The Chrysler Project

Senior Design Fall 1999

Buzz Word Bingo

(fun for the whole family)

B	I	N	G	O

Ben Komada - Recorder

Dave Swanson - Leader

Derek Flint - Facilitator

Makia Minich - Communicator

Rob Allred - Research Coordinator

We are sponsored by Chrysler, and our technical advisor is Dr. Medidi.

Problem Statement

- Chrysler uses controllers throughout their electronic subsystem in their automobiles.
- Hand held devices aid trouble shooting while the car is being designed.
- They need a device that handles the CAN, SCI and J-1850 protocols.
- No device that handles all three protocols exists!!!

Proposal

Design the software for a portable, handheld device that interfaces with the controller area network on Chrysler automobiles.

Chrysler provides the circuit diagram

Our team will be providing:
- the API for this micro-controller
- the software to integrate the different parts of the diagnostic tool
- any input/output software interface between the device and external hardware

High Level Requirements

- Implement J-1850 protocol
- Modular so it can be expanded to use other protocols.
- Identify the tools needed for development,
  (kernel, cross compiler, os, testing software)
- 3” x 5” LCD output
- User input devices
  - hex keypad
  - direction arrows and enter button

Future Requirements

- CAN 2.0, SPI, PCMCIA, SCI protocols
- Device must be flexible enough to be used in any type of vehicle
- API will allow the device's capabilities to be expanded as needs arise

Subsystems monitored

Electric Car

- Base Charging complete yes/no
- Delay timer status
- ETS Sleep yes/no
- Power Level
- Pulse Mode Enabled yes/no
- Vehicle Ready yes/no
- Vent Required yes/no
- Switched AC yes/no
- Switched DC yes/no
- Max Power Level

Risks, Risks, Risks

- High costs for late/defective delivery
- Need a specialized user interface
- Need to create new technology
- Must interface with unproven technology

Risk Mitigation

- High costs for late/defective delivery
  - Work faster
  - Work harder
  - Work smarter
  - Sleep less
  - Toss back more Mountain Dews

Risk Mitigation

- Need a specialized user interface
  - Work with customer to concisely capture requirements
  - Prototype a user interface utilizing the I/O API
  - Provide common internal interface for data passing

Risk Mitigation

- Need to create new technology and interface with unproven hardware
  - Use prototyping method with incremental development
  - Conference calls with Nelson at Chrysler
  - Visits to Chrysler Proving Grounds in Phoenix, AZ

Schedule

- Start - PST 01/17/2000 02:53:12.34
- Kernel running on micro-controller
  - EST 02/17/2000 02:53:12.45
- I/O from keypad to LCD screen
  - MST 03/10/2000 03:04:05.06
- I/O with J-1850 protocol
  - CST 03/29/2000 12:34:56.78
- Input from RS-232 port
  - GMT 04/15/2000 05:23:15.23
- Finish - UDT 05/01/2000 13:13:13.13

- These dates and times are tentative

Cost Analysis

- Purchase of hardware for device
  - LCD screen $19.99
  - Protocol chips ..... buck three-eighty
  - HC12 Micro-controller 3
  - Wires ..... six easy installments of $49.95
- Cross-compiler for HC12 platform
- Implementation of additional protocols $1E6
- Caffeine supply ..... priceless

Design Paradigm

- **Incremental development with prototyping**
  - **Retention of previous code builds help prevent irreversible errors**
  - **Reveals potential design problems early in design phase**
  - **Facilitates scheduling of project milestones**

Users of the Device

The “device” will be code named the “Allan Parson Project.”

The data displayed by the device will be directed toward design engineers

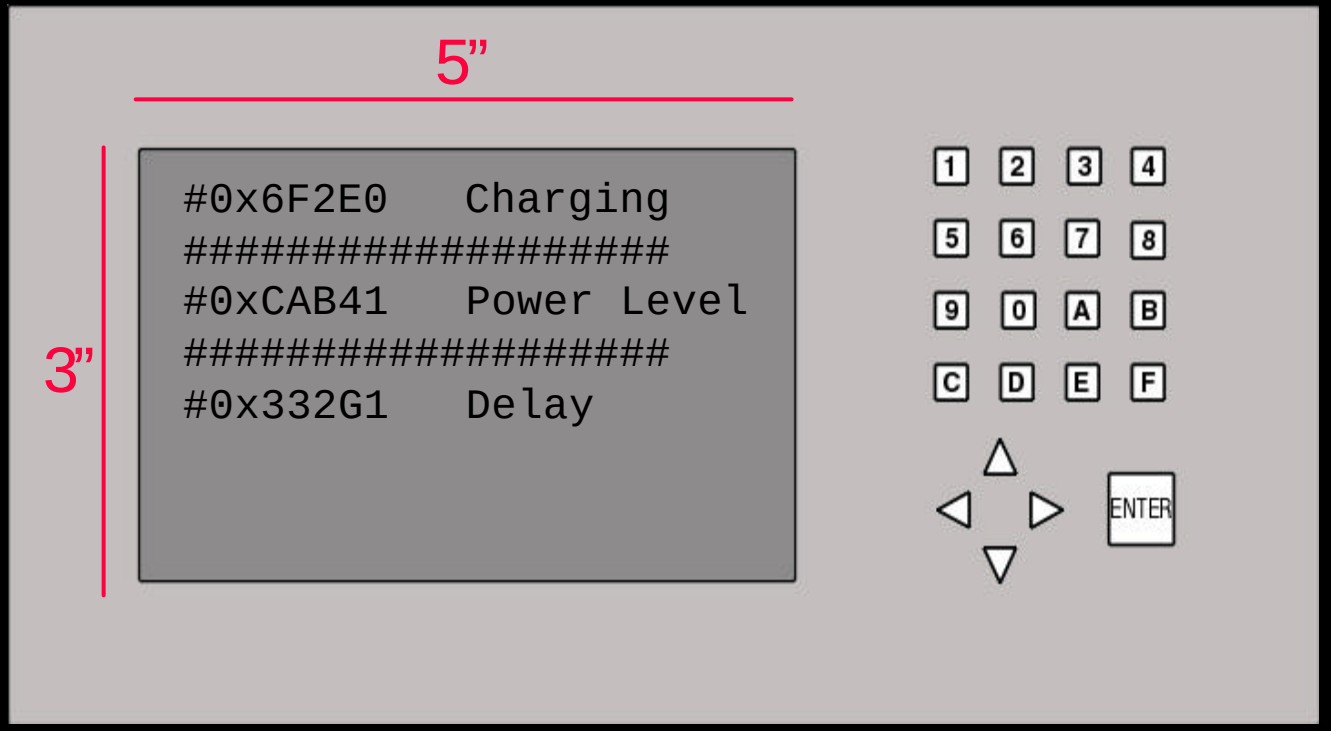
The tool will primarily be used in a factory setting by engineers at Chrysler.

Users have a high level of expertise

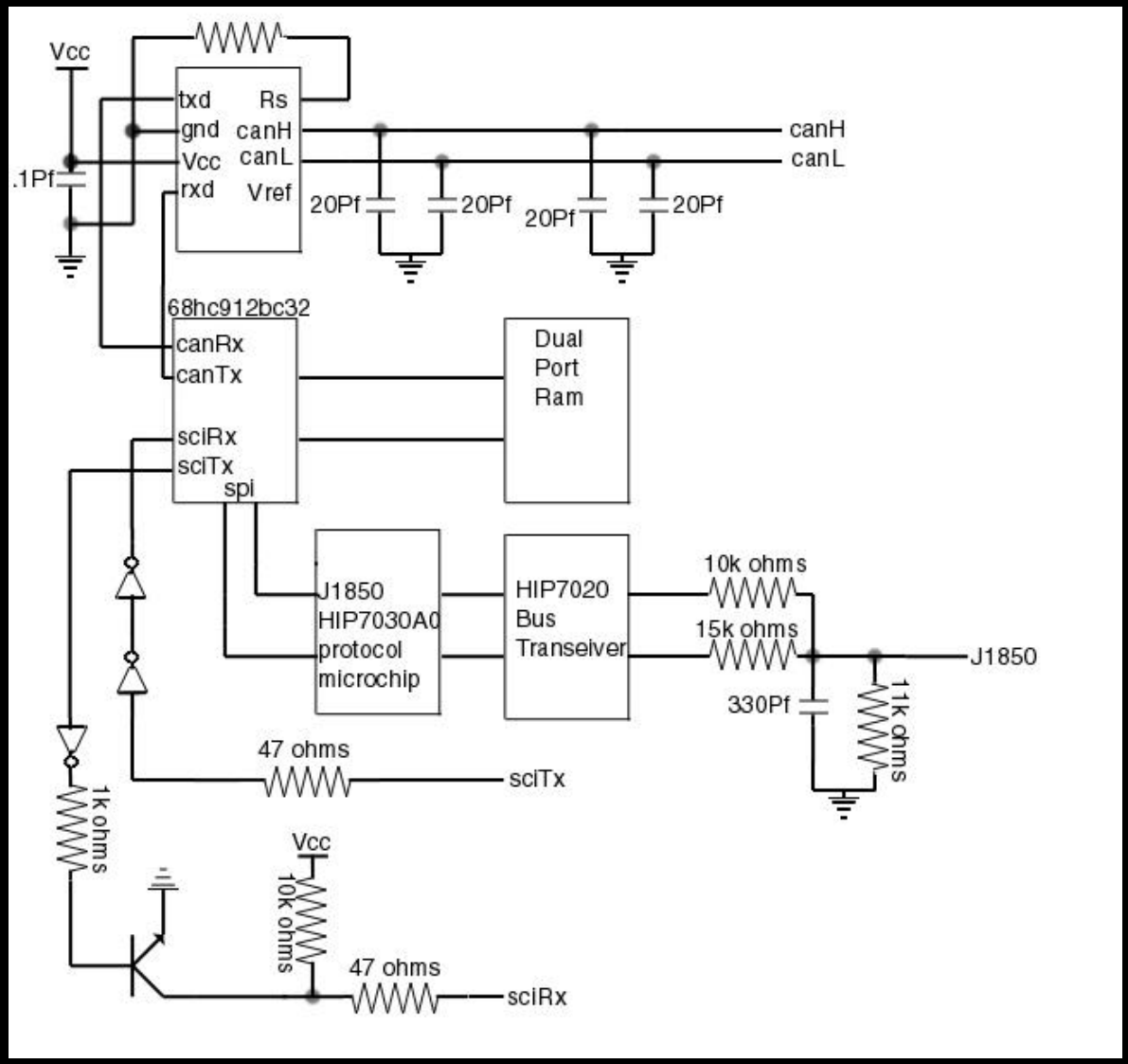
Tools Used In Design

- Kernel from third party vender
- C cross compiler
- Motorola 68hc12 (16 bit) controller
- Harris bus transceivers and protocol microchips
- A Chrysler vehicle ☺ for testing

Device Concept View



Preliminary Circuit Diagram



Conclusion

This device is intended to troubleshoot Chrysler vehicles during development. It will be flexible enough to be expanded for future protocols and data messages.

Auxiliary performance characteristics will be utilized in cross-team dialogue in order to efficiently facilitate a design architecture well-suited to the problem domain, thereby providing a preliminary platform upon which future proprietary development can be undertaken. Bingo!

Questions

???