

Building and Operating:
the Bug Descratcher kit
from Jackson Harbor Press

Introduction:

In 1992, WX7G (Dave Cuthbert) described a circuit in the Hints and Kinks section of QST (September 1992, page 87) entitled: A Debouncer for Semiautomatic Speed Keys. The idea of the circuit was to get rid of scratchy leading edge of transmitted dits and dahs caused by contact bounce with a semi-automatic key (aka bug). The circuit employed was basically a retriggerable one-shot (monostable multivibrator) which would extend the dit or dah by about 10 milliseconds after the end of the dit or dah while providing a continuously low (keyed) output without any of the bounces due to the mechanical bug contact. The Bug Descratcher does basically the same thing with a different part lineup (although less weight is added to the code elements) and offers the option of a SSR (Solid State Relay) output for universal keying (pos/neg HV tube keying or LV solid state keying) which protects the bug contacts. The Bug Descratcher can also be used with a straight key.

General notes on building the Bug Descratcher

The integrated circuit (U2) and the optional Solid State Relay (SSR1) are MOS devices. This means that they 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 these parts.

One decision the builder should make before starting construction of the Bug Descratcher kit is how the project will be mounted in the case. Ideally the Bug Descratcher will be mounted in an all metal case to minimize RF pickup - an Altoids tin will work fine. The circuit board can be mounted to the case with 4-40 (1/8 inch) sized hardware.

The Bug Descratcher is intended to operate from a 13.8 Volt source. The appropriate connector and cable should be purchased for the kit. While the components will operate at lower or higher voltages, the timing (weighting) will be best at 13.8 volts.

The components should be inserted a few at a time, soldered in place and then clip the leads. The pads and traces are small and delicate - a small tipped, low power (25 watts or less) soldering iron should be used.

Building the Bug Descratcher

Step 1) Get the parts together: All of the board mounted components have been supplied but you will still have to provide off-board items to fully implement the kit. These items include:

- Output connector to external keyed device
- metal case, an Altoids or other candy tin will work fine
- mounting hardware, 4-40 sized
- external power connector

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. The MOSFET should be inserted as shown with the flat side away from the PIC device (U1).

step 3) Insert 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 after soldering. Here is a suggested sequence for installing the parts:

- a) C2 – small yellow .1 uF capacitor marked 104 - located at the top left corner of the board
- b) 8 pin DIP socket - should be inserted just to the right of C2 with the notch towards the left side of the board, don't leave a one hole gap between the socket and C2

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- c) R2 – 10 k (brown-black-orange-gold) – form the leads of R2 by bending one lead around 180 degrees and then insert R2 just to the below the 8 pin socket
- d) R4 – 1 meg (brown-black-green-gold) – form the leads of R4 by bending one lead around 180 degrees and then insert R4 just to the right of R2
- e) D1 - marked 1n4148 – form the leads of D1 by bending the lead on the non-banded end around 180 degrees (as shown on the parts placement diagram) and then insert D1 to the right of R4 with the banded side to the right of the board
- f) C1 – dark red .01 uF polyester cap marked 103 – insert C2 just above D1
- d) R3 – 1 meg (brown-black-green-gold) – form the leads of R3 by bending one lead 90 degrees and then insert the unbent lead of R3 just above C2. Connect the bent lead of R3 to the unbanded end of D1 as shown on the parts placement diagram.

optional high voltage keying components:

- e) R1 – 2 k (red-black-red-gold) - located just to the right of R3
- f) 6 pin DIP socket insert with the notch facing the top of the board

Step 4) Check the board: Before proceeding, take the time to check the bottom of the board for solder bridges. Use the bottom view diagram 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 diode D1. After you are convinced that the board is OK, form the leads of IC U2 to fit in the socket, insert the IC the socket, being sure to follow the parts placement diagram for proper orientation (pin 1 indicated by a notch or dimple should be towards the left side of the board. If the optional high voltage keying option was purchased, form the leads of the SSR (6 pin DIP) and insert the SSR into the socket with the notch or dimple towards the top edge of the board.

Step 5) Solder connecting wires from the board to the input and output jacks and 13.8 volt supply connector. Note that there aren't any holes for the power connections (+Vin and ground), the wires must be soldered to the circuit board traces on the bottom side of the board. See the parts placement diagram and the hookup diagram for a visual of all these connections. Soldering problems are the main source of most problems with kits.

Operation:

Connect the Bug Descratcher input to the bug (semiautomatic key) or straight key. Connect the output of the Bug Descratcher to the transmitter or code practice oscillator. Powerup the Bug Descratcher and then key the bug, the output of the Bug Descratcher should follow the input except that the contact bouncing or scratchiness should be removed.

Notes:

If the high voltage keying option is installed, use it alone, don't attempt to use both the low voltage and high voltage outputs at the same time. Adding the SSR affects the keying characteristic of the the low voltage output negatively.

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 Bug Descratcher kit and
Best Regards,

Chuck Olson, WB9KZY

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List of parts included with the Bug Descratcher kit

Ref	marking	Description
C1	103	.01 uf polyester .2" lead space capacitor
C2	104	.1 uf multilayer ceramic .1" lead space capacitor
R2	brown-black-orange-gold	10 k ohm 1/4 watt resistor
R3	brown-black-green-gold	1 megohm 1/4 watt resistor
R4	brown-black-green-gold	1 megohm 1/4 watt resistor
U2	40107	8 pin DIP, dual NAND, open drain B series CMOS
D1	1n4148	Si signal diode
		8 pin DIP machined pin socket (for U1) circuit board

optional items for high voltage keying:

R1	red-black-red-gold	2 k ohm 1/4 watt resistor
SSR1		6 pin DIP solid state relay
		6 pin machined pin socket (for SSR1)

Items you'll need to provide to complete the Bug Descratcher kit

optional Metal case (an Altoids tin is fine)
4-40 sized (1/8 inch) mounting hardware
input jack
output jack
13.8 volt power jack, plug, cable
solder, wire