5.0 READER SECTION

Each LYNX contains a wide band time code reader. It will read all SMPTE and EBU code formats as well as 24 frame "film" code from 1/10 to 60x speed. The reader is also an integral part of the LYNX synchronizer.

5.1 READER DISPLAY

To access the reader display:

Pressthe DISPLAY key until the RDR (reader) light is lit. The numeric display will now indicates the incoming value, either time code, pilot tone, or tach.

Time code will automatically be displayed if there is valid time code present on the rear panel. If no code is present, the display will indicate either pilotone or tach pulse time.

When the LYNX is used as a synchronizer this code/time will generally come from the transport associated with the LYNX.

5.2 READER SOURCE INDICATORS

When in RDR mode, the source of code being displayed is indicated immediately to the left of the eight segment display. (See section 2.1.25 for a complete explanation of these indicator lights.)

5.3 RATE OF CODE INDICATORS

In Reader mode, the bank of lights immediately above the Code Type key, 30, DF, 25 and 24, indicate the frame rate of the code being read.

5.4 RESHAPED CODE / RESHAPED PILOT

See section 3.3 for selecting reshaped code or pilot output.

Reshaped Code is used for dubbing (copying) timecode directly from one machine to another. This code is identical to the code being read with the square wave edges restored to their original exactness.

However, any inconsistancies in the code such as wow and flutter will be passed down from the original to the copy, and in some cases the original may be poor enough that a reshaped copy cannot be used. If possible, it is advised to use the generator jam sync feature to copy code.

NOTE: It is important that you do not "dub" code directly from one transport to another without using the 'reshape' output or the generator jam-sync feature. Otherwise, the resulting code may be intermittent, or impossible to read.

6.0 SYNCHRONIZER SECTION

One primary function of the LYNX module is to synchronize a transport to another transport or to another code source. The synchronizer is totally dependent on the reader as its source of transport position information, so in order to synchronize or resolve the speed of a transport either time code or pilotone must be present at the reader input.

All synchronization tasks require that time code is present from both the Master and Slave transport. Be sure this connection is made from the LYNX to the appropriate transport before trying any synchronization operation.s

The LYNX module controls the search mode of the transport by using the transport's spooling motors, and achieves play-lock by controlling the capstan motor speed. This means that if a transport has an "external capstan" switch it must be in the "external position.

NOTE: The ability to synchronize a transport is ABSOLUTELY dependent upon selecting the correct transport at power up. Be sure to follow section 3.2 specifically so that the proper parameters are selected by the LYNX.

6.1 SYNCHRONIZATION OF TWO OR MORE TRANSPORTS WITH TIME CODE

See section 3.4

6.1.1 MASTER SELECTION

See section 2.1.19.

One Lynx module must be designated as the system master. To change masters, you must first deselect the present master then select a new master. Do this by touching the appropriate MSTR key.

6.1.2 MASTER REFERENCE

See section 2.1.17.

The master transport, and all the slaves in any system, can lock to one of four different speed references:

1) The internal crystal of the LYNX selected as master.
2) External video sync.
3) The power line frequency.
4) The master transport's own internal crystal. (in this position the master speed is not controlled by the LYNX module.)

In some instances, such as off-speed audio mixing, you will want the MASTER transport to run "wild" or on its own vari-speed control.

To make too the Lynx slaves follow that speed, the Lynx REF SRC selection should be put in the VSO position.

6.1.3 SYNCHRONIZATION WITHOUT AN OFFSET

This is the typical condition for multi-machine audio synchronization, in which the timecodes on multiple reels are identical. See section 3.4.

6.1.4.1 MANUAL OFFSET ENTRY

If the offset between two transports is known it can be manually entered using the display entry key pad. This will represent the difference in the timecode numbers when they are playing in "lock".

- Select the OFST position of the display.
- See section 3.6 for information on entering and storing the desired number in the OFST register.

And "offset" is always defined as:

```
  slave timecode
- master timecode
= number of frames of offset
```

In other words, a +1 hour offset would cause the slave's time code to be at 1 hour when the master's time code is at 0.

The offset represents the number of frames of difference in the two timecodes at the point that you are asking that they be synchronized. In the Lynx module, this is always displayed as a non-drop-frame timecode number.

NOTE: The offset of the master machine is, by definition, always 0.

NOTE: The display of offset entry values as +/- numbers will be supplied with software release 4.10.

6.1.4.2 AUTOMATIC OFFSET ENTRY/SYNC POINT SELECT

Since an offset value can be difficult to calculate by hand, the Lynx module has an automatic offset calculation feature called SYNC POINT.

The SYNC POINT feature reverses the above equation for time code offset. Instead of position being determined from an entered offset, it causes the offset to be determined from position.

Using the sync point feature, an offset value of any slave machine can be calculated automatically by marking the point of synchronism on the master, and the corresponding point of synchronism on the slaves. These points can be entered manually, or can be caught "on the fly" while machines are rolling. The resulting offset is computed, and automatically entered into the OFST display register when the sync point is stored.

MASTER TRANSPORT (set this first)

. Make sure the master is ONLINE and has its MASTER light on.

. Locate the sync point on the master transport.

. See section 2.1.6 for information on how to set a sync point.

SLAVE TRANSPORT

. Find the sync point on the slave transport.

. See section 2.1.6 for information on how to set a sync point.

. Repeat for all other slave transports.

Each LYNX module will automatically calculate its OFST value from the relationship between the master's sync point and its own sync point. This value can be seen by selecting the OFST display.

WARNING:

It is essential that a 'master' be assigned, and for its sync point to be set prior to assigning slave sync points.

NOTE: The sync point feature as described above can be used either when the transport is stopped or while it is moving, enabling a sync point to be captured "on the fly". Alternately, the sync points, if they are known ahead of time, can be entered manually by "storing" the known positions into the sync-point displays.

6.2 CODE ONLY MASTER SYNCHRONIZATION

6.2.1 CODE ONLY MASTER PRINCIPLES

The use of a synchronizer to cause a slave machine to chase and lock to an incoming source of timecode code is commonly referred to as 'code only master' operation.

This is different from locking a slave to a "master transport" because no master transport cable is used, and therefore tach and direction information cannot be used as a substitute for timecode in high speed wind because they are not available.

For this reason, a "code only master" must supply timecode at all times, even at wind speeds. This requires a wideband timecode playback amplifier and a defeat of tape lifter operation.

6.2.2 CODE ONLY MASTER APPLICATIONS

Code only master operation is used, typically, to cause an audio machine to slave to a video machine which has a wide-band timecode output available but is being already controlled from another source, such as a video editing computer.

It can also be used, in an emergency, to cause slave machines to chase a master where the master transport cable is broken, or none is available. Remember, however, that if the machine does not have "wideband" timecode available and the tape lifters are not defeated, the slave machines will stop as soon as timecode disappears. They will re-chase as soon as it reappears, such as when the machine is put back into "play" after fast wind.

Many machines, such as the OTARI MTR90 can be easily modified to supply wideband timecode from their standard playback electronics. Consult the machine instruction manual for details. Other machines, such as the Studer A800 comes supplied with a wideband timecode amplifier, dedicated to track 24 operation.

6.2.3 CODE ONLY MASTER SET-UP

See section 3.2.4

. Verify that code is present at "master" LYNX.

. Put the LYNX on line by touching the TRAN MODE key until the ON LINE light is lit.

. Touch the MASTER key.

. Touch reference source switch to put in "VSO" mode.

The master LYNX is now enabled. Now when any slave LYNX is put ONLINE it will chase and synchronizes to master time code.

6.3 SYCHRONIZING A VIDEO OR DIGITAL AUDIO TRANSPORT

The LYNX may be used to synchronize a video or digital audio transport. The procedure is essentially the same as synchronizing an analog audio or film transport except for the fact that a video sync reference must be supplied to both the LYNX and the transport being sychronized.

In this special case the transport is brought into lock, and then completely released to its own servo reference. At this time the transport may cause itself to re-frame. The lock/resolve lamps will stay lit under these conditions as long as the machine does not lose lock and stays within one frame of the correct position.

At this point the machine will 'self resolve' to the video sync reference it is receiving. This is the same video reference being supplied to the LYNX video reference input.

This common video sync signal allows the videotape frames and the audio frames to run at exactly the same rate after initial synchronization, holding the system in sync, while releasing the video machine's capstan and drum servos to their own internal control which is required for a stable picture.

Digital audio machines utilize the same type of operation, in that they require that the capstan servo be 'released' to their internal circuitry to allow correct internal clocking of the digital signals off the tape. Until lock is achieved, the digital audio outputs will typically be muted.

6.3.1 SET UP PROCEDURE (Video/Digital Audio)

Follow the same procedure as for sychronizing any transport as described in section 6.1. Be sure that LYNX has been initialized to the correct transport type after power-up.

Be sure to follow Sections 6.1.1 and 6.1.2 to establish a master and verify that all slaves are locked.

It is essential that the same source of video sync reference is connected to the video or digital audio transport and the LYNX which is "slaving" it. Be sure these connections are made before attempting to lock either video or digital audio transports.

7.0 USING THE LYNX AS A TRANSPORT SPEED RESOLVER

The LYNX can be used to resolve the speed of any audio transport using time code or pilotone already recorded on the tape.

To "resolve" a transport simply means to cause the transport to adjust its speed to cause the time code or pilot signal to run at precisely the same speed as the selected (master) reference source.

This feature can be used to allow jam-sync operation (see section 4.5), or for doing dubbing and transfers to other equipment which is running locked to the same reference source as the Lynx module. This is normally external video sync, but can be MAINS, which is sometimes used by film transfer equipment.

See section 2.1.17 for an explanation of the available reference source selections.

NOTE:
The pilot resolve feature will be supplied with software release 4.10.

The following table shows the various reference frequencies for different combinations of frame rates:

Code type	Frame Freq.	Pilot freq. expected	
30	30Hz	60Hz	
30-DF	30Hz	60Hz	
30 NTSC	29.97Hz	59.94Hz	
30-DF NTSC	29.97Hz	59.94Hz	
25	25Hz	50Hz	
24	24Hz	48Hz	* non-standard

NOTE: When using the LYNX as a resolver make sure the transport selection has been accomplished at power-up. See section 3.2 for an explanation of this procedure.

7.1 RESOLVING TRANSPORT SPEED TO TIME CODE

Make the transport a MASTER as described in section 2.1.19.

When the transport is manually put into "play" mode, the Lynx module will control the speed of the capstan until the incoming code speed is resolved.

When the transport is not in "play" the Lynx module will remember last speed at which resolve was achieved and run the capstan motor at that speed.

WARNING:

This may be slightly different than normal play speed. Be sure to take the Lynx module OFFLINE to restore the transport to its normal speed operation.

7.2 RESOLVING TRANSPORT SPEED TO PILOTTONE

NOTE: Pilotone operation will be supported in software release 4.10.

8.0 APPENDIX

8.1 TRANSPORT MENU

LYNX DISPLAY	TRANSPORT TYPE
atr-100	Ampex ATR 100, 102, 104
atr-124	Ampex ATR 124
atr-1200	Ampex MM 1100, 1200
8250-u	JVC 8250 Video Recorder
Otr10-1	Otari MTR10 series 1
Otr10-2	Otari MTR10 series 2
Otr12-1	Otari MTR12 series 1
Otr12-2	Otari MTR12 series 2
Otr-70	Otari MX-70
Otr90-1	Otari MTR90 series 1
Otr90-2	Otari MTR90 series 2
5050-3	Otari MX 5050 MARK 3
3324	Sony 3324 Digital Audio
JH24	Sony JH24, JH110
JH114	Sony JH114
BvU 800-P	Sony BVU 800 Video Recorder (parallel port control)
A80-v	Studer A80 voltage controlled
A800-3	Studer A-800 MARK 3
A810	Studer A-810
A820	Studer A-820
tasc-40	Tascam Series 40
tasc-50	Tascam Series 50

8.2 LIFTER MENU

(to be explained in software release 4.10)

8.3 ERROR MESSAGES EXPLAINED

no CodE

Occurs if a LYNX module is ONLINE in PLAY and code is not being received. This usually occurs if the code is not patched into the unit, or code runs out on the tape.

This error message helps to eliminate the simplest of the 'why doesn't it work' human errors. It is self-resetting, and turns off when code again is present.

CAPSTAn

Occurs if the LYNX module is ONLINE in PLAY mode, and you forgot to turn the capstan control on the machine to EXTERNAL, or the machine itself is inoperative.

This error will take the machine OFFLINE, and the CAPSTAn message will remain on the display until reset by hitting any key (CLR will do).

NOTE: The LYNX module is still functioning even though the error message is frozen on the display. This is intentional, so that if the machine comes offline due to a capstan error, the display will not reset before you may glance over at it. (i.e., "Why in the world did that machine go offline?," etc..)

no tAPE

Occurs if the LYNX module tries to move the position of the tape with no response from the transport. This will normally occur if the machine runs out of tape, but can also occur if the TRANSPORT CONTROL CABLE is not plugged in.

8.4 SYSTEM RESTRICTIONS

8.4.1 USE OF MIXED TIME CODES

It is not possible to sychronize time codes which have dissimilar frame rates. Both SMPTE 30 drop frame and 30 non drop frame time codes have the same 30 hertz frame rate so it is possible to synchronize tapes with these two disssimilar codes.

EBU 25 frame/second time code has a 25 hertz frame rate, while 24 frame film time code has a 24 hertz frame rate. Therefore, neither of these two code formats can be synchronized with one another or with either SMPTE code format.

8.4.2 48hz PILOT OUTPUT

The LYNX module generates standard pilot frequencies for 30, 30-DF, and EBU 25 frame timecodes.

It generates a non-standard 48hz frequency when generating 24fps film timecode, which is 2x the frame rate.

Standard 60Hz pilot can be resolved however. See section 7.0.

8.4.3 24-HOUR BOUNDRIES

The LYNX module will handle code operations which "wrap" around from 24 hours to 0 hours, which are running the same timecode type. However, it will not handle mixed time codes around 24 hour boundries, including 30 and 30-DF.

8.5 THINGS TO AVOID/PITFALLS

1. The system will not synchronize without a master selected.

2. When recording time code, remember that there can be crosstalk to adjacent tracks if recorded at high levels.

   A suggested recording level would be -5 Vu.

   On multi-track tapes track 24 is the industry accepted track.

3. The synchronizer will not lock codes with disimilar time bases, that is you cannot lock 30 frame code to 24 or 25 frame code. However, you may lock 30 frame and drop frame together because both code formats are bases on a 60 Hz clock. See section 8.4 System Restrictions for an explanation about mixed codes.

8.6 PROBLEM SOLVING

There are basically two things that will cause the unit to function incorrectly, especially in "chase" mode:

1. Bad tach source, caused by a bad transport cable.

2. No code source, caused by a bad patch, or running out of code.

Checking the code source:

- Look for the green LTC light when the transport is in "play".

- If the light is out or flickering the code is either not present or intermittently unreadable.

Checking the tach :

- Turn off the code signal and run the machine in PLAY at 30ips. The tach should count in real time, in the right direction.

- Try rewinding, making sure the direction changes correctly in the display.

- If the LYNX will not read tach you probably have a bad control cable or your transport is not properly transmitting tachometer and/or direction information.

Once the system has been set up, the LYNX module will sense the tape speed automatically and change the tach rate to the speed in use automatically after reading five seconds of code.

8.7 TIME CODE/USER BITS EXPLAINED

8.7.1 TIME CODE OVERVIEW

SMPTE, both drop and non-drop formats, EBU, and 24 frame film style codes are electronic signals which are printed onto tape and film as an audio signal. Each second of time is broken up into 30 frames for SMPTE code formats, 25 frames for EBU code and 24 frames for film style code. The code contains two frequency components, which for 30 frame code are 2400 / 4800 Hz.

Each frame is broken down into 80 bits. Each one of these bits or groups of bits supplies a time code reader with particular information, and the complete 80 bits as a whole supplies the reader with the start of frame information.

Of the 80 bits in each frame of time code, 32 are devoted to numerical time code information. These bits signify the Hours, Minutes, Seconds, and Frames of each frame of code.

Another 32 bits are spare bits which are always present, and which may or may not be used. These are normally referred to as the "user bits".

These "user bits" can contain non-changing numbers, such as dates, times, an operator or client number, etc. The "user bits" can also be caused to change every frame, allowing parallel time code to be contained in the "user bits" portion of the timecode as regular generator code is being created in the "time" bits.

The LYNX accomplishes this function in the JAM USER mode. (See section 4.5.4).

8.7.2 TIME CODE TYPES

There is only one format of EBU 25 frame and film 24 frame timecode, but there are two formats for SMPTE code, 30 and 30-DF code.

30 frame SMPTE code (also known as "non-drop" timecode) is recommended. This contains 30 frame numbers for every elapsed second of time.

When the LYNX generator is running at code-type 30, and the NTSC light is out, one hour of code time will equal one hour of time on a stopwatch.

Drop frame SMPTE code leaves certain frame numbers out of the code, so that one hour of code time will equal one hour of stopwatch time, when the code is moving at 29.97 frame per second. THis is the frame rate of color video signals.

The exact frames that are dropped are 00 and 01 at all minutes which are not multiples of ten.

SPMTE drop and non-drop code formats are not numerically identical and care should be taken to avoid mixing the two code formats if possible. The Lynx module will synchronize mixed formats, however. See section 8.4.1.

8.8 REAR PANEL CONNECTOR PIN DESIGNATIONS

Indexed by pin number

1. GROUND
2. Tran. gnd. sense
3. Stop [still] cmnd
4. Capst. freq collector
5. Capst. freq emitter
6. Lifter drop cmnd
7. Forward [dir] cmnd
8. Record tally
9. Reserved
10. Reserved
11. Reserved
12. Warning o/c out
13. Servo relay-A n/c
14. Servo relay-B COM
15. Servo relay-B n/o
16. Reserved
17. Reserved

18. +5v (5 ma max)
19. Rec-off cmnd +
20. Search cmnd +
21. 1k pullup to +5v
22. Reserved
23. Tran cmnd common
24. Rewind cmnd
25. Reserved
26. Tach direction sense
27. Reserved
28. Tran-ready o/c out
29. Servo relay-A n/o
30. Servo relay-A COM
31. Servo relay-B n/c
32. Reserved
33. Reserved

34. GROUND
35. Rec-off cmnd -
36. Search cmnd -
37. Play cmnd
38. Search volts out
39. Capst. volts out
40. Rec-on cmnd.
41. Reserved
42. Tach pulse in
43. Reserved
44. -12v (5 ma max)
45. +12v (5 ma max)
46. Mute relay n/o
47. Mute relay n/c
48. Mute relay com
49. Reserved
50. Reserved

Indexed by function

POWER AND GROUND

GROUND	1, 34
Tran. gnd. sense	2
+5v (5 ma max)	18
-12v (5 ma max)	44
+12v (5 ma max)	45

TRANSPORT LOGIC COMMANDS

Tran cmnd common	23	These command outputs are opto-isolator collectors, capable of 80v/30ma. Emitters are all tied to 'tran cmnd common'.
Stop [still] cmnd	3	
Rewind cmnd	24	
Forward [dir] cmnd	7	
Play cmnd	37	
Rec-on cmnd	40	
Lifter drop cmnd	6	
Rec-off cmnd -	35	These are opto-isolators which have both collectors and emitters available. Normally, the emitters would be connected to 'tran cmnd common'.
Rec-off cmnd +	19	
Search cmnd -	36	
Search cmnd +	20	

CAPSTAN CONTROL AND SEARCH OUTPUTS

Capst. freq collector	4	Opto-isolator output, pin 4 normally requires a pullup resistor to +5v, available on pin 21. These outputs are referenced to tran ground sense, pin 2.
Capst. freq emitter	5	
1k pullup to +5v	21	
Capst. volts out	39	
Search volts out	38	

MUTE AND SERVO RELAYS

Mute relay com	48	gray wire on cable pigtail
Mute relay n/c	47	violet wire on cable pigtail (open on mute)
Mute relay n/o	46	white wire or cable pigtail (closed on mute)
Servo relay-A COM	30	'A' and 'B' are the two poles of the same servo relay. This relay transfers control of servo speed to the LYNX module.
Servo relay-A n/c	13	
Servo relay-A n/o	29	
Servo relay-B COM	14	
Servo relay-B n/c	31	
Servo relay-B n/o	15	

TACH AND TALLY INPUTS

Tach pulse in	42	Max freq approx 250Khz.
Tach direction sense	26	
Record tally	8	

ANNUNCIATOR OUTPUTS

		RELEASE 4.10:
Warning o/c out	12	Indicates loss of sync.
Tran locked o/c out	28	Indicates locked.

8.9 CIRCUIT BOARD INTERFACE COMPONENTS BY FUNCTION

OPTOISOLATORS

STOP	U27	All H11-G2
PLAY	U26	(GE, Motorola, Siemens)
RW	U9	
FF	U10	
LIFTER	U18	
SEARCH	U26	
REC IN	U19	
REC OUT	U35	

RELAYS

MUTE	K1	Aromat DS2
SERVO ENA	K2	

TACH/DIRECTION INPUTS

TACH	U4 pin 5	LM-339
DIR	U4 pin 7	
REC tally	U4 pin 11	

ANALOG OUTPUTS

Search Volt	U25 pin 1	TL084
Capstan volt	U25 pin 14	

L-500-15
EPROM

DATE: December 29, 1987

SUBJECT: Lynx SAL software update, version L-409-6 (including operational changes contained in prior software versions).

Version L-409-6 software for the Lynx SAL module (released June, 1987) incorporates a number of operational changes which have been introduced since the last revision of the Operating Manual. This documentation summarizes the changes that directly affect the use the Lynx module which were introduced in software versions between L-409-0 (for which the Manual was written) and L-409-6 as well as documenting 409-6 itself.

ADDITIONAL TRANSPORT MENU SELECTIONS

Several additional machines have been added to the Transport Selection menu. The new menu choices include:

AE9-20	for AEG/Telefunken M-20 series audio recorders.
Juc-850	for parallel control of JVC's CR-850U, CR-600U and similar 3/4" U-matic VCRs.
Juc-8600	for JVC's BR-8600U, BR-7700U and similar 1/2" VHS recorders.
3324-d	a "tighter" lock setting for the Sony PCM-3324 digital recorder intended for digital track dubbing between 3324s. Applies a more stringent lock criterion before releasing the machine to self-resolve and thus has a longer lock-up time.
5850	for Sony's VO-5850 and VO-5800 3/4" U-matic VCRs. The interface cable for these machines includes a serial-to-parallel conversion circuit.
A-800-1	for the Studer A-800 Mark 1 multi-track with frequency input to the capstan servo (rather than voltage input).

A new Transport Menu listing to replace the old listing in Section 8.1 of your Operating Manual is attached to this software documentation.

IMPROVED SYNCPOINT OPERATIONS

Review of the SyncPoint function. Before detailing the changes in the SyncPoint operations, it may be worthwhile to review briefly the overall function of SyncPoints since many Lynx users continue to be confused about the distinction between Offsets and SyncPoints.

In a Lynx system, the contents of a Slave module's Offset register determines the position of that module's transport relative to the Master. (A Master cannot have an Offset.) The SyncPoint registers, on the other hand, provide a convenient way to automatically calculate a Slave's Offset by electronically marking a position on the Slave which is to be matched up to a similarly marked position on the Master. In other words:

The SyncPoint register causes Offset calculations.
The Offset register then controls the Slave's position.

When a value is entered into the SyncPoint register of a Slave module, the Slave module will get the SyncPoint value from the Master module, subtract the Master SyncPoint number from its own SyncPoint number, store the result in its Offset register, and re-sync to this new Offset value. If there is no SyncPoint set on the Master, all Slave modules with SyncPoints will wait until a SyncPoint is entered on the Master and then carry out the calculation just described. The same is true if the Master module has a SyncPoint but is not actually on-line as the Master.

Entering a new SyncPoint or trimming the value of the SyncPoint in a Slave module will cause an automatic recalculation of the Offset value for that one Slave (assuming that there is still a Master SyncPoint set).

Entering a new SyncPoint or changing (or clearing) an existing SyncPoint on the Master module will cause automatic recalculation of the Offset in **all** Slave modules which have a number in their SyncPoint register.

Clearing the SyncPoint register on a Slave module after the Offset has been calculated will retain the current, calculated Offset value and will prevent further automatic recalculations of the Offset. This can be particularly useful in a multi-machine situation because it allows the operator to perform a separate SyncPoint operation to set the Offset independently for each Slave machine. For example, once the operator has performed a SyncPoint operation to set the Offset for Slave #1, he can clear Slave 1's SyncPoint to prevent an undesired recalculation of its Offset while he sets the Offset for Slave #2 using a different SyncPoint on the Master.

More convenient SyncPoint entry. In software versions prior to 409-2, it was necessary to follow a very specific procedure for entering SyncPoints into the various modules in a Lynx system. This procedure, given in Section 2.1.4 of the Operating Manual, involved setting the Master's SyncPoint first, then setting the Slaves' SyncPoints while the Master was stopped. These restrictions no longer apply.

SyncPoints may now be entered in any order; i.e. Slaves' SyncPoints may be entered before the Master's SyncPoint.

SyncPoints may now be captured "on the fly" on Slaves as well as on the Master. The keystroke combination for capturing the current time code value as the SyncPoint (touching the SET/HOLD key while holding the SYNC POINT key) remains the same. As before, the display window will automatically show the SyncPoint value for approximately 2 seconds when a SyncPoint is captured.

If the Master is on-line and has a SyncPoint entered, the Slave will recalculate its Offset as soon as its SyncPoint is entered. Each Slave with a SyncPoint entered will automatically recalculate its Offset whenever a module with a SyncPoint entered is brought on-line as Master, or whenever the Master's SyncPoint is changed or cleared.

Clearing the SyncPoint register on a Slave module after the Offset has been calculated will prevent further automatic recalculations of the Offset without affecting the current, calculated Offset value.

SyncPoint Reminder indication. The SYNC PT light above the DISPLAY key will remain illuminated as long as there is a value stored in the SyncPoint register. (This is exactly analogous to the OFFSET light remaining lit whenever the Slave has an Offset

value entered.) This LED indication serves as a reminder that the module's Offset will be recalculated automatically if the Master's SyncPoint is changed.

SyncPoint Recalculation indication. Whenever a Slave's Offset is automatically recalculated because of a change in a SyncPoint, the Slave's SYNC PT light will flash and the display window will show the current SyncPoint value for approximately 2 seconds. (Remember that any Slave with a SyncPoint entered will automatically recalculate its Offset whenever a new or revised Master SyncPoint is entered as well as when a SyncPoint is entered for that specific Slave.) This flashing LED indication is intended as a reminder/warning that the Offset has just changed based on the operator's actions.

Automatic clearing of SyncPoint. The SyncPoint register in a Slave module will be cleared automatically whenever the Offset value is cleared or adjusted manually in the SET/HOLD mode. If the operator clears the Offset value, it is a very safe assumption that the SyncPoint which was used to calculate that Offset is no longer relevant and should also be cleared. Clearing the SyncPoint when the operator adjusts the Offset manually prevents the module from automatically performing a SyncPoint recalculation and thus undoing the operator's trim of the Offset value.

REVISED GENERATOR JAM INDICATION

When the time code generator in a Lynx module performs a Jam operation (either manual or automatic), the display window will fill with eight letter "J"s for approximately 1/4 second as a failsafe indication. This is most useful in the Automatic Jam mode, where the operator wants or needs to know when a code discontinuity causes a Jam operation, or if a Jam operation occurs unintentionally due to non-synchronous time code.

SLAVE RESOLVE OPERATION

Starting with software version L-409-2, the Slave Lock mode was changed so that once initial lock is achieved, the Slave reverts to a resolve-only mode. In this resolve-only mode, the Lynx Module will control the speed of the Slave so that its time code frame rate exactly matches the Master's, but the Lynx will not pay attention to whether the actual time code numbers continue to match. This allows the Slave to stay resolved to the Master's speed regardless of any discontinuities or jumps in the Master's time code.

When the Slave has locked to the Master, the Offset Error Display mode can show either the resolve error or the actual frame error if there has been a discontinuity in the Master time code. In the subframe display mode (SUB-F light illuminated) the module will display the resolve error, while the normal (non-subframe) display mode will show any numerical error caused by a jump in time code.

As an additional warning of a time code discontinuity, the RESOLVE light will flash to indicate that the Slave is still locked to the Master in a resolve-only mode, but is not in numeric frame lock any more.

This change to a resolve-only lock mode does not apply to "released" transports such as video machines and digital audio recorders since the Lynx Module releases these clocked transports to a self-resolve mode once lock is achieved rather than continuing to actively control their speed.

REVISED DEFAULT FOR CODE-ONLY MASTER MODE

The first time after power-up that a Lynx Module enters a code-only mode (i.e. receives time code but no transport tachometer signal) it will initialize to the VSO setting for the Reference Source. This is done because VSO Reference mode is the desired selection for use as a Code-Only Master in the vast majority of cases. (Unless VSO is selected in a Code-Only Master situation, the Slave modules will not lock to the actual running speed of the Master time code because they will assume that the Master transport is running resolved.)

This default initialization to VSO mode can, of course, be overridden by the operator at any time. One case where it is desirable to override the VSO default in a Code-Only situation is when using the Lynx Module to determine time code phasing as described below.

SUPPLEMENTARY SET-UP MENUS

Software versions starting with L-409-2 incorporate Supplementary Set-up menus for the Lynx SAL module. At present, two such menus are implemented, one to control the Lynx module's operation of the transport's tape lifters and the other to allow adjustment of the approach speed in locate or GoTo modes. These supplementary menus are separate and distinct from the main Transport Selection menu, and are accessed from the normal operating mode rather than the initial set-up mode.

Accessing the Supplementary Set-up Menus. Before accessing the supplementary menus the module should be properly initialized for the appropriate transport type.

From any normal operating mode, hold the SETUP key for approximately five seconds. The normal numerical display will disappear and will be replaced by the name and current value for the first Supplementary Set-up item.

The module will continue to operate normally while a supplementary menu is displayed; only the numeric display and the functions of the keys that have secondary, set-up mode functions change. The MENU key steps sequentially through the various Supplementary Set-up options, and the FORW and BACK keys increase and decrease the actual value for the displayed parameter.

Leaving the Supplementary Set-Up Menus. Once the desired values are set for each of the Supplementary Set-up options, the module may be returned to its normal operating display and key functions by holding the SETUP key for approximately five seconds, or until the normal time code or offset display returns to the numeric window.

If the Lynx Module is equipped with battery backed-up (non-volatile) memory, the settings of the Supplementary Set-up menu items will be retained along with the initial Transport menu selection when the module is powered down. When the transport selection is changed, however, the settings of all supplementary menu items will be initialized to their pre-programmed default values.

The Lifter Mode Option. The first Supplementary Set-up menu is the Lifter Mode option. To set the Lifter Mode, the display window should show "L IFt" along with one of three, three-digit numbers (000, 001, or 002); if it does not, use the MENU key to step through the set-up options until it does. Now the FORW and BACK keys may be used to select one of the three available lifter operating modes:

Mode 0 - Lifters never drop. In this mode, the Lynx Module sees only the tach signal from the transport in fast wind modes. See note below before using Mode 0.

Mode 1 - Lifters sometimes drop. The Lynx Module's lifter algorithm typically drops the lifters briefly as the transport approaches its park location to verify the true position from recorded time code. This allows the module to park the transport at precisely the right position for minimum lock-up time. This lifter mode was the only mode available in software versions prior to 409-2, and is the default mode whenever a module is initialized for a new transport.

Mode 2 - Lifters always dropped. This allows the Lynx module to read time code full-time at high speed (assuming that the transport has sufficiently wide audio bandwidth to reproduce time code at high speeds). This mode is particularly useful when spliced reels or other tapes with time code discontinuities are used.

The Lynx Module will continue to operate normally while the Lifter Mode menu is displayed so that the operator can try the various modes without having to exit and re-enter the Supplementary Set-up mode.

NOTE: The use of Mode 0 can potentially make lock-up times substantially slower than normal, because it prevents the module from verifying its exact position as it comes to a stop; consequently, the transport may not be parked at the right spot for optimum lock-up. For maximum performance, we highly recommend the use of Mode 1 for most applications, or Mode 2 when high-speed code reading is desired, or when there are any jumps in the recorded time code.

NOTE: If the high-level audio that may occur when a transport's lifters are dropped is a problem, the user is reminded of the Lynx Module's built-in MUTE RELAY. This single-pole, double-throw relay pulls in just before the module drops the transport's lifters and releases just after the module restores the lifters. The relay may be connected to any available auto-dim or auto-mute function in the user's audio console or monitoring system. (The Mute Relay should not be connected to any mute or dim function available in the transport itself, since these functions generally affect the transport's time code output along with its other audio outputs.)

The connections for the Mute Relay are available in the 6 inch stub cable at the Lynx Module end of TimeLine transport control cables. The pin-out for the Mute Relay function is:

White wire (pin 46):	Mute Relay Normally Open
Violet wire (pin 47):	Mute Relay Normally Closed
Grey wire (pin 48):	Mute Relay Common (swinger)

Search Speed Option. The second Supplementary Set-up menu is the Search Speed option, which allows the user to alter the pre-programmed search approach speed for optimum transport performance in certain operating conditions. For example, the default values for this parameter are generally optimized for 10-1/2" reels and may cause overshooting when fully-loaded 14" reels of tape are used on certain transports. In such a case, the user can adjust the Search Speed to achieve the fastest approach without overshoot.

To adjust the Search Speed, use the MENU key to step through the set-up options until "SPd" and a three-digit number appear in the display window. The three-digit number

represents the current value of the Search Speed parameter, which is normally the pre-programmed default value for the particular transport type selected in the Initial Set-up procedure. The operator may then use the FORW and BACK keys to increase or decrease the parameter value as necessary. Search Speed is adjustable in arbitrary units which are scaled from 050 to 200. The value you set will be retained in the module's non-volatile memory (if so equipped) until the module is re-initialized for a new transport type.

The Lynx Module will continue to operate normally while the Search Speed menu is displayed so that the operator can try different parameter values without having to exit and re-enter the Supplementary Set-up mode.

OTHER CHANGES, FIXES, AND IMPROVEMENTS

A number of users reported that the Lynx Module would sometimes fail to power up properly if switched off in the OFST ERR display mode. This has been corrected in 409-6.

When the Lynx Module is powered up, the individual LED indicators will now be extinguished rather than illuminated while the Sign-On Message is displayed.

If power to the module is interrupted before the machine selection process has been completed, the module will power back up in an uninitialized state with the first item in the Transport Selection menu flashing in the window. (Previously, it would wake back up selected to the transport that was in the window when power was interrupted.)

The possibility of noise on the RS-422 bus preventing the designation of one module as the Master has been eliminated.

A tendency for the Offset Error display to freeze when the module is reading wideband time code at high speed has been eliminated.

Lock-up time for transports with voltage-controlled capstan speed has been improved.

A tendency for certain "released" transports (video or digital audio recorders) to be released to self-resolve prior to 0 subframes of offset error has been eliminated. This was most frequently noted with the Sony PCM-3324.

When the offset of a "released" transport is manually slewed, the Lynx Module will now release the transport to self-resolve mode a second time after relocking with the new offset.

The lock criterion prior to release has been made more stringent for the Mitsubishi X-850 digital multitrack in the "850-d" (digital dubbing) menu setting. This setting now insures better than 0 subframe lock before release to maintain absolute phase alignment between tracks when doing individual track dubbing between X-850s.

A tendency for the Sony PCM-3324 to drop into Play mode when spooling forward has been eliminated.

A Sony/MCI JH-24 may now be operated as a Master at 7.5 i.p.s. This was previously ruled out because of the low tach rate with this machine at such a slow speed.

A relatively obscure error that affected the reading of tach pulses from a Studer A-820 in fast wind modes with 25 or 24 frame/second time code has been fixed. The Lynx Module

will correctly count tach pulses from the A-820 or any other machine to approximately 60x play speed at any frame rate.

DETERMINING TIME CODE PHASING WITH A LYNX MODULE

A useful design feature of the Lynx Module is its ability to display the phase of the incoming time code signal relative to the module's generator. This function can be used to determine whether the time code recorded on a video tape is synchronous with the video frames, or to check the rate and phase of an external source of time code.

A properly striped video tape will have longitudinal time code whose frame rate is precisely the same as the video frame rate, so that each time code word starts at the same point in each video frame. This will only be true if both the generator and the video recorder were properly locked to the same video clock source (such as a house sync generator) when the tape was striped.

Checking time code phasing of a video tape.

1. Make sure that both the video machine and the Lynx Module are properly connected to an appropriate video reference source, e.g. a house sync generator.

2. Select the appropriate mode for external sync reference on the video tape machine.

3. Select EXT VID as the generator reference on the Lynx Module (use the REF SRC key while the GEN light above the DSPL SEL key is lit)..

4. Connect the output of the time code channel on the video tape machine to the time code input (TC IN) of the Lynx Module.

5. Select the Offset Error display mode with the DSPL SEL key, and then select Subframe display with the SUBF key.

6. Touch the TRAN MODE key to light the ONLINE indicator, then touch the MASTER key to select the Lynx Module as the Master.

7. Play the videotape. If the Lynx Module is receiving only time code and not tach pulses from the transport (e.g. if the machine is not connected to the module with a transport control cable) it will default to VSO as the Master Reference. If this occurs, use the REF SEL key to select EXT VID as the reference.

8. With the videotape running, wait until the LOCK light comes on and then observe the Offset Error display on the Lynx Module. If the number in the display drifts in one direction or the other, re-check steps 1, 2, 3, and 7 above. If the set-up is correct and the number in the display continues to drift, the time code on the video tape was not properly recorded because it is not synchronous with the video. If the number displayed is stable, the time code on the video tape is synchronous with the video.

In most cases, the Lynx Module will show some non-zero number of subframes of offset error even when the time code recorded on the videotape is synchronous with the video frames. This "error" actually represents the difference between the start of the time code word and the start of the video frame for a particular videotape played on a particular machine. As long as the "error" is a small value, it need not be of concern since it will remain consistent for that tape and machine.

When synchronizing a video machine, the Lynx Module brings the machine into the proper relationship to the Master (zero offset error) and then releases the machine to self-resolve to the video sync signal. On release, the video machine re-frames itself (if neces-

sary) to be synchronized with the video sync reference signal, at which time the "offset error" appears. If the "offset error" for a given tape/machine combination is close to 50 subframes (1/2 frame), however, the video machine may not be consistent in whether it advances or retards to re-frame on release, thus causing an occasional real offset error of 1 frame. This problem may be prevented by entering a subframe offset equal to the displayed subframe offset error. An added benefit of this practice is that the Offset Error display will show zero offset error when the machine is locked up.

Checking phasing of an external time code source. A similar technique may be used to check the phasing of an external time code signal not associated with the transport connected to the Lynx Module.

1. Make sure that the Lynx Module is properly connected to an appropriate video reference source, e.g. a video sync generator.

2. Select EXT VID as the generator reference on the Lynx Module (use the REF SRC key while the GEN light above the DSPL SEL key is lit)..

3. Connect the external time code signal to the time code input (TC IN) of the Lynx Module. (If the module is connected to a transport, you will obviously have to disconnect the time code cable from the transport, but you do not need to disconnect the transport control cable.) Use the DSPL SEL key to select the RDR display mode and verify that the module is receiving the expected time code.

4. Touch the TRAN MODE key to light up the ONLINE indicator, then touch the MASTER key to select the Lynx Module as the Master. This will make the Lynx Module a code-only master since the module will not be receiving tach pulses from a transport. Since the module defaults to VSO mode in a code-only situation, use the REF SRC key to select EXT VID as the master reference source.

5. Select the Offset Error display mode with the DSPL SEL key, and then select Subframe display with the SUBF key.

6. Observe the Offset Error display on the Lynx Module. If the number in the display drifts in one direction or the other, the external time code is not locked to the video sync signal. A stable Offset Error display indicates that the external time code is synchronous with the video sync signal, with the number of subframes representing the phase difference between the external code and the Lynx's generated code (0 subframes indicates exact lock).

APPENDIX 1: TRANSPORT MENU

DISPLAY	TRANSPORT DESCRIPTION
AEG	
AEG-20	AEG/Telefunken M-20
AMPEX	
Atr-100	Ampex ATR 100, 102, 104
Atr-124	Ampex ATR 124
Atr-1200	Ampex MM 1100, 1200
uPr-3	Ampex VPR-3 1" VTR Ser. IF
uPr-6	Ampex VPR-6 1" VTR Ser. IF
uPr-80	Ampex VPR-80 1" VTR Ser. IF
AKAI	
dr-1200	Akai DR-1200 digital cart recorder
DENON	
dEn-3603	Denon DN-3603 RA
FOSTEX	
FoS-E16	Fostex E-series machines; E-8, E-16, E-2, E-22,
FoS-d20	D20 (R-DAT)
FoS-d20A*	D20 (R-DAT) (future)
FoS-d20d*	D20 (R-DAT) (future)
JVC	
J-610	JVC BR-S610 (S-VHS)
J-810	JVC BR-S810 (S-VHS)
J-850	JVC CR-850, CR-600
J-8250	JVC CR-8250, CR-6650
J-8600	JVC BR-8600, BR-7700U (US)
J-8600E	JVC BR-8600E, BR-770E (Euro)
3M	
79	3M M-79
MITSUBISHI	
850-A *	Mitsubishi X-850
850-d *	Mitsubishi X-50
880	Mitsubishi X-880 (future)
OTARI	
Otr10-1	Otari MTR10 series 1
Otr10-2	Otari MTR10 series 2
Otr12-1	Otari MTR12 series 1
Otr12-2	Otari MTR12 series 2
Otr20	Otari MTR20
Otr-55	Otari MX-55
Otr-70	Otari MX-70

DISPLAY	TRANSPORT DESCRIPTION
OTARI cont.	
Otr90-1	Otari MTR90 series 1
Otr90-2	Otari MTR90 series 2
5050-3	Otari MX 5050 MARK 3
SONY	
3324	Sony 3324 Digital Audio
3324-A *	Sony 3324 Digital Audio
3324-d *	Sony 3324 Digital Audio
3348	Sony 3348 Digital Audio
3348-A *	Sony 3348 Digital Audio
3348-d *	Sony 3348 Digital Audio
3402-A *	Sony 3402,3202
3402-d *	Sony 3402. 3202
S850	Sony VO-5850, VO-5800
APr-24	Sony APR-24
APr-5000	Sony APR-5000, 5003
BoU 800-P	Sony BVU 800 VTR (parallel)
boU800-S	Sony BVU 800 VTR Ser. IF
boU-950	Sony BVU-950 VTR Ser. IF
BUH-2000	Sony BVH-2000 1", Ser. IF
d4000-S	Sony dmr-4000 Ser. IF
JH24	Sony JH24, JH110
JH114	Sony JH114
STELLAVOX	
StEL-td9	Stellavox TD-9
STUDER	
A80-16	Studer A80, 16Hz tach
A80-18	Studer A80, 18Hz tach
A-800-1	Studer A800 MK I
A800-3	Studer A-800 MK III, MK IV
A807	Studer A-807 (1/2")
A810	Studer A-810
A812	Studer A-812
A820	Studer A-820 (small format)
A820-H	Studer A-820 MCH (512Hz tach)
A820-L	Studer A-820 MCH (32Hz tach)
TASCAM	
tASc-40	Tascam Series 40 (42,44,48)
tASc-50	Tascam Series 50 (52,58)
tASc-60	Tascam Series 60 (MS-16)

* The "A" position is the normal fully synchronized setting for the X850.

* The "d" position allows the slave machine to stay resolved to the master using the digital "word clock" on the dubbing connector. This is used for true digital dubbing between two X850 machines.