EECSucka - a ROM dumper for the EEC-IV
Constructor's notes version 1.00 – 27-Feb-99

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Use of the EECSucka involves connection to an EEC-IV engine control unit. The author (Andrew J March) shall not be liable for any consequential damage whatsoever.

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Freeware version
Free plans and software for a hand-wired version are available from
http://www.icenet.com.au/~amarch/eec.htm
Software provided with the freeware version is not compatible with the PCB version.

Commercial enquiries
Questions regarding purchase of PCBs, built up units, customisation, licensing or retailing should be directed to amarch@icenet.com.au.

What is the EECSucka?

The EECSucka allows a PC to read the contents of the ROM inside an EEC-IV engine control unit used in many Ford automobiles and light trucks.

The EEC-IV ROM is a strange beast, not at all like the usual 27C256. Although both types of ROM hold 32K bytes, the similarity stops there. The EEC-IV ROM communicates with its MCU over a proprietary multiplexed bus known as MBUS that squeezes all address, data and control lines onto just 11 pins. The ROM contains an internal 16-bit address counter which saves the MCU the effort of sending sequential addresses during non-branching code execution.

The EECSucka clocks the address counter by strobing an auxiliary test input pin. As the address counter is 16 bits wide it can access up to 64K bytes, although the memory beyond the first 32K bytes contains the blank value of $FF. Clocking past $FFFF causes the counter to rollover to $0000.

The unit plugs into the J3 service port at the rear of the EEC-IV and receives its operating power from the EEC-IV itself. The EEC-IV must be operating from a 12 volt supply. The 12 volts can be supplied to the EEC from the vehicle harness or alternatively through the J3 service port via the J2 of the EECSucka for bench use. ROM dumping in-vehicle must be attempted only when the engine is STOPPED.

Parts list

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J1     DB25 male right-angle PCB mount connector
J2     Flying leads or terminal block, 0.2" pitch, used with R/A J3 only
J3     Edge connector, double-sided, 15 dual pos. 0.1" pitch, 0.2" row spacing
U1     74HC157 integrated circuit
U2     74HC373 integrated circuit
D1     1N4002 1A diode
C1     0.1uf monolithic ceramic capacitor, 0.2" lead spacing
C2     47uF 35V electrolytic capacitor, 0.1" lead spacing
S1     100k x 8 commoned resistors, single in line package
S2     3k3 x 8 SIP commoned resistors, single in line package
R17    1k 1/4W 5% resistor
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Parts sources

J3 connector
Right-angle J3 connectors can be difficult to buy in small quantities. For my PCB prototype I decided to use an upright style made from a cut-off section of an expansion card connector salvaged from an old PC motherboard.

A right-angle type is available from AMP (part # 650118-1). It has 0.15" spacing between rows whereas the PCB is designed to accept 0.2" row spacing. It seems feasible to stretch the row spacing the additional 0.05". Unfortunately I cannot find a distributor that will sell small quantities.

Amtron Australia can make up a suitable right-angle type (part # 225A15213DRD100) from their 225A series parts bin. Their technical staff were unable to supply a drawing to confirm row spacing. Quoted price was Australian $10.95 + 22% tax and minimum order quantity of 25 pieces.

<u>Other parts</u>
In Australia, Altronics in Perth offers a mail order service.
Retail shop: 174 Roe Street, Pert, WA, 6000
Tel: 08 9328 1599, fax 08 9328 3487, outside Perth free call 1-800 999 007.
On the internet: www.altronics.com.au. email: retail@altronics.com.au

In the US, try Digikey at www.digikey.com

In the UK, try Farnell Components at www.farnellcomponents.com.

Assembly instructions

Start off by fitting the wire links. Solder one end only, stretch taut with pliers and solder the other end.

Fit the diode, resistor and SIP resistor networks next, then the capacitors. Note orientation of the SIP networks and C2.

Next solder in J1 and J3 before installing the ICs. Note that an upright style J3 connector can go in either way without affecting operation although you may wish to preserve orientation for pin-numbering reasons.

If an upright style of J3 connector is being used it is suggested not to use IC sockets as there may not be sufficient clearance between the PCB and EEC casing. For the same reason, it is recommended to use flying leads instead of a terminal block for J2.

Install the ICs by soldering diagonally opposite pins first. Check seating and orientation before soldering the remaining pins. Observe normal anti-static precautions when handling the ICs.

After soldering is completed, thoroughly clean the PCB solder side with flux stripper. Inspect your soldering with a magnifying glass under good light to confirm there are no missed joints, dry joints or solder bridges.

If making your own cable to connect the EECSucka to the PC, keep the length down to no more than a metre or so. Crimp a DB25 male and a DB25 female connector at either end of a length of 25-way ribbon cable (buy 26-way then strip off the wire opposite the striped wire). Before crimping the connectors double check orientation to confirm pin 1 of each connector goes to the striped wire of the ribbon cable.

Using the software

The software runs under DOS or in a DOS box under Windows. Copy the executable eecsucka.exe to your working directory.

To use in menu-mode, at the DOS prompt type:

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eecsucka
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To see a help screen with a full list of commands, at the DOS prompt type:

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eecsucka -h
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Troubleshooting

If your EECSucka does not seem to be working properly, check that 5 volts is being returned by the EEC by measuring the voltage across pin 8 (GND) and pin 16 (+5V) of U1. If the measurement is not with +/- 0.5V check that +12V is being supplied to the EEC. Confirm that diode D1 is oriented properly.

If the +5V rail from the EEC is OK, and you are still having problems, try using the software test menu to exercise the EECSucka. For these tests it is recommended that the EECSucka is disconnected from the EEC and powered from a separate +5V power supply.

To confirm U1 is reading the MBUS pins properly select the appropriate test menu option and ground out each of the MBUS pins on J3 one at a time. Hit any key of the PC keyboard to refresh the screen readout as each new pin is grounded.

Check that U2 is providing the correct outputs on PAUSE, RESET, MRESET, ROMDIS and DUMPST by selecting the appropriate test menu option and checking those pins with a voltmeter while tapping a key on the PC keyboard to advance to the next output.

If neither of these tests seem to be functioning check that the connecting cable between the EECSucka and PC is connected properly. If you PC has more than one printer port, make sure that the right port number is selected via the –p command line option.

Acknowledgments

The EECSucka was inspired by members of the EEC mailing list (http://eelink.umich.edu/~p-nowak/eec-efi/EEC-Mailadddrop.html) who have banded together with the common aim of understanding the inner workings of the ECUs in their beloved Ford motor vehicles.

Special mention must go to Tom Cloud (cloud@peaches.ph.utexas.edu) for diligently compiling many individual contributions into the EEC-IV Technical Notes document, and Emmett Stanicki (estanick@iaw.com) for technical advice regarding the J3 port.

Happy dumping!