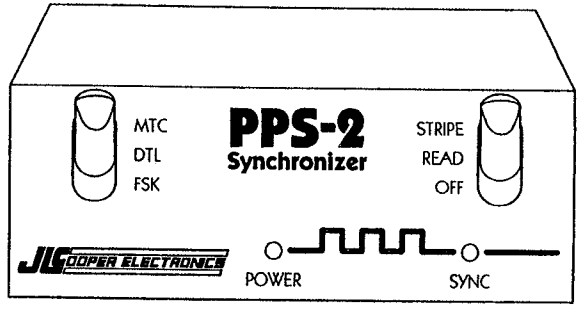
PPS-2

User's Manual
Fourth Edition, August, 1997



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142 Arena Street, El Segundo, CA 90245 U.S.A.

JLCOOPER ELECTRONICS

Greetings

Thank you for purchasing the PPS-2. This product represents a revolutionary price breakthrough in professional MIDI and tape synchronization. The PPS-2 allows MIDI sequencers, drum machines, workstations, and hard disk recording systems to sync to tape, and gives them the ability to "chase tape". This means that the tape can be started anywhere in the song.

Older sync boxes required that you always start at the beginning of the song. Also, typical SMPTE synchronizers tend to be expensive and can be very complicated to set up and use. The PPS-2, however, is surprisingly simple to use.

The PPS-2 produces two different kinds of sync tones (FSK or SMPTE), and can output three different kinds of MIDI timing messages, so it might be a good idea to now determine how you are going to use the PPS-2.

"Smart" FSK with MIDI Clock and Song Position Pointer
This is the way you will use the PPS-2 with drum machines, keyboard sequencers, "hardware" sequencers, and a few software-based sequencers. The PPS-2 lets a multi-track tape recorder control any sequencer or drum machine that recognizes MIDI Song Position Pointer. Sequencer tracks (or Drum Machine songs) are recorded first, and then the PPS-2 is used to "lay down" a special FSK sync tone, also known as "striping" the tape. The PPS-2 will read that FSK sync tone during tape playback, overdubs, and mix down. MIDI Song Position Pointer is generated by the PPS-2, causing the MIDI device to "chase" to the appropriate point in the song. Then the PPS-2 will generate MIDI Clocks, so that the MIDI device stays in perfect sync.

SMPTE
This is the way you will use the PPS-2 with most software-based sequencers and hard disk recording systems. The PPS-2 generates true SMPTE time code. The PPS-2 reads any form of SMPTE, converting it to either MIDI Time Code or Direct Time Lock.

SMPTE and MIDI Time Code (MTC)
While reading SMPTE, the PPS-2 will output MIDI Time Code (MTC). The PPS-2 lets a multi-track tape recorder control any device that recognizes MIDI Time Code (MTC). MTC, unlike MIDI Clock, is a way of sending SMPTE messages on a MIDI cable. It is used to drive almost all software sequencers and some hard disk recorders.

SMPTE and Direct Time Lock (DTL)
DTL is used by pre-3.5 versions of Mark of the Unicorn's Performer™ program, to sync Performer to SMPTE.

The optional PPS-2 Remote Software allows your Macintosh or Atari computer to change the PPS-2 SMPTE striping time and frame rate.

Please complete and mail he enclosed registration card, so that we may notify you of any updates or new products as they become available.

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Hookup

Special Notice about AC Line Conditioning:
All computer controlled equipment (including sequencers, drum machines, tone generators, and signal processors) must be protected from variations in the AC line. The PPS-2 is no exception. Lightning strikes, "brown outs", even nearby motorized equipment can scramble memories and in some cases cause damage to the hardware.

It is strongly recommended that all your computer-related equipment (including PPS-2) be plugged into an AC Line Conditioner. Many brands of multiple-outlet power strips at least have circuit breakers and surge suppressors. But ideally the PPS-2 should also be protected with a power strip that includes Line Filtering as well.

Many brands of AC Line Conditioners are sold in Music, Consumer Electronics, Computer, and Hardware stores.

The **SYNC OUT** output goes to an audio input that will arrive at the selected tape track, whether directly or via a mixing console to control the level.

The **SYNC IN** input comes from the tape track output.

The **MIDI OUT** of the PPS-2 goes to the MIDI In of the sequencer, drum machine, or computer interface.

To stripe FSK, feed the MIDI Out of the sequencer, drum machine, or computer interface to the PPS-2's **MIDI IN**. This is not necessary for striping SMPTE.

To overdub a new track into the sequencer while the sequencer is synced to tape, hook up the MIDI output of a keyboard controller to the **MIDI IN** of the PPS-2.

Power comes from the supplied 9VDC 500 mA adapter. (The center conductor is positive, keep this in mind if you ever need a replacement.)

Refer to figures on the following pages for hook up suggestions.

You may rack mount your PPS-2 with a JLCooper Nexus Rack Tray, or any equivalent rack tray. Do not use screws in excess of 1/4" length.

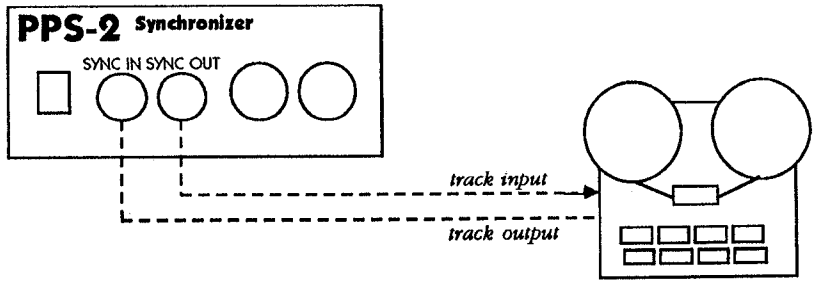


FIGURE 1: SYNC HOOK UP

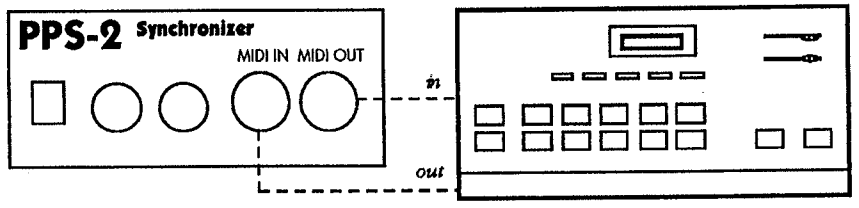


FIGURE 2: MIDI HOOK UP, NO MIDI PATCH BAY OR THRU BOX
Striping and Syncing to tape

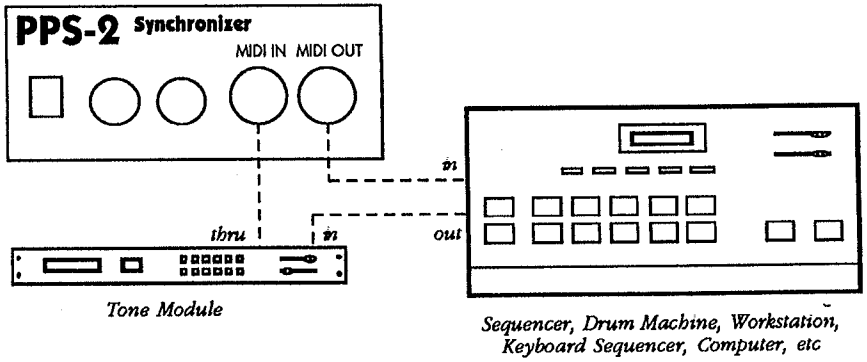


FIGURE 3: MIDI HOOK UP, NO MIDI PATCH BAY OR THRU BOX
Striping and Syncing to tape while monitoring the playback of a single MIDI sound module

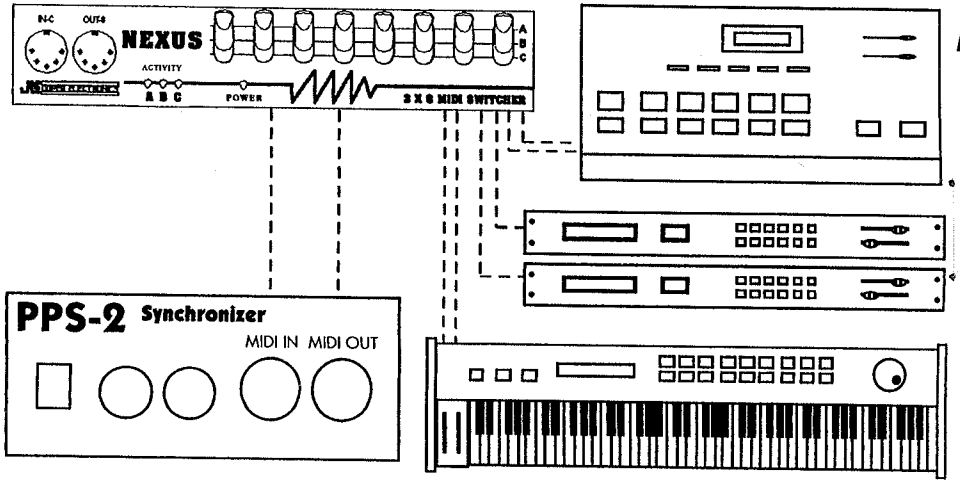


FIGURE 4: MIDI HOOK UP, WITH MIDI PATCH BAY OR THRU BOX
Striping and Syncing to tape while monitoring the playback of a several MIDI sound modules.

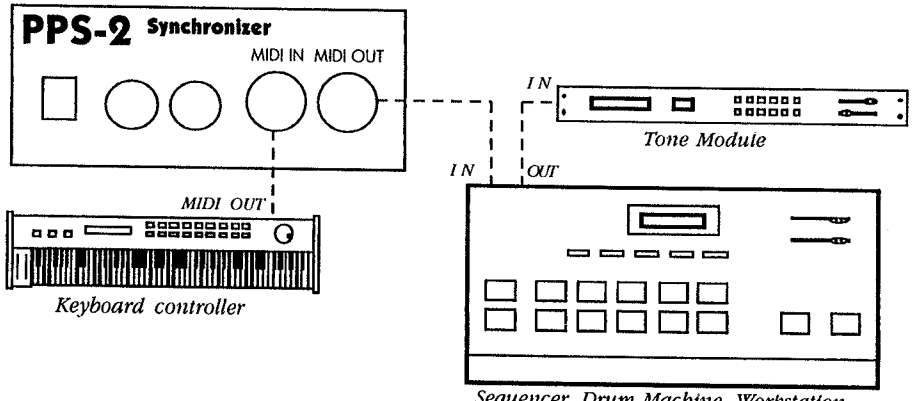


FIGURE 5: MIDI HOOK UP, NO MIDI PATCH BAY OR THRU BOX
Syncing to tape while overdubing a new sequencer track.

FSK OPERATION OVERVIEW

This section provides a general overview of the operation of the PPS-2 in FSK mode. The following sections will present the specifics. Once you have familiarized yourself with the operation of the **PPS-2**, you may refer back to this section as a quick guide to operation.

To Stripe Tape with FSK:

(1) Flip the left switch down to the FSK position before turning PPS-2 on.

(2) Set up the sequencer or drum machine.
- i The sequencer or drum machine must be ready to play back a previously recorded song.
- ii Set the sequencer or drum machine to Internal sync.
- iii Set the sequencer or drum machine to send out MIDI clocks.

(3) Hook up **MIDI OUT** of the sequencer or drum machine to **MIDI IN** of the PPS-2. Hook up **SYNC OUT** jack of PPS-2 to tape recorder input. Typically, sync tones are recorded on the last track.

(4) **Flip up the right switch to the STRIPE position.**

(5) Disable EQ and Noise Reduction, if possible, on that track, and set levels.

(6) Start tape transport in **RECORD** on the sync track. After a little pre-roll time, start the sequencer or drum machine.

(7) **LOCK LED** will come on, indicating that tape is being striped with the smart FSK tone.

(8) Stop the tape recorder at the end of the song.

To Sync Sequencer or Drum Machine to Tape:

(1) **Flip the right switch down to the READ position.**

(2) Hook up tape output to the **SYNC IN** jack of the PPS-2. Hook up the **MIDI OUT** of the PPS-2 to the sequencer or drum machine MIDI Input.

(3) Check to make sure that there is still no EQ on the sync track. If noise reduction was turned off during striping, make sure that it is still turned off.

(4) Set sequencer or drum machine to receive **external** MIDI Clock.

(5) Start the tape, either at the beginning or anywhere in the song.

(6) As soon as the PPS-2 receives the sync tone, the Lock LED will come on and a MIDI Song Position Pointer will be sent. This will be followed by a Continue command and by MIDI Clocks. The sequencer or drum machine will "chase" and lock.

SMPTE OPERATION PROCEDURE

In this mode, the PPS-2 will convert true SMPTE into MIDI Time Code frame messages, or into Performer's Direct Time Lock. The PPS-2 will also allow the striping of a tape with SMPTE. The SMPTE generated is 30 frames per second (non-drop), starting at 00:00:00:00.

Important
Flip the left switch to either MTC or DTL, *then* turn unit on.
The PPS-2, in order to maintain the most accurate timing possible, only checks the position of the left mode switch as you turn the unit on.

Striping
First hook up the **SYNC OUT** of the PPS-2 to the tape recorder input. Typically, the last track available is used for sync tones (e.g, if you are using an 8-Track, record the sync tone on track 8.) Be sure to defeat E.Q. from this track, and when possible defeat noise reduction too.

(Dolby C™ and dbx™ usually don't cause any problems. But if you have the option, leave them off during both recording and playback.)

To generate SMPTE, it is not necessary to hook up any sequencer.

You should set record level to somewhere between -15 and -10 dB. On decks with poor track separation, you may opt for lower levels to avoid hearing the sync tone "spill" into an adjacent track.

Start the tape recorder in **RECORD**.

To initiate a SMPTE stripe, flip the right switch up to the **STRIPE** position, with the left switch set to either MTC or DTL. The green LOCK LED should flash slowly.

It is common practice to stripe the whole length of tape.

Syncing to Tape
First hook up the tape output to the **SYNC IN** jack of the PPS-2.
Flip the right switch down to the **READ** position.

Before discussing syncing to tape with SMPTE, it may be helpful to say a few words about MTC and DTL. For a more detailed discussion, refer to the Appendix.

MIDI Time Code (MTC)
MTC allows SMPTE time (in hours, minutes, seconds, and frames) to be translated into a MIDI format. As soon as the tape begins to play a SMPTE track into the PPS-2, the PPS-2 immediately converts the stream of SMPTE times into MTC messages. So the sequencer must have first been told "when you see a certain time arrive, begin to play the sequence at this tempo." A Start time, sometimes called Offset time, must first be entered into the sequencer to use MTC.

Hook up the MIDI output of the PPS-2 to the MIDI input of your computer or other MTC-driven device. Flip the left switch to the MTC position. As soon as the PPS-2 receives SMPTE, the green lock LED will come on and MTC will be generated. Refer to your specific software-manufacturer's recommendations for using MTC.

Direct Time Lock (DTL)
Direct Time Lock is a proprietary timing scheme invented by Mark of the Unicorn for use with their Performer™ sequencing software. DTL is not a part of the MIDI specification, so it will only work with Performer™. There are a lot of things to set up on Performer™ to make it slave to Direct Time Lock.

On the Basics menu, first set **Receive Sync** to Direct Time Lock.

Turn **Slave to External Sync** on.

Select the small menu on the Counter Window, and select Set **Chunk Start** (or Sequence Start on earlier versions). Enter the SMPTE start time using Frames, not Real Time.

Hook up the MIDI output of the PPS-2 to the MIDI input of your computer. Flip the left switch to the DTL position. As soon as the PPS-2 receives SMPTE, the green lock LED will come on and DTL will be generated . Refer to the specific instructions in your Performer owners manual for using Direct Time Lock.

Playback Level
The PPS-2 will accept a fairly wide range of playback level. However, it is of course possible to go beyond the range of acceptability. Avoid overdriving the input of the PPS-2. The playback level should ideally be around -10. So, if the lock LED flashes on and off on playback, don't assume that the problem is dropout. It may be that the level is too high.

If you are passing the signal through a mixing console channel, and if the LOCK LED flickers on and off, try adjusting the fader up or down for a steady LOCK condition. If the SMPTE tone was recorded at the correct level, it should not be necessary to change the level on playback.

If you still experience difficulty in getting a steady lock, see Troubleshooting, page 13.

Auto Merging: Sequencer Overdubs
Suppose that it becomes necessary to overdub a new sequencer track while locked to SMPTE. If your sequencer has only one MIDI input, you will notice that the input is occupied by the MIDI cable from the output of the PPS-2. Hook up a MIDI cable from the output of your keyboard controller to the MIDI input of the PPS-2. (If you have a MIDI Patch Bay, this would be as simple as flipping a switch or pressing a button.) The PPS-2 will automatically merge the MIDI data coming from your keyboard with the MIDI timing data. Both will be sent on the single MIDI cable going to the input of your sequencer. Be aware that certain sequencers do not know how to read timing data and record notes at the same time. For example, Passport's Pro4™ and MasterTracks™ cannot read MTC on the same port as MIDI Notes.

SMPTE Regeneration/Jam Sync
It is a good practice to avoid copying a SMPTE track from one tape to another. The code being transferred to a new tape ought to be a regenerated version of the original.

While PPS-2 is receiving SMPTE from tape, new SMPTE time code is simultaneously sent out of the **SYNC OUT**. This is not merely reshaped code, rather it is freshly generated code, whose time value exactly corresponds to the incoming code. If the original code had some defects (of less than six frames), the new code interpolates, that is to say, the gaps are filled in with numerically correct frame numbers.

SMPTE Flywheel
Magnetic tape is vulnerable to drop-out caused by contamination or missing oxide particles. Thus a SMPTE tone on tape can occasionally have missing frames. When the PPS-2 encounters very short periods of bad SMPTE time code, it can continue to generate MTC or DTL. This feature is known as "flywheeling", and is used to prevent a sequencer from stopping during a recording session or mixdown. PPS-2 can flywheel through 6 bad frames of time code. If a drop-out lasts any longer, the PPS-2 behaves just as if incoming SMPTE has been stopped. As soon as good code is received, MTC or DTL conversion resumes.

TROUBLESHOOTING AND SERVICE

If you have followed the directions, but things still are not going quite as you expected, take a few minutes to do some troubleshooting. The key to frustration-free troubleshooting is threefold:

(1) Check the obvious first.
(2) Be painstakingly systematic, change only one variable at a time.
(3) Stay calm, it is only your livelihood at stake.

Here are some clues to solve common problems.

The LOCK LED does not come on when attempting to stripe FSK.
Check that the sequencer or drum machine is really set up to put out MIDI Clocks.
A surprising number of devices need to be "told" to do this. The MIDI cable should go from the MIDI out of the sequencer to the MIDI in of the PPS-2, and the switches should be set to STRIPE and FSK. (A sequencer does not need to send Song Position Pointer in order to stripe the tape.)

The LOCK LED does not come on when attempting to slave to FSK or SMPTE.
Check that the tone is really on tape by monitoring (listening to) the sync track AT A LOW LEVEL. It should not be a steady tone, rather it should sound sort of garbled or warbling. Check that the switch is set to the correct position.

The LOCK LED does not stay on steadily.
The level may be too high. The optimum level is between -15 and -7 *on semi-pro, that is, -10 equipment.* The PPS-2 is designed to read a low level signal, so it is easy to accidentally overdrive it, especially when using professional, that is, +4 equipment.

Ideally, E.Q. and noise reduction should be defeated during record and playback. Dolby C™ and dbx™ noise reduction usually cause no problems as long as they are used during both record and playback.

If the Lock LED always goes out at the same place in the song, suspect either tape drop-out or adjacent track cross-talk. On smaller tape decks, channel separation can be poor. A tape track with a lot of high energy content (such as a "scratch" mix) alongside a sync track can cause problems if the audio signal bleeds into the sync. Also, anything that can degrade audio can degrade sync as well. Be sure that the transport is well maintained with clean and demagnitized heads.

The tone should have been recorded into an ordinary line input. Some multi tracks incorporate special sync inputs and outputs. We do not recommend using these because they can introduce undesirable filtering and limit your ability to control the level. The filtering in a Tascam Porta 05 can only be defeated by having its circuitry modified by a qualified service center. If you have tried everything else and still cannot get a successful lock up with Porta 05, contact Tascam/Teac technical support.

Electrical AC line noise can cause a permanent drop-out, as when a refrigerator turns on while you are laying down time code. Listen to the sync tone for a click at the point of drop out. If it sounds muffled, it is probably a bad tape. If, however, you here a click at the drop-out point, you may have a surge or electrical noise problem.

No Chase or irregular tempo with FSK.
First verify that the sequencer or drum machine is indeed set to external MIDI Clock. If you have inadvertently left the sequencer or drum machine set to internal sync, it may still give the illusion of locking to MIDI Clock. But it will not chase or lock properly. (This does not apply to Alesis equipment, which has a single setting for both internal and MIDI clock.)

If the sequence plays back at about half tempo, check that the tempo of the sequence during the stripe operation did not exceed 240 B.P.M. If the sequence plays back at double tempo, be sure that you have not inadvertently caused a MIDI loop somewhere in the system. This can happen if a MIDI patch bay has not been correctly set up

The Lock LED is on but the sequencer is not playing back.
Check that the sequencer has been set up to read the correct type of MIDI timing commands. If using a Macintosh computer, check the software for correct MIDI port configurations and interface clock rate. If using MTC or DTL, recheck the start time (sometimes called offset time) on your sequencer.

With MTC or DTL, the sequence immediately chases to a very high measure number as soon as the tape is started.

The Start Time of the sequencer has probably not been set correctly. This is sometimes called offset time. Let the tape run a few seconds so that you can notice the SMPTE time display on your sequencer. Make sure that your Start Time is set a little later than the SMPTE stripe's beginning time.

No Response
If none of the switches do anything, and none of the LEDs are on, check the power hook up first. If the LEDs just stay on, this may indicate that the internal microprocessor is not running. Perhaps the unit has received an AC surge. Turn the power off and on once to see if the unit returns to life. If you still have no luck, see below.

At JLCooper Electronics, we pride ourselves on our consistency of conscientious workmanship. We use solid metal enclosures, and highest quality epoxy glass printed circuit boards. The PPS-2 is actually a precision micro processor-based instrument. Please transport it tucked away in one of your road cases.

If you experience any operational difficulties, let us reassure you that every unit is 100% factory tested. It worked when it left the factory, otherwise it wouldn't have been shipped. The most common cause of mysterious problems is a "noisy" AC outlet. We recommend the use of a AC surge suppressor *and line filter* with all computer-related equipment. These can be purchased at any hardware or computer store, and many music stores also now carry them.

As usual, there are no "user-serviceable" parts inside the PPS-2 . For warranty service in the event of a malfunction, call the factory to obtain a Return Authorization before sending the unit back.

If you need to call the factory, please have ready your serial number, a pen, and note the page number in the owners manual that relates to the problem you are having.

Please read this manual and debug your system before calling.

Appendix: Synchronization Terms

This chapter provides you with definitions of the synchronization terms that relate to the PPS-2. We will conclude with a discussion of the criteria for choosing the ideal synchronization procedure for your application. Although you probably already have an application for the PPS-2 in mind, you might find it helpful to review this chapter because there still seems to be a good deal of confusion in the industry over the differences between MIDI Clock, MIDI Time Code, and Direct Time Lock.

We have for the most part avoided the use of the term "MIDI Sync" in this manual. Although that term used to refer to MIDI Clock, these days it may refer to anything, and thus has become almost useless as an expression! This confusion is not helped by the fact that more than one popular sequencer manufacturer invents their own sync terminology, using words not even found in the Detailed MIDI Specification. This leaves many musicians and producers justifiably perplexed.

So please excuse us if we seem to be engaging in embarrassing overkill in attempting to clarify certain terms.

Definition of Terms

MIDI Clock with Song Position Pointer
Generally, these terms are also used to refer to a whole group of MIDI messages, including Start, Stop, and Continue.

MIDI Clock is known as a Real Time MIDI message. It is sent and received by most sequencers and drum machines *continually*, 24 times each quarter note. Thus the clock rate varies with the tempo. Nearly all sequencers can read MIDI Clock.

Song Position Pointer is a MIDI message that indicates how many sixteenth notes have elapsed since the beginning of a song.

MIDI Song Position Pointer by itself cannot synchronize anything. It must be used along with MIDI Continue and MIDI Clock messages to be useful. The MIDI Song Position Pointer message is sent out only **once** whenever a tape with FSK is started at some location other than the beginning of the song. It is never sent continually.

PPS-2 generates and reads its own special FSK (see below). While reading this FSK, PPS-2 generates MIDI Clock (with its associated Start, Stop, Continue, and Song Position Pointer messages) which are sent to your sequencer or drum machine. A sequencer that has been set up to receive MIDI Clock will slave its tempo to the FSK track. When the tape is started, PPS-2 sends a Song Position Pointer message into the sequencer. If the sequencer can recognize the message, it will internally prepare to playback at the right location within the song.

SMPTE
SMPTE was developed in the 1960's as a way to uniquely number each frame of a video tape for the purposes of editing. On audio tape, SMPTE consists of an sync tone that is recorded onto one track. One might say that the tone is recorded *along the length* of the tape. For this reason, it is known as Longitudinal Time Code or simply LTC. (There are other ways of encoding SMPTE onto various media, but we will limit the scope of our discussion to LTC.)

SMPTE Encoding
A SMPTE sync tone shifts its phase in a special way (called "bi-phase") to encode binary data. This binary data represents a time in hours, minutes, seconds, and frames. Each frame is further divided into 80 bits.

SMPTE Format
The frame rate may be either 24 frames per second (used for 35mm film), 25 frames per second (European and Australian video), 30 frames per second (general purpose tape sync), or 30 drop-frame (U.S. video). (30 drop-frame is a sort of compromise time code, color video really uses 29.97 frames per second. The 30 drop-frame format selectively removes certain frames to create an average of 29.97 over a certain period of time.)

The PPS-2 generates any of these forms of SMPTE. When the PPS-2 reads SMPTE, it converts it into either MIDI Time Code or Direct Time Lock. PPS-2 sends this MIDI information into your sequencer.

MIDI Time Code (MTC)
MTC is a way of sending SMPTE time on a MIDI cable. While reading SMPTE, the PPS-2 can directly convert the hour, minute, second, frame data into MTC, which your computer in turn can decode and lock to.

MTC is very different from ordinary MIDI Clock. This is because MIDI Clock messages are sent out at a rate that varies with the tempo. That is to say, the faster the sequence, the faster the MIDI Clock messages are transmitted. MTC however does not vary in tempo. Rather, it represents a steadily "upcounting" number stream that can be decoded by a sequencer as a time.

For this reason, sequencers that read MTC (such as Passport's MasterTracks™ or Opcode's Vision) must also allow the user to specify a start time and tempo as part of a sequence. As soon as the tape begins to play a SMPTE track into the PPS-2, the PPS-2 immediately converts the stream of SMPTE times into MTC messages. But the sequencer will not start until the SMPTE time on tape equals the pre-programmed starting time.

So the SMPTE stripe on tape might begin at a time of, say, 00:00:00:00. But the *sequencer's starting time must be a little later*, like 00:00:25:00. That way the sequence will start about 25 seconds into the tape, allowing you a little SMPTE *leader.*

Direct Time Lock (DTL)
This is a proprietary MIDI timing scheme invented by Mark of the Unicorn for use exclusively with their sequencing program, Performer™. It is not really part of the MIDI Specification.

It is used in a manner similar to MTC, a starting time and tempo are first programmed into the sequence. This starting time must be a little later than the beginning of the SMPTE stripe.

Smart FSK
FSK stands for Frequency Shift Keying. Technically speaking, even a Touch Tone telephone uses FSK. But in the recording industry, the term is usually restricted to describe the generic "tape sync" that is available out of most hardware sequencers and drum machines. The drawback of synchronizing using ordinary FSK is that the tape must always be started from the beginning of the song.

PPS-2 uses a special Smart FSK, which combines the simplicity of ordinary FSK with the chasing ability of SMPTE. MIDI Clocks from the sequencer (which may vary tempo in any fashion) are used to generate an FSK sync tone. This sync tone is encoded with a number representing the number of clocks since the start of the song. (This encoded number contains enough bits to handle over two hours worth of time at a tempo of 120 beats/second.)

Upon playback, PPS-2 reads and decodes this number, and converts it into a Song Position Pointer, and sends it into your sequencer or drum machine. Thereafter, MIDI Continue and Clocks are sent.

Choosing Smart FSK or SMPTE
If your sequencer reads MIDI Clock, but cannot read MTC or DTL, then choose Smart FSK. FSK is thus used for hardware sequencers, workstations, and drum machines, including devices by Alesis, Roland, Kawai, Yamaha, Korg, Ensoniq, Emu, etc. FSK allows any multi-track tape recorder to control these devices starting at any place in tape. PPS-2 will read that FSK sync tone during tape play back, overdubs, and mixdown. PPS-2 decodes the tone and sends a MIDI Song Position Pointer. The sequencer responds by chasing to the appropriate measure in the song. Then PPS-2 will generate MIDI Clocks, so that the sequencer stays in perfect sync.

If your sequencer or hard disk recorder reads MTC or DTL, then choose SMPTE. SMPTE is thus used for most software packages including those manufactured by Passport, Opcode, Digidesign, C-Lab, Steinburg-Jones, Hybrid Arts, SMPTE allows greater flexibility in that you can make changes to the length or tempo of a song even after the stripe has been recorded onto tape. (With FSK, the tempo and length of the song are encoded into the sync tone, and thus cannot be changed.)

JLCooper Electronics Limited Factory Warranty

JLCooper Electronics ("JLCooper") warrants this product to be free of defects in materials or workmanship for a period of 12 months from the date of purchase.

This warranty is non-transferable and the benefits apply to the original owner. Proof of purchase in the form of an itemized sales receipt is required for warranty coverage.

To receive service under this warranty, customers in the United States should contact the JLCooper factory at (310) 322-9990 and talk to a service technician. If necessary, a Return Authorization number may be issued.

For our customers outside the United States, it is recommended that you first contact your Dealer or Distributor, since they may offer their own service or support policy.

If local support is not obtainable, please send a FAX to JLCooper's Service Department at (310) 335-0110, with a detailed description of the service required.

Upon issuance of return authorization, the product should be properly packed and shipped to Service Department, JLCooper Electronics, 142 Arena St., El Segundo, CA 90245.

Please include the following: copy of the sales receipt, your name and address (no P.O. Boxes, please), a brief description of the problem, and any other related items discussed with the service department and considered necessary to evaluate the product or effect a repair. The return authorization number must be clearly written on the outside of the package.

JLCooper will, without charge for parts or labor, either repair or replace the defective part(s). Shipping costs are not covered by this warranty.

JLCooper's normal repair turn around time at the factory is approximately 15 business days, from receipt of product to shipping. Your actual turn around time will include return shipping.

Actual turn around time will vary depending upon many factors including the repeatability of the customer's reported complaint, the availability of parts required for repair, the availability of related products needed to evaluate the product if necessary.

Priority services are available. These should be discussed with the service technician at the time the return authorization is issued.

This warranty provides only the benefits specified and does not cover defects or repairs needed as result of acts beyond the control of JLCooper including but not limited to: abuse, damage by accident/negligence, modification, alteration, improper use, unauthorized servicing, tampering, or failure to operate in accordance with the procedures outlined in the owner's manual; nor for acts of God such as flooding, lightning, tornadoes, etc.

THE DURATION OF ANY OTHER WARRANTIES, WHETHER IMPLIED OR EXPRESS, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY OF MERCHANTABILITY, IS LIMITED TO THE DURATION OF THE EXPRESS WARRANTY HEREIN. JLCOOPER HEREBY EXCLUDES INCIDENTAL AND CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO: LOSS OF TIME, INCONVENIENCE, DELAY IN PERFORMANCE OF THIS WARRANTY, THE LOSS OF USE OF THE PRODUCT OR COMMERCIAL LOSS, AND FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, APPLICABLE TO THIS PRODUCT. JLCOOPER SHALL NOT BE LIABLE FOR DAMAGES OR LOSS RESULTING FROM THE NEGLIGENT OR INTENTIONAL ACTS OF THE SHIPPER OR HIS CONTRACT AFFILIATES. THE CUSTOMER SHOULD CONTACT THE SHIPPER FOR PROPER CLAIMS PROCEDURES IN THE EVENT OF DAMAGE OR LOSS RESULTING FROM SHIPMENT.