

9S12C32 board information

For more information on using the board to develop C programs see

http://users.ece.utexas.edu/~valvano/EE345L/Labs/Fall2008/Howtobuild_S12C32.pdf

To see/download many example C programs see

<http://www.ece.utexas.edu/~valvano/metrowerks/>

<http://users.ece.utexas.edu/~valvano/Starterfiles/>

To download data sheets for the 9S12C32 system (files that start with TechArts)

<http://users.ece.utexas.edu/~valvano/Datasheets/>

http://users.ece.utexas.edu/~valvano/Datasheets/MC9S12C128_V1.pdf

Department policies concerning the 9S12C32 kit

Each student will be given kit, which must last for the EE319K, EE345L EE345M sequence

You should test the board within 7 days (see link below or ask your TA how to test it)

If it broken at the time of this initial test,

show it to your TA who will verify that it is indeed broken,

then bring it back to the department for an exchange

If the board stops working after this initial test, you are responsible for purchasing a replacement

Buying another 9S12C32 board

The specific part to buy is ORDER CODE: NC12C32SP-SB \$49.95 plus shipping. To order, click on the University of Texas at Austin link at <http://www.technologicalarts.com/>

How to test the 9S12C32 board.

Check out from the second floor, the orange 9S12C32 board tester.

0) Download and unzip the Tester.zip programs from this website

<http://www.ece.utexas.edu/~valvano/metrowerks/>

1) plug the 9S12C32 docking module into testing protoboard/ZIF socket

2) connect RS232 cable to docking module and a PC COM port

3) place the 9S12C32 in BOOT mode

4) apply power to the docking module

5) hit reset on the docking module

6) run Metrowerks and download this program (Project->Debug)

7) quit Metrowerks and start a terminal program e.g., **HyperTerminal**

set COM port to match the cable, and baud rate 115200 bits/sec

8 bit data, no parity, no hardware flow control

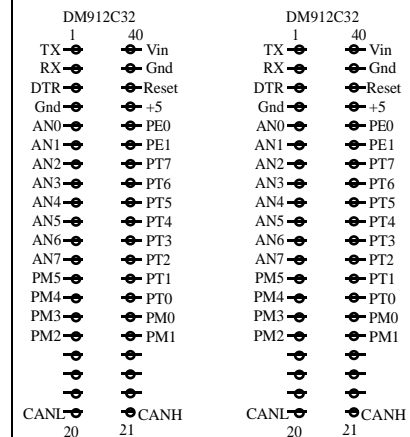
8) place the 9S12C32 in RUN mode

9) hit reset on the docking module

The interrupt vectors of the 9S12C32 that we will use are

0xFFD6	interrupt 20	SCI
0xFFDE	interrupt 16	timer overflow
0xFFE0	interrupt 15	timer channel 7
0xFFE2	interrupt 14	timer channel 6
0xFFE4	interrupt 13	timer channel 5
0xFFE6	interrupt 12	timer channel 4
0xFFE8	interrupt 11	timer channel 3
0xFFEA	interrupt 10	timer channel 2
0xFFEC	interrupt 9	timer channel 1
0xFFEE	interrupt 8	timer channel 0
0xFFFF0	interrupt 7	real time interrupt
0xFFFF6	interrupt 4	SWI software int
0xFFFF8	interrupt 3	trap software int
0xFFFFE	interrupt 0	reset

Cut out one of these and place it between module and protoboard



Required equipment (you will need to buy these)

- 1) You will need a voltmeter (any cheap one will do),
- 2) A wire stripper for 22 or 24 gauge wire
- 3) Soldering iron (ask your TA or the second floor staff for a lesson)

General guidelines

- 1) Test the CPU/docking module combination within 7 days of receiving the kit.
- 2) Make the cutout, shown on the other side of the page, trimming it as close to the writing as possible, and place it between the docking module and the protoboard. The pins of the docking module straddle the gap running down the center of the protoboard. To push the docking module into the protoboard, push straight down.
- 3) Label all your pieces (CPU module, docking module, cable, wall wart, and protoboard) with your name.

Precautions to avoid damaging your system

- 0) Do not attach or remove wires on the protoboard when power is on. Always shut power off when making hardware changes to the system.
- 1) Touch a grounded object before handling CMOS electronics. Try not to touch any exposed wires.
- 2) Do not plug or unplug the docking module into a protoboard while the system is powered.
- 3) Never remove the 9S12C32 CPU module from the docking module. THE PINS ON THE CPU MODULE ARE VERY FRAGILE. On the other hand, the male pins on the docking module have been very robust as long as you limit the twisting forces. To remove the docking module from the protoboard pull straight up (or at least pull up a little at a time on each end.)
- 4) Use and store the system with the docking module plugged into a protoboard (this will reduce the chances of contacting the metal pins tied directly to the 9S12 with either your fingers or stray electrical pulses).
- 5) Do not use the 9S12 with any external power sources, other than the supplied wall-wart, unless you really know what you are doing. In EE345M we will be powering the robot from a battery.
- 6) Avoid connecting signals to the 9S12 that are not within the 0 to +5V range. In particular, voltages less than 0V or greater than +5V will damage the 9S12. In EE345L and EE345M we will always use rail-to-rail analog chips that are powered 0 to +5V; this way no analog voltage can exceed the safe 0 to +5V range.
- 7) On the 9S12C32 board, do not connect any wires to the pins labeled Vin, DTR, TX, or RX. These pins contain voltages outside the safe 0 to +5V range. In EE345L and EE345M we will be connecting Vin to the power pin of the Max6225 voltage reference.
- 8) Lastly, do not connect to the Reset pin, unless you really know what you are doing.

Installing Metrowerks

CodeWarrior Version 3.1 will compile programs we need for EE319K/EE345L/EE345M. For version 3.1 you should use their 12K free educational license. There is an installer for Version 3.1 on the CD accompanying the second edition of the EE345L/EE345M textbook. Follow these steps to install the Special edition of Metrowerks CodeWarrior Version 4.7 (32 KiB free educational license for C code)

- 1) <http://www.freescale.com/>
- 2) click "**CodeWarrior Development Tools**" under Products
- 3) click "**HCS12(X)**" under "CodeWarrior Development Studio for"
- 4) In the "Special edition" column, click "**Get**".
- 5) Click "**Download**" button for "Special Edition Evaluation: CodeWarrior Development for HCS12X Microcontrollers V4.7"
- 6) If you have to, register as a new user (if you have registered before, just log in)
 - email must be correct
 - decide whether or not you want email from Metrowerks
 - Fill in the page with "project details" stating you are a student taking a class, fill in all required fields
- 7) Download CWHCS12X_v4_7_Special.exe (254 MB) and install (the special edition does not require downloading a separate license)
- 8) Download instructions and starter projects from my web site at <http://users.ece.utexas.edu/~valvano/metrowerks/>

If you have comments or suggestions, email me at valvano@mail.utexas.edu
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