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## **Building a Programmable Logic Controller with a PIC16F648A Microcontroller**



**Murat Uzam**



**CRC Press**  
Taylor & Francis Group



# Building A Programmable Logic Controller With A Pic16f648a Microcontroller

**Murat Uzam**

## **Building A Programmable Logic Controller With A Pic16f648a Microcontroller:**

Building a Programmable Logic Controller with a PIC16F648A Microcontroller Murat Uzam,2017-12-19 Programmable logic controllers PLCs are extensively used in industry to perform automation tasks with manufacturers offering a variety of PLCs that differ in functions program memories and the number of inputs outputs I O Not surprisingly the design and implementation of these PLCs have long been a secret of manufacturers Unveiling the mysteries of PLC technology Building a Programmable Logic Controller with PIC16F648A Microcontroller explains how to design and use a PIC16F648A microcontroller based PLC The author first described a microcontroller based implementation of a PLC in a series of articles published in Electronics World magazine between 2008 and 2010 This book is based on an improved version of the project including Updates to the hardware configuration with a smaller CPU board and two I O extension boards that now support 16 inputs and 16 outputs instead of 8 An increased clock frequency of 20 MHz Improvements to several macros Flowcharts to help you understand the macros functions In this book the author provides detailed explanations of hardware and software structures He also describes PIC Assembly macros for all basic PLC functions which are illustrated with numerous examples and flowcharts An accompanying downloadable resources contain source files ASM and object files HEX for all of the examples in the book It also supplies printed circuit board PCB Gerber and pdf files so that you can have the CPU board and I O extension boards produced by a PCB manufacturer or produce your own boards Making PLCs more easily accessible this unique book is written for advanced students practicing engineers and hobbyists who want to learn how to build their own microcontroller based PLC It assumes some previous knowledge of digital logic design microcontrollers and PLCs as well as familiarity with the PIC16F series of microcontrollers and w

**PIC16F1847 Microcontroller-Based Programmable Logic Controller** Murat Uzam,2020-10-22 The volume focusses on intermediate concepts of the PIC16F1847 Based PLC project and covers arithmetical operation ability of PLCs logical function performers and operations like AND NAND OR NOR Further it explains shift and rotate macros moving bits in a register to right or left and selection macros enabling one value to be selected from several given values according to certain criteria Demultiplexer circuit is illustrated which is used to send a signal to one of many devices Finally it explains decoder priority encoder and conversion macros All the concepts are supported using flowcharts Aimed at researchers and graduate students in electrical engineering power electronics robotics and automation sensors this book Presents arithmetical and logical macros to carry out arithmetical and logical operations to be used for 8 bit or 16 bit variables and or constant values Provides shift and rotate macros to do arithmetical or logical shift and rotate operations to be used for 8 bit or 16 bit variables Proposes selection macros to enable the user to do 8 bit or 16 bit move load selection maximum minimum limiting multiplexing and byte multiplexing operations Develops demultiplexer macros decoder macros and priority encoder macros to be used as combinational circuits Presents conversion macros to provide functions to convert given data from one format to another one

**PIC16F1847 Microcontroller-Based**

**Programmable Logic Controller, Three Volume Set** Murat Uzam,2020-10-22 Programmable logic controllers PLCs have been used extensively and are offered in terms of functions program memories and the number of inputs outputs I/Os ranging from a few to thousands With a focus on how to design and implement a PLC this set explains hardware and associated basic concepts intermediary and advanced concepts of PLC using PIC16F1847 microcontroller Flowcharts are provided to help the understanding of macros instructions Twenty application examples to show how to use the PIC16F1847 Based PLC in different control applications related files for hardware and software components and appendices are also provided Aimed at researchers and graduate students in electrical engineering power electronics robotics and automation sensors this book Explains how to design and use a PIC16F1847 microcontroller based PLC including easy to use software structures Covers concepts like Contact and Relay Based Macros Flip Flop Macros Timer Macros Counter Macros and Comparison Macros Presents arithmetical and logical macros to carry out arithmetical and logical operations to be used for 8 bit or 16 bit variables and or constant values Illustrates program control macros to enable or disable a block of PLC program or to move execution of a program from one place to another Discusses the implementation of Sequential Function Chart SFC elements with up to 24 steps

**Introduction to Industrial Automation** Stamatios Manesis,George Nikolakopoulos,2018-03-29 This book provides an extended overview and fundamental knowledge in industrial automation while building the necessary knowledge level for further specialization in advanced concepts of industrial automation It covers a number of central concepts of industrial automation such as basic automation elements hardware components for automation and process control the latch principle industrial automation synthesis logical design for automation electropneumatic automation industrial networks basic programming in PLC and PID in the industry

**Building Arduino PLCs** Pradeeka Seneviratne,2017-02-07 Learn the fundamentals of PLCs and how to control them using Arduino software to create your first Arduino PLC You will learn how to draw Ladder Logic diagrams to represent PLC designs for a wide variety of automated applications and to convert the diagrams to Arduino sketches A comprehensive shopping guide includes the hardware and software components you need in your tool box You will learn to use Arduino UNO Arduino Ethernet shield and Arduino WiFi shield Building Arduino PLCs shows you how to build and test a simple Arduino UNO based 5V DC logic level PLC with Grove Base shield by connecting simple sensors and actuators You will also learn how to build industry grade PLCs with the help of ArduiBox What You'll Learn Build ModBus enabled PLCs Map Arduino PLCs into the cloud using NearBus cloud connector to control the PLC through the Internet Use do it yourself light platforms such as IFTTT Enhance your PLC by adding Relay shields for connecting heavy loads Who This Book Is For Engineers designers crafters and makers Basic knowledge in electronics and Arduino programming or any other programming language is recommended

**PIC16F1847 Microcontroller-Based Programmable Logic Controller** Murat Uzam,2020-10-22 The PIC16F1847 Based PLC project supports up to 4 analog inputs and 1 analog output 1 High Speed Counter 2 PWM pulse width modulation outputs 1 Drum Sequencer

Instruction with up to 16 steps the implementation of Sequential Function Charts SFCs with up to 24 steps This volume presents advanced concepts of the PIC16F1847 Based PLC project and consists of topics like program control high speed counter and PWM macros It further explains memory related drum sequencer instruction sequential functional charts and analog input and output modules Aimed at researchers and graduate students in electrical engineering power electronics robotics and automation sensors this book Presents program control macros to enable or disable a block of PLC program or to move execution of a program from one place to another Proposes a High Speed Counter and four PWM Macros for high speed counting and PWM operations Develops memory related macros to enable the user to do memory read write operations Provides a Drum Sequencer instruction with up to 16 steps and 16 outputs on each step Discusses the implementation of Sequential Function Chart SFC elements with up to 24 steps

### **Pic16f1847 Microcontroller-Based**

**Programmable Logic Controller Three Volume Set** Murat Uzam,2020-10-23 Programmable logic controllers PLCs have been used extensively and are offered in terms of functions program memories and the number of inputs outputs I/Os ranging from a few to thousands With a focus on how to design and implement a PLC this set explains hardware and associated basic concepts intermediary and advanced concepts of PLC using PIC16F1847 microcontroller Flowcharts are provided to help the understanding of macros instructions Twenty application examples to show how to use the PIC16F1847 Based PLC in different control applications related files for hardware and software components and appendices are also provided Aimed at researchers and graduate students in electrical engineering power electronics robotics and automation sensors this book Explains how to design and use a PIC16F1847 microcontroller based PLC including easy to use software structures Covers concepts like Contact and Relay Based Macros Flip Flop Macros Timer Macros Counter Macros and Comparison Macros Presents arithmetical and logical macros to carry out arithmetical and logical operations to be used for 8 bit or 16 bit variables and or constant values Illustrates program control macros to enable or disable a block of PLC program or to move execution of a program from one place to another Discusses the implementation of Sequential Function Chart SFC elements with up to 24 steps

### *Design and Development of a Programmable Logic Controller and a Microcontroller System Design*

Tool Gandhi Puvvada,1987 **Building Smart Drones with ESP8266 and Arduino** Syed Omar Faruk Towaha,2018-02-27

Leverage the WiFi chip to build exciting Quadcopters Key Features Learn to create a fully functional Drone with Arduino and ESP8266 and their modified versions of hardware Enhance your drone's functionalities by implementing smart features A project based guide that will get you developing next level drones to help you monitor a particular area with mobile like devices Book Description With the use of drones DIY projects have taken off Programmers are rapidly moving from traditional application programming to developing exciting multi utility projects This book will teach you to build industry level drones with Arduino and ESP8266 and their modified versions of hardware With this book you will explore techniques for leveraging the tiny WiFi chip to enhance your drone and control it over a mobile phone This book will start with teaching you how to

solve problems while building your own WiFi controlled Arduino based drone You will also learn how to build a Quadcopter and a mission critical drone Moving on you will learn how to build a prototype drone that will be given a mission to complete which it will do it itself You will also learn to build various exciting projects such as gliding and racing drones By the end of this book you will learn how to maintain and troubleshoot your drone By the end of this book you will have learned to build drones using ESP8266 and Arduino and leverage their functionalities to the fullest What you will learn Includes a number of projects that utilize different ESP8266 and Arduino capabilities while interfacing with external hardware Covers electrical engineering and programming concepts interfacing with the World through analog and digital sensors communicating with a computer and other devices and internet connectivity Control and fly your quadcopter taking into account weather conditions Build a drone that can follow the user wherever he she goes Build a mission control drone and learn how to use it effectively Maintain your vehicle as much as possible and repair it whenever required Who this book is for If you are a programmer or a DIY enthusiast and keen to create a fully functional drone with Arduino and ESP8266 then this book is for you Basic skills in electronics and programming would be beneficial This book is not for the beginners as it includes lots of ideas not detailed how you can do that If you are a beginner then you might get lost here The prerequisites of the book include a good knowledge of Arduino electronics programming in C or C and lots of interest in creating things out of nothing

**Microcontroller Based Programmable Logic Controller (PLC)** Geok Sun Chong,2006      **High-Tech DIY Projects with Microcontrollers** Maggie Murphy,2014-07-15

Microcontrollers are small computers embedded in many everyday devices The average person interacts with several of them each day without even thinking about it But why have microcontrollers become so ubiquitous in what devices are they found and most importantly how does one go about making one All this and more is explained in the engaging text It will turn even the technologically illiterate into budding tech wizards

**MintDuino** James Kelly,Marc de Vinck,2011-09-13 Get started with MintDuino the Maker Shed kit that's perfect for learning or teaching the fundamentals of how microcontrollers work This hands on book shows you how to build a complete MintDuino project from start to finish Learn how to assemble the microcontroller on a breadboard no soldering required and immediately begin programming it You'll build the MintDuino Reflex Game in five separate stages or sub tasks Breaking down a large project into manageable tasks helps you track down errors quickly and lets you see how each part of the circuit works Once you complete the game you'll have the resources and experience to tackle more MintDuino projects If you're interested in the fascinating world of microcontrollers you'll enjoy this book Wire up and program the MintDuino to light an LED Build a game that tests the reflexes of two players Learn how to make your game light glow at random intervals Construct a pushbutton circuit to control individual players LEDs Put all of the components together including simple code to control your game

**Practical AVR Microcontrollers** Alan Trevennor,2012-11-27 In Practical AVR Microcontrollers you'll learn how to use the AVR microcontroller to make your own nifty projects and gadgets You'll start off with the basics in part

one setting up your development environment and learning how the naked AVR differs from the Arduino Then you ll gain experience by building a few simple gizmos and learning how everything can be interconnected In part two we really get into the goodies projects Each project will show you exactly what software and hardware you need and will provide enough detail that you can adapt it to your own needs and parts availability Some of the projects you ll make An illuminated secret panel A hallway lighting system with a waterfall effect A crazy lightshow Visual effects gizmos like a Moire wheel and shadow puppets In addition you ll design and implement some home automation projects including working with wired and wireless setups Along the way you ll design a useable home automation protocol and look at a variety of hardware setups Whether you re new to electronics or you just want to see what you can do with an AVR outside of an Arduino Practical AVR

Microcontrollers is the book for you **Microcontroller Programming** Julio Sanchez,Maria P. Canton,2018-10-03 From cell phones and television remote controls to automobile engines and spacecraft microcontrollers are everywhere Programming these prolific devices is a much more involved and integrated task than it is for general purpose microprocessors microcontroller programmers must be fluent in application development systems programming and I O operation as well as memory management and system timing Using the popular and pervasive mid range 8 bit Microchip PIC as an archetype Microcontroller Programming offers a self contained presentation of the multidisciplinary tools needed to design and implement modern embedded systems and microcontrollers The authors begin with basic electronics number systems and data concepts followed by digital logic arithmetic conversions circuits and circuit components to build a firm background in the computer science and electronics fundamentals involved in programming microcontrollers For the remainder of the book they focus on PIC architecture and programming tools and work systematically through programming various functions modules and devices Helpful appendices supply the full mid range PIC instruction set as well as additional programming solutions a guide to resistor color codes and a concise method for building custom circuit boards Providing just the right mix of theory and practical guidance Microcontroller Programming The Microchip PIC is the ideal tool for any amateur or professional designing and implementing stand alone systems for a wide variety of applications **PIC**

**Microcontrollers: Know It All** Lucio Di Jasio,Tim Wilmshurst,Dogan Ibrahim,John Morton,Martin P. Bates,Jack Smith,David W Smith,Chuck Hellebuyck,2007-07-30 The Newnes Know It All Series takes the best of what our authors have written over the past few years and creates a one stop reference for engineers involved in markets from communications to embedded systems and everywhere in between PIC design and development a natural fit for this reference series as it is one of the most popular microcontrollers in the world and we have several superbly authored books on the subject This material ranges from the basics to more advanced topics There is also a very strong project basis to this learning The average embedded engineer working with this microcontroller will be able to have any question answered by this compilation He she will also be able to work through real life problems via the projects contained in the book The Newnes Know It All Series presentation of theory

hard fact and project based direction will be a continual aid in helping the engineer to innovate in the workplace Section I An Introduction to PIC MicrocontrollersChapter 1 The PIC Microcontroller FamilyChapter 2 Introducing the PIC 16 Series and the 16F84AChapter 3 Parallel Ports Power Supply and the Clock OscillatorSection II Programming PIC Microcontrollers using Assembly LanguageChapter 4 Starting to Program An Introduction to AssemblerChapter 5 Building Assembler ProgramsChapter 6 Further Programming TechniquesChapter 7 Prototype HardwareChapter 8 More PIC Applications and DevicesChapter 9 The PIC 1250x Series 8 pin PIC microcontrollers Chapter 10 Intermediate Operations using the PIC 12F675Chapter 11 Using InputsChapter 12 Keypad ScanningChapter 13 Program ExamplesSection III Programming PIC Microcontrollers using PicBasicChapter 14 PicBasic and PicBasic Pro Programming Chapter 15 Simple PIC ProjectsChapter 16 Moving On with the 16F876Chapter 17 CommunicationSection IV Programming PIC Microcontrollers using MBasicChapter 18 MBasic Compiler and Development BoardsChapter 19 The Basics OutputChapter 20 The Basics Digital InputChapter 21 Introductory Stepper MotorsChapter 22 Digital Temperature Sensors and Real Time ClocksChapter 23 Infrared Remote ControlsSection V Programming PIC Microcontrollers using CChapter 24 Getting StartedChapter 25 Programming LoopsChapter 26 More LoopsChapter 27 NUMB3RSChapter 28 InterruptsChapter 29 Taking a Look under the Hood Over 900 pages of practical hands on content in one book Huge market as of November 2006 Microchip Technology Inc a leading provider of microcontroller and analog semiconductors produced its 5 BILLIONth PIC microcontroller Several points of view giving the reader a complete 360 of this microcontroller    **MintDuino** James Floyd Kelly,2011 Annotation Get started with MintDuino the Maker Shed kit that s perfect for learning or teaching the fundamentals of how microcontrollers work This hands on book shows you how to build a complete MintDuino project from start to finish Learn how to assemble the microcontroller on a breadboard and begin programming it    *DIY Microcontroller Projects for Hobbyists* Miguel Angel Garcia-Ruiz,Pedro Cesar Santana Mancilla,2021-07-30 A practical guide to building PIC and STM32 microcontroller board applications with C and C programming Key Features Discover how to apply microcontroller boards in real life to create interesting IoT projects Create innovative solutions to help improve the lives of people affected by the COVID 19 pandemic Design build program and test microcontroller based projects with the C and C programming language Book DescriptionWe live in a world surrounded by electronic devices and microcontrollers are the brains of these devices Microcontroller programming is an essential skill in the era of the Internet of Things IoT and this book helps you to get up to speed with it by working through projects for designing and developing embedded apps with microcontroller boards DIY Microcontroller Projects for Hobbyists are filled with microcontroller programming C and C language constructs You ll discover how to use the Blue Pill containing a type of STM32 microcontroller and Curiosity Nano containing a type of PIC microcontroller boards for executing your projects as PIC is a beginner level board and STM 32 is an ARM Cortex based board Later you ll explore the fundamentals of digital electronics and microcontroller board programming The book uses

examples such as measuring humidity and temperature in an environment to help you gain hands on project experience You'll build on your knowledge as you create IoT projects by applying more complex sensors Finally you'll find out how to plan for a microcontroller based project and troubleshoot it By the end of this book you'll have developed a firm foundation in electronics and practical PIC and STM32 microcontroller programming and interfacing adding valuable skills to your professional portfolio What you will learn Get to grips with the basics of digital and analog electronics Design build program and test a microcontroller based system Understand the importance and applications of STM32 and PIC microcontrollers Discover how to connect sensors to microcontroller boards Find out how to obtain sensor data via coding Use microcontroller boards in real life and practical projects Who this book is for This STM32 PIC microcontroller book is for students hobbyists and engineers who want to explore the world of embedded systems and microcontroller programming Beginners as well as more experienced users of digital electronics and microcontrollers will also find this book useful Basic knowledge of digital circuits and C and C programming will be helpful but not necessary

### **Designing Embedded Systems with PIC**

**Microcontrollers** Tim Wilmshurst, 2009-11-07 PIC microcontrollers are used worldwide in commercial and industrial devices The 8 bit PIC which this book focuses on is a versatile work horse that completes many designs An engineer working with applications that include a microcontroller will no doubt come across the PIC sooner rather than later It is a must to have a working knowledge of this 8 bit technology This book takes the novice from introduction of embedded systems through to advanced development techniques for utilizing and optimizing the PIC family of microcontrollers in your device To truly understand the PIC assembly and C programming language must be understood The author explains both with sample code and examples and makes the transition from the former to the latter an easy one This is a solid building block for future PIC endeavors New to the 2nd Edition Include end of chapter questions activities moving from introductory to advanced More worked examples Includes PowerPoint slides for instructors Includes all code snips on a companion web site for ease of use A survey of 16 32 bit PICs A project using ZigBee Covers both assembly and C programming languages essential for optimizing the PIC Amazing breadth of coverage moving from introductory to advanced topics covering more and more complex microcontroller families Details MPLAB and other Microchip design tools

### **PIC Microcontroller Project Book**

John Iovine, 2000 A true beginner's guide of the popular PIC microcontroller including 12 projects to build *Programming the PIC Microcontroller with MBASIC* Jack Smith, 2005-07-19 The Microchip PIC family of microcontrollers is the most popular series of microcontrollers in the world However no microcontroller is of any use without software to make it perform useful functions This comprehensive reference focuses on designing with Microchip's mid range PIC line using MBASIC a powerful but easy to learn programming language It illustrates MBASIC's abilities through a series of design examples beginning with simple PIC based projects and proceeding through more advanced designs Unlike other references however it also covers essential hardware and software design fundamentals of the PIC microcontroller series including programming in assembly

language when needed to supplement the capabilities of MBASIC Details of hardware software interfacing to the PIC are also provided BENEFIT TO THE READER This book provides one of the most thorough introductions available to the world's most popular microcontroller with numerous hardware and software working design examples which engineers students and hobbyists can directly apply to their design work and studies Using MBASIC it is possible to develop working programs for the PIC in a much shorter time frame than when using assembly language Offers a complete introduction to programming the most popular microcontroller in the world using the MBASIC compiler from a company that is committed to supporting the book both through purchases and promotion Provides numerous real world design examples all carefully tested

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## Building A Programmable Logic Controller With A Pic16f648a Microcontroller Introduction

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