Prophet 12 Manual Addendum

OS Version 1.4.1

Prophet 12 OS version 1.4.1 adds a number of new features not covered in the main Operation Manual. These features are described in the following Addendum in the order shown below.

New Features in OS 1.4.1

- Linear frequency modulation for classic DX-style FM
- Assignable voice-stacking in Unison mode
- MIDI note output for the arpeggiator
- New modulation destinations: Slop, Osc All Shape, All Delays
- Disable screen saver option for OLED display
- Soft knobs allow Playlist LIST and SET selection
- Support for alternate tunings

Checking Your Operating System Version

If you've just purchased your Prophet 12 new, OS 1.4.1 should already be installed. If you purchased your Prophet 12 prior to Dec, 2015 and wish to use the new features described above, you'll need to update your OS to version 1.4.1 or later.

To update your Prophet 12 OS, you'll need a computer and a USB cable, or a MIDI cable and MIDI interface. To download the latest version of the Prophet 12 OS along with instructions on how to perform a system update, visit the DSI website at:

http://www.davesmithinstruments.com/updating-prophet-12-os/
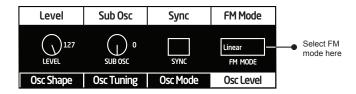
To check your OS version:

1. Press the GLOBAL button. The screen displays the version of the currently loaded OS.

2. If your OS is out of date, download the latest version from the URL above and update your instrument using the instructions included with the download.

New DX-Style Linear FM

The Prophet 12 now provides a choice between its original *exponential* method of FM (frequency modulation), and *linear* FM, which is the type found on the classic Yamaha DX-series of synthesizers. Exponential FM is selected by default. To choose linear FM, you'll need to use the menus in the Prophet 12 display.

To choose linear FM:

1. Press the front panel OSCILLATOR 1 selector to show the oscillator controls in the display.

2. Press soft button 4 (OSC LEVEL).

3. Use soft knob 4 (FM MODE) to set the FM mode to LINEAR.

Level	Sub Osc	Sync	FM Mode
◯ 127 LEVEL	◯ 0 SUB OSC	▢ SYNC	Linear FM MODE
Osc Shape	Osc Tuning	Osc Mode	Osc Level

Select FM mode here

Choosing Linear FM

Creating Sounds with FM

To create sounds with FM you'll use one oscillator (the *modulator*) to modulate the frequency of another oscillator (the *carrier*). This creates a new waveform that has additional harmonics known as *sidebands*.

The type of sidebands created depends on the tuning relationship between the modulator and the carrier. If both are tuned to the same note or a multiple of the same note (for example, carrier = C2, modulator = C3) then the harmonics created will be harmonically related and "in tune."

However, if the modulator is tuned to a note that is not the same as the carrier or is not a multiple of it (for example, carrier = C2, modulator = D#2) the sidebands won't be harmonically related and the resulting sound will be clangorous. This is why FM synthesis is well-known for creating metallic, bell-like timbres.
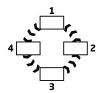
The amount of sidebands created is directly related to the amount of modulation applied (the FM AMOUNT parameter) and also the waveform of the modulator. The greater the FM AMOUNT setting, the more sidebands produced, and the "brighter" the sound will become. Think of the FM AMOUNT as being similar to a low pass filter cutoff: the higher the setting, the brighter the resulting waveform.

A modulator with a large number of harmonics, (a sawtooth wave, for example), will create many more sidebands than a modulator with a no harmonics (a sine wave, for example).

The original DX-7 synthesizer provided only sine waves for its oscillators (called *operators* in DX-7 terms). The Prophet 12, however, supplies a much broader range of waveshape choices. Experiment with different waveshapes for both the carrier and modulator to see how this changes the harmonic content of a sound.

The Default Carrier/Modulator Relationship

If you look at the OSCILLATORS section on the front panel of the Prophet 12, you'll see arrows between the oscillator selector buttons. These indicate the default carrier/modulator relationship between the oscillators. The arrows indicate which oscillator modulates which.

Default FM carrier/modulator relationship between the 4 oscillators on the front panel

- Turning up the FM amount on Oscillator 1 causes it to be modulated by Oscillator 2.

- Turning up the FM amount on Oscillator 2 causes it to be modulated by Oscillator 3.

- Turning up the FM amount on Oscillator 3 causes it to be modulated by Oscillator 4.

- Turning up the FM amount on Oscillator 4 causes it to be modulated by Oscillator 1.

Though the above shows the default oscillator relationships for performing FM, you can actually route any oscillator to another using the modulation matrix. This also allows you to modulate the same carrier oscillator with more than one modulator oscillator. When doing so, set the WAVE RESET parameter to ON for the various oscillators to avoid phase cancellation.

When creating a typical linear FM sound, you'll want to turn up the output level of the *carrier* oscillator so that you can hear it, but turn down the output level of the *modulator* oscillator so that you don't hear it.

To create a basic linear FM sound:

1. Press the GLOBAL button, then turn soft knob 1 and select BASIC PATCH.

2. Press soft button 1 (WRITE NOW). Then press the GLOBAL button again to exit the Global menu.

3. Press the front panel OSCILLATOR 1 selector to show the oscillator controls in the display, then press soft button 4 (OSC LEVEL).

4. Use soft knob 4 (FM MODE) to set the FM mode to LINEAR. (Setting any oscillator to linear FM sets all oscillators to linear FM.)

5. Turn soft knob 1 to set the oscillator LEVEL to 127.

6. Turn the SHAPE/NOISE knob and select SINE as the waveshape.

7. Turn the FM knob to 150.

8. Press the Oscillator 2 selector on the front panel, then turn the SHAPE/NOISE knob and select SINE as the waveshape.

9. Turn the PITCH knob for Oscillator 2 and listen to the effect on the tone of Oscillator 1.

10. Repeat steps 5-7 for Oscillator 3 and Oscillator 4. Use Oscillator 3 as the carrier and Oscillator 4 as the modulator.

11. Remember to leave the output LEVEL at zero for the modulators (oscillators 2 and 4) so that you don't hear them. It's only necessary to hear the carriers (oscillators 1 and 3).

Adjust the Pitch (note) value of Oscillators 2 and 4 (the modulators) to hear how this changes the timbre of your sound. For metallic, bell-like sounds, tune the pitch of Oscillator 2 and 4 to something other than C.

For evolving timbres, try routing Auxiliary Envelope 3 or 4 to the FM Amount parameter of Oscillator 1 and/or 3. The envelope causes the FM amount to change over time, thus changing the resulting waveform either subtly or drastically, depending on the envelope shape.
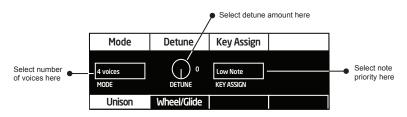
Selectable Voice-Stacking in Unison

The Prophet 12 now allows selectable voice-stacking in Unison mode. When UNISON is on, the Prophet 12 functions like a monophonic synthesizer in that you can only play 1 note at a time. However, that one note can be powered by up to 12 voices, depending on how many you choose to stack. With up to 48 oscillators powering a single note (12 voices x 4 oscillators per voice), you can create some very dense, speaker-rattling sounds.

Unison gives you control over not only how many voices to stack, but also the amount of detuning between the oscillators, and what note gets priority if you happen to play more than one note on the keyboard. (This is called the key assign mode or *note priority*. See "Key Assign Modes" in your manual for details.)

In many cases, stacking all 12 voices may be overkill and can produce sounds that are simply overpowering. In practical use, you may choose to stack fewer voices. To create a thick synth bass, for example, trying setting UNISON to 3 voices and setting DETUNE to a value of 5 or so.

To use Unison:

1. Press the UNISON button.

2. Use the controls in the display to choose the number of voices to stack, then set a DETUNE amount and KEY ASSIGN mode, if desired.

3. To turn off Unison, press the UNISON button again.

Unison controls

MIDI Note Output from the Arpeggiator

The Prophet 12's Arpeggiator now outputs MIDI note numbers. Any notes that you hold on the Prophet 12 keyboard will be arpeggiated according to the current settings of the Arpeggiator and output over MIDI as MIDI notes. You can use this feature to drive other MIDI-equipped devices such as synthesizers and drum machines. To access this feature, use the MIDI ARP NOTES setting in the GLOBAL menu.

To enable MIDI Note output from the arpeggiator:

1. Press the GLOBAL button, then turn soft knob 1 to select MIDI ARP NOTES (GLOBAL item #14).

2. Turn soft knob 3 (OFF/ON) and select ON. Press the GLOBAL button again to exit the Global menu.

To control an external MIDI device:

1. Connect the MIDI output of the Prophet 12 to the MIDI input of the external device.

2. On the Prophet 12, press the GLOBAL button and turn soft knob 1 to select MIDI OUT SELECT (GLOBAL item #12).

3. Turn soft knob 3 (OFF/ON) to select MIDI. Press the GLOBAL button again to exit the Global menu.

4. On the external device, set the the MIDI Channel and MIDI Receive port to match the Prophet 12.

5. Hold down a chord on the Prophet 12. The external device should be triggered by the arpeggiated notes.

New Modulation Destinations

The Prophet 12 has several new modulation destinations. These include:

- Slop ("osc 1 slop, osc 2 slop, osc 3 slop, osc 4 slop, osc all slop")

- Osc All Shape ("osc all shape mod")

- All Delays ("delay all time")

To access the new modulation destinations:

- Press the assign mod destination button, then turn soft knob 4 (destination) to select the desired modulation destination.

Disable Screen Saver for the Display

The Prophet 12 OLED display has a built in screen saver that puts it to sleep when not in use. This feature is designed to prolong the life of the display and we recommend using it. If, however, you want to disable this feature, you can now do so.

To disable the screen saver for the OLED display:

1. Press the global button, then turn soft knob 1 and select screen saver (item #26).

2. Turn soft knob 3 (off/on) and select off. Press the global button again to exit the Global menu.

Playlist List and Set Selection Using Soft Knobs

When using Playlists to organize presets, soft knobs 3 and 4 can now be used to select Playlist 1-4 and the Set 1-10, respectively.

To use the soft knobs to select a playlist and its set:

1. Press the playlist button.

2. Turn soft knob 3 to select the desired Playlist, 1-4.

3. Turn soft knob 4 to select the desired Set, 1-10.

Alternative Tunings

By default, the Prophet 12 is set to standard, equal-temperament, chromatic western tuning. Additionally, it now supports up to 16 additional alternative tunings, which you can access using the ALT TUNING SCALE setting in the GLOBAL menu.

Prophet 12 OS version 1.4.1 and later ships with 16 preset, alternative tunings. These range from Equal temperament to Indonesian Gamelan tunings. They are described in detail at the end of this section.

If your Prophet 12 has an older version of the operating system and you want to use these tunings, update your OS to version 1.4.1 or later and download the alternative tunings from the Prophet 12 Support section of the DSI website. Then install the tunings using the instructions included with the download.

If you want, you can replace the alternative tunings included with OS 1.4.1 and later with other tunings that you can find on the Internet. These must be in SysEx format. You can download them into the Prophet-6 using SysEx Librarian for Mac or MIDI-OX for Windows.

To use an alternate tuning:

1. Press the GLOBAL button, then turn soft knob 1 and select ALT TUNING SCALE (item #22).

2. Turn soft knob 3 (SCALE) and select one of the available tunings. See the list that follows.

3. Press the GLOBAL button again to exit the Global menu.

Default Alternative Tunings

1. 12-Tone Equal Temperament (non-erasable)

The default Western tuning, based on the twelfth root of two.

2. Harmonic Series

MIDI notes 36-95 reflect harmonics 2 through 60 based on the fundamental of A = 27.5 Hz. The low C on a standard 5 octave keyboard acts as the root note (55Hz), and the harmonics play upwards from there. The remaining keys above and below the 5 octave range are filled with the same intervals as Carlos' Harmonic 12 Tone that follows.

3. Carlos Harmonic Twelve Tone

Wendy Carlos' twelve note scale based on octave-repeating harmonics. A = 1/1 (440 Hz). 1/1 17/16 9/8 19/16 5/4 21/16 11/8 3/2 13/8 27/16 7/4 15/8

4. Meantone Temperament

An early tempered tuning, with better thirds than 12ET. Sounds best in the key of C. Use this to add an authentic touch to performances of early Baroque music. C=1/1 (260 Hz)

5. 1/4-Tone Equal Temperament

24 notes per octave, equally spaced 24root2 intervals. Mexican composer Julian Carillo used this for custom-built pianos in the early 20th century.

6. 19-Tone Equal Temperament

19 notes per octave (19root2) offering better thirds than 12 ET, a better overall compromise if you can figure out the keyboard patterns.

7. 31-Tone Equal Temperament

Many people consider 31root2 to offer the best compromise towards just intonation in an equal temperament, but it can get very tricky to keep track of the intervals.

8. Pythagorean C

One of the earliest tuning systems known from history, the Pythagorean scale is constructed from an upward series of pure fifths (3/2) transposed down into a single octave. The tuning works well for monophonic melodies against fifth drones, but has a very narrow palate of good chords to choose from. C=1/1 (261.625 Hz)

1/1 256/243 9/8 32/27 81/64 4/3 729/512 3/2 128/81 27/16 16/9 243/128

9. Just Intonation in A with 7-limit Tritone at D#

A rather vanilla 5-limit small interval just-intonation, except for a single 7/5 tritone at D#, which offers some nice possibilities for rotating around bluesy sevenths. A=1/1 (440 Hz) 1/1 16/15 9/8 6/5 5/4 7/5 3/2 8/5 5/3 9/5 15/8

10. 3-5 Lattice in A

A pure 3 and 5-limit tuning which resolves to very symmetrical derived relationships between notes. A=1/1 (440 Hz)

1/1 16/15 10/9 6/5 5/4 4/3 64/45 3/2 8/5 5/3 16/9 15/8

11. 3-7 Lattice in A

A pure 3 and 7-limit tuning which resolves to very symmetrical derived relationships between notes. Some of the intervals are very close together, offering several choices for the same nominal chords. A=1/1 (440 Hz)

1/1 9/8 8/7 7/6 9/7 21/16 4/3 3/2 32/21 12/7 7/4 63/32

12. Other Music 7-Limit Black Keys in C

Created by the group Other Music for their homemade gamelan, this offers a wide range of interesting chords and modes. C=1/1 (261.625 Hz)

1/1 15/14 9/8 7/6 5/4 4/3 7/5 3/2 14/9 5/3 7/4 15/8

13. Dan Schmidt Pelog/Slendro

Created for the Berkeley Gamelan group, this tuning fits an Indonesian-style heptatonic Pelog on the white keys and pentatonic Slendro on the black keys, with B and Bb acting as 1/1 for their respective modes. Note that some of the notes will have the same frequency. By tuning the 1/1 to 60 Hz, Dan found a creative way to incorporate the inevitable line hum into his scale. Bb, B = 1/1 (60 Hz)

1/1 1/1 9/8 7/6 5/4 4/3 11/8 3/2 3/2 7/4 7/4 15/8

14. Yamaha Just Major C

When Yamaha decided to put preset microtunings into their FM synth product line, they selected this and the following tuning as representative just intonations. As such, they became the de-facto introduction to JI for many people. Just Major gives preferential treatment to major thirds on the sharps, and a good fourth relative to the second. C= 1/1 (261.625)

1/1 16/15 9/8 6/5 5/4 4/3 45/32 3/2 8/5 5/3 16/9 15/8

15. Yamaha Just Minor C

Similar to Yamaha's preset Just Major, the Just Minor gives preferential treatment to minor thirds on the sharps, and has a good fifth relative to the second. C= 1/1 (261.625) 1/1 25/24 10/9 6/5 5/4 4/3 45/32 3/2 8/5 5/3 16/9 15/8

16. Harry Partch 11-limit 43 Note Just Intonation

One of the pioneers of modern microtonal composition, Partch built a unique orchestra with this tuning during the first half of the 20th century, to perform his own compositions. The large number of intervals in this very dense scale offers a full vocabulary of expressive chords and complex key changes. The narrow spacing also allows fixed-pitched instruments like marimbas and organs to perform glissando-like passages. G = 1/1 (392 Hz, MIDI note 67)

1/1 81/80 33/32 21/20 16/15 12/11 11/10 10/9 9/8 8/7 7/6 32/27 6/5 11/9 5/4 14/11 9/7 21/16 4/3 27/20 11/8 7/5 10/7 16/11 40/27 3/2 32/21 14/9 11/7 8/5 18/11 5/3 27/16 12/7 7/4 16/9 9/5 20/11 11/6 15/8 40/21 64/33 160/81

17. Arabic 12-Tone

A 12-tone approximation of an Arabic scale, which appears in some electronic keyboards designed for use with Arabic music. Not a just-intonation scale, nor equal tempered. These are the intervals in Cents relative to C:

60 = Cents 0.

61 = Cents +151.

62 = Cents +204.

63 = Cents +294.

64 = Cents +355.

65 = Cents +498.

66 = Cents +649.

67 = Cents +702.

68 = Cents +853.

69 = Cents +906.

70 = Cents +996.

71 = Cents +1057.

72 = Cents +1200