Little DARling System User Manual

Little DARling Distributed Audio Recorder
Little DARling Distributed Audio Recorder with DARlink
DARlink Wireless Remote Control

1 Contents

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"Read this First" and the "Quick Start Guide" are great places to begin ...

2 READ THIS FIRST

2.1 Introduction

2.1.1 Thank You!

Congratulations on your new Little DARling! I have so much fun bringing you these unique juicedLink products, so I thank you for your support! In addition to the products, I really enjoy sharing my experience, and teaching the community about the best practices for achieving great audio on a budget. So, make sure you subscribe to the juicedLink Blog. In addition to getting notified on updates to our Audio University series and Free Field Guide to Audio Production eBook, you'll get notified on any firmware updates for the Little DARling and other new product introductions.

Before operating the unit, please read this manual thoroughly. If you need any clarification of what is presented in the manual, then please don't hesitate to Contact me for assistance.

- Robert from juicedLink

2.1.2 How to Print/View This Document

Many PDF type documents are very difficult to read in the field on the small screens of smart phones, requiring the user to zoom in and scroll right and left to read each line in a paragraph. The font size and margin in this document were selected as the best option for viewing on a variety of screen sizes, from desktops down to smart phones. Here are recommended viewing configurations:

- Desktop/Laptop: Adobe Reader set to VIEW > PAGE DISPLAY > TWO PAGE VIEW
- Tablet: Hold tablet in vertical orientation.
- Smart Phone: Hold phone in horizontal orientation.

The margins are very small in order to fit the text to the entire page width. So, to print this document, you will need to use page scaling, and fit the document to the printable area. A better option is to use the page scaling option, select multiple pages per sheet, and specify 2 sheets per page. This will print with a readable font, and more information with less page flipping.

2.1.3 Document Notation Conventions

- References to markings/labels on the unit are denoted in underline/bold.
  - Example: **MIC IN**
- References to characters on the display will use a 7-segment font.
  - Example: *P* represents the character “P” displayed for “play”.
- Commands used in the Config File will be represented in the font `Courier`.
- Warnings will be preceded with WARNING
- Hyperlinks are used to navigate within the document and to link to external web pages.
  - For example, CONTENTS brings you back to the document Table of Contents, and juicedLink links to the juicedLink website.
- Some sections may have aids to help understand the material, such as overview figures or links to external tutorial videos.

Direction to the aids (videos, figures, etc) will be enclosed in a box like this.

2.2 Warnings – General

WARNING: Failure to read and observe notes and warnings may result in personal injury, and/or possible damage to this device and your other equipment.

WARNING - LOSS OF HEARING: This device, as well as any device with a headphone amplifier, is capable of driving the signal at levels that can be damaging to hearing. Always operate the headphone volume at the lowest practical level. Do not wear the headphones over your ears in any of the following circumstances:

- While plugging the headphones into the headphone driving device.
- While plugging a microphone or other source into the device input.
- While turning on or off the device.

WARNING - RISK OF ELECTRICAL SHOCK: This device, its enclosure, and the connections to cable shields that plug into this device are conductive. Avoid electrocution and observe caution with cable runs near areas where high-voltages and/or currents may exist.

3 Quick Start Guide

This section is a quick outline of the steps needed to get up and running. There will be links to other sections in the document and/or tutorial videos, to provide further detail and direct to more advanced features beyond the scope of the Quick Start Guide.

3.1 Preparation and Card Hygiene

Watch a tutorial video covering the following steps

1. **Subscribe to the juicedLink Blog** – Subscribe to the juicedLink Blog to get notified on any future updates to the firmware or config files.
2. **Download Required / Optional Files**
   - Visit the Little DARling Downloads page on the juicedLink website.
   - Download the required firmware bootimg.bin file.
   - Download the optional configuration file example config.ini.
     - For more on the use of configuration files, see Use of Config Files in Advanced Topics.
3. **Pretested Approved List of microSD Cards** – Select a card from the Pretested Approved list of microSD Cards.
4. **Download / Install the SD Association Card Formatter** – Download SD Formatter for PC/MAC from the SD Association website.
5. **Download Previously Recorded Audio Files to your Computer** – Assuming that have already used the card for a DAR recording, now it the time to download the recordings to your computer.
6. **Use SD Association Formatter to Format Card** -
   - Use the standard option settings (Format type – Quick, Size Adjustment – off).
   - **THIS MUST BE DONE EVERY TIME PRIOR TO INSERTING THE SD CARD.** So, after you have finished a day of recording, you will download your recordings to your computer. Then, you will format the SD card again. See “Time-Saving Tip”, below, on how to do this efficiently with multiple DARs / cards.
7. **Copy Files to microSD Card** – *It is required that the bootimg.bin file is pre-loaded on the microSD card for the unit to boot up and operate. Config files are optional and not required.*
8. **Time-Saving Tip -** I use multiple DARs simultaneously. Also, I do not use

the same configuration file for each DAR, since each is dedicated to a specific purpose (discussion of config file contents is beyond the scope of this section). As an example of my production flow, let's say I am using 8 DARs.

- I will label each unit DAR1, DAR2 … DAR8.
- I will also have a folder on my computer for each DAR.
    - Each folder is labeled DAR1, DAR2 … DAR8.
    - Each folder will contain:
        - bootimg.bin
        - A config.ini tailored to the needs of the specific DAR
            - For example, I will have the config file specify a recorded filename with some indication of the DAR (eg. DAR1, DAR2, etc.)
            - Also, where wireless DARlink is being used, I will have the DARs being worn by the talent deactivate the buzzer, while the DAR used with the camera enables the buzzer.
- At the end of a day of recording, I will insert the card (say, for DAR1) into the computer, then:
    - Download the recorded audio files to my computer.
    - Use the SD Association Formatter
    - Copy/Paste the contents of the DAR1 folder (bootimg.bin, config.ini) to the root directory of the card that will then get inserted into DAR1

3.2 Insert Battery, Card, Power On/Off, Attach Accessories

Watch a tutorial video covering the following steps

9 **Open Battery/microSD Cover** – Twist the thumbscrew counterclockwise to loosen, and remove the cover.

10 **Insert microSD card** – First, make sure *every step* has been followed to prepare the SD card in the Preparation and Card Hygiene section. Insert the microSD card with bootimg.bin and any config files that you wish to use into the microSD slot in the orientation with the microSD electrical contacts facing the surface of the printed circuit board. Push it in all of the way until it clicks.

11 **Insert AA battery** – As a distributed audio recorder, you will not be within eyesight of the recorder to check the battery level. So, it's recommended to always begin operation with a fresh battery. The bottom of the battery holder

has “+” and “-” indicators. Insert a single AA battery into the battery holder with the proper orientation. For more information about powering the device including battery types and battery life estimates, please jump to the Batteries and Battery Life section.

12 **Close Battery/microSD Cover** – Place the cover over the battery, and position the alignment pin and hole. Make sure the plastic tab has been tucked inside the enclosure to cover the microSD slot. Twist the thumbscrew clockwise to secure the cover.

13 **Power On** – The **PWR/STOP** (middle) buttons is recessed, and will require a pointed object (the tip of your microphones 3.5mm miniplug connector can be used) to engage. The button is recessed for operations that must not be accidentally interrupted (such as stopping the recording) while in the pocket of your talent. Press the **PWR/STOP** (middle) button to power on the device. Once powered, the display will

- Rotating effects until it boots
- c followed by a number will briefly be displayed. This indicates the number of line-items that have been read from a config file.

14 **Power OFF** – Hold down the **PWR/STOP** (middle) button for 3 seconds, and the unit will power down.

15 **Mounting DB002 Belt Clip** – The enclosure has 2 mounting threaded holes/PEMs for attaching accessories. Attaching the DB002 belt clip is not intuitive. Please see the video on the DB002 product page.

3.3 Navigation of Menus

Watch a tutorial video covering the following steps

16 **Get Familiar with Menus** – Pressing the **UP** (right) and **DOWN** (left) buttons will cycle through the menu. Holding one of the buttons will scan quickly through the menu.

16.1 G = **G**ain of codec amplifier
16.2 r = **r**ecord
16.3 P = **P**lay
16.4 h = **h**eadphone volume control.
16.5 S = **S**torage: Amount of storage left on microSD card
16.6 b = **b**attery: Relative battery voltage.
16.7 c = **c**onfiguration: Number of line items that have been read from a config file.
16.8 t = **t**ransmitter decode switch settings : DARlink wireless

enabled units only.

16.9 *F* = ***F*irmware**: Displays the Firmware Version

17 **Selecting a Menu Item** – Pressing both the **UP** and **DOWN** buttons simultaneously will select that menu item for execution or manipulation of the parameters. Pressing both the **UP** and **DOWN** buttons simultaneously again will exit that menu item, and return to the main menu.

18 **Check Storage Availability** – Select *5*, and a number from 0-9 will be displayed indicating the % of memory available on the microSD card.

19 **Check Battery Level** – Select *b*, and a number from 0-9 will be displayed indicating the relative battery strength. For more information about powering the device including assigning the battery type used, battery life estimates, and the limitations in the accuracy of the meter, please jump to the Batteries and Battery Life section.

20 **Number of line items read in config.ini** – Select *c*, and a number from 0-9 will be displayed indicating the number of line items read from the config.ini file.

21 **Check Firmware Version** – Select *F*. A sequence of 4 numbers will be displayed to represent the firmware version for each element, and the buttons will cycle through the different elements.

- *Fd* represents the DSP bootimg.bin firmware
- *F5* represents the Supervisor firmware
- *Ft* represents the transmitter decode firmware
- The current version numbers are recorded in the Firmware Version section.

3.4 Basic Recording/Playback

Watch a tutorial video covering the following steps

22 **Connect a Microphone** – The input is a 3.5mm locking TRS (tip/ring/sleeve) jack. Plug-in power (which is not the same as phantom power) is provided on the tip and ring for electret elements common in lavalier mics. The audio feeding the preamp is taken from the tip. The preamp then feeds 2 channels of the codec recording 2 files (the second recorded at a lower level as a safety track, in case the main recording gets blown out).

23 **Mic selection and proper use** - Lav mic selection (polar pattern and signal-to-noise performance) as well as proper microphone placement will effect the recording quality of your talent. This is beyond the scope of the Quick Start Guide, but more information can be found in the free juicedLink Field

Guide to Audio Production. There, you will learn the "*SANASENECYA*" techniques for achieving excellent audio, even on a budget.

24 **Adjust the Gain using Meter as guide** – Entering the G menu allows for adjustment of the codec audio gain, and the signal level meter is displayed on the right display. You will want to adjust the gain so the peaks splash up to the C on the display.

25 **Check Audio Quality with Headphones** – The meter provides an indication as to the signal level, but it does not provide any indication as to the quality of the audio signal. For instance, you may be experiencing a lot of wind noise, but you would not know this by observing the meter only. So, you will plug headphones into the headphone jack. Going to the h menu allows for adjustment of the headphone volume. The headphone signal is present in the left earcup. The right output is used for a slate tone initiated from a DARlink wireless remote.

26 **Start a Recording** – Entering the r menu starts a recording. The display the recording number and then will go blank, with the exception of a blinking decimal point indicating recording in progress. While recording, the **UP** and **DOWN** buttons will lock to prevent undesired changes to settings while on your talent. Also, the headphone out will mute. The only signal present at the output jack will be the slate signal initiated by a DARlink wireless remote.

26.1 **Adjustments During Recording** – Although the headphone is muted and both the **UP** and **DOWN** buttons are disabled during a recording event, the unit can be put into a temporary state to monitor and adjust limited audio parameters while recording, without having to completely stop a recording.

- Press both the **UP and DOWN** buttons simultaneously, and the both
- decimal points will start blinking rapidly. You then have 5 seconds to press the recessed **PWR/STOP** button (the tip of your microphones 3.5mm miniplug connector can be used).
  - The Storage amount remaining indicator will be displayed for ~2sec.
  - The battery indicator will be displayed for ~2sec.
  - The Gain menu and meter will be displayed and the headphone un-muted. You have ~60sec to make your desired gain adjustments, before the headphone mutes and the **UP** and **DOWN** buttons become inactive, as it returns to the normal recording state.

27 **Stop Recording** – Press the recessed **PWR/STOP** button to stop the recording (the tip of your microphones 3.5mm miniplug connector can be used). The recording number will be displayed, before going back up to the top level menu directory.

28 **Playback a Recording** – Enter the *P* menu to playback recordings. Hitting the **DOWN** button will rewind the current file to the beginning. Hitting the **DOWN** button again will jump to the beginning of the previous file. Hitting the **UP** button will jump to the beginning of the next file.

29 **Power Off** – Press and hold the recessed **PWR/STOP** button for ~3sec to power off the unit (the tip of your microphones 3.5mm miniplug connector can be used).

30 **Save recorded file to your computer** – Remove the microSD card from the DAR, and insert it into your computer. Follow the *Time-Saving Tip* in the Preparation and Card Hygiene section for quickly formatting and copying required files to the cards for multiple DARs.

3.5 Wireless Remote Control

Watch a tutorial video covering the following steps

31 **Equipment** – This section requires a Little DARling Distributed Audio Recorder with DARlink, and a DARlink Hand-held Remote Control Transmitters. A single transmitter can control multiple DAR recorder units.

32 **Match the Transmitter DIP switch settings** – On the transmitter, select a sequence of DIP switches as the scramble key (you can do this at random, if you are only using a single transmitter in your kit). The Transmitter DIP Switch Map section shows the location of the switches, and what those settings will correspond to for setting on the DAR. On the DAR, enter the *E* menu, and match the settings you selected.

33 **Start a recording** – Hitting the **REC** button will remotely commence recordings on the target DARs. This can be enabled/disabled by the the Use of Config Files. TIP: When using multiple DARs, it is convenient to be able to start them all at once, so I keep this enabled. Note, this should not be used to align recordings, and the slate tone should be used instead.

34 **Slate a recording** – Hitting one of the numbered buttons will remotely activate a slate signal recorded in the target DARs. A number of slate parameters for each button can be customized by the Use of Config Files.

35 **Send slate to a camera** – The slate signal is also present at the output jack, which can be connected to the mic input on a camera and recorded by its

audio.

36 **Stop a recording** - Hitting the **STOP** button will remotely terminate recordings on the target DARs. This can be enabled/disabled by the the Use of Config Files. TIP: I disable this, so I can't accidentally stop the DAR recordings from the remote control.

37 **Advanced Topics** – Beyond the scope of the Quick Start Guide, the DARlink Multi-Recorder and Multi-Camera Production Flow section will explain how the slate can be used as a tool to help align all of these clips, and also explain how the range of the wireless system is not critical in this flow.

4 Little DARling Distributed Audio Recorders

4.1 Part Number Key

This revision of the User Manual was written for the following part numbers:

4.1.1 Little DARling Distributed Audio Recorder

- DAR123

4.1.2 Little DARling Distributed Audio Recorder with DARlink

- DAR124RX01

4.2 Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

4.3 Firmware Version

The version of firmware running on the Little DARling can be obtained by viewing the *F* menu. This User Manual was written for the following revisions:

- DSP (bootimg.bin file)
  - 3658 – Initial Release
- Supervisor
  - 3636 – Initial Release
- Wireless-RX
  - 3643 – Initial Release

The latest version of this User Manual document, and the latest versions of firmware, can be obtained from the Little DARling Downloads page. The appendix contains the Firmware Update Procedure.

4.4 Control Descriptions

Most of the control and user interface descriptions have already been covered in the Quick Start Guide and videos. The Navigation of Menus section and video covers

the front panel buttons, display, and menu system. The available commands for the configuration file are described in the Use of Config Files section.

4.5 Theory of Operation

4.5.1 Audio Signal Path

4.5.1.1 Microphone Input and Plug-in Power

The input is a 3.5mm locking TRS (tip/ring/sleeve) jack. Plug-in power (which is not the same as phantom power) at 3V is provided on the tip and ring for electret elements common in lavaliere mics. The audio feeding the low-noise preamp input is taken from the connector tip.

4.5.1.2 Preamplifier and Codec Input

Audio from the microphone connector tip feeds the input of the low-noise preamplifier. The output of the low-noise preamp is then split into two signals. One signal feeds input channel of the codec directly. The other signal is sent through an attenuator and feeds a second channel of the codec. This provides for a second track recorded at a safe lower level, in the event that the main channel gets blown out (perhaps, by a loud signal event, such as your talent screaming).

4.5.1.3 Headphone Output

The left channel of the output connector contains the headphone signal coming from the codec headphone amplifier. The headphone mutes when a recording is started. For more details, see the System Actions During Record section.

4.5.2 Slate Tone

For a Little DARling with DARlink receiver, a slate tone can be generated by the DAR, initiated by a DARlink wireless transmitter. The tone is capacitively injected at the low-noise preamplifier output, passively mixing with the preamplifier output signal. The tone is also buffered and capacitively coupled to the right output, so a DAR could be used with a camera microphone input to inject a slate tone into the camera's audio recording. The buttons on the DARlink transmitter can be customized to control the duration of the tone and the number of tone impulses per event, as described in the Use of Config Files section.

4.5.3 Buzzer

For a Little DARling with DARlink receiver, a buzzer can sound when a wireless command is received. This can be enabled/disabled as described in the Use of Config Files section.

4.5.4 Output

The output connector is a 3.5mm locking TRS (tip/ring/sleeve) jack. The left channel has the headphone signal. The headphone mutes when a recording is started. The headphone can be temporarily enabled and gain adjusted while recording, before being forced into mute again. For more details, see the System Actions During Record section.

For a Little DARling with DARlink receiver, the right channel has a signal from the slate tone generator, initiated by a DARlink wireless transmitter. So, a DAR could be used with a camera microphone input to inject a slate tone into the camera's audio recording.

4.5.5 Recording

4.5.5.1 Audio File

The audio file saved contains 2 channels of audio. The first track contains the main signal, and the second track contains the backup track recorded at a safe lower level, in the event that the main channel gets blown out (perhaps, by a loud signal event, such as your talent screaming).

The file name can be specified by the Use of Config Files. The recording media is inserted into a microSD slot. Select a card from the Pretested Approved list of microSD Cards.

The file extension is .WAV. Each individual track is 16b/48KHz. Acknowledging that marketing of audio recorders has pushed higher sample rates on consumers, we base this specification on the Meyer/Moran paper published by the Audio Engineering Society that demonstrates that humans can not perceive the difference between CD quality (16b/44.1KHz) and higher bit rates (such as what is used with SACD or DVD-A). As an example, even the highest quality lav microphone (which may, at best, provide 70dB SNR for a lav with an unrealistically high 1Pa signal input) can not come close to utilizing the 144dB of dynamic range from even an ideal 24bit A/D, and is serviced with plenty of margin by 16bits. Over-designing a system (beyond what humans can perceive) has consequences for other system

parameters, such as battery life, file size, and SD card selection.

Although this format can accommodate 2GB file sizes (~ 3hrs of recording before the next recording file starts), we have chosen to make the file length correspond to approximately 1 hour before the next recording file starts. It makes it convenient to have the sequence of files organized in hours. As an example of card capacity, an 8GB card can have about a 12 hour recording time.

4.5.5.2 File Corruption Avoidance

If a recording is terminated without properly closing down the file on the SD card (for instance, running out of room on the SD card, or a power failure), then it can become corrupted. Although some techniques can sometimes recover corrupted files, it is better to avoid this situation in the first place. There are a number of techniques and options for the DAR:

- Stop recording when battery or space on card becomes low
  - This is enabled by default. The disadvantage is that the recording will stop while there is still some useful battery or memory left.
- Sequential 10 minute recordings
  - This is an option that can be specified by the Use of Config Files. The advantage here is that recording will run right up until the end of useful battery and memory. The disadvantage is that there will be a sequence of numerous 10min recordings that will have to be managed.
- When battery or space on card becomes low, then switch over to 10min recordings.
  - This is an option that can be specified by the Use of Config Files. The advantage here is that recording will run right up until the end of useful battery and memory, with a minimal number of files.

4.5.5.3 System Actions During Record

When a recording starts, the display will go blank with the exception of a blinking decimal point indicating recording in progress, and the **UP** and **DOWN** buttons will lock to prevent undesired changes to settings while the DAR is on your talent. Also, the headphone out will mute, so the only signal present at the output jack will be the slate signal initiated by a DARlink wireless remote.

Although the headphone is muted and both the **UP** and **DOWN** buttons are disabled during a recording event, the unit can be put into a temporary state to check and adjust limited audio parameters, without having to completely stop a recording. This

is described in the Basic Recording/Playback section. This temporary state will timeout, and return to mute the headphones and disable the **UP** and **DOWN** buttons.

4.6 Other Operational Items

4.6.1 Microphone Selection and Performance

Lav mic selection (polar pattern and signal-to-noise performance) as well as proper microphone placement will effect the recording quality of your talent. This is beyond the scope of this User Manual, but more information can be found in the free juicedLink Field Guide to Audio Production. There, you will learn the "*SANASENECYA"* techniques for achieving excellent audio, even on a budget.

The SNR of the chosen lav mic will set the SNR performance of the system. As an example, a typical upgrade people do with their Sennheiser wireless systems is to replace the Sennheiser ME2 (the lav that comes with the Senn system) with the Sanken COS-11D, which has better SNR performance.

4.6.2 Batteries and Battery Life

Battery life discussed in this section are from typical measurements. Results may vary for any number of reasons.

The unit requires a single AA battery for power. Illustration 1 shows the battery life for various battery types (alkaline, lithium, NiMH rechargeable, NiCD rechargeable) in a Little DARling with DARlink. The units recorded until the battery could no longer keep the unit operational (alkaline ~ 12hrs, NiMH ~ 12hrs, Lithium ~ 20hrs, NiCD ~ 6hrs). So, this shows that a full production day can easily be covered by a standard alkaline battery, or common NiMH rechargeable battery. Use of an expensive lithium battery is not necessary.

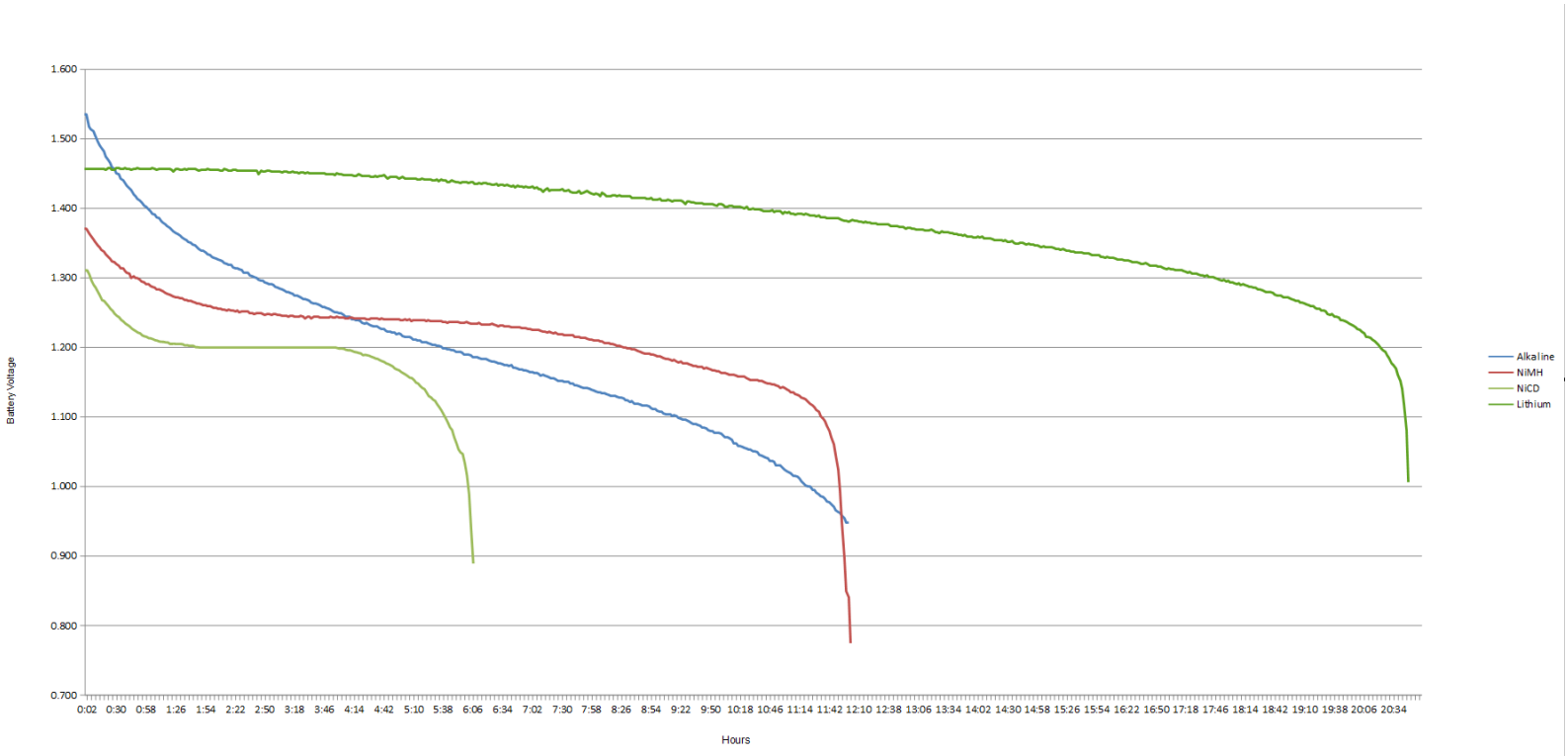

Illustration 1: Battery Life Plots

The type of battery chemistry used can be specified by the following procedure:

- Navigate to the b menu. This will show a value from 0-9, corresponding to the relative battery level.
- Press both the **UP** and **DOWN** buttons.
- Navigate through the menu to see the available batteries that can be selected (by, again pressing both the **UP** and **DOWN** buttons). The batteries that can be selected and their corresponding voltage levels are:
  - A = Alkaline (1.02V - 1.525V)
  - H = NiMH (1.16V - 1.36V)
  - C = NiCD (1.16V - 1.3V)
  - L = Lithium (1.24V – 1.46V)

This will set the voltage threshold to be used in the decision logic for when to shutdown the unit for File Corruption Avoidance. It also sets calibrates the battery battery indicator in the b menu. Illustration 1 also shows the limitation in the accuracy of the battery indicator, as a number of the plots show how the battery voltage flattens over a significant duration of its discharge. So, for those batteries, the voltage measurement is not a great indicator of the amount of battery life remaining.

5 DARlink Hand-held Remote Control Transmitters

5.1 Part Number Key

5.1.1 RX01 Compatible

- DAR-CMD-HHLR-433-MD
  - This is a Linx Technologies CMD-HHLR-433-MD.
  - Linx Technologies has obtained US FCC Part 15, Industry Canada, and European CE compliance.
    - Link to Linx CMD-HHLR-433-MD User Manual
  - When purchased from juicedLink, it ships with an extra label that can affix over the front panel buttons (for Rec, Stop, Slate-1, Slate-2, Slate-3, Slate-4, Slate-5, Slate-6).
- Compatible Transmitters
  - Linx Technologies CMD-HHLR-433-MD
  - Linx Technologies CMD-HHCP-433-MD

6 Advanced Topics

6.1 Use of Config Files

6.1.1 General

It is required that the bootimg.bin file is pre-loaded on the microSD card for the unit to boot up and operate. Config files are optional and not required.

The config.ini file is a .txt file with a .ini extension. It can be edited with Notepad in Windows, or TextEdit on Mac.

In the field, it is handy to be able to view the contents of the Config File for the various DARs you use. You can copy it to your smart phone a variety of ways. Probably, the easiest method is to email it to yourself.

6.1.2 Command List - General

Command		Description
#		Comment character. Use at beginning of line. The text following this character is ignored.
10MIN_STITCH =	0 1	- OFF - ON Default: 10MIN_STITCH = 0 File Corruption Avoidance using sequential 10 minute recordings, up until the battery dies or the SD card fills up. TIP: I typically do not use this.
10MIN_SAFETY =	0 1	- OFF - ON Default: 10MIN_SAFETY = 0 File Corruption Avoidance, switching over to sequential 10 minute recordings when the battery is low or the card is nearly full, up until the battery dies or the SD card fills up.

		TIP: I will typically enable this.
FILENAME =		5 characters maximum. Used as the base filename for saving recordings (FILENAME-001.WAV, and so on). Default: FILENAME = AUDIO *Why control this?* - Say you are using multiple DARs. If each one saves using the same filename, and if you pull them all into your computer into the same folder, then you would not be able to determine the origin of each file.

6.1.3 Command List - DARlink

Command		Description
SS =	0 1	- OFF - ON Allows wireless control of recording start. Default: SS = 1
ST =	0 1	- OFF - ON Allows wireless control of recording stop. Default: ST = 1 *Why control this?* - For some DARs or applications, you may not want to inadvertently stop the recording by accidentally pushing the incorrect button. TIP: I typically disable wireless ability to stop recording.
RS_BUZZ =	0 1	- OFF - ON

		Enables use of buzzer for recording start/stop. Default: `RS_BUZZ = 1` *Why control this?* - For some DARs, you may want to have audible feedback to confirm a start/stop event. On other DARs, you may not want to have an audible sound interrupt talent.

`SLATE1 =`
`SLATE2 =`
`SLATE3 =`
`SLATE4 =`
`SLATE5 =`
`SLATE6 =`
	`AB`
	`AB`
	`AB`
	`AB`
	`AB`
	`AB`
		The numbers in the command (`SLATE1, SLATE2,` etc) represent the button number on the transmitter.
		
		`A:`
		`0` = Buzzer OFF
		`1` = Buzzer ON
		
		`B:`
		`0` = 0 slate tone bursts generated
		`1` = single slate with 1 tone burst generated
		`2` = single slate with 2 tone bursts generated
		`3` = single slate with 3 tone bursts generated
		`4` = single slate with 4 tone bursts generated
		`5` = single slate with 5 tone bursts generated
		`6` = single slate with 6 tone bursts generated
		
		Default:
		`SLATE1 = 11`
		`SLATE2 = 12`
		`SLATE3 = 13`
		`SLATE4 = 14`
		`SLATE5 = 15`
		`SLATE6 = 16`
		
		Why control this? - See the DARlink Multi-Recorder and Multi-Camera Production Flow section for more details.

6.1.4 Example

This example will record all of the audio files with the prefix “DAR01”. Also, when the battery gets very low or the card space gets very low, it will switch to recording stitches of 10 minute audio files:

```
# ************************************************************
FILENAME = DAR01
10MIN_SAFETY = 1
# ************************************************************
```

6.2 DARlink Multi-Recorder and Multi-Camera Production Flow

Objectives of DARlink Production Flow:

- Assistance in managing and aligning multiple audio clips from multiple DARs, as well as multiple cameras.
- Eliminate dependence on wireless range.
  - DARlink uses similar technology as a key fob remote for your car. When you are right in front of the car, the link is reliable. If your car is down the row, sometimes it will unlock the car when you press the button, other times it will not.

6.2.1 Config File / Transmitter Button Strategy Overview

Refer to Illustration 2 while going through the example from this section.

Click this link to print a full page of the illustration for easy reference.

The `SLATEx` command can be used in the DAR config file to assign a function (slate with buzzer, slate without buzzer, neither slate nor buzzer) to particular button from the transmitter. So, by using different config files with different `SLATEx` commands in the various DARs, a single button from the transmitter can now perform different actions when received by the various groups of DARs. Here are some typical ways that you will want to assign TX buttons:

- **Choose a TX Button to Slate/Buzz Every DAR (ALL-SB):** By default, the `SLATEx` command generates a slate and buzzer tone. So, nothing needs to be done in a config file to accomplish this. Let's call this the ALL-SB button.
  - For example, say we want to assign transmitter button 6 to be our ALL-SB button. Then, for the config files that will be loaded in all of the DARs, we just make sure that we do not assign `SLATE6` to anything, and just use the default.

- **Choose a TX Button to Slate Every DAR (ALL-S):** This would be use at a time when we want to inject a slate tone into the audio recording, but do not want an audible buzzer sound to interrupt the talent or event (say, people in the wedding party while seated at dinner). The `SLATEx = AB` command in the config file will be used to achieve this, where `A` will be assigned as `0`. Let's call this the ALL-S button.
    - For example, say we want to assign transmitter buttons 3, 4, and 5 as our ALL-S buttons. Then, the config files loaded into all of the DARs will contain:
        - `SLATE3 = 03`
        - `SLATE4 = 04`
        - `SLATE5 = 05`
- **Choose a TX Button to Slate/Buzz only a Subset of DARs (CAMx)**: A typical application of this is for a DAR unit paired with a camera, to slate the camera audio for syncing it's video to all of the fielded DARs, but without interrupting the rest of the fielded DARs with a slate tone. So, if a second camera is already recording, it's audio and the fielded DARs it is already recording do not get interrupted with the slate tone. So, let's call this CAMx button.
    - For example, let's say we want to assign transmitter button 1 to CAM1, and button 2 to CAM2.
        - The config file loaded into the DAR associated with camera-1 will need to mute the slate from the transmitter used by the camera-2 operator:
            - `SLATE2 = 00`
        - The config file loaded into the DAR associated with camera-2 will need to mute the slate from the transmitter used by the camera-1 operator:
            - `SLATE1 = 00`
        - Then, the rest of the fielded DARs (on the talent) need to mute both of buttons 1 and 2:
            - `SLATE1 = 00`
            - `SLATE2 = 00`

The slate buttons on the transmitter are labeled/numbered 1-6 (when the supplied label has been affixed). But, instead of thinking of them as 1-6, you will want to re-associate the meaning of those numbers. From the example above in this section,

we have assigned:

- Slate Button 1: CAM1 (with 1 tone burst per received slate)
- Slate Button 2: CAM2 (with 2 tone bursts per received slate)
- Slate Button 3: ALL-S (with 3 tone bursts per received slate)
- Slate Button 4: ALL-S (with 4 tone bursts per received slate)
- Slate Button 5: ALL-S (with 5 tone bursts per received slate)
- Slate Button 6: ALL-SB (with 6 tone bursts per received slate)

There are some other things that we would like to add to each of the config files in the DARs. For instance, naming the DARs (DAR1, DAR2, etc) and having that reflected in the `FILENAME`. Also, some other potential housekeeping items. These can be reviewed in the Use of Config Files section, so we won't go into them in detail here. But, we'll include them in the example in Illustration 2.

Let's wrap up the example from this section with a comprehensive illustration:

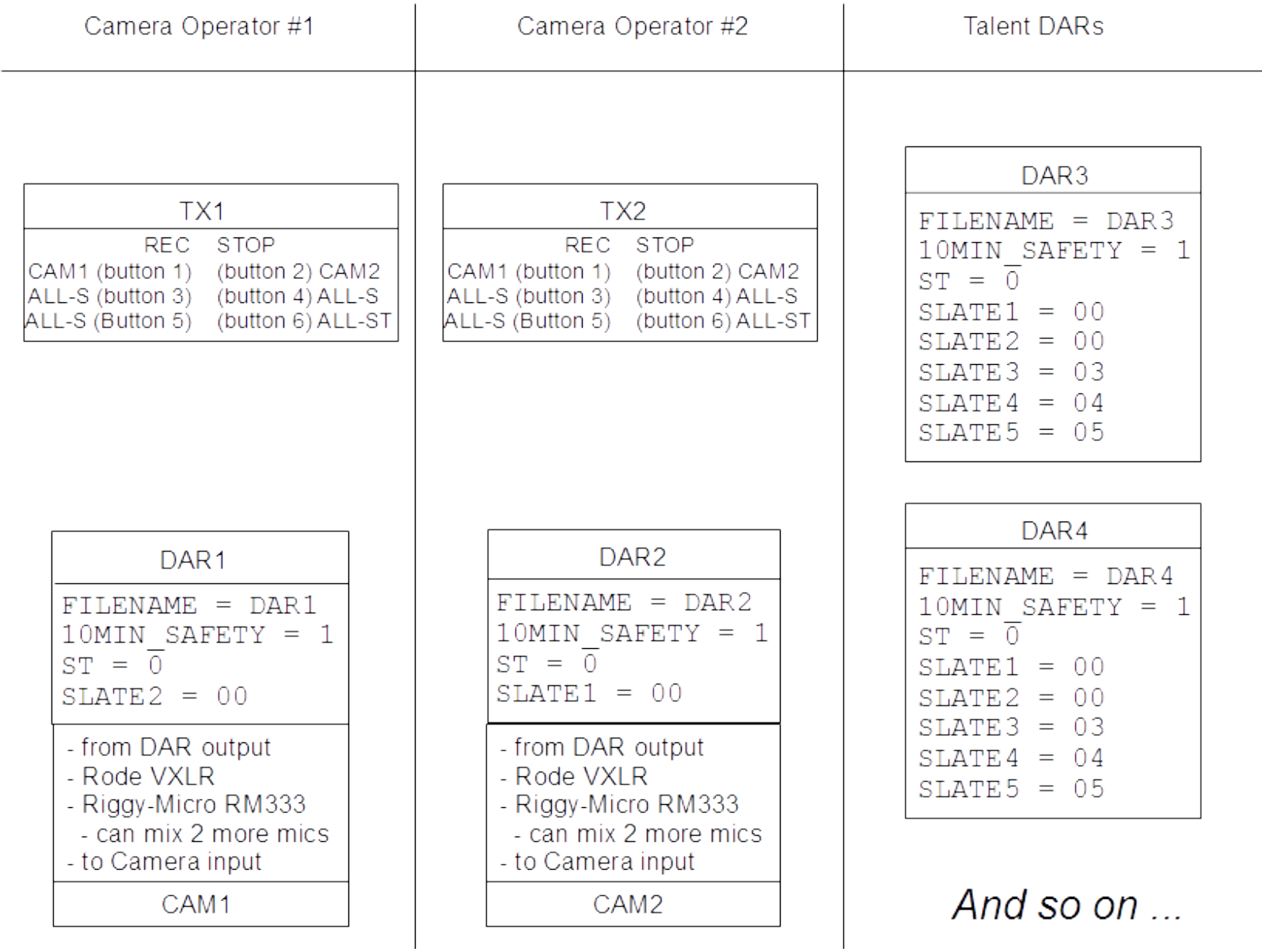

Illustration 2: Config File and Transmitter Button Strategy Example

6.2.2 Slate Strategy Overview

Refer to Illustration 3 while going through the example from this section.

Click this link to print a full page of the illustration for easy reference.

Here some examples of the different instances and types of slates that will be used.

1. Initial Slate.
    - This will be done while all of the units are being set up on the table in front of you, so wireless range is not a factor.
    - After the recordings have been started on all of the units, you will use the ALL-SB button to initiate the Initial Slate. Each unit will provide an audible

as well as visual indication (on the display) that it has received the transmission.
    - This can be done with either TX1 or TX2.
2. Camera1 video clip slated with CAM1 button on TX1.
    - This slate does not interfere with any of the other recordings.
    - In post, this slate provides a target for placing the video clip.
3. Camera2 video clip slated with CAM2 button on TX2.
    - Similar to (2), but with Camera2.
4. Interim Slates.
    - This is a technique for clock drift mitigation. If you are doing some event like a wedding, where it is many hours, and you are not slating each video clip (to avoid stepping on the recording of another camera operator), then this can provide for clock drift mitigation by creating a new synchronization point.
    - These were 5 slates created by camera operator 1 using TX1, as you can see that all 5 were picked up in CAM1 (using the ALL-S buttons, so there would be no buzzer sound at the event).
    - The reason camera operator 1 hit a slate multiple times is to provide for the best chances of having as many of the units receive the transmission, since he is not in control of where they are located. You can see that at least one slate was received by every unit except for DAR4 (which may have been further away, or even in another room at the time).
    - Because you are not in control of where everybody is located, you will want to periodically initiate an Interim Slate, to cycle through catching everybody. You can see in (7) that another Interim Slate was performed (this time catching DAR4).
    - We have a number of ALL-S buttons to choose from (3,4, and 5), and each has a different number of tone bursts associated with a received slate.
        - When slating multiple times (5, in this example), it is valuable to cycle through and use different ALL-S buttons, which will provide different number of tone bursts. For example, the operator could have used the sequence of buttons 3-4-5-3-4 for the 5 slates that were transmitted.
            - If the same button is used for every slate, it can be a little more difficult in post figuring out which tone burst to use for alignment (since some of the DARs will statistically not receive all of

them). Using different numbers of burst tones helps distinguish them.

5. Same as (2), except occurring after an Interim Slate event.
6. This is a slate at the end of a video clip, for Camera1 using the CAM1 button on TX1.
    - For a very, very long video recording, this acts as a sanity check that the video clock has not drifted too much from the DAR clock. If it has, it provides an ending reference point for how much to stretch (or shrink).
7. Another Interim Slate. See (4).
8. Same as (2).
9. Same as (3), but illustrating how camera operator 2 is not disrupting the continuing recording by camera operator 1.
10. Controlled environment slates.
    - 10-13 are intended to show a different shooting scenario, from 1-9.
        - 1-9 is depicting a DARlink production flow in more than uncontrolled environment. Something like an event, or a wedding.
            - Here, you could be shooting with multiple cameras at different locations, and you don't want a slate to inadvertently interrupt the recording of a different camera operator.
            - So, the synchronization with the fielded talent DARs occurs with the Initial Slate and Interim Slates.
        - 10-13 is more of a controlled environment, where both camera operators will always be shooting simultaneously.
            - So, this would be for something like shooting scenes in an independent film, or a sit-down interview, etc.
    - Here in (10), you can also get synchronization with each video clip. (10) shows camera operator 1 initiating ALL-SB and/or ALL-S slates from TX1.
11. Same as (10), but initiated by camera operator 2 on TX2.
12. Same as (10). Just showing that in this controlled environment, this can be done for each set of video clips.
13. Same as (11). Just showing that in this controlled environment, this can be done for each set of video clips.

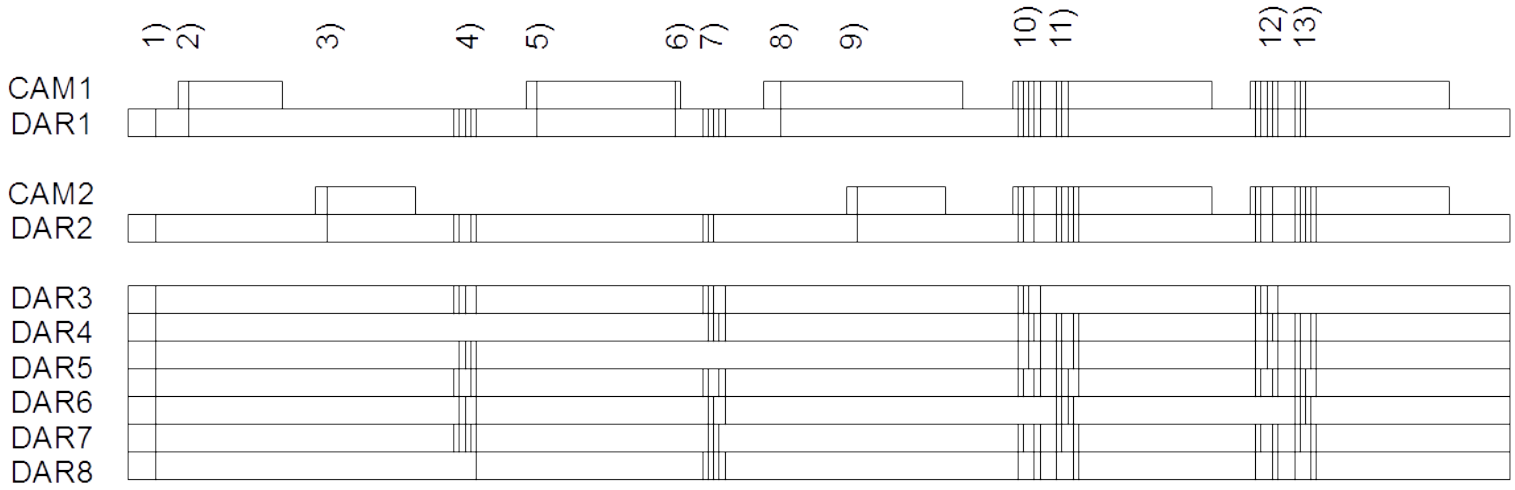

Illustration 3: Slate Strategy Examples

6.2.3 Slating a Camera Without a Camera DAR

In a controlled environment (scenes on set, or something), you have 2 options for slating a camera if you do not want to dedicate a DAR to the camera:

- Slate to the DAR buzzer on the talent. You'll need to get quiet on set and get enough vol from your mic, to get a good waveform.
- Get one of the talent to turn and show the face of the DAR, and video the LED display, which will illuminate simultaneous with the slate.

7 Appendix

7.1 Subscribe to the juicedLink Blog

Subscribe to the juicedLink Blog to get notified on any future updates to the firmware or config files.

7.2 Pretested Approved list of microSD Cards

SD Cards perform occasional housekeeping, most notably for wear leveling (shuffling the data internally to extend card life). This occasional housekeeping will result in an occasional delay before the next write event can occur. Early in the history of SD cards, this delay was very deterministic and limited by the original SD card specification. Unfortunately, some of the newer cards with higher capacity and faster speeds (not required for a low data-rate audio recorder application like this) can require longer delays for this occasional housekeeping.

We were confronted with a design choice on how to handle this. We could either choose a DSP with EMIF that would provide plenty of buffering to handle every corner case card in terms of its delay, or choose a much lower power DSP without EMIF (which would still have many times the buffering required for the original SD spec, but not enough for some corner case cards on the market) and preselect a list of cards. The savings in DSP power was around 60%, and since this was a battery life critical application, we choose the lower power approach.

Make sure you follow the instructions in the Preparation and Card Hygiene section.

CAPACITY: 8G cards will hold about 12hrs of recording, and 16G cards will hold about 24hrs of recording. So, the 16G cards are really only necessary if more expensive Lithium batteries are being used.

The EXACT card part numbers must be used:

- Pretested 8G Cards
  - Toshiba PFM008U-2DCK
  - SanDisk SDSDQUAN-008G-G4A
  - Sony SR8UY2A/TQ
- Pretested 16G Cards
  - SanDisk SDSQUNC-016G-GN6MA
  - Sony SR16UY2A/TQ

7.3 Transmitter DIP Switch Map

Illustration 4 shows back of the transmitter with both the switch and battery cover removed. First, note S2 (circled) should be set in the H position. Next, the 10 DIP switches (set to either the “0” or “1” position) need to be matched up with what has been selected as the decode sequence selected in the Ł menu of the DAR. The first 5 DIP switches will correspond to the setting in the left display in the Ł menu of the DAR, and the last 5 DIP switches will correspond to the setting in the right display of the Ł menu of the DAR. The next sections contain the switch/display relationship table, and some examples.

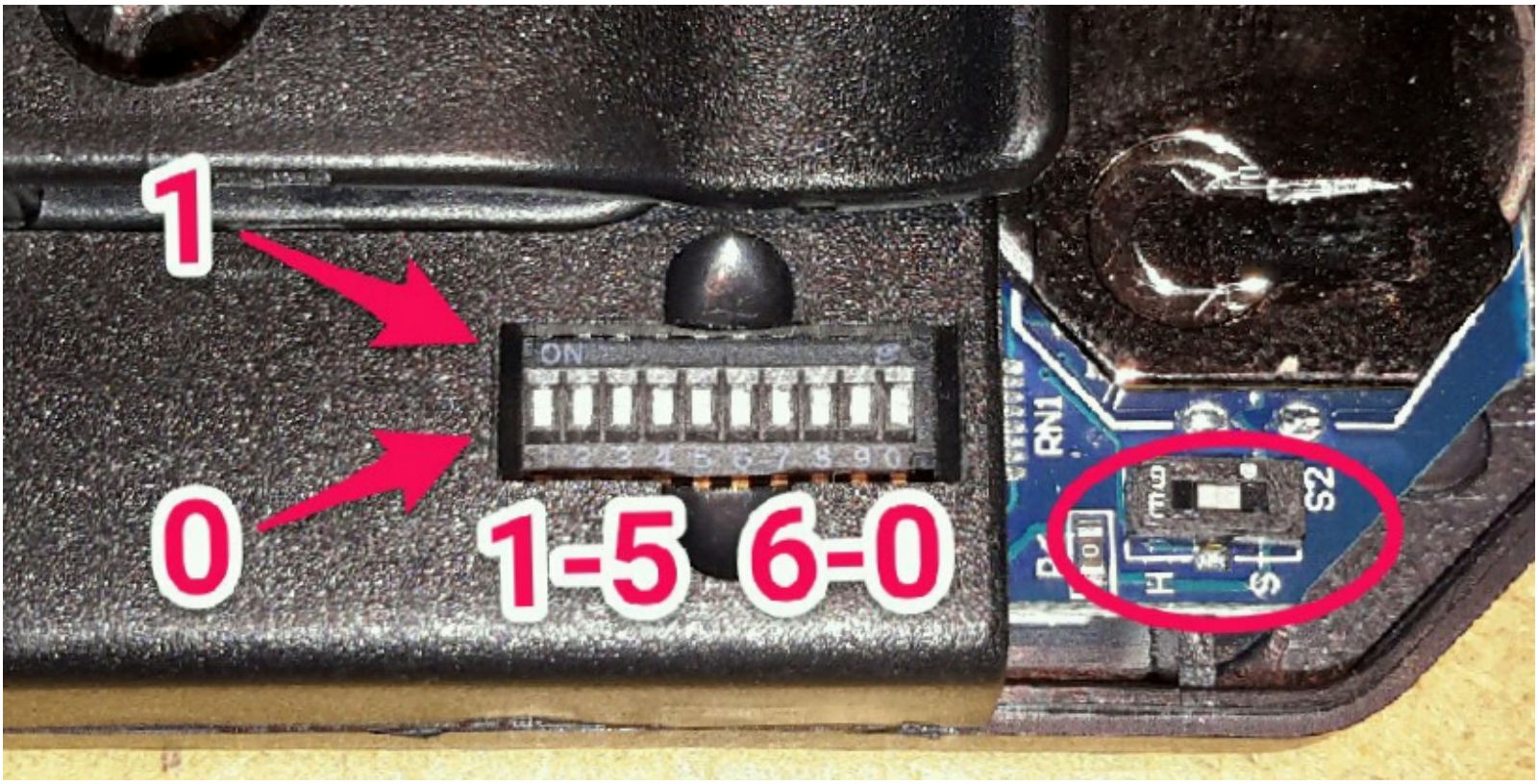

Illustration 4: Transmitter DIP Switches

7.3.1 Left Display Settings for Transmitter Switches 1-5

Display		Transmitter DIP Switches
L	R	1234567890
0		00000
0.		00001
1		00010
1.		00011
2		00100

2.	00101
3	00110
3.	00111
4	01000
4.	01001
5	01010
5.	01011
6	01100
6.	01101
7	01110
7.	01111
8	10000
8.	10001
9	10010
9.	10011
A	10100
A.	10101
b	10110
b.	10111
c	11000
c.	11001
d	11010
d.	11011
E	11100
E.	11101
F	11110
F.	11111

7.3.2 Right Display Settings for Transmitter Switches 6-0

Display		Transmitter DIP Switches
L	R	1234567890
	0	00000
	0.	00001
	1	00010
	1.	00011

2	00100
2.	00101
3	00110
3.	00111
4	01000
4.	01001
5	01010
5.	01011
6	01100
6.	01101
7	01110
7.	01111
8	10000
8.	10001
9	10010
9.	10011
A	10100
A.	10101
b	10110
b.	10111
c	11000
c.	11001
d	11010
d.	11011
E	11100
E.	11101
F	11110
F.	11111

7.3.3 Display Setting to Ignore DIP Settings (not recommended)

Display	Transmitter DIP Switches
L R	1234567890
- -	any setting

7.3.4 Examples

Display	Transmitter DIP Switches

L	R	1234567890
1	0	0001000000
2	0	0010000000
3.	0	0011100000
3.	F	0011111110
3.	F.	0011111111

7.4 Firmware Update Procedure

There are no firmware updates at this time.