3. FM Receiver Project

Lab Location: Main UG Labs
Teams: 3-4 students per team

Most electronic devices now depend on a mixture of hardware and software. It is therefore essential to learn both software and basic electronics skills. The FM receiver project aims to introduce you to combining software and hardware design. You will be provided with an FM receiver chip, which needs to be operated using a microcontroller. Your goal is to produce a prototype FM receiver, making use of a PIC, an LCD display, and an audio amplifier chip, as shown in Figure 3-1. For the basic function of the FM receiver, you need to use the components provided from the lab. This section of the manual provides an introduction to the production. Further details will be posted on SurreyLearn.

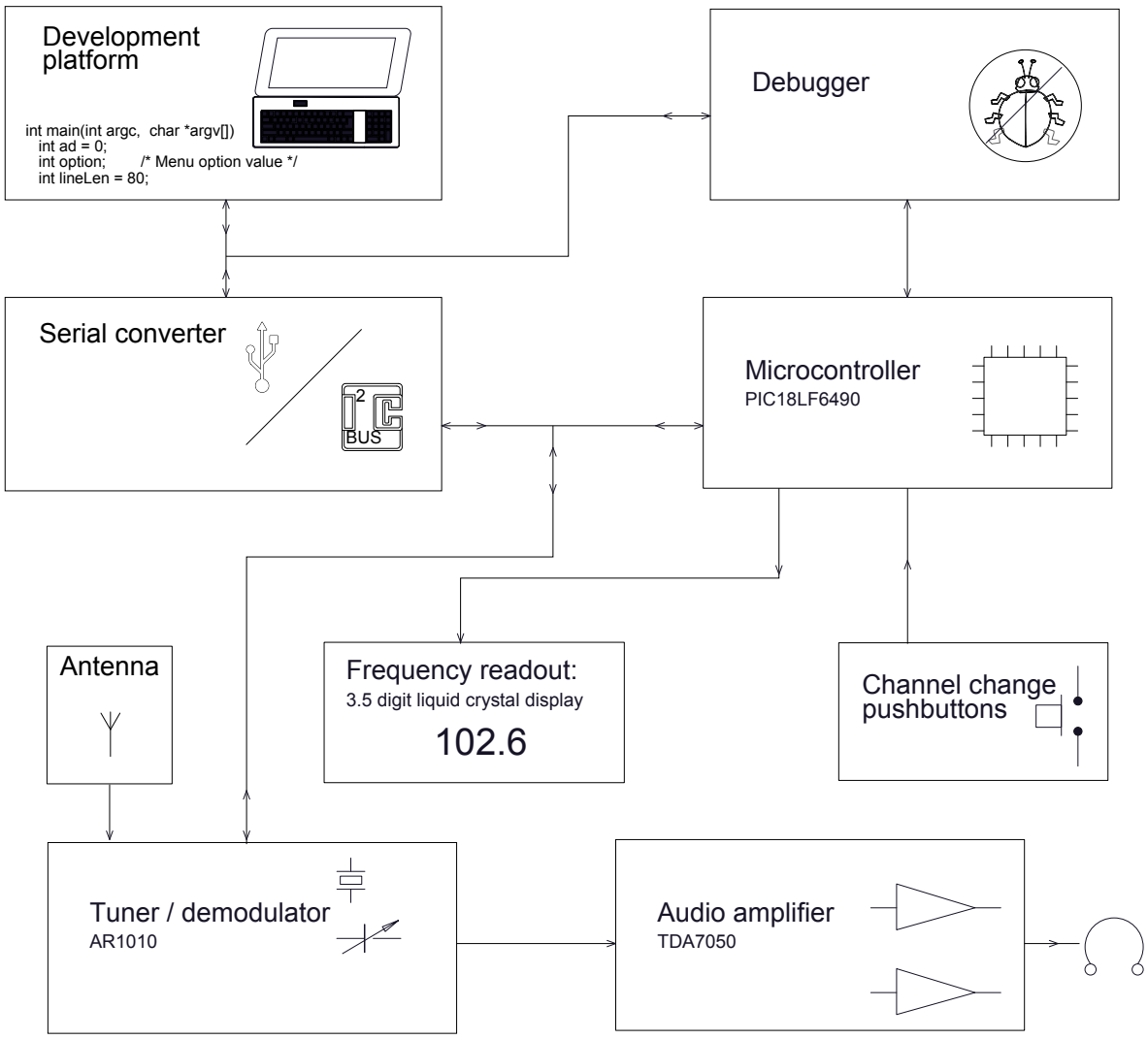

Figure 3-1: Basic FM Receiver Schematic.

3.1. Getting Started

The project should be carried out in groups of three. It is recommended that you spend the first session planning and allocating tasks for each person, as you did for the project in the

first semester. One way to approach the project is to break it down into three phases: research, design, and prototyping/testing.

Research Phase

To complete the project you will need to pick up new knowledge and skills. This requires you to perform some research on both circuit design, and on PIC programming. The SurreyLearn page will contain example circuit diagrams, plus details about the FM chip and other components that you will be given. This is a good place to start when considering how to approach the circuit design.

If you will be responsible for programming, then your first task will be to learn how to write basic C programmes for a PIC. To do this, you will have to some software called MPLAB, produced by a company called Microchip. Please see the SurreyLearn webpage for some links on getting started with MPLAB. Once you have familiarised yourself with the MPLAB software and some basics of PIC programming, you should proceed to study the example C code for the FM chip. This code is capable of controlling the FM chip from a PC after compilation in Visual C++. You don't have to worry about "C++" as Visual C++ is just used as a compiler of plain C language in this project. When you understand how this example code works, you should be able to adapt it for implementation on your PIC. Note that you will also have to write code to achieve the following:

- Output digits to the LCD display
- Detect and take action in response to button pushes (e.g. on/off, tune up/down)

Design Phase

Once you understand how to programme a PIC and the circuit theory, you can start to design your software and your circuit. Although it is a good idea to split the work into hardware design and software design, you will have to be careful to communicate with each other, so that your software is capable of working with your hardware and vice versa. Your team should come together regularly to review progress. Try to think about how you might troubleshoot during the design process, so that your design does not make it difficult to track down problems. Also, make sure to keep a note of your planning and reasons for design decisions, as these will be examined at the end of the project.

Prototyping and Testing Phase

An Electronic Prototype System (EPS) will be made available to you for prototyping your circuit. Please see the SurreyLearn page for more details about this.

3.2. Expectations and Marking

At the end of the project, to obtain the highest marks you will be expected to:

- Demonstrate a working prototype receiver
- Present a technical report, which describes the design of the circuit, and explains the reasons and theory behind the design
- Show your log books, which will indicate what you have personally contributed to the design of the prototype

An important point to note is that this is a very challenging project. This is something that the academics and demonstrators are very much aware of, and will take into account when marking. ***We do not expect everyone to get an FM receiver working.*** If you are not fully successful, then you will be judged on your design quality, and what you have learnt while

working on the project. ***A non-functioning FM receiver does not necessarily mean that you will get a low mark.***

3.3. Taking It Home

Unfortunately, we are not able to let you take all parts of the FM receiver home. This is not down to cost, but rather the time taken to prepare some of the components for your use (e.g. mounting of FM chips). We simply do not have the resources to replicate the considerable effort put into this preparation for each new year group. If you wish to take some parts home, then please enquire in the lab office to find out what you can take.