Do it yourself

Demon-Dialer

Construction &
Hardware
reference manual

(rev. B)

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1. Building your Demon-Dialer

1.1   About this kit

Check the bag of parts to see that it contains:

- 2 printed circuit boards (PCBS)
- 1 bag containing 13 pushbutton switches
- 1 bag containing all the other parts, you will find a partlist in appendix C
- A piece of anti-static foam holding 2 IC's, the MC68HC705C8P/DD (the heart of the Demon-Dialer) and the LM386N3, an amplifier chip. The foam also holds two IC-sockets for these chips.

As said before, the bag contains 2 PCBS, one of them is the actual Demon-Dialer, while the other PCB is the keyboard. You should be able to see which is which. A header is supplied to connect both PCBS together.

You're going to use a soldering iron to solder all the parts in. If you have never done so before it is probably a good idea to ask someone that has done it before to keep an eye on you. Do not use soldering irons any heavier than 30 Watts and make sure your soldering iron has a relatively fine tip (i.e. 1mm.). Use solder that has a rosin core and NEVER use plain solder and S-39.

1.2 The keyboard PCB

First you will build the keyboard, you need the male header, the push buttons and the keyboard PCB for that. The male header looks like a strip of 9 gold plated pins which are kept together by a thin black plastic strip. Take the header and stick it in the 9 holes marked JP3, with the black plastic strip on the top side of the board (the top side of the board is the side with the printing on it). Next flip the board over and solder the 9

pins. Make sure that the plastic strip lies firmly against the board (see drawing). Be careful that a component does not move until the solder is hard (takes only a few seconds at most). DO NOT CUT OFF THE REMAINING PART OF THE PINS, YOU WILL NEED THIS TO CONNECT THE KEYBOARD PCB TO THE MAIN PCB.

Now take the buttons, line up the pins and push them into the top side of the board and solder them on the other side. It does not matter which way the keys go in, either way will do. The keyboard PCB is now done.
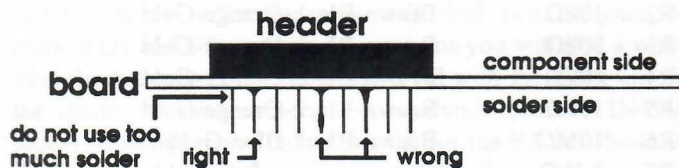
soldering the header

1.3 Resistors

Now it is time to solder the other PCB, the actual Demon-Dialer itself. All parts on the Demon-Dialer can be soldered in any order you choose. Our suggested way will work, but is not the only way. We suggest you now take one of the resistors (see list below) and put it into it's position on the board (on the top side). Make sure each lead of the resistor sticks through a different hole in the board and that the resistor lies flat on the board between the two holes. Now go to the bottom side and bend the leads sharply. Cut the leads with a pair of wire clippers close to the bend in the lead, but not so close that the resistor will fall out (Be careful not to damage the trace). Now solder the wires of the resistor and repeat this procedure until all resistors are done.

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You may wonder what a resistor looks like, or how to find the right resistor, since the values are not printed on them. Resistors (in this kit) are small cylinders with 4 or 5 coloured stripes that have leads coming out on both ends. They're also the most used parts in the Demon-Dialer. Resistors have colour codes to identify them. A list of part numbers (as used on the Demon-Dialer silk-screen), resistor values and the colour-code on the resistor follows:

Res.	Value	Resistor colour coding
R1	10kΩ	Brown-Black-Orange-Gold
R2	10kΩ	Brown-Black-Orange-Gold
R3	10kΩ	Brown-Black-Orange-Gold
R4	10kΩ	Brown-Black-Orange-Gold
R5	10kΩ	Brown-Black-Orange-Gold
R6	10MΩ	Brown-Black-Blue-Gold
R7	3.3kΩ	Orange-Orange-Red-Gold
R8	1kΩ	Brown-Black-Red-Gold
R9	10Ω	Brown-Black-Black-Gold
R10	10kΩ	Brown-Black-Orange-Gold
R11	10kΩ	Brown-Black-Orange-Gold
R12	10kΩ	Brown-Black-Orange-Gold
R13	10kΩ	Brown-Black-Orange-Gold
R14	27kΩ	Red-Purple-Orange-Red - Brown
R15	68kΩ	Blue-Grey-Orange-Gold
R16	56kΩ	Green-Blue-Orange-Gold
R17	8.2kΩ	Grey-Red-Orange-Gold
R18	200kΩ 1%	Red-Black-Black-Orange - Brown
R19	200kΩ 1%	Red-Black-Black-Orange - Brown
R20	200kΩ 1%	Red-Black-Black-Orange - Brown
R21	200kΩ 1%	Red-Black-Black-Orange - Brown
R22	200kΩ 1%	Red-Black-Black-Orange - Brown
R23	200kΩ 1%	Red-Black-Black-Orange - Brown
R24	200kΩ 1%	Red-Black-Black-Orange - Brown
R25	200kΩ 1%	Red-Black-Black-Orange - Brown

R26	100kΩ 1%	Brown-Black-Black-Orange - Brown
R27	100kΩ 1%	Brown-Black-Black-Orange - Brown
R28	100kΩ 1%	Brown-Black-Black-Orange - Brown
R29	100kΩ 1%	Brown-Black-Black-Orange - Brown
R30	100kΩ 1%	Brown-Black-Black-Orange - Brown
R31	100kΩ 1%	Brown-Black-Black-Orange - Brown

1.4 The Diodes

There are two small orange glass things with a black stripe on it in your bag of parts. These are diodes, with very tiny letters one of them says BAT85 while the other (slightly bigger) diode says 1N4148. You can only put the diodes in ONE WAY, On the silkscreen you will find two designations marked D1 and D2, in those designations you will find a white triangle, this triangle should correspond with the black line on the diode. At designation D1 you should put the 1N4148 diode, At designation D2 you should put the BAT85 diode. A diode is a semi-conductor which in practical terms means, that you can destroy the component if you heat it for too long. You can solder a diode in as if it was a resistor, however you should NOT be holding your soldering iron up to the lead of a diode for more than about 3 seconds otherwise it will break.

1.5 Capacitors

There are four different types of capacitors on the board. The first type is a MMK capacitor. They are plastic little boxes with two leads coming out the bottom they have the letters MMK written on them. After soldering you can clip off the excess wire. There are three MMK capacitors on the board.

Cap.	Value	Writing on capacitor
C5	10 nF/100 V	.01K (on the top)
C8	100 nF/63 V	.1K (on the top) or 0.1 (on the side)
		63-A
		WIMA
		BD
C9	100 nF/63 V	.1K (on the top) or 0.1 (on the side)
		63-A
		WIMA
		BD

Next, there are two multilayer capacitors called C6 and C10 which have a value of respectively 47nF and 100 nF. They are the little blue things with two wires that have '473M' for the 47nF and '0u1Z' for the 100nF written on them. You can solder it in as if it was a resistor, bending the leads and clipping them before you solder.

The third type is called a plate capacitor. There are three of them on the board. They are little stone like things, with two leads coming out the bottom here is their description:

Cap.	Value	Colour	Writing on capacitor
C2	330 pF	yellow	n33
C3	33 pF	grey/black or brown/purple	33p or 33
C4	33 pF	grey/black or brown/purple	33p or 33

The fourth type are the elco's (electrolytic capacitors).

Cap.	Value	Colour	Writing on capacitor
C1	10 μF/50 V	Blue	50 V 10 uF
C7	100 μF/6.3V	Black	100μF6.3V

On one side of the elco is a minus sign pointing to the shortest lead. The longer lead should be put in the hole marked "+" on the board. Make sure you put them in right, or you will blow up the elco.

1.6 The Crystal

The crystal is a fairly large metal object that has two wires coming out from one side. It is a 4.1943 MHz Crystal. It's designation is X1. The wires should be bent because the crystal lies flat on the board in this design. The wires should be bent close to the crystal, but not touching the metal housing. Make sure it all fits.

1.7 Chip Sockets

Take the 40 pin chip-socket and place it on the the board. Do the same with the small 8-pin chip-socket in position U2. Do NOT put the chips into the sockets yet.

1.8 Transistors

There are four transistors in the Demon-Dialer. They are black with three wires coming out on one side. Here are their designations and types.

Tr.	Value
Q1	BC557B
Q2	BC557B
Q3	BC547B
Q4	BC547B

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When you put them in, make sure that the round edge of the transistor lies over the 'round' side of the symbol printed on the silk-screen. The middle lead of the transistor should be bent a little bit to make the transistor fit the hole-pattern on the board. Just bend the leads on the back of the board, clip them off and solder. Beware, transistors are also semi-conductors, so take the same precautions as with the diodes.

1.9 The connectors

There are four connectors delivered with your Demon-Dialer of which you already used one on the keyboard PCB, the others are a 9 pin RS232 connector, a 3.5mm mono jack to hook up an external speaker (designation JP1) and a 9 pin female header (designation JP2). It should be obvious which one is which and where to solder them.

1.10 Connecting it all together

Put the chip marked MC68HC705C8P/DD into the 40 pin socket with the notch facing towards C10 (VERY IMPORTANT!!!). When taking the chips out of the static foam, make sure you are GROUNDED, and that no static can get at the contacts. When inserting the chip, hold the board in one hand and the chip in the other, this makes sure that that board and chip are at the same potential. Put the small chip (marked LM386N3) into the 8-pin socket with the notch facing towards C8 (ALSO IMPORTANT!!). Make sure all the pins on the chip really go into the socket.

IF YOU PUT THE CHIPS IN THE WRONG WAY YOU MAY DAMAGE THEM AS YOU APPLY POWER!!!

We did not ship a speaker with this kit, this was done on purpose, because the choice of speaker varies per person, one might like a nice and small speaker while somebody else may want a big and firm speaker.

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When you have found the speaker of your choice (we recommend you use a telephone earpiece) solder two wires to the speaker and solder the other end to a 3.5mm mono jack or directly on to the board (into the holes marked 'SPKR'). Here you have a choice, if you are building your Demon-Dialer into an again for the same reasons not shipped housing, you may want to use the two holes on the board if you are using a built in speaker. If you want to use an external speaker you should connect it to the Demon-Dialer through the jack connector.

NOTE: You can also do a combination of both, however if you then plug in the external speaker, the internal speaker will automatically turn off.

Now connect the Battery holder to the Demon-Dialer, the red wire is the plus and the black wire is the minus. Make sure that you put the wires in the right position. You will find two holes on the board marked + and -.

NOTE: Some of the Demon-Dialers are shipped with a separate battery block and a 9 Volt battery connector to connect the battery holder. However you should NEVER hook up a 9 Volt battery to this connector, YOU WILL BLOW UP YOUR DEMON-DIALER. Who ever invented the system of hooking up a 6 Volt battery holder that way, was either drunk or plain stupid.

Finally take the four bolts and stick them through the four holes on the keyboard PCB, now take the four spacers an put them over the bolts. Take the main PCB and put it underneath the keyboard PCB Connect JP2 and JP3 together and put the nuts on the bolts. Your Demon-Dialer is now ready.

1.11 Testing

Now put the batteries into the holder, be sure to keep the shift key pressed till all the batteries are in. When you have stuck in all four batteries an upgoing sweep will sound indicating that

your Demon-Dialer has power. You can now proceed to the software manual. If your Demon-Dialer did not produce a sweep tone you should read on.

1.12 You fucked up!

It's not working huh? Are you sure that you held the shift key down when you put the batteries in? If it still doesn't work: Check your solder connections. If it looks as if a connection has not 'flowed' nicely around the wire or if the solder is not as shiny as on the other connections, solder that connection again. Make sure that you did not inadvertently connect two traces on the print. Check the polarity on the elco's and the diodes. Check the position of the transistors, are the right transistors in the place, and are they the right way round. Also check that the right parts are in the right places. Here the printed silk-screen layout in Appendix D is particularly handy, since the writing on the silk-screen of the board is now covered with parts. If the transistors and the chips are also in the right way, you have a problem! If you really can't fix it, try calling somebody you know that has done this kind of work before. If you applied power with the chips facing the wrong way, the MC68HC705C8P/DD (the big chip) is almost certainly wasted.

Except for this chip, all parts to the Demon-Dialer can be obtained at your local electronics store.

Appendix A

Hookswitch Control

You can use the hookswitch control bit (AUX) to control an external relay to 'pick up the phone' and you can also pulse-dial through it. To toggle the hookswitch-control bit press ^* ^#. Here is how you do it.
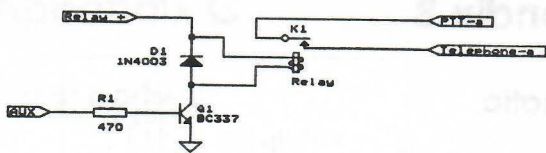
The serial port

The Demon-Dialer is equipped with a serial interface here are the settings for the serial interface: Speed is 16384 bps, format is 1 start bit, 8 data-bits, no parity, 1 stop-bit. The port is at TTL-level. Most computers will talk to it as it is. If your computer requires the real RS-232 levels, you can use this circuit to convert voltages.
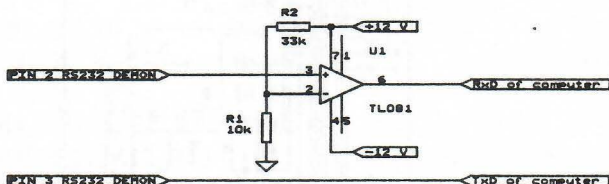
Audio to phone

The audio signal that comes out of the device is 2.0 Volt peak to peak. If you want to do any serious phreaking, you probably want to hook this device up to a phone-line directly. The switch in this schematic is for muting the audio when you are signalling.
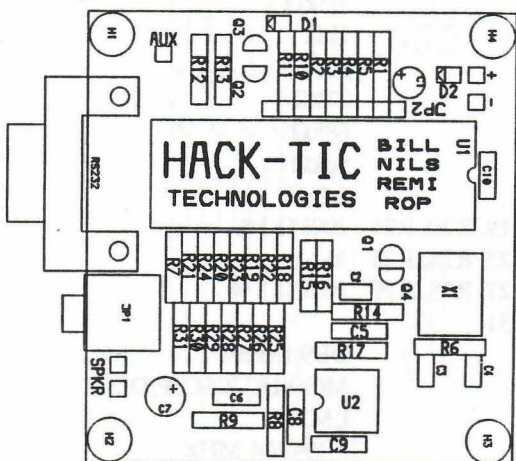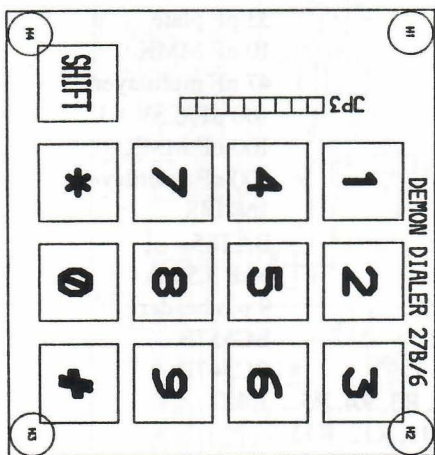
Appendix B

Schematic
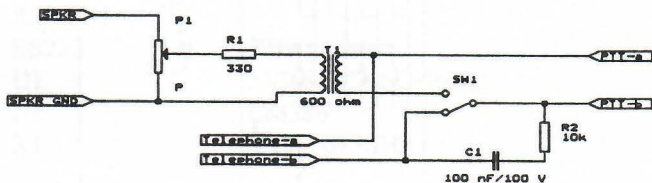
Appendix C

List of parts

C1	10 µF/50V
C2	330 pF plate
C3, C4	33 pF plate
C5	10 nF MMK
C6	47 nF multilayer
C7	100 µF/6.3V
C8, C9	100 nF MMK
C10	100 nF multilayer
D1	1N4148
D2	BAT85
JP1	jack 3.5mm
JP2, JP3	9 pin header
Q1, Q2	BC557B
Q3, Q4	BC547B
R1, R2, R3, R4, R5 R10, R11, R12, R13	10kΩ
R6	10MΩ
R7	3.3kΩ
R8	1kΩ
R9	10Ω
R14	27kΩ
R15	68kΩ
R16	56kΩ
R17	8.2kΩ
R18, R19, R20, R21 R22, R23, R24, R25	200kΩ 1%
R26, R27, R28, R29 R30, R31	100kΩ 1 %
RS232	DB9 female
U1	MC68HC705C8P/DD
U2	LM386
X1	4.194304 MHz

Appendix D

Silk Screen

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Notes :