Firmware Specification

Project Santa Monica
SM-5 / SM-7

DCN 300-000006 Rev X6

Revision History			
Rev #	**Date**	**Description**	**By**
X1	09/13/19	RFQ release	CS
X2	04/01/20	Update for SW requirements; Added hooks for network EQ parameter inquiry, Amp limit status; Added limit status network push.	CS
x3	04/02/20		CS
X4	05/01/20	Added parameter values, ranges, and sets	CS
X5	05/12/20	Typo corrections; Trim ring short touch to double tap; Change trim ring long touch indication and behaviour; Speaker Dim LED Indication; Amp fault clear behavior defined.	
X6	07/21/20	Add factory and control reset; Add network inquiry for mute, dim,LED, active preset, controls enabled and dip override status.; Add controls enable/disable, dip override set/reset, and EQ preset P band N enable/disable.	CS

Table of Contents

1 Purpose

The purpose of this document is to provide sufficient information to develop product firmware.

2 Scope

This document provides the specification for the Kali Project Santa Monica firmware. The behavior of all product operational states are captured along with required network communication handles.

3 Reference Documents / Sources

Network message protocol (TBD).

3.1 Order of Precedence

In the event of a conflict between this specification and the references cited herein, the order of precedence shall be this specification, then any reference documents, and finally any appendices

4 Definitions

“Shall” and “Shall not:” denotes that this consideration is critical for the product. These specifications cannot be deviated from.

“Should” and “should not:” denotes that this consideration is important for the product, but can be negotiated if it affects the implementation of other “Shall” and/or “Should” considerations, or substantially and unnecessarily affects cost. Deviations from these specifications must be specifically approved by Kali Engineering.

“May” and “May not:” denotes that this consideration would be implemented in an ideal product. These considerations shall not interfere with “Should” and/or “Shall” considerations. These specifications can be deviated from without specific approval.

5 Description

Firmware for project Santa Monica shall control operation of and communication with the product.

6 Variables / Network Handles

- Global Variables
  - LED Enable**
  - Standby Enable**
  - Speaker Trim**
  - Speaker Delay**
  - Amp Fault
  - Limiter Engaged
  - Dip Override**
  - Controls Enabled**
  - Active Preset**
  - HF Trim**
  - LF Trim**
  - Dim Status

  **Persistent through power cycle
- Network Handles (Specific protocol TBD)
  - Speaker LED Disable
  - Speaker LED Enable
  - Speaker LED Status Inquiry
  - Speaker Dip Override Set
  - Speaker Dip Override Reset
  - Speaker Dip Override Inquiry
  - Speaker Control Disable
  - Speaker Control Enable
  - Speaker Control Enable Inquiry
  - Speaker Identify
  - Speaker Name Inquiry
  - Speaker Name Set
  - Speaker Delay Set
  - Speaker Delay Inquiry
  - Speaker Trim Increment
  - Speaker Trim Decrement
  - Speaker Trim Level Set
  - Speaker Trim Inquiry
  - Speaker Mute
  - Speaker Unmute
  - Speaker Mute Inquiry
  - Speaker Dim
  - Speaker Undim
  - Speaker Dim Inquiry
  - Speaker Standby Enable Inquiry
  - Speaker Standby Disable
  - Speaker Standby Enable
  - Speaker Standby Delay Inquiry
  - Speaker Standby Delay

- Speaker FW Update
- Speaker Preset Select
- Speaker Active Preset Inquiry
- Speaker EQ Preset P Band N Parameters Set
- Speaker EQ Preset P Band N Inquiry
- Speaker EQ Preset P Band N Enable
- Speaker EQ Preset P Band N Disable
- Speaker EQ Preset P Band N Enable Status Inquiry

- Parameter ranges, values, and sets; resolution; [Default Values]
  - Speaker Name
    - Text Value 12 characters
  - Speaker Delay
    - 0-12ms; 0.05mS resolution; [0ms]
  - Speaker Trim Increment / Decrement
    - 0.5dB
  - Speaker Trim Level Set
    - -12dB to +6dB; 0.5dB resolution; [0dB]
  - Speaker Standby Delay
    - 5 minutes – 2 hours; [20 minutes]
  - Speaker EQ Parameters
    - Filter Type
      - {Low-pass 1st order; High-pass 1st order; Low-pass 2nd order; High-pass 2nd order; Peaking EQ; Low-shelf; High-shelf}; [Peaking EQ]
    - Frequency
      - 10 Hz – 40kHz; [1kHz]; 3 significant figures resolution
    - Gain
      - -24dB - +18dB; 0.05dB resolution
    - Q
      - 0.1 – 15.0; 0.1 resolution

7 State Machine Outline

- State Unplugged Mains
  - Entry Actions
  - Exit Actions
  - Event Mains plugged in
    - Transition to Plugged In Mains State

- State Plugged In Mains
  - Entry Actions
    - If power switch is on then
      - Transition to Switched On State
    - Else
      - Transition to Switched Off State
  - Exit Actions
    -
  - Event Unplug Mains
    - Transition to Unplugged Mains State
  - State Switched Off
    - Entry Actions
      -
    - Exit Actions
      -
    - Event Switch Power On
      - Transition to Switched On State
  - State Switched On
    - Entry Actions
      - Transition to Initialization State
    - Exit Actions
      - Hard Mute Amp
      - LED Solid Amber
    - Event Switch power off
      - Transition to Switched Off State

- State Initialization
  - Entry Actions
    - Hard Mute Amp
    - LED Solid Amber
    - Electronics Stabilize
    - If Touch Ring Pressed then
      - If DIP switch #6 & 8 ON with all others OFF then
        - //Perform Factory Reset
        - Controls Enabled = TRUE
        - Dip Override = FALSE
        - User EQ 0-8 reset to default parameters
        - All persistent variables reset to default values
      - Else
        - //Force stand-alone mode
        - Controls Enabled = TRUE
        - Dip Override = FALSE
    - Initialize DSP
      - If Dip Override is false then
        - Set preset and trims from dip switch
      - Else
        - Set Preset and Trims from NVM
    - Unmute Amp
    - Transition to Active State
  - Exit Actions
    -

- State Active
  - Entry Actions
    - If LED Enabled
      - LED Solid Blue
      - Else
        - LED Solid Blue for 2 seconds, then fade to black 1 second
  - Exit Actions
    - Hard Mute Amp
    - If LED Enabled
      - LED Solid Amber
      - Else
        - LED Solid Amber for 2 seconds, then fade to black 1 second
  - Event Amp / System fault
    - LED solid red
    - Network push amp fault status
  - Event Amp / System fault clear
    - LED solid red
    - Network push amp fault status

- Event Amp Limit
  - LED flashes red while limit is active.
  - Network push limit status
- Event USB Plug In
  - If firmware update file is on the root directory of the drive,
    - then transition to USB FW Update state.
  - Else if EQ parameters file is on the root directory of the drive,
    - then transition to USB EQ Parameter Update state.
  - Else do nothing.
- Event USB Unplug
  -
- Event Speaker Trim CCW
  - If Controls Enabled = true then
    - If trim is greater than -12dB then
      - decrease trim level by 0.5dB
    - Else if trim is at +0.5dB
      - decrease trim level by 0.5dB
      - LED solid white for 2 seconds or until level changed
    - Else (trim at minimum)
      - LED flashes white for 1/10 of a second 2 x per second for 4 seconds or until level changed.
  - Else
    - LED flash Magenta ½ second

- Event Speaker Trim CW
  - If Controls Enabled = true then
    - If trim is less than +6dB then
      - increase trim level by 0.5dB
    - Else if trim is at -0.5dB
      - increase trim level by 0.5dB
      - LED solid white for 2 seconds or until level changed
    - Else (trim at maximum)
      - LED solid white and flashes dark for 1/10 of a second 2 x per second for 4 seconds or until level changed.
  - Else
    - LED flash Magenta ½ second
- Event Trim Ring Double Tap
  - If Controls Enabled = true then
    - Action Transition to Standby State
  - Else
    - LED flash Magenta ½ second

- Event Trim Ring Long Touch
  - If Controls Enabled = true then
    - LED Flash Blue / Amber ½ second period, 2 seconds duration
    - If Standby Enabled
      - Disable Standby
    - If Standby Disabled
      - Enable Standby
      - Transition to Standby
  - Else
    - LED flash Magenta ½ second

- Event DIP Change
  - If Controls Enabled = true then
    - Set Dip Override to false
    - If switch 1-4 changed
      - Update EQ from preset
    - If switch 5-8 changed
      - Update LF / HF Trim
  - Else
    - LED flash Magenta ½ second
- Event Network Speaker LED Disable
  - Acknowledge command
  - Disable LED
- Event Network Speaker LED Enable
  - Acknowledge command
  - Enable LED
- Event Network Speaker LED Status Inquiry
  - Network respond LED status
- Event Network Speaker Dip Override Set
  - Acknowledge command
  - Dip Override = TRUE
- Event Network Speaker Dip Override Reset
  - Acknowledge command
  - Dip Override = FALSE
- Event Network Speaker Dip Override Inquiry
  - Network respond speaker dip override status
- Event Network Speaker Controls Enable
  - Acknowledge command
  - Controls Enabled = TRUE
- Event Network Speaker Controls Disable
  - Acknowledge command
  - Controls Enable = FALSE
- Event Network Speaker Controls Enabled Inquiry
  - Network respond speaker controls enabled status

- Event Network Speaker Identify
  - Acknowledge command
  - LED flash Blue ½ second period for 10 seconds
- Event Network Speaker Name Inquiry
  - Network respond speaker name
- Event Network Speaker Name Set
  - Acknowledge command
  - Set speaker name
- Event Network Speaker Delay Set
  - Acknowledge command
  - Set speaker signal delay time
- Event Network Speaker Delay Inquiry
  - Network respond speaker delay
- Event Network Speaker Trim Inquiry
  - Network respond speaker trim level
- Event Network Speaker Trim Increment
  - Acknowledge command
  - If trim is less than maximum then
    - increase trim level by 0.5dB
    - Network respond speaker trim level
  - Else (trim at maximum)
    - Network respond speaker trim level
- Event Network Speaker Trim Decrement
  - Acknowledge command
  - If trim is more than than minimum then
    - decrease trim level by 0.5dB
    - Network respond speaker trim level
  - Else (trim at minimum)
    - Network respond speaker trim level
- Event Network Speaker Trim Level Set
  - Acknowledge command
  - Set speaker trim level
- Event Network Speaker Mute
  - Acknowledge command
  - Mute speaker
- Event Network Speaker Unmute
  - Acknowledge command
  - Unmute speaker
- Event Network Speaker Mute Inquiry
  - Network respond speaker mute status

- Event Network Speaker Dim
  - If not currently dimmed
    - Acknowledge command
    - LED slow pulse blue
    - Adjust level by -20dB
  - Else
    - Do nothing
- Event Network Speaker Undim
  - Acknowledge command
  - If currently dimmed
    - LED Solid Blue
    - Adjust level by +20dB
  - Else
    - Do nothing
- Event Network Speaker Dim Inquiry
  - Network respond speaker dim status
- Event Network Speaker Standby Enable Inquiry
  - Network respond Standby Enable Status
- Event Network Speaker Standby Disable
  - Acknowledge command
  - Disable standby
- Event Network Speaker Standby Enable
  - Acknowledge command
  - Enable standby
- Event Network Speaker Standby Delay
  - Acknowledge command
  - Set standby timer
- Event Network Speaker Standby Delay Inquiry
  - Network respond Standby Delay
- Event Network Speaker Preset Select
  - Acknowledge command
  - Set Dip Override to true
  - Select preset
- Event Network Speaker Active Preset Inquiry
  - Network respond speaker active preset
- Event Network Speaker EQ Preset P Band N Parameters
  - Acknowledge command
  - Update EQ band N parameters in preset P
- Event Network Speaker EQ Preset P Band N Inquiry
  - Network respond EQ band N parameters in preset P
- Event Network Speaker EQ Preset P Band N Enable
  - Acknowledge command
  - Enable speaker EQ preset P Band N

- Event Network Speaker EQ Preset P Band N Disable
  - Acknowledge command
  - Disable speaker EQ preset P Band N
- Event Network Speaker EQ Preset P Band N Enable Status Inquiry
  - Network respond EQ preset P Band N enable status.

- State Network FW Update
  - Acknowledge command
  - Entry Actions
    - Mute Amp
    - Receive file / Update FW
    - LED flashing green ½ second period
  - Exit Actions
    -
  - Event USB Plug In
    - Ignore
  - Event USB Unplug
    Ignore
  - Event Speaker Trim CCW
    - Ignore
  - Event Speaker Trim CW
    - Ignore
  - Event Trim Ring Short Touch
    - Ignore
  - Event Trim Ring Long Touch
    - Ignore
  - Event file receive error
    - Abort FW update
    - LED flashing Red / Green ½ second period for 2 seconds
    - Transition to Active State
  - Event Success
    - LED solid green for 2 seconds
    - Transition to Initialize State

- State USB FW Update
  - Entry Actions
    - Mute Amp
    - Read file / Update FW
    - LED flashing green ½ second period
  - Exit Actions
    -
  - Event Speaker Trim CCW
    - Ignore
  - Event Speaker Trim CW
    - Ignore
  - Event Trim Ring Short Touch
    - Ignore
  - Event Trim Ring Long Touch
    - Ignore
  - Event Network Command
    - Respond Busy
    - Ignore Command
  - Event file read error
    - Abort FW update
    - LED flashing Red / Green ½ second period for 2 seconds
    - Transition to Active State
  - Event USB unplug
    - Abort FW update
    - LED flashing Red / Green ½ second period for 2 seconds
    - Transition to Active State
  - Event Success
    - LED solid green for 2 seconds
    - Transition to Initialize State

- State USB EQ Parameter Update
  - Entry Actions
    - Set Dip Override to false
    - If Dip Switch # 4 (user EQ) is ON then
      - Mute Amp
      - Read file / Update EQ parameters in DIP selected preset
      - LED flashing Cyan ½ second period
    - Else
      - LED flashing Red / Cyan ½ second period for 2 seconds
      - Transition to Active State
  - Exit Actions
    -
  - Event Speaker Trim CCW
    - Ignore
  - Event Speaker Trim CW
    - Ignore
  - Event Trim Ring Short Touch
    - Ignore
  - Event Trim Ring Long Touch
    - Ignore
  - Event Network Command
    - Respond Busy
    - Ignore Command
  - Event USB unplug
    - Abort EQ update
    - LED flashing Red / Cyan ½ second period for 2 seconds
    - Transition to Active State
  - Event file read error
    - Abort EQ update
    - LED flashing Red / Cyan ½ second period for 2 seconds
    - Transition to Active State
  - Event Success
    - LED solid Cyan for 2 seconds
    - Update EQ from preset
    - Transition to Initialize State

- State Standby
  - Entry Actions
    - Enter low power mode
  - Exit Actions
    -
  - Event Trim Ring Short Touch
    - Action Transition to Active State
  - Event Signal Detect

    - Action Transition to Active State

Notes:

- If Dip Override is true, then if the dip switch is changed while the unit is off or in standby, the change wont take effect when the unit is powered on or wakes from standby.
- All sub-states inherit events from their parent states unless specified otherwise