tone dexter®

User Guide

Version 1.3

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AudioSprockets®

Introduction

This user guide applies to firmware release V1.30. Most of the material also applies to earlier versions.

ToneDexter is a full featured preamp system for acoustic instruments that have a pickup. It uses new technology that allows the pickup to sound like a microphone placed in front of your instrument. Incorporating patented digital signal processing technology and a pristine analog signal path, ToneDexter works with guitar, violin, mandolin, dobro, ukulele, upright bass, and most other acoustic stringed instruments.

A separate software version (HGH) is available for higher pitched instruments like banjo, violin, and ukulele. This version is the same as the general release firmware (GEN) except for the adjustment ranges of the notch and EQ controls.

A separate software version (BAS) is available for upright bass. It has a number of modifications that allow it to work better with the lower frequencies of an upright bass. It stores WaveMaps in a unique section of memory so that they remain separate from the WaveMaps created by the GEN and HGH releases. Therefore, it's possible to use the bass version and the general or high versions on the same hardware, at separate times.

ToneDexter is intended for instruments fitted with piezo pickup systems, either passive or active. Magnetic pickups are not recommended due to their higher distortion and string position dependence, but nonetheless may sometimes yield usable results.

Getting Started

By way of introduction, a WaveMap® is a transformation filter that Tone-Dexter creates, stores, and uses. It is also known as an impulse response (IR), and is used to process the sound of the pickup to make it sound like your microphone.

It's necessary to create at least one WaveMap for your particular instrument by training ToneDexter with a microphone. Once that's done, the mic is no longer needed. Up to 22 WaveMaps can be stored, in two banks of 11 each. These can be for the same instrument with different mics or mic positions, or for different instruments. ToneDexter does not come with any existing WaveMaps.

Besides your instrument fitted with a pickup, you will need a decent quality microphone, a stand to hold it, and to make things easy, a pair of headphones.

Definition of Terms Used

- **tap** – a quick press and release to one of the two footswitches. Depending on context, the action may take effect upon depressing or upon release.

- **press and hold** – pressing and holding a footswitch for at least one second until the display changes and the action takes effect.

- **mute switch** – the left footswitch

- **boost switch** – the right footswitch

- **slot** – one of 22 WaveMap storage locations selectable with the **WaveMap select** knob, in conjunction with the **option A/B** switch.

Quick Start Training Procedure—
6 Steps to Great Amplified Tone

1. Plug your instrument into the input jack on the right. Plug a mic into the rear mic jack which provides 48V phantom power for condenser microphones. It's safe to use with dynamic mics as well. Position the mic in front of your instrument in a place that sounds good. There are four suggested mic locations:

   a. *Down under:* 6" out and 6" down from the bottom hollow of the guitar where the upper bout meets the lower bout. Point the mic up at where the picking hand is.

   b. *Up top:* The mirror image of down under, on the upper (bass) side.

   c. *Neck joint:* 10" – 15" away in the front, pointing straight at the place where the body meets the neck, or slightly back toward the sound hole.

   d. *Over nut:* 12-15" directly above the nut, pointed back at the sound hole.

2. While playing some low chords or double stops, adjust the **pickup level trim** to set the preamp to the proper operating range using the LED indicators. With soft playing the green light should light. With moderate to strong playing, the yellow LED should light. The red LED should not light unless an unusually strong signal is present. A frequently lit red LED indicates the level control is set too high.

3. Plug a pair of headphones into the headphone jack on the rear. Adjust the rear **headphones level** for a comfortable level while playing. Adjust the **phase switch** on the rear panel for the most perceived bass. See the phase switch section for more info on this. The use of headphones is not mandatory. You can train without them, but it will be less convenient to judge the result.

4. Tap the **mute switch** to enter **MUTE&TUNE mode**, then tap the **boost switch** to enter **TRAIN mode**. The display will show **LV** (for level), and a rotating bar. At any point during the training, you can abort the process by tapping the **mute switch**. This will take you back to **MUTE&TUNE mode** where you can easily start over, or go back to **RUN mode**.

   The first part of the training session is a **level setting phase** where the software is automatically adjusting the volume level of the mic to match the pickup level. This helps ensure consistent WaveMap volume. During this phase, it's suggested to repeatedly strum the upper 4 strings at the 4th or 5th fret, or middle range double stops for violin. You should avoid playing your instrument's lower register, as it will tend to

cause the WaveMap to be created less loud than they should be. The rotating bar will stop when the automatic level adjustment is finished.

Once the rotating bar stops, the **learning phase** has begun, and the display will show **TL_**. During the learning phase, it is possible to toggle back and forth between the training-in-progress sound **TL_** and the mic sound **ML_** by tapping the **boost switch**. This way, you can hear the mic in the headphones and adjust its position as necessary to achieve the sound you want. If you do adjust the mic position, tap the **mute switch** to abort the session and then tap the **boost switch** to start again, as the levels will be incorrect if you don't start over after moving the mic.

It's not overly critical what is played during training. For guitarists, a series of chords up and down the neck works well. Alternately, single notes that exercise the full range of the instrument will also work well. You can use your fingers or a pick. For other instruments, just play normally and try to cover the entire range. It's not very fussy about what is played.

An important point: while you're training, be sure to hold still and not move, so the distance from the mic to your instrument doesn't change. ToneDexter will count up from **TL1** to **TL9** as training progresses, and you will hear the sound improve as this happens. The complete training process should normally take 1 to 2 minutes. Note that if you are listening to the mic sound while training, you will see **ML** on the display instead of **TL**. Feel free to use the **boost switch** to toggle back and forth between **M** and **L** as desired; it will not affect training.

Once the learning phase completes, the display changes to **T__** (for trained). This is the **freeze phase**. At this point, unless you are in slot 22*, it's normal to hear the timbre of the sound change somewhat as the algorithm makes corrections to improve feedback immunity. You may notice that tone becomes less bassy.

* Slot 22 is special in that the corrections to improve feedback immunity are omitted. This results in the most realistic miked sound which may be useful for recording purposes. See helpful hint 8 below for more on slot 22.

5. To confirm that you're happy with the new sound, tapping the **boost switch** will allow you to audition the bypass pickup (display shows **P** for pickup), the microphone (display shows **M** for mic), the Wave-Map in the current slot (displays shows **S** for stored), and the newly trained WaveMap (display shows **T** for trained). It will cycle through those options in succession with repeated taps to the **boost switch**.

If for any reason you want to start over, tap the **mute switch** to abort the training session then tap the **boost switch** to restart training.

6. Once you're sure that you like the trained sound, use the **WaveMap select** knob select a preset slot in which to store the new WaveMap. As you scroll through the slots, you will hear the audio change. Occupied slots have a lit dot, empty slots do not. If the slot contains an existing WaveMap, you will hear it. If not, you will hear bypass sound. You may again audition by successively tapping the **boost switch**.

   To store the newly created WaveMap, press and hold the **boost switch.** (It doesn't matter which audition mode **P**, **M**, **S**, or **T** is selected when you do this.) At this point, the training session will end, the sound will change to the new WaveMap, and you'll be back in **RUN mode**. Unless you want to create additional WaveMaps, the mic can be disconnected.

Helpful Hints for Training

1. If you have an active pickup system, set any onboard EQ controls to flat, and the volume control to a midway position. This is not critical, but helpful for coming back to a repeatable known setting on the instrument. ToneDexter will train over a large range of tonal balances, but avoid using any pickup EQ that drastically removes frequency content from your pickup signal.

2. A small diaphragm condenser mic is recommended. Large diaphragm mics can also work well, but may be more finicky about placement. Dynamic mics, such as common vocal mics, can yield usable results, though generally will not have as much high frequency information. Tube (valve) mics, due to their higher non-linearity, are not recommended but may yield good results nonetheless. Both cardioid and omnidirectional pickup patterns will give excellent results. Active ribbon mics may also be used. Passive ribbon mics may be used so long as they can tolerate 48V phantom power. If using a passive ribbon mics, consider plugging in the mic with the unit unpowered, then applying power after that.

3. Experiment with various mic positions to find a sound that that is even and pleasing, and that gives good timbre through your intended sound reinforcement system. All instruments are different, and it may take a few tries to sort out the best mic and location for your instrument. You can store several WaveMaps using different mics and/or mic locations, and decide later which ones to keep or move to different locations.

4. You can train in your living room, in your kitchen, and yes even in your car. (Never train and drive and the same time!) The point is that you don't need a refined acoustic space because the WaveMap picks up very little of the room sound.

5. ToneDexter's EQ controls are disabled during training. During the **freeze phase** of training, the EQ will be re-enabled for audition modes **T** and **S**, but disabled for modes **M** and **P**. The EQ will be automatically re-enabled when you're back in RUN mode. Be aware of this, as EQing the newly created WaveMap may not be what you expect to hear. If any of the EQ knobs are active, the LEDs will be lit to remind you.

6. During the training phase you will hear the pickup sound gradually improve. It is highly immune to background noise and talking. If you need to pause, the training will automatically pause, and then continue when it hears more playing. If you do pause, make sure to resume your exact same position when restarting.

7. Some piezo pickups use multiple sensors that are mixed phase. In other words, one or more sensor elements are out of phase (have opposite polarity) with other sensor elements within the same pickup. The training technique described above must be modified to work with these pickups systems. Using a modified training technique whereby only strings with elements of like phase are played, these pickups can generally be made to work. Consult with Audio Sprockets for clarification if your particular instrument has problems training.

8. **Slot 22 is different.** If training reaches the **freeze phase** and you are in slot 22, the adjustments to improve feedback immunity are skipped, resulting in the most mic-like sound. This may be more appropriate for recording. The resultant WaveMap may be stored in any of the 22 available slots. You can create WaveMaps of both kinds depending on which slot you start training from.

To summarize:

- When training from slots 1-21, WaveMaps are created with feedback adjustments for live performance. This is independent of where it is stored or subsequently pasted.

- When training from slot 22, a WaveMaps is created without feedback adjustments. This is independent of where it is stored or subsequently pasted.

- Either type can be stored in any location, and freely deleted or pasted to new locations later.

Modes of Operation

RUN Mode

This is the normal mode of operation for playing. The display shows **R** (for run) along with the WaveMap number being used. If the number has a dot next to it, it means there is a WaveMap in that slot and it will be heard. If there is no dot, the slot is empty, and the signal passes straight through unaltered except by EQ and/or the feedback notch if engaged. Use the **WaveMap select** knob to choose between 11 WaveMap storage locations in each bank. The **option A/B** switch allows selecting between the lower bank 1-11 and the upper bank 12-22. When changing the selection, the sound will immediately change to the WaveMap stored in that slot.

RUN Mode with boost

Tap the **boost switch** and the unit will add anywhere from 0dB to 8dB more gain, as set by the **boost knob** on the rear. This is useful for solos or to switch from flat picking to fingerpicking where more gain is required. Tap the **boost switch** again to get back to normal level.

The boost circuitry is analog and is located after the effects return jack, so it will not affect the pickup level trim or diminish signal headroom.

BYPASS mode

Press and hold the **mute switch** (until the display shows **BYP**) to enter **BYPASS mode**. The sound will immediately change to the unprocessed pickup. (This will remind you why you need a ToneDexter!) EQ and notch will still be active if engaged. Remember, empty slots do not have a lit dot, and will play bypassed as well.

BYPASS mode with boost

Tapping the **boost switch** toggles the extra boost gain on and off.

MUTE&TUNE mode

Tapping the **MUTE switch** will mute all outputs (except the headphone jack), and engage the built in tuner. Play a single note at a time to tune your instrument. The display vector rotates clockwise if sharp, counter-clockwise if flat. It stops rotating if tuning is within 1 cent. In addition, the left decimal dot indicates flat, the right dot sharp, and the center dot lights if tuning is within 2 cents. The tuning standard is A = 440Hz.

Tap the **mute switch** again to get back to **RUN mode**.

TRAINING mode

Tap the **mute switch** to enter **MUTE/TUNE mode**. Tap the **boost switch** to enter **TRAINING mode**.

TRAINING mode consists of three phases: **Level Setting**, **Learning**, and **Freeze.** These occur in automatic succession once **Training mode** has begun. At any time during any of the **TRAINING mode** phases, you can tap the **mute switch** to abort **TRAINING mode** and then tap the **boost switch** to start over.

The unit starts with the **Level setting phase** where the mic path gain is automatically adjusted to match the pickup level.

Next comes the **Learning phase** where the WaveMap is constructed as you play. If desired, tap the **boost switch** to toggle the headphone audio audition between mic **M** and training-in-progress **T**. If you choose to reposition the mic, then tap the **mute switch** to abort **TRAINING mode** and tap the **boost switch** to start over.

After the **Learning phase** is complete, the unit enters **Freeze phase**. Tap the **boost switch** to toggle the audio audition between mic **M**, bypass pickup **P**, newly trained WaveMap **T**, or the currently stored WaveMap **S** (if the slot is not empty). Press and hold the **boost switch** to store the trained results in the selected slot, or tap the **mute switch** to abort **TRAINING mode**.

EDIT mode - copy and paste

Stored WaveMaps may be copied and pasted to any slot. The original is left intact.
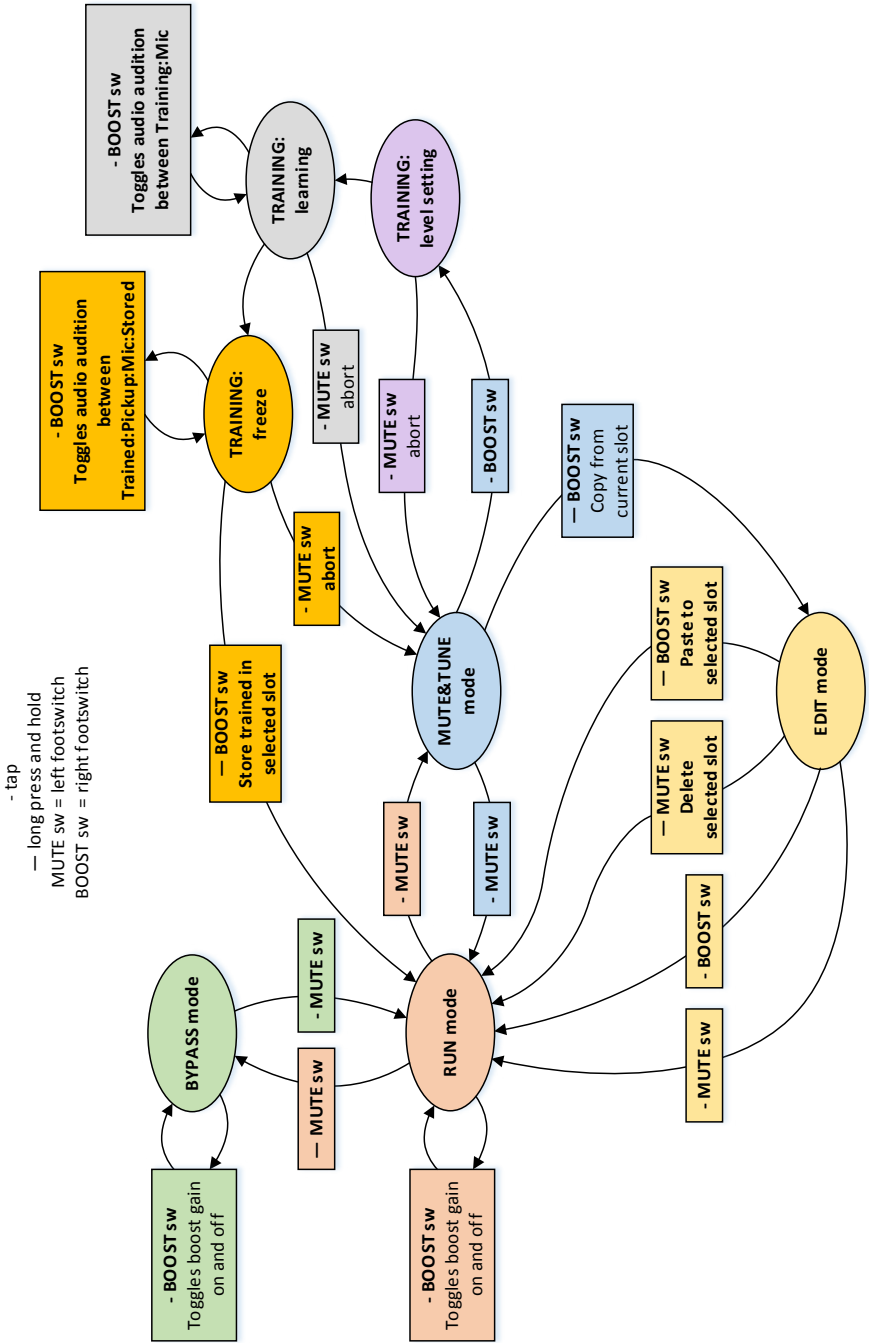
1. Make sure the slot to be copied is selected.
2. Tap the **mute switch** to enter **MUTE/TUNE mode**.
3. Press and hold the **boost switch** to enter **EDIT mode**.
4. Select a new slot to paste into. Remember: occupied slots have a lit dot, empty slots do not.
5. Press and hold the **boost switch** to paste it into the newly selected slot. If you paste into the same slot as it came from, the WaveMap will remain unchanged.

EDIT mode – delete

Unneeded WaveMaps may be deleted.

1. Tap the **mute switch** to enter **MUTE/TUNE mode**.
2. Press and hold the **boost switch** to enter **EDIT mode**.
3. Make sure the slot to be deleted is selected.
4. Press and hold the **mute switch** to delete it.

Mode Navigation Map

Controls

Pickup Level Trim

Adjusts gain of the pickup to get your signal into the proper operating range of the system. The LED indicators serve as the level metering. The green light should light with soft playing, the yellow LED should light with moderate to strong playing. The red LED should not light unless an unusually strong signal is present. A frequently lit red LED indicates the gain is too high and distortion may result.

Output Level

Sets the desired output level for the ¼" main output on the left side of the unit. The DI output may optionally be set to follow this output level control.

WaveMap Select

Selects one of 11 stored WaveMaps in each bank. Occupied slots have a lit dot next to the display number, empty slots do not.

Option A/B switch

Selects one of two banks of 11 WaveMaps, for a total of 22 WaveMaps that can be stored.

Character Select

This is a multipurpose control that alters the sound of the current Wave-Map to achieve a more focused, punchy sound relative to what the microphone heard. In addition, new with V1.30 firmware, it allows blending of the unprocessed pickup with the WaveMap. Blending occurs only on the left half of the dial range.

Note that when using the blend mode, the raw pickup signal is time and polarity aligned with the WaveMap to avoid any phasing or comb filter effects.

Fully clockwise
- Full mic sound
- Display shows **CH2**

2 o'clock position
- 50/50 blend of focused and mic sounds
- Display shows **CH1**

12 o'clock straight up position
- Focused sound
- Display shows **CH0**

Counter-clockwise from straight up

- Blends unprocessed pickup with focused CH0 sound
- Continuously variable from 30% (fully CCW) to 99% (almost straight up)
- Display shows blend percentage **Bnn** where **nn** is the percentage of focused CH0 sound. **B30** would be 30% focused CH0 sound, blended with 70% raw pickup sound.

Bass and Treble

These are shelving equalizers that boost or cut 9dB. The inflection points shown for various firmware versions are:

GEN (general firmware)

- 125Hz bass
- 2KHz treble

HGH (high firmware)

- 125Hz bass (when operating in low bank slots 1-11)
- 250Hz bass (when operating in high bank slots 12-22)
- 2KHz treble

BAS (bass firmware)

- 63Hz bass
- 1KHz treble

The EQ lights will go out when the EQ gain controls are centered and off. EQ is automatically disabled during training **level setting** and **learning phases**, and in audition modes **P** and **M**. The EQ affects the real-time run signal, and is not stored with the WaveMap. It also affects the signal when in bypass.

Notch

The WaveMaps created by ToneDexter have intelligent feedback suppression built into them. They are much more immune to feedback than the microphone signal would be, and thus will work well in most situations, especially if the phase switch is in the optimum position.

However, in very loud situations you may still experience feedback. In that case, a very narrow notch can be enabled by engaging the notch control. To engage the notch, rotate it clockwise slowly to find and stop the offending frequency. It will have minimal impact on the sound. When the notch control is fully counter-clockwise, the notch is disabled and the light will go out. Notch is automatically disabled during training, then resumes when back in run mode. The notch affects the real-time run signal, and is not stored with the WaveMap. It also affects the signal when in bypass.

The notch frequency ranges for the various firmware versions are:

GEN (general firmware)
- 73Hz (D2) to 392Hz (G4)

HGH (high firmware)
- 73Hz (D2) to 392Hz (G4) (when operating in low bank slots 1-11)
- 124Hz (B2) to 466Hz (A#4) (when operating in high bank slots 12-22)

BAS (bass firmware)
- 37Hz (D1) to 165Hz (E3)

Phase switch

The **phase switch** on the rear panel changes the phase (flips the polarity) of all the outputs. This is significant for two reasons.

- When playing through loud sound reinforcement, one phase/polarity position will usually be less prone to feedback than the other. Try both positions if you're experiencing feedback issues.

- When you're training with headphones, the sound of the headphone signal will combine with the acoustic leakage path to your ear. The "correct" phase will be the one that has the most perceived bass, the other position will sound more anemic. Headphones vary, so try both positions. The position of the phase switch does not affect training, only your perception of the sound.

DI fixed/variable switch

On the rear panel, this switch determines if the DI Output is a fixed level, or follows the output level control. Fixed level can be useful for situations where you want to use the output level control to adjust your personal monitoring via the ¼" output jack, and have that not affect what is sent to the front-of-house mixer via the XLR DI output.

Connections

Input
- 1/4" phone jack on the right side of the unit
- Works with passive or active pickups
- Input impedance: 1MΩ
- Gain range: off to +27dB
- Maximum signal level before clipping: +3dBV

Mic Input
- Female XLR jack on the rear
- Only used during training
- Provides 48V phantom power for active mics
- Differential input impedance: 2.5KΩ
- Maximum signal level before clipping: -29dBV

Output
- 1/4" phone jack on the left side of the unit
- Volume is controlled by **output level** control with range: off to +6dB
- Muted during training
- Output impedance: 300Ω unbalanced, 600Ω impedance balanced
- Headroom above nominal level: 15dB
- Nominal output level: -15dBV balanced or unbalanced
- Maximum output level (include +8dB boost): +14dBV balanced or unbalanced
- If connected, the pin 1 ground to the DI output jack is disconnected to prevent ground loops.

DI Output
- Male XLR jack on the rear
- Level is either fixed or follows the output level control, depending on the **DI fixed/var** switch on rear.
- Muted during training
- Output impedance: 600Ω balanced differential
- Headroom above nominal level: 15dB
- Nominal output level: -9dBV balanced differential
- Maximum output level (include +8dB boost): +20dBV balanced differential
- To prevent ground loops, pin 1 ground is disconnected when a phone plug is connected to the ¼" output jack.

Effects Loop
- 1/4" TRS phone jack on rear
- Tip send, Ring return
- Send output impedance: 300Ω unbalanced
- Headroom above nominal level: 15dB
- Nominal output level: -15dBV unbalanced
- Return input impedance: 1MΩ
- Nominal return level: -15dBV

Headphones Output

- 1/4" stereo phone jack on rear, for critical listening during training
- Volume set by the **headphones level** control on the rear
- Works with low or high impedance headphones
- Output impedance each side: 110Ω

Power

Accepts 9-15VDC regulated supplies of either polarity. Requires a 6W supply.

A Note about Hum

If you are using a passive piezo pickup, you may hear some AC power line hum if your system is not grounded. In normal use ToneDexter will be connected to an amplifier or PA system which is grounded, and you will not experience any noticeable hum. But if you do experience hum when training using just headphones, plugging one of the outputs into a grounded system will eliminate the hum.

Firmware Loading Instructions via SD Card

Old or new versions or alternate versions like BAS and HGH may be loaded at your discretion. Any existing WaveMaps will be preserved. Due to format differences, BAS firmware WaveMaps are not visible to GEN and HGH firmware, and vice versa. Each set of 22 WaveMaps exists in a distinct and separate part of memory.

1. From the Audio Sprockets website, download the compressed zip file corresponding to the firmware version you want to install, and put it someplace convenient on your computer, such as the desktop.

2. Click open or unzip the zip file to view its contents. It should include these three files:
   - app.bin
   - dsp.bin
   - "name".txt - where "name" indicates the version. (This file is not strictly necessary, but serves to indicate which version of the code you are dealing with.)

3. This is important - don't copy the zip file! Rather, extract or copy the three files inside the zip file to the root of the SD card.

4. The card must be formatted as FAT32. exFAT and NTFS formatting will not work. Most cards sized 32G or less come formatted to FAT32.

5. Click open the SD card to view the contents and verify the files are present. They should be visible without having to look inside any folder contained on the SD card.

6. Power down your ToneDexter by unplugging the power supply from AC line power (rather than by unplugging the power jack on the back of ToneDexter).

7. Push the SD card into the slot on the side of ToneDexter, with the card contacts facing down.

8. Plug the power supply back into AC line power. When ToneDexter powers up, it looks for the presence of the SD card and reads the files.

9. The display will show UPD, and soon after some moving dots to indicate the upgrade is in process. The process will finish automatically and then display the new code version, followed by either:
   • GEN (general release)
   • HGH (higher pitched instruments like violin, banjo, ukulele, etc.)
   • BAS (upright acoustic bass)

10. Remove the SD card from the slot.

Additional Notes

1. If you forget to remove the SD card before the next power up, it will unnecessarily go through the upgrade process again at the next power up, but there will be no harm done.

2. If you accidentally lose power during the upgrade process, just start the process over and all will be well.
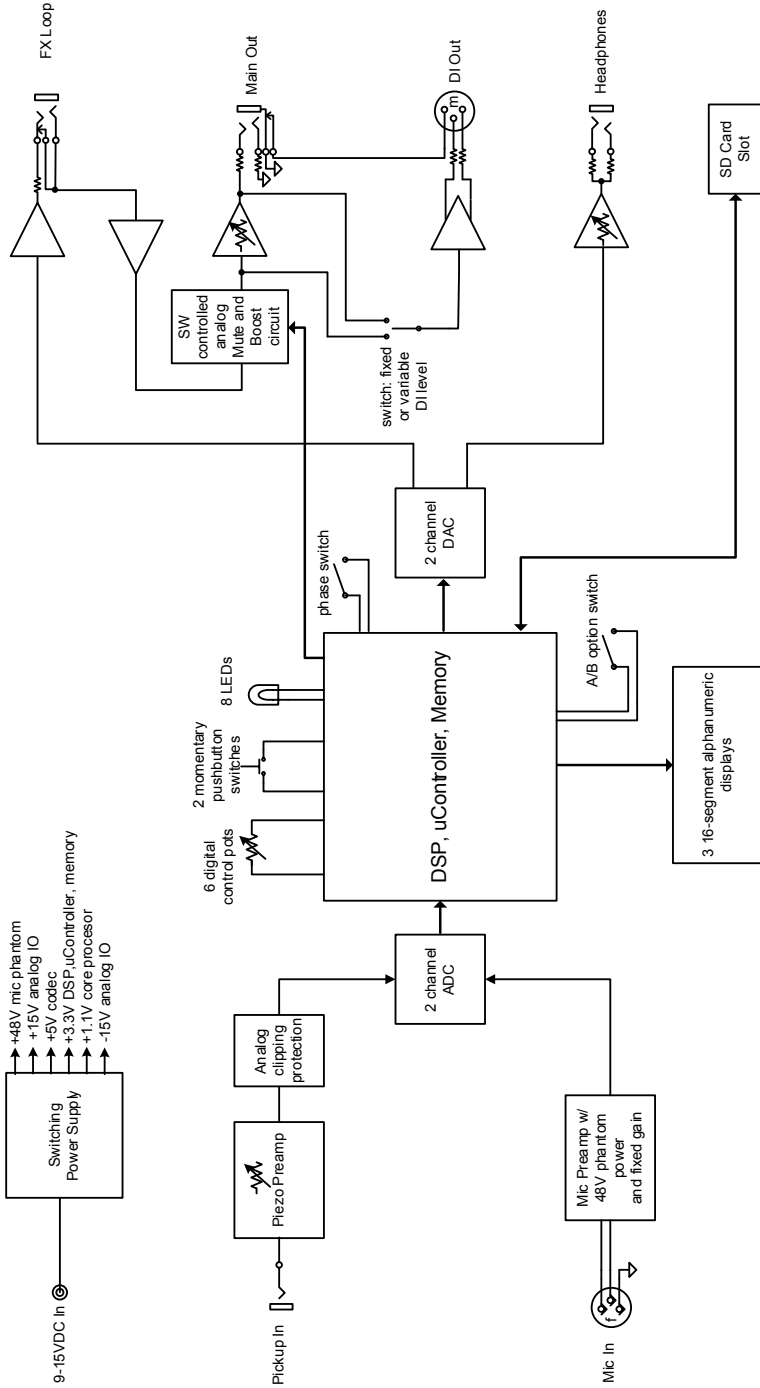
Getting WaveMaps In and Out of ToneDexter via SD Card   applies to V1.40 and later firmware

New with version ~~1.30 code~~ is the ability to move WaveMaps in and out of the unit. This is handy for backup, archiving, and using the same Wave-Maps on multiple units. In addition, the new system allows WaveMaps to be given meaningful alpha numeric names on your computer. They can be renumbered and reloaded with new ordering, allowing a method of resequencing that is more convenient than multiple copy and paste operations using the unit itself. Please note that the WaveMaps file format is proprietary and can only be used in a ToneDexter environment.

The operation depends on what files and folders are present on the SD card. Here's how it behaves:

- If app.bin and dsp.bin files are present, the firmware is updated. If not, no update is performed. In either case, the logic proceeds as follows:

- If there is a root folder called READ: The process reads up to 22 stored WaveMaps from ToneDexter's internal memory and writes them to that folder, with the following naming convention: 01.wm, 02.wm ... 22.wm. Only WaveMaps that exist inside ToneDexter are written to the SD card; blank slots are skipped. If the READ folder already contains a file of the same name, it is overwritten.

- For each file copied to the SD card, the display shows **Rnn** where **nn** is the slot number.

- If there is a root folder called WRITE: For any file in that folder named nnXyyyyy.wm where nn is 01-22, X is an alpha character and y is an alphanumeric character, the process writes those WaveMaps to the corresponding slot locations inside ToneDexter. It ignores any .wm files that are not named correctly. The file name, not including the extension, must be 2 to 8 characters. For example 01mart1.wm, 21gibson.wm, 13b100.wm, 07.wm, and 14r2d2.wm are all valid names. Whereas 015mart.wm, 23andme.wm, and 5guild.wm are not valid. All special characters are ignored.

- For each file copied to a WaveMap slot from the SD card, display shows **Wnn** where **nn** is the slot number.

- If there is a folder called WRITE but no folder called READ, the process will automatically create a READ folder and backup all Wave-Maps into it before overwriting any WaveMaps with files from the WRITE folder.

- If there is a root folder called READ_BA: a similar procedure is followed to read bass WaveMaps from ToneDexter and write them to the SD card. WaveMaps in the bass format have file extension .wmb.

- If there is a root folder called WRITE_BA: a similar procedure is followed to copy bass WaveMaps from the SD card and write them into ToneDexter.

- If there is a folder called WRITE_BA but no folder called READ_BA, the process will automatically create a READ_BA folder and backup all bass WaveMaps into it before overwriting any bass WaveMaps with files from the WRITE_BA folder.

Block Diagram

Compliance

USA: This product complies with FCC part 15 Class B requirements for home or office use.

CANADA: This product complies with ICES-003 Issue 6 Class B requirements. *CAN ICES-3 (B)/NMB-3(B)*