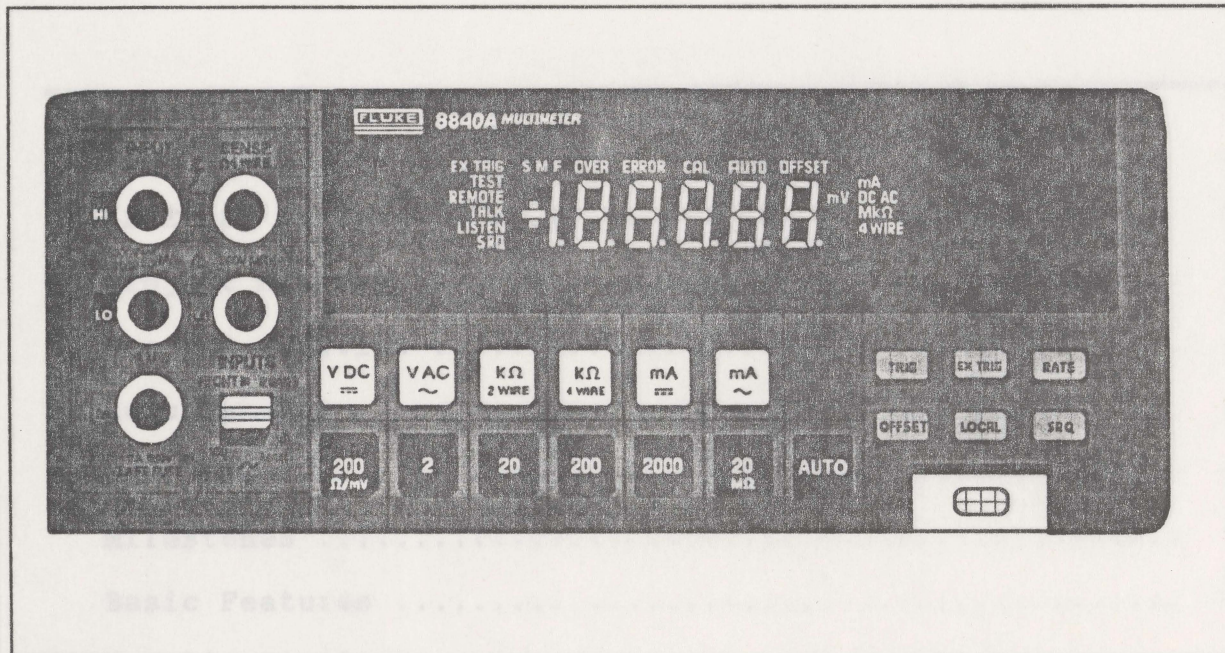


INSTRUCTION MANUAL

INTERFACE PROGRAM USING
FLUKE 8840A MULTIMETER AND
IEEE CEC-488 BUS



FLUKE 8840A MULTIMETER

A COMPUTER SCIENCE SEMINAR PROJECT
INSTALLATION AND SET UP SPRING 1991

Installation o A MELMITZLOU PRODUCTION

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INTRODUCTION

SECTION

HISTORY OF IEEE-488

The communications standard which we know as GPIB was developed at Hewlett-Packard, and was known originally as HPIB (Hewlett-Packard Interface Bus). Many people still associate it with Hewlett-Packard, and Hewlett-Packard is still a major supplier of GPIB-compatible instruments and plotters. As this high speed method of communicating with your instruments become more popular and widespread, the name was gradually changed from HPIB to GPIB (General Purpose Interface Bus). Eventually it was codified by the Institute of Electrical and Electronics Engineers as IEEE Standard 488. Today it is known by both "GPIB" and "IEEE-488", much as another communication standard is known both as "Serial" and "RS-232".

PROJECT HISTORY

From the onset of this project we followed a Seven Step Plan for the development of this application program. These steps were to guide the development groups to a finished product.

SOFTWARE LIFE CYCLE

1. Requirements (Analysis)
2. Preliminary Design
3. Detail Design
4. Implementation
 - Coding
 - Unit Testing
 - Integration
5. System Testing
6. Acceptance Testing
7. Operation Testing

Product Overview

It was decided that this program would be a fully functional menu driven program designed for ease of use. It was designed to use a number of multimeters, instruments and plotter. Only the Multimeter options were implemented for use because of a lack of time. The instruments and plotter options were not implemented but the program was written in such a way that modules designed for these option could be written and added to this program or accessed be this program. When using one of the Multimeters you may take a single reading or multiple readings with three reading rates available, with the data displayed graphically on the screen. You may save the readings to a file on the hard drive in a data subdirectory. The program will also read the setting from the multimeter and update the multimeter display on the screen. Error messages will be displayed to the message line on the screen. These messages are only displayed for a short period of time, so be alert and head all messages. This program was tested using methods that would exceed the bounds of reading and to try to produce errors. Hopefully the testing worked most of the bugs out of the program. If not please note these in the back of this manual for the information of other users.

At the end of the sixth week have preliminary design finished

At Nine and one-half weeks have detailed design finished

At Twelveth week have most of coding finished

At Fifteen weeks be ready for Operational Testing

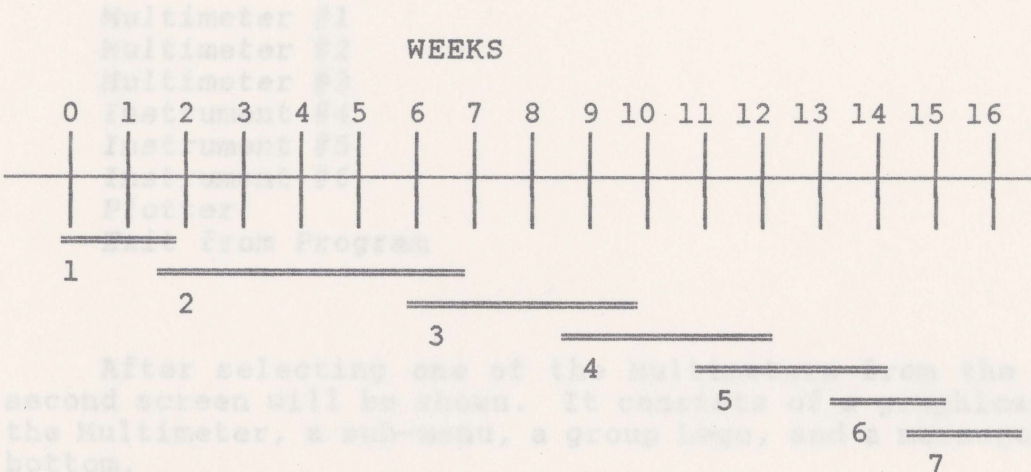
REQUIREMENTS

IBM Compatible AT Computer with 1 MB of RAM
 20MB Hard Drive with:
 Turbo Pascal 4.0
 Lotus 123
 CGA Graphics Card with Monitor
 IEEE-488 BUS installed in Computer
 FLUKE 8840A Multimeter with Manuals
 Connecting Cables

Display

When starting this program a main menu will be shown. From it the options will be:

TIME LINE



After selecting one of the options on the main menu a second screen will be shown. It contains a list of the Multimeter, a sub-menu, a group menu, and a line at the bottom.

- 1 Pick Project
- 2 Preliminary Design
- 3 Detailed Design
- 4 Coding and Debugging
- 5 Integration and Unit Testing
- 6 System and Acceptance Testing
- 7 Operational Testing

The sub-menu will have options that are available:

Milestones

- At the end of the sixth week have preliminary design finished
- At Nine and one-half weeks have detailed design finished
- At Twelveth week have most of coding finished
- At Fifteen weeks be ready for Operational Testing

Basic Features

Initialize the Multimeter

Clear device

Self-test of device

Ability to select one of three Multimeters

Select option of Function and Range from a menu

Take single readings

Take multiple readings with three timed rates

Save data readings to a file

Display

When starting this program a main menu will be shown. From it the options will be:

Multimeter #1

Multimeter #2

Multimeter #3

Instrument #4

Instrument #5

Instrument #6

Plotter

Exit from Program

After selecting one of the Multimeters from the main menu a second screen will be shown. It consists of a graphical display of the Multimeter, a sub-menu, a group Logo, and a message line at the bottom.

The graphical display of the multimeter will be updated with information received about function selection, range selection, single readings, continuous reading with the reading rates, data received from readings, saving the data to a file, and other selections that are available.

The sub-menu will have options that are available:

Initialize

Set Options

Single Trigger

Continuous Trigger

Device Clear

Self Test

Listing of Saved Files

QUIT

The Group Logo section has information on Group One and our Group name, MELMITZLOU PRODUCTION.

The last of the sections on the second screen is the Message Line. It will give help messages when an option is highlighted, and will also give errors messages and their possible solutions. Pay close attention to these messages because this information is suppose to be helpful.

GETTING

The first step in the installation process is to download the IREX-200 Bus in the computer. Refer to the manual for the procedures used.

MULTIMETER ADDRESSES

The three multimeter options that can be used all have a specific address hard coded into the program. The addresses that were used are 1, 15, and 16. To view the address of each multimeter, press the 1000 button on the multimeter while it is turned on. This will show the address of the multimeter on the screen of the multimeter. To change the address look to the PLUX 8840A multimeter manual to change the settings of the 1000 switch on the back of the multimeter.

STARTED

INSTALL PROGRAM TO HARD DRIVE

The first step in installing this program is, on the C: directory, make two sub-directories: IREX and DATA. Then copy the contents of the installation disk to C:\IREX. The C:\DATA sub-directory will store all the data that is saved from taking readings. The files that were copied to C:\IREX sub-directory were all the files that were needed to link and run the program. These files will be needed if the program is updated or other instruments or plotter modules are added to enhance this program. There also is a IREX200.SYS file included which is the file that will be ran to start the IREX-200 interfacing program to connect the PLUX 8840A Multimeter.

CONNECT ALL EQUIPMENT TO WORKSTATION

Connect the PLUX 8840A to the IREX-200 with the required cable. Multiple Meters may be connected by using multiple the cables. Make sure that the cables are connected to the correct pins for your work or any-else.

INSTALLATION AND SETTING STARTER

INSTALLATION OF IEEE BUS

The first step in the installation process is to install the IEEE-488 Bus in the computer. Refer to the manual for the procedures used.

MULTIMETER ADDRESSES

The three multimeter options that can be used all have a specific address hard coded into the program. The addresses that were used are : 1, 16, and 18. If you do not know the address of each multimeter, press the local button on the multimeter, while it is turned on. This will show the address of the multimeter on the screen of the multimeter. To change the address look in the FLUKE 8840A multimeter manual to change the settings of the dip switches on the back of the multimeter.

INSTALL PROGRAM TO HARD DRIVE

The first step to installing this program is, on the C: directory, make two sub-directories: IEEE and DATA. Then copy the contents of the installation disk to C:\IEEE. The C:\DATA sub-directory will store all the data that is saved from taking readings. The files that were copied to C:\IEEE sub-directory were all the files that were needed to link and run in graphics mode. These files will be needed if the program is updated or other instruments or plotter modules are added to enhance this program. There also is a IEEE488.EXE file included, which is the file that will be ran to start the IEEE-488 interfacing program to access the FLUKE 8840A Multimeter.

CONNECT ALL EQUIPEMENT TOGETHER

Connect the FLUKE 8840A to the IEEE-488 Bus with the required cable. Multiple Meters may be connected by piggy backing the cables. Make sure that everything is set up so as to be accessible for your work or experiments.

INSTALLATION AND GETTING STARTED

Getting Started

Make sure the Multimeter is connected to the IEEE-488 Bus. Turn on the computer and all instruments to be used. At the C:> prompt change directories to the IEEE sub-directory, C:\IEEE. At the C:\IEEE> prompt type IEEE488 the hit <enter>. This will run the IEEE488.EXE program. The first thing to show up on the screen will be the main menu, which will show you the options available.

Main Menu

At the main menu you may make the selection of one of the three Multimeters, or exit the program. The other three instrument options and the plotter option was added to make this program expandable, but were not implemented because of incifitent time available. After selecting one of the multimeters and the second graphic screen will be shown.

Multimeter Graphics and Sub-menu Screen

At the second screen you have the following options.

Initialize :	Initialize the Multimeter
Set Options :	Allows you select the function and range to be used. Will come up to the default setting automatically.
Single Trigger:	To take a single reading.
Continuous Trigger:	To take multiple readings. Must set the rate of the readings to be taken, slow, medium, or fast.
Device Clear :	To clear the device and reset to default settings.
Self Test :	To test the device for internal errors.
Save Data :	This is a toggle switch to change between save and not save.
List Files:	A Listing of all files in the Data Directory.
Quit :	To exit to the main menu.

INSTALLATION AND GETTING STARTED

Once you are at the Multimeter Screen it is advisable to Initialize the Multimeter before doing anything else. Just Select the Initialize option and it will be taken care of.

The next step will be to decided on the options of function and range you will be needing. Select Set Options from the sub-menu. Use the arrow keys to move from one selection to another. The option that you are on will be shown on the graphical display of the multimeter on the screen. Once you have the right function highlighted hit the enter key. Then move with the arrow key to select the range you want. If you are unsure, just select autorange. When you have highlighted the range you want hit the enter key. Now you have selected a function and a range and are ready to take readings.

Now you may select a single or multiple readings.

If you wish to save the results of the readings you are taking you may do this by selecting the Save Data option. When using this option bear in mind that once you have selected it, it will continue to save data until you de-select it. It works like a toggle switch. When you choose the save data option it automatically opens a file with the filename taken from the time opened and the device read from. This way you have a way to keep track of all the files that are saved. When you de-select the save data option it will close that file for you. Make sure to delete all files after you are finished with them, this will keep the data directory uncluttered.

Single Trigger will initiate a single reading to be taken. The outcome of the reading will be displayed on the multimeter on the screen. If an error has ocured it will show an error message on the message line.

Continuous Trigger will initiate a series of 14 readings at specified time intervals. After selecting Continuous Trigger you will be prompted to select a fast, medium, or slow reading rate these rates are similar to the rates given by the multimeter. Once the rate is selected the reading will be displayed to the screen until the 14 readings are taken or a key is hit to discontinue the readings.

Selecting the List Files option will show a listing of files that are stored in the Data sub-directory. Make sure to delete files when you have finished with them.

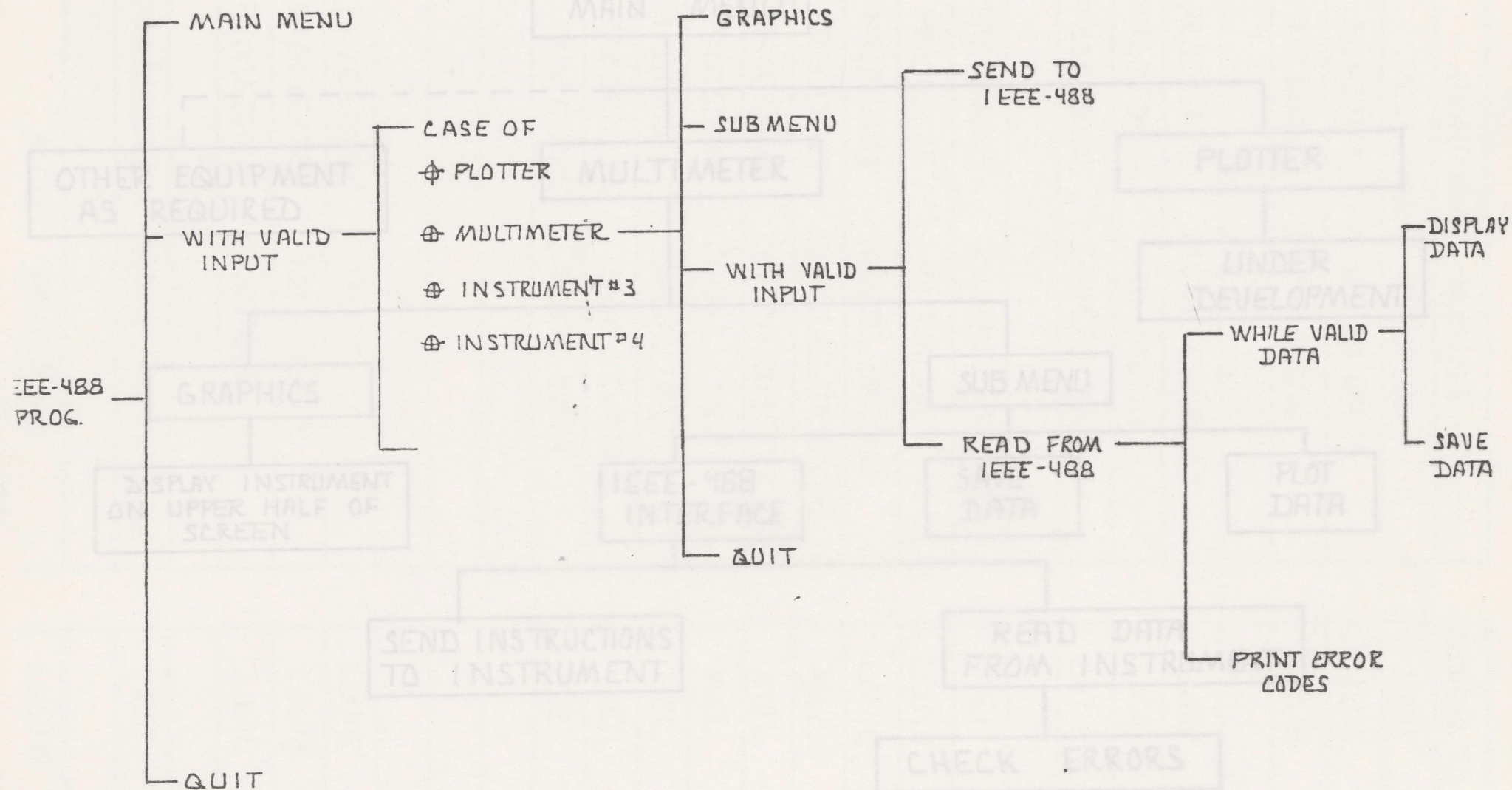
INSTALLATION AND GETTING STARTED

Final Remarks

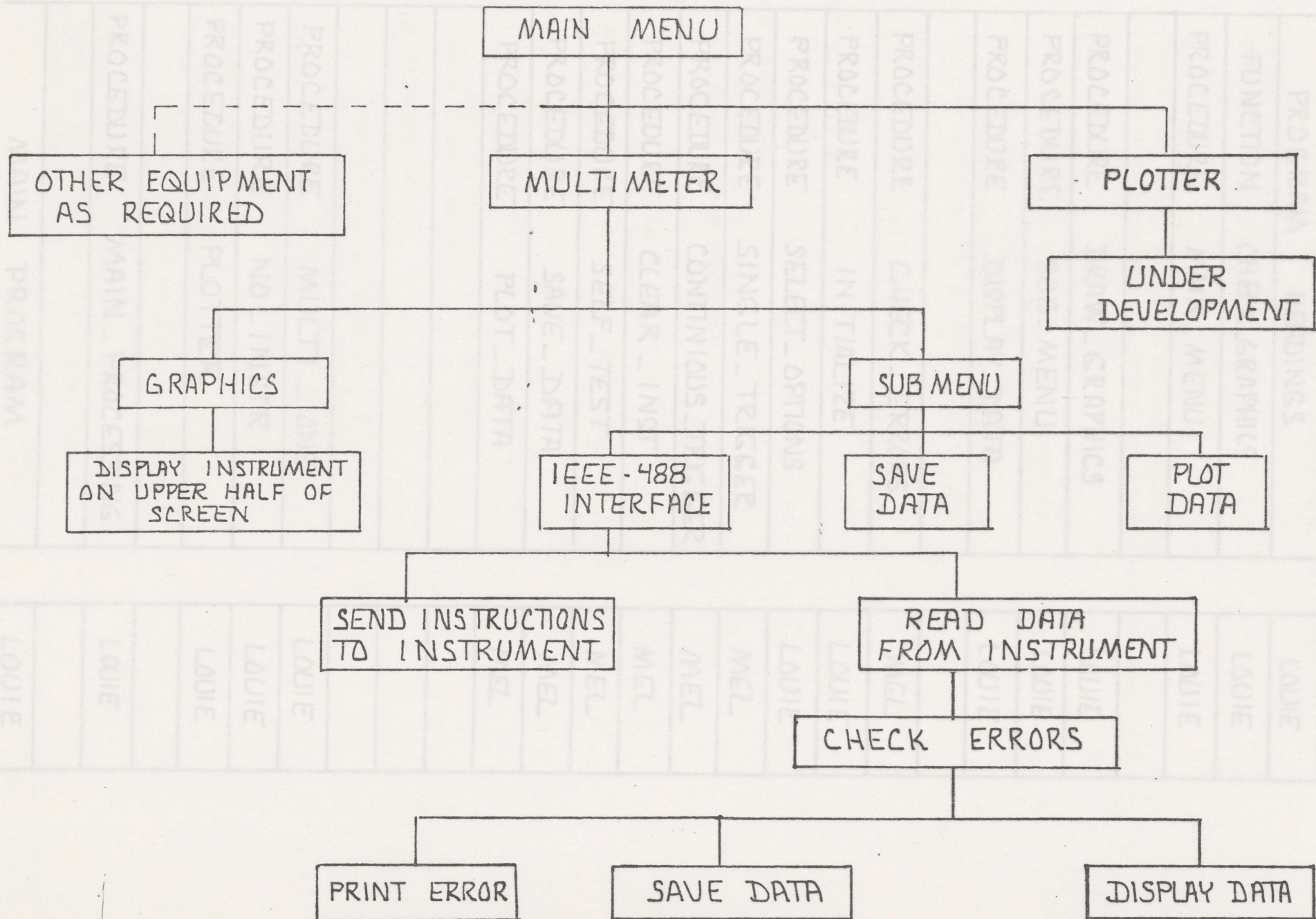
Included in this manual are a few of the documents that were produced in Research and Development of this project. Hopefully this will shed some insight into the process of the development of this learning experiment.

Our group would like to thank Mr. Les A. Kinsler for his help and guidance into completion of this application program.

Louie Bolig
Mel Wedermyer
Mitzy Carlson



IEEE-488 PROGRAM TREE



PROGRAM	MODULE
PROGRAM	HEADINGS
FUNCTION	CHECK_GRAPHICS
PROCEDURE	MAIN_MENU
PROCEDURE	DRAW_GRAPHICS
PROCEDURE	SUB_MENU
PROCEDURE	DISPLAY_DATA
PROCEDURE	CHECK_ERRORS
PROCEDURE	INITIALIZE
PROCEDURE	SELECT_OPTIONS
PROCEDURE	SINGLE_TRIGGER
PROCEDURE	CONTINUOUS_TRIGGER
PROCEDURE	CLEAR_INST
PROCEDURE	SELF_TEST
PROCEDURE	SAVE_DATA
PROCEDURE	PLOT_DATA
PROCEDURE	MULTI_ONE
PROCEDURE	NO_INSTR
PROCEDURE	PLOTTER
PROCEDURE	MAIN_PROCESSING
MAIN	PROGRAM

ASSIGN TO
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GROUP ONE SEMINAR PROJECT
Priority Level--- 1=Highest, 5=Lowest

INITIALIZE INSTRUMENT --- 4

Set Port Address

SELF TEST --- 5

Send command (ZO)

Check for error message in output buffer

Automatically resets to power up configuration when done

DEVICE CLEAR --- 4

Send command with Port Address & (*)

Resets to power up configuration

F1,R0,S0,T0,D0,B0,Y0,W0

Clears the Error Register

Zeros the Numeric Register

Zeros the Serial Register

OPEN FILE --- 1

Input file to be opened

Open file

CLOSE FILE --- 1

Close File

CHECK ERRORS --- 2

Check for valid data

Check for error messages

SAVE DATA --- 2

Open file Module

Check data for errors

Read from output buffer and store in file

Close file Module

PLOT DATA --- 3

Open file Module

Plot data

Select data to be plotted

Close file Module

SINGLE TRIGGER --- 1

Send command with

Selected Trigger Mode (T1-T4)

Selected Function and Range

(?) to Trigger reading

Check data for Error

Send data to Display Module

CONTINUOUS TRIGGER --- 2

Open file Module

Send command with

(TO) to set continuous trigger

Selected Function and Range

Selected Rate

Check for Error

Read from output buffer into file

Close file Module

INSTRUCTION MANUAL FOR IEEE488 INTERFACE PROGRAM

The writers of this manual are taking for granted that the user of this program has prior knowledge of the FLUKE 8840A Multimeter.

The addresses of the multimeters used are hard coded in the program. The addresses used are decimal 1, 16, 18. To change the address of a multimeter consults your FLUKE 8840A Multimeter Manual.

Before using this program READ THE ENTIRE MANUAL. It will help in the installation/setup, procedures used to take a reading, and the saving of data.

The program starts with a Main Menu, it is used to select the device to be used. After selecting a Multimeter, your screen switches to a second menu and a visual representation of the FLUKE 8840A Multimeter. In this second menu you are given choices of options. After taking a reading the value of the reading is displayed on the graphical multimeter. At the bottom of this screen is a Message Line. All messages and prompts on the use of a selection are displayed here.

This program was written with the following hardware and software specifications in mind :

- 12Mhz AT Computer with 1MB of RAM

- 20MB Hard drive with installed software:

 - Turbo Pascal 4.0

 - LOTUS 123 Spreadsheet

- CGA Graphics Card and Monitor

- IEEE 488 Control Board Bus

- FLUKE 8840A Multimeter with Manuals

- And any interconnecting cables

The Multimeter may be setup in one of the following manners or installed in a cabinet. For ease of use the portable meter would be better.

