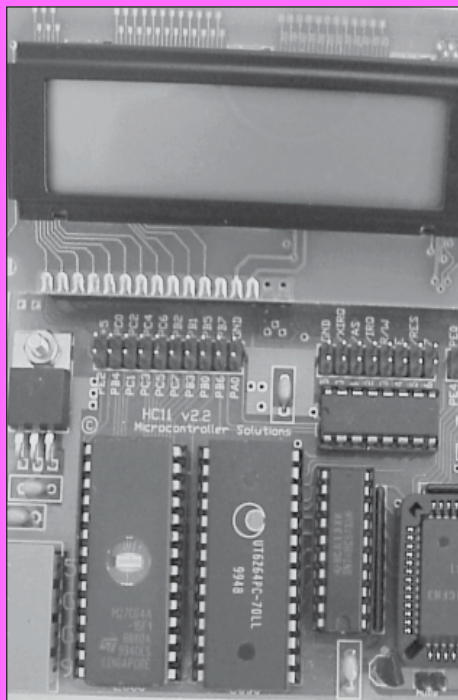

PRACTICAL EMBEDDED CONTROLLERS: TROUBLESHOOTING AND DESIGN FOR ENGINEERS AND TECHNICIANS



YOU WILL LEARN:

- How to design, set up and program a complete embedded controller development system
- How to apply the latest techniques in programming these versatile devices
- Troubleshooting tips, tricks and traps for microcontrollers
- Installation techniques for microcontrollers
- How to fix problems due to electrical noise and interference
- How to design correctly the first time to avoid earthing and EMC problems.
- How to avoid the five most common problems in the design of Microcontrollers
- How to choose and configure the correct software

WHO SHOULD ATTEND:

This is not an advanced course but one aimed at engineers and technicians who want a solid grounding in the fundamentals from an expert in the area. You may already have been working in this area but want to get more out of your designs with some useful practical information which you can apply immediately when troubleshooting or performing your next design.

- Electronic Technicians & Engineers
 - Instrumentation & Control System Engineers and Technicians
 - Electrical Engineers & Technicians
 - Project Engineers
 - Design Engineers
 - Technicians
 - Process Control Engineers
 - Systems Engineers
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The Workshop

From microwave ovens to alarm systems to industrial PLC and DCS control systems, embedded controllers are controlling our world. The microcontrollers that are at the heart of these and many more devices are becoming easier and simpler to use. But when these devices fail the solution to the problem needs to be found and the repairs done quickly.

The Embedded Controllers: Troubleshooting and Design workshop will help the technician, engineer and even the most casual user understand the inter-workings of microcontrollers along with the most common problems and their solutions.

Embedded controllers are used in most electronic equipment today. Embedded controllers are intelligent electronic devices used to control and monitor devices connected to the real world. This can be a Programmable Logic Controller (PLC), Distributed Control System (DCS) or a Smart Sensor. These devices are used in almost every walk of life today. Most automobiles, factories and even kitchen appliances have embedded controllers in them.

This two-day workshop covers all aspects of embedded controllers but focussing specifically on troubleshooting and design. The workshop covers design, specification, programming, installation, configuration and of course troubleshooting.

This hands-on workshop gives both the novice and experienced user a solid grasp of the basic principles enabling you to go away and apply the material learnt immediately to your application.

Workshop Objectives

The objectives are simply to give you a thorough grounding in the use of microcontrollers; thus enabling you to design your own system hardware and then to program it. Further to this it will also help you to troubleshoot, diagnose and fix faults on your microcontroller systems.

Practical Sessions

Groups of two attendees will be allocated a PC and microcontroller development board to develop complete projects. You will use internationally known software packages, chosen for their high profile and popularity in the industrial environment. You will develop your ability in working with Embedded Controller systems and reinforce the information learned in the workshop. You will learn first-hand how to set up and use the development system to build a complete working prototype project.

The Program

DAY ONE

INTRODUCTION

- Introduction
- Microcontroller Introduction
- Microcontroller Design & Functions
- Assembly Language Programming
- Inputs & Outputs
- Data Communications
- Noise Reduction
- Grounding Solutions
- Installation Techniques

MICROCONTROLLER BASICS

- Introduction
- Number Systems - Binary, Hex, & Decimal
- Gates - AND, OR, XOR & NOT gates
- Accumulators, A, B & D
- Registers - X, Y, D & Stack
- Communications - Synchronous & Asynchronous
- Power Systems - Resetting & Brownouts
- Crystals & Oscillators

INTRODUCTION TO PROGRAMMING THE MICROCONTROLLER

- Programming Structure & Specifications
- Addressing Modes
- Load, Stores & Transfers
- Arithmetic Operations
- Logical Operations
- Shifts & Rotates
- Index Registers & The Stack
- Condition Code Register
- Branches, Jumps, Interrupts & Calls
- Assembly Programming

INTRODUCTION TO MEMORY

- User Ram
- Buffalo Routines, Memory Map & Vectors
- Interrupts, Vectors & Pseudo-Vectors
- Control Registers
- EEPROM

INTRODUCTION TO INPUTS AND OUTPUTS

- Single Ended vs. Differential Inputs
- Digital Inputs
- Digital Outputs
- Analog Inputs
- Digital Control of Analog Devices
- Keypad Interfacing
- LCD Interfacing

DAY TWO

DATA COMMUNICATIONS

- Introduction to Data Communication
- Basics of Serial Data Communication
- Open System Interconnection Model
- Modes of Communications
- RS 232
- RS 485
- Fibre Optic Cables
- Fieldbus Protocols used in Controllers

ELECTRONIC NOISE REDUCTION IN CONTROLLERS AND PCBs

- Introduction to Noise Reduction
- Conductive Coupled Noise
- Capacitive Coupled Noise
- Magnetic Coupled Noise
- EMC & Noise Reduction in PCB Design

EMC GROUNDING SOLUTIONS

- Introduction to EMC Grounding Solutions
- EMC Grounding
- EMC Grounding on a PCB
- Protecting Controllers from Lightning
- Microcontroller Equipment Ground
- Enclosure or Safety Ground

INSTALLATION AND TROUBLESHOOTING

- Introduction to Installation & Troubleshooting
- Connections - Screw, Crimp & Solder
- Cable Runs & Trays
- Cable Ties & Mounting
- Cooling, Heating & Air Conditioning
- Cable Run Wire Management
- Conduit Installation
- Troubleshooting Specifics
- Safety Considerations

CONCLUSION

- CPU Design & Functions
- Assembly Language Programming
- Memory
- Inputs & Outputs
- Data Communication
- Noise Reduction
- Grounding Solutions
- Installation Techniques