# Programming the PIC16F1455

## Overview

The PIC16F1455 is programmed using a programmer such as the PICkit 3. The preferred way to do this is by using the Microchip program MPLAB X IDE (Integrated Development Environment). The IDE takes the GPSDO program source, compiles it, converts it to an object (hex) program, and controls the PICkit 3 to transfer the program to the PIC16F1455.

## Install MPLAB X V5.35

The GPSDO program is written in assembler. The latest versions of MPLAB X do not support assembler. The last version to do so is V5.35. It can be downloaded from the microchip website:

https://www.microchip.com/en-us/development-tools-tools-and-software/mplab-ecosystem-downloads-archive

Select the column Windows® (x86/x64) and use the tiny arrows to navigate to MPLAB X v5.35 and download it. Alternately follow this link:

https://ww1.microchip.com/downloads/en/DeviceDoc/MPLABX-v5.35-windows-installer.exe

Once downloaded, run the installer as Administrator. You can accept the default directory for the program C:\Program Files (x86)\Microchip\MPLABX\v5.35, and no proxy unless you have an unusual configuration. In the installer questions.

- Install only the IDE, not IPE.
- 8-bit only
- your choice to feedback or not
- OK to install device software
- On 'completing ... setup', untick all options

You should now be able to run the IDE (Integrated Development Environment).

## Compiling the GPSDO program

Accept updates if there are any and allow MPLAB to reload. Then:

On menu ribbon select File > New Project and answer the questions:

- Select Microchip Embedded, Standalone Project>Next
- Ignore family, type 16F1455 into device (note, no PIC prefix)>Next
- No header>Next
- Tool: PICkit 3>Next
- Compiler: mpasm (expand, only one option)>Next
- Project name and folder: You can create a folder for all projects (eg MyMicrochip) using File Explorer, then enter a project name (eg GPSDO) and the IDE creates a subdirectory GPSDO.X **OR** If you tick the ‘make in same directory’, it creates the project in the folder specified (in which case Folder and Project name may be different). I prefer the first option.

You may see a configuration loading error: 'MPASM is not supported on 64 bit Operating Systems. Please consider migrating your project "GPSDO" configuration "default" to XC8 Assembler or continue to use a previously released IDE.' - ignore it.

That should complete the creation of the project. Now the source file has to be added to the project. Leave MPLAB running, use file explorer to navigate to the project folder and open it. It will have some subfolders (debug, nbproject)

- Create another folder (Source is my preference)
- Copy the source [Main.asm] to the Source folder
- Go back to MPLAB, right click Source Files and select Add Existing Item. Navigate to Source and add Main.asm

Optional. You can close the two windows in the right pane, and/or double click Main.asm in the left pane and the source should open up in the right pane.

On the menu ribbon, select Production>Clean and build Main project

The program should now compile cleanly.

## Downloading to the PIC16F1455

Connect the PICkit 3 programming ribbon cable to the GPSDO programming pins, ensuring the orientation so the pin ►on the PICkit connects to the pin ►on the GPSDO. (note, not on the PCB yet, refer to documentation). Then plug the PICkit into the USB socket of the PC, it should light up. Power up the GPSDO.

On the bar under the menu bar in MPLAB, there are two green arrows. The up arrow ↑ uploads from the PIC. This is a safe way of determining if the processor is recognised by the PICkit. Left click the arrow, select your PICkit, answer the questions and you should see:

```
**************************************************

Connecting to MPLAB PICkit 3...

Currently loaded firmware on PICkit 3
Firmware Suite Version.....01.56.07
Firmware type..............Enhanced Midrange

Target voltage detected
Target device PIC16F1455 found.
Device Revision ID = 1006

Reading...

The following memory area(s) will be read:
program memory: start address = 0x0, end address = 0x1fff
configuration memory
User Id Memory
Read complete
```

Optional: After the GPSDO is programmed and has run calibration, there is data saved in program memory. This can be saved when programming so the PIC doesn't calibrate after every update. The properties can be changed now, or wait until an update is required.

- Right click the project name and select Properties
- In properties, select PICkit 3
- In Option Categories select Memories to program
- Change Auto select memories and ranges to Manual select memories and ranges
- Tick the Preserve Program Memory box
- In Preserve Program Memory Ranges enter 1f80-1fff

You can now program the PIC. Left click the green down arrow and it should all happen. The PIC will immediately try and run. Follow the commissioning notes.

## Updates

If the program is changed, a new Main.asm file will be released. Just copy it over the old one in the source directory, and follow the procedure starting from Production>Clean and build Main project.

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