

Armmite F4 as Embedded Controller

This section discusses using the Armmite F4 as an embedded controller. i.e. You want to place it in the corner and let it run doing a particular job without needing to service it. Once programed, when power is supplied it should just power up and run.

Battery Considerations

The OPTIONS on the Armmite F4 are stored in battery backed ram and the life of the battery needs to be considered. If the device is powered most of its life then the drain on the backup battery would be expected to be minimal. If, however it does go flat and a power reset happens for any reason, then the save options will be reset to default. Any variables save with VAR SAVE will also be lost. The loaded program in flash will still be available. When power is applied in this situation the default options will be applied. The AUTORUN option will be OFF, the USB Console is enabled, The ILI9341_16 display is enabled and Touch is enabled as well as all other default values. This is most likely not what will be required.

Two approaches to guard against this are possible:

- Battery monitoring and replacement as necessary - see Function PIN(BAT)
- Configure the Armmite F4 to run without a backup battery

No Battery and Embedding Configuration Options in a Program

Normally configurations options such as OPTION LCDPANEL are entered at the command prompt to configure the Armmite for any attached display panel, touch controller, etc. The drivers for these devices are enabled at startup so after using the OPTION command the Armmite will immediately restart (i.e., reboot). The user does not notice this (because it is quick) but this it is the reason why the commands should be entered at the command prompt and not in a program.

It is possible to enter these OPTIONS (Configuration Block) at the start of the program if a few simple rules are followed. These are:

- The commands must be at the start of the programs (they may be preceded by comments).
- The command OPTION SAVE BEGIN must be used at the start of this configuration block
- The commands should be in the same order as they would be entered at the command prompt. For example, OPTION LCDPANEL should come before OPTION TOUCH.
- They should be thoroughly tested at the command prompt before being embedded in a program as errors may not be detected and can cause the Armmite to behave strangely.
- They must be followed by the command OPTION SAVE END which will save the options and reboot the system.

When MMBasic finds this configuration block of commands (OPTION SAVE BEGIN) it will record the settings without restarting the processor until it encounters the OPTION SAVE END command, all the settings will be saved to battery backed RAM (now powered from main supply) and the processor will be restarted to enable all the drivers at the same time. After the restart the program will be run again but this time the commands in configuration block will be skipped over. The configuration block will be run again after a CPU RESTART command, a reset via the RST key or a power up with no options set. i.e. without battery backup ram storing the options.

The calibration parameters for the touch controller can also be configured in this way. To do this you should use GUI CALIBRATE to calibrate the touch screen at the command prompt in the normal way. Then use OPTION LIST which will list the calibration parameters as something like:

```
GUI CALIBRATE 0, 252, 306, 932, 730
```

This string must be included before the OPTION SAVE END so that the touch calibration settings will be saved along with the other options.

Errors in the configuration commands (for example the same I/O pin allocated to two different functions) are often detected during the reboot. However, this is not guaranteed so the configuration commands should be thoroughly tested at the command prompt before being embedded in a program.

This is an example of the sequence to configure an SPI ILI 9341 LCD Panel at startup, configure and calibrate touch, set the console to the serial console at 38400 bauds and set the backlight to 80%.

```

`This block of code will disable the default LCDPANEL
`Configure the ILI9341 and the Touch panel and switch to the serial
`console at 38400 and then restart with the new settings
OPTION SAVE BEGIN
OPTION LCDPANEL DISABLE
OPTION LCDPANEL ILI9341, LANDSCAPE, PC7, PC6, PD11
OPTION TOUCH PC12, PC5
GUI CALIBRATE 0, 3756, 3901, -882, -647
OPTION SERIAL CONSOLE ON
OPTION BAUDRATE 38400
BACKLIGHT 80,S
OPTION SAVE END
`The main program is then placed here
`it must include the MM.STARTUP Subroutine somewhere
SUB MM.STARTUP
    OPTION AUTORUN ON
END SUB

```

OPTION AUTORUN ON in MM.STARTUP (No Battery Backed up Options)

To have the configuration block run at startup requires OPTION AUTORUN ON to be set. The default is OFF, so when the default options are loaded at startup the the program will not normally run to load the configuration block.

The MM.STARTUP subroutine can be used to set the OPTION AUTORUN ON command. When the Armmite F4 is first powered up, RST button pushed or CPU RESTART command issued it will search for this subroutine and, if found, it will be run once.

This simple MM.STARTUP subroutine must be included in the program somewhere. It will cause the program in memory to execute at startup.

```

SUB MM.STARTUP
    OPTION AUTORUN ON
END SUB

```

This more complex version may be useful during development. It will auto execute the program after the initial power up, but will return to the command prompt for any further CPU RESTART or pushes of the RST button. This can be useful if you want to manually start the main program during development. If your, not quite finished program does not behave you can push the RST button to get the command prompt back.

Any power reset, however will automatically restart the main program. If your, not quite finished program does not behave you can push the RST button to get the command prompt back.

```

SUB MM.STARTUP
    IF MM.INFO$(RESTART)="0" THEN
        OPTION AUTORUN ON
    ELSE
        OPTION AUTORUN OFF
    END IF
END SUB

```

***Note:** OPTION RESET should not be used unless you really want to reset the options to default. It will switch to the USB Console and the default ILI9341_16 screen and sit at the command prompt. This is most likely not what you want in this situation.*

VAR Save VAR Restore not available.

If running without a battery the variables stored using VAR SAVE are not available. If you need persistant data between program runs then this would need to use another mechanism. i.e. The W25Q16 flash or an SDCard.

Startup and Reset – Quick Reference

This table provides a quick reference to the various start up and reset modes available for MMBasic and the Armmite F4.

Operation	Details
Normal Startup	<p>A normal start up is initiated by power being applied, the RST button being pressed or the CPU RESTART command.</p> <p>Each of these will cause MMBasic to restart. It will look for some key Options to be set which indicate that the options have been previously saved and are valid. e.g. checks Baudrate is not 0, that a TAB option is set. If the options pass this integrity check then MMBasic is started using these previously saved Options.</p> <p>If the Options are see as not yet set, then the default Options are loaded. This would be the case if the backup memory has never been used, the backup battery is flat or removed.</p> <p>The MM.STARTUP routine is searched for and if found any code in it is then executed.</p> <p>If OPTION AUTORUN ON is set then any program in the program memory is run, otherwise the command prompt is shown.</p>
Set Default Options	<p>The default Options are set as above if the Options are not deemed valid at startup.</p> <p>The OPTION RESET command will also set the default Options.</p> <p>This means the USB Console is enabled, The Serial Console is disabled and the ILI9341_16 LCD and TOUCH are enabled.</p> <p>MMbasic will restart to the command prompt.</p>
MMBasic Reset	<p>This will clear any save variables in the battery backed RAM, set the default Options and clear the program memory. This is achieved by initiating a restart with Key 1 held down or PE3 connected to Gnd.</p> <p>Setting the default options means the USB Console, LCD and Touch as above will be initiated.</p>
Serial Console Startup	<p>Holding Key 0 or connecting PE4 to Gnd while initiating a restart will enable the Serial Console and disable the USB Console.</p>
Firmware Upgrade	<p>Loading new firmware will not clear the stored variables or the program memory or change the Options.</p> <p>Connecting BT0 to 3.3v and restarting will put the Armmite in the bootloader mode, ready to accept new firmware.</p>
Startup with Configuration Block	<p>See the section Armmite F4 as Embedded Controller for details. This is used to run the Armmite F4 without a backup battery. At first startup the default options are set. The MM.STARTUP routine includes OPTION AUTORUN ON so the main program is executed. The main program has a configuration block of code bounded by OPTION SAVE BEGIN and OPTION SAVE END. This block includes OPTION LCDPANEL etc commands that are not normally allowed in a program. Once the OPTION SAVE END is reached MMBasic is restarted with the new options. On this restart the Configuration Block is skipped and the rest of the program is run.</p>