**Introductory Description:**

Toys. No matter what the age everyone loves a toy. When we are young our toys are simple, blocks, legos, or tinker toys. As we mature the price and complexity of our toys increase. One such toy is a car audio system. With its blinking lights, pulsating bass, and an infinite number of possible combinations of the two it is easy to see how millions of dollars are spent each year on car stereo equipment. The goal of this project is to develop and implement a Graphical User Interface for a car audio system. The scope of this project will extend only to the Panasonic head unit, ignoring for now any peripheral audio components. The target user group for this product would be people with several after-market audio components and the desire to integrate them into a handheld device for easy component control. The user interface will allow users to access information about their audio system and allow them the ability to change the settings of individual components.

**Description:**

This project will include the use of a Palm m505 color handheld and a Panasonic CQ-DF800U car audio CD player with built in AM/FM stereo and auxiliary input. The Palm will support a Graphical User Interface for the Panasonic head unit. The user interface will have all of the regular buttons of the deck face and will display them in an easy to understand fashion. By selection of different buttons on the Palm a signal will be sent by way of a serial cable to a signal decoder. The signal decoder will activate various controls provided to the user on the head unit.
The interfacing will be done through the LCD graphical display on the faceplate and by applying voltages to the correct pushbuttons on the same faceplate. The interfacing to the LCD screen will allow for feedback to the Palm. Signals from the LCD will be sent via serial cable to the Palm handheld to display CD track number, current radio station, current menu option, and selected input source.

**Benefits:**

The major advantage to the car audio interface is expandability. Expandability lends itself to adding multiple components to the control of the user. For example, by adding an interface to a crossover, a mp3 player, and amplifier control, the user would be able to adjust every aspect of their listening needs. Furthermore, if a RF transmitter were added to the universal output of the Palm the interface would become portable allowing the user to change the settings of the various components without being in eyesight of the stock displays.

**Comparison:**

There are no comparable units for this design on the market currently. There is however presidence for such a product. Universal remotes are nothing new to the market. They allow a person to access multiple home theatre components with the use of a single remote and a few include graphical interfaces. Philips makes one such product, the Philips Pronto Pro TSU6000. While the application for the remote differes slightly from the proposed design the design parameters are similar. The Philips Pronto Pro retails for $999 dollars.
Some of these design features include:

♦ Direct access buttons
♦ Color LCD screen
♦ 8 MB of memory for expandability
♦ RF capabilities for multi room control
♦ Customizable buttons
♦ Power management
♦ Touch screen

The specifications listed above are reflective of the standard features of the Philips line of products. This information was provided by a comprehensive examination of universal remotes that include a graphical interface. The car audio interface will aim to incorporate many of these features.

Optional Hardware:

After the completion of all design requirements for the car audio interface an additional piece of hardware may be incorporated into the design. This piece of hardware would be a serial port RF transmitter/reciever to be directly connected to both the Palm device and the interfacing hardware. By allowing the user to leave the serial cable at home a new freedom is granted. This would also bring the car audio interface closer to its goal of being out of eyesight of the stock displays while still having all relevant data required by the user.
**Project Development:**

The successful development of this project will depend upon two things. First, the ability to design and construct a GUI for use on the Palm m505. This will require interaction with the Palm operating system, its functions, and libraries. For this task the Metrowerks Code Warrior for Palm OS programming IDE was chosen for development of the GUI. Code Warrior is a C,C++ based development environment which works well with the Motorola Dragonball VZ processor in the Palm device.

The other obstacle for development is the hardware interface. The LCD display for the Panasonic deck has 75 pins. It would be virtually impossible to determine the proper pins to check for critical criteria. For this reason technical schematics have been obtained showing all pin connections. The service manual the schematics were obtained from was purchased at www.electronicsrepair.com. Panasonic was contacted regarding purchase of the schematics however no reply was ever received.

All programming of the Palm device will take place on a home PC running POSE. POSE is a software program that emulates a Palm device. Nearly all programming can be done on POSE with virtually no interaction with an actual device. Final testing will be done on the Palm m505.

The components for this project includes; Palm m505, Panasonic CQ-DF800U, interface hardware, decoding/encoding hardware, serial cable, and universal connector to BD9 serial adapter.

This design is scheduled to be presented in June 2003. The CD player is designed for use in an automobile, however it will be removed for display purposes and connected to a pair of appropriate speakers, power, and ground. Users will be shown the basic
layout of the user interface and will be allowed to “tinker” with the design. In this way the design can be appropriately proven to demonstrate the design criteria.