Georgia Institute of Technology

George W. Woodruff

School of Mechanical Engineering

ME 4447 / ME 6405

Introduction to Mechatronics

Laboratory Manual
Lab Manual Preparation

This manual is the product of a George W. Woodruff School of Mechanical Engineering Developmental Teaching Assistantship awarded to Lindsay W. Johnson, Spring Quarter, 1996. It has been modified by Akio Kita during his tenure as the Mechatronics Development Teaching Assistant.

Organization of Individual Labs

The introduction, requirement, and reference sections can be found in each of the five labs. The other sections contain additional information appropriate to the given lab.

Introduction  This section gives a brief overview of the lab, including what particular HC11 features will be used in the lab, and the lab’s purpose.
Software  This section describes the HC11 registers associated with the lab, as well as the correct usage of these registers.
Hardware Components  This section describes each of the hardware components used in the lab including electronic components and test equipment.
Definitions  This section gives some definitions common to the field of electronics that will be helpful in completing the lab.
Circuit Construction Tips  This section describes some tips for circuit assembly, debugging, and calibration where necessary.
Software Writing Tips  This section describes some tips for assembly code writing, debugging, and testing.
Analysis Tools  This section gives some equations that may be useful in circuit analysis or in code development.
Requirements  This section contains the information required by the student to successfully complete the lab.
References  This section contains the references used in the writing of the specific lab.

Required Equipment

• One Axiom Manufacturing CME11E9-EVB kit per group. This kit is available at the student bookstore in the textbook area. The kit comes complete with manuals and software.
• One electronic circuit breadboard (protoboard)
• Components used in the final project (components from the required labs may be used for the final project)

Note: All materials required to interface the EVB to the PC, as well as all electronic components used in the required labs, will be supplied in lab.
CME11E9-EVB kit contents
Each kit contains the following:
1. CME11E9-EVB (EValuation Board)
2. Twelve Volt Wall adapter unit.
3. Cdrom containing CME11E9-EVB kit Manual which contains:
   - Manuals for the EVB, Buffalo Monitor Program, MC68HC11E9 microprocessors
   - Software including the as11 Assembler, Small C Compiler, and Axiom IDE

Lab Descriptions
L1a: Interfacing and Communicating with the CME11E9-EVB
L1b: LED Display using Parallel Output
L2: Strain Gauge Data Acquisition using A/D conversion
L3: DC Motor Control using Interrupts and Pulse Width Modulation

Lab Rules
- Labs will not be conducted the first week of classes
- Labs L1a, L1b, L2, and L3 are performed in groups
- Eating or drinking is not allowed in the lab
- School owned equipment (e.g. power supplies) must remain in the lab

Lab Report Requirements
- Professional appearance is required of all lab reports
- The required lab report format consists of the following sections:
  1. Abstract or summary (briefly summarize what was done and some of the major conclusions)
  2. Introduction (describe the purpose of the lab and the required objectives)
  3. Materials and methods (describe the equipment and procedures used)
  4. Results and discussion (present the results and then discuss them - answer the lab questions in this section)
  5. Conclusions (briefly discuss the significance of what was learned from the experiment)
  6. Appendix (include a well documented program listing, and specifications for each of the electronic circuit components used in addition to the HC11)
- Lab demonstrations will be conducted following the prelab lecture on the same day that the lab reports are due
Selected Electronic Supply Retailers

Ack
Tel: (404) 351-6340
Fax: (404) 351-1879
544 Deering Rd. NW
Atlanta, GA 30367
Hours: 8-5 Mon-Fri

Austin Electronics (Surplus)
Tel: (770) 449-8697
Fax: (770) 263-9488
5600 Oakbrook Parkway NW
Norcross, GA 30093
Hours: 9-5 Mon-Fri

Digi-Key (phone order - overnight available)
Tel: (800) 344-4539
Fax: (218) 681-3380
Hours: 8-8 Mon-Fri
http://www.digikey.com

Radio Shack
Tel: (404) 523-4444
Fax: (404) 524-5522
32 Peachtree St. NW
Atlanta, GA 30303
Hours: 10-6 Mon-Sat

Radio Shack
Tel: (770) 434-1479
Fax: (770) 434-4147
Cumberland Mall
Atlanta, GA 30339
Hours: 9-7 Mon-Sun

Radio Shack
Tel: (770) 955-7262
Fax: (770) 955-6810
1307 Powers Ferry Rd. SE
Atlanta, GA 30067
Hours: 10-7 Mon-Sat