Building and Operating: Simple Keyer kit
from Jackson Harbor Press

Introduction:

The Simple Keyer kit provides an easy to use way to send Morse code. Press the Dah switch and dahs will be sent. Press the dit switch and dits will be sent. Press both switches at the same time and dahs will be sent. Code speed can be adjusted using the speed pot. There is no sidetone, memories, menus or any other complicating items. The keyer is an elegant 2 chip (4000 series CMOS logic) design by N1HFX and is used by permission. The design has been modified slightly to lower the standby power consumption.

General notes on building the Simple Keyer kit

Q1 (2n7000) is an n-channel MOSFET transistor The two ICs are 4000 series CMOS parts. This means that these parts should be handled as little as possible to prevent static damage. The builder should use a grounding strap and anti-static mat if available or at the very least, work on a grounded metal surface and be sure to touch ground prior to touching this part.

One decision the builder should make before starting construction of the Simple Keyer kit is how the project will be mounted in the case. The Simple Keyer kit was designed with a candy tin in mind as the case but any case could be used with suitable modification during the build of the kit. A drilling template for a candy tin is included with the circuit board. I use a 1/4 inch hand paper punch and the "armstrong" method to punch the holes along the side of the tin for the input and output jacks along with the holes needed for the speed pot . I use an awl to punch the hole in the bottom of the tin for the mounting hole.

The pads and traces are small and delicate - a small tipped, low power (25 watts or less) soldering iron should be used.

Building the Simple Keyer

Step 1) Get the parts together: All of the components have been supplied but you will still have to provide your own wire and solder and a 9V battery to fully implement the kit.

Step 2) Identify and orient the components: Most of the components should be fairly easy to identify and place - see the parts list and the parts placement diagram for descriptions. One important thing is the orientation of the five diodes, the end with the stripe is the cathode, note that D1 and D4 should have their leads formed as shown in the diagram, with the cathode on top.

step 3) Form the leads, place and solder the components on the main circuit board: Use the parts placement diagram for information on the placement and orientation of the parts. Clip the leads of the parts after soldering.

a) D5, the BAT42 diode, can be soldered either on the top or bottom of the board, I put mine on the bottom of the board. Be sure to put the banded end (cathode) towards the center of the board. Solder the leads and clip them close.

b) 14 pin DIP socket for IC1- place it at the bottom corner of the board with the notch pointing towrds the center of the board and solder in place.

c) 14 pin DIP socket for IC2- place it at the top right of the board with the notch pointing towards the left of the board and solder in place.

d) C4, .01 uF blue multi-layer ceramic capacitor marked 103, use the .01 uF cap with the white insulation tube on one lead. Remove the insulation and place C4 as shown on the parts placement diagram, at the upper left corner of the board, solder in place but only trim the left most lead (as viewed from the bottom), leave the right lead long and put the insulation tube over it. Bend the lead over as shown on the bottom view diagram and solder in the next step.

e) the output 3.5 mm connector - place it to the left of the IC2 14 pin socket. Solder all 5 connections of the jack in place and be sure to solder the long lead from C4 to the upper right most (as viewed from the bottom of the board with the connector at the top) contact of the jack.

f) the paddle 3.5 mm connector - place it at the lower left of the board. Solder all 5 connections of the jack in place.

g) R5, 820 k ohm resistors (gray, red, yellow, gold). Place R5 as shown on the parts placement diagram, to the right of C4 on the top left edge of the circuit board, solder in place.

h) D4, BAT42 diode. Form D4 as shown on the diagram with the banded end (cathode) to the top. Place D4 as shown on the parts placement diagram, at the top center of the circuit board with the banded end (cathode) to the left side of the circuit board and solder in place.

I) D2, BAT42 diode. Place D2 as shown on the parts placement diagram, at the top right of the circuit board with the banded end (cathode) to the left side of the circuit board and solder in place.

j) Q1, 2n7000 transistor. Place Q1 as shown on the parts placement diagram to the right of the output jack with the flat side facing towards the center of the board and solder in place.

k) D3, BAT42 diode. Place D3 as shown on the parts placement diagram, just to the right of Q1 with the banded end (cathode) to the top edge of the circuit board and solder in place.

l) R4, 27 k ohm resistors (red, violet, orange, gold). Place R4 as shown on the parts placement diagram, between the two jacks on the left side of the circuit board, solder in place.

m) C3, .01 uF blue multi-layer ceramic capacitor marked 103, Place C3 as shown on the parts placement diagram, to the right of R4, solder in place .

n) D1, BAT42 diode. Form the leads of D1 as shown on the diagram with the banded end (cathode) to the top. Place D1 as shown on the parts placement diagram, between the paddle jack and IC1 socket with the banded end (cathode) towards the top edge of the circuit board and solder in place.

o) R3, 27 k ohm resistors (red, violet, orange, gold). Place R3 as shown on the parts placement diagram, at the bottom left of the circuit board, solder in place.

p) C2, .01 uF blue multi-layer ceramic capacitor marked 103, Place C2 as shown on the parts placement diagram, to the right of R3, solder in place .

q) C6, .1 uF yellow multi-layer ceramic capacitor marked 104, Place C6 as shown on the parts placement diagram, below the IC2 socket on the right center of the board, solder in place .

r) R6, 22 megohm resistor (red, red, blue, gold). Form the leads of R6 similarly to D1/D4. Place R6 as shown on the parts placement diagram, to the bottom left of C6, solder in place.

s)) C1, .22 uF dark red polyester capacitor marked 224, Place C1 as shown on the parts placement diagram, to the right of IC1 socket., solder in place .

t)) C5, .047 uF dark red polyester capacitor marked 473, Place C3 as shown on the parts placement diagram, to the right of C1, solder in place.

u) R1, 100 k ohm resistor (brown, black, yellow, gold). Form the leads of R1 similarly to D1/D4. Place R1 as shown on the parts placement diagram, at the bottom right corner of the board, solder in place.

v) Solder the 9V battery snap (or other power input connector to the ground and + holes on the right center edge of the board. Solder the black lead to GND, solder the red lead to +.

w) R2, external (off board) 1 megohm linear taper pot. Solder wires as shown on the parts placement diagram to the two pads on the bottom edge of the board

Step 4) Check the board: Before proceeding, take the time to check the top (mostly) and the bottom of the board for solder bridges. Use the parts placement and bottom view diagrams as a guide to visually check for these shorts. It may help to clean the flux from the board and then use a strong light in conjunction with a magnifying glass to see these problems. Also, double check the orientation of the critical components such as the diodes and transistor. After you are convinced that the board is OK, form the leads of U1 (the CD4001 14 pin DIP IC) and insert it into the 14 pin socket at the bottom of the board with the pin 1 end (notched) oriented towards the middle of the board. Form the leads of U2 (the CD4013 14 pin DIP IC) and insert it into the 14 pin socket at the top right of the board with the pin 1 end (notched) oriented towards the left of the board. Connect the board to a 9V battery using a VOM to measure the current used, current should spike up to 1 mA (or less) at first and then settle back to virtually nothing. If the current is too high, recheck the board for shorts and polarity problems.

Step 5) putting the board into the candy tin. First, disconnect the battery.

a) put the 4-40 bolt through the hole on the bottom of the tin and secure it LOOSELY with a 4-40 nut

b) put a 6 mm knurled nut of both of the jacks, tighten them snugly.

c) put a 7 mm nut about half way down on the shaft of the 1 meg speed pot (R2)

d) put the board into the candy tin, putting the two jacks through the matching holes on the left side of the tin, make sure the hole on the right edge of the board fits over the 4-40 bolt and nut , loosen as needed.

e) secure the jacks with the other two 6 mm knurled nuts.

f) use a screwdriver to tighten the 4-40 bolt while starting the other 4-40 nut on the top side of the board. Tighten firmly.

g) put the pot through the matching hole on the front of the tin. Put the washer over the shaft and secure the pot with the other 7 mm hex nut. Tighten firmly and then attach the D knob.

h) put the four self adhesive rubber feet (Bumpons) on the bottom of the tin.

i) reconnect the battery.

Operation:

Connect a keyer paddle to the paddle jack, a 3.5 mm stereo plug is required, the tip is the dit, the ring is the dah. Connect a code practice oscillator or a solid state rig to the other 3.5 mm jack.

R2 (speed control pot) should be adjusted for a comfortable speed,. The speed range will vary with the supply voltage, at a nominal 9V (7.8 volt Nimh battery) I got a range of 4 to 33 WPM. At 16V, the range was 4 to 35 WPM. At 5V, the range was 4 to 30 WPM.

Modification ideas:

1) for a higher maximum speed, R1 can be replaced with a smaller value (47 k ohm) or even a small 100k ohm trim pot.

2) for a higher minimum speed (but less range) use a smaller value for the speed pot, 500k or 100k.

3) for a more linear speed range a reverse log taper pot might help, but they are hard to find, an audio taper pot will NOT help.

4) for use with a tube transmitter, connect the output to either the Keyall or Keyer Accessory kit (sold by Jackson Harbor Press)

5) if you need a sidetone, consider connecting the output to the Shaped CPO kit (sold by Jackson Harbor Press)

Please feel free to email with any questions, comments, suggestion or problems with this kit. My email address is:

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Thanks for choosing the Simple Keyer kit and
Best Regards,

Chuck Olson, WB9KZY

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List of parts included with the Simple Keyer kit

Ref	designation	Description
C1	224	.22 uF dark red polyester capacitor, .2" lead space
C2,3,4	103	.01 uF blue multilayer ceramic capacitor, .1" lead space
C5	473	.047 uF dark red polyester capacitor, .2" lead space
C6	104	.1 uF yellow multilayer ceramic capacitor, .1" lead space
D1-5		BAT42 Schottky glass diode
J1,2		stereo 3.5 mm jacks
R1		100 k ohm (brown, black, yellow, gold) resistor
R2		1 meg ohm speed pot
R3,4		27 k ohm (red, violet, orange, gold) resistor
R5		820 k ohm (gray, red, yellow, gold) resistor
R6		22 megohm resistor (red, red, blue, gold)
Q1	2n7000	2n7000 MOSFET transistor, TO-92 package
U1	CD4001	14 pin DIP quad NOR gate IC
U2	CD4013	14 pin DIP dual D flip flop IC
		two 14 pin DIP machine pin IC sockets
		circuit board
		Metal case (an Altoids candy tin is fine)
		4-40 sized mounting hardware (bolt and nuts)
		input power jack (9V battery snap connector OR other power connector)
		knob for R2
		four self adhesive rubber feet (bumpons)

Items you may need to provide to complete the Simple Keyer kit

solder, wire, keyer paddle, cables to paddle and rig