

# Analog Guitar Effect with User Presets

Recallable and Reprogrammable Settings Based on a Roland Dimension-D, and Powered by the STM32F29I-DISC1

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## Overview

The Roland Dimension-D was an analog rackmount effect unit popular in music production through the 1980s. It was famous for having only 5 buttons (one of which was an OFF) that engaged different modulation effects on the input audio signal.

[Video Demonstration](#), Source: Retrosonic Pro Audio

Using an STM32 demo board, I recreated that functionality in a Dimension-style analog circuit, but without the Dimension-D's mechanical buttons. This enables me to put the full authentic effect into a smaller floor or desktop-based unit. The device had "secret settings" some studios used as signature sounds and were achieved by pressing more than one of the buttons down at once, managing to get them to lock into place despite the button array's shared mechanical reset. Some modern replications of the Dimension-D omit these secret settings, but I am able to add them back as well as saving my own bank of settings, and allowing the user to program the device and save their own personal settings.

## Microcontroller Hardware Used

STM32F29I-DISC1

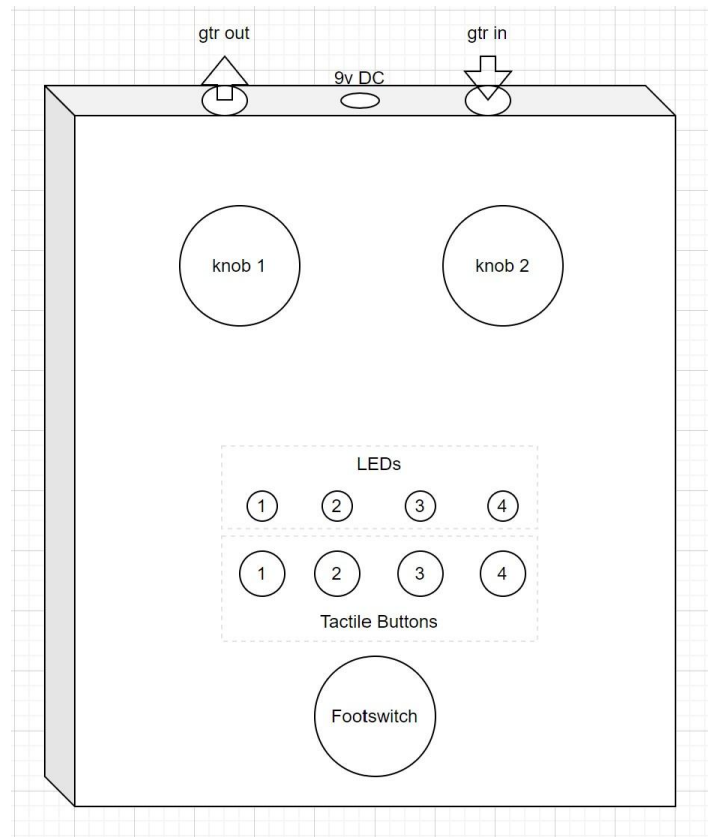
Processor: STM32F429ZIT

Arm® Cortex®-M4

## Software Environment

Programmed and debugged via STM32CubeIDE using the STMicroelectronics STM32F4 Hardware Abstraction Layer.

# Device Description



*Fig 1 - Device UX Layout Concept*

The device will have 2 knobs consisting of potentiometers acting as a voltage divider between GND and a reference voltage (5 Vdc), each read by a different ADC pin on the microcontroller. Knob 1 will control the level of the DEPTH, Knob 2 will control the RATE. Settings are written to digital potentiometers in the analog signal-modulating circuit via I<sup>2</sup>C. When a knob turn is detected (and is over a specified THRESHOLD), the unit snaps out of BUTTONS mode, goes into KNOBS mode, and is controlled entirely by the positions of the DEPTH and RATE knobs.

The footswitch will turn the unit from On (signal effect) mode to Off (guitar signal bypass) mode.

Factory settings and user-programmed settings are stored in flash memory, and re-written by holding a specific

The tactile buttons select a preset to be used. The unit reads the preset from memory, then writes the correct values to the device's internal digital potentiometers.

To access alternate button functions, Button 1 can be held down for 2 seconds and the LED lights will begin to blink. While still holding Button 1, Buttons 2 and 3 are used to move up or down to new "banks" of presets, indicated by a different color on the RGB LED array.

To write a new preset, the user must go to the USER bank, find their desired settings using the Knobs, then hold down the button they want to write their preset to for 5 seconds. During the hold time, the corresponding LED will swell, then a quick 3 blinks indicates that the new preset has been written. If the user lets go of the button during the LED swell, the unit will return to the previous state.

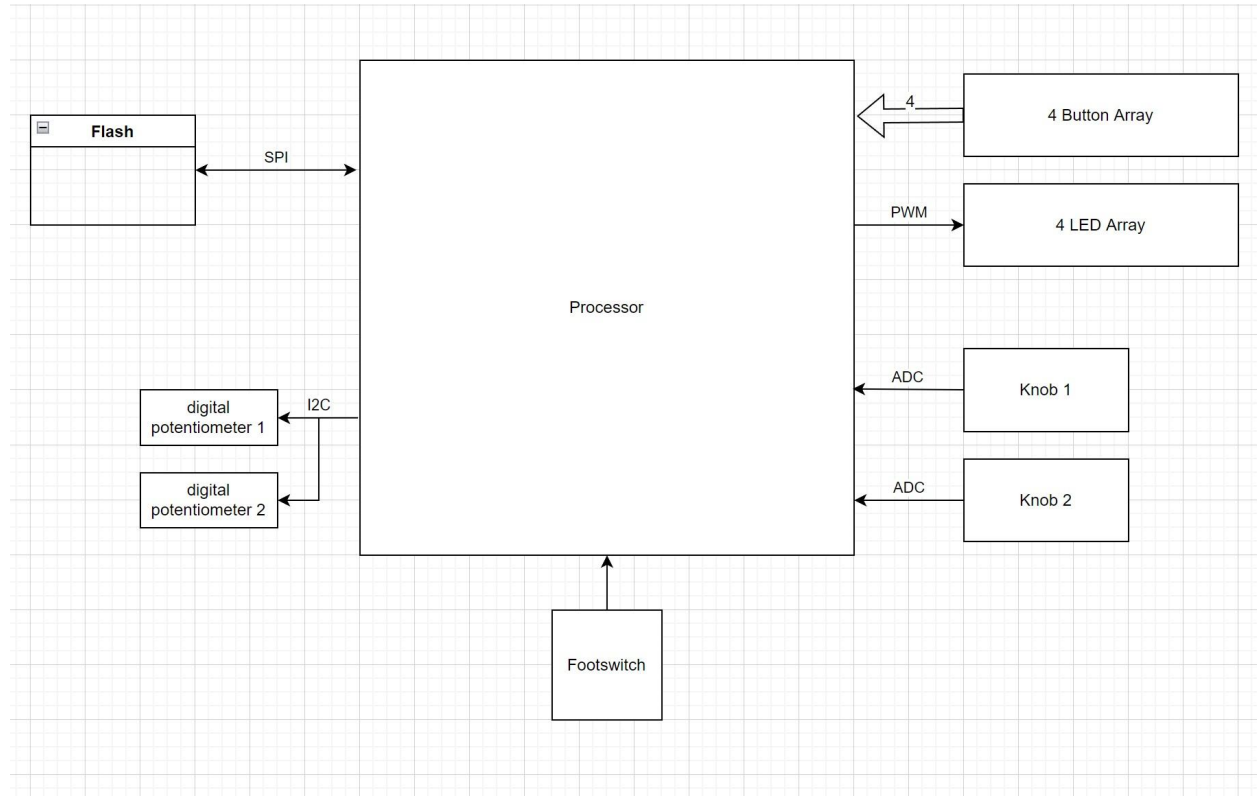
Presets can also include multiple buttons pressed at once. To select one of these “secret” presets, simply press two of the buttons at once. To write to a two-button preset, go to a USER bank, then write a preset by holding the desired two buttons as you would if writing to a single button.

The device is always on when connected to power, as guitar pedals are usually set to a desired setting, then left alone for long periods that might otherwise require a TIMEOUT in another system.

Power is supplied via a  $9V_{DC}$  2.1mm type-M connector.

## Function Diagrams

### Hardware Block Diagram



*Fig 2 - Hardware Block Diagram*

## Software Block Diagram

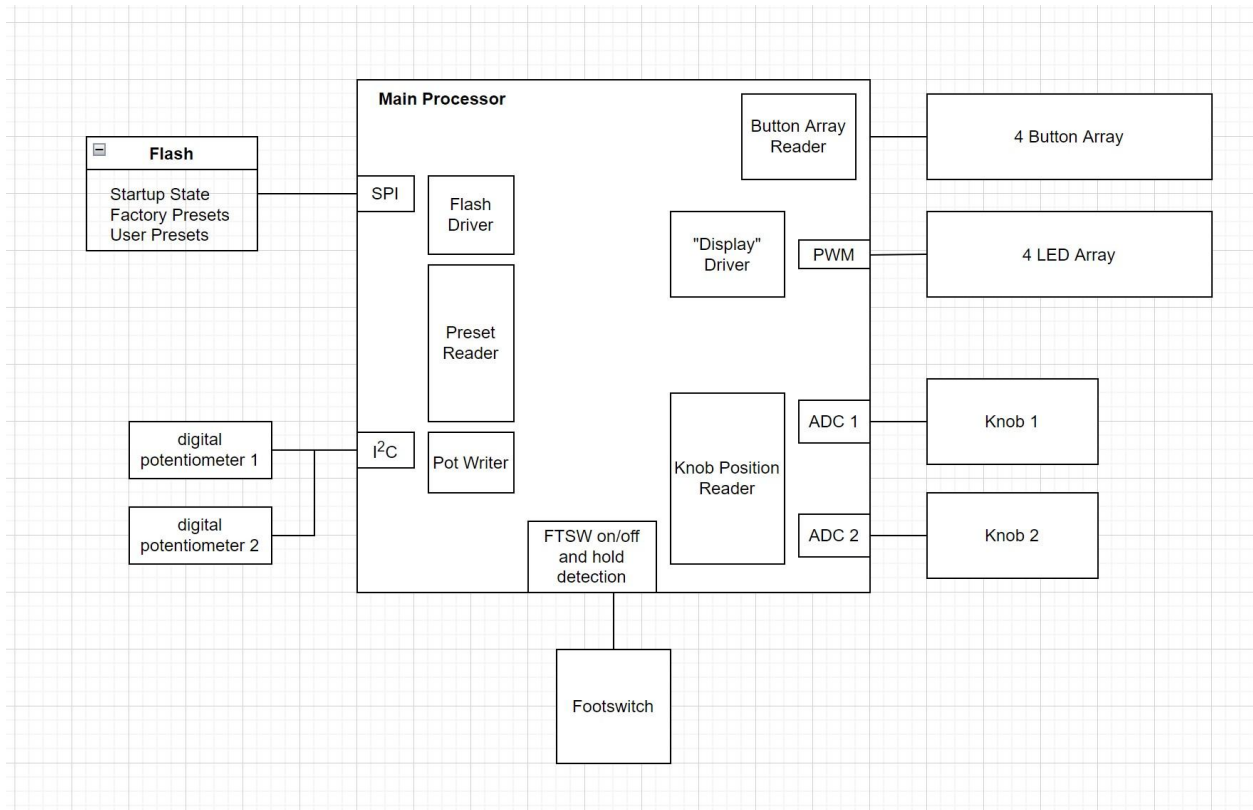


Fig 3 - Software Block Diagram

## Hierarchy of Control

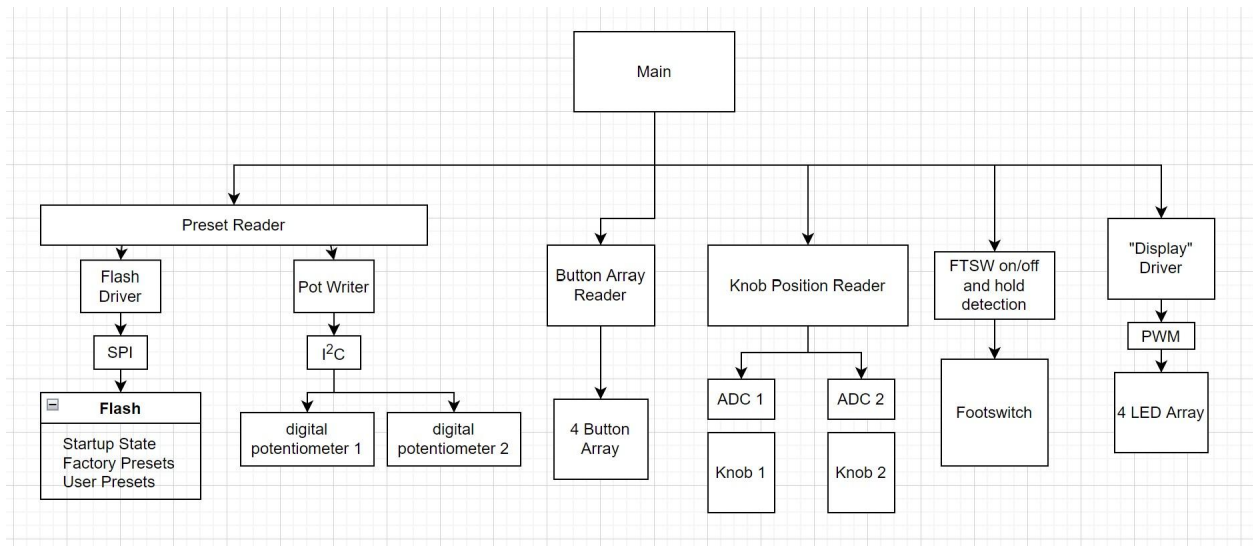


Fig 4 - Hierarchy of Control

## Flowchart

TODO

## State Table

TODO