Technical Whitepaper

Evacuation Mute Implementation on ACX Pluto Series DSPs

1. Introduction

In modern public address and voice alarm (PAVA) systems, the ability to mute or override normal audio distribution during an emergency is a crucial safety feature. This process, known as Evacuation Mute, ensures that all non-essential audio signals are silenced, allowing the evacuation or alarm messages to take full priority.

The ACX Pluto Series DSPs provide a flexible and reliable way to implement an evacuation mute mechanism through a combination of audio signal monitoring and internal logic processing. This document describes the theory, purpose, and practical implementation of an evacuation mute function using Pluto DSPs without the need of dedicated GPIO contacts.

2. Concept Overview

An Evacuation Mute is a safety-driven control function triggered by an external emergency system. When an evacuation alarm is activated, or a fault is detected, the DSP automatically mutes or attenuates the regular program audio, ensuring that emergency messages remain clear and undisturbed.

2.1 Typical Use Cases

- Voice alarm and evacuation systems in public buildings.
- Industrial or marine communication systems.
- Theatres, airports, or transport hubs requiring emergency paging integration.

2.2 Core Principle

The Pluto DSP continuously monitors an audio pilot tone, a 1 kHz signal routed through the evacuation control relay circuit. The tone acts as a “heartbeat,” confirming the integrity of the audio signal path.
When the tone level drops (e.g., due to a relay opening or a cable fault), the DSP logic detects the absence of the tone and triggers a mute control, attenuating all standard audio outputs.

3. System Architecture

3.1 Signal Flow Description

1. **Pilot Tone Generation:**
   The Pluto DSP generates a 1 kHz pilot tone via a dedicated analog output channel.
2. **Relay Circuit:**
   The pilot tone is routed externally through a Normally Closed (NC) relay contact in the building's evacuation system.
   - Under normal conditions: the relay is closed, allowing the pilot tone to loop back to a DSP analog input.
   - During evacuation or a fault: the relay opens, breaking the signal path.
3. **Tone Monitoring:**
   The corresponding analog input monitors the returning pilot tone level.
4. **Logic Control:**
   When the tone level drops below a defined threshold, internal logic in the DSP generates a mute control signal.
5. **Audio Attenuation:**
   The control logic engages a mute or reduces gain in the main audio path, silencing program audio during the evacuation event.

4. Implementation on ACX Pluto DSP

4.1 Required Components

- One analog output (for pilot tone)
- One analog input (for return monitoring)
- Logic control modules (for threshold detection): 'Audio Signal to Control', 'Control to Logic' and optionally a 'Control Meter'
- 'Logic Controlled Mute' (for main signal path)
- 'Signal Generator' (for pilot tone)

4.2 Step-by-Step Configuration

Step 1 – Create the Audio Loop

1. Connect an analog output from the Pluto to the Normally Closed relay of the evacuation system.
2. From the relay, route the signal back to an analog input on the Pluto.

(Refer to “ACX Pluto Evac Mute Schematic” for wiring illustration.)

Step 2 – Generate the Pilot Tone

1. Insert a Pilot Tone block in the DSP design.
2. Set:
    - Frequency: 1000 Hz
    - Level: 0 dB
3. Connect the output of this block to the chosen analog output.

(Refer to “DSP Schematic Evac Mute” for wiring illustration.)

Step 3 – Monitor the Return Signal

1. Route the analog input signal into an Audio Signal to Control block.
2. Configure the conversion as:
    - Mode: Log
    - Response Time: 0.001 ms (fast detection)
    - Audio Range Low: –100 dB
    - Audio Range High: 0 dB

Step 4 – Define Logic Conditions

1. Connect the output of the control block to a Control to Logic block.
2. Set:
    - Threshold ON: 50%
    - Threshold OFF: 50%
    - Output Invert: Enabled (so that “low signal” = “mute active”).

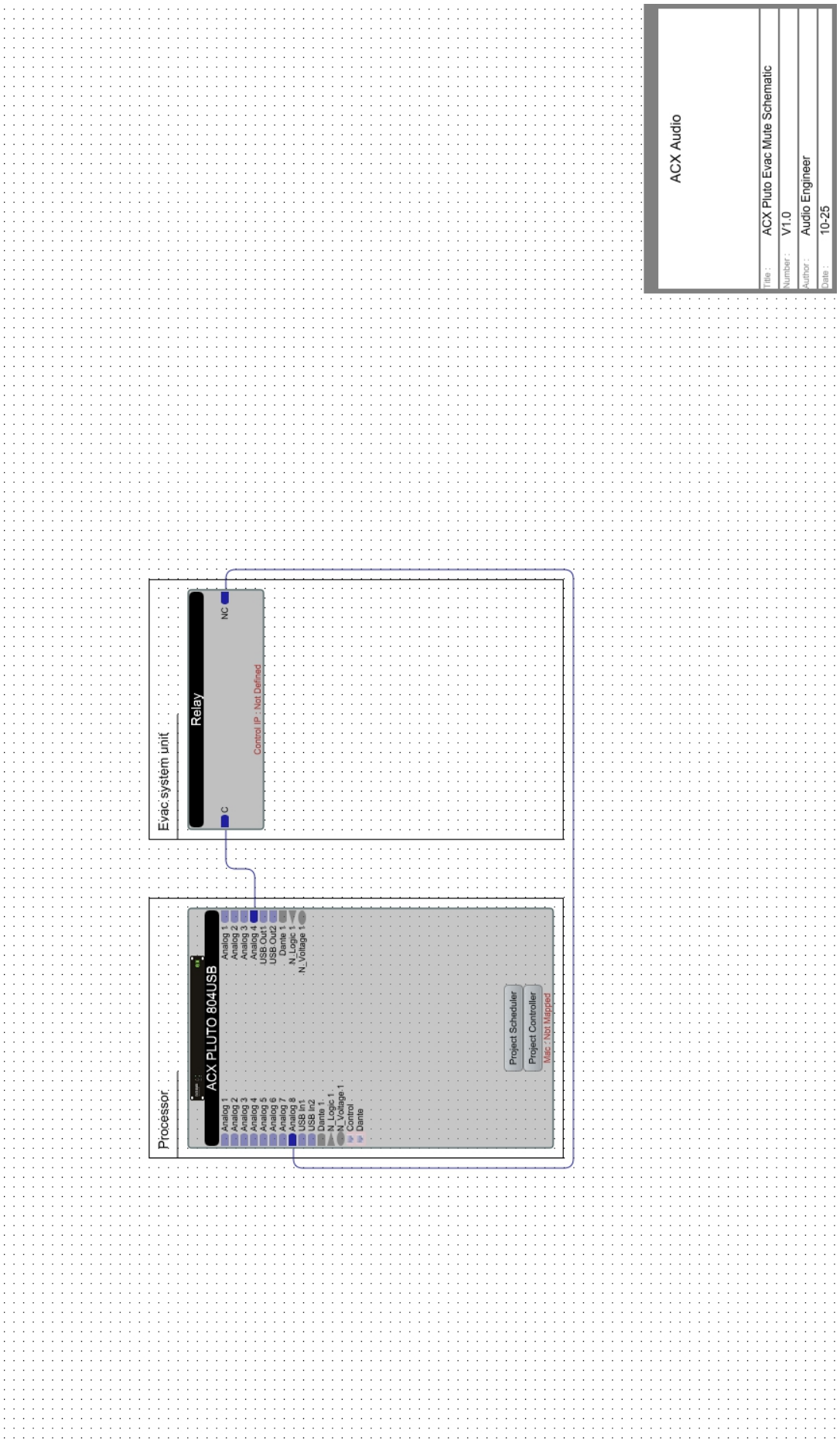
Step 5 – Control the Audio Mute

1. Route the logic output to a Logic Mute or Gain Control block in the main audio path.
2. When the pilot tone is lost, the logic output will automatically trigger a mute state.

5. Fault Scenarios

Scenario	Relay State	Tone Level	Mute Status
Normal operation	Closed	Deteted	Audio active
Evacuation triggered	Open	Not detected	Audio muted
Cable failure	-	Not detected	Audio muted
DSP failure	-	Not detected	Audio muted

ACX Pluto Evac Mute Schematic



DSP Schematic Evac Mute