

VS-840 Synchronization

The VS-840's built-in synchronization capabilities allow you to integrate the VS-840 with other recording and/or MIDI devices in your studio. For example, you can synchronize the VS-840 with another recording device, such as the VS-880, to gain more recording tracks. You can also synchronize the VS-840 with your MIDI sequencer, enabling you to record non MIDI instruments such as acoustic guitar or vocals along with your MIDI sequences. The purpose of this document is to demonstrate the synchronization capabilities of the VS-840. First, we will provide definitions of some of the common terms related to synchronizing recording devices. Next, we will show you how to synchronize the VS-840 with the VS-880. Then, we will show you how to setup the VS-840 to synchronize with a drum machine. Finally, we will show how to setup the VS-840 to synchronize with a computer sequencer.

I. Common Terms

The following is a list of terms you might encounter regarding the VS-840 and synchronization:

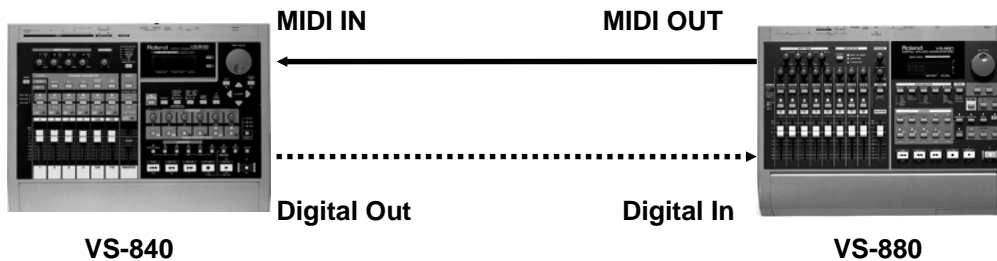
Digital Clock	Digital Clock is a timing reference on digital recording devices that is generated from an internal quartz crystal oscillator. It is used to provide timing stability during the recording process. Whenever a signal is recorded digitally between two devices, the clock signal from the source device is used for the timing reference. This ensures that there will be no timing irregularities during the recording process.
MIDI Clock	MIDI Clock is a stream of digital timing pulses that provides information about the current tempo of a song or sequence. It is commonly used with hardware sequencers and drum machines. While it is commonly used by many devices today, it is not precise enough to control a hard disk recorder like the VS-840. However, the VS-840 can generate MIDI Clock to control other devices. MIDI Clock works in conjunction with other MIDI messages including Start, Stop, Continue, and Song Position Pointer.
MIDI Machine Control (MMC)	MIDI Machine Control consists of controller messages sent from one device to another via MIDI to start recording, playing, and arming tracks for recording. This communication data does not contain any timing information.
MIDI Time Code (MTC)	MIDI Time Code is a synchronization signal that is digitally sent through MIDI for synchronization of absolute time between audio devices. Similar to SMPTE, MTC can have different frame rates for synchronization. MTC can be converted to SMPTE time code by using a device such as the Video Syncman by MIDIMan. See SMPTE for more details.
SMPTE	SMPTE is an acronym for Society of Motion Picture and Television Engineers. It also refers to a common standard for measurement of intermodulation distortion (IM), and for a standard reference code for identification of frames of film or videotape; SMPTE code is also used for synchronization of two or more audio tape recorders. See SMPTE Time Code for more details.
SMPTE Time Code	A synchronization code developed for video designed for frame edge lockup of multiple video and audio devices. SMPTE is calculated in Hours:Minutes:Seconds:Frames. There are several different types of SMPTE frame rates, i.e.: 30 frames per second, 29.97 fps non-drop, 29.97 fps drop, 25 fps (European standard), and 24 fps (used for film). The VS-840 supports all types of MTC which corresponds to all types of SMPTE. You will need to use the MIDIMAN 'Video Syncman' unit to interface between a SMPTE source and the VS-840. The VS-840 will also resolve (exactly lock to) the frame edge of the SMPTE or MTC. This means that the lock will not drift or go out of sync even if the song or project is very long.

II. Syncing the VS-840 with the VS-880 Using MIDI Machine Control and Digital Clock

Use the following procedure to synchronize the VS-840 with the VS-880. The VS-880 will be the master device using MIDI Machine Control (MMC) and Digital Clock.

Setup

- 1) Connect the MIDI OUT jack of the VS-880 to the MIDI IN jack of the VS-840.
- 2) Connect the coaxial digital output of the VS-840 to the digital input of the VS-880.



NOTE: Make sure that both the VS-840 and the VS-880 are powered on and that the current song's sampling rate (48kHz, 44.1kHz, or 32kHz) is the same on both units. If you are unsure what the current song's sampling rate is set to, press PLAY/DISPLAY on the VS-880 to access the Play screen (if necessary). Then, hold SHIFT and press SONG. The sampling rate will be displayed under "SYNC MODE." On the VS-840, press DISPLAY to return to the main screen (if necessary). The sampling rate will be displayed under "SONG #." The sampling rate is linked to the song. If the sampling rates do not match, you will need to create a new song on either the VS-840 or the VS-880 with a sampling rate that matches the other unit.

VS-880 Settings

- 1) Press SELECT so that INPUT>TRACK is lit.
- 2) Press SYSTEM until "SYS MIDI PRM?" is displayed. Press YES/ENTER.
- 3) Press PARAMETER RIGHT until "MIDI Thru" is displayed. Use the TIME/VALUE dial to select "MIDI Thru = Out."
- 4) Press PARAMETER RIGHT until "SysEx Tx" is displayed. Use the TIME/VALUE dial to select "SysEx Tx = On."
- 5) Press PARAMETER RIGHT until "MMC" is displayed. Use the TIME/VALUE dial to select "MMC = MASTER."
- 6) Press PARAMETER RIGHT until "CtrLocal" is displayed. Use the TIME/VALUE dial to select "CtrLocal = On."
- 7) Press PARAMETER RIGHT until "CtrType" is displayed. Use the TIME/VALUE dial to select "CtrType = Off."
- 8) Press SYSTEM until "Sync/Tempo PRM?" is displayed. Press YES/ENTER and "Syn:Source" will be displayed.
- 9) Use the TIME/VALUE dial to select "Syn:Source = INT."
- 10) Press SYSTEM until "System PRM?" is displayed. Press YES/ENTER and "SYS Master Clk" will be displayed.
- 11) Use the TIME/VALUE dial to select "SYS Master Clk = DIGITL."

VS-840 Settings

- 1) Press UTILITY and use the CURSOR LEFT / RIGHT buttons to highlight the MIDI icon. Press YES/ENTER.
- 2) Press the CURSOR DOWN button and use the TIME/VALUE dial to select "SLAVE."

Routing the Audio Signal

- 1) Set the MASTER fader on the VS-840 to 0db (approximately two-thirds of the way up).
- 2) Press EDIT/SOLO on the VS-880 (above the master fader) until "MST StereoIn =" is displayed.
- 3) Use the TIME/VALUE dial to select "Digital."
- 4) Press PARAMETER RIGHT so that "MST STIn Level =" is displayed. Use the TIME/VALUE dial to adjust the overall level of the VS-840 as desired.
- 5) Press PARAMETER RIGHT so that "MST StIn Bal =" is displayed. Use the TIME/VALUE dial to select "0."

When you press PLAY on the VS-880, both units will start playing. The VS-880's mix output will contain audio from both units.

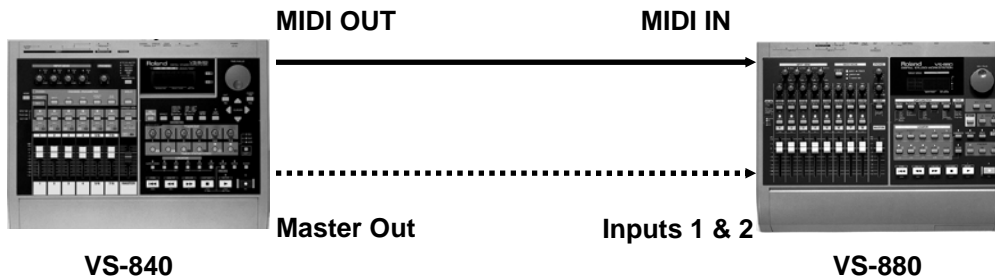
III. Syncing the VS-840 with the VS-880 Using MIDI Time Code

Use the following procedure to synchronize the VS-840 with the VS-880. The VS-840 will be the master device using MIDI Time Code.

Setup

- 1) Connect the MIDI OUT jack of the VS-840 to the MIDI IN jack of the VS-880.
- 2) Connect the left master output of the VS-840 to Input 1 (input B section) of the VS-880.
- 3) Connect the right master output of the VS-840 to Input 2 (input B section) of the VS-880.

NOTE: If you have any cables connected to Inputs 1 or 2 in the Input A section of the VS-880, you will need to disconnect them.

**VS-880 Settings**

- 1) Press SELECT so that INPUT>TRACK is lit.
- 2) Press SYSTEM until "Sync/Tempo PRM ?" is displayed and press YES/ENTER.
- 3) Use the TIME/VALUE dial to select "Syn:Source = EXT."
- 4) Press PARAMETER RIGHT three times so that "Syn:MTC Type" is displayed. Use the TIME/VALUE dial to select "30" (if necessary).
- 5) Press SYSTEM until "MIDI PRM ?" is displayed and press YES/ENTER.
- 6) Press PARAMETER RIGHT until "SysEx Rx =" is displayed. Use the TIME/VALUE dial to select "ON."
- 7) Press PARAMETER RIGHT until "MMC =" is displayed. Use the TIME/VALUE dial to select "SLAVE."

VS-840 Settings

- 1) Press UTILITY and use the CURSOR LEFT / RIGHT buttons to highlight the MIDI icon. Press YES/ENTER.
- 2) Press the CURSOR DOWN button and use the TIME/VALUE dial to select "MASTER."
- 3) Press UTILITY and use the CURSOR RIGHT button to highlight the SYNC / TEMPO icon.
- 4) Press YES/ENTER and use the TIME/VALUE dial to select "MTC."
- 5) Press the CURSOR DOWN button and use the TIME/VALUE dial to select "30" (if necessary).
- 6) Press DISPLAY to return to the main screen.

Routing the Audio Signal

- 1) Set the MASTER fader on the VS-840 to 0db (approximately two-thirds of the way up).
- 2) Set the INPUT SENS 1 and 2 knobs to "-10" (straight up).
- 3) Press EDIT/SOLO on the VS-880 (above the master fader) until "MST StereoIn =" is displayed.
- 4) Use the TIME/VALUE dial to select "Digital."
- 5) Press PARAMETER RIGHT so that "MST STIn Level =" is displayed. Use the TIME/VALUE dial to adjust the overall level of the VS-840 as desired.
- 6) Press PARAMETER RIGHT so that "MST StIn Bal =" is displayed. Use the TIME/VALUE dial to select "0."

When you press PLAY on the VS-880, both units will start playing. The VS-880's mix output will contain audio from both units.

Synchronizing with a Drum Machine (MIDI Clock)

The VS-840 can be synchronized with most drum machines using MIDI Clock messages. The VS-840 will need to be the master device. Use the following procedure to synchronize the VS-840 with a drum machine:

Setup

- 1) Connect the MIDI OUT jack of the VS-840 to the MIDI IN jack of your drum machine.

- 2) Connect the audio output(s) of your drum machine to the input section of the VS-840 or to an external mixer and/or amplifier.



Settings

- 1) Press UTILITY.
- 2) Use the CURSOR LEFT / RIGHT buttons to highlight the SYNC / TEMPO icon and press YES/ENTER.
- 3) Use the TIME/VALUE dial to select "MIDI CLOCK."
- 4) Set your drum machine to synchronize to MIDI Clock messages and press PLAY on the VS-840. Your drum machine should start playing in sync with the VS-840.

Routing the Audio Signal

If you are sending the audio output of your drum machine to the inputs 1 and 2 of the VS-840, use the following procedure to route the drum machine output to the master output of the VS-840:

- 1) Press MODE so that SELECT is lit.
- 2) Press the SELECT buttons for channels 1 and 2 so they are set to SOURCE (orange).
- 3) Press MONITOR SEL so that TR CUE + MASTER is lit.
- 4) Set the INPUT SENS 1 and 2 knobs to the 12 o'clock position (straight up).
- 5) Press PAN and use the CURSOR LEFT / RIGHT buttons to highlight the Channel 1 pan icon.
- 6) Use the TIME / VALUE dial to select "L63."
- 7) Press the CURSOR RIGHT button and use the TIME / VALUE dial to select "R63" for channel 2.
- 8) Use the channel 1 and 2 faders to adjust the level of the drum machine as desired.

Creating a Tempo Map

The VS-840 has a Tempo Map function that allows you to determine the tempo for its internal metronome or external MIDI devices. The Tempo Map lets you specify changes in the tempo (in beats per minute) and/or the time signature for each measure of your song. Use the following procedure to create a Tempo Map:

- 1) Press UTILITY and use the CURSOR LEFT / RIGHT buttons to highlight the SYNC / TEMPO icon. Press YES / ENTER.
- 2) Use the CURSOR DOWN button to highlight "TEMPO [ENTER] HERE!" and press YES / ENTER.
- 3) Use the CURSOR buttons to highlight "120.0" and the TIME / VALUE dial to adjust the tempo as desired.
- 4) Use the CURSOR LEFT button to highlight "4/4" and the TIME / VALUE dial to adjust the time signature as desired. If your song does not contain any additional tempo and/or time signature changes, skip to step #10.
- 5) Use the CURSOR buttons to highlight "<NEW>" for Tempo Map number 2.
- 6) Use the TIME / VALUE dial to select the desired tempo.
- 7) Press CURSOR LEFT and use the TIME / VALUE dial to select the desired time signature.
- 8) Press CURSOR LEFT and use the TIME / VALUE dial to select the measure where the tempo change will occur.
- 9) Repeat steps 5-8 to create any additional tempo changes if desired.
- 10) Press DISPLAY to return to the main screen.

Using the Sync Track

The VS-840 contains a Sync Track function that allows you to record MIDI Clock messages from an external device and then send those same messages out on playback. This is extremely useful if you have created a song on your sequencer or drum machine that contains numerous tempo and/or time signature changes and you want to synchronize it with the VS-840. Use the following procedure to create a Sync Track:

- 1) Press UTILITY and use the CURSOR LEFT / RIGHT buttons to highlight the SYNC / TEMPO icon. Press YES/ENTER.
- 2) Use the CURSOR DOWN button to highlight "SYNC REC" and press YES / ENTER. "Wait for Start" will be displayed.

Using the Sync Track (continued)

- 3) Start playing your sequencer or drum machine.
- 4) Stop playback on your sequencer / drum machine when the song is finished playing.
- 5) Use the CURSOR UP button to highlight "Gen" and use the TIME / VALUE dial to select "Sync TRACK."
- 6) Press PLAY / DISPLAY to return to the main Play screen.

- 7) Make sure that your sequencer / drum machine is in external sync mode and press PLAY on the VS-840. Your sequencer / drum machine should begin playing back in sync with the VS-840 using the same tempo changes that you originally programmed.

Synchronizing with a Computer (MTC)

The VS-840 can be synchronized with most computer-based sequencing programs by using MIDI Time Code (MTC). The VS-840 will need to be the master device. Use the following procedure to synchronize the VS-840 with a computer-based sequencer:

Setup

- 1) Connect the MIDI OUT jack of the VS-840 to the MIDI IN jack on your MIDI interface.
- 2) Connect the audio output of your MIDI sound module(s), keyboard, and/or sound card to the input section of the VS-840 or to an external mixer and/or amplifier.

Settings for the VS-840

- 1) Press UTILITY.
- 2) Use the CURSOR LEFT / RIGHT buttons to highlight the SYNC / TEMPO icon and press YES/ENTER.
- 3) Use the TIME/VALUE dial to select "MTC."
- 4) Press the CURSOR DOWN button and use the TIME/VALUE dial to select "30" (if necessary).

Routing the Audio Signal

If you are sending the audio output of your sound card/module to the input section of the VS-840, use the following procedure to route the sound card/module output to the master output of the VS-840:

- 1) Press MODE so that SELECT is lit.
- 2) Press the SELECT buttons for channels 1 and 2 so they are set to SOURCE (orange).
- 3) Press MONITOR SEL so that TR CUE + MASTER is lit.
- 4) Set the INPUT SENS 1 and 2 knobs to the 12 o'clock position (straight up).
- 5) Press PAN and use the CURSOR LEFT / RIGHT buttons to highlight the Channel 1 pan icon.
- 6) Use the TIME / VALUE dial to select "L63."
- 7) Press the CURSOR RIGHT button and use the TIME / VALUE dial to select "R63" for channel 2.
- 8) Use the channel 1 and 2 faders to adjust the level of the sound card/module as desired.

Settings for your Computer

- 1) Set your sequencing software to sync to external MIDI Time Code.
- 2) Set the MTC frame rate on your sequencing software to "30."
- 3) Press PLAY on your sequencing software to enter play standby mode (not necessary on all sequencers).
- 4) Press PLAY on the VS-840 and your sequencing software should begin playing back in sync.

We hope that this document has provided you with a better understanding of the procedures required to synchronize the VS-840 to external devices. These capabilities should allow you use the VS-840 and your other recording devices to their fullest potential.