. To revert to the internal keyer after Straight Key mode has been selected, repeat the Keyer control sequence via the front panel switch and respond to the 'SK' prompt- this mode toggles and off.

TX Power Output

Transmitter Power Output is adjustable. The 'Drive' pot on the rear panel may be adjusted to furnish between approximately 0.1W and 5W of RF output. *I know- it's backwards!*

Addendum:

Missing Parts :   dave@smallwonderlabs.com

Please- tell me what the part is, and include your mailing address the <u>first</u> time. A reference designator (e.g., 'C29') is less helpful than a description- I have to look it up, increasing the chances of an error here!

Instruction errors: *Please bring them to my attention at the above e-mail address. In the event of a conflict, the schematic has the highest precedence, followed by the pictorial, then the parts list.*

Comments and suggestions: ditto- always welcome. That's how products improve!

Troubleshooting: This information is included in the Supplement document, see the front page of this Instructions document for the Supplement URL. Factory troubleshooting is available- contact me for instructions.

Revisions:

02/01/04 (Initial release) created from 9/25/03 version of DSW-II-20 instructions. Schematic, P/L, pictorial and assembly text revised extensively.